BID PACKAGE

SPENCER OWEN COMMUNITY SCHOOLS
BUS TRANSPORTATION COMPLEX

1441 FLATWOODS ROAD

SPENCER, INDIANA 47460

Prepared by:

THREE I DESIGN ENGINEERING + ARCHITECTURE

2425 WEST INDIANA ST | EVANSVILLE, IN 47712 | P: 812-423-6800 | F: 812-423-6814 | THREEIDESIGN.COM

June 13, 2024

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SECTION 00 11 00
INVITATION TO BIDDERS

Sealed bids will be received by Spencer-Owen Community Schools (herein referred to as the "School Corporation") at the Superintendent's Office, located at 205 East Hillside Ave, Spencer, Indiana 47460, until 1 PM EDT, local time, Thursday, July 18, 2024, for **Spencer Owen Bus Transportation Building** Project. The Work shall be Bid as one unified Prime Contract. Bids will be publicly opened and read aloud in the boardroom at the above time and place. Bids received later than such hour will be returned unopened.

Complete and detailed Drawings and Specifications for this work, including but not limited to the Instructions to Bidders, General Conditions, and General Requirements are on file and may be **examined** at the following places:

F.W. Dodge
2625 Hawthorne Avenue
Evansville, IN 47714

National Construction News
1133 West Mill Rd., Suite 107
Evansville, IN 47710

McGraw-Hill Construction Dodge
www.construction.com/dodge

CMD Group
www.cmdgroup.com

Construction Software Technologies (ISQFT)
www.isqft.com

Builders Exchange of Louisville, Inc.
2300 Meadow Drive #100
Louisville, Kentucky 40218-1372

Three-I Design
2425 W Indiana Street
Evansville, IN 47712

By appointment only:

Spencer-Owen Community Schools
205 East Hillside Street
Spencer, Indiana 47460

Copies of Plans and Specifications may be obtained by contacting **Repro Graphix**, **437 N. Illinois Street, Indianapolis, Indiana 46204, (317) 637-3377**, upon depositing the sum of **Three Hundred Dollars ($300.00)** for each set. Digital files will be made available for purchase for the non-refunable amount listed on the e-planroom. If paying by check, please make checks payable to Repro Graphix, Inc. The deposit will be refunded in full to the bidder when the physical copies of the Plans and Specifications have been returned to Repro Graphix within ten (10) days after the time set for receiving bids, in good re-usable condition. If the physical copies of the Plans and Specifications are returned after this ten (10) day limit, or in an unusable condition, the deposit shall be forfeited to cover the cost of reproduction. All mailing costs shall be paid by the bidder.

The successful bidder shall, upon acceptance of his bid, be required to procure and pay for a Contractor's Bond for Construction (Form 86A or AIA Form A312) in an amount equal to his contract price. Such bonds shall comply with all laws of the State of Indiana governing public contracts let by governmental units. Bids should be enclosed in a sealed envelope, addressed to the School Corporation, with the name and place of business of the bidder and the project name to which the bid relates on the envelope, all as more particularly set forth in the Instructions to Bidders. Bids submitted by mail should be addressed to Mr. Andy Cline, Superintendent, Spencer-Owen Community Schools, 205 East Hillside Street, Spencer, Indiana 47460. No Bids received by fax or email will be accepted.

Bids should be made on the form included in the Project Manual which is based on the Indiana State Board of Accounts Form 96 (Revised 2013), and shall be accompanied by an acceptable certified check, cashier's check, or bid bond, executed by the bidder and an acceptable surety company, payable to the order of the School Corporation, in an amount not less than five percent (5%) of the total bid.

In the event any bidder withdraws his bid or fails to execute a satisfactory contract or contracts and furnish a satisfactory performance bond or bonds within ten (10) days after a contract or contracts has been awarded to such bidder by the School Corporation, said School Corporation may declare his certified check or cashier's check or bid bond forfeited to said School Corporation as liquidated damages.

The School Corporation shall have the right:

to accept any Bid within sixty (60) days after the time of opening of the Bids, during which time no Bids shall be withdrawn;

at any time to reject any and all Bids; and

to waive all formalities or irregularities in the bidding.

Contractors will be required to complete their work within a certain specified period as provided in Section 01 11 00 of the specifications.

A Pre-bid meeting will be conducted at McCormicks Creek Elementary School located at 1601 W. Flatwoods Rd., Spencer, Indiana on Thursday, June 27, 2024, at 1 PM EDT (local time).

Dated: June 13, 2024

SPENCER-OWEN COMMUNITY SCHOOLS

END OF SECTION

SECTION 00 21 00
INSTRUCTIONS TO BIDDERS

1 General Instructions

1.1 Pre-Qualification Requirement with the Indiana Department of Public Works

A. As a result of House Bill 1019 (2015) and Senate Bill 375 (2016), effective January 1, 2017, Contractors bidding public works projects must be pre-qualified with the State Department of Public Works before beginning construction on projects. Contractors bidding this project must be pre-qualified at a minimum under one of the following: **1542.00A** Institutional Buildings (Hospitals, Schools, Prisons) in excess of $10,000,000; **1542.00B** Institutional Buildings (Hospitals, Schools, Prisons) in excess of $1,000,000. Please refer to each above listed Sections on the IDOA website for additional information.

1.2 Bids

A. Sealed bids for **Spencer Owen Bus Transportation Building Project** will be received by the Spencer-Owen Community Schools (herein referred to as the "School Corporation") at the time and place mentioned in the published legal Invitation to Bidders, at which time and place all bids will be opened and publicly read aloud. Bids received after the designated time will be returned unopened.

1.3 Drawings And Specifications

A. The work on this project shall be performed in accordance with the Drawings and Specifications as well as all other Contract Documents prepared by Three-I Design, 2425 W Indiana St, Evansville, IN 47712.

B. Drawings and Specifications for said projects are on file and may be examined at the following locations:

McGraw-Hill Construction Dodge
8900 Keystone Crossing, Suite 540,
Indianapolis, Indiana 46240
Phone: (317) 817-9110 / Fax: (317) 571-8201

Construct Connect
3825 Edwards Road, Suite 800
Cincinnati, OH 45209
Phone: 800-364-2059
https://www.constructconnect.com

BX Indiana / Construction League
1200 South Madison Avenue
Indianapolis, Indiana 46225
Phone: (317) 423-7080 / Fax: (317) 423-7094

By appointment only:

Spencer-Owen Community Schools
205 East Hillside Street
Spencer, Indiana 47460

C. Copies of the Drawings and Specifications may be obtained from Repro Graphix, 437 N. Illinois Street, Indianapolis, IN 46204, Phone: (317) 637-3377.

1.4 Contract Document Interpretation

A. Bidders requesting Drawing or Specification interpretation from the Architect during the bidding period should contact the following no later than 10 calendar days (July 8, 2024) prior to the date of receipt of Bids: Three-I Design; Lauren Wargel, Project Architect, Email: lwargel@threeidesign.com.

1.5 Preparation And Submission Of Bids

A. Bids shall be submitted on form included in the Project Manual which is based on the Indiana State Board of Accounts Form 96 (Revised 2013), prescribed by the Indiana State Board of Accounts (Bid Form).

1. Indication of Amounts:

a. Each bid shall have the amount written with ink or type-written in words and figures. Should there be any discrepancies between the words and figures indicating any amount in the bid, the amount written in words shall be taken as the correct amount.

b. Any bid may be rejected if it contains any alterations or erasures.

2. Requirements for Signing Bids:

a. Any bid not signed by the individual making same shall have attached to it a Power of Attorney evidencing authority to sign the bid in the name of the person for whom it is signed.

b. A bid signed for a partnership shall be signed by one of the partners, or by an attorney-in-fact. If signed by an attorney-in-fact, there shall be attached to the bid a power of attorney, evidencing authority to sign the bid, executed by the partners.

c. Bids which are submitted by a corporation shall have the correct name thereof and the signature of the president or other authorized officer of the corporation and secretary or an assistant secretary manually written below the corporate name following the word "by _____", and shall have affixed the corporate seal.

3. Bond:

    a. Each bid shall be accompanied by an acceptable certified check, cashier's check, or bid bond as provided in Acts 1969, Chapter 483, payable to the order of the School Corporation in an amount not less than five percent (5 percent) of the total bid.

    b. In the event any bidder withdraws his bid or fails to execute a satisfactory contract or contracts and furnish a satisfactory performance bond or bonds within ten (10) days after a contract or contracts has been awarded to such a bidder by the School Corporation, said School Corporation may declare his certified check, cashier's check, or bid bond forfeited to said School Corporation as liquidated damages.

4. Financial Statement:

    a. Each bid shall be accompanied by a Financial Statement.

5. Non-Collusion Affidavit:

    a. Each bidder shall furnish with his bid an affidavit that such bidder has not directly or indirectly entered into a combination, undertaking, collusion, or agreement with any other bidder or prospective bidder, or with any officer or members of the School Corporation which tends to or does lessen or destroy free competition in the letting of contracts sought for by these Instructions to Bidders.

6. Each bidder shall furnish with his bid their current Certificate of Qualification received from the Indiana Department of Administration.

7. Each bid shall be enclosed in a sealed opaque envelope, properly marked with the name and place of business of the bidder, and the Project name for which the bid is submitted.

B. Before submitting a proposal, each Bidder shall examine and follow the requirements of all Contract Documents, together with all addenda, pertaining to the Work. Each Bidder shall also visit the site and any existing building or structures to verify the conditions under which Work will be performed. Submission of bid will be considered presumptive evidence that the Bidder has made due allowances in his bid for all contingencies and has visited the site and is acquainted with: all existing conditions, required construction traffic routing for heavy loads, the local facilities, potential or known difficulties, the requirements of the Contract Documents and of pertinent State or Local Codes, and the present state of labor and material markets. The Bidder will not be entitled to additional compensation for any difficulties which the Bidder could have discovered or reasonably anticipated prior to bidding.

C. Bidders are required to inform themselves fully of the conditions relating to construction and labor under which the Work will be performed, and the Contractor must employ, so far as possible, such methods and means in carrying out the Work as will not cause any interruption or interference with any other Contractors, Subcontractors, or Sub-subcontractors.

D. If any person or entity contemplating submitting a bid for the proposed Work is in doubt as to the true meaning of any part of the plans, specifications, or other Contract Documents, the individual or entity must submit to the Architect a written statement for an interpretation thereof. The person or entity submitting the request shall be responsible for its prompt delivery. Any interpretation of the Contract Documents will be made by Addendum duly issued by the Architect. No information furnished to a Bidder shall be binding on the Architect or Owner unless confirmed by an Addendum. A copy of any such Addendum shall be emailed, mailed, or delivered (via hand delivery or facsimile transmission to a number or email address provided by the prospective bidder or other method which would reasonably provide for the prospective bidders' timely receipt of the Addendum) to each known person receiving a set of such Contract Documents, and to other prospective bidders that have requested to be furnished with a copy of such Addendum. Should Bidder's investigation of local codes or rules reveal stipulations contrary to requirements of these specifications, or should the Bidder be in doubt as to the intent of the meaning of the documents, the Bidder shall so advise the Architect, in writing, without delay. This clause is intended to ensure that each Bidder gives notice of any violation, conflicts, discrepancies, or ambiguities in ample time for the Architect to issue clarifications or corrections by means of a duly issued addendum.

E. Each Bidder shall include in his bid all costs of labor, materials, equipment, delivery, allowances, fees, permits (except as otherwise specified), applicable taxes, insurance, and contingencies with overhead and profit necessary to produce a complete building, structure, or project, or to complete those portions of the Work covered by the bid proposal made without further cost to the Owner.

1.6 Award Of Contract

A. When Award is Effectual: The contract shall be deemed to have been awarded when notice of award shall have been duly served upon the awardee (i.e., the bidder or bidders to whom the School Corporation contemplates awarding the contract or contracts) by some officer or agent of the School Corporation duly authorized to give such notice.

B. Withdrawal of Bids:

1. Any bidder may withdraw his bid at any time prior to the scheduled time for receipt and opening of bids.

2. No bid shall be withdrawn after the opening of bids without the consent of the School Corporation for sixty (60) days after said opening.

1.7 Rejection Of Bids

A. The School Corporation reserves the right to reject any and all bids and to waive any formalities in the bidding.

1.8 Subcontractors And Materials

A. A complete list of all proposed subcontractors, material suppliers, and material manufacturers for each and every item to be used to fulfill the contract requirements is to be submitted to the Architect for approval after receipt of construction bids from each low bidder so notified. Said list, upon approval, will be filed with the School Corporation and shall not be changed except by an approved Change Order.

B. The Architect and Owner's Representative will receive the complete subcontractor and materials list proposed by the Contractor by email no later than 1:00 p.m. on the day following the bidding. Said list shall be confirmed in writing within forty-eight (48) hours thereafter. If low bidders do not comply with same, Architect and School Corporation will consider the bid incomplete and may take any action required to obtain a complete and responsible bid.

1.9 Question And Answer Period (Pre-Bid Meeting)

A. **A Pre-bid meeting will be conducted at McCormick's Creek Elementary School located at 1601 W. Flatwoods Rd., Spencer, Indiana on Thursday, June 27, 2024, at 1 PM EDT (local time).** All bidders, both prime contractors and subcontractors, are urged to attend for the purpose of clarifying the meaning and intent of the Drawings and Specifications. Please report to the main entrance and check-in at the office of the Elementary School.

B. Minutes of the question and answer period and instructions and interpretations by the Architect and School Corporation will be distributed to all known bidders by email, mail or delivered (via hand delivery or facsimile transmission to a number provided by the prospective bidder or other method which would reasonably provide for the prospective bidders timely receipt of the minutes). Said minutes, instructions, and interpretations shall be a part of the Contract Documents and shall have the same force as if they were incorporated therein.

1.10 Site Visit

A. A walk-through of the site will be available immediately following the question and answer period.

B. In any case, prior to bidding, all Contractors bidding on this work shall be required to make a personal inspection of the existing building and area to verify the existing dimensions, conditions, materials, and that the bidder has included all of the requirements in his bid proposal to properly complete the work

C. All bidders visiting the site MUST sign in at the reception desk at the school site to obtain proper identification to allow access to the building or to review exterior conditions.

1.11 Indiana State Gross Retail And Use Tax

A. This statement shall apply to all Contractors bidding any division of work in anticipation of a direct contract with the School Corporation.

1. All bids shall be submitted without inclusion in the bid price for the amounts, if any, of Gross Retail and Use Tax as set forth in Indiana Code Title 6 (Taxation) Article 2.5 (State Gross Retail and Use Taxes), and due the State of Indiana for services performed or material furnished in connection with the work contemplated by the Bidding. This provision shall apply both to transactions between the School Corporation and the Contractor and to transactions between the Contractor and any subcontractor or supplier furnishing service or material to the Contractor. However, any tax on rented equipment and on material not incorporated in the work shall be paid by the Contractor if assessed by the State of Indiana and shall not be paid by the School Corporation.

2. The School Corporation shall pay the amount of such tax, if any, with the exceptions noted in Paragraph 1 above, in addition to the contract price. Such amounts of tax shall be separately itemized in all statements. The School Corporation shall have the right to contest the tax with the State of Indiana. The Contractor shall provide any exemption certificates permitted or required by such statute.

1.12 Material Or Equipment Substitutions

A. Contractors requesting the approval of proposed materials or equipment, other than those listed in the Specifications, must submit their request in writing with supporting technical data to the Architect not later than ten (10) working days prior to bidding.

B. Specific materials or products have been specified by the Architect to describe the effect or standard of quality desired. Wherever possible, and without prejudice to price, quality, or other considerations, local sources of labor, materials, and services shall be given preference. Generally, where the words "or equal" appear, a product of another manufacturer will be acceptable, but only if approved in writing by the Architect prior to bidding in accordance with the provisions stated in the Contract Documents and these Instructions to Bidders.

C. Any request for approval of a material or item of equipment as an equal substitution to that specified in the Contract Documents shall be accompanied by data adequate to establish such equality and include a list of several situations wherein the substituted material has been successfully used. The Contractor's request shall also furnish all warranties or guarantees as to the quality of the substituted items. Any item submitted as a substitute shall comply in all respects with the specifications and/or catalog descriptions of manufacturers of items or materials specified by name or catalog number. The Architect's decision as to equality or relative merit of a substitution shall be final.

D. As directed in these Bidding Instructions and prior to signing the Agreement between Owner and Contractor, the successful Bidder shall present a complete list of all materials, manufacturers and Subcontractors he proposes to use to the Architect for the Architect's or Owner's Representative's approval.

E. Voluntary Alternates: The Owner encourages the receipt of reasonable and valid voluntary alternates as a part of the bidding process. However, if a Bidder desires to propose a voluntary alternate, the Bidder must give prior written notice of the Bidder's intent to submit a voluntary alternate. Each proposed voluntary alternate will be evaluated as to its merits by the Architect and a recommendation will then be made to the Owner. The Owner will make the final decision as to acceptance or rejection of the voluntary alternate. The Owner may or may not read the voluntary alternates aloud at the bid opening and voluntary alternates shall not be used to determine the contractor selected.

1.13 Reference Standards

A. Reference to Standards: Where materials or devices are identified or requested in the Contract Documents by reference to Government, Manufacturer's Association or Professional Society Standards, the pertinent sections of the latest edition of such standards shall have the same force and effect as if set forth in full in the Contract Documents.

1.14 Non-Discrimination

A. Each Contractor, Subcontractor, and Sub-subcontractor is prohibited from discrimination in hiring or on any matter of employment. Submission of a bid on this Project is implied acceptance of the non-discrimination terms provided in the A201 General Conditions of the Contract for Construction (2017 Edition) and any supplements thereto.

1.15 Method Of Bidding

A. Each Contractor bidding on this work shall also include and incorporate within said bid all of the requirements and instructions set forth in the INSTRUCTIONS TO BIDDERS, GENERAL CONDITIONS, and GENERAL REQUIREMENTS, and further including all addenda to the bidding documents that are published prior to the hour on the date set forth for submitting bids.

B. If there are any alternates that exist in this Project Manual or the Contract Documents with respect to the scope of work covered by the specific contract or contracts bid upon by a Bidder, the Bidder MUST specifically identify each such alternate on Bid Form page 3 and state whether each applicable alternate increases, decreases, or results in no change (N/C) to the Bidder's base bid for the contract bid upon. If a Bidder identifies all applicable alternates for the contract bid upon by the Bidder on the Bid Form 3, but the Bidder fails to indicate whether a particular alternate increases, decreases, or results in no change to the Bidder's base bid, such alternate shall be deemed part of the Bidders' base bid at no charge. Similarly, if the Bidder fails to identify any applicable alternate on Bid Form 3, then each applicable alternate that is not identified shall be deemed part of the Bidder's base bid at no charge.

C. The work to be bid upon is as described below:

Contract			**SPECIFICATION**
No.	**Name**		**SECTION**
1	**Spencer Owen Bus Transportation Building Unified Bid**		All Drawings, Division 0, Division 1, and All Technical Sections of the Specifications contained in the Project Manual.

D. Schedule of Alternates: See Section 01 23 00 - Alternates, for additional information.

END OF SECTION

SUBSTITUTION REQUEST FORM

TO: _____

PROJECT: _____

We hereby submit for your consideration the following product instead of the specified item for the above project.

Section Paragraph Specified Item

_____ _____ _____

Proposed Substitution: _____

Attach complete technical data including laboratory tests if applicable.

Include complete information changes to the Drawings and/or Specifications which the proposed substitution will require for proper installation.

Fill in the blanks below. Use additional sheets if necessary:

A. Does the substitution affect the dimensions shown on the Drawings? _____

_____

B. Will the undersigned pay for changes to building design, including engineering and detailing costs caused by substitution, if any? _____

_____

C. What effect does the substitution have on other trades?_____

_____

D. Differences between the proposed substitution and specified item?_____

_____

E. Manufacturer's warranties of proposed and specified items are:

_____ Same _____Different (explain on attachment)

The undersigned states that the function, appearance, and quality are equivalent or superior to the specified item.

Submitted by:

_____
Signature

_____
Firm _____
Address: _____

_____
Telephone _____

For Use by Design Consultant

Accepted Accepted as Noted
Not Accepted Received too Late
By _____
Date _____
Remarks _____
_____

DOCUMENT 003100 - AVAILABLE PROJECT INFORMATION

PART 1 - GENERAL

1.1 GEOTECHNICAL DATA

A. Subsurface Investigation Information: The following Geotechnical Report titled "Report of Geotechnical Engineering Investigation – Spencer Owen Transportation, Spencer, Indiana", dated May 10, 2024 was prepared for the Owner by Patriot Engineering and Environmental, Inc. for use in design. The Geotechnical Report is not a part of the construction Contract Documents and is enclosed within this document for informational use only. The Architect/Engineer and Owners Representative did not assist in preparing the report and does not accept responsibility for its accuracy and offers no opinion on the report and therefore, disclaims any responsibility for its contents.

B. Structural design has been based on the report and assumes that existing soils are clean and can be compacted and will achieve the densities specified in the Earthwork Section.

1.2 EXISTING CONDITIONS

A. Bidders should visit the site and inform themselves of all existing conditions under which work is to be performed, structure of the ground, obstacles that may be encountered, location, and availability of utilities and facilities, and other relevant matters concerning the work to be done.

B. A site survey can be found within the Drawings. It is not, however, a part of the Construction Documents and is for informational use only. Information contained therein is not a warrant or guarantee by the Owner, Architect, Project Consultant or Owner’s Representative.

1.3 PERMIT APPLICATION

A. Contractor shall obtain and pay for all applicable state and local permits.

1.4 CRIMINAL HISTORY BACKGROUND INFORMATION

A. See attached Exhibit 1 regarding the requirements of Indiana Code Section 20-5-2-7(b)(4)(c) for background checks.

END OF DOCUMENT 003100

REPORT OF GEOTECHNICAL ENGINEERING EXPLORATION

SPENCER OWEN TRANSPORTATION
SPENCER, INDIANA

PREPARED FOR:

SPENCER OWEN COMMUNITY SCHOOLS
205 East Hillside Avenue
Spencer, Indiana 47460

Patriot Engineering and Environmental, Inc.
2006 South Yost Avenue
Bloomington, Indiana 47403

May 10, 2024

May 10, 2024

Mr. Scott Stenftenagel
The Stenftenagel Group, LLC
2602 Newton Street, Suite C
Jasper, Indiana 47546

Re: Report of Geotechnical Engineering Exploration
Spencer Owen Transportation
1441 Flatwood Road
Spencer, Indiana
Patriot Project No.: 24-0454-11G

Dear Scott:

Attached is the report of our geotechnical engineering exploration for the above referenced project. This exploration was completed in general accordance with our Proposal No. P24-0664-11G dated March 19, 2024.

This report includes graphic logs of six (6) soil borings drilled at the proposed project site. Also included in the report are the results of laboratory tests performed on samples obtained from the site, and geotechnical recommendations pertinent to the site development, foundation design, and construction.

We appreciate the opportunity to perform this geotechnical engineering exploration and are looking forward to working with you during the construction phase of the project. If you have any questions regarding this report or if we may be of any additional assistance regarding any geotechnical aspect of the project, please do not hesitate to contact our office.

Respectfully submitted,
Patriot Engineering and Environmental, Inc.

Ian Grafe, E.I.
Geotechnical Engineer

William D. Dubois, P.E.
Senior Principal Engineer

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REPORT OF GEOTECHNICAL ENGINEERING EXPLORATION

Spencer Owen Transportation
1441 Flatwood Road
Spencer, Indiana
Patriot Project No.: 24-0454-11G

1.0 INTRODUCTION

1.1 General

The Stenftenagel Group, LLC is planning the construction of a structure to be located at 1441 Flatwood Road in Spencer, Indiana. The results of our geotechnical engineering exploration for the project are presented in this report.

1.2 Purpose and Scope

The purpose of this exploration is to determine the general near surface and subsurface conditions within the project area and to develop the geotechnical engineering recommendations necessary for the design and construction of the proposed structure. This was achieved by drilling soil borings, and by conducting laboratory tests on samples taken from the borings. This report contains the results of our findings, geotechnical engineering interpretation of these results with respect to the available project information, and recommendations to aid in the design and construction of the proposed structure.

2.0 PROJECT INFORMATION

The proposed project is located at 1441 Flatwood Road in Spencer, Indiana. The project consists of a two (2)-story structure of slab-on-grade construction, approximately 9,700 square feet in plan dimension, with adjacent parking and roadway areas. Additionally, we understand that a storm-water management area will be associated with the project and located north of the structure.

No structural loading information is available to us at the time of this report. Therefore, we estimate that the proposed structure will have wall loads not exceeding 2,500 pounds per lineal feet (plf), isolated column loads not exceeding 80 kips, and that floor loads will not exceed 150 pounds per square foot (psf). Additionally, based on visual observations of the existing site, it is assumed that any grade raise fill to complete the construction of building pads, finished pavement subgrades, etc., will not exceed 2 feet above the existing ground surface.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Conditions

The project site is presently an agricultural field north of McCormick's Creek Elementary. The surrounding area is generally an area of residential development and agricultural fields. The topography in the area proposed for construction is generally flat.

3.2 General Subsurface Conditions

Our interpretation of the subsurface conditions is based upon six (6) soil borings drilled at the approximate locations shown on the Boring Location Map (Figure No. 2) in Appendix "A". All depths discussed below refer to depths below the existing ground surface. Based on the results of the soil borings completed at the site, the following subsurface profile is presented. A description of each general soil unit has been identified and is described below:

Topsoil – Topsoil, a surficial layer of material that is a blend of silts, sands, and clays, with varying amounts of organic matter, was encountered at the ground surface at the boring locations. The topsoil layer was about 8 inches thick in the borings.

Silty and/or Sandy Clay (CL) - The topsoil layer is generally underlain by brown to gray, slightly moist to very moist, medium stiff to hard, silty and/or sandy clay. The silty and/or sandy clay layers typically extend to depths of 18.5 to 23.5 feet below the existing ground surface. The natural moisture content of this material ranges from 16 to 29 percent (%). The silty and/or sandy clay layers have hand penetrometer values of 1.0 to 2.5 tons per square foot (tsf). Standard Penetration Test N-values (blow counts) in this material varied from 2 to 48 blows per foot (bpf).

Clayey Silt (ML-CL) - Below the silty and/or sandy clay layers, medium dense clayey silt was encountered from 18.5 to 23.5 feet below existing grade in Borings B-2 and B-3. Standard Penetration Test N-values in this clayey silt varied from 17 to 24 bpf.

Sand (SP-SM) – Below the silty and/or sandy clay and clayey silt layers, medium dense sand was encountered from 23.5 to the termination of the borings at 25 feet below existing grade. Standard Penetration Test N-values in this sand varied from 14 to 18 bpf.

The soil conditions described above are general, and some variations in the descriptions should be expected; for more specific information, please refer to the boring logs

presented in Appendix "A". It should be noted that the dashed stratification lines shown on the soil boring logs indicate approximate transitions between soil types. In-situ stratification changes could occur gradually or at different depths.

3.3 Field Infiltration Testing

Per the Client's request, we performed two (2) percolation tests at the site to get a general idea of the infiltration rates for the storm-water drainage system. The tests were conducted in Hand Auger Borings Perc Test-1 and Perc Test-2 at a depth of 5 and 2.5 feet below the existing pavement surface respectively. The soil encountered at the percolation test level was silty and/or sandy clay. The results of the field infiltration tests ranged from 0.012 to 0.018 inches per hour.

3.4 Groundwater Conditions

The term groundwater pertains to any water that percolates through the soil found on site. This includes any overland flow that permeates through a given depth of soil, perched water, and water that occurs below the "water table", a zone that remains saturated and water-bearing year-round.

Groundwater was observed during drilling in three (3) of the six (6) soil borings performed at the site at depths between 14 and 18 feet below the existing ground surface. Groundwater was not observed in the remaining borings during drilling. Immediately after the borings were completed and the augers were removed from the boreholes, groundwater was observed at depths between 10 and 12 feet below the existing ground surface in three (3) of the six (6) soil borings. The remaining borings were dry at the cave-in depths shown on the boring logs.

It should be recognized that fluctuations in the groundwater level should be expected over time due to variations in rainfall and other environmental or physical factors. ***The true static groundwater level can only be determined through observations made in cased holes over a long period of time, the installation of which was beyond the scope of this exploration.***

4.0 DESIGN RECOMMENDATIONS

4.1 Basis

Our recommendations are based on data presented in this report, which include soil borings, laboratory testing, and our experience with similar projects. Subsurface variations that may not be indicated by a dispersive exploratory boring program can exist on any site. If such variations or unexpected conditions are encountered during construction, or if the project information is incorrect or changed, we should be informed immediately since the validity of our recommendations may be affected.

4.2 Foundations

The proposed structure can be supported on spread footings bearing on the native undisturbed medium stiff to very stiff clays encountered at shallow depths or on new well-compacted and tested structural fill overlying the same. These footings should be proportioned using a net allowable soil bearing pressure not exceeding 2,000 pounds per square foot (psf) for column footings or 1,500 psf for wall (strip) footings. For proper performance at the recommended design bearing pressure, foundations must be constructed in compliance with the recommendations for footing excavation inspection that are discussed in Section 5.0 *"Construction Considerations"*.

We estimate that the total foundation settlement should not exceed approximately 1 inch and that differential settlement should not exceed about ¾ inch. Careful field control during construction is necessary to minimize the actual settlement that will occur.

In using the above net allowable soil bearing pressures, the weight of the foundation and backfill over the foundation need not be considered. Hence, only loads applied at or above the minimum finished grade adjacent to the footing need to be used for dimensioning the foundations. Each new foundation should be positioned so it does not induce significant pressure on adjacent foundations; otherwise the stress overlap must be considered in the design.

All exterior foundations and foundations in unheated areas should be located at a depth of at least 30 inches below final exterior grade for frost protection. However, interior foundations in heated areas can bear at depths of approximately 24 inches below the finished floor. We recommend that wall (strip) footings be at least 18 inches wide and column footings be at least 24 inches wide for bearing capacity considerations.

Positive drainage of surface water, including downspout discharge, should be maintained away from structure foundations to avoid wetting and weakening of the foundation soils both during construction and after construction is complete.

4.3 Floor Slabs

The near surface or shallow subgrade soils encountered within the proposed building footprint generally consist of medium stiff to stiff clays, which if properly prepared are suitable for floor slab support. ***Depending on the weather conditions at the time of construction, scarifying and drying and/or chemical modification (Refer to Section 5.4 "Chemical Modification Considerations") may be necessary to manage moisture contents in the clays in order to achieve the necessary subgrade soil support prior to the placement of floor slabs or any grade raise fill.***

We recommend that all floor slabs be designed as "floating", that is, fully ground supported and not structurally connected to walls or foundations. This is to minimize the possibility of cracking and displacement of the floor slabs because of differential movements between the slab and the foundation. Although the movements are estimated to be within the tolerable limits for the structural safety, such movements could be detrimental to the slabs if they were rigidly connected to the foundations. Additionally, we recommend that all slabs should be liberally jointed and designed with the appropriate reinforcement for the anticipated loading conditions.

The building floor slabs should be supported on a minimum 6 inch thick well-compacted granular base course (i.e. Indiana Department of Transportation (INDOT) No. 53 crushed stone) bearing on a suitably prepared subgrade (Refer to Section 5.0 *"Construction Considerations"*). The granular base course is expected to help distribute loads and equalize moisture conditions beneath the slab.

Provided that the recommendations above for floor slab design and construction are followed, a modulus of subgrade reaction, "K_{30}" value of 85 pounds per cubic inch (pci), is recommended for the design of ground supported floor slabs. It should be noted that the "K_{30}" modulus is based on a 30 inch diameter plate load empirical relationship.

4.4 Seismic Considerations

For structural design purposes, we recommend using a ***Site Classification of "C"*** as defined by the 2014 Indiana Building Code (modified 2012 International Building Code (IBC)). Furthermore, along with using a Site Classification of "C", we recommend the use

of the maximum considered spectral response acceleration and design spectral response acceleration coefficients provided in Table No. 1 below. Refer to Appendix "B" for *"Seismic Site Class Evaluation"* report summary.

Table No. 1: Seismic Design Spectral Response Acceleration Coefficients

Period (seconds)	Maximum Considered Spectral Response Acceleration Coefficient	Soil Factor	Design Spectral Response Acceleration Coefficient
0.2	S_S = 0.232 g	1.20	S_{DS} = 0.186 g
1.0	S_1 = 0.108 g	1.692	S_{D1} = 0.122 g

These values were obtained from the *"Earthquake Ground Motion Parameters"* program for seismic design, developed by the United States Geological Survey (USGS) Earthquake Hazard Program, utilizing latitude 39.2671° (degree) north and longitude 86.7043° (degree) west as the designation for identifying the location of the parcel. Other earthquake resistant design parameters should be applied consistent with the minimum requirements of the 2014 Indiana Building Code.

4.5 Pavements

The near surface or shallow subgrade soils encountered within the proposed pavement areas generally consist of medium stiff to stiff clays, which if properly prepared are suitable for pavement support. ***Depending on the weather conditions at the time of construction, scarifying and drying and/or chemical modification (Refer to Section 5.4 "Chemical Modification Considerations") may be necessary to manage moisture contents in the clays in order to achieve the necessary subgrade soil support prior to the placement of pavement sections or any grade raise fill.***

If construction is performed during a wet or cold period, the contractor will need to exercise care during the grading and fill placement activities in order to achieve the necessary subgrade soil support for the pavement section (Refer to Section 5.0 "Construction Considerations"). The base soil for the pavement section will need to be firm and dry. The subgrade should be sloped properly in order to provide good base drainage. To minimize the effects of groundwater or surface water conditions, the base

section for the pavement system should be sufficiently high above adjacent ditches and properly graded to provide pavement surface and pavement base drainage.

Based upon the near surface soils encountered in the borings, we recommend using a California Bearing Ratio (CBR) value of 3 for the design of flexible (hot mix asphalt (HMA)) pavement sections. For design of rigid (concrete) pavement sections, we recommend using a modulus of subgrade reaction value of 85 pounds per cubic inch (pci). It should be recognized though, that the recommended CBR and modulus of subgrade reaction values provided are based on empirical relationships only, and laboratory tests may determine higher allowable values.

4.6 Storm-Water Management Basin

The soils encountered in the area of the proposed storm-water management basin (Hand auger borings 1 and 2) consist of sandy and/or silty clays which extend to depths between 2.5 and 5 feet below the existing ground surface. The clays are considered relatively favorable for a retention basin, due to the estimated moderate permeability characteristics of the clays. Therefore, if a retention capacity is required for the detention pond, the pond may require the installation of a clay liner, and/or a synthetic liner if sands are encountered during excavation.

The soils encountered in our borings should be readily excavated using conventional earthwork equipment. ***Additionally, depending on the invert elevation of the proposed detention basin, sand layers and seams could be encountered which are expected to be free-flowing and will tend to readily cave and/or slough into excavations; therefore, over-excavation, benching and/or shoring should be expected in order to maintain the side slopes of the excavations.***

Depending on seasonal conditions and the invert elevation of the proposed detention basin, localized and sporadic groundwater infiltration should be expected to be encountered in the detention basin excavation (Refer to Section 5.5 *"Groundwater Considerations"*). Furthermore, it should also be noted that there may be the potential for encountering heaving of sand layers near the groundwater elevations during construction.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Site Preparation

All areas that will support foundations, floors, pavements, or newly placed structural fill must be properly prepared. All loose surficial soil or "topsoil" and other unsuitable materials must be removed. Unsuitable materials include frozen soil, relatively soft material, relatively wet soils, deleterious material, or soils that exhibit a high organic content.

Approximately eight (8) inches of loose surficial topsoil was encountered in the borings. The topsoil was measured at discrete locations as shown on the Boring Location Map (Figure No. 2) in Appendix "A". The topsoil thickness measured at the boring locations may or may not be representative of the overall average topsoil thickness at the site. Therefore, it is possible that the actual stripping depth could significantly vary from this data. The data presented should be viewed only as a guide to the minimum stripping depth that will be required to remove organic material at the surface. Additional field exploration by *Patriot* would be required to provide an accurate estimate of the stripping depth. This limited data indicates that a minimum stripping depth will be required to remove the organic material at the surface, followed by the potential for additional stripping and/or scarification and recompaction as may be required to achieve suitable subgrade support. ***Additionally, if saturated conditions exist with the surface soils, light tracked equipment could be required to avoid pushing organics deeper into the suitable subgrade soils.*** A *Patriot* representative should verify the stripping depth at the time grading operations occur.

Prior to construction of floor slabs, pavements or the placement of new structural fill, the exposed subgrade must be evaluated by a Patriot representative, which will include proofrolling of the subgrade. Proofrolling should consist of repeated passes of a loaded, pneumatic-tired vehicle such as a tandem-axle dump-truck or scraper. The proofrolling operations should be observed by a *Patriot* representative, and the proofrolling vehicle should be loaded as directed by *Patriot*. Any area found to rut, pump, or deflect excessively should be compacted in-place or, if necessary, undercut and replaced with structural fill, compacted as specified in Section 5.3 *"Structural Fill and Fill Placement Control"*.

Care must be exercised during grading and fill placement operations. ***The combination of heavy construction equipment traffic and excess surface moisture can cause pumping and deterioration of the near surface soils. The severity of this potential***

problem depends to a great extent on the weather conditions prevailing during construction. The contractor must exercise discretion when selecting equipment sizes and also make a concerted effort to control construction traffic and surface water while the subgrade soils are exposed. We recommend that heavy construction equipment (i.e. dump trucks, scrapers, etc.) be rerouted away from the building and pavement areas. If such problems do arise, the operations in the affected area should be halted and the *Patriot* representative contacted to evaluate the condition.

5.2 Foundation Excavations

Upon completion of the foundation excavations and prior to the placement of reinforcing steel, a *Patriot* representative should check the exposed subgrade to confirm that a bearing surface of adequate strength has been reached. Any localized soft soil zones encountered at the bearing elevations should be further excavated until adequate support soils are encountered. The cavity should be backfilled with structural fill as defined below, or the footing can be poured at the excavated depth. Structural fill used as backfill beneath footings should be limited to lean concrete, well-graded sand and gravel, or crushed stone placed and compacted in accordance with Section 5.3 *"Structural Fill and Fill Placement Control"*.

If it is necessary to support spread footings on structural fill, the fill pad must extend laterally a minimum distance beyond the edge of the footing. The minimum structural pad width would correspond with a point at which an imaginary line extending downward from the outside edge of the footing at a 1H:2V (horizontal: vertical) slope intersects the surface of the natural soils. For example, if the depth to the bottom of excavation is 4 feet below the bottom of the foundation, the excavation would need to extend laterally beyond the edge of the footing at least 2 feet, as shown in Illustration "A" found at the conclusion of this report.

Excavation slopes should be maintained within all requirements set-forth by the Occupational Safety and Health Standards (OSHA), but specifically Section 1926 Subpart "P" – *"Excavations"*. We recommend that any surcharge fill or heavy equipment be kept at least 5 feet away from the edge of the excavation.

Construction traffic on the exposed surface of the bearing soil will potentially cause some disturbance of the subgrade and consequently loss of bearing capacity. However, the degree of disturbance can be minimized by proper protection of the exposed surface.

5.3 Structural Fill and Fill Placement Control

Structural fill, defined as any fill which will support structural loads, should be clean and free of organic material, debris, deleterious materials, and frozen soils. Samples of the proposed fill materials should be tested prior to initiating the earthwork and backfilling operations to determine the classification, the natural and optimum moisture contents and maximum dry density and overall suitability as a structural fill. ***Structural fill should have a liquid limit less than 40 and a plasticity index less than 20.***

All structural fill beneath floor slabs, adjacent to foundations and over foundations, should be compacted to at least 95 percent (%) of its maximum Standard Proctor dry density (ASTM D-698). This minimum compaction requirement should be increased to 100 percent (%) of the maximum Standard Proctor dry density for fill supporting footings, provided these are designed as outlined Section 4.0 *"Design Recommendations"*.

Structural fill supporting, around and over utilities should be compacted to at least 95 percent (%) of its maximum Standard Proctor dry density (ASTM D-698) for utilities underlying structural areas (i.e. buildings, pavements, sidewalks, etc.). However, the minimum compaction requirement can be reduced for backfill around and over the utilities to 90 percent (%) of the maximum Standard Proctor dry density where utilities underlie greenbelt areas (i.e. grassy lawns, landscaping, etc.). It is recommended that a clean well-grade granular material be utilized as the bedding material, as well as the backfill material around and over the utility lines.

In cut areas, where pavement sections are planned, the upper 10 inches of subgrade should be scarified and compacted to a dry density of at least 100 percent (%) of the Standard Proctor maximum dry density (ASTM D-698). Any grade-raise fill placed within 1 foot of the base of the pavement section should also be compacted to at least 100 percent (%) of the Standard Proctor maximum dry density. This can be reduced to 95 percent (%) for structural fill placed more than 1 foot below the base of the pavement section.

To achieve the recommended compaction of the structural fill, we suggest that the fill be placed and compacted in layers not exceeding 8 inches in loose thickness (the loose lift thickness should be reduced to 6 inches when utilizing small hand compactors) and within the range of 2 percentage (%) points below or above the optimum moisture content value. All fill placement should be monitored by a *Patriot* representative. ***Each lift should be***

***tested for proper compaction at a frequency of at least one (1) test every 2,500 square feet (ft^2) per lift for the building areas, at least one (1) test every 10,000 square feet (ft^2) per lift for the parking and roadway areas, and at a frequency of at least one (1) test for every 50 lineal feet of utility installation*.**

5.4 Chemical Modification Considerations

The addition of lime or lime kiln dust (LKD) to clay soils of moderate to high plasticity generally results in the reduction of the plasticity properties of the soil, reduction in moisture holding capacity, swell reduction, and increased soil strength. Prior to the application of the lime or lime kiln dust (LKD), a number of representative samples of soils should be obtained from the final graded subgrade soils to determine the lime or lime kiln dust (LKD) reactivity and percentage (%) of lime or lime kiln dust (LKD) needed for modification of the soils (usually 5 to 8 percent (%)). A specialty contractor experienced in lime modification should apply and determine the rate at which hydrated lime or lime kiln dust (LKD) is mixed into the existing soils. Mixing depths of 12 to 18 inches is typical. A *Patriot* representative should monitor the mixing and compaction processes.

It should be noted that in areas where chemical modification of the natural subgrade soil is completed prior to the placement of grade raise fill and the grade raise fill is less than 18 inches in thickness, we recommend that any cohesive grade raise fill be modified similar to the natural subgrade. It has been our experience that untreated cohesive structural fill, in less than 18 inches in thickness, placed on top of chemically modified soil may become unstable over time due to excessive moisture accumulation. The underlying chemically modified soil may act as a barrier to natural water seepage into the soil profile, thereby trapping the water within the structural fill to the point of saturation.

5.5 Groundwater Considerations

Groundwater was observed during our field activities at depths between about 10 and 18 feet below the existing ground surface; which is expected to be below the anticipated foundation excavation depths, though the groundwater observations could potentially be within the anticipated storm-water management basin excavations and potentially within trench excavation depths for subsurface utilities. Therefore, groundwater infiltration should be expected into the storm-water management basins and subsurface utility excavations, and depending on seasonal conditions, localized and sporadic groundwater infiltration may occur into the building foundation excavations on this site.

Groundwater inflow into shallow excavations **above** the groundwater table is expected to be adequately controlled by conventional methods such as gravity drainage and/or pumping from sumps. More significant inflow can be expected in deeper excavations **below** the groundwater table requiring more aggressive dewatering techniques, such as well or wellpoint systems. For groundwater to have minimal effects on the construction, foundation excavations should be constructed and poured in the same day, if possible.

6.0 EXPLORATIONAL PROCEDURES

6.1 Field Work

A total of six (6) soil borings were drilled, sampled, and tested at the project site on April 23, 2024, at the approximate locations shown on the Boring Location Map (Figure No. 2) in Appendix "A". The depths that the soil borings were advanced to are shown on the Boring Logs in Appendix "A". All depths are given as feet below the existing ground surface.

The borings were advanced using 3¼ inch inside diameter hollow-stem augers. Samples were recovered in the undisturbed material below the bottom of the augers using the standard drive sample technique in accordance with ASTM D 1586-74. A 2 inch outside diameter by 1$^{3}/_{8}$ inch inside diameter split-spoon sampler was driven a total of 18 inches with the number of blows of a 140-pound hammer falling 30 inches recorded for each 6 inches of penetration. The sum of blows for the final 12 inches of penetration is the Standard Penetration Test result commonly referred to as the N-value (or blow-count). Split-spoon samples were recovered at 2.5 feet intervals, beginning at a depth of 1 foot below the existing surface grade, extending to a depth of 10 feet, and at 5 feet intervals thereafter to the termination of the boring.

Water levels were monitored at each borehole location during drilling and upon completion of the boring. The boreholes were backfilled with auger cuttings prior to demobilization for safety considerations.

Upon completion of the boring program, of the samples retrieved during drilling were returned to *Patriot*'s soil testing laboratory where they were visually examined and classified. A laboratory-generated log of each boring was prepared based upon the driller's field log, laboratory test results, and our visual examination. Test boring logs and a description of the classification system are included in Appendix "A" in this report.

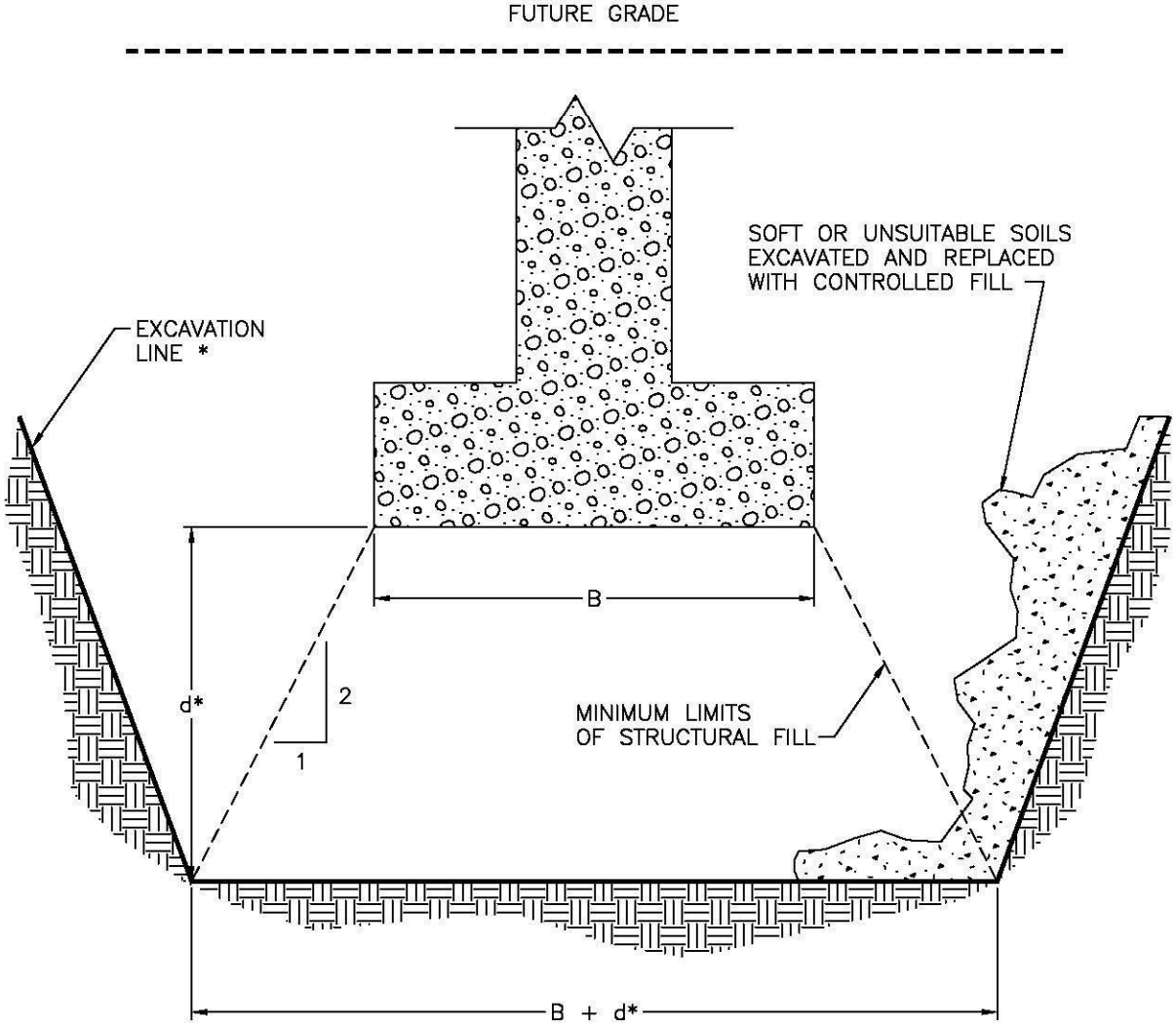
Indicated on each log are the primary strata encountered, the depth of each stratum change, the depth of each sample, the Standard Penetration Test results, groundwater conditions, and selected laboratory test data. The laboratory logs were prepared for each boring giving the appropriate sample data and the textural description and classification.

6.2 Laboratory Testing

Representative samples recovered in the borings were selected for testing in the laboratory to evaluate their physical properties and engineering characteristics. Laboratory analysis included natural moisture content determinations (ASTM D 2216) and an estimate of the cohesive soil strength was determined utilizing a hand penetrometer (q_p). The results of laboratory tests are summarized in Section 3.2 *"General Subsurface Conditions"*. Soil descriptions on the boring logs are in accordance with the Unified Soil Classification System (USCS).

7.0 ILLUSTRATIONS

See Illustrations "A" and "B" on the following pages. These illustrations are presented to further visually clarify several of the construction considerations presented in Section 5.2 *"Foundation Excavations"*.



*d IS DEPTH TO SUITABLE SOILS

* IN COMPLIANCE WITH OSHA STANDARDS

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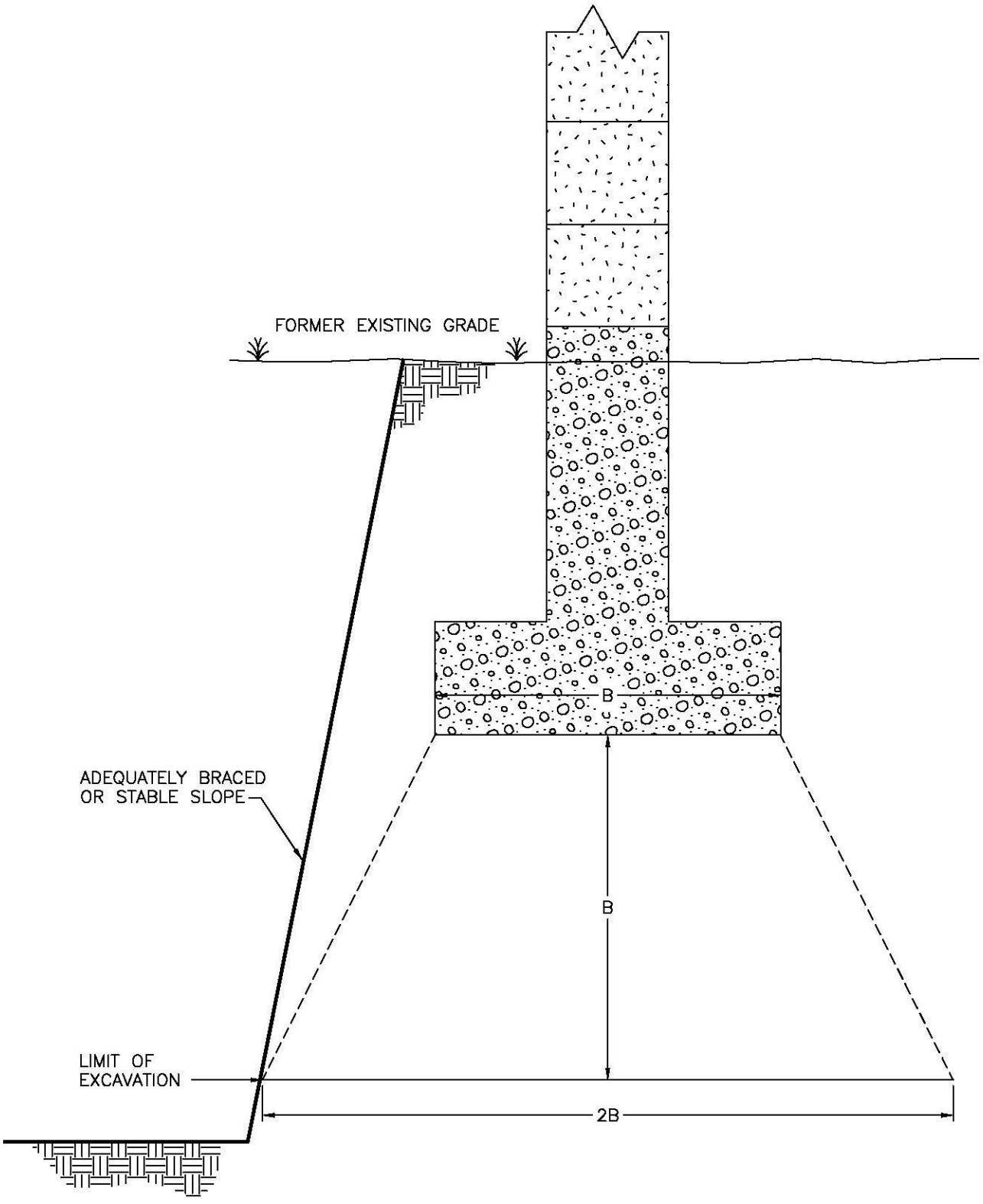
and Materials Engineers

Excavation for Footings In an Area of Fill
ILLUSTRATION A

job. no.:

figure:



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Excavation Near Existing In Use Foundations
ILLUSTRATION B

job. no.:

figure:

APPENDIX A

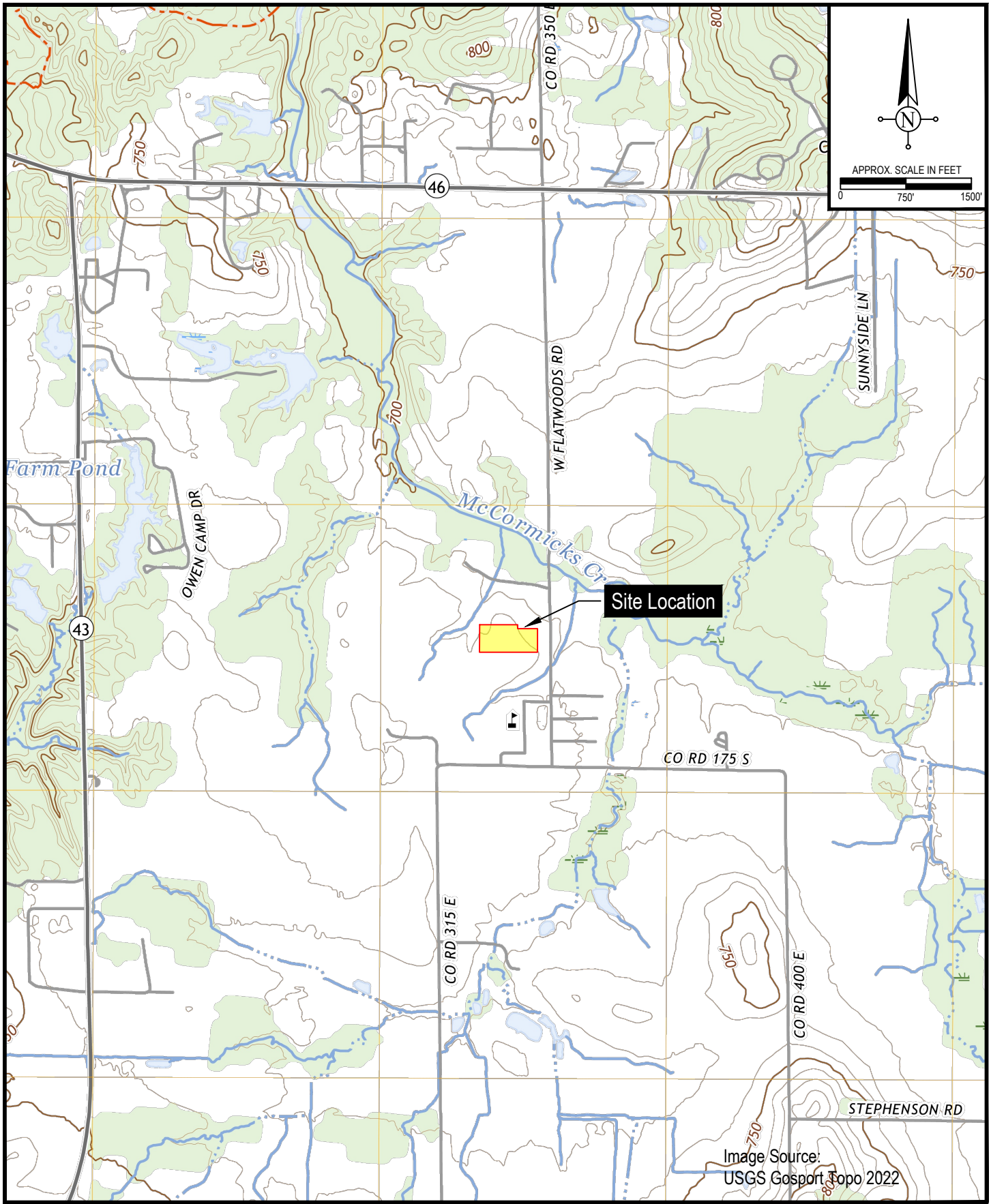
SITE VICINITY MAP (FIGURE NO. 1)

BORING LOCATION MAP (FIGURE NO. 2)

BORING LOGS

BORING LOG KEY

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

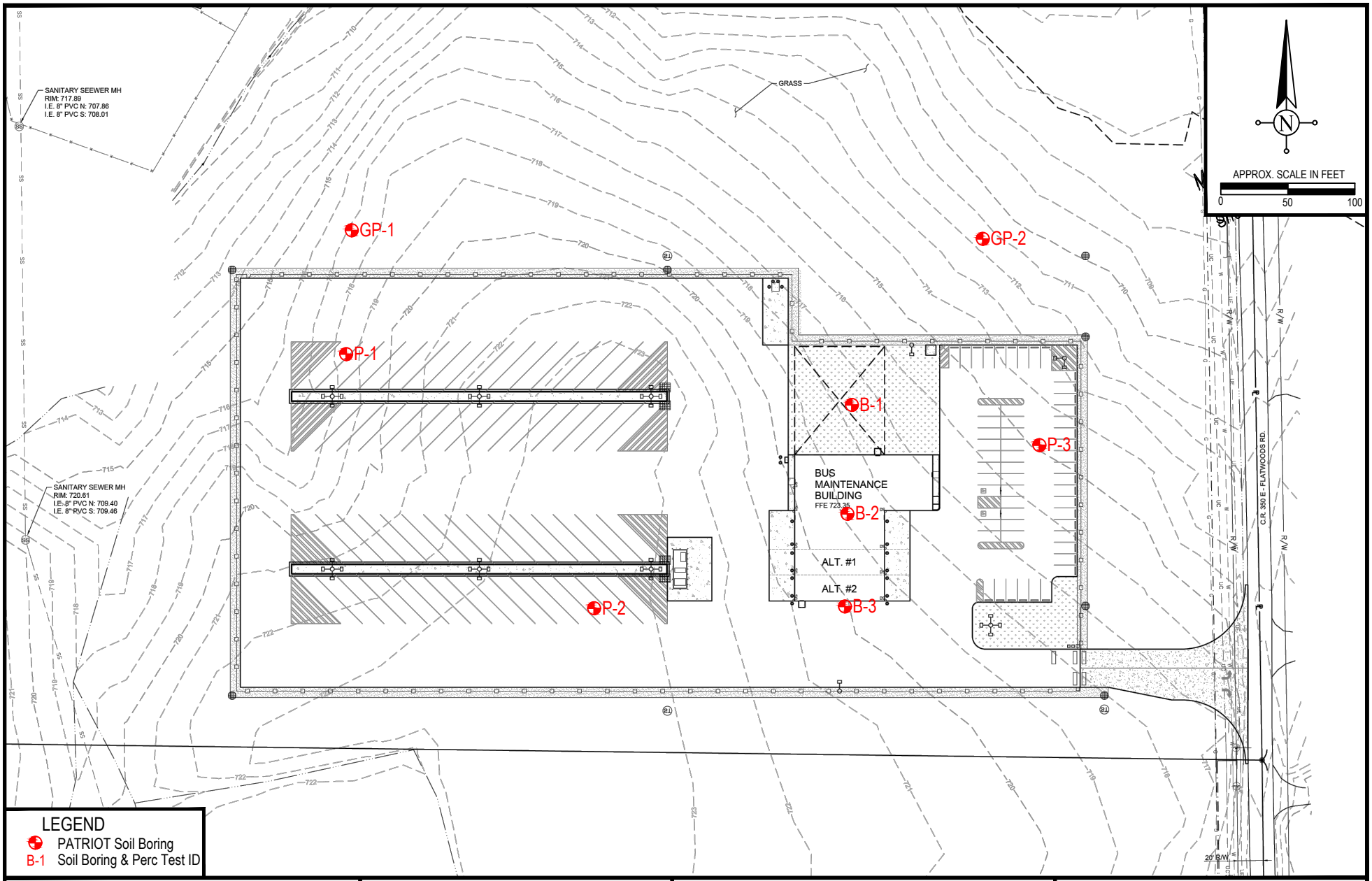


Patriot Engineering & Environmental, Inc.

Project: Spencer Owen Transportation Building 1441 Flatwood Road Spencer, Indiana	
	Drawn By: T. Humphreys
Project Number: 24-0454-11	Approved: I.Grafe
Date: 5/10/24	DWG: 24-0454-11_geo

Figure 1

Site Vicinity Map



LEGEND

PATRIOT Soil Boring

B-1 Soil Boring & Perc Test ID

Patriot Engineering & Environmental, Inc.

NOTES:

1. Boring locations were staked by PATRIOT. All locations are shown as approximate.
2. All locations were determined in the field with references to existing landmarks.
3. Image Source: Three i Design
4. Scale as shown.

Project: Spencer Owen Transportation Building
1441 Flatwood Road
Spencer, Indiana

	Drawn By: T. Humphreys
Project Number: 24-0454-11	Approved: I.Grafe
Date: 5/10/24	DWG: 24-0454-11_geo

Figure 2

Soil Boring Location Map

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LOG OF BORING B-1

Spencer Owen Transportation Building
1441 Flatwood Road
Spencer, Indiana

Client Name	: The Stenftenagel Group, LLC	Driller	: C. Leming
Project Number	: 24-0454-11G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- feet
Start Date	: 04/23/2024	Latitude	: 39°16'2.68"N
Drilling Method	: HSA	Longitude	: 86°42'16.14"W

Water Levels
- During Drilling - 14 feet
- After Completion - 11 feet
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 726	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL 8"						
	725				Brown and gray, moist, medium stiff to stiff, SILTY CLAY with little to some sand and trace gravel	1	100	2/2/3	1.4	22	
			CL			2	78	2/3/4	1.5	25	
5	720					3	100	4/5/9	2.5	20	
					Brown, moist, stiff, SILTY CLAY with little sand	4	78	3/5/7	1.4	20	
10	715	▽	CL								
		▼			Brown, moist, hard, SILTY CLAY with some sand and little gravel	5	78	9/21/17	1.8	18	Boring caved to 13 feet upon auger removal.
15	710		CL								
					Gray, moist, stiff, SILTY CLAY with trace sand	6	100	9/7/8	2.0	21	
20	705		CL								
			SP-SM		Gray, saturated, medium dense, fine to medium grained, SAND with trace silt	7	89	7/8/10			
25	700				Boring terminated at 25 feet.						
30											

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LOG OF BORING B-2

Spencer Owen Transportation Building
1441 Flatwood Road
Spencer, Indiana

Client Name	: The Stenftenagel Group, LLC	Driller	: C. Leming
Project Number	: 24-0454-11G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- feet
Start Date	: 04/23/2024	Latitude	: 39°16'2.08"N
Drilling Method	: HSA	Longitude	: 86°42'16.13"W

Water Levels
- During Drilling - 14 feet
- After Completion - 10 feet
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 726	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0	725				TOPSOIL 8"						
					Brown, mosit, medium stiff to stiff, SILTY CLAY with trace to little sand and trace gravel	1	100	3/4/4	1.3	19	
			CL			2	67	3/4/6	2.5	18	
5	720					3	100	4/5/7	2.0	21	
					Brown and gray, moist, medium stiff, SILTY CLAY with trace sand	4	100	3/3/4	1.3	21	
10	715	▽	CL								
		▼			Brown, moist, stiff, SILTY CLAY with little sand and trace gravel	5	67	5/5/9	1.0	20	
15	710		CL								Boring caved to 16 feet upon auger removal.
					Gray, saturated, medium dense, CLAYEY SILT	6	100	7/10/14		22	
20	705		ML-CL								
			SP-SM		Gray, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	7	100	7/7/10			
25	700				Boring terminated at 25 feet.						
30											

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LOG OF BORING B-3

Spencer Owen Transportation Building
1441 Flatwood Road
Spencer, Indiana

Client Name	: The Stenftenagel Group, LLC	Driller	: C. Leming
Project Number	: 24-0454-11G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- feet
Start Date	: 04/23/2024	Latitude	: 39°16'1.42"N
Drilling Method	: HSA	Longitude	: 86°42'16.17"W

Water Levels
- During Drilling - 18 feet
- After Completion - 12 feet
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 726	USCS	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0	725	CL	TOPSOIL 8" Brown, moist, stiff, SILTY CLAY with little SAND	1	100	3/4/5	1.3	24	
5	720	CL	Brown and gray, moist, stiff, SILTY CLAY with trace to little sand and trace gravel	2	100	3/4/5	2.5	21	
				3	100	3/4/7	2.2	18	
10	715			4	100	3/5/7	2.2	18	
15	710	CL	Brown, moist, medium stiff, SILTY CLAY with trace sand and trace gravel	5	100	3/3/5	1.4	16	Boring caved to 15 feet upon auger removal.
20	705	ML-CL	Gray, saturated, medium dense, CLAYEY SILT	6	0	3/7/10			Two attempts were made to obtain a splitspoon sample. Classification is based on field observations.
25	700	SP-SM	Gray, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	7	100	5/6/8			
30			Boring terminated at 25 feet.						

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LOG OF BORING P-1

Spencer Owen Transportation Building
1441 Flatwood Road
Spencer, Indiana

Client Name	: The Stenftenagel Group, LLC	Driller	: C. Leming
Project Number	: 24-0454-11G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- feet
Start Date	: 04/23/2024	Latitude	: 39°16'3.07"N
Drilling Method	: HSA	Longitude	: 86°42'19.91"W

Water Levels
▼ During Drilling - Dry
▽ After Completion - Dry
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 727	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL 8"						
	725		CL		Brown and gray, very moist, medium stiff to stiff, SILTY CLAY with trace to little sand and trace gravel	1	78	2/3/5	1.9	19	
5						2	100	2/4/5	1.7	18	Boring caved to 5 feet upon auger removal.
	720		CL		Gray and brown, moist, stiff, SILTY CLAY with trace sand and little gravel	3	100	5/4/5	1.8	20	
10			CL		Brown, moist, stiff, SILTY CLAY with some sand	4	89	3/4/5	1.3	23	
	715				Boring terminated at 10 feet.						Groundwater was not encountered during drilling, nor upon completion.
15											
	710										
20											
	705										
25											
	700										
30											

05-10-2024 C:\Users\lgrafe\Patriot Engineering\GEO - Documents\Mtech\2024 Mtech\0454-11G\P-1.bor

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LOG OF BORING P-2

Spencer Owen Transportation Building
1441 Flatwood Road
Spencer, Indiana

Client Name	: The Stenftenagel Group, LLC	Driller	: C. Leming
Project Number	: 24-0454-11G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- feet
Start Date	: 04/23/2024	Latitude	: 39°16'1.41"N
Drilling Method	: HSA	Longitude	: 86°42'18.38"W

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 728	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL 8"						
	725		CL		Brown and gray, moist, medium stiff to stiff, SILTY CLAY with little sand and trace gravel	1	100	2/2/3	2.0	18	Boring caved to 5 feet upon auger removal.
5						2	100	3/4/5	1.8	17	
	720		CL		Brown and black, moist, stiff, SILTY CLAY with little sand and trace gravel	3	100	3/5/7	2.4	20	
			CL		Brown and gray, moist, medium stiff, SILTY CLAY with trace sand and trace gravel	4	100	3/3/4	2.4	21	
10					Boring terminated at 10 feet.						Groundwater was not encountered during drilling, nor upon completion.
	715										
15											
	710										
20											
	705										
25											
	700										
30											

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PATRIOT ENGINEERING and Environmental Inc.
Indianapolis, Terre Haute, Evansville, Fort Wayne, Lafayette, Bloomington Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING P-3

Spencer Owen Transportation Building
1441 Flatwood Road
Spencer, Indiana

Client Name	: The Stenftenagel Group, LLC	Driller	: C. Leming
Project Number	: 24-0454-11G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- feet
Start Date	: 04/23/2024	Latitude	: 39°16'2.45"N
Drilling Method	: HSA	Longitude	: 86°42'14.30"W

Water Levels
▼ During Drilling - Dry
▽ After Completion - Dry
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet) 724	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					TOPSOIL 8"						
			CL		Brown and gray, moist, very soft to soft, SILTY CLAY with trace to little sand and trace gravel	1	56	1/2/2	1.5	25	
5	720					2	22	WOH/1/1	1.0	29	WOH - Weight of Hammer
			CL		Brown and gray, moist, stiff, SILTY CLAY with trace to little sand and trace gravel	3	78	3/5/6	2.0	20	Boring caved to 8 feet upon auger removal.
10	715					4	67	2/4/6	2.0	21	
					Boring terminated at 10 feet.						Groundwater was not encountered during drilling, nor upon completion.
15	710										
20	705										
25	700										
30	695										

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BORING LOG KEY

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
FIELD CLASSIFICATION SYSTEM
FOR SOIL EXPLORATION

NON-COHESIVE SOILS
(Silt, Sand, Gravel, and Combinations)

Density	Field Identification (SPT Blows/ft)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 51

Grain Size Terminology

Soil Fraction	Particle Size	US Standard Sieve Size
Boulders	> 12 inches	> 12 inches
Cobbles	3 - 12 inches	3 - 12 inches
Gravel: Coarse	¾ - 3 inches	¾ - 3 inches
Small	4.76 mm - ¾ inch	No. 4 - ¾ inches
Sand: Coarse	2.00 - 4.76 mm	No. 10 - No. 4
Medium	0.42 - 2.00 mm	No. 40 - No. 10
Fine	0.074 - 0.42 mm	No. 200 – No. 40
Silt	0.005 - 0.074 mm	< No. 200
Clay	< 0.005 mm	< No. 200

RELATIVE PROPORTIONS FOR SOILS

Descriptive Term	Percent
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

COHESIVE SOILS
(Clay, Silt and Combinations)

Consistency	Unconfined Compressive Strength (tons/ft^2)	Field Identification (SPT Blows/ft)
Very Soft	Less than 0.25	0 - 2
Soft	0.25 – < 0.5	3 - 4
Medium Stiff	0.5 - < 1.0	5 - 8
Stiff	1.0 - < 2.0	9 -15
Very Stiff	2.0 - < 4.0	16 - 30
Hard	Over 4.0	> 30

Classification: Provided on Boring Logs are made by visual inspection.

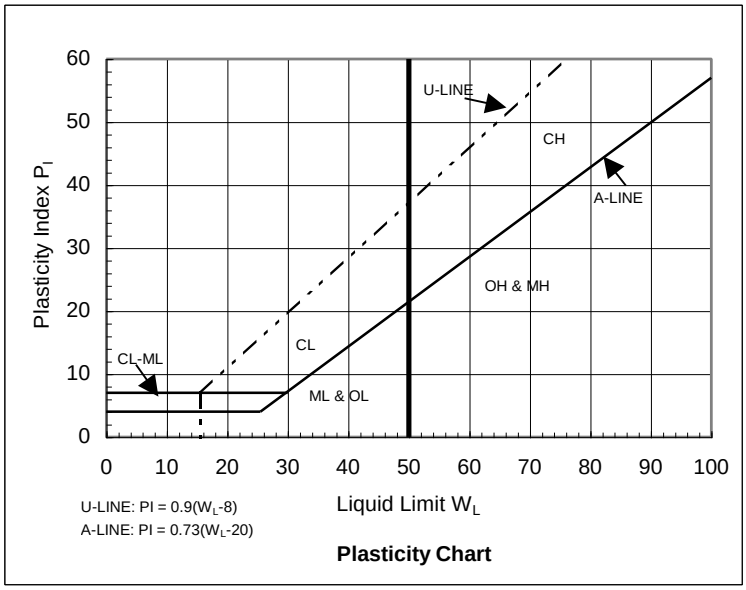
Standard Penetration Test: Driving a 2 inch outer-diameter (O.D.) by 1⅜ inch inner-diameter (I.D.) split-spoon sampler a total of 18 inches into undisturbed soil with the number of blows of a 140 pound hammer free-falling a distance of 30 inches recorded for each 6 inches of penetration. The sum of blows for the final 12 inches of penetration is the Standard Penetration Test result commonly referred to as the "N"-value (or blow-count).

Strata Changes: In the column "Descriptions" on the Boring Logs the horizontal lines represent strata changes. A solid line (———) represents an observed change, a dashed line (- - - - -) represents an estimated change.

Groundwater: Observations were made at the times indicated on the Boring Logs. Fluctuations in the groundwater level should be expected over time due to variations in rainfall and other environmental or physical factors. *Groundwater symbols*: (▼)-observed groundwater level and/or elevation during drilling; (∇)-observed groundwater level and/or elevation upon completion of boring.

Unified Soil Classification System (USCS)

Major Divisions			Group Symbol		Typical Names	Classification Criteria for Coarse-Grained Soils		
Coarse-grained soils (more than half of material is larger than No. 200)	Gravels (more than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	$C_U \geq 4$ $1 \leq C_C \leq 3$	$C_U = \frac{D_{60}}{D_{10}}$	$C_C = \frac{D^2_{30}}{D_{10} D_{60}}$
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW ($C_U < 4$ or $1 > C_C > 3$)		
		Gravels with fines (appreciable amount of fines)	GM	d/u	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below A line or $P_I < 4$	Above A line with $4 < P_I < 7$ are borderline cases requiring use of dual symbols	
			GC		Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above A line or $P_I > 7$		
	Sands (more than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_U \geq 6$ $1 \leq C_C \leq 3$	$C_U = \frac{D_{60}}{D_{10}}$	$C_C = \frac{(D_{30})^2}{D_{10} D_{60}}$
			SP		Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW ($C_U < 6$ or $1 > C_c > 3$)		
		Sands with fines (appreciable amount of fines)	SM	d/u	Silty sands, sand-silt mixtures	Atterberg limits below A line or $P_I < 4$	Limits plotting in hatched zone with $4 \leq P_I \leq 7$ are borderline cases requiring use of dual symbols	
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above A line with $P_I > 7$		
Fine-grained soils (more than half of material is smaller than No. 200)	Silt and clays (liquid limit <50)		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	1. Determine percentages of sand and gravel from grain size curve. 2. Depending on percentages of fines (fraction smaller than 200 sieve size), coarse-grained soils are classified as follows: Less than 5% - GW, GP, SW, SP More than 12% - GM, GC, SM, SC 5-12% - Borderline cases requiring dual symbols		
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL		Organic silts and organic silty clays of low plasticity			
	Silts and clays (liquid limit >50)		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH		Inorganic clays or high plasticity, fat clays			
			OH		Organic clays of medium to high plasticity, organic silts			
	Highly organic soils		PT		Peat and other highly organic soils			



Plasticity Chart

APPENDIX B

SEISMIC SITE CLASS EVALUATION

This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Hazards by Location

Search Information

Coordinates: 39.26713441502225, -86.70430671058959

Elevation: 725 ft

Timestamp: 2024-05-10T15:04:32.586Z

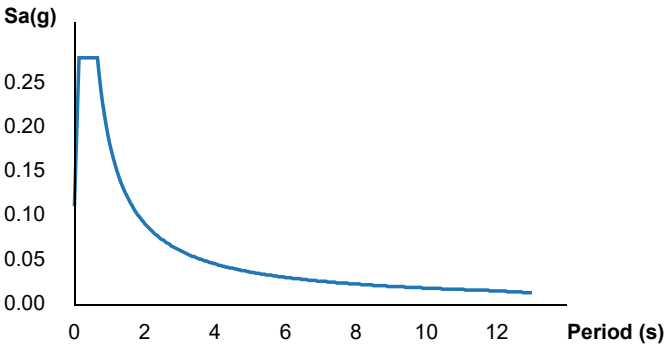
Hazard Type: Seismic

Reference Document: IBC-2012

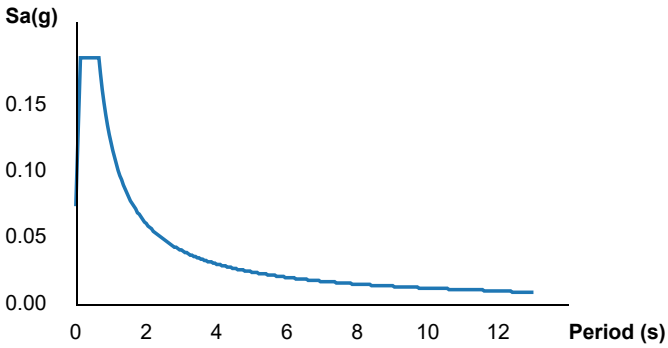
Risk Category: III

Site Class: C

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	0.232	MCE_R ground motion (period=0.2s)
S_1	0.108	MCE_R ground motion (period=1.0s)
S_{MS}	0.279	Site-modified spectral acceleration value
S_{M1}	0.182	Site-modified spectral acceleration value
S_{DS}	0.186	Numeric seismic design value at 0.2s SA
S_{D1}	0.122	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	B	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	1.692	Site amplification factor at 1.0s
CR_S	0.901	Coefficient of risk (0.2s)
CR_1	0.852	Coefficient of risk (1.0s)

PGA	0.112	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.134	Site modified peak ground acceleration
T_L	12	Long-period transition period (s)
SsRT	0.232	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.258	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.108	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.126	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.6	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

While the information presented on this website is believed to be correct, ATC and its sponsors and contributors assume no responsibility or liability for its accuracy. The material presented in the report should not be used or relied upon for any specific application without competent examination and verification of its accuracy, suitability and applicability by engineers or other licensed professionals. ATC does not intend that the use of this information replace the sound judgment of such competent professionals, having experience and knowledge in the field of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the results of the report provided by this website. Users of the information from this website assume all liability arising from such use. Use of the output of this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the report.

APPENDIX C

GENERAL QUALIFICATIONS

STANDARD CLAUSE FOR UNANTICIPATED SUBSURFACE CONDITIONS

GENERAL QUALIFICATIONS

of Patriot Engineering's Geotechnical Engineering Investigation

This report has been prepared at the request of our client for his use on this project. Our professional services have been performed, findings obtained, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report or on the test borings logs regarding vegetation types, odors or staining of soils, or other unusual conditions observed are strictly for the information of our client and the owner.

This report may not contain sufficient information for purposes of other parties or other uses. This company is not responsible for the independent conclusions, opinions or recommendations made by others based on the field and laboratory data presented in this report. Should there be any significant differences in structural arrangement, loading or location of the structure, our analysis should be reviewed.

The recommendations provided herein were developed from the information obtained in the test borings, which depict subsurface conditions only at specific locations. The analysis, conclusions, and recommendations contained in our report are based on site conditions as they existed at the time of our exploration. Subsurface conditions at other locations may differ from those occurring at the specific drill sites. The nature and extent of variations between borings may not become evident until the time of construction. If, after performing on-site observations during construction and noting the characteristics of any variation, substantially different subsurface conditions from those encountered during our explorations are observed or appear to be present beneath excavations, we must be advised promptly so that we can review these conditions and reconsider our recommendations where necessary.

If there is a substantial lapse of time between the submission of our report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, we urge that our report be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

We urge that Patriot be retained to review those portions of the plans and specifications that pertain to earthwork and foundations to determine whether they are consistent with our recommendations. In addition, we are available to observe construction, particularly the compaction of structural backfill and preparation of the foundations, and such other field observations as may be necessary.

In order to fairly consider changed or unexpected conditions that might arise during construction, we recommend the following verbiage (Standard Clause for Unanticipated Subsurface Conditions) be included in the project contract.

STANDARD CLAUSE FOR UNANTICIPATED SUBSURFACE CONDITIONS

"The owner has had a subsurface exploration performed by a soils consultant, the results of which are contained in the consultant's report. The consultant's report presents his conclusions on the subsurface conditions based on his interpretation of the data obtained in the exploration. The contractor acknowledges that he has reviewed the consultant's report and any addenda thereto, and that his bid for earthwork operations is based on the subsurface conditions as described in that report. It is recognized that a subsurface exploration may not disclose all conditions as they actually exist and further, conditions may change, particularly groundwater conditions, between the time of a subsurface exploration and the time of earthwork operations. In recognition of these facts, this clause is entered in the contract to provide a means of equitable additional compensation for the contractor if adverse unanticipated conditions are encountered and to provide a means of rebate to the owner if the conditions are more favorable than anticipated.

At any time during construction operations that the contractor encounters conditions that are different than those anticipated by the soils consultant's report, he shall immediately (within 24 hours) bring this fact to the owner's attention. If the owner's representative on the construction site observes subsurface conditions which are different than those anticipated by the consultant's report, he shall immediately (within 24 hours) bring this fact to the contractor's attention. Once a fact of unanticipated conditions has been brought to the attention of either the owner or the contractor, and the consultant has concurred, immediate negotiations will be undertaken between the owner and the contractor to arrive at a change in contract price for additional work or reduction in work because of the unanticipated conditions. The contract agrees that the following unit prices would apply for additional or reduced work under the contract. For changed conditions for which unit prices are not provided, the additional work shall be paid for on a time and materials basis."

Another example of a changed conditions clause can be found in paper No. 4035 by Robert F. Borg, published in ASCE Construction Division Journal, No. CO2, September 1964, page 37.

Form No. 96 (Revised 2013)

Bid Of

(Contractor Name)

(Address)

For
Public Works Projects Of

Spencer Owen Bus Transportation Building for Spencer-Owen Community Schools

Spencer, Indiana

Filed: _____ 2024

Action Taken: _____

_____

Form No. 96 (Revised 2013)

Contractors Bid For Public Works

Part 1

(To be completed for all bids) (Please type or print)

Date: _____

1. Owner's Name: Spencer-Owen Community Schools
2. County: _____
3. Bidder: (Firm): _____
   Address: _____
   City/State: _____
4. Telephone Number: _____
5. Facsimile Number: _____
6. Agent of Bidder:(If applicable) _____
7. Project Number: _____
8. Acknowledgment of Addenda: _____
   (Addenda Number(s))

Pursuant to notices given, the undersigned offers to furnish labor and material necessary to complete the construction work for the public works project, Spencer Owen Bus Transportation Building, in accordance with plans and specifications prepared by Three-I Design and dated **August 2024** for the sum of:

BASE BID: UNIFIED BID for Bus Transportation Building Project

_____ _____
(Words) (Numerals)

ALTERNATE BIDS

Refer to Section 01 23 00 – Alternates for descriptions and additional information. Enter the Alternate Number and for each Alternate Bid. Indicate net addition to or deduction from the Base Bid on the following page.

Alt. No.	Amount (Words)	Amount (Numerals)
1		
	Bay # 2 Building Addition	
2		
	Bay #3 Building Addition	
3		
	Emergency Generator	
4		
	Epoxy Floor Finish – (CORRIDOR #110, ELECTRICAL ROOM #111, JANITOR'S CLOSET #112, CORRIDOR #113, MEN'S RESTROOM #114, WOMEN'S RESTROOM #115, BREAK ROOM #116 AND PRINT ROOM #117)	
5		
	Epoxy Floor Finish – (STAIRS #118, PARTS ROOM #119, STORAGE/WORK ROOM #120 AND BAY #1 MAINTENANCE BAY #121)	
6		
	Epoxy Floor Finish – (BAY #2 MULTI-PURPOSE BAY #122)	
7		
	Epoxy Floor Finish – (BAY #3 WASH BAY #123)	
8		
	Main Entrance Drive Stabilization	
9		
	County Road Re-Build	

The Contractor and his subcontractors, if any, shall not discriminate against or intimidate any employee, or applicant for employment, to be employed in the performance of this contract, with respect to any matter directly or indirectly related to employment because of race, religion, color, sex, national origin, or ancestry. A breach of this covenant may be regarded as a material breach of the contract.

Certificate Of Use Of United States Steel Products

I, the Undersigned bidder or agent as a contractor on a public works project, understand my statutory obligation to use steel products made in the United States, I.C. 5-16-8-2. I hereby certify that I and all subcontractors employed by me for this project will use U.S. steel products on this project if awarded. I understand that violations hereunder may result in forfeiture of contractual payments.

Non-Collusion Affidavit

The undersigned bidder or agent, being duly sworn on oath, says that he has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to induce anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

He further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee, gift, commission or thing of value on account of such contract.

Oath And Affirmation

I affirm under the penalties of perjury that the foregoing facts and information are true and correct to the best of my knowledge and belief.

Dated at_____ this _____ day of _____, 2024

Attest:

_____
(Name of Organization)

By: _____
President

Acknowledgment

State of _____ **)**
)SS:
County of _____ **)**

_____ being duly sworn, deposes and says that he is

_____ of the above _____
(Title) (Name of Organization)

and that the statements contained in the foregoing bid, certification and affidavit are true and correct.

Subscribed and sworn to before me this ____ day of _____, 2024.

_____
Notary Public

My Commission Expires: _____

County of Residence: _____

Acceptance

The above bid is accepted this _____ day of _____, 2024, subject to the following conditions: _____

_____

Contracting Authority Members:

_____ _____

_____ _____

_____ _____

Part II

(Complete Sections I, II, III, and IV for all state and local public works projects as required by statutes if the project is one hundred thousand dollars ($100,000) or more. IC 36-1-12-4).

1. Owner's Name: Spencer-Owen Community Schools, Spencer, Indiana.
2. Bidder (Firm): _____
3. Date: _____

These statements to be submitted under oath by each bidder with and as a part of his bid. Attach additional pages for each section as needed.

Section I Experience Questionnaire

1. What public works projects has your organization completed for a period of one (1) year prior to date of the current bid?

Contract Amount	Class of Work	When Completed	Name and Address of Owner

2. What public works projects are now in the process of construction by your organization?

Contract Amount	Class of Work	When to be Completed	Name and Address of Owner

3. Have you ever failed to complete any work awarded to you? _ If so, where and why?

_____

_____

_____

_____

4. List references from private firms for which you have performed work.

_____

_____

_____

_____

Section II Plan and Equipment Questionnaire

1. Explain your plan or layout for performing the proposed work. (Examples could include a narrative of when you could begin work, complete the project, number of workers, etc., and any other information that you believe would enable the Owner to consider your bid.)

2. If you intend to sublet any portion of the work, state the name and address of each subcontractor, the equipment to be used by the subcontractor, and whether you expect to require a bond. However, if you are unable to currently provide a listing, please understand that a listing must be provided before contract approval.

3. Answer fully the following:
   3A.) Are the subcontractors and product manufacturers you will be entering into a contract with fully aware of the project schedule and required manpower and second shift work requirements?

   3B.) Will the subcontractors provide the required manpower and work the required hours to perform their work as per the project schedule?

   3C.) Will all of the product manufacturers provide and deliver the specified products to the site at the required times for proper installation, start-up, testing, etc…to adhere to the project schedule?

   3D.) Will the pre-engineered building manufacturer provide and deliver the specified complete pre-engineered building package to the site at the required times for proper installation to adhere to the project schedule?

4. Have you entered into contracts or received offers for all materials which substantiate within prices used in preparing your proposal? Otherwise, please explain the rationale used which would corroborate the prices listed.

5. Will you provide and sustain the proper manpower at all times to maintain and adhere to the construction timeline AND work overtime, weekends, holidays, second shifts, etc….all with the proper manpower at no additional costs to maintain the project schedule?

6. Are you aware that the Owner may withhold payment from the contractor for not performing as per Contract Documents?

7. Are you aware of the Monetary Damages as indicated in the Contract Documents?

Section III Contractor's Financial Statement

Attachment of the bidders' financial statement is mandatory. Any bid submitted without said financial statement as required by statute shall thereby be rendered invalid. The financial statement provided hereunder to the governing body awarding the contract must be specific enough in detail so that said governing body can make a proper determination of the bidders' capability for completing the project if awarded.

Section IV Oath And Affirmation

I hereby affirm under the penalties of perjury that the facts and information contained in the foregoing bid for public works are true and correct to the best of my knowledge and belief.

Dated at _____ this _____ day of _____, 2024

Attest: _____
(Name of Organization)

By: _____
President

Acknowledgment

State of _____ **)**
)SS:
County of _____ **)**

_____ being duly sworn, deposes and says that he is

_____ of the above _____
(Title) (Name of Organization)

and that the answers to the questions in the foregoing questionnaires and all statements therein contained are true and correct.

SUBCONTRACTORS
AND
SUPPLIERS LIST

DESCRIPTION

The apparent low bidder and second low bidder for each Contract shall provide one (1) copy of this list in accordance with the Instructions to Bidders. Complete the blanks appropriated to the work on which you have bid.

The Owner and Architect shall choose the Subcontractor or Product's Manufacturer or Supplier for any item where the Bidder leaves a blank, lists more than one name, or lists "as specified" for the item in question.

After submission of this list by the Bidder and after approval by the Architect and Owner, it shall not be changed unless written approval of the change is authorized and is accompanied by a notarized release from the originally named Subcontractor or Product's Manufacturer or Supplier.

Name of Bidder: _____

The Subcontractors and Suppliers List (Document 000410) shall be submitted to the Architect no later than twenty-four (24) hours after the Receipt of Bids. The document shall be emailed to the office of the Architect and Owner's Representative.

Bidder's Signature: _____Date:_____

DESCRIPTION	SUBCONTRACTOR (Installer)	PRODUCT (Manufacturer or Supplier)
Earthwork Contractor		
Site Utility Contractor		
Storm Structure Manufacturer		
Asphalt Contractor		
Fencing Contractor		
Crushed Stone Supplier		
Pre-Engineered Building Manufacturer		
Pre-Engineered Building Installer		
Concrete		
Masonry Contractor		
Brick Manufacturer		
CMU Manufacturer		

	SUBCONTRACTOR	PRODUCT
	(Installer)	(Manufacturer or Supplier)
Concrete Hollow Core		
Structural Steel		
Metal Railings		
Suspended Ceilings		
Doors and Hardware		
Sectional Overhead Doors		
Aluminum Doors and Storefront System		
Aluminum Window Units		
Pass-Through Window Unit		
Glazing		
Walk-Off Tile		
Casework - Countertops		
Toilet Accessories		
Light Gage Metal Framing and Gypsum Board		
Painting Contractor		
Epoxy Floor Finish		
LVT Covering and Wall Base		
Window Shades		
Electrical Contractor		
Electrical Panel Boards		
Electrical Devices Switches, Outlets		
Electrical Lighting Fixtures		
Fire Alarm System and Devices		

	SUBCONTRACTOR	PRODUCT
	(Installer)	(Manufacturer or Supplier)
Technology Contractor – Voice/Data		
Security Card Access Contractor		
HVAC Contractor		
Wet Pipe Sprinkler Contractor		
Exhaust Fans		
Diffusers and Grills		
Ductwork		
Ductwork Insulation		
Test and Balance		
HVAC Controls		
Plumbing Contractor		
Radiant Heat Installing Contractor		
Plumbing Fixtures and Carriers		
Floor Drains		
Trench Drains		
Domestic and Bldg. Hot Water Pipe Insulation		
Split System Air Conditioner		
Condensing Boilers		
Radiant Heating Units		
Hydronic Pumps		
Packaged Outdoor Central Station AHU		
Domestic Water Piping		
Drinking Fountains		

E-Verify Compliance Form

Spencer Owen Community Schools is now required to obtain the following affidavit before we can employ your business to provide contracted services to the school corporation. Please attest below that you qualify all your new hires employed after July 1, 2011 and new hires of any subcontractors through the E-Verify Program as required by Indiana Code.

E-Verify Compliance Requirement: Pursuant to I.C. 22-5-1.7, Contractor shall enroll in and verify the work eligibility status of all newly hired employees of Contractor through the E-Verify Program (Program). Contractor is not required to verify the work eligibility status of all newly hired employees through the Program if the Program no longer exists. Also pursuant to I.C. 22-5-1.7, Contractor must execute an **affidavit** affirming that the Contractor does not knowingly employ an unauthorized alien *and* shall be filed with the School Corporation prior to the execution of contracted services. **A contract for services shall not be deemed fully executed until such affidavit is delivered to the School Corp**.

Contractor and its subcontractors shall not knowingly employ or contract with an unauthorized alien or retain an employee or contract with a person that contractor or its subcontractor subsequently learns is an unauthorized alien. If Contractor violates this provision School Corporation shall require Contractor to remedy the violation not later than thirty (30) days after School Corporation notifies Contractor. If Contractor fails to remedy the violation within the thirty (30) day period, School Corporation shall terminate the contract for breach of contract. If School Corporation terminates the contract, Contractor shall be liable to School Corporation for actual damages in addition to any other contractual remedies. There is a rebuttable presumption that Contractor did not knowingly employ an unauthorized alien if Contractor verified the work eligibility status of the employee through the Program.

Prior to performing any work, Contractor shall require each subcontractor to certify to Contractor that the subcontractor does not knowingly employ or contract with an unauthorized alien and has enrolled in the Program. Contractor shall maintain on file a certification from each subcontractor throughout the duration of this contract or project which is the subject of this contract. If Contractor determines that a subcontractor is in violation of this provision, Contractor may terminate its contract with the subcontractor for such violation.

E-Verify Affidavit:

The undersigned being duly sworn upon *(his)(her)* oath, now says that I, _____ (name of contractor) at_____*(name of business entity)*, do hereby state that _____ (business entity) does not knowingly employ unauthorized aliens *and participates in the E-Verify Program when it hires new employees to confirm their work eligibility.*

I swear or affirm, under the penalties for perjury, that the foregoing statements are true.

_____
Signature of affiant/contractor (include title)

_____
Name of business entity

_____
Date

PART 1 - GENERAL

BID SECURITY

Each prospective bidder when required shall provide a Bid Bond as security along with each Bid Form submission. If combined bids are submitted, a Bid Bond for the largest bid submitted must be furnished.

A sample copy of the AIA Document A310-2010 Bid Bond is bound into the Project Manual following this page.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF DOCUMENT 000430

DRAFT

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

« »« »
« »

BOND AMOUNT: $ « »

PROJECT:
(Name, location or address, and Project number, if any)

« »
« »
« »

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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Signed and sealed this « » day of « » , « »

	« »
	(Contractor as Principal) *(Seal)*
	« »
(Witness)	*(Title)*
	« »
	(Surety) *(Seal)*
	« »
(Witness)	*(Title)*

PART 1 - GENERAL

OWNER CONTRACTOR AGREEMENT

The Construction Contract by and\between the Owner and the Contractor shall be entered into as an AGREEMENT.

The form of Agreement shall be AIA Document A101-2017 Standard form of Agreement Between Owner and Contractor Where the Basis of Payment is a Stipulated Sum and will be a No-Lien Agreement.

A sample copy of the AIA Agreement is bound into the project manual following this page.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF DOCUMENT 000500

DRAFT

AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

and the Contractor:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

« »
« »
« »

The Architect:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[« »] A date set forth in a notice to proceed issued by the Owner.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

[« »] By the following date: « »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

« »

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered, suitably stored and incorporated into construction, or, if approved in advance by the Owner's Representative, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives, if any that the Architect and Owner's Representative determines, in the Architect's and Owner's Representative's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

The Owner shall retain amounts from each progress payment as indicated in the AIA Document A201.

§ 5.1.7.1.1 Upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less two hundred percent (200%) of such amounts as the Architect and "Owner's Representative" shall determine for incomplete, defective and non-conforming Work, retainage applicable to such work and unsettled claims.

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect in collaboration with the Owner's Representative will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect and Owner's Representative.)

« »
« »
« »
« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[« »] Litigation in a court of competent jurisdiction

X Other *(Specify)*

Article 15.3 Mediation

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

The Stenftenagel Group
2602 Newton Street, Suite C
Jasper, IN 47546

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

§ 8.7 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal

requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« »

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*

PART 1 – GENERAL

GENERAL CONDITIONS

The General Conditions of the Contract shall be AIA Document A201-2017, General Conditions of the Contract for Construction.

A sample copy of this document is bound into the Project Manual following this page.

The AIA Document A201-2017, General Conditions of the Contract for Construction has been modified from the standard A201-2017, General Conditions of the Contract for Construction. The additions and modifications are underlined. The Contractor is responsible for performing a thorough review of the DRAFT copy bound in this manual.

PART 2 – PRODUCTS (Not used)

PART 3 – EXECUTION (Not used)

END OF DOCUMENT 000700

DRAFT

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

« »
« »

THE OWNER:
(Name, legal status and address)

« »« »
« »

THE ARCHITECT:
(Name, legal status and address)

« »« »
« »

TABLE OF ARTICLES

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion.

The author also has revised the text of the original AIA 2017 standard form.

Contractor is responsible for completely reviewing this entire document and all the contents within.

The revised articles and text are noted by underlining of the revised articles and text.

This document has important legal consequences.

Consultation with an attorney is encouraged with respect to its content.

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INDEX

(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner or Owner's Representative and a Subcontractor or a Sub-subcontractor, (3) between the Owner or Owner's Representative and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect and Owner's Representative shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's and Owner's Representative's duties. A Notice to Proceed executed by the Owner and Architect shall be issued to the Contractor for signature and shall be a binding document instructing the Contractor to immediately proceed as per Contract Documents.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, transportation and services incidental thereto provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, calculations, studies, surveys, models, sketches, drawings, specifications, and other similar materials and electronic/digital information produced in relation to the Project.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.1.9 The Project Manual
The Project Manual is that portion of the Contract Documents consisting of Contract Requirements, Conditions of the Contract, general requirements for construction, and sample forms.

§ 1.1.10 Approved Equal
"Approved Equal" refers to any materials, systems or installations which, in the opinion of the Architect/Engineer and Owner, are equal in quality, durability, functional performance, strength, appearance, etc., to the specified or scheduled material, systems or installation and will meet the intent and performance requirements of the Contract Documents, and are approved by the Architect/Engineer prior to bidding in accordance with the Instructions to Bidders.

§ 1.1.11 Furnished By Owner
"Furnished by Owner" refers to equipment delivered FOB to Project site by the Owner. Contractor shall receive, rig, unload, store, uncrate, protect, set in place and connect equipment complete ready for operation. All labor and materials necessary for final connection shall be provided by the Contractor.

§ 1.1.12 Surety
"Surety" shall mean a person, firm or corporation that has executed, as surety, the Contractor's Performance and labor and material payment bonds securing the performance of the Work within the Contract.

§ 1.1.13 Definitions and Industry Standards
§ 1.1.13.1 Definitions.
§ 1.1.13.1.1 General: Basic Contract definitions are included in the Conditions of the Contract.
§ 1.1.13.1.2 "Reviewed": When used to convey Architect's action on Contractor's submittals, applications, and requests, "reviewed" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
§ 1.1.13.1.3 "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
§ 1.1.13.1.4 "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
§ 1.1.13.1.5 "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
§ 1.1.13.1.6 "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
§ 1.1.13.1.7 "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
§ 1.1.13.1.8 "Provide": Furnish and install, complete and ready for the intended use.
§ 1.1.13.1.9 "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
§ 1.1.13.2 Standards.
§ 1.1.13.2.1 Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
§ 1.1.13.2.2 Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
§ 1.1.13.2.3 Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source

§ 1.2 Correlation and Intent of the Contract Documents
§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. The Contractor shall promptly call to the attention of the Owner, Owner's Representative and the

Architect any discrepancies or inconsistencies in the Drawings or Specifications that affect its Work. **In the event of discrepancies or inconsistencies within or between parts of the Contract Documents, or between the Contract Documents and applicable standards, codes and ordinances, the Contractor shall (1) provide the better quality or greater quantity of Work, or (2) comply with the more stringent requirement.** Figure dimensions shall take precedence over scale measurements, large scale details shall take precedence over small scale drawings, and drawings of a later date shall take precedence over those of an earlier date. Any part of the Work shown on the Drawings but not in the Specifications, or vice versa, shall be considered as part of the Work, the same as though included in both. The Work to be undertaken by the Contractor shall include all incidental work necessary for the completion of the Project even though it may not be specifically described in the Specifications or Drawings. In the case of an inconsistency between Drawings and Specifications and within either Document not clarified by Addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect's/Engineer's and the Owner's Representative's interpretation.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.1.2 During the assembly of the Contractor's Bid, the Contractor shall verify with all product suppliers that the product/s they are seeking a price on can be provided and delivered to the project site within a timeframe that will allow the Contractor to install such product/s in time to conform to the Project schedule and timeline. Any costs incurred by delay of such product/s not being delivered within the timeframe required to adhere to the Project schedule shall be at the expense of the Contractor.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

.1 Whenever a product is specified in accordance with a Federal Specification, an ASTM Standard, an American National Standards Institute Specification, or other association standard, the Contractor shall present an affidavit from the manufacturer when requested by the Owner or required by the Contract Documents, certifying that the product complies with the particular standard or specification. When requested by the Owner, Owner's Representative or required by the Contract Documents, support test data shall be submitted to substantiate compliance.

.2 Whenever a product is specified or shown by describing proprietary items, model numbers, catalog numbers, manufacturer, trade names, or similar reference, no substitutions may be made unless accepted prior to execution of the Agreement or if accepted as a change in the Work in accordance with the Contract Documents.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.4.1 The terms "knowledge," "recognize," and "discover," and their respective derivatives, when used in reference to the Contractor, shall be interpreted to mean that which the Contractor knows (or should know), recognizes (or should recognize), and discovers (or should discover) in exercising reasonable care and skill.

§ 1.4.3 The phrase "reasonably inferable" and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a contractor familiar with the Project and exercising the care, skill and diligence required of the Contractor by the Contract Documents.

§ 1.4.4 The words "approved", "equal to" and "as directed", shall mean "to the satisfaction of the Architect and Owner's Representative".

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner has designated the Stenftenagel Group L.L.C. as the Owner's Representative who shall have express authority to bind the Owner with respect to all matters requiring Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract.

Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; or (2) a change in the Work materially changes the Contract Sum. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner may furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site, but information furnished by the Owner that is not identified as a Contract Document is for informational purposes only and the Owner shall not be liable for inaccuracies or

omissions therein, nor shall any inaccuracies or omissions in such items justify an increase in the Contract Sum or relieve the Contractor of its responsibility to perform the Work in accordance with the Contract Documents.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2. Any additional sets of Contract Documents requested by Contractors shall be obtained from the Owner at a cost of $250 per set unless specified otherwise by Owner.

§ 2.3.7 The Owner shall render decisions and give approvals to the extent required by the Contract Documents. Before performing the Work, the Contractor shall in form the Owner in writing of any information that is necessary for the Contractor's performance of the Work. The Owner's approval or acceptance of, or payment for, any of the Work shall not be construed or operate as a waiver of any right under this Agreement or of any cause of action arising out of the performance of this Agreement.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a three-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's and Owner's Representative's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.1.1 The exactness of existing grades, elevations, dimensions and locations given on the Drawings, or any document issued by the Architect or the Owner, or the work installed by separate contractors, is not guaranteed by the Architect or the Owner. The Contractor shall satisfy itself as to the accuracy of all grades, elevations, dimensions and locations. In all cases of interconnection of its Work with existing or other work, Contractor shall verify at the site all dimensions and conditions relating to such existing or other work. Any errors due to the Contractor's failure

to verify all such grades, elevations, dimensions or locations and existing conditions shall be promptly rectified by the Contractor without additional cost to the Owner or an extension in the Contract Time.

§ 3.2.1.2 Mechanical and electrical drawings arc diagrammatic only: actual Work shall be installed from approved shop drawings with all measurements obtained at the Project site by the Contractor.

§ 3.2.2 The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner pursuant to Section 2.3.4, and shall at once report to the Architect errors, inconsistencies or omissions discovered. The Contractor shall not be liable to the Owner or Architect for damage resulting from errors, inconsistencies or omissions in the Contract Documents unless the Contractor recognized such error, inconsistency or omission and knowingly failed to report it to the Architect. If Contractor performs any construction activity knowing it involves a recognized error, inconsistency or omission in the Contract Documents without such notice to the Architect, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents arc in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, authorities relating to design (but not mean s, methods, techniques, sequences and procedures), but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require. If additional instructions from the Architect are necessary for the proper execution of the Work, the Contractor shall make a written request for the Architect 's interpretation as provided under Article 4. The Work shall be executed in conformity with the Architect's additional instructions and the Contactor shall refrain from any Work relating thereto until the Contractor has received the Architect's additional instructions.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if
the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statues, ordinances, codes, rules and regulations, and lawful orders of public authorities relating to design (but not means, methods, techniques, sequences and procedures).

§ 3.2.5 The Contractor shall not scale dimensions from Drawings unless expressly directed to do so in writing by the Architect/Engineer.

§ 3.2.6 Where there is a conflict or inconsistency in or between the Drawings and Specifications, the Contractor shall be deemed to have estimated on providing the better quality of Work and the larger quantity required.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof as well as the safety of all occupants of the adjacent spaces and structures and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor’s employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.2.1 E-Verify Certification. Pursuant to Indiana Code 22-5-1.7, Contractor providing services to Owner certifies that it has enrolled in and is verifying the work eligibility status of all newly hired employees through the E-Verify program for the duration of this and future contracts for services with Owner, unless and until the E-Verify program no longer exists. Contractor affirms that it does not knowingly employ or retain in its employ unauthorized aliens, which includes persons whose immigration status makes them ineligible to work for Contractor. Contractor requires all of its Subcontractors, before performing services under this Contract, in any amount, to provide to Contractor a Certification that, at the time of Certification, (a) Subcontractor does not knowingly employ or contract with unauthorized aliens, meaning persons whose immigration status makes them ineligible to work for Subcontractor, and (b) Subcontractor has enrolled in and is participating in the E-Verify program. Contractor certifies that it will keep on file these Subcontractor Certifications referenced for the duration of contract with Subcontractor to provide services under this or future contract with Owner. This provision does not apply to subcontractors who are self-employed and do not employ employees or to contractor who is not providing services to Owner.

§ 3.3.2.2 Contractor Not Suspended or Debarred: By signing this Agreement, Contractor certifies that Contractor, its principals or sub-recipients are not suspended or debarred by Federal Government, nor is known suspension or debarment procedure pending. Contractor agrees to notify the Owner in writing of suspension or debarment, or potential suspension or debarment proceeding. Failure to report suspension or debarment, or potential suspension or debarment will be sufficient cause to terminate this Agreement and report such termination to Federal authorities. Contractor representative certifies that he/she has authorization to make such certification and to bind Contractor to all representations herein.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ **3.3.3.1**The Contractor shall furnish to the Architect and Owner's Representative weekly progress reports on the Work in such form as requested by the Owner's Representative, including information on the status of materials and equipment which may be in the course of preparation, manufacture or transit.

§ **3.3.3.2** Regularly scheduled Contractor coordination meetings shall be held weekly with all Contractors currently performing work and Contractors scheduled to perform work within a one week time period from coordination meeting date. A sign-in sheet documenting all attendees participating is required to be submitted to Owner's Representative. The lack of conducting such weekly coordination meetings may result in withholding payment until coordination meetings are resumed to the satisfaction of the Owner's Representative.

§ **3.3.3.3** Contractor shall have a qualified, previously Owner approved full-time Superintendent on-site at all times during all construction and punch list activities, including construction and punch list activities being performed by Contractor's subcontractors.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, humidity control, transportation, complete cleaning and dusting of all building components, all direct job-site (or "General Conditions") costs and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them. The Contractor shall remove from the Project any person or entity under the Contractor's control which the Owner or Owner's Representative considers unsatisfactory. The Contractor shall assure harmonious labor relations to prevent delay, disruption or interference to the Project, and shall prevent strikes, slowdown, work interruptions, jurisdictional disputes and other labor disputes relating to the Work.

§ 3.4.4 Materials and equipment shall conform to manufacturers' standards and shall be installed in strict accordance with the manufacturers' latest directions. The Contractor shall, if required by the Owner or the Architect, furnish satisfactory evidence as to the kind and quality of any materials.

§ 3.4.5 The Contractor shall pay all royalties and license fees relating to the Work.

§ 3.4.6 The Contractor shall perform and be solely responsible for paying all costs for performing and adhering to all requirements for conducting expanded criminal history checks and conducting expanded child protection index checks on all Contractor's and Contractor's Sub-Contractors workers scheduled to be on school property as per the attached Exhibit A; CRIMINAL HISTORY AND EXPANDED CHILD PROTECTION INDEX CHECK POLICY FOR ALL WORKERS attached at the end of Section 01 11 00; Administrative Procedures. The Contractor shall carefully read the attached Exhibit and have an authorized Contractor's representative sign and return the Exhibit prior to the acceptance and execution of the Owner-Contractor Agreement.

§ 3.5 Warranty

§ 3.5.1 1 In addition to any warranties implied by law or any special warranties with respect to particular equipment or systems, the Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit and shall be performed in a workmanlike manner and comply with all applicable laws, building codes, rules and regulations. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 If, within one year after the date of Substantial Completion of the Work, or by the terms of an special warranty required by the Contract Documents, any portion of the Work is found to be defective, installed incorrectly or non-conforming in any way with the requirements of the Contract Documents, the Contractor shall correct it promptly within seven days after receipt of a written notice from the Owner. The Contractor's warranty excludes defects or damages caused by normal wear and tear during normal usage, use for a purpose for which the Project was not intended, improper or insufficient maintenance and abuse. This warranty is in addition to all special or extended warranties required by the Contract Documents or otherwise received from the Contractor or any Subcontractor, material supplier or manufacturer. The one year period for correction of defective or non-conforming Work does not constitute a limitation period with respect to the enforcement of the Contractor's other obligations under the Contract Documents and the foregoing warranty shall not affect, limit or impair the Contractor's responsibility for defects in the Work which do not appear within the applicable warranty period. Neither the acceptance of the Work nor any payment shall constitute a waiver of any claims against the Contractor for defective or nonconforming Work, whether latent or apparent, or otherwise act to release or discharge the Contractor from liability.

§ 3.5.3 The Contractor shall indemnify the Owner, the Owner's Representative, and Architect against all claims, damages and expenses, including attorney's fees, incurred by the Owner, the Owner's Representative, or the Architect as a result of the Contractor's failure to abide by its warranty obligations.

§ 3.5.4 The Contractor shall reimburse and compensate the Owner for Owner's Representative time spent for addressing and assisting with resolving ongoing Warranty issues that are reoccurring after one site review by Owner's Representative.

§ 3.5.5 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

§ 3.6.1 The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.6.2 The Contractor shall include in the proposal / Bid amount the cost of any and all state and federal taxes applying to the operation of performing the Contract.

§ 3.6.3 Only as permitted under Indiana law, materials supplied for permanent installation in this Project are exempt from State of Indiana sales taxes. The Owner will provide the Contractor with the Owner's tax exemption certificate number.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 3 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. Any surveys and other documents describing the physical characteristics, legal limitations or utility locations for the Project site that are not identified as Contract Documents arc for infom1ational purposes only and the Owner shall not be liable for inaccuracies or omissions therein, nor shall any inaccuracies or omissions in such items relieve the Contractor of its responsibility to perform the Work in accordance with the Contract Documents. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 The Contractor shall adhere to the following allowance requirements,

.1 allowances shall cover the cost to the Contractor and all subcontractors of all materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's and subcontractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, coordination, safety provisions, supervision, project management, research and development and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent and Other Key Personnel

§ 3.9.1 The Contractor shall employ a competent project manager, superintendent and necessary assistants who shall be in attendance at the Project site during performance of all of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. The superintendent shall be on the Project site at all times any work is being performed by Contractor, Contractor's Sub-Contractors and during completion of all punch-list items, unless prior arrangements have been previously approved by Owner's representative in writing. The Contractor's project manager shall be the person who has responsibility for the prosecution of the Work and who has the authority to act on behalf of the Contractor in all matters for the coordination, direction and technical administration of the Work.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner, Owner's Representative and Architect of the name and qualifications of a proposed superintendent and project manager. Qualifications of the proposed superintendent shall include a listing of three past similar projects in scope and size in the past six years, references, education, certifications and other applicable information. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner, Owner's Representative or the Architect (1) has reasonable objection to the proposed superintendent or project manager or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent and/or project manager to whom the Owner, Owner's Representative or Architect has made reasonable and timely objection. The Owner will reject a proposed superintendent and/or project manager based upon recent performance on projects for public school corporations within the last six years, for the following but not limited to 1.) not completing projects onschedule/time; 2.) poor management; 3.) allowing poor and/or unacceptable workmanship of on-site Work, 4.) non-responsiveness and or 5.) other reasons where the Owner can provide reasonable evidence. Contractor shall not change the superintendent or project manager without the Owner's Representative's consent, which shall not unreasonably be withheld or delayed.

§ 3.9.4 The Contractor shall provide a competent and adequate staff, including but not limited to the project manager and superintendent for the timely and proper administration of the Work. If the Owner determines that the continued participation of any member of the Contractor's staff is not in the best interest of the Project, the Owner may require the Contractor to replace the unsatisfactory staff member. In addition, the Contractor shall not change key members of its staff including but not limited to its project manager and superintendent without the prior written consent of the Owner which consent shall not be unreasonably withheld, so long as such key person remains satisfactory to and employed by the Contractor.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, within fourteen (14) calendar days from the date the notice to proceed was issued, shall submit for the Owner's and Architect's information, review and approval a Contractor's construction schedule for the Work. The Contractor's schedule shall include a detailed breakdown of the planned duration, start date and completion date for each activity and estimated dates for delivery of submittals, materials and equipment. The schedule shall not exceed time limits current under the Contract Documents, shall not be revised unless approved by Owner's Representative. The schedule shall be accurately updated every two weeks as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, within (5) calendar days of the date of the Agreement, and thereafter as necessary to maintain a current submittal schedule and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Project Schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals. The Contractor's schedule shall include a detailed breakdown of the planned duration, start date and completion date for each activity and estimated dates for delivery of submittals, materials and equipment. The schedule shall not exceed time limits current under the Contract Documents, shall not be revised unless approved by Owner's Representative, shall be revised and accurately updated every two weeks as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent Owner's Representative approved schedules submitted by the Contractor to the Owner and Architect. Contractor shall diligently monitor the progress of the Work, and update the construction schedule on a prompt and daily basis to reasonably reflect the actual progress of the Work.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.11.1 Contractor shall maintain on-site an updated set of record drawings (as-built) drawings, drawings and specifications that contain all Addenda, approved Construction Modifications, ASI's on the appropriate drawing sheets and specification pages/sections. Owner's Representative shall inspect updated set of drawings and specifications for accuracy. If drawings and specifications are not updated to the approval of the Owner's Representative, payment applications may be withheld until drawings and specifications are updated to the satisfaction of the Owner's Representative.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation by clearly identifying such deviation on the submittal at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.12.11 Where any item of work is required by specifications to be furnished, installed or performed in accordance with a specified product manufacturer's instructions, the responsible Contractor for such work shall procure and distribute the necessary copies of such instructions and information to all parties.

§ 3.12.12 Upon approval of Submittals/Shop Drawings, Contractor shall print-out hard copies of Submittals/Shop Drawings, at full size sheets, and shall submit to Owner's Representative on-site within three days after approval by A/E. Contractor shall provide binders with identification tabs to insert Submittals/Shop Drawings.

§ 3.12.13 All Submittals/Shop Drawings shall be submitted within 30 calendar days of the issuance of the Notice To Proceed unless, the contractor has provided an itemized list of Submittals/Shop Drawings to the A/E and Owner's

Representative with written documentation and approval from the A/E and Owner's Representative to permit a delay of submitting the listed Submittals/Shop Drawings beyond the 30 calendar day period from issuance of the Notice to Proceed. Failure to submit all Submittals/Shop Drawings within the prescribed time frame may result in the Architect withholding a recommendation for payment in whole or in part.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted and approved by the Owner's Representative, applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment. The Contractor shall not interfere with Owner's operations at the Project site, and shall, upon reasonable request of the Owner's Representative, Owner or Architect, relocate materials or equipment at no cost to the Owner.

§ 3.13.2 The Contractor is responsible for its Project site access. The Contractor shall keep roads, walks, ramps, and other areas on and adjacent to the Project site in good working order and condition and free from obstructions which might present a hazard to or interfere with traffic or the public, and shall provide adequate barricades, signs and other devices for traffic guides and public safety. When directed by the Owner's Representative, the Contractor shall add clean stone to access drives, walkways, etc…at Contractor's expense. The Contractor shall be responsible for daily cleaning of all areas affected in any way by construction activities. When construction operations necessitate the closing of traffic lanes, the Contractor shall be responsible for arranging such closing in advance with authorities having jurisdiction. The Contractor shall confine operations at the Project site to areas permitted by law, ordinances, permits and the Contract Documents. Where applicable, Contractor shall be responsible for weekly mowing and weed-eating all areas with-in and around construction limits, fences and areas as designated by Owner's Representative.

§ 3.13.3 Contractor shall be responsible for all costs for repair of all items to pre-construction conditions or better of any damage to site pavement, yards, curbs, existing structures, components, surfaces, etc., that is damaged in any way as a result of construction activities. All repairs shall meet approval of Owner's Representative.

§ 3.13.4 Contractor shall be responsible for site dust control when applicable and as directed by Owner's Representative.

§ 3.13.5 Only materials and equipment that are to be used directly in the Work and in the **immediate** future shall be brought to and stored on the Project site by the Contractor. Equipment no longer required for the Work shall be promptly removed from the Project. Contractor shall be solely responsible for the protection of materials, tools, and equipment stored at the Project site from weather, theft, damage, and all other adversity.

§ 3.13.6 The Contractor shall not permit any of its or its Subcontractors' employees to use any existing facilities at the Project site, including without limitation, lavatories, toilets, entrances, and parking areas other than those designated by the Owner or the Owner's authorized representative. Without limitation by any other provision of the Contract Documents, the Contractor shall comply with any and all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site, as may be amended from time to time.

§ 3.13.7 The Contractor recognizes that the school buildings shall remain in operation during performance of the Work. Accordingly, the Contractor shall cooperate with the Owner and Owner's Representative in scheduling and performing the Work to avoid unnecessary or unreasonable conflict, delay in or interference with the classes being held at the school buildings and the Owner's other ongoing operations at or adjacent to the Project. It is critical that such classroom instruction and Owner's other operations not suffer any significant interference, including, without limitation, any interruption in utilities or unreasonable noise, dust, odor, vibration or hazardous condition. The Contractor shall perform the Work and limit its use of the Project site in such manner as to minimize any interference with Owner's classroom instructions, occupancy and operations in the school buildings consistent with the Contract Documents and applicable building rules and regulations. Without limiting the generality of the foregoing, at no additional cost to Owner, the Contractor shall provide and apply continuous internal and external dust control, as required, to prevent the spread of dust and to avoid the creation of a nuisance at the Project site or in the surrounding areas as identified and determined by the Owner's Representative as a result of construction activities. All ingress/egress from the Project site shall be maintained in a dry condition, and any mud tracked onto areas of the Project or any building or property of third persons shall be immediately removed and the affected area cleaned. The Contractor, the Owner and its representatives, and the Architect shall regularly meet and communicate in order to coordinate the performance of the Work activity with the Owner's classroom instruction and other

ongoing operations at the Project. The Owner shall have the right in writing to direct a postponement or rescheduling of any date or time for the performance of any part of the Work that may interfere with the ongoing operation of the Owner's premises. The Contractor shall, upon the Owner's written request, reschedule any portion of the Work affecting operation of the premises to hours when the premises are not in operation or as may be requested by the Owner. The Contractor may seek an extension of time as permitted by the Contract Documents for any such postponement or rescheduling of any performance of the Work and an equitable adjustment in the Contract Sum but only if (1) the performance of the Work was properly scheduled and coordinated by the Contractor in compliance with the requirements of the Contract Documents, (2) such rescheduling or postponement is required for the sole convenience of the Owner, and (3) the Contractor complies with the claim and notice requirements of Article 15.

§ 3.13.8 The Contractor shall be responsible for the Project remaining secure at all times. All of the workers of Contractor and its subcontractors, whatever tier, at the Project site shall be clearly identified by company badges, t-shirts or other acceptable identification.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents. Patching (whether occasioned by existing Work removal or by ill-timed and damaged new Work) shall mean the restoration of a surface or item to its original condition to match the existing unless otherwise indicated, noted, detailed, or specified. Cutting and patching shall be done by the proper trades or crafts necessary for the material involved, but the cost of the same shall be borne by the Contractor requiring the cutting and patching. When patching involves painting, special coating, vinyl fabric or other applied finish, the entire surface affected (i.e., wall, bulkhead or ceiling) shall be refinished as a part of this requirement to the satisfaction of the Owner's Representative, unless complete refinishing of the entire space is scheduled or specified elsewhere.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.14.3 If portions of new work are installed and not accepted or approved in writing, all unacceptable portions of new work shall be removed and corrected. If remediated work consists of portions or areas of wall, ceiling or floor surfaces, with the result of the remediated work having the appearance of a "patch" or displays inconsistencies of color, texture, surface uniformity, flatness, smoothness, etc…, the entire wall, ceiling or floor surface shall be removed and corrected to the approval of the Architect and Owner's Representative. All costs associated with remediation work shall be by the Contractor.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of dust, waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove completely all dust from all building components, waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up promptly and thoroughly within one day from email notification as directed by the Owner's Representative to a clean, dust free and acceptable condition as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner's Representative and its agents, Owner and Architect with access to the Work in preparation and progress wherever located and at any time.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harm less the Owner, the Owner' s Representative, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, but only to the extent caused by the failure to abide by the Contract Documents or the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or
anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

§ 3.18.2 No claim against the Owner's Representative/Clerk of the Works, its Agents, or employees shall accrue to any Contractor, subcontractor, sub-sub-contractor, consultant, architect, engineer, supplier, fabricator, manufacturer, tenant, surety, or any third party as a result of this agreement for the performance or non-performance of the Owners Representative/Clerk of the Works, its Agents or employees.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's Representative during construction until the date the Architect issues the final Certificate For Payment. The Owner has retained the services of the Stenftenagel Group, L.L.C. to serve as the Owner's Representative. The Architect and the Owner's Representative will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect and the Owner's Representative will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect and the Owner's Representative will not be required to make exhaustive or continuous on-site observations to check the quality or quantity of the Work. The Architect and the Owner's Representative will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents. If Work is being executed at locations other than the Project site, the Contractor shall notify the Owner's Representative and Architect/Engineer where and when

such Work will occur in order that the Owner's Representative and Architect/Engineer may conduct visits prior to its delivery to the Project site.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner and Owner's Representative reasonably informed about the progress and quality of the portion of the Work completed, and exercise reasonable care and skill to keep the Owner informed of (1) known deviations from the Project Schedule, and (2) defects and deficiencies observed in the Work. The Architect nor the Owner's Representative will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect nor the Owner's Representative or its agents, will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's and Owner's Representative's evaluations of the Contractor's Applications for Payment, the Architect and Owner's Representative will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect and the Owner's Representative have authority to reject Work that does not conform to the Contract Documents. Whenever the Architect and the Owner's Representative considers it necessary or advisable, the Architect and the Owner's Representative will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect and the Owner's Representative nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect and the Owner' s Representative to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives and may authorize minor changes in the Work as provided in Section 7.4. The Architect and Owner's Representative will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect and Owner's Representative will conduct site visits to determine the date or dates of Substantial Completion and the date of final completion; and the Architect will issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final recommendation for payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions in collaboration with the Owner's Representative on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect in conjunction with the Owner's Representative (when applicable) will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Owner may authorize the Architect to prepare and issue supplemental Drawings and Specifications in response to the requests for information.

§ 4.2.15 Neither the Owner's Representative, its Agents or employees shall be required to make interpretations as to construction means, methods, techniques, procedures or other matters for which the Owner's Representative, its agents or employees have no responsibility.

§ 4.2.16 Contractor shall be responsible for and shall promptly reimburse the Owner for any and all additional Architect costs incurred by the Owner that are caused in whole or in part by the Contractor including but not limited to the following: (1) the Architect having to review the Contractor's submittal out of sequence from the initial Project submittal schedule agreed to by the Architect; (2) the Architect responding to the Contractor's request for information that are not prepared in accordance with the Contract Documents or where such information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings or prior Project correspondence or documentation; (3) the Architect providing construction phase services 60 days after substantial completion of the Work or the Substantial Completion Date, whichever date is earlier; (4) the Architect providing more than two reviews of each shop drawing, product data item, sample or other similar submittal of the Contractor; (5) the Architect providing more than two inspections of any portion of the Work to determine whether the Work is substantially complete; and (6) the Architect providing more than two inspections of any portion of the Work to determine final completion of the Work. The invoices submitted by the Architect for such additional services, when approved by the Owner, shall be used as the basis for adjusting the Contract Sum by a deductive Change Order.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, within seven days after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. Contractor shall prepare and submit to the Owner for its approval a list of persons or

entities proposed for each of the principal portions of the Work and their experience and qualifications. The failure of the Owner to object to any person or entity on the list within ten (10) days shall constitute notice of no reasonable objection. The Contractor shall not contract with, or accept bids from, any person or entity to whom the Owner has a reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner, Owner's Representative or Architect has reasonable objection to a person or entity proposed by the Contractor based upon past performance of subcontractor's work on Projects within the last five years, the Contractor shall propose another subcontractor at no additional change in the Contract Sum or Contract Time to whom the Owner's Representative, Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, and the Owner, Owner's Representative or Architect presents no reasonable proof of poor past performance, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, technical, administrative, procedural, legal and otherwise, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors which upon request by the Owner's Representative, a copy of such agreement between Contractor and Subcontractor shall be provided for review. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.3.1 The Contract Documents shall confer no benefit, right or remedy, either intended or incidental, upon any Subcontractor, design professional, sub-subcontractor, material supplier, equipment lessor or laborer to make claims against the Owner, Owner's Representative or the Architect.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with the Contractor. The Contractor shall make any revisions to the Project Schedule deemed necessary by the Contractor and the Architect after a joint review and mutual agreement.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor' s Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work , promptly report to the Architect and Owner's Representative apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor to report shall constitute an acknowledgment that the Owner's or separate contractors completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, lack of properly cleaning, organization, site maintenance (mowing, weed eating where applicable) to the satisfaction of the Owner's Representative, improperly timed activities or repair/replacement of defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, delays and improperly timed activities (to the extent permitted by Article 8), damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for cleaning, dusting and maintaining the building, premises and surrounding area free from dust, inadequate dust control, waste materials and rubbish, performing mowing, weed eating within and adjacent to Project Construction Limits, the Owner may take immediate and appropriate measures to clean up and/or provide the required action. The Architect and the Owner's Representative on behalf of the Owner may elect to proceed with

the means necessary and will allocate the cost among those responsible. Those costs will be deducted from the responsible Contractor's Contract Sum.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner and Contractor. A Construction Change Directive requires agreement by the Owner and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone, acting as the Owner's agent.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.1.4 A change in the Contract Sum or the Contract Time shall be accomplished only by Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that the Owner has been unjustly enriched by any alteration of or addition to the Work shall be the basis of any claim to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents.

§ 7.1.5 The form and content of all recurring documents (i.e., Change Orders, Field Orders, reports, and time sheets) may be designated by the Architect, and the Contractor agrees to use such forms.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 The Contractor shall submit a properly itemized and detailed Change Order Proposal covering additional or deleted Work. The Proposal shall be itemized for the various components of the Work and segregated by labor, material, and equipment in a detailed format satisfactory to the Architect and Owner's Representative. Details to be submitted will include detailed line item estimates showing detailed materials quantity take-offs, material prices by item and related labor hour pricing information and extensions (by line item). If Work indicated in the Change Order Proposal will take place while Contractor is mobilized on-site and currently performing Work, requested costs associated with an on-site foreman or supervisor will not be permitted. The Contractor's Change Order Proposal shall be submitted within seven (7) calendar days of the Architect's request, unless the Architect extends such period of time due to the circumstances involved. The Contractor's failure to so advise the Architect within the specified time period shall constitute a waiver of the Contractor's right to an increase in the Contract Time or the Contract Sum.

§ 7.2.3 As an alternative to a lump sum Change Order Proposal, the Owner may elect to have changed Work performed on a cost plus/Time and Material basis. Upon written notice to proceed, the Contractor shall perform such authorized changed work at actual cost of the changed work with an agreed percentage fee and "do-not-exceed" price for the changed work to be performed. Such directions to the Contractor shall be confirmed in writing by the Architect. The Owner shall not be liable for any charges in excess of the do-not-exceed price. Daily timesheets of all Contractor's employees and Subcontractors working on the Project will be required to be submitted to the Owner's Representative at the end of each day for review and approval for both labor, material and equipment used by the Contractor for time periods during which changed Work is performed on a cost plus basis. Daily timesheets must break down the paid hours worked by the Contractor's employees and Subcontractors showing both base contract Work as well as changed work performed by each employee. If such proposals are not received in a timely manner, if the proposals are not acceptable to the Owner, or if the changed Work should be started immediately to avoid damage or delay to the Project, the Owner, through the Architect, may direct the Contractor to proceed with the changes without waiting for the Contractor's proposal or for the formal Change Order to be issued.

§ 7.2.4 The Owner, Owner's Representative and the Architect shall be permitted to review, audit and copy the Contractor' s records relating to Change Order Proposals, Change Orders and changed work (whether based on lump sum, unit prices, or costs) upon reasonable notice and during normal business working hours throughout the term of this Agreement and for a period of three (3) years after final payment or longer if required by law. "Records" shall include any and all information, materials and data of every kind and character (hard copy as well as computer readable data) that may, in the Owner' s or Architect's judgment, have any bearing on or pertain to the pricing of changed, added or deleted Work and the accuracy of the Contractor's representations regarding pricing and claims information submitted by the Contractor. If an audit or examination in accordance with this Section discloses overcharges by the Contractor, the cost of the audit shall be immediately reimbursed by the Contractor in addition to the overcharges.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation as stipulated in 7.3.12;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in accordance with 7.3.11. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs for the Contractor's Project Managers and Superintendents assigned to the Project, including any costs associated with the evaluation and administration of the change, are part of the overhead allowance enumerated in 7.3.11.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order. A Change Order signed by the Contractor conclusively establishes the Contractor's agreement therewith, including the adjustment in the Contract Sum and the Contract Time.

§ 7.3.7 If the Contractor docs not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Architect and Owner's Representative on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit (as may be limited by the Contract) as set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

.5 Costs for the Contractor's Project Manager and Superintendents assigned to the Project, including any costs associated with the evaluation and administration of the change, part of the overhead allowance enumerated in 7.3. 1 1.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.3.11 After the Construction Contingency/Allowance is exhausted, the allowance for the combined overhead and profit included in the total cost to the Owner shall be based on the following schedule:

.1 for the Contractor, for Work performed by the Contractor's own forces, 7 percent of the cost.

.2 for the Contractor, for Work performed by the Contractor's subcontractor, 5 percent of the amount due the subcontractor.

.3 for each subcontractor or sub-subcontractor involved, for Work performed by that subcontractor's or sub-subcontractor's own forces, 0 percent of the cost.

.4 cost to which overhead and profit is to be applied shall be determined in accordance with subparagraph 7.3.7.

§ 7.3.12 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Labor and materials shall be itemized in the manner prescribed in 7.3.4 and 7.3.11. Where major cost items are subcontracts, they shall be itemized also. In no case will a change involving more than $1,000.00 be approved without such itemization.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will

affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing and completing the Work.
Within 15 calendar days from receiving Notice to Proceed, the Contractor shall submit for Owner's approval a detailed Project Schedule showing all work activities, milestones, utility (electric, water, gas, sanitary sewer) disruptions, connections, tie-ins, etc. Project Schedule shall incorporate the Time Limits as stated in the Contract Documents. Upon approval of the Project Schedule, the Project Schedule will become the baseline for the entire Project. An updated Project Schedule shall be submitted to the Owner's Representative for review and approval each month. An accelerated plan (Recovery Schedule) will be required to be submitted to the Owner's Representative for review and approval as per 8.2.5, if **any** activity falls more than (3) three days behind schedule.

§ 8.2.2 The Contractor shall not, except by instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and the completion of a criminal history background check on all workers to be on-site to. The date of commencement of the Work shall not be changed by the effective date of such insurance or lack of receiving approved certificate of insurance and approved criminal history background check information and fulfilling of its procedures.

§ 8.2.3 The Contractor shall proceed expeditiously, regularly, with adequate manpower, diligently and uninterrupted at such rate of progress as will ensure full completion thereof and shall achieve Substantial Completion within the Contract Time. By executing the Contract, the Contractor expressly understands and agrees that the time for the completion of the Work described therein is a reasonable time for completion of the same, taking into consideration the average climatic range and usual industrial conditions prevailing in the locality of the Project.

§ 8.2.4 Completion shall be understood to be Substantial Completion as determined by the Owner's Representative for the Owner's beneficial occupancy, with only minor "punch list" items yet to be completed and items such as test and balancing of heating system, or landscaping etc., which cannot be completed due to climatic conditions.

§ 8.2.5 The Owner's Representative and the Architect shall have the right to modify the Project Schedule to vary the sequence or suspend, delay, or accelerate the commencement or execution of the Work. The Contractor shall transfer its efforts and the efforts of the Contractor's assigned subcontractors to such points as directed by the Owner's Representative and Architect and execute such portions of the Work as may be required to enable separate contractors to properly carry on their work without delay or interference.

§ 8.2.6 If the Contractor should (1) fail, refuse or neglect to supply a sufficient number of workers or deliver materials or equipment with such promptness as to prevent delay in the progress of the Work; (2) fail to commence and diligently prosecute the Work, work the necessary overtime, second shift, weekends, holidays, and proceed to the point to which the Contractor should have proceeded in accordance with the Project Schedule in order to achieve Substantial and Final Completion in accordance with the Project Schedule; or (3) fail to commence, prosecute, finish, deliver or install the different portions of the Work in accordance with the Project Schedule, the

Architect and Owner's Representative shall have the right to direct the Contractor to prepare a written plan (Recovery Schedule), for the Owner's approval, to accelerate the Work to comply with the Project Schedule, including, without limitation, providing additional labor, expediting deliveries of materials and equipment, performing overtime and/or resequencing the Work, without an increase in the Contract Sum. Upon the Owner's Representative's approval of the Recovery Schedule, the Contractor shall accelerate the Work immediately in accordance with the Recovery Schedule. At any time, the Owner and/or Owner's Representative shall have the full right without penalty to notify the Contractor's Bond Company of Contractor's non-conformance to adhere to the requirements of the Contract Documents as stated above.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for the period of time lost on the Critical Path of the Project Schedule. As reviewed and determined by the Owner's Representative, the Contract Time shall not be extended due to inadequate construction forces, poor management of Contractor's subcontractors and Contractor's own forces or the failure of the Contractor to place orders for equipment or materials sufficiently in advance to assure timely delivery.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 If the Project is delayed as determined by the Owner's Representative by poor management, any act or omission of the Contractor or any person or entity for whom the Contractor is responsible, or by acts, omissions, events, or occurrences that are not excusable to the Contractor pursuant to the terms of the Contract Documents, the Contractor shall (1) be assessed liquidated damages if provided for in the Contract, or (2) if liquidated damages are not provided for in the Contract, compensate the Owner for, and indemnify the Owner and Owner's Representative against, all damages, losses and all expenses, including additional compensation of separate Contractors the Architect, Owner's Representative for any additional hours and expenses required and attorney's fees, proximately covered by such delay. The Owner shall have the full right and may also elect to notify the Contractor's Bond Company of Contractor's non-conformance to adhere to the requirements as stated above.

§ 8.3.4 The Contractor shall be entitled to an increase in the Contract Sum, but only for and to the extent of an increase in the Contractor's General Conditions, caused by a delay to the critical path of the Project Schedule and caused by the Owner, a separate contractor, a suspension of the Work by the Owner, or a concealed or unknown condition under Sections 3.7.4 or 3.7.5, but only if the Contractor timely submits a written claim to the Owner in accordance with applicable provisions of Article 15. Otherwise, the Contractor's sole remedy for any delay in the commencement, prosecution, or completion of the Work, disruption to or interference with the performance of the Work, loss of productivity, or other similar claims, whether or not foreseeable, shall be an increase in the Contract Time unless caused by acts constituting intentional interference by the Owner or the Architect with the Contractor's performance of the Work where such acts continue after the Contractor's written notice to the Architect of such interference. The Owner's, Owner's Representative or the Architect's exercise of the right to make changes in the Work or to require the correction of damaged, defective or non-conforming Work shall not under any circumstances be construed as intentional interference. In no event shall the Contractor be entitled to any compensation or the recovery of any damages in connection with any such claims, including consequential or incidental damages, lost opportunity costs, impact damages, or other similar remuneration. If the Contractor submits a progress report indicating, or the Contractor otherwise expresses an intention to achieve, completion of the Work prior to any completion date required by the Contract or expiration of the Contract Time, no liability of the Owner to the Contractor for any failure of the Contractor to so complete the Work shall be created, implied or permitted .

§ 8.3.5 The Contractor shall include in its bid a sufficient amount of money to cover the required manpower, multiple shift work, overtime, holiday work, equipment, protection, etc., to complete its Work in accordance with the Project Schedule and Substantial Completion Dates listed in the Contact Documents, including accounting for inclement weather. It is the Contractor's obligation to provide a copy of the "National Climatic Center" report with any weather delay filed. This includes the current information as well as the monthy averages available at the time of bidding.

§ 8.3.6 Claims relating to time shall be made in accordance with applicable provisions of Article 15. Unless the Contractor shall, within seven (7) days from the commencement of any possible excusable delay or within seven (7) days from the time delay, notify the Owner's Representative and the Architect/Engineer in writing of all facts then available to the Contractor relative to the nature and extent of the delay, and its anticipated effect, if any, upon the time for Substantial Completion of the Work as hereinbefore described, and shall also request that a determination be made as to whether or not the delay is an excusable delay so as to extend the number of calendar days for completion of the Work, the act or occurrence in question shall not thereafter be an excusable delay for any purpose except upon the written consent of the Architect/Engineer and Owner's Representative.

§ 8.3.7 The Contractor shall include in its bid a sufficient amount of money to cover and include any moisture mitigation products and/or procedures approved by the floor finish and floor covering products manufacturer, required to maintain and adhere to the Project Guideline Schedule for the proper timely installation of the specified floor finish and/or floor covering product/s. Contractor shall also provide sufficient amount of money to cover all testing procedures and requirements as stipulated by the floor finish and floor covering products manufacturer for the proper installation without any reduction or compromising the Owner's Warranty to be received by the manufacturer.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect and Owner's Representative, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect and Owner's Representative may require. This schedule, unless objected to by the Architect or Owner's Representative, shall be used as a basis for reviewing the Contractor's Applications for Payment required and a complete billing breakdown on AIA Form G703, or similar form provided by the Architect, prepared in such form and supported by such data as the Architect or Owner's Representative may require. Once approved by the Owner's Representative, these documents shall be used as the basis for the Contractor's Applications for Payment. Each subsequent Application for Payment must be accompanied by an updated billing breakdown.

§ 9.3 Applications for Payment

§ 9.3.1 Based upon an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2., for completed portions of the Work, notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents, the Owner shall make progress payments to the Contractor as provided below and elsewhere in the Contract Documents. The period covered by each Application for Payment shall be one calendar month ending on the last day of the month. The Application for Payment must be prepared in duplicate on AJ A Form G-702 and G-703, or similar form provided by the Architect, and shall indicate the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. Any detailed or supplemental information requested by the Architect and Owner's Representative shall be supplied by the Contractor.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 The Owner will retain 5% of the amount due the Contractor on account of progress payments throughout the entire duration of the Project. At the time all the Work is 100% completed and, at the request of the Contractor, the Architect/Engineer (with consent of Surety and the Owner) may recommend the reduction of retainage on any remaining partial payments to 0% provided that all punch list items are fully completed and closeout documents are received to the satisfaction of the Owner's Representative and the manner of completion of the Work and its timely progress are satisfactory to the Architect/Engineer and the Owner's Representative.

§ 9.3.2 Unless otherwise approved by the Owner and Owner's Representative, payments shall only be made on account of materials and equipment installed, approved and successfully incorporated into the Work. Only if approved in advance by the Owner's Representative, payment may similarly be made for materials and equipment suitably stored on or off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site. Payments for material or equipment stored off the site shall not be approved unless approved in writing by the Owner.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment (1) all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work, (2) the Work covered by the Application for Payment has been completed in accordance with the Contract Documents, (3) the current payment shown is now due, (4) except as set forth in the Application for Payment, no additional amounts are due, (5) all amounts have been paid by the Contractor for Work for which previous payments have been received, (6) the Contractor has complied with and paid all amounts due under federal, state, and local tax laws, including social security, unemployment compensation and workers' compensation laws, and (7) the remaining balance of the Contract Sum is sufficient to complete the Work free and clear of all liens and encumbrances.

§ 9.3.4 When Partial payment is requested by the contractor and if approved by the Owner's Representative for equipment stored off-site, but not yet incorporated into the Work, such equipment shall become the property of the Owner, but if the equipment is stolen, damaged, lost, etc., the Contractor will be required to replace such equipment at his own expense. Until equipment is properly incorporated into the Work, the Owner shall pay only 95% of the amount(s) submitted by the Contractor in his monthly Payment Application or as approved by the Owner for equipment suitably stored off-site. The remaining 5% is retainage. For approval and payment of equipment stored off-site the following conditions must be met:

a. The Owner's Representative shall visit the site where equipment is being stored and will be compensated by the Contractor at a rate of $100 per hour for time spent for traveling to and from site where equipment is being stored and for time spent reviewing equipment.

b. Provide a complete itemized list of equipment stored-off-site for which Contractor is requesting payment. Itemized list shall include description of each piece of equipment, manufacturer, serial number, product number, etc.

c. Provide an itemized invoice that indicates the cost for each piece of equipment and that the equipment is tagged for incorporation into the Work.

d. Provide a letter from the bonding company indicating agreement to the arrangements and that payment to the contractor shall not relieve any party of their responsibility to complete the Project per Contract Documents.

e. Provide and submit certificate of insurance that completely covers property loss of all equipment being stored off-site.

f. Equipment stored off-site shall not be covered by the Owner's Builder's Risk Policy until equipment is delivered to and incorporated into the Project.

g. The Contractor shall certify in writing that requested stored-off-site equipment included in the Payment Application are free and clear of damage, all liens, claims, security interests or encumbrances and that no work, materials or equipment is subject to any retained interests by any other person or company. Title to all equipment covered by the Payment Application for which the Contractor is requesting payment for equipment listed and stored-off-site and which has not passed to the Owner is hereby conveyed and transferred to the Owner effective upon payment of the said Payment Application.

§ 9.4 Recommendations for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the approved Contractor's Application for Payment from the Owner's Representative, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a recommendation for payment will constitute a representation by the Architect to the Owner, based on the Owner's Representative's and Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Owner's Representative's and Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect and Owner's Representative. The issuance of a recommendation for payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a recommendation for payment will not be a representation that the Architect nor the Owner's Representative has (1) made exhaustive or continuous on-site observations to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment , or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a recommendation for payment in whole or in part, as recommended by the Owner's Representative or to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to recommend payment in the amount of the Application, the Architect will notify the Contractor, Owner's Representative and Owner as provided in Section 9.4. 1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a recommendation for payment for the amount for which the Architect and Owner's Representative agree is able to make such representations to the Owner. The Architect or Owner may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's or Owner's Representative's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of:

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials, services, or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a separate contractor or third parties who could make a claim against the Owner;

.6 reasonable evidence that the Work will not be completed within the Contract Time, Final Completion Date, or a Milestone Date, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;

.7 repeated failure to comply with the safety requirements of the Contract Documents or to carry out the Work in accordance with the Contract Documents;

.8 failure to submit the Construction Schedule in accordance with Division 01 Section "Construction Progress Documentation" of this Manual or failure to submit periodic updated schedule reports prior to each Progress Meeting;
.9 failure to keep record documents, "as-built" drawings and all drawings and specifications up to date; or
.10 for reasons previously indicated in Section 8.2.5;
.11 failure to perform cleaning, organization of the site, mowing/weed-eating of the site (when applicable, as indicated in the Contract Documents**;**
.12 failure to provide the proper management of Contractor's workers and subcontractors and as indicated in the Contract Documents;
.13 failure to submit Proposal Request responses within the time identified in the Contract Documents;
.14 failure to properly implement and maintain the criminal history and background checks procedures and requirements;
.15 failure to conduct weekly contractor coordination meetings with contractors and subcontractors performing or scheduled to perform work within a one week period from the scheduled weekly contractor coordination meeting; failure to provide a sign-in sheet of attendees of the contractor coordination meeting;
.16 failure to conduct and participate in pre-installation meetings as per contract documents or as requested by Owner's Representative;
.17 failure to develop a comprehensive, detailed and itemized punch list acceptable to the Owner's Representative of each space/area immediately prior to request for substantial completion;
.18 failure to submit Submittals/Shop Drawings within the prescribed time frame as per Section 3.12.13.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld with the next Application for Payment that includes such amounts.

§ 9.5.4 The Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers, and the Owner may, but is not obligated to, make direct payment on behalf of the Contractor to any Subcontractor, material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment received, and charge such payments against the Contract Sum.§ 9.5.4 The Architect may withhold a recommendation for payment in whole or in part, if the Project Schedule falls behind and/or an approved accelerated plan (Recovery Schedule) is not immediately developed, submitted and work started as per plan to the satisfaction of the Owner's Representative.

§ 9.6 Progress Payments
§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner. If any payment claim or lien is made or filed with or against the Owner or the Project, the Contractor shall, within twenty (20) days of the filing of the lien or submission of the claim, satisfy, discharge or bond-off the claim or lien, cause the Owner to be dismissed from any action which may be brought in connection with the claim or lien, and compensate the Owner for, and indemnify the Owner against, any and all losses, damages, and expenses, including attorney's fees, sustained or incurred by them.

§ 9.6.3 The Architect may, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Contractor shall pay for all labor, materials, equipment and services through the period covered by the previous payment received from the Owner, and shall furnish satisfactory evidence, including (as a condition precedent to payment) releases and lien waivers on forms provided by the Owner, to verify compliance with this requirement. The Owner has the right to request additional written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment supplier's amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner

shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both , under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, Contractor (unless required by applicable law), shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner and Owner's Representative from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Owner does not pay the Contractor within fort-five (45) days after by the date established in the Contract Documents the amount certified by the Architect due to the Contactor under the Contract or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, slop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately if the delay impacts the critical path of the Project Schedule and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents and as determined by the Owner's Representative so that the Owner can occupy or utilize the Work for its intended use; provided , however, that as a condition precedent to Substantial Completion, the Owner and the Architect has received all certificates of occupancy and any other permits, approvals, licenses and other documents from any governmental authority having jurisdiction over the Project that are necessary for the beneficial occupancy and use of the Project.

§ 9.8.1.1 Project Closeout includes those activities leading to Substantial Completion and Final Completion of the Work. Project Closeout activities and requirements are specified in Division 01 Section "Closeout Procedures" of this Manual. To administer and conduct Project Closeout, the Contractor shall indicate a designated value on the schedule of values and on payment applications as specified in Division 01 Section "Payment Procedures" of this Manual.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner may agree to accept separately, is substantially complete, the Contractor shall prepare a detailed itemized punch-list for each space and submit to the Architect and Owner's Representative a comprehensive punch-list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. If Contractor fails to develop itemized and detailed punch-lists for each space, the Work, or portion thereof will not be considered to be reviewed by the Architect or Owner's Representative to determine if areas are substantially complete.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect and Owner's Representative will make a review to determine whether the Work or designated portion thereof is substantially complete. If the Architect's or Owner's Representative's review discloses any item, whether or not included on the Contractor's list, which is not sufficiently

complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect or Owner's Representative. In such case, the Contractor shall then submit a request for another review by the Architect and Owner's Representative to determine Substantial Completion.

§ 9.8.4 If, upon the Architect's/Engineer's and Owner's Representative's completion of the initial review and the second review, as described in Paragraph 9.8.3, there remains incomplete or unsatisfactory Work, the Contractor will be back-charged for time accrued by the Owner's Representative and Architect/Engineer, including the Architect's/Engineer's consultants and Owner's Agents and Consultants. Charges will be at each of the party's current prevailing rate and commence following the second review. The back-charges will be deducted from the Project Closeout cost indicated on the Contractor's Schedule of Values.

§ 9.8.5 The Certificate of Substantial Completion shall establish a fourteen-day (14) period after the date of substantial completion within which the Contractor will have to complete all items on the accompanying punch list to the Certificate of Substantial Completion. If Contractor does not complete the punch list within the time period specified herein, the Contractor shall reimburse Owner for all Owner's Representative's fees, architectural, consultant, attorneys' and all other fees that Owner incurs as a result of Contractor's delay in completing of punch list items.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof that has been completed to the satisfaction of the Contract Documents. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents. Such incomplete work or work not in accordance with the Contract Documents shall be itemized, listed and assigned a value on a Punchlist Document developed and issued jointly by the Architect and Owner's Representative. The assigned value listed shall be approximately 200% of the cost to perform and complete this work/item as assigned by the Owner's Representative. All costs listed on the Punchlist for work to be completed will be totaled with this totaled amount being retained until work or item is properly completed or performed as per Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage, provided such occupancy or use is consented to by the insurer as required under Section 11 .3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect and Owner's Representative.

§ 9.9.2

Immediately prior to such partial occupancy or use, the Owner, Owner's Representative, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work. The Owner's Representative shall develop a Punch-list of all non-conforming items of which the Contractor shall complete as stipulated in the Contract Documents. All Punch-list items shall be completed as per the Contract Documents prior to Owner's occupancy. Items agreed to by the Owner's Representative and Contractor that cannot reasonably be completed prior to Owner's Occupancy, must be expeditiously completed at times not to interfere with the Owner's operations in any way, which may require after hour Work , weekend work and/or holiday Work required to complete remaining items at no additional cost to the Owner or increase to Contract Sum.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final review and acceptance and upon receipt of a final Application for Payment, the Architect and Owner's Representative will promptly make such review and, when the Architect and Owner's Representative finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final recommendation for payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and observations, the Work has been completed in accordance with terms and conditions of the Contract Documents. The Architect's final recommendation for payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made to the Contractor within seven (7) days after (1) the Work has been fully completed in strict accordance with the Contract Documents, and (2) the Contractor has furnished (a) a general release of all liens and claims and a final lien waiver on forms acceptable to the Owner, (b) the number of copies of record drawings required by the Contract Documents, and (c) all Operational/Instructional/Maintenance manuals, warranties , and any other close-out documents required by the Contract Documents. As a condition precedent to the issuance of final payment, the Contractor, if required, shall submit evidence satisfactory that all indebtedness relating to the Work has been satisfied.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls , bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantia l reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner, and (6) all closeout documents are received and approved to the satisfaction of the Owner's Representative. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. if such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 As a condition precedent to final payment, the Contractor shall furnish the Architect and Owner's Representative, in form acceptable to the Architect and Owner's Representative, all warranties, operating manuals, and a complete set of record drawings with all field changes noted and, if requested by the Architect, Owner's Representative, or Owner, a signed affidavit verifying that the Work has been completed in accordance with the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

.4 excavations, trenches, buildings and grounds from all water damage, including the use of temporary drainage to keep excavations free of water at all times and prevent washing of soils adjacent to new and existing building foundations, structures, etc…;

.5 benchmarks, monuments and other reference points affected by the Work, including reestablishment of benchmarks, monuments or other reference point and the resetting of markers which are displaced or destroyed, all under the supervision of a licensed surveyor who shall furnish certificates of its work;

.6 the structural components of the Project by assuring safe erection procedures and sequences and the use of temporary bracing, bracing of new or existing masonry walls, steel structures, CMU walls, use of guys and tie-downs as may be prudent and approved by a licensed structural engineer;

.7 any such property, including areas used for temporary field offices, storage sheds and material storage and assembly, shall be restored to its original condition. unless otherwise specified, without cost to the Owner;

.8 students, staff, occupants of areas adjacent to where Contractor is performing Work;

.9 adjacent existing spaces, life safety systems, materials, systems, components and equipment where Contractor is performing Work; and

.10 temporary walkways, exits, drives and building access;

.11 Contractor shall maintain all construction access drives, walkways free of mud, dirt debris, snow, ice, and where applicable shall add stone to construction access drives and walkways at the request of the Owner's Representative at no additional cost to the Owner.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss. In addition, the Contractor shall comply with the safety requirements of Division I of the Specifications and other safety requirements and regulations set forth elsewhere in the Contract Documents. In the event of conflict between these Construction Documents and requirements of any Local, State or governing Federal Authority or laws, the most stringent requirement shall govern the Work.

§ 10.2.2.1 The Contractor represents that it is knowledgeable of the Occupational Safety and Health Act (OSHA) and promulgated regulations applicable to the performance of Work. The Contractor acknowledges and accepts affirmative duty of enforcing these regulations, and the Contractor shall promptly advise the Owner and Owner's Representative of investigations by the Federal safety and health inspectors at the Contractor's subcontractor or the sub-subcontractor's Workplaces or at the project site. The Contractor shall advise the Owner and Owner's Representative of the outcome(s) of all such investigations and/or inspections. The Contractor assumes full and exclusive responsibility and agrees to indemnify and hold the Owner and Owner's Representative and it's agents harmless against any and all consequences arising from the Contractor's violation of regulations governing the Work of this Project, including payment of any fines, penalties and/or interest assessed in connection therewith, court costs and all attorney fees that are incurred by the Owner related thereto.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents and who shall cooperate with the separate contractors to the extent necessary to promote Project safety. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect. A safety representative employed by the Owner or an insurer may, from time to time, conduct safety inspections and submit safety findings. The Contractor shall, at its expense, implement any abatement procedures recommended by such safety representative.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.7.1 Contractor shall properly secure all staged and stored material or products located on site from becoming stolen, wind-blown, unsecured, damaged or causing damage to any adjacent property, structures or personnel.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days immediately upon discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.2.9 The Contractor acknowledges that the safety of the Owner's students, staff and visitors is of the utmost importance. The Contractor shall take no action which would jeopardize the safety of the Owner's students, staff, or visitors. The Contractor shall take all necessary and appropriate steps to preclude access to the construction site by the Owner's students, staff and visitors. Contractor shall be responsible for all safety precautions and requirements related to or arising out of its Work. Any fines generated as a result of Contractor's non-compliance with a local, state, or federal safety regulation shall be the responsibility of Contractor. Any fine issued to the Owner as a result of Contractor's (including its Subcontractors, equipment lessors, suppliers, Sub-subcontractors, and any other person or entity directly or indirectly acting for the Contractor) non-compliance shall be the responsibility of the Contractor and not the Owner.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended

appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.3.7 A "hazardous material or substance" is any substance or material identified as hazardous under any federal, state or local law or regulation, or any other substance or material that may be considered hazardous or otherwise subject to statutory or regulatory requirement governing hand ling, disposal and/or cleanup.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS (THIS ARTICLE HAS BEEN REVISED IN IT'S ENTIRITY)

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. Such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;

.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 Claims for damages insured by usual personal injury liability coverage;

.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property , including loss of use resulting therefrom;

.6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;

.7 Claims for bodily injury or property damage arising out of completed operations; and

.8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

The Contractor and Subcontractors shall provide insurance from Insurance Companies that have an "A"VI rating through
A.M. Rating System as indicated in 11.1.6.

The Owner, Owner's Representative, Owner's Representative's agents, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents below or required by law, whichever coverage is greater. Coverages written on an occurrence basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified below.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time req uired by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness. The Contractor shall prov ide written notification to the Owner of the cancellation or expiration of any insurance required by Section 11.I .The Contractor shall provide such written notice within five (5) business days of the date Contractor is first aware of the cancellation or expiration, or is first aware that the cancellation or expiration is threatened or otherwise may occur, whichever comes first.

§ 11.1.4 The Certificates for the commercial general liability, automobile liability and any umbrella or excess liability policies shall name (1) the Owner, the Owner's agents, employees, trustees, Owner's Representative and Agents, the Architect and the Architect's Consultants as additional insureds for claims caused in whole or in part by the Contractor' s negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed
operations. The additional insured endorsement shall state that coverage is afforded the additional insureds as primary and non-contributory. The Contractor agrees to waive any and all rights of subrogation against the additional
insureds.

§ 11.1.5 The Contractor shall furnish insurance in the following categories and for the stated minimum amounts:

Worker's Compensation.	Statutory.
Employer's Liability covering all employees, volunteers, temporary employees and leased workers.	$1,000,000 each accident, $1,000,000 disease each employee, and S 1,000,000 disease policy limits.
Commercial General Liability (form CG 00 01 or its equivalent) for bodily injury and property damage including personal injury, premises/operations, broad form property damage, independent contractors, products and completed operations (with limits of $2,000,000 and coverage for a minimum period of three (3) years after date of Substantial Completion), and deletion of	$2,000,000 per occurrence $5,000,000 limits shall be $3,000,000 per occurrence).

exclusions pertaining to (1) explosion, collapse, shoring, grading and or underground property damage hazards, (2) damages or injury arising from defective Work, including costs to repair or replace damaged Work, and (3) contractual liability coverage as broad as what is found on a CG 0001 ISO form or equivalent (the Commercial General Liability Insurance may be arranged under a single policy for the full limits required or by a combination of underlying policies with the balance provided by an Excess of Umbrella Liability Policy). The policy shall include a severability or separation of insured endorsement and the limits required herein shall apply on a per project basis. The project owner shall be included as an additional insured on a CG 2026 11/85 and a CG 2037 10/01 ISO form or an equivalent form

Commercial Automobile Liability, including owned, non-owned and hired car coverages. $ 1,000,000 combined single limit for bodily injury and property damage.

§ 11.1.6 The insurance shall be procured from companies licensed to do business in the state in which the Project is located. The insurers must have a minimum AM Best rating of AVI I. All insurance procured or maintained by the Contractor shall be primary. Any insurance maintained by the Owner shall be considered excess and non-contributory. Coverage shall be on an occurrence basis. Except with respect to bodily injury and property damage included within the products and completed operations hazards, the aggregate limit shall apply per Project to the Contractor's Work. The Contractor waives all rights against the Owner, Owner's Representative the Architect and separate contractors for damages covered by the Contractor's insurance. The Contractor shall permit the Owner to examine the actual policies upon request.

§ 11.1.7 The Owner shall withhold all payments to the Contractor until such Certificates of Insurance are received by the Owner. The Owner shall have the right, but not the obligation, to prohibit the Contractor from entering the Project site until such Certificates have been received and approved by the Owner. The failure of the Owner or Architect to demand such Certificates or to identify a deficiency in the evidence of insurance provided shall not be construed as a waiver of the Contractor's obligation to maintain the insurance. If the Contractor fails to maintain any required insurance, the Contractor shall be in default and the Owner shall have the right, but not the obligation, to purchase the insurance at the Contractor's expense, stop the Work, or terminate the Agreement.

§ 11.1.8 The Contractor shall cause its Subcontractors to procure insurance satisfying the requirements of this Article and naming the Owner, Owner's Representative and its Agents and Architect as additional insureds under their commercial general liability, automobile liability, and any umbrella or excess liability policies and all such insurance shall be on a primary basis/non-contributory. All insurance maintained by the Owner shall be considered excess.

§ 11.1.9 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located. The Owner and/or Owner's Representative shall have the full right without penalty to notify the Contractor's Bond Company of Contractor's non-conformance to adhere to the requirements of the Contract Documents.

§ 11.1.10 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.11 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents; the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been

cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained , unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who arc beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 1.1.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project. The Owner does not insure any equipment, scaffolding, towers, staging, forms or tools owned or rented by the Contractor; or any tools owned by mechanics, outbuilding, shops or housing facilities

§ 11.2.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without
duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements , and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss. The property insurance may exclude (1) underground value, (2) land value, grading or tilling and cost of excavation , (3) lawns, trees, shrubs and plants, (4) those portions of walks, roadways and other paved surfaces which arc more than 25 feet from the Project site, and (5) tools, equipment, scaffolding, staging, towers and forms owned or rented by the Contractor and Subcontractors.

§ 11.2.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then affect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.2.1.3 If Contractor makes a claim covered by the Builder's Risk or property insurance policy maintained in connection with the Project, the Contractor shall be responsible for, and shall permit the proceeds of its claim to be reduced by, the amount of the deductible required under the Builder's Risk or property insurance policy irrespective of the cause or nature of the occurrence giving rise to the claim.

§ 11.2.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.2.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§11.2.1.6 Property insurance provided by the Owner shall not cover any tools, apparatus, machinery, scaffolding, hoists, forms, staging, shoring, and other similar items commonly referred to as construction equipment that may be on the Project site and the capital value of which is not included in the Work. The Contractor and Subcontractors shall make their own arrangements for any insurance it may require on such construction equipment. The Contractor waives all claims and all rights of subrogation against the Owner for loss of or damage to tools, apparatus, machinery, scaffolding, hoists, forms, staging, shoring, equipment, materials, and supplies.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and
the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 1 1.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. The Owner shall provide written notification to the Contractor of the cancellation or expiration of any insurance required by Sections 11.2 and 11.3. The Owner shall provide such written notice with in five (5) business days of the date Owner is first aware of the cancellation or expiration or is first aware that the cancellation or expiration is threatened or otherwise may occur. whichever comes first.

§ 11.3.7 Waivers of Subrogation
If permitted by the Owner's insurance company without penalties. the Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent of actual recovery of any insurance proceeds under any property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner and made payable to the Owner in good faith for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach , or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. lf the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 Performance and Payment Bond

§ 11.4.1 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements. The costs of all bonds are included in the Contract Sum. The bonds shall meet all statutory requirements of the state in which the Project is located. The bonds shall be executed by a responsible surety licensed in the state in which the Project is located and approved by the Owner and shall remain in effect for a period not less than one (1) year following the date of Substantial Completion or the Contractor's warranty period, which ever time period is longer. The Contractor shall keep the surety informed of the progress of, and changes in, the Work, and requests for reduction or release of retainage and for final payment.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered or installed contrary to the Architect's or Owner's Representative's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect or Owner, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time. If testing is required and recommended by the Architect/Engineer for the purpose of determining if Work installed meets the requirements of the Contract and acceptance of the Owner and Architect, costs for testing shall be the responsibility of the contractor. Owner and Architect shall inform Contractor in writing and select testing agency to perform the work.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's and Owner's Representative's services and expenses made necessary thereby, shall be at the Contractor's expense. If the Contractor fails to correct defective or non-conforming Work within two (2) days after receipt of written notice from the Owner or the Architect, the Owner may make good the deficiencies and the cost shall be charged to the Contractor. If payments due the Contractor are not sufficient to cover the cost, the Contractor shall pay the difference to the Owner. When a change in the Work is contemplated which may affect the Contract sum or duration of the Work , the Architect/Engineer may issue a Proposal Request, AJA Fom1G709, the Contractor shall promptly , but in no case longer than seven (7) working days, issue a reply or change quotation, stipulating the change in cost and/or duration as a result of the proposed change. The issuance of a Proposal Request does not, in any way, authorize commencement of the Work therein described. Should, after review and consultation with the Owner, and Owner's Representative, the Architect/Engineer finds the Change Quotation by the Contractor to be acceptable, the Architect/Engineer will issue a written Change Order to the Contractor within 14 days of receipt of the Change Quotation.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within

a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 or this Agreement shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 Sections 12.2.2 and 3.5 relates only to the specific obligation of the Contractor to correct the Work , and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time with in which proceedings may be commenced to establish the Contractor' s liability with respect to the Contractor 's obligations other than specifically to correct the Work.

§ 12.2.6 At the request of the Owner's Representative, the Contractor at no additional costs shall provide invoices and specific information to the Owner's Representative for seeking potential rebate opportunities for the Owner from local utility companies.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be affected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.1.1 Contractor and all Subcontractors are responsible to comply with Indiana Code as it pertains to public works projects. The following are notable requirements set forth in IC 5-16-13, in effect as of July 1, 2015, but are not inclusive of all requirements.

. 1 Contractor shall self-perform Work of at least 15 percent of total Contract price.

.2 Contractor and all Subcontractors, regardless of tier, shall maintain General Liability Insurance of at least $1,000,000 per occurrence and $2,000,000 in aggregate.

.3 Contractor and all Subcontractors, regardless of tier, shall not pay cash to its employees for Work performed on this public works Project.

.4 Contractor and all Subcontractors, regardless of tier, shall comply with federal Fair Labor Standards Act of 1938.

.5 Contractor and all Subcontractors, regardless of tier, shall be in compliance with workers compensation requirements of Indiana Code 22-3-5-1 and Indiana Code 22-3-7-34 and commits worker's compensation fraud if such Contractor or Subcontractor falsely classifies an employee as an independent contractor, sole proprietor, owner, partner, officer, or member of a limited liability company .

.6 Contractor and all Subcontractors, regardless of tier, shall be in compliance with unemployment compensation system requirements off Indiana Code 22-4-1 through 22-4-39-5 .

.7 Contractor and all Subcontractors, regard less of tier, shall be in compliance with requirements for drug testing of its employees set forth in Indiana Code 4-13-18 - 1 through 4- 13-18-7.

§ 13.1.2 Following provisions shall be in effect for Contracts awarded on July 1, 2016 and afterward.
.1 Contractor and all Subcontractors, regardless of tier, prior to performing construction work shall be qualified by either Indiana Department of Administration or INDOT.
.2 For public works by local governmental entities under Indiana Code 36-1-12, Contractor and its Subcontractors shall comply with requirements for drug testing of its employees set forth in Indiana Code 4-13-18 if estimated cost of public works Contract is at least $150,000.
.3 Contractor and all Subcontractors, regardless of tier, shall preserve its payroll and related records for three (3) years after completion of the project work and such records shall be open to inspection by the Indiana Department of Workforce Development.

§ 13.1.3 As a result of House Bill 1019 (2015) and Senate Bill 375 (2016), effective January 1, 2017, Contractors bidding public works projects must be prequalified with State Department of Public Works before beginning construction on projects. Contractors bidding this project must be prequalified up to $10 million or at a minimum, the total amount of the Project. Information regarding the process for pre-qualification can be found at the following link: https://www.in.gov/idoa/files/CONTRACTOR_APPLICATION_w-attachAandB-Nov-2015.pdf.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Except as expressly provided in the Contract Documents, duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, misc… and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect and Owner timely notice of when and where tests and inspections are to be made so that they may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after the effective date of this Agreement, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If such procedures for testing, inspection or approval under Sections 13.4.1 and 13.4.2 reveal failure or complete or partial non-compliance of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and

compensation for the Architect's and Owner's Representative's services and expenses shall be at the Contractor's expense. The Contractor also agrees that the cost of testing services required for the convenience of the Contractor in its scheduling and performance of the Work , and the cost of testing services related to remedial operations performed to correct deficiencies in the Work, shall be borne by the Contractor.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Unless otherwise expressly provided in the Contract Documents, payments due and unpaid under the Contract Documents shall bear no interest. If interest is expressly provided for in the Contract Documents, then such interest shall apply only with respect to liquidated and non-disputed payments, and shall only accrue from and after the tenth (10th) day following the Owner's receipt of a notice containing an express statement by the Contractor of its intention to assess interest. In the event the Owner is entitled to withhold payment under the Contract Documents, or in the event of a good faith dispute between the Owner and the Contractor, no interest shall accrue.

§ 13.7 Time Limits on Claims

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1. 1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit on the Work performed, and costs incurred by reason of such termination. Recovery by the Contractor of lost anticipated profits and other incidental or consequential damages are specifically excluded.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract

Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of any provision of the Contract Documents;

.5 repeatedly does not provide the proper management of workers on site performing work under Contractor's contract; or

.7 does not fully implement or fail to properly perform and maintain the Criminal History and Background Check Procedures as per Contractor Documents; or

.8 continues to ignore requests to clean, organize the site, provide proper access to and around construction areas.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, two days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's and Owner's Representative's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted to the extent pem1itted by Section 8.3.4 for increases in the cost and time lost to the critical path of the Project Schedule caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. shall be made by Change Order and shall include mark-up i n accordance with this Agreement. No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, plus a reasonable markup for overhead and profit on Work performed. The Contractor shall make its records available for the Owner's and Architect's review. In the event any termination of the Contractor for default is later determined to have been improper, the termination shall automatically convert to a termination for convenience, and the Contractor shall be limited in its recovery strictly to the compensation provided for in this Section 14.4.3, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 The Contractor shall make all claims for an increase in the Contract Sum or the Contract Time in accordance with the Contract Documents and in strict compliance with the procedures provided below. If the Contractor claims that it is entitled to additional sums or time, for any reason whatsoever, the Contractor shall give the Owner and the Architect written notice of the claim within ten (10) days after the occurrence giving rise to the claim or within ten (10) days after the Contractor first recognizes the condition giving rise to the Claim, whichever is later. The notice of the claim shall set forth the circumstances giving rise to the claim, and to the extent reasonably available, facts, documents, backup data and other information supporting the claim and the relief sought. Failure by the Contractor to provide written notice of the claim shall result in a waiver of the claim. Within thirty (30) days after providing written notice of a claim, the Contractor shall submit complete support for the claim including, without limitation, documents, backup data and other information supporting the claim, the relief sought, and those persons with knowledge of the claim. No additional sums shall be paid to the Contractor, and no additional time shall be granted or recognized, unless the Contractor has received a written Change Order signed by the Owner and the Architect. VERBAL CHANGES OR EXTRAS SHALL NOT BE VALID OR ENFORCEABLE.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4 and 11, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the initial Decision Maker unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to litigation of any Claim arising prior to the date final payment is due, unless 30 days after the Claim has been referred to the Initial Decision Maker the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to litigation.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The parties in good faith shall attempt to agree upon a mediator. If parties cannot so agree in 10 business days of the notice, the parties shall jointly petition the circuit court of the county where the Project is being constructed to provide a list of five mediators from which the parties shall alternately strike those not wanted. The parties shall strike within five business days of receipt of the list of mediators with the party requesting mediation striking first. The individual remaining at the conclusion of the striking process shall serve as mediator. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

ENTIRE SECTION 15.4 ARBITRATION HAS BEEN DELETED

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Either party, at its sole discretion, may consolidate a mediation conducted under this Agreement with any other mediation to which it is a party provided that (1) the mediation agreement governing the other mediation

permits consolidation, (2) the mediations to be consolidated substantially involve common questions of law or fact, and (3) the mediations employ materially similar procedural rules and methods for selecting mediator(s).

§ 15.4.4.2 Either party , at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in mediation, provided that the party sought to be joined consents in writing to such joinder. Consent to mediation involving an additional person or entity shall not constitute consent to mediation of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to a mediation conducted under this Section 1 5.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

ARTICLE 16 MISCELLANEOUS PROVISIONS

§ 16.1 If any part of the Contract Documents are later found to be contrary to, prohibited by or invalid under applicable law, rules or regulations, that provision shall not apply and shall be omitted to the extent so contrary, prohibited or invalid, but the remainder of the Contract Documents shall not be invalidated and shall be given full force and effect insofar as possible.

§ 16.2 Notwithstanding anything herein to the contrary, pursuant to Ind. Code 36-1-12-15 and Ind. Code 5-16-6-1, the Contractor agrees:

1. That in the hiring of employees for the performance of Work under this Contract or any subcontract hereunder, neither the Contractor nor its Subcontractors, nor any person acting on behalf of the Contractor or its Subcontractors, shall, by reason of race, religion, color, sex, national origin, ancestry or disability, discriminate against any person who is qualified and available to perform the work to which the employment relates; and
2. that neither the Contractor nor its Subcontractors, nor any person acting on behalf of the Contractor or its Subcontractors, shall discriminate against or intimidate any employee hired for the performance of Work under this Contract on account of race, religion, color, sex, national origin, ancestry or disability; and
3. that there may be deducted from the amount payable to the Contractor by the Owner, under this Contract, a penalty of five dollars ($5.00) for each person for each calendar day during which such person was discriminated against or intimidated in violation of the provisions of this Contract; and
4. that this Contract may be canceled or terminated by the Owner and all money due or to become due hereunder may be forfeited, for a second or any subsequent violation of this contract provision.

§ 16.3 Contractor shall, to the extent applicable, comply with the Owner's criminal history background and child protection index check policy(ies) and comply with applicable laws regarding such criminal history background and child protection index check policies.

§ 16.4 STEEL PRODUCTS

§ 16.4.1 In accordance with Indiana Code § 5-16-8, if any steel products are to be used or supplied in the performance of Contractor's Work, only steel products as defined in Section 16.5.2 shall be used or supplied in the performance of this Agreement or any of the subcontracts unless the head of the public agency determines, in writing, that the cost of steel products is deemed to be unreasonable.

§ 16.5.2 As defined in Indiana Code § 5-16-8-1, "Steel products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated, or otherwise similarly process, or processed by a combination of two (2) or more of such operations, from steel made in the United States by the open hearth, basic oxygen, electric furnace, Bessemer or other steel making process.

PART 1 - GENERAL

PERFORMANCE BOND

The Form of Performance Bond shall be AIA Document A312-2010.

A sample copy of this Document Is bound into the Project Manual following this page.

PAYMENT BOND

The Form of Payment Bond shall be AIA Document A312-2010.

A sample copy of this Document Is bound into the Project Manual following this page.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF DOCUMENT 000600

DRAFT

AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

« »« »
« »

CONSTRUCTION CONTRACT
Date: « »
Amount: $ « »
Description:
(Name and location)

« »
« »

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: « » None « » See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

« »
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« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

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ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the

Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

DRAFT

AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

« »« »
« »

CONSTRUCTION CONTRACT
Date: « »
Amount: $ « »
Description:
(Name and location)

« »
« »

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: « » None « » See Section 18

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

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ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- **.1** have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- **.2** have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

E-Verify Compliance Form

Spencer Owen Community Schools is now required to obtain the following affidavit before we can employ your business to provide contracted services to the school corporation. Please attest below that you qualify all your new hires employed after July 1, 2011 and new hires of any subcontractors through the E-Verify Program as required by Indiana Code.

E-Verify Compliance Requirement: Pursuant to I.C. 22-5-1.7, Contractor shall enroll in and verify the work eligibility status of all newly hired employees of Contractor through the E-Verify Program (Program). Contractor is not required to verify the work eligibility status of all newly hired employees through the Program if the Program no longer exists. Also pursuant to I.C. 22-5-1.7, Contractor must execute an **affidavit** affirming that the Contractor does not knowingly employ an unauthorized alien *and* shall be filed with the School Corporation prior to the execution of contracted services. **A contract for services shall not be deemed fully executed until such affidavit is delivered to the School Corp**.

Contractor and its subcontractors shall not knowingly employ or contract with an unauthorized alien or retain an employee or contract with a person that contractor or its subcontractor subsequently learns is an unauthorized alien. If Contractor violates this provision School Corporation shall require Contractor to remedy the violation not later than thirty (30) days after School Corporation notifies Contractor. If Contractor fails to remedy the violation within the thirty (30) day period, School Corporation shall terminate the contract for breach of contract. If School Corporation terminates the contract, Contractor shall be liable to School Corporation for actual damages in addition to any other contractual remedies. There is a rebuttable presumption that Contractor did not knowingly employ an unauthorized alien if Contractor verified the work eligibility status of the employee through the Program.

Prior to performing any work, Contractor shall require each subcontractor to certify to Contractor that the subcontractor does not knowingly employ or contract with an unauthorized alien and has enrolled in the Program. Contractor shall maintain on file a certification from each subcontractor throughout the duration of this contract or project which is the subject of this contract. If Contractor determines that a subcontractor is in violation of this provision, Contractor may terminate its contract with the subcontractor for such violation.

E-Verify Affidavit:

The undersigned being duly sworn upon *(his)(her)* oath, now says that I, _____ (name of contractor) at_____*(name of business entity)*, do hereby state that _____ (business entity) does not knowingly employ unauthorized aliens *and participates in the E-Verify Program when it hires new employees to confirm their work eligibility.*

I swear or affirm, under the penalties for perjury, that the foregoing statements are true.

_____
Signature of affiant/contractor (include title)

_____
Name of business entity

_____
Date

ESCROW AGREEMENT

THIS ESCROW AGREEMENT made and entered into this _____ day of _____, 2024, by and between the Spencer Owen Community Schools, (herein called Owner), _____ (herein called Contractor), and the _____ as Escrow Agent (herein called Escrow Agent) witnesseth:

WHEREAS, Owner and Contractor entered into a contract dated _____, 2024, provided for the construction remodeling by the Contractor of a public building subject to the provisions of IC 36-1-12-14.

WHEREAS, said construction contract provides that portions of payments by Owner to Contractor shall be retained by Owner (herein called Retainage), and placed in an Escrow Account;

NOW, THEREFORE, it is agreed as follows:

1. Owner will hereinafter deliver or cause to be delivered to Escrow Agent the Retainage, to be held in escrow in accordance with the terms of this Agreement.

2. The Escrow Agent shall promptly deposit these funds in a special account.

   (a) The agent shall invest all cash proceeds held in any short-term or money market fund available to such accounts through Agent's Trust Department which are considered prudent to safeguard principal, to earn reasonable interest and make funds available within a reasonable time for distribution when required.

3. The Escrow Agent shall hold the escrowed principal until receipt of written authorization from the Owner specifying the portions of the escrowed funds to be released from the escrow to the Contractor. Upon receipt of such notice, the Escrow Agent shall consider it a direction and remit the designated portion of escrowed principal as directed.

4. Income shall normally be accrued until termination; however, on the direction of the Owner, income may be remitted to Contractor in proportion to the amount of principal disbursed.

   Before any remittance of income received hereunder, Escrow Agent shall deduct its fee which shall be computed in accordance with the published Escrow Retainage Fee Schedule in effect from time to time.

5. In event of controversy, the Escrow Agent shall pay over the net sum held by it hereunder as follows:

   (a) Payment by Joint Authorization:

Upon receipt of a joint written authorization executed by the Contractor and the Owner, the Escrow Agent will make distribution in accordance with such written direction.

(b) Payment to Owner:

Upon receipt from the Owner of a copy of the architect's certificate pursuant to Article 14.2.2 of the General Conditions showing that the Owner has terminated the employment of the Contractor, the Escrow Agent shall pay over to the Contractor such sum, if any, as the Owner directs and shall pay the balance to the Owner.

(c) Payments by Court Order:

Upon receipt of a certified or file stamped copy of a court order receiving the disputed claim or directing a specific distribution of all or any portion of said funds, Escrow Agent will make distribution in accordance with such order.

6. This Agreement and anything done or performed hereunder by either the Contractor or Owner shall not be construed to prejudice or limit the claims which either party may have against the other arising out of the aforementioned Construction Agreement.

7. The duties and responsibilities of the Escrow Agent shall be limited to those expressly set forth herein, to hold such money and to pay and deliver to such person and under such conditions as herein set forth. Escrow Agent shall act in good faith using its best judgment. Escrow Agent shall not be liable for any act taken or omitted in good faith and shall be fully protected when relying on any written notice, demand, certificate or document which it believes to be genuine.

(a) This instrument constitutes the entire agreement between parties regarding the duties of the Escrow Agent with respect to the investment and payment of escrow fund.

	Spencer Owen Community Schools
(Contractor)	(Owner)
BY _____	BY _____
ADDRESS _____	ADDRESS _____
_____	Spencer, Indiana
_____	
(Escrow Agent)	

BY _____

(Escrow Agent

PROJECT **Bus Transportation Building Complex**

EXHIBIT A

1. Contractor's Liability Insurance

2. Broad Form Builder's Risk Completed Value Insurance

1 Contractor's Liability Insurance

A. Each Contractor shall take out and maintain insurance of such types and in such amounts as are necessary to cover his responsibilities and liabilities on a project of the character contemplated under this contract and shall require all his subcontractors to carry similar insurance.

B. No Contractor shall commence work under this contract until he has obtained all insurance required under this Section and such insurance has been approved by the Owner, nor shall any Contractor allow any subcontractor to commence work on his subcontract until the same insurance has been obtained by the subcontractor and approved by the Owner.

C. Each Contractor shall file with the Owner and Architect, prior to the commencement of work, a Certificate of Insurance. Any certificate submitted and found to be altered or incomplete will be returned as unsatisfactory.

D. If requested by the Owner, the Contractor shall furnish the Owner with true copies of each policy required of him or his subcontractors. Said policies will not be cancelled or materially altered, except after thirty (30) days advance written notice to the Owner and Architect, mailed to the addresses indicated herein.

E. Insurance under this Section, as a minimum, shall include the following coverages:

1. Workmen's Compensation and Employer's Liability Insurance:

Workmen's Compensation and Occupational Disease Insurance of statutory limits as provided by the state in which this contract is performed and Employers' Liability Insurance at a limit of not less than $500,000.00 for all damages arising from each accident or occupational disease per person and $500,000.00 annual aggregate. The contractor and their Workers' compensation insurance carrier agrees to waive their rights to subrogate against the project owner, their employees, representatives and agents.

2. Commercial General Liability Insurance on an ISO CG 0001 occurrence form or an equivalent covering the contractor's operations and completed operations under the agreement, whether such operation by the contractor or by a subcontractor or by anyone directly or indirectly employed by any of them or by anyone of whose acts any of them may be liable and in which the Architect and the Owner, its board of directors, employees, representative & agents are named as additional insureds on a CG 2026 11/85 and a CG 2037 10/01 ISO form or equivalent form(s) on a primary non-contributory basis through final payment and for the additional periods specified herein covering:

    a. Operations -- Premises Liability:

Including, but not limited to, Bodily Injury, including death at any time resulting therefrom, to any person or Property Damage resulting from execution of the work provided for in this contract, or due to or arising in any manner from any act or omission or negligence of the Contractor and any subcontractor, their respective employees or agents.

    b. Commercial General Liability:

Contractors to provide a full Commercial General Liability Policy.

    c. Products -- Completed Operations Liability:

Including, but not limited to, Bodily Injury, including death at any time resulting therefrom to any person or Property Damage because of goods, products, materials or equipment used or installed under this contract, or because of completed operations, which may become evident within three (3) years after the date of final payment made to the Contractor including damage to the building or its contents.

    d. Contractual Liability:

Each and every policy for liability insurance, carried by each Contractor and subcontractor, as required by this Section shall specifically include Contractual Liability coverage as broad as what is on an ISO CG 0001 with no contractual limitation endorsement.

    e. Special Requirements:

The insurance required under Paragraph 2 of this subsection shall specifically include the following special hazards:

Property Damage caused by conditions otherwise subject to exclusions "x,c,u", Explosion, Collapse or Underground Damage.

Broad Form Property Damage endorsement, which has reference to property in the "care, custody, or control" of the insured.

Aggregate limits must apply per project.

Contain a severability or separation of insureds clause

Coverage for ongoing operations, independent contracts and any persons or entities performing work on behalf of the contractor.

"Occurrence" Property Damage coverage in lieu of "caused by accident".

f. Limits of Liability:

The insurance under Paragraph 2 of this subsection shall be written in the following limits of liability, as a minimum:

For all Contracts:

Bodily Injury and Property Damage:	
$1,000,000.00	Each Occurrence
$2,000,000.00	Aggregate Products and Completed Operations
	$1,000,000 Personal and Advertising injury – contractual liability exclusion excepted-
$2,000,000.00	General Aggregate

3. Commercial Automobile Liability covering:

   a. All owned, hired, or non-owned vehicles including the loading or unloading thereof.

   b. Limits of Liability:

The insurance under Paragraph 3 of this subsection shall be written in the following limits of liability as a minimum:

For all Contracts:
Combined Single Liability (CSL): $1,000,000

4. For contracts in excess of $250,000, the automobile policy would include the project owner, its board of directors, employees, representatives and agent as an additional insured on a primary/non-contributory basis.

5. Umbrella Liability coverage excess of the General Liability, Employer's Liability and Automobile Liability and shall be no less broad than the respective policy. The limits shall apply on a per project basis. Additional insured must follow the primary.

Each Occurrence and Aggregate	$5,000,000.00

F. Hold Harmless Agreement

1. The Contractor shall indemnify and hold harmless the Owner, Owner's Representative, its agents, and the Architect and their agents and employees from and against all claims, damages, losses and expenses including attorney's fees arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (including but not limited to the work) including the loss of use resulting therefrom, and (b) is caused in whole or in part by any negligent act or omission of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

2. In any and all claims against the Owner, Owner's Representative, its agents, or the Architect or any of their agents or employees by an employee of the Contractor, Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Hold Harmless Agreement shall not be limited in any way by any limitation on the amount payable by or for the Contractor or any Subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts.

3. The obligations of the Contractor under this Hold Harmless Agreement shall not extend to any claim, damage, loss or expense for which the Architect is legally liable arising out of professional services performed by the Architect, his agents, or employees, including (a) the preparation of maps, plans, opinions, reports, surveys, designs or specifications, and (b) periodic observation of the work or engineering services.

2 Broad Form Builders Risk Completed Value Insurance

A. The Owner will effect and maintain Builders Risk Completed Value insurance or an equivalent coverage covering all risks of physical loss. This insurance is to be upon all the structures on which the work of all the Contracts is to be done to one hundred percent (100%) of the insurable value thereof, including items of labor and materials connected therewith whether in or adjacent to the structures insured, materials in place or to be used as part of the permanent construction including surplus materials, shanties, protective fences, bridges, temporary structures, miscellaneous materials and supplies incident to the work, and such scaffoldings, stagings, towers, and equipment as are not owned or rented by the Contractor, the cost of which is included in the cost of the work. EXCLUSIONS: This insurance does not cover any tools owned by mechanics, any tools, equipment, scaffolding, staging, towers, and forms owned or rented by the Contractor, the capital value of which is not included in the cost of the work, or any structures erected for housing of food service for the workmen. A waiver of subrogation in favor of the project owner applies.

B. Said insurance, to be furnished by the Owner, shall insure the Owner's interest, shall insure the interest of all Contractors having a contact with the Owner, and shall also include all Subcontractors of each Contractor. The Contractors shall be named or designated in such capacity as insured jointly with the Owner in all policies and all Subcontractors for each Contractor shall be included as insured jointly with the Contractors in all policies by designation, by name, of each of said Subcontractors, or by designation, "Subcontractors, as their respective interest may appear". Certificates of such insurance shall be filed with each of the Contractors and the Architect. If the Owner fails to affect or maintain insurance as above and so notifies the Contractor, the Contractor may insure his own interest and that of the subcontractors and charge the cost thereof to the Owner. If the Contractor is damaged by the failure of the Owner to maintain such insurance or to so notify the Contractor, he may recover as stipulated in the Contract for recovery of damages. If other special insurance not herein provided for is required by the Contractor, the Owner shall affect such insurance at the Contractor's expense by appropriate riders to his Builders Risk Insurance policy. The Owner, Contractors, and all subcontractors waive all rights, each against the other, for damages caused by fire or other perils covered by insurance provided under the terms of this article, except such rights as they may have to the proceeds of insurance held by the Owner. The loss, if any, is to be made adjustable with and payable to the Owner for the insureds and Contractors and subcontractors as their interest may appear, except in such cases as may require payment of all or a proportion of said insurance to be made to a mortgagee as his interest may appear.

C. The Owner shall be responsible for and at his option may insure against loss of use of his existing property, due to fire or otherwise, however caused. If required in writing by any party in interest, the Owner as Trustee shall, upon the occurrence of loss, give bond for the proper performance of his duties. He shall deposit any money received from insurance in an account separate from all his other funds and he shall distribute it in accordance with such agreement as the parties in interest may reach. If after loss no special agreement is made, replacement of injured work shall be ordered and executed as provided under Article 7.

D. The project owner shall have power to adjust and settle any loss with the insurers unless one of the Contractors interested shall object in writing within three (3) working days of the occurrence of loss.

END OF EXHIBIT A

EXHIBIT-A

CRIMINAL HISTORY AND EXPANDED CHILD PROTECTION INDEX CHECK POLICY FOR ALL WORKERS

PRIME CONTRACTOR'S RESPONSIBILITIES, PROCEDURES AND REQUIREMENTS FOR CONDUCTING PERSONAL BACKGROUND AND CHILD ABUSE CHECKS, PERFORMING MANDATORY REPORTING OF CONVICTIONS, ARRESTS AND SUBSTANTIATED CHILD ABUSE FOR ALL WORKERS ON-SITE

To protect students and staff members, the School Corporation requires an inquiry, as prescribed by Indiana law into the personal background of each worker employed by the Prime Contractor and/or Prime Contractor's sub-contractors that will be on school property.

Definition of ***Worker***: Any person that is directly or indirectly employed by the Prime Contractor, or a sub-contractor, sub-sub-contractor, to perform work for on school property for any duration of the Project. This encompasses all personnel/workers of all trades or vendors. Any personnel/workers anticipated to be on school property for any duration of the Project shall undergo an expanded criminal history check through a reputable screening vendor such as Safe Hiring Solutions or another reputable screening vendor of the Prime Contractor's choice as indicated in the Contract Documents.

The Prime Contractor shall perform the necessary procedures and be solely responsible for obtaining and documenting personal background information on each worker anticipated to be on school property. Information shall include the following:

A. An expanded **criminal history check** as defined by I.C. 20-26-2-1.5;
B. An Indiana **expanded child protection index check** as defined by I.C. 20-26-2-1.3;
C. A search of the national sex offender registry maintained by the United States Department of Justice;
D. Beginning July 1, 2017, a search of the State child abuse registry;
E. Verification of the applicant's eligibility to work using the E-Verify database maintained by the federal government as required by I.C. 12-32-1.

The background information on each worker shall also include an expanded child protection index check in other states.

The School Corporation requires that an **expanded criminal history check** be conducted for each worker who will be on school property and may likely be working in the area or directly adjacent and outside the area/s where children and staff are present, and/or may have direct, ongoing contact with children while performing construction related activities while employed directly or indirectly for the Prime Contractor and/or Prime Contractor's Sub-Contractor/s. The expanded criminal history check shall be conducted prior to and well advanced to the worker entering onto school property.

The School Corporation requires that an **Indiana expanded child protection index check** be conducted for each worker who will be on school property and may likely be working in the area or directly adjacent and outside the area/s where children and staff are present, and/or may have direct, ongoing contact with children while performing construction related activities while employed directly or indirectly for the Prime Contractor and/or Prime Contractor's Sub-

Contractor/s. The expanded criminal history check shall be conducted prior to and well advanced to the worker entering onto school property.

The Prime Contractor shall deny access at any time onto school property to a worker who has current infractions as identified by the previously listed history checks, index checks, registry searches and:

A. Is the subject of a substantiated report of child abuse or neglect or
B. Has been charged with or convicted of one (1) of the following crimes:
    a. Murder (I.C. 35-42-1-1).
    b. Causing suicide (I.C. 35-42-1-2).
    c. Assisting Suicide (I.C. 35-42-1-2.5).
    d. Voluntary manslaughter (I.C. 35-42-1-3).
    e. Reckless homicide (I.C. 35-42-1-5).
    f. Battery (I.C. 35-42-2-1) unless ten (10) years have elapsed from the date the individual was discharge from probation, imprisonment, or parole, whichever is later.
    g. Aggravated battery (I.C. 35-42-2-1.5)
    h. Kidnapping (I.C. 35-42-3-2).
    i. Criminal confinement (I.C. 35-42-3-3).
    j. A sex offense under (I.C. 35-42-4).
    k. Carjacking (I.C. 35-42-5-2) (before its repeal).
    l. Arson (I.C. 35-43-1-1), unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
    m. Incest (I.C. 35-46-1-3).
    n. Neglect of a dependent as a Class B felony (for a crime committed before July 1, 2014) or a Level 1 felony or Level 3 felony (for a crime committed after June 30, 2014) (I.C. 35-46-1-4(b)(2) and (3)), unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
    o. Child selling (I.C. 35-46-1-4(d)).
    p. Contributing to the delinquency of a minor (I.C. 35-46-1-8), unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
    q. An offense involving a weapon under I.C. 35-47 or I.C. 35-47.5, unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or paroles, whichever is later.
    r. An offense relating to controlled substances under I.C. 35-48-4, unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
    s. An offense relating to material or a performance that is harmful to minors of obscene under I.C. 35-49-3, unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
    t. An offense relating to operating a motor vehicle while intoxicated under I.C. 9-30-5, unless five (5) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.

u. Domestic battery (I.C. 35-42-2-1.3), unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
v. An offense that is substantially equivalent to any of the offenses listed in this subsection in which the judgment of conviction was entered under the law of any other jurisdiction.

Information and records obtained under this policy are confidential and shall not be released except as necessary to implement this policy or defend a decision made pursuant to this policy. Prior to the approved screened worker entering onto school property the Prime Contractor shall submit to the Owner's Representative all documents supporting each worker's background history checks. If these documents are not received, the worker shall not be permitted onto school property until all proper documents are received. The School Corporation at any time shall have the right to immediately review any or all information and records obtained by the Prime Contractor under this policy or the School Corporation shall have the right to perform their own background check to confirm the Prime Contractor's proper screening and documentation of a worker/s as per this policy.

Any costs associated with obtaining the expanded criminal history record and the expanded child protection index check are to be borne by the Prime Contractor and shall be included in the Prime Contractor's Bid Sum.

PRIME CONTRACTOR'S AND WORKER'S DUTY TO REPORT ARREST AND/OR CRIMINAL CHARGE

During the course of the approved worker being on school property, each worker shall be required to immediately report to the Prime Contractor the following:

A. Arrest or the filing of criminal charges against the worker; and
B. Conviction of the worker for a crime; and
C. Substantiated report of child abuse or neglect of which the worker is the subject

The Prime Contractor shall immediately report and notify the School Corporation of such charges in writing. The School Corporation or its designee reserves the right to revoke the worker's allowance to be on-site. At this time, his or her badge will be surrendered, and the worker be immediately removed from school property.

PRIME CONTRACTOR'S RESPONSIBILITIES, PROCEDURES AND REQUIREMENTS FOR DOCUMENTING AND BADGING OF ALL WORKERS ON SCHOOL PROPERTY

Immediately upon entry of approved worker on to school property and worker performing work, the Prime Contractor shall have had or immediately perform the following:

A. Issue a badge to the worker in accordance with the following requirements:
   a. The badge shall be large enough to be noticeable and legible from a distance of 5 feet
   b. Contain a number
   c. Contain the name of the worker clearly printed in legible font
   d. Contain the name of the Contractor of which the worker is employed and performing work
   e. Contain the start date on-site
   f. Contain the anticipated end date on-site

B. Document and maintain an accurate and updated daily log of all workers on-site. The log shall be kept in job-site trailer or another location on-site for review by the Owner's Representative or the Owner upon request. The log shall reflect and document the same information as indicated on the badge issued to the workers.

C. An updated worker log which lists all approved workers on-site shall be submitted to the Owner's Representative at each Progress Meeting.

ENFORCEMENT AND PRIME CONTRACTOR'S NON-COMPLIANCE WITH REQUIREMENTS

A. Any worker on school property not displaying a badge or a valid and current assigned badge will be asked by the Owner's Representative, school administration employee to immediately display a valid and current assigned badge. Failure to produce such a badge within a one-hour timeframe upon request will result in violation of this policy. Workers with such violations will incur monetary penalties of $25.00 per incident that will be charged to the Prime Contractor. Additionally, the worker will immediately be asked to leave school property until a valid and current badge is assigned and is being displayed by worker. Non-compliance of this policy may be considered a breach of the Prime Contractor's Agreement with the School Corporation. The monetary penalties will be documented and charged to the Prime Contractor per incident and deducted from the Prime Contractor's Contract Amount by Change Order at end of Project.

B. At each Progress Meeting or at the request of the Owner's Representative, the Prime Contractor fails to submit an up-to-date worker log of all approved workers on-site, a monetary penalty of $25 will be charged to the Prime Contractor per incident and deducted from the Prime Contractor's Contract Amount by Change Order at end of Project.

JOBSITE CONDUCT POLICY

In addition to the requirements as set forth by Indiana law (I.C. 20-26-5-10), the following requirements upon each worker will be strictly enforced by the Prime Contractor and School Corporation or its designee:

- **No tobacco of any kind permitted on school property.**
- **No radios will be permitted on jobsite.**
- **Shirts must be worn at all times.**
- **No fraternizing with students and/or staff.**
- **No guns, knives or weapons of any kind will be permitted on school property.**
- **Identification Badge must be worn at all times.**
- **No use of foul language will be tolerated.**
- **Exterior doors shall be secured at all times.**

Anyone not complying with the above rules will promptly and permanently be removed from school property.

The Prime Contractor will be charged with clearly communicating and enforcing this policy to ALL workers on school property.

ACKNOWLEDGEMENT

The Prime Contractor agrees to implement and follow this Policy and assumes full responsibility that all personnel/workers on-site are approved as per the procedures and requirements indicated in this Policy.

I, _____, representing _____, the Contractor,
(Authorized Prime Contractor's Representative) *(Prime Contractor)*

fully understand the terms of this Policy and will adhere to these Policy procedures and requirements.

The School Corporation understands these procedures are to be followed and implemented by the Prime Contractor and understands that the Prime Contractor will conduct an inquiry into all workers on school property as per this Policy. The School Corporation shall enforce the compliance of this Policy through the Superintendent, or his or her designee.

I, _____, representing _____, the School Corporation.
(Superintendent) *(School Corporation)*

SECTION 01 11 00
ADMINISTRATIVE PROVISIONS - SUMMARY

1 General

1.1 Requirements Included

A. Work covered by Contract Documents – Scope-of-Work

B. Contract Method.

C. Work Sequence.

D. Contractor's Use of Premises.

E. Owner Occupancy.

F. Alternates.

G. Coordination.

H. Reference Standards.

1.2 Work Covered by Contract Documents – Scope-Of-Work

A. Work of this Contract comprises of Work to be performed at 1441 Flatwoods Road, Spencer, Indiana 47460 for the construction of a new bus transportation building and all associated site and utility work for Spencer Owen Community School Corporation as indicated in drawings, specifications and project manual. Refer to all drawings and specifications for complete description of the scope-of-work.

1. Work consists of **(general description)** but not limited to the following:

a. Site work grading and excavation including all temporary staging, temporary utilities, site access and maintenance of site conditions during all construction activities to allow work to be performed on schedule.

b. Installation and connection of sanitary sewer piping and structures, stormwater piping and structures, oil-grease separator structure, gas piping, electric, domestic water piping, and communication utilities.

c. Installation of concrete and asphalt pavement, curbs, concrete islands, fueling island, site electric, site lighting, site fencing, site security and safety systems, and site seeding.

d. Construction of a new pre-engineered building system with maintenance bays, storage areas, overhead doors, doors and hardware, restrooms, offices, etc. with all specified supporting HVAC systems, electrical and lighting systems, fire alarm systems, security systems, technology systems, compressed air systems, trench drains, wet pipe sprinkler system, etc.

e. Installation of CMU wall construction, hollow-core plank mezzanine floor construction, bar joists, metal decking, TPO roof membrane, concrete floor slabs, steel stairs and railing, doors and hardware, window units, floor finishes, wall finishes, ceiling finishes, etc.

1.3 Contract Method

A. Construct the work under a single lump sum Unified Bid Contract.

1.4 Work Sequence and Schedule (Also refer to Section 01 27 00 Monetary Penalties for failure to complete given tasks within the given associated periods listed below. Refer to Section 01 32 00 Progress Schedule for On-Site Mobilization, Substantial Completion, Punch List, and Final Completion Dates)

A. Commence Work upon notification by the Owner. Notify the Architect's office in writing 72 hours before starting any Work. Inspect the site in the company with the Owner's Representative before starting any Work.

B. Tentative Notice to Proceed: August 9, 2024.

C. Anticipated On-Site Construction Start: August 19, 2024.

D. **Substantial Completion Date: July 18, 2025**.

1. Substantial Completion: Substantial Completion refers to all work being completed. All Work shall be completed and ready for the development of a punch list performed by the A.E. and the Owner's Representative.

E. **Final Completion Date: August 23, 2025**

1. Final Completion: Final Completion refers to all Closeout documents have been received and approved by the Owner's Representative.

F. The Contractor is expected to provide the proper management, coordination of subcontractors, procurement of materials and equipment, necessary manpower, means and method, work the required hours, including working second shift, overtime, weekends and holidays to meet the above listed Dates at no extra cost to the Owner.

1.5 Contractor Use of Premises and Heavy Load Access to and from the Site

A. Limit use of premises for Work and for construction operations, to allow for Owner occupancy.

B. Coordinate use of premises under direction of Owner's Representative.

C. The Contractor shall be solely responsible for paying all costs form performing and adhering to all requirements for conducting expanded criminal history checks and conducting expanded child protection index checks on all Contractor's and Contractor's Sub-Contractors workers scheduled to be on school property as per the attached Exhibit-A CRIMINAL HISTORY AND EXPANDED CHILD PROTECTION INDEX CHECKS POLICY FOR ALL WORKERS attached at the end of Section 01 11 00; Administrative Procedures. The Contractor shall carefully read the attached Exhibit and have authorized Contractor's Representative sign and return the Exhibit prior to the acceptance and execution of the Owner-Contractor Agreement.

D. As per the Spencer County Highway-Road Department, all truck deliveries of materials, products, and equipment weighing greater than 5 tons shall be required to utilize a specific travel route due to an existing bridge on Flatwoods Road located just north of the construction site. Trucks are to utilize Walden Road or County Line 175 Road to access and from Flatwoods Road and the Project site. Refer to the drawings for the location of the approved travel route. **It shall be the responsibility of the Prime Contractor to communicate the above access route to all subcontractors and suppliers of deliveries of materials and equipment. The Contractor shall be responsible to provide and post directional signage. Refer to Section 01 50 00; Temporary Facilities and Controls for additional signage information.**

E. There will be no room for material or equipment storage anywhere on-site. The Contractor shall provide off-site storage and mobilize materials and equipment on-site as needed and immediately just prior to installation.

1.6 Owner Occupancy

A. The Owner will occupy the bus transportation building and the entire site for conducting all operations beginning August 1, 2025.

B. All Contractors shall at all times yield to buses traveling to and from McCormick's Creek and shall not block Flatwoods Road or any drive located along Flatwoods Road or adjacent to McCormick's Creek Elementary School.

1.7 Alternates

A. Alternates quoted on Bid Forms will be exercised as Owner option. Accepted alternates will be listed in Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work affected by accepted alternates as required to complete the Work.

C. Bid prices shall be indicated on the Bid Form. All bidders shall indicate for each alternate listed the appropriate add or deduct amount or no change. **No indication of price will be considered as no change in price to complete the scope of work.**

D. Schedule of Alternates: See Section 01 23 00 – Alternates, for Schedule of Alternates.

1.8 Coordination

A. Prime Contractor shall have an experienced, English speaking and qualified job superintendent on-site at ALL TIMES during any construction activity. The job superintendent shall also be on-site at all times while any sub-contractor or sub-sub-contractor is on site performing work, including weekends, holidays, after hours, etc..... The Prime Contractor and job superintendent shall be responsible for all coordination, scheduling and complete management and oversight of all activities and Work of all sub-contractors.

B. Coordinate work of the various Sections of Specifications to ensure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.

C. Verify characteristics of elements of interrelated operating equipment and building components are compatible; coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduits as closely as practicable; make runs parallel with lines of the building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. Execute cutting and patching to integrate elements of Work, uncover ill-timed, defective, and non-conforming work, provide openings for penetrations of existing surfaces, and provide samples for testing. Seal penetrations through floors, walls, and ceilings.

1.9 Reference Standards

A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or when in conflict with applicable codes.

B. The date of the standard is that in effect as of the Bid date, except when a specific date is specified.

C. Obtain copies of standards when required by Contract Documents. Maintain a copy at job site during progress of the specific work.

2 Products

Not Used

3 Execution

Not Used

END OF SECTION

SECTION 01 21 00
ALLOWANCES

1 General

1.1 Requirements Included

A. Schedule of Allowances.

B. Costs included in Allowances.

C. Contractor costs included in Contract sum.

D. Architect Responsibilities.

E. Contractor Responsibilities.

F. Correlation with Contractor Submittals.

1.2 Related Requirements

A. Section 01 29 00 – Payment Procedures: Final Payment.

B. Section 01 33 00 - Submittals: Scheduling of allowances.

C. Individual Specifications Sections Listed Under Schedule of Allowances: Specification of products and installation under Allowances.

1.3 Schedule Of Allowances

A. Allow the lump sum of $100,000 for additional work. This amount shall be included in the Contractor's Base Bid amount and Contract Sum.

1.4 Costs Included in Allowances

A. Cost of product to Contractor or subcontractor, less applicable trade discounts.

B. Delivery to site.

C. The included Allowances per Contract shall be used only as directed by the Architect and the Owner's Representative for the Owner's purposes.

1. No overhead and profit for labor and materials shall be allowed for the use of the Allowance amount.

2. Mark up the Contractor's project management, research, on-site review and verification, submittal development, and site superintendent are to be included in the Contract Sum Allowance amount.

1.5 Contractor Costs Included in Contract Sum

A. The following items are to be included in the Contractor's bid price and are not to be included in the allowance sum.

1. Products and equipment handling at the site, including delivery, unloading, uncrating, and storage.

2. Protection of products from elements and from damage.

3. Labor for installation and finishing, except when installation is specified as part of allowance.

4. Other expenses required to complete installation.

5. Contractor overhead and profit.

6. Contractor's project management, research, on-site review, verification, and site superintendent.

7. Cleaning.

8. Protection of existing building surfaces, components, etc.…

1.6 Architect Responsibilities

A. Consult with the Contractor in consideration of products, and suppliers, and installers.

B. Select products, obtain the Owner's written decision, and transmit full information to the Contractor:

1. Manufacturer, product, model, or catalog number, accessories, attachments, and finishes.

2. Supplier and installer as applicable.

3. Cost to Contractor, delivered to site and installed.

1.7 Contractor Responsibilities

A. Assist Architect in determining suppliers and installers; obtain proposals when requested.

B. Make recommendations for Architect consideration.

C. On notification of selection, execute purchase agreement with designated supplier and installer.

D. Arrange for and process shop drawings, product data, and samples.

E. Arrange for delivery; promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

F. Install, adjust, and finish products.

G. Provide warranties for products and installation as requested by Owner's Representative.

1.8 Correlation with Contractor Submittals

A. Schedule shop drawings, product data, samples, and delivery dates in accordance with the Progress Schedule for products selected under allowances.

1.9 Allowance Remaining at Substantial Completion

A. At the time of Final Completion, the Contractor shall credit back to the Owner, on their final application for payment, the amount of all unused Allowance amounts assigned to their bid package.

2 Products

Not Used.

3 Execution

Not Used.

END OF SECTION

SECTION 01 23 00
ALTERNATES

1General

1.1 Summary

A. This Section includes administrative and procedural requirements for Alternates.

1.2 Definitions

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

B. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 Procedures

A. Coordination:

1. Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

2. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Alternate prices for Alternate 1 and Alternate 2 shall remain valid for 60 calendar days with no change in price. Alternate prices for all remaining Alternates shall remain valid with no change in price for the entire duration of the Project.

E. Indicate cost of each Alternate on the Bid Form as an ADD or DEDUCT from the Base Bid Work amount. If no cost change, indicate N/C on the Bid Form. If left blank, it shall indicate that Contractor shall perform the Work at no cost to Owner.

F. Schedule: A Schedule of Alternates is included at the end of this Section.

2 Products

Not Used.

3 Execution

3.1 Schedule and Description of Alternates

A. General: See Section 01 11 00, Administrative Provisions and related specification sections and drawings for additional information.

1. **ALTERNATE 1** - ***ADDITION OF BAY #2*** - *MULTI PURPOSE BAY BETWEEN COLUMNS 4 AND 5:*

- THE EXTERIOR WALL AT COLUMN LINE 4 OF THE BASE BID WILL MOVE TO COLUMN LINE 5. ALL PLUMBING, MECHANICAL, FIRE ALARM SYSTEM, SECURITY DEVICES AND ELECTRICAL ITEMS WILL MOVE WITH AND BE EXTENDED TO THE EXTERIOR WALL.
- THE EXTERIOR CONCRETE APRONS WILL EXTEND TO THE END OF THE BUILDING ADDITION.
- LIGHTING, ELECTRICAL, FIRE ALARM DEVICES, WET-PIPE SPRINKLER SYSTEM, RADIANT HEATING AND EXHAUST WILL BE ADDED TO THE SPACE.
- IF ALTERNATE #1 IS ACCEPTED BUT ALTERNATE #2 IS NOT, THE OWNER PROVIDED CONTRACTOR INSTALLED WASH ARM AND SOAP MIXING STATION WILL BE INSTALLED IN BAY #2. THE TRENCH DRAIN WILL BE INSTALLED THE FULL LENGTH IN THE CENTER OF BAY #2 CREATING A MULTI PURPOSE BAY THAT CAN BE USED FOR MAINTENANCE AND WASHING.
- IF ALTERNATES #1 AND #2 ARE BOTH ACCEPTED, THE TRENCH DRAINS IN BAY #2 WILL BE LOCATED AT THE EXTERIOR OVERHEAD DOORS IN LIEU OF INSTALLED THE FULL LENGTH IN THE CENTER OF THE BAY.

2. **ALTERNATE 2** - **ADDITION OF BAY #3** - WASH BAY BETWEEN COLUMNS 5 AND 6:

- THE EXTERIOR WALL AT COLUMN LINE 4 OF THE BASE BID WILL MOVE TO COLUMN LINE 6. ALL PLUMBING, MECHANICAL, FIRE ALARM SYSTEM, SECURITY DEVICES AND ELECTRICAL ITEMS WILL MOVE WITH AND BE EXTENDED TO THE EXTERIOR WALL.
- A SEPARATION WALL WILL BE ADDED BETWEEN BAY #2 AND BAY #3 WITH DOUBLE DOORS.
- AN EXTERIOR EGRESS DOOR WILL BE ADDED.

- THE EXTERIOR CONCRETE APRONS WILL EXTEND TO THE END OF BUILDING ADDITION.
- LIGHTING, ELECTRICAL, FIRE ALARM DEVICES, SECURITY DEVICES, WET-PIPE SPRINKLER SYSTEM, RADIANT HEATING AND EXHAUST WILL BE ADDED TO THE SPACE.
- THE OWNER PROVIDED CONTRACTOR INSTALLED WASH ARM AND SOAP MIXING STATION WILL BE INSTALLED IN BAY 3.

- THE TRENCH DRAIN WILL BE INSTALLED THE FULL LENGTH AND IN THE CENTER OF BAY #3 FOR WASHING.

3. **ALTERNATE 3: EMERGENCY GENERATOR** – INSTALL EMERGENCY BACKUP GENERATOR, ATS AND 18 SPACE CIRCUIT PANEL . SEE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION. ITEMS TO BE INCLUDED ON GENERATOR: GATE OPERATOR, OVERHEAD DOORS, ERS WIRELESS PANEL, ACCESS CONTROL AND CAMERA PANEL, FIRE ALARM PANEL MDF PANEL, IDF PANEL AND SHADED LIGHT FIXTURES. BATTERY BACKUP WILL NOT BE REQUIRED IF ALTERNATE 3 IS APPROVED FOR PROJECT. BASE BID SHALL INCLUDE PROVIDING A BATTERY BACKUP FOR THE FOLLOWING ITEMS: GATE OPERATOR, ERS WIRELESS PANEL, ACCESS CONTROL AND CAMERA PANEL, FIRE ALARM PANEL AND SHADED LIGHT FIXTURES. BASE BID SHALL INCLUDE PROVIDING A UPS FOR THE FOLLOWING ITEMS: MDF PANEL AND IDF PANEL.

4. **ALTERNATE 4: EPOXY FLOOR FINISH** – INSTALL EPOXY FLOOR FINISH IN LIEU OF SEALED CONCRETE IN CORRIDOR #110, ELECTRICAL ROOM #111, JANITOR'S CLOSET #112, CORRIDOR #113, MEN'S RESTROOM #114, WOMEN'S RESTROOM #115, BREAK ROOM #116 AND PRINT ROOM #117. SEE ROOM FINISH SCHEDULE AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.

5. **ALTERNATE 5: EPOXY FLOOR FINISH** – INSTALL EPOXY FLOOR FINISH IN LIEU OF SEALED CONCRETE IN STAIRS #118, PARTS ROOM #119, STORAGE/WORK ROOM #120 AND BAY #1 MAINTENANCE BAY #121. SEE ROOM FINISH SCHEDULE AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.

6. **ALTERNATE 6: EPOXY FLOOR FINISH** – INSTALL EPOXY FLOOR FINISH IN LIEU OF SEALED CONCRETE IN BAY #2 MULTI-PURPOSE BAY #122. SEE ROOM FINISH SCHEDULE AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.

7. **ALTERNATE 7: MAIN ENTRANCE DRIVE STABILIZATION** – DISC THE TOP 16" WITH CODE L LIME AND RECOMPACT TO 98% STD PROCTOR. SUBJECT TO REWORK AS SUGGESTED BY PROOF ROLL. ALL REWORK IF DEEMED REQUIRED BY PATRIOT TESTING AND THE OWNER'S REPRESENTATIVE SHALL BE AT THE EXPENSE OF THE CONTRACTOR. SEE CIVIL DRAWINGS FOR LOCATION, LIMITS SHOWN HATCHED. STABILIZATION TO EXTEND 2'-0" PAST WIDTH OF PAVEMENT. SEE DETAILS 4 AND 7 ON SHEET C11. ALSO REFER TO SPECIFICATION SECTION 32 11 23; AGGREGATE BASE COURSES; FOR ADDITIONAL INFORMATION.

8. **ALTERNATE 8: COUNTY ROAD RE-BUILD** – RECONSTRUCT EXISTING COUNTY ROAD, 300 FEET IN LENGTH X 24 FEET IN WIDTH, CENTERED ON MAIN ENTRANCE DRIVE, WITH 8" ASPHALT PAVEMENT OVER #53 COMPACTED STONE BASE AND PROPERLY GRADED AND PREPARED SUBGRADE. REFER TO DETAIL 13 ON SHEET C11 AND SPECIFICATIONS FOR ADDITIONAL INFORMATION. SHALL INCLUDE REMOVAL AND DISPOSAL OF THE EXISTING ASPHALT AND PAVEMENT CONSTRUCTION. ALSO, SHALL INCLUDE REMOVAL AND REINSTALLATION OF EXISTING MAILBOXES, CUTTING OF EXISTING ASPHALT, GRADING AND ADDING STONE TO EXISTING CONNECTING PRIVATE DRIVES TO OBTAIN PROPER TRANSITIONS. ALL DISTURBED ADJACENT YARD AREAS SHALL BE REPAIRED, FINAL GRADED, SEEDED AND STRAWED WITH REQUIRED PROPER MAINTENANCE UNTIL FULL GROWTH OF GRASS AS APPROVED BY THE OWNER'S REPRESENTATIVE. THE CONTRACTOR SHALL PROVIDE ALL DIRECTIONAL AND WARNING SIGNAGE, BARRICADES, ETC…AS REQUIRED DURING ALL CONSTRUCTION ACTIVITIES AND AS DIRECTED BY THE OWNER'S REPRESENTATIVE AND THE COUNTY HIGHWAY DEPARTMENT.

END OF SECTION

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

1General

1.1 Summary

A. Allowance for Authorization.

B. Change Order.

C. Minor Changes in the Work.

D. Execution of Change Order Documents.

E. Correlation of Contract Submittals.

F. Sample Forms.

1.2 Related Requirements

A. Section 01 21 00 – Allowances.

1.3 Supplemental Instructions (SI)

A. Supplemental Instructions are clarifications and adjustments to the Drawings and/or Specifications that require no change in Contract Sum or Time.

1.4 Architect Initiated Proposal Requests (PR)

A. A Proposal Request is a document issued by the Architect to obtain pricing from Contractors.

B. The Contractor shall submit the name of the individual authorized to receive Proposal Request documents and be responsible for informing others in Contractor's employ or subcontractors of the work.

C. Pricing for Proposal Requests are due within 7 calendar days after the issue date.

D. Document each lump sum quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.

E. Provide data to support computations:

1. Quantities of products, labor, and equipment.

2. Overhead and profit.

3. Justification for any change in contract time.

4. Credit for deletions from contract, similarly documented.

1.5 Proceed Order

A. The Architect, with the consent of the Owner and Owner's Representative, may issue a document, instructing the Contractor to proceed with a change in the work. Proceed Orders are used on emergency items or work items that are critical in maintaining the construction schedule.

B. The document will describe changes in the work and will designate the method of determining any change in contract sum or contract time.

C. The Contractor shall promptly carry out the change in work.

D. For **Time and Material Proceed Order** work:

1. Maintain detailed records of work done on a time and material basis. Provide on a daily basis, full information required for evaluation of proposed changes, and to substantiate costs of changes in work.

2. The Owner's Representative must verify and sign the Contractor's daily time sheets, not as approval for payment, but for record that work was completed per the Supplemental Instruction or approval of the Owner's Representative. Authorization number must be indicated on all Daily Time Sheets. If daily time and material sheets are not developed and submitted on a daily basis, said time and material sheets may be deemed unacceptable and the work performed may be deemed as unauthorized work as determined by the Owner's Representative.

3. Submit itemized account and supporting costs data after completion of change within 15 days after completion.

E. The Architect and the Owner's Representative will determine the change allowable in contract sum and contract time as provided in the contract documents.

1.6 Allowance Authorization

A. An allowance authorization will be issued based upon the Contractor's price quotation as approved by the Architect and the Owner's Representative.

1.7 Change Order

A. A change order will be issued based upon the Contractor's price quotation as approved by the Architect and Owner's Representative.

1.8 Minor Changes in The Work

A. The Architect will advise of minor changes in the work not involving an adjustment to contract sum or contract time as authorized by AIA A201, 2013 Edition, by issuing supplemental instructions AIA Form G710 or similar form.

1.9 Execution Of Change Documents

A. The Architect will issue Change Orders and Allowance Authorizations.

B. Signed copies of Change Orders are to be returned to the Architect within 7 calendar days.

1.10 Correlation of Contractor Submittals

A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized change order and/or allowance authorization as a separate line item and adjust the contract sum.

B. Promptly submit revisions to Construction Schedule to reflect any change in contract time if applicable.

C. Promptly enter changes in project record documents.

1.11 Documenting Approved Proposal Requests, SI's and Change Orders (Contract Modifications)

A. Promptly add each approved Contract Modification to the appropriate Record Drawing Sheet. The Owner's Representative shall review the Record Drawings just prior to review of each requested payment application and reserve the right to reject the request for payment until the Record Drawings have been updated to the satisfaction of the Owner's Representative.

2Products

Not Used.

3Execution

Not Used.

END OF SECTION

SECTION 01 27 00
MONETARY PENALTIES

1 General

1.1 Summary

A. There shall be Monetary Penalties associated for failure to complete given tasks within the given associated time periods and upon notifications of non-compliance for such tasks listed for the project. These penalties will be handled by issuance of a Deductive Change Order or a Deductive Allowance Authorization to the Contract.

1.2 Related Sections

A. General Conditions of the Contract for Construction: Progress Payments and Final Payment.

B. Section 01 11 00 – Administrative Provisions.

C. Section 01 32 00 – Progress Schedule

D. Section 01 33 00 – Submittals for required documentation.

E. Section 01 77 00 - Contract Closeout: Final Payment.

1.3 Schedule of Penalties

A. Contractor is to notify the Architect and the Owner Representative of the readiness of the project for Punchlist or Final Completion walk-through at least one-week before the actual visit by both to the site.

B. Number of Substantial Completion Inspections.

1. There will only be three substantial completion-punch list review walk-throughs, and each requested visit represents one of these walk-throughs. For all additional visits beyond the designated three walk-throughs and understanding that the additional visits were not required due to fault of the Architect or the Owner Representative, that the Contractor will be required to pay the Owner all costs, properly itemized and related to the additional services required by the Architect and the Owner Representative.

C. Number of Final Inspections.

1. There will only be two final completion walk-through inspections, and each requested visit represents one of these walk-through inspections. For all additional visits beyond the designated two and understanding that the additional visits were not required due to fault of the Architect or the Owner Representative, the Contractor will be required to pay the Owner all costs, properly itemized and related to the additional services required by the Architect and the Owner's Representative.

D. **Substantial Completion:** Substantial Completion refers to all work being completed. All Work shall be completed and ready for the development of a punch list performed by the Architect and Owner's Representative.

1. As determined by the Owner's Representative, If all Work has not been completed by the designated Substantial Completion Date, the Contractor shall be charged $150.00 per calendar day past the designated Substantial Completion Date unless there is an item or items that can't be completed, as determined by the Owner's Representative and Architect, and has been discussed and agreed to in writing/email with Contractor, Owner's Representative, and A/E.

2. A Change Order will be issued against the Final Payment.

E. Punch Lists:

1. All Punch List items shall be completed within 7 calendar days after the designated Substantial Completion Date, unless there is an item or items on the Punch List that can't be completed, as determined by the Owner's Representative and Architect, and has been discussed and agreed to in writing/email with Contractor, Owner's Representative and A/E.

2. After the seventh calendar day after the date of Substantial Completion, the Contractor shall be charged $150.00 per calendar day for failure to have completed any of the Punch List Items to the satisfaction of the Architect and Owner's Representative, and a Change Order will be issued against the Final Payment.

F. Project Close-Out Documents Deadline:

1. All project closeout requirements/documents shall be completed by the Final Completion Date as indicated in the Progress Schedule, Section 01 32 00. All Closeout Documents shall meet the approval of the Architect and Owner's Representative after review. The Contractor shall be charged $100.00 per day past the designated time noted above for failure to provide all approved/acceptable closeout documents and a Change Order will be issued against the Final Payment.

G. Daily Cleaning:

1. All Contractors on site shall participate in cleaning activities as per Section 01 74 13. Failure of Contractors to participate in daily cleaning activities as per Section 01 74 13 shall incur penalties/costs as indicated in Section 01 56 90.

2 Products

Not Used.

3 Execution

Not Used.

END OF SECTION

SECTION 01 29 00
PAYMENT PROCEDURES

1General

1.1 Requirements Included

A. Format.

B. Preparation of Applications.

C. Submittal Procedures, including certified payroll.

D. Payment.

E. Final Payment.

1.2 Related Requirements

A. General Conditions of the Contract for Construction: Progress Payments and Final Payment.

B. Section 01 21 00 - Allowances.

C. Section 01 33 00 - Submittals: Submittal procedures.

D. Section 01 33 00 - Submittals: Schedule of Values.

E. Section 01 77 00 - Contract Closeout: Final Payment.

1.3 Format

A. AIA G702 and AIA G703 - Application and Certificate for Payment.

1.4 Preparation Of Applications

A. Type required information or use media-driven printout.

B. Execute certification by signature of authorized officer.

C. Use data on accepted Schedule of Values. Provide dollar value in each column for each line item for portion of Work performed and for products stored on site.

D. List each authorized and fully executed Change Order and/or Allowance Authorization as an extension on continuation sheet, listing Change Order and/or Allowance Authorization number and dollar amount.

E. Prepare Application for Final Payment as specified in Section 01 77 00.

F. Submit "pencil copy" of payment application to Owner's Representative a week before the end of each month.

G. When Architect or Owner's Representative requires substantiating information, submit data justifying line item amounts in question. Support application with receipts and other vouchers showing payment for materials and labor and other such evidence of the Contractor's right to payment as the Architect or Owner's Representative may direct.

1.5 Submittal Procedures

A. Submit applications monthly. Submit "pencil copy" of payment application to Owner's Representative a week before the end of each month. Payment applications shall be based on the cost of labor and materials incorporated in the Work and for the value of materials suitably stored at the site.

B. Payment for stored materials, equipment and fabricated items will not be processed until said materials, equipment and fabricated items have been successfully incorporated into the Work as approved by the Owner's Representative.

C. Only upon prior written approval from Owner's Representative, if application is made for materials, equipment and fabricated items not incorporated in the Work but delivered and stored at the site, submit bill of sale or other documentation to establish Owner's title to such material. Store said materials, equipment, and fabricated items so that they will not deteriorate or be damaged in any way and as per manufacturer's recommendations. Safeguard said materials, equipment, and fabricated items from theft, burglary, pilferage, fire, vandalism, and mischief.

D. Only upon prior written approval from Owner's Representative, if application is made for materials, equipment and fabricated items not incorporated in the Work but stored off-site, the requirements as indicated in AIA A201 General Conditions Document; Article 9 will be enforced.

E. The Contractor retains sole responsibility for the care and protection of materials and Work installed in the building or materials stored on the site for which payment has been made and for the restoration of damaged Work and replacement of damaged or stolen materials.

F. No provision of the above articles is to be construed as a waiver of right of the Owner to require fulfillment of all terms of the contract.

G. It is accepted for Payment Applications to be transmitted via email in lieu of regular mail. Notary seal and signature must be clearly visible and legible for payment application to be considered and accepted.

1.6 Payment

A. Architect and Owner's Representative's Responsibilities:

1. After "pencil copy" has been approved by Owner's Representative, Contractor shall submit such approved application to Architect via email, and copy Owner's Representative. Architect shall certify payment and email completed certified payment application to Owner's Representative for delivery to Owner for payment. Note: Contractor shall be aware that each payment application, once approved and certified, must be entered into claims for school board action and approval. Contractor shall allow for up to 45 days from date of certification of approved payment application by Architect.

2. If upon receipt of the "pencil copy" of the payment application, the Owner's Representative may request the Contractor to make the required adjustments to protect the Owner. Items that may require adjustments to the "pencil copy" are as follows but not limited to:

   a. Defective Work not remedied.

   b. Claims filed or reasonable evidence indicating probable filing of claims.

   c. Failure of the Contractor to make payments properly to subcontractors or for material or labor.

   d. Damage to another Contractor.

   e. In the opinion of the Owner's Representative the requested payment does not reflect the work in place and completed.

3. When advised by Contractor that Work is substantially completed, within a reasonable time, make a joint visit to the Work with the Contractor, and if the Architect determines that the Work is substantially complete, prepare a Certificate of Substantial Completion to be submitted to the Owner and the Contractor for their execution.

4. The Architect may withhold a recommendation for payment in whole or in part, if the Project Schedule falls behind schedule and an approved accelerated plan is not acted upon to the satisfaction of the Owner's Representative.

B. Owner's Responsibilities:

1. Payment of the amount certified to be due the Contractor. Payment will be made for ninety-five percent (95%) of the amount certified. The remaining five percent (5%) will be held as retainage throughout the duration of the Project. **Refer to Section 01 77 00; 1.6 Substantial Completion and Contract Closeout Procedures for release of retainage requirements.**

2. For Contracts in excess of $200,000, establishment of an escrow retainage account in accordance with the provisions of Indiana Code, 5-16-5.5. Contractor shall coordinate the establishment of an escrow account with Owner or submit a request letter to the Owner and the Owner's Representative) stating they would like the Owner to hold retainage. Letter shall be issued immediately upon receipt of Notice to Proceed. It is the responsibility of the Contractor to initiate and coordinate the establishment of the escrow account. All costs for set-up of the escrow account and agreement shall be borne by the Contractor.

1.7 Final Payment

A. The making and acceptance of the final payment constitutes a waiver of all claims by the Owner, other than those arising from unsettled liens, from faulty Work appearing after Substantial Completion or from failure to comply with Drawings and Specifications and the terms of any special guarantees specified in the Contract and of all claims by the Contractor, except those previously made and still unsettled.

1. Final Payment shall not be made until all closeout documents have been received and approved by the Owner's Representative. This includes the completion of all punch list items to the satisfaction of the Architect and the Owner's Representative. **Refer to Section 01 77 00; 1.6 Substantial Completion and Contract Closeout Procedures for release of retainage requirements.**

2 Products

Not Used.

3 Execution

Not Used.

END OF SECTION

SECTION 01 31 17
PROJECT MEETINGS

1 General

1.1 Summary

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Pre-Construction Conferences.

2. Pre-Installation Conferences.

3. Progress Meetings.

B. Contractor or Awardee shall be required to have present at each of the project meetings a representative acceptable to the AE and Owner's Representative. The designated representative shall have sufficient authority and knowledge to make decisions for the Contractor he is representing on matters affecting this Project.

C. Contractor or sub-contractor for which the Contractor is responsible for, or representative unable to attend a specified meeting shall have an acceptable alternate representative designated and **shall notify the Owner's Representative not less than 3 days prior to date of meeting**.

1.2 Pre-Construction Conference

A. The purpose of this meeting is to review submittals that will be required by the Contractors and to review the project procedures that are to be followed during the progress of construction.

B. Advance written notice of the Pre-Construction Conference date, time, and place will be sent to various successful bidders by Architect and Owner's Representative. Prime Contractor shall require their principal subcontractors to attend.

C. Agenda: Discuss items of significance that could affect progress, including the following:

1. Discussion of Construction Schedule.

2. Critical work sequencing.

3. Designation of responsible personnel.

4. Processing of field decisions.

5. Procedures for processing Application for Payment.

6. Distribution of Contract Documents.

7. Submittal of shop drawings, product data, and samples.

8. Procedures for maintaining Record Documents.

9. Use of premises.

    a. Office and storage areas.

    b. Owner's requirements.

10. Major equipment deliveries and priorities.

11. Safety and first-aid procedures.

12. Security procedures.

13. Housekeeping procedures.

14. Working hours.

D. The Owner's Representative shall prepare minutes and record significant discussions and agreements and disagreements of each conference, and the approved schedule. The Owner's Representative shall promptly distribute the record of the meeting to everyone concerned.

1.3 Pre-Engineered Building (PEMB) Permit Conference

A. A PEMB conference will be conducted at the date and time indicated in the Progress Schedule Section 0132 00. The purpose of this meeting is to discuss and finalize all details regarding the foundation design, anchor bolt layouts, loads, final building dimensions, column and X-bracing locations, wall girts and roof purlin locations in reference to adjacent building components and construction so the PEMB manufacturer can expedite the production of anchor bolt layouts in conjunction with an approved foundation design and the PEMB can be put in the production "que".

1. Attendees: The Owner's Representative, Architect-Engineer, Prime Contractor, installing foreman, and representatives of the PEMB manufacturer involved in or affected by the installation of the PEMB, and its coordination or integration with other materials and installations that have preceded or will follow, shall be required to participate in this conference call.

1.4 Pre-Installation Conferences

A. Conduct a pre-installation conference at the project site before each construction activity.

B. Attendees: The Prime Contractor, installing foreman, and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Contractor shall schedule conferences and advise the Architect and Owner's Representative of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for particular activity under consideration at each pre-installation conference, including requirements for the following:

a. Contract Documents.

b. Options.

c. Related Change Orders.

d. Purchases.

e. Deliveries.

f. Shop drawings, product data, and quality control samples.

g. Review of mock-ups.

h. Possible conflicts.

i. Compatibility problems.

j. Time Schedules.

k. Weather limitations.

l. Manufacturer's recommendations.

m. Warranty requirements.

n. Compatibility of materials.

o. Acceptability of substrates.

p. Temporary facilities.

q. Space and access limitations.

r. Governing regulations.

s. Safety.

t. Inspecting and testing requirements.

u. Required performance results.

v. Recording requirements.

w. Protection.

2. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

C. Contractor and appropriate Sub-contractors shall review and comply with required pre-installation conferences outlined in the Contract Documents. (See individual Specification Sections.)

1.5 Progress Meetings

A. Progress meetings will be established on a bi-monthly basis or more frequent as determined by Architect or the Owner's Representative, to review the progress of construction, possible delays, problems, and projected construction activity. The Owner's Representative will provide a Project Meeting Schedule to the Contractor at the Pre-Construction Meeting. Contractor and his principal sub-contractors, suppliers, representatives, or manufacturers' representatives required to attend as requested by the Owner's Representative and failing to be in attendance at project meetings, when specifically requested, will be taken into consideration when payment applications are being considered for approval by Architect and the Owner's Representative.

1. Meetings shall be conducted in the nearby McCormick's Creek Elementary School unless otherwise determined elsewhere.

2. Contractor will be required for his principal subcontractors to attend.

3. The progress and schedule of each involved Contractor shall be coordinated at this meeting. The representatives of the Contractor present shall have the authority to change the Contractor's work schedule or authorize work with the consent of the Owner's Representative and Architect. Attendance at these meetings is required for approval of the Contractor's Application for Payment.

4. Coordinate dates of meetings with the preparation of payment requests.

5. Contractor shall be required to submit to the Owner's Representative the enclosed Contractor Progress Report before each progress meeting. Contractor will be required to review the same during the meeting.

B. Minimum Agenda shall be as follows but not limited to the following:

1. Review work progress since last meeting.

2. Note field observations, problems, and decisions.

3. Identify problems which impede planned progress.

4. Review off-site fabrication problems.

5. Review and discuss possible long lead products/equipment.
6. Develop corrective measure and procedures to regain planned schedule.
7. Revise Construction Schedule as indicated.
8. Plan progress during next work period.
9. Review submittal schedules, expedite as required to maintain schedule.
    a. Tracking of material deliveries.
10. Maintaining quality and work standards.
11. Review security safety issues.
12. Review and discuss testing.
13. Complete other current business.
14. Documentation of information for approval of Applications for Payment.

1.6 Pre-Closeout Meeting

A. When the work or designed portion thereof is 75 percent substantially complete, by billing, the Owner's Representative will conduct a Pre-Closeout Meeting.

B. The minimum agenda will be to review Section 01 77 00 – Closeout Procedures.

1. O & M Manuals – Required at 75 percent completion by billing.
2. Prerequisites to Substantial Completion.
3. Punch Lists development.
4. Record Drawings.
5. Start to Finalize Change Orders.
6. Extra Stock.
7. Owner's Training.
8. Final Payment Application.

C. Contractor shall attend this "Progress Meeting" for Pre-Closeout.

2 Products

Not Used.

3 Execution

Not Used.

END OF SECTION

SPENCER OWEN BUS TRANSPORTATION BUILDING

CONTRACTOR'S PROGRESS MEETING REPORT

Date: _____ **Contractor:** _____

Average Manpower on Site (Including Subcontractors): _____

Progress Since Last Progress Meeting:

Planned Progress to Next Progress Meeting:

Major Material Delivery Status:

Construction Schedule Status and Plan to Resolve Any Issues:

Signed: _____

SECTION 01 32 00
PROGRESS SCHEDULE

1 General

1.1 Requirements Included

A. Compliance and schedules.

B. Construction schedule.

C. Project Guideline Schedule: Attached at the end of this Section.

1.2 Compliance and Schedules

A. Guideline Schedule indicates milestone activities for the Project, as well as anticipated completion dates. Prior to bidding on the Project, all Contractors shall review the guideline schedule to determine if the intent of the schedule can be met. The guideline schedule is to be used for bidding purposes only; however, the indicated completion date of all Work of the Project must be accomplished by Contractor. Coordination between all Contractors and with subcontractors is necessary.

B. Prime Contractor is responsible for expediting approvals and deliveries of material so as not to delay job progress.

C. Prime Contractor shall begin each phase of work as quickly as physically possible. Coordinate with subcontractors.

D. Prime Contractor shall fully cooperate with the Owner's Representative and Architect in the coordination of the Work and the convenience of the Owner.

E. The Contractor's construction schedule will be established with dates as listed in the Project Guideline Schedule. Prime Contractor shall seek input from all SUB-contractor during the pre-construction meeting. The approved Construction Schedule will be updated every two weeks, reflecting the construction progress. The approved Construction Schedule will not be allowed to deviate from the Substantial Completion and Final Completion Dates as indicated in the Project Guideline Schedule.

F. Prime Contractors, subcontractors, suppliers, and manufacturers shall schedule materials deliveries and installations to conform with the Contract Documents and provisions to this effect shall be included in all subcontracts.

1.3 Construction Schedule

A. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

B. CPM Reports: concurrent with CPM schedule, submit each of the following reports. The format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

   1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.

   2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

   3. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

C. Construction Schedule Updating Reports: Submit with Applications for Payment.

D. Daily Construction Reports: Submit at weekly intervals. Reports to be supplied in electronic pdf format to Owner's Representative and Architect.

E. Site Condition Reports: Submit at time of discovery of differing conditions.

F. Contractor shall bind himself and his subcontractors to work as per the approved schedule, even though there may be changes in the schedule for his scope of work. Deviation from the Substantial and Final Completion Dates will not be accepted.

   1. Contractor and sub-contractors shall work overtime, second shifts, and weekends, if necessary, to maintain and complete his portion of the project construction schedule and to meet and adhere to the Project Guideline Schedule.

      a. Overtime, second shift work night work, holiday work, and weekend work will be at no additional cost to the Owner.

      b. Failure to maintain any portion of the schedule may jeopardize Contractor's pay application approval until substantial proof that Contractor is providing means required to bring all activities int compliance with project guideline schedule.

      c. If the Contractor does not maintain his portion of the schedule the Owner will have the right to supplement the Contractor's forces. All costs associated with the Owner hiring additional forces to maintain/restore the schedule shall be deducted from the Contractor's contract amount.

G. Refer to General Conditions, Items 8.3.1 and 8.3.2 for inclement weather delays.

H. Neither the Owner, Owner's Representative nor the Architect shall in any way be accountable for acts of omissions by Contractor for non-compliance with the Contract Requirements of the approved progress schedule.

1.4 Coordination

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.5 Project Guideline Schedule

A. See Project Guideline Schedule attached at the end of this Section.

2 Products

2.1 Contractor's Construction Schedule, General

A. Time Frame: Develop schedule from date established for commencement of the Work to date of Substantial Completion.

1. The contract completion date shall not be changed by submission of a schedule that shows a later completion date, unless specifically authorized by Change Order where liquidated damages of $150 per calendar day will go into effect.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following.

1. Activity Duration: Define activities so no activity is longer than 21 days, unless specifically allowed by the Owner's Representative.

2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 30 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.

4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

5. Punch List and Final Completion: Include not more than 3 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.

2. Work Under More Than One Contract: Include a separate activity for each contract.

3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

4. Work Restrictions: Show the effect of the following items on the schedule:

a. Uninterruptible services.

b. Provisions for future construction.

c. Seasonal variations.

d. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work.

D. Milestones: Include milestones indicated in the Project Guideline Schedule and Contract Documents, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.

2. Unanswered Requests for Information.

3. Rejected or unreturned submittals.

4. Notations on returned submittals.

5. Pending modifications affecting the Work and Contract Time.

F. Recovery Schedule: When periodic update schedule indicates the Work is three or more calendar days behind the current approved schedule, submit a separate recovery schedule, for the Owner's Representative's review and approval, indicating means by which Contractor intends to regain compliance with the schedule. If no recovery schedule is submitted, Owner may withhold payments until Contractor submits and approved recovery schedule AND activities on-site demonstrate Contractor recovery work is in-place and proceeding as per recovery schedule.

2.2 Contractor's Construction Schedule (Gantt Chart)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within fourteen calendar days of the date established for the Notice of Award. Microsoft project is an approved scheduling software.

B. Preparation: Indicate each significant construction activity separately. Identify the first workday of each week with a continuous vertical line.

1. For construction activities that require (1) one month or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2. Prepare a list of all activities required to complete the work.

3. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to the other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals

b. Mobilization and demobilization

c. Purchase of materials

d. Delivery

e. Fabrication

f. Utility interruptions

g. Installation

h. Closeout meeting (At 75% Project Completion)

i. Work by Owner that may affect or be affected by Contractor's activities:

j. Testing

k. Punchlist and final completion

l. Activities occurring following final completion. Closeout submittals review and approval.

m. Critical path activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with contract milestone dates.

2.3 Reports

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report to Architect and Owner's Representative. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

3 Execution

3.1 Contractor's Construction Schedule

A. Contractor's Construction Schedule Updating: Every two weeks, update schedule to reflect actual construction progress and activities. Issue schedule (2) two days before each regularly scheduled progress meeting.

1. Revise the schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting. Upon review of necessary work activities adjustments to the schedule for work to adhere to Project Guideline Schedule. Upon Owner's Representative's approval of the updated schedule, the schedule shall become the active and current schedule which the Contractor shall adhere to.

2. Include a report with an updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

3. As the Work progresses, indicate final completion percentage for each activity. Failure to submit updated schedule two days before each Progress Meeting and provide an updated schedule approved by the Owner's Representative may result in delay of Contractor payment until schedule is revised, received, and approved by Owner's Representative.

B. Distribution: Distribute copies of approved schedule to Owner's Representative and Architect, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post them in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.2 **PROJECT GUIDELINE SCHEDULE** (Refer to Section 01 27 00 Monetary Penalties for failure to complete given tasks within the given associated time periods listed below)

- **August 8, 2024** – Tentative Date for School Board to Award Contract
- **August 9, 2024** – **Notice to Proceed is Issued.** Immediately start development of submittals for all products, materials, and equipment.
- **August 26, 2024** – **Pre-Engineered Building (PEMB) Permit Conference** (Exact time to be coordinated and scheduled)
- **August 30, 2024** – **Project On-Site Start Date** (Or sooner pending receipt of executed contract documents)
- **September 27, 2024** – All submittals have been submitted and approved.
- **February 1, 2025** or sooner – Pre-Engineered Building Package is delivered.
- **July 18, 2025** – **Substantial Completion Date for All Work.**
- **August 1, 2025** – **Final Completion / Owner Occupancy**

Substantial Completion: Substantial Completion refers to all work being completed. All Work shall be completed and ready for the development of a punch list performed by the Architect and Owner's Representative.

Final Completion: Final Completion refers to all Closeout documents have been received and approved by the Owner's Representative.

END OF SECTION

SECTION 01 33 00
SUBMITTALS

1General

1.1 Requirements Included

A. Procedures.

B. Construction Progress Schedules.

C. Schedule of Values.

D. Shop Drawings.

E. Request for Electronic Files.

F. Product Data.

G. Manufacturer's Instructions.

H. Samples.

1.2 Related Requirements

A. Section 01 21 00 - Allowances.

B. Section 01 29 00 - Payment Procedures: Submittal of Applications.

C. Section 01 45 00 - Quality Control: Manufacturers' field service reports.

D. Section 01 77 00 - Contract Closeout: Closeout submittals.

1.3 Procedures

A. The Contractor shall provide, implement and fully maintain and update a Project Management Program such as ProCore to manage and procure submittals, RFIs, PRs, etc….

B. Forward submittals to Three-I Design, Attention: Lauren Wargel; 2425 W Indiana St, Evansville, IN 47712

C. Phone: (812) 423-6800

1. Address shop drawings to "Shop Drawing Manager".

D. Transmit each item under Architect accepted form.

1. Identify Project, Contractor, subcontractor, major supplier; identify pertinent Drawing sheet and detail number, and Specification Section number, as appropriate.

2. Identify deviations from Contract Documents.

3. Provide space for Contractor and Architect review stamps.

E. Submit log showing required submittals for each bid specification in duplicate within fifteen (15) days after date established in Notice to Proceed.

F. Submit initial progress schedules, and schedule of values in duplicate within fifteen (15) calander days after date established in Notice to Proceed.

1. After review by Architect and Owner's Representative, revise and resubmit as required.

2. Submit revised schedules with each Application for Payment, reflecting changes since previous submittal.

G. Comply with progress schedule for submittals related to Work progress.

1. Coordinate submittal of related items.

H. After Architect review of submittal, revise and resubmit as required, identifying changes made since previous submittal.

I. Immeadiatly after approval of submittal, provide **hard copies** of approved submittals to Owner's Representative on-site. Provide full size drawings of submittals where applicable. Provide labeled binders with index tabs to identify submittals in sequencial order with same format as per specification sections.

J. Distribute copies of reviewed submittals to concerned persons.

1. Instruct recipients to promptly report any inability to comply with provisions.

2. Electronic submittals are required.

1.4 Construction Progress Schedules

A. Submit horizontal bar chart with separate bar for each major trade or operation, identifying first workday of each week. As per Section 3.10 of AIA 201, The schedule shall include a detailed breakdown of planned duration, start date and completion date for each activity and estimated dates for delivery of submittals, materials and equipment. The schedule shall not exceed time limits of the Work as indicated in the Contract Documents, shall be revised and accurately updated every two weeks as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, shall provide for expeditious and practicable execution of the Work and must be reviewed and approved by the Owner's Representative in writing to be determined "current "and to be utilized moving forward.

B. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities.

1. Show projected percentage of completion for each item of Work as of time of each Application for Progress Payment.

1. Show submittal dates required for shop drawings, product data, and samples, and product delivery dates, including those furnished by Owner and those under Allowances. **All** submittals are required to be submitted by no later than 30 calendar days after notice to proceed has been issued. Specifically itemize and indicate long-lead items such as structural steel, hollow core planks, storefront systems, security glazing, glazing, window units, paint finishes, ceiling systems, doors and hardware, electronic door hardware, toilet partions, toilet accessories, storm water pipe and structures, HVAC equipment, VFDs, Pumps, Plumbing equipment and fixtures, Electrical Switchgear, Panels and Devices, casework, and floor finishes on the Construction Schedule.

1.5 Schedule Of Values

A. Submit typed schedule on AIA Form G703; Contractor's standard form or media-driven printout will be considered on request. Submit to Owner's Representative for comment and approval. Schedule of Values shall be adjusted at the request of the Owner's Representative.

B. Format: Table of Contents of this Project Manual. Identify each line item with number and title of the major Sections.

C. Contractor to separate and itemize specific work as requested by Owner's Representative.

D. Include in each item amount of Allowances specified in Section 01 21 00.

E. Include in each line item a directly proportional amount of Contractor's overhead and profit.

F. Include a line item for Daily and Final Cleaning for the amount of ½% of the Contract amount.

G. Include a line item for Closeout Documents for the amount of 1% of the Contract amount.

H. Revise schedule to list change orders on each application for payment.

1.6 Request For Electronic Files

A. At the request of any Contractor, the Architect will provide electronic drawing files in AutoCAD 2019 or later format to aid the Contractor in preparation of shop drawings or record drawings.

1. A signed affidavit is required before release of any AutoCAD files, stating that the information received will not be used for any purpose other than in the preparation of shop drawings or record drawings for this project.

1.7 Shop Drawings

A. Forward Shop Drawings to Three-I Design and copy the Owner's Representative.

B. Transmit each item using the Electronic Submittal Transmittal provided by or approved by the Architect.

1. **When submitting submittals, identify any deviations from the Contract Documents/Specifications clearly on the cover sheet of the submittal.**

2. Provide space for Contractor and Architect review stamps.

3. **All** submittals are required to be submitted by no later than 30 calendar days after notice to proceed has been issued. Specifically itemize and indicate long-lead items such as pre-engineered building system, structural steel, hollow core planks, storefront systems, glazing, window units, paint finishes, ceiling systems, doors and hardware, electronic door hardware, toilet partitions, toilet accessories, stormwater pipe and structures, HVAC equipment, VFDs, Pumps, Plumbing equipment and fixtures, Electrical Switchgear, Panels and Devices, casework, and floor finishes.

1.8 Product Data

A. Forward Shop Drawings to Three-I Design and copy the Owner's Representative.

B. Transmit each item using the Electronic Submittal Transmittal provided by or approved by the Architect.

1. **When submitting submittals, identify any deviations from the Contract Documents/Specifications clearly on the cover sheet of the submittal.**

2. Provide space for Contractor and Architect review stamps.

C. Identify applicable products, models, options, and other data; supplement manufacturers' standard data to provide information unique to the Work.

1. **All** submittals are required to be submitted by no later than 30 calendar days after notice to proceed has been issued. Specifically itemize and indicate long-lead items such as pre-engineered building system, structural steel, hollow core planks, storefront systems, glazing, window units, paint finishes, ceiling systems, doors and hardware, electronic door hardware, toilet partitions, toilet accessories, stormwater pipe and structures, HVAC equipment, VFDs, Pumps, Plumbing equipment and fixtures, Electrical Switchgear, Panels and Devices, casework, and floor finishes, manufacturer's instructions and warranties

D. When required in individual Sections, submit manufacturer's warranties and printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing.

2 Execution

Not Used.

END OF SECTION

SECTION 01 45 00
QUALITY CONTROL

1 General

1.1 Requirements Included

A. General Quality Control.

B. Workmanship.

C. Manufacturers' Instructions.

D. Manufacturers' Certificates.

E. Manufacturers' Field Services.

F. Testing Laboratory Services.

1.2 Related Requirements

A. Section 01 11 00 - Administrative Provisions: Applicability of specified reference standards.

B. Section 01 33 00 - Submittals: Submittal of Manufacturer's Instructions.

1.3 General Quality Control

A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

1.4 Workmanship

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.5 Manufacturers' Instructions

A. Comply with the manufacturer's instructions in full detail, including each step in sequence.

1. Should instructions conflict with Contract Documents, request clarification in writing from Engineer before proceeding.

1.6 Manufacturers' Certificates

A. When required by an individual Section, submit manufacturer's certificate, in duplicate, that products meet or exceed specified requirements.

1.7 Manufacturers' Field Services

A. When specified in respective Sections, require manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to make appropriate recommendations. Contractor shall notify Owner's Representative and Engineer in writing or email one week prior to the on-site arrival of Manufacturer's Representative. Contractor shall be responsible for all associated costs for testing.

B. Representative shall submit written report to Engineer and Owner's Representative in electronic format listing observations and recommendations within 48 hours from date of inspection, test or site visit. Report shall be fully executed and signed by Contractor and Manufacturer's Representative performing inspection, test or site visit.

C. In the event the Engineer and/or Owner's Representative feel that a visit to the Project site by an authorized Manufacturer's Representative is warranted to inspect, review and address concerns of a piece of equipment or product regarding the product's or equipment's installation, condition, performance, operation or possible compromise of the warranty, the Contractor shall promptly schedule the Manufacturer's Representative to visit the site at no cost to the Owner or Engineer. All costs for the Manufacturer's Representative's visit shall be the responsibility of the Contractor.

1.8 Testing Laboratory Services

A. Owner will employ and pay for services of an Independent Testing Laboratory to perform inspections, tests, and other services required by individual Specification Sections, except where otherwise noted.

B. Services will be performed in accordance with the requirements of governing authorities and with specified standards.

C. Reports will be submitted to Engineer in duplicate giving observations and results of tests, indicating compliance or non-compliance with specified standards and with Contract Documents.

D. Contractor shall cooperate with Testing Laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.

1. Notify Engineer and Testing Laboratory twenty-four (24) hours prior to expected time for operations requiring testing services.

2. Make arrangements with the Testing Laboratory and pay for additional samples and tests for Contractor's convenience.

E. Test results may be made available to Contractors for informational purposes only.

1. The accuracy of said results is not warranted by either the Engineer or Owner and said testing shall in no way serve to relieve the Contractor from responsibility for performing the tested work in accordance with the Contract Documents.

F. Test results indicating non-compliance with specified standards and with the Contract Documents shall be re-tested at the Contractor's expense.

2 Products

Not Used.

3 Execution

Not Used.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

1General

1.1 Requirements Included

A. Electricity.

B. Heat, Ventilation.

C. Telephone Service.

D. Water.

E. Sanitary Facilities.

F. Barriers.

G. Enclosures.

H. Protection of Installed Work.

I. Security.

J. Water Control.

K. Site Dust Control.

L. Cleaning During Construction.

M. Paving.

N. Contractor Area.

O. Contractor Employee Provisions.

P. First Aid Personnel.

Q. Project Identification.

R. Signage.

S. Field Offices and Sheds.

T. Removal.

U. Asbestos Materials.

1.2 Related Requirements

A. Section 01 11 00 - Administrative Provisions: Contractor use of premises.

B. Section 01 32 00 - Progress Schedule.

C. Section 01 51 13 - Temporary Electricity: Source for electrical connections.

D. Section 01 51 26 - Temporary Lighting.

E. Section 01 51 23 - Temporary Heating and Ventilating.

F. Section 01 51 36 - Temporary Water: Source for temporary water.

G. Section 01 56 90 – Daily Cleaning.

H. Section 01 77 00 - Contract Closeout: Final cleaning.

1.3 Utilities Use Charges

A. Temporary Water Service: The Prime Contractor shall arrange for and pay for labor, equipment, and materials to install temporary and permanent water connection and meter/s to local utility company water system. Coordinate with the local utility company and with Owner's Representative. Owner will be responsible for obtaining a permit and tap-in fee for a permanent water meter/service. The General Contractor shall pay for all water usage charges to the time of Substantial Completion.

B. Temporary Gas Service: The Prime Contractor shall arrange for and pay for labor, equipment, and materials to install temporary and permanent gas connection and metering to the local utility company natural gas system. The Prime Contractor will be responsible for usage charges related to heating the building. Owner will be responsible for obtaining a permit and tap-in fee for a permanent gas meter/service.

C. Temporary Electric Power Service: The Prime Contractor shall arrange for and pay for labor, equipment, temporary poles and materials, coordinate, size, install temporary electrical connections and meter/s to the local electric utility company electrical power transformer and connections for temporary electrical service to construction areas and Job-Site office trailers. The Owner will be responsible for electric usage charges for temporary electric and will be responsible for tap-in fees for the permanent electric meter/service.

1.4 Electricity

A. The Contractor shall furnish and install temporary special connections and temporary electrical distribution panels of sufficient size for services required other than extension cords.

B. The Contractor shall provide, install, and maintain in a timely manner temporary power distribution panels in all areas and at locations to remote and maintain construction activities. All electrical distribution panels shall be of sufficient size and meet all applicable electrical code requirements.

1. Extension cords to be provided by each Contractor.

1.5 Lighting

A. Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

B. The Contractor shall provide temporary security lighting fixtures operated by photocell as indicated on drawings.

C. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system. The Contractor shall provide, install and maintain in a timely manner and as per Owner's Representative, temporary lighting in all areas to promote and maintain construction activities.

D. All areas where work is being performed shall have temporary lighting with minimum a minimum foot candle level of 25 fcl's which shall be measured at a distance of 4' above the finished floor. Complete and full lighting coverage shall be provided and coordinated as construction progresses.

E. The Contractor shall be responsible for the complete removal of temporary lighting as permanent lighting is installed and provides illumination of spaces.

1.6 Heat, Ventilation

A. The Contractor shall provide ventilation of enclosed areas to cure materials, to disperse humidity, and to prevent accumulations of dust, fumes, vapors, or gases.

B. Refer to provisions specified in Section 01 51 23.

1.7 Telephone Service

A. Provide cellular telephone to job superintendent during construction period.

1.8 Water

A. The Contractr shall provide water service required for construction operations.

1. Extend branch piping with outlets located so that water is available by use of hoses.

2. Refer to provisions specified in Section 01 51 36.

1.9 Sanitary Facilities

A. The Contractor shall provide and maintain required facilities and enclosures of sufficient quantity to support the number of workers on-site.

1.10 Barriers

A. The Contractor shall provide as required to prevent public entry to construction area, to provide for Owner's use of site, and to protect adjacent properties from damage from construction operations.

B. Provide and maintain all temporary (construction) fences and gates as shown on Drawings.

1. Construction: 6 foot high chain link fence equipped with vehicular and pedestrian gates as required for security and circulation.

2. Materials:

a. Fabric: 2 inch diamond mesh, #9 gage chain link constructed of aluminized wire.

b. Tension Wire - #7 aluminized.

c. Gate, Corner, and Terminal Posts - 3 inch OD Pipe 5.79 pounds per foot.

d. Line Posts - 2 inch OD Pipe 2.17 pounds per foot.

e. Corner Braces and Gate Frames - 1-5/8 inch OD Pipe 2.27 pounds per foot galvanized.

3. Erection: Space line posts a maximum of 10 feet on center. Drive posts a minimum of 2 feet into existing grade without concrete foundations. Provide weighted pedestals without drilling at asphalt and other areas.

4. Install and move fence in conformance with chronological requirements of construction.

C. Remove temporary fence when no longer required and remove from site.

D. Contract One shall provide barriers around trees and plants designated to remain.

1. Protect against vehicular traffic, stored materials, dumping, chemically injurious materials, and puddling or continuous running water.

2. Refer to provisions specified in Section 01 56 39.

1.11 Enclosures

A. The Contractor shall provide secure temporary weathertight closures of openings in exterior surfaces to provide acceptable working conditions and protection for materials, to allow for temporary heating, and to prevent entry of unauthorized persons.

1. Provide doors with self-closing hardware and locks.

1.12 Protection Of Installed Work

A. Provide temporary protection for installed products.

1. Control traffic in immediate area to minimize damage.

B. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

    1. Protect finished floors and stairs from traffic, movement of heavy objects, and storage.

C. Prohibit traffic and storage on waterproofed and roofed surfaces, on lawn and landscaped areas.

1.13 Security

A. Provide security program and facilities to protect Work and Owner's operations from unauthorized entry, vandalism, and theft.

    1. Coordinate with Owner's security program.

1.14 Storm Water Control

A. Grade site to drain.

B. Maintain excavations free of water.

C. Provide and operate pumping equipment.

D. Provide dewatering as required when ground water is encountered during excavation for utilities until backfilling is complete.

1.15 Cleaning During Construction

A. All Contractors shall comply with Section 01 56 90 – Daily Cleaning

B. Control accumulation of waste materials and rubbish; periodically dispose of off-site.

C. Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

D. Provide dumpsters for excess material and trash.

E. If, in the opinion of the Owner's Representative, the project is not kept in sufficiently clean manner, and debris and/or waste materials or stored materials impede the completion for occupancy or construction progress, the Owner may take any means necessary, such as hiring others to clean up or move debris and/or materials, of which the entire cost will be charged against the Contractor, who in the Owner Representative's opinion, is at fault.

F. Daily cleaning of construction site shall be required.

1.16 Temporary Stone Base and Asphalt Paving

A. In accordance with the Progress Schedule, the Contractor shall perform the required earthwork, site dust control, install underground utilities, install stone base for the Contractor to utilize as contractor parking, job-site trailers, and minimum material storage.

   1. The Contractor will have the option to also install the asphalt binder at approved locations to promote access around the site and to assist with preventing dirt and debris from being transferred onto the county road.

   2. The asphalt pavement shall be kept free of mud and debris at all times during all construction activities.

B. If the sub surface soils, stone base and/or asphalt binder course is damaged or compromised in any way due to weather conditions and construction usage, the Contractor will pay for the proper approved reconstruction. At a time when the stone base, asphalt base or asphalt surface is scheduled to be installed, a proof roll of all areas will be performed with a fully loaded tri-axel truck. Any area that does not pass the proof roll will be replaced and corrected to the approval of the Geotech (Patriot Engineering) and the Owner's Representative at the Contractor's expense. All areas of the stone base, asphalt binder surfaces shall be cleaned free of all mud, dirt, debris, etc…in preparation for the installation of the asphalt base and asphalt surface. Immediately prior to the installation of the asphalt surface, a tack-coat will be required to be installed over all asphalt binder surfaces.

1.17 Contractor Staging Area, Project Site and Project Access

A. As per the Spencer County Highway-Road Department, all truck deliveries of materials, products, and equipment weighing greater than 5 tons shall be required to utilize a specific travel route due to an existing bridge on Flatwoods Road located just north of the construction site. Trucks are to utilize Walden Road or County Line 175 Road to access and from Flatwoods Road and the Project site. Refer to the drawings for the location of the approved travel route. It shall be the responsibility of the Prime Contractor to communicate the above access route to all subcontractors and suppliers of deliveries of materials and equipment. The Contractor shall be responsible for providing and posting directional signage.

B. There will be no room for material or equipment storage anywhere on-site. The Contractor shall provide off-site storage and mobilize materials and equipment on-site as needed immediately just prior to installation.

C. Contractor shall install and maintain all temporary access drives, staging areas and walkways at the Contractor's expense.

D. Contractor shall add, grade and maintain stone access drives, staging areas and walkways as required at the Contractor's expense and as directed by the Owner's Representative.

E. Stone, debris, or tracking of dirt/mud onto public streets, drives, walks and parking lots will be tolerated. Contractor will be responsible for immediate removal of any and all debris, stone, dirt/mud from public streets, drives, parking lots and sidewalks to clean condition at the Contractor's expense as approved by Owner's Representative.

F. Contractor will be permitted to use areas on the site as designated by the Owner's Representative, for offices, material storage, and employee parking.

G. Contractor shall restore these areas to their original condition after use at the Contractor's expense.

H. Do not deviate from usage of designated areas without written approval of the Owner's Representative.

I. Contractor employees violating this provision will be removed from the project.

J. Contractor areas are designated on the site plans.

K. Provide access for students and school employees to all parking areas, drives and occupied adjacent buildings on campus at all times in accordance with the requirements of the Owner's Representative.

L. Contractor shall be responsible for weekly mowing, weedeating, daily trash pick-up and organization of entire construction site, the immediate adjacent areas and topsoil pile to the acceptance of the Owner's Representative.

M. The Contractor shall be responsible for maintaining, grading, adding stone as required on a daily basis to the adjacent County Road immediately adjacent to the Project site at the Contractors expense and as directed by the Owner's Representative.

1.18 Contractor Employee Provisions

A. Implement procedures required and post the following rules for contractor employees at the project site.

1. The Contractor shall make available to the Owner a statement outlining the drug testing and protocol procedures in place by the Contractor's company.

2. A Criminal History Check shall be done for all employees prior to their working on site.

a. Do not employ, for this project, anyone found to be the perpetrator of sexual or physical abuse of a minor under the age of 18 years of age; including, but not limited to a conviction for any of the following felonies:

1) Kidnapping.

2) Criminal confinement.

3) Rape.

4) Criminal deviate conduct.

5) Child molesting.

6) Child exploitation.

7) Vicarious sexual gratification.

8) Child solicitation.

9) Child seduction.

10) Sexual misconduct with a minor.

11) Incest.

b. Do not employ, for this project, anyone found to be convicted of:

1) Dealing in or manufacturing cocaine, a narcotic drug, or methamphetamine;

2) Dealing in a Schedule I, II, or III controlled substance as defined by IC 35-48-4-2;

3) Dealing in a Schedule IV controlled substance as defined by IC 35-48-4-3;

4) Dealing in a Schedule V controlled substance as defined by IC 35-48-4-4;

5) Dealing in a counterfeit substance as defined by IC 35-48-4-5;

6) Dealing in marijuana, hash oil, or hashish as defined by IC 35-48-4-10(b).

3. Employees shall dress appropriately.

a. No articles of clothing with liquor, drug, foul language, etc., advertisements.

b. Workers should wear shirts and appropriately fitting pants/slacks all times while on the job site.

4. Remove from the project any employee exhibiting alcohol or substance abuse behavior.

5. All construction personnel will conduct themselves in an unimpeachable manner while on the construction site, including proper language, etc.

6. The Owner's Representative may require the Contractor to remove an employee from the project as unsuitable at the Owner's discretion.

7. Construction employees to use only their own toilet facilities.

8. No employees are to eat in occupied areas of Jasper Middle School campus.

9. No teaching areas will be interfered with during school hours without express approval of same by Owner's Representative.

10. Construction employees shall not be within areas used by students during school hours without express approval of same by Owner's Representative.

11. There shall be no smoking on School property.

12. No guns or knives will be allowed on School property.

13. No coffee breaks, loafing, etc., will be tolerated in areas occupied by students or school employees.

14. Police areas daily inside and out, including streets and sidewalks surrounding construction, in which construction personnel are working or otherwise using, to keep same free from debris, dust, mud, etc.

15. All requirements of Occupational Safety and Health Act (OSHA) will be followed implicitly and compliance is the sole responsibility of each Contractor.

1.19 First Aid Personnel

A. Each Contractor shall provide his own registered first aid person at the site during all working hours when work is in progress.

1.20 Project Identification

A. The Contractor shall provide 8-foot by 8-foot, two-sided project identification sign of wood frame and exterior grade plywood construction, painted, with exhibit lettering by professional sign painter, pre-cut vinyl self-adhesive letters, to Architect's design and colors. List the title of the Project, names of Owner, Clerk of Works and Logo, Architect, professional consultants, and Prime Contractors.

B. Erect on-site at the location indicated, or if not indicated, as established by the Owner's Representative.

C. Allow no other signs to be displayed unless approved by the Owner's Representative.

1.21 Signage

A. Contractor shall provide signage for the following:

1. (5 signs) Warning/Construction Area – Stay Out/Construction Personell Only.

2. (10 signs) Exterior Directional Signs to direct deliveries to and from the Project Site. Text to be determined and approved by Owner's Representative and County.

3. (3 signs) Exterior Directional Signs to warn heavy loads to utilize Alternate route. Text to be determined and approved by Owner's Representative and County.

B. All signage shall be 4' wide X 3' tall; double-sided, aluminum panel white in color with red letters 8" in height. Signage shall be mounted on 4X4 treated posts construction as directed by the Owner's Representative. Signage located on permenant pavement shall be constructed on weighted painted 2X4 stands weighted by sand bags. Holes in permenant pavement will not be permitted.

C. Erect on site and at locations as per Owner's Representative direction. Confirm exact text of signage with Owner's Representative prior to making signs.

D. Allow no other signs to be displayed, unless approved by Owner's Representative.

1.22 Field Offices And Sheds

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading. Each Prime Contractor shall have their own field office. All offices shall be in excellent condition. Trailers of unsightly conditions will not be permitted on-site.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1.23 Removal

A. Termination and Removal (by installing Contractor): Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

B. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

C. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Soils in all such areas shall be tilled to a depth of 24" to loosen the soil for proper root and vegetation growth. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

D. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

E. Remove temporary materials, equipment, services, and construction prior to Substantial Completion inspection.

F. Clean and repair damage caused by installation or use of temporary facilities.

1. Remove underground installations to a depth of 2 feet; grade site as indicated.

2. Restore existing facilities used during construction to specified, or to original, condition.

2 Products

Not Used.

3 Execution

Not Used.

END OF SECTION

SECTION 01 51 13
TEMPORARY ELECTRICITY

1 General

1.1 Requirements Included

A. Temporary electrical service.

B. Operation and maintenance.

C. Removal.

1.2 Related Requirements

A. Section 01 11 00 - Administrative Provisions: Contractor use of premises.

B. Section 01 50 00 - Temporary Facilities and Controls.

C. Section 01 51 26 - Temporary Lighting.

D. Section 01 51 23 - Temporary Heating, Cooling, and Ventilating.

E. Section 26 05 00 - Basic Electrical Requirements.

1.3 Service Requirements

A. Power Source: Coordinate with the local Utility company for temporary service. The Contractor shall arrange for and pay for labor, equipment, and materials to install temporary electrical connection and meter (if required) to electrical power and connections for electrical service to construction areas.

1. The Owner will pay for tap fees and permits.

2. Before the availability of electric utility service, provide portable generators if required.

3. Contractors requiring more temporary electricity than what is specified shall supply at their own cost.

B. Service: 120/240 volt, single phase, 60 Hz, alternating current; capacity and ampacity to accommodate maximum construction activities at any time.

C. Supply temporary poles and lines or underground conduit as coordinated with new Work as determined and required by on site temporary activities and temporary facilities.

1. Locate where indicated, or if not indicated, where directed by Owner's Representative.

D. Contractor shall extend from each of the 200 amp services to two 100 amp services 100 feet inside the building approximately 200 feet apart from each other so that temporary power serves the entire project.

E. Service for the Contractor Construction Trailers, Sheds, Etc.: Furnished and paid for by contractor requiring same.

1.4 Distribution

A. Contractor shall provide, install and maintain in a timely manner temporary power distribution panels in all areas of the building and at remote locations to maintain construction activities. All electrical distribution panels shall be of sufficient size and meet all applicable electrical code requirements.

B. At a minimum supply and install weatherproof distribution boxes with one 240 volt, single phase power outlet and four weatherproof 120 volt outlets consisting of 100 ampere fused switches with equipment ground, spaced so that a 100 foot extension cord will reach all areas of the building.

C. Wiring, connections, and protection for temporary lighting.

D. Wiring, connections, and protection for temporary and permanent equipment for environmental control, for temporary use of electrically operated equipment, and for testing.

E. Arrange for and pay for labor, equipment, and materials to install temporary electrical connections to electrical power and connections for electrical service to construction areas.

F. Distribution for Contractor Construction Trailers, Sheds, Etc: Furnished and paid for by contractor requiring same.

1.5 Use Of Permanent System

A. Obtain written agreement with the Owner's Representative establishing the start of warranty and conditions of use.

1. Provide barriers and warning labels on energized equipment.

2. Replace wiring devices and plates damaged during construction.

1.6 Costs

A. Obtain permits and inspections.

1. The Owner will pay for the electrical permits if required.

B. The Contractor shall pay for installation, operation, maintenance, and removal of the system and restoration of permanent equipment including all Power Company changes.

C. All costs for electrical usage charges for electrical service utilized during the life of the Project shall be paid by the Owner.

1. Take measures to conserve energy usage.

2 Products

2.1 Materials

A. Devices and Equipment: Standard devices, meeting UL and National Electrical Code requirements.

3 Execution

3.1 Installation

A. Install in accordance with the National Electrical Code and OSHA requirements.

B. Install initial service at the time of site mobilization.

C. Comply with requirements of Section 26 05 00.

D. Modify, supplement, and extend the system as work progresses or as directed by the Owner's Representative.

3.2 Operation And Maintenance

A. Maintain the system to provide continuous service including prompt restoration of interruptions to the Owner's system when temporary service is connected.

3.3 Removal

A. Remove temporary materials and equipment when the permanent system is operational.

B. Restore permanent facilities used for temporary purposes to original and specified condition.

END OF SECTION

SECTION 01 51 23
TEMPORARY HEATING, COOLING, HUMIDITY CONTROL AND VENTILATING

1 General

1.1 Requirements Included

A. Temporary heating, cooling, and ventilating.

B. Operation and maintenance.

C. Removal.

1.2 Related Requirements

A. Section 01 11 00 - Administrative Provisions: Contractor use of premises.

B. Section 01 50 00 - Temporary Facilities and Controls.

C. Section 01 51 13 - Temporary Electricity.

D. Section 01 77 00 - Contract Closeout: Final cleaning.

E. Individual Sections: Ambient conditions for storage, installation, curing, humidity control and cold-weather construction.

1.3 Service Requirements

A. Maintain temperature, proper and acceptable humidity levels, and ventilation in enclosed areas to provide ambient conditions for storage, preparation, and Work; to cure installed materials, to prevent condensation, and to prevent accumulations of dust, fumes, and gasses.

B. Maintain temperature in enclosed areas at a sustainable minimum 50 degrees F, or higher as specified in individual Sections.

1.4 Utility Sources

A. Gas: The Contractor shall arrange with local Utility company for temporary or permamnent service from main utility connection to building. The Contractor shall arrange for temporary or permanent service into and distribution inside building. Refer to Civil Drawings for utility information.

1.5 Temporary Heating

A. Areas of new construction shall be considered **enclosed** when building shell is complete, weathertight with all exterior openings, windows and doors are closed by permanent work or temporary enclosures are approved by the Owner Representative.

B. Heating (Exterior): Provide, maintain and monitor temporary heating required by exterior construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures and adverse weather. Select equipment that will not have a harmful effect on completed installations or elements being installed. Said Contractors shall pay for all costs, including fuel, gas, and electricity. Use of electrical heaters will be permitted.

C. Before the enclosure of the building, the Contractor shall provide labor, materials, and equipment to enclose, heat, and protect the installation of materials when required to meet the requirements of the approved construction schedule. The Contractor shall pay for all costs, including fuel, gas, and electricity. Use of electrical heaters will be permitted.

1.6 <u>After the construction is enclosed</u> as defined in 1.5.A of this Section, the Contractor will provide and pay for temporary heat, ventilation and humidity control equipment. The Contractor shall make connections to the temporary heat, ventilation, and humidity control equipment. Owner will pay for fuel and electric utility costs for approved temporary equipment.

A. **Prior to the Date of Substantial Completion**, when construction has progressed to a phase of completion where the entire building is weathertight, all exterior permanent doors and windows are installed, and exterior building envelope construction is complete and sealed, including completed installation of roof systems, exterior wall panels, flashings, gutters and downspouts are complete, the use of permanent equipment and systems may be considered if approved in writing by A/E and Owner's Representative. Where permanent new mechanical equipment is utilized for conditioning of spaces under construction, **the Warranty for such equipment shall not begin or become initiated until the Certificate of Substantial Completion is issued.** All new mechanical equipment proposed to be utilized shall have been properly started and inspected by a qualified manufacturer's representative and as per related specifications included in the project manual. All mechanical safety devices, fire protection devices shall have been tested and be in full operation. Additionally, before substantial completion, a qualified manufacturer's representative shall inspect the mechanical equipment and indicate in writing to the Owner's Representative that the equipment and all components, such as ductwork, coils, interior of all components, etc., are clean to like new condition and fully acceptable as per manufacturer's requirements and approved by the Owner's Representative. This procedure shall be performed on all HVAC equipment, boilers, pumps, fans, etc…that is requested to be utilized for conditioning of spaces. Any cleaning, repair, adjustments, or costs associated with any corrections to the equipment shall be the responsibility of the Contractor. The Contractor shall be responsible for all above requirements and also complete proper maintenance, filter changes including costs of filters, etc. of all equipment utilized until the Certificate of Substantial Completion is issued. All return duct openings shall be covered with approved filter media and shall be changed a minimum of twice a week or as determined by the Owner's Representative. Systems are complete and fully operational with all permanent utility connections and safety devices installed and operational. The automatic controls are operational and independent of central automation systems. The construction set of filters in place.

2 Products

2.1 Materials for Temporary Equipment

A. Materials may be new or used, adequate for the purpose.

2.2 Equipment

A. Portable Units: Vented, complete with automatic controls.

1. Fuel to be natural gas only.

2. Contractor shall observe safety precautions as required.

3 Execution

3.1 Installation

A. Locate units and outlets to provide uniform distribution of heating, cooling, and ventilating.

1. Vent exhaust ducts to the exterior.

B. Modify and extend systems as Work progresses.

3.2 Operation And Maintenance Of Temporary and Permanent Systems

A. Upon approval of the Owner's Representative, operate and maintain equipment being used; clean or replace filters and install filters in duct extensions as necessary to maintain work areas and finished areas in specified condition.

B. Temporary Heat:

1. Temporary heat shall be provided for building spaces as required for the installation of any material and for working conditions required by any trade or trades working on the Project.

2. The following temperatures shall be maintained:

a. 50 degrees F minimum during working hours and non-working hours.

b. For a period of seven days prior to interior finishing (wall coverings, resilient tile, acoustical ceilings, etc.), and until final acceptance or occupancy by the Owner, spaces shall be kept 60 degrees F to 75 degrees F during working hours and 60 degrees F minimum at all other times. Humidity levels shall be maintained between 45% to 50% at all times.

3. When temporary heat is required, the Contractor shall provide and maintain all temporary heating systems:

a. Temporary heating system consisting of approved natural gas fired unit heaters, direct-fired make-up air units, boilers, and unit heaters or other similar approved equipment. All such units shall be properly vented to the exterior, piped, wired, thermostatically controlled and have all required safety controls. Relocate heaters and components as necessary to prevent interference with continuing construction.

b. The permanent heating system and its components may be used for temporary heat when available as indicated in 1.6.A of this Section. The building shall be in the finishing stages and the permanent heating system must be installed as designed when used to supply temporary heat. This shall include permanent power wiring connections to a permanent power source. Provide all phases of operation, maintenance, control, and items of like nature during the time the permanent system is used to furnish temporary heat.

1) At the termination of the use of the permanent system as a temporary heating system, the system shall be thoroughly cleaned, equipped with new filters, new belts if required, etc., and any damage repaired or replaced.

2) The use of the permanent heating system for temporary heat shall not affect the warranty period which begins on the date of Substantial Completion of the Project.

3) Refer to Division 23 for other requirements that may affect the use of the permanent system.

C. Temporary Ventilation, Humidity Control and Cooling:

1. Temporary ventilation, humidity control and cooling shall be provided by the Contractor for enclosed building spaces as required for installation of finish building materials.

a. For a period of seven days before interior finishing (wall coverings, resilient tile, acoustical ceilings, etc.) maintain a maximum of 75 degrees F and humidity levels between 45% through 50% in that respective space until final acceptance by the Owner.

2. The permanent ventilation, humidity control and cooling system components may be used for temporary ventilation, humidity control and cooling where available as indicated in 1.6.A of this Section. The building shall be in the finishing stages and the permanent system must be installed as designed when used to supply temporary ventilation or cooling. This shall include permanent wiring connections to a permanent power source. Provide all phases of operation, maintenance, control, and items of like nature during the time the permanent system is used to furnish temporary ventilation or cooling.

a. At the termination of the use of the permanent system as temporary ventilation or cooling system, the system shall be thoroughly cleaned, equipped with new filters, new belts if required, etc., and any damage repaired or replaced.

b. The use of the permanent system for temporary ventilation or cooling shall not affect the warranty period which begins on the date of Substantial Completion of the Project.

D. Cost of Fuel and Electric Power:

1. The cost of all fuel and power consumed for temporary heat, ventilation, humidity control and cooling will be paid by the Owner when construction has progressed to a phase of completion where the entire building is weathertight, all exterior permanent doors and windows are installed, and exterior building envelope construction is complete and sealed, including completed installation of roof systems, exterior wall panels, flashings, gutters and downspouts are complete. Equipment rental or otherwise is the responsibility of the Contractor.

E. Maintenance and Removals:

1. All portions of temporary heating, ventilation, and cooling systems, not part of the permanent systems, shall be removed when the period of usefulness is over. Relocate components as required to prevent interference with continuing construction. Restore any compromised surfaces and patch penetrations. Keep temporary air filters in place and change as often as necessary. Install a clean set of permanent filters prior to air balancing.

3.3 Removal

A. Remove temporary materials and equipment when permanent system is operational or at Substantial Completion.

B. Restore permanent equipment used for temporary service to original condition.

C. After Substantial Completion, replace temporary filters with new, clean, reusable filters.

END OF SECTION

SECTION 01 51 26
TEMPORARY LIGHTING

1 General

1.1 Requirements Included

A. Temporary lighting.

B. Operation and maintenance.

C. Removal.

D. Cleaning.

1.2 Related Requirements

A. Section 01 11 00 - Administrative Provisions: Contractor use of premises.

B. Section 01 50 00 - Temporary Facilities and Controls.

C. Section 01 51 13 - Temporary Electricity.

D. Section 01 77 00 - Contract Closeout: Final cleaning.

E. Section 26 05 00 - Basic Electrical Requirements.

1.3 Service Requirements

A. Temporary Lighting for Storage, Shop, Work, Circulation Areas, and Other Construction Areas While Work is in Progress: Minimum 25 footcandles.

1.4 Use Of Permanent System

A. Obtain written agreement with Owner's Representative establishing start of warranty and conditions of use.

1. Provide temporary lamps of a different color from that specified.

    a. Remove and install new lamps at Substantial Completion.

2. Replace fixtures damaged during Constructor's use.

1.5 Costs

A. Pay for installation, operation, maintenance, and removal of temporary lighting.

B. Costs of Electricity Used for Lighting: As specified in Section 01 51 13.

2 Products

2.1 Materials

A. Receptacles, Fixtures, Controls: Standard products, meeting UL standards.

3 Execution

3.1 Installation

A. Install in accordance with the National Electrical Code.

B. All temporary lighting shall be LED fixtures.

C. Provide LED temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

D. Install and operate LED temporary lighting that fulfills security and protection requirements without operating entire system. Provide, install and maintain in a timely manner and as per the Owner's Representative, temporary lighting in all areas to promote and maintain construction activities.

E. All areas where work is being performed shall have temporary lighting with minimum foot candle level of 25 fcl's which shall be measured at a distance of 4' above the finished floor. Complete and full lighting coverage of all areas shall be provided, extended and coordinated as construction progresses.

F. Contractor shall provide and install (5) Five LED 200 Watt Security Light Fixtures, with photocell at locations as identified by Owner's Representative.

G. Contractor shall be responsible for complete removal of temporary lighting as permanent lighting is installed and provides illumination of spaces.

3.2 Operation And Maintenance

A. Maintain lighting.

1. Promptly replace worn or defective parts.

2. Relamp as required.

3.3 Removal

A. Remove temporary materials and equipment when permanent system is operational.

B. Restore permanent lighting used during construction to original and specified condition.

1. Replace damaged fixtures, lamps, and other component parts.

3.4 Cleaning

A. Clean permanent fixtures used during construction under provisions of Section 01 77 00.

END OF SECTION

SECTION 01 51 36
TEMPORARY WATER

1 General

1.1 Requirements Included

A. Service requirements.

B. Costs.

C. Installation.

D. Maintenance.

E. Removal.

1.2 Related Requirements

A. Section 01 11 00 - Administrative Provisions: Contractor use of premises.

B. Section 01 50 00 - Temporary Facilities and Controls.

1.3 Service Requirements

A. Water Quality: Suitable to the purpose.

B. Source: The Contractor shall arrange with the local Utility company for temporary service, meters and distribution points around site. Refer to Civil Drawings for utility information.

C. Contractors requiring more than specified shall provide and pay for cost of same. Drinking water shall be supplied and paid by all Contractors.

1.4 Distribution

A. Provide valved outlets located so that water is available under adequate pressure by means of hoses.

1.5 Use Of Permanent System

A. Obtain written agreement with Owner, establishing start of warranty and conditions of use.

1.6 Costs

A. Owner shall pay for permits and tap-in fees.

B. The Contractor shall pay for installation, operation, maintenance, and removal of temporary systems, meters and restoration of permanent equipment, if required.

C. Owner will pay the costs of water consumed for normal construction operations. The Contractor shall take measures to conserve usage.

D. The Cntractor shall supply and pay for all water utilized for soil stabilization and dust control operations.

2 Products

2.1 Materials

A. Drinking Water Dispensers: Standard products.

3 Execution

3.1 Installation

A. Install initial service at time of job mobilization.

B. Modify and extend service as work progresses.

C. Size piping to supply construction needs and temporary fire protection.

D. Disinfect piping used for drinking water.

3.2 Maintenance

A. Maintain system to provide continuous service with adequate pressure to outlets.

3.3 Removal

A. Remove temporary system when permanent system is operational.

B. Restore permanent facilities used for temporary purposes to original condition.

END OF SECTION

SECTION 01 51 37
TEMPORARY STORM WATER CONTROL

1 General

1.1 Requirements Included

A. Control of surface water and ground water during construction.

1.2 Related Requirements

A. Section 00 31 32 - Soils Investigation Data.

B. Section 01 50 00 - Construction Facilities and Temporary Controls.

C. Section 31 25 13 – Soil Erosion Control.

D. Section 01 51 13 - Temporary Electricity.

E. Section 33 46 00 - Subdrainage System: Permanent subdrainage system.

2 Products

Not Used.

3 Execution

3.1 Preparation

A. Rough grade site to prevent standing water and to direct surface drainage away from excavations, trenches, adjoining properties, and public rights-of-way.

3.2 Water Control

A. Maintain excavations and trenches free of water.

B. Provide and operate pumping equipment of a capacity to control water flow.

C. Provide a dewatering system and pumping to maintain all excavations dry and free of water inflow, until a permanent dewatering system may be used.

D. Provide piping to handle pumping outflow to discharge in a manner to avoid erosion or deposit of silt.

E. Provide settling basins to avoid silting; install erosion control at the outfall.

F. Protect all storm structures and pipe from infiltration of silt, sediment and debris. All storm structures and pipe containing debris of any kind shall be cleaned to new condition free of silt, sediment and debris at end of the project to the approval of the Owner's Representative.

G. Remove equipment and installation when no longer needed.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including amended General Conditions and other Division 1 Specifications Sections, apply to work of this Section.

1.2 PURPOSE

A. The purpose of this Section is to define and emphasize the responsibilities of each Contractor to clean, remove his rubbish and debris from the construction area as follows:

1. General Contractor shall execute housekeeping and be responsible for the housekeeping of his sub-contractors to keep their work, the site and adjacent properties from accumulations of construction operations and as follows:
    a. Clean up all waste materials, rubbish and debris resulting from his own operations at such frequencies as required by the Owner's Representative, but as a minimum on a daily basis.
    b. Place waste materials, rubbish and debris outside the building in rubbish containers, as provided under Section 01 50 00.
    c. Repair, patch, and touch up marred surfaces to match adjacent finishes damaged by his own operations.
    d. Leave all work areas in a "broom clean" condition at the completion of their work for the day. During sweeping or brooming of areas, Contractors shall not create dust. Each Contractor shall provide measures, supply and pay for materials for controlling and prevention of dust.
    e. Participate in joint clean up as directed by the Owner's Representative and as per specifications.

2. The General Contractor shall be responsible for the following items of cleaning and debris control:
    a. Coordinate and oversee cleaning and ensure all areas of the buildings and grounds are maintained from accumulations of waste materials, rubbish and debris control.
    b. Responsible for daily site cleaning, daily roadway, drives, access and sidewalk cleaning.
    c. Responsible for Project dust control including but not limited to all site activities and areas and interior activities and areas.

3. General Contractor is financially responsible for their own clean-up operations and the clean-up operations of their sub-contractors. Clean-up must be timely as well as thorough in order to meet safety regulations and permit other Contractors to perform without hindrance from dirt and debris.
   Contractors failing to meet housekeeping requirements will be charged for services arranged by the Owner's Representative. The Owner reserves the right to proceed with cleanup at the Contractor's expense with a twenty-four-hour written notice.

4. The cost of this work shall be included in the Contractor's bid and must appear as a line item listed as "Clean-up" in the "Schedule of Values" as .5% of the total contract amount.

B. Each Friday afternoon, or more often if necessary, as determined by the Owner's Representative, the Contractors shall perform an overall clean-up of the entire Project, including a broom cleaning. Each Contractor and Sub-Contractor will be required to provide one (1) worker for four (4) hours minimum to participate in general building and site clean-up. This work will be directed by the General Contractor. Each Contractor's sub-contractor performing work on-site at any time during the week shall also provide one (1) worker for four (4) hours minimum to participate in general building and site clean-up. If any Contractor or Contractor's sub-contractor fails to supply a worker as indicated, the Contractor will be charged at a rate of $70 per hour (up to 4 hours per worker designated to perform cleaning) for each event the Contractor or Contractor's sub-contractor fails to provide a worker for clean-up. The dollar amounts shall be recorded throughout the life of the Project and be deducted from the Contractor's contract.

1.3 SAFETY REQUIREMENTS

A. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on Project site.
2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
3. Do not dispose of wastes into streams or waterways.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.
C. Use only those cleaning materials which will not create hazards to health or property and will not damage surfaces.
D. Each Contractor shall provide his own cleaning materials and equipment.
E. The General Contractor shall furnish one (1) 50-gallon trash receptacle for every 10,000 sq. ft. of work area, but not less than two (2) containers per floor. The fifty-gallon trash receptacle is for use by all contractors for general trash items (i.e. lunch waste, coke cans, etc.). These containers are not to be used for construction waste of any type.

   The General Contractor shall be responsible providing all dumpsters and waste disposal and for the dumping of trash receptacles each week or more as directed by the Owner's Representative.

PART 3 – EXECUTION

3.1 DURING EXECUTION

A. Execute cleaning to ensure that building, grounds, and public properties are maintained free from accumulations of waste materials and rubbish. Provide daily site cleaning, daily roadway, drives and sidewalks cleaning.
B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
C. Daily during progress of work, clean site and public properties and dispose of waste materials, debris and rubbish in dumpster type rubbish container provided under Section 015000.
D. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
E. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.
F. Place no new work on dirty surfaces.
G. Immediately prior to installation of finishes all building components must be cleaned to dust free condition as approved by Owner's Representative.

SECTION 01 61 00
MATERIAL AND EQUIPMENT

1 General

1.1 Requirements Included

A. Products.

B. Transportation and handling.

C. Storage and protection.

D. Substitutions and approved equals.

1.2 Related Requirements

A. Section 01 11 00 - Administrative Provisions: Reference standards.

B. Section 01 21 00 – Allowances.

C. Section 01 45 00 - Quality Control: Submittal of manufacturers' certificates.

D. Section 01 77 00 - Contract Closeout: Operation and maintenance data.

E. Section 01 77 00 - Contract Closeout: Warranties and bonds.

F. Section 01 77 00 - Contract Closeout: Spare Parts and Maintenance Manuals.

1.3 Products

A. Products include material, equipment, and systems.

B. Comply with Specifications and referenced standards as minimum requirements.

C. Components required to be supplied in quantity within a Specification section shall be the same and shall be interchangeable.

D. Do not use materials and equipment removed from the existing structure, except as specifically required, or allowed, by Contract Documents.

1.4 Transportation And Handling

A. Transport products by methods to avoid product damage; deliver in dry and undamaged condition in manufacturer's unopened containers or packaging Contractor shall pay for all costs associated with repair or replacement of damaged equipment due to unloading and placement of equipment and/or components.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

C. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

1.5 Storage And Protection

A. Contractor shall provide off-site storage. There is no on-site storage for material and equipment. Contractor shall schedule delivery of material and equipment as needed for work currently being installed.

B. Store products in accordance with the manufacturer's instructions, with seals and labels intact and legible.

C. Store sensitive products in weathertight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

D. For exterior storage of fabricated products, place on sloped supports above ground.

1. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

E. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

F. Arrange storage to provide access for inspection.

1. Periodically inspect to ensure products are undamaged and are maintained under required conditions.

G. Contractor retains responsibility for all materials, including existing materials which have been removed and are to be reinstalled.

1.6 Substitutions And Approved Equals

A. Wherever a named material, or equipment and required warranties is listed (including manufacturer, brand, model, catalog number, etc.) such proprietary mention is used to indicate the quality and performance required by the design.

B. Proprietary brands, models, etc. of other manufacturers may be used upon, and only upon, the following conditions.

1. That, in the opinion of the Engineer and Owner's Representative, whose decision shall be final, the proposed manufacturer or equipment item is fully equal in design, materials, construction, workmanship, warranties, performance, finish, etc. to the item proprietarily named.

a. No compromise in quality level, however small, is acceptable.

2. That any bidder desiring to bid on an "approved equal" proprietary product submit to the Engineer and Owner's Representative no less than fourteen (14) calendar days prior to the date for receipt of bids, complete written specifications, descriptions, technical data, and performance criteria of the proposed item(s) he wishes to have considered for acceptance as an "approved equal".

    a. Such approval, if granted, will be in the form of a written addendum issued by the Engineer and sent to all prospective bidders of record.

    b. If the information submitted by the bidder is insufficient, in the Engineer's and Owner's Representative's opinion, for allowing him to reach a decision, such request for "approved equal" consideration will be regarded as "non-responsive" and no action whatsoever taken.

    c. The full burden of proof remains with the bidder proposing substitution.

3. That no oral request for "approved equal" materials will be entertained and no oral response proffered.

4. That the Engineer and Owner's Representative assumes no responsibility for the receipt of or the receipt within the time specified of any request for "approved equal" consideration and likewise assumes no responsibility, except a bona fide effort for the issuance, if any, of related addendum in sufficient time prior to the time set for receipt of bids.

5. That the Engineer and Owner's Representative in appraising and evaluating materials and/or workmanship for possible "approved equal" certification reserves the right to arrange for whatever testing or investigation procedures he may deem pertinent, including but not limited to, price and performance data from whatever source he may consider responsible.

6. Any bidder who includes in his bid any approved "or equal" substitute equipment, articles, or materials, shall also include the additional cost required for all additional diagrams and drawings the Engineer and Owner's Representative may require for accommodating the "or equal" equipment.

    a. The modifications to which reference is made include those affecting other trades and equipment in adjacent and/or contiguous areas such as but not limited to steel framing, masonry, electrical, plumbing, and painting.

7. That it be understood the eventual use of materials or installation techniques other than those specified without written approval of the Engineer and Owner's Representative as "approved equal" shall constitute a violation of the Contract and that the Engineer and Owner's Representative shall have the right to require the removal of such material or the modification of such installation technique or both, and the replacement thereof with the specified materials or installation techniques or both, at the Contractor's expense.

2 Products

Not Used.

3 Execution

Not Used.

END OF SECTION

SECTION 01 71 23
FIELD ENGINEERING

1 General

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Sections, apply to the work of this section.

1.2 Grades, Lines, Levels, And Surveys

A. Establish base lines and benchmarks before starting construction.

B. Verify all grades, elevations, lines, levels, locations, sizes, and dimensions as shown on Drawings and report any errors or inconsistencies to the Engineer before commencing work.

C. Verify alignment or indicated offset of new and existing building levels or other building elements prior to construction start.

D. Verify existing dimensions as required for bid preparation or material fabrication.

E. Verify all existing conditions, dimensions and locations of existing building and site components prior to development of submittals, installation of Work, etc.…

2 Products

Not Used.

3 Execution

Not Used.

END OF SECTION

SECTION 01 71 24
WORK LAYOUT

1 General

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Sections, apply to work of this section.

1.2 Layout

A. Each Contractor shall be responsible for the layout of his work and the coordination of his work with other trades.

B. Verify all grades, elevations, lines, levels, locations, sizes, and dimensions as shown on Drawings and report any errors or inconsistencies to the Engineer before commencing work.

C. Do not scale dimensions from drawings unless expressly directed to do so by the Engineer.

2 Products

Not Used.

3 Execution

Not Used.

END OF SECTION

SECTION 01 73 29
CUTTING AND PATCHING

1 General

1.1 Requirements Included

A. Requirements and limitations for cutting and patching of Work.

B. Responsibility for cutting and patching where not otherwise indicated.

1.2 Related Requirements

A. Individual Specifications Sections:

1. Cutting and patching incidental to work of the Section.

2. Advance notification to other Sections of openings required in work of those Sections.

3. Limitations on cutting structural members.

1.3 Submittals

A. Submit written request in advance of cutting or alteration which affects:

1. Structural integrity of any element of Project.

2. Integrity of weather-exposed or moisture-resistant element.

3. Efficiency, maintenance, or safety of any operational element.

4. Visual qualities of sight-exposed elements.

5. Work of Owner or separate contractor.

B. Include in request:

1. Identification of Project.

2. Location and description of affected work.

3. Necessity for cutting or alteration.

4. Description of proposed work, and products to be used.

5. Alternatives to cutting and patching.

6. Effect on work of Owner or separate contractor.

7. Written permission of affected separate contractor.

8. Date and time work will be executed.

2 Products

2.1 Materials

A. Those required for original installation.

3 Execution

3.1 General

A. Execute cutting, fitting, and patching, including excavation and fill, to complete Work, and to:

1. Cut edges of existing asphalt in uniform straight line of full depth to allow installation of new asphalt, concrete and components where required.

2. Fit the several parts together, to integrate with other work.

3. Uncover work to install ill-timed work.

4. Remove and replace defective and non-conforming work.

5. Remove samples of installed work for testing.

3.2 Inspection

A. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

B. After uncovering, inspect conditions affecting performance of work.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.3 Preparation

A. Provide supports to assure structural integrity of surroundings, soils and to keep new installed work in-place.

B. Provide devices and methods to protect other portions of the Project from damage.

C. Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water at all times.

3.4 Performance

A. Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.

B. Cut rigid materials using masonry saw or core drill. Pneumatic tools are not allowed without prior approval.

C. Restore work with new products in accordance with requirements of Contract Documents.

D. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

E. Refinish surfaces to match adjacent surfaces and finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit. All refinished areas shall meet the approval of the Owner's Representative. Areas not meeting approval of the Owner's Representative, shall be listed and remain on punch list until satisfactorily completed and approved by Owner's Representative.

F. At all areas where rework was performed, new work shall be uniform in appearance and not have the appearance of a "patch".

END OF SECTION

SECTION 01 74 13
CONSTRUCTION CLEANING

1 General

1.1 Requirements Included

A. Cleaning and disposal of waste materials, debris, and rubbish during construction.

1.2 Related Requirements

A. General Conditions of the Contract for Construction: Cleaning Up.

B. Section 01 50 00 - Construction Facilities and Temporary Controls.

C. Section 01 77 00 - Contract Closeout: Final cleaning.

D. Individual Specifications Sections: Specific cleaning for Product or work.

2 Products

2.1 Equipment

A. Provide covered containers for deposit of waste materials, debris, and rubbish.

3 Execution

3.1 Cleaning

A. Maintain areas under Contractor's control free of waste materials, debris, and rubbish.

1. Maintain site daily in a clean and orderly condition.

B. Remove dust, debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to closing the space.

C. Broom clean interior areas prior to start of surface finishing and continue cleaning on an as-needed basis.

D. Control cleaning operations so that dust and other particulates will not adhere to wet or newly coated surfaces.

E. Control accumulation of waste materials and rubbish; periodically dispose of off-site.

F. Clean interior areas prior to the start of finishing work, maintain areas and all contents free of dust and other contaminants during finishing operations.

G. Provide dumpsters for excess material and trash.

H. If, in the opinion of the Owner's Representative, Contractor andnot kept in sufficiently clean manner, and debris and/or waste materials or stored materials impede the completion for occupancy or construction progress, the Owner's Representative may take any means necessary, such as hiring others to clean up or move debris and/or materials, at a rate of $100 per hour, of which the entire cost will be charged against the Contractor, and deducted from the Contractors Contract amount.

I. Daily cleaning and organization of construction site shall be required.

J. Upon one warning, verbal with email follow-up, from the Owner's Representative regarding the lack of proper daily cleaning and housekeeping, cleaning of drives, streets, sidewalks, etc.…if the Contractor refuses to provide immediate cleaning at locations where directed by Owner's Representative, the Owner's Representative shall give notice to Contractor via email of such conditions and applicable cost. Such costs shall be deducted from the Contractor's Contract amount.

K. Performing clean-up is a requirement for Pay Request approval.

L. The Contractor shall be responsible for immediate clean-up of any dust or debris that migrates into the Owner-occupied areas adjacent to construction activities, as directed by the Owner's Representative.

3.2 Disposal

A. Remove waste materials, debris, and rubbish from site weekly and dispose of off-site.

B. Maintain disposal area in an orderly manner; prevent runoff into waterways or onto adjacent properties.

END OF SECTION

SECTION 01 77 00
CONTRACT CLOSEOUT AND SUBSTANTIAL COMPLETION

1General

1.1 Requirements Included

A. Closeout procedures.

B. Final cleaning.

C. Project record documents.

D. Operation and maintenance data.

E. Approved Submittals.

F. Warranties and bonds.

G. Owner Training.

H. Sequence of Operation.

I. Testing Documents.

J. Spare parts and maintenance materials.

1.2 Related Requirements

A. Section 01 11 00 - Administrative Provisions: Partial Owner Occupancy.

B. Section 01 50 00 - Construction Facilities and Temporary Controls.

C. Section 01 27 00 – Monetary Penalties.

D. Section 01 32 00 – Progress Schedule.

1.3 Overall Project (ALL WORK) Closeout Procedures and Release of Retainage

A. When Contractor considers ALL Work under the Contract has reached final completion, the Contractor shall submit written certification that the Contract Documents have been reviewed, All Work has been inspected, and that ALL Work is complete in accordance with Contract Documents and ready for Architect's and Owner's Representative's final review.

1. The Architect and Owner's Representative shall then inspect and issue to the Contractor a list (Punch-list) of items to be completed or corrected.

2. Upon receipt of this list, the Contractor shall have 3 calendar days to address these items.

3. The Contractor shall notify the Architect in writing when all items have been completed or corrected.

4. At the end of the 3-calendar day period, the Owner's Representative and Architect shall then review the Work to determine if all items have been completed to the satisfaction of the Owner's Representative, Architect and Contract Documents.

   a. If all Work has been completed to the satisfaction of the Owner's Representative, Architect and Contract Documents, the Architect shall issue a Certificate of Substantial Completion.

   The Contractor can then start development of the ***Release of Retainage Payment Application*** for release of all retainage and the development of the ***Final Payment Application***. Note: If all closeout documents have not been received and approved, the amount associated with the closeout documents X %200 will be withheld until all closeout documents have been received and approved.

   b. If all Work has not been completed to the satisfaction of the Owner's Representative, Architect and Contract Documents, the following actions will be taken:

   b.1. The specified monetary penalties and procedures shall be implemented and enforced until all Work has been completed to the satisfaction of the Owner's Representative, Architect and Contract Documents.

   b.2. The associated punch-list will be updated, and each incomplete or non-conforming work item shall have a value assessed to it as determined by the Owner's Representative. This value shall be multiplied by 200%. This amount will be retained until work for this item has been deemed acceptable by the Architect and Owner's Representative.

B. In addition to the submittals required at closeout as indicated in the conditions of the Contract, the Contractor shall provide submittals required by governing authorities, and submit a final statement-payment application of accounting giving total adjusted Contract Sum, previous payments, and sum remaining due.

C. Architect will issue, if required, a final Change Order reflecting approved adjustments to Contract Sum not previously made by Change Order.

1.4 Final Cleaning

A. Execute prior to certificate of Substantial Completion inspection.

B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean exterior of all windows that have been soiled due to construction activities.

C. Clean site; sweep paved areas, rake clean other surfaces.

D. Remove waste and surplus materials, rubbish, and construction facilities from the Project and from the site.

E. All interior spaces shall be left in a dust-free condition.

1.5 Maintenance Data

A. Maintenance data shall be submitted in electronic document file format and hard copy as approved by the Owner's Representative and delivered to the Project site at 75 percent completion of the entire project. A Closeout Meeting shall be conducted on-site when Project is 75% complete and at the request of the Owner.

B. Provide data for the following.

1. As required in Technical Sections Divisions 5 through 33.

C. Submit one (1) electronic copy on CD and two (2) hard copy sets prior to final inspection, bound in 8-1/2 by 11 inch three-ring side binders with durable plastic covers.

D. Provide a separate volume for each system, with a table of contents and index tabs for each volume.

1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect and Contractor.

2. Part 2: Maintenance instructions, arranged by system.

a. For each system, give names, addresses, and telephone numbers of subcontractors and suppliers.

3. List:

a. Appropriate design criteria.

b. List of equipment.

c. Parts list.

d. Operating instructions.

e. Maintenance instructions, equipment.

f. Maintenance instructions, finishes.

g. Shop drawings and product data.

h. Warranties.

1.6 Approved Product Submittals

A. Provide all approved submittals in indexed form. Provide (1) hard copy of each approved submittal and flash drive with approved submittals.

1.7 Warranties And Bonds

A. Provide duplicate, notarized copies.

B. All warranties shall be submitted to Owner's Representative in "hard copy" and also electronic format.

C. In the event the building changes ownership, all warranties shall be completely transferable and uninterrupted at no additional cost.

D. Execute Contractor's submittals and assemble documents executed by subcontractors, suppliers, and manufacturers.

E. Provide table of contents and assemble in binder with durable plastic cover.

F. Submit material prior to final application for payment.

1.8 Owner Training

A. Provide Owner training. Schedule with Owner's Representative.

1. Provide all training documents, sign-in sheet, etc…

1.9 Manufacturer Inspection Documents

A. Provide all manufacturer inspection reports in electronic format and hard copies.

1.10 Spare Parts And Maintenance Materials

A. Provide products and maintenance materials in quantities specified in each Section, in addition to that used for construction of Work.

1. Coordinate with Owner, deliver to Project site, and obtain receipt prior to final payment.

2 Products

Not Used.

3 Execution

Not Used.

END OF SECTION

Exhibit "A"
Contract Closeout Document Summary

DATE:

RE: Name of PROJECT
Name of OWNER
A.E. Project No.: XX-XXX

To close out your Contract on the above referenced project, the following paperwork is required to be submitted:

A. **Please submit the original and two (2) copies of each item.**

B. **Please reference Owner Name and Project on all final paperwork.**

C. **All the following listed documents are to be submitted to the Architect and the Owner's Representative in electronic document file format as well as "hard-copies" as listed in the above Line A. No final release of Final Payment will be executed until all Close-out Documents are received and in the proper format and all Punch-list items and Contract Requirements have been completed and approved by the Owner's Representative and the Architect.**

SCD #01 Signed Change Order deleting remaining Allowance balance (if applicable)

SCD #02 AIA G702 Application and Certificate for Final Payment

SCD #03 AIA G703 Continuation Sheet for Application and Certificate for Final Payment

SCD #04 AIA G706 Contractor's Affidavit of Payment of Debts and Claims

SCD #05 AIA G706A Contractor's Affidavit of Release of Liens

SCD #06 AIA G707 Consent of Surety Company to Final Payment

SCD #07 AIA G704 Certificate of Substantial Completion (unless previously executed)

SCD #08 Signed and dated Punch List documenting all items have been completed

SCD #09 Signed Asbestos-Free Certification Letter

SCD #10 Owner Training and Demonstrations as required by Contract Documents – submit Training/Demo forms with appropriate signatures

SCD #11 Provide spare parts and maintenance materials as required by Contract Documents – submit receipt signed by Owner's representative

SCD #12 Contractor's signed Warranty and signed product warranties as required by Contract Documents

SCD #13 Electronic Operation and Maintenance Manuals and hard copies as required by Contract Documents

SCD #14 Electronic Project Record Drawings and hard copies as required by Contract Documents

SCD #15 Submit current Certificate of Insurance (All Insurance required under Paragraph E, Section 007316 shall stay in effect for not less than one year after completion of project)

AIA® Document G701™ – 2001

Change Order

PROJECT *(Name and address)*:	**CHANGE ORDER NUMBER:** 001	OWNER: ☒
	DATE:	ARCHITECT: ☒
TO CONTRACTOR *(Name and address)*:	**ARCHITECT'S PROJECT NUMBER:**	CONTRACTOR: ☒
	CONTRACT DATE:	FIELD: ☐
	CONTRACT FOR:	OTHER: ☐

THE CONTRACT IS CHANGED AS FOLLOWS:
(Include, where applicable, any undisputed amount attributable to previously executed Construction Change Directives)
CREDIT to delete unused Contract Allowance [DEDUCT $xxx,xxx.xx]. See attached Exhibit "A".

The original Contract Sum was	$	0.00
The net change by previously authorized Change Orders	$	0.00
The Contract Sum prior to this Change Order was	$	0.00
The Contract Sum will be increased by this Change Order in the amount of	$	0.00
The new Contract Sum including this Change Order will be	$	0.00

The Contract Time will be increased by Zero (0) days.
The date of Substantial Completion as of the date of this Change Order therefore is

NOTE: This Change Order does not include changes in the Contract Sum, Contract Time or Guaranteed Maximum Price which have been authorized by Construction Change Directive until the cost and time have been agreed upon by both the Owner and Contractor, in which case a Change Order is executed to supersede the Construction Change Directive.

NOT VALID UNTIL SIGNED BY THE ARCHITECT, CONTRACTOR AND OWNER.

Gibraltar Design, Inc.		
ARCHITECT *(Firm name)*	**CONTRACTOR** *(Firm name)*	**OWNER** *(Firm name)*
9102 N. Meridian Street, Suite 300 Indianapolis, IN 46260		
ADDRESS	**ADDRESS**	**ADDRESS**
BY *(Signature)*	**BY** *(Signature)*	**BY** *(Signature)*
Rick Lyons		
(Typed name)	*(Typed name)*	*(Typed name)*
DATE	**DATE**	**DATE**

AIA® Document G702™ – 1992

Application and Certificate for Payment

TO OWNER:

PROJECT: Test - Small Project

APPLICATION NO: 001
PERIOD TO:
CONTRACT FOR: General Construction
CONTRACT DATE:
PROJECT NOS: / /

Distribution to:
OWNER:
ARCHITECT:
CONTRACTOR:
FIELD:
OTHER:

FROM CONTRACTOR:

VIA ARCHITECT:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM		$ 0.00
2. NET CHANGE BY CHANGE ORDERS		$ 0.00
3. CONTRACT SUM TO DATE (Line 1 ± 2)		$ 0.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)		$ 0.00
5. RETAINAGE:		
a. 0 % of Completed Work (Column D + E on G703)	$ 0.00	
b. 0 % of Stored Material (Column F on G703)	$ 0.00	
Total Retainage (Lines 5a + 5b or Total in Column I of G703)		$ 0.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 Less Line 5 Total)		$ 0.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)		$ 0.00
8. CURRENT PAYMENT DUE		$ 0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)	$ 0.00	

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$ 0.00	$ 0.00
Total approved this Month	$ 0.00	$ 0.00
TOTALS	$ 0.00	$ 0.00
NET CHANGES by Change Order	$ 0.00	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ..... $ 0.00

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

AIA® Document G703™ – 1992

Continuation Sheet

AIA Document, G702™–1992, Application and Certification for Payment, or G736™–2009, Project Application and Project Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
In tabulations below, amounts are in US dollars.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO: 001
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
			WORK COMPLETED						
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00 %	0.00	0.00
	GRAND TOTAL	$0.00	$0.00	$0.00	$0.00	$0.00	0.00 %	$0.00	$0.00

User Notes:

(1833326694)

AIA® Document G706™ – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☒
		ARCHITECT: ☒
	CONTRACT FOR:	CONTRACTOR: ☒
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	SURETY: ☐
		OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment ☐ Yes ☒ No

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.
3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

AIA® Document G706A™ – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☒
	CONTRACT FOR:	ARCHITECT: ☒
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	CONTRACTOR: ☒
		SURETY: ☐
		OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY:

(Signature of authorized representative)

(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☒
	CONTRACT FOR:	ARCHITECT: ☒
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	CONTRACTOR: ☒
		SURETY: ☐
		OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

AIA® Document G704™ – 2000

Certificate of Substantial Completion

PROJECT:
(Name and address)

PROJECT NUMBER: /
CONTRACT FOR:
CONTRACT DATE:

OWNER: ☒
ARCHITECT: ☒
CONTRACTOR: ☒
FIELD: ☐
OTHER: ☐

TO OWNER:
(Name and address)

TO CONTRACTOR:
(Name and address)

PROJECT OR PORTION OF THE PROJECT DESIGNATED FOR PARTIAL OCCUPANCY OR USE SHALL INCLUDE:

The Work performed under this Contract has been reviewed and found, to the Architect's best knowledge, information and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated above is the date of issuance established by this Certificate, which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

Warranty **Date of Commencement**

ARCHITECT **BY** **DATE OF ISSUANCE**

A list of items to be completed or corrected is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment.

Cost estimate of Work that is incomplete or defective: $0.00

The Contractor will complete or correct the Work on the list of items attached hereto within Zero (0) days from the above date of Substantial Completion.

CONTRACTOR **BY** **DATE**

The Owner accepts the Work or designated portion as substantially complete and will assume full possession at (time) on (date).

OWNER **BY** **DATE**

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance shall be as follows:
(Note: Owner's and Contractor's legal and insurance counsel should determine and review insurance requirements and coverage.)

PUNCH LIST

PROJECT NAME:	**Spencer Owen Bus Transportation Building Complex**	**ARCHITECT'S PROJECT NUMBER:**	**XXXXXX**
ROOM-SPACE-AREA:	Exterior/Interior	PUNCH LIST DEVELOPED BY: The Stenftenagel GROUP, LLC Clerk of The Works	
DATE:	XXXXX		

The following items are items that were found to be incomplete and/or nonconforming with the Contract Documents. Absence of any item from this list does not relieve the Contractor of the responsibility for completing and/or correcting all items as per Contract Documents. Subsequent amendments and/or additions to this list may be issued.

ITEM	AREA	DESCRIPTION	CONTRACTOR	REVIEW DATE	DATE ITEM COMPLETED	VALUE ACCESSED

(CONTRACTOR LETTERHEAD)

DATE

TO: Name of Owner
Address
Address

RE: Name of Project
Name of Owner
A.E. Project No.: XX-XXX

ASBESTOS-FREE STATEMENT

To Whom It May Concern:

(Name of Contractor) hereby certifies that no asbestos or asbestos-containing materials have been used in the execution of their work, or their Subcontractors' or Suppliers' work, on the above-referenced Project. All materials were installed per Plans, Specifications, and Addenda as prepared by The Architect.

Sincerely,

(Contractor Signature, Name, and Title)

TRAINING

Project Name: _____

A.E. Project Number: _____

Specification Section: _____

Training Hours Specified: _____

Training Hours Provided By: _____

_____

_____

_____

(Date/Dates Conducted)

Signed By:

_____

_____

_____

(Contractor – Name, Title and Company)

Date: _____

Signed By:

_____

_____

_____

(Owner – Name, Title and Organization)

Date: _____

DEMO

Project Name: _____

ARCHITECT Project Number: _____

Specification Section: _____

Demo Specified: _____

Demo Provided By: _____

_____

_____

_____

_____

(Date/Dates Conducted)

Signed By:

_____

_____

_____

(Contractor – Name, Title and Company)

Date: _____

Signed By:

_____

_____

_____

(Owner – Name, Title and Organization)

Date: _____

SPARE PARTS

Project Name: _____

Architect Project Number: _____

Parts or Product Provided Per Specifications:

_____

_____

_____

_____

_____

_____

_____

_____

Signed By:

_____

_____

_____

(Contractor – Name, Title and Company)

Date: _____

Signed By:

_____

_____

Gibraltar Design, Inc.

Date: _____

Signed By:

_____

_____

_____

(Owner – Name, Title and Organization)

Date: _____

(CONTRACTOR LETTERHEAD)

DATE

TO: Owner
Address
Address

RE: Name of Project
Name of Owner
Architect Project No.: XX-XXX

WARRANTY

To Whom It May Concern:

We hereby certify that all work done by ***(Name of Contractor)*** has been completed in accordance with all Contract Documents for the above-referenced Project.

We further acknowledge our responsibility to warrant the material and workmanship for a period *of ( ) calendar year(s)** commencing on *(Date of Substantial Completion).*

Sincerely,

(Contractor Signature, Name, and Title)

** Edit as required by Contract Documents.*

OPERATION AND MAINTENANCE MANUALS

Date Received: _____

Project Name: _____

Architect Project Number: _____

Contract: **No. _____; Name** _____
(e.g., General;Mechanical; Electrical; etc.)

Contractor Name/Address: _____
_____
_____

Information Submitted: _____
_____

Reviewed By:

_____
_____
_____
(Architect – Name, Title and Company)

Date: _____

ELECTRONIC PROJECT RECORD DRAWINGS

Date Received: _____

Project Name: _____

Architect Project Number: _____

Contract: **No. _____; Name** _____
(e.g., General;Mechanical; Electrical; etc.)

Contractor Name/Address: _____

_____

_____

Information Submitted: _____

_____

Reviewed By:

_____

_____

_____

(Architect – Name, Title and Company)

Date: _____

SECTION 01 57 13 - TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.

B. Section 31 22 00 - Grading: Temporary and permanent grade changes for erosion control.

C. Section 32 11 23 - Aggregate Base Courses: Temporary and permanent roadways.

D. Section 32 92 19 - Seeding: Permanent turf for erosion control.

1.03 REFERENCE STANDARDS

A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus; 2021.

B. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 2022.

C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2015 (Reapproved 2023).

D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a (Reapproved 2023).

E. ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile; 2021a.

F. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2017 (Reapproved 2021).

G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.

H. Indiana Storm Water Quality Manual - www.in.gov/idem/stormwater/resources/indiana-storm-water-quality-manual

1.04 PERFORMANCE REQUIREMENTS

A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Also comply with all more stringent requirements of State of Indiana Erosion and Sedimentation Control Manual.

C. Comply with all requirements of IDEM for erosion and sedimentation control, even though this project is not required by law to comply.

D. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

E. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

F. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

G. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   1. Control movement of sediment and soil from temporary stockpiles of soil.
   2. Prevent development of ruts due to equipment and vehicular traffic.
   3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

H. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
   1. Prevent windblown soil from leaving the project site.
   2. Prevent tracking of mud onto public roads outside site.
   3. Prevent mud and sediment from flowing onto sidewalks and pavements.
   4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

I. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
   2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

J. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

K. Open Water: Prevent standing water that could become stagnant.

L. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.05 SUBMITTALS

A. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

B. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mulch: Use one of the following:
   1. Straw or hay.
   2. Wood waste, chips, or bark.
   3. Erosion control matting or netting.
   4. Cutback asphalt.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C. Bales: Air dry, rectangular straw bales.
   1. Cross Section: 14 by 18 inches (350 by 450 mm), minimum.
   2. Bindings: Wire or string, around long dimension.

D. Bale Stakes: One of the following, minimum 3 feet (1 m) long:

1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot (1.98 kg per linear m).
2. Wood, 2 by 2 inches (50 by 50 mm) in cross section.

E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
1. Average Opening Size: 30 U.S. Std. Sieve (0.600 mm), maximum, when tested in accordance with ASTM D4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D4491/D4491M.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
4. Tensile Strength: 100 pounds-force (450 N), minimum, in cross-machine direction; 124 pounds-force (550 N), minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
6. Tear Strength: 55 pounds-force (245 N), minimum, when tested in accordance with ASTM D4533/D4533M.
7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

F. Silt Fence Posts: One of the following, minimum 5 feet (1500 mm) long:
1. Hardwood, 2 by 2 inches (50 by 50 mm) in cross section.

G. Gravel: See Section 32 11 23 for aggregate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.
1. Width: As required; 20 feet (7 m), minimum.
2. Length: 150 feet (___ m), minimum.
3. Provide at each construction entrance from public right-of-way.
4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.
1. Provide linear sediment barriers:
   a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
2. Space sediment barriers with the following maximum slope length upslope from barrier:
   a. Slope of Less Than 2 Percent: 100 feet (30 m)..
   b. Slope Between 2 and 5 Percent: 75 feet (23 m).
   c. Slope Between 5 and 10 Percent: 50 feet (15 m).
   d. Slope Between 10 and 20 Percent: 25 feet (7.5 m).
   e. Slope Over 20 Percent: 15 feet (4.5 m).

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.

2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Soil Stockpiles: Protect using one of the following measures:
   1. Cover with polyethylene film, secured by placing soil on outer edges.
   2. Cover with mulch at least 4 inches (100 mm) thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches (150 mm) of straw or hay.

F. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
   1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
   2. Asphalt: Use only where no traffic, either vehicular or pedestrian, is anticipated.

G. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

A. Traffic-Bearing Aggregate Surface:
   1. Excavate minimum of 6 inches (150 mm).
   2. Place geotextile fabric full width and length, with minimum 12 inch (300 mm) overlap at joints.
   3. Place and compact at least 6 inches (150 mm) of 1 1/2 to 3 1/2 inch (40 to 90 mm) diameter stone.

B. Silt Fences:
   1. Store and handle fabric in accordance with ASTM D4873/D4873M.
   2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch (405 mm) high barriers with minimum 36 inch (905 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 4 inches (100 mm) in ground.
   3. Embed bottom of fabric in a trench on the upslope side of fence, with 2 inches (50 mm) of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
   4. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches (460 mm), with extra post.
   5. Fasten fabric to wood posts using one of the following:
      a. Four nails per post with 3/4 inch (19 mm) diameter flat or button head, 1 inch (25 mm) long, and 14 gauge, 0.083 inch (2.11 mm) shank diameter.
      b. Five staples per post with at least 17 gauge, 0.0453 inch (1.150 mm) wire, 3/4 inch (19 mm) crown width and 1/2 inch (12 mm) long legs.

C. Straw Bale Rows:
   1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
   2. Install bales so that bindings are not in contact with the ground.
   3. Embed bales at least 4 inches (100 mm) in the ground.
   4. Anchor bales with at least two stakes per bale, driven at least 18 inches (450 mm) into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
   5. Fill gaps between ends of bales with loose straw wedged tightly.
   6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

D. Mulching Over Large Areas:
   1. Dry Straw and Hay: Apply 2-1/2 tons per acre (6350 kg per hectare); anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
   2. Erosion Control Matting: Comply with manufacturer's instructions.

E. Temporary Seeding:
   1. When hydraulic seeder is used, seedbed preparation is not required.
   2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.

3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft (0.5 kg per 100 sq m).
4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft (6 to 8 kg per 100 sq m).
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch (12 to 25 mm) deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches (13 mm) or more rainfall at the project site, and daily during prolonged rainfall. Develop full inspection report for each event and immediately provide copy of the report to the Owner's Representative.

B. Repair deficiencies immediately.

C. Silt Fences:
1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Straw Bale Rows:
1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
2. Remove silt deposits that exceed one-half of the height of the bales.
3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Clean out temporary sediment control structures weekly and relocate soil on site.

F. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Floors and slabs on grade.

C. Concrete foundations and anchor bolts for pre-engineered building.

D. Concrete reinforcement and accessories.

E. Joint devices associated with concrete work.

F. Miscellaneous concrete elements, including equipment pads.

G. Concrete curing.

H. Provide all labor and materials required for the thorough completion of the concrete work not provided for in the specifications of other Contractors doing work in connection with the concrete work.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

1.03 REFERENCE STANDARDS

A. ACI MNL-15 - Field Reference Manual; 2020.

B. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

C. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.

D. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.

E. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

F. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.

G. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.

H. ACI PRC-308 - Guide to External Curing of Concrete; 2016.

I. ACI PRC-309 - Guide for Consolidation of Concrete; 2005.

J. ACI PRC-347 - Guide to Formwork for Concrete; 2014 (Reapproved 2021).

K. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

L. ACI SPEC-301 - Specifications for Concrete Construction; 2020.

M. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

N. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

O. ASTM C31/C33M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2023.

P. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.

Q. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2023.

R. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2024.

S. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

T. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

U. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2023.

V. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method; 2009.

W. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

X. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

Y. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).

Z. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2023, with Editorial Revision.

AA. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.

AB. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2019.

AC. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.

AD. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2016 (Reapproved 2023).

AE. ASTM D4819 - Standard Specification for Flexible Cellular Materials Made From Polyolefin Plastics; 2021.

AF. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

AG. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

AH. Conform to all requirements of the governing Building Code and all OSHA requirements that are more stringent than the above-referenced codes, standards and specifications.

AI. Perform all work in accordance with the above codes and standards which hereby become a part of this section of specifications unless specified otherwise herein.

AJ. Conflicts: In case of conflict between the standards cited, drawings, specifications and Building Code requirements, the most stringent requirement is to be followed.

1.04 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Submit shop drawings of reinforcing steel and formwork.

C. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
   2. For membrane-forming, moisture emission-reducing, curing and sealing compound, provide manufacturer's installation instructions.

D. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI CODE-318, Chapter 5 - Concrete Quality, Mixing and Placing.
   3. Indicate proposed mix design complies with admixture manufacturer's written recommendations.

E. Test Reports: Submit report for each test or series of tests specified.

F. Submit an anchor bolt survey performed by a licensed surveyor a minimum of ten (10) days before structural steel is to be erected. After review by the Structural Engineer, all inconsistencies shall be corrected as noted prior to starting the structural steel erection.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

B. Follow recommendations of ACI PRC-305 when concreting during hot weather.

C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

D. For slabs indicated to receive membrane-forming, moisture emission-reducing, curing and sealing compound, do not proceed with application unless manufacturer's representative is present for every day of placement.

PART 2 PRODUCTS

2.01 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI PRC-347 to provide formwork that will produce concrete complying with tolerances of ACI SPEC-117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
   2. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches (38 mm) of concrete surface.

2.02 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
   1. Form: Flat Sheets.
   2. WWR Style: As indicated on drawings.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.

C. Fly Ash: ASTM C618, Class C or F.

D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.

F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

G. Accelerating Admixture: ASTM C494/C494M Type C.

H. Retarding Admixture: ASTM C494/C494M Type B.

I. Water Reducing Admixture: ASTM C494/C494M Type A.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:
   1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited. Permeance not to exceed 0.01 perms as tested before and after mandatory conditioning. Minimum thickness to be 15 mil.
   2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of nonmetallic aggregate, cement, water reducing and plasticizing agents.
   1. Grout: Comply with ASTM C1107/C1107M.
   2. Minimum Compressive Strength at 28 Days: 5000 pounds per square inch (34 MPa).
   3. Products containing aluminum powder are not permitted.

2.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

B. Slab Isolation Joint Filler: 1/4-inch (6 mm) thick, height equal to slab thickness, with removable top section forming 1/2-inch (13 mm) deep sealant pocket after removal.

2.07 CURING MATERIALS

A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
   1. Product dissipates within 30 to 60 days.

B. Curing and Sealing Compound: Clear styrene acrylate type, 30 percent solids content minimum, and have test data from an independent testing laboratory indicating a maximum moisture loss of 0.030 grams per square centimeter when applied at a coverage rate of 300 square feet per gallon.
   1. Super Rez-Seal as manufactured by the Euclid Chemical Co.
   2. Day-Chem Cure & Seal J-23 as manufactured by Dayton-Superior.
   3. Or approved equal.
      a. Manufacturer's certification required.
      b. Sodium silicate compounds are not permitted.

2.08 CONCRETE MIX DESIGN

A. General: The quality and consistency of concrete desired is that which will meet the compressive strength required with the least amount of mixing water consistent with workability and finishing requirements.
   1. Maintain minimum requirements for aggregate types, water-cementitious materials (W/C) ratio, air entrainment, slump and compressive strength.

B. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.

C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience, as specified in ACI SPEC-301.

D. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer at the mixing plant.

E. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.

3. Water-Cement Ratio: Maximum 40 percent by weight.
4. Maximum Aggregate Size: 5/8 inch (16 mm).
5. Proportion the fine aggregate between a maximum of 45 percent and a minimum of 35 percent of the total aggregate weight and utilizing the maximum amount of coarse aggregate within these limits that is consistent with the desired workability.

2.09 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

B. Before starting operations and from time to time as work progresses, examine the work installed by others insofar as it influences the concrete work. Promptly notify the Engineer in writing if any conditions exist that will prevent giving satisfactory results in concrete work.
   1. Starting work without such notification will constitute and acceptance of preceding work and a waiver of all claims or questions as to the suitability of any preceding work for receiving the concrete work.

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.
   1. Verify lines, levels and measurement before proceeding with formwork.
   2. Joints are to be tight. leakproof and arranged vertically and horizontally to conform to the pattern of the design.
   3. Align form joints where required in successive units for continuous surfaces leaving completed surface smooth and free from irregularities.
   4. Where applicable, calculate deflections and compensate for same in form construction leaving finished concrete members with true surfaces conforming to the desired lines, planes and elevations.
   5. Provide temporary openings as required for cleaning and inspection.
   6. Construct forms so that they can be removed readily without hammering or prying against the concrete.
   7. Do not apply form release agent where concrete surfaces receive special finishes or applied coatings which may be affected by agent.
   8. Hand trim sides of earth forms to remove loose dirt and debris.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use latex bonding agent only for non-load-bearing applications.

E. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches (150 mm). Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
   1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Reinforcing supports: Furnish bar and mesh supports for the purpose of holding all reinforcement in place during concrete placement.
   1. Concrete bricks may be used for slabs-on-grade and footing steel supports.
   2. Provide properly sized metal chairs or bar positioners to hold required clearances between bars and form faces for all formed structural items including columns, beams, walls, piers and structural slabs.

C. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI PRC-304.

B. Place concrete for floor slabs in accordance with ACI PRC-302.1.

C. Notify Owner's Representative a minimum of seventy-two (72) hours prior to commencement of placement operations.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

A. Anchor joint fillers and devices to prevent movement during concrete placement.

B. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
   1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

C. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch (5 mm) thick blade and cut at least 1 inch (25 mm) deep but not less than one quarter (1/4) the depth of the slab.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. The Owner's Representative will inspect finished slabs for compliance with specified tolerances. The finished slabs shall be inspected within three days after installation and again just prior to the installation of floor finish.

B. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/8 inch (3 mm) in 10 feet (3 m) identified by the placement of a 10 foot long straight edge in any direction.
   2. Under Seamless Resilient Flooring: 1/8 inch (3 mm) in 10 feet (3 m) identified by the placement of a 10 foot long straight edge in any direction.
   3. Under Carpeting: 1/8 inch (3 mm) in 10 feet (3 m) identified by the placement of a 10 foot long straight edge in any direction.

C. Correct the slab surface if tolerances are less than specified.

D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch (6 mm) or more in height.

C. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, and seamless flooring.
   2. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.

D. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

E. All exposed concrete edges, light pole bases, etc. shall be rubbed to smooth finish without fins, honeycombs or pin holes.

3.08 CURING AND PROTECTION

A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than seven days.

C. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
   2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-fog spray, or saturated burlap.
   3. Final Curing: Begin after initial curing but before surface is dry.
      a. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.09 FIELD QUALITY CONTROL

A. The Contractor shall employ Patriot Testing and Engineering to perform field quality control tests, as specified in Division 1. The Contractor shall be responsible for coordination, scheduling and shall pay all costs for all testing.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 50 cubic yards (38 cu m) or less of each class of concrete placed.

D. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

E. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to the Owner's Representative, Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Owner's Representative in collaboration with the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.11 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured. All concrete shall be protected from construction traffic.

END OF SECTION

SECTION 03 41 13 - PRECAST CONCRETE HOLLOW CORE PLANKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precast floor planks.

B. Connection plates with brackets and hangers.

C. Grouting plank joint keys.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 04 20 00 - Unit Masonry

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ACI SPEC-301 - Specifications for Concrete Construction; 2020.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

E. ASTM A416/A416M - Standard Specification for Low-Relaxation, Seven-Wire Steel Strand for Prestressed Concrete; 2018.

F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

G. ASTM C150 - Standard Specification for Portland Cement; 2022.

H. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

J. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars; 2018, with Amendment (2020).

K. PCI MNL-116 - Manual for Quality Control for Plants and Production of Structural Precast Concrete Products; 2021.

L. PCI MNL-120 - PCI Design Handbook; 2017, with Errata (2021).

M. PCI MNL-123 - Connections Manual: Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988.

N. PCI MNL-124 - Design for Fire Resistance of Precast Prestressed Concrete; 2011.

O. PCI MNL-126 - PCI Manual for the Design of Hollow Core Slabs and Walls; 2015.

P. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction; 2000.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate location of hanger tabs and devices for mechanical and electrical work and cutting of field openings.

1.05 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Product Data: Indicate standard component configuration, design loads, deflections, and cambers.

C. Shop Drawings: Indicate plank locations, unit identification marks, connection details, edge conditions, bearing requirements, support conditions, dimensions, openings, openings intended to be field cut, and relationship to adjacent materials.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design precast concrete hollow core planks in accordance with the PCI Manual for the Design of Hollow Core Slabs under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Fabricator Qualifications: Company specializing in manufacturing the work of this section with minimum of three years documented experience.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Erector Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

E. Welding Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.4/D1.4M and no more than 12 months before start of scheduled welding work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.

PART 2 PRODUCTS

2.01 PRECAST UNITS

A. Precast Hollow Core Planks: Comply with PCI MNL-120, PCI MNL-126, PCI MNL-124, ACI CODE-318, and ACI SPEC-301.
   1. Dimensions as indicated on drawings.
   2. Design components to withstand dead loads and design loads in the configuration indicated on drawings and as follows:
      a. Floor Assembly: 150 pounds per square foot (7.2 kPa) live load.
      b. Maximum Allowable Deflection of Floor Planks: 1/240 of span.
   3. Design connections in accordance with PCI MNL-123.
   4. Design components to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.
   5. Grouted Keys: Capable of transmitting horizontal shear force of 2,000 pounds per linear foot (2,976 kg/m).

2.02 MATERIALS

A. Concrete Materials: ACI SPEC-301.

B. Tensioning Steel Tendons: ASTM A416/A416M, Grade 250 - 250K psi (1725 MPa); seven-wire stranded steel cable; low-relaxation type; full length without splices; weldless; uncoated.

C. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa) deformed steel bars.

D. Non-Shrink Grout: Non-metallic, minimum compressive strength of 7,000 psi (48 MPa) at 28 days.

E. Cement Grout: Minimum compressive strength of 4,000 psi (28 MPa) at 28 days.

2.03 ACCESSORIES

A. Connecting and Supporting Devices: Plates, angles, items cast into concrete, items connected to steel framing members, and inserts: ASTM A36/A36M carbon steel; prime painted.

B. Core Hole End Plugs: Cardboard insert with stiff concrete fill.

2.04 FABRICATION

A. Embed anchors, inserts, plates, angles, and other items at locations indicated.

B. Provide openings required by other sections, at locations indicated.

C. Cut exposed ends recessed for grout fill of stressing tendons.

D. Plant Finish: Finish members to PCI MNL-116 Finish A Grade. The underside of all planks shall be smooth, slick finish with no pin holes.

E. Connecting and Supporting Steel Devices: Do not paint surfaces in contact with concrete or surfaces requiring field welding.

2.05 FABRICATION TOLERANCES

A. Comply with PCI MNL-116 and PCI MNL-135, except as specifically amended below.
   1. Maximum Variation From Nominal Dimensions:
      a. Width: Plus or minus 1/4 in (6 mm).
      b. Length: Plus or minus 1/2 in (12 mm).
      c. Depth: Plus or minus 1/4 in (6 mm).
   2. Maximum Variation From Intended Camber: Plus or minus 1/4 inch in 10 feet (2 mm per m).
   3. Maximum Variation from Plan End Squareness: Plus or minus 1/4 in (6 mm).
   4. Maximum Sweep: Plus or minus 1/4 in (6 mm).
   5. Maximum Misalignment of Anchors, Inserts, Openings: Plus or minus 1/8 inch (3 mm).

2.06 SOURCE QUALITY CONTROL

A. See Section 03 30 00 for testing of concrete and grout, materials, and mix designs.

B. Produce planks in accordance with requirements of PCI MNL-116. Maintain plant records and quality control program during production of precast planks. Make records available upon request.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify supporting structure is ready to receive work.

3.02 PREPARATION

A. Prepare support devices for the erection procedure and temporary bracing.

3.03 ERECTION

A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.

B. Align and maintain uniform horizontal and end joints, as erection progresses.

C. Maintain temporary bracing in place until final connection is made. Protect members from staining.

D. Adjust differential camber between precast members to tolerance before final attachment and grouting.

E. Secure units in place. Perform welding in accordance with AWS D1.1/D1.1M.

F. Grout longitudinal keys as indicated.

G. Tape seal underside of plank joints to prevent grout leakage. Joints shall be smooth uniform tooled finish.

H. Make plank-to-plank joints smooth using grout, troweled smooth. Transition differential elevation of adjoining planks with grout to a maximum slope of 1:12.

3.04 TOLERANCES

A. Erect members level and plumb within allowable tolerances. Comply with PCI MNL-135, except as specifically amended below.
   1. Plan Location from Building Grid Datum: Plus or minus 3/4 in (19 mm).
   2. Top Elevation from Building Elevation Datum at Plank Ends: Plus or minus 1/2 inch (12.5 mm).
   3. Maximum Jog in Alignment of Matching Ends: Plus or minus 1/2 inch (12.5 mm).

3.05 PROTECTION

A. Protect members from damage caused by field welding or erection operations.

B. Provide non-combustible shields during welding operations.

3.06 CLEANING

A. Clean weld marks, dirt, and blemishes from surface of exposed members.

END OF SECTION

SECTION 04 20 00 - UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Utility brick.

C. Clay facing brick.

D. Mortar and grout.

E. Reinforcement and anchorage.

F. Flashings.

G. Lintels.

H. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Loose steel lintels.

B. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.

D. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023

E. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.

F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

G. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2023.

H. ASTM C91/C91M - Standard Specification for Masonry Cement; 2023.

I. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.

J. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2023a.

K. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

L. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

M. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

N. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2023.

O. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

P. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.

Q. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

R. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2023.

S. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.

T. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.

1.04 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
   1. Submit wall elevations showing sizes, locations and spacing of all reinforcing in reinforced masonry.
   2. Submit wall elevations showing locations and spacing of all expansion joints in masonry.
   3. Submit product data on all mortar admixtures proposed for use.

D. Mortar Mix Design: Include description of type and proportions of ingredients. Include test reports, per ASTM C780, for mortar mixes required to comply with property specification.

E. Submit proposed mix design for grout, including description of aggregates, compressive strength, anticipated slump, air content and admixtures to the Structural Engineer for review prior to commencement of work.

F. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Materials in broken containers or in packaging showing water marks or other evidence of damage will be rejected.

C. Unload steel lintels delivered by the Structural Steel Contractor and place on substantial blocks of sufficient size and strength to prevent any metal work touching the ground after piling.
   1. Place each piece so that water cannot stand thereon and so that it will not be bent, twisted or otherwise damaged.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not erect masonry when ambient temperature is below 32 degrees F on a rising temperature or below 40 degrees F on a falling temperature, or when there is a probability of such condition existing within 48 hours of placement, unless approved special provisions are made for heating the materials and protecting the work.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depths as indicated on drawings for specific locations.
   2. Load-Bearing Units: ASTM C90, normal weight.
      a. Hollow block, as indicated.
      b. Exposed Faces: Manufacturer's standard color and texture where indicated.
   3. Nonloadbearing Units: ASTM C129.
      a. Hollow block, as indicated.
   4. All Concrete Block shall be manufactured by Dubois County Block and Brick.

2.02 BRICK UNITS

A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.

1. Nominal size: Utility.
2. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
3. As manufactured by The Belden Brick Company, Canton, Ohio.
    a. Utility Brick to be 8601 Dark Smooth (Main Brick).
    b. Utility Brick to be 280-284 Smooth (Accent Brick).

2.03 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91/C91M, Type N.

B. Portland Cement: ASTM C150/C150M, Type I.

C. Hydrated Lime: ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144.

E. Grout Aggregate: ASTM C404.

F. Water: Clean and potable.

G. Accelerating Admixture: Nonchloride type for use in cold weather.

H. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
    1. Color: Standard gray.

2.04 REINFORCEMENT AND ANCHORAGE

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa), deformed billet bars; uncoated.

B. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

C. Single Wythe Joint Reinforcement: ASTM A951/A951M.
    1. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3.
    2. Size: 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not less than 5/8 inch (16 mm) of mortar coverage on each exposure.

D. Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
    1. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3.
    2. Size: 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not less than 5/8 inch (16 mm) of mortar coverage on each exposure.

E. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
    1. Type: Truss, ladder, or tab, with adjustable ties or tabs spaced at 16 in (406 mm) on center.
    2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B.
    3. Size: 0.1875 inch (4.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods and adjustable components of 0.1875 inch (4.8 mm)wire, width of components as required to provide not less than 5/8 inch (16 mm) of mortar coverage from each masonry face.
    4. Vertical adjustment: Not more than 1 1/4 inches (32 mm).
    5. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

F. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

2.05 ACCESSORIES

A. Preformed Control Joints: Polyvinyl chloride material. Provide with corner and tee accessories, fused joints.

B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

D. Weeps:

E. Cavity Vents:

F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials. As appropriate, use Sure Klean No. 600 Detergent or Vana Trol as manufactured by ProSoCo, Inc., Kansas City, Kansas; 202 New Masonry Detergent or 202V Vana-Stop as manufactured by Diedrich Technologies, Inc., Oak Creek, Wisconsin; or equal as approved by the Architect and the brick manufacturer.

2.06 LINTELS

A. CMU Masonry Lintels: Built-in-place CMU masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated on Drawings and filled with coarse grout.

2.07 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior, loadbearing masonry: Type S.
   3. Exterior, non-loadbearing masonry: Type N.
   4. Interior, loadbearing masonry: Type S.
   5. Interior, non-loadbearing masonry: Type N.

B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).

C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

C. Dampen units with absorption rate greater than 12 percent before laying.

D. The General Contractor will clean dirt from the top of concrete footings and concrete foundation walls prior to laying any block or brick.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
   3. Mortar Joints: Concave.
   4. Minimum size for cut block is six (6) inches.
      a. Use a masonry saw for all cuts.
   5. Step back unfinished work for joining the new work.

D. Brick Units:
   1. Bond: Running.
   2. Coursing: Two units and two mortar joints to equal 8 inches (200 mm).
   3. Mortar Joints: Concave.
   4. Minimum size for cut brick is three (3) inches.
      a. Use a brick saw for all cuts.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Interlock intersections and external corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Isolate masonry partitions from vertical structural framing members with a control joint.

I. At bearing points fill the courses of block solid with grout for three (3) courses in depth, unless shown otherwise.

J. Thoroughly wet brick before laying, except in cool weather.

K. Fill openings between brick with mortar, each course, except where shown otherwise on the Drawings and where otherwise approved.

L. Mark plumb lines on brick walls every four (4) feet and adjust the bond accordingly by selecting or cutting brick as approved.

M. All head and bed joints shall be tooled to a smooth finish. All head and bed joints shall be free of eyelids and uneven surfaces and shall be brushed to remove all crumbs as approved by the Owner's Representative.

3.06 REINFORCED MASONRY

A. Lay masonry with core cells vertically aligned clear of mortar and unobstructed.

B. Reinforce masonry unit cores with reinforcement bars and grout as indicated.

C. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 120 bar diameters.

D. Splice reinforcement in accordance with the Drawings.

E. Wet masonry unit surfaces in contact with grout just prior to grout placement as required for proper curing.

F. When grouting is stopped for more than one hour terminate grout 1-1/2 inches below top of upper masonry unit to form a positive key for subsequent grout placement.

G. Place reinforcing bars supported and secured against displacement with caging devices and centering clips.

1. Space vertically so that every section of vertical reinforcing steel bar is restrained by two clips or devices. One near the top and one near the bottom of the bar.

3.07 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch (16 mm) mortar cover on each side.

E. Lap joint reinforcement ends minimum 6 inches (150 mm).

3.09 REINFORCEMENT AND ANCHORAGES - MULTIPLE WYTHE UNIT MASONRY

A. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties spaced as indicated on drawings.

B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.

3.10 LINTELS

A. Install loose steel lintels over openings.

B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
   1. Reinforce as indicated on Drawings.
   2. Do not splice reinforcing bars.
   3. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.
   4. Place and consolidate grout fill without displacing reinforcing.
   5. Allow masonry lintels to attain specified strength before removing temporary supports.
   6. Match bond pattern of adjacent walls unless otherwise noted.

C. Maintain minimum 8 inch (203 mm) bearing on each side of opening.

3.11 GROUTED COMPONENTS

A. Reinforce bond beams with 2, No. 5 (M16) bars, 2 inch (50 mm) from bottom web.

B. Lap splices minimum 36 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. At bearing locations, fill masonry cores with grout for a minimum 12 inches (300 mm) either side of opening.

3.12 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Size control joints as indicated on drawings; if not indicated, 3/4 inch (19 mm) wide and deep.

3.13 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, glazed frames, window frames, anchor bolts, and plates and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.14 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).

C. Maximum Variation from Plane of Wall: 1/8 inch in 10 ft (3 mm/3 m) and 1/4 inch in 20 ft (6 mm/6m) or more.

D. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/1 m) and 1/8 inch in 10 ft (3 mm/3 m); 1/4 inch in 30 ft (6 mm/9 m).

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/8 inch, plus 1/8 inch (minus 3 mm, plus 3 mm).

3.15 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.16 PROTECTION

A. Protect finished installation under provisions of Division 1.

B. Maintain protective boards at exposed external corners which may be damaged by construction activities.

C. Provide protection without damaging completed work.

D. At day's end, cover unfinished walls to prevent moisture infiltration.

E. At all masonry walls located at grade provide means and methods necessary to keep masonry from being stained or splattered with dirt, mud, debris, etc.

3.17 FIELD QUALITY CONTROL

A. The Contractor shall employ Patriot Testing and Engineering to perform field quality control tests, as specified in Division 1. The Contractor shall be responsible for coordination, scheduling and shall pay all costs for all testing. Additional requirements listed on Drawings.

B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.18 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.19 SEALING OF BRICK

A. Brick to be sealed with H&C Clarishield or approved equal. Color to be clear. Allow minimum of 4 hours dry time between coats. Apply second coat in perpendicular direction to the first coat.

END OF SECTION

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members.

B. Structural steel support members.

C. Base plates, shear stud connectors.

1.02 RELATED REQUIREMENTS

A. Section 05 21 00 - Steel Joist Framing.

B. Section 05 31 00 - Steel Decking: Support framing for small openings in deck.

C. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; 2023.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

E. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2018.

F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

H. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.

I. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2022.

J. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2019.

K. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry; 2023.

L. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2021.

M. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2019.

N. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.

O. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

P. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

Q. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

R. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

S. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2020.

T. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

U. SSPC-SP 2 - Hand Tool Cleaning; 2018.

V. SSPC-SP 3 - Power Tool Cleaning; 2018.

1.04 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections not detailed.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Fabricator: Company specializing in performing the work of this section with minimum three years of documented experience.

C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

D. Erector: Company specializing in performing the work of this section with minimum three years of documented experience.

E. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Steel Structural Shapes: ASTM A992/A992M.

D. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade C.

E. Pipe: ASTM A53/A53M, Grade B, Finish black.

F. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

G. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.

H. Unheaded Anchor Rods: ASTM F1554, Grade 55, plain, with matching ASTM A563/A563M nuts and ASTM F436/F436M Type 1 washers.

I. Headed Anchor Rods: ASTM F1554, Grade 55, plain.

J. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

K. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Fabricate connections for bolt, nut, and washer connectors.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC-SP 2.

B. Shop prime structural steel members. Do not prime surfaces that will be field welded or in contact with concrete.

2.04 SOURCE QUALITY CONTROL

A. Welded Connections: Visually inspect all shop-welded connections and test at least 10 percent of welds using one of the following:
   1. Ultrasonic testing performed in accordance with ASTM E164.
   2. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   3. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 GENERAL

A. Field verify any dimensions required for material length.

B. Place material to be stored on site on substantial blocks of sufficient size and strength to prevent contact with the ground.
   1. Place material to prevent bending, twisting or other damage during storage.

3.03 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components indicated on drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without approval of Structural Engineer.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Steel Roof Deck Accessories: Erect all deck support frames, opening frames, roof deck closure plates and other accessories necessary to complete the metal deck installation.

3.04 FIELD QUALITY CONTROL

A. The Contractor shall employ Patriot Testing and Engineering to perform field quality control tests, as specified in Division 1. The Contractor shall be responsible for coordination, scheduling and shall pay all costs for all testing. Additional requirements listed on Drawings and in paragraph B below.

B. Welded Connections: Visually inspect all field-welded connections and test at least 10 percent of welds using one of the following:
   1. Ultrasonic testing performed in accordance with ASTM E164.
   2. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   3. Magnetic particle inspection performed in accordance with ASTM E709.

END OF SECTION

SECTION 05 21 00 - STEEL JOIST FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Open web steel joists, with bridging, attached seats and anchors.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Superstructure framing.

B. Section 05 50 00 - Metal Fabrications: Non-framing steel fabrications attached to joists.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

C. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.

D. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2019.

E. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry; 2023.

F. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2021.

G. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2019.

H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

J. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.

K. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2020.

L. SJI 100 - Standard Specifications for K-Series, LH-Series, and DLH-Series Open Web Steel Joists, and for Joist Girders; 2020.

M. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders; 2008.

N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

O. SSPC-SP 2 - Hand Tool Cleaning; 2018.

P. SSPC-SP 3 - Power Tool Cleaning; 2018.

1.04 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.

C. Manufacturer's Certification that joists comply with SJI Specifications.

1.05 QUALITY ASSURANCE

A. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Transport, handle, store, and protect products to SJI requirements.

B. Store joists on blocking to prevent contact with the ground and protect from the weather or damage until installed.

C. Correction of defects or damage due to Contractor negligence is the Contractor's responsibility.

PART 2 PRODUCTS

2.01 MATERIALS

A. Open Web Joists: SJI Type K Joists:
   1. Provide bottom chord extensions as indicated.
   2. Minimum End Bearing on Steel Supports: As shown on the drawings.
   3. Minimum End Bearing on Concrete or Masonry Supports: As shown on drawings.
   4. Finish: Shop primed.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 DESIGN

A. Designations:
   1. Joists indicated by Depth and Chord size: SJI designations
      a. Design for loading indicated in SJI Standard Load Tables.

B. Criteria
   1. Total load deflection not to exceed 1/360 of span.
   2. Design extended ends to support all live and dead loads.
   3. Design joists for indicated net uplift conditions.

2.03 FABRICATION

A. Connections:
   1. Weld all connections in accordance with the referenced SJI Standard Specifications.
   2. Substitution of sections or modification of details shall be made only when approved by the Structural Engineer.

B. Bearing Ends"
   1. "K" Series
      a. Minimum 4 inch (5-1/2 inch desired) length of bearing on masonry supports.
      b. Minimum 2-1/2 inch (4 inch desired) length of bearing on structural steel supports.
   2. Provide end bearing depth as shown on Drawings.

C. Bridging:
   1. Provide bridging in accordance with SJI Standard Specifications unless otherwise noted.
   2. Provide bridging as required for the net uplift pressure indicated on Drawings.

2.04 FINISH

A. Shop prime joists as specified.

B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

2.05 SOURCE QUALITY CONTROL

A. Welded Connections: Visually inspect all shop-welded connections and test at least 10 percent of welds using one of the following:
   1. Ultrasonic testing performed in accordance with ASTM E164.
   2. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   3. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 ERECTION

A. Erect steel joists in accordance with SJI Standard Specifications.

B. Erect joists with correct bearing on supports.

C. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.

D. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.

E. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.

F. Do not field cut or alter structural members without approval of joist manufacturer and Structural Engineer.

G. After erection, prime welds and damaged shop primer.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm).

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

3.04 FIELD QUALITY CONTROL

A. The Contractor shall employ Patriot Testing and Engineering to perform field quality control tests, as specified in this Section and Division 1. The Contractor shall be responsible for coordination, scheduling and shall pay all costs for all testing.

B. Welded Connections: Visually inspect all field-welded connections and test at least 10 percent of welds using one of the following:
   1. Ultrasonic testing performed in accordance with ASTM E164.
   2. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   3. Magnetic particle inspection performed in accordance with ASTM E709.

C. Cleaning: All joists shall be cleaned free of mud and debris immediately after erection and just prior to painting.

END OF SECTION

SECTION 05 31 00 - STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof deck.

B. Supplementary framing for openings up to and including 12 inches (305 mm).

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

D. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).

E. ICC-ES AC70 - Acceptance Criteria for Power-Actuated Fasteners Driven into Concrete, Steel and Masonry Elements; 2019, with Editorial Revision (2021).

F. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.

G. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.03 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

C. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.

1.04 QUALITY ASSURANCE

A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 STEEL DECK

A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.
   1. Calculate to structural working stress design and structural properties specified.
   2. Maximum Vertical Deflection of Roof Deck: 1/240 of span.
   3. Maximum Lateral Deflection of Diaphragms: 1/500 of the height of the wall.

B. Roof Deck: Non-composite type, fluted steel sheet:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS), with G90/Z275 galvanized coating.
      a. Grade as required to meet performance criteria.
   2. Structural Properties:
      a. Span Design: Three span.
   3. Minimum Base Metal Thickness: 20 gauge, 0.0359 inch (0.91 mm).

4. Nominal Height: 1-1/2 inch (38 mm).
5. Profile: Fluted; SDI WR.
6. Formed Sheet Width: 36 inch (900 mm).
7. Side Joints: Lapped, mechanically fastened.
8. End Joints: Lapped, mechanically fastened.

2.02 ACCESSORY MATERIALS

A. Fasteners: Galvanized hardened steel, self tapping.

B. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.

C. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.

D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATED DECK ACCESSORIES

A. Roof Sump Pans: Formed sheet steel, 14 gauge, 0.0747 inch (1.90 mm) minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches (38 mm) below roof deck surface, bearing flange 3 inches (75 mm) wide, sealed watertight.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.

B. On steel supports provide minimum 1-1/2 inch (38 mm) bearing.

C. Fasten deck to steel support members at ends and intermediate supports at 6 inches (150 mm) on center maximum, parallel with the deck flute and at each transverse flute using methods specified.

D. At mechanically fastened male/female side laps fasten at 12 inches (300 mm) on center maximum.

E. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.

F. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

G. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

H. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 05 21 00 - Steel Joist Framing: Structural joist bearing plates, including anchorage.

D. Section 05 51 00 - Metal Stairs.

E. Section 05 52 13 - Pipe and Tube Railings.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

G. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

J. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

K. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

L. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

M. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 PERFORMANCE REQUIREMENTS

A. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.05 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.06 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

C. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

D. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Verify dimensions on site prior to shop fabrication.

B. Fit and shop assemble items in largest practical sections, for delivery to site.

C. Fabricate items with joints tightly fitted and secured.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; galvanized finish.

B. Lintels: As detailed; galvanized finish.

2.04 FINISHES - STEEL

A. Prime paint steel items unless otherwise noted.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Masonry / Brick Lintels: All exterior brick lintels shall be hot-dipped galvanized and shall be painted with high-performance paint. Color to be as specified by the Architect.

F. Steel Pipe Bollards: All steel pipe bollards shall be hot-dipped galvanized and shall be painted with high-performance paint. Color to be as specified by the Architect.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).

C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).

D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).

E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

C. Keep work in alignment.

D. Supply items to be cast into concrete or embedded in masonry to appropriate Contractors.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 05 51 00 - METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with metal treads.

B. Structural steel stair framing and supports.

C. Handrails and guards.

1.02 RELATED REQUIREMENTS

A. Section 05 52 13 - Pipe and Tube Railings: Metal handrails for the stairs specified in this section.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2023.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

G. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2015 (Reapproved 2021).

H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

L. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. NAAMM AMP 510 - Metal Stairs Manual; 1992.

N. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications:
   1. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
   2. Dimensions: As indicated on drawings.
   3. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   4. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   5. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Industrial: All joints made neatly.
      a. Welded Joints: Welded on back side wherever possible.
      b. Welds Exposed to Touch: Ground smooth.
      c. Bolts Exposed to Touch in Travel Area: No nuts or screw threads exposed to touch.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH METAL TREADS

A. Jointing and Finish Quality Level: Industrial, as defined above.

B. Risers: Closed.

C. Treads: Checkered steel plate.
   1. Tread Thickness: 1/4 inch (6 mm), minimum.
   2. Anchorage to Stringers: Welded to carrier angles welded to stringers.

D. Risers: Steel sheet.
   1. Riser Thickness: As required by design; 14 gauge, 0.075 inch (1.9 mm) minimum.
   2. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.

E. Stringers: Rolled steel channels.
   1. Stringer Depth: As indicated on drawings.
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Railings: Steel pipe railings.

2.03 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: See Section 05 52 13.

B. Guards: Pipe railings, see Section 05 52 13.

2.04 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

D. Checkered Plate: ASTM A786/A786M, rolled steel floor plate; manufacturer's standard pattern.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

E. Obtain approval prior to site cutting or creating adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stair railings and guardrails.

B. Balcony railings and guardrails.

1.02 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

B. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

C. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.

D. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

1.03 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.04 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

C. Fabricator Qualifications:

1. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 50 pounds per linear foot (730 N/m) applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds (890 N) applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.

F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

H. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
   1. Ease exposed edges to a small uniform radius.
   2. Welded Joints:
      a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.

2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M, Grade B Schedule 80, black finish.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured.

D. Welded Joints:
   1. Interior Components: Continuously seal joined pieces by continuous welds.
   2. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rough Carpentry.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Concrete.

B. Section 06 20 00 - Metal Roofing: Treated for finish carpentry and millwork.

C. Section 07 41 13 – Metal Roofing: Treated wood blocking for the installation of metal roofing.

1.03 REFERENCE STANDARDS

A. ASTM D2898 - Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.

B. ASTM E84 - Surface Burning Characteristics of Building Materials.

C. AWI - Quality Standards of Architectural Woodwork Institute.

D. AWPA C2 - Pressure treatment for lumber and timber above ground, soil and water.

E. AWPA C9 - Plywood - Preservative Treatment by Pressure Process.

F. AWPA C31 - Plywood - Preservative Treatment by Pressure Process

G. PS 1 - Construction and Industrial Plywood.

H. PS 20 - American Softwood Lumber Standard.

I. PS 51 - Hardwood and Decorative Plywood.

1.04 SYSTEM DESCRIPTION

A. General Requirements: Provide all cutting, jobbing, furring, grounds, blocking, finishing, and setting; provide all forms, struts, necessary to fully complete the work.

1. Provide all miscellaneous millwork such as wood bricks, temporary scaffolding, bracing, etc., including all guards as required to protect all finished work, all transportation, derricks, tools, and utensils for work under this contract.
2. Include all nails, screws, rough hardware, timbers, bolts, rods, hangers, and anchor irons that are necessary.

1.05 SUBMITTALS

A. See Division 1 for submittal procedures.

B. B. Indicate anchoring, joining, and type of materials.

1.06 QUALITY ASSURANCE

A. A. Rough Carpentry Lumber: Visible grade stamp, of agency certified by American Forest and Paper Association (AFPA).

1.07 DELIVERY, STORAGE, AND HANDLING

A. A. Store lumber stacked off the ground in such a manner as to ensure proper drainage, ventilation, and protection from the weather.

PART 2 PRODUCTS

2.01 ROUGH CARPENTRY MATERIALS

A. Lumber: PS 20; graded in accordance with established Grading rules; air dry or kiln dry to a maximum moisture content of 19 percent; of following species and grades.

1. Structural Light Framing: 2 inches to 4 inches thick and 5 inches and wider; Stress Group A; Grade No. 2.
2. Non-Structural Light Framing: 2 inches to 4 inches thick and up to 4 inches wide; Stress Group A; construction grade.
3. Studding: Stress Group A; stud grade.

B. Douglas Fir Plywood: Sheathing grade.

1. Thickness: As indicated on Drawings.

C. Softwood Plywood: PS 1; Sheathing grade.
   1. Thickness: As indicated on Drawings.

D. Nails, Spikes, and Staples: Galvanized for exterior locations and high humidity locations; plain finish for other interior locations; size and type to suit application.
   1. Use stainless steel nails in conjunction with pressure treated wood.

E. Bolts, Nuts, Washers, Lags, Pins, and Screws: Medium carbon steel; sized to suit application; galvanized for exterior locations, high humidity locations, and treated wood; plain finish for other interior locations.
   1. Toggle bolt type for anchorage to hollow masonry.
   2. Expansion shield and lag bolt type for anchorage to solid masonry or concrete.
   3. Bolts or power activated type for anchorage to steel.
   4. 5/8 inch round bolts for anchorage of bucks and frames in masonry or concrete.
   5. Use stainless steel fasteners in conjunction with pressure treated wood.

2.02 WOOD PRESERVATIVE TREATED LUMBER AND PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA C2 and C9 (except that materials which are not in contact with the ground and are continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Dry lumber after treatment to a maximum moisture content of 19 percent.

C. Dry plywood after treatment to a maximum moisture content of 18 percent.

D. Do not use material that is warped or does not comply with requirements for untreated material.

E. Mark material with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

F. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
   4. Wood floor plates that are installed over concrete slabs-on-grade.

PART 3 EXECUTION

3.01 INSPECTION

A. Personally inspect the existing building in order to become familiar with all conditions under which the work is to be done.

3.02 PREPARATION

A. Verify items provided by other Sections are properly sized and located.

B. Beginning of installation means acceptance of existing surfaces.

3.03 FRAMING, FURRING, BLOCKING, AND STRIPPING

A. Erect wood framing, furring, stripping, and nailing members true to lines and levels.
   1. Do not deviate from true alignment more than 1/4 inch.
   2. Anchor all grounds and nailing strips with countersunk 1/4 inch toggle bolts or other approved type anchors.
   3. Extend anchors, where possible, not less than 8 inches in brick and concrete and 12 inches into structural units.
      a. Place anchors near the top and bottom of items and not over 2 feet on center, intermittently.

4. Use nails of ample size, minimum 16d nails.

B. Space members at 16 inches on center.

C. Construct members of continuous pieces of longest possible lengths.

D. Cover treated wood at fascias and parapet walls with 15 pound felt, or an approved equal, to prevent the chemicals in the wood from staining finished wall surfaces when wet.

3.04 TEMPORARY CLOSURES

A. Provide temporary batten doors, complete with hinges, padlocks, and all framing and plywood to close all exterior door openings.

B. Provide weathertight closures where removal of existing construction leaves building open to the weather.

3.05 SCHEDULE

A. Provide and install items listed and shown on drawings.

B. Rough Carpentry Items:
   1. Treated Wood Roof Curbs:
      a. Provide all new treated wood curbs for roof mounted equipment, goosenecks, metal flues, and miscellaneous duct penetrations.
      b. Cut openings in the new and existing roof deck at curbs, unless noted to be cut by others.
   2. Wood Furring Strips.
   3. Treated wood blocking in cavity of metal stud walls for items such as toilet accessories, casework, partitions, etc and at locations indicated on drawings.
   4. Wood Blocking for wall patching.
   5. Project Signs:
      a. Provide a project sign.
      b. The location shall be designated by the Architect.
      c. Painting of the signs shall be by a recognized sign painter in colors as selected.

END OF SECTION

SECTION 06 20 00 - FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Millwork.

1.02 PRODUCTS INSTALLED BY NOT FINISHED UNDER THIS SECTION

A. Section 05 50 00 - Miscellaneous Metals: Angle and channel supports for vanities and counters.

1.03 RELATED REQUIREMENTS

A. Section 05 50 00 - Miscellaneous Metals.

B. Section 06 10 00 – Rough Carpentry: Rough carpentry, wood blocking and other items indicated.

C. Section 06 61 16 – Solid Surfacing Fabrications.

D. Section 08 81 00 - Glass and Glazing: Glazing for millwork, etc.

E. Section 09 91 00 - Painting: Site finishing of finish carpentry and millwork

1.04 REFERENCE STANDARDS

A. ASTM D2898 - Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.

B. ASTM E84 - Surface Burning Characteristics of Building Materials.

C. AWI - Quality Standards of Architectural Woodwork Institute.

D. AWPA C2 - Pressure treatment for lumber and timber above ground, soil and water.

E. AWPA C9 - Plywood - Preservative Treatment by Pressure Process.

F. AWPA C31 - Plywood - Preservative Treatment by Pressure Process.

G. PS 1 - Construction and Industrial Plywood.

H. PS 20 - American Softwood Lumber Standard.

I. PS 51 - Hardwood and Decorative Plywood.

1.05 SYSTEM DESCRIPTION

A. General Requirements: Provide all cutting, jobbing, furring, grounds, blocking, finishing, and setting; provide all forms, struts, millwork items, moldings, various items of equipment, trim, etc., necessary to fully complete the work.

1. Provide all miscellaneous millwork such as wood bricks, temporary scaffolding, bracing, etc., including all guards as required to protect all finished work, all transportation, derricks, tools, and utensils for work under this contract.
2. Provide all miscellaneous trim, casings, moldings, etc., to complete installations throughout the project.
3. Include all nails, screws, rough hardware, timbers, bolts, rods, hangers, and anchor irons that are necessary.

1.06 QUALITY ASSURANCE

A. A. When applicable, fabricate millwork and site made finish carpentry items in accordance with recommendations of Quality Standards of Architectural Woodwork Institute (AWI).

1.07 SUBMITTALS

A. Submit shop drawings under provisions of Division 1.

B. Indicate anchoring, moldings, joining, and type of materials.

C. Submit samples under provisions of Division 1 of standard colors and patterns of plastic laminate for Architect selection.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver shop fabricated carpentry items until site conditions are adequate to receive the work.
   1. Protect items from weather while in transit.

B. Store shop fabricated carpentry items indoors, in ventilated areas with a constant, minimum temperature of 60 degrees F, maximum relative humidity of 25 to 55 percent.

C. Do not bring interior finish into the building until the building is completely enclosed.

D. Store lumber stacked off the ground in such a manner as to ensure proper drainage, ventilation, and protection from the weather.

PART 2 PRODUCTS

2.01 ROUGH CARPENTRY MATERIALS

A. Rough Carpentry Items: As specified in Section 06 10 00 – Rough Carpentry.

2.02 FINISH CARPENTRY AND MILLWORK MATERIALS

A. General:
   1. Season and kiln dry materials for finish work and millwork.
   2. Scrape, sand, and remove plane marks from trim and casings.
   3. Use woodwork free from raised grain.
   4. Maximum moisture content of 12 percent for material 1 inch or less in thickness, and not exceeding 14 percent for material over 1 inch thickness.
   5. Maximum moisture content of 12 percent for millwork, which is assembled or built up of more than one piece at the mill, except doors.

B. Hardwood Lumber: Clear select, plain sliced red oak, custom grade in accordance with AWI, unless noted otherwise.
   1. Display cases; red oak.
   2. Caps and trim; red oak.
   3. Display wall trim; red oak.
   4. Shelving; red oak; custom grade.
   5. Platform molding and trim; red oak.

C. Hardwood Plywood: PS 51; graded in accordance with AWI; core material of veneer; type of bond recommended for application; plain sliced red oak, Grade 1.

D. Wood Particleboard: Minimum 45 pounds density; composed of wood flakes, with high waterproof resin binders; of grade to suit application; sanded faces.

E. Hardboard: Pressed wood fiber with resin binder, tempered grade.

F. Plastic Laminate: Grade 10-HGS; minimum 0.050 inch thick; color and finish shall be as selected by the Architect, manufactured in conformance with the standards of NEMA.

G. Plastic Laminate Backing: Grade 92?BGS; paper base laminate without a decorative finish; manufactured in conformance with the standards of NEMA.

H. Cork for Display Cases: Class B Cork Faced Acoustical Wall Panels as manufactured by Homasote Company, West Trenton, New Jersey; 1/2 inch thick.

I. Rolled Cork for Millwork: 1/4 inch thick ASTM E84 Class B linoleum resilient tackable surface; Tac-Wall as manufactured by Walltalkers, a Division of RJF International Corporation, Fairlawn, Ohio; colors as selected by the Architect from the manufacturers full range of available colors.

J. Adhesive: For shop fabricated work, use adhesive of type recommended by millwork manufacturer to suit application.

K. Nails: Size and type to suit application.
   1. Use stainless steel nails in conjunction with pressure treated wood.

L. Bolts, Nuts, Washers, Lags, Pins, and Screws: Size, type, and finish to suit application.
   1. Use stainless steel fasteners in conjunction with pressure treated wood.

2.03 MILLWORK HARDWARE

A. Provide the following millwork hardware as approved by the Architect.
   1. Shelf Standards and Rests.
   2. Shelf Brackets.
   3. Drawers and Door Pulls.
   4. Catches.
   5. Drawer Slides.
   6. Hinges.
   7. Millwork Locks.
   8. Sliding Door Track Assemblies.
   9. Sliding Door Pulls.
   10. Plastic Grommets: Plastic, of appropriate size, as manufactured by Doug Mockett and Company, Manhattan Beach, California, or approved equal.
   11. Keyboard Tray: As indicated.

2.04 WOOD PRESERVATIVE TREATED LUMBER AND PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA C2 and C9 (except that materials which are not in contact with the ground and are continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
   2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Dry lumber after treatment to a maximum moisture content of 19 percent.

C. Dry plywood after treatment to a maximum moisture content of 18 percent.

D. Do not use material that is warped or does not comply with requirements for untreated material.

E. Mark material with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

F. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
   4. Wood framing members that are less than 18 inches above the ground in crawl spaces or unexcavated areas.
   5. Wood floor plates that are installed over concrete slabs-on-grade.

2.05 FABRICATION

A. Fabricate millwork and finish carpentry items in accordance with recommendations of AWI, custom grade, and to extent shown and detailed on Drawings.
   1. Direction and Matching of Wood Grain on Individual Cabinet: Continuous vertical figure across doors of individual cabinet; drawer fronts may be horizontal or vertical figure without sequence (not required from cabinet to cabinet).
      a. Do not use molded plastic drawer parts.
   2. Use exposed fastening devices or nails only when unavoidable.
   3. Ease edges of all exposed millwork.

2.06 PREPARATION OF FINISH CARPENTRY ITEMS AND MILLWORK FOR FINISHING

A. Sand work smooth and set exposed nails and screws.
   1. Apply wood filler in exposed nail and screw indentations and leave ready to receive site applied finishes.

2. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.

B. Preservative treat surfaces in contact with cementitious materials.

C. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures.
   1. Verify locations of cutouts from site dimensions.
   2. Prime paintSeal contact surfaces of cutouts.

PART 3 EXECUTION

3.01 EXAMINATION

A. A. Personally inspect the building in order to become familiar with all conditions under which the work is to be done.

3.02 PREPARATION

A. Verify items provided by other Sections are properly sized and located.

B. Beginning of installation means acceptance of existing surfaces.

3.03 INSTALLATION OF FINISH CARPENTRY ITEMS AND MILLWORK

A. Exterior Finish: Erect in strict conformity with the details shown on Drawings, and as approved.
   1. Construct built up items, in addition to nailing where necessary or specified, with glued joints.
   2. Machine sand exposed surfaces of finished woodwork ready to receive paint or other finish.
   3. Use blind nailing where possible, and where face nailing is used, set face nails for putty stopping.
      a. House into each other and bolt members, meeting at right angles, with concealed bolts.

B. Interior Finish: Furnish machine sanded finish material and hand sand on the job as required.
   1. Detail trim with kerfed and splined mitered corners.
   2. Nail trim to finish and rough jambs and grounds.
   3. Set trim straight, plumb, or level in alignment, and fit closely, make tight joints to conceal shrinkage.
   4. Secure trim with fine finishing nails and glue.
      a. Use screws where required by the Architect.
   5. Anchor shelves in closets or other areas to framing members with countersunk screws.

C. Millwork:
   1. Set and secure millwork and finish carpentry items in place rigid, plumb, and square.
   2. Use purpose designed fixture attachments for mounted components.
   3. Use threaded steel concealed joint fasteners to align and secure adjoining units.
   4. When necessary to cut and fit on site, make material with ample allowance for cutting.
      a. Provide trim for scribing and site cutting.
   5. Permanently fix units to floor using appropriate angles and anchorages.
   6. Counter?sink semi?concealed anchorage devices used to wall mount components and conceal with solid plugs of species to match surrounding wood.
      a. Place flush with surrounding surfaces.
   7. Carefully scribe millwork to adjacent building materials, leaving gaps of 1/32 inch maximum.
   8. Install and adjust millwork hardware to correct operation.
   9. Ensure that mechanical and electrical items affecting this Section of work are properly placed, complete, and have been approved by the Architect Construction Manager prior to commencement of installation.

3.04 SCHEDULE

A. Provide and install items listed on drawings.

B. Millwork:

1. Plastic Laminate Casework.

END OF SECTION

SECTION 07 21 13 - BOARD INSULATION

GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall.

1.02 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry: Cavity wall insulation.

B. Section 07 21 27 – Enclosed Cavity Foamed Insulation.

C. Section 07 53 24 - Roof Insulation and Membrane Roofing - TPO: Rigid insulation on roofs.

1.03 REFERENCES

A. ASTM C272 - Water Absorption of Core Materials for Structural Sandwich Constructions.

1.04 QUALITY ASSURANCE

A. Comply with the Indiana Energy Conservation Code (ASHRAE 90.1 – 2007).

PRODUCTS

2.01 INSULATION MATERIALS

A. Extruded Polystyrene Insulation: Extruded cellular polystyrene, thermal resistance R per inch of 5.0; minimum compressive strength of 25 psi; water absorption by volume in accordance with ASTM C272, maximum 0.15 percent; ship lap edges; thickness indicated.
   1. Styrofoam as manufactured by Dow Chemical Company, Midland, Michigan.
   2. Foamular as manufactured by Owens-Corning, Toledo. Ohio.

2.02 ADHESIVE MATERIALS

A. Adhesive: Type recommended by insulation manufacturer for application.

EXECUTION

3.01 PREPARATION

A. Verify substrate and adjacent materials and insulation boards are dry and ready to receive insulation and adhesive.

B. Verify substrate surface is flat, free of irregularities and materials that will impede adhesive bond.

C. Verify insulation boards are unbroken, and free of damage, with face membrane undamaged.

3.02 INSTALLATION - EXTRUDED POLYSTYRENE PERIMETER FOUNDATION INSULATION

A. Apply adhesive in continuous beads per board length.

B. Install boards vertically on foundation wall or grade beam perimeter, extending from bottom of floor slab to top of footing, unless otherwise indicated on Drawings.

C. Place boards in a method to maximize contact bedding.

D. Butt edges and ends tight to adjacent board and to protrusions.

END OF SECTION

SECTION 07 21 16 - BATT AND BLANKET INSULATION

GENERAL

1.01 SECTION INCLUDES

A. Batt and blanket insulation, with and without vapor barrier, in exterior wall and ceiling construction.

B. Batt and blanket insulation for filling crevices in exterior wall and roof assembly.

C. Batt and blanket insulation for acoustical wall construction.

D. Reinforced vapor barrier.

1.02 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry: Steel column insulation.

1.03 REFERENCES

A. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

B. ASTM C665 - Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

C. ASTM E84 - Surface Burning Characteristics of Building Materials.

D. ASTM E96 - Water Vapor Transmission of Materials.

E. ASTM E136 - Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.

F. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

G. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.

H. UL 723 - Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. Samples: Submit samples of reinforced vapor barrier under provisions of Division 1.

1.05 QUALITY ASSURANCE

A. Comply with the Indiana Energy Conservation Code (ASHRAE 90.1 – 2007).

1.06 PERFORMANCE REQUIREMENTS

A. Materials of this Section shall provide a thermal, acoustical, and air barrier at building enclosure elements.

PRODUCTS

2.01 MATERIALS

A. Blanket or Batt Insulation - Acceptable Manufacturers:
   1. Owens-Corning Fiberglas Corporation, Toledo, Ohio.
   2. Knauf Fiber Glass, Shelbyville, Indiana.
   3. Johns Manville, Denver, Colorado.
   4. Guardian, Insulation Division, Albion, Michigan.
   5. Or as noted under specific products.

B. Blanket or Batt Insulation: Preformed glass or mineral fiber type, unfaced or, with flame resistant reflective membrane on one side.
   1. Unfaced Thermal Insulation: Unfaced fiberglass batt or blanket, thermal resistance of R-11 for 3 1/2 inches thickness and R-19 for 6 1/4 inches thickness, Type I, in accordance with ASTM C665 and ASTM E136.
      a. Surface burning characteristics; flame spread 10 and smoke development 10 in accordance with ASTM E84.
      b. Thickness as shown on Drawings.
   2. Unfaced Acoustical Insulation: Unfaced fiberglass batt or blanket, sound attenuation insulation, Type I, in accordance with ASTM C665.

a. Surface burning characteristics; flame spread 10 and smoke development 10 in accordance with ASTM E84.
b. Thickness as shown on Drawings.s.

C. Reinforced Vapor Barrier: Griffolyn Type T-55FR as manufactured by Reef Industries, Inc., Houston, Texas; Dura-Skrim 2FR as manufactured by Raven Industries, Springfield, Ohio; or approved equal; 3 ply high density polyethylene and nylon yarn laminate.

D. Clips, Nails, Staples, or Wires: Steel wire; galvanized; type and size to suit application.

E. Tape: As recommended by the manufacturer for the intended application.

F. Impaling Pins: Galvanized wire pin on galvanized base; adhesive application; with speed washers and dome caps.

EXECUTION

3.01 PREPARATION

A. Verify adjacent materials are dry and ready to receive installation.

B. Verify mechanical and electrical services within walls have been installed and tested.

3.02 INSTALLATION

A. General:
1. Install batt and blanket insulation in accordance with manufacturer's instructions.
2. Trim insulation neatly to fit spaces.
3. Use batts free of damage.
4. Lap all insulation approximately 1/2 inch at joints.
a. Include all exterior walls, all interior cold walls, top side of corridor air plenums, junctions between walls and ceilings, junctions between walls and canopies or overhangs, around duct openings, around perimeter of all aluminum window, door/storefront units and exterior wall louvers to in-fill gap between opening and unit and around penetrations of electrical, mechanical, and plumbing work, all to provide a continuous tight insulating envelope for the building.
5. Provide insulation shown on typical wall section at all similar locations.
6. Secure free hanging insulation to back-up screen of welded wire mesh.
7. Install insulation at beams, columns, and joists to prevent infiltration of air into the structure.
8. Extend insulation in stud walls tight to underside of floor or roof deck above.
9. Install reinforced vapor barrier continuously over insulation with adhesive, floor to deck above.
a. Tape all joints in vapor barrier to make an airtight installation.
b. Tape joint at floor and at deck above.
c. Tape all tears in vapor barrier.
d. Provide continuous taping leaving no open seams in vapor barrier.

B. Exterior Wall Insulation:
1. Install vertically one layer of unfaced thermal insulation between metal studs following contour of wall with no void between wall and insulation.
a. Cover entire wall surface, including surfaces above suspended ceilings.
b. Make insulation tight against deck or structure above and the floor below.

C. Roof Expansion Joints:
1. Completely fill space between wood curbs with unfaced thermal insulation.

END OF SECTION

SECTION 07 21 19 - FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foamed-in place insulation at junctions of dissimilar wall and window or wall to achieve thermal seal – where not exposed to interior of Building.

B. Filling miscellaneous voids in construction with foam insulation – where not exposed to interior of Building.

C. Foamed-in place insulation at junctions of wall and roof materials to achieve thermal seal – with exposure to interior of Building – includes themalignition barrier.

1.02 REGULATORY REQUIREMENTS

A. A. Conform to applicable code for flame/fuel/smoke requirements.

1.03 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Include product description, insulation properties, locations of use, and preparation requirements.

C. Submit manufacturer's installation instructions under provisions of Division 1.

D. Submit manufacturer's certificate under provisions of Division 1 that products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in plastic foam insulation with minimum three years experience.

B. Applicator: Certified and approved by manufacturer with current certification at time of installation.

PART 2 PRODUCTS

2.01 FURNISH MANUFACTURER'S REQUIRED EQUIPMENT FOR SPRAYING INSULATION SYSTEM IN PLACE.

A. Fomo Products, Inc., Norton, Ohio.

B. Dow Chemical, Midland, Michigan.

C. Basis-of-Design Product: Fomo Products; Handi-Seal.

2.02 MATERIALS – FIPI – NOT EXPOSED TO INTERIOR OF BUILDING

A. One component foamed-in-place polyurethane insulation with the following characteristics.
   1. Thermal Conductivity: ASTM C177; Minimum k value at 75 degrees F, 0.224; minimum R value at 75 degrees F, 4.5.
   2. Density: ASTM D1622; minimum 1.0 pounds per cubic foot.
   3. Surface Burning Characteristics: ASTM E84; flame spread, 5; fuel contributed, 0; smoke developed, 10.

2.03 FOAMED-IN-PLACE INSULATION (FIPI) - ACCEPTABLE MANUFACTURERS – EXPOSED TO INTERIOR OF BUILDING

A. Basis-of-Design Cellulose Product: International Cellulose Corp.; K-13 Spray on System.
   1. Thickness: 2-inch standard.
   2. Color: Lt Grey or White.
   3. Or approved equal.

B. Basis-of-Design Polyurathane Product: Icynen Polyurethane Spray Foam Insulation; Mississauga, Ontario; ProSeal HFO.
   1. Equal Manufacturers:
      a. BASF Polyurethane Foam Enterprises LLC; Walltite.
   2. Thickness: As required in Field, approximately 2-inches.

3. Thermal/Ignition Barrier: DC-315 Intumescent Paint Coating, 24 wet mils minimum.

2.04 MATERIALS – FIPI – EXPOSED TO INTERIOR OF BUILDING

A. Cellulose Spray Applied System.
   1. Tested for surface burning characteristics in accordanace with ASTM E84 and is rated class A. Flame Spread 5, Smoke Developed 5. Combustibilty E136 = Noncombustible.
   2. Thermal Conductivity: ASTM C518; Minimum R value R/ inch = 3

B. Foam Insulation System: Two-component, closed-cell, rigid-class polyurethane foam, sprayed-in-place, with the following properties:
   1. Density: ASTM D1622, Nominal 2 pounds per cubic foot.
   2. Water Vapor Permeance: ASTM E96, 1.4 perms at 1”
   3. Compressive Strength: ASTM D1621, 22 PSI.
   4. Tensile Strength: ASTM D1623 Type C, 28 PSI.
   5. Closed cell content: ASTM D6226, 90 percent minimum.
   6. Flame Spread Index: ASTM E84, 25 maximum.
   7. Smoke Developed Index: ASTM E84, 350 maximum.
   8. Substrate Primer: As required by manufacturer.

2.05 EQUIPMENT

A. Furnish manufacturer’s required equipment for spraying insulation system in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

B. Beginning of installation means acceptance of substrate and project conditions.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Contact Manufufacturer for procedures on handling primed/ panted steel for proper adhesion.

C. All surfaces shall be free of oil, grease, loose mill scale, dirt or other foreign materials.

D. Comply with SPFA applicable guidelines.

3.03 APPLICATION - FIPI – NOT EXPOSED TO INTERIOR OF BUILDING

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Be cautious of flammability of Non-Plenum insulation during and after installation.

D. Do not apply to underside of roof deck until after construction roof traffic has ceased.

3.04 INSTALLATION – FIPI – EXPOSED TO INTERIOR OF BUILDING

A. Install manufacturer’s recommended primer for substrates indicated.

B. Install insulation/air barrier system in accordance with manufacturer’s written installation instructions.

C. Install cellulose or foam insulation system in multiple layers with minimum pass thickness of 1/2 inch.
   1. Minimum total insulation thickness: 2 inches.

D. Develop finish skin surface to smooth and unbroken texture.

E. Apply Thermal/Ignition Barrier to Polyurathane Foam Systems.

3.05 FIELD QUALITY CONTROL

A. A. Field inspection will be performed in accordance with Division 1.

3.06 PROTECTION

A. Protect finished installation in accordance with Division 1.

END OF SECTION

SECTION 07 21 27 - ENCLOSED CAVITY FOAMED INSULATION

GENERAL

1.01 SUMMARY

A. Section Includes enclosed cavity foamed insulation and air barrier system.

B. Contractor's Option at CMU walls: Provide cavity wall insulation and air barrier system specified in this Section or cavity wall insulation and air barrier system specified in Section 04 20 00 – Unit Masonry.

C. Related Sections:
   1. Division 04 Section "Unit Masonry" for CMU substrate material.
   2. Division 09 Section "Gypsum Board" for glass-mat reinforced gypsum sheathing substrate material.

1.02 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Product Data: For each material indicated, including manufacturer's preparation and installation data.

C. Shop Drawings: Wall elevations and details showing extend of cavity foamed insulation, intersections with adjacent surfaces, details at window and other opening perimeters, details of expansion joints, flashing, and other items for a complete insulation and air barrier system.

D. Test Reports: Indicating compliance with specified requirements.

E. Certificates:
   1. Installer certificates indicating accreditation by SPFA (Spray Polyurethane Foam Alliance).

1.03 QUALITY ASSURANCE

A. Installer Qualifications: An experienced firm who is approved by manufacturer to install manufacturer's products and who has successfully completed similar installations.
   1. Applicator: Currently accredited by SPFA (Spray Polyurethane Foam Alliance).
   2. Provide list of minimum three completed installations within the last three years.

B. Comply with Indiana Energy Conservation code (ASHRAE 90.1 – 2007).

C. Preinstallation Meeting: Conduct meeting at project site minimum one week prior to beginning installation. Comply with requirements in Division 01 Section "Project Meetings." Review installation procedures and coordination required with related work, including manufacturer's written instructions.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials in accordance with Division 01.

B. Deliver and store materials and other products in their original unopened containers or packaging until ready for installation.

C. Store and protect materials in accordance with manufacturer's recommendations.

1.05 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products when environmental conditions are beyond manufacturer's limits.

B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit cavity foamed insulation/air barrier system to be installed according to manufacturer's written instructions.

PRODUCTS

2.01 MANUFACTURER AND SYSTEM

A. BASF Polyurethane Foam Enterprises LLC; Walltite.

B. Icynen Polyurethane Spray Foam Insulation; Mississauga, Ontario.

2.02 MATERIALS

A. Foam Insulation Air Barrier System: Two-component, closed-cell, rigid-class polyurethane foam, sprayed-in-place, with the following properties:
   1. Density: ASTM D1622, Nominal 2 pounds per cubic foot.
   2. Compressive Strength: ASTM D1621, 22 PSI.
   3. Tensile Strength: ASTM D1623 Type C, 28 PSI.
   4. Closed cell content: ASTM D6226, 90 percent minimum.
   5. Flame Spread Index: ASTM E84, 25 maximum.
   6. Smoke Developed Index: ASTM E84, 350 maximum.

B. Substrate Primer: As required by manufacturer.

2.03 ACCESSORIES

A. Transition Strips: Manufacturer's recommended self-adhering strips for indicated conditions.
   1. Perimeter openings of windows and other conditions encountered.
   2. Substrate material transitions and where indicated.

2.04 EQUIPMENT

A. Furnish manufacturer's required equipment for spraying insulation/air barrier system in place.

EXECUTION

3.01 EXAMINATION

A. Examine substrates under which insulation systems will be installed, for compliance with requirements. Verify flashing and veneer anchors are in place.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer to achieve best results for substrates under project conditions indicated.

B. Comply with SPFA applicable guidelines.

3.03 INSTALLATION

A. Install manufacturer's recommended primer for substrates indicated.

B. Install insulation/air barrier system in accordance with manufacturer's written installation instructions.

C. Install foam insulation/air barrier system in multiple layers with minimum pass thickness of 1/2 inch.
   1. Minimum total insulation thickness: 2 inches.
   2. Minimum R-Value: R-13.

D. Develop finish skin surface to smooth and unbroken "orange peel" texture. Uneven surfaces, "treebark" or "popcorn" textures are not acceptable.

E. Maximum Tolerance Variation from Indicated Thickness: Minus 1/4 inch, plus 1/2 inch.

3.04 FIELD QUALITY CONTROL

A. Site Tests: Conducted by Installer for compliance with requirements. Maintain records for submission at Substantial Completion.
   1. Provide daily visual inspection, adhesion/cohesion testing and density measurements.

3.05 PROTECTION

A. Protect insulation/air barrier system from ultraviolet radiation as recommended by manufacturer's written instructions.

END OF SECTION

SECTION 07 53 24 - ROOF INSULATION AND MEMBRANE ROOFING - TPO

GENERAL

1.01 SECTION INCLUDES

A. Roof insulation, fully adhered membrane roofing and flashing.

B. Wood nailers and blocking for the attachment of roofing.

C. Sealant where roofing materials are installed.

D. Installation of all materials in accordance with manufacturer's currently published specifications and details consistent with job conditions.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 11 40 00 - Food Service Equipment: Equipment rails for roof mounted equipment.

B. Section 22 11 19 - Piping Specialties: Pipe portals for roof mounted equipment.

C. Section 22 05 29 and 23 05 29 - Supports and Anchors: Equipment rails for roof mounted equipment.

D. Section 23 34 23 - Power Ventilators: Prefabricated roof curbs.

E. Section 23 37 00 - Relief Vents/Outdoor Air Intakes: Prefabricated roof curbs.

1.03 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry.

B. Section 07 62 00 - Sheet Metal Flashing.

C. Section 07 41 13 - Metal Roofing

D. Section 07 71 19 – Aluminum Fascias, Copings, Gutters and Downspouts.

1.04 REFERENCES

A. Thermoplastic Polyolefin (TPO) Single Ply Roofing Systems Specification Manual.

B. ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

C. ASTM D4434: Performance Criteria only for Thermoplastic Sheet Materials.

D. FM 4470: Corrosion Test for Fastener, by Factory Mutual.

E. ASTM C1289 – Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

F. AWPA - Standard C2: Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Process.

G. AWPB - Standard LP2: Standard for Soft Wood Lumber, Timber and Plywood Pressure Treated with Water Borne Preservatives for Above-Ground Use.

H. UL Building Materials Directory.

1.05 SYSTEM DESCRIPTION

A. Thermoplastic Polyolefin (TPO) Roofing System: Fully adhered 0.060 inch single layer thermoplastic polyolefin roof system with heat-weldable seams over mechanically fastened rigid roof insulation.

B. Flashings: Install flashing and counterflashing at walls, for all openings in roof coverings, for all vertical projections above the roof, and elsewhere as required.

1.06 QUALITY ASSURANCE

A. Applicator:
   1. Experienced and trained installers as approved by the roofing system manufacturer.
   2. Bidders for the roofing system must furnish evidence of his manufacturer's current approval status with the bid.

1.07 REGULATORY REQUIREMENTS

A. UL Class A Fire Hazard Classification.

B. Wind Uplift: FM 1-90, 2005 Standards.

C. FM Loss Prevention Data Sheet 1-49: Perimeter detailing and fastening.

1.08 SUBMITTALS

A. Submit shop drawings under the provisions of Division 1.
   1. Include fastener type, quantity, and spacing for mechanical attachment of thermal barrier, insulation materials, and overlay board to meet requirements of International Building Code (ICC) with latest Indiana amendments, and in accordance with manufacturer's recommendations.

B. Submit shop drawings showing panel layout for tapered insulation.

C. Submit a signed certification that the roof deck, insulation, and all roofing materials are of the type and applied in accordance with the applicable UL construction classifications as listed in the current edition of the UL Building Materials Directory and that roof covering materials conform with UL Class A.

D. Submit sample copy of manufacturer’s warranty.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Under provisions of Division 1, store materials in weather protected and properly ventilated environment clear of ground and moisture.

C. Do not exceed safe liveload carrying capacity in stacking procedure of roofing or insulation materials on the roof decks.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not apply roofing system during inclement weather.

B. Do not apply roofing system to damp or frozen substrates.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.11 PREINSTALLATION CONFERENCE

A. Prior to the installation of any materials, there shall be a joint meeting between the Owner’s Representative, and Roofing Contractor and authorized representative of the Roof Membrane Manufacturer to review all procedures and materials to be used in the work specified.
   1. Include review of drains, overflow height, and sump requirements.

1.12 WARRANTY

A. Contractor's Warranty: Include coverage of any and all defects in workmanship and material which may appear within a period of five (5) years after the completion and acceptance of the work by Owner’s Representative. This includes the insulation as well as all roof surfacing materials. In addition, any material such as ceiling tile, interior building finished surfaces, floor coverings, equipment damaged as a result of defects in workmanship and materials, shall be replaced by the Contractor at no cost to the Owner. Contractor’s Warranty shall be notarized and signed by the authorized Contractor Repsresentative.

B. Manufacturer's Warranty: Provide twenty (20) year full value, non-prorated, no dollar limit guarantee, materials and labor. This warranty runs concurrently with Contractor's Warranty.

PRODUCTS

2.01 ROOF MEMBRANE

A. Acceptable Manufacturers:
   1. Carlisle SynTec Systems, Carlisle, Pennsylvania.
   2. Firestone Building Products, Carmel, Indiana.
   3. Genflex Roofing Systems, Indianapolis, Indiana.
   4. Versico Roofing Systems, Carlisle, Pennsylvania.

B. Fully Adhered System: ASTM D6878, TPO membrane, ultraviolet resistant, reinforced.
   1. Thickness: 60 mils.
   2. Color: White.
   3. Provide membranes in the largest possible dimension as determined by job conditions. Membrane to have the following information stamped into the exposed surface.
      a. Date of Installation.
      b. Manufacturer.

2.02 INSULATION

A. Polyisocyanurate: ASTM C1289, both faces finished with fiberglass mat.
   1. Compressive Strength: Minimum 20 psi.
   2. R-Value: Based on LTTR 5.6 per inch of thickness.

B. Insulation Overlay Board: Provide one of the following:
   1. 1/2 inch thick DensDeck Prime overlay board as manufactured by Georgia Pacific Corporation, Atlanta, Georgia; or 1/2 inch thick Securock Roof Board as manufactured by United States Gypsum Company, Chicago, Illinois.
   2. 1/2 inch thick high density (Minimum 100 psi) polyisocyanurate overlay board.
      a. Firestone Building Products; Isogard HD Cover Board.
      b. Carlisle SecurShield HD Cover Board.

C. Thickness of Insulation: Total thickness of 4 inches consisting of two layers of polyisocyanurate and one layer of overlay board, providing a minimum total R-value of 20.46.

D. Tapered Insulation System: Tapered polyisocyanurate insulation as supplied by the insulation manufacturer.
   1. Provide insulation blocks with a tapered surface; minimum 1/4 inch per foot taper; R value of 5.6 per inch of thickness.
      a. Where tapered insulation abuts other construction at a specific elevation, adjust slope to meet that condition.
   2. Factory fabricate miters, consisting of two diagonally cut blocks with all edges matching in thickness with abutting blocks.

2.03 FLASHING AND GRAVEL STOPS

A. Single Ply Sheet Flashing: TPO reinforced membrane flashing to be of same type, thickness, and color of roofing membrane, 0.060 inch.

B. Flashing Strips: 8 inch wide TPO flashing strips for miscellaneous applications.

C. Detail Flashing: Manufacturer's standard unreinforced TPO detail flashing membrane for flashing of miscellaneous penetrations.

D. Prefabricated Flashing Accessories: As approved by the membrane manufacturer.

E. Mechanical Termination: 1 inch by 1/8 inch aluminum bar.

2.04 SEALANT

A. Use sealant materials compatible with the roofing materials, as recommended by the membrane manufacturer.

B. Non-staining, water resistant, gun grade urethane or silicone sealant as approved by the membrane manufacturer.

2.05 WOOD NAILERS, PLYWOOD, AND BLOCKING

A. Preservative Treatment by Pressure Process: AWPA C2 and C9.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Dry lumber after treatment to a maximum moisture content of 19 percent.

C. Dry plywood after treatment to a maximum moisture content of 18 percent.

D. Do not use material that is warped or does not comply with requirements for untreated material.

E. Mark material with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

F. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, and vapor barriers.
   2. Wood blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.06 FASTENERS

A. Provide mechanical fasteners as approved by the membrane manufacturer and in compliance with FM 4450.
   1. Use stainless steel nails in conjunction with pressure-treated wood.
      a. Use factory-coated steel fasteners and metal or plastic plates for securing roof insulation and overlay board to metal deck substrate.

2.07 ADHESIVES AND ACCESSORIES

A. Adhesives: Compatible with materials with which it is used, furnished by the membrane manufacturer.

B. Expansion Joint Covers: Composite Construction of 3 inches wide flexible neoprene flashing, each edge seamed to copper sheet metal flanges, designed for nominal joint width of 2 inches.
   1. Include special formed corners, T's, wall flashings, and intersections, each sealed water tight and formed for project conditions.
   2. Metalastic as manufactured by GAF Material Corporation, Wayne, New Jersey; Expand-O-Flash as manufactured by Johns Manville Roofing Systems Group, Denver, Colorado; or an approved equal.

C. Walkway Pads: Provide for linear feet of manufacturer's approved walkway pads at location as designated on drawings and located by the owner's representative.

D. Preformed Pipe Boots and Pipe Portals: Furnished and approved by membrane manufacturer.
   1. Basis-of-Design Products: Portals Plus; Pipe Portal Systems and Boots.

E. All other materials not specifically described, but required for a complete and proper installation of roofing shall be as selected by approved manufacturer and subject to approval of Architect.

EXECUTION

3.01 INSPECTION

A. Complete construction of any bay or any section of roof before beginning roofing work.

B. Verify roof surfaces are smooth, firm, dry, and free from dirt or foreign material and have been approved. Verify slope parameters.

C. Verify vents and other projections through the roofs are properly flashed and secured in position.

D. Immediately prior to installing the membrane inspect all areas to determine that they are free from all debris and other irregularities.

E. Examine and try all surfaces on which or against which this work is to be applied and notify the Architect and Owner's Representative in writing of any surfaces that are unsuitable to receive this work.

F. Notify the Owner's Representative prior to the installation of the roof membrane.

G. Beginning of installation means acceptance of substrate conditions.

3.02 ROOF CURB INSTALLATION

A. Install all roof curbs and equipment rails level at the top with pitch built in.

B. Provide tapered saddles or crickets at curbs to provide proper drainage.

3.03 INSULATION APPLICATION

A. General:
   1. Cut insulation to fit neatly around all projections through the roof with long joints continuous and end joints staggered.
   2. Lay the two layers of insulation and one layer of insulation overlay board with all seams staggered between the layers.
   3. Bring insulation units into moderate contact with one another without forcing.
   4. Fill any open joints or voids in the insulation with an approved loose fill insulation or spray foam insulation approved by insulation and roof membrane manufacturer..
   5. Install additional insulation at low areas and feather off flush to provide positive drainage in all areas.
   6. Note the sloping of the roof construction to the roof drain locations.
      a. Feather the insulation down at all roof gutters
      b. Upon completion all roof surfaces must be uniform, must not trap or pocket water, and must drain properly to the roof drains.
   7. Install only as much insulation which can be roofed by the end of the day and properly protect all surfaces and edges of insulation left exposed at the end of each work day.
      a. Ensure that the work in progress is water tight at the end of the day.
      b. Any material such as ceiling tile, interior building finished surfaces, floor coverings, equipment damaged as a result of not providing a water tight roof condition at the end of each day or if inclement weather conditions occur while Work is in progress during the day shall be replaced by the Contractor at no cost to the Owner. Contractor shall pay for all costs associated with any and all clean-up required as a result of water damage or any other roof installation related damage.

B. Tapered Insulation System:
   1. Provide one layer of insulation overlay board over the tapered insulation.
   2. Minimum total thickness of tapered roof insulation, including the insulation and insulation overlay board; 4 inch at roof drains.

C. Insulation for Fully Adhered Roof Decks: Install insulation on unballasted roof decks with approved mechanical fasteners at a spacing and pattern as recommended by the membrane manufacturer. Stagger joints of bottom and top insulation boards a minimum of 12” in both directions.
   1. First Layer: Polyisocyanurate.
   2. Second Layer: Polyisocyanurate.
   3. Third Layer: Insulation overlay board, 1/2 inch thick.

3.04 MEMBRANE INSTALLATION

A. Install roof membrane sheets in accordance with manufacturer’s specifications and instructions, and regulatory requirements.

B. Use appropriate bonding adhesive for substrate surface, applied with a solvent-resistant roller, brush, or spray.

C. Fully adhere membrane sheets with bonding adhesive at the rate as approved by the manufacturer for the type adhesive used. Apply adhesive to both the underside of the membrane and the substrate surface. A greater quantity of bonding adhesive may be required based upon the substrate surface condition.

D. Install one layer of TPO membrane, in bonding adhesive, lapping side laps 3 inches and 3 inches on ends.

E. Membrane laps shall be heat-welded together. All welds shall be continuous, without voids or partial welds. Welds shall be free of burns and scorch marks. Weld width shall be a minimum of 1-1/2 inches for automatic machine welding and 2 inches for hand welding.

F. Provide waterproof cut-off to membrane at end of day's operation or when inclement weather is expected using methods recommended by membrane roofing manufacturer. Install cut-off at all exposed edges of roofing and roof penetrations. Remove cut-off before resuming work.

G. Wrinkles in the membrane or debris under the membrane is not acceptable.

H. Any ponding of water on any portion of the membrane surfaces or along and adjacent to gutters is not acceptable.

3.05 FLASHING AND GRAVEL STOPS

A. Install flashings in accordance with manufacturer's specifications and instructions, and regulatory requirements.

B. Install flashing at all vertical surfaces, roof interruptions, and penetrations.

C. Seal flashing and flanges of items penetrating or protruding through roof membrane.

D. Fabricate all sheet metal with TPO coated metal that is to receive membrane sheet materials for bonding/termination purposes. Terminate all flashings in accordance with manufacturer's specifications and instructions.

E. Mechanical Termination: Where membrane flashing terminates on a wall, set edge of flashing in water cut-off mastic and cover with an aluminum bar secured by mechanical fasteners to make a tight seal.

F. Provide sheet metal collars at goosenecks, metal flues, and miscellaneous duct penetrations.

3.06 ACCESSORIES

A. Install preformed accessories and expansion joint covers in accordance with manufacturer's instructions.

3.07 SEALANT

A. Caulk bed joints above flashings where roof materials are installed with sealant.

B. Install sealant in accordance with the manufacturer's instructions.

3.08 WOOD NAILERS, PLYWOOD, AND BLOCKING

A. Install wood nailers, plywood, and blocking in accordance with the manufacturer's currently published details consistent with the job conditions.

3.09 PROTECTION

A. It is imperative that all precautions are used to be sure that all surfaces are thoroughly water tight at the end of each day or when rain is imminent.

B. Any material such as ceiling tile, interior building finished surfaces, floor coverings, equipment damaged as a result of not providing a water tight roof condition at the end of each day or if inclement weather conditions occur while Work is in progress during the day shall be replaced by the Contractor at no cost to the Owner.

3.10 FIELD QUALITY CONTROL

A. At the completion of the roofing work there will be a joint meeting between the Owner's Representative, Roofing Contractor, and authorized representative of the Roof Membrane Manufacturer at the job site for a field inspection of all roof surfaces to determine the extent of any remedial work required prior to acceptance of the work by the Architect and Owner's Representative.

3.11 CLEANING

A. Any debris, dust and dirt falling on to interior floor or components under areas of the roof replacement work as a result of the installation of the roof system shall be cleaned to a dust free condition by the Contractor to the satisfaction of the Owner's Representative at no cost to the Owner.

B. Finished roof membrane surface shall be free of screws, rivets, metal trimmings, metal shavings, rust stains and any black tar or bituminous markings to a completely white membrane surface.

END OF SECTION

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cap flashings.

B. Roof flashings.

C. Counterflashings over base flashings.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 04 20 00 - Unit Masonry: Flashing reglets and accessories.

1.03 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry: Through wall flashing at sills, heads of openings, and similar uses.

B. Section 06 10 00 – Rough Carpentry: Wood blocking, nailers, and grounds. New wood roof curbs.

C. Section 07 53 24 - Roof Insulation and Membrane Roofing - TPO.

D. Section 07 71 19 - Aluminum Fascias, Copings, Gutters, and Downspouts.

E. Section 07 90 00 - Joint Sealants.

F. Section 09 91 00 - Painting: Prime and finish painting.

1.04 REFERENCE STANDARDS

A. ASTM A525 - Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process.

B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

C. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2022.

D. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).

1.05 SYSTEM DESCRIPTION

A. A. Work of this Section is to physically protect membrane roofing and base flashings from damage that would permit water leakage to building interior.

1.06 QUALITY ASSURANCE

A. Applicator: Company specializing in sheet metal flashing work with minimum five (5) years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store prodcuts under provisions of Division 1.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

1.08 WARRANTY

A. Furnish a notarized affidavit, signed by the General Contractor and this Contractor, stating that all sheet metal work covered under this section of the specifications carries the Contractor's five (5) year unconditional warranty to replace, with new materials, at no additional expense, any materials, labor, or workmanship which show defects within said two (2) year period.

B. Furnish a flashing endorsement stating that flashing work is included with the roof bond.

C. Install all flashings to conform with the requirements for a twenty (20) year roof bond although a roofing bond is not required for the project.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Aluminum Sheet: ASTM B209, 3003 5005 alloy, H14 temper; 0.032 inch thick, or thickness noted; finish as selected by the Architect from manufacturer available standard and custom colors.

2.02 ACCESSORIES

A. Fasteners: Appropriate for the material to be fastened.

B. Underlayment: ASTM D226; No. 15 asphalt saturated roofing felt.

2.03 FABRICATION

A. Provide all accessories and items necessary for a water tight installation.

B. Form sections true to shape, accurate in size, square, and free from distortion or defects.

C. Form pieces in longest practical lengths.

D. Seams:
   1. Flat lock seams minimum 3/4 inch wide.
   2. Lap unsoldered plain lap seams minimum 3 inches.
   3. Fabricate all seams in direction of flow.

E. Provide expansion joints at minimum 30 foot intervals in sheet metal work.

F. Provide reinforcement as necessary.

G. Hem exposed edges on underside 1/2 inch; miter and seam corners.

H. Fabricate corners from one piece with minimum 18 inch long legs; seam or solder for rigidity, seal with sealant.

I. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

J. Seal metal joints.

K. Turn cap flashing down 4 inches over base flashing and form to provide spring action against base flashing.

L. Fabricate cleats and starter strips of same material as sheet.

PART 3 EXECUTION

3.01 EXAMINATION

A. Surfaces to be even, smooth, sound, thoroughly clean and dry, and free from all defects that might affect application.

B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

C. Verify roofing termination and base flashings are in place, sealed, and secure.

D. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Field measure site conditions prior to fabricating work.

B. Insert flashings into reglets to form tight fit.

C. Secure flashings in place using concealed fasteners.
   1. Use exposed fasteners only in locations approved by Architect.

D. Seam and seal all joints.

E. Fit flashings tight in place.
   1. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

F. Install starter and edge strips, and cleats before starting installation.

3.03 INSTALLATION

A. Provide cap flashings over all base flashings, except where shown otherwise.
B. Install water resistant paper underlayment for all sheet metal linings or coverings.
C. Extend reglets into masonry full depth of face brick and turn up 1 inch.
D. Except where specifically shown otherwise, do not cut mortar joints to receive reglets.
E. Install aluminum flashing at heads of all doors not covered by a canopy.

END OF SECTION

SECTION 07 71 19 - ALUMINUM FASCIAS, COPINGS, GUTTERS, AND DOWNSPOUTS

GENERAL

1.01 SECTION INCLUDES

A. Aluminum fascias, cap covers, and copings.

B. Aluminum gutters and downspouts.

1.02 RELATED SECTIONS

A. Section 05 50 00 - Miscellaneous Metals: Miscellaneous framing for fascias and panels.

B. Section 07 41 13 – Metal Roofing.

C. Section 07 62 00 - Sheet Metal Flashing.

1.03 REFERENCES

A. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.

B. American National Standards Institute/Single Ply Roofing Institute (ANSI/SPRI) ES-1 – Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

1.04 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.
   1. Indicate on shop drawings, configuration and dimension of components, fasteners, adjacent construction, required clearances and tolerances, and other affected work.

B. Submit sample of manufacturer’s warranty as indicated in 1.7 Warranty listed below.

C. Submit manufacturer's available color samples for final color selection by the Architect.

D. Submit performance testing data indicating compliance with ANSI/SPRI ES-1.

1.05 QUALITY ASSURANCE

A. Design, fabricate, and install fascias and copings in accordance with ANSI/SPRI ES-1.

1.06 DELIVERY AND HANDLING

A. Deliver items in proper construction sequence.

B. Handle finished items with care to avoid bending and other damage during transportation and erection.

1.07 WARRANTY

A. Provide five (5) year warranty on finish against failures due to noticeable checking, peeling, blistering, fading and chalking.

PRODUCTS

2.01 MATERIALS

A. Aluminum: Sheet; ASTM B209, 3003 alloy, H14 temper.
   1. Fascias: 0.050 inch thickness.
      a. Heights Up to and Including 12 inches: 0.050 inch thickness.
      b. Heights Over 12 inches: 0.063 inch thickness.
   2. Cap Covers: 0.050 inch thickness.
   3. Copings: 0.063 inch thickness.
      a. Widths Up To And Including 12 inches; 0.063 inch thickness.
      b. Widths Over 12 inches; 0.080 inch thickness.
   4. Backing Plates: 0.050 inch thickness.
   5. Gutters: 0.063 inch thickness
   6. Downspouts: 0.050 inch thickness.
   7. Gutter Anchor Straps: 0.080 inch thickness.
   8. Gutter Support: 1/4 inch by 2 inches.

B. Fasteners: Provide stainless steel fasteners, clips, button rivets, and screws.
   1. Furnish self sealing washers and concealed fastening.

C. Sealant: Sonolastic two part polysulfide sealant, as manufactured by Sonneborn, or an approved equal.

2.02 FABRICATION

A. General:
   1. Form and fabricate prior to applying finish.
   2. Provide weep holes at 16 inches on center.
   3. Fabricate expansion joints, joint covers, and angle closure to provide weathertight joints.
   4. Provide aluminum stiffener channels where required.
   5. Weld all corners and grind smooth prior to applying finish.

B. Fascias, Cap Covers, and Copings:
   1. Fabricate sections in maximum 8'-0" lengths.
   2. Provide overlap offset joints with 1/8 inch separation between joints, or separated butt joints with backing plates.
      a. Weld plate, or approved equal, on one side and caulk on other side.
   3. Reinforce standing ridges at each corner.

C. Gutters and Downspouts:
   1. Form gutters and downspouts of profiles and sizes indicated on drawings and as required to properly collect and remove water.
   2. Form sections square, true, and accurate in size, in maximum possible lengths and free of distortions and defects detrimental to appearance or performance.
      a. Hem exposed edges.
      b. Allow for expansion at joints.

2.03 FINISH

A. Exposed Surfaces: 1 mil thick, 70 percent Kynar 500 or Hylar 5000 type finish, over minimum 0.2 mil baked-on modified epoxy primer. Color to be determined.

EXECUTION

3.01 INSPECTION

A. Verify that deck, roof membrane, and other items affecting work of this Section are in place and positioned correctly.

B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Consult with contractors of adjoining work to properly work out all details.

B. Install joints straight and plumb.

C. Do not use exposed fasteners except where approved by the Architect. All fasteners shall be pre-finished to match color and be installed in a neat and uniform pattern.

D. Caulk all joints and all fastenings in conformance with sealant manufacturer's printed instructions.

E. Apply finish to cover all exposed surfaces, including all edges, to a uniform color, free of surface defects.

F. Clean all surfaces immediately after erection.

G. Install gutters and downspouts.
   1. Join lengths with formed seams sealed watertight.
   2. Flash and seal gutters to downspouts.
   3. Slope gutters minimum 1/16 inch per foot.
   4. Provide a leaf screen at each downspout.

5. Apply on inside of gutter over each gutter splice/joint and at downspout connection, Karnack Seam Sealer with mesh to a minimum width of 6” as per manufacturer’s instruction.

END OF SECTION

SECTION 07 90 00 - JOINT SEALANTS

GENERAL

1.01 SECTION INCLUDES

A. Preparing sealant substrate surfaces.

B. Sealant, caulking, and backing.

1.02 RELATED SECTIONS

A. Section 04 20 00 – Unit Masonry.

B. Section 07 62 00 - Sheet Metal Work: Sealants used in conjunction with metal flashings.

C. Section 07 71 19 - Aluminum Fascias, Copings, Gutters, and Downspouts: Sealants used in conjunction with aluminum fascias.

D. Section 08 51 13 - Aluminum Windows: Sealants used in conjunction with aluminum windows.

E. Section 08 81 00 - Glazing: Sealants used in conjunction with glazing methods.

1.03 REFERENCES

A. ASTM C834 - Latex Sealing Compounds.

B. ASTM C920 - Elastomeric Joint Sealants.

C. ASTM D2240 - Rubber Property - Durometer Hardness.

D. ASTM E90 - Airborne Sound Transmission Loss of Building Partitions.

1.04 TESTING REQUIREMENTS

A. Preconstruction Compatibility and Adhesion Testing: Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to each joint substrate indicated.

1.05 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Submit product data indicating sealant chemical characteristics, performance criteria, limitations, manufacturer's installation instructions, and color availability.

C. Submit preconstruction compatibility and adhesion test reports and preconstruction field-adhesion test reports.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three (3) years experience.

B. Applicator: Company specializing in applying the work of this Section as approved by sealant manufacturer.

1.07 FIELD SAMPLES

A. Install field samples, illustrating sealant type, color, and tooled surface.

B. Locate where approved by the Architect.

C. Accepted sample may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not apply to damp or frosted surfaces.

B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

PRODUCTS

2.01 SEALANTS

A. Exterior Sealants:
   1. Exterior Polyurethane Sealant: Single, non-staining, non-bleeding, non-sagging type; color as selected; ASTM C920, Type S, Grade NS, Class 25, use NT, M, A.
      a. Acceptable Manufacturers:
         1) MasterSeal NP 1 as manufactured by BASF, Shakopee, Minnesota.
         2) DYmonic as manufactured by Tremco, Inc., Construction Division, Beachwood, Ohio.
         3) Dynatrol I-XL as manufactured by Pecora Corporation, Harleysville, Pennsylvania.
         4) Sikaflex 1a as manufactured by Sika Corporation, Lyndhurst, New Jersey.
      b. Locations:
         1) General exterior construction joints.
         2) Exterior joints between dissimilar materials.
         3) Joints in concrete, masonry, and stone.
         4) Joints between concrete and aluminum or metal.
         5) Joints between masonry and aluminum or metal.
         6) Joints between stone and aluminum or metal.
   2. Silyl Terminated Polyethers: Multicomponent, non sag, low modulus, high movement; complying with ASTM C920, Type S, Grade NS, Class 25, use NT (non traffic); fast curing, tintable, moisture curing sealant; color as selected.
      a. Acceptable Manufacturer:
         1) Hyflex 150 as manufactured by Sika Corporation, Lyndhurst, New Jersey.
         2) MasterSeal NP 150 as manufactured by BASF, Shakopee, Minnesota.
      b. Locations:
         1) Joints between glass, except structural glazing.
         2) Aluminum window frames.
         3) Stone and other sensitive substrates where non staining is critical.
         4) Concrete.
         5) Masonry.
         6) Wall expansion joints.
   3. Exterior Silicone Sealant: Single component, non-sagging, non-staining, non-bleeding; color as selected; ASTM C920, Type S, Grade NS, Class 50, use G, A, O.
      a. Acceptable Manufacturers:
         1) 795 building sealant as manufactured by Dow Corning Corporation, Midland, Michigan.
         2) Silpruf as manufactured by General Electric Company, Silicone Products Division, Waterford, New York.
         3) Spectrem 2 as manufactured by Tremco, Inc., Construction Division, Beachwood, Ohio.
         4) Pecora 864 Architectural Silicone Sealant as manufactured by Pecora Corporation, Harleysville, Pennsylvania.
         5) Sikasil WS-295 as manufactured by Sika Corporation, Lyndhurst, New Jersey.
      b. Locations:
         1) Glazing.
         2) Joints between aluminum or metal surfaces.
         3) Joints between painted surfaces.

B. Interior Sealant:
   1. General Purpose: Knife grade interior acrylic latex caulk.
      a. Acceptable Manufacturers:
         1) AC20 + Silicone as manufactured by Pecora Corporation, Harleysville, Pennsylvania.

2) Bostik, Chem-Calk 600, Middleton, MA 01949.
3) Tremflex 834 as manufactured by Tremco, Inc., Construction Division, Beachwood, Ohio.

b. Locations:
1) Interior joints between dissimilar materials.

2. Interior Sealant: One or two component polyurethane sealant complying with ASTM C920, Grade NS, Class 12.5, with a Shore Hardness of 55.
a. Acceptable Manufacturers:
1) MasterSeal CR 195 as manufactured by BASF, Shakopee, Minnesota.
2) Dynaflex as manufactured by Pecora Corporation, Harleysville, Pennsylvania.
b. Locations:
1) All interior masonry joints requiring sealant.

3. Concrete Floor Expansion Joints:
a. Vulkem 45SSL as manufactured by Tremco, Inc., Construction Division, Beachwood, Ohio.
b. MasterSeal SL-1 as manufactured by BASF, Shakopee, Minnesota.
c. Sikaflex 1c SL as manufactured by Sika Corporation, Lyndhurst, New Jersey.

4. Concrete Floor Saw-Cut Control Joints: One-part, self-leveling, durable compound manufactured specifically as a control joint filler.
a. Everjoint as manufactured by L & M Construction Chemicals, Omaha, Nebraska.

5. Concrete Floor Saw-Cut Control Joints:
a. Semi-rigid epoxy joint filler with minimum Shore D hardness of 50 in accordance with ASTM D2240.
1) Euco 700 as manufactured by Euclid Chemical Company, Cleveland, Ohio.
2) SikaDur 51 SL as manufactured by Sika Corporation, Lyndhurst, New Jersey.
b. Fast setting two component polyurea control joint filler, Shore A/Shore D hardness 30/85, for horizontal applications.
1) MasterSeal CR100 as manufactured by BASF, Shakopee, MN.
2) LoadFlex as manufactured by Sika Corporation, Lyndhurst, New Jersey.

6. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
a. Provide sealant to effectively reduce airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
b. Acceptable Manufacturers:
1) AC-20 FTR Acoustical and Insulation Sealant as manufactured by Pecora Corporation.
2) SHEETROCK Acoustical Sealant as manufactured by United States Gypsum Co.
3) Acoustical Sealant as manufactured by Tremco, Inc., Construction Division, Beachwood, Ohio.

2.02 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width; as manufactured by Dow Chemical Company or Sonneborn.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.

B. Beginning of installation means acceptance of existing surfaces.

3.02 PREPARATION

A. Clean joints in accordance with manufacturer's instructions.

B. Prime joints where required by sealant manufacturer.

C. Remove loose materials and foreign matter which might impair adhesion of sealant.

D. Verify that joint backing and release tapes are compatible with sealant.

E. Perform preparation in accordance with manufacturer's recommendations.

F. Protect elements surrounding the work of this Section from damage or disfiguration.

3.03 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Measure joint dimensions and size materials to achieve required width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint depth.

D. Install bond breaker where joint backing is not used.

E. Apply sealant within recommended application temperature ranges.
   1. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Tool joints concave, except horizontal joints or unless noted otherwise.

3.04 CLEANING AND REPAIRING

A. Clean work under provisions of Division 1.

B. Clean adjacent soiled surfaces.

C. Repair or replace defaced or disfigured finishes caused by work of this Section.

D. Roughen and fill joints not completely filled at completion of work.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Division 1.

B. Protect sealants until cured.

3.06 SCHEDULE

A. Install sealant in joints around all frames of all types, such as door frames, louvers, ovber top of exterior wall mounted fixtures, etc.

B. Install sealant in all non-rated penetrations in walls, floors, and ceilings.

C. Fill joints in wash surfaces slightly convex to obtain flush joint when dry.

D. Cut sealant square between frame and wall at interior frames.

E. Provide backer rod and polyurethane sealant at joint between floors and walls.

F. Provide sealant at all cap flashings.

END OF SECTION

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Steel doors, panels, and frames.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

C. Section 09 91 00 - Painting: Field painting of doors and frames.

1.03 REFERENCE STANDARDS

A. ANSI A250.11 – Erection Instructions for Steel Frames.

B. ASTM A366 – Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.

C. ASTM A568 – Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements.

D. ASTM A569 - Steel, Carbon (0.25 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.

E. ASTM A620 – Steel Sheet, Carbon, Cold-Rolled Drawing Quality, Special Killed.

F. ASTM A924 – General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

G. DHI - Door Hardware Institute: The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.

H. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

I. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

J. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated frames and doors.

1.05 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1. Indicate anchor types and spacings, location of cutouts for hardware, and reinforcement.
2. Indicate door elevations, internal reinforcement, closure method, and cut outs for glazing.

1.06 QUALITY ASSURANCE

A. Conform to requirements of ANSI A250.8.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Hollow Metal Doors and Frames:

1. Ceco Door, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. Curries, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
3. Deansteel Manufacturing Company, Inc; Hollow Metal Doors - SP Series: www.deansteel.com/#sle.

4. Metal Products, Inc., Corbin, Kentucky.
5. Republic Doors, an Allegion brand; ____: www.republicdoor.com/#sle.
6. Steelcraft, an Allegion brand; ____: www.allegion.com/#sle.
7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Steel:
1. Doors and Frames: Commercial quality, stretcher leveled flatness, cold rolled steel, ASTM A366 or ASTM A620 and A568 general requirements or Ggalvanized steel sheet, ASTM A924 or A653 hot dip galvanized to A60 minimum coating weight standard.
2. Internal Reinforcing: Hot rolled pickled and oiled steel, ASTM A569.

2.03 DOORS AND FRAMES

A. Interior Doors located in maintenance building side: ANSI A250.8, Level 2 (Heavy Duty), Model 2 (Seamless); 18 gage minimum thickness; galvanized.

B. Interior Doors located in Office area side: ANSI A250.8, Level III (Extra Heavy Duty), Model 2 (Seamless); 16 gage minimum thickness.

C. Interior Frames in the maintenance side of building: 14 gage thick material; galvanized.

D. Interior Frames in Office area: 16 gage thick material.

2.04 DOOR CORE

A. Interior Doors located in maintenance side of the building: Polystyrene insulation.
1. Provide minimum U factor of 0.129.

B. Interior Doors: Impregnated cardboard honeycomb for interior doors.

2.05 ACCESSORIES

A. Jamb Anchors: Stirrup and strap type.

B. Glazing Stops: Rolled steel channel shape, mitered corners; prepared for countersunk style screws.

2.06 PROTECTIVE COATINGS

A. Bituminous Coating: As recommended by the manufacturer.
1. Touch up damaged areas in the field.

B. Primer: As recommended by the manufacturer.
1. Touch up damaged areas in the field.

2.07 FABRICATION

A. Fabricate frames as welded unit for knock down field assembly type.
1. Grind all welds smooth.
2. Verify throat opening and wall thickness prior to fabrication.
3. Omit stops at transoms to receive louvers.

B. Fabricate doors to 1 3/4 inches in thickness.

C. Fabricate all interior door leafs in maintenance side with solid welded cap flush with edge of door to prevent water from ponding on top of door leaf.

D. Fabricate transom panels same as doors.

E. Fabricate frames and doors with hardware reinforcement plates welded in place for all attached components.
1. Frames:
a. Hinges: Minimum 7 gage by 1-1/4 inches by 10 inches long.
b. Strike: Minimum 12 gage.
c. Flush Bolts: Minimum 12 gage.
d. Closers: Minimum 12 gage.
e. All Other Surface Mounted Hardware: Minimum 12 gage.
2. Doors:

a. Hinges: Minimum 7 gage.
b. Lock Face and Flush Bolts: Minimum 14 gage.
c. All Other Surface Mounted Hardware: Minimum 16 gage.

3. Provide mortar guard boxes.

F. Prepare interior frames for silencers.
1. Provide three single rubber silencers for single doors on strike side.
2. Provide two single silencers on frame head at double doors.

G. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.

H. Close top edge of doors located in maintenance building side of building flush with inverted steel channel closure.
1. Weld in place.
2. Seal joints watertight.

I. Provide junction boxes in all exterior door frames and in interior door frames specifically noted on the Drawings to receive electric or electronic hardware.
1. Provide a junction box at the center hinge mounting location in the hinge jamb, the lock jamb behind the box strike, and 1/3 of the way from the latch side at the head.
2. Verify locations with the hardware supplier.

2.08 FINISH

A. Primer: Baked on.

B. At frames installed in masonry, coat inside of frame profile in masonry with bituminous coating to a minimum thickness of 1/16 inch.
1. Coating may be shop or field applied.

PART 3 EXECUTION

3.01 EXAMINATION

A. Install frames in accordance with ANSI A250.11.

B. Install doors in accordance with DHI.

C. Coordinate with wall construction for anchor placement.

D. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

E. Coordinate installation of glass and glazing.
1. Install glazing beads on corridor side of frame where possible.

F. Verify existing conditions before starting work.

G. Verify that opening sizes and tolerances are acceptable.

H. Verify that finished walls are in plane to ensure proper door alignment.

3.02 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.03 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 31 00 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall-mounted access units.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

1.04 SUBMITTALS

A. See Division 01 for submittal procedures.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Location: As indicated on drawings.
   2. Size: 24 by 24 inches.
   3. Color: Gray
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   5. Signage: Provide sticker on door "Fire Protection Drain Valve"

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 36 13 - SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.

B. Steel insulated panels of flush stile and rail design.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Prepared wall opening in masonry.

B. Section 05 50 00 - Miscellaneous Metals: Bent steel plate frame for door opening.

C. Section 08 71 00 - Door Hardware: Lock cylinders.

D. Section 09 91 00 - Painting: Finish painting.

E. Section 26 00 00 - Electrical Systems.

1.03 REFERENCE STANDARDS

A. NEMA - National Electrical Manufacturer's Association.

B. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

1.04 SYSTEM DESCRIPTION

A. Design Considerations:
   1. Design Uniform Wind Load: In accordance with requirements of Indiana Building Code applicable codes.
   2. Maximum deflection of 1/120 of door width when in an open horizontal position.
   3. Dimensions shown on Drawings are nominal opening sizes.
      a. Increase actual door sizes to allow proper lap at jambs and head.

B. Panels: Insulated flush steel stile and rail with infill panel.

C. High lift track and hardware.

D. Electric operation at on 115 volt, single phase, 60 Hz service to 1/2 hp motor manually operable in case of power failure, with transit time of 12 inches per second.

1.05 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, installation details, and templates for setting inserts or attachments affecting work of other trades.

C. Submit wiring diagrams and electrical details for all automatic door controls.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.
   1. Include data for motor and transmission, shaft and gearing, lubrication frequency, control adjustments, and spare part sources.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for warranty requirements.

B. Extended Correction Period: Correct defective work and adjustments as required and requested within a 2-year period commencing on Date of Substantial Completion.

C. Manufacturer Warranty: Provide 5-year manufacturer warranty for electric operating equipment. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sectional Doors:
   1. Overhead Door Corporation, Dallas, Texas: Insulated flush steel; Thermacore 596 Series.

2. Haas Door, Wauseon, Ohio: Insulated flush steel; CHT-732.
3. Raynor Garage Doors, Dixon, Illinois: Insulated flush steel; Tri-Core Optima.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Sheet Steel: Galvanized to 1.25 ounces per square foot, flat.

B. Insulation: Polyurethane or polystyrene; fully encapsulated; minimum R-value of 13.5.

C. Glazing Material: As recommended by the manufacturer.

D. Finish Paint: As recommended by the manufacturer.

2.03 COMPONENTS

A. Panels: Flush steel construction, outer steel sheet of 20 gage thick, flat profile; inner steel sheet of 26 gage thick, flat profile; thermal break; ship lap or tongue and groove joints; 16 gage end stiles; header and jamb weather stripping. Provide custom color panels with color to be selected by the Owner.

B. Track: Minimum 12 gage thick by 3 inch wide rolled steel track, continuous, vertical mounted; galvanized steel mounting brackets, 1/4 inch thick.

C. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel ball bearing rollers.

D. Lift Mechanism: Torsion spring on cross head shaft, with braided steel lift cables.

E. Chain Hoist: As recommended by the manufacturer for the type and size door specified. Chain hoist shall have emergency release installed in the event of a power failure the door can steel be raised or lowered manually.

F. Electric Operator: NEMA Type 14, UL approved motor; side center mounted on cross head shaft; center mounted draw bar assembly; adjustable safety friction clutch; brake system actuated by independent voltage solenoid controlled by motor starter; enclosed gear driven limit switch; enclosed magnetic cross line reversing starter, mounting brackets, and hardware.
   1. Control Station: Standard three button (OPEN?CLOSE?STOP) momentary type control for the each electric operator; 24 volt circuit.
      a. Include key operated switch located at exterior location indicated.
      b. See Electrical Drawings for locations of controls.
   2. Safety Edge: At bottom of door panel, full width; electromechanical sensitized type, wired to reverse door upon striking object; rubber covered to provide weatherstrip seal.
   3. Provide battery backup option at each door so in the event of a power failure the door can be operated.

G. Lock: Inside side mounted, adjustable keeper, spring activated latch bar with feature to keep in locked or retracted position; interior and exterior handle; lock master keyed.

H. Weatherstripping: Provide EPDM rubber sealing strips at door head and jambs. Provide full width; double contact resilient weatherstripping at bottom of door panel.

I. Vision Lights: Provide openings and resilient glazing channel for vision lights as shown. Factory glaze with 5/8 inch insulating glass.

J. Provide one exhaust port at bottom panel at each door opening.

2.04 FINISHES

A. Steel: Painted with primer. Prepared for paint finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Beginning of installation means acceptance of existing surfaces.

B. Obtain job dimensions prior to erection of any work.

C. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

D.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

3.03 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Install vertical tracks to extend as high as possible prior to turning to horizontal position.

D. Securely brace door tracks suspended from structure.

E. Secure tracks to structural members only.

F. Provide all supplementary parts necessary to complete the installation, though not definitely shown or specified.

G. Fit and align door assembly, including hardware, level and plumb to provide smooth operation.

H. Coordinate installation of electrical service.
   1. Complete wiring from disconnect to unit components.

I. Install perimeter trim.

3.04 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch (1.5 mm).

B. Maximum Variation from Level: 1/16 inch (1.5 mm).

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch (3 mm) from 10 ft (3 m) straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

3.06 CLEANING

A. Clean doors and frames and glazing.

B. Remove temporary labels and visible markings.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 41 00 - ALUMINUM ENTRANCES AND STOREFRONTS

GENERAL

1.01 SECTION INCLUDES

A. Aluminum doors and frames.

B. Glazed lights.

C. Anchors, brackets, and attachments.

D. Perimeter sealant.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 08 71 00 - Door Hardware: Door hardware.

1.03 RELATED SECTIONS

A. Section 05 50 00 - Miscellaneous Metals: Fabricated metal attachment devices.

B. Section 08 71 00 - Door Hardware.

C. Section 08 81 00 - Glazing.

1.04 REFERENCES

A. AA - Designation System for Aluminum Finishes.

B. AAMA 605.2 - Voluntary Specifications for High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels.

C. ASTM A36 - Structural Steel.

D. ASTM B221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

1.05 PERFORMANCE

A. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F without causing detrimental effects to system or components.

B. Design Uniform Wind Load: In accordance with requirements of Indiana Building Code.

C. Limit mullion deflection to 1/175, or flexure limit of glass with full recovery of glazing materials, whichever is less.

D. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior.

E. Limit air infiltration through assembly to 0.06 cubic feet per minute per square foot of assembly surface area, measured at a reference differential pressure across assembly of 0.3 inch water gage.

F. System to accommodate, without damage to system or components, or deterioration of perimeter seal; movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing.

1.06 SUBMITTALS

A. Submit shop drawings under provisions of Division 1.

1. Include system and component dimensions; components within assembly; framed opening requirements and tolerances; anchorage and fasteners; door hardware requirements; and affected related work.

B. Submit templates and setting instructions for all anchors, inserts, and attachments affecting work of other trades.

C. Submit samples of finishes under provisions of Division 1.

1.07 QUALITY ASSURANCE

A. Comply with the Indiana Energy Conservation Code (ASHRAE 90.1 – 2007).

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver and handle system components under provisions of Division 1.

B. Store and protect system components under provisions of Division 1.

C. Provide wrapping to protect prefinished aluminum surfaces.

PRODUCTS

2.01 ALUMINUM ENTRANCES AND STOREFRONTS - ACCEPTABLE MANUFACTURERS

A. Kawneer Company, Inc., Norcross, Georgia.

B. Tubelite Architectural Products, Reed City, Michigan.

C. Trulite Glass and Aluminum Solutions, Peachtree City, Georgia.

D. Special-Lite Inc., Decatur, Michigan.

E. Efco Corporation, Monett, Missouri.

F. Cross Aluminum Products, Inc., Niles, Michigan.

2.02 MATERIALS

A. Extruded Aluminum: ASTM B221; 6063-T5 alloy and temper.

B. Steel Sections: ASTM A36; shapes to suit mullion sections.

C. Fasteners: Aluminum, stainless steel, or cadmium plated steel.

D. Sealant: As recommended by the manufacturer.

2.03 FABRICATED COMPONENTS

A. Frames: Aluminum framing system equal to Kawneer Trifab VG 451 non-thermal framing system, nominal 2 inches wide by 4 1/2 inches deep, flush center glazing; as approved by the Architect.

B. Thermally Broken Frames: Aluminum framing system equal to Kawneer VG 451T framing system, nominal 2 inches wide by 4 1/2 inches deep, flush center glazing; as approved by the Architect.

C. Full Glass Doors: 1 3/4 inches thick, 6 inches wide top rail, 6 inches wide vertical stiles, minimum 1/8 inch wall thickness; square glazing stops.

D. Trim and Scribe Moldings: Minimum 1/16 inch thickness.

E. Glazing Members: Snap in design.

F. Reinforce for hardware per templates furnished.

2.04 HARDWARE

A. Weatherstripping: Continuous double weatherstripping; manufacturer's available door sweep.

B. See Section 08 71 00 - Door Hardware for remaining hardware.

2.05 FABRICATION

A. Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of assembly, yet enabling installation.

B. Rigidly fit and secure joints and corners.

C. Make joints and connections flush, hairline, and weatherproof.

D. Develop drainage holes with moisture pattern to exterior.

E. Prepare components to receive anchor devices.
   1. Fabricate anchorage items.

F. Arrange fasteners, attachments, and jointing to ensure concealment from view.

G. Fabricate bottom rail of doors and sidelights with two sheets 1/8 inch thick aluminum sheet, or approved equal, fill core with solid rigid polystyrene insulation.

H. Prepare components with internal reinforcement for door hardware.

I. At all exterior storefronts and doors, provide aluminum components/framing to accept School Guard Glazing (3/8" and ¼" glazing for a total unit thickness of 1")

J. Provide junction boxes in all exterior door frames and in interior door frames specifically noted on the Drawings to receive electric or electronic hardware.
   1. Provide a junction box at the hinge jamb, the lock jamb, and at the head.
   2. Verify locations with the hardware supplier.

2.06 FINISHES

A. All Exposed Aluminum Surfaces:
   1. Fluoropolymer paint coating conforming with the requirements of AAMA 605.2; 70 percent Kynar 500 or Hylar 5000 type finish.
      a. Color as indicated on drawings.

B. Concealed Steel Items: Primed with iron oxide paint.

C. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

EXECUTION

3.01 INSPECTION

A. Verify wall openings are ready to receive work of this Section.

B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Install doors, frames, and hardware in accordance with manufacturer's instructions.

B. Use anchorage devices to securely attach frame assembly to structure.
   1. Do not use plastic shields.

C. Align assembly plumb and level, free of warp or twist.

D. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Install perimeter sealant and backing materials in accordance with Section 07 90 00. Fill voids between jambs, head and sill with spray foam or batt insulation as approved by window/storefront manufacturer.

F. Install weatherstripping and sealants to eliminate light leakage through joints.

G. Adjust operating hardware.

H. The AAMA 501.2 test is a Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems. At completion, perform AAMA 501.2 test by approved third party. Test to be witnessed by the Owner's Representative.

3.03 TOLERANCES

A. Variation from Plane: 0.03 inch per foot maximum or 0.25 inch per 30 feet, whichever is less.

B. Misalignment of Two Adjoining Members Abutting in Plane: 0.015 inch.

3.04 CLEANING

A. Remove protective material from prefinished aluminum surfaces.

B. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths.
   1. Take care to remove dirt from corners.
   2. Wipe surfaces clean.

C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08 51 13 - ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows, thermally broken with fixed sash.

B. Operating hardware.

C. Factory glazing.

D. Perimeter sealant.

1.02 RELATED REQUIREMENTS

A. Section 07 90 00 - Joint Sealants: Perimeter sealant and back-up materials.

B. Section 08 81 00 - Glazing.

C. Section 07 25 00 - Weather Barriers: Sealing frame to water-resistive barrier installed on adjacent construction.

1.03 REFERENCE STANDARDS

A. AA - Designation System for Aluminum Finishes.

B. AAMA - Voluntary Guide Specifications for Aluminum Architectural Windows.

C. AAMA 605.2 - Voluntary Specifications for High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels.

D. AAMA 910.93 - Voluntary Life Cycle Specifications and Test Methods for Architectural Grade Windows and Sliding Glass Doors.

E. AAMA 1503.1 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections.

F. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

G. ASTM B221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

H. ASTM C509 - Elastomeric Cellular Preformed Gasket and Sealing Material.

I. ASTM E283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

J. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

K. ASTM E331 - Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

1.04 SYSTEM DESCRIPTION

A. Windows with fixed openings.

1.05 PERFORMANCE

A. Windows shall conform to the AAMA Voluntary Guide Specifications for Aluminum Architectural Windows; F-HC85 Grade Fixed.

B. Design Uniform Wind Load: In accordance with requirements of Indiana Building Code applicable codes.

C. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior.

D. Air Infiltration Test: With ventilators closed and locked, limit air infiltration to maximum 0.05 cubic foot per minute of perimeter crack length at 6.24 pounds per square foot pressure differential when tested in accordance with ASTM E283.

E. Water Resistance Test: With ventilators closed and locked, there shall be no uncontrolled water leakage at 8 pounds per square foot pressure differential for projected windows, and 10 pounds per square foot pressure differential for fixed windows, when tested in accordance with ASTM E331.

F. Uniform Load Structural Test: With ventilators closed and locked, there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms, or other damage which would cause the window to be inoperable; at a static air pressure difference of 67.5 pounds per square foot for projected and casement windows and 127.5 pounds per square foot for fixed windows, both positive and negative, when tested in accordance with ASTM E330.

G. Uniform Load Deflection Test: With ventilators closed and locked, no member shall deflect over 1/175 of its span at a static air pressure difference of 50 pounds per square foot positive and negative pressure, when tested in accordance with ASTM E330.

H. Life Cycle Testing: There shall be no damage to fasteners, hardware parts, support arms, actuating mechanisms, or other damage which would cause the window to be inoperable when tested in accordance with AAMA 910.93. Air infiltration and water resistance tests shall not exceed specified requirements.

I. Condensation Resistance Factor (CRF): With ventilators closed and locked, minimum CRF of 52 for projected and fixed windows, when tested in accordance with AAMA 1503.1.

J. Thermal Transmittance Test: With ventilators closed and locked, U-value shall be maximum of 0.44 BTU per hour per square foot per degrees F for projected and fixed windows when tested in accordance with AAMA 1503.1

1.06 SUBMITTALS

A. See Division 01 for submittal procedures.
   1. Include wall opening and component dimensions; wall opening tolerances; anchorage and fasteners; affected related work; installation requirements; thickness of metals; details of closure plates, closure angles, sills, louvers, and moldings; finish.

B. Submit samples under provisions of Division 1.
   1. Finishes.

C. Submit independent laboratory test reports verifying deflection, air infiltration, water infiltration, condensation resistance factor, uniform load structural test, and thermal barrier tests.

D. Submit written certification that all glass and glazing meets or exceeds requirements of federal, state, and local codes and regulations, updated to time of installation.

E. Submit sealed glass unit manufacturer's certificate indicating that units meet or exceed specified requirements.

F. Provide sample of manufacturer’s warranty as indicated in 1.9 Warranty listed below.

1.07 QUALITY ASSURANCE

A. A. Comply with the Indiana Energy Conservation Code (ASHRAE 90.1 – 2007).

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver and handle window units under provisions of Division 1.

B. Store and protect window units under provisions of Division 1.

C. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide ten (10) year manufacturer's warranty under provisions of Division 1.

C. Warranty: Cover complete window system for failure to meet specified requirements.

D. Replace all broken glass caused by installation of work under this Section.

E. Provide ten (10) year manufacturer's warranty on insulating glass, including coverage of sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Efco Corporation, Monett, Missouri - Series 510.

B. Traco/Kawneer, Cranberry Township, Pennsylvania; Series TR-2100TR-2400.

C. Wausau Window and Wall Systems, Wausau, Wisconsin - 2250 Series.

D. Moduline Window Systems, Wausau, Wisconsin; Signature Series 12P.

E. Basis-of-Design Product: EFCO; Series 810-I.

2.02 MATERIALS

A. Extruded Aluminum: ASTM B221; 6063 alloy, T5 temper.

B. Sheet Aluminum: ASTM B209; 5005 alloy, H34 temper.

C. Bituminous Paint: As recommended by the manufacturer.

D. Butyl Tape: As recommended by the manufacturer.

E. Sealants: As recommended by the manufacturer.

F. Factory Glazing:
   1. Acceptable Glass Manufacturers:
      a. PPG Industries, Inc., Pittsburgh, Pennsylvania.
      b. LOF Glass, Toledo, Ohio.
      c. AFG Industries, Inc., Kingsport, Tennessee.
      d. Pilkington Building Products, Toledo, Ohio.
      e. Oldcastle Glass Group, Plano, Texas.
      f. HGP Industries, Dallas, Texas.
      g. Globe Amerada Architectural Glass, Selma, Alabama.
      h. Tempglass, Inc., Toledo, Ohio.
      i. Virginia Glass Products Company, Martinsville, Virginia.
      j. Viracon, Owatonna, Minnesota.
   2. Float Glass: Clear float; 1/4 inch thick; visible light transmission of 88 percent; summer day time U-value of 1.04; shading coefficient of 0.94.
   3. Triple Glazed Sash: Provide one piece of single float glass and one piece of insulating glass in all window sash. Arrangement as standard with the sash manufacturer. Outermost pane to be tinted.
      a. Inner Pane: Clear float; 1/4 inch thick; visible light transmission of 88 percent; summer day time U-value of 1.04; shading coefficient of 0.94. Fully tempered.
      b. Outer Pane:
         1) Gray Insulating Glass Units: Double pane units with double edge seal; outer pane of 1/4 inch thick gray float glass, inner pane of 1/4 inch thick clear float glass; 1/2 inch interpane space purged with dry hermetic air; total unit thickness of 1 inch; visible light transmission of 32 percent; summer day time U-value of 0.26 to 0.27; shading coefficient of 0.32.
      c. Provide Low-E coating.
      d. Fully temper both lights.
      e. Basis-of-Design Product: PPG; Solarban 70.XL.

2.03 FABRICATED COMPONENTS

A. Frames:
   1. Minimum 3 1/2 inches deep profile, of minimum 0.125 inch thick section.
   2. Thermally broken with interior portion of frame insulated from exterior portion, with minimum 3/8 inch self adhering polyurethane or approved equal.
   3. Applied glass stops of snap-on type.

B. Fasteners: Stainless steel or cadmium plated steel.

C. Sills:

1. Extruded aluminum.
2. Sloped for positive wash; slope from under sash leg to 1/2 inch beyond wall face.
3. One piece full width of opening, but not more than 10 feet long.
4. Closed ends.
5. Expansion joints and covers at joints.

D. Reinforced Mullion: 3 1/2 inches deep profile of extruded aluminum cladding with internal reinforcement of steel shaped structural section.

2.04 FABRICATION

A. Provide all supplementary parts necessary to complete the installation though not definitely shown or specified.

B. Fabricate windows allowing for minimum clearances and shim spacing around perimeter of assembly, yet enabling installation.

C. Rigidly fit and mechanically fasten joints and corners.
1. Miter joints.
2. Accurately fit and secure corners tight.
3. Make corner joints flush, hairline, and weatherproof.
4. Seal corner joints with sealant.

D. Develop drainage holes with moisture pattern to exterior.

E. Prepare components to receive anchor devices.
1. Fabricate anchorage items.

F. Prepare components with internal reinforcement for operating hardware.

G. Provide sash angles at window jambs and heads on both interior and exterior.

H. Factory glaze all sash.

I. Provide internal reinforcement in mullions with steel members to maintain rigidity.

J. Provide closure plates and trim angles required between window mullions and partitions.

2.05 FINISHES

A. All Exposed Aluminum Surfaces:

B. Fluoropolymer paint coating conforming with the requirements of AAMA 605.2; 70 percent Kynar 500 or Hylar 5000 type finish.

C. Concealed Steel Items: Primed with iron oxide paint.

D. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining water-resistive barrier materials are ready to receive aluminum windows; see Section 07 25 00.

B. Beginning of installation means acceptance of existing conditions.

C. Obtain field dimensions for all column covers and closure plates between window mullions and partitions prior to fabrication.

D. Obtain field dimensions of existing sash so that mullions and horizontal members of new sash match as nearly as possible regarding location, size, and detail.
1. Indicate any deviations from this requirement on the shop drawings.

3.02 INSTALLATION

A. Install window frames and hardware in accordance with manufacturer's instructions.

B. Use anchorage devices to securely attach frame to structure.
1. Do not use plastic shields.

C. Install windows level, plumb, square, true to line, without distortion, or without impeding thermal movement; anchor securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
   1. Provide flashings and sill pans as required for a watertight and weatherproof installation.

E. Maintain dimensional tolerances, aligning with adjacent work.

F. Pack fibrous insulation or use foamed-in-place insulation in shim spaces at perimeter to maintain continuity of thermal barrier.

G. Set sill members in bed of sealant or with gaskets for weathertight construction.

H. Install perimeter sealant, backing materials, and installation requirements in accordance with Section 07 90 00.
   1. Apply sealant to ends of sill for watertight seal.

I. Separate aluminum work from steel work with butyl tape.

J. Fasten sash angles with screws and set in sealant.

K. Install anodized aluminum interior trim angles after fabric wall covering has been installed.

L. Anchor, caulk, and grout aluminum sills.

M. Locate joints of sills at mullion center lines.

N. Adjust operable hardware for smooth operation and tight fit of sash.

O. The AAMA 501.2 test is a Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Aluminum Windows, Curtain Walls, and Sloped Glazing Systems. At completion, perform AAMA 501.2 test by approved third party. Test to be witnessed by the Owner's Representative.

3.03 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
   1. Take care to remove dirt from corners.
   2. Wipe surfaces clean.

C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 08 56 53 - SECURITY WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security transaction windows with pass-through device.

1.02 REFERENCE STANDARDS

A. Underwriters Laboratory UL 752-Standard for Bullet Resisting Equipment.

B. ASTM E119-98- Standard Test Methods for Fire Tests of Building Construction and Materials.

C. ASTM B 209/B 209M- Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

D. ASTM A 666-Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.

1.03 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Product Data: For each type of framing and glas] including manufacturer recommended installation instructions.

C. Shop Drawings: Include plans, elevations, sections, details, attachment to other work and glazing details.

D. Manufacturer's Instructions: for installation and cleaning of TSS Bullet Transaction Window Assemblies. All required submittals shall be approved prior to installation.

E. Product Test Reports: Indicating compliance with requirements

1.04 DELIVERY, STORAGE AND HANDLING

A. Protect windows and accessories in accordance with AAMA CW-10 "Care and Handling of Architectural Aluminum from Shop to Site" until Substantial Completion.

B. Deliver materials to the project site with the manufacturer's UL Listed Labels intact and legible. Handle the materials with care to prevent damage. Store materials inside and under cover, stack flat and off floor. Project conditions (temperature, humidity, and ventilation) shall be within the maximum limit recommendations provided by manufacturer. Do not install products stored in conditions outside manufacturer's recommended limits.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Workmanship Warranty: All materials shall be warranted against defects for a period of 1 year for the date of receipt at the project site. Provide certificates of manufacturer's standard limited warranty with closeout documents.

C. Finish Warranty: Manufacturer's warranty against deterioration of factory finishes for the period of 5 years from the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design:
   1. Subject to compliance with requirements, provide products by the following:
      a. Total Security Solutions, Inc., 935 Garden Lane, Fowlerville, MI 48836, 866 734-6277. Attn: Sales Department, sales@tssbulletproof.com. Web: www.tssbulletproof.com.

B. Design Performance:
   1. Through the design, manufacturing techniques and material application, the TSS Horizontal Sliding Transaction Window shall be of the "non-ricochet" type. This design is intended to permit the capture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration.

2. This assembly shall provide single transaction positions utilizing the “horizontal sliding” configuration. This design shall employ horizontal sliding track to allow for physical movement on transaction window. Each transaction position may have a stainless steel dip tray as shown on the drawings.
3. Components must be manufactured in strict accordance with the specifications, design and details. All vision panels shall be cut to size with all exposed edges polished. Necessary holes shall be pre drilled and tapped where required.
4. Stainless Steel assembly screws and acrylic spacers shall be provided. Clear anodized angles and channels shall be provided. Anchor screws shall be provided by the installer.
5. No field alterations to the construction of the units fabricated under the acceptable standards shall be allowed unless approved by the manufacturer and the Architect.
6. Standard manufacturing tolerances +/- 1/16" shall be maintained.

2.02 PERFORMANCE CRITERIA

A. Ballistic Resistant:
1. Level 3 in accordance with UL 752 – Testing for Ballistic Resistance for the complete assembly including framing, glazing and panels.

2.03 FABRICATION

A. Aluminum sections to be manufactured in accordance with ASTM B209, Extruded aluminum alloy 6063 T5 Anodized to match the existing décor and be free of sharp edges or burrs when in place.
1. Glazing Channel: U-Channel specifically designed for securing transparencies tightly in place. Angles and stops are only acceptable for top attachment.
2. Tolerances: All joints and connections shall be tight, providing hairline joints and true alignment of adjacent members

2.04 FRAMING FINISH

A. Factory-applied finish:
1. Clear Anodic Finish: Architectural Class I, clear coating AA-M10C22A41 Mechanical Finish Chemical Finish: etched, medium matte; 0.70 mils minimum complying with AAMA 611 "Voluntary Specification for Anodized Architectural Aluminum"

B. Cap the bottom of glazing with the corresponding finish material selected for frame.

2.05 GLAZING

A. Glazing shall be Bullet Resistant Level 3, size as shown on the drawings.
1. Bullet Resistant Level 3
   a. 1 1/4" LP 1250 Laminated
   b. 1 1/4” TSS-003 L/S Glass Clad
   c. 1 1/4" LP 1250 Laminated
   d. 1 1/4" LP 1250 All Polycarbonate
   e. TSS 003 L/S

B. Acrylic: All acrylic pieces shall meet or exceed UL 752 testing for ballistic integrity. All edges of acrylic shall be filed, sanded after cutting to remove rough edges and then polished until “water clear” transparent. All through holes for fasteners shall be 3/8” in diameter and be drilled clean. Chipped edges at through-hole exit points are not acceptable. All acrylic pieces shall be supported in the proper glazing channel designed for this purpose (see aluminum, Section D).

C. Glazing gaskets:
1. Interior: Closed cell neoprene.
2. Exterior: Solid neoprene.

2.06 ACCESSORIES

A. Anchors: Fully concealed manufacturer recommended.
1. Mounting plates and connecting clips shall be fabricated from 1/8” thick clear polycarbonate.
2. Cash Tray:

a. Location: Recessed.
b. Finish: Brushed Stainless Steel #4 finish.
c. Material: 18 gauge stainless steel.
d. Dimensions: 16" x 8" from the outside edge of flanges with a clear opening.
e. Provide a shelf 1 1/2" thick by full width of window to accommodate recessed cash tray. The countertop shall be 1'-6" deep and centered under the window. Countertop material shall be:
    1) Stainless steel 18 gauge #4 finish.

PART 3 EXECUTION

3.01 PREPARATION

A. Prior to beginning installation, verify that all supports have been installed as required by the Contract Documents and architectural drawings, and Shop Drawings have been approved.

B. Notify Architect of any unsatisfactory preparation that is responsibility of others.

C. Clean and prepare all surfaces per manufacturers recommendations as required for achieving the best results for the substrate under the project conditions.

D. Verify field dimensions of openings prior to fabrication of framing.

E. Coordinate structural requirements to ensure proper attachment and support.

F. Do not begin installation of material until all unsatisfactory conditions have been resolved and approved by Architect.

3.02 INSTALLATION

A. Do not begin installation until openings have been verified and surfaces properly prepared in accordance with drawings.

B. Install in accordance with manufacturer's instructions and UL 752. Set all equipment plumb.

C. All products shall be installed per installation instructions provided by manufacturer.

D. Security window units shall arrive on site completely pre-fabricated to field dimensions approved by shop drawings.

E. Install framing and secure to structure in accordance with manufacturer's recommendations and approved shop drawings.

F. Provide required support and securely fasten and set windows plumb, square, and level without twist or bow.

G. Apply sealant in accordance with window and sealant manufacturer's recommendations as indicated in installation instructions.

H. Remove excess sealant and leave exposed surfaces clean and smooth

3.03 PROTECTION

A. Clean and protect windows from damage during ongoing construction operations. If damage occurs, remove and replace as required to provide windows in their original, undamaged condition.

B. Inspection and Cleaning: Verify installation is complete and complies with manufacturer's requirements.

C. Provide final cleaning of product and accessories, removing excess sealant, labels and protective covers.

D. Touch-up, repair or replace damaged products prior to substantial completion.

END OF SECTION

SECTION 08 71 00 - DOOR HARDWARE

P1 GENERAL

1.01 SUMMARY

A. Section includes:
   1. Mechanical and electrified door hardware
      a. Electronic access control system components
      b. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
   2. Section excludes:
      a. Windows
      b. Cabinets (casework), including locks in cabinets
      c. Signage
      d. Toilet accessories
      e. Overhead doors
   3. Related Sections:
      a. Division 01 “General Requirements” sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
      b. Division 06 Section “Rough Carpentry”
      c. Division 06 Section "Finish Carpentry”
      d. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
      e. Division 08 Sections:
         1) “Metal Doors and Frames”
         2) “Flush Wood Doors”
         3) “Stile and Rail Wood Doors”
         4) “Interior Aluminum Doors and Frames”
         5) "Aluminum-Framed Entrances and Storefronts"
         6) “Stainless Steel Doors and Frames”
         7) “Special Function Doors”
         8) "Entrances”
      f. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.
      g. Division 26 “Electrical” sections for connections to electrical power system and for low-voltage wiring.
      h. Division 28 “Electronic Safety and Security” sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL, LLC
   1. UL 10B - Fire Test of Door Assemblies
   2. UL 10C - Positive Pressure Test of Fire Door Assemblies
   3. UL 1784 - Air Leakage Tests of Door Assemblies
   4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute
   1. Sequence and Format for the Hardware Schedule
   2. Recommended Locations for Builders Hardware
   3. Keying Systems and Nomenclature
   4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association
   1. NFPA 70 – National Electric Code
   2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
   3. NFPA 101 – Life Safety Code
   4. NFPA 105 – Smoke and Draft Control Door Assemblies

5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute
   1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
   2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
   3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
   4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
   5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:
   1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
   2. Prior to forwarding submittal:
      a. Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.
      b. Review drawings and Sections from related trades to verify compatibility with specified hardware.
      c. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:
   1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
   2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
      a. Wiring Diagrams: For power, signal, and control wiring and including:
         1) Details of interface of electrified door hardware and building safety and security systems.
         2) Schematic diagram of systems that interface with electrified door hardware.
         3) Point-to-point wiring.
         4) Risers.
   3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
      a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
   4. Door Hardware Schedule:
      a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
      b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
      c. Indicate complete designations of each item required for each opening, include:
         1) Door Index: door number, heading number, and Architect’s hardware set number.
         2) Quantity, type, style, function, size, and finish of each hardware item.
         3) Name and manufacturer of each item.
         4) Fastenings and other pertinent information.
         5) Location of each hardware set cross-referenced to indications on Drawings.
         6) Explanation of all abbreviations, symbols, and codes contained in schedule.

7) Mounting locations for hardware.
8) Door and frame sizes and materials.
9) Degree of door swing and handing.
10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:
   a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
   b. Use ANSI/BHMA A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
   e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
   f. Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.

C. Informational Submittals:
   1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
   2. Provide Product Data:
      a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
      b. Include warranties for specified door hardware.

D. Closeout Submittals:
   1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
      a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
      b. Catalog pages for each product.
      c. Final approved hardware schedule edited to reflect conditions as installed.
      d. Final keying schedule
      e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
      f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:
   1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
      a. fire door assemblies, in compliance with NFPA 80.
      b. required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:
   1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project’s vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
    a. For door hardware: DHI certified AHC or DHC.
    b. Can provide installation and technical data to Architect and other related subcontractors.
    c. Can inspect and verify components are in working order upon completion of installation.
    d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:
1. Fire-Rated Door Openings:
    a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
    b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
2. Smoke and Draft Control Door Assemblies:
    a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
    b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
3. Electrified Door Hardware
    a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
4. Accessibility Requirements:
    a. Comply with governing accessibility regulations cited in “REFERENCES” article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings
1. Keying Conference
    a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
        1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
        2) Preliminary key system schematic diagram.
        3) Requirements for key control system.
        4) Requirements for access control.
        5) Address for delivery of keys.
2. Pre-installation Conference
    a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Inspect and discuss preparatory work performed by other trades.
    c. Inspect and discuss electrical roughing-in for electrified door hardware.
    d. Review sequence of operation for each type of electrified door hardware.

e. Review required testing, inspecting, and certifying procedures.
f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:
   a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

D. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

E. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

F. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

G. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

H. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

I. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.05 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.06 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
   1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
   2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
      a. Mechanical Warranty
         1) Locks
            (a) Schlage ND Series: 10 years
         2) Exit Devices
            (a) Von Duprin: 3 years
         3) Closers
            (a) LCN 4000 Series: 30 years
      b. Electrical Warranty
         1) Exit Devices
            (a) Von Duprin: 1 year

B. MAINTENANCE
   1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
   2. Turn over unused materials to Owner for maintenance purposes.

PRODUCTS

2.01 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute.”
   1. Where “No Substitute” is noted, submittals and substitution requests for other products will not be considered.

B. Approval of alternate manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Acceptable Manufacturers” in the individual article for the product category are only to be considered by official substitution request in accordance in section 01 25 00.

C. Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication
   1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
   2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
   3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
   1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:
   1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
   2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
   3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. Ives 5BB series
   2. Acceptable Manufacturers and Products:
      a. Hager BB1191/1279 series

b. Best FBB series

B. Requirements:
1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high
5. 2 inches or thicker doors:
   a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high
6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
9. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins
10. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 CONTINUOUS HINGES

A. Manufacturers:
1. Scheduled Manufacturer:
   a. Ives
2. Acceptable Manufacturers:
   a. Select
   b. Pemko

B. Requirements:
1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:
    a. Von Duprin EPT-10
2. Acceptable Manufacturers and Products:
    a. No Substitute

B. Requirements:
1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.06 FLUSH BOLTS

A. Manufacturers:
1. Scheduled Manufacturer:
    a. Ives
2. Acceptable Manufacturers:
    a. Rockwood
    b. Trimco

B. Requirements:
1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.07 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:
1. Scheduled Manufacturer and Product:
    a. Schlage ND series
2. Acceptable Manufacturers and Products:
    a. No Substitute

B. Requirements:
1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
    a. Lever Design: Sparta (SPA)

2.08 EXIT DEVICES

A. Manufacturers and Products:
1. Scheduled Manufacturer and Product:
    a. Von Duprin 99/33A series
2. Acceptable Manufacturers and Products:
    a. No Substitute

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to “KEYING” article, herein.
3. Provide grooved touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer’s approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.09 ELECTRIC STRIKES

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. Von Duprin 6000 Series.
   2. Acceptable Manufacturers and Products:
      a. No Substitute

B. Requirements:
   1. Provide electric strikes designed for use with type of locks shown at each opening.
   2. Provide electric strikes UL Listed as burglary resistant that are tested to a minimum endurance test of 1,000,000 cycles.
   3. Where required, provide electric strikes UL Listed for fire doors and frames.
   4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.10 POWER SUPPLIES

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. Schlage/Von Duprin PS900 Series
   2. Acceptable Manufacturers and Products:
      a. No Substitute

B. Requirements:
   1. Provide power supplies approved by manufacturer of supplied electrified hardware.
   2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components

with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.

3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:
   a. 12/24 VDC Output, field selectable.
   b. Class 2 Rated power limited output.
   c. Universal 120-240 VAC input.
   d. Low voltage DC, regulated and filtered.
   e. Polarized connector for distribution boards.
   f. Fused primary input.
   g. AC input and DC output monitoring circuit w/LED indicators.
   h. Cover mounted AC Input indication.
   i. Tested and certified to meet UL294.
   j. NEMA 1 enclosure.
   k. Hinged cover w/lock down screws.
   l. High voltage protective cover.

2.11 CYLINDERS

A. Manufacturers:
   1. Scheduled Manufacturer and Product:
      a. Best
   2. Acceptable Manufacturers and Products:
      a. No Substitute

B. Requirements:
   1. Provide interchangeable cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

2.12 KEYING

A. Scheduled System:
   1. New factory registered system:
      a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:
   1. Construction Keying:
      a. Replaceable Construction Cores.
         1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
            (a) 3 construction control keys
            (b) 12 construction change (day) keys.
         2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.
   2. Permanent Keying:
      a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
         1) Master Keying system as directed by the Owner.
      b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
      c. Provide keys with the following features:
         1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
         2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
      d. Identification:
         1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.

2) Identification stamping provisions must be approved by the Architect and Owner.
3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

e. Quantity: Furnish in the following quantities.
1) Change (Day) Keys: 3 per cylinder/core that is keyed differently.
2) Permanent Control Keys: 3.
3) Master Keys: 6.
4) Key Blanks: quantity as determined in the keying meeting.

2.13 KEY CONTROL SYSTEM

A. Manufacturers:
1. Scheduled Manufacturer:
a. Telkee
2. Acceptable Manufacturers:
a. HPC
b. Lund

B. Requirements:
1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
b. Provide hinged-panel type cabinet for wall mounting.

2.14 DOOR CLOSERS

A. Manufacturers and Products:
1. Scheduled Manufacturer and Product:
a. LCN 4040XP series
2. Acceptable Manufacturers and Products:
a. No Substitute

B. Requirements:
1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.

7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.15 DOOR TRIM

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Ives.
   2. Acceptable Manufacturers:
      a. Trimco
      b. Rockwood

B. Requirements:
   1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.16 PROTECTION PLATES

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Ives
   2. Acceptable Manufacturers:
      a. Trimco
      b. Rockwood

B. Requirements:
   1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
   2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
   3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.17 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturers:
      a. Glynn-Johnson
   2. Acceptable Manufacturers:
      a. No Substitute

B. Requirements:
   1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.18 DOOR STOPS AND HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Ives
   2. Acceptable Manufacturers:
      a. Trimco
      b. Rockwood

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.19 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Zero International
   2. Acceptable Manufacturers:
      a. National Guard
      b. Reese
      c. Pemko

B. Requirements:
   1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
   2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
   3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
   4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.20 SILENCERS

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Ives
   2. Acceptable Manufacturers:
      a. Rockwood
      b. Trimco

B. Requirements:
   1. Provide "push-in" type silencers for hollow metal or wood frames.
   2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
   3. Omit where gasketing is specified.

2.21 DOOR POSITION SWITCHES

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Schlage
   2. Acceptable Manufacturers:
      a. No Substitute

B. Requirements:
   1. Provide recessed or surface mounted type door position switches as specified.
   2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.22 FINISHES

A. Finish: BHMA 626/652 (US26D); except:
   1. Hinges at Exterior Doors: BHMA 630 (US32D)
   2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)

3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Where on-site modification of doors and frames is required:
   1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
   2. Field modify and prepare existing doors and frames for new hardware being installed.
   3. When modifications are exposed to view, use concealed fasteners, when possible.
   4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
      a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
      b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
      c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.03 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
   2. Custom Steel Doors and Frames: HMMA 831.
   3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
   4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer’s instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:
   1. Install construction cores to secure building and areas during construction period.
   2. Replace construction cores with permanent cores as indicated in keying section.
   3. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:
   1. Conduit, junction boxes and wire pulls.
   2. Connections to and from power supplies to electrified hardware.
   3. Connections to fire/smoke alarm system and smoke evacuation system.
   4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
   5. Connections to panel interface modules, controllers, and gateways.
   6. Testing and labeling wires with Architect's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

M. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

N. Overhead Stops/Holders: Mount overhead stopes/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

P. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

R. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

T. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
   2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.05 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.06 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

111554 OPT0371565 VERSION 2

HARDWARE GROUP NO. 001

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	MORTISE CYLINDER	1E74 CAM AS REQ (AS REQ)	626	BES
1	EA	SFIC CORE	BEST SFIC CORE KEYED TO EXISTING DISTRICT SYSTEM (AS REQ)		BES
		NOTE	BALANCE OF HARDWARE BY DOOR MFR		

A. COORDINATE HARDWARE WITH DOOR MFR.

B. REMOVE CYLINDER AND CORE IF NOT REQUIRED.

HARDWARE GROUP NO. 101

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50HD SPA	626	SCH
1	EA	SFIC CORE	BEST SFIC CORE KEYED TO EXISTING DISTRICT SYSTEM		BES
1	EA	SURFACE CLOSER	4040XP REG/PA AS REQ MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 103

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50HD SPA	626	SCH
1	EA	SFIC CORE	BEST SFIC CORE KEYED TO EXISTING DISTRICT SYSTEM		BES
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 201

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80HD SPA	626	SCH
1	EA	SFIC CORE	BEST SFIC CORE KEYED TO EXISTING DISTRICT SYSTEM		BES
1	EA	SURFACE CLOSER	4040XP REG/PA AS REQ MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 341

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S SPA OS-LOC	626	SCH
1	EA	SURFACE CLOSER	4040XP REG/PA AS REQ MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

A. OCCUPIED/VACANT INDICATOR ON OUTSIDE OF DOOR.

HARDWARE GROUP NO. 401C

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S SPA	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 412

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE

1	EA	MANUAL FLUSH BOLT	FB457	626	IVE
1	EA	PASSAGE SET	ND10S SPA	626	SCH
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	SET	MEETING STILE	8193AA (2 PCS - 1 SET) (OMIT @ NON-RATED DOORS)	AA	ZER

HARDWARE GROUP NO. 512

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	MANUAL FLUSH BOLT	FB457	626	IVE
1	EA	CLASSROOM LOCK	ND70HD SPA	626	SCH
1	EA	SFIC CORE	BEST SFIC CORE KEYED TO EXISTING DISTRICT SYSTEM		BES
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	SET	MEETING STILE	8193AA (2 PCS - 1 SET) (OMIT @ NON-RATED DOORS)	AA	ZER

HARDWARE GROUP NO. 715A

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	628	IVE
1	EA	PANIC HARDWARE	33A-NL-OP LENGTH AS REQ	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
1	EA	SFIC CORE	BEST SFIC CORE KEYED TO EXISTING DISTRICT SYSTEM		BES
1	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
1	EA	OH STOP	100S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	RAIN DRIP	142AA DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	655A LENGTH AS REQ	A	ZER

HARDWARE GROUP NO. 801

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8302 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP REG/PA AS REQ MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. C711AC

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-33A-NL-OP-CON LENGTH AS REQ	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
1	EA	SFIC CORE	BEST SFIC CORE KEYED TO EXISTING DISTRICT SYSTEM		BES
1	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	WIRE HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	CREDENTIAL READER BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC (OMIT 2RS BOARD WHERE NOT REQ)		VON

A. INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

B. FREE EGRESS BY THE PUSH PAD.

C. COORDINATE POWER SUPPLY WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS.

D. OMIT POWER SUPPLY WHERE PROVIDED BY SECURITY.

HARDWARE GROUP NO. C715A

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-33A-NL-OP-CON LENGTH AS REQ	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
1	EA	SFIC CORE	BEST SFIC CORE KEYED TO EXISTING DISTRICT SYSTEM		BES
1	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
1	EA	OH STOP	100S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	RAIN DRIP	142AA DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	655A LENGTH AS REQ	A	ZER
1	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	WIRE HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH

1	EA	CREDENTIAL READER	CREDENTIAL READER BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 900-BBK 120/240 VAC (OMIT 2RS BOARD WHERE NOT REQ)		VON

A. INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

B. FREE EGRESS BY THE PUSH PAD.

C. COORDINATE POWER SUPPLY WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS.

D. OMIT POWER SUPPLY WHERE PROVIDED BY SECURITY.

HARDWARE GROUP NO. CEZ221

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	INSTITUTION LOCK	ND82HD SPA	626	SCH
2	EA	SFIC CORE	BEST SFIC CORE KEYED TO EXISTING DISTRICT SYSTEM		BES
1	EA	ELECTRIC STRIKE	6211-FS (FAIL SAFE) VOLTAGE AS REQ	630	VON
1	EA	SURFACE CLOSER	4040XP REG/PA AS REQ MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
2	EA	CREDENTIAL READER	CREDENTIAL READER BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS FA900 120/240 VAC (OMIT 2RS BOARD WHERE NOT REQ)	LGR	SCE

A. INGRESS AND EGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

B. WIRE THE ELECTRIC STRIKE TO THE FIRE ALARM SYSTEM.

C. THE ELECTRIC STRIKE WILL BECOME FAIL SAFE UPON ACTIVATION OF THE FIRE ALARM SYSTEM.

D. OPENING IS NO LONGER FIRE RATED, POSITIVE LATCHING NO LONGER REQUIRED IN THE EVENT OF A FIRE

E. COORDINATE POWER SUPPLY WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS.

F. OMIT POWER SUPPLY WHERE PROVIDED BY SECURITY.

HARDWARE GROUP NO. D205I

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	STOREROOM LOCK	ND80HD SPA	626	SCH
1	EA	SFIC CORE	BEST SFIC CORE KEYED TO EXISTING DISTRICT SYSTEM		BES

1	EA	SURFACE CLOSER	4040XP REG/PA AS REQ MTG BRKT, SPCR & PLATE AS REQ (REG ARM MOUNT)	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	RAIN DRIP	11A (MOUNT @ BOTTOM DOOR)	A	ZER
1	EA	RAIN DRIP	142AA DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	SET	GASKETING	328AA H & J	AA	ZER
1	EA	DOOR SWEEP	8193AA	AA	ZER
1	EA	THRESHOLD	655A LENGTH AS REQ	A	ZER
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	BLK	SCE

A. -DOOR CONTACT TO MONITOR DOOR POSITION

END OF SECTION

SECTION 08 81 00 - GLAZING

GENERAL

1.01 SECTION INCLUDES

A. All glass, glazing materials, and glazing throughout the project.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 08 11 13 - Standard Steel Frames: Glass stops.

B. Section 08 14 16 - Wood Doors: Glass stops.

C. Section 08 41 00 - Aluminum Entrances and Storefronts: Vinyl glazing beads.

1.03 RELATED SECTIONS

A. Section 06 20 00 – Finish Carpentry.

B. Section 07 90 00 - Joint Sealants: Sealant and back-up materials.

C. Section 08 51 13 - Aluminum Windows: Factory glazing.

D. Section 09 91 00 - Painting: Painting and sealing of rabbets and stops.

1.04 SUBMITTALS

A. Product Data: Descriptive data for each glass and glazing product indicated.

B. Submit written certification that all glass and glazing meets or exceeds requirements of federal, state, and local codes and regulations, updated to time of installation.

C. Submit sealed glass unit manufacturer's certificate under provisions of Division 1 indicating units meet or exceed specified requirements.

D. Submit product data for manufactured horizontal sliding doors for display cases.

E. Submit sample of manufacturer’s warranty information as indicated in 1.8 Warranty listed below.

1.05 QUALITY ASSURANCE

A. Conform to GANA Glazing Manual for glazing installation methods.

B. Comply with the Indiana Energy Conservation Code (ASHRAE 90.1 – 2007).

C. ASTM C 1048 Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.

D. ANSI Z97.1 – Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

E. Federal Safety Standards for Architectural Glazing Materials 16CFR1201-1.11.”

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Keep temperature of glass and frame materials above 40 degrees F during glazing.

1.08 WARRANTY

A. Provide ten (10) year manufacturer's warranty on insulating glass, including coverage of sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

B. Provide five (5) year warranty on safety glass against edge separation and vision obstruction.

PRODUCTS

2.01 ACCEPTABLE GLAZING MANUFACTURERS

A. PPG Industries, Inc., Pittsburgh, Pennsylvania.

B. LOF Glass, Toledo, Ohio.

C. Virginia Glass Products Company, Martinsville, Virginia.

D. Viracon, Owatonna, Minnesota.

E. Guardian Industries Corporation, Carleton, Michigan.

F. Pilkington Building Products, Toledo, Ohio.

G. Oldcastle Glass Group, Plano, Texas.

H. Globe Amerada Architectural Glass, Selma, Alabama.

I. Glasmont Corporation, Indianapolis, Indiana.

J. DeLuxe Insulated Glass, Inc., Indianapolis, Indiana.

2.02 GLASS MATERIALS

A. General: Furnish factory label on each pane of glass.

B. Float Glass: Clear, glazing quality; 1/4 inch thick; visible light transmission of 88 percent; summer day time U-value of 1.04; shading coefficient of 0.94.
   1. Fully tempered where noted.

C. Ultraclear Insulating Glass Units: Double pane units with double edge seal; outer pane of 1/4 inch thick ultraclear float glass, inner pane of 1/4 inch thick clear float glass; 1/2 inch interpane space purged with dry hermetic air; total unit thickness of 1 inch.
   1. Basis-of-Design Product: PPG Industries, Inc.; Solarban 70.
      a. Visible Light Transmittance: 60 to 64 percent.
      b. Winter Nighttime U-Factor: 0.28 to 0.29.
      c. Summer Daytime U-Factor: 0.26 to 0.27.
      d. Solar Heat Gain Coefficient: 0.38 to 0.39.
   2. Provide Low-E coating on second surface.
   3. Fully temper both lights.
   4. Provide 5/8” inch thickness for exterior doors.

D. Insulating-Glass Units for Vertical Glazing (SG5 IGU)
   1. Overall thickness: 1-1/8” insulating glass, laminated glass low-e coating on No. 2 surface, 3/8” air space, and mill finish air spacer.
   2. Outer-lite: ¼” tempered glass, low-e coating on the No. 2 surface.
   3. Airspace: 3/8” argon gas filled air space and mill finish air spacer.
   4. Inner-lite: SG5.
   5. Ratings Required:
      a. 5-aa1 (12 minute)
      b. Visible light transmittance 59%
      c. Reflectance Visible Light 13%
      d. U-Value (winter) .24
      e. Shading Coefficient .32
      f. Solar Heat Gain Coefficient .28”

E. Laminated glass products should not be cut on site.

2.03 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene or EPDM; 70-90 Shore A durometer hardness; size recommended by the manufacturer for the use intended.

B. Spacer Shims: Neoprene or EPDM; 50 Shore A durometer hardness; size recommended by the manufacturer for the use intended.

C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; coiled on release paper; color as selected by the Architect; Pre-Shimmed 440 Tape as manufactured by Tremco, Cleveland, Ohio, or an approved equal.

D. Glazing Clips: Manufacturer's standard type.

EXECUTION

3.01 INSPECTION

A. Verify surfaces of glazing channels or recesses are clean, free of obstructions, and ready for work of this Section.

B. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses.

3.03 INSTALLATION

A. Install all glazing in accordance with FGMA Glazing Manual.

B. Measure actual frames to obtain glass sizes.

C. Set glass, installed with wood or metal stops, without putty bed.
   1. Back and face putty to prevent rattling.

D. Set patterned glass with smooth side to exterior.

3.04 MIRRORS

A. Install with theftproof anchorage to prevent rattling and loosening.

B. Mount mirror on approved filler material to provide solid backing for mirror.

3.05 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after final approval.

C. Replace damaged or broken glass prior to acceptance.

END OF SECTION

SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Acoustic insulation.

D. Gypsum sheathing.

E. Gypsum wallboard.

F. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Structural steel stud framing.

B. Section 06 10 00 - Rough Carpentry: Building framing and sheathing.

C. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

D. Section 07 21 00 - Thermal Insulation: Acoustic insulation.

1.03 REFERENCE STANDARDS

A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

B. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.

C. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

D. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.

E. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2018 (Reapproved 2023).

F. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022, with Editorial Revision (2023).

G. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

J. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 REGULATORY REQUIREMENTS

A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.

B. Conform to applicable code for fire-rated assemblies.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not apply gypsum board when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature of 50 degrees F during and after installation of gypsum board.

1.06 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Product Data:

1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.
2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Deliver and store manufactured materials in original packages plainly marked with manufacturer's brand name.

D. Materials in broken containers or in packages showing water marks or other evidence of damage will be rejected.

PART 2 PRODUCTS

2.01 MANUFACTURER'S

A. United States Gypsum Company, Chicago, Illinois.

B. Georgia-Pacific Corporation, Atlanta, Georgia.

C. National Gypsum Company, Charlotte, North Carolina.

D. Lafarge North America, Inc., Herndon, Virginia.

E. CertainTeed Corporation, Valley Forge, Pennsylvania.

2.02 GYPSUM BOARD MATERIALS

A. Gypsum Board: ASTM C1396; Type X, fire resistive type, UL rated; maximum permissible length; ends square cut, tapered edges, thicknesses required.

B. Gypsum Sheathing: 5/8 inch thickness, non-combustible water resistant core sheathing, surfaced with inorganic glass mats partially or completely embedded in the core; conforming to ASTM C1177; Dens-Glass Gold as manufactured by Georgia-Pacific; Gold Bond e2XP extended exposure sheathing as manufactured by National Gypsum; GlasRoc Sheathing as manufactured by CertainTeed.

C. Abuse Resistant Gypsum Board: 1/2 inch and 5/8 inch thickness; Fiberock VHI Abuse-Resistant as manufactured by United States Gypsum Company; ToughRock Fireguard C gypsum board as manufactured by Georgia-Pacific; Hi-Abuse Brand Wallboard regular as manufactured by National Gypsum; ProRoc Abuse-Resistant Gypsum Board as manufactured by CertainTeed; or approved equal.

D. Single Layer Installations: Provide 5/8 inch abuse resistant gypsum board.

E. At new gypsum board Corridor walls on the corridor side only.

F. Two Layer Installations: Provide 1/2 inch abuse resistant as second layer of gypsum board over 1/2 inch Type X gypsum board.

G. Omit abuse resistant gypsum board above finished ceilings and in other unexposed areas; use Type X gypsum board of the same thickness.

2.03 ACCESSORIES

A. Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board; as recommended by the manufacturer.

B. Corner Beads: Galvanized steel with 1/8 inch bead and 1 1/4 inch flanges.

C. Edge Trim and expansion/control joint: Galvanized steel; as recommended by the manufacturer for the use intended and as approved by the Architect.

D. Fasteners: As recommended by the manufacturer for the use intended.

E. Adhesive: As recommended by the manufacturer for the use intended.

F. Joint Materials: Reinforcing tape, joint compound, adhesive, water, and fasteners as recommended by the manufacturer.

2.04 GYPSUM BOARD ACCESSORIES

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that project conditions are appropriate for work of this section to commence.

B. Beginning of installation means acceptance of substrate and existing surfaces.

3.02 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with manufacturer's specifications and ASTM C840.

B. Install gypsum sheathing in accordance with manufacturer’s specifications and ASTM C1280.

C. Install gypsum board on all metal framing and furring, unless noted or shown otherwise.

D. Erect fire rated gypsum board vertically, with edges and ends occurring over firm bearing.

E. Double Layer Applications: Secure second layer to first with fasteners and adhesive.
   1. Apply adhesive in accordance with manufacturer's specifications.

F. Use screws nails when fastening gypsum board to metal wood furring or framing.

G. Place corner beads at external corners.
   1. Use longest practical length.

H. Place edge trim at all terminations of gypsum board and where gypsum board abuts dissimilar materials.

I. Extend gypsum board on both sides of all partitions to underside of floor or roof deck above, unless shown or noted otherwise.
   1. Second layer of gypsum board may be omitted above suspended ceilings, except at fire rated walls.

J. Provide 5/8 inch space between floor and bottom edge of all gypsum board on walls.
   1. Extend gypsum board to within 5/8 inch of floor behind bases, cabinets, and fixed equipment.

K. Offset joints in gypsum board on opposite surfaces of partitions.

L. Locate vertical joints at door openings at center of opening, not at door edge.

M. Control Joints: Isolate gypsum panel surfaces with control joints or by other approved means at the following locations as approved by the Architect. Maintain required fire ratings of construction.
   1. Where partitions or furring abuts a structural element, except floor, or dissimilar wall or ceiling.
   2. Where ceiling or soffit abuts a structural element, dissimilar wall, or partition or other vertical penetration.
      a. Provide sealant at joint.
   3. Where construction changes within plane of partition or ceiling.
   4. Where partition or furring run exceeds 25 feet.
   5. Where ceiling dimensions exceed 50 feet in either direction with perimeter relief, or 30 feet without perimeter relief.
   6. Where wings of "L", "U", and "T" shaped ceiling areas are joined.
   7. Where expansion or control joints occur in exterior walls.

N. Provide gypsum board on metal stud walls above suspended ceilings at walls to receive full height ceramic tile wall finish.
   1. Verify extent of tile finish with Ceramic Contractor.

O. Install abuse resistant gypsum board in accordance with manufacturer's specifications.

P. Erect exterior gypsum sheathing board horizontally, with edges butted tight and ends occurring over firm bearing.

3.03 JOINT TREATMENT

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Tape and fill all joints above ceilings.

B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.

C. At outside corners, spread joint filler minimum of 16 inches from corner bead.

3.04 LEVELS OF GYPSUM BOARD FINISH

A. Finish Levels: In accordance with GA-214.

B. Level #2: All concealed surfaces above ceilings.

C. Level #3: Walls to receive fabric wall covering and painted surfaces in non-public areas, such as custodian rooms and storage rooms.

D. Level #4: Walls and ceilings to receive paint.

E. Level #5: Walls to receive wall coating, gloss and/or semi-gloss finish. Walls adjacent to door and window openings where exterior light “washes” wall surface as identified by Owner’s Representative

3.05 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

B. B. Provide straight edge and square edge to Architect for checking alignment of walls and corners.

3.06 SEALANT AND INSULATION INSTALLATION

A. Install sealant within partitions in accordance with manufacturer's specifications.

3.07 CLEANING

A. Protect all finished floors and other finish surfaces during and after completion of gypsum board work.

B. Clean all finish surfaces of joint compound and other debris caused by this work.

C. At completion, verify that all floor drains are clear of all debris at joint meeting with Owner’s Representative and Mechanical Contractor.

END OF SECTION

SECTION 09 22 13 - METAL FRAMING AND FURRING

GENERAL

1.01 SECTION INCLUDES

A. Wall, bulkhead, and furred space framing.

B. Metal channel ceiling and soffit framing.

C. Framing accessories.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 05 50 00 - Miscellaneous Metals.

1.03 RELATED SECTIONS

A. Section 05 40 00 - Cold Formed Metal Framing.

B. Section 05 50 00 - Miscellaneous Metals: Steel channel assemblies. Backing plates for stair rails.

C. Section 06 10 00 – Rough Carpentry: Wood blocking.

D. Section 07 21 16 - Batt and Blanket Insulation: Thermal and acoustical insulation.

E. Section 08 11 13 - Standard Steel Doors and Frames: Installation of door frames.

F. Section 09 29 00 - Gypsum Board.

1.04 REFERENCES

A. ASTM A36 - Structural Steel.

B. ASTM A446 - Steel Sheet, Zinc-Coated (Galvanized) by Hot Dip Process, Structural (Physical) Quality.

C. ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

D. ASTM E90 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

1.05 SYSTEM DESCRIPTION

A. Metal stud framing for exterior and interior walls.
   1. Walls include partitions, bulkheads, piers, pilasters, jambs, returns, reveals, backs of recesses and alcoves, and jambs and heads of doors and windows.

B. Metal furring and framing for interior ceilings and exterior soffits.
   1. Ceilings and soffits include furred spaces and other overhead work.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated assemblies.

1.07 COORDINATION

A. Coordinate work of this Section with installation of hollow metal frames.

B. Coordinate the installation of bucks, anchors, blocking, and electrical and mechanical work which is to be placed in or behind framing, lathing, and furring.

PRODUCTS

2.01 METAL FRAMING AND FRAMING - ACCEPTABLE MANUFACTURERS

A. Allied Studco, Inc., Phoenix, Arizona.

B. Clark Steel Framing Systems, Middletown, Ohio.

C. Consolidated Systems, Inc., Columbia, South Carolina.

D. Dietrich Metal Framing, Inc., Pittsburgh, Pennsylvania.

E. Marino Industries Corp., Westbury, New York.

F. The Steel Network, Inc., Raleigh, North Carolina.

2.02 FRAMING MATERIALS

A. General:
   1. Sheet steel conforming to ASTM A446.
      a. Grade A: Possessing minimum yield strength of 33 ksi.
      b. Grade C: Possessing minimum yield strength of 40 ksi.
   2. Galvanized Coating: ASTM A525, G-60.
   3. Size, gage, and length as recommended by the manufacturer for the intended use.

B. Studs for Exterior Soffit and Parapet Construction:
   1. Studs: Minimum Grade C; sheet steel, formed to channel shape, punched web; galvanized.
   2. Tracks: Grade A; formed steel, channel shaped, same width as stud, tight fit, solid web; galvanized.

C. Interior Studs and Tracks: Electrogalvanized sheet steel; minimum 20 gage thick for gypsum board construction; "C" shape; Grade A. Comply with manufacturer's recommendations for height/spacing/loading requirements.
   1. Z Furring Channels: Minimum 24 gage, corrosion-resistant, thickness required for intended use.
   2. Studs for Walls to Receive Ceramic Tile: Galvanized sheet steel; minimum 18 gage thick; minimum size, 3 5/8 inches; length as required.
   3. Provide deflection tracks at heads of walls.

D. Furring Channels: Hat shaped formed steel; minimum 25 gage thick, 7/8 inch deep by 2-9/16 inches wide; length as required.

E. Main Ceiling Channels: Formed steel; minimum 16 gage thick, 17/32 inch deep by 1 1/2 inches or 2 inches high; length as required.

F. Hangers: Galvanized steel wire, minimum No. 8 size; to rigidly support ceiling components in place.

G. Horizontal Bridging: 1-1/2 inches deep, cold rolled channels where possible.

H. Anchorage and Fastening Devices: Approved devices of type and size to suit application; as recommended by the manufacturer and as approved by the Architect.
   1. Provide bent plate clip angles and corner reinforcement as required.

I. Metal Strapping: Sheet metal; minimum 20 gage; width required for device to be anchored; minimum length, 16 inches.

J. Sealant for Gypsum Board Construction: Non-hardening, non-skinning, as recommended by the manufacturer.

K. Lateral Bracing: Formed steel; minimum 16 gage thick; size and length as required.

L. Resilient Channels for Gypsum Board Construction: Formed steel; minimum 25 gage thick; size and length as required, serrated face, flattened "Z" profile.

2.03 FINISHES

A. Framing Materials: Galvanized.

B. Hangers, Anchors, and Fastening Devices: Galvanized.

2.04 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required; with framing members fitted, reinforced, and braced to suit design requirements.

B. Fit and assemble in largest practical sections for delivery to site, ready for installation.

EXECUTION

3.01 INSPECTION

A. Verify that surfaces and conditions are ready to receive work.

B. Beginning of installation means acceptance of substrate and existing surfaces.

3.02 INSTALLATION - GENERAL

A. Install in accordance with the manufacturer's printed instructions and as approved by the Architect.

B. Anchor door bucks and framing members to adjacent studs and runners.

C. When fastening metal framing to miscellaneous or structural steel, use stud welds or 1/4 inch self-drilling, self-tapping TEC screws.

3.03 METAL STUD FRAMING

A. Align and secure top and bottom runners at maximum 24 inches on center.
   1. Place two beads of sealant continuous between runners and substrate.

B. Fit runners under and above openings; secure intermediate studs at spacing of wall studs.

C. Install studs vertically at maximum 16 inches on center.
   1. Place two beads of sealant continuous between studs and adjacent vertical surfaces.

D. Connect studs to tracks as recommended by the manufacturer and as approved by the Architect.

E. Stud splicing not permissible.

F. Construct corners using minimum three studs.

G. Double studs at wall openings, door and window jambs, and not more than 1-1/2 inches each side of openings and wall intersections.

H. Brace stud framing system and make rigid.

I. Coordinate erection of studs with requirements of door frame supports and attachments.

J. Align stud web openings.

K. Coordinate installation of bucks and anchors with electrical and mechanical work to be placed in or behind stud framing.

L. Extend partitions through ceiling to floor or roof deck above, unless shown otherwise on Drawings.

M. Maintain clearance under structural building members to avoid deflection transfer to studs.

N. Install horizontal bridging in all walls at maximum 4 feet on center, starting at approximately 1'-6" above floor.
   1. Fasten at each stud.

O. At pipe spaces, chases, and similar locations with finish materials applied to only one side of metal studs, tie the two rows of studs together or brace back to adjacent wall.

P. Provide additional studs and channels where required.

Q. Frame in all ducts, pipes, roof conductors, conduit, and electrical panels in finished areas.

R. Frame in the sides, top, and bottom of all surface mounted electrical panels, including those in rooms with exposed block walls, and frame in all conduit extending from the panel to the floor or ceiling.

S. Anchor runners to top of masonry walls with 3/8 inch diameter anchor bolts at maximum 4 feet on center.
   1. Extend bolts minimum 8 inches into masonry.
   2. Provide three masonry nails equally spaced between bolts.

T. Provide chases where required for mechanical trades.

U. Establish expansion joints at interior corners in gypsum board construction where required by the Architect.

V. Provide blocking for wall mounted door stops consisting of a horizontal metal stud anchored securely between vertical studs.
   1. Coordinate locations of door stops.

W. Install metal strapping to provide backing for markerboard and tackboard grounds, wall mounted casework, and other wall mounted items.
   1. Anchor metal strapping across minimum of two framing members.

X. Wood Blocking: Provide two rows of wood blocking in walls to receive upper casework cabinets. Verify locations with casework suppliers.

3.04 WALL AND FURRED SPACE FRAMING

A. Erect wall furring by directly attaching to masonry, concrete, and existing walls.
   1. Erect furring channels vertically horizontally.
      a. Secure in place on alternate channel flanges at maximum 24 inches on center.
   2. Space furring channels maximum 16 inches on center.
   3. Shim furring channels to provide straight and plumb finished wall surfaces.

3.05 CEILING AND SOFFIT FRAMING

A. Install framing to height indicated.
   1. Erect after work above ceiling is complete.
   2. Coordinate location of hangers with other work.

B. Install ceiling furring independent of walls, columns, and work above ceiling.
   1. Securely anchor hangers to structural members with hanger wire or embed in structural slab.
   2. Do not attach hanger wires to metal roof deck.

C. Space 1-1/2 inch main carrying channels at maximum 48 inches on center; not more than 6 inches from wall surfaces; lap and splice securely.
   1. Use 2 inch channels where supporting members are more than 4 feet, but less than 5 feet on center.
   2. Use two pieces of 2 inch channels nested together where supporting members are more than 5 feet, but less than 6 feet on center.

D. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

E. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure; lap and splice securely.
   1. Use 7/8 inch furring channels at maximum 16 inches on center for gypsum board construction.

F. Reinforce openings in suspension system, which interrupt main carrying channels or furring channels with lateral channel bracing.
   1. Extend bracing minimum 24 inches past each opening.

G. Establish contraction, control, and expansion joints with specified joint device, where required by the Architect.
   1. Cope or miter beads at corners.
   2. Fasten at minimum 8 inches on center, staggered in the two wings.
   3. Cut channels free at expansion joints.
   4. Locate expansion joints at maximum 12 feet on center in both directions.

H. Laterally brace suspension system.

I. Erect resilient channels at maximum 16 inches on center.
   1. Rigidly secure in place.

3.06 BULKHEAD FRAMING

A. Provide all framing for bulkhead and overhead construction, unless specifically noted otherwise.

3.07 SOUNDPROOF PARTITIONS

A. Install rigid fiberglass insulation between base runner and floor, and between top runner and construction above.

B. Apply continuous sealant to both sides of joint between insulation and floor, and between insulation and construction above.

3.08 TOLERANCES

A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet.

B. Maximum Variation from True Position: 1/8 inch.

END OF SECTION

SECTION 09 51 00 - ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

C. Non fire-rated.

D. Perimeter trim.

1.02 RELATED REQUIREMENTS

A. Division 23 - Air diffusion devices in ceiling system.

B. Division 26 - Lighting Fixtures and Accessories: Light fixtures in ceiling system.

1.03 REFERENCE STANDARDS

A. AA - Designation System for Aluminum Finishes.

B. ASTM A475 - Zinc-Coated Steel Wire Strand.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

D. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

F. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SYSTEM DESCRIPTION

A. A. Class A Incombustible Materials: Furnish all other acoustical materials to conform with a UL Class A Incombustible rating.

1.05 REGULATORY REQUIREMENTS

A. Provide seismic restraints for ceiling suspension system in accordance with Indiana Building Code, Chapter 16. Provide substantiation and design calculations as required.

B. Furnish certification to the Architect and Owner’s Representative, upon completion of the project, that all materials have been furnished and installed in accordance with all federal, state, and local codes and regulations.

1.06 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.
   1. Base grid layouts on lighting layouts shown on the drawings.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit three samples 6"x6" in size illustrating material and finish of acoustical units.

E. Samples: Submit three samples each, 12" long, of suspension system main runner, cross runner, and perimeter molding.

F. Manufacturer's warranty information.

G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.07 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.08 SEQUENCING/SCHEDULING

A. Do not install acoustical ceilings until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Schedule installation of acoustical units after interior wet work is dry.

1.09 EXTRA MATERIAL

A. Provide the following amounts of extra acoustical materials to Owner.
   1. Acoustical Board 24 inches x 24 inches: 100 square feet.

1.10 WARRANTY

A. Provide manufacturer's standard ten (10) year warranty against visible sag under high temperature and high humidity.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Chicago Metallic Corporation, Chicago, Illinois
   2. Armstrong World Industries, Inc; ____: www.armstrongceilings.com/#sle.
   3. Certainteed Architectural; ____: www.certainteed.com/ceilings-and-walls/#sle.
   4. USG Corporation; ____: www.usg.com/ceilings/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Suspension Systems:
   1. Chicago Metallic Corporation, Chicago, Illinois
   2. Armstrong World Industries, Inc; ____: www.armstrongceilings.com/#sle.
   3. Certainteed Architectural; ____: www.certainteed.com/ceilings-and-walls/#sle.
   4. USG Corporation; ____: www.usg.com/ceilings/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACOUSTICAL UNITS

A. Acoustical Panels: Conforming to the following:
   1. Size: 24 inches by 24 inches.
   2. Thickness: Minimum 5/8 inch.
   3. Composition: Mineral fiber board with mold and mildew resistant coating or formulation.
   4. Weight:
      a. Non-Fire Rated: Minimum 0.60 pound per square foot.
   5. Light Reflectance: Minimum 83 percent.
   6. NRC Range: Minimum 0.55.
   7. CAC Range: Minimum 33 to 35.
   8. Fire Hazard Classification: Flame spread 25 or less.
   9. Edge: Square.
   10. Surface Color: White.
   11. Surface Finish: Washable.
   12. Product Name: Fine Fissured with HumiGuard Plus Performance (A); Fine Fissured with BioShield Option (C); Radar ClimaPlus.

2.03 SUSPENSION SYSTEM(S)

A. Non-Fire Rated Grid: ASTM C635, heavy duty, exposed T; components die cut and interlocking; Chicago Metallic Snap-Grid 200 System; Armstrong Prelude XL System; USG DX System.

B. Accessories: Clips, splices, edge moldings, adhesives, and all other accessories required by the manufacturer for suspended grid system and as per seismic requirements.
   1. Hold Down Clips: Provide hold down clips at all acoustical ceilings within 10 feet of exterior doors.

C. Grid Materials: Commercial quality cold rolled steel, hot-dip galvanized.

D. Grid Finish: Flat white, equal to USG #050.

E. Support Channels and Hangers: Galvanized steel; size and type to suit application, to rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

F. Wire Hangers: Galvanized steel wire; ASTM A475, Class C.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

C. Beginning of installation means acceptance of existing conditions.

D. Coordinate acoustical layouts with Architect and Electrical Engineer prior to installation.

3.02 INSTALLATION

A. Install system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Install after major above-ceiling work is complete.
   1. Coordinate the location of hangers with other work.

C. Hang system independent of walls, columns, ducts, pipes, and conduit, where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
   1. Do not suspend acoustical materials from metal roof deck.

D. Where supporting member spacing is greater than 4'?0" or where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
   1. Over 4 Feet But Less Than 6 Feet: Use 2 inches cold rolled channels.
   2. Over 6 Feet But Less Than 8 Feet: Use two pieces of 2 inches cold rolled channels nested together.

E. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
   1. Use #12 steel wire hangers spaced at maximum 4 feet on center in two directions.
   2. Maximum space between a main runner hanger and a wall; 1 foot.
   3. Support cross tees at maximum of 24 inches from wall where main runners are parallel to wall.

F. Locate system on room axis according to approved grid layouts based on lighting layouts shown on the Electrical Drawings.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
   1. Support ceiling grid at each fluorescent fixture with #12 wire hangers located within 6 inches of each corner of each light fixture.
   2. Install main runners parallel with long dimension of light fixtures.
   3. Modify the 24 inch by 48 inch grid system, where 12 inch by 48 inch light fixtures occur, to 12 inch by 48 inch to correspond to ends of light fixtures.

H. Install main runners, uninterrupted, from edge molding to edge molding.

I. Do not eccentrically load system, or produce rotation of runners.

J. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths.
   1. Miter corners.
   2. Provide edge moldings at junctions with other interruptions.
   3. Where round obstructions or bullnose concrete block corners occur, provide preformed closers to match edge molding.
   4. Do not use exposed fasteners, including pop rivets, on moldings and trim.

K. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

L. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
   1. Field rabbet cut edges of reveal edge boards to match factory cut rabbets.

M. Install acoustical materials in vestibules, stairwells, areas above landings, and in all recesses off corridors in areas noted to receive acoustical materials.

N. Use no border tile less than 8 inches wide.

O. Adjust ceiling heights to accommodate above ceiling equipment, or level changes required at window heads.

P. Provide openings in acoustical materials for speakers, sprinklers, and other items extending through the ceiling surface.

Q. Install protection above light fixtures, speakers, grilles, etc., in accordance with UL assembly requirements.

3.03 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.04 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean all acoustical units and trim of dirt following erection.
   1. Replace all damaged, discolored, or improperly installed units and trim.

C. Remove all unused materials, rubbish, debris, and equipment and dispose of off the site.

3.05 ADDITIONAL REQUIREMENTS

A. Replace all acoustical units, which become damaged during construction and before Owner occupancy with new matching materials.

END OF SECTION

SECTION 09 65 00 - RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Concrete: Floor substrate.

B. Section 05 50 00 - Miscellaneous Metals.

C. Section 06 10 00 - Carpentry Work: Cleaning of concrete slabs.

1.03 REFERENCES

A. RH testing by in situ probes per the ASTM F2170.

B. PH testing per the ASTM F710.

C. FS SS-W-40A - Wall Base: Rubber and Vinyl Plastic.

1.04 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Shop Drawings: Indicate floor patterns and accent area; including colors to be used in each installation..

C. Submit samples under provisions of Division 1.
   1. Submit two 6 inches by 6 inches samples of each color to be used as noted on the drawings.
   2. Include sample of premolded external base corner.
   3. Submit manufacturer's installation instructions under provisions of Division 1.
   4. Product Test Reports: Based on evaluation of comprehensive tests performed within the last two years by a qualified testing agency, indicating compliance with ASTM standards for type of resilient flooring indicated.

1.05 MAINTENANCE DATA

A. Submit cleaning and maintenance data under provisions of Division 1.
   1. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning and buffing.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer with minimum 5 years experience, who has successfully completed at least 10 installations of resilient flooring similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations: Obtain each resilient flooring material through one source from a single manufacturer.

C. Contractor shall coordinate and pay for all costs for all testing required for testing of floor slab moisture and any additional testing required by flooring manufacturer.

D. Mockup: Before beginning installation, install resilient flooring in one room selected by Owner's Representative to demonstrate typical installation.
   1. Obtain approval of room mockup before starting resilient flooring installation.
   2. Maintain room mockup during construction in an undisturbed condition as a standard for judging the resilient flooring installation throughout building.

1.07 DELIVERY, STORAGE, AND HANDLING

A. A. Deliver and store manufactured materials in original packages plainly marked with manufacturer's brand name.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Store materials for 3 days prior to installation in area of installation to achieve temperature stability.

B. Maintain ambient temperature required by adhesive manufacturer 3 days prior to, during, and 24 hours after installation of materials.

C. Moisture vapor emission content of the concrete slab must not exceed manufacturer's recommended criteria when using the calcium chloride test as per ASTM F1869.

1.09 WARRANTY

A. Provide five (5) year warranty on materials and workmanship, including repairs or replacement if mastic bleeds through tile joints.

B. LVT Warranty: Written warranty, signed by luxury vinyl tile manufacturer agreeing to replace tile that does not comply with requirements or that fails within specified warranty period.
   1. Warranty Period: 15 years from date of Substantial Completion.

1.10 EXTRA MATERIAL

A. Provide the following to the Owner.
   1. Three complete boxes of each type and color of resilient tile the project.
   2. 100 lineal feet of each color of base materials used.

1.11 DEMONSTRATION

A. Instruct Owner’s Personnel on care and maintenance of Resilient Flooring.

PART 2 PRODUCTS

2.01 VINYL BASE MATERIALS

A. Acceptable Manufacturers:
   1. Armstrong World Industries, Inc., Lancaster, Pennsylvania.
   2. Flexco Company, Tuscumbia, Alabama.
   3. Roppe Rubber Corporation, Fostoria, Ohio.
   4. Johnsonite by Tarkett, Solon, Ohio.

B. Vinyl Base: FS SS-W-40A; Type 2 vinyl; 1/8 inch thick, top set coved toeless; premolded external corners; height noted. Provide coils in 120’ lengths.
   1. Colors as selected by the Architect, or as noted on the drawings.

2.02 LUXURY VINYL TILE (LVT) FLOORING MATERIALS

A. Vinyl Tile: Interface Studio Set (basis of design).
   1. Colors and Patterns as noted on the drawings.

2.03 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.
   1. Provide and install moisture mitigation as required by flooring manufacturer.
   2. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
   3. Edge Strips: Metal, rubber, or vinyl as approved.
   4. Colors as selected by the Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Beginning of installation means acceptance of existing substrate and site conditions.

3.02 PREPARATION

A. Concrete Subfloors:

1. Verify that concrete slabs comply with ASTM F 2170 in Situ probe relative humidity specifications. RH limits are noted in the Floor Manufacturer's installation instruction.
2. Verify that concrete slabs comply with Alkalinity testing to ASTM F 710. PH limits are noted in the Flooring Manufacturer installation instruction. Provide results to Owner's Representative prior to installation.
3. Verify that concrete slabs are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by resilient floor tile manufacturer. Provide all test results in writing to Owner's Representative prior to installation of floor covering.

B. Remove sub-floor ridges and bumps.
   1. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.

C. Apply, trowel, and float filler to leave a smooth, flat, hard surface.

D. Prohibit traffic from area until filler is cured.

E. Vacuum clean substrate.

F. Moisture Testing:
   1. Test for moisture by relative humidity probe and digital meter method according to ASTM F 2170. Proceed with installation only after substrates have a maximum relative-humidity-measurement reading of 70 to 75 percent in 24 hours and as recommended by flooring product manufacturer so Owner will receive full product warranty. If moisture mitigation products are required as recommended by the flooring product manufacturer, and to maintain and adhere to the substantial completions dates, Contractor shall provide and install recommended floor mitigation product at no cost to the Owner.

G.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Set flooring in place, press with heavy roller to attain full adhesion.

E. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.

F. Install edge strips at unprotected or exposed edges, and where flooring terminates.

G. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

H. Lay flooring with joints and seams in accordance with drawings.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Install tile pattern as determined on the Finish Legend and by Architect.

C. Allow minimum 1/2 full size tile width at room or area perimeter.

3.05 INSTALLATION - BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.
   1. Spread adhesive to full coverage with notched trowel.

D. Scribe and fit to door frames and other interruptions.

E. Install in and around all recesses, openings, equipment, etc.

F. Install at base of all casework.

3.06 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Protect finished floors with heavy paper.

C. Provide board walks in areas used continuously as passageways by workmen.

3.07 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

C. Do not clean with solvents or wet mopping.

3.08 ADDITIONAL REQUIREMENTS

A. Contractor shall conduct moisture tests on floor slabs prior to installation of tile. Test shall meet acceptable levels as per manufacturer’s recommendations. Results of moisture tests shall be provided in writing to Owner’s Representative prior to installation of floor covering. If moisture tests dictate that moisture mitigation is required, Contractor shall provide moisture mitigation as recommended by flooring manufacturer.

END OF SECTION

SECTION 09 67 23.01 - RESINOUS FLOORING – GENERAL USE AREAS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resinous Systems of the Following Types:
   1. Sherwin-Williams HPF, Resuflor 3746 High Performance Epoxy

1.02 RELATED SECTIONS

A. Section 03300 – Cast-In-Place Concrete.

1.03 REFERENCES

A. ASTM International (ASTM):
   1. ASTM C 413 - Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   2. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
   3. ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics.
   4. ASTM D1475 - Standard Test Method For Density of Liquid Coatings, Inks, and Related Products.
   5. ASTM D 2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
   6. ASTM D 2240 - Standard Test Method for Rubber Property—Durometer Hardness.
   7. ASTM D 2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
   8. ASTM D2369 - Standard Test Method for Volatile Content of Coatings.
   9. ASTM D 2370 - Standard Test Method for Tensile Properties of Organic Coatings.
   10. ASTM D 3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
   11. ASTM D 4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
   12. ASTM D 4366 - Standard Test Methods for Hardness of Organic Coatings by Pendulum Damping Tests
   13. ASTM D5441 - Standard Test Method for Analysis of Methyl Tert-Butyl Ether (MTBE) by Gas Chromatography.
   14. ASTM D 7234 - Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
   15. ASTM F 1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
   16. ASTM F 2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
   17. ASTM G 154 - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.

B. Deutsches Institute fur Normung (DIN):
   1. DIN 53460 – Testing of Plastics; Determination of the Vicat Softening Temperature of Thermoplastics.

C. International Concrete Repair Institute (ICRI):
   1. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

D. Military Specifications (MIL):
   1. MIL-D-3134J - Deck Covering Materials.

E. National Floor Safety Institute (NFSI):
   1. ANSI/NFSI B101.1 - Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.

1.04 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used, including properties, VOC content, wet static coefficient of friction, compressive strength, tensile strength, elongation and similar properties.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

C. Verification Samples: Two representative units of each system, including color and texture.

D. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.

E. Manufacturer’s Certification: Submit manufacturer’s certification that materials comply with specified requirements and are suitable for intended application.

F. Manufacturer’s Project References: Submit manufacturer’s list of successfully completed resinous flooring system projects, including project name and location, name of architect, and type and quantity of flooring systems furnished.

G. Applicator’s Project References: Submit applicator’s list of successfully completed resinous flooring system projects, including project name and location, name of architect, and type and quantity of flooring systems applied.

H. Care and Maintenance Instructions: Submit manufacturer’s care and maintenance instructions, including cleaning instructions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Applicator’s Qualifications:
   1. Applicator regularly engaged, for a minimum of 5 years, in application of resinous flooring systems of similar type to that specified.
   2. Employ persons trained for application of resinous flooring systems.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect’s review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
   1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
   2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
   3. Retain mock-up during construction as a standard for comparison with completed work.
   4. Do not alter or remove mock-up until work is completed or removal is authorized.

1.06 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery Requirements: Deliver materials to site in manufacturer’s original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, and batch number.

B. Storage and Handling Requirements:
   1. Store and handle materials in accordance with manufacturer’s instructions.

2. Keep materials in manufacturer's original, unopened containers and packaging until application.
3. Store materials in clean, dry area indoors between 65 and 80 degrees F (18 and 27 degrees C).
4. Store materials out of direct sunlight.
5. Keep materials from freezing.
6. Protect materials during storage, handling, and application to prevent contamination or damage.

1.08 PROJECT CONDITIONS

A. Apply flooring system under the following ambient conditions:
   1. Ambient and Concrete Floor Temperatures: Between 65 and 85 degrees F (18 and 29 degrees C).
   2. Material Temperature: Between 65 and 85 degrees F (18 and 29 degrees C).
   3. Relative Humidity: Maximum 80 percent.
   4. Dew Point: Floor temperature more than 5 degrees over dew point.

B. Do not apply flooring system under ambient conditions outside manufacturer's limits.

1.09 WARRANTY

A. Submit manufacturer's standard warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: The Sherwin-Williams High Performance Flooring, 866-540-1299 swflooring@sherwin.com Website: https://industrial.sherwin-williams.com/na/us/en/resin-flooring.html

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.02 SHERWIN-WILLIAMS HPF, RESUFLOR 3746 HIGH PERFORMANCE EPOXY

A. Resuflor Performance HTS.
   1. Moisture Mitigating Prime Coat (if a moisture mitigating primer is needed): Resuprime 3830-3835 Moisture Mitigation Primer can be used.
   2. Prime Coat: RESUFLOR 3561 Epoxy Resin Glaze; Add Grit Aa Required For Slip Resistance
   3. Topcoat: Resuflor 3746 High Performance Epoxy; COLOR: STEEL GRAY (54)
   4. Provide Mock Up Sample to the Architect for approval.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine concrete surfaces to receive flooring system. Verify concrete is structurally sound.

B. Moisture Testing of Concrete: Perform at least one of the following two tests to determine moisture in concrete. Type of test and frequence as recommended by manufacturer and installer.
   1. In-situ Probe Test:
      a. Measure relative humidity in concrete in accordance with ASTM F 2170.
      b. Application of flooring system shall start only if test results are below 75 percent relative concrete humidity.
      c. If test results are above limits, notify Architect and flooring manufacturer in writing.

C. Do not begin preparation or installation until satisfactory moisture test results are achieved. Provide flooring manufacturer's recommended moisture vapor control coating if required.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Protection of In-Place Conditions: Protect adjacent surfaces and adjoining walls from contact with flooring system materials.

C. Surface Preparation:
   1. Prepare concrete surface in accordance with manufacturer's instructions.
   2. Remove dirt, dust, debris, oil, grease, curing agents, bond breakers, paint, coatings, sealers, silicones, and other surface contaminants which could adversely affect application of flooring system.
   3. Steel shot blast concrete to a minimum surface profile of ICRI 310.2R, CSP 5.
   4. Key-cut termination points with 1/4-inch (6-mm) by 1/4-inch (6-mm) cut.
   5. Patch depressions, divots, and cracks in concrete in accordance with manufacturer's instructions.
   6. Mechanically remove loose, delaminated, and damaged concrete and repair in accordance with manufacturer's instructions.
   7. Joints: Fill joints in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install flooring system in accordance with manufacturer's instructions and approved submittals at locations indicated on the Drawings.

B. Ensure concrete is dry, clean, and prepared in accordance with manufacturer's instructions.

C. Allow concrete to cure a minimum of 7 days before applying flooring system.

D. Mixing:
   1. Mix material components together in accordance with manufacturer's instructions.
   2. Mix only enough material that can be applied within working time.
   3. Add and mix colorants with materials in accordance with manufacturer's instructions to achieve uniform color.

E. Apply flooring system materials to obtain consistent mil thickness and smooth, uniform appearance and texture.

F. Overlay: Apply overlay in accordance with manufacturer's instructions. Apply overlay to prepared concrete surface.

G. Traction Aggregate: Broadcast traction aggregate in accordance with manufacturer's instructions. Broadcast traction aggregate into wet overlay.

H. Cove:
   1. Apply cove primer and cove in accordance with manufacturer's instructions at locations indicated on the Drawings.
   2. Apply cove to height and shape as indicated on the Drawings.
   3. Apply cove to create seamless, smooth transition between flooring and walls.

I. Seal Coat:
   1. Apply seal coat in accordance with manufacturer's instructions.
   2. Apply seal coat over traction aggregate.

3.04 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

B. appropriate sections in Division 01.

3.05 CLEANING AND PROTECTION

A. Allow flooring system to dry in accordance with manufacturer's instructions before opening to traffic.

B. Allow flooring system to dry a minimum of 1 week before cleaning by mechanical means.

C. Protect completed flooring system from damage during construction.

END OF SECTION

SECTION 09 67 23.02 - RESINOUS FLOORING - MAINTENANCE BAYS

SHERWIN-WILLIAMS HIGH PERFORMANCE FLOORING, RESUFLOR PERFORMANCE HTS

PART 1 GENERAL

2.01 SECTION INCLUDES

A. Resinous Systems of the Following Types:
   1. Sherwin-Williams HPF, Resuflor Performance HTS

2.02 RELATED SECTIONS

A. Section 03300 – Cast-In-Place Concrete.

2.03 REFERENCES

A. ASTM International (ASTM):
   1. ASTM C 413 - Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   2. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
   3. ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics.
   4. ASTM D1475 - Standard Test Method For Density of Liquid Coatings, Inks, and Related Products.
   5. ASTM D 2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
   6. ASTM D 2240 - Standard Test Method for Rubber Property—Durometer Hardness.
   7. ASTM D 2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
   8. ASTM D2369 - Standard Test Method for Volatile Content of Coatings.
   9. ASTM D 2370 - Standard Test Method for Tensile Properties of Organic Coatings.
   10. ASTM D 3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
   11. ASTM D 4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
   12. ASTM D 4366 - Standard Test Methods for Hardness of Organic Coatings by Pendulum Damping Tests
   13. ASTM D5441 - Standard Test Method for Analysis of Methyl Tert-Butyl Ether (MTBE) by Gas Chromatography.
   14. ASTM D 7234 - Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
   15. ASTM F 1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
   16. ASTM F 2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
   17. ASTM G 154 - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.

B. Deutsches Institute fur Normung (DIN):
   1. DIN 53460 – Testing of Plastics; Determination of the Vicat Softening Temperature of Thermoplastics.

C. International Concrete Repair Institute (ICRI):
   1. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

D. Military Specifications (MIL):
   1. MIL-D-3134J - Deck Covering Materials.

E. National Floor Safety Institute (NFSI):
   1. ANSI/NFSI B101.1 - Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.

2.04 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used, including properties, VOC content, wet static coefficient of friction, compressive strength, tensile strength, elongation and similar properties.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

C. Verification Samples: Two representative units of each system, including color and texture.

D. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.

E. Manufacturer’s Certification: Submit manufacturer’s certification that materials comply with specified requirements and are suitable for intended application.

F. Manufacturer’s Project References: Submit manufacturer’s list of successfully completed resinous flooring system projects, including project name and location, name of architect, and type and quantity of flooring systems furnished.

G. Applicator’s Project References: Submit applicator’s list of successfully completed resinous flooring system projects, including project name and location, name of architect, and type and quantity of flooring systems applied.

H. Care and Maintenance Instructions: Submit manufacturer’s care and maintenance instructions, including cleaning instructions.

2.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Applicator’s Qualifications:
   1. Applicator regularly engaged, for a minimum of 5 years, in application of resinous flooring systems of similar type to that specified.
   2. Employ persons trained for application of resinous flooring systems.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect’s review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
   1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
   2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
   3. Retain mock-up during construction as a standard for comparison with completed work.
   4. Do not alter or remove mock-up until work is completed or removal is authorized.

2.06 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

2.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery Requirements: Deliver materials to site in manufacturer’s original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, and batch number.

B. Storage and Handling Requirements:
   1. Store and handle materials in accordance with manufacturer’s instructions.

2. Keep materials in manufacturer's original, unopened containers and packaging until application.
3. Store materials in clean, dry area indoors between 65 and 80 degrees F (18 and 27 degrees C).
4. Store materials out of direct sunlight.
5. Keep materials from freezing.
6. Protect materials during storage, handling, and application to prevent contamination or damage.

2.08 PROJECT CONDITIONS

A. Apply flooring system under the following ambient conditions:
1. Ambient and Concrete Floor Temperatures: Between 65 and 85 degrees F (18 and 29 degrees C).
2. Material Temperature: Between 65 and 85 degrees F (18 and 29 degrees C).
3. Relative Humidity: Maximum 80 percent.
4. Dew Point: Floor temperature more than 5 degrees over dew point.

B. Do not apply flooring system under ambient conditions outside manufacturer's limits.

2.09 WARRANTY

A. Submit manufacturer's standard warranty.

PART 2 PRODUCTS

3.01 MANUFACTURERS

A. Acceptable Manufacturer: The Sherwin-Williams High Performance Flooring, 866-540-1299 swflooring@sherwin.com Website: https://industrial.sherwin-williams.com/na/us/en/resin-flooring.html

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

3.02 SHERWIN-WILLIAMS HPF, RESUFLOR PERFORMANCE HTS

A. Resuflor Performance HTS.
1. Primer Coat: Resuflor MPE, 3-5 mils. If a moisture mitigating primer is needed, Resuprime 3830-3835 Moisture Mitigation Primer can be used.
2. Build Coat: Resuflor MPE, 17-13 mils.
3. Topcoat: Resutile HTS 100, 3 mils.
4. Color: As selected by Architect from manufacturer's full range.

3.03 SYSTEM PROPERTIES

A. Resuflor Performance HTS
1. Abrasion Resistance Taber Abraser CS-17 Taber Abrasion Wheel, 1,000 gram load, 1,000 revolutions, ASTM D4060, 18 mg/loss
2. Adhesion to Concrete, psi (MPa), ASTM D4541, 450 [3.10] (concrete failed)
3. Adhesion to concrete, psi [MPa], ASTM D7234, 732[4.48] (concrete failed)
4. Coefficient of Friction-COF, James Friction Tester, ASTM D2047, 0.63
5. Coefficient of Friction-Wet Static, BOT 3000, ANSI/NFSI B101.1, 0.94
6. Compressive Strength, psi [MPa], ASTM D695, 13,500 [93.08]
7. Flammability, mm/min, ASTM D635, 182
8. König Hardness 93 mil/0.08 mm film), ASTM D4366, 171.3
9. Resistance to Yellowing as measured using ASTM D2244 after 1000 consecutive hours UV exposure in QUV, ASTM G154, <10 increase of yellow units (CIE Lab ?) if pigmented topcoat
10. Shore D Hardness, ASTM D2240, 80-85 @ 0 sec|75-80 @ 15 sec
11. Tensile Strength, psi [MPa], ASTM D2370, 6,250 [43.09]
12. Percent Elongation, ASTM D2370, 6%
13. Volatile Organic Compound, VOC lb./gal [g/l], ASTM D3960, Resuflor MPE A+B=0.41 [49] Resutile HTS 100 A+B=0.05 [6]

14. Water Absorption, 24- hour immersion, ASTM C413, 0.2% weight increase

3.04 PRODUCT PROPERTIES

A. Resuflor MPE: A neutral, two-component, high solids epoxy.
   1. Percent Solids, by weight (by volume), ASTM D1475, A + B: 95.45 (94.56).
   2. Volatile Organic Compound-VOC, ASTM D3960, Mixed A + B: 0.41 lb./gal (49 g/L).
   3. Abrasion Resistance, mg loss, Taber Abraser, C-17 Taber Abrasion Wheel, 1,000 gram load, 1,000 revolutions, ASTM D4060: 83.1.
   4. Coefficient of Friction-COF, James Friction Tester, ASTM D2047: 0.59-0.62.
   5. Adhesion to Concrete, ASTM D5441: 732 psi (4.48 MPa) concrete failed.
   6. Adhesion to Concrete, ASTM D7234: 450 psi (3.10 MPa) concrete failed.
   7. Compressive Strength, ASTM D695: 13,500 psi (93.079 MPa).
   8. Tensile Strength, ASTM D2370: 8,000 psi (55.158 MPa).
   9. Percent Elongation, ASTM D2370: 5.
   10. Shor D Hardness, ASTM D2240: 80-85 at 0 sec, 75-80 at 15 sec.

B. Resutile HTS 100: A clear high solids, three-component, satin finish, aliphatic, moisture-cure urethane.
   1. Percent Solids, by weight (by volume), ASTM D2369, A + B + C: 94.02 (92.57).
   2. Volatile Organic Compound-VOC, ASTM D3960, Mixed A + B + C: 0.05 lb/gal (6 g/L).
   3. Abrasion Resistance, mg loss, Taber Abraser, C-17 Taber Abrasion Wheel, 1,000 gram load, 1,000 revolutions, ASTM D4060: 18.
   4. Coefficient of Friction-COF, James Friction Tester, ASTM D2047: 0.63.
   5. Wet Static Coefficient of Friction, BOT 3000, ANSI/NFSI B101.1: 0.94.
   6. Flammability, ASTM G154: 182 mm/min.
   7. Resistance to Yellowing as measured using ASTM D2244 after 1000 consecutive hours UV exposure in QUV, ASTM G154, Less than 10 increase of yellow units (CIE Lab ?b)
   8. Tensile Strength, (resin only), ASTM D2370: 6,250 psi (43,092 MPa).
   9. Percent Elongation, (resin only), ASTM D2370: 6.
   10. König Hardness, (3 mil/76.2 micron film), ASTM D4366: 171.3.
   11. Water Absorption, 24-hour immersion, ASTM C413: 0.2 percent weight increase.

PART 3 EXECUTION

4.01 EXAMINATION

A. Examine concrete surfaces to receive flooring system. Verify concrete is structurally sound.

B. Moisture Testing of Concrete: Perform at least one of the following two tests to determine moisture in concrete. Type of test and frequence as recommended by manufacturer and installer.
   1. In-situ Probe Test:
      a. Measure relative humidity in concrete in accordance with ASTM F 2170.
      b. Application of flooring system shall start only if test results are below 75 percent relative concrete humidity.
      c. If test results are above limits, notify Architect and flooring manufacturer in writing.

C. Do not begin preparation or installation until satisfactory moisture test results are achieved. Provide flooring manufacturer's recommended moisture vapor control coating if required.

4.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Protection of In-Place Conditions: Protect adjacent surfaces and adjoining walls from contact with flooring system materials.

C. Surface Preparation:
   1. Prepare concrete surface in accordance with manufacturer’s instructions.
   2. Remove dirt, dust, debris, oil, grease, curing agents, bond breakers, paint, coatings, sealers, silicones, and other surface contaminants which could adversely affect application of flooring system.

3. Steel shot blast concrete to a minimum surface profile of ICRI 310.2R, CSP 5.
4. Key-cut termination points with 1/4-inch (6-mm) by 1/4-inch (6-mm) cut.
5. Patch depressions, divots, and cracks in concrete in accordance with manufacturer's instructions.
6. Mechanically remove loose, delaminated, and damaged concrete and repair in accordance with manufacturer's instructions.
7. Joints: Fill joints in accordance with manufacturer's instructions.

4.03 INSTALLATION

A. Install flooring system in accordance with manufacturer's instructions and approved submittals at locations indicated on the Drawings.

B. Ensure concrete is dry, clean, and prepared in accordance with manufacturer's instructions.

C. Allow concrete to cure a minimum of 7 days before applying flooring system.

D. Mixing:
1. Mix material components together in accordance with manufacturer's instructions.
2. Mix only enough material that can be applied within working time.
3. Add and mix colorants with materials in accordance with manufacturer's instructions to achieve uniform color.

E. Apply flooring system materials to obtain consistent mil thickness and smooth, uniform appearance and texture.

F. Overlay: Apply overlay in accordance with manufacturer's instructions. Apply overlay to prepared concrete surface.

G. Traction Aggregate: Broadcast traction aggregate in accordance with manufacturer's instructions. Broadcast traction aggregate into wet overlay.

H. Cove:
1. Apply cove primer and cove in accordance with manufacturer's instructions at locations indicated on the Drawings.
2. Apply cove to height and shape as indicated on the Drawings.
3. Apply cove to create seamless, smooth transition between flooring and walls.

I. Seal Coat:
1. Apply seal coat in accordance with manufacturer's instructions.
2. Apply seal coat over traction aggregate.

4.04 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

B. appropriate sections in Division 01.

4.05 CLEANING AND PROTECTION

A. Allow flooring system to dry in accordance with manufacturer's instructions before opening to traffic.

B. Allow flooring system to dry a minimum of 1 week before cleaning by mechanical means.

C. Protect completed flooring system from damage during construction.

END OF SECTION

SECTION 09 67 23.03 - RESINOUS FLOORING - WASH BAY

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes:
   1. High-performance resinous flooring systems.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Data must state that moisture testing is not required.
   2. Installer Certificates for Qualification: Signed by manufacturer certifying that installers comply with specified requirements.
   3. Material Certificates: For each resinous flooring component, from manufacturer.
   4. Material Test Reports: For each resinous flooring system.
   5. Maintenance Data: For maintenance manuals.
   6. Samples: Submit one sample of coating, indicating coating applied on horizontal surfaces. Sample shall illustrate transition from Resinous Flooring system. Provide sample which is a true representation of proposed field applied finish-created by the contractor; not laboratory applied finish. Provide minimum 12 feet by 4 feet field sample color and four (4) texture options for owner approval as a mockup at location designated by General Contractor for review and written approval prior to installation of any other areas.
   7. Product Schedule: For resinous flooring.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
   1. Engage an installer who is approved in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
   2. Installer Letter of Certification: Installer to provide letter stating that they have been in business for at least 10 years and listing 5 projects in the last 2 years of similar scope. For each project provide: project name, location, date of installation, contact information, size of project, and manufacturer of materials with system information.
   3. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
   4. Pre-installation Conference: Conduct conference at Project site before work and mockups begin.
   5. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
      a. Apply full-thickness mockups on 48-inch square floor area selected by Architect.
      b. Simulate finished lighting conditions for Architect's review of mockups.
      c. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
      d. Mockup shall demonstrate desired slip resistance for review and approval by General Contractor prior to installing project areas.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by:
   1. The Sherwin Williams Company, Cleveland, OH. Contact Scott Kaiser, scott.kaiser@sherwin.com, 503-319-5209
   2. Basis of Design: FasTop Multi Topfloor SL45
      a. Cove Base (Optional): FasTop Multi Cove Base, 15-20 linear feet per kit at 6” with 1” radius.
      b. Primer (Optional for outgassing): Resuflor Aqua 3477 at 250 sq. ft. per gallon.
      c. Slurry (1/4”): Fastop Multi SL45 @ 32-35 sq. ft. per unit.
      d. Broadcast: 5310 Dry Silica (20-40 mesh) into wet slurry.
      e. Topcoat: Elladur 4850 Polyaspartic at 160-200 sq. ft. per gallon.
      f. Total System Thickness 1/4” nominal.
      g. If a non-slip texture is desired, the “aggregate texture” can be selected from the Sherwin-Williams High Performance Flooring Industrial Texture Bar.
      h. Fine mesh aluminum oxide can be added into the topcoat to provide a more slip resistant finish. Mock up samples should be installed and approved by the owner’s representative and design team before the high performance flooring system is installed.
      i. Optional: 4” or 6” smooth, integral cove base as selected by architect, with termination at metal cove cap.

2.02 MATERIALS

A. VOC Content of Resinous Flooring: Provide resinous flooring systems, for use inside the weatherproofing system, that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].
   1. Resinous Flooring: 100 g/L.

2.03 HIGH-PERFORMANCE RESINOUS FLOORING

A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, high-performance, resin-based, monolithic floor surfacing designed to produce a seamless floor.

B. System Characteristics:
   1. Color and Pattern: As indicated from manufacturers listed above.
   2. Slip Resistance: Provide slip resistant finish.

PART 3 EXECUTION

3.01 PREPARATION

A. Inspection: Prior to commencing Work, thoroughly examine all underlying and adjoining work, surfaces and conditions upon which Work is in any way dependent for perfect results. Report all conditions which affect Work. No "waiver of responsibility" for incomplete, inadequate or defective underlaying and adjoining work, surfaces and conditions will be considered, unless notice of such unsatisfactory conditions has been filed and agreed to in writing before Work begins. Commencement of Work constitutes acceptance of surfaces.

B. USE ONLY MOISTURE INSENSITVE SYSTEMS, that require no moisture testing and warrantied by manufacturer. No systems allowed that require moisture testing.

C. Only installers approved by the manufacturer in writing shall perform installation of the material.

D. Surface Preparation: Remove all surface contamination, loose or weakly adherent particles, laitance, grease, oil, curing compounds, paint, dust and debris by blast track method or approved mechanical means (acid etch not allowed). If surface is questionable, try a test patch. Create a minimum surface profile for the system specified in accordance with the methods described in ICRI No. 03732 to achieve CSP 4.

3.02 ENVIRONMENTAL CONDITIONS

A. All applicators and all other personnel in the area of the RF installation shall take all required and necessary safety precautions. All manufacturers' installation instructions shall be implicitly instructions shall be implicitly followed.

B. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.

C. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

E. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

F. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

3.03 APPLICATIONS

A. Install resinous floor over properly prepared concrete surface in strict accordance with the manufacturer's directions.
   1. Install the primer and/or base coats over thoroughly cleaned and prepared concrete.
   2. Install topcoat over flooring after excess aggregate has been removed.
   3. Maintain a slab temperature of 60°F to 80°F for 24 hours minimum before applying floor topping.
   4. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
      a. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
      b. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
      c. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
   5. Sealant: Saw cut resinous floor topping at expansion joints in concrete slab. Fill sawcuts with sealant prior to final seal coat application. Follow manufacturer's written recommendations.
   6. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
   7. Slip Resistant Finish: Provide grit for slip resistance.
   8. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.04 COMPLETED WORK

A. Cleaning: Upon completion of the Work, clean up and remove from the premises surplus materials, tools, appliances, empty cans, cartons and rubbish resulting from the Work. Clean off all spattering and drippings, and all resulting stains.

B. Protection: Protect Work in accordance with manufacturer's directions from damage and wear during the remainder of the construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

C. Contractor shall insure that coating is protected from any traffic until it is fully cured to the satisfaction of the coating manufacturer.

END OF SECTION

SECTION 09 68 13 - TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Concrete: Floor substrate surface.

B. Section 09 65 13 - Resilient Flooring: Vinyl bases.

C. Section 26 05 26 – Grounding and Bonding.

1.03 REFERENCE STANDARDS

A. AATCC 134 - Electrostatic Propensity of Carpets.

B. ASTM E84 - Surface Burning Characteristics of Building Materials.

C. ASTM E648 - Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

D. ASTM E662 - Specific Optical Density of Smoke Generated by Solid Materials.

E. ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

F. DOC FF-1-70 - Surface Flammability of Carpets and Rugs.

G. NFPA 253 - Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

H. NFPA 255 - Surface Burning Characteristics of Building Materials.

I. NFPA 258 - Smoke Generation of Solid Materials.

1.04 SUBMITTALS

1. Indicate patterns and accent areas; including colors to be used in each installation.

A. Indicate seaming plan, method of joining seams, and direction of carpet.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Sustainable Design Submittal: Submit VOC content documentation for adhesives.

E. Submit manufacturer's installation instructions under provisions of Division 1.

F. Submit manufacturer’s warranty information.

1.05 MAINTENANCE DATA

A. Submit maintenance data under provisions of Division 1.

B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning and shampooing.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has successfully completed at least 10 installations of carpet similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance, including type of carpet seams required for type of carpet indicated.

B. Mockup: Before installing carpet, install carpet in one room selected by Owner's Representative to demonstrate typical carpet installation.

1. Obtain approval of room mockup before starting carpet installation.

2. Maintain room mockup during construction in an undisturbed condition as a standard for judging the carpet installation throughout building.

C. Source Limitations: Obtain each type of carpet through one source from a single manufacturer.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of Indiana Building Code.

B. Conform to flammability requirements of 75/450 for floors in accordance with ASTM E84 (NFPA 255).

1.08 ENVIRONMENTAL REQUIREMENTS

A. Store materials for three (3) days prior to installation in area of installation to achieve temperature stability.

B. Maintain minimum 70 degrees F ambient temperature three (3) days prior to, during, and twenty-four (24) hours after installation of materials.

C. Moisture vapor emission content of the concrete slab must not exceed manufacturer's recommended criteria when using the calcium chloride test as per ASTM F1869.

1.09 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Carpet Warranty: Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
   1. Warranty Period: 15 years from date of Substantial Completion.

C. Installation Warranty: Written warranty, signed by carpet installer and Contractor agreeing to correct faulty workmanship and defects within specified warrant period.
   1. Warranty Period: 2 years from date of Substantial Completion.
   2. Within one (1) month of expiration of installation warranty, arrange meeting with Owner’s Representative to inspect carpet installation.
   3. Correct all defects noted before expiration of installation warranty.

1.10 EXTRA MATERIALS

A. Furnish not less than 5 percent of amount installed for each carpet tile type and color indicated, but not less than 10 square yard.

1.11 DEMONSTRATION

A. Instruct Owner’s Personnel on care and maintenance of Carpet Tile.

PART 2 PRODUCTS

2.01 MATERIALS

A. Carpet: To be manufactured by Interface, Inc. Carpet tile, Walk-off carpet Tile and sealer to be purchased by Contractor and Contractor installed. A sealer is required to be applied to floors that are to receive carpet tile. The Carpet tile shall be installed in spaces using a Releasable Adhesive system. Contractor to provide quantity of tile and sealer needed. Contractor shall be responsible for unloading, storage, distribution and installation. Contractor shall provide all accessories such as transition strips, thresholds, etc. unless noted otherwise, or as noted at the end of this Section.
   1. Vinyl Trim Material: Furnished and installed by Contractor.

B. Carpet: Colors, pattern, and design of all carpet as indicated on the drawings.
   1. General:
      a. Carpet specifications subject to maximum manufacturer's tolerance of 5 percent.

2.02 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by carpet manufacturer.

B. Primers, Sealers and Adhesives: Waterproof; of types recommended by carpet manufacturer.

C. Vinyl Trim: As manufactured by Roppe, Fostoria, Ohio; or an approved equal; color as selected by the architect.
   1. Carpet Edge Abutting Uncarpeted Area: As indicated on drawings.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are smooth and flat with maximum variation of 1/8 inch in 10 feet and are ready to receive work.

B. Beginning of installation means acceptance of existing substrate and site conditions.

C. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Clean out completely and fill all saw-cuts and joints with floor manufacturer recommended filler.

C. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

D. Apply filler at junction of different types of flooring to provide a smooth transition.

E. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

F. Vacuum clean substrate.
   1. Install moisture mitigation, primer / sealer as reccommended by floor covering manufacturer.

3.03 INSTALLATION - GENERAL

A. Apply carpet and adhesive in accordance with manufacturer's instructions.

B. Verify carpet match before cutting to ensure minimal variation between dye lots.

C. Double cut carpet, to allow intended seam and pattern match.

D. Make cuts straight, true, and unfrayed.

E. Fit seams straight, not crowded or peaked, free of gaps.

F. Cut and fit carpet around interruptions.

G. Fit carpet tight to intersections with vertical surfaces without gaps.

H. Consult with Owner’s Representative prior to installation of any carpet trim.

3.04 INSTALLATION - CARPET TILES

A. Install carpet tiles in the free lay method in accordance with manufacturer's instructions.

B. Install carpet with all fiber nap in a quarter-turn non-directional pattern.

3.05 FIELD QUALITY CONTROL

A. Moisture vapor emission content of the concrete slab must not exceed manufacturer's recommended criteria when using the calcium chloride test as per ASTM F1869. Provide results of test in writing to Owner’s representative prior to installation procedures.

B. The Owner may take random samples for testing, approximately one square yard of each type and color of carpet delivered to the project.

C. Testing will be the responsibility of the Contractor.

D. Remove all materials not meeting the specifications and replace with new approved materials.

3.06 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove excess adhesive without damage, from floor, base, and wall surfaces.

C. Clean and vacuum carpet surfaces.

D. All carpet shall be free of dust, paint, debris or other construction debris.

3.07 PROTECTION

A. Prohibit traffic from carpet areas for 24 hours after installation.
   1. Provide plastic runway covers continuos and areas of concentrated foor traffic and as directed by Owner's Representative.

3.08 ADDITIONAL REQUIREMENTS

A. Contractor shall conduct moisture tests on floor slabs prior to installation of carpet. Test shall meet acceptable levels as per manufacturer's recommendations. Results of moisture tests shall be provided in writing to Owner's Representative prior to installation of floor covering. If moisture tests dictate that moisture mitigation is required, Contractor shall provide moisture mitigation as recommended by flooring manufacturer.

END OF SECTION

SECTION 09 91 00 - PAINTING

GENERAL

1.01 SECTION INCLUDES

A. Surface preparation and painting.

B. Surface finish schedule.

1.02 RELATED SECTIONS

A. Section 05 12 00 - Structural Steel: Shop primed items.

B. Section 05 50 00 - Miscellaneous Metals: Shop primed items.

C. Section 08 11 13 - Standard Steel Doors and Frames: Shop primed items.

D. Section 08 36 13 – Overhead Sectional Doors: Shop primed items.

E. Section 09 96 00 – High Performance Coatings

F. Mechanical and Electrical Items.

1.03 REFERENCES

A. SSPC-SP-1 - Solvent Cleaning.

B. SSPC-SP-2 - Hand Tool Cleaning.

C. SSPC-SP-3 - Power Tool Cleaning.

1.04 SUBMITTALS

A. Submit two 8 inch by 10 inch color draw downs for each color identified in the “Finish Legend” and four 4 inch by 5 inch stain samples of each color to be used as noted on the Drawings.
   1. Manufacturer data identified on each draw down.
   2. Where color is not specified, submit samples under provisions of Division 1.

B. Provide product data on all finishing products.
   1. Provide physical properties of each product to be used on the project, including the following.
      a. Weight per gallon.
      b. Solids by weight.
      c. Solids by volume.
      d. V. O. C. as supplied.

C. Schedule of surfaces and products, applicable to project.

D. Submit manufacturer's application instructions under provisions of Division 1.

E. Submit documentation indicating installer is an EPA Lead-Safe Certified Firm.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced firm who is Lead-Safe Certified through the Environmental Protection Agency (EPA).

1.06 FIELD SAMPLES

A. Provide field sample panel of each color selected, 4 feet long by 4 feet wide, illustrating color, texture, and finish.

B. Locate where directed.

C. Accepted samples may remain as part of the work at the discretion of the Architect.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Deliver products to site in sealed and labeled containers, inspect to verify acceptance.

D. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

E. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by manufacturer's instructions.

F. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.08 CLOSEOUT DOCUMENTS

A. Provide itemized final finish paint schedule as acceptable to Owner's Representative indicating all paint finishes, manufacturer and colors for all room finishes and building components.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 50 degrees F for twenty-four (24) hours before, during, and forty-eight (48) hours after application of finishes, unless required otherwise by manufacturer's instructions.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.

C. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior, unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 foot-candles measured mid-height at substrate surface.

PRODUCTS

2.01 PAINT - ACCEPTABLE MANUFACTURERS

A. The Sherwin-Williams Company, Cleveland, Ohio (S-W).

B. Or as specifically noted on the Drawings.

2.02 MATERIALS

A. Coatings: Ready mixed, except field catalyzed coatings.
   1. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.

B. Coatings: Good flow and brushing properties; capable of drying or curing free of streaks or sags.

C. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners, and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.03 FINISHES

A. Refer to Finish Specifications and Schedule on drawings.

B. Colors to be selected by the Architect and Owner.

EXECUTION

3.01 INSPECTION

A. Verify that surfaces and substrate conditions are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work.
   1. Report any condition that may potentially affect proper application.

C. Beginning of installation means acceptance of substrate and existing surfaces.

3.02 PREPARATION - GENERAL

A. Provide all scaffolding and staging required for work in this Section.
   1. Coordinate locations to eliminate interference with work of others.

B. Remove electrical plates, hardware, light fixture trim, clocks, speakers, and fittings prior to preparing surfaces or finishing.

C. Correct minor defects and clean surfaces which affect work of this Section.

D. Shellac and seal marks which may bleed through surface finishes.

3.03 SURFACE PREPARATION - NEW SURFACES

A. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust.
   1. Feather edges to make touch?up patches inconspicuous.
   2. Clean surfaces with solvent.
   3. Prime bare steel surfaces.

B. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent.
   1. Apply coat of etching primer.

C. Concrete and Unit Masonry Surfaces: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter.
   1. Remove oil and grease with a solution of tri?sodium phosphate; rinse well and allow to dry.
   2. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water.
   3. Allow to dry.

D. Metal Doors: Apply one coat of paint to glazing stops and rabbets prior to glazing.

E. Impervious Surfaces: Remove mildew by scrubbing with solution of tri?sodium phosphate and bleach.
   1. Rinse with clean water and allow surface to dry.

3.04 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this Section.

C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove empty paint containers from site.

3.05 APPLICATION

A. Paint and finish all new interior and exterior general construction items; heating, air conditioning, and ventilating items; plumbing installations; and electrical items which will be exposed in the final work, except as noted below.
   1. Surfaces Not to be Painted:
      a. Sprinkler heads.
      b. Identification plates and tags.
      c. Factory finished equipment, unless specifically noted to be field finished.
      d. Stainless steel, copper, and bronze, unless specifically noted to be painted.
      e. Anodized aluminum.
      f. Concrete floors, unless specifically noted to be painted.
      g. Exterior concrete.
      h. Door hardware, except closers and removable mullions that are not aluminum or plated.
      i. Glass.
      j. Plated finishes.
      k. Concealed surfaces, unless specifically noted to be painted.

B. Apply products in accordance with manufacturer's instructions.

C. Overspray on concrete floors will not be acceptable.

D. Do not apply finishes to surfaces that are not dry.

E. Apply each coat to uniform finish.

F. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

G. Sand lightly between coats to achieve required finish.

H. Allow applied coat to dry before next coat is applied.

I. Apply paint by the brush method, as recommended by the manufacturer and as approved by the Architect.
   1. Apply final coat to concrete, masonry, and smooth finished wall and ceiling surfaces with roller.
   2. Apply paint to exposed ceiling surfaces and in inaccessible areas by spraying.
   3. Do not use spray application on other areas without written approval of Architect.

J. Draw lines of demarcation between different shades or colors to eliminate blurred edges.

K. Back-prime all surfaces of interior and exterior wood blocking and woodwork, except pressure treated wood and wood framing, with one coat of aluminum paint.

L. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

M. Where clear finishes are required, tint fillers to match wood.
   1. Work fillers into the grain before set.
   2. Wipe excess from surface.

N. Coat steel items that come in contact with aluminum items with a field coat of bituminous paint.

O. Paint Piping and Coverings in Boiler Room and Mechanical Equipment Rooms only.
   1. See Division 22 and Division 23, Mechanical Identification, for required colors.

P. Paint exposed conduit and surface raceways in with wall.

Q. Paint coverings of boiler and breeching light gray.

R. Paint walls behind metal enclosures with one coat primer and one finish coat prior to installation of metal enclosures.

S. Paint any damaged surfaces or new surfaces in existing areas where new work is required.
   1. Paint as scheduled; or touch up damaged areas, paint entire wall, or paint to a stopping point as approved by the Architect.

T. Paint all new exposed ceiling construction, including joists, structural members, metal deck or deck forms and all new and existing exposed conduit, surface raceways, pipes, pipe covering, and ductwork in these ceiling areas.
   1. Paint walls the same color as exposed structure, in these areas, from the underside of deck down to a point level with lowest point of roof structure. Remainder of wall to floor line shall be color as indicated on the “Finish Legend”.

U. Seal, stain, and varnish concealed and semi-concealed surfaces of millwork items.
   1. Seal internal surfaces of millwork items with two coats of shellac.
   2. Brush apply only.

3.06 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint shop primed equipment.

B. Touch up marred or damaged shop prefinished items.

C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

D. Replace identification markings on mechanical or electrical equipment when painted accidentally.

E. Paint interior surfaces of air ducts, and convector and heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line.
   1. Paint dampers exposed behind louvers, grilles, and convector and heating cabinets to match face panels.

F. Paint exposed conduit, surface raceways, and electrical equipment occurring in finished areas.

G. Paint both sides and all edges of plywood backboards for electrical and telephone equipment with one coat of light to medium gray paint before installation of equipment.

H. Reinstall electrical plates, hardware, light fixture trim, clocks, speakers, and fittings removed prior to finishing.

I. Paint all exterior steel downspout boots, cleanout covers, valve covers. Confirm colors with Owner's Representative.

J. Paint all equipment located on roofs, including aluminum exhaust fans, gravity relief vents, appliance exhausts, and all equipment, unless factory finish is acceptable to Architect.
   1. Do not paint aluminum roof penthouses.

K. Refer to Divisions 22, 23, and Section 26 for schedule of color coding and identification banding of equipment, ductwork, piping, conduit, and surface raceways.

3.07 CLEANING

A. As work proceeds, promptly remove paint where spilled, splashed, or spattered.

B. During progress of work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.08 SCHEDULE - SHOP PRIMED ITEMS FOR SITE FINISHING

A. Miscellaneous Metals (Section 05 50 00): Various items.

B. Standard Steel Doors and Frames (Section 08 11 13): Metal doors, frames, and accessories.

C. (Section 08 36 13): Door accessories.

3.09 SCHEDULE - INTERIOR AND EXTERIOR SURFACES

A. Gypsum Board - Latex (Location: Offices)
   1. Prime Coat: B28W2600 ProMar 200 Zero VOC Interior Latex Primer
   2. Two Finish Coats: B20W12651 ProMar 200 Zero VOC Interior Latex - Eg-Shel. Colors as indicated on drawings.

B. Gypsum Board - Epoxy (Location: Unisex Restrooms)
   1. Prime Coat: B28W2600 ProMar 200 Zero VOC Interior Latex Primer
   2. Two Finish Coats: K45W2151 Pro Industrial Precatalyzed Waterbased Epoxy - Eg-Shel. Colors as indicated on drawings.

C. Concrete and Masonry - Latex (Location: Offices, Vestibule, Conference Room, IT Room, Corridor #101, Corridor #106)
   1. Prime Coat (bare CMU areas only): B25W25 PrepRite Block Filler
   2. Two Finish Coats: B66W1251 Pro Industrial DTM Acrylic - Eg-Shel. Colors as indicated on drawings.

D. Concrete and Masonry - Epoxy (Location: Unisex Restrooms, Men's and Women's Restrooms, Breakroom, Print Room, Electrical Room, Janitor's Closet, Corridor #110, Corridor #113)
   1. Prime Coat/Spot Prime Coat (bare CMU areas only): B25W25 PrepRite Block Filler
   2. Two Finish Coats: K45W1151 Pro Industrial PreCatalyzed Waterbased Epoxy - Eg-Shel. Colors as indicated on drawings.

E. Concrete and Masonry - Epoxy (Location: Maintenance Bays, Parts Storage #119 and Storage/Work Room #120)
   1. Prime Coat/Spot Prime Coat (bare CMU areas only): B25W25 PrepRite Block Filler
   2. Finish Coat: K46W2151 Pro Industrial PreCatalyzed Waterbased Epoxy - Semi-Gloss. Colors as indicated on drawings.

F. Hollow Metal Doors and Frames
   1. Prime Coat
      a. Prime Coat (bare galvanized metal only): B66W1310 Pro Industrial Pro-Cryl Universal Primer

b. Prime Coat (bare ferrous metal and rusting areas only): B50WZ4 Kem Bond HS High Solids Alkyd Universal Metal Primer

2. Two Finish Coats: B53W2151 Pro Industrial Waterbased Alkyd Urethane Enamel - Semi-Gloss. Colors as indicated on drawings.

G. Interior Primed Metal (Location: Stairs, Guardrail and Handrail)
1. Spot Prime / Prime Coat
a. Spot Prime/Prime Coat (bare ferrous metals only): B50WZ4 Kem Bond HS High Solids Alkyd Universal Metal Primer
b. Spot Prime/Prime Coat (bare galvanized metals only): B66W1310 Pro Industrial Pro-Cryl Universal Primer
2. First Coat: B70W8111 Armorseal 8100 Water Based Epoxy Floor Coating - Gloss
3. Second Coat: B70W8111 Armorseal 8100 Water Based Epoxy Floor Coating - Gloss. Colors as indicated on drawings.

H. Interior Exposed Concrete Ceiling Deck (Location: Ceiling in Parts Storage #119 and Storage/Work Room #120)
1. Prime/Spot Prime Coat (bare concrete/masonry areas only): LX02W0050 Loxon Concrete & Masonry Primer/Sealer - Interior/Exterior Latex
2. Finish Coat(s): B42W181 Pro Industrial Waterborne Acrylic Dryfall - Flat

I. Interior Galvanized Steel (Location: Bent Plate at Perimeter of Mezzanine and Exposed Galvanized Conduits, J-Boxes and piping)
1. Prime Coat (bare galvanized metal only): B66W1310 Pro Industrial Pro-Cryl Universal Primer
2. Finish Coat: B70Y8100 Armorseal 8100 Water Based Epoxy Floor Coating - Gloss, Safety Yellow

J. Interior Exposed Structural Steel (Location: Exposed PEMB Steel Structure, Wall Girts, Purlins, Exposed Compressed Black Iron Air Pipe, Wet-Pipe Sprinkler Piping and Gas Piping)
1. Prime Coat: B67A5 Recoatable Epoxy Primer
2. Two Finish Coats: B65WJ311 Hi-Solids Polyurethane, Two-Component Aliphatic, Acrylic Polyurethane Resin Coating - Gloss. Colors to be selected by manufacturer's full range of colors.
3. Compressed air pipe color shall be blue. Verify with Owner.
4. Wet-Pipe Sprinkler System riser pipe shall be painted red from finished floor elevation up to eave height. All branch lines to be painted same color as structural steel.
5. Gas piping shall be painted yellow.

END OF SECTION

SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes surface preparation and field application of exterior fluoropolymer coating system to all new exterior lintels, overhead door galvanized bent plate jambs, cast iron downspout boots and exterior pipe bollards.

B. Surface preparation.

1.02 REFERENCES

A. SSPC-SP-1 - Solvent Cleaning.

B. SSPC-SP-2 - Hand Tool Cleaning.

C. SSPC-SP-3 - Power Tool Cleaning.

1.03 SUBMITTALS

A. Product Data: For each coating system indicated. Include primers and finish coats.
   1. Provide physical properties of each product to be used on the project, including the following.
      a. Weight per gallon.
      b. Solids by weight.
      c. Solids by volume.
      d. VOC content as supplied.

B. Submit one paint color sample of each color to be used as indicated in on drawings.
   1. Where color is not specified, submit samples under provisions of Division 1.

C. Schedule of surfaces and products, applicable to project.

D. Submit manufacturer's application instructions under provisions of Division 1.

E. Submit manufacturer’s field quality-control inspection reports.

F. Submit manufacturer’s warranty information.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an applicator with minimum 10 years experience, who has successfully completed high performance coating system applications similar in material and extent to those indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain high performance coatings through one source from a single manufacturer for each product indicated.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section “Project Meetings.” Review methods and procedures related to High Performance Coatings including, but not limited to, the following:
   1. Inspect and discuss existing conditions and preparatory work required.
   2. Review and finalize construction schedule and verify availability of materials, applicators personnel, and equipment needed to make progress and avoid delays.
   3. Review weather and forecasted weather conditions and procedures for unfavorable conditions.

1.05 FIELD SAMPLES

A. Provide field sample panel of each color selected, 4 feet long by 4 feet wide, illustrating color, texture, and finish.

B. Locate where directed.

C. Accepted samples may remain as part of the work at the discretion of the Architect.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Deliver products to site in sealed and labeled containers, inspect to verify acceptance.

D. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

E. Store paint materials at minimum ambient temperature of 50 degrees F and a maximum of 75 degrees F, in well ventilated area, unless otherwise indicated in manufacturer's instructions.

F. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 75 degrees F, unless otherwise indicated in manufacturer's written installation instructions.

B. Do not apply exterior coating during windy conditions. Application of paint shall be coordinated at times where no overspray will be subject of carrying at locations where vehicles are parked around the building, in parking lots, drives or along streets.

C. Do not apply exterior coatings during rain or snow, or when relative humidity is above 70 percent, unless otherwise indicated in manufacturer's written installation instructions.

1.08 WARRANTY

A. Finish Warranty: Provide warranty to repair or refinish products and panels that show evidence of deterioration of exterior field-applied finishes within specified warranty period.
   1. Fluoropolymer Coating System: 10 years from date of Substantial Completion.
   2. Deterioration includes the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to metal panels.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Fluoropolymer Coating System:
   1. Sherwin Williams (No substitutions).

2.02 MATERIALS, GENERAL

A. Material Compatibility: Provide primers and finish coat materials that are compatible with one another and existing exterior substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Coatings: Two-component fluoropolymer coating system consisting of fluoropolymer resins and an aliphatic isocyanurate.

C. Accessory Materials: As recommended by manufacturer of coating materials.

2.03 FINISHES

A. Color: As selected by Architect.

2.04 EXTERIOR HIGH PERFORMANCE COATING SYSTEMS

A. Primer: As recommended by manufacturer of coating system.

B. Finish Coat: Two-component fluoropolymer coating system.
   1. Sherwin Williams

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not begin application of coatings until substrates have been properly prepared.

C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

E. Beginning of installation means acceptance of substrate surfaces and existing conditions.

3.02 PREPARATION - GENERAL

A. Provide all scaffolding and staging required for work of this Section.
   1. Coordinate locations to eliminate interference with work of others.

B. Correct minor defects and clean surfaces which affect work of this Section.

C. Remove finish hardware, fixture covers, and accessories and store.

3.03 SURFACE PREPARATION

A. Cleaning: Before applying high performance coating system, clean existing metal substrates of substances that could impair bond of coatings.
   1. Pressure wash entire area to remove dirt, grime, and other contaminants that could impair bond of coatings.
   2. Clean and prepare surfaces to be coated according to manufacturer’s written instructions for substrate indicated and as specified.

B. Existing Painted Metal Surfaces: Solvent clean all surfaces in accordance with SSPC-SP-1.
   1. Clean rusted surfaces in accordance with SSPC-SP-2 or SSPC-SP-3.
   2. Spot prime as required.
   3. Finish as specified for new work.

C. Existing Gloss Surfaces: Sand or etch gloss surfaces prior to application of primer coat.

3.04 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this Section.

C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Keep all overspray from all existing building components including but not limited to exterior masonry, window units, limestone, concrete pavement, etc.

E. Remove empty paint containers from site.

3.05 APPLICATION

A. Apply high performance coating system to all exterior metal panel surfaces as indicated on Drawings.

B. Apply products in accordance with manufacturer's instructions.

C. Do not apply finishes to surfaces that are not dry.

D. Apply each coat to smooth uniform finish as approved by the Architect and Owner’s Representative. Paint “runners” shall not be acceptable.

E. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

F. Sand lightly between coats to achieve required finish.

G. Allow applied coat to dry before next coat is applied.

H. Apply paint as recommended by the manufacturer and as approved by the Architect.

I. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer’s recommended spreading rate to achieve a wet film thickness as recommended by manufacturer to achieve warranty indicated.

3.06 FIELD QUALITY CONTROL

A. Inspection Reports: Arrange for coating manufacturer's technical personnel to inspect existing conditions prior to installation, inspect coating installation while in progress, and inspect coating installation on completion and submit reports to Owner's Representative for each phase of process.

3.07 CLEANING

A. As work proceeds, promptly remove paint where spilled, splashed, or spattered.

B. During the progress of work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

END OF SECTION

SECTION 10 14 00 - SIGNAGE

GENERAL

1.01 SECTION INCLUDES

A. Exterior mounted aluminum letters and numbers.

1.02 RELATED SECTIONS

A. Section 04 20 00 – Unit Masonry.

B. Section 08 81 00 – Glazing.

1.03 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Furnish full size spacing templates for aluminum letters and numbers.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site and store and protect under provisions of Division 1.

PRODUCTS

2.01 MATERIALS

A. Aluminum Letters and Numbers: Provide with flat faces, free of waves and depressions. Grind all edges smooth.
   1. Cast or fabricate aluminum letters.
   2. Letters shall be 12” high. Refer to drawings.
   3. Letter style as selected by the Architect.
   4. Minimum three mounting lugs for each letter.
   5. Building Name: See drawings. Verify building name prior to fabrication.
   6. Finish: Catalyzed polyurethane baked enamel finish.
      a. AA - M12C22A34, classic black.
   7. Provide all anchors and accessories required for flush stand off mounting.

EXECUTION

3.01 INSTALLATION

A. Aluminum Letters: Install in accordance with manufacturer's recommendations.
   1. Install on the masonry wall in accordance with manufacturer's recommendations.
   2. Install on the metal panel siding in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 10 21 13.19 - PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments.

1.02 RELATED REQUIREMENTS

A. Section 10 28 00 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ADAAG - Americans with Disabilities Act Accessibility Guidelines.

1.04 SYSTEM DESCRIPTION

A. Provide doors for all partitions.

B. Extend head rails full length of each installation and return at end partitions.

1.05 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

D. Provide color samples to Architect for review and selection.

1.06 REGULATORY REQUIREMENTS

A. Provide toilet partitions per NFPA 286

B. Install work in conformance with ADAAG and Indiana Handicapped Accessibility Rules.
   1. Handicapped Stall Latches: Shall not require pinching, grasping, or turning.
   2. Coat Hook in Handicapped Stall: Mount on wall at hinge side of door within 54 inches of the floor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Toilet Compartments:
   1. ASI Accurate Partitions: www.asi-accuratepartitions.com/#sle.
   2. Metpar Corp: www.metpar.com/#sle.
   3. Partitions Systems, Inc. of South Carolina, Columbia, South Carolina.
   4. Ampco Products, Inc., Miami, Florida.
   5. Substitutions: Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Partitions: Fabricated from polymer resins under high pressure forming a single component section.

B. Provide special plastic protective covering on each panel, door, and pilaster during shipment.

2.03 HARDWARE

A. Doors:
   1. Hinges: 6463-T5 heavy aluminum extrusion with clear anodized finish, wrap around flanges, surface mounted, through bolted to doors and pilasters with one-way sex bolts.
   2. Coat Hook and Bumper: Provide each door with one coat hook and bumper.
      a. Provide each door on handicap compartments with one door pull and one wall stop.
   3. Strike and Keeper: 6463-T5 heavy aluminum extrusion with clear anodized finish, wrap around flange, surface mounted to pilaster with one-way sex bolts.
   4. Door Latch Housing: 6463-T5 heavy aluminum extrusion with clear anodized finish, surface mounted to door with one-way sex bolt.
      a. Fabricate slide bolt and button with "Tough-Coat Black" finish.

B. Pilaster Shoes: Plastic nonabsorbent, corrosive resistant and color to match partitions, 3 inches high.

C. Wall Brackets: Full length, continuous, 6463?T5 aluminum, mill finish, minimum 1.685 pounds per linear foot.
   1. Predrill at 6 inches on center, through bolt to panels and pilasters with one-way sex bolts.

D. Headrails: 6463-T5 heavy aluminum extrusion with mill finish, anti-grip configuration, minimum 1.188 pounds per linear foot.
   1. Fasten to top of pilasters and headrail brackets with one?way sex bolts.

E. Headrail Brackets: 16 gage stainless steel.

2.04 FABRICATION

A. Fabricate doors, panels, and partitions to 1 inch thickness.
   1. Machine edges to radius of 0.250 inch; exposed edges free of saw marks.

B. Fabricate doors and panels to 55 inches high, mount at 14 inches above floor.
   1. Fabricate pilasters to 82 inches high; fasten to pilaster shoes with one?way sex bolts.

C. Heatsinc, provide full length aluminum edging strips on bottom edges of all doors and panels. Field applied aluminum edging strips is not allowed.

2.05 FINISHES

A. Color through thickness of panel, door, or pilaster; to be selected from manufacturer's available range.

B. Stainless Steel Surfaces: No. 4 finish.

C. Exposed Steel Surfaces: Polished chrome.

D. Aluminum: Clear anodized.

E. Non-Ferrous Surfaces: Polished Chrome.

2.06

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing where required.

D. Beginning of installation means acceptance of surfaces and substrate.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Allow for clearance at cove bases.

C. Extend pilasters, adjacent to walls, to floor.

D. Provide pilaster at urinal screen anchored to floor and to ceiling above.

E. Attach panel brackets securely to walls using approved anchor devices.
   1. Do not use plastic or rawl plugs.
   2. Locate anchor devices at joints in wall tile finish.

F. Locate headrail joints at pilaster centerlines.

G. Adjust hinges to locate doors in partial open position when unlatched.
   1. Return outswing doors to closed position.

3.03 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).

3.04 CLEANING

A. Remove protective maskings. Clean surfaces.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Division 1.

END OF SECTION

SECTION 10 26 00 - WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards and accessories.

1.02 REFERENCE STANDARDS

A. A. ASTM B 221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B. ASTM D1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

1.03 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Shop Drawings: For corner guard units showing locations and installation details.

C. Samples: Submit actual pieces of rigid plastic materials for color selection.

D. Maintenance Data: For corner guards to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has specialized in installing corner guards similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

B. Source Limitations: Obtain wall protection units through one source from a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Store inside well-ventilated area protected from the weather, moisture, soiling, extreme temperatures, and humidity.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 degrees F for not less than 72 hours before beginning installation and for the remainder of the construction period.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. ARDEN Architectural Specialties, Inc.

B. Balco, Inc.

C. Construction Specialties, Inc.

D. InPro Corporation.

E. Korogard Wall Protection Systems; Div. of RJF International Corporation.

F. Pawling Corporation.

G. Basis-of-Design Product: Inpro, glue on option.

2.02 MATERIALS

A. Extruded Rigid Plastic: ASTM D 1784, Class 1, textured, chemical and stain-resistant, high-impact resistant PVC or acrylic modified vinyl plastic with integral color throughout.

1. Impact Resistance: Minimum 25.4 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
2. Chemical and Stain Resistance: Tested according to ASTM D 543.
3. Self-extinguishing when tested according to ASTM D 635.

4. Flame-Spread Index: 25 or less.
5. Smoke-Developed Index: 450 or less.

B. Fasteners:
1. Field applied heavy duty adhesive.

2.03 CORNER GUARDS

A. Surface-Mounted, Rigid Vinyl, Corner Guards: Assembly consisting of snap-on plastic cover installed over continuous retainer; field applied heavy duty adhesive; fabricated with 90-degree turn to match wall condition.
1. Cover: One-piece, extruded rigid vinyl, minimum 0.078-inch wall thickness.
a. Profile: Nominal 3-inch-long leg and 1/4-inch corner radius.
b. Height: 4 inches above finish floor to minimum of 48 inches in height.
c. Color: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
1. Examine walls to which corner guards will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment to support fasteners.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install wall-protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
1. Install corner guard units at locations indicated on drawings, if not indicated, provide one at every gypsum board outer corner within the building.
2. Provide mounting hardware, anchors, adhesive and other accessories required for a complete installation.
a. Adjust end and top caps as required to ensure tight seams. Install bottom and top end caps to prohibit removal or vandalism.

END OF SECTION

SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 10 21 13.19 - Plastic Toilet Compartments.

1.03 REFERENCE STANDARDS

A. ADAAG - Americans with Disabilities Act Accessibility Guidelines.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2022.

E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).

F. ASTM A167 - Stainless and Heat Resisting Chromium Nickel Steel Plate, Sheet, and Strip.

G. ASTM A366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality.

1.04 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Provide erection drawings for backing plates required for grab bars.

1.05 KEYING

A. Supply two keys for each accessory to Owner.

B. Key all accessories in the building alike.

1.06 REGULATORY REQUIREMENTS

A. Install work in conformance with ADAAG and Indiana Handicapped Accessibility Rules.

1.07 SEQUENCING AND SCHEDULING

A. Coordinate the work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet Accessories:
   1. American Specialties, Inc; _____: www.americanspecialties.com/#sle.
   2. Bradley Corporation: www.bradleycorp.com/#sle.
   3. Bobrick Washroom Equipment: https://www.bobrick.com/.
   4. A & J Washroom Accessories, New Windsor, New York.
   5. GAMCO, Division of Bobrick, Durant, Oklahoma.
   6. Substitutions: Section 01 60 00 - Product Requirements.

B. Provide products of each category type by single manufacturer.

2.02 MATERIALS

A. Sheet Steel: ASTM A366.

B. Stainless Steel Sheet: ASTM A167, Type 304.

C. Tubing: ASTM A269, stainless steel.

D. Fasteners, Screws, and Bolts: Hot dip galvanized, tamperproof.

2.03 ACCESSORY ITEMS

A. Grab Bars: 1 1/2 inch outside diameter stainless steel tubing; smooth satin finish; concealed mountings.
   1. Bobrick Series B-6806.
   2. Bradley Series 812.
   3. ASI 3200 Series.
   4. AJ UG30 Series.

B. Backing Plates for Grab Bars: Anchor plates.
   1. Bobrick 2562.
   2. Bradley 899-015.
   3. AJ BP10.

C. Surface Mounted Paper Towel Dispenser: Owner Provided, Contractor Installed.
   1. Mount on wall as indicated on drawings.
   2. Quantity: As indicated on drawings.

D. Sanitary Napkin Disposal Unit: Stainless steel.
   1. Mount on wall as indicated on drawings:
      a. Bobrick B-254.
      b. Bradley 4722.
      c. ASI 0473.
      d. AJ U582.

E. Toilet Paper Holders: Owner Provided, Contractor Installed.
   1. Mount on wall as indicated on drawings.
      a. Bobrick B-2740.
      b. Bradley 5244.
      c. ASI 0264-1A.
      d. AJ U812.

F. Soap Dispenser: Owner Provided, Contractor Installed.
   1. Mount on wall as indicated on drawings.
   2. Quantity: As indicated on drawings.

G. Mirror: Stainless steel angle frame; size as shown on drawings.
   1. Bobrick B-290 Series.
   2. Bradley 780 Series.
   3. ASI 0600 Series.
   4. AJ U700 Series.

H. Mop and Broom Holder: Stainless steel.
   1. Mount on wall as indicated on drawings.
   2. Bobrick B-223x24.
   3. Bradley 9953-3 Holders.
   4. ASI 8215-3.
   5. AJ UJ12A.

2.04 FABRICATION

A. Weld joints of fabricated components and grind smooth.

B. Form exposed surfaces from single sheet of stock, free of joints.

C. Form surfaces flat without distortion.

D. Maintain flat surfaces without scratches or dents.

E. Back paint components where contact is made with building finishes to prevent electrolysis.

F. Shop assemble components and package complete with anchors and fittings.

G. Provide steel anchor plates, adapters, and anchor components for installation.

H. Hot dip galvanize exposed and painted ferrous metal and fastening devices.

2.05 FACTORY FINISHING

A. Galvanizing: ASTM A123 to 1.25 ounces per square foot.

B. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

C. Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats baked enamel.

D. Chrome/Nickel Plating: ASTM B456, Type SC 2 satin finish.

E. Stainless Steel: No. 4 satin luster finish.

2.06 UTILITY ROOM ACCESSORIES

A. Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, hat-shaped channel.

1. Holders: Three spring-loaded rubber cam holders.

a. Length: 24 inches (___ mm).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

D. Beginning of installation means acceptance of conditions and substrate.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site at appropriate time for installation.

B. Provide templates and rough-in measurements as required.

C. Verify exact location of accessories for installation. Provide all required blocking in walls as required for all accessories.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.04 OPERATION AND MAINTENANCE DATA

A. Submit manufacturer's operation and maintenance data.
   1. Include test, refill or recharge schedules, procedures, and re-certification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers, Cabinets and Accessories:
   1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
   2. Larsen's Manufacturing Co: https://www.larsensmfg.com.
   3. Potter-Roemer; Division of Smith Industries, Inc.: https://www.potterroemer.com.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
   2. Hose type discharge; grip and squeeze operation; fully charged; rechargable.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Cartridge Operated: Spun shell.
   2. Class: A:B:C type.
   3. Size: 5 pound (2.27 kg).
   4. Temperature range: Minus 65 degrees F (Minus 54 degrees C) to 120 degrees F (___ degrees C).

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinets
   1. Formed sheet steel, 20 gage, size to accomodate extinguisher.
   2. Semi-recessed.

B. Trim: Primed
   1. Rolled edge.

C. Door: Primed steel, 20 gage thick, reinforced for flatness and rigidity; latch access.

D. Glass: 1/4 inch thick tempered glass.

E. Mounting Hardware: Appropriate to cabinet.

F. Provide sign over each cabinet.

2.04 ACCESSORIES

A. Extinguisher Brackets: Manufacturer's standard wall bracket, baked enamel finish.

2.05 FABRICATION

A. Form body of cabinet with tight inside corners and seams.

B. Predrill holes for anchorage.

C. Form perimeter trim and door stiles by welding, filling, and grinding smooth.

D. Hinge doors for 180 degree opening with continuous piano hinge.
   1. Provide roller type catch.

2.06 FINISHES

A. Extinguisher: Red enamel.

B. Cabinet Trim and Door: Red baked enamel.

C. Cabinet Interior: White baked enamel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

C. Verify extinguisher size is compatible with cabinet interior.

D. Verify locations of all extinguishers and cabinets prior to installation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level, 48" from finished floor to center of handle.

C. Install brackets, 48" from finished floor to top of bracket.

D. Place extinguishers in cabinets and on wall brackets.

E. Position signage above fire extinguisher location.

END OF SECTION

SECTION 10 55 91 - MAIL CHUTES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel through wall drop box.

1.02 SUBMITTALS

A. See Division 01 for submittal procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Locking Secuirty Mailbox: Model TTDVWM006SA12
   1. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

A. 16 gauge galvanized steel

B. Delivery door to be flush mount with exterior wall.

C. Commercial grade powder coat finish.

D. High security hopper drop door.

E. Locking delivery hold (interior access only).

F. Color: Sand

G. Stainless steel hinges.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Conceal fastenings where exposed to view.

C. Fit trim, ceiling and floor cover pieces accurately and tightly to adjacent construction.

3.02 CLEANING

A. Clean chute interior and finish trim surfaces.

B. Remove strippable temporary protection after adjacent work is complete.

C. Clean exposed surfaces with mild cleaning agents.

END OF SECTION

SECTION 10 75 00 - FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum Flagpoles.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete base and foundation construction.

B. Section 09 91 13 - Exterior Painting: Site painting.

C. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

D. Section 31 23 23 - Fill: Sand to fill foundation tube sleeve.

1.03 REFERENCE STANDARDS

A. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2022.

B. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles; 2007.

1.04 SUBMITTALS

A. Submit samples under provisions of Division 1.

B. Product Data: Provide data on pole, accessories, and configurations.

C. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flagpoles:
   1. Concord American Flagpole; Internal - Independence: www.concordamericanflagpole.com/#sle.
   2. Morgan-Francis Flagpoles & Accessories; ____: www.morgan-francis.com/#sle.
   3. Pole-Tech Co, Inc; ____: www.poletech.com/#sle.
   4. Substitutions: Submit under provisions of Division 1.

2.02 FLAGPOLES

A. Flagpoles: Designed in accordance with NAAMM FP 1001.
   1. Material: Aluminum.
   2. Design: Cone tapered.
   3. Mounting: Ground mounted type.
   4. Nominal Height: 30 ft (____ m); measured from nominal ground elevation.

2.03 ACCESSORIES

A. Finial Ball: Aluminum, 6 inch (150 mm) diameter.

B. Flag to be provided by owner.

C. See drawings for lighting information.

2.04 MOUNTING COMPONENTS

A. See drawings for foundation information.

2.05 FINISHING

A. Metal Surfaces in Contact With Concrete: Asphaltic paint.

B. Provide aluminum flash collar at base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch (25 mm).

3.05 ADJUSTING

A. Adjust operating devices so that halyard function smoothly.

END OF SECTION

SECTION 12 24 00 - WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

1.02 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Selection Samples: Include fabric samples in full range of available colors and patterns.

D. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware (excluding bead chains) and fabrics (excluding PVC-free fabrics, clear vinyl, insect screens and the spring assist mechanism): 25 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:
   1. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROLLER SHADES

A. General:
   1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
   2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Interior Roller Shades - Basis of Design: Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
   1. Description: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and other components necessary for complete installation.
      a. Mounting: Ceiling mounted.
   2. Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
   3. Roller Tubes: As required for type of shade operation; designed for removal without removing mounting hardware.
      a. Material: Extruded aluminum or steel, with wall thickness and material selected by manufacturer.
      b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.

4. Hembars: Designed to maintain bottom of shade straight and flat, selected from manufacturer's standard options.
5. Manual Operation:
    a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
    b. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 lb (43 kg) minimum breaking strength. Provide upper and lower limit stops.
6. Accessories:
    a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to mounting end caps, without exposed fasteners; clear anodized finish.
    b. End Cap Covers: Match fascia or headbox finish.
    c. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.03 SHADE FABRIC

A. Fabric: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
    1. Manufacturers:
        a. Phifer, Inc; Style Sheerweave PW4400, 3% open basket weave: www.phifer.com/#sle.
        b. Substitutions: See Section 01 60 00 - Product Requirements.
    2. Material: Vinyl coated polyester.
    3. Openness Factor: 3%.
    4. Color: Soft Grey (Pewter).

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.03 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

END OF SECTION

SECTION 12 32 00 - MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured custom casework, with cabinet hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and nailers for anchoring casework.

B. Section 07 92 00 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

C. Section 09 65 00 - Resilient Flooring: Resilient wall base.

D. Section 12 36 00 - Countertops: Additional requirements for countertops.

E. Section 22 40 00 - Plumbing Fixtures: Sinks and fittings installed in casework.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

1.04 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Product Data: Component dimensions, configurations, construction details, joint details, attachments.

C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements, placement dimensions and tolerances and clearances required.

D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches (51 mm by 75 mm).
   1. Plastic laminate samples, for color, texture, and finish selection.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

B. Acceptance at Site:
   1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.

C. Storage:
   1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
   1. Ruptured, cracked, or stained finish coating.
   2. Discoloration or lack of finish integrity.
   3. Cracking or peeling of finish.
   4. Delamination of components.
   5. Failure of adhesives.

6. Failure of hardware.

PART 2 PRODUCTS

2.01 QUALIFICATIONS

A. All casework shall adhere to all requirements of the drawings and these specifications.

B. Plastic Laminate Casework: Acceptable manufacturers include:
   1. Euronique, Inc. Elberfeld, Indiana.
   2. Stevens Cabinet Company, Teutopolis, Illinois.
   3. Meyer Custom Woodworking, Jasper, Indiana.
   4. TMI Systems Design Corp., Dickinson, North Dakota.
   5. P.R. Bean, Washington, Indiana.

C. Casework of other nationally recognized casework manufacturers may be considered for approval provided a written request is received ten (10) working days prior to opening of bids.
   1. Casework must conform to design, quality of materials, workmanship, and function of casework specified and shown on drawings.

D. Manufacturers requesting approval shall submit evidence of at least five (5) years experience and installations for similar type of project.
   1. Manufacturers shall also show evidence of financial stability, plant facilities, catalogs, and specifications.
   2. Submit samples, catalogs, and specifications with written request for approval.
   3. Samples may be impounded by Owner and retained until completion of job for verification and compliance of specifications.

E. Architect opinion and decision is final in evaluation of manufacturers' products.

F. Obtain casework from single source and manufacturer, unless otherwise indicated.

2.02 MATERIALS

A. Vertical grade high pressure plastic laminate for exterior cabinet surfaces, minimum 0.028 inch thickness.
   1. Color as specified on the drawings.

B. Heavy gage high pressure plastic laminate backing sheet with textured surface, putty color or manufacturer’s standard color, minimum 0.020 inch thickness.

C. Horizontal grade high pressure plastic laminate, satin or textured finish minimum 0.050 inch thickness with heavy gage neutral colored backing sheet for balanced construction.
   1. Color as specified on the drawings.

D. Thermally Fused Melamine Laminated Particle Board:
   1. Melamine resin impregnated decorative paper thermally fused to 45 to 48 pound density particle board.
   2. Particle board of balanced construction with moisture content not to exceed 8 percent.
   3. Thermally fused melamine laminate, colorfast; putty color or manufacturer’s standard color.
      a. Provide thermally fused melamine laminate for semi-exposed cabinet interiors behind doors and drawers; putty color or manufacturer’s standard color.

E. Hardboard:
   1. Tempered hardboard 1/4 inch thick, smooth both sides.
   2. Hardboard exposed one side 1/4 inch thick, prefinished in neutral color to match cabinet interior.
      a. Opposite face prefinished with neutral color balance coating.

F. Fiberboard: Of uniform density to meet the following minimum standards.
   1. Internal Bond: 0 psi.
   2. Modulus of Rupture: 3,000 psi.
   3. Modulus of Elasticity: 300,000 psi.
   4. Screw Holding Power: 325 pounds.

G. Edge Treatment: 3mm PVC edge strips of size to suit material thickness.
   1. Color selected, satin finish.
   2. Use for door and drawer edges.

H. Scribe Mold and Fillers: Paint to match plastic laminate casework.
   1. Scribe Mold at Backsplash and Endsplash: 5/8 inch by 5/16 inch wood mold with radius lead edge.
   2. Scribe Mold at Junction Between Casework and Adjacent Construction: 7/8 inch by 5/16 inch wood mold with radius lead edge.
   3. Fillers: Same material as casework fronts; fill space between casework and adjacent construction.

I. Hardware:
   1. Hinges:
      a. Heavy duty, five knuckle 2-1/2 inch institutional type hinge.
         1) Mill ground, hospital tip, tight pin feature with all edges eased.
         2) Hinge full wrap around type of tempered steel 0.093 inch thick.
         3) Provide each hinge with a minimum of seven #8 screws , 5/8 inch FHSM to assure positive door action and alignment.
         4) Provide one pair per door to 48 inch height.
         5) Provide one and one-half pair per door over 48 inches in height.
         6) Provide hinge to accommodate 13/16 inch thick laminated door allowing 270 degree swing.
      b. Satin chrome finish.
   2. Pulls:
      a. Satin chrome wire pull 5 inch.
   3. Drawer Glides:
      a. Standard Drawers: With positive in-stop.
         1) Nylon bearing rollers, both front and rear.
         2) Minimum 100 pounds load rating.
   4. Catches:
      a. Roller catch for base and wall cabinets, minimum 5 pounds pull.
      b. Roller catch for tall cabinets.
         1) Two per door, minimum 5 pounds pull per catch.
      c. Roller catch for mobile cabinets.
   5. Stop Chains: Provide stop chains on tall casework doors and all doors adjacent to walls.
   6. Adjustable Shelf Clips:
      a. Heavy duty shelf support clip with positive locking pin for back two supports on all adjustable shelves.
         1) Molded Natural Nylon.

2.03 CABINET CONSTRUCTION

A. Sub-Base: Continuous base of 3/4 inch unfinished fir plywood.

B. Cabinet Top and Bottom - Wall and Base Cabinets:
   1. Fabricate base cabinet bottoms of thermally fused laminated particle board on the interior side, 3/4 inch thick with phenolic neutral colored backer sheet on concealed side.
      a. Wall Cabinet Top and Bottom: 1 inch thick.
   2. Provide neutral color phenolic overlay solid sub-top for all lower base cabinets.
   3. Exterior Exposed Wall Cabinet Bottoms: Thermally fused laminate to match exterior of cabinet.
      a. Conceal screws and fastening devices on bottom side of wall cabinets.
   4. Exposed Edges: 1mm PVC, color as selected.
   5. Provide complete plastic laminate interiors where indicated on Drawings.

C. Cabinet Ends:

1. Fabricate of Thermally fused laminated particle board on interior side, 3/4 inch thick with phenolic neutral backer sheet on concealed side.
    a. Drill holes for adjustable shelves at 1-1/4 inches on center for standard cabinetry.
2. Exposed Edges: 1mm PVC, color as selected.
3. Laminate exposed exterior and interior cabinet ends with high pressure plastic laminate.

D. Fixed and Adjustable Shelves:
1. Interior Shelves: Thermally fused laminated particle board, two sides.
    a. Edge leading exposed edge of shelves with 3mm PVC, color as selected.
2. Color of exposed shelves to match exterior cabinet color.
3. Thickness: 3/4 inch for shelving to 36 inches wide; 1 inch for shelving 36 inches wide and over.
4. Instrument Storage Shelves: 3/4 inch thick consisting of 1/8 inch tempered hardwood laminated to top and bottom of 1/2 inch particle board core.
    a. Rabbet front leading edge to receive 3/4 inch by 3/4 inch extruded metal edge.

E. Cabinet Backs:
1. Standard Cabinet Back: Use 1/4 inch thick prefinished hardboard on all cabinets with doors.
    a. Provide rear, unexposed side of back with continuous hot melt glue at joint between back and sides/top/bottom for sealing against moisture and vermin, and to further contribute to case rigidity.
2. Exposed Exterior Backs: 3/4 inch thick particle board faced with high pressure plastic laminate.

F. Doors:
1. Hinged and Sliding Doors: 13/16 inch thick, plastic laminate.
    a. Core material 3/4 inch thick, 45 pound density particle board bonded on exterior with high pressure laminate and with heavy gage balancing sheet on interior face.
    b. Edge exposed door with 3mm PVC edges, color as selected.
2. Sliding Glass Doors: 1/4 inch thick float glass with ground and polished edges.
    a. Fit with etched and anodized aluminum shoes and nylon rollers.

G. Drawers:
1. Apply drawer fronts to drawer sub-front.
    a. Provide high pressure plastic laminate on exterior side with heavy gage backing sheet on interior face.
    b. Total Thickness: 13/16 inch.
    c. Provide 3mm PVC on all edges, color as selected.
2. Sides and Back of Drawers: 3/4 inch thick thermally fused laminated particle board.
3. Sub-Front of Drawer: 3/4 inch thick thermally fused laminated paticle board.
4. Exposed Top Edge: PVC color as selected.
5. Drawer Sides: Dado to receive front and back, glue and pin together.
6. Drawer Bottom: Prefinished 1/4 inch thick hardboard, housed and glued into front, sides, and back.
    a. Provide underside of drawer with continuous hot melt glue at joint between bottom and back/sides/front for sealing and rigidity.
    b. Reinforce drawer bottoms as required with intermediate spreaders.
7. Fit paper storage drawers with hood at back.
8. Provide all drawers with roller glides as specified above.

H. Vertical and Horizontal Dividers:
1. Tempered hardboard, 1/4 inch thick, smooth both faces.
    a. Secure in cabinet with molded plastic clips.
2. Thermally fused laminated particle board, 3/4 inch thickness.
    a. Secure in cabinet with molded plastic clips.
    b. Edges: 3mm PVC, color as selected.

I. Countertops:

1. Solid Surface: See Section 12 36 00
    a. Thickness as shown on Drawings.
    b. Furnish countertops in design as shown on drawings.
2. Provide continuous tops for counter type cabinets fixed in a line.

J. Workmanship:
1. Finish all exterior exposed vertical surfaces with high pressure plastic laminate, unless otherwise indicated.
    a. Laminate plastic to particle board core with balancing sheet using a rigid-type adhesive.
    b. Fabricate using cold press method with regulated pressure for a minimum 70 degrees F.
    c. Properly temper all material in factory under controlled humidity and temperature conditions prior to gluing.
2. Accurately machine cabinet parts with interlocking dadoes and rabbets for premium quality joinery construction.
    a. Glue and screw all joints for maximum stability and construction.
3. Dado and rabbet end panels to receive bottom, top, and back.
    a. House back into cabinet sides, top, and bottom to insure rigidity and a fully closed cabinet.
4. Fully house drawer bottom into sides, back, and subfront.
    a. Fully dado sides of drawers to receive drawer back, lock in fully to sides, and fasten with glue and mechanical fasteners.
5. Apply hanging rails to back side of all wall, base, and tall cabinets for extra rigidity and to facilitate installation.
    a. Secure rails, cabinet backs, and drawer bottoms by the hot melt glue process for extra strength.
6. Square all cases, plumb and true.
7. Countersink and plug exposed fasteners.
8. Provide removable back panels and closure panels for plumbing access where shown on Drawings.
9. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings.
    a. Verify location of cutouts from on site dimensions.
    b. Seal contact surfaces of cut edges.

K. Provide chases for electrical wiring. Verify locations.

L. Provide valances at undercounter light fixtures.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Environmental Conditions:
1. Do not deliver casework until the following conditions have been met:
    a. Building has been enclosed (windows and doors sealed and weather-tight).
    b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
    c. Ceiling, overhead ductwork, piping, and lighting have been installed.

B. Verify adequacy of support framing and anchors.

3.02 INSPECTIONS

A. Obtain and verify dimensions affecting work of this Section from site.

B. Beginning of installation means acceptance of existing conditions.

C. Install casework under the supervision of the manufacturer's representative with factory-trained journeymen authorized by manufacturer.

D. Verify that service connections are correctly located and of proper characteristics.

3.03 INSTALLATION

A. Erect casework straight, level, and plumb and securely anchor in place.
   1. Scribe and closely fit to adjacent work.
   2. Cut and fit work around pipes, ducts, etc.

B. Install all items complete and adjust all moving parts to operate properly.

C. Coordinate work with others.

D. Leave surface clean and free from defects at time of final acceptance.

E. Provide 24 additional metal shelf supports.

F. Replace units that are damaged, including those that have damaged finishes.

3.04 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.05 CLEANING

A. Clean casework and other installed surfaces thoroughly.

B. Remove all cartons, debris, sawdust, scraps, etc. and leave spaces clean and all casework ready for owner's use.

END OF SECTION

SECTION 12 36 00 - COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops.

B. Window Sills

1.02 RELATED REQUIREMENTS

A. Section 12 32 00 - Manufactured Wood Casework.

B. Section 07 92 00 - Joint Sealants

1.03 REFERENCE STANDARDS

A. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

1.04 SUBMITTALS

A.

B. Submit 2 samples for each finish selection: Fully finished, for color selection. Minimum sample size: 4 inches by 4 inches.

C. Product Data: For solid-surfacing products indicated, including mounting hardware, accessories, and finishing processes.

D. Shop Drawings: Show location of each item, including dimensioned plans and elevations, fabrication and installation details, and attachment devices.
   1. Show locations and sizes of blocking and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   2. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, and other items installed in solid-surfacing fabrications. Provide rough-in information required by plumbing trades for coordination of their work.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified and approved by manufacturer, has minimum five years experience installing solid-surfacing fabrications similar in design and extent to that indicated for this Project, and whose work has resulted in construction with a record of successful in-service performance.

B. Fabricator Qualifications: A firm who is certified by manufacturer to fabricate solid-surfacing products similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Source Limitations: Engage a qualified firm to assume undivided responsibility for fabrication and installation of solid-surfacing fabrications.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MATERIALS

A. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin containing methyl methacrylate complying with material and performance requirements in ANSI Z124.3, for Type 6, without a precoated finish. Appearance to be solid without veining.

B. Accessories: Materials and devices required for complete installation.
   1. Sealant: Silicone rubber for sealing joints in solid surfacing products.
   2. Joint Adhesive: Manufacturer's two-component adhesive to create inconspicuous, non-porous joints with chemical bonding capabilities.
   3. Adhesive: Neoprene-based panel adhesive approved by manufacturer for installation.

2.02 SOLID-SURFACING MATERIAL TOPS AND PANELS

A. Tops: Fabricate in one piece with shop-applied backsplashes and edges, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
   1. Thickness and Counter Design: As indicated on drawings.
   2. Backsplashes and Returns: 1/2 inch thick; coved, 4-inch in height, unless otherwise indicated.
   3. Supports: As required.

2.03 FABRICATION

A. Quality Standard: Comply with AWI Section 400 requirements for tops.

B. Grade: Custom.

C. Solid-Surfacing-Material Thickness: As indicated on drawings.

D. Fabricate tops in one piece with shop-applied backsplashes and edges, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

E. Provide top and bottom eased edges.

F. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

G. Machine and ease all edges to a minimum of 1/8 inch radius, unless otherwise indicated. Provide machined fillet material to match solid surface in color and texture to create total fillet condition at all inside corners of countertops.

H. Shop-install undercounter solid polymer reinforcing strips to tops using manufacturer's recommended adhesive.

I. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.

2.04 FINISH

A. Colors and Finishes: As indicated on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with installer present, for compliance with requirements for installing solid surfacing fabrications.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Clean substrate of foreign materials that will adversely affect adhesion of solid surfacing fabrications.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install solid-surfacing fabrications in accordance with manufacturer's written installation instructions and approved shop drawings.

B. Install solid-surfacing fabrications level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of

C. 1/8 inch in 96 inches.

D. Secure solid-surfacing fabrications in place with construction adhesive as recommended by manufacturer.

E. Tops: Install with approved adhesive and seal all joints and perimeters with approved sealant.

F. Caulk space between backsplash and wall with sealant specified in

G. Division 7 Section "Joint Sealants."

3.04 CLEANING

A. Clean countertops surfaces thoroughly.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 13 34 19 - METAL BUILDING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame of the nominal length, width, eave height, and roof pitch indicated on drawings.
   1. All exposed primary and secondary steel components are gray primed steel.

B. Insulated Metal wall and roof panels including soffits, gutters and downspouts, and roof mounted equipment curbs.
   1. Exterior walls are covered with field-assembled wall panels attached to framing members using exposed fasteners. Insulate wall and roof panels with field installed reinforced white vinyl insulation as specified.
   2. Roof system consists of the manufacturer's standard standing-seam insulated roof, insulated with reinforced vinyl insulation as specified.
   3. Manufacturer's standard building components and accessories may be used, provided components, accessories, and complete structure conforms to design indicated and specified requirements.

C. Exterior doors, windows, overhead doors, and louvers.

1.02 REFERENCE STANDARDS

A. AISC 360 - Specification for Structural Steel Buildings; 2022.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

F. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2022.

G. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

J. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2018, with Editorial Revision (2019).

K. MBMA (MBSM) - Metal Building Systems Manual; 2019.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Engineer, design, fabricate and erect the pre-engineered metal building system to withstand loads from wind, seismic, gravity and movement (including thermally induced) and to resist in-service use conditions that the building will experience, including exposure to weather, without failure.

B. See Structural Drawings for required loading information.

C. All Pre-Engineered Metal Building column bases to be designed as pinned connections.

D. Calculations for frame deflections (drift) shall be performed using only the Bare Frame Method. Reductions based on engineering judgement using the assumed composite stiffness of the building are not permitted.
   1. Maximum lateral deflection/drift due to 10-year wind load shall not exceed H/360 (where H denotes eave height of the building).

E. Structural Framing and Roof and Siding Panels: Design primary and secondary structural members and exterior covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturer's Association's (MBMA) "Design Practices Manual."
   1. Structural Steel: Comply with the American Institute of Steel Construction's (AISC) "Specifications for the Design, Fabrication and Erection of Buildings" for design requirements using Allowable Stress Provisions.
   2. Light Gage Steel: Comply with the American Iron and Steel Institute's (AISI) "Specification for the Design of Cold-Formed Steel Structural Members" and "Design of Light Gage Steel Diaphragms" for design requirements using Allowable Stress Provisions.
   3. Welded Connections: Comply with the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.

1.04 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Product Data: Provide data on profiles, component dimensions, fasteners.

C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, cambers, and loads; wall and roof system dimensions, roofing and siding panels, liner panels, general construction details, anchors and methods of anchorage, and installation; framing anchor bolt settings, sizes, locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.
   1. Roofing and Siding Panels: Provide layouts of panels on walls and roofs, details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Include transverse cross-sections.
   2. Building Accessory Components: Provide detail of metal building accessory components to clearly indicate methods of installation including the following:
      a. Sheet Metal Accessories: Provide layouts at 1/8 inch scale. Provide details of ventilators, louvers, gutters, downspouts, and other sheet metal accessories at not less than 1-1/2 inch scale showing profiles, methods of joining and anchorages.

D. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

E. Samples for initial selection purposes in form of manufacturer’s color charts or chips showing full range of colors, textures, and patterns available for metal roofing and siding panels with factory-applied finishes.

F. Samples for verification purposes of roofing and siding panels. Provide sample panels 12-inch long by actual panel width in the profile, style, color and texture indicated. Include clips, battens, fasteners, closures, and other panel accessories.

G. Provide installer certification signed by metal building manufacturer that the installer complies with requirements included under the “Quality Assurance“ Article.

H. Professional engineer’s certificate prepared and signed by a Professional Engineer, legally authorized to practice in the State of Indiana, verifying that the structural framing and covering panels meet indicated loading requirements and codes of authorities having jurisdiction.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this type of work.
   1. Design Engineer Qualifications: Licensed in the State in which the Project is located.
   2. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.

B. Perform work in accordance with AISC 360 and MBMA (MBSM).

C. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
   1. Not less than three years of documented experience.
   2. Single-Source Responsibility: Obtain the metal building system components, including structural framing, wall and roof covering, and accessory components, from one source from a single manufacturer.

D. Erector Qualifications: Company specializing in performing the work of this section with minimum three years experience.

E. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver prefabricated components, sheets, panels and other manufactured items so they will not be damaged or deformed. Package wall and roof panels for protection against transportation damage.

B. Handling: Exercise care in unloading, storing and erecting wall and roof covering panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platform or pallets, covered with tarpaulins or other suitable weather tight ventilated covering. Store metal wall and roof panels so that water accumulations will drain freely. Do not store panels in contact with other materials that might cause staining, denting or other surface damage.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Roofing and Siding Panel Finish Warranty: Furnish the roofing and siding panel manufacturer's written warranty, covering failure of the factory-applied exterior finish on metal wall and roof panels within the warranty period. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.
   1. Warranty period for factory-applied exterior finishes on wall and roof panels is 20 years after the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, provide metal building systems provided by one of the following:
   1. Butler Manufacturing Company; www.butlermfg.com
   2. Nucor Building Systems; www.nucorbuldingsystems.com

2.02 ASSEMBLIES

A. Single span rigid frame.

B. Primary Framing: Rigid frame of rafter beams and columns, braced end frames and end wall columns, portal frames and wind bracing in locations shown on Drawings.

C. Secondary Framing: Purlins, Girts, Eave struts, and Flange bracing, and other items detailed.

D. Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly, insulation, and liner sheets, and accessory components.

E. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly and insulation, and accessory components.

F. Roof Slope: 2 inches in 12 inches (1/6).

2.03 PERFORMANCE REQUIREMENTS

A. Installed Thermal Resistance of Wall System: R-value of 13 (RSI-value of 2.2893).

B. Installed Thermal Resistance of Roof System: R-value of 19 (RSI-value of 3.3459).

C. Design structural members to withstand dead load, applicable snow load, and design loads due to pressure and suction of wind calculated in accordance with applicable code.

D. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

E. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

2.04 MATERIALS - GENERAL

A. Paint and Coating Materials: Comply with performance requirements of the federal specifications indicated. Unless specifically indicated otherwise, compliance with compositional requirements of federal specifications indicated is not required.
   1. Shop Primer for Ferrous Metal: Fast-curing, lead-free, universal gray colored primer, selected by the manufacturer for resistance to normal atmospheric corrosion, compatibility with finish paint systems, and capability to provide a sound foundation for field-applied topcoats.

2.05 STRUTURAL FRAMING

A. Rigid Frames: Fabricate from hot-rolled structural steel shapes or factory welded built-up "I-Beam" shapes. Members to be tapered or parallel flange members. Outer face of columns to be vertical. Furnish frames with attachment plates, bearing plates and splice members. Factory drill for field bolted assembly. Provide length of span and spacing of frames indicated.

B. Primary Endwall Framing: Fabricate endwall columns from hot-rolled structural steel shapes or factory welded built-up "I-Beam" shapes.

C. Secondary Framing: Provide the following secondary framing members:
   1. Roof Purlins, Sidewall and Endwall Girts: "C" or "Z" shaped sections fabricated from minimum 16 gage (0.0598 inch) roll-formed steel. Purlin spacers shall be fabricated from minimum 14 gage (0.0747 inch) cold-formed sections.
   2. Eave Struts: Unequal flange "C" shaped sections formed to provide adequate backup for both wall and roof panels. Fabricate from minimum 16 gage (0.0598 inch) roll-formed steel.
   3. Flange and Sag Bracing: 1-5/8 by 1-5/8 inch (minimum) angles fabricated from minimum 16 gage (0.0598 inch) roll-formed steel.
   4. Base or Sill Angles: Fabricate from minimum 14 gage (0.0747 inch) cold-formed galvanized steel sections.
   5. Secondary endwall structural members, except columns and beams, shall be the manufacturer's standard sections fabricated from minimum 14 gage (0.0747 inch) cold-formed galvanized steel.

D. Wind Bracing and Portal Frames:
   1. Wind bracing to be minimum 1/2 inch diameter steel rods conforming to either ASTM A36 or ASTM A572, Grade 50. Locate wind X-Bracing only in bays where indicated on Drawings.
   2. Portal frames to be hot-rolled structural shapes or factory welded built-up "I-Beam" shapes. Locate portal frames only in bays where indicated on Drawings.

2.06 MATERIALS - FRAMING

A. Structural Steel Members: ASTM A992/A992M.

B. Structural Tubing: ASTM A500/A500M, Grade C cold-formed.

C. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1; galvanized to ASTM A153/A153M.

D. Welding Materials: Perform in accordance with AWS D1.1/D1.1M.

E. Shop Painting: Clean surfaces to be primed of loose mill scale, rust, dirt, oil, grease and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power-tool cleaning, SSPC-SP7 for brush-off blast cleaning and SSPC-SP1 for solvent cleaning.

1. Prime structural steel primary and secondary framing members with the manufacturer's standard rust-inhibitive primer gray in color.

2.07 MATERIALS - ROOFING AND SIDING PANELS

A. Face Sheets: Fabricate wall panel face sheets to the profile or configuration indicated from 26-gage (0.0179-inch) structural quality, Grade C, zinc-coated steel sheets.

B. Standing Seam Roof Panels: Manufacturer's standard factory-formed standing-seam roof panel system designed for mechanical attachment of panels to roof purlins using a concealed clip. Form panels of 24-gage (0.0239-inch), Grade C, zinc-coated steel sheets. Provide roofing systems with a UL-90 uplift rating.
   1. Clips: Provide 16-gage (0.0598-inch) panel clips.
   2. Cleats: Factory-calked, seamed cleats formed from 24-gage (0.0239-inch), Grade C, zinc-coated steel sheets.
   3. Mechanical attachment of roof panels shall utilize manufacturer's standard concealed fastener.

C. Fasteners: Self-tapping screws. Bolts, nuts, self-locking rivets, self-locking bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
   1. Provide metal-backed neoprene washers under heads of fasteners bearing on weather side of panels.
   2. Provide manufacturer's standard fasteners which will maintain the integrity of panel finish warranty. Fastener shall have a corrosion resistant coating and painted head to match panel and/or trim color.
   3. Locate and space fastenings in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.
   4. Provide fasteners with heads matching color of roofing or siding sheets by means of plastic caps or factory-applied coating.

D. Accessories: Provide the following sheet metal accessories factory-formed of the same material in the same finish as roof and wall panels:
   1. Flashings when required.
   2. Closers
   3. Fillers
   4. Ridge Covers
   5. Fascias
   6. Metal Expansion Joints
   7. Insulation pan at ridge line as required.
   8. Continuous snow guards.

E. Flexible Closure Strips: Closed-cell, expanded cellular rubber, self-extinguishing flexible closure strips. Cut or pre-mold to match configuration of roofing and siding sheets. Provide closure strips where indicated or necessary to ensure weather tight construction.

F. Sealing Tape: Pressure-sensitive 100 percent solids grey polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic nonsag, nontoxic, non-staining tape 1/2 inch wide and _ inch thick.

G. Joint Sealant: One-part elastomeric polyurethane, polysulfide, or silicone rubber sealant as recommended by the building manufacturer.

H. Metal Finish: Provide the manufacturer's standard shop-applied 'Kynar' finish to galvanized steel wall panels, and related trim and accessory elements. For siding, apply finish coat on exterior facings and manufacturer's standard wash coat on reverse face.
   1. Color: As selected by Architect from the manufacturer's standard colors.
   2. Provide 20-year limited finish warranty.

I. Provide manufacturer's standard shop-applied 'Kynar' finish at standing seam roof panels.
   1. For roofing panels, apply finish coat on exterior facings and manufacturer's standard wash coat over primer on interior surface.

2. Physical characteristics of exterior coating shall provide resistance to failure through cracking, checking, crazing, spotting or loss of adhesion.
3. Provide 20-year limited finish warranty.
4. Color: As selected by Architect from the manufacturer's standard colors.

2.08 SHEET METAL ACCESSORIES

A. General: Unless otherwise indicated, provide coated galvanized steel accessories with coated steel roofing and siding panels.

B. Gutters: Form in sections not less than 20 ft. in length, complete with end pieces, outlet tubes, and other special pieces as required. Size in accordance with SMACNA. Join sections with riveted and soldered or sealed joints. Provide expansion-type slip joint at center of runs. Furnish gutter supports spaced 36 inches on center, constructed of same metal as gutters. Provide bronze, copper or aluminum wire ball strainers at outlets. Finish to match roof fascia, and rake.

C. Downspouts: Form in 10-foot-long sections, complete with elbows and offsets. Join sections with 1-1/2 inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls: locate fasteners at top and bottom and at approximately 5 feet on center in between. Finish to match wall panels.

D. Trim and Flashing
1. 'Kynar' color coated trim and flashing shall be 26 gage. Trim shall be provided at eave, ridge, rake and where necessary to insure a properly constructed building.
2. High eave flashing and flashing parallel to the roof panels shall accommodate the thermal expansion and contraction of the roof without damage to the roof panels or flashing. Counter-flashing for parapet conditions are by others.
3. All exposed trim and flashing material shall be manufactured from galvanized or Galvalume steel strip.
4. Exterior gable flashing shall be manufactured in 20' lengths.

2.09 THERMAL INSULATION

A. Roof Insulation: reinforced 6" fiberglass batt with white, metalized polypropylene film.

B. Glass Fiber Blanket Wall Insulation: reinforced 4" fiberglass batt with white, metalized polypropylene film.

C. Glass fiber blanket shall be fine fiber, flexible, resilient glass fiber blanket. TIMA Standard PEB 202. The density shall be .6 pounds per cubic foot. It shall be odor free and shall not provide substance for vermin, rodents or insects. Moisture absorption shall be less than .2% by volume. Glass fiber blanket shall be supplied in two layers installed with staggered joints.

D. Thermal Values
1. The insulation in the roof shall have a thermal resistance (R) of 19 and the walls (R-13) when calculated as outlined in the ASHRAE Handbook of Fundamentals.

E. Vapor Retarder: Roof and Wall
1. White polypropylene film, metallization, fiberglass and polyester fabric maximum perm rating of 0.02 (Test Method ASTM E96).
2. Locations:
   a. On the underside of roof sheets, extending across top flange of purlin members and held taut and snug to roofing panels by 'tabbing and tucking' method of installation.
   b. On wall insulation sheets.
3. STANDARD: WMP-VR-R PLUS Polypropylene/Scrim/Polyester by Lamtec Corp. 1-800-852-6832

2.10 INTERIOR WALL LINER PANELS

A. Factory-fabricated steel panels shall be:
1. Concealed fastening system attached directly to wall substructure with fastener concealed behind flush face.
2. Gauge: 26

3. Width: 36”
4. Color: White silicone polyester coating (Signature 200)
5. STANDARD: S-36 Panel by MBCI

B. All exposed flashing trim, etc. shall be of the same gauge, material and finish as liner panels.

C. Hem all exposed edges of flashing and trim on underside, 1/2 inch minimum.

D. Provide J-mold trim at all vertical and top horizontal edges of all liner panels.

2.11 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC 360 for plate, bar, tube, or rolled structural shapes.

B. Provide wall opening framing for doors, windows, and other accessory components.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.02 ERECTION - FRAMING

A. Erect framing in accordance with AISC 360.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 ERECTION - ROOFING AND SIDING

A. General
1. Install in accordance with manufacturer's instructions.
2. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface. Protect factory finishes from damage.
3. Field cutting of panels by torch is not permitted.
4. Fasten cladding system to structural supports, aligned level and plumb.
5. Locate end laps over supports. End laps minimum 2 inches (50 mm). Place side laps over bearing. Arrange so prevailing winds blow over, not into, lapped joints.
6. Provide expansion joints where indicated.
7. Use concealed fasteners.
8. Avoid "panel creep" or application not true to line.
9. Install sealant and gaskets, providing weather tight installation.
10. Provide weather seal under ridge cap. Flash and seal roof panels at eave rake with rubber, neoprene, or other closures to exclude weather.

B. Standing-Seam Roof Panel System: Fasten roof panels to purlins with concealed clip in accordance with the manufacturer’s instructions.
1. Install clips at each support with self-drilling fasteners.
2. At end laps of panels, install tape calk between panels.
3. Install factory-calked cleats at standing-seam joints. Machine-seam cleats to the panels to provide a weather tight joint.
4. At the end of each day, remove all metal filings complete from all metal finished surfaces.

C. Wall Sheets: Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as necessary for waterproofing. Handle and apply sealant and backup in accordance with the sealant manufacturer’s recommendations.
1. Align bottom of wall panels and fasten panels with blind rivets, bolts or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws. Fasten window and door frames with machine screw or bolts. When building height

requires two rows of panels at gable ends, align lap of gable panels over wall panels at eave height.

2. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
3. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
4. Provide for system interface with conventional construction. Provide water tight joints which allow for building movement.
5. At the end of each day, remove all metal filings complete from all metal finished surfaces.

D. Sheet Metal Accessories: Install ventilators, louvers, roof curbs and other sheet metal accessories in accordance with manufacturer's recommendations for positive anchorage to building and weather tight mounting. Adjust operating mechanism for precise operation.

E. Insulation shall not be installed when the temperature is 0 degrees F. or lower. The insulation shall be pulled taut over the purlins and girts before attaching the roof and wall panels. The facing shall face toward the interior of the ceiling. The tabs shall be six (6) inches and tucked with the next adjacent roll. Tear in the facing shall be covered with matching facing tape.

F. Dissimilar Materials: where aluminum surfaces come in contact with ferrous metal or other incompatible materials, keep aluminum surfaces from direct contact by applications to the other materials as follows:

1. One coat of zinc chromate primer, as FS TT-P-645, followed by two coats of aluminum paint, SSPC-Paint 101.
2. In lieu of 2 coats of aluminum paint, apply one coat of high-build bituminous paint, SSPC-Paint 12, applied to a thickness of 1/16" over zinc chromate primer.
3. Backpaint aluminum surface where not practical to paint other surface.

G. Cleaning and Touch-Up: Clean component surfaces of matter that could preclude paint bond. Touch up abrasions, marks, skips, or other defects to shop-primed surfaces with same type material as shop primer.

H. Gutters: The inside joints and seams of the inside of the gutters shall be coated with Karnack seam sealer with mesh as per manufacturer's recommendation.

3.04 INSTALLATION – INTERIOR WALL LINER PANELS

A. Comply with manufacturers standard instructions and conform to standards set forth in the Architectural Sheet Metal Manual published by SMACNA.

B. Install wall panels in such a manner that horizontal lines are true and level and vertical lines are plumb.

C. Install starter and edge trim before installing wall panels.

D. Remove protective strippable film prior to installation of panels.

E. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.

F. Do not allow panels or trim to come into contact with dissimilar materials.

G. Protect installed panels and trim from damage caused by adjacent construction until completion of installation.

H. Remove and replace any panels or components, which are damaged beyond successful repair.

I. At the end of each day, remove all metal filings complete from all metal finished surfaces.

3.05 CLEANING

A. Clean any grease, finger marks or stains from the panels per manufacturer's recommendations.

B. Remove all scrap and construction debris from the site.

3.06 DAMAGED MATERIAL

A. Upon determination of responsibility, repair or replace damaged metal panels and flashing to the satisfaction of the architect and/or owner.

3.07 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from level; 1/8 inch (3 mm) from plumb.

B. Siding and Roofing: 1/8 inch (3 mm) from true position.

END OF SECTION

SECTION 21 05 00 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Above ground piping.

B. Escutcheons.

C. Expansions - hose and braid.

D. Mechanical couplings.

E. Pipe hangers and supports.

F. Pipe sleeves.

G. Pipe sleeve-seal systems.

H. Piping specialties.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 09 91 13 - Exterior Painting: Preparation and painting of exterior fire protection piping systems.

C. Section 21 05 23 - General-Duty Valves for Water-Based Fire-Suppression Piping.

D. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment: Piping identification.

E. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.03 REFERENCE STANDARDS

A. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

E. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.

F. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

G. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2018.

H. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

J. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).

K. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.

L. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

M. AWWA C606 - Grooved and Shouldered Joints; 2022.

N. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. NFPA 1963 - Standard for Fire Hose Connections; 2019.

P. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections. Prepare detailed shop drawings for the complete fire protection system, showing all locations of all heads, piping, hangers and other installation details. Drawings shall bear the stamp of a certified sprinkler technician and shall be complete with all calculations and equipment drawings for approval by the Engineer, Indiana State Fire Marshall and the Owner's Underwriter.

D. The Fire Protection Contractor shall provide complete sprinkler drawings and hydraulic calculations to the authority having jurisdiction.

E. Project Record Documents: Record actual locations of components and tag numbering.

F. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Fire protection system shall be designed and installed by a qualified company specializing in performing work of the type specified in this section.
   1. Minimum five experience.

C. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

D. The Fire Protections Contractor shall design the system per NFPA, ISFM, and the Owner's Underwriter.

E. The entire system shall be installed per NFPA 13, NFPA 24, and IBC requirements.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Repair damage to the work of other Contractors or to the building and its contents caused by leaks in the equipment or system install under this contract or by disconnected pipes, fittings, overflows, freeze-ups, etc. at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Sprinkler-based System :
   1. Comply with NFPA 13.
   2. See Section 21 13 00.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories. Install seismic bracing as requried.

2.02 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A53 Schedule 40, black.
   1. Steel Fittings: ASME B16.9, wrought steel, buttwelded or ASME B16.5, steel flanges and fittings.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
   3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.

4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
5. Unless indicated otherwise, piping shall be ASTM A 135, schedule 10 for mains with grooved fittings and shop welded outlets or other approved means. All other pipe shall be threaded schedule 40.

2.03 PIPE SLEEVES

A. Vertical Piping:
1. Sleeve Length: 1 inch (25 mm) above finished floor.
2. Provide sealant for watertight joint.

B. Plastic, Sheet Metal, or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:
1. Zinc-coated.
2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
1. Galvanized steel pipe with asphalt coating.
2. Connect sleeve with floor plate except in mechanical rooms.
3. All pipe penetrations through masonry walls, floors, partitions, and roofs shall be galvanized steel pipe.
4. Galvanized steel pipe sleeves: ASTM A 53, Type E, Grade B, Schedule 40, plain ends.

E. Not required for wall hydrants for fire department connections or in drywall construction.

F. Clearances:
1. Provide allowance for insulated piping.
2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external; pipe diameter.
3. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.

2.04 PIPE SLEEVE-SEAL SYSTEMS

A. Modular Mechanical Seals:
1. Elastomer-based interlocking links to continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
3. Size and select seal component materials in accordance with service requirements.
4. Service Requirements:
   a. Underground, buried, and wet conditions.
5. Glass-reinforced plastic pressure end plates.

2.05 ESCUTCHEONS

A. Material:
1. Fabricate from nonferrous metal.
2. Chrome-plated.
3. Metals and Finish: Comply with ASME A112.18.1.

B. Construction:
1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.06 PIPE HANGERS AND SUPPORTS

A. See additional specifications for further information on hangers and supports.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Malleable iron, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, zinc coated, adjustable, clevis.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

E. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hook.

F. Wall Support for Pipe Sizes 4 inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.

G. Vertical Support: Steel riser clamp.

H. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

I. Seismic Hangers and Couplings:
   1. Provide coupling with a factory set disengagement rating of 140 percent to 160 percent of the static weight.
   2. Provide resettable and reusable, break away couplings.
   3. Provide tether cables to avoid excessive seismic joint movement.
   4. Coupling to be manufactured from non-corrosive materials.

2.07 EXPANSION JOINTS - HOSE AND BRAID

A. Provide flexible loops with two flexible sections of hose and braid, two 90-degree elbows, and 180-degree return with support bracket and air release or drain plug.

B. Provide flexible loops capable of movement in the x, y, and z planes. Flexible loops to impart no thrust loads to the building structure.

C. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
   1. Maximum Allowable Working Pressure: 150 psig (1030 kPa) at 120 degrees F (49 degrees C).
   2. Accommodate the Following:
      a. Angular Rotation: 15 degrees.
      b. Force developed by 1.5 times specified maximum allowable operating pressure.
   3. End Connections: Same as specified for pipe jointing.
   4. Provide necessary accessories including, but not limited to, swivel joints.

2.08 MECHANICAL COUPLINGS

A. Rigid Mechanical Couplings for Grooved Joints:
   1. Dimensions and Testing: Comply with AWWA C606.
   2. Minimum Working Pressure: 300 psig (2065 kPa).
   3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
   4. Housing Coating: Factory applied orange enamel.
   5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).
   6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

2.09 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
   1. Activate electric alarm.
   2. Test and drain valve.
   3. Replaceable internal components without removing valve from installed position.

B. Backflow Preventer: Reduced-pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.

C. Fire Department Connections:
   1. Type: Exposed, projected wall mount made of corrosion-resistant metal complying with UL 405.
      a. Inlets: Two-way, 2-1/2 inch (65 DN) swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or authority having jurisdiction. Brass caps with gaskets, chains, and lugs.
      b. Rated Working Pressure: 175 psi (1200 kPa).
      c. Finish: Chrome.
      d. Signage: Raised or engraved lettering 1 inch (25.4 mm), minimum, indicating system type.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Do not run piping over the top of or within 3'-0" of any electrical panel.

F. All piping in areas with ceilings shall be concealed. Center sprinkler heads in the ceiling tiles. Coordinate head locations with diffusers, grilles, lights, speakers, etc.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Pipe Hangers and Supports:
   1. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

K. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
   2. Aboveground Piping:
      a. Pack solid using mineral fiber complying with ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.

L. Manufactured Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.

3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a watertight seal.
6. Install in accordance with manufacturer's recommendations.

M. Escutcheons:
1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

N. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

O. The system shall be hydrostatically tested at 200 psig for two hours.

P. All devices, pipe, fittings, valves, etc. shall be UL/FM approved for use in fire protection systems and have a maximum working pressure of 175 psi.

Q. Provide any and all sprinkler heads as required to provide protection in all areas. Install all heads required under or around all obstructions.

R. Install low point drains as required.

S. Coordinate requirements for access panels and doors for fire-suppression items requiring access that are concealed behind finished surfaces. Access panels and doors specified in Division 08 Section “Access Doors and Frames”.

END OF SECTION

SECTION 21 05 23 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Two-piece ball valves with indicators.

B. Iron butterfly valves with indicators.

C. Check valves.

D. Bronze OS&Y gate valves.

E. Iron OS&Y gate valves.

F. NRS gate valves.

G. Indicator posts.

H. Trim and drain valves.

1.02 RELATED REQUIREMENTS

A. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment.

B. Section 21 13 00 - Fire-Suppression Sprinkler Systems.

1.03 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

C. ASME B31.9 - Building Services Piping; 2020.

D. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

E. AWWA C606 - Grooved and Shouldered Joints; 2022.

F. FM (AG) - FM Approval Guide; Current Edition.

G. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Obtain valves for each valve type from single manufacturer.
   2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

B. Where listed products are specified, provide products listed, classified, and labeled by FM (AG), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for the purpose indicated.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Set valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors and maintain at higher than ambient dew point temperature.
      b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.

C. Use the following precautions for handling:
   1. Do not use operating handles or stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. FM Global Approved: Provide valves listed in FM (AG) Approval Guide under the following headings:
   1. Automated Sprinkler Systems:
      a. Indicator posts.
      b. Valves:
         1) Gate valves.
         2) Single check valves.
         3) Miscellaneous valves.

B. ASME Compliance:
   1. ASME B16.1 for flanges on iron valves.
   2. ASME B1.20.1 for threads on threaded-end valves.
   3. ASME B31.9 for building services piping valves.

C. Comply with AWWA C606 for grooved-end connections.

D. Comply with NFPA 13 for valves.

E. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:
   1. Worm-gear actuator with handwheel for quarter-turn valves, except trim and drain valves.
   2. Handwheel: For other than quarter-turn trim and drain valves.
   3. Hand-lever: For quarter-turn trim and drain valves 2 NPS (50 DN) and smaller.

2.02 TWO-PIECE BALL VALVES WITH INDICATORS

A. Description:
   1. Minimum Pressure Rating: 175 psig (1200 kPa).
   2. Body Design: Two piece.
   3. Body Material: Forged brass or bronze.
   4. Port Size: Full or standard.
   5. Seat: PTFE.
   6. Stem: Bronze or stainless steel.
   7. Ball: Chrome-plated brass.
   8. Actuator: Worm gear or traveling nut.
   9. End Connections for Valves 1 NPS (25 DN) through 2 NPS (50 DN): Threaded ends.
   10. End Connections for Valves 2-1/2 NPS (65 DN): Grooved ends.

2.03 IRON BUTTERFLY VALVES WITH INDICATORS

A. Minimum Pressure Rating: 175 psig (1200 kPa).

B. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, or polyamide coating.
C. Seat: EPDM.
D. Stem: Stainless steel.
E. Disc: Ductile iron, nickel plated.
F. Actuator: Worm gear or traveling nut.
G. Supervisory Switch: Internal or external.
H. Body Design: Grooved-end connections.

2.04 CHECK VALVES

A. Minimum Pressure Rating: 175 psig (1200 kPa).
B. Type: Center guided check valve.
C. Body Material: Cast iron, ductile iron.
D. Center guided check with elastomeric seal.
E. Hinge Spring: Stainless steel.
F. End Connections: Flanged, grooved, or threaded.

2.05 BRONZE OS&Y GATE VALVES

A. Minimum Pressure Rating: 175 psig (1200 kPa).
B. Body and Bonnet Material: Bronze or brass.
C. Wedge: One-piece bronze or brass.
D. Wedge Seat: Bronze.
E. Stem: Bronze or brass.
F. Packing: Non-asbestos PTFE.
G. Supervisory Switch: External.
H. End Connections: Threaded.

2.06 IRON OS&Y GATE VALVES

A. End Connections: Flanged.
B. Maximum Working Pressure: 175 psi (1,200 kPa).
C. Body and Bonnet Material: Cast or ductile iron.
D. Wedge: Cast or ductile iron, or bronze with elastomeric coating.
E. Stem: Brass, bronze, or stainless steel.
F. Packing: Non-asbestos PTFE.
G. Supervisory Switch: External.

2.07 NRS GATE VALVES

A. Minimum Pressure Rating: 175 psig (1200 kPa).
B. Body and Bonnet Material: Cast or ductile iron.
C. Wedge: Cast or ductile iron with elastomeric coating.
D. Stem: Brass or bronze.
E. Packing: Non-asbestos PTFE.
F. Supervisory Switch: External.
G. End Connections: Flanged.

2.08 INDICATOR POSTS

A. Type: Underground.

B. Base Barrel Material: Cast or ductile iron.

C. Cap: Cast or ductile iron.

D. Operation: Wrench.

2.09 TRIM AND DRAIN VALVES

A. Ball Valves:
   1. Description:
      a. Pressure Rating: 175 psig (1200 kPa).
      b. Body Design: Two piece.
      c. Body Material: Forged brass or bronze.
      d. Port Size: Full or standard.
      e. Seat: PTFE.
      f. Stem: Bronze or stainless steel.
      g. Ball: Chrome-plated brass.
      h. Actuator: Hand-lever.

B. Angle Valves:
   1. Description:
      a. Pressure Rating: 175 psig (1200 kPa).
      b. Body Material: Brass or bronze.
      c. Ends: Threaded.
      d. Stem: Bronze.
      e. Disc: Bronze.
      f. Packing: Asbestos free.
      g. Handwheel: Malleable iron, bronze, or aluminum.

C. Globe Valves:
   1. Description:
      a. Pressure Rating: 175 psig (1200 kPa).
      b. Body Material: Bronze with integral seat and screw-in bonnet.
      c. Ends: Threaded.
      d. Stem: Bronze.
      e. Disc Holder and Nut: Bronze.
      f. Disc Seat: Nitrile.
      g. Packing: Asbestos free.
      h. Handwheel: Malleable iron, bronze, or aluminum.

2.10 SPECIALTY VALVES

A. General Requirements:
   1. Standard UL's "Fire Protection Directory" Listing or "Approval Guide," published by FM Global, listing.
   2. Minimum Pressure Rating: 175 psig.
   3. Body Material: Cast or ductile iron.
   4. Size: Same as connected piping.
   5. End Connections: Flanged or grooved.

B. Alarm Valves:
   1. Standard: UL 193.
   2. Design: For horizontal or vertical installation. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gauge, and in-line attachment with strainer.
   3. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping. Pipe check with check valve to main drain piping.

C. Automatic (Ball Drip) Drain Vales:
   1. Standard: UL 1726.
   2. Pressure Rating: 175 psig minimum.
   3. Type: Automatic draining, ball check.

4. Size: NPS 3/4-inch.
5. End Connections: Threaded.

PART 3 EXECUTION

3.01 EXAMINATION

A. Confirm valve interior to be free of foreign matter and corrosion.

B. Remove packing materials.

C. Examine guides and seats by operating valves from the fully open position to the fully closed position.

D. Examine valve threads and mating pipe for form and cleanliness.

3.02 INSTALLATION

A. Comply with specific valve installation requirements and application in the following Sections:
   1. Section 21 13 00 for application of valves in wet and dry pipe, fire-suppression sprinkler systems.

B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.

C. Valves in horizontal piping installed with stem at or above the pipe center.

D. Position valves to allow full stem movement.

E. Install valve tags. Comply with Section 21 05 53 requirements for valve tags, schedules, and signs on surfaces concealing valves; and the appropriate NFPA standard applying to the piping system in which valves are installed.

END OF SECTION

SECTION 21 05 29 - HANGERS AND SUPPORTS FOR FIRE SPRINKLER PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and equipment hangers, supports, and associated anchors.

1.02 REFERENCES

A. NFPA 13 - Standard for the Installation of Sprinkler Systems.

B. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems.

C. Provide pipe hangers and supports of materials, design, and manufacture which comply with MSS SP-58.

D. Select and apply pipe hangers and supports, complying with MSS SP-69.

E. Fabricate and install pipe hangers and supports, complying with MSS SP-89.

1.03 QUALITY ASSURANCE

A. Supports for Sprinkler Piping: In conformance with NFPA 13, UL listed.

B. Supports for Standpipes: In conformance with NFPA 14, UL listed.

1.04 SUBMITTALS

A. Submit under provisions of Division 01 Section "General Requirements".

B. Submit shop drawing of hanger and support spacing, framing and attachment methods.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 Inch to 1 1/2 Inches: Carbon steel, adjustable swivel ring, UL listed, Grinnell Fig. 69 or equal. Use plastic coated hangers at all uninsulated copper piping.

B. Hangers for Pipe Sizes 2 Inches and Cold Pipe Sizes 6 Inches and Over: Carbon steel, black or galvanized, adjustable, clevis, UL listed, Grinnell Fig. 260 or equal.

C. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.

D. Trapeze Supports: 12 gauge channel complete with nuts, pipe clamps, pipe straps, and drive-in end caps. Furnish cushion strip on all uninsulated copper piping and cast iron roll and stand for hot pipe sizes 6 inches and over.

E. Pipe Supported Tight to Wall, Floor, or Ceiling: Superstrut A1200, Unistrut P1000, or equal, 12 gauge channel complete with pipe clamps, nuts, bolts, and end caps. Furnish cushion strip on all uninsulated copper piping. and adjustable steel yoke and cast iron roll for hot- pipe sizes 6 inches and over.

F. Vertical Support: Steel riser clamp, UL listed, Grinnell Fig. 261, Superstrut C720, or equal.

G. Floor Support for Pipe Sizes to 4 Inches and Cold Pipe Sizes: Cast iron adjustable pipesaddle, locknut nipple, floor flange, and concrete pier or steel support.

H. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

I. Shield for Insulated Piping 2 Inches and Smaller: 18-gauge galvanized steel shield over insulation in 180 degree segments, at least 12 inches long at pipe support.

J. Pipe Shields: Pipe Shields Inc., FRI, or equal, pipe hanger shield with water proofed calcium silicate insulation encased in a galvanized metal casing completely around the pipe. Provide insulation same thickness as pipe insulation. Furnish the following models:
   1. Chilled Water: A2000 with calcium silicate insulation extending 1" beyond the metal casing.
   2. All others: A1000.

K. Concrete Anchors: In accordance with Division 03 Section "Concrete Accessories".

2.02 HANGER RODS

A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.03 ATTACHMENTS TO STRUCTURE

A. Inserts for new formed concrete construction: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods. For Suspension from New Formed Concrete Structure: Grinnell Figure 282, Superstrut 452, or equal, UL listed for the rod sizes, Grinnell, Fig. 282, Superstrut 452, or equal.

B. Connection to Existing Concrete Structure: Concrete anchors conforming to Division 03 Section "Concrete Accessories".

C. For Suspension from New Formed Concrete Structure: B-Line B3014, Grinnell Figure 282, Superstrut 452, or equal, adjustable concrete insert.

D. For Support on New Concrete: Galvanized steel headed bolts.

E. Welded Connection to Steel Beams: B-Line B3083, Grinnell, Superstrut, or equal, steel welded beam attachment.

F. Clamp Connection to Steel Beams: B-Line, Grinnell, Superstrut, or equal, beam clamp with retaining clip style as required by load.

2.04 SUPPORTS, BRACING, AND ACCESSORIES

A. Miscellaneous Steel: Angles, channels, brackets, rods, clamps, etc., of new materials conforming to ASTM A36. Hot-dip galvanize all steel parts after fabrication where used outdoors or inside the penthouse.

B. Fasteners: All bolts and nuts, except as otherwise specified, shall conform to ASTM Standard Specifications for Low Carbon Steel Externally and Internally Threaded Standard Fasteners, Designation A307. Bolts shall have heavy hexagon heads, and nuts shall be of the hexagon heavy series. All bolts, washers, nuts, anchor bolts, screws and other hardware used outdoors or inside the penthouse shall be galvanized, and all galvanized nuts shall have a free running fit. Provide bolts of ample size and strength for the purpose intended. All ferrous metal components below grade shall be stainless steel.

C. Sheet Metal Screws: Plated, size 10 minimum.

D. Pre-engineered pipe bracing systems may be Mason Industries Seismic Sway Brace System or equal.

2.05 COUNTER FLASHING

A. Metal Flashing: 26-gauge galvanized steel.

B. Flexible Flashing: 47-mil thick sheet butyl; compatible with roofing.

C. Caps: Steel, 16 gauge.

2.06 EQUIPMENT CURBS

A. See Architectural and Structural Drawings for the design detail of the equipment curb.

2.07 SLEEVES

A. Adjust-To-Crete, AMI Products, or equal, 24 gauge, electro-galvanized adjustable sleeve, up to 6 inch diameter. For 8 inches and larger, provide galvanized standard weight steel pipe sleeves.

B. Caulk: Acrylic sealant of quality specified in Division 087 Section "Joint Sealants".

2.08 FIREPROOFING OF FLOOR AND WALL PENTRATIONS

A. Materials and installation shall comply with U.L. "Fire Resistance Directory", for Through-Penetration for Firestop Devices, latest edition. See Division 07 Section "Penetrating Firestopping".

2.09 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers for installation without disengagement of supported pipe.

2.10 FINISHES

A. Prime-paint exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
   1. Steel in the Clean Room interstitial space is considered exposed.

B. Hot-dip galvanized outdoors.

C. Repair damage to galvanizing at welds, scratches, etc. using Z.R.C. (no known equal) cold galvanizing compound.

PART 3 EXECUTION

3.01 ATTACHMENTS TO STRUCTURE

A. Concrete Structure: Locate anchors from any edge condition and at a spacing to obtain maximum working loads specified in the applicable ICC report.
   1. See structural drawings for additional restrictions for locating anchors.

B. Steel Structure: Attach at beam axis. Avoid eccentric loads wherever possible.

C. Rating: Ultimate strength at least five times the imposed load.

D. Submit for structural review all pipe hanger locations, point loads and structural attachment details for pipes 6 inches and larger.

E. Coordinate installation so that attachments to structure are made prior to fireproofing. If attachments must be made after fireproofing, then thoroughly clean area of fire proofing before welded or bolted attachments are made and replace fireproofing as necessary. Fireproofing material shall match existing.

F. Inserts:
   1. Furnish inserts to Divisions 03 Sections "Concrete" and "Concrete Forming", for placement in concrete form work.
   2. Furnish inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Furnish hooked rod to Divisions 03 Sections "Concrete" and "Concrete Forming".
   4. Reinforcement for inserts carrying pipe larger than 4 inches.
   5. Where concrete slabs form finished ceiling, furnish inserts to be flush with slab surface.
   6. Where inserts are omitted, submit an attachment plan to the University.

3.02 SUPPORTS, BRACING, AND ACCESSORIES

A. Common support systems: This section is responsible for the provision, coordination, calculations, and seismic bracing of support systems common to Division 21 work. Individual section shall provide their own horizontal support struts. Division 21 shall coordinate with other divisions of all aspects of hanger installation, horizontal strut installation, pipe/conduit/cable tray/etc. installation, seismic bracing installation, and so on.

B. Set all machines and devices dead level, except where pitch or slope is specified or shown. Securely fasten to the structure unless shown otherwise. Use dry pack cement grout to obtain complete contact between structure and equipment.

C. This Section is responsible for the concrete work for the support of equipment provided by this Section. Coordinate locations with anchor bolts before concrete is placed.

D. Pipe Hangers and Supports:
   1. Support horizontal piping as follows:
      a. Pipe Size: 1/2 to 1-1/4 inch; Maximum Spacing: 6'-6"; Hanger Diameter: 3/8 inch
      b. Pipe Size: 1-1/2 to 2 inch; Maximum Spacing: 10'-0"; Hanger Diameter: 3/8 inch
      c. Pipe Size: 2-1/2 to 3 inch; Maximum Spacing: 10'-0"; Hanger Diameter: 1/2 inch

d. Pipe Size: 4 to 6 inch; Maximum Spacing: 10'-0"; Hanger Diameter: 5/8 inch
e. Pipe Size: 8 to 12 inch; Maximum Spacing: 14'-0"; Hanger Diameter: 7/8 inch
f. Pipe Size: 14 inch and over; Maximum Spacing: 20'-0"; Hanger Diameter: 1 inch
g. PVC (All sizes); Maximum Spacing: 6'-0"; Hanger Diameter: 3/8 inch
h. C.I. Bell and Spigot (or No-Hub); Maximum Spacing: 5'-0"; Hanger Diameter: 3/8 inch

2. Install hangers to provide at least 1/2 inch space between finished covering and adjacent work.
3. Place a hanger within 12 inches of each horizontal elbow.
4. Use hangers with at least 1-1/2 inch vertical adjustment.
5. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
6. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers. Use specified pipe shields (if applicable). Trapeze size, and support size and spacing shall be governed by the cumulative weight of the supported piping. Maximum trapeze deflection shall be 1/240th of the span on a maximum stress of 15,000 psi, whichever is more stringent.
8. Support riser piping independently of connected horizontal piping.
9. Brace piping longitudinally and transversely as specified and indicated on the drawings. Design of the seismic bracing shall be in accordance with Division 01 Section "Lateral Force Procedures".
10. Support all pipe from the building structure so that there is no apparent deflection in pipe runs. Fit piping with steel sway braces and anchors to prevent vibration and/or horizontal displacement under load when required. Do not support from, or brace to, ducts, other pipes, conduit, or any materials except building structure. Piping or equipment shall be immobile and shall not be supported or hung by wire, rope, plumber's tape, plastic ties, or blocking of any kind. Vertical piping running between floors shall be additionally supported at mid points in a rigid and immobile fashion. Any exposed or concealed piping which can be physically moved, and which is not properly supported will not be accepted, and additional support or bracing will be required. Install seismic bracing as at locations as specified in the contract drawings.
11. Install and secure all equipment with anchors and braces to floors, structural members and walls with sufficient backing, to prevent vibration and/or horizontal displacement under load and seismic force as hereinbefore specified. Follow manufacturer's recommendations for the installation of vibration isolators where required for all equipment requiring such.

E. Equipment Bases and Supports:
1. Comply with Divisions 03 Sections "Concrete" and "Concrete Forming" for concrete bases.
2. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
3. Construct support of steel members. Brace and fasten with flanges bolted to structure. Level equipment installed on steel rails using shims to compensate for the deflection of the steel.
4. Provide rigid anchors for pipes after vibration-isolation components are installed.

F. Counter Flashing:
1. See Architectural drawings for flashings.
2. Provide flexible flashing and metal counterflashing where piping penetrates weatherproofed or waterproofed walls, floors, and roofs.
3. Counterflash vent and soil pipes projecting at least 3 inches above finished roof surface with lead worked at least 1 inch into hub, at least 8 inches clear on sides using 24 x 24 inch sheets. For pipes through outside walls, turn flanges back into wall and caulk, metal counterflash, and seal.
4. Counterflash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides using at least 36 x 36 inch sheets. Fasten flashing to drain clamp device.
5. Seal floor, shower, mop sink, and drains watertight to adjacent materials.
6. Provide acoustical-lead flashing around pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.

G. Sleeves:
   1. Set sleeves in position in formwork. Provide reinforcing around sleeves.
   2. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves full depth and provide floor plate.
   3. Where piping penetrates floor, ceiling, or wall, close-off space between pipe and
   4. adjacent work with fire-stopping insulation and caulk airtight. Provide close-fitting metal collar or escutcheon covers at both sides of penetration.
   5. Install chrome-plated steel escutcheons at finished surfaces.

3.03 SEISMIC RESTRAINTS

A. Provide all support hangar system, equipment, and piping with seismic restraints in accordance with Division 01 Section "Lateral Force Procedures".

B. Pipe seismic restraints shall not interfere with pipe thermal expansion loop action or pipe building joint expansion loop action.

END OF SECTION

SECTION 21 05 48 - VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Seismic control requirements.

B. Seismic restraint systems

1.02 DEFINITIONS

A. Fire Suppression Component: Where referenced in this section in regards to seismic controls, applies to any portion of the fire suppression system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

C. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2014.

D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

E. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

G. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Seismic Controls: Include seismic load capacities.

C. Shop Drawings - Seismic Controls:
   1. Include dimensioned plan views and sections indicating proposed fire suppression component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
   2. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
   3. Indicate proposed arrangement of distributed system trapeze support groupings.
   4. Indicate proposed locations for distributed system flexible fittings and/or connections.
   5. Indicate locations of seismic separations where applicable.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 SEISMIC CONTROL REQUIREMENTS

A. Design and provide fire suppression component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor fire suppression components.

B. Seismic Design Criteria: ICC (IBC)/ASCE 7/NFPA 13.

C. Seismic Restraints:
   1. Provide seismic restraints for fire suppression components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
   2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
      a. ASHRAE (HVACA).
      b. FEMA 412.
      c. FEMA 413.
      d. FEMA 414.
      e. FEMA E-74.
      f. SMACNA (SRM).
   3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
   4. Seismic Restraint Systems:
      a. Arrange restraint elements to avoid obstruction of sprinklers in accordance with NFPA 13.
      b. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
      c. Use only cable restraints to restrain vibration-isolated fire suppression components.
      d. Use only one restraint system type for a given fire suppression component or distributed system (e.g., piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
      e. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain fire suppression component in all lateral directions; consider bracket geometry in anchor load calculations.
      f. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported fire suppression component weight.
      g. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported fire suppression component weight.
      h. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
      i. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
      j. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

D. Seismic Attachments:
   1. Comply with support and attachment requirements of NFPA 13.

2. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
3. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
4. Do not use power-actuated fasteners.
5. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps, but not for sway bracing attachments as prohibited by NFPA 13.
6. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
7. Concrete Housekeeping Pads:
   a. Increase size of pad as required to comply with anchor requirements.
   b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

E. Seismic Interactions:
1. Include provisions to prevent seismic impact between fire suppression components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
3. Comply with minimum clearance requirements between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

F. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections, in accordance with NFPA 13, to accommodate:
   a. Relative displacements at connections between components, including distributed systems (e.g., piping); do not exceed load limits for equipment utility connections.
   b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
   c. Design displacements at seismic separations.
   d. Anticipated drifts between floors.
2. Provide clearance around fire suppression system piping extending through walls, floors, platforms, and foundations in accordance with NFPA 13.

2.02 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Where required by NFPA 13, provide products listed as complying with UL 203A or FM 1950.

C. Cable Restraints:
1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

D. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Seismic Controls:
   1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
   2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
   3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch (3 mm), use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch (3 mm) or less.
   4. Equipment with Sheet Metal Housings:
      a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
      b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
      c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
   5. Concrete Housekeeping Pads:
      a. Size in accordance with seismic design to meet anchor requirements.
      b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
   6. Seismic Restraint Systems:
      a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
      b. Install restraints within permissible angles in accordance with seismic design.
      c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
      d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
      e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

END OF SECTION

SECTION 21 05 53 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates. Equipment Labels.

B. Valve Tags.

C. Pipe markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers catalog literature for each product required.

C. Manufacturer's Installation Instructions: Indicate special procedures, and installation instructions.

D. Submit equipment label schedule to include in maintenance manuals.

E. Submit valve chart and schedule, including valve tag number, location, valve manufacturer name and model number, for each piping system to include in the maintenance manuals.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Automatic Controls: Tags.

B. Control Panels: Nameplates.

C. Instrumentation: Tags.

D. Major Control Components: Nameplates.

E. Piping: Tags.

F. Relays: Tags.

G. Small-sized Equipment: Tags.

2.02 NAMEPLATES. EQUIPMENT LABELS.

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch (6 mm).
   3. Background Color: Black.
   4. Thickness: 1/8 inch (3 mm).
   5. Plastic: Comply with ASTM D709.

2.03 VALVE TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.04 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

C. Color code as follows:
   1. Fire Quenching Fluids: Red with white letters.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to applied.

E. Coordinate installation of identifying devices with locations of access panels and doors.

F. Install identifying devices before installing acoustical ceilings and similar concealment.

G. Equipment label installation:
   1. Install or permanently fasten on each major item of equipment.
   2. Locate equipment labels where accessible and visible.

H. Pipe label installation:
   1. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; and exterior exposed locations as follows:
      a. Near each valves and control device.
      b. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
      c. At access doors, manholes, and similar access points that permit view of concealed piping.
      d. Near major equipment items and other points of origination and termination.
      e. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 15 feet in areas of congested piping and equipment.

I. Valve tag installation:
   1. Install tags on valves and control devices in piping system.

J. Valve chart and schedule:
   1. Provide valve chart and schedule in aluminum frame with clear plastic shield. Install at location as directed by the Owner.

END OF SECTION

SECTION 21 13 00 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

C. Fire department connections.

1.02 RELATED REQUIREMENTS

A. Section 21 05 00 - Common Work Results for Fire Suppression: Pipe and fittings.

B. Section 21 05 23 - General-Duty Valves for Water-Based Fire-Suppression Piping.

C. Section 21 05 48 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment.

D. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment.

E. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).

C. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).

D. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

E. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.

F. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 1963 - Standard for Fire Hose Connections; 2019.

H. UL (DIR) - Online Certifications Directory; Current Edition.

I. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
   1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
   3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.

D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements for additional provisions.
2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
3. Sprinkler Wrenches: For each sprinkler type.

G. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.05 QUALITY ASSURANCE

A. Maintain one copy of referenced design and installation standard on site.

B. Comply with FM (AG) requirements.

C. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

E. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years experience and approved by manufacturer.

F. Equipment and Components: Provide products that bear FM (AG) label or marking.

G. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sprinklers, Valves, and Equipment:
1. Tyco Fire Protection Products; _____: www.tyco-fire.com/#sle.
2. Viking Corporation; _____: www.vikinggroupinc.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for building areas noted in Schedule.

B. Occupancy: See Schedule; comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.

D. Interface system with building fire and smoke alarm system.

E. Provide fire department connections where indicated.

F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

G. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
6. Other Types: As required.

2.03 SPRINKLERS

A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.
1. Response Type: Quick.
2. Coverage Type: Standard.

3. Finish: Chrome plated.
4. Escutcheon Plate Finish: Chrome plated.
5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Exposed Area Type: Pendant type.
1. Response Type: Quick.
2. Coverage Type: Standard.
3. Finish: Chrome plated.
4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

C. Guards: Finish to match sprinkler finish.

2.04 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following (Substitutions: See Section 016000 – Product Requirements):
a. ADT Security Services, Inc.
b. McDonnell & Miller; ITT Industries.
c. Potter Electric Signal Company.
d. System Sensor; a Honeywell company.
e. Viking Corporation.
f. Watts Industries (Canada) Inc.

C. Standard: UL 346.

D. Water-Flow Detector: Electrically supervised.
1. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
2. Type: Paddle operated.
3. Pressure Rating: 250 psig.
4. Design Installation: Horizontal or vertical.

E. Valve Supervisory Switches:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following (Substitutions: See Section 016000 – Product Requirements):
a. Fire-Lite Alarms, Inc.; a Honeywell company.
b. Kennedy Valve; a division of McWane, Inc.
c. Potter Electric Signal Company.
d. System Sensor; a Honeywell company.
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

F. Manual Control Stations:
1. Description: UL listed or FM approved, hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.

G. Control Panels:
1. Description: Single-area, two-area, or single-area cross-zoned control panel as indicated, including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves. Panels contain power supply; battery charger; standby batteries; field-wiring terminal strip; electrically supervised solenoid valves and polarized fire-alarm bell; lamp test facility; single-pole, double-throw auxiliary alarm contacts; and rectifier.

2. Panels: UL listed and FM approved when used with thermal detectors and Class A detector circuit wiring. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.

H. Horn and Light:
1. Provide a combination horn and light alarm with 100-decibel vibratory horn and a 40- watt flashing light. Unit shall be similar to Farr-Larm as manufactured by Fire-Trols. Substitutions: See Section 016000 – Product Requirements.

2.05 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
1. Activate electric alarm.
2. Test and drain valve.
3. Replaceable internal components without removing valve from installed position.

B. Backflow Preventer: Reduced pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.

C. Test Connections:
1. Backflow Preventer Test Connection:
a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch (65 mm) National Standard male hose threads with cap and chain.
b. Furnish one valve for each 250 gpm (16 L/s) of system demand or fraction thereof.
c. Provide permanent sign reading "Test Valve" in accordance with Section 21 05 53.

D. Fire Department Connections:
1. Type: Flush, wall mount made of corrosion resistant metal complying with UL 405.
a. Location: Shall be where directed by local authorities.
b. Inlets: Two way, 2-1/2 inch (65 DN) swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
c. Outlet: With pipe threads, 4 NPS (100 DN).
d. Rated Working Pressure: 175 psi (1200 kPa).
e. Finish: Chrome.
f. Signage: Raised or engraved lettering 1 inch (25.4 mm) minimum indicating system type.

E. Hose Connections:
1. Description: UL 668, brass or bronze, 175-psig minimum pressure rating, hose valve for connecting fire hose. Include angle or gate pattern design; female NPS inlet and male hose outlet; and lugged cap, gasket, and chain. Include NPS 2-1/2 as indicated, and hose valve threads according to NFPA requirements and matching local fire department threads.

F. Branch Outlet Fittings:
1. Standard: UL 213.
2. Pressure Rating: 175 psig minimum.
3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
4. Type: Mechanical-T and -cross fittings.
5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
7. Branch Outlets: Grooved, plain-end pipe, or threaded.

G. Flow Detection and Test Assemblies:
1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.

3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

H. Branch Line Testers:
1. Standard: UL 199.
2. Pressure Rating: 175 psig minimum.
3. Body Material: Brass.
4. Size: Same as connected piping.
5. Inlet: Threaded.
6. Drain Outlet: Threaded and capped.
7. Branch Outlet: Threaded, for sprinkler.

I. Sprinkler Inspector's Test Fittings:
1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.
3. Body Material: Cast- or ductile-iron housing with sight glass.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

J. Adjustable Drop Nipples:
1. Standard: UL 1474.
2. Pressure Rating: 250 psig minimum.
3. Body Material: Steel pipe with EPDM-rubber O-ring seals.
4. Size: Same as connected piping.
5. Length: Adjustable.
6. Inlet and Outlet: Threaded.

K. Flexible, Sprinkler Hose Fittings:
1. Standard: UL 1474.
2. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
3. Pressure Rating: 175 psig minimum.
4. Size: Same as connected piping, for sprinkler.

L. Sprinkler Guards:
1. Standard: UL 199.
2. Type: Heavy duty 2 piece wire cage with screw fastening device for attaching to sprinkler head.
3. Guards shall be a steel wire cage designed to encase the sprinkler and protect it from mechanical damage. Guards shall be provided on sprinklers in areas where damage could occur.

M. Pressure Gauges:
1. Standard: UL 393.
2. Dial Size: 3-1/2- to 4-1/2-inch diameter.
3. Pressure Gage Range: 0 to 250 psig minimum.
4. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.
5. Air System Piping Gage: Include "AIR" or "AIR/WATER" label on dial face.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Provide approved double check valve assembly at sprinkler system water source connection.

D. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

E. Locate outside alarm gong on building wall as indicated.

F. Place pipe runs to minimize obstruction to other work.

G. Place piping in concealed spaces above finished ceilings.

H. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

I. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

J. Flush entire piping system of foreign matter.

K. Install guards on sprinklers where indicated.

L. Hydrostatically test entire system to 200 psig.

M. Require test be witnessed by Fire Marshal.

N. Perform fire-hydrant flow test according to NFPA 13, NFPA 14, and NFPA 291. Use results for system design calculations required in Part 1 "Quality Assurance" Article. Report test results promptly and in writing.

O. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.

P. Examine walls and partitions for suitable thicknesses, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.

Q. Clean dirt and debris from sprinklers.

R. Remove and replace sprinklers with paint other than factory finish.

S. Protect sprinklers from damage until Substantial Completion.

3.02 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves. Refer to Division 01 Section "Demonstration and Training."

3.03 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

3.04 SCHEDULES

A. System Hazard Areas:
   1. Vestibule 100, Corridor 101, Receptionist 102, Office 103, Office 104, Conference 105, Corridor 106, Restroom 107, Restroom 108, IT Room 109, Corridor 110, Electrical 111, Janitor 112, Corridor 113, Restroom 114, Restroom 115, Break Room 116, Stairs, 118, parts Storage, 119, Storage 120, and Mezzanine 200: Light Hazard.
   2. Maintenance Bay 121, Bay #2 122, and Bay #3 123: High Hazard.
   3. Print Room 117: No Fire Protection.

END OF SECTION

SECTION 22 05 00 - GENERAL PLUMBING REQUIREMENTS

PART 1 GENERAL

1.01 GUARANTEE AND MAINTENANCE

A. Without additional cost to the Owner, repair defects in workmanship, equipment and material for a period of two (2) years from the date of substantial completion unless a longer time period is indicated in other Specification Sections.

B. Remove equipment or material which fails to meet performance ratings specified and shown in the Contract Documents. Replace with equipment which meets all specified requirements without additional cost to the Owner.

C. Guarantee that systems will operate without excessive noise (maximum NC of 35) as determined by the Architect / Engineer.

D. Provide a guarantee against system or equipment leaks for three (3) years from the date of approval of final payment by the Architect / Engineer. Properly repair leaks occurring during this period without additional cost to the Owner. This clause shall not be interpreted as holding the Contractor responsible for deterioration of system or equipment due to its abuse as determined by the Architect / Engineer.

E. Repair damage to the work of other Contractors or to the building and its contents caused by leaks in the equipment or system installed under this Contract or by disconnected pipes, fittings, overflows, freeze-ups, etc. at no additional cost to the Owner.

END OF SECTION

SECTION 22 05 13 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

C. Single phase electric motors.

D. Three phase electric motors.

E. Electronically Commutated Motors (ECM).

1.02 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators; 2021.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

C. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for motors larger than 20 horsepower.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
   3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

C. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 22 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Sleeves.
   2. Sleeve-seal systems.
   3. Grout.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 PRODUCTS

2.01 SLEEVES

A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.02 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Advance Products & Systems, Inc.
   2. CALPICO, Inc.
   3. Metraflex Company (The).
   4. Pipeline Seal and Insulator, Inc.
   5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
   1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   2. Pressure Plates: Stainless steel.
   3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.03 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 EXECUTION

3.01 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors and masonry partitions and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
   1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors and concrete walls as new slabs and walls are constructed.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls.

D. Install sleeves for pipes passing through interior masonry partitions.
   1. Cut sleeves to length for mounting flush with both surfaces.
   2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
   3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls and partitions at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.02 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls, foundation walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.03 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:
   1. Exterior Concrete Walls above Grade:
      a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
      b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.
   2. Concrete Walls below Grade:
      a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.
         1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
      b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.
         1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
   3. Concrete Slabs above Grade:
      a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
      b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.
   4. Interior Masonry Partitions:
      a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

END OF SECTION

SECTION 22 05 18 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Escutcheons.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 PRODUCTS

2.01 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed and exposed-rivet hinge, and spring-clip fasteners.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
   1. Escutcheons for New Piping:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
      c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.
      d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.
      e. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.
      f. Bare Piping in Equipment Rooms: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.

3.02 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons using new materials.

END OF SECTION

SECTION 22 05 19 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Bimetallic-actuated thermometers.
   2. Thermowells.
   3. Dial-type pressure gages.
   4. Gage attachments.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.04 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage, from manufacturer.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Ashcroft Inc.
   2. Ernst Flow Industries.
   3. Marsh Bellofram.
   4. Miljoco Corporation.
   5. Nanmac Corporation.
   6. Noshok.
   7. Palmer Wahl Instrumentation Group.
   8. REOTEMP Instrument Corporation.
   9. Tel-Tru Manufacturing Company.
   10. Trerice, H. O. Co.
   11. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
   12. Weiss Instruments, Inc.
   13. WIKA Instrument Corporation - USA.
   14. Winters Instruments - U.S.

B. Standard: ASME B40.200.

C. Case: Stainless steel, 3-inch diameter.

D. Element: Bimetal coil helix with silicone dampening

E. Dial: Aluminum with white finish and black markings in deg F.

F. Pointer: Aluminum with black finish.

G. Recalibrator: Recalibrator screw on rear of case

H. Window: Clear glass

I. Ring: Stainless steel

J. Connector: Adjustable angle type

K. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

L. Stem: 0.250 inch O.D. of length to suite application.

M. Accuracy: Plus or minus 1 percent of scale range.

2.02 THERMOWELLS

A. Thermowells:
1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type metal fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Type: Stepped shank unless straight or tapered shank is indicated.
5. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
6. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
7. Bore: Diameter required to match thermometer bulb or stem.
8. Insertion Length: Length required to match thermometer bulb or stem.
9. Lagging Extension: Include on thermowells for insulated piping and tubing.
10. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.03 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. AMETEK, Inc.; U.S. Gauge.
b. Ashcroft Inc.
c. Ernst Flow Industries.
d. Flo Fab Inc.
e. Marsh Bellofram.
f. Miljoco Corporation.
g. Noshok.
h. Palmer Wahl Instrumentation Group.
i. REOTEMP Instrument Corporation.
j. Tel-Tru Manufacturing Company.
k. Trerice, H. O. Co.
l. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
m. Weiss Instruments, Inc.
n. WIKA Instrument Corporation - USA.
o. Winters Instruments - U.S.
2. Standard: ASME B40.100.
3. Case: Dry-type, drawn stainless steel, brightly finished, 4-1/2” diameter
4. Pressure-Element Assembly: Phosphor-bronze bourdon tube.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type.
6. Movement: Brass with precision milled teeth.
7. Dial: Nonreflective aluminum with permanently etched black scale markings graduated in psi.
8. Pointer: Adjustable type, aluminum with black finish.
9. Window: Shatter-proof acrylic.
10. Ring: Stainless steel.
11. Accuracy: Grade 1A, plus or minus 1 percent of entire scale range.

2.04 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and porous stainless steel-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Bronze ball, full port, with stainless steel ball and trim and NPS 1/4 or NPS 1/2 ASME B1.20.1 pipe threads.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

G. Install valve and snubber in piping for each pressure gage for fluids.

3.02 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.03 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.04 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F

B. Scale Range for Domestic Hot-Water Piping: 30 to 240 deg F.

3.05 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 100 psi.

B. Scale Range for Domestic Water Piping: 0 to 100 psi.

END OF SECTION

SECTION 22 05 23 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ball valves.

B. Butterfly valves.

C. Check valves.

D. Gate valves.

E. Globe valves.

1.02 RELATED REQUIREMENTS

A. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

B. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

C. Section 22 07 19 - Plumbing Piping Insulation.

D. Section 22 10 05 - Plumbing Piping.

E. Section 22 15 00 - General-Service Compressed-Air Systems.

1.03 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Non-rising stem.

E. OS&Y: Outside screw and yoke.

F. PTFE: Polytetrafluoroethylene.

G. RS: Rising stem.

H. TFE: Tetrafluoroethylene.

I. WOG: Water, oil, and gas.

1.04 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022, with Errata (2023).

E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

F. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.

G. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

H. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2023).

I. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).

J. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.

K. MSS SP-45 - Drain and Bypass Connections; 2020.

L. MSS SP-67 - Butterfly Valves; 2022.

M. MSS SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends; 2011.

N. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.

O. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

P. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

Q. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

R. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.06 QUALITY ASSURANCE

A. Manufacturer:
   1. Obtain valves for each valve type from single manufacturer.
   2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
   2. Protect valve parts exposed to piped medium against rust and corrosion.
   3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
   4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
   5. Secure check valves in either the closed position or open position.
   6. Adjust butterfly valves to closed or partially closed position.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.

1.08 EXERCISE THE FOLLOWING PRECAUTIONS FOR HANDLING:

A. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. See drawings for specific valve locations.

B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

C. Provide the following valves for the applications if not indicated on drawings:
   1. Shutoff: Ball, butterfly, gate or plug.
   2. Throttling: Provide globe, angle, ball, or butterfly.
   3. Swing Check (Pump Outlet):
      a. 2 inch (50 mm, DN) and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

D. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

E. Low Pressure, Compressed Air Valves 150 psi (1035 kPa) or Less:

1. 2 inch (50 mm, DN) and Smaller:
    a. Bronze: Provide with solder-joint ends. Threaded.
    b. Ball: One piece, full port, brass with brass trim.
    c. Where indicated: Safety Exhaust, bronze.
    d. Bronze Swing Check: Class 125, bronze disc.

F. Domestic, Hot and Cold Water Valves:
1. 2 inch (50 mm, DN) and Smaller:
    a. Bronze: Provide with solder-joint ends.
    b. Ball: One piece, full port, brass with brass trim.
    c. Bronze Swing Check: Class 125, bronze disc.
    d. Bronze Globe: Class 125, bronze disc.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
1. Hand Lever: Quarter-turn valves 6 inch (150 mm, DN) and smaller except plug valves.

D. Insulated Piping Valves: With 2 inch (50 mm, DN) stem extensions and the following features:
1. Gate Valves: Rising stem.
2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
2. Solder Joint Connections: ASME B16.18.

F. General ASME Compliance:
1. Solder-joint Connections: ASME B16.18.

G. Potable Water Use:
1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

H. Valve Bypass and Drain Connections: MSS SP-45.

I. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE, BALL VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by on of the following:
1. Apollo Flow Controls; Conbraco Industries, Inc.
2. Crane; Crane Energy Flow Solutions.
3. Hammond Valve.
4. Milwaukee Valve Company.
5. NIBCO INC.
6. WATTS.

B. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

C. Two Piece, Full Port with Bronze Trim:
1. Comply with MSS SP-110.
2. WSP Rating: 150 psi (1035 kPa).
3. WOG Rating: 600 psi (4140 kPa).
4. Body: Forged bronze or dezincified-brass alloy.
5. Ends Connections: Pipe thread or solder.

6. Seats: PTFE.
7. Stem: Bronze, blowout proof.
8. Ball: Chrome plated brass.
9. Operator: Provide lockable handle and stem extension.

2.04 BRONZE, SAFETY-EXHAUST BALL VALVES

A. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T-585-70-SV or a comparable product be one of the following:
   1. Conbraco Industries, Inc.; Apollo Div.
   2. Jamesbury, Inc.

2.05 BRONZE, SWING CHECK VALVES

A. Manufacturers: Subject to compliance with requirements, provide NIBCO Model T-585-70-SV or a comparable product be one of the following:
   1. Apollo Valves; a part of Aalberts Integrated Piping Systems.
   2. Crane Fluid Systems; Crane Co.
   3. Jenkins Valves; a Crane Co. brand.
   4. Jomar Valve.
   5. Keckley Company.
   6. Lance Valves.
   7. Milwaukee Valve Company.
   8. NIBCO INC.
   9. Red-White Valve Corp.
   10. Shurjoint; a part of Aalberts Integrated piping Systems.
   11. Stockham; a Crane Co. brand.
   12. Val-Matic Valve & Manufacturing Corp.
   13. Victaulic Company.

B. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

C. Class 125:
   1. Pressure and Temperature Rating: MSS SP-80, Type 3.
   2. Design: Y-pattern, horizontal or vertical flow. Horizontal only for swing check valves.
   3. WOG Rating: 200 psi (1380 kPa).
   4. Body: Bronze, ASTM B62.
   5. End Connections: Threaded.
   6. Disc: Bronze.

2.06 BRONZE, GLOBE VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Where valve support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

END OF SECTION

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Strut systems for pipe or equipment support.

B. Beam clamps.

C. Pipe hangers.

D. Pipe supports, guides, shields, and saddles.

E. Seismic bracing hardware.

F. Anchors and fasteners.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 05 50 00 - Metal Fabrications.

C. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

N. UL (DIR) - Online Certifications Directory; Current Edition.

O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.

B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

D. Vibration Isolation and Seismic Restraint Requirements: See Section 22 05 48.

E. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.
1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

F. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

2.02 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

A. Strut Channels:
1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.

B. Hanger Rods:
1. Threaded zinc-plated steel unless otherwise indicated.
2. Minimum Size, Unless Otherwise Indicated or Required:
a. Equipment Supports: 1/2 inch (13 mm, DN) diameter.
b. Piping up to 1 inch (25 mm, DN): 1/4 inch (6 mm, DN) diameter.
c. Piping larger than 1 inch (25 mm, DN): 3/8 inch (10 mm, DN) diameter.
d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) in length.

C. Channel Nuts:
1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

2.03 BEAM CLAMPS

A. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.

B. C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.

C. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).

D. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

E. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.04 PIPE HANGERS, CARBON STEEL PIPE

A. Band Hangers, Adjustable:
   1. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

B. Clevis Hangers, Adjustable:
   1. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated. Galvanized Metalic.
   2. Coating: Pregalvanized or hot dipped.
   3. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.05 PIPE HANGERS, COPPER PIPE

A. MSS SP-58, type1, through 58, coper-coated steel, factory-fabricated components.

B. Hanger rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.06 PIPE CLAMPS

A. Riser Clamps:
   1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
   2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
   3. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).

2.07 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B. Pipe Supports:
   1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
   2. Liquid Temperatures Up to 122 degrees F (50 degrees C):
      a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
      b. Support From Below: MSS SP-58 types 35 through 38.

C. Pipe Supports, Thermal Insulated:
   1. General Requirements:
      a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
      b. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.
      c. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
      d. Provide pipe supports for 1/2 to 30 inch (15 to 750 mm, DN) iron pipes.
      e. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.
   2. PVC Jacket:
      a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
      b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
      c. Minimum Thickness: 60 mil, 0.06 inch (1.524 mm).

2.08 SEISMIC BRACING HARDWARE

A. Cable Suspension Systems:
   1. Strut channel or bracket-fitted fitting with locking mechanism for pipe or equipment suspension using cable wires extended to surface-mounted end-fixing fittings.
   2. Provide cable wire and end-fixing as required to hold minimum weight of 120 lb (54.4 kg).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

G. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION

SECTION 22 05 48 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.

C. Vibration-isolated equipment support bases.

D. Vibration isolators.

E. Seismic restraint systems.

F. Vibration-isolated and/or seismically engineered roof curbs.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.

B. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.

1.03 DEFINITIONS

A. Plumbing Component: Where referenced in this section in regards to seismic controls, applies to any portion of the plumbing system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

A. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

B. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2014.

C. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

D. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. MFMA-4 - Metal Framing Standards Publication; 2004.

F. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Seismic Controls:
      a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
      b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing plumbing equipment and/or plumbing connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
   3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
   4. Select vibration isolators for outdoor equipment to comply with wind design requirements.
   5. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch (50 mm) operating clearance beneath base unless otherwise indicated.

2.02 VIBRATION ISOLATORS

A. General Requirements:
   1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
   2. Spring Elements for Spring Isolators:
      a. Color code or otherwise identify springs to indicate load capacity.
      b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
      c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
      d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
      e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
      f. Selected to function without undue stress or overloading.
   3. Seismic Snubbing Elements for Seismic Isolators:
      a. Air Gap: Between 0.125 inches (3 mm) and 0.25 inches (6 mm) unless otherwise indicated.
      b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch (6 mm) thick; capable of being visually inspected for damage and replaced.

B. Vibration Isolators for Seismic Applications:
   1. Resilient Material Isolator Mounts, Seismic:
      a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.
   2. Restrained Spring Isolators, Seismic:
      a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for seismic applications with integral snubbing in all directions.
      b. Bottom Load Plate: Steel with provisions for bolting to supporting structure as required.
      c. Furnished with integral leveling device for positioning and securing supported equipment.
      d. Provides constant free and operating height.
   3. Resilient Material Isolator Hangers, Seismic:

a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.

4. Spring Isolator Hangers, Seismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
   b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

2.03 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:
   1. Comply with ASCE 19.
   2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
   3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
   4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

2.04 VIBRATION-ISOLATED AND/OR SEISMICALLY ENGINEERED ROOF CURBS

A. Vibration Isolation Curbs:
   1. Seismic Curb:
      a. Location: Between structure and rooftop equipment.
      b. Construction: Steel.
      c. Integral vibration isolation to comply with requirements of this section.
      d. Snubbers consist of minimum 0.25 inch (6 mm) thick resilient pads to avoid metal-to-metal contact without compromising vibration isolating capabilities.
      e. Weather exposed components consist of corrosion resistant materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:
   1. Spring Isolators:
      a. Position equipment at operating height; provide temporary blocking as required.

b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.

2. Isolator Hangers:
   a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
   b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
3. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
4. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
5. Adjust isolators to be free of isolation short circuits during normal operation.
6. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

F. Seismic Controls:
1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch (3 mm), use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch (3 mm) or less.
4. Equipment with Sheet Metal Housings:
   a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
   b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
   c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Seismic Restraint Systems:
   a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
   b. Install restraints within permissible angles in accordance with seismic design.
   c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
   d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
   e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

END OF SECTION

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Schedules:
   1. Submit plumbing component identification schedule listing equipment, piping, and valves.
   2. Detail proposed component identification data in terms of of wording, symbols, letter size, and color coding to be applied to corresponding product.
   3. Valve Data Format: Include id-number, location, function, and model number.

C. Product Data: Provide manufacturers catalog literature for each product required.

D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Nameplates:
   1. Heat exchangers, water heaters, and other heat transfer products.
   2. Control panels, transducers, and other related control equipment products.
   3. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.

B. Tags:
   1. Piping: 3/4 inch (20 mm) diameter and smaller.
   2. Manual operated and automated control valves.
   3. Instrumentation, relays, gauges, and other related control equipment products.

C. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

2.02 NAMEPLATES

A. Description: Laminated piece with up to three lines of text.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch (6 mm).
   3. Background Color: Black.
   4. Nameplate Height: 3/4 inch (19 mm).
   5. Nameplate Material:
      a. Flexible: Vinyl with adhesive backing per ASTM D709.
      b. Metal: Brass with center-side holes for screw fastening.

2.03 TAGS

A. Metal: Brass, 19 gauge 1-1/2 inch (40 mm) in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

2.04 PIPE MARKERS

A. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.

B. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

C. Identification Scheme, ASME A13.1:
   1. Primary: External Pipe Diameter, Uninsulated or Insulated.
      a. 3/4 to 1-1/4 inches (19 to 32 mm): Use 8 inch (203 mm) field-length with 1/2 inch (13 mm) text height.
      b. 1-1/2 to 2 inches (38 to 51 mm): Use 8 inch (203 mm) field-length with 3/4 inch (19 mm) text height.
      c. 2-1/2 to 6 inches (64 to 152 mm): Use 12 inch (305 mm) field-length with 1-1/4 inch (32 mm) text height.
   2. Secondary: Color scheme per fluid service.
      a. Compressed Air: White text on blue background.
      b. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive identification products.

3.02 INSTALLATION

A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags in clear view and align with axis of piping

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

E. Apply ASME A13.1 Pipe Marking Rules:
   1. Place pipe marker adjacent to changes in direction.
   2. Place pipe marker adjacent each valve port and flange end.
   3. Place pipe marker at both sides of floor and wall penetrations.
   4. Place pipe marker every 25 to 50 feet (7.6 to 15.2 m) interval of straight run.

END OF SECTION

SECTION 22 05 93 - TESTING, ADJUSTING, AND BALANCING FOR PLUMBING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. TAB of domestic water system.
   2. TAB of plumbing equipment:
      a. Domestic hot-water in-line circulation pumps.

1.03 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

F. TDH: Total dynamic head.

1.04 INFORMATIONAL SUBMITTALS

A. Certified TAB reports.

B. Instrument calibration reports, to include the following:
   1. Instrument type and make.
   2. Serial number.
   3. Application.
   4. Dates of use.
   5. Dates of calibration.

1.05 QUALITY ASSURANCE

A. TAB Specialists Qualifications, Certified by AABC:
   1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
   2. TAB Technician: Employee of the TAB specialist and certified by AABC.

B. TAB Specialists Qualifications, Certified by NEBB or TABB:
   1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
   2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB.

C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

D. ASHRAE 111 Compliance: Requirements in ASHRAE 111 applicable to analogous domestic water system and plumbing equipment balancing.

E. ASHRAE 188 Compliance: Comply with balancing and report requirements, Section 8.3 "Balancing."

F. Code and Authorities Having Jurisdiction Compliance: TAB is required to comply with governing codes and requirements of authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.07 P2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

2.01 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, and balancing valves and fittings. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine approved submittals for plumbing systems and equipment.

D. Examine equipment performance data, including pump curves.
   1. Relate performance data to Project conditions and requirements, including pump system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
   2. Calculate pump system-effect factors to reduce performance ratings of plumbing equipment when installed under conditions different from the conditions used to rate equipment performance. Compare results with the design data and installed conditions.

E. Examine system and equipment installations, and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

F. Examine test reports specified in individual system and equipment Sections.

G. Examine temporary and permanent strainers. Verify that temporary strainer screens used during system cleaning and flushing have been removed and permanent strainers are installed and clean.

H. Examine system pumps to ensure absence of entrained air in the suction piping.

I. Examine operating safety interlocks and controls on plumbing equipment.

J. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

2.02 PREPARATION

A. Prepare a TAB plan that includes the following:
   1. Equipment and systems to be tested.
   2. Strategies and step-by-step procedures for balancing the systems.
   3. Instrumentation to be used.
   4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of plumbing systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
   1. Domestic Water System:
      a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed in accordance with applicable code and authority having jurisdiction.
      b. Water heaters are installed and functioning.
      c. Piping is complete and all points of outlet are installed.
      d. Systems are flushed, filled, and air purged.
      e. Strainers are clean.
      f. Shutoff and balance valves are 100 percent open.
      g. Hot-water circulating pumps are operational and proper rotation is verified.
      h. Suitable access to balancing devices and equipment is provided.

2.03 GE

2.04 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system in accordance with the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems"]and in this Section.

B. Mark equipment and balancing devices, including valve position indicators and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

C. Take and report testing and balancing measurements in inch-pound (IP) units.

2.05 GENERAL PROCEDURES FOR PLUMBING EQUIPMENT

A. Test, adjust, and balance plumbing equipment indicated on Drawings, including, but not limited to, the following:
   1. Domestic water in-line pumps.
   2. Domestic water heaters.

2.06 PROCEDURES FOR DOMESTIC WATER SYSTEMS

A. Prepare test reports for pumps and other equipment. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required equipment flow rates with system design flow rates.

B. Prepare schematic diagrams of systems' Record drawings piping layouts.

C. In addition to requirements in "Preparation" Article, prepare domestic water systems for testing and balancing as follows:
   1. Check expansion tank for proper setting.
   2. Check water heater for proper discharge temperature setting.
   3. Check remotest point of outlet for adequate pressure.
   4. Check flow-control valves for proper position.
   5. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
   6. Verify that motor controllers are equipped with properly sized thermal protection.
   7. Check that air has been purged from the system.

D. Measure and record upstream and downstream pressure of each piece of equipment.

E. Check settings and operation of each safety valve. Record settings.

2.07 PROCEDURES FOR DOMESTIC HOT-WATER CIRCULATING INLINE PUMP

A. Balance system with manual balancing valves by setting at design flow.

B. Adjust pump to deliver total design flow.
   1. Measure pump TDH as follows:
      a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
      b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
      c. Convert pressure to head and correct for differences in gauge heights.
      d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
   2. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.
   3. Mark final settings and verify that all memory stops have been set.
   4. Verify final system conditions as follows:
      a. Re-measure and confirm that total flow is within design.
      b. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
      c. Mark final settings.

2.08 PROCEDURES FOR WATER HEATERS

A. Gas-Fired Water Heaters:
   1. Measure and record entering- and leaving-water temperatures.
   2. Measure and record water flow.
   3. Measure and record pressure drop.
   4. Record relief valve(s) pressure setting.
   5. Capacity: Calculate in Btu/h of heating output.
   6. Efficiency: Calculate operating efficiency for comparison to submitted equipment.
   7. Fan, motor, and motor controller operating data.

2.09 TOLERANCES

A. Set plumbing system's flow rates within the following tolerances:
   1. Domestic Water Flow Rate: Plus or minus 10 percent. If design value is less than 10 gpm, within 10 percent.

2.10 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
   1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
   2. Include a list of instruments used for procedures, along with proof of calibration.
   3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:
   1. Pump curves.
   2. Manufacturers' test data.
   3. Field test reports prepared by system and equipment installers.
   4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:
   1. Title page.
   2. Name and address of the TAB specialist.
   3. Project name.
   4. Project location.
   5. Architect's name and address.
   6. Engineer's name and address.
   7. Contractor's name and address.
   8. Report date.
   9. Signature of TAB supervisor who certifies the report.
   10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
   11. Summary of contents, including the following:
      a. Indicated versus final performance.
      b. Notable characteristics of systems.
      c. Description of system operation sequence if it varies from the Contract Documents.
   12. Nomenclature sheets for each item of equipment.
   13. Notes to explain why certain final data in the body of reports vary from indicated values.
   14. Test conditions for pump performance forms, including the following:
      a. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of distribution systems. Present each system with single-line diagram and include the following:
   1. Flow rates.
   2. Pipe and valve sizes and locations.
   3. Balancing stations.

4. Position of balancing devices.

E. Gas-Fired Water Heaters Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:
   1. Unit Data:
      a. System identification.
      b. Location.
      c. Make and type.
      d. Model number and unit size.
      e. Manufacturer's serial number.
      f. Fuel type in input data.
      g. Output capacity in Btu/h.
      h. Ignition type.
      i. Burner-control types.
      j. Motor horsepower and speed.
      k. Motor volts, phase, and hertz.
      l. Motor full-load amperage and service factor.
      m. Sheave make, size in inches, and bore.
      n. Center-to-center dimensions of sheave and amount of adjustments in inches.
   2. Test Data (Indicated and Actual Values):
      a. Total airflow rate in cfm.
      b. Entering-water temperature in deg F.
      c. Leaving-water temperature in deg F.
      d. Low-fire fuel input in Btu/h.
      e. High-fire fuel input in Btu/h.
      f. High-temperature-limit setting in deg F.
      g. Operating set point in Btu/h.
      h. Heating value of fuel in Btu/h.

F. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves, and include the following:
   1. Unit Data:
      a. Unit identification.
      b. Location.
      c. Service.
      d. Make and size.
      e. Model number and serial number.
      f. Water flow rate in gpm.
      g. Water-pressure differential in feet of head or psig.
      h. Required net positive suction head in feet of head or psig.
      i. Pump speed.
      j. Impeller diameter in inches.
      k. Motor make and frame size.
      l. Motor horsepower and rpm.
      m. Voltage at each connection.
      n. Amperage for each phase.
      o. Full-load amperage and service factor.
      p. Seal type.
   2. Test Data (Indicated and Actual Values):
      a. Static head in feet of head or psig.
      b. Pump shutoff pressure in feet of head or psig.
      c. Actual impeller size in inches.
      d. Full-open flow rate in gpm.
      e. Full-open pressure in feet of head or psig.
      f. Final discharge pressure in feet of head or psig.

g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

G. Instrument Calibration Reports:
1. Report Data:
a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

2.11 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION

SECTION 22 07 19 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes insulating the following plumbing piping services:
   1. Domestic cold-water piping.
   2. Domestic hot-water piping.
   3. Domestic recirculating hot-water piping.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.07 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.08 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

PART 2 PRODUCTS

2.01 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

D. Mineral-Fiber, Preformed Pipe Insulation:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Johns Manville; Micro-Lok.
      b. Knauf Insulation; 1000-Degree Pipe Insulation.
      c. Owens Corning; Fiberglas Pipe Insulation.
   2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ or factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.02 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Ramco Insulation, Inc.; Super-Stik.

B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.03 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
      b. Eagle Bridges - Marathon Industries; 225.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
      d. Mon-Eco Industries, Inc.; 22-25.
   2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
      b. Eagle Bridges - Marathon Industries; 225.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
      d. Mon-Eco Industries, Inc.; 22-25.
   2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. PVC Jacket Adhesive: Compatible with PVC jacket.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Corning Corporation; 739, Dow Silicone.
      b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
      c. P.I.C. Plastics, Inc.; Welding Adhesive.

d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.04 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
   b. Vimasco Corporation; 749.
2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
   b. Eagle Bridges - Marathon Industries; 550.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
   d. Mon-Eco Industries, Inc.; 55-50.
   e. Vimasco Corporation; WC-1/WC-5.
2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.05 SEALANTS

A. ASJ Flashing Sealants and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.06 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.07 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Johns Manville; Zeston.
      b. P.I.C. Plastics, Inc.; FG Series.
      c. Proto Corporation; LoSmoke.
      d. Speedline Corporation; SmokeSafe.
   2. Adhesive: As recommended by jacket material manufacturer.
   3. Color: White.
   4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
      a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.08 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ABI, Ideal Tape Division; 428 AWF ASJ.
      b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
      c. Compac Corporation; 104 and 105.
      d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
   2. Width: 3 inches.
   3. Thickness: 11.5 mils.
   4. Adhesion: 90 ounces force/inch in width.
   5. Elongation: 2 percent.
   6. Tensile Strength: 40 lbf/inch in width.
   7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ABI, Ideal Tape Division; 370 White PVC tape.
      b. Compac Corporation; 130.
      c. Venture Tape; 1506 CW NS.
   2. Width: 2 inches.
   3. Thickness: 6 mils.
   4. Adhesion: 64 ounces force/inch in width.
   5. Elongation: 500 percent.
   6. Tensile Strength: 18 lbf/inch in width.

2.09 SECUREMENTS

A. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
   1. Verify that systems to be insulated have been tested and are free of defects.

2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
      a. For below-ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
   5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:
   1. Vibration-control devices.
   2. Testing agency labels and stamps.
   3. Nameplates and data plates.

3.04 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
   1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
   2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
   3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
   4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
   5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
   6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
   7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
   8. For services not specified to receive a field-applied jacket, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
   9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
   1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
   2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
   3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
   4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
   5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.05 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
   2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
   3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
   4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
   1. Install preformed pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
   4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
   3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   4. Install insulation to flanges as specified for flange insulation application.

3.06 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
   1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.07 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
   1. Underground piping.

3.08 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:
   1. NPS 1 and Smaller: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
   2. NPS 1-1/4 and Larger: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:
   1. NPS 1-1/4 and Smaller: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
   2. NPS 1-1/2 and Larger: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

END OF SECTION

SECTION 22 07 19.11 - UNDER-LAVATORY PIPE AND SUPPLY COVERS - PLUMBEREX

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Under-lavatory pipe and supply covers.

1.02 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).

D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

E. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

F. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2021.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

I. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog illustrations of covers, sizes, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. General:
   1. Insulate exposed drainage piping including hot, cold, and tempered water supplies under lavatories or sinks per ADA Standards.
   2. Adhesives, sewing threads, and two-ply laminated materials are prohibited.

3. Exterior Surfaces: Smooth nonabsorbent with no finger recessed indentations for easy cleaning.
4. Construction: 1/8 inch (3.2 mm) PVC with antimicrobial, antifungal, and ultraviolet light (UV) resistant properties.
    a. Provide one piece injected molded design with internal bridge at top of J-bend to prevent separating.
    b. Comply with ASTM C1822 for covers on accessible lavatory piping.
    c. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
    d. Microbial and Fungal Resistance for Interior and Exterior: Comply with ASTM G21.

B. ASTM E84 Compliant, Under-Lavatory Insulators:
1. Construction: Soft, non-laminated, flexible PVC with antimicrobial, antifungal, and UV-resistant properties. Fusion molded one piece universal design for multiple P-trap configurations. Adhesives, sewing threads, and two ply laminated materials shall not be allowed. Exterior surfaces shall be smooth nonabsorbent with no finger recessed indentations for easy cleaning. Supply riser shall be flexible and a minimum of 15 inches (381 mm) inches in length.
2. Provide with weep hole for condensation drainage and ventilation.
3. Comply with:
    a. ASTM E84/UL 723 to comply with flame spread and smoke development rating of 25/450.
    b. ASTM C1822 Type I.
    c. ADA Standards.
    d. 36 CFR 1191.
    e. ICC (IBC).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls, floor finishes, lavatories, and piping are prepared and ready for installation of under-lavatory guards.

B. Confirm location and size of fixtures and piping before installation.

3.02 INSTALLATION

A. Install under-lavatory guards according to manufacturer's written instructions..

3.03 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings and outside the buildings to the connection to the facility water distribution piping.

1.03 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.04 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

2.02 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Copper Unions:
   1. MSS SP-123.
   2. Cast-copper-alloy, hexagonal-stock body.
   3. Ball-and-socket, metal-to-metal seating surfaces.
   4. Solder-joint or threaded ends.

2.03 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:
   1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
   2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.04 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. A.Y. McDonald Mfg. Co.
    b. Capitol Manufacturing Company.
    c. Central Plastics Company.
    d. HART Industrial Unions, LLC.
    e. Jomar Valve.
    f. Matco-Norca.
    g. Watts; a Watts Water Technologies company.
    h. Wilkins.
    i. Zurn Industries, LLC.
2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Matco-Norca.
    d. Watts; a Watts Water Technologies company.
    e. Wilkins.
    f. Zurn Industries, LLC.
2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 125 psig minimum at 180 deg F.
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.
2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Elster Perfection Corporation.
    b. Grinnell Mechanical Products.
    c. Matco-Norca.
    d. Precision Plumbing Products.
    e. Victaulic Company.
2. Standard: IAPMO PS 66.

3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

PART 3 EXECUTION

3.01 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved.

B. Install domestic water piping level and plumb.

C. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping to permit valve servicing.

F. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

3.02 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

E. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.03 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

3.04 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.05 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Vertical Piping: MSS Type 8 or 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.06 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

3.07 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

3.08 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Piping Inspections:
a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
2. Piping Tests:
a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and

allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.09 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
   a. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
   a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
   b. Fill and isolate system according to either of the following:
      1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
   c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
   d. Repeat procedures if biological examination shows contamination.
   e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.

D. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.

3.12 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Shutoff Duty: Use ball valves for piping NPS 3 and smaller.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION

SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Balancing valves.
   2. Temperature-actuated, water mixing valves.
   3. Strainers.
   4. Outlet boxes.
   5. Hose bibbs.
   6. Wall hydrants.
   7. Water-hammer arresters.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties.

1.03 INFORMATIONAL SUBMITTALS

A. Test and inspection reports.

B. Field quality-control reports.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

B. After installation and just prior to Owner occupancy, perform bacteria tests and provide test results to the Owner's representative in writing. Include results in closeout documents.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.02 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.03 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bell & Gossett; a Xylem brand.
      b. NIBCO INC.
      c. Nexus Valve, Inc.; Aalberts Hydronic Flow Control.
      d. WATTS; A Watts Water Technologies Company.
   2. Type: Ball or Y-pattern globe valve with two readout ports and memory-setting indicator.
   3. Body: Brass or bronze.
   4. Size: Same as connected piping, but not larger than NPS 2.

2.04 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Acorn Engineering Company; a Division of Morris Group International.

b. Apollo Valves; a part of Aalberts Integrated Piping Systems.
c. Leonard Valve Company.
d. POWERS; A WATTS Brand.
e. Symmons Industries, Inc.
f. WATTS.
g. Zurn Industries, LLC.

2. Standard: ASSE 1070.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded inlets and outlet.

2.05 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:
1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller.
3. End Connections: Threaded for NPS 2 and smaller.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Drain: Factory-installed, hose-end drain valve.

2.06 OUTLET BOXES

A. Clothes Washer Outlet Boxes:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Acorn Engineering Company; a Division of Morris Group International.
b. Guy Gray, IPS Corporation.
c. Oatey Co.
d. Sioux Chief Manufacturing Company, Inc.
e. Symmons Industries, Inc.
f. Water-Tite, IPS Corporation.
2. Mounting: Recessed.
3. Faucet: Separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
4. Supply Shutoff Fittings: NPS 1/2 ball valves with integral water hammer arrester and NPS 1/2 copper, water tubing.
5. Drain: NPS 2 standpipe and P-trap for direct waste connection to drainage piping.

B. Icemaker Outlet Boxes:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. Acorn Engineering Company.
b. IPS Corporation.
c. LSP Products Group, Inc.
d. Oatey.
e. Plastic Oddities.
2. Mounting: Recessed.
3. Material and Finish: Enameled-steel or epoxy-painted-steel box and faceplate.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
5. Supply Shutoff Fittings: NPS 1/2 ball valves with integral water hammer arrester and NPS 1/2 copper, water tubing.

2.07 HOSE BIBBS

A. Hose Bibbs:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company.
c. MIFAB, Inc.
d. WATTS.
e. Woodford Manufacturing Company.
f. Zurn Industries, LLC.
g. Chicago Faucet

2. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
3. Pressure Rating: 125 psig.

2.08 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. MIFAB, Inc.
d. WATTS.
e. Woodford Manufacturing Company.
f. Zurn Industries, LLC.
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1.
7. Outlet, Concealed: With integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounted with cover.
9. Operating Keys(s): One with each wall hydrant.

2.09 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. MIFAB, Inc.
d. Precision Plumbing Products.
e. Sioux Chief Manufacturing Company, Inc.
f. WATTS.
g. Zurn Industries, LLC.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

PART 3 EXECUTION

3.01 INSTALLATION OF PIPING SPECIALTIES

A. Balancing Valves: Install in locations where they can easily be adjusted. Set at indicated design flow rates.

B. Temperature-Actuated, Water Mixing Valves: Install with shutoff valves on inlets and with shutoff valve on outlet.

C. Water-Hammer Arresters: Install in water piping in accordance with PDI-WH 201.

3.02 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.03 ADJUSTING

A. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

3.04 TESTING

A. After installation and just prior to Owner occupancy, perform bacteria tests and provide test results to the Owner's representative in writing. Include results in closeout documents.

END OF SECTION

SECTION 22 11 23 - DOMESTIC WATER PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Circulators.

1.02 RELATED REQUIREMENTS

A. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

E. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide certified pump curve with duty point marked over pump and system operating conditions and NPSH curve and power requirement by pump tag.
   2. Manufacturer's catalog sheets for fixtures, fittings, accessories, and supplies.

C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing type of products specified in this section, with minimum three years of documented experience.

B. Certifications: Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc, as suitable for purpose specified and indicated.

C. Identification: Provide pumps with manufacturer's name, model number, and rated capacity identified by permanently attached label.

D. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 1-year manufacturer warranty for pumps except circulator type. Complete forms in Owner's name and register with manufacturer.

C. Manufacturer Warranty: Provide 5-year manufacturer warranty for circulators. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 CIRCULATORS

A. Manufacturers:
   1. Armstrong Fluid Technology; _____: www.armstrongfluidtechnology.com/#sle.
   2. Bell & Gossett, a Brand of Xylem, Inc; _____: www.xylem.com/#sle.
   3. Grundfos Pumps Corporation; MAGNA 3: www.grundfos.com/#sle.

4. Taco, Inc; _____: www.tacocomfort.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Casing: Bronze with bronze cast impeller, and stainless steel rotor assembly.

C. Shaft: Alloy steel with integral thrust collar and two oil-lubricated bronze sleeve bearings.

D. Mechanical Seal: Carbon rotating against a stationary ceramic seat.

E. Pipe-End Connection: Union connection.

F. Maximum Discharge Pressure: 145 psi (1000 kPa).

G. Motor: 1,750 rpm, ECM duty with flexible coupling.

H. Service Temperature Range: Minus 30 to 250 degrees F (Minus 34.4 to 121.1 degrees C).

I. Controls: Provide aquastat set for high-temp cutoff, electric plug, and illuminated hand switch.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products with related fittings, and accessories according to manufacturer instructions.

B. Potable and Drinking Water Service: Provide NSF 61 certified; comply with ICC (IPC).

C. Electrical-Driven Pump Work:
1. Provide electric-motor-driven equipment specified complete with local disconnect switch and control panel with starter, controls, safety devices, and related wiring.
2. Provide automatic control and protective devices field-wired to interface-related devices required for specified operation.

D. Ensure that small pressure gauges are installed on both upstream and downstream ends.

E. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are nonoverloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

3.02 PROTECTION

A. Protect installed products from damage due from subsequent construction operations.

B. Repair or replace products damaged before Date of Substantial Completion.

END OF SECTION

SECTION 22 13 00 - FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Pipes, tubes, and fittings.
   2. Piping and tubing joining materials.
   3. Valves.

1.03 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.04 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:
   1. Piping and Valves: 100 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressure within Buildings: 0.5 psig or less.

C. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of the following:
   1. Piping specialties.
   2. Valves. Include pressure rating and capacity.
   3. Dielectric fittings.

B. Delegated-Design Submittal: For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Detail fabrication and assembly of seismic restraints.
   2. Design Calculations: Calculate requirements for selecting seismic restraints.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Welding certificates.

C. Field quality-control reports.

1.07 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

PART 2 PRODUCTS

2.01 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
   1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
   2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
   3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
   4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
      a. Material Group: 1.1.
      b. End Connections: Threaded or butt welding to match pipe.
      c. Lapped Face: Not permitted underground.
      d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
      e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

2.02 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.03 MANUAL GAS SHUTOFF VALVES

A. See "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.
   1. CWP Rating: 125 psig.
   2. Threaded Ends: Comply with ASME B1.20.1.
   3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
   4. Tamperproof Feature: Locking feature for valves indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
   5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
   6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.
   1. CWP Rating: 125 psig.
   2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
   3. Tamperproof Feature: Locking feature for valves indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
   4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. BrassCraft Manufacturing Company; a Masco company.

b. Conbraco Industries, Inc.; Apollo Div.
c. Lyall, R. W. & Company, Inc.
d. McDonald, A. Y. Mfg. Co.
e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Bronze Plug Valves: MSS SP-78.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Lee Brass Company.
b. McDonald, A. Y. Mfg. Co.
2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. McDonald, A. Y. Mfg. Co.
b. Mueller Co.; Gas Products Div.
c. Xomox Corporation; a Crane company.
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

G. Cast-Iron, Lubricated Plug Valves: MSS SP-78.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Flowserve.
b. Homestead Valve; a division of Olson Technologies, Inc.

c. McDonald, A. Y. Mfg. Co.
d. Milliken Valve Company.
e. Mueller Co.; Gas Products Div.
f. R&M Energy Systems, A Unit of Robbins & Myers, Inc.

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 and the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of accidental ignition.

3.03 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Install fittings for changes in direction and branch connections.

3.04 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
   1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
   1. Prohibited Locations:
      a. Do not install natural-gas piping in or through circulating air ducts or gas vents (flues) or ventilating ducts.
      b. Do not install natural-gas piping in solid walls or partitions.

O. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

P. Connect branch piping from top or side of horizontal piping.

Q. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

R. Do not use natural-gas piping as grounding electrode.

S. Install sleeves for piping penetrations of masonry walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.05 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance.

3.06 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:
   1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
   2. Cut threads full and clean using sharp dies.
   3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
   4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
   5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:
   1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
   2. Bevel plain ends of steel pipe.
   3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

3.07 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping.

B. Comply with requirements for pipe hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
   1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
   2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
   3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
   4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
   5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.08 CONNECTIONS

A. Install piping adjacent to appliances to allow service and maintenance of appliances.

B. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

C. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.09 LABELING AND IDENTIFYING

A. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for piping and valve identification.

3.10 PAINTING

A. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, and piping specialties, except components, with factory-applied paint or protective coating.
   1. Alkyd System: MPI EXT 5.1D.
      a. Prime Coat: Alkyd anticorrosive metal primer.
      b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
      c. Topcoat: Exterior alkyd enamel (gloss).
      d. Color: Gray.

B. Paint exposed, interior metal piping, valves and piping specialties, except components, with factory-applied paint or protective coating.
   1. Latex Over Alkyd Primer System: MPI INT 5.1Q.
      a. Prime Coat: Quick-drying alkyd metal primer.
      b. Intermediate Coat: Interior latex matching topcoat.
      c. Topcoat: Interior latex (gloss).
      d. Color: Gray.

C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Test, inspect, and purge natural gas according to NFPA 54 and the International Fuel Gas Code and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.12 OUTDOOR PIPING SCHEDULE

A. Aboveground natural-gas piping shall be one of the following:
   1. Steel pipe with malleable-iron fittings and threaded joints.
   2. Steel pipe with wrought-steel fittings and welded joints.

3.13 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. Aboveground, distribution piping shall be one of the following:
   1. Steel pipe with malleable-iron fittings and threaded joints.
   2. Steel pipe with wrought-steel fittings and welded joints.

3.14 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at service meter shall be the following:
   1. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 and larger at service meter shall be one of the following:
   1. Bronze plug valve.
   2. Cast-iron, nonlubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:
   1. Two-piece, full-port, bronze ball valves with bronze trim.
   2. Bronze plug valve.

D. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be one of the following:
   1. Two-piece, full-port, bronze ball valves with bronze trim.
   2. Bronze plug valve.
   3. Cast-iron, nonlubricated or lubricated plug valve.

E. Valves in branch piping for single appliance shall be one of the following:
   1. Two-piece, full-port, bronze ball valves with bronze trim.
   2. Bronze plug valve.

END OF SECTION

SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Hubless, cast-iron soil pipe and fittings.
   2. PVC pipe and fittings.
   3. Specialty pipe fittings.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.05 FIELD CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
   1. Notify Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
   2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
   1. Soil, Waste, and Vent Piping: 10-foot head of water.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.02 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.03 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. AB & I Foundry; a part of the McWane family of companies.
   2. Charlotte Pipe and Foundry Company.
   3. NewAge Casting.
   4. Tyler Pipe; a part of McWane family of companies.

B. Pipe and Fittings: ASTM A888 or CISPI 301.

C. CISPI, Hubless-Piping Couplings:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. ANACO-Husky.
      b. Charlotte Pipe and Foundry Company.
      c. Dallas Specialty & Mfg. Co.

d. Fernco Inc.
e. Josam Company.
f. Matco-Norca.
g. MIFAB, Inc.
h. Mission Rubber Company, LLC; a division of MCP Industries.
i. NewAge Casting.
j. Tyler Pipe; a subsidiary of McWane Inc.

2. Standards: ASTM C1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

2.04 PVC PIPE AND FITTINGS

A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

B. Solid-Wall PVC Pipe: ASTM D2665, drain, waste, and vent.

C. PVC Socket Fittings: ASTM D2665, made to ASTM D3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

D. Adhesive Primer: ASTM F656.

E. Solvent Cement: ASTM D2564.

2.05 SPECIALTY PIPE FITTINGS

A. Transition Couplings:
1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
2. Unshielded, Nonpressure Transition Couplings:
a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1) Dallas Specialty & Mfg. Co.
2) Fernco Inc.
3) Froet Industries LLC.
4) Mission Rubber Company, LLC; a division of MCP Industries.
5) Plastic Oddities.
b. Standard: ASTM C1173.
c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. End Connections: Same size as and compatible with pipes to be joined.
e. Sleeve Materials:
1) For Cast-Iron Soil Pipes: ASTM C564, rubber.
2) For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.
3) For Dissimilar Pipes: ASTM D5926, PVC or other material compatible with pipe materials being joined.
3. Shielded, Nonpressure Transition Couplings:
a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1) Cascade Waterworks Mfg. Co.
2) Mission Rubber Company, LLC; a division of MCP Industries.
b. Standard: ASTM C1460.
c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

d. End Connections: Same size as and compatible with pipes to be joined.

PART 3 EXECUTION

3.01 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.02 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
   1. Install piping as indicated unless deviations to layout are approved.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Install seismic restraints on piping.

K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
   1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
   2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
      a. Straight tees, elbows, and crosses may be used on vent lines.
   3. Do not change direction of flow more than 90 degrees.
   4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
      a. Reducing size of waste piping in direction of flow is prohibited.

L. Lay buried building waste piping beginning at low point of each system.
   1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
   2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
   3. Maintain swab in piping and pull past each joint as completed.

M. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
   1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
   2. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow.
   3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

O. Install underground PVC piping according to ASTM D2321.

P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors.
   1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors.
   1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.03 JOINT CONSTRUCTION

A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

B. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC Piping: Join according to ASTM D2855 and ASTM D2665 appendixes.

3.04 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:
   1. Install transition couplings at joints of piping with small differences in ODs.
   2. In Waste Drainage Piping: Unshielded, nonpressure transition couplings.

3.05 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
   2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
   3. Vertical Piping: MSS Type 8 or Type 42, clamps.
   4. Install individual, straight, horizontal piping runs:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
   2. NPS 3: 60 inches with 1/2-inch rod.
   3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

3.06 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect waste and vent piping to the following:
   1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
   2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
   3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
   4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

3.07 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.08 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
      a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.
      a. Expose work that was covered or concealed before it was tested.
   3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
      a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
      b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
      c. Inspect joints for leaks.
   4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
      a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
      b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
      c. Air pressure must remain constant without introducing additional air throughout period of inspection.
      d. Inspect plumbing fixture connections for gas and water leaks.
   5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
   6. Prepare reports for tests and required corrective action.

3.09 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Repair damage to adjacent materials caused by waste and vent piping installation.

3.10 PIPING SCHEDULE

A. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

B. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Underground, soil, waste, and vent piping NPS 6 and smaller shall be any of the following:
1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
2. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION

SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Cleanouts.
   2. Floor drains.

1.03 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FRP: Fiberglass-reinforced plastic.

C. HDPE: High-density polyethylene plastic.

D. PE: Polyethylene plastic.

E. PP: Polypropylene plastic.

F. PVC: Polyvinyl chloride plastic.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.05 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

PART 2 PRODUCTS

2.01 CLEANOUTS

A. Metal Floor Cleanouts:
   1. ASME A112.36.2M, Cast-Iron Cleanouts:
      a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
         1) Josam Company.
         2) Smith, Jay R. Mfg. Co.
         3) Tyler Pipe.
         4) Watts Drainage Products.
         5) Zurn Plumbing Products Group.
         6) Mifab

2.02 FLOOR DRAINS

A. Cast-Iron Floor Drains:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Josam Company; Josam Div.
      b. MIFAB, Inc.
      c. Smith, Jay R. Mfg. Co.
      d. Tyler Pipe; Wade Div.
      e. Watts Drainage Products.
      f. Zurn Plumbing Products Group; Specification Drainage Operation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
   1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
   2. Locate at each change in direction of piping greater than 45 degrees.
   3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
   4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
   1. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
   2. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
   3. Install air-gap fittings on indirect-waste piping discharge into sanitary drainage system.

3.02 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.03 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 13 23 - SANITARY WASTE INTERCEPTORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Grease interceptors.
   2. Solids interceptors.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of interceptor. Include materials of fabrication, dimensions, rated capacities, retention capacities, operating characteristics, size and location of each pipe connection, furnished specialties, and accessories.

PART 2 PRODUCTS

2.01 GREASE INTERCEPTORS

A. Cast-Iron or Steel Grease Interceptors:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Jay R. Smith Mfg Co; a division of Morris Group International.
      b. Josam Company.
      c. MIFAB, Inc.
      d. WATTS; A Watts Water Technologies Company.
      e. Zurn Industries, LLC.
   2. Standard: ASME A112.14.3 and PDI-G101, for intercepting and retaining fats, oils, and greases from food-preparation or -processing wastewater.
   3. Body Material: Cast iron or steel.

2.02 SOLIDS INTERCEPTORS

A. Cast-Iron or Steel Solids Interceptors:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Jay R. Smith Mfg Co; a division of Morris Group International.
      b. Josam Company.
      c. MIFAB, Inc.
      d. WATTS; A Watts Water Technologies Company.
      e. Zurn Industries, LLC.
   2. Type: Factory-fabricated interceptor made for removing and retaining clay from wastewater.
   3. Body Material: Cast iron or steel.
   4. Mounting: Above floor.

PART 3 EXECUTION

3.01 INSTALLATION

A. Set interceptors level and plumb.

B. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.
   1. Above-Floor Installation: Set unit with bottom resting on floor unless otherwise indicated.

3.02 CONNECTIONS

A. Piping installation requirements are specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Make piping connections between interceptors and piping systems.

END OF SECTION

SECTION 22 15 13 - GENERAL-SERVICE COMPRESSED-AIR PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes piping and related specialties for general-service compressed-air systems operating at 200 psig or less.

B. Related Sections include the following:
   1. Section 221519 "General-Service Packaged Air Compressors and Receivers" for general-service air compressors and accessories.

1.03 DEFINITIONS

A. Low-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures of 150 psig or less.

1.04 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Dielectric fittings.
   2. Flexible pipe connectors.
   3. Pressure regulators. Include rated capacities and operating characteristics.
   4. Quick couplings.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For general-service compressed-air piping specialties to include in emergency, operation, and maintenance manuals.

1.06 QUALITY ASSURANCE

A. ASME Compliance:
   1. Comply with ASME B31.9, "Building Services Piping," for low-pressure compressed-air piping.

PART 2 PRODUCTS

2.01 PIPES, TUBES, AND FITTINGS

A. Schedule 40, Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B, black or hot-dip zinc coated with ends threaded according to ASME B1.20.1.
   1. Steel Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized seamless steel pipe. Include ends matching joining method.
   2. Malleable-Iron Fittings: ASME B16.3, Class 150 or 300, threaded.
   3. Malleable-Iron Unions: ASME B16.39, Class 150 or 300, threaded.

B. Transition Couplings for Metal Piping: Metal coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.02 VALVES

A. Metal Ball Valves: Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping."

2.03 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Hart Industries International, Inc.
d. Jomar International Ltd.
e. Matco-Norca, Inc.
f. McDonald, A. Y. Mfg. Co.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
h. Wilkins; a Zurn company.

2. Description:
a. Standard: ASSE 1079.
b. Pressure Rating: 150 psig.
c. End Connections: Solder-joint copper alloy and threaded ferrous.

2.04 FLEXIBLE PIPE CONNECTORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Flex-Hose Co., Inc.
2. Flexicraft Industries.
3. Hyspan Precision Products, Inc.
4. Mercer Rubber Co.
5. Metraflex, Inc.
6. Proco Products, Inc.
7. Unaflex, Inc.
8. Universal Metal Hose; a Hyspan Company

B. Stainless-Steel-Hose Flexible Pipe Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
1. Working-Pressure Rating: 200 psig minimum.
2. End Connections, NPS 2 and Smaller: Threaded steel pipe nipple.

2.05 QUICK COUPLINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Aeroquip Corporation; Eaton Corp.
2. Bowes Manufacturing Inc.
3. Foster Manufacturing, Inc.
4. Milton Industries, Inc.
5. Parker Hannifin Corp.; Fluid Connectors Group; Quick Coupling Div.
6. Rectus Corp.
7. Schrader-Bridgeport; Amflo Div.Schrader-Bridgeport/Standard Thomson.
8. Snap-Tite, Inc.; Quick Disconnect & Valve Division.
9. TOMCO Products Inc.
10. Tuthill Corporation; Hansen Coupling Div.

B. General Requirements for Quick Couplings: Assembly with locking-mechanism feature for quick connection and disconnection of compressed-air hose.

PART 3 EXECUTION

3.01 PIPING APPLICATIONS

A. Low-Pressure Compressed-Air Distribution Piping: Use the following piping materials for each size range:
1. NPS 2 and Smaller: Schedule 40, black-steel pipe; threaded, malleable-iron fittings; and threaded joints.

B. Drain Piping: Use the following piping materials:
1. NPS 2 and Smaller: Type L copper tube; wrought-copper fittings; and brazed or soldered joints.

3.02 VALVE APPLICATIONS

A. General-Duty Valves: Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping" for metal general-duty valves. Use metal valves, unless otherwise indicated.
   1. Metal General-Duty Valves: Use valve types specified in "Valve Applications" Article in Section 220523.12 "Ball Valves for Plumbing Piping" according to the following:
      a. Low-Pressure Compressed Air: Valve types specified for low-pressure compressed air.
      b. Equipment Isolation NPS 2 and Smaller: Safety-exhaust, copper-alloy ball valve with exhaust vent and pressure rating at least as great as piping system operating pressure.

3.03 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved.

B. Install piping concealed from view and protected from physical contact by building occupants, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and to coordinate with other services occupying that space.

E. Install piping adjacent to equipment and machines to allow service and maintenance.

F. Install air and drain piping with 1 percent slope downward in direction of flow.

G. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.

H. Install eccentric reducers where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.

I. Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.

J. Install piping to permit valve servicing.

K. Install piping free of sags and bends.

L. Install fittings for changes in direction and branch connections.

M. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

N. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.04 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Dissimilar Metal Piping Material Joints: Use dielectric fittings.

3.05 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping."

B. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.

C. Install shutoff valve at inlet to each automatic drain valve and pressure regulator.

3.06 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. NPS 2 and Smaller: Use dielectric unions.

3.07 FLEXIBLE PIPE CONNECTOR INSTALLATION

A. Install flexible pipe connectors in discharge piping of each air compressor.

B. Install stainless-steel-hose flexible pipe connectors in steel compressed-air piping.

3.08 SPECIALTY INSTALLATION

A. Install quick couplings at piping terminals for hose connections.

3.09 CONNECTIONS

A. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment and machine.

3.10 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.

B. Vertical Piping: MSS Type 8 or 42, clamps.

C. Individual, Straight, Horizontal Piping Runs:
   1. 100 Feet or Less: MSS Type 1, adjustable, steel clevis hangers.
   2. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

D. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

E. Base of Vertical Piping: MSS Type 52, spring hangers.

F. Support horizontal piping within 12 inches of each fitting and coupling.

G. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

H. Install hangers for Schedule 40, steel piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1/4 to NPS 1/2: 96 inches with 3/8-inch rod.
   2. NPS 3/4 to NPS 1-1/4: 84 inches with 3/8-inch rod.
   3. NPS 1-1/2: 12 feet with 3/8-inch rod.

I. Install supports for vertical, Schedule 40, steel piping every 15 feet.

3.11 LABELING AND IDENTIFICATION

A. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment."

3.12 FIELD QUALITY CONTROL

A. Perform field tests and inspections.

B. Tests and Inspections:
   1. Piping Leak Tests for Metal Compressed-Air Piping: Test new piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig above system operating pressure, but not less than 150 psig. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.

2. Repair leaks and retest until no leaks exist.

C. Prepare test reports.

END OF SECTION

SECTION 22 30 00 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Domestic-water heat exchangers.

B. In-line circulator pumps.

1.02 RELATED REQUIREMENTS

A. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

B. Section 22 11 23 - Domestic Water Pumps.

1.03 REFERENCE STANDARDS

A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); Current Edition.

B. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.

D. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.

C. Shop Drawings:
   1. Indicate heat exchanger dimensions, size of tappings, and performance data.

D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Certifications:
   1. Water Heaters: NSF approved.
   2. Pressure Vessels for Heat Exchangers: ASME labeled to ASME BPVC-VIII-1.
   3. Water Tanks: ASME labeled to ASME BPVC-VIII-1.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for _____. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 DOMESTIC-WATER HEAT EXCHANGERS

A. Manufacturers:

1. Armstrong Fluid Technology; _____: www.armstrongfluidtechnology.com/#sle.
2. Bell & Gossett, a brand of Xylem, Inc; _____: www.bellgossett.com/#sle.
3. New York Thermal, Inc. (NTI).
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Type: Double wall type that separates the potable water from the heat transfer medium with a space vented to the atmosphere in accordance with ICC IPC.

C. Tubes: U-tube type with 3/4 inch (19 mm) diameter seamless copper tubes suitable for 125 psi (860 kPa) working pressure.

D. Heads: Cast iron or steel, with steel tube sheets, threaded or flanged for piping connections.

E. Water Chamber and Tube Bundle: Removable for inspection and cleaning.

F. Coating: Prime coat exterior.

G. Code: ASME BPVC-VIII-1 for service pressures, ASME "U" symbol stamped on heat exchanger.

H. Accessories:
1. Wells for temperature regulator sensor and high limit sensor at water outlet.
2. ASME rated pressure and temperature relief valve on water outlet.
3. Thermometers and pressure gauge tappings in water inlet and outlet.

2.02 IN-LINE CIRCULATOR PUMPS

A. Manufacturers:
1. Armstrong Fluid Technology; _____: www.armstrongfluidtechnology.com/#sle.
2. Bell & Gossett, a brand of Xylem, Inc; _____: www.bellgossett.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Casing: Bronze, rated for 125 psig (860 kPa) working pressure, with stainless steel rotor assembly.

C. Impeller: Bronze.

D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

E. Seal: Carbon rotating against a stationary ceramic seat.

F. Drive: Flexible coupling.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions required for applicable certifications.

B. Coordinate system, equipment, and piping work with applicable electrical, fuel, gas, vent, drain, and waste support interconnections as included or provided by other trades.

C. Domestic Water Heat Exchangers:
1. Install domestic water heat exchangers with clearance for tube bundle removal without disturbing other installed equipment or piping.
2. Pipe relief valves and drains to nearest floor drain.

D. Pumps:
1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush valve water closets.

B. Wall hung urinals.

C. Lavatories.

D. Sinks.

E. Under-lavatory pipe supply covers.

F. Bottle filling stations.

G. Mop sinks.

H. Service sinks.

I. Emergency eye and face wash.

1.02 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.

B. Section 22 10 06 - Plumbing Piping Specialties.

C. Section 22 30 00 - Plumbing Equipment.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).

C. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

D. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).

E. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2018.

F. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018, with Errata.

G. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2022.

H. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.

I. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.

J. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

K. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2021.

L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

M. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

N. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

O. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

P. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on-site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 FLUSH VALVE WATER CLOSETS

A. Water Closets:
   1. Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
   2. Bowl: ASME A112.19.2; 16.5 inches (420 mm) high with elongated rim.
   3. Flush Valve: Exposed (top spud).
   4. Flush Operation: Manual, oscillating handle.
   5. Handle Height: 44 inches (1117 mm) or less.
   6. Inlet Size: 1-1/2 inches (38 mm).
   7. Trapway Outlet: 4 inch (100 mm, DN).
   8. Color: White.
   9. Manufacturers:
      a. American Standard, Inc; Baby Devoro, 2-Piece Gravity: www.americanstandard-us.com/#sle.
      b. Kohler Company; _____: www.kohler.com/#sle.
      c. Mansfield Plumbing Products LLC; _____: www.mansfieldplumbing.com/#sle.
      d. Zurn Industries, LLC; _____: www.zurn.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

B. Flush Valves:
   1. Valve Outlet Size: 1-1/2 inches (40 mm, DN).
   2. Manufacturers:
      a. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
      b. Sloan Valve Company; _____: www.sloanvalve.com/#sle.
      c. Zurn Industries, LLC; ZEMS Series: www.zurn.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   3. Manual Operated:
      a. Type: ASME A112.18.1 or ASME A112.19.5; diaphragm type complete with vacuum breaker stops, and accessories.
      b. Supplied Volume Capacity: 1.5 gal (5.7 L) per flush.
   4. Exposed Type: Chrome-plated, escutcheon, integral screwdriver stop.

C. Toilet Seats:

1. Manufacturers:
    a. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
    b. Bemis Manufacturing Company; _____: www.bemismfg.com/#sle.
    c. Church Seat Company; _____: www.churchseats.com/#sle.
    d. Olsonite; _____: www.olsonite.com/#sle.
    e. Zurn Industries, LLC; _____: www.zurn.com/#sle.
    f. Substitutions: See Section 01 60 00 - Product Requirements.
2. Plastic: Solid, white finish, enlongated shape, open front, slow-closing hinged seat cover, extended back complete with self-sustaining hinges, and brass bolts with covers.

D. Water Closet Carriers:
1. Manufacturers:
    a. Jay R. Smith Manufacturing Company; _____: www.jrsmith.com/#sle.
    b. JOSAM Company; _____: www.josam.com/#sle.
    c. Zurn Industries, LLC; Z1201-N: www.zurn.com/#sle.
    d. Substitutions: See Section 01 60 00 - Product Requirements.
2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.03 WALL HUNG URINALS

A. Manufacturers:
1. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
2. Kohler Company; _____: www.kohler.com/#sle.
3. Mansfield Plumbing Products LLC; _____: www.mansfieldplumbing.com/#sle.
4. Zurn Industries, LLC; _____: www.zurn.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
1. Consumption Volume: 1.0 gal (3.7 L) per flush, maximum.
2. Flush Style: Washout.
3. Flush Valve: Exposed (top spud).
4. Flush Operation: Manual, oscillating handle.
5. Trapway Outlet: Integral.
6. Removable stainless steel strainer.
7. Supply Size: 3/4 inch (19 mm).
8. Outlet Size and Location: 2 inches (50 mm), bottom side.

C. Flush Valves:
1. Manufacturers:
    a. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
    b. Sloan Valve Company; _____: www.sloanvalve.com/#sle.
    c. Zurn Industries, LLC; ZEMS Series: www.zurn.com/#sle.
    d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Manual Operated:
    a. Type: ASME A112.18.1 or ASME A112.19.5; diaphragm type, complete with vacuum breaker stops, and accessories.
    b. Supplied Volume Capacity: 1.0 gal (3.9 L) per flush.
3. Exposed Type: Chrome-plated, escutcheon, integral screwdriver stop.

D. Urinal Carriers:
1. Manufacturers:
    a. Jay R. Smith Manufacturing Company; _____: www.jrsmith.com/#sle.
    b. JOSAM Company; _____: www.josam.com/#sle.
    c. Zurn Industries, LLC; Z1221: www.zurn.com/#sle.
    d. Substitutions: See Section 01 60 00 - Product Requirements.
2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.04 LAVATORIES

A. Manufacturers:
   1. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
   2. Gerber Plumbing Fixtures LLC; _____: www.gerberonline.com/#sle.
   3. Kohler Company; _____: www.kohler.com/#sle.
   4. Mansfield Plumbing Products LLC; _____: www.mansfieldplumbing.com/#sle.
   5. Zurn Industries, LLC; _____: www.zurn.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wall-Hung Basin:
   1. Porcelain-Enamelled Cast Iron: ASME A112.19.1; white, rectangular basin with splash lip, front overflow, soap depression, and hanger. Size as indicated on drawings with 4-inch (100 mm) centerset spacing.
   2. Vitreous China: ASME A112.19.2; white, rectangular basin with splash lip, front overflow, soap depression, and hanger. Size as indicated on drawings with 4-inch (100 mm) centerset spacing.
   3. Carrier:
      a. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.
      b. Manufacturers:
         1) Jay R. Smith MFG. Co; _____: www.jrsmith.com/#sle.
         2) JOSAM Company; _____: www.josam.com/#sle.
         3) Zurn Industries, LLC; Z1231: www.zurn.com/#sle.
         4) Substitutions: See Section 01 60 00 - Product Requirements.

C. Supply Faucet:
   1. Deck Mounted Faucet Manufacturers:
      a. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
      b. Kohler Company; _____: www.kohler.com/#sle.
      c. Chicago Faucet.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. ASME A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator with maximum flow of 2.2 gpm (8.3 L/min), indexed handles.
   3. Two-Lever Handle, Gooseneck Spout, Supply Faucet: ASME A112.18.1; deck-mount, ceramic cartridge disc valve, and maximum flow of 1.5 gpm (3.8 L/min).

D. Accessories:
   1. Chrome-plated 17 gauge, 0.0538 inch (1.37 mm) brass P-trap with clean-out plug and arm with escutcheon.

E. Lavatory Carrier:
   1. Manufacturers:
      a. Jay R. Smith Manufacturing Company; _____: www.jrsmith.com/#sle.
      b. JOSAM Company; _____: www.josam.com/#sle.
      c. Zurn Industries, LLC; Z1231EZ: www.zurn.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

2.05 SINKS

A. Manufacturers:
   1. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
   2. Jay R. Smith Manufacturing Company; _____: www.jrsmith.com/#sle.
   3. Kohler Company; _____: www.kohler.com/#sle.
   4. Just Manufacturing, Inc..
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Single Compartment Bowl

1. ASME A112.19.3; see drawings by xx by xx inch (xx by xx by xx mm) outside dimensions, 18 gauge, 0.050 inch (1.27 mm) thick, type 304 stainless steel, self-rimming and undercoated, with ledge back drilled for trim.
2. Drain: 1-1/2 inch (38 mm) chromed brass.

C. Kitchen Faucets:
1. Manufacturers:
   a. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
   b. Chicago Faucet.
   c. Substitutions: See Section 01 60 00 - Product Requirements.
2. Two-Handle Faucet:
   a. Type: Deck-mount, lever operated faucet with mounting plate.
   b. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.
   c. Materials: Stainless steel disc valve on brass body with polished chrome finish.

D. Accessories: Provide braided water supply lines, slip-joint p-trap, and stainless steel basket strainer.

2.06 UNDER-LAVATORY PIPE SUPPLY COVERS

A. General:
1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
2. Adhesives, sewing threads and two ply laminated materials are prohibited.
3. Exterior Surfaces: Smooth nonabsorbent with no finger recessed indentations for easy cleaning.
4. Construction: 1/8 inch (3.2 mm) PVC with antimicrobial, antifungal and UV resistant properties.
   a. Provide one piece injected molded design with internal bridge at top of J-bend to prevent separating.
   b. Comply with ASTM E84 for flame and smoke development.
   c. Comply with ASTM C1822 Type III for covers on accessible lavatory piping.
   d. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
   e. Comply with ICC A117.1.
   f. Thermal Resistance: R value of 0.504 or lower when tested by ASTM C177.
   g. Microbial and Fungal Resistance for Interior and Exterior: Comply with ASTM G21.
5. Color: High gloss white.
6. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

2.07 BOTTLE FILLING STATIONS

A. Manufacturers:
1. Haws Corporation; _____: www.hawsco.com/#sle.
2. Oasis International; _____: www.oasiscoolers.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Bottle Filler:
1. Surface mount assembly.
2. Lead-free waterways.
3. Hands free operation.
4. Provide less filter.

2.08 MOP SINKS

A. Manufacturers:
1. Acorn Engineering Company; _____: www.acorneng.com/#sle.
2. Just Manufacturing Company; _____: www.justmfg.com/#sle.
3. Zurn Industries, LLC; _____: www.zurn.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Material: Stainless steel.

C. Type: Rectilinear.

D. Grid Strainer: Stainless steel; integral; removable.

E. Dimensions: As indicated on drawings.

F. Accessories:
   1. 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced plastic hose.
   2. Hose clamp hanger.
   3. Mop hanger.

G. Terrazzo Mop Sink Manufacturers:
   1. Acorn Engineering Company; _____: www.acorneng.com/#sle.
   2. Just Manufacturing Company; _____: www.justmfg.com/#sle.
   3. Zurn Industries, LLC; _____: www.zurn.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

H. Material: Precast terrazzo composed of marble chips cast in Portland cement.

I. Type: Rectilinear, standard height.

J. Grid strainer: Stainless steel; integral; removable.

K. Dimensions: As indicated on drawings.

L. Accessories:
   1. 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced plastic hose.
   2. Hose clamp hanger.
   3. Mop hanger.

2.09 SERVICE SINKS

A. Manufacturers:
   1. Acorn Engineering Company; _____: www.acorneng.com/#sle.
   2. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
   3. Elkay Manufacturing Company; _____: www.elkay.com/#sle.
   4. Just Manufacturing Company; _____: www.justmfg.com/#sle.
   5. Zurn Industries, LLC; _____: www.zurn.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wall-Mount, Single-Bowl, Wash Sink: Two-hole, stainless steel finished, _____ bowl, _____ gal (_____ L)with integral-molded drain and stopper. Size as indicated on drawings.

C. Two-Lever Handle Service Faucet:
   1. Type: Wall-mount spout faucet with union inlets and mounting plate.
   2. Spray Type: Full stream spray at 1.8 gpm (6.8 L/min), maximum.
   3. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.
   4. Materials: Ceramic disc cartridge valve on brass body with polished chrome finish.
   5. Products:
      a. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
      b. Chicago Faucet.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

D. Accessories:
   1. Mop hanger.

2.10 HOSE BIB BOXES

A. Manufacturers:
   1. Metcraft Industries, Inc; _____: metcraftindustries.com/#sle.
   2. Outdoor Shower Company; _____: www.outdoorshowerco.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Material: 316 stainless steel.

C. Finish: Satin.

D. Mount in wall fully recessed.

E. Provide with NPT PVC ball valves and fittings.

F. Provide with internal hose drain bracket and waste outlet.

G. Provide with concealed hinge door and cam cylinder lock keyed alike.

2.11 EMERGENCY EYE WASH

A. Manufacturers:
   1. Haws Corporation; _____: www.hawsco.com/#sle.
   2. Therm-Omega-Tech, Inc; _____: www.thermomegatech.com/#sle.
   3. Speakman.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Emergency Wash: ANSI Z358.1; wall-mounted, self-cleaning, nonclogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receptor, twin eye wash heads and face spray ring, stainless steel dust cover, copper alloy control valve and fittings.

C. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.
   1. Manufacturers:
      a. Acorn Controls; _____: www.acorneng.com/#sle.
      b. Watts.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

3.04 CLEANING

A. Clean plumbing fixtures and equipment.

3.05 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 22 45 00 - EMERGENCY PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Eye/face wash equipment.

B. Emergency-fixture water-tempering valves.

1.02 REFERENCE STANDARDS

A. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2014.

B. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2023.

C. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.

D. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog sheets for fixtures, fittings, accessories, and supplies.

C. Field Test Reports: Plumbing fixture operational tests.

PART 2 PRODUCTS

2.01 EYE/FACE WASH EQUIPMENT

A. Manufacturers:
   1. Acorn Safety; _____: www.acorneng.com/#sle.
   2. Bradley Corporation; _____: www.bradleycorp.com/#sle.
   3. Encon Safety Products, Inc; _____: www.enconsafety.com/#sle.
   4. Guardian Equipment; _____: www.gesafety.com/#sle.
   5. Haws Corporation; _____: www.hawsco.com/#sle.
   6. Speakman Company; _____: www.speakman.com/#sle.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. ANSI Z358.1, wall-mounted bowl with dual eye-spray head assembly.

C. Product Certification: UL (DIR).

D. Tepid Supply Water Temperature: Set to 85 degrees F (29 degrees C).

E. Water Supply Connection Size: 1/2 inch (12.7 mm).

F. Water Discharge Flow Rate: Minimum, 3 gpm (11.3 Lpm) for 15 minutes.

G. Pipe and Fittings Material: PVC.

H. Valve: Full flow, self closing, quick to open thru wide-handle manual hand operator.

I. Drain: Built-into the bowl assembly with 1-1/4 inch (3.2 cm) female outlet.

J. Accessories:
   1. Bowl Cover: Valve-operated stainless steel hinged assembly.
   2. Signage: ANSI Z535.2, emergency eye/face wash safety equipment.

K. Thermostatic Mixing Valve:
   1. ASSE 1070 listed with combination stop, strainer, check valve, and flexible stainless steel connectors.
   2. Manufacturers:
      a. Acorn Controls; _____: www.acorneng.com/#sle.
      b. Watts.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that fixtures and accessories are of the correct type and size prior to installation.

B. Verify that deck, wall and floor finishes are prepared and ready for fixture installation.

3.02 INSTALLATION

A. Install fixtures and fittings in accordance with the manufacturer's instructions.

B. Adjust water flow rates to comply with manufacturer's rating of the fixture.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Operational Tests: Upon completion and sterilization of plumbing systems, conduct operating tests to demonstrate satisfactory, functional, and operating efficiency.

3.04 CLEANING

A. Thoroughly clean plumbing fixtures and equipment.

3.05 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace products damaged before Date of Substantial Completion.

END OF SECTION

SECTION 23 05 00 - GENERAL HVAC REQUIREMENTS

PART 1 GENERAL

1.01 GUARANTEE AND MAINTENANCE

A. Without additional cost to the Owner, repair defects in workmanship, equipment and material for a period of two (2) years from the date of substantial completion unless a longer time period is indicated in other Specification Sections.

B. Remove equipment or material which fails to meet performance ratings specified and shown in the Contract Documents. Replace with equipment which meets all specified requirements without additional cost to the Owner.

C. Guarantee that systems will operate without excessive noise (maximum NC of 35) as determined by the Architect / Engineer.

D. Provide a guarantee against system or equipment leaks for three (3) years from the date of approval of final payment by the Architect / Engineer. Properly repair leaks occurring during this period without additional cost to the Owner. This clause shall not be interpreted as holding the Contractor responsible for deterioration of system or equipment due to its abuse as determined by the Architect / Engineer.

E. Repair damage to the work of other Contractors or to the building and its contents caused by leaks in the equipment or system installed under this Contract or by disconnected pipes, fittings, overflows, freeze-ups, etc. at no additional cost to the Owner.

END OF SECTION

SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.03 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

PART 2 PRODUCTS

2.01 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

2.02 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.03 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.
   1. For motors with 2:1 speed ratio, consequent pole, single winding.
   2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:
   1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
   2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.04 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
   1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width-modulated inverters.
   2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
   3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
   4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.05 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
   1. Permanent-split capacitor.
   2. Split phase.
   3. Capacitor start, inductor run.
   4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.06 P3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 23 05 17 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Sleeves.
   2. Grout.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 PRODUCTS

2.01 SLEEVES

A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.02 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 EXECUTION

3.01 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in masonry walls and floors.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors 2 inches above finished floor level.
   2. Using grout, seal the space outside of sleeves in slabs and walls.

3.02 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves for the following piping-penetration applications:
   1. Exterior Walls:
      a. Piping Smaller Than NPS 6: Galvanized steel pipe sleeves.
   2. Interior Masonry Partitions and Floors:
      a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

END OF SECTION

SECTION 23 05 18 - ESCUTCHEONS FOR HVAC PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Escutcheons.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 PRODUCTS

2.01 ESCUTCHEONS

A. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

B. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

C. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install escutcheons for piping penetrations of walls.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
   1. Escutcheons for New Piping:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.

3.02 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons using new materials.

END OF SECTION

SECTION 23 05 19 - METERS AND GAGES FOR HVAC PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Bimetallic-actuated thermometers.
   2. Thermowells.
   3. Dial-type pressure gages.
   4. Gage attachments.
   5. Test plugs.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Ashcroft Inc.
   2. Miljoco Corporation.
   3. Trerice, H. O. Co.
   4. WATTS.
   5. Weiss Instruments, Inc.
   6. Weksler Glass Thermometer Corp.

B. Standard: ASME B40.200.

C. Case: Sealed type(s); stainless steel with 3-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

H. Window: Plain glass or plastic.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1 percent of scale range.

2.02 THERMOWELLS

A. Thermowells:
   1. Standard: ASME B40.200.
   2. Description: Pressure-tight, socket-type fitting made for insertion in piping tee fitting.
   3. Material for Use with Copper Tubing: CNR or CUNI.
   4. Material for Use with Steel Piping: CRES or CSA.

5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.03 DIAL-TYPE PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Ashcroft Inc.
   b. Miljoco Corporation.
   c. WATTS.
   d. Weiss Instruments, Inc.
   e. Weksler Glass Thermometer Corp.
2. Standard: ASME B40.100.
3. Case: Sealed type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass or plastic.
10. Ring: Stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.04 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and porous-metal-type surge-dampening device. Include extension for use on insulated piping.

2.05 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Miljoco Corporation.
2. Trerice, H. O. Co.
3. WATTS.
4. Weiss Instruments, Inc.
5. Weksler Glass Thermometer Corp.

B. Description: Test-station fitting made for insertion in piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

G. Install valve and snubber in piping for each pressure gage for fluids.

H. Install test plugs in piping tees.

3.02 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow space for service and maintenance of meters, gages, machines, and equipment.

3.03 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.04 THERMOMETER SCHEDULE

A. Thermometers shall be the following:
   1. Sealed, bimetallic-actuated type.

B. Thermometer stems shall be of length to match thermowell insertion length.

3.05 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Heating, Hot-Water Piping: 30 to 240 deg F.

B. Scale Range for Chilled-Water Piping: 0 to 100 deg F.

3.06 PRESSURE-GAGE SCHEDULE

A. Pressure gages shall be the following:
   1. Sealed, direct-mounted, metal case.

3.07 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Heating, Hot-Water Piping: 0 to 100 psi.

B. Scale Range for Chilled-Water Piping: 0 to 100 psi.

END OF SECTION

SECTION 23 05 23 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Globe valves.

B. Ball valves.

C. Check valves.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC.

C. Section 23 05 53 - Identification for HVAC Piping and Equipment.

D. Section 23 07 16 - HVAC Equipment Insulation.

E. Section 23 07 19 - HVAC Piping Insulation.

F. Section 23 21 13 - Hydronic Piping.

1.03 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. PTFE: Polytetrafluoroethylene.

G. RS: Rising stem.

H. TFE: Tetrafluoroethylene.

I. WOG: Water, oil, and gas.

1.04 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

B. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022, with Errata (2023).

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

D. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.

E. ASME B31.9 - Building Services Piping; 2020.

F. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

G. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.

H. MSS SP-45 - Drain and Bypass Connections; 2020.

I. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

J. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

K. MSS SP-125 - Check Valves: Gray Iron and Ductile Iron, In-Line, Spring-Loaded, Center-Guided; 2018.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

E. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.
   1. See Section 01 60 00 - Product Requirements for additional provisions.

1.06 QUALITY ASSURANCE

A. Manufacturer:
   1. Obtain valves for each valve type from single manufacturer.
   2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
   2. Protect valve parts exposed to piped medium against rust and corrosion.
   3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
   4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
   5. Secure check valves in either the closed position or open position.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors in dry environment.
      b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

C. Exercise the following precautions for handling:
   1. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. See drawings for specific valve locations.

B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

C. Provide the following valves for the applications if not indicated on drawings:
   1. Throttling (Hydronic): Ball and Globe.
   2. Isolation (Shutoff): Gate and Ball.
   3. Swing Check (Pump Outlet):
      a. Size 2 inch (50 mm, DN) and Smaller: Bronze with bronze disc.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
   1. Hand Lever: Quarter-turn valves 6 inch (150 mm, DN) and smaller.

D. Valves in Insulated Piping: Provide 2 inch (50 mm, DN) stem extensions and the following features:
   1. Gate Valves: Rising stem.

2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
2. Solder Joint Connections: ASME B16.18.

F. General ASME Compliance:
1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
2. Building Services Piping Valves: ASME B31.9.

G. Bronze Valves:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

H. Valve Bypass and Drain Connections: MSS SP-45.

I. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE, BALL VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Two Piece, Full Port with Bronze or Brass Trim:
1. Comply with MSS SP-110.
2. WSP Rating: 150 psi (1,035 kPa).
3. WOG Rating: 400 psi (2,758 kPa).
4. Body: Forged bronze or dezincified-brass alloy.
5. End Connections: Pipe thread or solder.
6. Seats: PTFE.
7. Stem: Bronze or brass.
8. Ball: Chrome plated brass.
9. Operator: Provide lockable handle and stem extension.
10. Manufacturers:
a. Apollo Valves; _____: www.apollovalves.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 BRONZE, SWING CHECK VALVES

A. Class 125:
1. Pressure and Temperature Rating: MSS SP-80, Type 3.
2. Design: Y-pattern, horizontal or vertical flow.
3. WSP Rating: 200 psi (1,380 kPa).
4. Body: Bronze, ASTM B62.
5. End Connections: Threaded or soldered.
6. Disc: Bronze.
7. Manufacturers:
a. Apollo Valves; _____: www.apollovalves.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges, are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Install check valves where necessary to maintain direction of flow as follows:
   1. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components.

1.02 RELATED REQUIREMENTS

A. Section 23 05 48 - Vibration and Seismic Controls for HVAC.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Installer's Qualifications: Include evidence of compliance with specified requirements.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. Carbon Steel Pipe Hangers and Supports
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
   3. Nonmetallic Coatings: Plastic coated, or epoxy powder-coated.
   4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe and Tube Hangers:
   1. Description: MSS SP-58, Types 1 through 58, copper-plated steel, factory-fabricated components.
   2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-plated steel or stainless steel.

C. Trapeze Pipe Hanges
   1. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

D. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 2.0. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
   6. Prefabricated Trapeze-Framed Metal Strut Systems:
      a. Strut Channel or Bracket Material:
      b. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.
   7. Hanger Rods:
      a. Threaded zinc-plated steel unless otherwise indicated.
   8. Anchors and Fasteners:
      a. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION

SECTION 23 05 48 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.

C. Vibration-isolated equipment support bases.

D. Vibration isolators.

E. Seismic restraint systems.

F. Vibration-isolated and/or seismically engineered roof curbs.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.03 DEFINITIONS

A. HVAC Component: Where referenced in this section in regards to seismic controls, applies to any portion of the HVAC system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., ductwork, piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

A. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

C. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2014.

D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

E. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

G. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. MFMA-4 - Metal Framing Standards Publication; 2004.

I. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Seismic Controls:
      a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
      b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.07 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.
   1. Designer may be employed by the manufacturer of the seismic restraint products.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
   3. Select vibration isolators for outdoor equipment to comply with wind design requirements.

2.02 SEISMIC CONTROL REQUIREMENTS

A. Design and provide HVAC component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor HVAC components.

B. Seismic Restraints:
   1. Provide seismic restraints for HVAC components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
   2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
      a. ASHRAE (HVACA).
      b. FEMA 412.
      c. FEMA 413.
      d. FEMA 414.
      e. FEMA E-74.
      f. SMACNA (SRM).

3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
4. Seismic Restraint Systems:
    a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
    b. Use only cable restraints to restrain vibration-isolated HVAC components, including distributed systems.
    c. Use only one restraint system type for a given HVAC component or distributed system (e.g., ductwork, piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
    d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain HVAC component in all lateral directions; consider bracket geometry in anchor load calculations.
    e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported HVAC component weight.
    f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported HVAC component weight.
    g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
    h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
    i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.
5. Ductwork Applications:
    a. Provide independent support and seismic restraint for in-line components (e.g., fans, heat exchangers, humidifiers) having an operating weight greater than 75 pounds (334 N).
    b. Positively attach appurtenances (e.g., dampers, louvers, diffusers) with mechanical fasteners.

C. Seismic Attachments:
1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
3. Do not use power-actuated fasteners.
4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
6. Concrete Housekeeping Pads:
    a. Increase size of pad as required to comply with anchor requirements.
    b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

D. Seismic Interactions:
1. Include provisions to prevent seismic impact between HVAC components and other structural or nonstructural components.

2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

E. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections to accommodate:
a. Relative displacements at connections between components, including distributed systems (e.g., ductwork, piping); do not exceed load limits for equipment utility connections.
b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
c. Design displacements at seismic separations.
d. Anticipated drifts between floors.

2.03 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Manufacturers:
1. Vibration-Isolated Equipment Support Bases:
a. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com/#sle.
b. Mason Industries; _____: www.mason-ind.com/#sle.
c. Vibration Eliminator Company, Inc; _____: www.veco-nyc.com/#sle.
d. Vibro-Acoustics; _____: www.vibro-acoustics.com/#sle.
e. Substitutions: See Section 01 60 00 - Product Requirements.
2. Source Limitations: Furnish vibration-isolated equipment support bases and associated components and accessories produced by the same manufacturer as the vibration isolators and obtained from a single supplier.

2.04 VIBRATION ISOLATORS

A. Manufacturers:
1. Vibration Isolators:
a. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com/#sle.
b. Mason Industries; _____: www.mason-ind.com/#sle.
c. Vibration Eliminator Company, Inc; _____: www.veco-nyc.com/#sle.
d. Vibro-Acoustics; _____: www.vibro-acoustics.com/#sle.
e. Substitutions: See Section 01 60 00 - Product Requirements.
2. Source Limitations: Furnish vibration-isolators and associated accessories produced by a single manufacturer and obtained from a single supplier.

B. General Requirements:
1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:
a. Color code or otherwise identify springs to indicate load capacity.
b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
f. Selected to function without undue stress or overloading.

2.05 SEISMIC RESTRAINT SYSTEMS

A. Manufacturers:
1. Seismic Restraint Systems:
a. AFCON, a brand of Anvil International; _____: www.anvilintl.com/#sle.
b. Eaton Corporation; _____: www.eaton.com/#sle.
c. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com/#sle.
d. Mason Industries; _____: www.mason-ind.com/#sle.
e. Vibro-Acoustics; _____: www.vibro-acoustics.com/#sle.

f. Substitutions: See Section 01 60 00 - Product Requirements.

2. Source Limitations: Furnish seismic restraint system components and accessories produced by a single manufacturer and obtained from a single supplier.

B. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

C. Cable Restraints:
1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

D. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

2.06 VIBRATION-ISOLATED AND/OR SEISMICALLY ENGINEERED ROOF CURBS

A. Manufacturers:
1. Vibration-Isolated and/or Seismically Engineered Roof Curbs:
a. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com/#sle.
b. Mason Industries; _____: www.mason-ind.com/#sle.
c. Vibration Eliminator Company, Inc; _____: www.veco-nyc.com/#sle.
d. Vibro-Acoustics; _____: www.vibro-acoustics.com/#sle.
e. Substitutions: See Section 01 60 00 - Product Requirements.
2. Source Limitations: Furnish vibration-isolated roof curbs and associated accessories produced by the same manufacturer as the vibration isolators and obtained from a single supplier.

B. Vibration Isolation Curbs:
1. Seismic Curb:
a. Location: Between structure and rooftop equipment.
b. Construction: Steel.
c. Integral vibration isolation to comply with requirements of this section.
d. Snubbers consist of minimum 0.25 inch (6 mm) thick resilient pads to avoid metal-to-metal contact without compromising vibration isolating capabilities.
e. Weather exposed components consist of corrosion resistant materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:
1. Vibration-Isolated Equipment Support Bases:
a. Provide specified minimum clearance beneath base.

2. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
3. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
4. Adjust isolators to be free of isolation short circuits during normal operation.
5. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

F. Seismic Controls:
1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch (3 mm), use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch (3 mm) or less.
4. Equipment with Sheet Metal Housings:
   a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
   b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
   c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
   a. Size in accordance with seismic design to meet anchor requirements.
   b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
6. Seismic Restraint Systems:
   a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
   b. Install restraints within permissible angles in accordance with seismic design.
   c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
   d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
   e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

END OF SECTION

SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Adhesive-backed duct markers.

D. Pipe markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Ductwork: Nameplates.

C. Piping: Tags.

D. Pumps: Nameplates.

E. Small-sized Equipment: Tags.

2.02 NAMEPLATES

A. Letter Color: White.

B. Letter Height: 1/4 inch (6 mm).

C. Background Color: Black.

D. Plastic: Comply with ASTM D709.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 ADHESIVE-BACKED DUCT MARKERS

A. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch (0.76 mm); printed with UV and chemical resistant inks.

B. Style: Individual Label.

C. Color: Yellow/Black.

2.05 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

C. Color code as follows:

1. Heating, Cooling, and Boiler Feedwater: Green with white letters.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

D. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
   1. Identify service, flow direction, and pressure.
   2. Install in clear view and align with axis of piping.
   3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

E. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic and refrigerating systems.

C. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).

C. NEBB (TAB) - Procedural Standard for Testing Adjusting and Balancing of Environmental Systems; 2019.

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   3. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   4. Units of Measure: Report data in I-P (inch-pound) units only.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.

2. Temperature control systems are installed complete and operable.
3. Final filters are clean and in place. If required, install temporary media in addition to final filters.
4. Duct systems are clean of debris.
5. Fans are rotating correctly.
6. Air coil fins are cleaned and combed.
7. Access doors are closed and duct end caps are in place.
8. Air outlets are installed and connected.
9. Duct system leakage is minimized.
10. Hydronic systems are flushed, filled, and vented.
11. Pumps are rotating correctly.
12. Proper strainer baskets are clean and in place.
13. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

H. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

I. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.06 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

3.07 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Sheave Make/Size/Bore.

B. Pumps:
1. Identification/number.
2. Manufacturer.
3. Size/model.
4. Impeller.
5. Service.
6. Design flow rate, pressure drop, BHP.
7. Actual flow rate, pressure drop, BHP.
8. Discharge pressure.
9. Suction pressure.
10. Total operating head pressure.

C. Air Cooled Condensers:
1. Identification/number.
2. Manufacturer.
3. Model number.
4. Serial number.

D. Cooling Coils:
1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Entering air DB temperature, design and actual.
7. Entering air WB temperature, design and actual.
8. Leaving air DB temperature, design and actual.
9. Leaving air WB temperature, design and actual.
10. Leaving water temperature, design and actual.
11. Saturated suction temperature, design and actual.

E. Air Moving Equipment:
1. Manufacturer.
2. Model number.
3. Serial number.
4. Air flow, specified and actual.
5. Return air flow, specified and actual.
6. Outside air flow, specified and actual.

7. Total static pressure (total external), specified and actual.
8. Inlet pressure.
9. Discharge pressure.
10. Sheave Make/Size/Bore.
11. Number of Belts/Make/Size.
12. Fan RPM.

F. Return Air/Outside Air:
1. Design air flow.
2. Actual air flow.
3. Design return air flow.
4. Actual return air flow.
5. Design outside air flow.
6. Actual outside air flow.
7. Return air temperature.
8. Outside air temperature.

G. Exhaust Fans:
1. Manufacturer.
2. Model number.
3. Serial number.
4. Air flow, specified and actual.
5. Total static pressure (total external), specified and actual.
6. Sheave Make/Size/Bore.
7. Fan RPM.

END OF SECTION

SECTION 23 07 13 - DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

1.02 RELATED REQUIREMENTS

A. Section 23 05 53 - Identification for HVAC Piping and Equipment.

B. Section 23 31 00 - HVAC Ducts and Casings: Glass fiber ducts.

1.03 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. CertainTeed Corporation; _____: www.certainteed.com/#sle.
   2. Johns Manville; _____: www.jm.com/#sle.

3. Knauf Insulation: www.knaufinsulation.com/#sle.
4. Owens Corning Corporation; _____: www.ocbuildingspec.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 1,200 degrees F (649 degrees C).
3. 1-1/2" thick concealed supply and return ductwork.

2.03 GLASS FIBER, RIGID

A. Manufacturer:
1. CertainTeed Corporation; _____: www.certainteed.com/#sle.
2. Johns Manville; _____: www.jm.com/#sle.
3. Knauf Insulation; _____: www.knaufinsulation.com/#sle.
4. Owens Corning Corporation; 700 Series FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
1. K (Ksi) Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 450 degrees F (232 degrees C).
3. Maximum Density: 8.0 pcf (128 kg/cu m).
4. 1-1/2" thick exposed exhaust ductwork on Mezzanine.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated Ducts Conveying Air Below Ambient Temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Ducts Exposed in Mechanical Equipment Rooms: Finish with PVC Jacket.

3.03 SCHEDULES

A. Exhaust Ducts Within 10 ft (3 m) of Exterior Openings:

B. Supply Ducts as stated above.

C. Return Ducts as stated above.

END OF SECTION

SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

A. Section 23 21 13 - Hydronic Piping: Placement of hangers and hanger inserts.

B. Section 23 23 00 - Refrigerant Piping: Placement of inserts.

1.03 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).

C. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2019).

D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

E. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017 (Reapproved 2023).

F. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

G. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

H. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

I. ASTM C610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation; 2017 (Reapproved 2023).

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

K. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

L. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturers:

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K (Ksi) Value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 1,200 degrees F (649 degrees C).

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 180 degrees F (82 degrees C).
   3. Connection: Waterproof vapor barrier adhesive.

2.04 JACKETING AND ACCESSORIES

A. PVC Plastic.
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F (minus 18 degrees C).
      b. Maximum Service Temperature: 150 degrees F (66 degrees C).
      c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil, 0.010 inch (0.25 mm).
      e. Connections: Brush on welding adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

3.03 SCHEDULE

A. Heating Systems:
   1. Heating Water Supply and Return: 1-1/2" thk. glass fiber

B. Cooling Systems:
   1. Condensate Drains from Cooling Coils: 1" thk. flexible elastomeric
   2. Refrigerant Suction: 1" thk. flexible elastomeric
   3. Refrigerant Hot Gas: 1" thk. flexible elastomeric

END OF SECTION

SECTION 23 11 23 - FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for natural gas piping systems.

1.02 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting.

B. Section 09 91 23 - Interior Painting.

C. Section 23 05 48 - Vibration and Seismic Controls for HVAC.

D. Section 23 05 53 - Identification for HVAC Piping and Equipment.

1.03 REFERENCE STANDARDS

A. ANSI Z21.80/CSA 6.22 - Line Pressure Regulators; 2019.

B. ANSI Z223.1 - National Fuel Gas Code; 2024.

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

D. ASME B31.1 - Power Piping; 2022.

E. ASME B31.9 - Building Services Piping; 2020.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

G. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

H. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2020.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

J. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

K. MSS SP-78 - Gray Iron Plug Valves, Flanged and Threaded Ends; 2011.

L. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Identify pipe with marking including size, ASTM material classification, and ASTM specification.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.
   1. Fittings: ASTM A234/A234M, wrought steel welding type.
   2. Joints: ANSI Z223.1, welded.
   3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.

2.02 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

2.03 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.

B. Flanges for Pipe Size Over 1 Inch (25 mm):
   1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

2.04 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.

2.05 BALL VALVES

A. Manufacturers:
   1. Apollo Valves; _____: www.apollovalves.com/#sle.
   2. Grinnell Products; _____: www.grinnell.com/#sle.
   3. Milwaukee Valve Company; _____: www.milwaukeevalve.com/#sle.
   4. Nibco, Inc; _____: www.nibco.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder, threaded, or grooved ends with union.

2.06 PLUG VALVES

A. Construction 2-1/2 Inches (65 mm) and Larger: MSS SP-78, 175 psi (1200 kPa) CWP, cast iron body and plug, pressure lubricated, Teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.07 LINE PRESSURE REGULATORS AND APPLIANCE REGULATORS INDICATORS

A. Manufacturers:
   1. Actaris Metering Systems (A brand of ITT Controls); _____: www.actaris-metering-systems.com/#sle.
   2. Dungs Combustion Controls; _____: www.dungs.com/#sle.
   3. Maxitrol Company; _____: www.maxitrol.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Compliance Requirements:
   1. Line Pressure Regulator: ANSI Z21.80/CSA 6.22.

C. Materials in Contact With Gas:
   1. Housing: Aluminum, steel (free of non-ferrous metals).
   2. Seals and Diaphragms: NBR-based rubber.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 05 16.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.

I. Provide support for utility meters in accordance with requirements of utility companies.

J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
   1. Painting of interior piping systems and components is specified in Section 09 91 23.
   2. Painting of exterior piping systems and components is specified in Section 09 91 13.

K. Install valves with stems upright or horizontal, not inverted.

L. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

M. Sleeve pipes passing through partitions, walls and floors. All masonry wall/floor penetrations shall be sleeved with galvanized pipe, included in sleeves and sleeve seals.

N. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

3.04 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Provide plug valves in natural gas systems for shut-off service.

3.05 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:

a. Pipe Size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
   1) Maximum Hanger Spacing: 6.5 ft (2 m).
   2) Hanger Rod Diameter: 3/8 inches (9 mm).
b. Pipe Size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
   1) Maximum Hanger Spacing: 10 ft (3 m).
   2) Hanger Rod Diameter: 3/8 inch (9 mm).
c. Pipe Size: 2-1/2 inches (65 mm) to 3 inches (75 mm):
   1) Maximum Hanger Spacing: 10 ft (3 m).
   2) Hanger Rod Diameter: 1/2 inch (13 mm).

END OF SECTION

SECTION 23 21 13 - HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hydronic system requirements.

B. Heating water piping, above grade.

C. Radiant heating piping system.

D. Pipe hangers and supports.

E. Unions, flanges, mechanical couplings, and dielectric connections.

F. Valves:
   1. Ball valves.
   2. Check valves.
   3. Pressure independent temperature control valves and balancing valves.

G. Flow controls.

1.02 RELATED REQUIREMENTS

A. Section 23 05 23 - General-Duty Valves for HVAC Piping.

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC.

C. Section 23 05 53 - Identification for HVAC Piping and Equipment.

D. Section 23 07 19 - HVAC Piping Insulation.

1.03 REFERENCE STANDARDS

A. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2021.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

D. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.

E. ASME B31.9 - Building Services Piping; 2020.

F. ASTM B32 - Standard Specification for Solder Metal; 2020.

G. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

H. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

I. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing; 2023b.

J. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2024.

K. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2024.

L. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2019).

M. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing; 2023b.

N. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

O. AWWA C606 - Grooved and Shouldered Joints; 2022.

P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with minimum 5 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
   1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
   2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
   3. Grooved mechanical joints may be used in accessible locations only.
      a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.
      b. Use rigid joints unless otherwise indicated.
   4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated:
   1. For shut-off and to isolate parts of systems or vertical risers, use gate, ball, or butterfly valves.

2.02 HEATING WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), L, drawn, using one of the following joint types:
   1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
      a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
      b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.

2.03 RADIANT HEATING PIPING

A. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
   1. Manufacturers:
      a. Uponor, Inc; _____: www.uponorpro.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Fittings: Brass and copper.

3. Joints: Mechanical compression fittings.
4. Manufacturers:
    a. Uponor, Inc; _____: www.uponorpro.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inches (13 to 38 mm): Malleable iron, adjustable swivel, split ring.

B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge-shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.05 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe of 2 Inches (50 mm, DN) and Less:

B. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
1. Dimensions and Testing: In accordance with AWWA C606.
2. Mechanical Couplings: Comply with ASTM F1476.
3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

2.06 BALL VALVES

A. Manufacturers:
1. Apollo Valves; _____: www.apollovalves.com/#sle.
2. Grinnell Products; _____: www.grinnell.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up To and Including 2 Inches (50 mm):
1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

2.07 SWING CHECK VALVES

A. Manufacturers:
1. Apollo Valves; _____: www.apollovalves.com/#sle.
2. Grinnell Products; _____: www.grinnell.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up To and Including 2 Inches (50 mm):
1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.

2.08 FLOW CONTROLS

A. Manufacturers:
1. Bell & Gossett, a brand of Xylem, Inc; _____: www.bellgossett.com/#sle.
2. Griswold Controls; _____: www.griswoldcontrols.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

C. Calibration: Control flow within 10 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, minimum pressure 2 psi (13.7 kPa).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner, parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and to avoid interference with use of space.

D. Group piping whenever practical at common elevations.

E. Sleeve pipe passing through partitions, walls, and floors.

F. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified _____.

G. Slope piping and arrange to drain at low points.

H. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. See Section 23 07 19.

3.02 SCHEDULES

A. Hanger Spacing for Copper Tubing.

1. 1/2 Inch (15 mm) and 3/4 inch (20 mm): Maximum span, 5 feet (1500 mm); minimum rod size, 1/4 inch (6 mm).
2. 1 Inch (25 mm): Maximum span, 6 feet (1800 mm); minimum rod size, 1/4 inch (6 mm).
3. 1-1/2 Inches (40 mm) and 2 Inches (50 mm): Maximum span, 8 feet (2400 mm); minimum rod size, 3/8 inch (9 mm).

END OF SECTION

SECTION 23 21 16 - HYDRONIC PIPING SPECIALTIES

GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Hydronic specialty valves.
   2. Air-control devices.
   3. Strainers.
   4. Connectors.

B. Related Requirements:
   1. Section 230523.12 "Ball Valves for HVAC Piping" for specification and installation requirements for ball valves common to most piping systems.
   2. Section 230523.14 "Check Valves for HVAC Piping" for specification and installation requirements for check valves common to most piping systems.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product:
   1. Include construction details and material descriptions for hydronic piping specialties.
   2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
   3. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For hydronic piping specialties to include in emergency, operation, and maintenance manuals.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

PART 2 - PRODUCTS

2.01 HYDRONIC SPECIALTY VALVES

A. A. Bronze, Calibrated-Orifice, Balancing Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bell & Gossett; a Xylem brand.
      b. Flow Design, Inc.
      c. Giswold Controls
      d. NIBCO, Inc.
   2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
   3. Ball: Brass or stainless steel.
   4. Plug: Resin.
   5. Seat: PTFE.
   6. End Connections: Threaded or socket.
   7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
   8. Handle Style: Lever, with memory stop to retain set position.
   9. CWP Rating: Minimum 125 psig.
   10. Maximum Operating Temperature: 250 deg F

B. Automatic Flow-Control Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Caleffi.
    b. Flow Design, Inc.
    c. Griswold Controls
    d. NIBCO, Inc.
2. Body: Brass or ferrous metal.
3. Flow Control Assembly, provide either of the following:
    a. Piston and Spring Assembly: Stainless steel or Corrosion resistant, tamper proof, self-cleaning, and removable.
    b. Elastomeric Diaphragm and Polyphenylsulfone Orifice Plate: Operating ranges within 2- to 80-psig differential pressure.
4. Combination Assemblies: Include bronze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow within plus or minus 10 percent, regardless of system pressure fluctuations.
8. Minimum CWP Rating: 175 psig.
9. Maximum Operating Temperature: 200 deg F.

2.02 AIR-CONTROL DEVICES

A. Manual Air Vents:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. a. AMTROL, Inc.
    b. b. Apollo Flow Controls; Conbraco Industries, Inc.
    c. Bell & Gossett; a Xylem brand.
    d. TACO Comfort Solutions, Inc.
2. Body: Bronze.
3. Internal Parts: Nonferrous.
4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/8.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 225 deg F.

B. Automatic Air Vents:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. AMTROL, Inc.
    b. Bell & Gossett; a Xylem brand.
    c. TACO Comfort Solutions, Inc.
2. Body: Bronze or cast iron.
3. Internal Parts: Nonferrous.
4. Operator: Noncorrosive metal float.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/4.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 240 deg F.

C. Diaphragm-Type Non-ASME Expansion Tanks:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. AMTROL, Inc.
    b. Apollo Flow Controls; Conbraco Industries, Inc.
    c. Bell & Gossett; a Xylem brand.

d. TACO Comfort Solutions, Inc.
e. WATTS.

2. Tank: Carbon steel, rated for minimum 100-psig working pressure at minimum 200 deg F maximum operating temperature. Non-ASME construction.
3. Diaphragm: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.

D. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

E. In-Line Air Separators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AMTROL, Inc.
b. Bell & Gossett; a Xylem brand.
c. TACO Comfort Solutions, Inc.
2. Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.
3. Maximum Working Pressure: Up to 175 psig.
4. Maximum Operating Temperature: Up to 300 deg F.

F. F. Air Purgers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AMTROL, Inc.
b. Bell & Gossett; a Xylem brand.
c. TACO Comfort Solutions, Inc.
2. Body: Cast iron with internal baffles that slow the water velocity to separate the air from solution and divert it to the vent for quick removal.
3. Maximum Working Pressure: 150 psig.
4. Maximum Operating Temperature: 250 deg F.

2.03 STRAINERS

A. Y-Pattern Strainers:
1. Body: ASTM A126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller.
3. CWP Rating: 125 psig.

PART 3 - EXECUTION

3.01 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

B. Install check valves at each pump discharge and elsewhere as required to control flow direction.

3.02 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping as required for system air venting.

END OF SECTION

SECTION 23 21 23 - HYDRONIC PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Circulators.

B. In-line pumps.

1.02 RELATED REQUIREMENTS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC.

C. Section 23 07 19 - HVAC Piping Insulation.

D. Section 23 21 13 - Hydronic Piping.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture, assembly, and field performance of pumps, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Armstrong Fluid Technology, Inc; _____: www.armstrongfluidtechnology.com/#sle.

B. Bell & Gossett, a Xylem Inc. brand; _____: www.bellgossett.com/#sle.

C. Grundfos Pumps Corporation; _____: www.grundfos.com/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GENERAL

A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Electrical Requirements:

1. Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.

2.03 CIRCULATORS

A. Horizontal shaft, single-stage pump with direct connected, resilient-mount, oil lubricated motor for discharge pressures of up to 125 psi (860 kPa).

B. Casing: Cast iron, with flanged pump connections.

C. Impeller: Non-ferrous keyed to shaft.

D. Bearings: Oil-lubricated bronze sleeve.

E. Shaft: Alloy steel with bronze sleeve, integral thrust collar.

F. Drive: Flexible coupling.

G. Electrical:
   1. Motor: 1,750 rpm unless indicated otherwise; see Section 23 05 13.
   2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

2.04 IN-LINE PUMPS

A. Casing: Cast iron with seal flush connection, threaded suction, and discharge ports with gauge port and drain plug.

B. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.

C. Shaft: Carbon steel with stainless steel impeller cap screw or nut and bronze sleeve.

D. Electrical:
   1. Motor: 1,750 rpm, open drip-proof (ODP); see Section 23 05 13.
   2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

END OF SECTION

SECTION 23 23 00 - REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Valves.

D. Pressure relief valves.

E. Filter-driers.

F. Solenoid valves.

G. Expansion valves.

1.02 RELATED REQUIREMENTS

A. Section 23 07 16 - HVAC Equipment Insulation.

B. Section 23 07 19 - HVAC Piping Insulation.

C. Section 23 63 13 - Air Cooled Refrigerant Condensers.

1.03 REFERENCE STANDARDS

A. AHRI 710 (I-P) - Performance Rating of Liquid-Line Driers; 2009.

B. AHRI 711 (SI) - Performance Rating of Liquid-Line Driers; 2009.

C. AHRI 760 (I-P) - Performance Rating of Solenoid Valves for Use with Volatile Refrigerants; 2014.

D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Errata (2023).

E. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

G. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.

H. ASME B31.9 - Building Services Piping; 2020.

I. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.

J. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

K. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Filter-Driers:
   1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

2.02 REGULATORY REQUIREMENTS

A. Comply with ASME B31.9 for installation of piping system.

B. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

2.03 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Pipe Supports and Anchors:
   1. Provide hangers and supports that comply with MSS SP-58.
      a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Malleable iron adjustable swivel, split ring.
   3. Wall Support for Pipe Sizes to 3 Inches (75 mm): Cast iron hook.
   4. Vertical Support: Steel riser clamp.
   5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   6. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
   7. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 REFRIGERANT

A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

2.05 VALVES

A. Manufacturers:
   1. Hansen Technologies Corporation; _____: www.hantech.com/#sle.
   2. Henry Technologies; _____: www.henrytech.com/#sle.
   3. Flomatic Valves; _____: www.flomatic.com/#sle.
   4. Parker Hannifin - Sporlan Division; _____: www.parker.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 STRAINERS

A. Manufacturers:
   1. Hansen Technologies Corporation; _____: www.hantech.com/#sle.
   2. Parker Hannifin - Sporlan Division; _____: www.parker.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 PRESSURE RELIEF VALVES

A. Manufacturers:
   1. Hansen Technologies Corporation; _____: www.hantech.com/#sle.
   2. Henry Technologies; _____: www.henrytech.com/#sle.
   3. Sherwood Valve/Harsco Corporation; _____: www.sherwoodvalve.com/#sle.

B. Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB, selected to ASHRAE Std 15, with standard setting of 235 psi (1620 kPa).

2.08 FILTER-DRIERS

A. Manufacturers:
   1. Flow Controls Division of Emerson Electric; _____: www.emersonflowcontrols.com/#sle.
   2. Parker Hannifin - Sporlan Division; Catch-All; _____: www.parker.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

C. Construction: UL listed.
   1. Connections: As specified for applicable pipe type.

2.09 SOLENOID VALVES

A. Manufacturers:
   1. Flow Controls Division of Emerson Electric; _____: www.emersonflowcontrols.com/#sle.
   2. Parker Hannifin - Sporlan Division; _____: www.parker.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.10 EXPANSION VALVES

A. Manufacturers:
   1. Flow Controls Division of Emerson Electric; _____: www.emersonflowcontrols.com/#sle.
   2. Parker Hannifin - Sporlan Division; _____: www.parker.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Angle or Straight Through Type: AHRI 760 (I-P); design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with nonreplaceable capillary tube and remote sensing bulb and remote bulb well.

C. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F (6 degrees C) superheat. Select to avoid being undersized at full load and excessively oversized at part load.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain-end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.5.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.
   4. Place hangers within 12 inches (300 mm) of each horizontal elbow.

5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Insulate piping and equipment.

I. Fully charge completed system with refrigerant after testing.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Test refrigeration system in accordance with ASME B31.5.

C. Pressure test system with dry nitrogen to 200 psi (1380 kPa). Perform final tests at 27 inches (92 kPa) vacuum and 200 psi (1380 kPa) using halide torch. Test and repair piping until no leakage.

3.04 SCHEDULES

A. Hanger Spacing for Copper Tubing.

1. 1/2 inch (13 mm), 5/8 inch (16 mm), and 7/8 inch (22 mm) OD: Maximum span, 5 feet (1500 mm); minimum rod size, 1/4 inch (6.3 mm).

END OF SECTION

SECTION 23 25 13 - WATER TREATMENT FOR CLOSED-LOOP HYDRONIC SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes the following water treatment for closed-loop hydronic systems:
   1. Manual chemical-feed equipment.
   2. Chemicals.

1.03 ACTION SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, and furnished specialties and accessories for the following products:
   1. Bypass feeders.
   2. Chemical material safety data sheets.
   3. Inhibited propylene glycol.

1.04 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Water-Analysis Provider Qualifications: Verification of experience and capability of HVAC water-treatment service provider.

C. Field quality-control reports.

D. Water-Treatment Program: Written sequence of operation on an annual basis for the application equipment required to achieve water quality defined in "Performance Requirements" Article.

E. Water Analysis: Illustrate water quality available at Project site.

1.05 QUALITY ASSURANCE

A. HVAC Water-Treatment Service Provider Qualifications: An experienced HVAC water-treatment service provider, capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.

PART 2 PRODUCTS

2.01 HVAC WATER-TREATMENT MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Anderson Chemical Company.
   2. Aqua-Chem, Inc.
   3. Barclay Water Management, Inc.
   4. Boland Trane Services.
   5. Cascade Water Services, Inc.
   6. Earthwise Environmental Inc.
   7. H-O-H Water Technology, Inc.
   8. Metro Group, Inc. (The).
   9. Nalco; an Ecolab company.
   10. Sonitec-Vortisand Inc.
   11. Suez Water Technologies (Formerly GE Water).

12. Watcon, Inc.

2.02 PERFORMANCE REQUIREMENTS

A. Provide all hardware, chemicals, and other material necessary to maintain HVAC water quality in all systems, as indicated in this Specification. Water quality for hydronic systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of hydronic equipment without creating a hazard to operating personnel or the environment.

B. Base HVAC water treatment on quality of water available at Project site, hydronic system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.

C. The water treatment provider shall be responsible for providing chemicals to maintain the following. Maintained water quality values shall be determined by the water treatment provider.
   1. pH.
   2. Alkalinity.
   3. Steel Corrosion Inhibiters.
   4. Yellow Metal Corrosion Inhibitor.
   5. Scale Control.
   6. Dispersants.
   7. Microbiological Limits:

2.03 MANUAL CHEMICAL-FEED EQUIPMENT

A. Bypass Feeders: Provide steel feeders with corrosion-resistant exterior coating, minimum 3-1/2-inch fill opening in the top, and NPS 3/4 bottom inlet and top side outlet. Provide quarter turn or threaded fill cap with gasket seal and diaphragm to lock the top on the feeder when exposed to system pressure in the vessel.
   1. Capacity: 5 gal.
   2. Minimum Working Pressure: 125 psig.

2.04 CHEMICALS

A. Chemicals shall be as recommended by the water treatment provider, compatible with piping system components and connected equipment, and able to attain water quality determined by the water treatment provider.

B. Inhibited Propylene Glycol:
   1. Propylene glycol with inhibitor additive, to provide freeze protection for heat-transfer fluid and corrosion protection for carbon steel, brass, copper, stainless steel, and cast-iron piping and fittings.
   2. Inhibitor creates a passive layer on all surfaces that contact propylene glycol to prevent corrosion and stabilizes fluid pH, to compensate for acids formed from glycol degradation.
   3. Concentrated inhibited propylene glycol is to be 95.5 percent propylene glycol by weight and 4.5 percent performance additives.
   4. Concentrated inhibited propylene glycol is mixed with water in proper proportion specified by the manufacturer to provide freeze protection as specified. Premixed heat-transfer fluid may be used, or glycol/water mixture may be prepared at the time of installation. Use only deionized water for mixing.
   5. Provide only propylene glycol that is specifically blended for HVAC application. Automotive-type antifreeze is unacceptable.

PART 3 EXECUTION

3.01 WATER ANALYSIS

A. Perform an analysis of supply water to determine quality of water available at Project site.

3.02 INSTALLATION

A. Install chemical-application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units, so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate..

B. Install seismic restraints for equipment and floor-mounting accessories, and anchor to building structure.

C. Bypass Feeders: Install in closed hydronic systems, and equip with the following:
   1. Install bypass feeder in a bypass circuit around circulating pumps unless indicated otherwise on Drawings.

3.03 PIPING CONNECTIONS

A. Piping installation requirement are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to equipment, allow space for service and maintenance.

C. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Dielectric fittings are specified in Section 232113 "Hydronic Piping."

D. Install shutoff valves on HVAC water-treatment equipment inlet and outlet.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:
   1. Inspect field-assembled components and equipment installation.
   2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
   3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of hydronic systems' startup procedures.
   4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
   5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
   7. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
   8. Repair leaks and defects with new materials, and retest piping until no leaks exist.

C. Equipment will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Comply with ASTM D3370 and with the following standards:
   1. Silica: ASTM D859.
   2. Acidity and Alkalinity: ASTM D1067.
   3. Iron: ASTM D1068.
   4. Water Hardness: ASTM D1126.

3.05 MAINTENANCE SERVICE

A. Scope of Maintenance Service: Provide chemicals and service program to maintain water conditions required above, to inhibit corrosion and scale formation for hydronic piping and equipment. Services and chemicals shall be provided for a period of two years from date of Substantial Completion and shall include the following:
   1. Initial water analysis and HVAC water-treatment recommendations.
   2. Startup assistance for Contractor to flush the systems, clean with detergents, and initially fill systems with required chemical treatment prior to operation.
   3. Periodic field service and consultation.
   4. Customer report charts and log sheets.

5. Laboratory technical analysis.
6. Analyses and reports of all chemical items concerning safety and compliance with government regulations.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment.

END OF SECTION

SECTION 23 31 13 - METAL DUCTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Single-wall rectangular ducts and fittings.
   2. Single-wall round ducts and fittings.
   3. Sheet metal materials.
   4. Duct liner.
   5. Sealants and gaskets.
   6. Hangers and supports.

B. Related Sections:
   1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
   2. Section 233300 "Air Duct Accessories" for dampers, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of the following products:
   1. Liners and adhesives.
   2. Sealants and gaskets.

B. Delegated-Design Submittal:
   1. Sheet metal thicknesses.
   2. Joint and seam construction and sealing.
   3. Reinforcement details and spacing.
   4. Materials, fabrication, assembly, and spacing of hangers and supports.

1.05 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.06 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
   2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 PRODUCTS

2.01 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.02 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.03 SHEET METAL MATERIALS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Ductmate Industries, Inc.
    b. Linx Industries (formerly Lindab).
    c. McGill AirFlow LLC.
    d. MKT Metal Manufacturing.
    e. SEMCO LLC.

f. Sheet Metal Connectors, Inc.
g. Spiral Manufacturing Co., Inc.
h. Stamped Fittings Inc.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.04 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. CertainTeed Corporation.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Owens Corning.
1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:
1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick stainless steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

a. Fan discharges.
b. Intervals of lined duct preceding unlined duct.
c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

9. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.05 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.06 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

PART 3 EXECUTION

3.01 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.02 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.03 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.

B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 12 feet in horizontal ducts, and at every floor for vertical ducts.

C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.04 DUCT SEALING

A. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
   1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   2. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
   3. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
   4. Unconditioned Space, Exhaust Ducts: Seal Class C.
   5. Unconditioned Space, Return-Air Ducts: Seal Class B.
   6. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
   7. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
   8. Conditioned Space, Exhaust Ducts: Seal Class B.
   9. Conditioned Space, Return-Air Ducts: Seal Class C.

3.05 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Structural-steel fasteners appropriate for construction materials to which hangers are being attached.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.06 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.07 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

3.08 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.09 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
   1. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.
      a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
      b. Concealed: Type 304, stainless-steel sheet, No. 2D finish.
      c. Welded seams and joints.

B. Intermediate Reinforcement:
   1. Galvanized-Steel Ducts: Galvanized steel.
   2. Stainless-Steel Ducts:
      a. Exposed to Airstream: Match duct material.
      b. Not Exposed to Airstream: Galvanized.

C. Liner:
   1. Supply Air Ducts: Fibrous glass, Type I, 1 inch thick. (Where indicated)
   2. Return Air Ducts: Fibrous glass, Type I, 1 inch thick. (Where indicated)

D. Elbow Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
      a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
      b. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
   2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
      a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
         1) Radius-to Diameter Ratio: 1.5.
      b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
      c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

E. Branch Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
      a. Rectangular Main to Rectangular Branch: 45-degree entry.
      b. Rectangular Main to Round Branch: High efficiency takeoff.

END OF SECTION

SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Manual volume dampers.
   2. Control Dampers
   3. Flange connectors.
   4. Turning vanes.
   5. Duct-mounted access doors.
   6. Flexible connectors.
   7. Duct accessory hardware.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail duct accessories' fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
      a. Special fittings.
      b. Manual volume damper installations.
      c. Control damper installations.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 90A and NFPA 90B.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.02 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. American Warming and Ventilating; a Mestek Architectural Group company.
      b. Arrow United Industries.
      c. Cesco Products; a division of MESTEK, Inc.
      d. Greenheck Fan Corporation.
      e. Nailor Industries Inc.
      f. Ruskin Company.
      g. United Enertech.
      h. Vent Products Co., Inc.
   2. Construction:
      a. Linkage out of airstream.

b. Suitable for horizontal or vertical airflow applications.

3. Blades:
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized steel; 16 gauge thick.
4. Locking device to hold damper blades in a fixed position without vibration.

2.03 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. American Warming and Ventilating; a division of Mestek, Inc.
   2. Arrow United Industries; a division of Mestek, Inc.
   3. Cesco Products; a division of Mestek, Inc.
   4. Greenheck Fan Corporation.
   5. Lloyd Industries, Inc.
   6. McGill AirFlow LLC.
   7. Metal Form Manufacturing, Inc.
   8. Nailor Industries Inc.
   9. NCA Manufacturing, Inc.
   10. Pottorff.
   11. Ruskin Company.
   12. Vent Products Company, Inc.
   13. Young Regulator Company.

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

2.04 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. CL WARD & Family Inc.
   2. Ductmate Industries, Inc.
   3. DynAir; a Carlisle Company.
   4. Elgen Manufacturing.
   5. Ward Industries; a brand of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel unless indicated otherwise.

D. Gauge and Shape: Match connecting ductwork.

2.05 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Aero-Dyne Sound Control Co.
   2. CL WARD & Family Inc.
   3. Ductmate Industries, Inc.
   4. Duro Dyne Inc.
   5. DynAir; a Carlisle Company.
   6. Elgen Manufacturing.
   7. Ward Industries; a brand of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Fabricate curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

D. Vane Construction:
   1. Single wall.

2.06 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Aire Technologies.
   2. Arrow United Industries.
   3. Cesco Products; a division of MESTEK, Inc.
   4. CL WARD & Family Inc.
   5. Ductmate Industries, Inc.
   6. Duro Dyne Inc.
   7. Elgen Manufacturing.
   8. Flexmaster U.S.A., Inc.
   9. McGill AirFlow LLC.
   10. Ruskin Company.
   11. United Enertech.
   12. Ventfabrics, Inc.
   13. Ward Industries; a brand of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 7-2 (7-2M), "Duct Access Doors and Panels," and Figure 7-3, "Access Doors - Round Duct."
   1. Door:
      a. Double wall, rectangular.
      b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
      c. 24-gauge-thick galvanized steel door panel.
      d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
      e. Fabricate doors airtight and suitable for duct pressure class.
   2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
      a. 24-gauge-thick galvanized steel or 0.032-inch-thick aluminum frame.
   3. Number of Hinges and Locks:
      a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
      b. Access Doors up to 18 Inches Square: Continuous and two sash locks.
      c. Access Doors up to 24 by 48 Inches Three hinges or Continuous and two compression latches with outside and inside handles.

2.07 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. CL WARD & Family Inc.
   2. Ductmate Industries, Inc.
   3. Duro Dyne Inc.
   4. DynAir; a Carlisle Company.
   5. Elgen Manufacturing.
   6. Ventfabrics, Inc.
   7. Ward Industries; a brand of Hart & Cooley, Inc.

B. Fire-Performance Characteristics: Adhesives, sealants, fabric materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested in accordance with ASTM E84.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Materials: Flame-retardant or noncombustible fabrics.

E. Coatings and Adhesives: Comply with UL 181, Class 1.

F. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch- thick, galvanized sheet steel.

G. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
   1. Minimum Weight: 26 oz./sq. yd.
   2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
   3. Service Temperature: Minus 40 to plus 200 deg F.

2.08 DUCT ACCESSORY HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. CL WARD & Family Inc.
   2. Ductmate Industries, Inc.
   3. Duro Dyne Inc.
   4. DynAir; a Carlisle Company.
   5. Elgen Manufacturing.
   6. Hardcast; a Carlisle Company.
   7. United Enertech.
   8. Ventfabrics, Inc.
   9. Ward Industries; a brand of Hart & Cooley, Inc.

B. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

C. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.09 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A653/A653M.
   1. Galvanized Coating Designation: G90.
   2. Exposed-Surface Finish: Mill phosphatized.

B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install duct accessories in accordance with applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
   1. Install steel volume dampers in steel ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated and as needed for testing and balancing.

F. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
   1. On both sides of duct coils.
   2. One side of automatic control dampers
   3. Elsewhere as indicated.

G. Install access doors with swing against duct static pressure.

H. Access Door Sizes:
   1. One-Hand or Inspection Access: 8 by 5 inches.
   2. Two-Hand Access: 12 by 6 inches.
   3. Head and Hand Access: 18 by 10 inches.
   4. Head and Shoulders Access: 21 by 14 inches.

I. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

J. Install flexible connectors to connect ducts to equipment (where indicated).

K. Install duct test holes where required for testing and balancing purposes.

3.02 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Operate dampers to verify full range of movement.
   2. Inspect locations of access doors, and verify that size and location of access doors are adequate to perform required operation.
   3. Inspect turning vanes for proper and secure installation, and verify that vanes do not move or rattle.

END OF SECTION

SECTION 23 34 16 - CENTRIFUGAL HVAC FANS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backward inclined centrifugal fans.

B. Forward curved centrifugal fans.

C. Bearings and drives.

1.02 RELATED REQUIREMENTS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC.

C. Section 23 07 13 - Duct Insulation.

D. Section 23 33 00 - Air Duct Accessories: Backdraft dampers.

E. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015 (Reaffirmed 2020).

B. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

C. AMCA 99 - Standards Handbook; 2016.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016, with Errata (2018).

E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point plotted, power, rpm, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Include complete installation instructions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

1.07 FIELD CONDITIONS

A. Permanent fans may not be used for ventilation during construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ACME Engineering and Manufacturing Corporation; _____: www.acmefan.com/#sle.

B. Carnes, a division of Carnes Company Inc; VIBK: www.carnes.com/#sle.

C. Loren Cook Company; _____: www.lorencook.com/#sle.

D. PennBarry, Division of Air System Components; _____: www.pennbarry.com/#sle.

E. Twin City Fan & Blower; _____: www.tcf.com/#sle.

F. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

C. Fabrication: Comply with AMCA 99.

D. Performance Base: Sea level conditions.

2.03 WHEEL AND INLET

A. Backward Inclined: Steel or aluminum construction with smooth curved inlet flange, heavy back plate, backwardly curved blades welded or riveted to flange and backplate; cast iron hub riveted to back plate and keyed to shaft with set screws.

B. Forward Curved: Black enameled steel construction with inlet flange, backplate, shallow blades with inlet and tip curved forward in direction of airflow, mechanically secured to flange and back plate; steel hub swaged to backplate and keyed to shaft with set screw.

2.04 BEARINGS AND DRIVES

A. Bearings: Heavy duty pillow block type, selfgreasing ball bearings, with ABMA STD 9 life at 50,000 hours.

B. Shafts: Hot rolled steel, ground and polished, with keyway, protectively coated with lubricating oil, and shaft guard.

C. Drive: Direct drive only.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install fans with resilient mountings and flexible electrical leads, see Sections 23 05 48 and 26 05 83.

C. Install flexible connections between fan inlet and discharge ductwork; see Section 23 33 00. Ensure metal bands of connectors are parallel with minimum one inch (25 mm) flex between ductwork and fan while running.

D. Install fan restraining snubbers; see Section 23 05 48. Adjust snubbers to prevent tension in flexible connectors when fan is operating.

E. Provide fixed sheaves required for final air balance.

F. Provide safety screen where inlet or outlet is exposed.

G. Provide backdraft dampers on exhaust fans located at discharge side; see Section 23 33 00.

END OF SECTION

SECTION 23 34 24 - CIRCULATION FANS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

1.02 REFERENCE STANDARDS

A. AMCA 99 - Standards Handbook; 2016.

B. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.

C. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016, with Errata (2018).

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate installation instructions.

D. Maintenance Materials: Furnish the following for Owner's use in project maintenance.
   1. See Section 01 60 00 - Product Requirements for additional provisions.
   2. Extra Fan Belts: One set for each individual fan.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum three years of documented experience.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for fan. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Patterson Fan Company, Inc; _____: www.pattersonfan.com/#sle.

B. Ruck Air Movement, Inc; _____: www.ruck-airmovement.com#sle.

C. Greenheck.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GENERAL REQUIREMENTS

A. Static and Dynamically Balanced: Comply with AMCA 204.

B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.

C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.

D. Fabrication: Comply with AMCA 99.

E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 CAGE FANS

A. Product Description: Electrically-operated, personnel ventilation fan for mounting at loading dock door openings.

B. Disconnect Switch:
   1. Factory mounted and wired.
   2. NEMA 250 Enclosure: Unless otherwise indicated, as specified for the following installation locations:

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install fan in a location free of obstacles such as cables, lights, and building structures that would impede proper air circulation.

C. OSHA compliant finger guards are required if unit is mounted less than 7 feet (213.36 cm) above finished floor or where workers have access.

END OF SECTION

SECTION 23 37 13 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes ceiling-mounted diffusers.

1.03 SUBMITTALS

A. Product Data: For each product indicated, include the following:
   1. Data Sheet: Indicate materials of construction, finish, and mounting details.
   2. Diffuser, Register, and Grille Schedule: Indicate model number, size, performance data including throw and drop, static-pressure drop, and noise ratings and accessories furnished.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   1. Anemostat, a Mestek Company.
   2. Carnes.
   3. Krueger.
   4. METALAIRE, Inc., Metal Industries Inc.
   5. Price Industries.
   6. Titus.
   7. Nailor Industries

2.02 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas where diffusers are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install diffusers level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. Where architectural features or other items conflict with installation, notify Engineer for a determination of final location.

C. Install diffusers with airtight connections to ducts.

3.03 ADJUSTING

A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 23 40 00 - HVAC AIR CLEANING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disposable, extended area panel filters.

B. Disposable panel filters.

C. Extended surface high efficiency media filters.

D. Filter gauges.

1.02 REFERENCE STANDARDS

A. AHRI 850 (I-P) - Performance Rating of Commercial and Industrial Air Filter Equipment; 2013 (Reaffirmed 2023).

B. AHRI 851 (SI) - Performance Rating of Commercial and Industrial Air Filter Equipment; 2013 (Reaffirmed 2023).

C. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017, with Addendum (2022).

D. UL 900 - Standard for Air Filter Units; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate assembly and change-out procedures.

D. Operation and Maintenance Data: Include instructions for operation, changing, and periodic cleaning.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements for additional provisions.
   2. Extra Filters: One set of each type and size.

PART 2 PRODUCTS

2.01 FILTER MANUFACTURERS

A. American Air Filter Company, Inc; _____: www.aafintl.com/#sle.

B. Camfil, a company of the The Camfil Group; _____: www.camfil.us/#sle.

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Comply with the rating requirements in AHRI 851 (SI).

2.03 DISPOSABLE, EXTENDED AREA PANEL FILTERS

A. Media: UL 900 Class 1, pleated, lofted, non-woven, reinforced cotton fabric; supported and bonded to welded wire grid by corrugated aluminum separators.

B. Minimum Efficiency Reporting Value (MERV): 8, when tested in accordance with ASHRAE Std 52.2.

C. Rating, per ASHRAE Std 52.2:
   1. Weight Arrestance: 85 percent.
   2. Initial resistance at 500 fpm (2.54 m/s) face velocity: 0.20 in-wc (50 Pa).
   3. Recommended final resistance: 0.9 in-wc (224 Pa).

2.04 DISPOSABLE PANEL FILTERS

A. Media: UL 900 Class 2, fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive.

B. Performance Rating:

1. Face Velocity: 500 fpm (2.54 m/s).
2. Initial Resistance: 0.15 in-wc (37 Pa).
3. Recommended Final Resistance: 0.50 in-wc (125 Pa).

C. Casing: Cardboard frame.

2.05 EXTENDED SURFACE HIGH EFFICIENCY MEDIA FILTERS

A. Minimum Efficiency Reporting Value (MERV): 13, when tested in accordance with ASHRAE Std 52.2.

2.06 FILTER GAUGES

A. Manufacturers:
1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com/#sle.
2. H.O. Trerice Co; _____: www.trerice.com/#sle.
3. Weiss Instruments; _____: www.weissinstruments.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Direct Reading Dial: 3-1/2 inch (90 mm) diameter diaphragm actuated dial in metal case, vent valves, black figures on white background, front recalibration adjustment, range 0 to 2.0 in-wc (0 to 500 Pa), 2 percent of full scale accuracy.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install air cleaning devices in accordance with manufacturer's instructions.

B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.

C. Install filter gauge static pressure tips upstream and downstream of filters. Mount filter gauges on outside of filter housing or filter plenum, in accessible position. Adjust and level.

D. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

E. Provide filter gauges on filter banks, installed with separate static pressure tips upstream and downstream of filters.

END OF SECTION

SECTION 23 51 23 - GAS VENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Listed double-wall vents.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for product.

B. Shop Drawings: For vents.
   1. Include plans, elevations, sections, and attachment details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Detail fabrication and assembly of hangers and seismic restraints.

1.04 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Sample Warranty: For special warranty.

1.05 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
   2. AWS D9.1/D9.1M, "Sheet Metal Welding Code," for shop and field welding of joints and seams in vents.

B. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations.

PART 2 PRODUCTS

2.01 LISTED SPECIAL GAS VENTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following. Manufacturer shall be approved by the boiler and water heater supplier.
   1. Heatfab Saf-T Vent.
   2. Metal-Fab, Inc.
   3. Selkirk Corporation.
   4. Duravent.

B. Description: Double-wall metal vents tested according to UL 1738 and rated for 480 deg F continuously, with positive or negative flue pressure complying with NFPA 211.

C. Construction: Inner shell and outer jacket separated by at least a 1/2-inch airspace.

D. Inner Shell: ASTM A959, Type 29-4C stainless steel.

E. Outer Jacket: Stainless steel.

F. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATION

A. Listed Special Gas Vent: Condensing gas appliances.

3.03 INSTALLATION OF LISTED VENTS

A. Comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.

B. Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.

C. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.

D. Lap joints in direction of flow.

3.04 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes.

END OF SECTION

SECTION 23 52 16 - CONDENSING BOILERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured units.

B. Boiler construction.

C. Boiler trim.

D. Fuel burning system.

E. Factory installed controls.

F. Provide with condensate neutralization.

1.02 RELATED REQUIREMENTS

A. Section 23 21 14 - Hydronic Specialties.

B. Section 23 21 23 - Hydronic Pumps.

1.03 REFERENCE STANDARDS

A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); Current Edition.

B. AHRI 1500 - Performance Rating of Commercial Space Heating Boilers; 2015.

C. ANSI Z21.13 - American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers; 2022.

D. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata (2023).

F. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2023.

G. NBBI Manufacturer and Repair Directory - The National Board of Boiler and Pressure Vessel Inspectors (NBBI); Current Edition.

H. NFPA 54 - National Fuel Gas Code; 2024.

I. SCAQMD 1146.1 - Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters; 1990, with Amendment (2018).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide data indicating general assembly, components, controls, safety controls, and wiring diagrams with electrical characteristics and connection requirements, and service connections.

C. Manufacturer's Installation Instructions: Indicate assembly, support details, connection requirements, and include start up instructions.

D. Manufacturer's Factory Inspection Report: Submit boiler inspection prior to shipment.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect boilers from damage by leaving factory inspection openings and shipping packaging in place until final installation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide a five year warranty to include coverage for heat exchanger.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Natural Gas, Propane, or Combination Natural Gas/Propane for Indoor Applications:
   1. Bosch Thermotechnology; _____: www.bosch-thermotechnology.us/#sle.
   2. Bradford White Corporation; _____: www.bradfordwhite.com/#sle.
   3. LAARS Heating Systems Company; _____: www.laars.com/#sle.
   4. Lochinvar LLC; _____: www.lochinvar.com/#sle.
   5. The Fulton Companies; _____: www.fulton.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MANUFACTURED UNITS

A. Factory assembled, factory fire-tested, self-contained, readily transported unit ready for automatic operation except for connection of water, fuel, electrical, and vent services.

B. Unit: Metal membrane wall, water or fire tube, condensing boiler on integral structural steel frame base with integral fuel burning system, firing controls, boiler trim, insulation, and removable jacket, suitable for indoor application.

C. Thermal Efficiency as defined by AHRI 1500: ____.

2.03 BOILER CONSTRUCTION

A. Comply with the minimum requirements of ASME BPVC-IV and ANSI Z21.13 for construction of boilers.

B. Assembly to bear the ASME "H" stamp and comply with the efficiency requirements of the latest edition of ASHRAE Std 90.1 I-P.

C. Required Directory Listings:
   1. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); current edition at www.ahrinet.org.
   2. NBBI Manufacturer and Repair Directory - The National Board of Boiler and Pressure Vessel Inspectors (NBBI); current edition at www.nationalboard.org.

D. Heat Exchanger: Construct with materials that are impervious to corrosion where subject to contact with corrosive condensables.

E. Provide adequate tappings, observation ports, removable panels, and access doors for entry, cleaning, and inspection.

F. Insulate casing with insulation material, protected and covered by heavy-gauge metal jacket.

G. Factory apply boiler base and other components, that are subject to corrosion, with durable, acrylic, powder coated, painted, or weather-proofed finish.

2.04 BOILER TRIM

A. ASME rated pressure relief valve.

B. Flow switch.

C. Electronic Low Water Cut-off: Complete with test light and manual reset button to automatically prevent firing operation whenever boiler water falls below safe level.

D. Temperature and pressure gauge.

E. Pressure Switches:
   1. High gas pressure.

2. Low gas pressure.
3. Air pressure.

F. Manual reset high limit.

G. Boiler Pump (where required by boiler design):
1. Primary pump, factory supplied and sized for field installation to ensure minimum, continuous circulation through boiler.
2. Where pump is not provided by boiler manufacturer, provide pump in accordance with boiler manufacturer's recommendations.
3. Pump time delay.

2.05 FUEL BURNING SYSTEM

A. Provide forced draft automatic burner or pulse combustion, integral to boiler, designed to burn natural gas, and maintain fuel-air ratios automatically.
1. Blower Design: Statically and dynamically balanced to supply combustion air; direct connected to motor.
2. Forced Draft Design: Mixes combustion air and gas to achieve 90 percent combustion efficiency.
3. Pulse Combustion Design: Self-aspirating, not requiring blower for combustion.
4. Combustion Air Filter: Protects fuel burning system from debris.

B. Gas Train: Plug valve, safety gas valve, gas-air ratio control valve, and pressure regulator controls air and gas mixture.

C. Emission of Oxides of Nitrogen Requirements: Comply with SCAQMD 1146.1 for natural gas fired system, as applicable.

D. Intakes: Combustion air intake capable of accepting free mechanical room air or direct outside air through a sealed intake pipe.

2.06 FACTORY INSTALLED CONTROLS

A. Option for internal or external (0-10) VDC control.

B. Temperature Controls:
1. Automatic reset type to control fuel burning system on-off and firing rate to maintain temperature. Reset controlled by boiler, boiler manufacturer to provide outdoor sensor.
2. Manual reset type to control fuel burning system to prevent boiler water temperature from exceeding safe system water temperature.
3. Low-fire start time delay relay.

C. Electronic PI setpoint/modulation control system.

D. Microprocessor-based, fuel/air mixing controls.

E. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135, BACnet IP.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install boiler and provide connection of natural gas service in accordance with requirements of NFPA 54 and applicable codes.

C. Pipe relief valves to nearest floor drain.

D. Pipe cooled condensate produced by the combustion process from the boiler condensate connection and/or flue stack with suitable piping material to neutralizer prior to discharging into nearest floor drain.

E. Install primary boiler pump in accordance with Section 23 21 23.

F. Provide piping connection and accessories in accordance with Section 23 21 14.

3.02 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.

B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain boilers. Refer to Section 017900 "Demonstration and Training."
1. Instructor shall be factory trained and certified.
2. Provide not less than two hours of training.
3. Train personnel in operation and maintenance and to obtain maximum efficiency in plant operation.
4. Obtain Owner sign-off that training is complete.
5. Owner training shall be held at Project site.

END OF SECTION

SECTION 23 74 13 - PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged roof top unit.

B. Roof mounting curb and base.

1.02 RELATED REQUIREMENTS

A. Section 23 05 48 - Vibration and Seismic Controls for HVAC.

B. Section 23 40 00 - HVAC Air Cleaning Devices.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2015, with Addendum (2016).

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

C. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

D. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

E. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.

F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements for additional provisions.
   2. Extra Filters: One set for each unit.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide a five year warranty to include coverage for refrigeration compressors.

C. Workmanship warranty period: One year from date of substantial completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carrier Global Corporation; _____: www.carrier.com/#sle.

B. Trane Technologies, PLC; _____: www.trane.com/#sle.

C. York, a brand of Johnson Controls International, PLC; _____: www.york.com/#sle.

D. Valent.

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MANUFACTURED UNITS

A. General: Roof mounted units having gas burner and electric refrigeration.

B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, heat exchanger and burner, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

C. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

D. Disconnect Switch: Factory mount disconnect switch in control panel.

2.03 FABRICATION

A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver operated flush cam type fasteners. Structural members shall be minimum 18 gauge, 0.0478 inch (1.21 mm), with access doors or panels of minimum 20 gauge, 0.0359 inch (0.91 mm).

B. Insulation: 2 inch (50 mm) thick neoprene coated glass fiber with edges protected from erosion.

C. Heat Exchangers: Aluminized steel, of welded construction.

D. Supply Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch pulley, and rubber isolated hinge mounted high efficiency motor or direct drive; see Section 23 05 48. Isolate complete fan assembly.

E. Air Filters:
   1. 2 inch (50 mm) thick glass fiber disposable media in metal frames.

F. Roof Mounting Curb: 14 inches (350 mm) high galvanized steel, channel frame with gaskets, nailer strips.

G. Vibration Isolation Curb: _____.

2.04 BURNER

A. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot.

B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after airflow proven and slight delay, allow gas valve to open.

C. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet temperature and energize burner when temperature drops to lower safe value.

D. Supply Fan Control: Temperature sensor sensing bonnet temperatures and independent of burner controls, with provisions for continuous fan operation.

2.05 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

B. Provide capillary tubes or thermostatic expansion valves for units of 6 Tons of refrigeration (21 kw) capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 Tons of refrigeration (26 kW) cooling capacity and larger.

2.06 COMPRESSOR

A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

2.07 CONDENSER COIL

A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.

B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that proper power supply is available.

C. Examine curbs and equipment supports for suitable conditions where units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 90A.

C. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

D. Install sensors furnished by manufacturer for field installation. Install control wiring and make final connections to control devices and unit control panel.

E. Install separate devices furnished by manufacturer and not factory installed.

F. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

3.03 SYSTEM STARTUP

A. Prepare and start equipment. Adjust for proper operation.

B. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Inspect units for visible damage to refrigerant compressor, condenser and evaporator coils, and fans.
   3. Start refrigeration system when outdoor-air temperature is within normal operating limits and measure and record the following:
      a. Cooling coil leaving-air, dry- and wet-bulb temperatures.
      b. Cooling coil entering-air, dry- and wet-bulb temperatures.
      c. Condenser coil entering-air dry-bulb temperature.
      d. Condenser coil leaving-air dry-bulb temperature.
   4. Simulate maximum cooling demand and inspect the following:
      a. Compressor refrigerant suction and hot-gas pressures.
      b. Short-circuiting of air through outside coil or from outside coil to outdoor-air intake.
   5. Inspect casing insulation for integrity, moisture content, and adhesion.
   6. Verify that clearances have been provided for servicing.
   7. Verify that controls are connected and operable.
   8. Verify that filters are installed.
   9. Clean coils and inspect for construction debris.
   10. Inspect and adjust vibration isolators and seismic restraints.
   11. Verify bearing lubrication.

12. Clean fans and inspect fan-wheel rotation for movement in correct direction without vibration and binding.
13. Start unit.
14. Inspect and record performance of interlocks and protective devices including response to smoke detectors by fan controls and fire alarm.
15. Operate unit for run-in period.
16. Calibrate controls.
17. Adjust and inspect high-temperature limits.
18. Inspect outdoor-air dampers for proper stroke.
19. Verify operational sequence of controls.
20. Measure and record the following airflows. Plot fan volumes on fan curve.
    a. Supply-air volume.
    b. Return-air flow.
    c. Outdoor-air flow.

C. After startup, change filters and verify bearing lubrication.

D. Remove and replace components that do not properly operate and repeat startup procedures as specified above.

E. Prepare written report of the results of startup services.

F. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain boilers. Refer to Section 017900 "Demonstration and Training."
1. Instructor shall be factory trained and certified.
2. Provide not less than two hours of training.
3. Train personnel in operation and maintenance and to obtain maximum efficiency in plant operation.
4. Obtain Owner sign-off that training is complete.
5. Owner training to be held at Project site.

END OF SECTION

SECTION 23 81 26.13 - SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air-source heat pumps.

B. Indoor air handling (fan and coil) units for ductless systems.

1.02 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping: Includes indoor coil condensate drain.

B. Section 22 30 00 - Plumbing Equipment: Cooling condensate removal pumps.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Errata (2023).

D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.

E. NEMA MG 1 - Motors and Generators; 2021.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

H. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.Verify available warranties and warranty periods for units and components with manufacturers listed in Part 2.

B. Warranty Period:
   1. For Compressor: Ten years from date of Substantial Completion.
   2. For Parts: Ten years from date of Substantial Completion.
   3. For Labor: One year from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carrier Corporation; _____: www.carrier.com/#sle.

B. Rheem Manufacturing Company Inc; _____: www.rheem.com/#sle.

C. Trane Technologies, PLC; _____: www.trane.com/#sle.

D. York International Corporation / Johnson Controls; _____: www.york.com/#sle.

E. LG.

F. Mitsubishi.

G. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator.
   2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

2.03 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
   1. Location: High-wall.

B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
   2. Manufacturer: System manufacturer.

2.04 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
   1. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.
   2. Refrigerant: R-410A.
   3. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.

B. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

C. Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
   1. Provide thermostatic expansion valves.

D. Operating Controls:
   1. Control by room thermostat to maintain room temperature setting.
   2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig (1965 kPa) and off when pressure drops below 140 psig (965 kPa) for operation to 0 degrees F (-18 degrees C).

2.05 ACCESSORY EQUIPMENT

A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
   1. Automatic switching from heating to cooling.
   2. Preferential rate control to minimize overshoot and deviation from setpoint.
   3. Short cycle protection.
   4. Thermostat Display:
      a. Actual room temperature.

b. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Install refrigeration systems in accordance with ASHRAE Std 15.

D. Pipe drain from cooling coils to nearest floor drain.

E. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

F. Tests and Inspections:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

G. Remove and replace malfunctioning units and retest as specified above.

H. Prepare test and inspection reports.

I. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain boilers. Refer to Section 017900 "Demonstration and Training."
   1. Instructor shall be factory trained and certified.
   2. Provide not less than two hours of training.
   3. Train personnel in operation and maintenance and to obtain maximum efficiency in plant operation.
   4. Obtain Owner sign-off that training is complete.
   5. Owner training shall be held at Project site.

END OF SECTION

SECTION 23 83 00 - RADIANT HEATING AND COOLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Radiant heating hydronic piping.

1.02 RELATED REQUIREMENTS

A. Section 08 31 00 - Access Doors and Panels.

B. Section 23 07 16 - HVAC Equipment Insulation.

C. Section 23 07 19 - HVAC Piping Insulation.

D. Section 23 21 13 - Hydronic Piping.

E. Section 23 21 14 - Hydronic Specialties.

1.03 REFERENCE STANDARDS

A. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2024.

B. ASTM F1807 - Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring, or Alternate Stainless Steel Clamps, for SDR9 Cross-Linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing; 2023.

C. DIN 4726 - Warm Water Surface Heating Systems and Radiator Connecting Systems - Plastics Piping Systems and Multilayer Piping Systems; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for radiant tubing and manifolds.

C. Manufacturer's Installation Instructions: Indicate installation instructions and recommendations.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions of equipment and controls, installation instructions, maintenance and repair data, and parts listings.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide 5 year manufacturer's warranty for complete system.

PART 2 PRODUCTS

2.01 RADIANT-HEATING HYDRONIC PIPING

A. Applications:
   1. Provide the following types of hydronic, radiant heating piping for the applications described:
      a. Piping in Interior Reinforced Concrete Floors: PEX.
      b. Piping in Subfloors: PEX.

B. Crosslinked Polyethylene (PEX) Pipe and Fittings:
   1. Manufacturers:
      a. Heat Innovations Inc; _____: www.heatinnovations.com/#sle.
      b. IPEX Inc; _____: www.ipexamerica.com/#sle.
      c. Oventrop Corporation; _____: www.oventrop-us.com/#sle.
      d. Uponor, Inc; _____: www.uponor.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Pipe Material: PEX plastic according to ASTM F876.
3. Oxygen Barrier: Limit oxygen diffusion through the tube to maximum 0.000044 grains per cu ft/day (0.10 mg per cu m/day) at 104 degrees F (40 degrees C) according to DIN 4726.
4. Fittings: ASTM F1807, metal insert and copper crimp rings.
5. Pressure/Temperature Rating: Minimum 100 psig (690 kPa) and 180 degrees F (82 degrees C).

C. Distribution Manifolds (Manufacturer's Standard):
1. Manifold: Minimum 1 inch (25 mm), brass, copper, or stainless steel.
2. Main Shutoff Valves:
   a. Factory installed on supply and return connections.
   b. Two-piece brass or bronze body.
   c. Ball: Chrome-plated bronze.
   d. Seals: PTFE.
   e. CWP Rating: 150 psig (1035 kPa).
   f. Maximum Operating Temperature: 225 degrees F (107 degrees C).
3. Manual Air Vents:
   a. Body to consist of bronze or brass.
   b. Internal Parts: Nonferrous.
   c. Operator: Key furnished with valve or screwdriver bit.
   d. Inlet Connection: 1/2 inch (15 mm).
   e. Discharge Connection: 1/8 inch (6 mm).
   f. CWP Rating: 150 psig (1035 kPa).
   g. Maximum Operating Temperature: 225 degrees F (107 degrees C).
4. Balancing Valves:
   a. Body: Provide plastic or bronze, plug or globe cartridge type.
   b. Plug: EPDM.
   c. Globe Cartridge and Washer: Brass with EPDM composition washer.
   d. Seat: PTFE.
   e. Visual Flow Indicator: Flowmeter with visible indication in a clear plastic cap at top of valve.
   f. Differential Pressure Gauge Connections: Integral seals for portable meter to measure loss across calibrated orifice.
   g. Handle Style: Knob, with memory stop to retain set position if used for shutoff.
   h. CWP Rating: Minimum 125 psig (860 kPa).
   i. Maximum Operating Temperature: 250 degrees F (121 degrees C).
5. Zone Control Valves:
   a. Body: Provide brass or bronze, plug or globe cartridge type.
   b. Plug: EPDM.
   c. Globe Cartridge and Washer: Brass with EPDM composition washer.
   d. Seat: PTFE.
   e. Actuator: Replaceable electric motor.
   f. CWP Rating: Minimum 125 psig (860 kPa).
   g. Maximum Operating Temperature: 250 degrees F (121 degrees C).
6. Thermometers:
   a. Mounted on supply and return connections.
   b. Case: Dry type, metal or plastic, 2 inch (50 mm) diameter.
   c. Element: Bi-metallic coil.
   d. Movement: Mechanical, connecting element and pointer.
   e. Dial: Satin-faced, non-reflective aluminum with permanently etched scale markings.
   f. Pointer: Black metal.
   g. Window: Plastic.
   h. Connector: Rigid, back type.
   i. Thermal System: Bi-metallic coil.

j. Accuracy: Plus or minus 1 percent of range or 1 scale division to maximum of 1.5 percent of range.

7. Mounting Brackets: Provide copper, plastic, or rubber-clad steel, where in contact with manifold.

PART 3 EXECUTION

3.01 EXAMINATION

A. Hydronic Radiant Heating Piping:

1. Examine surfaces and substrates to receive radiant heating piping for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   a. Ensure that surfaces and pipes in contact with radiant heating piping are free of burrs and sharp protrusions.
   b. Ensure that surfaces and substrates are level and plumb.
2. Proceed with installation only after unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Clean all surfaces prior to installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Hydronic Radiant Heating Piping:

1. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
2. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
3. Install piping as indicated unless deviations to layout are approved on shop drawings or coordination drawings.
4. Install radiant heating piping continuous from the manifold through the heated panel and back to the manifold without piping joints in heated panels.
5. Connect radiant piping to manifold in a reverse-return arrangement.
6. Do not bend pipes in radius smaller than manufacturer's minimum bend radius dimension.
7. Piping in Interior Reinforced Concrete Floors:
   a. Secure piping in concrete floors by attaching pipes to reinforcement using cable ties.
   b. Space cable ties a maximum of 12 inches (_____ mm) and at center of turns or bends.
   c. Maintain 2 inch (50 mm) minimum cover.
   d. Install a sleeve of 3/8 inch (9.5 mm) thick, foam type insulation or PE pipe around tubing and extending for a minimum of 10 inches (250 mm) on each side of slab joints to protect the tubing passing through expansion or control joints.
   e. Maintain minimum 40 psig (275 kPa) pressure in piping during concrete placement and continue for 24 hours after placement.
   f. All tubing rising vertically up though concrete floor slab at manifold locations shall pass through 90 degree PVC conduit elbows of the appropriate size.
8. Revise locations and elevations from those indicated as required to suit field conditions and ensure integrity of piping and as approved by Architect.
9. After system balancing has been completed, mark balancing valves to permanently indicate final position.
10. Perform the following adjustments before operating the system:
    a. Open valves to fully open position.
    b. Check operation of automatic valves.
    c. Set temperature controls so all zones call for full flow.
    d. Purge air from piping.
11. Manifold enclosures: Provide heavy gauge aluminum enclosure with a top, secured to wall.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Hydronic Radiant Heating Piping:
   1. Prepare radiant heating piping for testing as follows:
      a. Open all isolation valves and close bypass valves.
      b. Open and verify operation of zone control valves.
      c. Flush with clean water and clean strainers.
   2. Perform the following tests and inspections with the assistance of a factory authorized service representative:
   3. Execute, complete, and pass required radiant-heating piping tests and inspections to accept installed piping.
   4. Prepare test and inspection reports.
   5. Protect hydronic piping system from damage during construction.

END OF SECTION

SECTION 26 05 00 - BASIC ELECTRICAL REQUIREMENTS

GENERAL

1.01 SUMMARY

A. Section Includes:
1. The work included in this division of the specifications includes, but is not limited to, all labor, material and equipment to completely install all electrical work throughout the entire project as shown on the Contract Documents.
    a. Products Installed But Not Supplied Under This Section:
        1) This Contractor is responsible for connection of equipment supplied by other Contractors as indicated in the Contract Documents.
            (a) This Contractor is responsible for connection of equipment supplied by Owner as indicated in the Contract Documents.
        2) Related Sections:
            (a) General Requirements specifically applicable to Division 26, in addition to Division 00 and Division 01 provisions.
                (1) Division 01 - Submittals.
            (b) Division 01 - Temporary Electricity.
                (1) Division 01 - Temporary Lighting.
            (c) Division 01 - Contract Closeout.
                (1) Section 03 30 00 - Concrete.
                (2) Section 06 10 00 - Rough Carpentry.
                (3) Section 06 20 00 - Finish Carpentry.
                (4) Section 07 84 00 - Fire Stopping.
                (5) Section 07 90 00 - Joint Sealants.
                (6) Section 08 71 00- Door Hardware.
                (7) Section 09 91 00 - Painting.
                (8) Section 31 20 00 - Earthwork.
2. References
    a. ANSI/ASHRAE 90/7-2007 with Indiana Amendments - 675 IAC 19-4-1 2010 Indiana Energy Conservation Code.
    b. ANSI/NECA 1-2006 - Good Workmanship in Electrical Contracting.
    c. ETL- Intertek Laboratory (NRTL).
    d. IEEE C2 - National Electrical Safety Code.
    e. NFPA 70, 2008 Edition (NEC) with State of Indiana Amendments.
    f. NRTL- Nationally Recognized Testing Laboratory recognized by OSHA.
        1) UL - Underwriters Laboratories, Inc. (NRTL).
3. General
    a. The provisions of Division 00 and Division 01 apply to work in this Section, and are part of these specifications.
    b. The work included in this division of the specifications includes, but is not limited to, all labor, material and equipment to install completely all electrical work throughout the entire project as shown on the Contract Documents.
4. Drawings Use And Interpretation
    a. Drawings are diagrammatic and indicate general arrangement of systems and equipment, except when specifically dimensioned or detailed.
    b. For exact locations of building elements, refer to dimensioned Architectural and Structural Drawings.
    c. Field verify locations and arrangement of existing systems and equipment. Field verify all existing conditions and clearances prior to the bid date and modify work as required.
5. Permits And Inspection
    a. Provide necessary permits, licenses, and inspections that are required for proper execution and completion of the work.
6. Drawings

a. Maintain a set of architectural, structural, mechanical, and electrical drawings on the job site at all times. Before installing work, determine that it does not interfere with clearances required for beams, foundations, finished columns, pilasters, partitions, walls, electrical outlets, piping, fixtures, ductwork, etc., as shown on Drawings and details. If work is installed so that interferences develop which have not been called to the Architect/Engineer's attention before bids, make required changes in the work at no additional cost to the Owner.
b. The Drawings are intended to show the size and location of the material and equipment. It may be necessary to make changes in order to pass immovable obstructions. Make such changes as directed, without extra charge to the Owner.

7. Project Record Drawings
   a. At the start of the project, request a set of Drawings from the Architect /Engineer.
   b. Revise these drawings as the job progresses to incorporate changes from the original Drawings.
   c. Dimensionally locate all underground utilities.
   d. All of the Project Record Drawings shall be clear, neat, and legible.
   e. Upon completion of the job, and before final payment is made, submit the Project Record Drawings in digital pdf and two (2) hard copy prints, with labels stating they are "Project Record Drawings", date same.
   f. These Project Record Drawings shall be of the same scale and sheet size as the Contract Drawings.
8. Quality Assurance
   a. Install work using procedures defined in NECA Standards of Installation.
9. Delivery, Storage and Handling
   a. Deliver, store, protect, and handle products to site under provisions of Division O l .
   b. Accept equipment. Inspect for damage.
   c. Protect all materials from damage. Store all materials indoors at all times, unless other storage arrangements are approved by the Architect Construction Manager.
   d. Keep materials stored in such manner so as not to interfere with the process of the work of other Contractors or with the operation of existing facilities.
10. Regulatory Requirements
    a. Perform all work to conform to or exceed the minimum requirements of the current edition of NFPA 70 (National Electrical Code), with State of Indiana amendments, IEEE C2, and all federal, state, local and municipal codes and ordinances. Comply with the directions of all properly appointed authorities having jurisdiction.
    b. Installations indicated in the Contract Documents that exceed the minimum requirements of NFPA 70 (National Electrical Code) or other regulations shall be installed as indicated.
    c. Furnish products listed and classified by Underwriters Laboratories, Inc. (UL) as suitable for the purposes indicated.
11. Project Conditions
    a. Measurement Procedures:
       1) Unless specific measurements are indicated in the Contract Documents, this Contractor is responsible for field verifying and coordinating all locations, placements and adequate clearances for materials and equipment installed under work of this Contract.
          (a) 2. Where specific measurements, offsets, etc. are indicated, Contractor shall field verify and coordinate these with existing conditions, work of other Contractors and construction.
12. Sequencing and Scheduling
    a. Sequence and schedule work in accordance with Division 01 and Section 26 05 00.
    b. Coordinate the work specified in Division 26 under the provisions of Division 01.
    c. Before installing any work, check the drawings for exact dimensions and see that the electrical work does not interfere with clearance required for beams, foundations, finished columns, pilasters, partitions, piping, ductwork, etc. After work is installed and

it develops that interferences occur, which have not been called to the Architect's Construction Manager's attention before the installation, make such changes to the electrical work, at the expense of this Contractor, as requested by the Architect Construction Manager.

d. The location and arrangement of the various parts of the installation are indicated on the Contract Documents. Install all parts as approximately shown. Make all changes necessary to pass immovable obstructions without additional cost to the Owner. However, do not decrease sizes or quantities, or make radical changes in any part of the installation without the written consent of the Architect Construction Manager.

e. Prior to installation, issue a print to the other Contractors of the project showing exact location of light fixtures, outlets and supporting devices.

f. Check the exact location of switches, outlets, panels, cabinets, etc. Where said equipment may become inaccessible if installed where indicated, relocate said equipment as requested by the Architect Construction Manager, at no additional cost to the Owner.

1) For equipment requiring connections by other contractors, provide Architect approved submittals to the appropriate Contractors. Approval submittals are to depict the required connections.

B. Products

C. Manufacturers

1. Substitution of Equal Products:

a. No substitutions will be considered, except in accordance with the following:

1) Contractor shall submit, in writing, request for approval of equal products a minimum of ten (10) working days prior to Bid, or as otherwise indicated under Division 01.

2) Request shall include:

(a) Product for which substitution is being requested.

(1) Manufacturer's product data sheets.

(2) Fabrication and detail drawings.

(3) Other supporting material substantiating equality of proposed product.

(4) Impact of proposed product on construction time and other Contractors.

(5) Architect shall be the sole judge of acceptability of equality of proposed product, and Architect's decision shall be final.

D. Existing Products

1. Where existing products are to remain and be reused, expanded or otherwise modified, ensure that new materials are compatible with existing. Systems shall be tested to assure for complete operating systems.

E. Materials

1. Materials and products listed in the Contract Documents establish the standard of quality required.

2. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purposes specified and shown.

3. All materials shall be new, complete with manufacturer's guarantee or warranty and shall be approved by NRTL if a standard has been established by recognized government agency for the type of material.

4. All materials of the same type or class shall be the product of one manufacturer. For example, all panelboards shall be from the same manufacturer, all lighting switches from the same manufacturer, etc.

a. Materials shall also comply with all applicable standards of the National Electrical Manufacturer's Association, Insulated Power Cable Engineers Association, National Electrical Safety Code, Institute of Electrical and Electronics Engineers, Edison Electrical Institute, American Insurance Association, National Board of Fire Underwriters, National Fire Protection Association, National Safety Council, National

Bureau of Standards, the National Electrical Code and the Williams-Steiger Occupational Safety and Health Act of 1970. Such standards are hereby made a part of these specifications.

F. Execution

G. Installers
   1. Work shall be performed by individuals skilled in work of specific trade involved.
   2. This Contractor's responsibility shall not end with the installation and/or connection of the various apparatus. Provide electricians to properly adjust the various electrical devices, make the required tests, etc., until such time as the entire electrical installation functions properly in every detail.

H. Examination
   1. Contractor shall verify existing and site conditions prior to commencing any work.
      a. Contractor shall immediately bring to the attention of the Architect Construction Manager any discrepancies found between the Contract Documents and site conditions.
         1) Work indicated in the Contract Documents is to provide intent of work required.
            (a) Unless specifically dimensioned, or otherwise noted, equipment locations and connection points are approximate and are to be verified by Contractor as part of work of the Contract.
               (1) Contractor shall be responsible for verifying all dimensions and installation requirements for materials and equipment to be provided.

I. Preparation
   1. Contractor is responsible for protection of existing and new construction during work under his Contract.

J. Installation
   1. Perform all work in accordance with industry standards of practice and workmanship as described in ANSI/NECA I-2006 - Good Workmanship in Electrical Contracting.
   2. All work shall present a neat mechanical appearance when completed.
   3. All methods and techniques of installation shall be subject to the approval of the Architect Construction Manager.
   4. No energized conductors shall be exposed at any time except when the immediate area is under the direct supervision of a qualified electrician.
      a. Only UL approved tools shall be used at the project.
      b. Expedite the work of installing the new main electrical services and other electrical work necessary so that the heating system may be operated when required, as requested by the Architect Construction Manager.
         1) Temporary Utilities:
            (a) Provide temporary electricity and lighting under provisions of Division 01.
      c. Interruption Of Service:
         1) Make all changes in services or service shutdowns to provide a minimum of interference with operation of services in the building.
            (a) When changes require shut-down of building services, notify the Owner not less than twenty-four (24) hours in advance and obtain approval from the Owner proper building authorities and Architect Construction Manager before making changes. Give duration and nature of shutdown.
               (1) Obtain approval from the Owner proper building authorities and Architect Construction Manager for all temporary arrangements.
               (2) Contractor shall coordinate; all electric and utilities switch-over shall be performed after hours, on weekends, or holidays and coordinated with Owner so activities are not interrupted in any way. See Section O11400.
      d. Accessibility:
         1) Locate all equipment that must be serviced, operated or maintained in fully accessible positions. Minor deviations from the Drawings may be made to allow

for better accessibility, but changes of magnitude or which involve extra cost shall not be made without the approval of the Architect Construction Manager.

(a) Allow ample space for removal of all parts that may require replacement or service in the future.

2) All equipment labeling and system programming shall utilize and display the Owner's room numbers. Do not use the Architect's room numbers.

K. Construction

1. Paint all surface mounted or otherwise exposed conduit, raceways, surface raceways, boxes, electrical equipment and electrical supporting devices and hardware occurring in finished areas and/or on finished surfaces to match the surfaces on which they are installed. This shall include both interior and exterior locations. All painting shall be performed in accordance with the provisions of Section 09 91 00.
2. Excavation And Backfill:
   a. Provide all excavation and backfill necessary in the construction of this particular part of the work as included in these specifications. Provide all sheeting and bracing using proper materials which may, in the opinion of the Architect, Owner's representative, be necessary for the protection of foundations and walls of the building.
   b. Remove all surplus earth from the premises or disposed of on the premises as requested by the Owner's Representative.
   c. Backfill and compact all trenches in layers not exceeding 12 inches thick. Provide approved fill material. All testing to be the responsibility of the Contractor.
   d. All backfill installed by this Contractor below floor slabs and below paved areas shall be as specified in Section 31 20 00.
   e. At his option, this Contractor may install conduit, etc., in advance of earth fills by the General Contractor. Install such conduit with backfill material adjacent to the conduit and with the compaction requirements as specified under Section 31 20 00.
   f. Coordinate installation pads in sequence as requested by the Architect Construction Manager .

L. Cutting/Repair/Restoration

1. The General Contractor is responsible for all cutting indicated on the Architectural Drawings related to installation or removal of work of the Mechanical and Electrical Trades. All required cutting may not be shown. Any additional cutting and patching required, which is not indicated on the Architectural Drawings, is the responsibility of the trade requiring the access, as provided for in the specifications.
2. Properly patch and repair cuts made into or penetration made through fire rated walls, floors, and ceilings to maintain their proper fire rating. Penetrations of fire barriers are to be sealed under Section 07 84 00.
3. Roof openings required by this Contractor that are not shown on the architectural or structural drawings shall be cut and, if necessary, reinforced under referenced roofing Sections pertaining to roof involved and paid for by this Contractor.
4. All undue or untimely damage or mutilation of masonry, plaster and other finished surfaces around conduit, equipment, etc., done by this Contractor shall be repaired by the proper Contractor and paid for by this Contractor.
5. This Contractor shall be responsible for damage to or mutilation of the work of the other Contractors or to the building and its contents caused by materials and equipment installed by him.
   a. The finish of any item that has been marred, scratched or damaged in any way by this Contractor shall be repaired and repainted at the expense of this Contractor, and to the satisfaction of the Architect Construction Manager.
      1) Contractor is responsible for all repairs of existing and new construction caused by work of this Contract.
   b. Contractor is responsible for repair of any and all of the materials installed under this Contract that are faulty or damaged.
   c. All finish painting shall be done under Section 09 91 00.

M. Re-Installation
   1. Contractor shall re-install any and all work performed under this Contract which does not meet the requirements of the Contract Documents.
      a. Such re-installation shall be done at the Contractor's expense.
      b. Such work shall be done on a schedule submitted to and approved by the Architect Construction Manager.

N. Field Quality Control
   1. Contractor is responsible for site inspections, adjustments, starting and documentation of materials and equipment as indicated in the Contract Documents.
   2. Where specifically indicated, Contractor shall arrange, and pay for, the Manufacturer's Field Services to start-up, inspect, or otherwise verify installation and operation of specific equipment.

O. Adjusting
   1. Contractor is responsible for adjusting equipment provided under work to meet specified requirements of the Contract Documents, manufacturer's requirements and recommendations and industry standard recommendations.

P. Cleaning
   1. Contractor is responsible for clean-up as indicated under requirements of Division 01.

Q. Demonstration
   1. Contractor is responsible for coordinating demonstrations and training sessions.
   2. Sessions shall be of the type and minimum length as indicated under specific sections.
   3. Demonstration and training sessions shall be scheduled at the Owner's convenience and coordinated with the Architect Construction Manager.
   4. Demonstration and training sessions shall occur at time of first beneficial use of such equipment and systems, unless specifically requested otherwise by Architect/Construction Manager. Provide instruction sign-in sheet with date, instructor, syllabus of instruction and Owner signature with close out documents.

R. Protection
   1. Contractor is responsible for protection of existing and new construction during work under his Contract.

END OF SECTION

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Wiring connectors.

C. Electrical tape.

D. Wire pulling lubricant.

E. Cable ties.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.03 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide new conductors and cables manufactured not more than one year prior to installation.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

E. Comply with NEMA WC 70.

F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

H. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.

I. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.
   a. Exceptions:
      1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.

2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
2. Control Circuits: 14 AWG.

J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

K. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
3. Color Code:
a. 480Y/277 V, 3 Phase, 4 Wire System:
1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.
4) Neutral/Grounded: Gray.
b. 208Y/120 V, 3 Phase, 4 Wire System:
1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.
4) Neutral/Grounded: White.
c. 240/120 V High-Leg Delta, 3 Phase, 4 Wire System:
1) Phase A: Black.
2) Phase B (High-Leg): Orange.
3) Phase C: Blue.
4) Neutral/Grounded: White.
d. 240/120 V, 1 Phase, 3 Wire System:
1) Phase A: Black.
2) Phase B: Red.
3) Neutral/Grounded: White.
e. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
1. Copper Building Wire:
a. Cerro Wire LLC: www.cerrowire.com/#sle.
b. Encore Wire Corporation: www.encorewire.com/#sle.
c. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.
d. Service Wire Co: www.servicewire.com/#sle.
e. Southwire Company: www.southwire.com/#sle.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
1. Feeders and Branch Circuits:
a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.
2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, FOR SIZE 6 AWG AND SMALLER.
a. Size 4 AWG and Larger: Type XHHW-2.
b. Installed Underground: Type XHHW-2.
c. type THHN/THWN in raceway; branch circuits type THHN/THWN in raceway; fire alarm circuits power-limited, fire protective, signaling circuit cable; fire alarm circuits

type THHN/THWN in raceway; class 1/2 control circuits type THNN/THWN in raceway.

2.04 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors or push-in wire connectors.
   2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

C. Wiring Connectors for Terminations:
   1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
   2. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
   3. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

D. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. Ideal Industries, Inc: www.idealindustries.com/#sle.
      c. NSI Industries LLC: www.nsiindustries.com/#sle.

E. Push-in Wire Connectors: Rated 600 V, 221 degrees F (105 degrees C).
   1. Manufacturers:
      a. Ideal Industries, Inc: www.idealindustries.com/#sle.
      b. NSI Industries LLC: www.nsiindustries.com/#sle.
      c. Wago Corporation: www.wago.us/#sle.

F. Mechanical Connectors: Provide bolted type or set-screw type.
   1. Manufacturers:
      a. Burndy LLC; _____: www.burndy.com/#sle.
      b. nVent ILSCO: www.ilsco.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.

G. Compression Connectors: Provide circumferential type or hex type crimp configuration.
   1. Manufacturers:
      a. Burndy LLC; _____: www.burndy.com/#sle.
      b. nVent ILSCO: www.ilsco.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.

2.05 ACCESSORIES

A. Electrical Tape:
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
   2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
   3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and

sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

B. Wire Pulling Lubricant:
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. American Polywater Corporation: www.polywater.com/#sle.
      c. Ideal Industries, Inc: www.idealindustries.com/#sle.
   2. Listed and labeled as complying with UL 267.
   3. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
   4. Suitable for use at installation temperature.

C. Cable Ties: Material and tensile strength rating suitable for application.
   1. Manufacturers:
      a. Burndy LLC; _____: www.burndy.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated without specific routing, determine exact routing required.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
   5. Use pulling means, including fish tape, cable, rope and basket weave wire/cable grips, taht will not damage cables or raceway.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
   1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

G. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

H. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

I. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

J. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
   5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

K. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

L. Insulate ends of spare conductors using vinyl insulating electrical tape.

M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

N. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

O. Install exposed cables, parallel and perpendicular to surfaces of exposed strucutral members and follow surface contours where possible. Support cables according to Division 26 Section 260500. Seal around cables penetrating fire-rated elements according to "Firestopping." Identify wire and cables according to Division 26 Section 260500.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground rod electrodes.

E. Ground enhancement material.

F. Ground access wells.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.03 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
   3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

F. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Ground Rod Electrode(s):

a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
c. Where location is not indicated, locate electrode(s) at least 5 feet (1.5 m) outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
d. Provide ground enhancement material around electrode where indicated.
e. Provide ground access well for first connected electrode.

3. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
1. Use insulated copper conductors unless otherwise indicated.
a. Exceptions:
1) Use bare copper conductors where installed underground in direct contact with earth.
2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
a. Exceptions:
1) Use mechanical connectors for connections to electrodes at ground access wells.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
a. Exceptions:
1) Use exothermic welded connections for connections to metal building frame.
4. Manufacturers - Mechanical and Compression Connectors:
a. allG Fabrication; _____: www.allgfab.com/#sle.
b. Burndy LLC; _____: www.burndy.com/#sle.
c. Harger Lightning & Grounding; _____: www.harger.com/#sle.
d. nVent ERICO; _____: www.nvent.com/#sle.
e. Thomas & Betts Corporation; _____: www.tnb.com/#sle.
5. Manufacturers - Exothermic Welded Connections:
a. Burndy LLC; _____: www.burndy.com/#sle.
b. nVent ERICO; Cadweld: www.nvent.com/#sle.
c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC; _____: www.thermoweld.com/#sle.

D. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.
4. Manufacturers:
a. allG Fabrication; _____: www.allgfab.com/#sle.
b. Galvan Industries, Inc; _____: www.galvanelectrical.com/#sle.
c. Harger Lightning & Grounding; _____: www.harger.com/#sle.

d. nVent ERICO; _____: www.nvent.com/#sle.

E. Ground Enhancement Material:
1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.

F. Ground Access Wells:
1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches (250 mm).
4. Cover: Factory-identified by permanent means with word "GROUND".
5. Manufacturers:
a. allG Fabrication; _____: www.allgfab.com/#sle.
b. Harger Lightning & Grounding; _____: www.harger.com/#sle.
c. nVent ERICO; _____: www.nvent.com/#sle.
d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC; _____: www.thermoweld.com/#sle.
6. Miscellanous conductors:
a. Grounding bus: bare, annealed copper bars of rectangular cross section
b. Braided bonding jumpers: copper tape, braided # 30 AWG bare copper wire, terminated with copper ferrules
c. Bonding straps: soft copper, 0.05 inch thick and 2 inches wide, except as indicated

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.
2. Indoor Installations: Unless otherwise indicated, install with 4 inches (100 mm) of top of rod exposed.

D. Make grounding and bonding connections using specified connectors.
1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. Coordinate and schedule ground resistance testing with Owner's Representative. Provide alll test reports to Owner's Representative immediately after testing.

END OF SECTION

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
   2. Coordinate work to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
   4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 30 00.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. NFPA 70.
      b. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
      c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
   1. Manufacturers:
      a. ABB: www.electrification.us.abb.com/#sle.
      b. Eaton Corporation: www.eaton.com/#sle.
      c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
e. nVent; Caddy: www.nvent.com/#sle.

2. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
3. Conduit Clamps: Bolted type unless otherwise indicated.
4. Products:
   a. Gripple, Inc; Universal Bracket: www.gripple.com/#sle.
   b. Gripple, Inc; Fast Trak: www.gripple.com/#sle.
   c. Gripple, Inc; Universal Clamp (Threaded): www.gripple.com/#sle.
   d. Gripple, Inc; Low Profile Bracket Kits: www.gripple.com/#sle.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
1. Manufacturers:
   a. ABB: www.electrification.us.abb.com/#sle.
   b. Eaton Corporation: www.eaton.com/#sle.
   c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
   d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
   e. nVent; Caddy: www.nvent.com/#sle.
   f. _____.

D. Metal Channel/Strut Framing Systems:
1. Manufacturers:
   a. ABB: www.electrification.us.abb.com/#sle.
   b. Atkore International Inc; Unistrut: www.unistrut.us/#sle.
2. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
3. Comply with MFMA-4.
4. Channel Material:
   a. Indoor Dry Locations: Use zinc-plated steel.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
   a. Equipment Supports: 1/2-inch (13 mm) diameter.
   b. Busway Supports: 1/2-inch (13 mm) diameter.
   c. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch (6 mm) diameter.
   d. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch (10 mm) diameter.
   e. Trapeze Support for Multiple Conduits: 3/8-inch (10 mm) diameter.
   f. Outlet Boxes: 1/4-inch (6 mm) diameter.
   g. Luminaires: 1/4-inch (6 mm) diameter.

F. Anchors and Fasteners:
1. Manufacturers - Mechanical Anchors:
   a. Dewalt: anchors.dewalt.com/#sle.
   b. Hilti, Inc: www.hilti.com/#sle.
   c. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.
   d. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.
2. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
   2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners in accordance with manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION

SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Stainless steel rigid metal conduit (RMC).

C. Aluminum rigid metal conduit (RMC).

D. Flexible metal conduit (FMC).

E. Liquidtight flexible metal conduit (LFMC).

F. Aluminum electrical metallic tubing (EMT).

G. Rigid polyvinyl chloride (PVC) conduit.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

D. Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Section 26 05 33.16 - Boxes for Electrical Systems.

F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

G. Section 27 05 33.13 - Conduit for Communications Systems.

H. Section 31 23 16 - Excavation.

I. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

J. Section 31 23 23 - Fill: Bedding and backfilling.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

C. Warranty
   1. Provide manufacturer's standard warranty.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC) or rigid PVC conduit.
2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC) or rigid PVC conduit.
3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit (RMC) or rigid PVC conduit.
4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) where emerging from underground.
5. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows for bends.

D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC).

E. Concealed Within Hollow Stud Walls: Use aluminum electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use aluminum electrical metallic tubing (EMT).

G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC).

H. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC).
1. Locations subject to physical damage include, but are not limited to:
a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.
b. Where exposed below 20 feet (6.1 m) in warehouse areas.

I. Corrosive Locations Above Ground: Use stainless steel rigid metal conduit (RMC).

J. Hazardous/Classified Locations: Use galvanized steel rigid metal conduit (RMC).

K. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
1. Maximum Length: 6 ft for light fixtures and 2 ft for mechanical equipment.

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Provide conduit, fittings, supports, and accessories required for complete raceway system.

C. Provide products listed, classified, and labeled as suitable for purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:
1. Branch Circuits: 3/4-inch (21 mm) trade size.
2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
3. Control Circuits: 3/4-inch (21 mm) trade size.
4. Flexible Connections to Luminaires: 3/4-inch (_____ mm) trade size.
5. Underground, Interior: 3/4-inch (21 mm) trade size.
6. Underground, Exterior: 1-inch (27 mm) trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
2. Nucor Tubular Products: www.nucortubular.com/#sle.
3. Rymco USA: www.rymcousa.com/#sle.
4. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
5. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
1. Manufacturers:

a. ABB; T&B: www.electrification.us.abb.com/#sle.
b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
c. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use steel or malleable iron.
   a. Where not subject to severe corrosive influence, stainless steel or aluminum fittings may be used.
   b. Do not use die cast zinc fittings.
5. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
1. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
2. Gibson Stainless & Specialty Inc: www.gibsonstainless.com/#sle.
3. Patriot Industries, a division of Patriot Aluminum Products LLC: www.patriotsas.com/#sle.
4. Rymco USA: www.rymcousa.com/#sle.

B. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.

C. Fittings:
1. Manufacturers:
   a. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
   b. Eaton: www.eaton.com/#sle.
   c. Gibson Stainless & Specialty Inc: www.gibsonstainless.com/#sle.
   d. Patriot Industries, a division of Patriot Aluminum Products LLC: www.patriotsas.com/#sle.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use stainless steel with corrosion resistance equivalent to conduit.
5. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.

B. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

C. Fittings:
1. Manufacturers:
   a. ABB; T&B: www.electrification.us.abb.com/#sle.
   b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
   c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
   1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.
   2. Electri-Flex Company: www.electriflex.com/#sle.
   3. International Metal Hose: www.metalhose.com/#sle.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:
   1. Manufacturers:
      a. ABB; T&B: www.electrification.us.abb.com/#sle.
      b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
      c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel, malleable iron, or aluminum.
      a. Do not use die cast zinc fittings.

2.07 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
   1. American Conduit, a division of Hydro: www.americanconduit.com/#sle.

B. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.

C. Fittings:
   1. Manufacturers:
      a. Arlington Industries: www.aifittings.com/#sle.
      b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
   3. Material: Use aluminum.
   4. Connectors and Couplings: Use compression/gland or set-screw type.
      a. Do not use indenter type connectors and couplings.
   5. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.
   6. Embedded Within Concrete, Where Permitted: Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
   1. ABB; Carlon: www.carlon.com/#sle.
   2. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
   3. Cantex Inc: www.cantexinc.com/#sle.
   4. Heritage Plastics, a division of Atkore International: www.heritageplastics.com/#sle.
   5. JM Eagle: www.jmeagle.com/#sle.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.09 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch (0.51 mm).

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).

E. Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.

F. Sealing Systems for Concrete Penetrations:
   1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
   2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

G. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
   1. Products:
      a. Alta Products, LLC; Sigrist Pipe Chase Housing, Curbs, and Exit Seals: www.altaproductsllc.com/#sle.
      b. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.

H. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
   1. Products:
      a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Minimum raceway size: 1/2" inch trade size

C. Install conduit in accordance with NECA 1.

D. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

E. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.
   1. Outdoors use the following wiring methods:
      a. Exposed: rigid steel or IMC
      b. Concealed: rigid steel or IMC
      c. Underground, single: RNC
      d. Underground, group: RNC
      e. Connection to vibrating equipment (including transformers and hydraulic, pneumatic, electric solenoid or motor driven equipment: LFMC
      f. Boxes and Enclosures: NEMA 3r or Type 4
   2. Indoors use the following wiring methods:
      a. Feeders (between distribution equipment): RMC, IMC or EMT
      b. Exposed: RMC, IMC or EMT
      c. Concealed: RMC, EMT, IMC or MC cable

d. Connection to vibrating eqiupment (including transformers and hydraulic, pneumatic, electric solenoid or motor driven eqiupment): FMC, except in wet or damp location use LFMC
e. Damp or Wet location: rigid steel
f. Boxes and enclosures: NEMA 250 type 1, except in damp or wet locations use NEMA 250 type 4 stainless steel

F. Conduit Routing:
1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal conduits unless specifically indicated to be exposed.
a. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.
b. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot -water pipes. Install
c. horizontal raceway runs above water and steam piping.
d. Install raceways level and square and at proper elevations. Provide adequate headroom.
e. Complete raceway installation before starting conductor installation.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
a. Electrical rooms.
b. Mechanical equipment rooms.
c. Within joists in areas with no ceiling.
5. Unless otherwise approved, do not route exposed conduits:
a. Across floors.
b. Across roofs.
c. Across building exterior surfaces.
6. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
7. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
8. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
9. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.

G. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit clamp to support single conduit from beam clamp or threaded rod.
5. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
6. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.

H. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.

5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
7. Secure joints and connections to provide mechanical strength and electrical continuity.

I. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 84 00.

J. Underground Installation:
1. Provide trenching and backfilling; see Section 31 23 16 and Section 31 23 23.

K. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Secure conduits to prevent floating or movement during pouring of concrete.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

M. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
   a. Where conduits enter building from outside.
   b. Where service conduits enter building from underground distribution system.
   c. Where conduits enter building from underground.
   d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
   a. Where conduits pass from outdoors into conditioned interior spaces.
   b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
3. Where conduits cross boundaries of hazardous/classified locations, provide identified/listed sealing fittings or conduit mechanical seals as approved by authorities having jurisdiction; locate as indicated or in accordance with NFPA 70.

N. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end. Install pull wires in empty raceways. Use #14 AWG zinc coated steel or monofilament plastic line with not less than 200lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.

3.03 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 26 05 33.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

C. Boxes and enclosures for integrated power, data, and audio/video.

D. Underground boxes/enclosures.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 07 84 00 - Firestopping.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

D. Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Section 26 05 33.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 27 26 - Wiring Devices:
   1. Wall plates.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
   4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
   5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
   6. Coordinate the work with other trades to preserve insulation integrity.
   7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.

3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation; _____: www.cooperindustries.com/#sle.
    b. E-Lids LLC; _____: www.e-lids.com/#sle.
    c. Hubbell Incorporated; Bell Products; _____: www.hubbell-rtb.com/#sle.
    d. Hubbell Incorporated; RACO Products; _____: www.hubbell-rtb.com/#sle.
    e. O-Z/Gedney, a brand of Emerson Electric Co; _____: www.emerson.com/#sle.
    f. Thomas & Betts Corporation; _____: www.tnb.com/#sle.
    g. American Electric; FL Industries.
    h. Butler Manufacturing Co.; Walker Division.
    i. Crouse-Hinds; Div. of Cooper Industries.
    j. Electric Panelboard Co., Inc.
    k. Erickson Electrical Equipment Co.
    l. Hoffman Engineering Co.; Federal-Hoffman, Inc.
    m. Lamson & Sessions; Carlon Electrical Products.
    n. Parker Electrical Manufacturing Co.
    o. Robroy Industries, Inc.; Electrical Division.
    p. Scott Fetzer Co.; Adalet-PLM.
    q. Spring City Electrical Manufacturing Co.
    r. Woodhead Industries, Inc.; Da niel Woodhead Co.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 1, painted steel.
    b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

b. Boxes 6 square feet (0.56 sq m) and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.

4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
   a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
   b. Back Panels: Painted steel, removable.
   c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
6. Manufacturers:
   a. Hoffman, a brand of Pentair Technical Products; _____: www.hoffmanonline.com/#sle.
   b. Hammond.

D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
1. Manufacturers:
   a. Hubbell Incorporated; _____: www.hubbell.com/#sle.

E. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Size: As indicated on drawings.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
4. Provide logo on cover to indicate type of service.
5. Applications:
   a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 8 load rating.
   b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 15 load rating.
   c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
   a. Manufacturers:
      1) Hubbell Incorporated; Quazite Products; _____: www.hubbellpowersystems.com/#sle.
   b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

2.02 ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:
   1. Unless dimensioned, box locations indicated are approximate.
   2. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
   3. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
      a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
      b. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area.
   4. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.

I. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
   2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
   3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Underground Boxes/Enclosures:
   1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
   2. Flush-mount enclosures located in concrete or paved areas.
   3. Mount enclosures located in landscaped areas with top at 1 inch (25 mm) above finished grade.

4. Provide cast-in-place concrete collar constructed in accordance with Section 03 30 00, minimum 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep), around enclosures that are not located in concrete areas.
5. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

N. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

O. Close unused box openings.

P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

Q. Provide grounding and bonding in accordance with Section 26 05 26.

R. Identify boxes in accordance with Section 26 05 53.

3.03 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 26 05 36 - CABLE TRAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal cable tray systems:
   1. Metal ladder cable tray.

1.02 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 CABLE TRAY SYSTEM - GENERAL REQUIREMENTS

A. Provide new cable tray system consisting of all required components, fittings, supports, accessories, etc. as necessary for a complete system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use cable tray for applications other than as permitted by NFPA 70 and product listing/classification.

D. Provide cable tray system and associated components suitable for use at indicated span/load ratings under the service conditions at the installed location.

E. Unless otherwise indicated, specified span/load ratings are based on safety factor of 1.5 and working load only (no additional concentrated static load), with ratings for metal cable tray systems in accordance with NEMA VE 1.

F. Unless otherwise indicated, specified load/fill depths and inside widths are nominal values, with values for metal cable tray systems in accordance with NEMA VE 1 including applicable allowable tolerances.

2.02 METAL CABLE TRAY SYSTEMS

A. Comply with NEMA VE 1.

B. Finishes:
   1. Mill-Galvanized Before Fabrication (Pre-Galvanized) Steel: Comply with ASTM A653/A653M, G90 coating.

C. Metal Ladder Cable Tray:
   1. Material: Mill-galvanized before fabrication (pre-galvanized) steel.
   2. Load/Fill Depth: As indicated on drawings.
   3. Span/Load Rating: As indicated on drawings.
   4. Rung Spacing: 9 inches (229 mm) on center for straight lengths.
   5. Inside Width: As indicated on drawings.
   6. Inside Radius of Fittings: 12 inches (305 mm).

2.03 SOURCE QUALITY CONTROL

A. Metal Cable Tray: Perform factory design tests in accordance with NEMA VE 1, including electrical continuity and load testing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage cable tray system has been completed.

B. Verify that field measurements are as indicated.

C. Verify that the dimensions and span/load ratings of cable tray system components are consistent with the indicated requirements.

D. Verify that mounting surfaces are ready to receive cable tray and associated supports.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Modifications to Existing Cable Tray Systems: Remove inactive or abandoned cables from existing cable tray system.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install cable tray in accordance with NECA 1 (general workmanship), and NEMA VE 2.

C. Unless otherwise indicated, arrange cable tray to be parallel or perpendicular to building lines.

D. Arrange cable tray to provide required clearances and maintain cable access.

E. Install cable tray plumb and level, with sections aligned and with horizontal runs at the proper elevation.

F. Cable Tray Movement Provisions:
   1. Provide suitable expansion fittings where cable tray is subject to movement, including but not limited to:
      a. Where cable tray crosses structural joints intended for expansion.
      b. Long straight cable tray runs in accordance with NEMA VE 2.
   2. Use expansion guides in lieu of hold-down clamps where prescribed in NEMA VE 2.
   3. Set gaps for expansion fittings in accordance with NEMA VE 2.

G. Cable Provisions:
   1. Use suitable fixed barrier strips to maintain separation of cables as indicated and as required by NFPA 70.
   2. Use suitable drop-out fittings or bushings where cables exit cable tray as required to maintain minimum cable bending radius.
   3. Use suitable cable support fittings for long vertical cable tray runs with heavy cables.

H. Provide end closures at unconnected ends of cable tray runs.

I. Cable Tray Support:
   1. Use manufacturer's recommended hangers and supports, located in accordance with NEMA VE 2 and manufacturer's requirements, but not exceeding specified span unless otherwise approved by Engineer. Provide required support and attachment in accordance with Section 26 05 29, where not furnished by cable tray manufacturer.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

J. Grounding and Bonding Requirements, in Addition to Requirements of Section 26 05 26:
   1. Comply with grounding and bonding requirements of NEMA VE 2.
   2. Metal Cable Tray Systems: Use suitable bonding jumpers or classified connectors to provide electrical continuity.
   3. Metal cable tray system may be used as sole equipment grounding conductor only where all conditional requirements of NFPA 70 are met, including but not limited to:
      a. Installation must be in a qualifying facility with suitable maintenance and supervision as determined by authorities having jurisdiction.
      b. Cable tray system must be steel or aluminum (as specified) and classified as an equipment grounding conductor (note that stainless steel cable tray is not permitted for use as an equipment grounding conductor).
      c. Cable tray must meet minimum cross-sectional area requirements.

K. Conduit Termination:
   1. Use listed cable tray conduit clamps (evaluated for bonding connection) to terminate conduits at cable tray.
   2. Provide insulating bushing at conduit termination to protect cables.
   3. Provide independent support for conduit.

L. Cable Installation:
   1. Comply with cable installation requirements of NEMA VE 2.

2. Use appropriate cable pulling tools, applied to prevent excessive force on cable tray system and maintain minimum cable bending radius.
3. Use cable clamps or cable ties to fasten conductors/cables to vertical and horizontal runs of cable tray.
    a. Distance Between Fastening Points for Vertical Runs: 18 inches (450 mm).
    b. Distance Between Fastening Points for Horizontal Runs: As required to maintain spacing and confine conductor/cable within the cable fill area.

M. Penetrations: Install firestopping to preserve fire resistance rating of building elements, using materials and methods specified in Section 07 84 00.

N. Identification Requirements, in Addition to Those Specified in Section 26 05 53.

END OF SECTION

SECTION 26 05 48 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.

C. Vibration-isolated equipment support bases.

D. Vibration isolators.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

1.03 DEFINITIONS

A. Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., conduit, cable tray).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

B. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

C. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Seismic Controls:
      a. Coordinate the arrangement of seismic restraints with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
      b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
   2. Seismic Controls: Include seismic load capacities.

D. Shop Drawings - Vibration Isolation Systems:
   1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.
   2. Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.

E. Certification for seismically qualified equipment; identify basis for certification.

F. Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.

G. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.07 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing electrical equipment and/or electrical connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
   3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
   4. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch (50 mm) operating clearance beneath base unless otherwise indicated.

D. Equipment Isolation:
   1. Transformers:
      a. Specified vibration isolators are in addition to any factory-installed internal core and coil assembly vibration isolators unless otherwise indicated.
      b. Floor-Mounted Transformers, Nonseismic Applications: Use resilent material isolator pads, resilient material isolator mounts, or open (unhoused) spring isolators.
      c. Floor-Mounted Transformers, Seismic Applications: Use seismic type resilient material isolator mounts or seismic type restrained spring isolators.
   2. Engine Generators:

a. Specified vibration isolators are in addition to any factory-installed internal vibration isolators between generator set and integral base unless otherwise indicated; obtain generator set manufacturer approval of applied vibration isolation.

E. Conduit Isolation:
1. Use flexible conduit or cable for electrical connections to vibration-isolated equipment, including equipment installed under other sections or by others.
2. Vibration Isolators:

2.02 SEISMIC CONTROL REQUIREMENTS

A. Design and provide electrical component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor electrical components.

B. Seismic Restraints:
1. Provide seismic restraints for electrical components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
a. ASHRAE (HVACA).
b. FEMA 413.
c. FEMA E-74.
d. SMACNA (SRM).
3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.

C. Seismic Attachments:
1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
3. Do not use power-actuated fasteners.
4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
6. Concrete Housekeeping Pads:
a. Increase size of pad as required to comply with anchor requirements.
b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

D. Seismic Interactions:
1. Include provisions to prevent seismic impact between electrical components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

E. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections to accommodate:
a. Relative displacements at connections between components, including distributed systems (e.g., conduit, cable tray); do not exceed load limits for equipment utility connections.

b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
c. Design displacements at seismic separations.
d. Anticipated drifts between floors.

2.03 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Manufacturers:
1. Vibration-Isolated Equipment Support Bases:
a. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com/#sle.
b. Mason Industries; _____: www.mason-ind.com/#sle.
c. Vibration Eliminator Company, Inc; _____: www.veco-nyc.com/#sle.

B. Vibration-Isolated Structural Steel Bases:
1. Description: Engineered structural steel frames with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.

C. Vibration-Isolated Concrete Inertia Bases:
1. Description: Concrete-filled engineered steel forms with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
2. Minimum Base Depth: 6 inches (152 mm).
3. Minimum Base Mass (Including Concrete): 1.5 times weight of supported equipment.
4. Concrete Reinforcement: Welded or tied reinforcing bars running both ways in a single layer.
5. Concrete: Filled on site with minimum 3000 psi (20 mPa) concrete in accordance with Section 03 30 00.

2.04 VIBRATION ISOLATORS

A. Manufacturers:
1. Vibration Isolators:
a. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com/#sle.
b. Mason Industries; _____: www.mason-ind.com/#sle.
c. Vibration Eliminator Company, Inc; _____: www.veco-nyc.com/#sle.

B. General Requirements:
1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Secure fasteners according to manufacturer's recommended torque settings.

E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

F. Vibration Isolation Systems:
1. Vibration-Isolated Equipment Support Bases:
a. Provide specified minimum clearance beneath base.
2. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.

3. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
4. Adjust isolators to be free of isolation short circuits during normal operation.
5. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

G. Seismic Controls:
1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch (3 mm), use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch (3 mm) or less.
4. Equipment with Sheet Metal Housings:
   a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
   b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
   c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
   a. Size in accordance with seismic design to meet anchor requirements.
   b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.

END OF SECTION

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

B. Section 26 05 36 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.

C. Section 26 27 26 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

D. Section 27 10 00 - Structured Cabling: Identification for communications cabling and devices.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
   1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
   2. Do not install identification products until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Panelboards:
         1) Identify voltage.
         2) Identify power source and circuit number. Include location when not within sight of equipment.

3) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

b. Transformers:
1) Identify kVA rating.
2) Identify voltage and phase for primary and secondary.
3) Identify power source and circuit number. Include location when not within sight of equipment.

c. Enclosed switches, circuit breakers, and motor controllers:
1) Identify voltage and phase.
2) Identify power source and circuit number. Include location when not within sight of equipment.

d. Enclosed Contactors:
1) Identify ampere rating.
2) Identify voltage and phase.

e. Transfer Switches:
1) Identify voltage and phase.
2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
3) Identify load(s) served. Include location when not within sight of equipment.
4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

2. Emergency System Equipment:
a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.

3. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
2. Identification for Communications Conductors and Cables: Comply with Section 27 10 00.
3. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
4. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
a. At each source and load connection.
b. Within boxes when more than one circuit is present.
c. Within equipment enclosures when conductors and cables enter or leave the enclosure.

C. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
2. Use voltage markers or color coded boxes to identify systems other than normal power system.

D. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 27 10 00.
2. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
3. Use identification label to identify fire alarm system devices.

a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.

4. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
   a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

E. Identification for Luminaires:
   1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
   1. Manufacturers:
      a. Brimar Industries, Inc: www.brimar.com/#sle.
      b. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
      c. Seton Identification Products; _____: www.seton.com/#sle.
   2. Materials:
      a. Indoor Clean, Dry Locations: Use plastic nameplates.
      b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
   3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
   4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
   5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
   6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:
   1. Manufacturers:
      a. Brady Corporation; _____: www.bradyid.com/#sle.
      b. Brother International Corporation: www.brother-usa.com/#sle.
   2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
   3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
   1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
   2. Legend:
      a. Equipment designation or other approved description.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height:
      a. System Designation: 1 inch (25 mm).
      b. Equipment Designation: 1/2 inch (13 mm).
   5. Color:
      a. Normal Power System: White text on black background.
      b. Emergency Power System: White text on red background.

D. Format for General Information and Operating Instructions:
   1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
   2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height: 1/4 inch (6 mm).

5. Color: Black text on white background unless otherwise indicated.

E. Format for Receptacle Identification:
   1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
   2. Legend: Power source and circuit number or other designation indicated.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height: 3/16 inch (5 mm).
   5. Color: Black text on clear background.

F. Format for Fire Alarm Device Identification:
   1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
   2. Legend: Designation indicated and device zone or address.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height: 3/16 inch (5 mm).
   5. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

A. Manufacturers:
   1. Brady Corporation; _____: www.bradyid.com/#sle.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

F. Minimum Text Height: 1/8 inch (3 mm).

G. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Manufacturers:
   1. Brady Corporation; _____: www.bradyid.com/#sle.

B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl type markers.

C. Minimum Size:
   1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).
   2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
   3. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).

D. Legend:
   1. Markers for Voltage Identification: Highest voltage present.
   2. Markers for System Identification:
      a. Emergency Power System: Text "EMERGENCY".

E. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

A. Manufacturers:
   1. Brady Corporation; _____: www.bradyid.com/#sle.
   2. Brimar Industries, Inc: www.brimar.com/#sle.
   3. Seton Identification Products; _____: www.seton.com/#sle.

B. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

C. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).

D. Legend: Type of service, continuously repeated over full length of tape.

E. Color:

2.06 WARNING SIGNS AND LABELS

A. Manufacturers:
   1. Brimar Industries, Inc: www.brimar.com/#sle.
   2. Clarion Safety Systems, LLC; _____: www.clarionsafety.com/#sle.
   3. Insite Solutions, LLC; _____: www.stop-painting.com/#sle.
   4. Seton Identification Products; _____: www.seton.com/#sle.

B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

C. Warning Signs:
   1. Materials:
      a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
      b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
   2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
   3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

D. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Boxes: Outside face of cover.
   8. Conductors and Cables: Legible from the point of access.
   9. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION

SECTION 26 05 83 - WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 26 05 33.13 - Conduit for Electrical Systems.

C. Section 26 05 33.16 - Boxes for Electrical Systems.

D. Section 26 27 26 - Wiring Devices.

E. Section 26 28 16.16 - Enclosed Switches.

F. Section 26 29 13 - Enclosed Controllers.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.

B. Sequencing:
   1. Install rough-in of electrical connections before installation of equipment is required.
   2. Make electrical connections before required start-up of equipment.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Comply with NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

PART 3 EXECUTION

3.01 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

B. Outdoor photo controls.

C. Lighting contactors.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 33.16 - Boxes for Electrical Systems.

C. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

E. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.

H. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

I. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
   3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
   4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:
   1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.

D. Interconnection Diagrams showing field installed wiring

E. Include diagrams for power, signal and control wiring

F. Closeout Submittals
   1. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.
   2. Software and Firmware Operational Documentation:
      a. Software operating and upgrade manuals.
      b. Program Software Backup: On USB media . Provide names, versions, and website addresses for locations of installed software.
      c. Device address list.
      d. Printout of software application and graphic screens.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all occupancy sensors.

C. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.

D. Provide two year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

A. Manufacturers:
   1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
   2. Legrand North America, Inc; _____: www.legrand.us/#sle.
   3. Lutron Electronics Company, Inc; _____: www.lutron.com/#sle.

B. All Occupancy Sensors:
   1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
   2. Sensor Technology:
      a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
      b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
      c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
      d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.

3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
7. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

C. Wall Switch Occupancy Sensors:
1. All Wall Switch Occupancy Sensors:
a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
b. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
c. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.
2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).
3. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).

2.03 OUTDOOR PHOTO CONTROLS

A. Manufacturers:
1. Intermatic, Inc; _____: www.intermatic.com/#sle.
2. NSI Industries LLC; _____: www.nsiindustries.com/#sle.

B. Stem-Mounted Outdoor Photo Controls:
1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
2. Housing: Weatherproof, impact resistant polycarbonate.
3. Photo Sensor: Cadmium sulfide.
4. Provide external sliding shield for field adjustment of light level activation.
5. Light Level Activation: 1 to 5 footcandles (10.8 to 53.8 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
6. Voltage: As required to control the load indicated on the drawings.
7. Failure Mode: Fails to the on position.
8. Load Rating: As required to control the load indicated on the drawings.

2.04 LIGHTING CONTACTORS

A. Manufacturers:
1. ABB; _____: www.electrification.us.abb.com/#sle.
2. Eaton Corporation; _____: www.eaton.com/#sle.
3. Rockwell Automation Inc; _____: www.rockwellautomation.com/#sle.
4. Schneider Electric; _____: www.se.com/#sle.
5. Siemens Industry, Inc; _____: www.new.siemens.com/#sle.

B. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on the drawings.

C. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect.
   1. Disconnects: Circuit breaker type.

D. Short Circuit Current Rating:

E. Enclosures:
   1. Comply with NEMA ICS 6.
   2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   3. Finish: Manufacturer's standard unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of lighting control devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switch Occupancy Sensors: 44 inches above finished floor.
   2. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 12 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.

G. Provide required supports in accordance with Section 26 05 29.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Occupancy Sensor Locations:
   1. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

J. Outdoor Photo Control Locations:
   1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
   2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

K. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

L. Combination Enclosed Lighting Contactors:
   1. Except where indicated to be mounted adjacent to the equipment they supply, mount lighting contactors such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

3.03 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

D. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

3.04 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.
   3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
   4. Location: At project site.

END OF SECTION

SECTION 26 22 13.13 - LOW-VOLTAGE DISTRIBUTION TRANSFORMERS - SCHNEIDER ELECTRIC SQUARE D

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

1.02 DEFINITIONS

A. Low-voltage distribution transformers may also be identified as transformer, XFMR, or T.

B. Low-Voltage Distribution Transformer:
   1. Input and output voltage of 1,000 V or less.
   2. Rated for operation at 60 Hz.
   3. Air cooled; does not use oil as coolant.
   4. 15 kVA to 1,000 kVA for dry-type units.
   5. Includes step-up and step-down transformers.

1.03 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

C. ISO 9001 - Quality Management Systems — Requirements; 2015.

D. ISO 14001 - Environmental Management Systems — Requirements with Guidance for Use; 2015.

E. NEMA ST 20 - Dry Type Transformers for General Applications; 2021.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Provide sufficient information to determine compliance with contract documents. Identify submittal data with specific equipment tags and/or service descriptions to which they pertain. Identify specific model numbers, options, and features of equipment proposed.

C. Indicate deviations from contract documents with reference to corresponding drawing or specification number and written justification for deviation.

D. Product Data: Provide manufacturer's standard catalog pages and data sheets for transformers, enclosures, components, and accessories.

E. Shop Drawings:
   1. Indicate construction detail including enclosure dimensions, kVA, primary and secondary nominal voltage, voltage taps, required clearances, unit weight.
      a. Include conduit/wire way access points with distance for wiring routing to meet minimum bending radius.
      b. Include location for ground lug to be field installed without covering ventilated air flow slots or holes.
   2. Indicate basic performance characteristics including insulation class, temperature rise, coil material, impedances, no-load and full-load losses, audible noise level, and inrush data expressed in amperes RMS or multiples of rated input current.

F. Seismic Qualification Certification:
   1. Certificate of compliance.
   2. Dimensioned equipment outline drawings identifying center of gravity and mounting/anchoring provisions.
   3. Details and installation requirements of equipment anchorage devices on which certification is based.

G. Manufacturer's qualification statement.

H. Operation and Maintenance Data:
   1. Provide detailed information on system operation, replacement parts, and recommended maintenance procedures and intervals.
      a. Provide contact information for parts stocking location closest to Owner.
      b. Identify critical spare parts associated with long lead times and those critical to unit operation.
      c. Identify maintenance spare parts required to regularly perform scheduled equipment maintenance including, but not limited to, consumable parts required to be exchanged during scheduled maintenance periods.

I. Specimen warranty.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 01 60 00 - Product Requirements for additional provisions.

1.05 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70.
   2. Requirements of local authorities having jurisdiction.
   3. Applicable local codes.

B. Manufacturer Qualifications:
   1. Firm engaged in manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for minimum of 10 years.
   2. Certified in accordance with ISO 9001 with applicable quality assurance system regularly reviewed and audited by third-party registrar. Develop and control manufacturing, inspection, and testing procedures under guidelines of quality assurance system.
   3. Service, repair, and technical support services available 24 hours per day, 7 days per week from manufacturer or their representative.
   4. Certified in accordance with ISO 14001.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Prior to delivery to project site, verify suitable storage space is available to store materials in well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres.

B. Protect materials during delivery and storage and maintain within manufacturer's written storage requirements. At minimum, store indoors in clean, dry space with uniform temperature to prevent condensation and protect electronics from potential damage from electrical and magnetic energy.
   1. Prevent entry of dust/debris through ventilated openings.

C. Deliver materials to project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified in Contract Documents.
   1. Protect transformers less than 500 kVA with cardboard or wood material; plastic wrapping is not acceptable.

D. Inspect products and report concealed damage or violation of delivery, storage, and handling requirements to Engineer.

1.07 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty for defects in material and workmanship for 12 months from date of commissioning or 18 months from date of shipment, whichever comes first. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Schneider Electric; Square D Energy Efficient Low Voltage Distribution Transformers; www.se.com/#sle.

B. Source Limitations: Furnish products produced by same manufacturer as other electrical distribution equipment for project and obtained from single supplier.

2.02 LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

A. Basis of Design: Schneider Electric; Square D Energy Efficient Low-Voltage Distribution Transformers; www.se.com/#sle.

B. Transformer Ratings/Configurations: As indicated on drawings.

C. Comply with NEMA ST 20; listed and labeled as complying with UL 1561.

D. Efficiency:
   1. Comply with 10 CFR 431, Subpart K.

E. Sound Levels: Standard sound levels complying with NEMA ST 20 unless otherwise indicated.

F. Cores and Coils:
   1. Coils: Continuous wound construction using wire insulated with 200 degrees C insulation or higher.
      a. Bare wire is not acceptable.
   2. Winding Material: Aluminum.
   3. Construct cores with low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point to prevent core overheating.
   4. Impregnate core and coil assembly with nonhygroscopic thermosetting varnish using dip and bake system.
      a. Spray and room cure systems are not acceptable.
   5. Visibly ground core to enclosure with flexible grounding conductor sized in accordance with NFPA 70.
   6. Bolt completed core and coil assembly to base of enclosure and isolate with rubber vibration-absorbing mounts; no metal-to-metal contact between core/coil and enclosure except for flexible safety ground strap.
      a. Sound isolation systems that require complete removal of fastening devices are not acceptable.

G. Insulation System: Class 220 degrees C.

H. Temperature Rise: 150 degrees C.

I. Impedance: As required for panelboard ampere interrupting capacities; system series ratings are acceptable.

J. Taps:
   1. Provide full capacity primary taps to accommodate voltage changes in increments between 10 V and 15 V, with minimum of one tap above and one tap below rated voltage.
   2. Tap Steps:
      a. 120 V: 10 percent, 12.0 V.
      b. 208 V: 5 percent, 10.4 V.

c. 240 V: 5 percent, 12.0 V.
d. 277 V: 5 percent, 13.9 V.
e. 480 V: 2.5 percent, 12.0 V.
f. 600 V: 2.5 percent, 15.0 V.

3. Provide the following tap capacities as indicated on drawings:
   a. One 10 percent full capacity primary tap above and one 10 percent full capacity primary tap below rated voltage.
   b. One 5 percent full capacity primary tap above and one 5 percent full capacity primary tap below rated voltage.
   c. One 5 percent full capacity primary tap above and two 5 percent full capacity primary taps below rated voltage.
   d. Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.
   e. Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.

K. Terminals:
1. Accommodate AL9CU lugs.
2. Provide NEMA two-hole configurations.
3. Maintain separation of primary terminals and secondary terminals.
4. Primary Terminals: Accommodate wire sized for 125 percent of nameplate current.
   a. Include provisions to accommodate 250 percent of nameplate current.
5. Secondary Terminals: Accommodate wire sized for 125 percent of nameplate current.
6. XO/HO Terminals: Accommodate wire sized up to 200 percent of rated line current.
7. Support paralleling for conductors exceeding 400 kcmil.
8. Locate terminals to allow for enclosure bottom or side entry.
9. Size wiring compartment in accordance with NFPA 70 to accommodate bend radius for conductors sized at 125 percent of nameplate current.
   a. When primary wire is sized for 250 percent, provide one bend access point.

L. Enclosures:
1. UL 50E Rating, Unless Otherwise Indicated:
2. Construction: Steel.
3. Ventilation Openings:
   a. Type 1; convertible to Type 2 and Type 3R using field-installed kits.
   b. Ventilation openings on left or right side are not acceptable.
4. Finish:
   a. Manufacturer's standard grey; UL component recognized paint process.
   b. Salt Spray Resistance: 600 hours when tested in accordance with UL requirements.
5. Mounting Provisions:
   a. Floor mounting.
   b. Wall mounting up to 800 lb (363 kg).
   c. Trapeze mounting up to 1,200 lb (544 kg).
6. Marked Minimum Clearance:
   a. Sides With Ventilated Openings: Not exceeding 3 inches (76.2 mm).
   b. Sides Without Ventilated Openings: Not exceeding 1/2-inch (12.7 mm).
7. Enclosure Temperature: Not exceeding 90 degrees F (50 degrees C) above 104 degrees F (40 degrees C) ambient temperature.

M. Markings and Labeling:
1. Provide identification and warning labels/nameplates exterior to equipment resistant to weather, UV, and intended installation environment.
2. Nameplate Information:
   a. Information required by NFPA 70 and NEMA ST 20.
   b. Efficiency at 35 percent loading at 167 degrees F (75 degrees C).
   c. Identification as distribution transformer, or why it is not.

d. Statement of compliance with 10 CFR 431, Subpart K.
e. Department of Energy 10 CFR 429 database identifier.

3. Provide warning labels/nameplates complying with ANSI Z535.4 at access locations to advise personnel of possible hazards in accordance with listing, NFPA 70, NFPA 70E, and other applicable standards.

N. Accessories:
1. Provide AL9CU lug kits sized as required for termination of conductors indicated on drawings.
2. Provide ground kits.
3. Provide mounting brackets as required.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer92s written instructions.

B. Unless otherwise indicated, install and anchor floor-mounted transformers on raised concrete pad 4 inches (100 mm) high; see Section 03 30 00.

C. Use flexible conduit for connections to transformer enclosure at locations identified by manufacturer. Do not route conductors through ventilation openings.

D. Arrange equipment to provide minimum clearance in accordance with transformer nameplate and manufacturer's instructions.

E. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Manufacturer Services: Provide services of manufacturer's field representative to perform functional testing, commissioning, and first parameter adjusting.
1. Replace damaged or malfunctioning equipment and report discrepancies or installation issues.

C. Perform high-potential test to verify connections are cleared from ground.

D. Measure primary and secondary voltages and make appropriate tap adjustments.

E. Verity that energized transformer does not emit excessive noise with front cover installed. Contact manufacturer if noise is other than standard 120 Hz constant hum.

3.03 PROTECTION

A. Protect installed transformers from subsequent construction operations.

END OF SECTION

SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Load centers.

D. Overcurrent protective devices for panelboards.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
   2. Include wiring diagrams showing all factory and field connections.
   3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
   4. Include documentation of listed series ratings upon request.
   5. Identify mounting conditions required for equipment seismic qualification.

C. Manufacturer's equipment seismic qualification certification.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Panelboard Keys: Six of each different key.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Schneider Electric: www.se.com/#sle.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Seismic Qualification: Provide panelboards and associated components suitable for application under the seismic design criteria specified in Section 26 05 48 where required. Include certification of compliance with submittals.

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
1. Phase and Neutral Bus Material: Copper.
2. Ground Bus Material: Copper.

D. Circuit Breakers:
1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures unless otherwise indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Copper.
3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures unless otherwise indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 LOAD CENTERS

A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.

B. Bussing:
1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Bus Material: Copper.

C. Circuit Breakers: Thermal magnetic plug-in type.

D. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures unless otherwise indicated.
2. Fronts: Provide hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

2.06 OVERCURRENT PROTECTIVE DEVICES

A. Fusible Switches:
1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA KS 1, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
2. Fuse Clips: As required to accept indicated fuses.

3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

B. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
         1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
         2) 14,000 rms symmetrical amperes at 480 VAC.
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   3. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Provide compression lugs where indicated.
      c. Lug Material: Copper, suitable for terminating copper conductors only.
   4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
      a. Provide the following field-adjustable trip response settings:
         1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
         2) Long time delay.
         3) Short time pickup and delay.
         4) Instantaneous pickup.
         5) Ground fault pickup and delay where ground fault protection is indicated.
   6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Provide required seismic controls in accordance with Section 26 05 48.

G. Install panelboards plumb.

H. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

I. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.

J. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

K. Provide grounding and bonding in accordance with Section 26 05 26.

L. Install all field-installed branch devices, components, and accessories.

M. Provide fuses complying with Section 26 28 13 for fusible switches as indicated.

N. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

O. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

P. Provide filler plates to cover unused spaces in panelboards.

Q. Circuit directory: type directory to indicate installed circuit loads after balancing panelboard loads, obtain approval before installing.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

F. Test GFCI circuit breakers to verify proper operation.

G. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 IDENTIFICATION

A. Identify field-installed wiring and components and provide warning signs as specified in Division 26 Section 260500.

B. Panelboard Nameplates: Label each panelboard with engraved laminated -plastic or metal nameplates mounted with corrosion-resistant screws.

C.

3.05 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.06 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates and covers.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
   4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Operation and Maintenance Data:

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Warranty
   1. Provide warranty in accordance with requirements of Division 01 and Section 26 05 00.

PART 2 PRODUCTS

2.01 WIRING DEVICES - GENERAL REQUIREMENTS

A. Provide wiring devices suitable for intended use with ratings adequate for load served.

B. Wiring Device Applications:
   1. Receptacles Installed Outdoors or in Damp or Wet Locations: Use weather-resistant GFCI receptacles with weatherproof covers.
   2. Provide GFCI protection for:
      a. Receptacles installed within 6 feet (1.8 m) of sinks.
      b. Receptacles installed in kitchens.
      c. Receptacles serving electric drinking fountains.

C. Wiring Device Finishes:
   1. Provide wiring device finishes as described below, unless otherwise indicated.
   2. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.
   3. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
   4. Wiring Devices Installed in Wet or Damp Locations: Gray with weatherproof cover.

2.02 WALL SWITCHES

A. Manufacturers:
   1. Hubbell Incorporated; _____: www.hubbell.com/#sle.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.03 RECEPTACLES

A. Manufacturers:
   1. Hubbell Incorporated; _____: www.hubbell.com/#sle.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.
   3. Hospital Grade Receptacles: Listed as complying with UL 498 Supplement SD, with green dot hospital grade mark on device face.

C. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

D. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
      a. Provide test and reset buttons of same color as device.
   2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

E. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.
   1. Standard Locking Convenience Receptacles: Single, 30A, 240V L6-30R.

2.04 WALL PLATES AND COVERS

A. Manufacturers:
   1. Hubbell Incorporated; _____: www.hubbell-wiring.com/#sle.

B. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard; _____.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

E. Weatherproof Switch Covers for Wet or Damp Locations: Gasketed, metallic, with externally operable actuating means and corrosion-resistant screws; listed as suitable for use in wet locations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switches: 48 inches (1200 mm) above finished floor.
      b. Wall Dimmers: 48 inches (1200 mm) above finished floor.
      c. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
   2. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   3. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
   4. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.04 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

END OF SECTION

SECTION 26 28 13 - FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fuses.

B. Spare fuse cabinet.

1.02 RELATED REQUIREMENTS

A. Section 26 28 16.16 - Enclosed Switches: Fusible switches.

B. Section 26 29 13 - Enclosed Controllers: Fusible switches.

1.03 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.

E. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
      a. Fusible Enclosed Switches: See Section 26 28 16.16.
      b. Fusible Switches for Enclosed Motor Controllers: See Section 26 29 13.
   2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
   1. Spare Fuse Cabinet: Include dimensions.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Fuses: One set(s) of three for each type and size installed.
   3. Spare Fuse Cabinet Keys: six.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation; _____: www.cooperindustries.com/#sle.

B. Littelfuse, Inc; _____: www.littelfuse.com/#sle.

C. Mersen; _____: ep-us.mersen.com/#sle.

2.02 APPLICATIONS

A. Service Entrance:

1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

B. Feeders:
1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

C. General Purpose Branch Circuits: Class RK1, time-delay.

2.03 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

H. Class L Fuses: Comply with UL 248-10.

2.04 SPARE FUSE CABINET

A. Description: Wall-mounted sheet metal cabinet with shelves and hinged door with cylinder lock, suitably sized to store spare fuses and fuse pullers specified.

B. Finish: Manufacturer's standard, factory applied grey finish unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that mounting surfaces are ready to receive spare fuse cabinet.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

C. Install spare fuse cabinet where indicated.

END OF SECTION

SECTION 26 28 16.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

D. Section 26 28 13 - Fuses.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

B. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
2. Include wiring diagrams showing all factory and field connections.
3. Identify mounting conditions required for equipment seismic qualification.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation: www.eaton.com/#sle.

B. Schneider Electric: www.se.com/#sle.

C. Siemens Industry, Inc: www.new.siemens.com/#sle.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
   2. Minimum Ratings:
      a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
      b. General Duty Single Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
      c. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
      d. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    a. Indoor Clean, Dry Locations: Type 1.
    b. Outdoor Locations: Type 3R.

L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

M. Heavy Duty Switches:
1. Comply with NEMA KS 1.
2. Conductor Terminations:
    a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

N. General Duty Switches:
1. Conductor Terminations:
    a. Provide mechanical lugs.
    b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Provide externally operable handle with means for locking in the OFF position, capable of accepting two padlocks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Provide required seismic controls in accordance with Section 26 05 48.

F. Install enclosed switches plumb.

G. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 26 05 26.

I. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 29 13 - ENCLOSED CONTROLLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed NEMA controllers for low-voltage (600 V and less) applications:
   1. Magnetic motor starters.
   2. General purpose contactors.
   3. Manual motor starters.

B. Overcurrent protective devices for motor controllers, including overload relays.

C. Control accessories:
   1. Auxiliary contacts.
   2. Pilot devices.
   3. Control and timing relays.
   4. Control power transformers.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
   1. Includes requirements for the seismic qualification of equipment specified in this section.

D. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

E. Section 26 28 13 - Fuses: Fuses for fusible switches.

1.03 REFERENCE STANDARDS

A. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

E. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.

F. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).

G. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

K. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

L. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate the work to provide motor controllers and associated overload relays suitable for use with the actual motors to be installed.

3. Coordinate the work to provide controllers and associated wiring suitable for interface with control devices to be installed.
4. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
5. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
6. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Identify mounting conditions required for equipment seismic qualification.

D. Manufacturer's equipment seismic qualification certification.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Schneider Electric: www.se.com/#sle.

2.02 ENCLOSED CONTROLLERS

A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.

D. Seismic Qualification: Provide controllers and associated components suitable for application under the seismic design criteria specified in Section 26 05 48 where required. Include certification of compliance with submittals.

E. Service Conditions:
1. Provide controllers and associated components suitable for operation under the following service conditions without derating:
   a. Altitude:
      1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers): Less than 3,300 feet (1,000 m).
      2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet (2,000 m).
   b. Ambient Temperature: Between 32 degrees F (0 degrees C) and 104 degrees F (40 degrees C).
2. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

F. Short Circuit Current Rating:
   1. Provide controllers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures:
   1. Comply with NEMA ICS 6.
   2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1 or Type 12.
      b. Outdoor Locations: Type 3R or Type 4.
   3. Finish: Manufacturer's standard unless otherwise indicated.

I. Instrument Transformers:
   1. Comply with IEEE C57.13.
   2. Select suitable ratio, burden, and accuracy as required for connected devices.
   3. Current Transformers: Connect secondaries to shorting terminal blocks.
   4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

J. Magnetic Motor Starters: Combination type unless otherwise indicated.
   1. Combination Magnetic Motor Starters: NEMA ICS 2, Class A combination motor controllers with magnetic contactor(s), externally operable disconnect and overload relay(s).
   2. Configuration: Full-voltage non-reversing unless otherwise indicated.
   3. Disconnects: Circuit breaker type.
      a. Circuit Breakers: Motor circuit protectors (magnetic-only) unless otherwise indicated or required.
      b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
      c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
   4. Overload Relays: Bimetallic thermal type unless otherwise indicated.
   5. Pilot Devices Required:
      a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings.
      b. Single-Speed, Non-Reversing Starters:
         1) Pushbuttons: START-STOP.
         2) Selector Switches: HAND/OFF/AUTO.
         3) Indicating Lights: Red ON, Green OFF.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Overload Relays:
   1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
   2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
   3. Trip-free operation.
   4. Visible trip indication.
   5. Resettable.
      a. Employ manual reset unless otherwise indicated.
      b. Do not employ automatic reset with two-wire control.
   6. Bimetallic Thermal Overload Relays:
      a. Interchangeable current elements/heaters.

b. Adjustable trip; plus/minus 10 percent of nominal, minimum.
c. Trip test function.

B. Fusible Disconnect Switches:
1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA KS 1, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
2. Fuse Clips: As required to accept indicated fuses.
3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

C. Circuit Breakers:
1. Interrupting Capacity (not applicable to motor circuit protectors):
a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
2. Motor Circuit Protectors:
a. Description: Instantaneous-trip circuit breakers furnished with magnetic instantaneous tripping elements for short circuit protection, but not with thermal inverse time tripping elements for overload protection; UL 489 recognized only for use as part of a listed combination motor controller with overload protection; ratings, configurations, and features as indicated on the drawings.
b. Provide field-adjustable magnetic instantaneous trip setting.

2.04 CONTROL ACCESSORIES

A. Auxiliary Contacts:
1. Comply with NEMA ICS 5.
2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each magnetic motor starter, minimum.

B. Pilot Devices:
1. Comply with NEMA ICS 5; heavy-duty type.
2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
4. Indicating Lights: Push-to-test type unless otherwise indicated.
5. Provide LED lamp source for indicating lights and illuminated devices.

C. Control and Timing Relays:
1. Comply with NEMA ICS 5.
2. Provide number and type of relays indicated or required to perform necessary functions.

D. Control Power Transformers:
1. Size to accommodate burden of contactor coil(s) and all connected auxiliary devices, plus _____ VA spare capacity.
2. Include primary and secondary fuses.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install controllers in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install enclosed controllers plumb and level.

F. Provide grounding and bonding in accordance with Section 26 05 26.

G. Install all field-installed devices, components, and accessories.

H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated.

I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

J. Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.

3.02 CLOSEOUT ACTIVITIES

A. Operation and Maintenance Data: For magnetic controllers to include in operation and maintenance manuals

B. In addtion to items specified in Section 01 78 23 Operation and Maintenance Data include the following:
   1. Routine maintenance requirements for magnetic controllers and installed components
   2. Manufacturer's written instruction for testing and adjusting circuit breaker and MCP trip settings
   3. Manufacturer's written instructions for setting field adjustable overload relays
   4. Load current and overload relay heater list: comple after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor.

END OF SECTION

SECTION 26 32 13 - ENGINE GENERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 23 51 00 - Breechings, Chimneys, and Stacks: Engine exhaust piping.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

D. Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA/EGSA 404 - Standard for Installing Generator Sets; 2014.

C. NEMA MG 1 - Motors and Generators; 2021.

D. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 99 - Health Care Facilities Code; 2024.

G. NFPA 110 - Standard for Emergency and Standby Power Systems; 2022.

H. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries; Current Edition, Including All Revisions.

I. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.
   1. Include generator set sound level test data.

B. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

C. Manufacturer's equipment seismic qualification certification.

D. Specimen Warranty: Submit sample of manufacturer's warranty.

E. Manufacturer's factory emissions certification.

1.05 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Packaged Engine Generator Set:
   1. Caterpillar Inc; _____: www.cat.com/#sle.
   2. Cummins Power Generation Inc; _____: www.cumminspower.com/#sle.
   3. Generac Power Systems; _____: www.generac.com/industrial/#sle.

2.02 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:
   1. Application: Emergency/standby.
   2. Configuration: Single packaged engine generator set operated independently (not in parallel).

D. Packaged Engine Generator Set:
   1. Type: Natural Gas.
   2. Power Rating: 14 kW, standby.
   3. Voltage: As indicated on drawings.

E. Generator Set General Requirements:
   1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
   2. Factory-assembled, with components mounted on suitable base.
   3. List and label engine generator assembly as complying with UL 2200.
   4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
   5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.

G. Starting and Load Acceptance Requirements:
   1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
   2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
   3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
   4. Maximum Load Step: Supports 100 percent of rated load in one step.

H. Exhaust Emissions Requirements:
   1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
   2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

I. Sound Level Requirements:
   1. Do not exceed 65 dBA when measured at 23 feet (7 m) from generator set in free field (no sound barriers) while operating at full load; include manufacturer's sound data with submittals.

2.03 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Gaseous (Spark Ignition):
   1. Fuel Source: Natural gas.
   2. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
   3. Provide components/features indicated and as necessary for operation and/or required by applicable codes, including but not limited to:
      a. Carburetor.
      b. Gas pressure regulators.
      c. Fuel shutoff control valves.
      d. Low gas pressure switches.

C. Engine Starting System:
   1. System Type: Electric, with DC solenoid-activated starting motor(s).
   2. Battery(s):
      a. Battery Type: Lead-acid.
      b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
      c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
   3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
   4. Battery Charger:
      a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
      b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
      c. Listed as complying with UL 1236.
      d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
      e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
      f. Provide alarm output contacts as necessary for alarm indications.

D. Engine Speed Control System (Governor):
   1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
   2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:
   1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.

F. Engine Cooling System:
   1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
   2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.

G. Engine Air Intake and Exhaust System:

1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.

2.04 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:
   1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
   2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
   3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 1, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.

2.05 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:
   1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
   2. Generator Set Control Functions:
      a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
      b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
      c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
      d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
      e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
      f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
      g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
   3. Generator Set Status Indications:
      a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
      b. Current (Amps): For each phase.
      c. Frequency (Hz).
      d. Real power (W/kW).
      e. Reactive power (VAR/kVAR).
      f. Apparent power (VA/kVA).
      g. Power factor.
      h. Duty Level: Actual load as percentage of rated power.
      i. Engine speed (RPM).
      j. Battery voltage (Volts DC).
      k. Engine oil pressure.
      l. Engine coolant temperature.
      m. Engine run time.
      n. Generator powering load (position signal from transfer switch).
   4. Generator Set Protection and Warning/Shutdown Indications:

a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
    1) Overcrank (shutdown).
    2) Low coolant temperature (warning).
    3) High coolant temperature (warning).
    4) High coolant temperature (shutdown).
    5) Low oil pressure (shutdown).
    6) Overspeed (shutdown).
    7) Low fuel level (warning).
    8) Low coolant level (warning/shutdown).
    9) Generator control not in automatic mode (warning).
    10) High battery voltage (warning).
    11) Low cranking voltage (warning).
    12) Low battery voltage (warning).
    13) Battery charger failure (warning).
b. In addition to NFPA 110 requirements, provide the following protections/indications:
    1) High AC voltage (shutdown).
    2) Low AC voltage (shutdown).
    3) High frequency (shutdown).
    4) Low frequency (shutdown).
    5) Overcurrent (shutdown).
c. Provide contacts for local and remote common alarm.
d. Provide lamp test function that illuminates all indicator lamps.

5. Other Control Panel Features:
    a. Event log.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized, minimum 8 inch high concrete pad constructed in accordance with Section 03 30 00.

F. Provide required support and attachment in accordance with Section 26 05 29.

G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

H. Provide engine exhaust piping in accordance with Section 23 51 00, where not factory installed.
    1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.
    2. Do not exceed manufacturer's maximum back pressure requirements.

I. Provide grounding and bonding in accordance with Section 26 05 26.

J. Identify system wiring and components in accordance with Section 26 05 53.

3.02 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Engage a factory authorized service representative to perform startup service.
    1. Remove and replace components that do not operate and repeat startup procedures as specified above
    2. Prepare written report of the results of startup services.

C. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of four hours of training.
   3. Instructor: Manufacturer's authorized representative.
   4. Location: At project site.

END OF SECTION

SECTION 26 36 23.13 - AUTOMATIC/NONAUTOMATIC TRANSFER SWITCHES - SCHNEIDER ELECTRIC ASCO 7000

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

1.02 ABBREVIATIONS AND ACRONYMS

A. ATS: Automatic transfer switch.

B. NTS: Nonautomatic transfer switch.

1.03 DEFINITIONS

A. Automatic transfer switches may also be identified as ATS, ADTS, ACTS, ATB, ADTB, ACTB, AUS, ADUS, ACUS, AUB, ADUB, or ACUB.

B. Nonautomatic transfer switches may also be identified as NTS, NDTS, NCTS, NTB, NDTB, NCTB, NUS, NDUS, NCUS, NUB, NDUB, or NCUB.

1.04 REFERENCE STANDARDS

A. IEC 60947-6-1 - Low-Voltage Switchgear and Controlgear – Part 6-1: Multiple Function Equipment – Transfer Switching Equipment; 2021.

B. IEC 61000-4-2 - Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test; 2008.

C. IEC 61000-4-3 - Electromagnetic Compatibility (EMC) – Part 4-3: Testing and Measurement Techniques – Radiated, Radio-Frequency, Electromagnetic Field Immunity Test; 2020.

D. IEC 61000-4-4 - Electromagnetic Compatibility (EMC) - Part 4-4: Testing and Measurement Techniques – Electrical Fast Transient/Burst Immunity Test; 2012.

E. IEC 61000-4-5 - Electromagnetic Compatibility (EMC) - Part 4-5: Testing and Measurement Techniques - Surge Immunity Test; 2014, with Amendment (2017).

F. IEC 61000-4-6 - Electromagnetic Compatibility (EMC) – Part 4-6: Testing and Measurement Techniques – Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields; 2013 (Corrigendum 2015).

G. IEC 61000-6-2 - Electromagnetic Compatibility (EMC) – Part 6-2: Generic Standards – Immunity Standard for Industrial Environments; 2016.

H. IEC CISPR 11 - Industrial, Scientific and Medical Equipment – Radio-Frequency Disturbance Characteristics – Limits and Methods of Measurement; 2015, with Amendments (2019).

I. ISO 9001 - Quality Management Systems — Requirements; 2015.

J. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

K. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2020.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

N. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

O. UL 891 - Switchboards; Current Edition, Including All Revisions.

P. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

Q. UL 1558 - Switchgear; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Executed warranty.

C. Project Record Documents:
   1. Configured settings/parameters for adjustable components updated to as-installed and commissioned state, noted if different from factory default.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70.
   2. Requirements of authorities having jurisdiction.
   3. Applicable local codes.

B. Manufacturer Qualifications:
   1. Firm engaged in manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for minimum of 10 years.
   2. Certified in accordance with ISO 9001 with applicable quality assurance system regularly reviewed and audited by third-party registrar. Develop and control manufacturing, inspection, and testing procedures under guidelines of quality assurance system.
   3. Service, repair, and technical support services available 24 hours per day, 7 days per week, 365 days per year from manufacturer or their representative.
   4. Maintain records of each switch, by serial number, for minimum of 20 years.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Prior to delivery to project site, verify suitable storage space is available to store materials in well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres.

B. Protect materials during delivery and storage and maintain within manufacturer's written storage requirements. At minimum, store indoors in clean, dry space with uniform temperature to prevent condensation and protect electronics from potential damage from electrical and magnetic energy.

C. Deliver materials to project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified in Contract Documents.

D. Inspect products and report damage or violation of delivery, storage, and handling requirements to Engineer.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty for defects in material and workmanship for 24 months from date of shipment. Complete forms in Owner's name and register with manufacturer.
   1. Except for circuit breakers in service entrance transfer switches and soft load transition switches, provide replacements for parts determined to be defective at no charge for 5 years from date of shipment.
   2. Provide replacements for main contacts determined to be defective at no charge for 10 years from date of shipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Schneider Electric; ASCO 7000 Series; www.ascopower.com/#sle.

B. Source Limitations: Provide automatic transfer switches, controllers, and accessories produced by same manufacturer as other electrical distribution equipment for project and obtained from single supplier.

2.02 LOW-VOLTAGE AUTOMATIC/NONAUTOMATIC TRANSFER SWITCHES

A. Basis of Design: Schneider Electric; ASCO 7000 Series; www.ascopower.com/#sle.

B. Description: Transfer switches consisting of inherently double-throw power transfer switch with solenoid-operated mechanism and microprocessor controller; automatic or nonautomatic operation as indicated.
   1. Automatic Transfer Switches: Transfer switches with automatically initiated transfer between sources.
   2. Nonautomatic Transfer Switches: Transfer switches with manually initiated transfer between sources.

C. Comply with NEMA ICS 10 Part 1 and IEC 60947-6-1; list and label as complying with UL 1008 and, where applicable, UL 891 or UL 1558.

D. Transfer Switch Construction:
   1. Electrically operated, mechanically held.
   2. Provide one type of main operator for available sizes for ease of maintenance and commonality of parts.
   3. Positively locked, unaffected by momentary outages, such that contact pressure is maintained at constant value and contact temperature rise is minimized for maximum reliability and operating life.
   4. Main Contacts: Silver composition.
   5. Designed to allow inspection of contacts from front without disassembly of operating linkages and disconnection of power conductors.
   6. Stationary and Moveable Contacts: Removable and replaceable without removing power conductors and/or bus bars.
   7. Switches Rated 800 A and Greater: Provide segmented, blow-on construction for high withstand and close-on capability, protected by separate arcing contacts.
   8. Devices utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

E. Transition Modes:
   1. Open Transition:
      a. Transfer load between power sources using 2-position, break-before-make switch.
      b. Maximum Transfer Time to Alternate Source: 100 milliseconds.
      c. Electrical Operator: Momentarily energized, single-solenoid mechanism.
      d. Mechanically interlocked to allow only two possible positions, normal or emergency.
      e. Main operators which include overcurrent disconnect devices, linear motors, or gears are not acceptable.
   2. Delayed Transition:
      a. Transfer load between power sources using 2-position, break-before-make switch with user-defined interruption period in both directions.
      b. Delay: Adjustable from 0 to 6 minutes with 1-second resolution.
      c. Electrical Operator: Dual solenoid mechanism, momentarily energized.
      d. Provide both electrical and mechanical interlocks to prevent both sets of main contacts from being closed at same time.
      e. Main operators which include overcurrent disconnect devices, linear motors, or gears are not acceptable.
   3. Closed Transition:
      a. Transfer load between power sources without interruption by momentarily connecting both sources of power only when both sources are present and acceptable.
      b. Source Requirements for Transfer:

1) Voltage Differential: Maximum of 5 percent.
2) Frequency Differential: Maximum of 0.2 Hz.
3) Phase Angle Differential: Maximum of 5 degrees.

c. Maximum Interconnection Time: 100 milliseconds.
1) If both normal and emergency main contacts remain closed in excess of 100 milliseconds, after preset time delay attempt to return transfer switch to "safe" state by removing paralleled condition using the following procedure:
(a) Open last set of contacts that closed to remove overlap condition.
(b) Activate red "TS Locked Out" indicator light.
(c) Lock out controller from further automatic operation until reset with "TS Locked Out" pushbutton.
2) If main contacts still remain paralleled after procedure above, use separate independent extended parallel alarm timer to operate output relay with two form C contacts to alarm extended overlap condition and shunt trip either normal or emergency source circuit breaker.

d. Operate as open transition, break-before-make switch when power source serving load fails or becomes unacceptable.
e. Accomplish transfer with no power interruption, without altering or actively controlling standby generator.
f. Electrical Operator: Dual solenoid mechanism, momentarily energized.
g. Main operators which include overcurrent disconnect devices, linear motors, or gears are not acceptable.

F. Withstand and Closing Ratings:
1. Rate to close on and withstand available RMS symmetrical short circuit current at terminals with overcurrent protection indicated.
2. Label with UL 1008, 0.025- or 0.050-second, time-based ratings, or appropriate short-time rating(s) as applicable. Transfer switches which have only series or specific-breaker ratings are not acceptable.
3. Include 0.3-second, 18-cycle, short-time rating as standard for switch sizes 600 through 4,000 A for selective coordination purposes.

G. Neutral Configurations:
1. Solid Neutral: Provide neutral conductor plate with fully rated AL-CU pressure connectors.
2. Switched Neutral: Provide fully-rated switched (break-before-make) neutral transfer contacts.
3. Overlapping Neutral:
a. Provide fully rated overlapping neutral transfer contacts.
b. Connect neutrals of normal and emergency power sources together only during transfer and retransfer operation; maintain connection until power source contacts close on source to which transfer is being made.
c. Maximum Neutral Overlapping Time: 100 milliseconds.

H. Enclosures:
1. Comply with UL 50.
2. UL 50E Rating, Unless Otherwise Indicated:
a. Indoor Clean, Dry Locations: Type 1 or Type 12.
b. Outdoor Locations: Type 3R or Type 4.

I. Pilot Devices:
1. Provide 0.63 inch (16 mm), industrial-grade, door-mounted switches and pilot lights to facilitate viewing and replacement.
2. Provide separate removable plate for door controls, supplied loose for open type units.
3. Provide three-position momentary switch for test/automatic/reset modes.
a. Test Position: Simulates normal source failure.
b. Reset Position: Bypass time delays on either transfer to emergency or retransfer to normal.

4. Provide 0.63 inch (16 mm), industrial-grade, type 12 LED indicating lights, consisting of one green LED to indicate when transfer switch is connected to normal source and one red LED to indicate when transfer switch is connected to emergency source.
5. Provide 0.63 inch (16 mm), industrial-grade, type 12 LED indicating lights, energized by controller outputs to indicate true source availability of normal/emergency sources as determined by voltage sensing trip/reset settings for each source.

J. Controller:
1. Construction:
   a. Provide single, built-in microprocessor for controller's sensing and logic for maximum reliability and minimum maintenance.
   b. Provide capability for serial communication through separate module.
   c. Provide single controller with 12 selectable nominal voltages for maximum application flexibility and minimal spare part requirements.
   d. Connect controller to transfer switch with interconnecting wiring harness, including keyed disconnect plug to enable controller disconnection from transfer switch for routine maintenance.
   e. Provide multi-layer printed circuit boards for sensing and control logic.
   f. Provide industrial-grade, plug-in interfacing relays with dust covers.
   g. Provide enclosure with protective cover mounted separately from transfer switch unit for safety and ease of maintenance. Include built-in pocket for storage of operator92s manuals.
   h. Wire customer connections to common terminal block to simplify field-wiring connections.
2. Voltage Sensing: True RMS, accurate to within plus/minus 1 percent of nominal voltage.
3. Frequency Sensing: Accurate to within plus/minus 0.2 percent.
4. Service Conditions:
   a. Ambient Operating Temperature: Between minus 4 degrees F (minus 20 degrees C) and 140 degrees F (60 degrees C).
   b. Ambient Storage Temperature: Between minus 67 degrees F (minus 55 degrees C) and 185 degrees F (85 degrees C).
5. Electromagnetic Compatibility (EMC):
   a. IEC CISPR 11, Group 1, Class A.
   b. IEC 61000-4-2.
   c. IEC 61000-4-3.
   d. IEC 61000-4-4.
   e. IEC 61000-4-5.
   f. IEC 61000-4-6.
   g. IEC 61000-6-2.
6. Controller Display/Keypad:
   a. Provide integral four-line, 20-character LCD display and keypad for viewing available data and setting operational parameters.
   b. Make operational parameters available for viewing and limited control through serial communications input port.
   c. Make the following operational parameters adjustable only via controller DIP switches:
      1) Nominal line voltage and frequency.
      2) Single or three phase sensing.
      3) Operating parameter protection.
      4) Transfer operating mode configuration (open, closed, or delayed transition).
   d. Controller Instructions and Settings: Accessible, readable, and accomplished without use of codes, calculations, or instruction manuals.
7. Provide the following integral features, capable of being activated through keypad programming:

a. Commit to Transfer: Selectable to determine whether load should be transferred to emergency generator if normal source restores before generator is ready to accept load.
b. Engine Exerciser:
1) Enables user to program up to seven different exercise routines.
2) Programmable Routine Parameters:
(a) Enable/disable routine.
(b) Enable/disable transfer of load during routine.
(c) Start Time: By time of day, day of week, and week of month (first, second, third, fourth, alternate, or every week).
(d) Duration of run.
3) At end of specified duration, transfer load back to normal source and run generator for specified cool down period.
c. Provide terminals for remote contact which close to signal transfer to emergency source. If emergency source fails while connected to emergency source, but normal source is acceptable, override transfer command and return to normal source.
d. System Status: Provide system status screen for controller LCD display, accessible from menu by pressing 93ESC94 key maximum of two times. Display clear description of active operating sequence and switch position, such as "Normal Failed; Load on Normal; TD Normal to Emergency; 2 min 15 s".
e. Self-Diagnostics: Provide diagnostics screen for detecting system errors. Provide information on status input signals to controller, which may prevent load transfer commands from being completed.
f. Data Logging: Log data, storing previous 99 events in nonvolatile memory, retained in event of total power loss; include the following:
1) Event Logging:
(a) Data, time, and reason for transfer from normal to emergency.
(b) Data, time, and reason for transfer from emergency to normal.
(c) Data, time, and reason for engine start.
(d) Data and time engine stopped.
(e) Data and time emergency source available.
(f) Data and time emergency source not available.
2) Statistical Data:
(a) Total number of transfers.
(b) Total number of transfers due to source failure.
(c) Total number of days controller has been energized.
(d) Total number of hours both normal and emergency sources have been available.

K. Voltage, Frequency, and Phase Rotation Sensing:
1. Voltage and Frequency Sensing: Continuously monitored on normal and emergency sources with the following minimum pickup and dropout/trip capabilities:
a. Undervoltage:
1) Sources: Normal and emergency, 3 phase.
2) Dropout/Trip: 70 to 98 percent.
3) Pickup/Reset: 85 to 100 percent.
b. Overvoltage:
1) Sources: Normal and emergency, 3 phase.
2) Dropout/Trip: 102 to 115 percent.
3) Pickup/Reset: 2 percent below trip.
c. Under Frequency:
1) Sources: Normal and emergency.
2) Dropout/Trip: 85 to 98 percent.
3) Pickup/Reset: 90 to 100 percent.
d. Over Frequency:

1) Sources: Normal and emergency.
2) Dropout/Trip: 102 to 110 percent.
3) Pickup/Reset: 2 percent below trip.

e. Voltage Unbalance:
1) Sources: Normal and emergency.
2) Dropout/Trip: 5 to 20 percent.
3) Pickup/Reset: 1 percent below dropout.

2. Repetitive Accuracy of Settings: Within plus/minus 0.5 percent over operating temperature range of minus 4 degrees F (minus 20 degrees C) to 140 degrees F (60 degrees C).
3. Voltage and Frequency Settings: Field adjustable in 1-percent increments locally via display/keypad or remotely via serial communications port access.
4. When activated by keypad or through serial port, capable of sensing phase rotation of both normal and emergency sources and rejecting source if phase rotation does not match rotation reference selected in settings (ABC or CBA).
5. Source Status Screens: For normal and emergency sources, display digital readout of voltage on each phase, frequency, and phase rotation.
6. Include selectable algorithm to:
a. Prevent repeated transfer cycling to source which experiences primary-side, single-phase failures on grounded-wye-to-grounded-wye transformer then regenerates voltage when unloaded.
b. Inhibit retransfer to normal/utility source upon detection of single-phasing condition until dedicated timer expires, alternate source fails, or normal source fails and is restored during time delay period; time delays adjustable via display/keypad.

L. Time Delays:
1. Provide adjustable time delay of 0 to 6 seconds for override of momentary normal source outages and delay of transfer and engine starting signals. Provide capability to extend time delay to 60 minutes by providing external 24 VDC power supply.
2. Provide time delay on transfer to emergency, adjustable from 0 to 60 minutes, for controlled timing of load transfer to emergency source.
3. Delayed Transition:
a. Provide adjustable time delay of 0 to 6 seconds to override momentary emergency source outage to delay retransfer signals during initial loading of engine generator set.
b. Provide adjustable time delay of 0 to 5 minutes for load disconnect position for delayed transition operation.
c. Time Delays: Adjustable via display/keypad; value displayed on LCD or remote device to represent remaining time until next event occurs.
4. Closed Transition:
a. Provide adjustable time delay of 1 to 5 minutes on failure to synchronize normal and emergency sources prior to transfer.
b. Provide adjustable time delay of 0.1 to 1 second on extended parallel condition of both power sources during transfer.
5. Provide two time delay modes on retransfer to normal source, independently adjustable from 0 to 60 minutes; one for normal source power failures and one for test mode function. Automatically bypass time delay if emergency source fails and normal source is acceptable.
6. Provide time delay on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.
7. Provide time-delay-activated output signal to drive external relay(s) for selective load disconnect control; capable of activating adjustable time delay of 0 to 5 minutes in following modes:
a. Prior to transfer only.
b. Prior to and after transfer.
c. Normal to emergency only.
d. Emergency to normal only.

e. Normal to emergency and emergency to normal.
f. All transfer conditions or only when both sources are available.

8. Time Delays: Adjustable in 1 second increments, except extended parallel time to be adjustable in 0.01 second increments.

M. Provide SPDT contact, rated 5 A at 30 VDC, for low-voltage engine start signal; prevents dry cranking of engine by requiring generator set to reach proper output and run for duration of cool-down setting, regardless of whether normal source restores before load is transferred.

N. Provide auxiliary contacts, rated 10 A at 250 VAC, consisting of one contact which is closed when transfer switch is connected to normal source and one contact which is closed when transfer switch is connected to emergency source.

2.03 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Factory test for proper operation of individual components and compliance with sequence of operation. Verify operating transfer time, voltage, frequency, and time delay settings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer92s written instructions.

B. Install transfer switches in accordance with NECA 1.

C. Unless otherwise indicated, install and anchor floor-mounted transfer switches on raised concrete pad 4 inches (100 mm) high; see Section 03 30 00.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Manufacturer Services: Provide services of manufacturer's field representative to perform functional testing, commissioning, and first parameter adjusting.

1. Include necessary material, equipment, labor, and technical supervision.
2. Replace damaged or malfunctioning equipment and report discrepancies or installation issues.
3. Identify transfer switches with label indicating inspection/testing agency and date of service.

C. Correct deficiencies and replace damaged or defective transfer switches or associated components.

3.03 PROTECTION

A. Protect installed transfer switches from subsequent construction operations.

END OF SECTION

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 33.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.

B. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

F. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

C. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 WARRANTY

A. Manufacturer and Installer agree to repair or replace components of luminaries that fail in materials or workmanship within specified warranty period.

B. Warranty period of five years

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Manufacturers:
   1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
   2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.03 EMERGENCY LIGHTING UNITS

A. Manufacturers:
   1. Acuity Brands, Inc; _____: www.acuitybrands.com/#sle.
   2. Cooper Lighting, a division of Cooper Industries; _____: www.cooperindustries.com/#sle.

B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

C. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

D. Battery:
   1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

E. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

F. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.04 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single- or double-face as indicated or as required for installed location.
   2. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
   1. Manufacturers:
      a. Acuity Brands, Inc; _____: www.acuitybrands.com/#sle.
      b. Cooper Lighting, a division of Cooper Industries; _____: www.cooperindustries.com/#sle.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
   4. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Emergency Lighting Units:
   1. Unless otherwise indicated, connect unit to unswitched power from circuit indicated. Bypass local switches, contactors, or other lighting controls.

J. Exit Signs:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

K. Install lamps in each luminaire.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.03 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.04 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

B. Lighting manufacturer to provide factory representative to program all lighting control stations per owner directive.

C. Provide 4 hours of training for Owner Representative.

END OF SECTION

SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Poles and accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 33.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.

B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources ; 2021.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 1598 - Luminaires; Current Edition, Including All Revisions.

H. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:
   a. Include estimated useful life, calculated based on IES LM-80 test data.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 WARRANTY

A. Manufacturer and Installeer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period

B. Warranty period: five years from date of substaintial completion. CONFIRM WARRANTY

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Manufacturers:
   1. Acuity Brands, Inc; _____: www.acuitybrands.com/#sle.
   2. Cooper Lighting, a division of Cooper Industries; _____: www.cooperindustries.com/#sle.

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

H. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

I. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

J. Exposed Hardware: Stainless steel.

2.03 POLES

A. Manufacturers:
   1. Acuity Brands, Inc; _____: www.acuitybrands.com/#sle.
   2. Cooper Lighting, a division of Cooper Industries; _____: www.cooperindustries.com/#sle.

B. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
   2. Structural Design Criteria:
      a. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
         1) Design Wind Speed: _____ miles per hour (_____ kph), with gust factor of 1.3.

b. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.
3. Material: Steel, unless otherwise indicated.
4. Shape: Square straight, unless otherwise indicated.
5. Finish: Match luminaire finish, unless otherwise indicated.
6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Pole-Mounted Luminaires:
1. Maintain the following minimum clearances:
a. Comply with IEEE C2.
b. Comply with utility company requirements.
2. Foundation-Mounted Poles:
a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 30 00.
1) Install anchor bolts plumb per template furnished by pole manufacturer.
2) Position conduits to enter pole shaft.
b. Tighten anchor bolt nuts to manufacturer's recommended torque.
3. Grounding:
a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
4. Install separate service conductors, size as indicated on drawings, from each luminaire down to handhole for connection to branch circuit conductors.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Install lamps in each luminaire.

3.02 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.03 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

B. Lighting manufacturer to provide factory representative to program all lighting control stations per owner directive.

C. Provide four hours of training for Owner Representative.

END OF SECTION

SECTION 27 05 00 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

RELATED DOCUMENTS

2.01 DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

2.02 SUMMARY

2.03 SECTION INCLUDES:

A. Metal conduits and fittings.

B. Nonmetallic conduits and fittings.

C. Optical-fiber-cable pathways and fittings.

D. Boxes, enclosures, and cabinets.

1. Related Requirements:
    a. Division 27 Section "Communications Equipment Room Fittings" for voice and data cabling associated with system panels and devices.
        1) Division 27 Section "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.
        2) Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.
    b. c. Install: Operations at project site including unloading, temporarily storing, Unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
    c. Provide: Furnish and install, complete and ready for the intended use.

PART 2 - PRODUCTS

METAL CONDUITS AND FITTINGS

4.01 MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY THE FOLLOWING:

A. AFC Cable Systems, Inc.

B. Allied Tube & Conduit: a Tyco International Ltd. Co.

C. Alpha Wire Company.

D. Anamet Electrical, Inc.

E. Southwire Company.

F. Thomas & Betts Corporation.

G. Western Tube and Conduit Corporation.

H. Wheatland Tube Company; a division of John Maneely Company.

1. Approved Equals.
    a. General Requirements for Metal Conduits and Fittings:
        1) Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
        2) Comply with TIA-569-B.
    b. GRC: Comply with ANSI C80.1 and UL 6.
    c. ARC: Comply with ANSI C80.5 and UL 6A.
    d. IMC: Comply with ANSI C80.6 and UL 1242.
    e. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
        1) Comply with NEMA RN 1.
            (a) Coating Thickness: 0.040 inch, minimum.
    f. EMT: Comply with ANSI C80.3 and UL 797.
    g. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1) Conduit Fittings for Hazardous (Classifiedj Locations: Comply with UL 886 and NFPA 70.
2) Fittings for EMT:
(a) Material: Steel or die cast.
(b) Type: Setscrew.
(1) Expansion Fittings: PVC or steel to match conduit type, complying with UL- 467, rated for environmental conditions where installed, and including flexible external bonding jumper.
(2) Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040
(3) inch, with overlapping sleeves protecting threaded joints.
(4) Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2. NONMETALLIC CONDUITS AND FITTINGS
a. Manufacturers: Subject to compliance with requirements, provide products by the following:
1) AFC Cable Systems, Inc.
2) Allied Tube & Conduit: a Tyco International Ltd. Co.
3) Anamet Electrical, Inc.
4) Arnco Corporation.
5) CANTEX Inc.
6) CertainTeed Corp.
3. Condux International, Inc.
4. OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS
a. Manufacturers: Subject to compliance with requirements, provide products by the following:
1) Alpha Wire Company.
(a) Arnco Corporation.
(1) Endot Industries Inc.
(2) IPEX.
(3) Lamson & Sessions; Carlon Electrical Products.
(4) Approved Equals.
b. Description: Comply with UL 2024: flexible-type pathway, approved for plenum installation unless otherwise indicated.
1) Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
(a) Comply with TIA-569-B.
5. METAL WIREWAYS AND AUXILIARY GUTTERS (Not used on this project)
a. Manufacturers: Subject to compliance with requirements, provide products by the following:
1) Cooper B-Line, Inc.
2) Hoffman; a Pentair company.
3) Mono-Systems, Inc.
4) Square D: a brand of Schneider Electric.
b. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
1) Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2) Comply with TIA-569-B.
c. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

d. Wireway Covers: Hinged type unless otherwise indicated.
e. Finish: Manufacturer's standard enamel finish. 1.
   1) 2. Thomas & Betts Corporation.
f. General Requirements for Nonmetallic Conduits and Fittings:
   1) Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2) Comply with TIA-569-B.
g. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise
   1) indicated.
h. Rigid HDPE: Comply with UL 651 A. Continuous HDPE: Comply with UL 651B.
i. RTRC: Comply with UL 1684A and NEMA TC 14.
j. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
k. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
l. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services'"Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

6. NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS
   a. Manufacturers: Subject to compliance with requirements, provide products by the following:
      1) Allied Moulded Products, Inc.
      2) Hoffman; a Pentair company.
      3) Lamson & Sessions; Carlon Electrical Products.
      4) Niedax-Kleinhuis USA, Inc.
   b. General Requirements for Nonmetallic Wireways and Auxiliary Gutters:
      1) Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
         (a) Comply with TIA-569-B.
   c. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil- resistant gaskets.
   d. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.
   e. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.
   f. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   g. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services'"Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

7. SURFACE PATHWAYS (Not used on this project)
   a. General Requirements for Surface Pathways:
      1) Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
      2) Comply with TIA-569-B.
   b. Surface Nonmetallic Pathways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from

manufacturer's standard colors. Product shall comply with UL-94 V-0 requirements for self-extinguishing characteristics.

1) Manufacturers: Subject to compliance with reqUirements, provide products by the following:
   (a) Hubbell Incorporated: Wiring Device-Kellems Division.
   (b) Lamson & Sessions: Carlon Electrical Products.
   (c) Mono-Systems, Inc.
   (d) Panduit Corp.
   (e) Wiremold / Legrand.

c. General Requirements for Boxes, Enclosures and Cabinets:

8. BOXES, ENCLOSURES, AND CABINETS
   a. Manufacturers: Subject to compliance with requirements, provide products by the following:
      1) Install a owner supplied wall cabinet. Contact owner for cabinet delivery.
   b. General Requirements for Boxes, Enclosures, and Cabinets:
      1) Comply with TIA-569-B.
      2) Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.
   c. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
   d. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.
   e. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
   f. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
   g. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized, cast iron with gasketed cover.
   h. Device Box Dimensions: 4 inches square by 2-1/2 inches deep.
   i. Gangable boxes are allowed.
   j. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
      1) Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
      2) Interior Panels: Steel: all sides finished with manufacturer's standard enamel.
   k. Cabinets:
      1) NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
         (a) Hinged door in front cover with flush latch and concealed hinge.
            (1) Key latch to match panelboards.
            (2) Metal barriers to separate wiring of different systems and voltage.
            (3) Accessory feet where required for freestanding equipment.

9. PATHWAY APPLICATION
   a. Outdoors: Apply pathway products as specified below unless otherwise
      1) indicated:
         (a) Exposed Conduit: RNC, Type EPC-40-PVC.
            (1) Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC.
            (2) Underground Conduit: RNC, Type EPC-40-PVC, direct buried concrete
            (3) encased.
            (4) Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
   b. Indoors: Apply pathway products as specified below unless otherwise indicated:
      1) Exposed, Not SUbject to Physical Damage: EMT or RNC.
      2) Exposed, Not Subject to Severe Physical Damage: EMT.
      3) Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:
         (a) Loading dock.

(b) Corridors used for traffic of mechanized carts, forklifts, and pallet- handling units.
(c) Mechanical rooms.
(d) Gymnasiums
(1) Concealed in Ceilings and Interior Walls and Partitions: EMT RNC, Type EPC-
(2) 40-PVC or innerduct.
(3) Damp or Wet Locations: GRC IMC.
(4) Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway Plenum-type, communications-cable pathway EMT Insert pathway type.
(5) Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: Riser-type, optical-fiber-cable pathway Riser-type, communications-cable pathway EMT Insert pathway type.
(e) Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical-fiber-cable pathway Riser-type, optical-fiber-cable pathway Plenum-type, optical-fiber-cable pathway General-use, communications-cable pathway Riser-type, communications-cable pathway Plenum-type, communications-cable pathway EMT.
(1) Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250 Type 4 stainless steel nonmetallic in institutional and commercial kitchens and damp or wet locations.

c. Minimum Pathway Size: 3/4-inch trade size. Minimum size for optical-fiber cables
1) is 1 inch.
d. Pathway Fittings: Compatible with pathways and suitable for use and location.
1) Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2) PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3) EMT: Use setscrew, steel or cast-metal fittings. Comply with NEMA FB 2.10.
e. Do not install aluminum conduits, boxes, or fittings in contact with concrete or
1) earth.
f. Install surface pathways only where indicated on Drawings.
g. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg
1) F.

10. INSTALLATION
a. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA
1) 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
2) Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
b. Complete pathway installation before starting conductor installation.
c. Comply with requirements in Section 260529 "Hangers and Supports for Electrical
1) Systems" for hangers and supports.
d. Arrange stub-ups so curved portions of bends are not visible above finished slab.
e. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.

f. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
g. Support conduit within 12 inches of enclosures to which attached.
h. Pathways Embedded in Slabs:
    1) Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10- foot intervals.
    2) Arrange pathways to cross building expansion joints at right angles with expansion fittings.
    3) Arrange pathways to keep a minimum of 2 inches of concrete cover in all
        (a) directions.
            (1) Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
            (2) Change from ENT to RNC, Type EPC-40-PVC, GRC or IMC before rising
            (3) above floor.
i. Stub-ups to Above Recessed Ceilings:
    1) Use EMT, IMC, or RMC for pathways.
    2) Use a conduit bushing or insulated fitting to terminate stub-ups not
        (a) terminated in hubs or in an enclosure.
j. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.
k. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.
l. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.
m. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
n. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
o. Cut conduit perpendicular to the length. For conduits of 2-inc. Cap underground pathways designated as spare above grade alongside pathways in use.h trade size and larger, use roll cutter or a guide to ensure cUt is straight and perpendicular to the length.
p. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-Ibtensile strength. Leave at least 12 inchesof slack at each end of pull wire
q. Surface Pathways:
    1) Install surface pathway for surface telecommunications outlet boxes only
        (a) where indicated on Drawings.
            (1) Install surface pathway with a minimum 2-inch radius control at bend
            (2) points.
            (3) Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
r. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:
    1) 3/4-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50
        (a) feet.

(1) 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75
(2) feet.
(3) Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

s. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway sealing fittings according to NFPA 70.

t. Install devices to seal pathway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
1) Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2) Where an underground service pathway enters a building or structure.
3) Where otherwise required by NFPA 70.

u. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

v. Expansion-Joint Fittings:
1) Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
(a) Install type and quantity of fittings that accommodate temperature
(1) change listed for each of the following locations:
(2) Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
(b) Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight rUn per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
(1) Install expansion fittings at all locations where conduits cross building or structure expansion joints.
(2) Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

w. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

x. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

z. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

aa. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

1) Set metal floor boxes level and flush with finished floor surface.

11. INSTALLATION OF UNDERGROUND CONDUIT
    a. Direct-Buried CondUit:
        1) Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
            (a) Install backfill as specified in Section 312000 "Earth Moving."
                (1) After installing conduit, backfill and compact. Start at tie-in point, and work toward end of condUit run, leaving condUit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
                (2) Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
                (3) Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
                (4) Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
                (5) For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
                (6) ó. Warning Planks: Bury warning planks approximately 12 inches above direct- buried conduits, but a minimum of 6 inches below grade. Align planks along centerline of conduit.
                (7) 7. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

12. SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS
    a. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

13. FIRESTOPPING
    a. A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

14. PROTECTION
    a. Protect coatings, finishes, and cabinets from damage or deterioration.
        1) Repair damage to galvanized finishes with zinc-rich paint recommended by manufactUrer.
            (a) Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 27 05 04 - COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1. SUMMARY
   a. Section Includes: Pathways.
      1) UTP cable.
         (a) Optical fiber cabling.
            (1) Cable connecting hardware, patch panels, and cross-connects.
            (2) Cabling identification products.
         (b) Related Sections:
            (1) Division 27 Section "Sleeves and Sleeve Seals for Communications Pathways and Cabling.
            (2) Division 27 Section "Communications Equipment Room Fittings" for associated communications cabling associated with system panels and devices.
            (3) Division 27 Section "Communications Horizontal Cabling" for associated communications cabling associated with system panels and devices.
            (4) Division 27 Section "Telecommunications Grounding and Bonding".
   b. DEFINITIONS
      1) BICSI: Building Industry Consulting Service International.
      2) Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
      3) EMI: Electromagnetic interference.
      4) IDC: Insulation displacement connector. LAN: Local area network.
         (a) RCDD: Registered Communications Distribution Designer.
         (b) UTP: Unshielded twisted pair.
      5) Furnish: Supply and deliver to Project site, ready for unloading, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
      6) Install: Operations at project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
         (a) Provide: Furnish and install, complete and ready for the intended use.
   c. BACKBONE CABLING DESCRIPTION
      1) Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.
      2) Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.
      3) Backbone cabling will include a Fiber Trunk Cable from the Elementary MDF to the Middle School MDF. This will be placed in underground conduit placed by others. Any splicing in this section will be fusion spliced.
   d. PERFORMANCE REQUIREMENTS
      1) General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-C.I, when tested according to test procedures of this standard.
   e. ACTION SUBMITTALS

1) Product Data with Shop Drawings:
   (a) Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
      (1) Provide as a single complete system submittal with master product list referencing each paragraph in this section specifying product.

f. INFORMATIONAL SUBMITTALS
   1) Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

g. QUALITY ASSURANCE
   1) All Work specified under this Section shall be fully compliant with following: ANSI/TIA-568-C.1-2009 "Commercial Building Telecommunications Cabling
      (a) Standard (Currently Ratified) including all addenda and subsets."
         (1) ANSI/TIA-569-C-2012 " Telecommunications Pathways and Spaces (Currently Ratified) including all addenda and subsets."
         (2) ANSI/TIA-606-B-2012 "Administrative Standard for Telecommunications Infrastructure (Currently Ratified) including all addenda and subsets."
         (3) ANSI-TIA-607-B-2012 "Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises (Currently Ratified) including all addenda and subsets."
         (4) ANSI/TIA-758-B-2012 "Customer-owned Outside Plant Telecommunications Infrastructure Standard (Currently Ratified) including all addenda and subsets."
      (b) In addition, all Work shall fully comply with these specifications and related Drawings and all manufacturers' recommended installation practices.
      (c) Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff and shall have a thorough understanding of all standards referenced in this Section.
      (d) Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
         (1) Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present when any work of this Section is performed at Project site.
         (2) Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on- site testing.
      (e) C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2) Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A. Grounding: Comply with ANSI-J-STD-607-A.

h. DELIVERY, STORAGE, AND HANDLING
   1) Test cables upon receipt at Project site.
      (a) Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
         (1) l. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.
         (2) 2. Test each pair of UTP cable for open and short circuits.

i. PROJECT CONDITIONS

1) Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HV AC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

j. COORDINATION
1) Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.01 PATHWAYS

A. All communication, data and control cable shall be installed in conduit. General Requirements: Comply with TIA/EIA-569-B.

B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

C. Support brackets with cable tie slots for fastening cable ties to brackets.
1. l. J-hooks.
a. Straps and other devices.
1) Cable Trays:
(a) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
(1) Cooper B-Line, Inc.
(2) Caddy
(3) ECable Tray Material: Metal, suitable for indoors, and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inches thick.
(4) Basket Cable Trays: None called out on this project.
(b) Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
(1) Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1 /2 inches deep.
2. TRUNK CABLE
a. Manufacturers: Subject to compliance with requirements, provide products by one of the following: NO COPPER TRUNK CALLED OUT ON THIS PROJECT.
1) Belden CDT Inc.; Electronics Division.
(a) Berk-Tek; a Nexans company.
(1) CommScope, Inc.
(2) General Cable
(3) Mohawk; a division of Belden CDT.
(4) Superior Essex Inc.
(b) Description: 100-ohm, 4-pair UTP.
(1) Comply with ICEA S-90-661 for mechanical properties.
(2) Comply with TIA/EIA-568-C.l for performance specifications.
(3) Comply with TIA/EIA-568-C.2, Category 6.
(4) Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
(5) Communications, Plenum Rated: Type CMP or MPP, complying with
(6) NFPA 262.
3. UTP CABLE HARDWARE
a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1) PANDUIT

(a) General Requirements for Cable Connecting Hardware: Comply with TIA/EIA- 568-C.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
(b) Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
(1) Number of Jacks per Field: One for each four-pair UTP cable indicated.
(c) Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
(d) Patch Cords: Factory-made, 4-pair cables in lengths as required for proper connectivity at the patch panel; terminated with 8-position modular plug at each end. Excessive slack at the patch panel is not acceptable. Coordinate with Architect /Owner.
2) Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
(a) Patch cords shall have color-coded boots for circuit identification.
(b) Provide (2) per 4-pair installed.

4. OPTICAL FIBER CABLE INDOOR (NOT REQUIRED ON THIS PROJECT)
a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1) Corning Cable Systems.
(a) Description: SINGLEMODE FREEDOM One Tight Buffered, Interlocking Armored Cable, Riser, 12 fiber, Single Mode (OS2)
(b) Jacket:
(1) Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
(2) Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

5. OPTICAL FIBER CABLE OUTDOOR
a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1) Corning Cable Systems.
(a) Description: SINGLEMODE ALTOX Loose Tube, Gel-Free Cable, 12 Fiber, Single Mode (OS2) max. attenuation 0.4 db/km
(b) Jacket:
(1) Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
(2) Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

6. OPTICAL FIBER CABLE HARDWARE
a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1) Corning Cable Systems.
(a) Panduit
(b) Panels: Modular panels housing multiple-numbered, duplex cable connectors.
(1) Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria. Provide as required to house terminations of all fiber cable installed.
(c) Patch Cords: Factory-made, dual-fiber cables in lengths as required for proper connectivity at the patch panel. Excessive slack at the patch panel is

not acceptable. Coordinate with Architect/Owner. Provide (1) per each pair of fiber strands installed.

(d) Cable Connecting Hardware:

(1) Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with ANSI/TIA-568-C.3.

(2) All connectors will be LC type, utilizing fusion spliced pigtails. Insertion loss not more than 0.5 dB.

7. GROUNDING
   a. Comply with ANSI/TIA-607-B-2012.
8. LIGHTNING PROTECTION
   a. Provide proper lightning protection where applicable.
9. IDENTIFICATION PRODUCTS
   a. Comply with ANSI/TIA-606-B-2012 and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
10. SOURCE QUALITY CONTROL
    a. Factory test cables on reels according to ANSI/TIA-568-C.I.
    b. Factory test UTP cables according to ANSI/TIA-568-C.2.
    c. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and ANSI/TIA-568-C.3.
       1) Cable will be considered defective if it does not pass tests and inspections.
       2) Prepare test and inspection reports.

PART 3 - EXECUTION

3.01 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.
   1. CLEANING AND PROTECTION
      a. Protect system components from damage and deterioration during installation. Protect equipment from dust and debris during installation. After installation maintain equipment protection. Notify other trades of equipment sensitivity to dust and debris. Clean equipment upon final completion of Work.
      b. Before final acceptance, clean system components.
   2. WIRING METHODS
      a. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
         1) This Project is an non-plenum enivorment.
         2) Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
            (a) Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
            (b) Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
   3. INSTALLATION OF PATHWAYS
      a. Cable Trays: Comply with NEMA VE 2 and ANSI/TIA-569-B-2012.
      b. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.
      c. Comply with ANSI/TIA-569-B-2012 for pull-box sizing and length of conduit and number of bends between pull points.

d. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
    1) Install manufactured conduit sweeps and long-radius elbows whenever possible.
    2) Pathway Installation in Communications Equipment Rooms:
        (a) Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
            (1) Install cable trays to route cables if conduits cannot be located in these positions.
            (2) Secure conduits to backboard when entering room from overhead.
            (3) Extend conduits 3 inches above finished floor.
            (4) Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
        (b) Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

4. INSTALLATION OF CABLES
    a. Comply with NECA 1.
    b. General Requirements for Cabling: Comply with ANSI/TIA-568-C.l.
        1) Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
            (a) Install 110-style IDC termination hardware unless otherwise indicated.
                (1) Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
                (2) Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
                (3) Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
                (4) Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
                (5) Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
                (6) Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
                (7) In the communications equipment room, install a 10-foot- long service loop on each end of cable.
                (8) Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
                (9) Provide patch cords as directed by the Owner.
            (b) UTP Cable Installation: Comply with ANSI/TIA-568-C.2.
                (1) Do not untwist UTP cables more than 1 /2 inch from the point of termination to maintain cable geometry.
            (c) Optical Fiber Cable Installation: Comply with ANSI/TIA-568-C.3.
                (1) Cable may be terminated on connecting hardware that is rack or cabinet
                (2) mounted.
        2) Open-Cable Installation:
            (a) Install cabling with horizontal and vertical telecommunications spaces with terminating interconnection equipment.

(b) guides in hardware and
(1) Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
(2) Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

3) Group connecting hardware for cables into separate logical fields.

4) Separation from EMI Sources:

(a) Comply with BICSI TDMM and ANSI/TIA-569-B-2012 recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
(1) Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
(2) Electrical Equipment Rating Less Than 2 kV A: A minimum of 5 inches. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
(3) Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
(4) Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1 /2 inches.
(5) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
(6) Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
(7) Electrical Equipment Rating Less Than 2 kVA: No requirement. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
(8) Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
(9) Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

5. FIRESTOPPING
   a. Comply with requirements in Division 07 Section "Penetration Firestopping." Comply with ANSI/TIA-569-B-2012, "Firestopping."
   b. Comply with BICSI TDMM, "Firestopping Systems" Article.
6. GROUNDING
   a. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
   b. Comply with ANSI/TIA-607-B-2012.
   c. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
   d. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.
7. IDENTIFICATION
   a. Identify system components, wiring, and cabling complying with ANSI/TIA-606-B- 20l 2. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
      1) Administration Class: 2.

(a) Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
(b) Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
(c) See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion about TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with ANSI/EIA-606-B-2012 for Class 2 level of administration.
(d) Comply with requirements in Division 27 Section "Communications Horizontal Cabling" for cable and asset management software.

2) Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
3) Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
(a) Cable and Wire Identification:
(1) Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
(2) Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
(3) Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 25 feet.
(4) Label each terminal strip and screw terminal in each cabinet, rack, or panel.
(5) Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
(6) Label each unit and field within distribution racks and frames.
(7) Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
(8) Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in ANSI/TIA- 606-B-2012, for the following:
(9) Cables use flexible vinyl or polyester that flexes as cables are bent.

8. FIELD QUALITY CONTROL
a. Testing Agency: a qualified testing agency to perform tests and inspections.
1) Tests and Inspections:
(a) I. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with ANSI/TIA-568-C.I.

(1) Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
(2) Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
(3) Test instruments shall meet or exceed applicable requirements in ANSI/TIA68-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
(4) Optical Fiber Cable Tests:
(5) Test instruments shall meet or exceed applicable requirements in ANSI/TIA68-C.2. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
(6) Link End-to-End Attenuation Tests:
(7) Horizontal and singlemode backbone link measurements: Test at 1310 and 1550 nm. The max attenuation should be 0.5 per TIA-568. Max loss shuld be 0.3 per fusion splice or less. The typical loss is .05 (fusion).
(8) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in ANSI/TIA-568-C. l.

(b) Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table l 0.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
(c) Remove and replace cabling where test results indicate that they do not comply with specified requirements.

2) End-to-end cabling will be considered defective if it does not pass tests and inspections.
(a) Prepare test and inspection reports.

END OF SECTION

SECTION 27 05 29 - HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other communications work.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition; 2022.

E. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

F. MFMA-4 - Metal Framing Standards Publication; 2004.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cable supports, channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.
   1. Fiberglass Channel/Strut Framing Systems: Include requirements for strength derating according to ambient temperature.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. TIA-569.
      b. NFPA 70.
      c. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of communications work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit Supports: Straps and clamps suitable for conduit to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

D. Metal Channel/Strut Framing Systems:
   1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
   2. Comply with MFMA-4.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
   2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners in accordance with manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION

SECTION 27 15 00 - COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.01 WORK INCLUDED

1.02 PROVIDE ALL LABOR, MATERIAL, TOOLS, AND EQUIPMENT FOR THE COMPLETE INSTALLATION OF WORK CALLED FOR IN THE CONSTRUCTION DOCUMENTS.

A. The contractor is directed to examine each and every section of the specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described that may relate to the provision of the work described herein. Materials and performance are specified herein that relate to these systems.

B. The use of proprietary or copyrighted names or reference to patented trade items with this specification or elsewhere in the Contract Documents is meant to establish a standard of quality and performance. All materials and equipment proposed for installation must meet or exceed all specified requirements.

C. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1. SCOPE OF WORK
    a. Install Data /Voice/ WAP / CCTV drops as called out on prints. This includes installing new Cat6 and Cat6a modular jacks, faceplates or surface boxes, terminating and labeling.
        1) Install blue data drops to each outlet and install blue Cat6 modules. Number of drops are indicated on prints. In the event there is no number called out the amount would be one drop.
            (a) Install one Green Cat6A data drops to each WAP location. Terminate in green Cat6a modules in a one-port surface mount box. Leave a 1O' foot coil at each location and suspend from a .75" J Hook. Label the box and the ceiling grid directly below the box. Test cable and label.
                (1) Install owner supplied and programmed wireless access point at each WAP location. Provide a 2' patch cable from jack module to WAP. This patch cable will be green in color.
                (2) Install 2 data drops to each projector location. Terminate with a RJ45 and coil in the box. These will be pulled to the projector during projector installation. Test cables and label.
                (3) Pull 1 Cat6e Purple data drop to each camera location. Terminate in a Purple Cat6e jack in a 1 port surface mount box. Leave a 1 O' coil suspended from a .75" J Hook. Test and label the cable, surface mount box and the ceiling grid below the coil. CCTV cameras will be installed and and provided by the camera vendor.
                (4) Build out the IDF as called out for in the prints. PROVIDE ALL MOUNTING HARDWARE REQIRED. MEET WITH THE OWNERS REP BEFORE STARTING BUILDOUT TO VERIFY EXACT LOCATION OF EQUIPMENT.
                (5) Pull Trunk Fiber to the IDF starting from the MDF. Verify route and footage with electrician. Leave a 1 O' coil in the MDF and the bus bar IDF. Keep these coils separate from the data drops if possible. Terminate all fibers in per drawings. All connectors will be LC type and fusion spliced. No mechanical connectors are allowed. All fiber and equipment to be Corning.
                (6) Install a OSP 12 Stand Single Mode fiber from the Elementary School IDF to the MDF. This will be pulled in conduit and hand holes provided by others. Leave a 1 O' coil at each end. Suspend this coil and provide support. At each hand hold leave a 1 O' coil.
                (7) Build-out cabinet as called out. Install straight patch panels. Install wire managers, blanks panel, install black blanks in any ports that do not have modules.

(8) Test all cables and have certified by your RCDD. These should be stamped with RCDD stamp and one paper copy and one electronic copy provided to the owner.
(9) Within sixty days of job completion provide PANDUIT PAN-GEN 15 Year Warranty to owner. With the warranty provide CAD AS BUILT DRAWINGS to the owner in electronic and paper versions. As builds should reflect approximate cable routing, rack details and print out of drop locations showing room, IDF, Patch Panel and Port numbers. Please set up a meeting with the owner's rep and I.T. Dept. to discuss final requirement. This can be
(10) done in conjunction with the MDF and IDF Build out meeting.
(11) This is a PANDUIT Project. NO SUBSTUITIONS ON UTP CABLE OR HARDWARE. See
(12) Approved Material List at the end of this section.
(13) Install Strain Relief bars on back of all patch panels.
(14) Install UPS supplies in the new IDF. The UPS will be a Liever GXT4-3000RT 120 or equal.
(15) SUMMARY
(16) Section Includes:
(17) l. Category 6e twisted pair cable.
(18) Category 6a twisted pair cable.
(19) Twisted pair cable hardware, including plugs and jacks.
(20) Cabling identification products.
(21) Grounding provisions for twisted pair cable.
(22) Source quality control requirements for twisted pair cable.

b. DEFINITIONS
1) Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
2) EMI: Electromagnetic interference.
3) FTP: Shielded twisted pair.
4) F/FTP: Overall foil screened cable with foil screened twisted pair.
5) F/UTP: Overall foil screened cable with unscreened twisted pair.
6) IDC: Insulation displacement connector.
7) LAN: Local area network.
8) Jack: Also commonly called an "outlet," it is the fixed, female connector.
9) Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.
(a) RCDD: Registered Communications Distribution Designer.
(1) Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
(2) Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
(3) S/FTP: Overall braid screened cable with foil screened twisted pair.
(4) S/UTP: Overall braid screened cable with unscreened twisted pairs.
(5) UTP: Unscreened (unshielded) twisted pair.

c. COPPER HORIZONTAL CABLING DESCRIPTION
1) Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.
(a) l . TIA-568-C. l requires that a minimum of two equipment outlets be installed for each work area.

(1) Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
(2) Bridged taps and splices shall not be installed in the horizontal cabling.
(3) A work area is approximately l 00 sq. ft., and includes the components that extend from the equipment outlets to the station equipment.
(4) The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

d. ACTION SUBMITTALS
1) Product Data:
(a) Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Provide as a single complete system submittal with master product list referencing each paragraph in this section specifying product.

e. INFORMATIONAL SUBMITTALS
1) Qualification Data: For RCDD, installation supervisor, and field inspector.

f. CLOSEOUT SUBMITTALS
1) Maintenance Data: For splices and connectors to include in maintenance manuals.

g. QUALITY ASSURANCE
1) Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
(a) l . Contractor responsible for this Section shall have a Registered Communications Distribution Designer (RCDD) on staff who will oversee and be responsible for this Project. RCDD shall have sufficient experience in this type project to be able to lend adequate technical support to field forces during installation, warranty period, and extended warranty periods or maintenance contracts.
(1) Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present any time work of this Section is performed at Project site.

h. DELIVERY, STORAGE, AND HANDLING
1) Test cables upon receipt at Project site.

1.03 TEST EACH PAIR OF TWISTED PAIR CABLE FOR OPEN AND SHORT CIRCUITS.

A. PROJECT CONDITIONS
1. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
a. COORDINATION
1) Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C. l, when tested according to test procedures of this standard.

2.02 TELECOMMUNICATIONS PATHWAYS AND SPACES: COMPLY WITH TIA-569-D.

A. Grounding: Comply with TIA-607-B.

1. GENERAL CABLE CHARACTERISTICS
    a. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:
        1) Communications, Non-plenum: Type CMR complying with UL 1666.
            (a) Communications, Non-plenum: Type CMP or Type CMR in listed plenum or riser communications raceway.
                (1) Communications, Non-plenum: Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
    b. CATEGORY 6 TWISTED PAIR CABLE
        1) Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.
            (a) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
                (1) General Cable; General Cable Corporation.
                (2) Panduit
                (3) Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
                (4) Conductors: 100-ohm, 23 AWG solid copper.
                (5) Shielding/Screening: Unshielded twisted pairs (UTP).
                (6) Cable Rating: Non-Plenum.
            (b) Jacket: color thermoplastic as follows:
                (1) Data - BLUE (Cat6e)
                (2) WIFI - GREEN (Cat6A)
                (3) CCTV - PURPLE OR VIOLET (Cat6e)
    c. TWISTED PAIR CABLE HARDWARE
        1) Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
            (a) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
                (1) This project is a PANDUIT CERTIFIED PROJECT. UTP cable can be Panduit or General GenSpeed 6000 Category 6 and Category 6A (WAP).
                (2) General Requirements for Twisted Pair Cable Hardware:
                (3) Comply with the performance requirements of Category 6e and 6A.
                (4) Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
                (5) Cables shall be terminated with connecting hardware of same category or higher.
                (6) Connecting Blocks:
                (7) 110-style IDC for Category 6e and 6A.
                (8) Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.
                (9) Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
                (10) Number of Terminals per Field: One for each conductor in assigned cables.
                (11) Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
                (12) 1 . Features:
                (13) Universal T568A and T568B wiring labels.
                (14) Labeling areas adjacent to conductors.

(15) Replaceable connectors.
(16) 24 or 48 ports.
(17) Construction: 16-gauge steel and mountable on 19-inch equipment racks.
(18) Number of Jacks per Field: One for each four-pair cable indicated, plus spares and blank positions adequate to suit specified expansion criteria.
(19) Patch Cords: Factory-made, four-pair cables in 36-inch lengths at the patch panel and 10-foot lengths at the Workstation Outlet; terminated with an eight- position modular plug at each end.
(20) Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
(21) Patch cords shall have color-coded boots for circuit identification.
(22) Provide (2) per horizontal cable installed; lengths as described above. Excessive slack at the patch panel is not acceptable. Coordinate with Architect /Owner.
(23) Plugs and Plug Assemblies:
(24) Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
(25) Standard: Comply with TIA-568-C.2.
(26) Jacks and Jack Assemblies:
(27) Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
(28) Designed to snap-in to a patch panel or faceplate.
(29) Standard: Comply with TIA-568-C.2.
(30) Faceplate:
(31) Two, Four, or Six port, vertical stainless steel single gang faceplates designed to mount to single gang wall boxes. Faceplate port quantity determined by the number of cables to be installed per the drawings at each location. Any unused ports to be blanked off.
(32) Eight, Ten, or Twelve port, vertical double gang stainless steel faceplates designed to mount to double gang wall boxes. Faceplate port quantity determined by the number of cables to be installed per the drawings at each location. Any unused ports to be blanked off.
(33) All faceplates will be stainless steel.
(34) For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
(35) Wall locations will require stainless steel plates with lugs for mounting phone.
(36) Flush mounting jacks, positioning the cord at a 90-degree angle.
(37) Legend:
(38) Machine printed, in the field, using adhesive-tape label.

d. IDENTIFICATION PRODUCTS
   1) Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

e. GROUNDING
   1) Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.
      (a) Comply with TIA-607-B.

f. SOURCE QUALITY CONTROL
   1) Factory test cables on reels according to TIA-568-C.1.
   2) Factory test twisted pair cables according to TIA-568-C.2.

(a) Cable will be considered defective if it does not pass tests and inspections.
(b) Prepare test and inspection reports.

PART 3 - EXECUTION

3.01 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.
   1. Install non-plenum cable.
      a. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."
         1) Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
            (a) Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.
      b. INSTALLATION OF PATHWAYS
         1) Comply with requirements for demarcation point, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings."
            (a) Comply with Section 270528 "Pathways for Communications Systems."
               (1) Comply with Section 270536 "Cable Trays for Communications Systems."
      c. INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES
         1) Comply with NECA 1 and NECA/BICSI 568.
            (a) General Requirements for Cabling:
               (1) Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
               (2) Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
               (3) Install 110-style IDC termination hardware unless otherwise indicated.
               (4) Do not untwist twisted pair cables more than 1 /2 inch from the point of termination to maintain cable geometry.
               (5) Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
               (6) MUTOA shall not be used as a cross-connect point.
               (7) Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
               (8) Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
               (9) Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
               (10) Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
               (11) Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

(12) In the communications equipment room, install a 10-foot- long service loop on each end of cable.
(13) Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.
(14) Open-Cable Installation:
(15) Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
(16) Suspend twisted pair cabling, not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
(17) Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
(18) Group connecting hardware for cables into separate logical fields.
(19) Separation from EMI Sources:
(20) Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
(21) Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
(22) Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
(23) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
(24) Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
(25) Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
(26) Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1 /2 inches.
(27) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
(28) Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
(29) Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
(30) Electrical Equipment Rating Less Than 2 kVA: No requirement.
(31) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
(32) Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
(33) Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
(34) Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

d. FIRESTOPPING
   1) Comply with requirements in Section 078413 "Penetration Firestopping."
      (a) Comply with TIA-569-D, Annex A. "Firestopping."
         (1) Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

e. GROUNDING

1) Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."
   (a) Comply with TIA-607-B and NECA/BICSI-607.
      (1) Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.
      (2) Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

f. IDENTIFICATION
   1) Identify system components, w1nng, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
      (a) Administration Class: Class 2.
         (1) 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
         (2) Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration, including optional identification requirements of this standard.
         (3) Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
         (4) Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
         (5) Cable and Wire Identification:
         (6) Label each cable within 6 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
         (7) Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
         (8) Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
         (9) Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
         (10) Label each unit and field within distribution racks and frames.
         (11) Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
         (12) Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:
         (13) Cables use flexible vinyl or polyester that flexes as cables are bent.

g. FIELD QUALITY CONTROL
   1) Perform tests and inspections.
      (a) Tests and Inspections:
         (1) Visually inspect twisted pair cabling jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568-C.1.
         (2) Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
         (3) Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross- connection.
         (4) Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
         (5) Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.
         (6) Remove and replace cabling where test results indicate that they do not comply with specified requirements.
         (7) End-to-end cabling will be considered defective if it does not pass tests and inspections.
         (8) Prepare test and inspection reports.
         (9) APPROVED MATERIAL PART LIST:
         (10) MANUF. PART# PATCH CORDS 3' BLUE PANDUIT UPSP3BUY
      (b) PATCH CORDS 3' GREEN PANDUIT UPSP3GRY
      (c) PATCH CORDS 3' PURPLE PANDUIT UPSP3VLY
      (d) PATCH CORDS 5' BLUE PANDUIT UPSP5BUY
      (e) PATCH CORDS 5' GREEN PANDUIT UPSP5GRY
      (f) PATCH CORDS 5' PURPLE PANDUIT UPSP5VLY
      (g) CAT6E BLUE CABLE GENERAL 7133900
      (h) CAT6E PURPLE CABLE GENERAL 7133909
      (i) CAT6A GREEN CABLE GENERAL 7133823
      (j) BLUE JACKS CAT6E PANDUIT CJ688TGBU
      (k) GREEN JACKS CAT6A PANDUIT CJ688TGGR
      (l) PURPLE JACKS CAT6E PANDUIT CJX88TGVL
      (m) BLUE KEYSTONE CAT6E PANDUIT NK688MBUW
      (n) MODULAR PLUG (RJ45) PANDUIT SP688-C
         (1) 48 PORT STRAIGHT PATCH PANEL PANDUIT CPP48FMWBLY
         (2) 24 PORT ANGLED PATCHPANEL PANDUIT CPPA24FMWBLY
         (3) 24 PORT STRAIGH PATCH PANEL PANDUIT CPP24FMWBLY
      (o) STRAIN RELIEF BARS PAN DUIT SRB 19D5BL
         (1) 1 U FIBER RACK TRAY CORNING CCH-01U
         (2) 12 PORT LC ADAPTOR PNL CORNING CCH-CP12-A9

(3) 12 STRAND SM OUTDOOR CORNING 012EU4-T4100D20
(p) LC FUSION CONNECTORS CORNING SOC-LCU-900-SM
(q) LC FUSION CONNECTOR FAN OUTCORNING SOC-LCU-FAN-SM
(r) MINI-COM FACEPLATE 4 PORT PANDUIT CFP4EI
(s) MINI-COM FACEPLATE 2 PORT PANDUIT CFP2EI
(t) MINI-COM STAINLESS WALL PLATE PANDUIT KWPY
(u) MINI-COM STAINLESS WS PLATE PANDUIT CFPL6SY
(v) MINI-COM 1 PORT SURFACE BOX PANDUITCBXI BL-A
(w) MINI-COM 2 PORT SURFACE BOX PANDUITCBX2BL-AY
(x) ICONS- PHONE PANDUIT CIPIG-C
(y) ICONS- DATA PANDUIT CIDBL-C
(z) POWER STRIP PANDUIT CMRPSH20
(1) RACK BUSBAR KIT PAN DUIT RGRB 19Y
(aa) GOUND JUMPER KITS PANDUIT GJ672UH
(ab) BUS BAR PANDUIT GB2B0306TPI-1
(ac) GROUNDING LABELS PANDUIT IA-TMGB
(ad) SUPPLY ANY MISC MATERIAL TO COMPLETE THE JOB AS CALLED OUT ON THE PRINTS

END OF SECTION

SECTION 27 51 23 - INTERCOMMUNICATIONS AND PROGRAM SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Intercom equipment.

1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate cable routing and connections.

PART 2 PRODUCTS

2.01 INTERCOM SYSTEM

A. Manufacturers:
   1. Valcom; _____: www.valcom.com/#sle.

B. Intercom System: Private voice communication between locations indicated on drawings.

2.02 COMPONENTS

A. Direct Connected, Keyed Master Intercom Station: Desk-mounted master intercom unit.
   1. Nominal Size: _____.
   2. Intercom Amplifier: 2 watts rated output with less than 5 percent total harmonic distortion, frequency response of 100 to 10,000 Hz plus or minus 3 dB, and minimum 60 dB signal-to-noise ratio at rated output.
   3. All-Call Amplifier: 1 watt rated output for each connected station, with less than 5 percent total harmonic distortion, frequency response of 100 to 10,000 Hz plus or minus 3 dB, and minimum 60 dB signal-to-noise ratio at rated output.
   4. Speaker Sensitivity: 92 dB.
   5. Input Sensitivity: Provide adequate input sensitivity to deliver rated amplifier output when no more than 10 dynes per square centimeter impinge on speaker/microphone.
   6. Handset: Standard molded plastic telephone handset with 5 ft (1.5 m) long permanently coiled cord.

B. Central Control Master Intercom Station: Desk-mounted master intercom unit.
   1. Nominal Size: _____.
   2. Speaker Sensitivity: 92 dB.
   3. Handset: Standard molded plastic telephone handset with 5 ft (1.5 m) long permanently coiled cord.

C. Intercom Control Unit: Surface wall-mounted intercom control unit.
   1. Intercom Amplifier: 2 watts rated output with less than 5 percent total harmonic distortion, frequency response of 100 to 10,000 Hz plus or minus 3 dB, and minimum 60 db signal-to-noise ratio at rated output.
   2. All-Call Amplifier: 1 watts rated output for each connected station, with less than 5 percent total harmonic distortion, frequency response of 100 to 10,000 Hz plus or minus 3 dB, and minimum 60 dB signal-to-noise ratio at rated output.
   3. Input Sensitivity: Provide adequate input sensitivity to deliver rated amplifier output when no more than 10 dynes per square centimeter impinge on speaker/microphone.

D. Speaker/Microphone Intercom Units: Flush, recessed wall-mounted unit.
   1. Sensitivity: 92 dB at one W input, 4 ft (3.3 m) on axis of speaker.
   2. Handset: Standard molded plastic telephone handset with 5 ft (1.5 M) permanently coiled cord.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 27 53 13 - CLOCK SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clock system requirements.

B. Wired clock systems and associated components:
   1. Master clock unit.
   2. Wired secondary indicating clocks.

C. Wireless clock systems and associated components:
   1. Master clock unit.
   2. Wireless secondary indicating clocks.

D. IP Network clocks and accessories:
   1. Wi-Fi network indicating clocks.
   2. Power over Ethernet (PoE) network indicating clocks.
   3. Network time server.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 27 51 23 - Intercommunications and Program Systems: For interface with clock system.

1.03 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

C. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

PART 2 PRODUCTS

2.01 CLOCK SYSTEM REQUIREMENTS

A. Provide new clock system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Interface with Other Systems:
   1. Provide products compatible with other systems requiring interface with clock system.
   2. Interface with intercom system as specified in Section 27 51 23.

a. Capable of initiating selected intercom system events according to clock system program schedule.

C. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B, consumer application.

2.02 WIRED CLOCK SYSTEMS

A. Manufacturers:
1. Wired Clock System - Basis of Design: _____.
2. Wired Clock System - Other Acceptable Manufacturers:
a. American Time; _____: www.american-time.com/#sle.
b. Midwest Time Control; _____: www.midwest-time.com/#sle.
c. National Time & Signal; _____: www.natsco.net/#sle.

B. Master Clock Unit:
1. Description: Microprocessor-based controller and associated accessories for maintaining time reference and correcting connected wired secondary indicating clocks.
2. Acceptable Time Reference Source(s): Based on Network Time Protocol (NTP) server time data obtained via local area network (LAN) or Global Positioning System (GPS) satellite antenna/receiver.
3. Wired Secondary Indicating Clock Power and Time Correction Signal Circuit(s): As required for connection to wired secondary clocks, including any existing clocks (where indicated).

C. Analog Wired Secondary Indicating Clocks:
1. Power Source: As required for connection to master clock unit.
2. Time Reference Source: Synchronized with master clock unit time correction signal.

D. Provide components and wiring as indicated or as required for connection between master clock unit and wired secondary indicating clocks.

2.03 WIRELESS CLOCK SYSTEMS

A. Manufacturers:
1. Wireless Clock System - Basis of Design: _____.
2. Wireless Clock System - Other Acceptable Manufacturers:
a. American Time; _____: www.american-time.com/#sle.
b. Midwest Time Control; _____: www.midwest-time.com/#sle.
c. The Sapling Company, Inc; _____: www.sapling-inc.com/#sle.

B. Master Clock Unit:
1. Basis of Design: _____.
2. Description: Microprocessor-based controller and associated accessories for maintaining time reference and correcting connected wireless secondary indicating clocks.
3. Acceptable Time Reference Source(s): Based on Network Time Protocol (NTP) server time data obtained via local area network (LAN) or Global Positioning System (GPS) satellite antenna/receiver.
4. Wireless Time Correction Signal Transmitter/Antenna: Compatible with wireless secondary clocks, including any existing clocks (where indicated).
5. Wired Secondary Indicating Clock Power and Time Correction Signal Circuit(s): As required for connection to wired secondary clocks, including any existing clocks (where indicated).
6. Features:
a. Supports security access control for system programming functions.
b. Supports remote interface via web browser or software.
c. Supports automatic daylight savings time adjustment.

C. Digital Wireless Secondary Indicating Clocks:
1. Basis of Design: _____.
2. Power Source: 120 VAC; provide required transformers.

D. Provide components as indicated or as required for extension of wireless time correction signal between master clock unit and wireless secondary indicating clocks.

2.04 IP NETWORK CLOCKS

A. Manufacturers:
   1. Wi-Fi Network Indicating Clocks - Basis of Design: _____.
   2. Wi-Fi Network Indicating Clocks - Other Acceptable Manufacturers:
      a. American Time; _____: www.american-time.com/#sle.
      b. National Time & Signal; _____: www.natsco.net/#sle.
      c. The Sapling Company, Inc; _____: www.sapling-inc.com/#sle.

B. Wi-Fi Network Indicating Clocks:
   1. Time Reference Source: Network Time Protocol (NTP) server time data obtained via wireless local area network (WLAN); capable of time synchronization without master clock unit.
   2. Wi-Fi Network Compatibility: Suitable for connection to Owner's network.
   3. Wi-Fi Antenna: Internal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Wiring Method for NFPA 70 Class 2 and Class 3 Circuits: Unless otherwise indicated, use cables (not in conduit), where permitted by code.
   1. Use suitable listed cables in wet locations, including underground raceways.
   2. Use suitable listed cables for vertical riser applications.
   3. Use listed plenum rated cables in spaces used for environmental air.
   4. Conceal all cables unless specifically indicated to be exposed.
   5. Route exposed cables parallel or perpendicular to building structural members and surfaces.
   6. Do not exceed manufacturer's recommended maximum cable length between components.

D. Provide grounding and bonding in accordance with Section 26 05 26.

E. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

F. Identify system wiring and components in accordance with Section 26 05 53.

END OF SECTION

SECTION 28 10 00 - ACCESS CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access control system requirements.

B. Access control units and software.

C. Access control point peripherals, including readers and keypads.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware: Electrically operated door hardware, for interface with access control system.

B. Section 11 12 00 - Parking Control Equipment: Parking gates, for interface with access control system.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 28 20 00 - Video Surveillance: For interface with access control system.

F. Section 28 46 00 - Fire Detection and Alarm: For interface with access control system.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. UL 294 - Access Control System Units; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Access Control Units:
   1. Coordinate with owner.

B. Access Control Software:
   1. Coordinate with owner.

C. Readers and Keypads:
   1. Coordinate with owner.

2.02 ACCESS CONTROL SYSTEM REQUIREMENTS

A. Provide new access control system consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Access Control Points:
   1. See article "ACCESS CONTROL POINT PERIPHERALS" below for device descriptions.
   2. Door Number See drawings:

a. Location: See drawings.
b. Description: _____.
c. Function: Operational and emergency.
d. Access: Controlled entry, free exit.
e. Peripherals on Unsecure Side:
1) Reader/Keypad: Contactless smart card reader Type _____.
f. Peripherals on Secure Side:
1) Reader/Keypad: Contactless smart card reader Type _____.
2) _____.
g. Locking Device: Electric strike.
1) Configuration: Fail-secure.

3. Parking Gate Number _____:
a. Location: See drawings.
b. Description: Main gate.
c. Access: Controlled entry, controlled exit.
d. Peripherals on Unsecure Side:
1) Remote opener.
e. Peripherals on Secure Side:
1) Sensors, see drawings.

C. Interface with Other Systems:
1. Provide products compatible with other systems requiring interface with access control system.
2. Interface with electrically operated door hardware as specified in Section 08 71 00.
a. Capable of locking/unlocking/releasing controlled doors.
b. Capable of receiving input from integral door hardware switches.
3. Interface with parking control gates as specified in Section 11 12 00.
a. Capable of controlling gate access.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.
1. Access Control Units and Readers: Listed and labeled as complying with UL 294.

2.03 ACCESS CONTROL UNITS AND SOFTWARE

A. Provide access control units and software compatible with readers to be connected.

B. Unless otherwise indicated, provide software and licenses required for fully operational system.

C. Access Control Unit:

2.04 ACCESS CONTROL POINT PERIPHERALS

A. Provide devices compatible with control units and software.

B. Provide devices suitable for operation under the service conditions at the installed location.

C. Readers and Keypads:
1. General Requirements:
a. Provide readers compatible with credentials to be used.
b. Color: See drawings.

D. Door Locking Devices (Electric Strikes and Magnetic Locks): Comply with Section 08 71 00.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install access control system in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Wiring Method: Unless otherwise indicated, use cables (not in conduit).
1. Use suitable listed cables in wet locations, including underground raceways.
2. Use suitable listed cables for vertical riser applications.
3. Use listed plenum rated cables in spaces used for environmental air.

4. Conceal cables unless specifically indicated to be exposed.
5. Use power transfer hinges complying with Section 08 71 00 for concealed connections to door hardware.
6. Route exposed cables parallel or perpendicular to building structural members and surfaces.
7. Do not exceed manufacturer's recommended maximum cable length between components.

D. Provide grounding and bonding in accordance with Section 26 05 26.

E. Identify system wiring and components in accordance with Section 26 05 53.

END OF SECTION

SECTION 28 15 23 - INTERCOM ENTRY SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Intercom entry system and associated door/entry stations, interior stations, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 08 71 00 - Door Hardware: Electrically operated door hardware, for interface with intercom entry system.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

C. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include system interconnection schematic diagrams.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Intercom Entry System:
   1. Aiphone Corporation: www.aiphone.com/#sle.

2.02 INTERCOM ENTRY SYSTEM

A. Provide new intercom entry system consisting of required equipment, conduit, boxes, wiring, connectors, hardware, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. System Description:
   1. System Type: Audio-video, analog.
   2. System Capacity:
      a. Door/Entry Stations: One.
      b. Interior Master Stations: One.
   3. Interface with Other Systems:
      a. Provide products compatible with other systems requiring interface with intercom entry system.
      b. Interface with electrically operated door hardware as specified in Section 08 71 00.
         1) Capable of locking/unlocking/releasing controlled doors.

C. Door/Entry Stations:
   1. Vandal resistant, with tamper proof hardware.
   2. Suitable for the environment where installed.
   3. Provide means to initiate call to designated interior station(s).
   4. Provide for hands-free two-way communication with interior station(s).
   5. Audio-Video Door/Entry Station:

a. Furnished with integral video camera for door/entry monitoring and visitor identification.
b. Call Initiation: Single button; initiates call to pre-determined interior station(s).
c. Finish: Painted steel or stainless steel.
d. Mounting: As indicated on drawings.
e. Features:
1) LED low-light video illumination.
2) PTZ (Pan/Tilt/Zoom) camera.

D. Interior Stations:
1. Audio-Video Master Station:
a. Basis of Design: _____.
b. Provides for hands-free and handset two-way communication with designated door/entry station(s) and other interior station(s).
c. Provide means for unlocking/releasing door corresponding to door/entry station communication is established with.
d. Provide means to initiate video monitoring of connected door/entry station(s).
e. Mounting: Wall or desk.
f. Features:
1) Adjustable audible call notification volume.
2) Adjustable communication volume.
3) Adjustable LCD screen brightness.
4) PTZ (Pan/Tilt/Zoom) camera control.

E. Accessories:
1. Provide components as indicated or as required for a complete operating system.
2. Wiring: Provide manufacturer's recommended cables as indicated or as required for connections between system components.
3. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Provide grounding and bonding in accordance with Section 26 05 26.

D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

E. Identify system wiring and components in accordance with Section 26 05 53.

END OF SECTION

SECTION 28 20 00 - VIDEO SURVEILLANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Video surveillance system requirements.

B. Video recording and viewing equipment.

C. Cameras.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. IEEE 802.3 - IEEE Standard for Ethernet; 2022, with Amendments (2023).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 303 - Standard for Installing and Maintaining Closed-Circuit Television (CCTV) Systems; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

1. Camera Poles: Include information on maximum supported effective projected area (EPA) and weight for design wind speed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Video Recording and Viewing Equipment:

1. Coordinate with owner to tie to existing NVR system.

B. Cameras:

1. Coordinate with owner.

2.02 VIDEO SURVEILLANCE SYSTEM

A. Provide modifications and extensions to existing video surveillance system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. System Description: IP system with connection to network (IP) cameras.

C. Cameras Required:

1. See article "CAMERAS" below for product descriptions.
2. Camera Number 6:
   a. Location: See drawings.
   b. Camera Type: Indoor and outdoor.

c. Lens Type: Furnished with camera.
d. Mounting: Pole and surface mount.

D. Interface with Other Systems:
1. Provide products compatible with other systems requiring interface with video surveillance system.

E. Provide products listed, classified, and labeled as suitable for the purpose intended.

F. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B, consumer application.

2.03 CAMERAS

A. Provide cameras and associated accessories suitable for operation under the service conditions at the installed location. Provide additional components (e.g. enclosures, heaters, blowers, etc.) as required.

B. Where not factory-installed, provide additional components (e.g. lenses, mounting accessories, etc.) as necessary for complete installation.

C. Network (IP) Cameras:
1. Signal-to-Noise Ratio: Not less than 50 dB.
2. Provide the following standard features:
a. Automatic electronic shutter.
b. Automatic gain control.
c. Automatic white balance.
d. Web-based interface for remote viewing and setup.
e. Password protected security access.
3. Network (IP) Indoor Fixed Dome Camera Type _____:
a. Camera Type: True day/night with IR cut filter.
b. Image Sensor: 1/4 inch CMOS.
c. Resolution: Up to 1080p (1920 x 1080).
d. Frame Rate: Up to 30 frames per second (fps) at all available resolutions.
e. Video Streaming: Supports two simultaneous video streams using H.264 and H.264/MJPEG compression .
f. Power: Power over Ethernet (IEEE 802.3af) or 24 VAC as indicated or as required.

2.04 ACCESSORIES

A. Camera Enclosures: Where not factory-installed, provide camera enclosures suitable for operation under service conditions at installed location.

B. Camera Mounting Supports: Where not factory installed, provide mounting supports necessary for installation.

C. Camera Poles:
1. Provide poles suitable for cameras, supports, and accessories to be installed.
2. Provide ground lug, accessible from handhole.

D. Provide components as indicated or as required for connection of video surveillance system to devices and other systems indicated.

E. Provide components as indicated or as required for system power and network connections.

F. Provide cables as indicated or as required for connections between system components.

G. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install video surveillance system in accordance with NECA 1 (general workmanship) and NECA 303.

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment in accordance with Section 26 05 29.

D. Wiring Method: Unless otherwise indicated, use wiring in conduit for outside cameras.
   1. Use suitable listed cables in wet locations, including underground raceways.
   2. Use suitable listed cables for vertical riser applications.

E. Pole-Mounted Cameras:

F. Provide grounding and bonding in accordance with Section 26 05 26.

G. Identify system wiring and components in accordance with Section 26 05 53.

END OF SECTION

SECTION 28 31 02 - ADDRESSABLE FIRE ALARM SYSTEM

GENERAL

1.01 SUMMARY

A. Section Includes:
1. Fire alarm control and smoke detection system.
a. Related Sections:
1) Section 08 71 00 - Door Hardware.
(a) Section 21 12 00-Standpipe and Hose System.
(1) Section 21 12 23- Fire Protection Valves.
(2) Section 21 13 19 - Pre-Action Sprinkler System.
(3) Section 21 13 26 - Deluge Sprinkler System.
(4) Section 21 23 00 - Wet-Pipe Sprinkler Systems.
(5) Section 21 24 00- Dry-Pipe Sprinkler System.
(6) Section 21 24 01 - Halon Agent Extinguishing System.
(7) Section 21 24 02 - Halon 1301 Fire Extinguishing/Suppression System.
(8) Section 21 24 03 - FM 200 Fire Extinguishing/Suppression System.
(9) Section 21 30 00 - Fire Pumps.
(10) Section 21 41 00 - Fire Water Storage Tanks.
(11) Section 23 33 00 -Ductwork Accessories.
(12) Section 23 09 13 - Automatic Temperature Control System.
(13) Section 23 09 93 - Sequence of Operation.
(14) Section 27 15 00-Telephone Systems and Local Area Networks (LANS).
(15) Section 27 51 23-School Intercommunications System.
(16) Section 28 05 00 - Electronic Safety And Security Systems Electrical Requirements.
(17) Section 28 05 01 - Basic Electronic Safety And Security Systems Requirements.
(18) Section 28 13 01 - Intrusion Detection and Security Card Access Systems.
(19) 21. Section 28 16 01 -Security Systems.
(20) 22. Section 28 23 00- Closed Circuit Television (CCTV) Security Systems.
2. General
a. The provisions of Section 28 05 01 apply to the work in this Section and are part of these specifications.
3. References
a. EIA RS-232C.
b. UL 864 9th Edition - Standard for Control Units and Accessories for Fire Alarm Systems.
c. 675 IAC 13-2.3-131 - 1998 Indiana Building Code, Chapter 11 - Accessibility.
d. NFPA 70 - National Electrical Code, Article 760.
e. NFPA 72 - National Fire Alarm Code.
f. NFPA 90A - Air Conditioning and Ventilating Systems.
4. Regulatory Requirements
a. All items of the fire alarm system shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by the Underwriters' Laboratories, Inc. (UL), and shall bear the UL label. All control equipment shall be listed under UL category UOJZ as a single control unit. Partial listing shall not be acceptable.
b. In addition to the UL-UOJZ requirement listed above, the system controls shall be UL listed for power-limited applications per NFPA 70, Article 760. All circuits must be marked in accordance with NFPA 70, Article 760.23.
5. Submittals

a. Submit shop drawings and product data for each building under provisions of Division 01 and Section 26 05 00.
b. Submit complete descriptive data indicating UL listing for all system components.
c. Submit complete sequence of operations of system.
d. Submit rough-in drawings containing 1 /8" = 1 '-0" scale drawings of Architect's building floor plans indicating all conduit sizes and runs, quantity and types of cables, equipment locations, visual device strobe output candela rating for each device, system riser diagram, and any other special details required to coordinate the work.
    1) These rough-in drawings shall be separate from general power and light, or other shop drawing, and are to show symbols, wiring, details and notes applicable only to the fire alarm system.
e. All drawings shall be revised to "As-Built" status at the project completion. All drawings must be drawn on a CAD system. Hand drawn or scanned copies of drawings are not acceptable. Drawings must be submitted as electronic drawing files in AutoCAD 2000 format on CD-ROM. File that are not editable [DWF, etc.) or in other formats [DXF, etc.) are not acceptable. Each project drawing shall be submitted as a separate drawing file. Zipped files containing multiple drawings are not acceptable.

6. Scope Of Work
    a. A.
    b. Fire Alarm System:
        1) Provide a complete and operational new fire alarm system as indicated in the Contract Documents.
            (a) The new system shall use supervised multiplex data communications circuits, closed loop initiation circuits with individual zone supervision, individual indicating appliance circuit supervision, and incoming and standby power supervision.
            (b) The new systems shall include, but is not limited to, the following:
                (1) A fire alarm control panel in location as indicated in the Contact Documents. Fire alarm control panels in locations as indicated in the Contact Documents.
                (2) Digital alarm communicator transmitter [DACT).Automatic telephone dialer with automated communication of alarm to off-site monitoring.
                (3) Network monitoring module for secured monitoring of FACP status and operation over local area network.
                (4) Network interface modules for connection of fire alarm control panels to fire alarm network for peer-to-peer interconnections.
                (5) Fiber optic modem modules for interconnection of fire alarm control panels over fiber optic cable.
                (6) Remote annunciators and Graphic Maps . Annunciators to provide annunciation of alarm system status.
                (7) Graphic annunciators providing annunciation of alarm system status.
                (8) Manual stations.
                (9) Automatic fire detectors.
                (10) Audio/visual units.
                (11) All wiring, connections to devices, outlet boxes, and all other necessary material for a complete operating system.

7. System Description
    a. The system shall be an addressable type system with multi-addressable peripherals network to interlink fire alarm devices to the control panel. The system shall use digital, full duplex multiplex communication techniques over all network circuits to minimize wiring and to maximize system expansion without the need to make an additional home run to the control panel. Each network circuit shall have the capability for the addition of addressable devices for future expansion.
    b. The fire alarm system shall allow for loading or editing special instructions and operating sequences as required. The system shall be capable of on site

programming to accommodate and facilitate building parameter changes or changes as required by local codes.

c. The ability for selective input/output control functions based in ANDing, ORing, NOTing, timing and special coded operating shall be incorporated in the resident software programming of the system.

d. The alarm shall be displayed on an eighty-character (80) LCD Display. The top line of the forty characters shall be the point label and the second line shall be the device type identifier.

e. The control panel shall have the ability to store a minimum of three hundred events in an alarm log plus a minimum of three hundred events in a separate trouble log. These events shall be stored in a battery protected random access memory (RAM). Systems not having discrete alarm and trouble logging memory shall include an alternate supervised (e.g.: floppy drive, tape cassette) historic recording method with battery backup. Real time and date shall accompany all history event recording.

f. The system shall be capable of being tested by one person. While in testing mode, the alarm activation of an initiating device circuit shall be silently logged as an alarm condition in the historical data file. The panel shall automatically reset itself after logging of the alarm.

g. Provide a manual evacuation (drill) switch to operate the alarm indicating appliances without causing other control circuits to be activated. However, should a true alarm occur, all alarm functions would occur as previously described. Locate this switch immediately adjacent to the system annunciator panel serving the main office area of the building. If there is no annunciator panel serving the main office area, install this switch immediately adjacent to the system annunciator panel serving the main entrance of the building.

h. Smoke detectors and 24 VDC power and wiring from the fire alarm system for electromagnetic hold-open smoke cut-off doors and fire rated rolling doors.

i. Detection Operation:

    1) Smoke sensors shall be smoke density measuring devices having no self-contained alarm set point (fixed threshold). The alarm decision for

        (a) each sensor shall be determined by the control panel. The control panel shall determine the condition of each sensor by comparing the sensor value to the stored values.

            (1) The control panel shall maintain a moving average of the sensor's smoke chamber value to automatically compensate (move the threshold) for dust and dirty conditions that could affect detection operations. The system shall automatically maintain constant smoke obscuration sensitivity for each sensor (via the floating threshold) by compensating for environmental factors. The smoke obscuration sensitivity shall be adjustable to within 0.3 percent of either limit of the UL window (0.5 percent to 4.0 percent) to compensate for any environment.

        (b) The system shall automatically indicate when an individual sensor needs cleaning. When a sensor's average value reaches a predetermined value, a "DIRTY SENSOR" trouble condition shall be audibly and visually indicated at the control panel for the individual sensor. Additionally, the LED on the sensor base shall glow steady giving a visible indication at the sensor location. If a "DIRTY SENSOR" is left unattended, and its average value increases to a second predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control panel for the individual sensor. To prevent false alarms, these "DIRTY" conditions shall in no way decrease the amount of smoke obscuration necessary for system activation.

            (1) The control panel shall continuously perform an automatic self-test routine on each sensor that will functionally check sensor electronics and ensure the accuracy of the values being transmitted to the control

panel. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.

2) Connection to kitchen hood fire-suppression system for system alarm initiation. The kitchen hood fire-suppression systems shall shut down any gas supply for cooking.
3) Connection and operation under system alarm condition to shut-off valves for gas and fuel oil supplies that serve or pass through student-occupied spaces. The system shall not shut off gas supplies serving emergency power sources. The kitchen hood fire-suppression systems shall shut down any gas supply for cooking.
4) Automated connection to off-site monitoring as indicated hereinafter.

8. System Alarm Operation
   a. Alarm Activation: The system alarm operation subsequent to the alarm activation of any manual station, or automatic detection device , or sprinkler flow switch activation shall be as follows:
      1) Signal Synchronization:
         (a) All audible alarm indicating appliances shall sound in a synchronized temporal pattern alarm signal until silenced by the alarm silence switch at the control panel or at the remote annunciator.
            (1) All visual alarm strobes shall operate in a continuous and synchronized pattern until extinguished by total system reset. All visual alarm strobes shall be synchronized as one pattern throughout the building.
            (2) Activation of alarm silence shall not extinguish visual alarms. All visual alarms shall remain operating when audible alarms are silenced.
            (3) The audible alarms shall be automatically silenced after 15 minutes of alarm operation.
            (4) Shutdown all building air handling systems. Upon total reset of the fire alarm control panel, the air handling units shall sequentially start up to minimize power demand. Coordinate with Temperature Control Trades and provide separate contact closure from fire alarm system to building automation system to signal total reset of the fire alarm system control panel.
            (5) Close duct mounted smoke dampers. Coordinate with Temperature Control Trades.
            (6) Activate an automatic telephone dialer for notification of alarm and trouble conditions to the proper authorities. Activate contact closures to signal the Owner's monitoring service equipment.
            (7) Activate a digital alarm communicator transmitter (DACT) for notification of alarm and trouble conditions to the designated monitoring service.
      2) Subsequent Alarm: Any subsequent alarm activation shall reactivate the alarm indicating appliances as specified above.
      3) Sprinkler System Switches:
         (a) Flow Switches: The activation of any sprinkler system flow switch shall, in addition to the alarm operations specified above, activate a supervised exterior sprinkler alarm bell.
         (b) Tamper Switches:
            (1) The activation of any standpipe or sprinkler tamper switch shall activate a distinctive system supervisory audible signal and "Sprinkler Supervisory Tamper" indication at the control panel and the remote annunciator. There shall be no confusion between valve tamper activation and opens and/or grounds on fire alarm initiation circuit wiring.

(2) Activating the trouble silence switch shall silence the supervisory audible signal while maintaining the "Sprinkler Supervisory Tamper" indication that the tamper contact is still activated.
(3) Restoring the valve to the normal position shall cause the audible and visual signals to pulse at a march-time rate.
(4) Activating the trouble silence switch will silence the supervisory audible signal and restore the system to normal.

4) Provide a dry contact closure with wiring to the school intercommunication system to sound a prerecorded message over the school intercommunication system speakers. This contact closure shall be maintained until silenced by
(a) the alarm silence switch at the control panel or at the remote annunciator. The prerecorded message device will be provided at part of the school intercommunication system.

9. Supervision
a. The audio/visual unit circuits shall be independently fused and supervised.
b. All auxiliary manual controls shall be supervised so that all switches must be returned to the normal automatic position to clear system trouble.
c. The incoming power to the system shall be supervised so that any power failure shall be audibly and visually indicated at the control panel and the remote annunciator. There shall be continuous "power on" illuminated indicator or display while incoming power is present.
d. The system batteries shall be supervised so that disconnection of a battery shall be audibly and visually indicated at the control panel and the remote annunciator.
e. The system expansion modules connected by ribbon cables shall be supervised for module placement. Should a module become disconnected from the CPU, the system trouble indicator shall illuminate and audible trouble signal shall sound.
f. Wiring to a remote annunciator shall be supervised for open and ground conditions. An independent annunciator trouble indicator shall illuminate and an audible trouble signal shall sound at the control panel.
1) There shall be separate initiation for each sprinkler valve tamper switch to perform the operation listed for Paragraph 1.8.

10. Power Requirements
a. Provide 120 VAC power from dedicated circuits to the fire alarm system control panel and any required Notification Appliance Circuit (NAC) extender panels.
1) In building with emergency power circuits served by emergency generator, the circuits serving the fire alarm system control panel and any required Notification Appliance Circuit (NAC) extender panels shall be circuit from the emergency power system.
2) The system shall be provided with sufficient additional battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of 24 hours with 5 minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic.
3) All external system circuits requiring system operating power shall be 24 VDC and shall be individually fused at the control panel.

B. Products

C. Products
1. Provide a main fire alarm system control panel for the system. This panel shall be the addressable type with the capability to serve all system devices and equipment. Also, the panel shall provide a minimum capacity for the quantity of addressable initiating devices as listed below. The fire alarm control panel shall be as follows:
a. Minimum capacity for 650 or more intelligent points/devices: GE Security/EST Model EST3, Notifier Model NFS-3030, or approved equal.
1) Panel Features:

(a) Construction shall be modular with solid state, microprocessor based electronics. It shall display only those primary controls and display essential to operation during a fire alarm condition. Although the keypad/keyboard can be used for control of the entire system, it shall only be used for maintenance purposes. A local audible device shall sound during alarm, trouble or supervisory conditions. This audible device shall sound differently during each condition to distinguish one condition from another without having to view the panel. The audible device shall also provide audible feedback to ensure that the key has been pressed properly.

(1) Primary Keys and Panel Display: The control panel shall have an eighty-character (80) backlit liquid crystal display. To conserve battery standby power, it shall not be lit during an AC power failure unless an alarm condition occurs or there is keyboard activity. The display shall
(2) support both upper and lower case letters. A cursor shall be visible when entering information.
(3) Function Keys: Additional function keys shall be provided to access status data for all system points. As a minimum, the status data shall include disable/enable status, verification tallies of initiating devices, and acknowledge status.
(4) LED Supervision: All slave modules LEDs shall be supervised for burnout or disarrangement. Should a problem occur, the panel shall display the module and the LED location numbers to facilitate location of that LED.
(5) The fire alarm control panel shall allow for loading or editing special instructions and operating sequences as required. The fire alarm control panel shall be capable of on site programming to accommodate and facilitate expansion, building parameter changes or changes as required by local codes. All software operations shall be stored in a nonvolatile programming memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.
(6) Should a trouble condition be present within the system and the audible trouble signal silenced, the trouble signal shall resound at preprogrammed time intervals to act as a reminder that the fire alarm system is not 100 percent operational. Both the time interval and the trouble reminder signal shall be programmable to suit the Owner's application.
(7) There shall be a minimum of three access levels. Passcode capability shall be at least four characters. Changes to passcodes shall only be made by authorized personnel. Systems not capable of password protected manual command operations shall provide key-operated switches for these functions. Function key switches shall be keyed switches or locks used within the system.
(8) An operator, at the fire alarm control panel, having a proper access level, shall have the capability to manually control the following for each analog sensor:
(9) Clear peak detection values.
(10) Enable or disable the point.
(11) Clear verification tally.
(12) Control a sensor's relay driver output.
(13) Change sensor sensitivity.
(14) It shall be possible to program the control panel to automatically change the sensitivity setting of each analog sensor based on time-of-day and day-of-week (for example, to be more sensitive during unoccupied times and less sensitive during occupied periods). There

shall be five sensitivity settings available for each photo sensor and four for each ionization sensor.

(15) The fire alarm control panel shall be capable of operating remote CRT's and/or printers. The output shall be paralleled ASCII from an EIA RS-232-C connection with an adjustable baud rate of 300, 1200, 2400 and 4800 to allow use of any commonly available CRT or printer.

2) Modules:
   (a) Network Monitoring Interface Module: NIC card designed to be installed in FACP and provide secured monitoring of FACP status and operation over local area network.
   (b) TCP/IP Network Interface Module: NIC Card designed to connect fire alarm control panel to fire alarm network for peer-to-peer interconnections between panels and other distributed remote node locations.
   (c) Provide other modules as required to provide specified system features and operation.
3) Control Panel Power and Battery Back-Up:
   (a) Normal Power: Panel shall operate from 120 VAC power circuit under normal conditions.
      (1) Power Circuit Surge Protection: UL 1449 listed, Category B, Type 2 surge protective device with l 30V-to-ground MCOV, 700V L-N, 700V L-G, and 600V N-G V.P.R., short circuit current rating of 1 0kA and diagnostic LED. Device to be panel mount style. Provide surge protective device on each incoming power circuit to panel. Surge protective device shall be Ditek DTK-HW Series unit or equivalent.
      (2) Battery Back-Up: Upon loss of the 120 VAC power circuit for the panel, the panel shall automatically transfer to and operate from integral standby battery supply. Provide sealed type rechargeable battery supply for the panel with sufficient additional capacity to operate the entire system, including all panels, detectors, remote annunciators, and accessories, in a normal supervisory mode for a period of 24 hours with at least five (5) minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be integral and automatic.
4) Network Monitoring Module: NIC card designed to be installed in FACP and provide secured monitoring of FACP status and operation over local area network.

D. Common Alarm and Reset Control Station
   1. Where new and existing fire alarm panels are to be permanently Interconnected for common system alarm and common system reset and the systems cannot be networked for the specified common operation, provide a wall mounted control station at each of the following locations providing keyed station enable/disable switch and control buttons for common system silence and common system reset.
      a. Adjacent to the new existing fire alarm control panel.
         1) Adjacent to the remote annunciator in the main office.
            (a) Adjacent to the graphic annunciator in the main office.
               (1) Graphic annunciators .

E. Notification Appliance Circuit (NAC) Extender Panels
   1. Provide notification appliance circuit extender panels or remote booster power supply panels as needed to serve all fire alarm system audible and visual notification appliances. Provide panels with battery back-up.
   2. Panel Power and Battery Back-Up:
      a. Normal Power: Panel shall operate from 120 VAC power circuit under normal conditions.

1) Power Circuit Surge Protection: UL 1449 listed, Category B, Type 2 surge protective device with l 30V-to-ground MCOV, 700V L-N, 700V L-G, and 600V N-G V.P.R., short circuit current rating of 1 0kA and diagnostic LED. Device to be panel mount style. Provide surge protective device on each incoming power circuit to panel. Surge protective device shall be Ditek DTK-HW Series unit or equivalent.
   (a) Battery Back-Up: Upon loss of the 120 VAC power circuit for the panel, the panel shall automatically transfer to and operate from integral standby battery supply. Provide sealed type rechargeable battery supply for the panel with sufficient additional capacity to operate the entire system, including all panels, detectors, remote annunciators, and accessories, in a normal supervisory mode for a period of 24 hours with at least 5 minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be integral and automatic.

F. Digital Alarm Communicator Transmitter (DACT) and Accessories
   1. Provide a digital alarm communicator transmitter (DACT) that is internally mounted in the fire alarm system control panel providing two communication lines for connections to analog telephone lines or other monitoring service lines.
   2. Telephone Line Protector: UL 497A approved telephone line surge protective device with l 30V-to-ground MCOV and peak surge current rating of at least 8,000 A. Device shall provide RJ31 X connection with grounding screw and automatic reset to protect against repeated surges. Provide surge protective device on each incoming telephone line to the fire alarm control panel. Surge protective device shall be Ditek DTK-MRJ31 XSCPWP or equivalent.

G. Automatic Telephone Dialer and Accessories
   1. Provide a two-channel unit with built-in test speaker, test switches for each channel, rechargeable power supply, telephone line seizure function, telephone connecting cord, and 6-minute message tape. The message tape shall be fully programmed by the supplier. Napco Security Systems 5000-MKSR Telephone Dialer or approved equal.
   2. Telephone Line Protector: UL 497A approved telephone line surge protective device with l 30V-to-ground MCOV and peak surge current rating of at least 8,000 A. Device shall provide RJ31 X connection with grounding screw and automatic reset to protect against repeated surges. Provide surge protective device on each incoming telephone line to the telephone dialer. Surge protective device shall be Ditek DTK-MRJ31 XSCPWP or equivalent.

H. Remote Annunciators and Graphic Maps
   1. Alpha-Numeric Annunciator:
      a. The annunciator shall provide an alphanumeric, eighty-character (80) liquid crystal display (LCD) that provides clear language information as to the control panel point status (alarm, trouble, etc.), type of alarm (smoke detector, pull station, etc.), number of alarms on the system, and a custom location label. The annunciator shall communicate to the control panel over one twisted, shielded pair of wire and operating power shall be 24 VDC and be fused at the control panel. Point-wired annunciators will not be considered as equal. Status information of each device shall be available for individual displayed to investigate specific point detail. Annunciator shall include audible buzzer for tone alert, control buttons for alarm acknowledge, system supervisory acknowledge, trouble acknowledge, alarm silence, and system reset, and a key-operated enable/disable switch. Provide a remote annunciator at each location indicated on the Drawings.
      b. Provide annunciator with stainless steel trim.
         1) Graphic Annunciator:
            (a) Provide a surface-mounted, front-lighted graphic annunciator, as per Architect's detail. Front panel shall be acrylic Plexiglas or fiberglass with a graphic scale reproduction of the building key plan. Individual zones shall be

color outlined and front lighted with red LED's to indicate the area and device type initiating the alarm. Background shall be a solid color. Zone outlines shall be in a contrasting color or colors as selected by the Architect. Entire display shall have transparent protective acrylic Plexiglas cover.

(b) Cabinet shall be tamper resistant construction, with no external fasteners. The entire front panel shall be hinged for access and equipped with lock and keys.

(c) Provide a graphic annunciator at each location indicated on the Drawings.

2) Graphic Map:

(a) Wall mounted, framed map containing a single-line drawing of the building floor plan with room designations and north arrow. A scale drawing of the building floor plan will be made available from the Architect.. Building plan shall include room and/or area names that coincide with the alpha-numeric messages programmed to display on the system annunciator. For each map, identify the map's physical location on the building with "YOU ARE HERE" label with leader line indicating the map location. The text and leader line shall be red in color.

(b) Map shall consist of a 1 /8" thick anti-glare transparent acrylic front panel, black full color image of building floor plan on white color background laminated to 3/16" graphic arts board, and black bronze silver gold anodized aluminum frame. Color of background shall be as selected by the Architect. Colors of floor plan image and background shall be as selected by the Architect.

(c) Map dimensions shall be approximately 24" W x 24" H.

(1) Map design shall be submitted to the Architect for review and approval.

(2) Graphic Map shall be as manufactured by H.R. Kirkland Company or approved equal.

(3) Provide graphic map at the following locations:

(4) One map at the main fire alarm control panel. Verify exact mounting location with the Architect.

(5) One map at each alpha-numeric remote annunciator. Verify exact mounting location with the Architect.

I. Addressable Peripheral Devices

1. Manual Stations: Provide addressable manual stations containing electronics that communicate the station's status (alarm, normal) to the control panel over two wires that also provide power to pull station. The address shall be set on each station. The stations shall be constructed of high impact red Lexan with white lettering and a smooth high gloss finish. The stations shall be double-action type devices requiring two separate and distinct actions. single-action type devices. The stations shall mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks.

a. Surface Mount Box: In existing finished areas where the outlet box for a manual station cannot be installed flush due to wall construction, provide a surface style box specifically design to mount the manual station. Obtain permission of Architect for use of surface mount boxes in finished areas. Box shall have red paint finish.

b. Wire Guards: Provide wire guards over manual stations where indicated on the drawings or in this Section. The wire guards shall consist of welded, open metal mesh formed to fit over and around manual stations and with a top mounted full-width hinge. Finish color of guard shall be red.

1) Indoor Protective/Tamper Covers: Provide a tamper/protective cover for each manual station unless otherwise indicated. The cover shall consist of a clear Lexan shield with red frame that fits over the manual stations, an aircraft cable style retaining cable attaching the cover to the frame, and a built-in alarm horn that sounds when the shield is lifted to gain access to the manual station. Horn shall be powered by integral, replaceable 9-volt battery. The cover shall be Safety Technologies International (STI) Model STI-1100 "Stopper II" or approved

equal. Horn shall be powered remotely by 24 VDC power supply. The cover shall be Safety Technologies International (STI) Model STI-11 00RC "Stopper II" or approved equal. Provide 24 VDC power supplies and wiring as necessary to power all covers. Provide will all accessories recommended by the cover manufacturer. For surface mounted manual stations or other similar conditions provide covers with spacer mounting rings to provide proper mounting of covers.

(a) Exterior and Wet Location Protective/Tamper Covers: Provide a tamper/protective cover for each manual station unless otherwise indicated. The cover shall consist of a clear Lexan shield with red frame that fits over the manual stations, an aircraft cable style retaining cable attaching the cover to the frame, a built-in alarm horn that sounds when the shield is lifted to gain access to the manual station, and weather gasketing for exterior and wet location use. Horn shall be powered by integral, replaceable 9-volt battery. The cover shall be Safety Technologies International (STI) Model STI-1150 "Weather Stopper II" or approved equal. Horn shall be powered remotely by 24 VDC power supply. The cover shall be Safety Technologies International (STI) Model STI- l l 50R "Weather Stopper II" or approved equal. Provide 24 VDC power supplies and wiring as necessary to power all covers. Provide will all accessories recommended by the cover manufacturer. For surface mounted manual stations or other similar conditions provide covers with spacer mounting rings to provide proper mounting of covers.

2) Area Detectors:

(a) Sensors: The sensors shall be of the heat or photoelectric smoke type and shall communicate actual chamber values to the system control panel. The smoke sensors and bases shall be listed to UL Standard 268 and documented compatible with the control equipment to which they are connected. The sensors shall be listed for both ceiling and wall mount applications. There shall be no limit to number of sensors, stations or zone adaptor modules that may be activated or "in Alarm" simultaneously.

(1) Heat Sensor Head:

(2) The sensor shall be a combination rate-of-rise/fixed temperature sensor UL Listed as a rate-compensated heat detector. Sensor rate-of-rise operation shall be 15 degrees F per minute and

(3) self-restoring. Sensor fixed-temperature operation shall be set for 135 degrees F, independent of the rate of rise setting.

(4) Each sensor shall be capable of being configured for utility monitoring and capable of sensing temperature between 32 and 158 degrees F.

(5) The heat type sensor shall be a plug-in unit that mounts to a

(6) twist-lock base that is common with both heat and photoelectric smoke type sensors and shall be compatible with other addressable detectors, addressable manual stations, and addressable zone adapter modules in the same circuit.

(b) Photoelectric Smoke Sensor Head:

(1) The sensor shall be of the solid-state photoelectric type, shall operate on the light scattering, photodiode principle, and shall contain no radioactive material. The sensor shall use a pulsed infrared LED light source designed to ignore invisible particles or smoke densities that are below the factory set point, and be sealed against rear airflow entry. To minimize nuisance alarms, detectors shall have a built-in insect screen.

(2) The photoelectric type sensor shall be a plug-in unit that mounts to a twist-lock base that is common with both the photoelectric smoke and heat type sensor and shall be compatible with other addressable detectors, addressable manual stations, and addressable zone adaptor modules on the same circuit.

(3) Addressable Sensor Bases: Sensor bases shall be compatible with all sensors. Each base shall be capable of communicating sensor values to the panel if a "wrong device type" trouble condition is present. The panel shall continue to monitor for alarms and troubles using the default setting for the wrong device until the proper type is installed or the program is changed. Each sensor base shall contain a LED (if not part of the sensor head) that will flash each time it is scanned by the control panel (about once every 4 seconds). When the control panel determines that a sensor is in the alarm or trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

(4) Base: Unless otherwise indicated, the sensor base shall provide connections for sensor and annunciate power-on, alarm and trouble conditions locally at the base.

(5) Base With Supervised Relay: Where indicated, the sensor base shall be provided with a control relay for programmable operation. The relay shall not take any additional addressable device capacity.

(6) Sensor Guards: Provide a protective guard for each sensor where a wire guard is indicated, a vandal-proof device is indicated, and where a sensor is subject to mechanical damage. Guard shall be listed for use with the sensor being protected. Provide guard with mounting frame. Provide vandal guard extension box for surface mounted sensors.

3) Duct Smoke Detector: Each duct detector shall be a complete package that includes a solid-state photoelectric type sensor, a sensor base, a compact air duct sensor housing with supervised output for multiple remote relays, a set of sampling tubes, a remote relay, and a duct detector remote test station.

(a) Housing and sensor shall obtain operating power from the supervisory current in the fire alarm detection loop.

(b) Sampling Tubes: Provide each duct detector with sampling tubes in accordance with the detector manufacturer's recommendations and instructions.

(c) Remote Relays: Provide each duct detector with remote relay contacts for the functions listed below. Relay shall operate on 24 VDC power and provide at least one normally-open and one normally-closed set of contacts.

(1) Provide each duct detector with a remote relay for shutdown of the associated air handling unit motor starter or motor drive control circuit and dampers as specified in this Section and in Division 23.

(2) Provide each duct detector with a remote relay for signaling the building automation system as specified in this Section and in Division 23.

(3) Remote Test Station: Provide each duct detector with one remote test station. Station shall include alarm indicator light and key test switch. Install the station on the nearest adjacent wall to the duct detector.

4) Addressable Input/Output Modules: Modules shall be designed for flush mounting in standard electrical outlet box and to operate on 24 voe.

(a) Monitor Module:

(1) Module shall provide supervised monitor circuit(s) capable of reporting normal, alarm and/or trouble conditions.

(2) Provide monitor modules as required for conventional initiating device circuits of the system for items such as dry contacts and direct connected detectors.

(3) Tamper Switch and Waterflow Switch Monitor Module:

(4) Module shall provide supervised Class B monitoring of normally open, dry contacts. Provide a monitor module for each sprinkler system flow

switch and each supervised control valve, including wall indicating valves and post indicating valves.

(b) Control Relay Module:

(1) Module shall provide double pole/double throw contacts for control of external appliances such as fans and dampers.

(2) Provide control modules for air handling units, fans and dampers as necessary to meet all requirements specified in the Contract Documents.

(3) Provide control modules for each elevator control panel for elevator capture.

(4) Provide each module with trim plate for outlet box mounting.

(5) Signal Module:

(6) Module shall provide supervised signal circuits capable of activating audio and visual alarm signaling devices and reporting trouble conditions. Each signal module circuit shall be individually fused at 2 amperes.

(7) Provide signal modules as required to operate all audio/visual signal devices.

(8) Isolated Loop Circuit Protectors: Provide isolated loop circuit protectors for fire alarm system wiring that is run external to buildings.

J. Signal Notification Appliances and Accessories

1. Audio/Visual Units:

a. Units shall meet minimum requirements of Americans with Disabilities Act [ADA). Units shall operate from 24 VDC, polarized. Visual units shall utilize a Xenon strobe with a light intensity meeting ADA requirements. Unit housing shall be red and have the word "FIRE" in readily visible in white lettering.

1) Units shall include separate wire leads for in/out wiring of the signal circuit[s) and have the ability of the control panel silencing the audio alarm portion of the unit and the visual portion of the unit remain flashing.

(a) Indoor Units:

(1) Units shall have a minimum SPL level of 82 dBA (synchronized temporal pattern) under UL 464 reverberant chamber test.

(2) Units shall have the ability for the horns and visual strobes to be operated in a synchronized pattern so that all strobes flash at the same time.

(3) Units shall have selectable strobe outputs of 15, 30, 75 and 110 candelas.

(4) Exterior Weatherproof Audio/Visual Units:

(5) Units shall be rated for exterior and wet locations and the operating voltage applied. Provide units with weatherproof back box by unit manufacturer. Audible output shall be a minimum of 83 dBA @10 feet (reverberant per UL 464). Strobe output shall be a minimum of 75 candela.

(6) Set horn and strobe output levels to maximum settings.

2) Visual Units:

(a) Unit shall meet minimum requirements of Americans with Disabilities Act (ADA). Unit shall operate from 24 VDC, polarized, and utilize a Xenon strobe. Unit housing shall be red and have the word "FIRE" in readily visible in white lettering.

(b) Units shall include separate wire leads for in/out wiring of the signal circuit(s) and have the ability of the control panel silencing the audio alarm signals while visual units remain flashing.

(c) Indoor Units:

(1) Units shall have the ability for the strobes to be operated in a synchronized pattern so that all strobes flash at the same time.

(2) Units shall have selectable strobe outputs of 15, 30, 75 and 110 candelas.
(3) Exterior Weatherproof Visual Units:
(4) Units shall be rated for exterior and wet locations and the operating voltage applied. Provide units with weatherproof back box by unit manufacturer. Strobe output shall be a minimum of 75 candela.

3) Synchronizing Modules: Provide synchronizing modules as required to synchronize the horns and the strobes of all audio/visual units and visual units. Module shall be as manufactured by specified acceptable manufacturer.
4) Indoor Surface Mount Box and Adapter Skirt:
(a) In existing finished areas where the outlet box for a signal notification device cannot be installed flush due to wall construction, provide a surface style box or adapter skirt to cover outlet box. The surface style box shall be specifically design to mount the signal notification appliances. The adapter skirt shall be designed to cover a surface mounted 4" square, 1-1 /2" deep outlet box and provide a finished trim appearance. Obtain permission of Architect for use of surface mount boxes in finished areas.
(b) Surface mount box shall include adapter plate. Box and plate shall have red paint finish.
5) Wire Guards: Provide wire guards for audio/visual units and visual units where indicated on the drawings or in this Section. The wire guards shall consist of welded, open metal mesh formed to fit over and around the audio/visual and visual only units. Finish color of guard shall be red.

b. Sprinkler Alarm Bell:
1) Bell shall be a l 0-inch diameter, 24 VDC rated vibrating bell with output of 92 dBA at 10 feet (anechoic chamber measurement). This bell shall be used for alarm for the sprinkler system as required by applicable codes and shall be permanently labeled as to its function. This color of the bell shall be red. The bell shall be surface mounted.
(a) Provide the following bell and bell accessories:
(1) Bell: Edwards Model 439D- l 0AW-R, Notifier Model MB-G l 0-24-R, Wheelock Model MB-Gl 0-24-R, or approved equals.
(2) Weatherproof Outlet Box for Bell: Edwards Model 449, Wheelock Model WWB, or approved equal.
(3) Yard Hood: Weather-protective yard hood painted to match the color of the wall on which it is mounted.
(4) Sign: Permanent identification sign installed near the bell which is in accordance with the latest edition of NFPA #13. The sign shall read, "Sprinkler Fire Alarm - When Bell Rings Call Fire Department or Police".

K. Fire Alarm Wire and Cable
1. All wiring shall be power-limited cable unless other types are required by system manufacturer or applicable codes.
2. All wiring shall meet the requirements of the National Electrical Code and all other applicable national, state, and local codes.
3. Non-Plenum Rated Cabling: Where system cabling is installed in conduit or other enclosed raceway, cabling may be non-plenum rated cabling.
4. Plenum Rated Cabling: Where system cabling is installed without conduit or other enclosed raceways, or in open cable tray in supply and return air ducts, air plenums such as above accessible ceiling, or in risers, system cabling shall be plenum-rated.
a. Communications Wiring: Twisted and shielded # 18 AWG two-conductor cable or other cabling as recommended by the fire alarm system manufacturer. Minimum conductor size shall be # 18 AWG.

b. Notification Appliance Signal Wiring: Wiring to signaling devices, such as fire alarm audio and visual units, shall be solid or stranded, two-conductor cable. Minimum conductor size shall be # 16 AWG. # 14 AWG.
    1) All 24 volt power wiring from control panels to zone addressable modules shall be two-conductor cable or other cabling as recommended by the fire alarm system manufacturer. Minimum conductor size shall be #14 AWG.

L. Keys, Manuals, And Spare Parts
1. Keys: Provide to the Owner a minimum of four copies of all system cabinet keys. This shall include, but not be limited to, keys for the fire alarm control cabinet, NAC panels, and remote annunciators.
2. Manuals: Provide to the Owner four (4) copies of a Fire Alarm System Maintenance Manual. The manuals shall include service and repair manuals, schematics, parts lists, etc., description of system operation, schedule of circuits and components by function, location and wire codes.
3. Spare Parts: Furnish to the Owner system parts and equipment as listed below for the fire alarm system installed on this project. The quantity of each type of part or equipment shall be six (6) percent of total units of each type installed on the site and no less than one (l) of each, unless otherwise noted.
    a. Manual Stations.
        1) Area Smoke Sensor.
            (a) Area Heat Sensors.
                (1) Area Sensors Base with LED.
            (b) Area Sensors Base with Supervised Relay.
                (1) Duct Smoke Detectors.
                (2) Addressable Input/Output Modules. Provide three (3) of each type of addressable 1/0 module (Monitor, Control Relay, Signal, etc.) installed on this project.
                (3) Indoor Audio/Visual Unit.
            (c) Indoor Visual Unit.
                (1) Outdoor/Weatherproof Audio/Visual Unit.
                (2) Outdoor/Weatherproof Visual Unit.

M. Execution

N. General
1. Provide the system as indicated and in accordance with all applicable codes and the manufacturer's recommendations. All wiring shall be installed in strict compliance with all the provisions of NFPA 70 - Article 760, Power-Limited Protective Signaling Circuits.
2. All equipment and wiring shall be installed as directed by the manufacturer's instructions and diagrams.
3. The manufacturer's authorized representative shall provide on-site supervision of installation.
4. The manufacturer's authorized representative shall provide all on-site software modifications and supervision of the complete fire alarm system installation, perform a complete functional test of the system, and submit a written report to the Owner attesting to the proper operation of the completed system.
    a. Coordinate the installation of equipment and devices that pertain to the work of other Trades on the project with the appropriate Trade.

O. System Installation
1. All equipment shall be installed at the locations and heights indicated.
2. 120 VAC Power: Provide 120 VAC power from dedicated circuits to the control panel and any required Notification Appliance Circuit (NAC) extender panels whether or not indicated on the Drawings.
3. Mount the fire alarm control cabinet and peripheral equipment securely to walls or columns. This Contractor shall provide all necessary brackets, mounting devices, structural pieces and expansion type anchor inserts necessary for this purpose.

4. Locate the system's manual evacuation (drill) switch immediately adjacent to the system annunciator panel serving the main office area of the building. If there is no annunciator panel serving the main office area, install this switch immediately adjacent to the system annunciator panel serving the main entrance of the building.
    a. Mounting Heights:
        1) Mount fire alarm control panels and notification appliance circuit (NAC) extender panels, and automatic telephone dialer, at plus 72 inches above finish floor to the top.
        2) Alpha-Numeric Annunciators and Graphic Maps:
            (a) Mount fire alarm system remote annunciators at plus 48 inches above finish floor to the top of the annunciator backbox.
                (1) Mount graphic maps directly above the annunciators at plus 52 inches above finish floor to the bottom of the maps.
                (2) Graphic Annunciators: Mount fire alarm system remote annunciators at plus 72 inches above finish floor to the top of the annunciator backbox.
                (3) Mount manual evacuation (drill) switch at plus 48 inches above finish floor to the top of the outlet boxes.
                (4) Mount manual stations at plus 48 inches above finish floor to the top of the outlet boxes.
                (5) Mount fire alarm audio/visual units, visual units, and audible only units at 84" (7'-0") above finish floor to the 1QQ (80" to the bottom) or 6" below finished ceilings, whichever is lower, to the top of the outlet boxes unless otherwise noted.
    b. Area Detectors:
        1) Provide area detectors at all indicated locations.
            (a) 2. Notification Appliance Circuit (NAC) Extender Panels: Provide an area smoke detector at each Notification Appliance Circuit (NAC) extender panel location whether or not indicated on the Drawings.
        2) Duct Smoke Detectors:
            (a) Detectors:
                (1) Provide duct smoke detectors in all new fan systems that are in excess of 2,000 cubic feet per minute in accordance with NFPA 90A.
                (2) Provide each duct detector with sampling tubes in accordance with the detector manufacturer's recommendations and instructions.
                (3) Connect the detectors so that if smoke of sufficient concentration appears, they will activate the fire alarm system in the same manner as manual stations, area detectors, or other initiating device.
                (4) In return air ducts, install the detectors ahead of any fresh-air inlet.
                (5) Refer to the Division 23 drawings and specifications for locations.
                (6) Remote Relays:
                (7) Provide each duct detector with a remote relay for shutdown of the associated air handling unit motor starter or motor drive control circuit and dampers as specified in this Section and in Division 23. Locate the relay within 3 feet of the device being controlled in accordance with NPFA 72. The Temperature Control Trade shall wire from the contacts of each detector's associated remote relay to the associated air handling unit motor starter or motor drive control circuit for shutdown of the fan. This Contractor shall furnish and install all other detector wiring for power, alarm, trouble, etc.
                (8) Provide each duct detector with a remote relay for signaling the building automation system as specified in this Section and in Division 23. Locate the relay within 3 feet of the device being controlled in accordance with NPFA 72. The Building Automation System contractor shall wire from contacts of each detector's associated remote relay to

the associated air handling unit building automation system control panel.

(9) Remote Test Station: Provide each duct detector with one remote test station. Install the station on the nearest adjacent wall to the duct detector at a height of 48 inches above the finished floor. Provide printed label on each station indicating associated air handler and associated detector (supply or return).

(10) This Contractor shall furnish and install all other detector wiring for power, alarm, trouble, etc.

c. Flow Switches and Supervised Valves: Connect all fire protection system flow switches and supervised valves to the fire alarm system. Coordinate locations with the fire protection trades.

d. Audio/Visual Units and Visual Units:

1) Set the strobe output levels to 75-candela for all rooms up to a maximum dimension of 40' x 40' where in compliance with applicable codes.

2) The strobe output levels may be set to 15-candela in the following rooms if their usage meets all 1998 Indiana Building Code, Chapter 11 - Accessibility (675 IAC 13-2.3-131) requirements for strobe brightness and coverage:

(a) Small toilet rooms.

(1) Small internal office suite hallways.

(2) Small mechanical rooms.

(3) Set the strobe output levels to 110-candela strobe in all rooms exceeding 50 feet in any direction or where required for provide coverage required by applicable codes. This shall include, but not be limited to, cafeterias, gymnasiums, field houses, and auditoriums.

3) Sprinkler Alarm Bell: Install the bell on the exterior of the building near the incoming service for the building sprinkler system at a height of between 10 and 15 feet unless otherwise noted. If the location of the bell is not indicated on the Drawings, verify the exact mounting location of this bell with the Architect.

4) Kitchen Hood: Connect the fire alarm system to the kitchen hood fire-suppression system for system alarm initiation. The kitchen hood fire-suppression systems shall shut down any gas supply for cooking.

5) Gas and Fuel Shut-Off Valves: Connect the system to shut-off valves for gas and fuel oil supplies that serve or pass through student-occupied spaces for alarm condition shut down.

6) Digital Alarm Communicator Transmitter (DACT):

(a) Connect the DACT to two (2) phone lines for dial-out to an approved Central Station upon activation of the fire alarm system. An alarm and/or trouble condition shall dial the Central Station monitoring services.

(b) The fire alarm system Contractor shall be responsible for the installation and testing of the phone lines connected to the DACT. The Owner shall be responsible for providing information (names, phone numbers, messages, etc.) to be provided to the Central Station monitoring service.

(c) Arrange for the proper connection of the DACT to the telephone system with the local telephone company and with the Contractor responsible for the telephone system installation. the Owner.

7) Automatic Telephone Dialer:

(a) The telephone dialer shall be connected to one outside telephone and connected to relay contacts in the fire alarm panel to initiate operation of the dialer upon activation of a fire alarm system signal to notify the local fire department.

(1) Both channels shall be utilized; one for the alarm and one for trouble.

(2) The tape messages shall be programmed by the manufacturer to the proper requirements for both alarm and trouble channels.

(3) The dialer messages shall be specifically approved by the answering office. This Contractor shall obtain this approval.
(4) Arrange for the proper connection of the dialer to the telephone system with the local telephone company and with the Contractor responsible for the telephone system installation. the Owner.

P. Conduit, Raceways, and Wire and Cable Installation
1. All wiring shall meet the requirements of the National Electrical Code, and all national, state, and local codes.
2. Install all system cabling in conduit, boxes, and other enclosed raceways for system equipment and outlets. Provide a complete conduit and raceway system for all system cabling. Do not install cabling in cable trays.
3. Install all fire alarm system cables as follows:
a. General: Install all system cabling in conduit, boxes, and other enclosed raceways for system equipment and outlets unless specifically otherwise noted.
b. Above Finished Ceilings:
1) Do not install system cables in cable tray unless specifically noted or indicated.
(a) Provide independent "J" hook system in ceiling cavities. Do not install cable in I.T. cable system. In all other locations, install cables in conduit or other enclosed raceways.
(1) Where cables are installed without conduit or other enclosed raceway or in open cable tray:
(2) Route cables parallel or perpendicular to building lines.
(3) Arrange cable runs to maintain headroom above ceiling and present neat appearance.
(4) Bundle cable runs together by system type and secure the cables to the building structure utilizing bridle rings or cable ties of at least 30 pounds tensile strength.

1.02 4)

A. Secure and support all cables at intervals not more than six feet

B. M.'..:Q5 and such that cables do not sag more than seven (7) inches from any point of support.
1. Provide clearances of at least 10 feet from electrical bus duct, six (6) feet from large motors and transformers, 12 inches from conduit and cables used for electrical power distribution, and 6 inches from lighting fixtures.
a. All fire alarm system cabling within building perimeters are to be installed above the building finished floor line.
1) Provide all wiring, conduit, pull boxes, outlets, and mounting boxes required for the installation and operation of a complete fire alarm system, as specified and described.
b. Provide all outlets and mounting boxes required as a part of the mounting arrangement for stations, control cabinets, and signals. These shall be in accordance with the manufacturer's specifications.
1) Provide two (2) spare one inch conduits from the fire alarm control panel stubbed above the nearest accessible corridor ceiling and marked for future use.
2) Paint all junction boxes red and labeled them with the words "Fire Alarm". Maintain all wiring color codes throughout the installation.
c. This Contractor shall provide power from a dedicated 1P-20 ampere, 120-volt circuit for fire alarm system control panel and all notification appliance circuit (NAC) extender panels. Wiring for 120 VAC power wiring shall be # 12 AWG installed in conduit.
1) Audio/visual and Visual Only Unit Cabling:
(a) A single pair of conductors can be used for indicating appliance circuits where the system provides the capability to silence audio devices without interrupting visual/strobe operation.
(b) Where audio units cannot be silenced without interrupting visual/strobe operation provide separate pairs of conductors on indicating appliance

circuits for the audio and the visual signals as required to allow the audio units to be silenced while the visual units remain activated.

2) Connect a maximum of ten horns, strobes, and horn/strobe devices per signal circuit.

C. Cleaning
   1. Clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of system installation.

D. Programming and Labeling

1.03 A.

A. Program the system to display the Owner's room numbers for each system addressable device. Do not use the Architect's room numbers.

1.04 B.

A. System labeling shall utilize the Owner's room numbers.

B. Testing
   1. The completed fire alarm system shall be fully tested in accordance with NFPA-72 by the Contractor in the presence of the Owner's representative, the Architect, the local authority having jurisdiction, and the manufacturer's technical representative. Upon completion of a successful test, the contractor shall so certify in writing to the Owner, Architect, and all authorities having jurisdiction.

C. Warranty
   1. Provide warranty under the provisions of Division 01.
   2. The equipment manufacturer shall make available to the Owner a maintenance contract proposal to provide a minimum of two inspections and tests per year in compliance with NFPA 72 guidelines.

D. Training
   1. The equipment manufacturer's representative shall provide, as part of this contract, a minimum of 8 hours in two sessions system operation training for the building Owner's representative, and fire department personnel. The training session shall be at a time to be stipulated by the Owner.

E. Closeout Manuals
   1. At the completion of the project and before final payment the Electrical Contractor shall turn over to the Owner all system keys, spare parts, manuals, as-built drawings, etc., required by these Specifications, and certify in writing that the Fire Alarm System has been installed in conformance with all applicable codes and is operating properly.

END OF SECTION

SECTION 28 46 00 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Transmitters for communication with supervising station.

1.02 RELATED REQUIREMENTS

A. Section 23 33 00 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Proposal Documents: Submit the following with cost/time proposal:
   1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
   3. Certification by Contractor that the system design will comply with Contract Documents.
   4. Proposed maintenance contract.

C. Evidence of designer qualifications.

D. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
   1. Copy (if any) of list of data required by authority having jurisdiction.
   2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
   4. System zone boundaries and interfaces to fire safety systems.
   5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
   6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
   7. List of all devices on each signaling line circuit, with spare capacity indicated.
   8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
   9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
   10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
   11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.

12. Certification by Contractor that the system design complies with Contract Documents.

E. Evidence of installer qualifications.

F. Inspection and Test Reports:
   1. Submit inspection and test plan prior to closeout demonstration.
   2. Submit documentation of satisfactory inspections and tests.
   3. Submit NFPA 72 "Inspection and Test Form," filled out.

G. Operating and Maintenance Data: See Section 01 78 00 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
   1. Complete set of specified design documents, as approved by authority having jurisdiction.
   2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
   3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
   4. List of recommended spare parts, tools, and instruments for testing.
   5. Replacement parts list with current prices, and source of supply.
   6. Detailed troubleshooting guide and large scale input/output matrix.
   7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
   8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

H. Project Record Documents: See Section 01 78 00 for additional requirements; have one set available during closeout demonstration:
   1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
   2. "As installed" wiring and schematic diagrams, with final terminal identifications.
   3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

I. Closeout Documents:
   1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
   2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Units and Accessories:
   1. Honeywell Security & Fire Solutions/Gamewell-FCI; _____: www.gamewell-fci.com/#sle.
   2. Simplex, a brand of Johnson Controls; _____: www.simplex-fire.com/#sle.
   3. Provide control units made by the same manufacturer.

B. Initiating Devices and Notification Appliances:
   1. Honeywell Security & Fire Solutions/Gamewell-FCI; _____: www.gamewell-fci.com/#sle.
   2. Simplex, a brand of Johnson Controls; _____: www.simplex-fire.com/#sle.
   3. Same manufacturer as control units.
   4. Provide initiating devices and notification appliances made by the same manufacturer, where possible.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
   1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
   2. Protected Premises: Entire building shown on drawings.

3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
    a. ADA Standards.
    b. The requirements of the local authority having jurisdiction, which is _____.
    c. Applicable local codes.
    d. Contract Documents (drawings and specifications).
    e. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
7. Program notification zones and voice messages as directed by Owner.
8. Fire Command Center: Location indicated on drawings.
9. Fire Alarm Control Unit: New, located at fire command center.

B. Supervising Stations and Fire Department Connections:
1. Public Fire Department Notification: By on-premises supervising station.
2. On-Premises Supervising Station: Existing proprietary station operated by Owner, located at _____.
3. Means of Transmission to On-Premises Supervising Station: Directly connected noncoded system.

C. Circuits:
1. Initiating Device Circuits (IDC): Class B, Style A.
2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
3. Notification Appliance Circuits (NAC): Class B, Style W.

D. Spare Capacity:
1. Initiating Device Circuits: Minimum 25 percent spare capacity.
2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
3. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Duct smoke detectors.

C. HVAC:
1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

2.04 COMPONENTS

A. General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Master Control Unit: _____.

D. Initiating Devices:
   1. Addressable Systems:
      a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
      b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.

E. Notification Appliances:

F. Circuit Conductors: Copper or optical fiber; provide 200 feet (60 m) extra; color code and label.

G. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

H. Locks and Keys: Deliver keys to Owner.

I. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
   1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
   2. Provide one for each control unit where operations are to be performed.
   3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
   4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Owner's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.03 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.

3. Have authorized technical representative of control unit manufacturer present during demonstration.
4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
5. Repeat demonstration until successful.

END OF SECTION

SECTION 31 10 00 - SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and grubbing.

B. Selective removal and trimming.

C. Debris removal.

1.02 RELATED REQUIREMENTS

A. Section 01 57 13 - Temporary Erosion and Sediment Control.

B. Section 31 22 00 - Grading: Topsoil removal.

C. Section 31 23 23 - Fill: Material for filling holes, pits, and excavations generated as result of removal operations.

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.266 - Logging Operations; Current Edition.

B. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning); 2017.

C. ANSI Z133 - American National Standard for Arboricultural Operations - Safety Requirements; 2017.

1.04 QUALITY ASSURANCE

A. Clearing Firm Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sedimentation Barrier: See Section 01 57 13 - Temporary Erosion and Sediment Control.

B. Fill Material: As specified in Section 31 22 00 - Grading

PART 3 EXECUTION

3.01 EXAMINATION

A. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 PREPARATION

A. Coordinate work with utility companies; notify before starting work and comply with local requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are to remain.

E. Install sedimentation barrier according to Section 01 57 13 - Temporary Erosion and Sediment Control.

F. Locate all existing underground existing utilities by pot-holing to determine exact location and depth of utility prior to clearing and excavation activities. Immediately document exact location of utility on record drawings.

3.03 CLEARING AND GRUBBING

A. Do not remove or damage vegetation beyond limits indicated on drawings.

B. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
   1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.

2. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

C. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 SELECTIVE REMOVAL AND TRIMMING

A. Selective Removal: Individual tree and shrub identified for removal as indicated on drawings according to 29 CFR 1910.266.

B. Selective Trimming: Individual limbs and branches cut back according to ANSI A300 Part 1 identified for removal as indicated on drawings. Follow recommendations of ANSI Z133 and best local practices for species involved.

3.05 REMOVED VEGETATION PROCESSING

A. Do not burn, bury, landfill, or leave on-site, except as indicated on drawings.

B. Trees: Sell if marketable.

3.06 DEBRIS REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and windblown debris from public and private lands.

END OF SECTION

SECTION 31 22 00 - GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal and storage of topsoil.

B. Rough grading and subgrade treatment the site for site structures.

C. Fine grading.

D. Finish grading for planting.

1.02 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing.

B. Section 31 23 16 - Excavation.

C. Section 31 23 16.13 - Trenching: Trenching and backfilling for utilities.

D. Section 32 92 19 - Seeding: Finish ground cover.

PART 3 EXECUTION

2.01 EXAMINATION

A. Verify survey bench mark and intended elevations for grading areas are as indicated.

B. Verify the absence of standing or ponding water.

2.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect above- and below-grade utilities to remain.

D. Provide temporary means and methods to remove standing or ponding water from areas prior to grading.

E. Protect site features to remain, including but not limited to bench marks, survey control points, and fences.

F. Locate all existing underground existing utilities by pot-holing to determine exact location and depth of utility prior to clearing and excavation activities. Immediately document exact location of utility on record drawings.

2.03 ROUGH GRADING

A. Excavate and fill subgrade material to elevations indicated on plans.

B. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

C. Based upon the Geotechnical Report prepared by Patriot Engineering, the stripping of XX inches on topsoil is anticipated.

D. Do not remove topsoil when wet.

E. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

F. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

G. When excavating through roots, perform work by hand and cut roots with sharp axe.

H. Replace displaced subgrade in accordance with Section 31 23 23.

I. Remove and replace unsuitable materials as specified fill.

J. Rough grade and remove all soils left on site from utility company excavations.

2.04 FINE GRADING

A. Scrape and spread subgrade material uniformly smooth and without disruptions as indicated on drawings.

B. Fine grade all areas disturbed by utility companies during installation of utilities.

2.05 SOIL REMOVAL

A. Stockpile excavated topsoil on site.

B. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet (2.5 m); protect from erosion.

2.06 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch (13 mm) in size. Remove soil contaminated with petroleum products.

C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches (75 mm).

D. Place topsoil in areas where seeding are indicated.

E. Place topsoil where required to level finish grade.

F. Place topsoil to the following compacted thicknesses:
   1. Areas to be Seeded with Grass: 6 inches (150 mm).

G. Place topsoil during dry weather.

H. Remove roots, weeds, rocks, and foreign material while spreading.

I. Near plants spread topsoil manually to prevent damage.

J. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

K. Lightly compact placed topsoil.

L. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

2.07 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) (30 mm) from required elevation.

B. Top Surface: Plus or minus 1/2 inch (13 mm).

2.08 FIELD QUALITY CONTROL

A. See Section 31 23 23 for compaction density testing.

2.09 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove unused stockpiled subsoil. Grade stockpile area to prevent standing water.

C. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31 23 16 - EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for slabs-on-grade, paving, and site structures.

B. Trenching for utilities outside the building to utility main connections.

C. Temporary excavation support and protection systems.

1.02 RELATED REQUIREMENTS

A. Section 01 57 13 - Temporary Erosion and Sediment Control: Slope protection and erosion control.

B. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal; topsoil removal.

C. Section 31 22 00 - Grading: Grading.

D. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

E. Section 31 23 23 - Fill: Fill materials, backfilling, and compacting.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

PART 3 EXECUTION

2.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

2.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 10 00 for clearing, grubbing, and topsoil removal.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Notify utility company to remove and relocate utilities.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Owner's Representative.

G. Locate all existing underground existing utilities by pot-holing to determine exact location and depth of utility prior to clearing and excavation activities. Immediately document exact location of utility on record drawings.

2.03 TEMPORARY EXCAVATION SUPPORT AND PROTECTION

A. Excavation Safety: Comply with OSHA92s Excavation Standard, 29 CFR 1926, Subpart P.
   1. Depending upon excavation depth, time that excavation is open, soil classification, configuration and slope of excavation sidewalls, design and provide an excavation support and protection system that meets the requirements of 29 CFR 1926, Subpart P:

2.04 EXCAVATING

A. Excavate to accommodate new structures and construction operations.
   1. Excavate to the specified elevations.
   2. Cut utility trenches wide enough to allow inspection of installed utilities.

B. Notify Architect and Owner's Representative of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Provide temporary means and methods, as required, to remove all water from excavations until directed by Owner's Representative. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

2.05 SUBGRADE PREPARATION

A. See Section 31 23 23 for subgrade preparation at general excavations.

B. See Section 31 23 16.13 for subgrade preparation at utility trenches.

2.06 FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation and the subgrade has been properly scarified or disced and dried.

2.07 FIELD QUALITY CONTROL

A. Provide for visual inspection by proof-rolling of load-bearing and all excavated surfaces by the Owner's Representative and Patriot Testing and Engineering before placement of foundations.

B. The Contractor shall utilize Patriot Testing and Engineering and pay for all costs associated with all testing to be performed by Patriot Testing and Engineering. The Contractor shall be responsible for all coordination and scheduling of all testing activities.

2.08 CLEANING

A. Remove excavated material that is unsuitable for re-use from site.

2.09 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 31 23 16.13 - TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Site grading.

B. Section 31 23 16 - Excavation: Building and foundation excavating.

C. Section 31 23 23 - Fill: Backfilling at building and foundations.

1.03 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2022, with Errata .

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).

D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017, with Editorial Revision (2020).

G. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).

H. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

1.05 SUBMITTALS

A. Compaction Density Test Reports.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill - Fill Type general: Subsoil excavated on-site.
   1. Graded.
   2. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris.
   3. Complying with ASTM D2487 Group Symbol CL.

B. Granular Fill - Fill Type #8 stone: Coarse aggregate, complying with State of Indiana Highway Department standard.

C. Trenches shall be capped-off with a minimum of 12” thick damp compacted #53 stone.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 TRENCHING

A. Notify Owner’s Representative and Patriot Engineering f unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove excavated material that is unsuitable for re-use from site.

G. Remove excess excavated material from site.

H. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Owner's Representative and Patriot Testing. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

I. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot (305 mm) into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Owner's Representative and Patriot Testing.

3.03 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place as determined by Patriot Testing. Backfill with approved general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.04 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Slope grade away from building minimum 2 inches in 10 feet (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

G. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

H. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.
   2. At non-paved: 85 percent of maximum dry density.

I. Reshape and re-compact fills subjected to vehicular traffic.

3.05 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Utility Piping, Conduits, and Duct Bank:
   1. Bedding: Use approved compacted general fill.
   2. Cover with approved general fill in yard spaces. Cover with #8 crushed stone compacted in 8" lifts under all paved concrete, asphalt pavement areas and foundations. Extend #8 compacted stone cover a minimum of 24" beyond perimeter of all paved concrete, asphalt pavement and foundations. Trenches shall be capped-off with a minimum of 12" thick damp compacted #53 stone.
   3. Fill up to subgrade elevation.
   4. Compact in maximum 8 inch (200 mm) lifts to 95 percent of maximum dry density.

3.06 FIELD QUALITY CONTROL

A. Perform compaction density testing on compacted fill in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").

C. If tests indicate work does not meet specified requirements, remove work, replace and retest as directed by Patriot Testing.

D. The Contractor shall utilize Patriot Testing and Engineering and pay for all costs associated with all testing to be performed by Patriot Testing and Engineering. The Contractor shall be responsible for all coordination and scheduling of all testing activities.

END OF SECTION

SECTION 31 23 23 - FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for paving and site structures.

B. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Section 01 57 13 - Temporary Erosion and Sediment Control: Slope protection and erosion control.

B. Section 31 22 00 - Grading: Site grading.

1.03 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2022, with Errata .

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).

D. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017, with Editorial Revision (2020).

E. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).

1.05 SUBMITTALS

A. Product Data for Manufactured Fill.

B. Compaction Density Test Reports.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.07 WARRANTY

A. Correct defective Work within a six month period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill - Fill Type earth: Complying with State of Indiana INDOT Embankment Specifications standard.

B. Use of on-site material is subject to approval of the Owner’s Representative and Patriot Testing laboratory to ensure conformance with these specifications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches (150 mm) to identify soft spots and to dry out subgrade as required as recommended by Patriot Testing and Engineering.

B. Cut out soft areas of subgrade as identified by Patriot Testing that is not capable of compaction in place. Backfill and compact with approved general fill.

C. Compact subgrade to density equal to or greater than requirements as approved and tested by Patriot Testing for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces. Place and compact select approved fill materials in continuous layers not exceeding 8 inches loose depth.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 feet (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, foundations, and similar construction and 24 inches beyond edge of pavement, slabs on grade and foundations: 98 percent of maximum dry density.
   2. At grass earthen areas: 85 percent of maximum dry density.

H. Reshape and re-compact fills subjected to vehicular traffic.

I. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Owner's Representative and Patriot Testing. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

J. Additional Fill: If required, provide all additional fill material required from an approved source off of the site.

K. Upon approval of all final subgrade elevations, the contractor is responsible for protecting all subgrade areas from any and all damage due to truck and construction traffic and activities, rain/snow events. Any repair, correction or grading to the approved subgrade will be at the contractor's expense.

3.04 FIELD QUALITY CONTROL

A. Perform compaction testing in accordance with ASTM D2922 and ASTM D3017 and under provisions of Division 1.

B. Provide for visual inspection and proof rolling of all bearing surfaces located under pavements and buildings. All areas shall be proof rolled and tested immediately prior to installation of stone base, asphalt pavement and concrete slabs and pavement.

C. The Contractor shall employ Patriot Testing & Engineering, Evansville, IN, to perform all required review of sugrade, proof-rolling, testing and compaction testing. Contractor shall be responsible for payment for all associated costs of all required proof-rolling, testing and compaction testing for the Project.

D. Concrete Slabs-On-Grade: One test per every 1000 square feet area per lift or fraction thereof.

E. Continuous Footings: Tests to be performed at corners and at 50 foot distances or fractions thereof.

F. General Site: One test per every 5,000 square feet area or fraction thereof, but not less than one test per day.

G. Utility Trenches: One test per every 50 lineal feet or fraction thereof.

H. In all of the above items, perform the density-moisture tests on subgrade, subbase, base, and every lift of fill and backfill material.

I. Recompact failed tested areas and retest until the test results meet specifications.

J. Correct any areas found to have inadequate compaction or surface tolerances.

K. Correct and re-test at no cost to the Owner.

END OF SECTION

SECTION 31 31 16 - TERMITE CONTROL

GENERAL

1.01 SECTION INCLUDES

A. Soil treatment below slabs-on-grade for subterranean insects.

B. Soil treatment at interior and exterior foundation perimeter, for subterranean insects.

C. Cores of unit masonry foundation walls.

D. Isolated interior column piers.

1.02 RELATED SECTIONS

A. Section 31 20 00 - Earthwork.

1.03 REFERENCES

A. EPA - Federal Insecticide, Fungicide and Rodenticide Act.

B. NPCA - National Pest Control Association.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Indicate toxicants to be used, composition by percentage, dilution schedule, and intended application rates for all areas.
   1. Include schedule of all areas to be treated, including lineal and square footages.

C. Submit manufacturer's installation instructions under provisions of Division 1.

D. Submit equipment list, describing type and size of equipment used to apply termiticide.

1.05 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 1.

B. Accurately record moisture content of soil before treatment, date and rates of application, areas of application, diary of meter readings, finished gallons of termiticide used, and corresponding soil coverage.

1.06 QUALITY ASSURANCE

A. Applicator: Company specializing in soil treatment for termite control with five (5) years documented experience.

B. Material Packaging: Manufacturer's labels and seals identifying content.

1.07 REGULATORY REQUIREMENTS

A. Conform to State of Indiana requirements for application licensing and authority to use toxicant chemicals.

1.08 WARRANTY

A. Provide five (5) year warranty for material and installation under provisions Division 1.
   1. Warranty to state that Contractor will apply treatment to exterminate any ground nesting-termite infestation which appears within the warranty period at no additional cost to the Owner.

B. Warranty: Bonded Guaranty: Cover against invasion or propagation of subterranean termites, damage to building or building contents caused by termites; repairs to building or building contents so caused.

C. Inspect work annually and report in writing to Owner.

D. Owner reserves right to renew warranty bonded guaranty for an additional five (5) years.

PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. Repellant Type Treatment:
   1. Talstar.

2. Prelude.
3. Pro Build TC.

B. Non-Repellant Type Treatment:
1. Termidor.
2. Premise.
3. Imaxx.

2.02 MATERIALS

A. Toxicant Chemical: Water based emulsion, uniform composition, synthetic dye to permit visual identification of treated soil.

B. Deliver products to job site in original sealed and labeled containers from the manufacturer.

2.03 MIXING

A. Dilute toxicant chemical in accordance with manufacturer's specifications.

EXECUTION

3.01 INSPECTION

A. Verify the soil surfaces are unfrozen, sufficiently dry to absorb toxicant, ready to receive treatment.

B. Beginning of application means acceptance of soil conditions.

C. Contractor shall be prepared for on-site inspection covering proper application and rate of termiticide.

3.02 APPLICATION

A. Apply toxicant 12 hours prior to installation of vapor barrier under slab-on-grade or finish grading outside foundation walls.

B. Apply per EPA approved specimen label of termiticide.

C. Areas of Application:
1. Under Floor Slabs-on-Grade: Apply after slab fill is in place and utility lines have been treated, at rate of one gallon finished solution per 10 square feet.
2. Both Sides of Foundation Walls: Apply after backfill is placed, at a rate of 4 gallons finished solution per 10 lineal feet, per foot of depth, maximum of 4 foot of depth.
3. Grade Beam to a Depth of One Foot: Apply after backfill is placed, at a rate of 4 gallons finished solution per 10 lineal feet, per foot of depth.

D. Apply as a coarse spray to ensure uniform distribution.

E. Coordinate soil treatment at foundation perimeter with finish grading and landscaping work to avoid disturbance of treated soil.
1. Retreat disturbed treated soil.

3.03 RETREATMENT

A. If inspection identifies the presence of termites, retreat soil and retest.

END OF SECTION

SECTION 32 11 23 - AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Paving aggregates.

C.

1.02 RELATED REQUIREMENTS

A. Section 32 12 16 - Asphalt Paving: Finish and binder asphalt courses.

B. Section 32 13 13 - Concrete Paving: Finish concrete surface course.

1.03 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil–Aggregate Subbase, Base, and Surface Courses; 2017 (Reapproved 2021).

B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.

C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

D. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).

1.04 SUBMITTALS

A. Compaction Density Test Reports.

PART 2 PRODUCTS

2.01 MATERIALS

A. Coarse Aggregate Type # 8 stone: Coarse aggregate, complying with State of Indiana Highway Department standard.

B. Blended Aggregate Type #53 stone: complaying with INDOT standardstone; free of shale, clay, friable material and debris.
   1. Graded in accordance with ASTM C136/C136M, within the following limits:
      a. 1 inch (25 mm) sieve: 80 to 100 percent passing.
      b. 3/4 inch (19 mm) sieve: 70 to 90 percent passing.
      c. 3/8 inch (9 mm) sieve: 55 to 80 percent passing.
      d. No. 4 (4.75 mm) sieve: 35 to 60 percent passing.
      e. No. 30 (sieve micro m): 12 to 30 percent passing.
      f. No. 200 (75 micro m): 5 to 10 percent passing.

C. Alternate #8 - Main Entrance Drive Stabilization
   1. Contractor shall provide labor and materials and perform lime stabilization at areas indicated on the drawings and 12” beyond the edge of the pavement. Contractor shall stabilize the soil subgrade to a minimum depth of 16”. Contractor shall utilize lime content of 5 percent by unit weight (correlates to 75-pounds of lime per square yard with a 16-inch stabilization depth). Lime analysis of the Contractor’s lime supply shall be performed by Patriot Engineering, with said analysis at Contractor’s expense. Contractor shall include all dust control, provide water, and testing by Patriot Testing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

A. Spread aggregate over prepared substrate per plans and details.

B. Place aggregate in maximum 6" layers and roller compact to specified density.

C. Level and contour surfaces to elevations and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 FIELD QUALITY CONTROL

A. If tests indicate work does not meet specified requirements, remove work, replace and retest.

B. Frequency of Tests: 1 test per 5000 SF.

C. Proof roll compacted aggregate at surfaces that will be under paving.

D. The Contractor shall employ Patriot Testing & Engineering, Evansville, IN, to perform all required proof-rolling, testing and compaction testing. Contractor shall be responsible for payment for all associated costs of all required proof rolling, testing and compaction testing for the Project

END OF SECTION

SECTION 32 12 16 - ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Double course bituminous concrete paving.

1.02 RELATED REQUIREMENTS

A. Section 32 11 23 - Aggregate Base Courses: Aggregate base course.

B. Section 32 17 23 - Pavement Markings.

1.03 REFERENCE STANDARDS

A. AI MS-2 - Asphalt Mix Design Methods; 2015.

B. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 2009a.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with State of Indiana Highways standard.

B. Mixing Plant: Complying with State of Indiana Highways standard.

C. Obtain materials from same source throughout.

1.05 SUBMITTALS

A. Mix designs

1.06 WARRANTY

A. Correct defective Work within a [one year] period after Date of Substantial Completion.

1.07 FIELD CONDITIONS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

B. Place bitumen mixture when temperature is not more than 15 F degrees (8 C degrees) below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 ASPHALT PAVING MIXES AND MIX DESIGN

A. Asphalt Base Course: 3.0 to 6 percent of asphalt cement by weight in mixture in accordance with AI MS-2.

B. Asphalt Binder Course: 4.5 to 6 percent of asphalt cement by weight in mixture in accordance with AI MS-2.

C. Asphalt Surface Course: 5 to 7 percent of asphalt cement by weight in mixture in accordance with AI MS-2.

D. Submit proposed mix design of each class of mix for review prior to beginning of work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 AGGREGATE BASE COURSE

A. Place and compact aggregate base course.

3.03 PREPARATION - PRIMER

A. Apply primer in accordance with manufacturer's instructions.

B. Apply primer on aggregate base or subbase at uniform rate of 1/3 gal/sq yd (1.5 L/sq m).

C. Use clean sand to blot excess primer.

3.04 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions.

B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd (1.5 L/sq m).

3.05 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

A. Place asphalt binder course within 24 hours of applying primer or tack coat.

B. Place asphalt binder course to thickness per plan details.

C. Place asphalt surface course within two hours of placing and compacting binder course.

D. Place asphalt surface course to thickness per plan details

E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

F. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.06 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch (6 mm) measured with 10 foot (3 m) straight edge placed in any direction and location. No bird baths or ponding will be accepted.

B. Variation from True Elevation: Within 1/4 inch (____ mm).

3.07 FIELD QUALITY CONTROL

A. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

B. The Contractor shall employ Patriot Testing & Engineering, Evansville, IN, to perform all required proof-rolling, testing and compaction testing. Contractor shall be responsible for payment for all associated costs of all required proof-rolling, testing and compaction testing for the Project

END OF SECTION

SECTION 32 13 13 - CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks, integral curbs, gutters, median barriers, parking areas, and equipment pads and drives, and joint sealants.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 31 23 23 - Fill: Compacted subbase for paving.

C. Section 32 11 23 - Aggregate Base Courses: aggregate base course.

1.03 REFERENCE STANDARDS

A. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.

B. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.

C. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.

G. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

H. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

I. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

J. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.

1.04 SUBMITTALS

A. Product Data: Provide data on joint filler, admixtures, and curing compound.

B. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.

1.05 WARRANTY

A. Correct defective Work within a one year period after Date of Substantial Completion.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

1.07 TESTING AND INSPECTION

A. Perform testing and inspection under provisions of Division 1. Contractor shall coordinate and pay all costs associated with required testing as specified in this Section and shall include all

costs in Bid amount. Contractor shall utilize Patriot Engineering and Environmental, Inc. to perform all testing and reporting. Contractor shall coordinate and schedule all testing. Testing requirements include the following:

1. Make four concrete test cylinders for every 50 or less cubic yards of each class of concrete placed each day.
   a. Make cylinders in accordance with ASTM C31.
2. Make one additional test cylinder during cold weather and cure on the site under same conditions as the concrete it represents.
3. Perform one slump test for each set of test cylinders taken.
   a. Perform slump test in accordance with ASTM C143.
4. Perform one air content test for each set of test cylinders taken on concrete requiring air-entrainment.
   a. Perform air content test in accordance with ASTM C173 or ASTM C231.
5. Perform compressive strength tests in accordance with ASTM C39 for each set of cylinders taken.
   a. Test one cylinder at 7 days, two cylinders at 28 days.
   b. Retain one cylinder as a spare for testing at the direction of the Architect.
   c. Spare cylinders may be discarded 56 days after casting, unless directed otherwise by the Architect.
6. Prepare a test report for each set of cylinders; containing the following information for each set of cylinders.
   a. Date of molding.
   b. Name and location of project.
   c. Name of Contractor and Concrete Supplier.
   d. Location of pour and Class of concrete.
   e. Mix design.
   f. Slump.
   g. Age of testing.
   h. Compressive strength (psi).
   i. Data from previous test of same cylinder group.
   j. Air content (for concrete requiring air-entrainment).
7. Perform cement and aggregates tests to ensure conformance with requirements stated herein.
8. Report test results to the Architect, Owner's Representative and to the Contractor within 24 hours after tests are performed.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

A. Concrete Sidewalks and curb: 4,000 psi 28 day concrete, refer to plans for thickness and reinforcing.

B. Drives and Equipment Pads: 4,000 psi 28 day concrete, refer to plans for thickness and reinforcing.

2.02 REINFORCEMENT

A. Reinforcing Steel and Welded Wire Reinforcement: Types specified according to plans and details.

2.03 CONCRETE MATERIALS

A. Concrete Materials: As specified in Section 03 30 00.

2.04 ACCESSORIES

A. Curing Compound: ASTM C309, Type 1, Class A.

B. Slab Isolation Joint Filler: 1/2 inch (13 mm) thick, height equal to slab thickness, with removable top section that will form 1/2 inch (13 mm) deep sealant pocket after removal.

C. Joint Sealant: Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.
   1. Colors of Exposed Joint Sealants: As selected from the submittals and approved by the Owner from the manufacturer's full range.
   2. Obtain each type of joint sealant from single source from single manufacturer.
   3. Products: Subject to compliance with requirements, provide the following:
      a. Crafco Inc., an ERGON company; RoadSaver Silicone SL.
      b. Dow Corning Corporation; 890-SL
      c. Pecora Corporation; 300 SL
   4. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint-sealant-substrate test and field tests.

2.05 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.

B. Fiber Reinforcement: Macro-Synthetic firbers shall be for fence posts and bollards in accrodance with ASTM C1116. Add to mix at rate of 5 pounds per cubic yard (____ kg per cubic meter), or as recommended by manufacturer for specific project conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

A. See Section 32 11 23 for construction of base course for work of this Section.

3.03 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 REINFORCEMENT

A. Place reinforcement as indicated in details.

3.05 COLD AND HOT WEATHER CONCRETING

A. Follow recommendations of ACI PRC-305 when concreting during hot weather.

B. Follow recommendations of ACI PRC-306 when concreting during cold weather.

C. Do not place concrete when base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

3.06 PLACING CONCRETE

A. Coordinate installation of snow melting components.

B. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

3.07 JOINTS

A. Align curb, gutter, and sidewalk joints.

B. Place 3/8 inch (10 mm) wide expansion joints at 20 foot (6 m) intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
   1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch (13 mm) of finished surface.

C. Saw cut contraction joints max. 3/8" wide within 24 hours after pour. Saw cuts to have 1/4" radius edges. Cut 1/4 into depth of slab.

3.08 FINISHING

A. Area Paving: Light broom, texture perpendicular to pavement direction.

B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius (6 mm radius).

C. Curbs and Gutters: Light broom, texture parallel to pavement direction.

D. Joint Sealant:
   1. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.
   3. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
   4. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant- substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
   5. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
   6. Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
   7. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
      a. Do not leave gaps between ends of joint-sealant backings.
      b. Do not stretch, twist, puncture, or tear joint-sealant backings.
      c. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
   8.
      a. Place joint sealants so they directly contact and fully wet joint substrates.
      b. Completely fill recesses in each joint configuration.
      c. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
   9. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.09 TOLERANCES

A. Slabs-On-Grade: Finished concrete surface shall be installed not to exceed 1/8” variation measured by 10-foot straightedge in any direction and at any point on concrete surface. Ponding of water or bird baths will not be accepted.

B. Remedy for Out-of-Tolerance Work: The Contractor shall remedy any slab section out of tolerance. Contractor shall undertake the remedial measures that have been approved by the Architect, Engineer and Owner’s Representative.

3.10 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B.

END OF SECTION

SECTION 32 17 23 - PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Painted pavement markings.

1.02 RELATED REQUIREMENTS

A. Section 32 12 16 - Asphalt Paving.

B. Section 32 13 13 - Concrete Paving.

1.03 REFERENCE STANDARDS

A. FHWA MUTCD - Manual on Uniform Traffic Control Devices; 2023.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons (18 L) accompanied by batch certificate.

B. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment, accompanied by batch certificate.

C. Store products in manufacturer's unopened packaging until ready for installation.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.05 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 PAINTED PAVEMENT MARKINGS

A. Comply with State of Indiana Highway Department standards.

B. Comply with FHWA MUTCD.

C. Painted Pavement Markings: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that pavement is dry and ready for installation.

3.02 PREPARATION

A. Establish survey control points for locating and dimensioning of markings.

B. Place barricades, warning signs, and flags as necessary to alert approaching traffic.

C. Clean surfaces prior to installation.
   1. Remove dust, dirt, and other debris.

D. Apply paint stencils by type and color at necessary intervals.

3.03 INSTALLATION

A. General:
   1. Position pavement markings as indicated on drawings.
   2. Field location adjustments require approval of Architect.
   3. All edges and lines shall be crisp and clean. Overspray will not be acceptable.

B. Painted Pavement Markings:
   1. Apply in accordance with manufacturer's instructions.
   2. Apply in accordance with State of Indiana Highway Department standards.
   3. Apply in accordance with FHWA MUTCD standards.

3.04 FIELD QUALITY CONTROL

A. If inspections indicate work does not meet specified requirements, rework and reinspect at no cost to Owner.

B. Allow the pavement marking to set at least the minimum time recommended by manufacturer.

3.05 PROTECTION

A. Prevent approaching traffic from crossing newly applied pavement markings.

END OF SECTION

SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Posts, rails, and frames.

B. Wire fabric.

C. Manual gates with related hardware.

D. Automatic Cantilever Sliding Gate.

E. Automatic gate operators.

F. Accessories.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a(Reapproved 2022).

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

E. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon,
   1. Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
      a. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2023.
      b. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC), Polyolefin and Other Polymer-Coated Steel Chain Link Fence Fabric; 2017 (Reapproved 2022).
      c. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework; 2018 (Reapproved 2022).
      d. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2018 (Reapproved 2022).
      e. ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction; 2020.
      f. CLFMI CLF-FIG0111 - Field Inspection Guide; 2014.
      g. CLFMI CLF-PM0610 - Product Manual; 2017.
      h. CLFMI CLF-SFR0111 - Security Fencing Recommendations; 2014.
      i. CLFMI WLG 2445 - Wind Load Guide for the Selection of Line Post and Line Post Spacing;2023.
      j. FS RR-F-191/1D - Fencing, Wire and Post Metal (Chain-Link Fence Fabric); 1990.
      k. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
      l. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
      m. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
      n. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fabric, posts, accessories, fittings, and hardware.

C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.

D. Manufacturer's Qualification Statement.

E. Fence Installer Qualification Statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

C. Lightning Protection System: Maximum grounding-resistance value of 25 ohms undder normal dry conditions.

D. Pre-installation Conference: Conduct conference at project site.

1.05 WARRANTY

A. Correct defective Work within a fifteen-year period after Date of Substantial Completion.

B. Provide five-year manufacturer warranty for materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Automatic Gate Operators:
   1. Liftmaster # CSL24UL or equal, vehicular slide gate operator commercial, DC motor with (4) photoeye sensors #LMTBUL and associated cabling. Provide and program universal single remote control button #811LM. 5 year commercial limited warranty].

2.02 COMPONENTS

A. Line Posts: 2-7/8" O.D. diameter typical and 4" O.D. diameter where HDPE privacy slats.

B. Corner and Terminal Posts: 6-5/8" O.D. diameter.

C. Manual Swing Gate Posts: 6-5/8" diameter.

D. Top and Brace Rail: 1-5/8" diameter, plain end, sleeve coupled.

E. Bottom Rail: 1-5/8" diameter, plain end, sleeve coupled.

F. Gate Frame: welded fabrication. Size to be determined by gate opening.

G. Fabric: 2-inch (51 mm) diamond mesh interwoven wire, 8 gauge fused and bonded, black vinyl coated. 9-gauge core wire. top selvage knuckle end closed, bottom selvage twisted tight.

H. Fabric with Pre-Inserted Slats: 2-inch (51 mm) diamond mesh interwoven wire, 8 gauge fused and bonded, black vinyl coated. top selvage knuckle end closed, bottom selvage twisted tight.

2.03 PRIVACY SLATS: HIGH-DENSITY POLYETHYLENE (HDPE), WOVEN INTO FABRIC.

A. Visual Barrier: 80 percent.

B. Slat Color: Black
   1. Tension Wire: ASTM A824 Type II, galvanized steel wire, 6 gauge, 0.1920 inch (4.9 mm) thick steel.
      a. Tie Wire: 9-gauge galvanized steel wire for attachment of fabric to line posts and rails.

2.04 POSTS, RAILS, AND FRAMES:

A. ASTM A1011/A1011M, Designation SS; hot-rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi (345 MPa); zinc coating complying with ASTM F1043 and ASTM F1083.

B. Line Posts: Type I round in accordance with FS RR-F-191/1D.

C. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round in accordance with FS RR-F-191/1D.

D. Comply with CLFMI CLF-PM0610.
   1. Wire Fabric:
      a. ASTM A392 zinc coated steel chain link fabric.
      b. Factory coated 9 gauge core wire with a min. 0.02 inch thick coating of plasticized polyvinyl-chlordie calss 2B fused and bonded applied by the fusion method over a thermoset plastic bonding agent. The bond shall exhibit equal or greater strength than the cohesive strength of the vinyl. All cut ends shall be coated with vinyl at the factory.
      c. 2" mesh and black in color.
      d. Comply with CLFMI CLF-PM0610.

2.05 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Single Swinging Gates: 180-degree hinges, 2 for gates up to 60 inches (1,525 mm) high, 3 for taller gates; fork latch with gravity drop and padlock hasp; keeper to hold gate in fully open position.

B. Hinges: Finished to match fence components.

C. Latches: Finished to match fence components.

2.06 CANTILEVER AUTOMATIC SLIDING GATE

A. General: Provide automated vehicular gate that complies with ASTM F2200

B. Gate Height: 8 feet

C. Gate Length: 45 feet total (30' wide opening)

D. Gate Wire Fabric: Match fencing, include hdpe privacy slats.

E. Gate Posts: 8-5/8" O.D. tube steel

F. Bottom of gate shall be close to the finish pavement/ground to not allow a person to gain access under the gate.

2.07 AUTOMATIC GATE OPERATORS

A. Sliding Gates: Pre-wired, pedestal mounted gate operator for horizontal sliding gates, per ASTM F2200 and UL 325.
   1. Operating type: roller chain.
   2. Control Functions: Open, Pause, Close.
   3. Maximum Open/Close Time: 20 seconds.
   4. Access: [Universal Single Remote Control Button #811LM, need ten (15) total].
   5. Maximum gate weight: 1,500 pounds (560 kilograms).
   6. Horsepower Rating: Suitable for connected load.
   7. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.
      b. Secondary Device: Provide electric sensing edge with wireless edge kit or non-monitored safety edge as an option along with continuous-constant control device.
         1) Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
            (a) Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
               (1) Outdoor Locations: Type 3R.

2.08 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners, and fittings; steel.

C. Privacy Slats: High-density polyethylene (HDPE) strips, sized to fit fabric weave.

2.09 FINISHES

A. Components and Fabric: Vinyl coated over coating of 1.8 ounces per square foot galvanizing (over coating of 550 g/sq m galvanizing).

B. Accessories: Same finish as framing.

C. C. Color(s): Black.

2.10 GROUT AND ANCHORING CEMENT

A. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

2.11 FENCE GROUNDING

A. Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
   1. Material above Finished Grade: Copper.
   2. Material on or below Finished Grade: Copper.
   3. Bonding Jumpers: Braided copper tape, 1 inch wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.

B. Connectors and Grounding Rods: Comply with UL 467.
   1. Connectors for Below-Grade Use: Exothermic welded type.
   2. Grounding Rods: Copper-clad steel, 5/8 by 96 inches.

PART 3 EXECUTION

3.01 PREPARATION

A. Removal: Obstructions or debris.

B. Ground Preparation:
   1. Prepare grading along fence line to provide the specified fabric clearance.

3.02 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Place fabric on outside of posts and rails.

C. Set intermediate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

D. Line Post Footing Depth Below Finish Grade: ASTM F567.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail. Install brace rail one bay from end and gate posts.

G. Provide top rail through line post tops and splice with 6 inch (150 mm) long rail sleeves.

H. Do not stretch fabric until concrete foundation has cured 28 days.

I. Stretch fabric between terminal posts or at intervals of 100 feet (30 m) maximum, whichever is less.

J. Position bottom of fabric 2 inches (50 mm) above finished grade.

K. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches (380 mm) on centers.

L. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

M. Install bottom tension wire stretched taut between terminal posts.

N. Install hardware and gate with fabric to match fence.

O. Peen all bolts upon installation.

P. Perform three random field inspections confirming proper installation.

Q. Install operator in accordance with manufacturer's instructions and in accordance with NFPA 70.

3.03 GROUNDING AND BONDING

A. Fence Grounding: Install at maximum intervals of 1500 feet except as follows:
   1. Fences within 100 Feet of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet.
      a. Gates and Other Fence Openings: Ground fence on each side of opening.
         1) Bond metal gates to gate posts.
         2) Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.
      b. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.
      c. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.
         1) Connections: Make connections to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
            (a) Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
            (b) Make connections with clean, bare metal at points of contact.
            (c) Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
            (d) Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
            (e) Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
   2. Bonding to Lightning Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning protection down conductor or lightning protection grounding conductor complying with NFPA 780.

3.04 TOLERANCES

A. Maximum Variation from Plumb: 1/4 inch (6 mm).

B. Maximum Offset from True Position: 1 inch (25 mm).

C. Do not infringe on adjacent property lines.

3.05 FIELD QUALITY CONTROL

A. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

B. Post Settings: Randomly inspect three locations against design for:
   1. Hole diameter.
   2. Hole depth.
   3. Hole spacing.
   4. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.
   5. Gates: Inspect for level, plumb, and alignment.

a. Workmanship: Verify neat installation free of defects. See CLFMI CLF-FIG0111 for field inspection guidance.
    1) Grounding-Resistance Testing: Engage a qualified testing agency to perform tests and inspections.
        (a) Grounding-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure grounding resistance no fewer than two full days after last trace of precipitation, without soil having been moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural grounding resistance. Perform tests by two-point method according to IEEE 81.
        (b) Excessive Grounding Resistance: If resistance to grounding exceeds specified value, notify Architect promptly. Include recommendations for reducing grounding resistance and a proposal to accomplish recommended work.
        (c) Report: Prepare test reports certified by a testing agency of grounding resistance at each test location. Include observations of weather and other phenomena that may affect test results.

3.06 CLEANING

A. Leave immediate work area neat at end of each workday.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

C. Clean fence with mild household detergent and clean water rinse well.

D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

E. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate operation of system to Owner's personnel.
    1. Use operation and maintenance data as reference during demonstration.
    2. Briefly describe the function, operation, and maintenance of each component.
    3. Grounding test results.

END OF SECTION

SECTION 32 92 19 - SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Seeding, seeding, mulching and fertilizer.

D. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Preparation of subsoil topsoil in preparation for the work of this section.

1.03 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 SUBMITTALS

A. Submit a complete list of seed mixes to be used, including botanical and common names, percent purity, percent germination, and percent maximum weed seed, before seeding.

B. Submit pesticide product data.

C. Submit chemical data.

D. Submit mulch and hydromulch product data and source.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.06 WARRANTY

A. Correct defective Work within a three month period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Pesticides shall be applied by an individual licensed by the State and shall comply with all local codes.

C. Seed shall be labeled in accordance with the US Dept of Ag. Rules and Regulations under the Federal Seed Act.

2.02 SEED MIXTURE

A. Seed Mixture:
   1. Kentucky Blue Grass: 85 percent.
   2. Norlea Perennial Rye: 15 percent.

2.03 SOIL MATERIALS

A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.

B. Topsoil: Excavated from site and free of weeds, stones, sticks, glass, etc.

2.04 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: Recommended for grass, slow release nitrogen, biological materials, and biostimulant materials; of proportion necessary to eliminate deficiencies of topsoil.
   1. Provide common fertilizer with an N-P-K ration of 12-12-12.

C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

D. Erosion Fabric: Jute matting, open weave.

2.05 TESTS

A. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

B. Submit minimum 10 oz (280 g) sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.

C. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 31 22 00.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches (50 mm) of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.04 SEEDING

A. Apply seed at a rate of 25 lbs per 1000 sq ft (____ Kg per 1000 sq m) evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Planting Season: March 1 to May 10 and August 10 to September 30.

D. Do not sow immediately following rain, when ground is too dry, or during windy periods.

E. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches (3 mm). Maintain clear of shrubs and trees.

F. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.

G. Following germination, immediately re-seed areas without germinated seeds that are larger than 2 by 2 inches (_____ mm).

3.05 HYDROSEEDING

A. Apply seeded slurry with a hydraulic seeder at a rate of 50 lbs per 1000 sq ft (____ Kg per 1000 sq m) evenly in two intersecting directions.

B. Do not hydroseed area in excess of that which can be mulched on same day.

C. Immediately following seeding, apply mulch to a thickness of 1/8 inches (3 mm). Maintain clear of shrubs and trees.

D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.

E. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches (100 by 100 mm).

3.06 PROTECTION

A. Cover seeded slopes where grade is 4 inches per foot (____ mm per m) or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

B. Secure outside edges and overlaps at 36 inch (900 mm) intervals with stakes.

C. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

3.07 MAINTENANCE

A. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition with full coverage with no bare spots as approved by Owner and Owner’s Representative.

B. Water as eequired to prevent grass and soil from drying out.

C. Roll surface to remove minor depressions or irregularities.

D. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

E. Immediately reseed areas that show bare spots.

END OF SECTION

SECTION 33 01 10.58 - DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disinfection of site domestic water lines specified in Section 33 14 16.

1.02 RELATED REQUIREMENTS

A. Section 33 14 16 - Site Water Utility Distribution Piping.

1.03 REFERENCE STANDARDS

A. AWWA B300 - Hypochlorites; 2018.

B. AWWA B301 - Liquid Chlorine; 2018.

C. AWWA B302 - Ammonium Sulfate; 2023.

D. AWWA B303 - Sodium Chlorite; 2018.

E. AWWA C651 - Disinfecting Water Mains; 2014, with Addendum (2020).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Test Reports: Indicate results comparative to specified requirements.

C. Certificate: From authority having jurisdiction indicating approval of water system.

D. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

E. Disinfection report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   5. Date and time of flushing start and completion.
   6. Disinfectant residual after flushing in ppm for each outlet tested.

F. Bacteriological report:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   6. Coliform bacteria test results for each outlet tested.
   7. Certification that water complies, or fails to comply, with bacterial standards of AHJ.

1.05 QUALITY ASSURANCE

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.

B. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of the State in which the Project is located.

C. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.01 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping system has been cleaned, inspected, and pressure tested.

B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.

B. Provide and attach equipment required to perform the work.

C. Inject treatment disinfectant into piping system.

D. Maintain disinfectant in system for 24 hours.

E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.

F. Replace permanent system devices removed for disinfection.

3.03 FIELD QUALITY CONTROL

A. Test samples in accordance with AWWA C651.

END OF SECTION

SECTION 33 14 16 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water pipe for site conveyance lines.

1.02 RELATED REQUIREMENTS

A. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

B. Section 33 01 10.58 - Disinfection of Water Utility Piping Systems: Disinfection of site service utility water piping.

1.03 REFERENCE STANDARDS

A. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter; 2024.

B. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; 2022.

C. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials; 2021.

D. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 3/4 In. (19 mm) Through 3 In. (76 mm), for Water Service; 2020.

E. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

1.04 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with utility company requirements.

PART 2 PRODUCTS

2.01 WATER PIPE

A. Polyethylene Pipe: AWWA C901:
   1. Fittings: AWWA C901, molded or fabricated.
   2. Joints: Compression.

B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service" in large letters.

PART 3 EXECUTION

3.01 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.02 TRENCHING

A. See the sections on excavation and fill for additional requirements.

B. Backfill around sides and to top of pipe with approved cover fill, tamp in place and compact, then complete backfilling.

C. Top of pipe shall be a minimum depth of 36 inches below top of subgrade elevation.

3.03 INSTALLATION - PIPE

A. Maintain separation of water main from sewer piping in accordance with local code.

B. Route pipe in straight line.

C. Install pipe to allow for expansion and contraction without stressing pipe or joints.

D. Install access fittings to permit disinfection of water system performed under Section 33 01 10.58.

E. Install all required restraints, ties and lug locks to prevent separation of joints and fittings.

END OF SECTION

SECTION 33 31 13 - SITE SANITARY SEWERAGE GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, and accessories.

B. Connection of building sanitary drainage system to municipal sewers.

C. Cleanout access.

1.02 RELATED REQUIREMENTS

A. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS

A. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.

B. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2020.

C. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2021.

D. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2023.

1.05 SUBMITTALS

A. Product Data: Provide data indicating pipe, pipe accessories.

B. Field Quality Control Submittals: Document results of field quality control testing.

C. Project Record Documents:

1. Record exact location of pipe runs, depths from finish pavement and yard elevations, connections,sizes, manholes, cleanouts, and invert elevations.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Provide products that comply with applicable code(s).

B. Plastic Pipe: ASTM D2729, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of 4 and 6 inches (____ mm), bell and spigot style solvent sealed joint end. Refer to drawings for pipe size.

C. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in accordance with applicable code(s).

3.02 TRENCHING

A. See Section 31 23 16.13 for additional requirements.

B. Backfill around sides and to top of pipe with approved cover fill, tamp in place and compact, then complete backfilling.

3.03 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.

1. Plastic Pipe: Also comply with ASTM D2321.

B. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 10 feet (3 m).

C. Connect to building sanitary sewer outlet and Owner's waste water sewer system through installed foundation wall sleeves.

3.04 INSTALLATION - CLEANOUTS

3.05 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with IDEM.

3.06 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 42 11 - STORMWATER GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stormwater drainage piping.

B. Stormwater pipe accessories.

C. Catch Basins

1.02 RELATED REQUIREMENTS

A. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

A. AASHTO M 252 - Standard Specification for Corrugated Polyethylene Drainage Pipe; 2023.

B. AASHTO M 294 - Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter; 2021.

C. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.

D. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2021.

E. ASTM C478 - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections; 2019.

F. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals; 2018.

G. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2020.

H. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2021.

I. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2023.

J. ASTM F667/F667M - Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings; 2016 (Reapproved 2021).

K. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials; 2021.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating pipe, pipe accessories.

C. Shop Drawings: Indiacte structure locations, elevations, piping sizes, and elevations of penetrations.

D. Project Record Documents:
   1. Record location of pipe runs, connections, and invert elevations.

PART 2 PRODUCTS

2.01 STORMWATER PIPE MATERIALS

A. Provide products that comply with applicable code(s).

B. Plastic Pipe: ASTM D3034, Type PSM, Poly Vinyl Chloride (PVC) material; inside nominal diameter of various inches, bell and spigot style solvent sealed joint end.

C. Polyethylene Tubing: ASTM F667, perforated; with filter sock.
   1. N-12 as manufactured by ADS, Inc., Columbus, OH.
   2. Hi-Q by Hancor.

D. Plastic Pipe: ASTM D3350, High Density Polyethylene (HDPE) corrugated wall pipe with integrally formed smooth liner; inside nominal diameter of various inches, meeting the requirements of AASHTO M 252, Type S, for diameters between 3 inches (75 mm) and 10 inches (250 mm) and AASHTO M 294, Type S, for diameters between 12 inches (300 mm) and 60 inches (1500 mm), soil-tight, bell and spigot joints with rubber gaskets, with pipe and fittings manufactured from virgin PE compounds with cell classification 3254420C.
   1. ADS N-12

2.02 PIPE ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

B. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
   1. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   2. Color: To be selected by Owner from manufacturer's standard range.
   3. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, and rubber coupling.

C. Filter Fabric: Non-Woven
   1. 140NL as manufactured by Nicolon Corp., Norcross GA.
   2. 311 as manufactured by Synthetic Industries, Chattanooga, TN.
   3. 4545 as manufactured by Amoco Fabrics and Fibers Co., Atlanta, GA.
   4. FX-35HS asmanufactured by Carthage Mills, Cincinnati, OH.

2.03 STRUCTURES

A. Basin lid and Frame: Two piece heavy duty cast iron construction, EJIW or approved equal, model number as shown on Drawings.

B. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478, with resilient connectors complying with ASTM C923.

PART 3 EXECUTION

3.01 TRENCHING

A. See Section 31 23 16.13 - Trenching for additional requirements.

B. Backfill around sides and to top of pipe with approved cover fill, tamp in place and compact, then complete backfilling.

C. Verify that trench cut excavation base is ready to receive work, and excavations, dimensions, and elevations areas indicated on Drawings.

D. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight. Lay filter fabric in trench where applicable.
   1. Plastic Pipe: Also comply with ASTM D2321.

B. Lay pipe to slope gradients noted on layout drawings;

C. Place pipe with perforations facing down.

D. Connect to building storm drainage system, foundation drainage system.

3.03 INSTALLATION - DRAINAGE STRUCTURES

A. Form bottom of excavation clean and smooth to correct elevation

B. Form and place cast-in-place concrete base pad, with provision for pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.04 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION