PUBLIC WORKS PROJECT NUMBER: 89006007-23-034-C1
I-70 WB CENTERVILLE WELCOME CENTER
GREENFIELD DISTRICT / INDOT

Volume 5 of 5

AUGUST 2024

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SPECIFICATIONS

PROJECT MANUAL
For construction of:

I-70 WB Welcome Center
Centerville, Indiana

Public Works Project
89006007-23-034-C1

For

Department of Transportation

Prepared by

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Date of Issue

August 2024

CERTIFICATION PAGE

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COORDINATION WITH ADJACENT PROJECTS

Contractor shall be responsible for coordinating with any ongoing/planned construction projects by INDOT along I-70 and/or any local entity projects in the vicinity and/or close proximity of this project. The following projects are being planned by INDOT/LPA at this time.

Contract #	Work Type	Location	Route #	Project Manager	Letting Date	Priority Year
R-43375	I-70 Added Travel Lanes	from 0.94 mile west of I-70/US 35 (RP 148+0.23) to the IN/OH state line (RP 156+0.23)	I-70	Daniel Corbin DCorbin@indot.in.gov	07/2024	2024-2029
R-44969	I-70 Added Travel Lanes	From 1.5 miles west of I-70/SR 1 (RP 136+0.00) to 0.31 mile west of Centerville Road Interchange (RP 145+0.00) in Wayne County	I-70	Daniel Corbin DCorbin@indot.in.gov	02/2025	2025-2029
R-44968	I-70 Added Travel Lanes	From 0.31 mile west of Centerville Road Interchange (RP 145+0.00) to 0.94 mile west of I-70/US 35 (RP 148+0.23) in Wayne County	I-70	Daniel Corbin DCorbin@indot.in.gov	10/2025	2025-2029
N/A	Sanitary Sewer	Lift Station Improvements by Town of Centerville	Means Road	Kevin Slick kslick@town.centerville.in.us	2025	2025/26

UTILITY COORDINATION

The Contractor shall be responsible for coordination with all utilities during construction as well as construction of the utilities as shown on plans within the project limits in accordance with INDOT, all other regulating agencies and the individual utility company standards and specifications.

The Water and Sanitary Sewer facilities of the Town of Centerville exist within the rest areas project limits and are expected to be affected by this project. New water and sanitary sewer facilities to be installed within the rest area project limits. Upgrade to the existing lift station at the intersection of Means Road and Sowers Road is planned by the Twon as separate project. If questions arise, Kevin Slick of the Town utility may be contacted at 765-855-5515 or kslick@town.cenetrville.in.us.

The facilities of Whitewater Valley REMC exist within the rest areas project limits and are expected to be affected by this project. New 3 Phase

service will be installed to replace the existing service is planned. If questions arise, Brooke Reiboldt of the utility may be contacted at 765-223-2061; Ext 231 or breiboldt@wwvremc.com.

The facilities of Frontier exist within the rest areas project limits and are expected to be affected by this project. New WIFI service installation is planned. If questions arise, Dustin Bercot of the utility may be contacted at 260-403-6419 or dustin.c.bercot@ftr.com.

GEOTECHNICAL CONSIDERATIONS

Contractor shall refer to Geotechnical Report dated January 17th, 2024 provided by Terracon for recommendations regarding Demolition, Site Preparation, Foundation Soil Preparation, Foundation Soil Stabilization, Fill Material Types, Utility Trench Backfill, Grading and Drainage, and Earthwork Construction Considerations.

- Demolition:
  - Existing foundations, floor slabs, and utilities to be removed in areas that conflict with new construction activities shall be removed to a depth of at least 2’ below the affected utility foundation soil or design pavement subgrade elevation.
- Site Preparation:
  - Trees including the root ball that are in the footprint of the proposed construction shall be removed entirely.
  - It is anticipated that soft saturated soils may be present near the surface of the bed of the existing ditch. Some undercutting may be required prior to the placement of fill materials in these locations.
  - Large quantities of fill is required in the area of the new welcome center building as well as the car parking lot. Settlement plates shall be installed at locations recommended in the geotechnical report. See Earthwork section of the geotechnical report for additional details.
- Foundation Soil Preparation
  - Unsuitable soils shall be removed and remediated within the footprint of the proposed structures and pavements and a minimum of 15 ft beyond the outside edge of the footings.
  - The foundation soils shall be proofrolled with adequately loaded equipment. Areas that are excessively deflecting under the proofroll shall be delineated and addressed. Excessively wet or dry material shall be removed, moisture conditioned and recompacted, or modified by treating/applying/mixing with Portland cement or kiln dust depending on observations and depth of the unsuitable conditions.
  - Any unstable soils which will receive fill, building elements, or pavements once properly cleared and benched, where necessary, shall be removed or scarified to a minimum depth of 10 inch, moisture conditioned and compacted per the compaction requirements in the geotechnical report.

DEPARTMENT SALVAGEABLE ITEMS

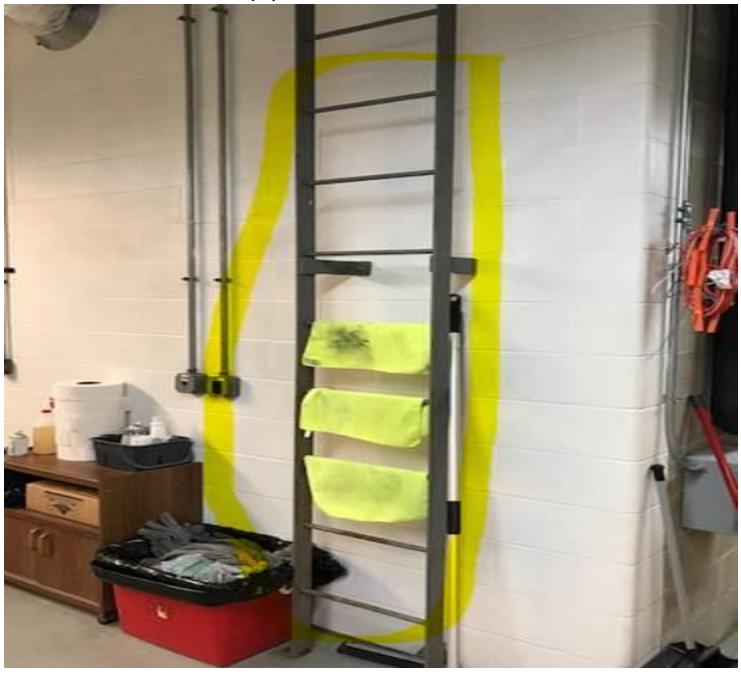
Description

Following items will be salvaged by the Department before the Contractor begin any work on site. Contractor shall coordinate with Mr. William Byers, INDOT Greenfield District Facilities at WByers@indot.in.gov or 317-468-3488.

Items to be Salvaged:

- Square D Disconnects (9):

- Attic Access ladders (2):



- Trash Cans:

- Fire Extinguishers:

- Park Benches:

- Roll-Up Security Window:

- All Shelving Units:

- All Electrical Panels:

- All ADA Mirrors:

- All Cores From Door Handles:

- Blue Star Memorial Highway Sign & Pole:

- Cummins Emergency Generator (if not reused onsite):

- State Seal (If Contractor Can Set Aside Once Dug Out During Demolition):

Items that INDOT may not own and need to be coordinated further before building demolition:

Frontier Data/Network Panel:

Culligan Water Softener System:

Abilities Indiana Cooler/Vending Machines/Coin Machine/Vending Products Stored Onsite:

GTL Payphone (GTL Sticker: 877-485-4537):

Nelbud Fire Panel:

BUILDING SEWERS

§ 51.040 PERMIT REQUIRED FOR CONNECTION OR USE.

No unauthorized person shall uncover, make any connections with or opening into, use, alter or disturb any public sewer or appurtenance thereof without first obtaining a written permit from the Clerk-Treasurer. (Prior Code, § 51.25) (Ord. 9-1950, passed 9-22-1950; Ord. 3-1960, passed 1-18-1960; Ord. 2-1960, passed 1-18-1960) Penalty, see § 51.999

§ 51.041 CLASSES OF BUILDING SEWER PERMITS; SEWER TAP FEES.

(A) (1) There shall be two classes of building sewer permits, one for residential and commercial service and one for service to establishments producing industrial waste.

(2) In either case, the owner or his or her agent shall make application on a special form furnished by the town's Building Inspector.

(3) The permit application shall be supplemented by any plans, specifications or other information considered pertinent in the judgment of the Inspector.

(B) (1) An applicant for a new sewer service, from any main line of the municipally-owned sewer utility, shall pay a tap-in fee of:

(a) For single-family residential: $1,100; and

(b) Per unit for multi-family: $1,100.

(2) Commercial, non-residential and non-industrial shall pay a tap-in fee in accordance with the following schedule:

Less than 1-inch water line	$1,200
Less than 2-inch water line	$2,300
Less than 4-inch water line	$4,000
Greater than 4-inch water line (or as determined by Council)	$6,500

(C) All tap-in fees shall be paid with application to the town's utilities.
(Prior Code, § 51.26) (Ord. 9-1950, passed 9-22-1950; Ord. 3-1960, passed 1-18-1960; Ord. 2-1960, passed 1-18-1960; Ord. 2003-03, passed 4-8-2003)

§ 51.042 COST AND EXPENSE OF BUILDING SEWER.

All costs and expense incident to the installation and connection of the building sewer shall be borne by the owner. The owner or the person installing the building sewer for the owner shall indemnify the town from any loss or damage that may directly or indirectly be occasioned by the installation. The owner shall restore the street to its original condition. The fee for street repair shall be paid in advance of the sewer tap.
(Prior Code, § 51.27) (Ord. 9-1950, passed 9-22-1950; Ord. 3-1960, passed 1-18-1960; Ord. 2-1960, passed 1-18-1960)

§ 51.043 NUMBER OF BUILDING SEWERS FOR EACH BUILDING.

(A) A separate and independent building sewer shall be provided for every building.

(B) However, where one building stands at the rear of another on an interior lot and no private sewer is available or can be constructed to the rear building through an adjoining alley, court, yard or driveway, the building sewer from the front building may be

extended to the rear building and the whole considered as one building sewer.
(Prior Code, § 51.28) (Ord. 9-1950, passed 9-22-1950; Ord. 3-1960, passed 1-18-1960; Ord. 2-1960, passed 1-18-1960) Penalty, see § 51.999

§ 51.044 CONNECTION OF NEW BUILDINGS TO OLD BUILDING SEWERS.

Old building sewers may be used in connection with new buildings only when they are found on examination and tested by the Inspector to meet all requirements of this chapter.
(Prior Code, § 51.29) (Ord. 9-1950, passed 9-22-1950; Ord. 3-1960, passed 1-18-1960; Ord. 2-1960, passed 1-18-1960)

§ 51.045 MATERIAL SPECIFICATIONS; SIZE AND SLOPE.

(A) The building sewer shall be cast iron soil pipe, ASTM specification or equal; vitrified clay sewer pipe, ASTM specification or equal; or some other suitable material approved by the Inspector. Joints shall be tight and water-proof. Any part of the building sewer that is located within ten feet of a water service pipe shall be constructed of cast iron soil pipe with leaded joints. Cast iron pipes with leaded joints may be required by the inspector where the building sewer is exposed to damage by tree roots. If installed in filled or unstable ground, the building sewer shall be of cast iron soil pipe; however, non-metallic material may be accepted if laid on a suitable concrete bed or cradle approved by the Inspector.

(B) The size and slope of the building sewers shall be subject to the approval of the Inspector, but in no event shall the diameter be less than six inches. The slope of the six-inch pipe shall not be less than one-eighths inch per foot.
(Prior Code, § 51.30) (Ord. 9-1950, passed 9-22-1950; Ord. 3-1960, passed 1-18-1960; Ord. 2-1960, passed 1-18-1960)

§ 51.046 ELEVATION.

(A) Whenever possible, the building sewer shall be brought to the building at an elevation below the basement floor. No building sewer shall be laid parallel to or within three feet of any bearing wall which might thereby be weakened. The depth shall be sufficient to afford protection from frost. The building sewer shall be laid at a uniform grade and in straight alignment, in-so-far as possible. Changes in direction shall be made only with properly-curved pipes and fittings.

(B) In all buildings in which any building drain is too low to permit gravity flow to the public sewer, sanitary sewage carried by the drains shall be lifted by approved artificial means and discharged to the building sewer. No water-operated sewage ejector shall be used.
(Prior Code, § 51.31) (Ord. 9-1950, passed 9-22-1950; Ord. 3-1960, passed 1-18-1960; Ord. 2-1960, passed 1-18-1960) Penalty, see § 51.999

§ 51.047 EXCAVATIONS; PIPE LAYING AND BACKFILL.

All excavations required for the installation of a building sewer shall be open trench work unless otherwise approved by the Inspector. Pipe laying and backfill shall be performed in accordance with ASTM specifications; however, no backfill shall be placed until the work is inspected by the Inspector or his or her representative.
(Prior Code, § 51.32) (Ord. 9-1950, passed 9-22-1950; Ord. 3-1960, passed 1-18-1960; Ord. 2-1960, passed 1-18-1960) Penalty, see § 51.999

§ 51.048 JOINTS AND CONNECTIONS.

(A) All joints and connections shall be made gas-tight and water-tight. Cast iron pipe joints shall be firmly packed with oakum or hemp and filled with molten lead, Federal Specification QQ-1-156, not less

than one inch deep. Lead shall be run in one pouring and calked tight. No paint, varnish or other coatings shall be permitted on the jointing material until after the joint has been tested and approved.

(B) All joints in vitrified clay pipe or between this pipe and metals shall be made with approved jointing material in accordance with the latest edition of Volume III, Plumbing Rules and Regulations of the state's Administrative Building Council.

(C) Other jointing materials and methods may be used only by approval of the Inspector.
(Prior Code, § 51.33) (Ord. 9-1950, passed 9-22-1950; Ord. 3-1960, passed 1-18-1960; Ord. 2-1960, passed 1-18-1960) Penalty, see § 51.999

§ 51.049 CONNECTION OF BUILDING SEWER TO PUBLIC SEWER.

(A) The connection of the building sewer into the public sewer shall be made at the "Y" branch, if this branch is available at a suitable location. If the public sewer is 12 inches in diameter or less and no properly-located "Y" branch is available, the owner shall, at his or her expense, install a "Y" branch in the public sewer at the location specified by the Inspector. Where the public sewer is greater than 12 inches in diameter, and no properly-located "Y" branch is available, a neat hole may be cut in the public sewer to receive the building sewer and a tapping saddle may be used, with entry in the downstream direction at an angle of about 45 degrees. Also, a 45-degree ell may be used to make the connection, with the spigot end cut so as not to extend past the inner surface of the public sewer. The invert of the building sewer at the point of connection shall be at the same or at a higher elevation than the invert of the public sewer. A smooth neat joint shall be made, and the connection made secure and water-tight by encasement in concrete. Special fittings may be used for the connection only when approved by the Inspector.

(B) The applicant for the building sewer permit shall notify the Inspector when the building sewer if ready for inspection and connection to the public sewer. The connection shall be made under the supervision of the Inspector or his or her representative.
(Prior Code, § 51.34) (Ord. 9-1950, passed 9-22-1950; Ord. 3-1960, passed 1-18-1960; Ord. 2-1960, passed 1-18-1960) Penalty, see § 51.999

§ 51.050 BARRICADES AND LIGHTS; PUBLIC PROPERTY TO BE RESTORED.

All excavations for building sewer installation shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways and other public property disturbed in the course of the work shall be restored in a manner satisfactory to the Inspector.
(Prior Code, § 51.35) (Ord. 9-1950, passed 9-22-1950; Ord. 3-1960, passed 1-18-1960; Ord. 2-1960, passed 1-18-1960) Penalty, see § 51.999

RATES AND CHARGES

§ 51.065 RATES, CHARGES TO BE COLLECTED.

(A) For the use of and the services rendered by sewage works, rates and charges shall be collected from the owners of each and every lot, parcel of real estate or building that is connected with the town sanitary sewer system or otherwise discharges sewage, industrial wastes, water or other liquids, either directly or indirectly, into the sanitary sewer system of the town.

(B) Such rates and charges include operations and maintenance, user charges, debt service charges, which rates and charges shall be payable as hereinafter provided and shall be in an amount determinable as provided in § 51.067 of this chapter.
(Prior Code, § 51.40) (Ord. 2-1960, passed 1-18-1960; Ord. 1990 SEW-1, passed 5-29-1990)

§ 51.066 SEWAGE RATES BASED ON WATER USAGE.

The sewage rates and charges shall be based on the quantity of water used on or in the property or premises subject to such rates and charges, as the same is measured by the water meter there in use, plus a base charge based on the size of the water meter installed, except as herein otherwise provided. (Prior Code, § 51.41) (Ord. 2-1960, passed 1-18-1960; Ord. 1990 SEW-1, passed 5-29-1990)

§ 51.067 WATER USAGE RATES.

(A) The water usage schedule on which the amount of said rates and charges shall be determined by the Town Council.

(B) For tap fee services rendered by the Sewer Department of the town, see § 51.041 of this chapter. (Prior Code, § 51.42) (Ord. 2-1960, passed 1-18-1960; Ord. 1-1973, passed 11-28-1973; Ord. 2-1980, passed 5-7-1980; Ord. 1990 SEW-1, passed 5-29-1990; Ord. 2003-03, passed 4-8-2003)

§ 51.068 RATES FOR SERVICE TO TOWN.

For the service rendered to the town, the town shall be subject to the same rates and charges hereinabove provided, or to charges and rates established in harmony therewith.
(Prior Code, § 51.43) (Ord. 2-1960, passed 1-18-1960; Ord. 1990 SEW-1, passed 5-29-1990)

§ 51.069 RATES WHERE USER NOT A METERED WATER CONSUMER; WATER NOT SUPPLIED BY TOWN.

(A) (1) For users of the sewage works that are unmetered water users or where accurate meter readings are not available, the monthly charge shall be determined as an average of single-family dwelling units, except as herein provided. Sewage service bills shall be rendered monthly.

(2) The schedule on which said rates and charges, including all users located within the Rice-Kellam Sewer District shall be as follows:

(a) Unmetered users located within the town's corporate boundary residential single-family (assuming 4,890 gallons average): $68.20 per month.

(b) Unmetered users located within or served by the Rice-Kellam Sewer District (assuming 4,890 gallons average):$68.20 per month.

(B) The quantity of water discharged into the sanitary sewage system and obtained from sources other than the utility that serves the town shall be determined by the town in such a manner as the town shall reasonably elect, and the sewage service shall be billed at the above appropriate rates; except as is hereinafter provided in this section, the town may make proper allowances in determining the sewage bill for quantities of water shown on the records to be consumed, but which are also shown to the satisfaction of the town that such quantities do not enter the sanitary sewage system.

(1) In the event a lot, parcel of real estate or building discharging sanitary sewage, industrial wastes, water or other liquids into the town's sewage system, either directly or indirectly, is not a user of water supplied by the water utility serving the town and the water used thereon or therein is not measured by a water meter, or is measured by a water meter not acceptable to the town, then the amount of water used shall be otherwise measured or determined by the town. In order to ascertain the rate or charge provided in this chapter, the owner or other interested party shall, at his or her expense, install and maintain meters, weirs, volumetric measuring acceptable to the town for the determining of sewage discharge.

(2) (a) In the event a lot, parcel of real estate or building discharging sanitary sewage, industrial wastes, water or other liquids into the town's sanitary sewerage system, either directly or indirectly, is a user of water supplied by the water utility serving the town, and in addition, is a user of water from another source which is not measured by

hydrant. In the case of any automobile or vehicular accident involving the breaking or disconnection of a fire hydrant, the car owner involved shall pay for the repair of the hydrant.

(B) Any owner or user tampering with meters other than an authorized town utility employee will be subject to a penalty of $50, plus the cost of any repairs, plus water and wastewater charges at a three-month average for the period of unauthorized use.
(Prior Code, § 52.04) (Ord. 1-1984, passed 3-6-1984)

§ 52.05 DISCONTINUANCE OF SERVICE.

Water service to any consumer may be discontinued for the following reasons:

(A) Wasting or improper use after it has been called to his or her attention;

(B) Refusal to pay bills within the prescribed time; and/or

(C) Interfering with or destroying any water appurtenances or appliances belong to the town.
(Prior Code, § 52.05)

§ 52.06 ADOPTION OF STATE CODES.

The Indiana Water Code, all future amendments thereto, and all rates and regulations pertaining thereto, are hereby automatically adopted and incorporated by reference herein without further action by the Town Council.
(Prior Code, § 52.06) (Ord. 1988-1, passed - -)

§ 52.07 INDIANA UTILITY REGULATORY COMMISSION.

(A) The Town Council hereby determines to remove the Water Utility from the jurisdiction of the state's Utility Regulatory Commission pursuant to I.C. 8-1.5-3-9.1.

(B) The Town Council hereby finds that written notice of this meeting has been provided by mail to all ratepayers of the Electric Utility and to the state's Utility Regulatory Commission in accordance with I.C. 8-1.5-3-9.1.
(Prior Code, § 52.07) (Ord. 2001-01, passed 4-3-2001)

INSTALLATION AND CONNECTION

§ 52.20 INSTALLATION OF WATER METERS.

(A) All water meters shall be installed outside in titles or inside consumers' premises in the location and manner selected by the Water Department Manager. Any refusal by the prospective user to agree to meter location or installation to serve the best interest of the town shall, at the option of the Council, be sufficient reason to refuse water service until the requirements are met.

(B) The Water Department shall install all water service between the main and shut-off. The meter shall remain the property of the utility.
(Prior Code, § 52.10)

§ 52.21 MAIN EXTENSIONS TO AREAS NOT PREVIOUSLY SERVED.

(A) Main extensions to areas not previously served shall be made in conformity to the *Rules and Standards of Service of Water Utilities* or approved by the state's Public Service Commission.

(B) No water line shall run out of the town corporate limits.
(Prior Code, § 52.11)

§ 52.22 STREET IMPROVEMENTS; EXTENSION OF SERVICE TO NON-USERS.

Prior to any new paving improvements in streets or alleys as provided by the town, all vacant lot owners or non-users of town water service shall be given written notice in advance of the date the paving improvement is to be made, and shall have 30 days in which to pay the water tap charge and have service laid from the street or alley water main to the property line in advance of payment surfacing construction. If action by the property owner is not taken after notice is given, the future expense of cutting and replacing the street or alley paving for future water services shall be paid for by property owner at the time water service is installed.
(Prior Code, § 52.12)

§ 52.23 EACH LOT TO HAVE SEPARATE SERVICE LINES.

In no case shall service pipes be allowed to run across from one lot to another. Each lot shall be served by a service directly from the distribution main serving the premises.
(Prior Code, § 52.13) Penalty, see § 10.99

RATES AND CHARGES

§ 52.35 CASH DEPOSIT REQUIRED.

The waterworks system shall require from any customer or prospective customer, to ensure the payment of water bills, a cash deposit which shall be paid to the utility cashier, as follows.

(A) If billings are made on a monthly basis, the cash deposit required shall be equivalent to the estimated amount of water consumption to be used over a two-month period. In no case shall the deposit be less than $25. The cash deposit shall be held by the utility-cashier to be applied in whole, or in part, against any delinquent charges owed by the customer.

(B) Interest shall be paid on the cash deposit at the rate of 0% per annum.

(1) No interest shall be paid after discontinuance of service to the customer if the public utility has made a reasonable effort to return the deposit to the customer, his or her heirs, administrators or assigns.

(2) No interest shall be paid on the deposit if the deposit is retained for less than 12 months.

(C) The utility cashier shall issue a certificate of deposit to every customer from whom a deposit is received.
(Prior Code, § 52.20) (Ord. 2001-04, passed 12-4-2001)

§ 52.36 TAP-ON FEES.

(A) All taps for water service in the mains of the waterworks system shall be made under the direct authority and supervision of the Water Department Manager. All applications for new water service shall be made to the utility cashier's office.

(B) In any residential, business or industrial area within the town limits, or in any area serviced by the town water mains, or in any other area where a water main is in the street, alley or easement, and is contiguous to the property being serviced, the service pipe, material, installation and the pipe of the service line shall be charged by the water utility as follows.
(Prior Code, § 52.21) (Ord. 2003-03, passed 4-8-2003)

§ 52.37 WATER RATES SCHEDULE.

For the use of and the services rendered by the waterworks system of the town the following rates and

charges shall be collected from the owners of each and every lot, parcel of real estate or building that is connected with the town water system. The term owners shall include but not be limited to any lessee or tenant of the owner who shall occupy said lot, parcel of real estate or building and who shall have applied for the use and service rendered by the waterworks. The term owner and user shall be synonymous.

(A) *Minimum monthly base charge.* Each user shall pay a minimum charge in accordance with the following applicable size of meter installed, for which the user will be entitled to the quantity of water set out in the schedule of rates in division (B) of this section. In no event shall the monthly minimum for metered or unmetered service be less than $26.94.

Monthly Base Charge - Metered Users	
Size of Meter in Inches	*Minimum Charge Per Month*
5/8"	$26.94
3/4"	$26.94
1"	$65.95
1-1/2"	$137.56
2"	$225.57
3"	$407.97
4"	$649.39
6"	$1,339.03

(B) *Metered monthly charges by usage.* Each metered user shall pay a charge in accordance with the following schedule of rates applicable to the amount of water used.

Metered Rate per 1,000 Gallons	*Charge Per 1,000 Gallons*
First 3,330	$8.09
Next 5,000	$7.52
Next 16,670	$6.72
Next 16,670	$5.36
Over 41, 670	$4.05

(C) The rates and charges shall become effective commencing June 1, 2017, and shall be billed to the owners and users commencing July 1, 2017.
(Prior Code, § 52.22) (Ord. 6-1950, passed 4-6-1950; Ord. 2-1968, passed 4-23-1968; Ord. 1982-6, passed 7-6-1982; Ord. 1995-1, passed 2-7-1995; Ord. 2001-04, passed 12-4-2001; Ord. 2002-03, passed 10-8-2002; Ord. 2017-02, passed 6-13-2017)

§ 52.38 CHARGES WHEN WATER METER FAILS.

In case of the failure of any meter, the town may bill compensation on the average of billings for the last six months before the meter failed to register properly.
(Prior Code, § 52.23)

§ 52.39 PAYMENT OF BILLS; DELINQUENT PAYMENTS.

(A) After the fifteenth day of each month if charges are not paid, penalties of 10% of the first $3 and 3% of the balance for water and wastewater charges will be added for each month the bill remains unpaid.

(B) (1) Payment by a check which is dishonored will be treated as non-payment and penalties will apply and water service will be turned off.

(2) An additional charge of $5 will be added for each dishonored check.

(C) If the monthly bill is not paid by the fifteenth of the month, a past due notice will be mailed advising that water service will be cut off as of the first day of the following month.
(Prior Code, § 52.24) (Ord. 1-1984, passed 3-6-1984)

INDOT APPROVED MATERIAL

Whenever it states Department in any place in the plans and specifications, it shall be interpreted as Indiana Department of Transportation (INDOT).

Contractor shall use INDOT approved materials for all ITS and lighting related equipment as specified in the approved list herewith or the latest approved list identified on the INDOT website at the time of installation.

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments

CABINET AND BACKPANEL

SM Material Code 913M15031

TS0070	EAGLE SIGNAL/MOBOTREX Model TF-5016IN Size 6(P) & Size 7(R) & Size 5(M) Stretch	W028700	TS-2, TYPE 1 16 POSITIONS
TS0070	EAGLE SIGNAL/MOBOTREX Model 5038324917 ITS Controller Cabinet, Ground Mounted	W158704	ITS
TS0090	ECONOLITE CONTROL PRODUCTS, INC MODEL 171-1081-504 Size 6(P) & Size 7(R) & Size 5 (M) & Size 5 (M) Stretch	W028110	TS-2 TYPE 1 16 POSITIONS
TS0108	JAMES H. DREW MODEL 482632 ITS RACK/TOWER MOUNTED CABINET	W158709	ITS
TS0108	JAMES H. DREW MODEL 592632 ITS-FM-TALL RACK/TOWER MOUNTED CABINET	W218705	ITS
TS0069	SOUTHERN MANUFACTURING MODEL 334 (332) ITS Controller Cabinet, Ground Mounted	W178710	ITS
TS0069	SOUTHERN MANUFACTURING MODEL G ITS Controller Cabinet, Pole Mounted	W178712	ITS
TS0169	TRAFFIC CONTROL PRODUCTS, INC MODEL TS2-IN-P-16 Size 6 (P) Cabinet Assembly	W218700	TS-2 TYPE 1 16 POSITIONS

BUS INTERFACE UNIT (BIU)

SM Material Code: 913M15033

TS0090	ECONOLITE CONTROL PRODUCTS, INC ECP-160-1018-501	W218703	ASSY BIU
TS0090	ECONOLITE CONTROL PRODUCTS, INC ECP-160-1018-502	W218704	ASSY BIU W/PANEL LOCK
TS0080	EBERLE DESIGN INC. EDI MODEL BIU-700	W068703	

TRAFFIC SIGNAL CABINET POWER SUPPLY

SM Material Code: 913M15035

TS0090	ECONOLITE CONTROL PRODUCTS, INC TS-2 MODEL PS-2412	W028722	
TS0090	ECONOLITE CONTROL PRODUCTS, INC TS-2 MODEL TS 200E	W068704	

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments
TS0080	EBERLE DESIGN INC---------- TS-2 MODEL PS-250	W228700	

TRAFFIC SIGNAL MALFUNCTION MANAGEMENT UNIT (MMU)
SM Material Code: 913M15034

TS0080	EBERLE DESIGN INC. ---------- MMU2-16LE(ip) (Ethernet Capable)	W028703	TS-2
TS0200	RENO A&E, ---------- MMU-1600GE (Ethernet Capable)	W068705	TS-2
TS0200	RENO A&E, ---------- MMU2-1600GE (Ethernet Capable)	W178707	TS-2

INTELLEGENT TRANSPORTATION SYSTEMS
SM Material Code: 913M15029

ITS FIELD SERVER
SM Material Code: 913M15029

TS0152	HEWLET PACKARD ENTERPISES---------- Controller, Multi-Purpose Model # HPE GL10 IoT Gateway Series	W188750	
TS0154	DELL TECHNOLOGIES---------- Controller, Multi-Purpose Model Latitude 5424 Rugged Laptop, 256 GB, SSD (w/Intel Dual Band Wireless AC 8265 {802.11ac} and 2x2 Bluetooth 4.2)	W228702	

TRAFFIC SIGNAL SECONDARY CONTROLLER
SM Material Code: 913M15030

TS0090	ECONOLITE CONTROL PRODUCTS, INC---------- COBALT G TS2, TYPE 1	W178753	MINIMUM 2GB SD CARD REQUIRED
TS0090	ECONOLITE CONTROL PRODUCTS, INC---------- COBALT G TS2, TYPE 2	W178754	MINIMUM 2GB SD CARD REQUIRED

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments
TS0090	ECONOLITE CONTROL PRODUCTS, INC COBALT C TS2, TYPE 1	W178755	MINIMUM 2GB SD CARD REQUIRED
TS0090	ECONOLITE CONTROL PRODUCTS, INC COBALT C TS2, TYPE 2	W178756	MINIMUM 2GB SD CARD REQUIRED
TS0169	TRAFFIC CONTROL PRODUCTS, INC INTELIGHT X-3L, TS2 TYPE 1 & TYPE 2	W198701	MINIMUM 2GB SD CARD AND REMOVABLE DATA MANAGEMENT DEVICE REQUIRED
TS0169	TRAFFIC CONTROL PRODUCTS, INC INTELIGHT XN-1, TS2 TYPE 1 & TYPE 2	W218701	MINIMUM 2GB SD CARD AND REMOVABLE DATA MANAGEMENT DEVICE REQUIRED

VEHICLE DETECTION INTERFACE DEVICES

SM Material Code: 913M15038

TS0216	SENSYS NETWORKS MODEL APCC-SPP Serial Port Radio	W118790	TRAFFIC SIGNAL & ITS
TS0216	SENSYS NETWORKS MODEL APCC-ACC-1 Care Isolator	W118791	TRAFFIC SIGNAL & ITS
TS0216	SENSYS NETWORKS MODEL APCC-M Access Point Card	W118792	TRAFFIC SIGNAL & ITS
TS0216	SENSYS NETWORKS MODEL EX TS2 COMPLIANT EXPANSION INTERFACE CARD	W118793	TRAFFIC SIGNAL
TS0216	SENSYS NETWORKS MODEL FLEX-CTRL-M-E Flex Control Module Enhanced	W218706	ITS ONLY
TS0216	SENSYS NETWORKS MODEL FLEX-ISOL-M Flex Isolator Module	W218707	ITS ONLY
TS0216	SENSYS NETWORKS MODEL FLEX-RP-B-LL-2 w/Flex-ANT-2(Flex Repeater w/Long Range Antenna)	W218708	ITS ONLY
TS0216	SENSYS NETWORKS MODEL RP240-BH-LL-2 (7-YEAR BATTERY)	W118794	TRAFFIC SIGNAL & ITS
TS0545	WAVETRONIX MODEL: 112 CLICK! 2 CONTACT CLOSURE CARD	W128790	ITS Only

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments
TS0545	WAVETRONIX MODEL: 114 CLICK! 4 CONTACT CLOSURE CARD	W128791	ITS Only
TS0545	WAVETRONIX MODEL: 222 CLICK SYSTEM SURGE PROTECTION CARD	W128790	ITS Only

COUNTING VEHICLE DETECTORS
SM Material Code: 913M15032

TS0080	EBERLE DESIGN INC. EDI MODEL ORACLE 2EC Traffic Signal & ITS	W068710	TS1/TS2 CARD RACK
TS0200	RENO MODEL C/TC, 1203 Traffic Signal & ITS	W028781	TS1/TS2 CARD RACK
TS0216	SENSYS NETWORKS MODEL VSN240-F-2 FLUSH-MOUNT SENSOR Traffic Signal & ITS	W158702	
TS0216	SENSYS NETWORKS MODEL VSN240-T-2 FLUSH-MOUNT SENSOR (STOP BAR) Traffic Signal & ITS	W158703	
TS8163	3M CANOGA C944 Traffic Signal & ITS	W158705	4-CHANNEL CARD RACK

TRAFFIC SIGNAL & ITS NON-COUNTING VEHICLE DETECTORS
SM Material Code: 913M15032

TS0080	EBERLE DESIGN INC. EDI MODEL ORACLE 2E	W068712	TS1/TS2 CARD RACK
TS0200	RENO MODEL C, 1200	W028780	TS2/TS1 CARD RACK

TRAFFIC SIGNAL & ITS PRE-FORMED DETECTION LOOPS
SM Material Code: 913M15038

TS0040	DE-TECH MODEL HDR DETECTOR	W028779	
TS0150	NEVER FAIL SYSTEMS MODEL A	W078702	ASPAHLT PAVE-OVER ONLY
TS0150	NEVER FAIL SYSTEMS MODEL C	W078703	CONCRETE PAVE-OVER ONLY

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments
TS0150	NEVER FAIL SYSTEMS MODEL F	W078704	SAW-SLOT PAVE-OVER ONLY
TS0162	PATRIOT TECHNOLIGIES MODEL CG16MMA	W068713	ASPHALT PAVE-OVER ONLY
TS0162	PATRIOT TECHNOLIGIES MODEL CG16MMC	W068714	CONCRETE PAVE-OVER ONLY
TS0162	PATRIOT TECHNOLIGIES MODEL CG9.5MM	W068715	SAW-SLOT ONLY
TS0200	RENO A&E MODEL PLH	W068716	
TS8163	3M MICROLOOP MODEL 701, 702	WO68717	

TRAFFIC SIGNAL ONLY EXTERNAL TIME CLOCK

SM Material Code: 913M15042

TS0100	ELTEC NTC-17E-1AC	W028794	
TS0161	RTC MANUFACTURING, Inc. AP22 TIME SWITCH	W188794	

TRAFFIC SIGNAL ONLY FLASHERS

SM Material Code: 913M15070

TS0080	EBERLE DESIGN, INC FLASHER MODEL 810	W028795	
TS0170	PDC PDC SSF-86-3 MODEL 204	W028796	
TS0170	PDC PDC SSF-87W	W028797	
TS0230	SOLID STATE DEVICES MODEL 204	W028798	
TS0250	TRAFFIC SENSOR CORP TSC-204-15	W028799	
TS0250	TRAFFIC SENSOR CORP TSC-310	W028111	

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments
TS0200	RENO A&E FL-200	W068718	

TRAFFIC SIGNAL ONLY LOAD SWITCHES
SM Material Code: 913M15043

TS0080	EBERLE DESIGN, INC 510	W028112	
TS0170	PDC PDC SSS-86-3 MODEL 200	W028113	
TS0170	PDC PDC SSS-87W	W028114	
TS0250	TRAFFIC SENSOR CORP TSC-200	W028116	
TS0250	TRAFFIC SENSOR CORP TSC-300	W028117	
TS0200	RENO A&E LS-200	W068719	

TEMPORARY DETECTION
SM Material Code: 913M15044

TS0090	ECONOLITE CONTROL PRODUCTS, INC AUTOSCOPE SERIES, ALL	W028120	TEMPORARY USE ONLY
TS0135	ITERIS ODETICS VANTAGE & VERSICAM SERIES, ALL	W068722	TEMPORARY USE ONLY
TS0545	WAVERTONIX MODEL: SS-225 SMART SENSOR MATRIX ASSEMBLY	W128720	

SYSTEM INTERCONNECT & COMMUNICATION EQUIPMENT
SM Material Code: 913M15080

TS0222	CRADLEPOINT RUGGEDIZED ROUTER MODEL # R920 SERIES	W248105	WIRELESS IP MODEM
TS0222	CRADLEPOINT ANTENNA MODEL # AG60 SERIES (2 X CELLULAR 3G/4G/LTE/GPS/2 X WiFi 2.4GHZ FOR CRADLEPOINT IBR900)	W178105	CELL ANTENNA W/CABLE

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments

ITS WIRELESS COMMUNICATION EQUIPMENT
SM Material Code: 913M15027

ITS NETWORKING EQUIPMENT
SM Material Code: 913M15028

TS0018	EXTREME NETWORKS Core Switch Platform Model # 7520-48Y-8C-AC-R	W128781	
TS0018	EXTREME NETWORKS Field Switch [ISW 900] Model # ISW 8 GbP, 4-SFP (12-port Switch)(Part #16804)	W238701	
TS0018	EXTREME NETWORKS IS AC-DC Power Supply 240 W Output DIN Rail-25 -70C Model/Part #16807	W238702	This power supply is for the ISW900
TS0018	EXTREME NETWORKS XN-ACPWR-800W-F Power Supply	W238700	This power supply is for the 7520 Core Switch (power cord #1061)
TS0118	DIGITAL LOGGERS, INC Pro Switch (Remote Control & Reboot) Model # Digital Loggers Pro Remote Power Switch	W188770	
TS0118	DIGITAL LOGGERS, INC Web Controlled Power Switch Model # Digital Loggers DIN RELAY – 4	W188771	FOR USE AT TRAFFIC SIGNALS ONLY

TRAFFIC SIGNAL HEAD (LED MODULES)
SM Material Code: 913M15095

12″ RED CIRCULAR INDICATIONS

TS0060	DIALIGHT MODEL: 433-1210-003XL	W068727
TS0120	GE LUMINATION/GELCORE MODEL: DR6-RTFB-VLA	W068728
TS9027	LEOTEK MODEL: TSL-12R-LX-IL6-A1-P2	W068729

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments
TS9027	LEOTEK	W178725	
	MODEL: TSL-12R-LX-IL6-A1-P3		
8171	SWARCO/FuturLED	W088727	
	MODEL: FL-12R-S2		
TS0255	TRASTAR/DURALIGHT	W108727	
	MODEL: JXC-300HFTR		

12″ YELLOW CIRCULAR INDICATIONS

TS0060	DIALIGHT	W068730	
	MODEL: 433-3230-901XL		
TS0120	GE LUMINATION/GELCORE	W218702	
	MODEL: DR6-YTFB-VLA		
TS0120	GE LUMINATION/GELCORE	W078728	
	MODEL: DR6-YZFB-VLA		
TS9027	LEOTEX	W078730	
	MODEL: TSL-12Y-LX-IL6-A1-P2		
TS9027	LEOTEK	W178728	
	MODEL: TSL-12Y-LX-IL6-A1-P3		
8171	SWARCO/FuturLED	W088728	
	MODEL: FL-12A-S2		
TS0255	TRASTAR/DURALIGHT	W108728	
	MODEL: JXC-300HFTY		

12″ GREEN CIRCULAR INDICATIONS

TS0060	DIALIGHT	W068731	
	MODEL: 433-2220-001XL		
TS0120	GE LUMINATION/GELCORE	W068732	
	MODEL: DR6-GTFB-VLA		

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments
TS9027	LEOTEK MODEL: TSL-12G-LX-IL6-A1-P2	W068733	
TS9027	LEOTEK MODEL: TSL-12G-LX-IL6-A1-P3	W178733	
8171	SWARCO/FuturLED MODEL: FL-12G-S2	W088729	
TS0255	TRASTAR/DURALIGHT MODEL: JXC-300HFTG	W108729	

12″ RED ARROWS

TS0060	DIALIGHT MODEL: 432-1314-001XOD	W108732	Tinted
TS9027	LEOTEK MODEL: TSL-12RA-IL6-A1 Note: This model is the arrow equivalent to –IL6-A1-P2.	W108734	Tinted
TS9027	LEOTEK MODEL: TSL-12RA-IL6-A1-P3	W178734	
TS0255	TRASTAR/DURALIGHT MODEL: JXJ300-07TR03	W108736	Tinted
TS0098	GE LIGHTING MODEL: DR6-RTAAN-VLA	W178735	

12″ YELLOW ARROWS

TS0060	DIALIGHT MODEL: 431-3334-901XOD	W068734	
TS9027	LEOTEK MODEL: TSL-12YA-IL6-A1 Note: This model is the arrow equivalent to –IL6-A1-P2.	W068736	
TS9027	LEOTEK MODEL: TSL-12YA-IL6-A1-P3	W178736	
8171	SWARCO/FuturLED MODEL: FL-12A-S2-A	W088730	

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments
TS0255	TRASTAR/DURALIGHT MODEL: JXJ300-07TY03	W108737	
TS0098	GE Lighting MODEL: DR6-YTAAN-VLA	W178740	

12″ GREEN ARROWS

TS0060	DIALIGHT MODEL: 432-2324-001XOD	W068737	
TS9027	LEOTEK MODEL: TSL-12GA-LX-IL6-A1 Note: This model is the arrow equivalent to -IL6-A1-P2.	W068739	
TS9027	LEOTEK MODEL: TSL-12GA-IL6-A1-P3	W178737	
8171	SWARCO/FuturLED MODEL: FL-12G-S2-A	W088731	
TS0255	TRASTAR/DURALIGHT MODEL: JXJ300-07TG03	W108738	
TS0098	GE Lighting MODEL: DR6-GTAAN-VLA	W178738	

COUNTDOWN PEDESTRIAN SIGNAL HEAD (LED)
SM Material Code: 913M15095

TS0060	DIALIGHT CO MODEL: 430-6479-001X	W048703	
TS0120	GE LUMINATION/GELCORE MODEL: PS7-CFF1-27A	W058728	
TS9027	LEOTEK ELECTRONICS USA CO MODEL: TSL-PED-16-CIL-P1	W058733	
TS9027	LEOTEK MODEL: TSL-PED-16-SPC-V1	W178732	

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments
TS0255	TRASTAR/DURALIGHT MODEL: JXM-400VIEIL	W108739	
TS0098	GE Lighting MODEL: PS7-CFF1-VLA	W178730	

TRAFFIC SIGNAL HEAD (EXTENDED LED MODULES)
SM Material Code: 913M15085

12″ RED CIRCULAR INDICATIONS

TS0060	DIALIGHT MODEL: 433-1210-003XL15	W168720	

12″ YELLOW CIRCULAR INDICATIONS

TS0060	DIALIGHT MODEL: 433-3230-901XL15	W168721	

12″ GREEN CIRCULAR INDICATIONS

TS0060	DIALIGHT MODEL: 433-2220-001XL15	W168722	

12″ RED ARROWS

TS0060	DIALIGHT MODEL: 432-1314-001XOD15	W168723	Tinted

12″ YELLOW ARROWS

TS0060	DIALIGHT MODEL: 431-3334-901XOD15	W168724	

12″ GREEN ARROWS

TS0060	DIALIGHT MODEL: 432-2324-001XOD15	W168725	

LED MODULES FOR SOLAR APPLICATION (12 VOLT DC)
SM Material Code: 913M15095

12″ RED CIRCULAR INDICATIONS (12 VOLT DC)

TS0060	DIALIGHT CO MODEL: 433-1210-005XL	W088735	

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments
TS0120	GE LUMINATION/GELCORE MODEL: DR6-RTFB-23B	W088736	
SPOO30	PRECISION SOLAR CONTROLS 12 WATT MODEL: 2384	W088737	
TS9027	LEOTEK ELECTRONICS USA CO MODEL: TSL-12R-LX-IL6-B1-P2	W098730	

12″ YELLOW CIRCULAR INDICATIONS (12 VOLT DC)

Source Code	Manufacturer Product Name	Approval Number	Comments
TS0060	DIALIGHT CO MODEL: 433-3230-905-XL	W088738	
TS0120	GE LUMINATION/GELCORE MODEL: DR6-YTFB-23B	W088739	
SPOO30	PRECISION SOLAR CONTROLS 12 WATT MODEL: 2385	W088740	
TS9027	LEOTEK ELECTRONICS USA CO MODEL: TSL-12Y-LX-IL6-B1-P2	W098731	

12″ GREEN CIRCULAR INDICATIONS (12 VOLT DC)

Source Code	Manufacturer Product Name	Approval Number	Comments
TS9027	LEOTEK ELECTRONICS USA CO MODEL: TSL-12G-LX-IL6-B1-P2	W098730	

SOLAR POWERED SCHOOL ZONE FLASHER
SM Material Code: 913M15035

Source Code	Manufacturer Product Name	Approval Number	Comments
TS0280	K & K SYSTEMS MODEL: 112-IN SOLAR SCHOOL WARNING FLASHER	W078731	
TS0290	CARMANAH MODEL: R829-F SOLAR SCHOOL ZONE FLASHING BEACON	W228701	
TS0281	SOLAR TRAFFIC CONTROLS MODEL: 80S080J-1 (NORTH) SOLAR SCHOOL WARNING FLASHER	W108730	
TS0281	SOLAR TRAFFIC CONTROLS MODEL: 80S065I-1 (SOUTH) SOLAR SCHOOL WARNING FLASHER	W108731	
TS0099	ELECTROTECHNICS CORPS MODEL: MODEL FS2 SOLAR SCHOOL ZONE FLASHER W/NTC17E TIME CLOCK	W138730	

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments

SOLAR POWERED 24 HOUR FLASHER BEACON
SM Material Code: 913M15035

TS0290 CARMANAH----------W128732
MODEL: MODEL R247E (177-3013) SOLAR 24 HOUR FLASHING BEACON

TS0099 ELECTROTECHNICS CORPS.----------W098733
MODEL: MODEL FS2 SOLAR 24 HOUR FLASHING BEACON

TS0280 K & K SYSTEMS----------W078732
MODEL: 116-IN SOLAR 24 HOUR FLASHING BEACON

TS0281 SOLAR TRAFFIC CONTROLS----------W088732
MODEL: 80S24255I-4 SOLAR 24 HOUR FLASHING BEACON

TS0281 SOLAR TRAFFIC CONTROLS----------W088733
MODEL: 80S24255E-3 SOLAR 24 HOUR FLASHING BEACON

TS0049 TAPCO Blinker Beacon ----------W138733
MODEL: 2180-BBDAY (Amber)

TS0049 TAPCO Blinker Beacon ----------W138734
MODEL: 2180-BBDRY (Red)

ITS CLOSED CIRCUIT TV CAMERAS
SM Material Code: 913M15026

TS0029 CAMERA LOWERING SYSTEMS, INC ---------- W168744
MODEL: CEPM-16HD-DE-XXX-110514
Arm and disconnect unit for external tower mount with guide cable and permanent mount lowering tool.

TS0029 CAMERA LOWERING SYSTEMS, INC./N STAR LIGHTING,LLC- W218709
MODEL: CDPF-DDxxx-yyy-LG Series
For use on pole with permanent lowering tool.

TS0029 CAMERA LOWERING SYSTEMS, INC.---------- W218710
MODEL: CEPM-DDxxx-yyy-PG Series
For externally mounted lattice tower camera lowering devices.

TS0242 CohuHD COSTAR----------W198740
MODEL: CohuHD Rise 4220 Dome Camera
For roadway surveillance applications.

TS0148 MG SQUARED, INC.---------- W208730
MODEL: CLDMG2-EXT-HYPIPX2-XX
Model contains two (2) CAT 6 Cables with Male RJ-45 Connectors.
Arm and disconnect unit for external pole/Tower mount with guide cable and permanent mount lowering tool.

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments
TS0243	MICROSEMI Outdoor POE Lightning Surge Protector MODEL: PD-OUT/SP11 *in-line surge suppression for field/Cohu camera	W238703	
TS0189	PROXIM Wireless Corp MODEL: Gigabit PoE Surge Arrestor CPN#235-00001	W248702	
TS0114	WTI MODEL: SIDEWINDER H.264 Standard Definition For vehicle-mounted applications.	W168741	
TS0114	WTI MODEL: Viper H.264 High Definition For vehicle-mounted applications.	W178743	
TS0259	TKH MODEL: BL880M1lR, Networked Bullet Camera, 3.5-8MM Motorized, 8MP,H.264/MJPEG, P-Iris, IR, IP67 For fixed signs surveillance.	W188740	

ITS MICROWAVE VEHICLE RADAR

SM Material Code: 913M15025

Source Code	Manufacturer Product Name	Approval Number	Comments
TS0137	IMAGE SENSING SYSTEMS, INC. MODEL: RTMS ECHO	W238710	w/power supply & surge panel for RTMS Echo (Part#ITS-ISS-Echo-SP)
TS0137	IMAGE SENSING SYSTEMS, INC. MODEL: RTMS G4 RADAR	W108747	
TS0137	IMAGE SENSING SYSTEMS, INC. MODEL: RTMS SX-300	W178745	

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments

ACCESSIBLE PEDESTRIAN SYSTEM (APS)
SM Material Code: 913M15103

TS0194 CAMPBELL COMPANY----------W208701
MODEL: GUARDIAN APS
Not applicable to the Guardian 400A or the Guardian Mini

TS0045 POLARA ENTERPRISES ----------W198702
MODEL: iNNAVIGATOR iN2
Central Unit necessary. Requires 50-pin cable to pedestrian input on back panel.

TS0045 POLARA ENTERPRISES ----------W198703
MODEL: iNNAVIGATOR iN3
No Central Unit necessary. Power line Communication through pedestrian head.

TS0181 PELCO PRODUCTS, INC ----------W198704
MODEL: SE-2901 INTELLICROSS APS
SE-2901 all buttons pre-programmed.

DYNAMIC MESSAGE SIGN (DMS)
SM Material Code: 925M15040

SP0015 DAKTRONICS ----------W238750
MODEL: VANGUARD VF-2020 96X400-20-RGB

SP0015 DAKTRONICS ----------W238751
MODEL: VANGUARD VFC-3000 CONTROLLER [OA-1248-0028]

SP0015 DAKTRONICS ----------W238752
MODEL: DDMS CONTROLLER [OA-1249-5011] & [OA-1249-5010]

9447 SUNRISE SESA TECHNOLOGIES, INC.----------W238753
MODEL: M6000 WIFC-20 96X400

TRAVEL TIME SIGN (TTS)
SM Material Code: 925M15041

SP0015 DAKTRONICS ----------W238754
MODEL: VANGUARD FIELD CONTROLLER VFC 5000 SERIES [OA-1248-0070]

9447 SUNRISE SESA TECHNOLOGIES, INC.----------W238755
MODEL: M5000-FFA-66 7x15

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments

ITS-ACCESSIBLE PORTABLE CHANGEABLE MESSAGE SIGN (pCMS)
SM Material Code: 925M15042

SP0090	VER-MAC MODEL: PCMS-1500LP G3	W238756	

ROAD WEATHER INFORMATION SYSTEM (RWIS)
SM Material Code 925M15044
[RWIS - Road Weather Information System]

TS2301	GREAT PLAINS TOWER MODEL: ROADWAY 30' MID HINGED LATTICE FOLDING TOWER	W238709	Part# DT/MHLT30/12 [Tower for RWIS use only]
TS2300	Lufft MODEL: LCOM Remote Processing Unit	W238704	
TS2300	Lufft MODEL: VS2K VISIBILITY SENSOR	W238705	
TS2300	Lufft MODEL: NIRS31 NON-INVASIVE SURFACE STATE SENSOR	W238706	
TS2300	Lufft MODEL: IRS31-UMB INVASIVE SURFACE STATE SENSOR	W238707	Can also use IRS31 Pro-UMB where sub-surface temps are required
TS2300	Lufft MODEL: WS-600 COMPACT WEATHER STATION	W238708	

SOLAR POWERED RECTANGULAR RAPID FLASHING BEACON ASSEMBLY (RRFB)
SM Material Code 922M15053

TS0175	AVAILED TECHNOLOGIES, CORP. MODEL: AV-400 RRFB	W238759	
TS0290	CARMANAH MODEL: R920-E *With R290-E Control Unit	W238757	
TS0660	JSF TECHNOLOGIES, INC. MODEL: AB-9207 (Single Direction)	W248700	AC Power Option Available
TS0660	JSF TECHNOLOGIES, INC. MODEL: AB-9407 (Dual Direction)	W248701	AC Power Option Available

TRAFFIC SIGNAL and ITS DEVICES

Specification Reference: 922 **SM Material Codes: 913M15025 to 913M15103, 925M15040 to 925M15042, 925M15044 & 922M15053**

Source Code	Manufacturer Product Name	Approval Number	Comments
TS0245	TRAFFICALM MODEL: M75-SA300	W238758	

CCTV ASSEMBLY

Description

This work shall consist of furnishing and installing closed circuit television (CCTV) cameras and supporting equipment.

Materials

Cameras shall be selected from the Department's Qualified Materials List according to use case.

Camera lowering equipment shall be included and shall be selected from the Department's Qualified Materials List. The camera lowering equipment shall include two CAT6 Power-over-Ethernet (PoE) cables to connect the camera to the cabinet.

In-line PoE surge suppression shall be included and shall be selected from the Department's Qualified Materials List

Construction Requirements

In-line surge suppression shall be installed on all PoE cable runs between the cabinet and the camera. In-line surge suppression shall be installed both in the cabinet and within 5 feet of the camera.

All installation services shall comply with all manufacturer's instructions and warranty provisions and warranty contract maintenance services and Department electrical codes. All wiring entry to the camera dome shall use watertight fittings. All materials shall be installed in a neat and professional manner. All wiring entry and exits shall be made at the side or underneath components; no exposed top entry or exits are permitted. This requirement extends to all enclosures, junction boxes, support arms, or any other externally exposed devices..

~~**Method of measurement**~~

~~CCTV Assembly will be measured by the number of units installed.~~

~~**Basis of payment**~~

~~CCTV Assembly will be paid for at the contract unit price per EACH.~~

~~Payment will be made under:~~

~~**Pay Item**~~	~~**Pay Unit Symbol**~~
~~CCTV Assembly~~	~~EACH~~

~~The cost of all labor, materials, design, vendor support, and items necessary to provide a complete and functioning CCTV assembly shall be included in the cost of CCTV assembly.~~

CONDUIT

Description

Work under this item shall include furnishing and installing conduit as shown on the plans and described in these specifications to provide raceways for fiber-optic cable, copper communications cable, and power conductors.

Materials

HDPE conduits shall meet or exceed the requirements of section 922.19. Schedule 80, coilable, HDPE conduit shall be color coded orange, green, and blue for communication cable and black for power cable. The HDPE shall meet or

exceed the properties listed in ASTM D-3350 for minimum cell classification of Class E Colored with UV Stabilizer. The properties and dimensions shall be in accordance with ASTM F 2160 standard specification for "Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD)".

Fiberglass conduit shall be manufactured to NEMA TC-14 2002 standards and listed by Underwriters Laboratories (UL) standard 1684 "Above Ground and Below Ground". Carbon black shall be used as an ultraviolet inhibitor. All fiberglass conduit shall be Iron Pipe Size (IPS), "Standard Wall" with a minimum 0.07-inch wall thickness, and a minimum impact resistance per the following table and in accordance with ASTM D2444.

Table: Fiberglass Conduit Impact Resistance

CONDUIT SIZE	STANDARD WALL IMPACT RESISTANCE
2-inch	40 lbs ft
3-inch	60 lbs ft
4-inch	70 lbs ft
5-inch	100 lbs ft
6-inch	100 lbs ft

PVC and steel conduits shall meet the requirements of section 922.19.

Liquid-tight Flexible Metal Conduit (LFMC) shall consist of a single strip of continuous, flexible, interlocked galvanized steel inside and out, forming a smooth internal wiring channel with a liquid tight covering of UV resistant flexible polyvinyl chloride (PVC). LFMC shall be manufactured in accordance with UL 360. All liquid-tight connectors shall be UL/CSA listed for wet locations.

Construction Requirements

General:

The Contractor shall comply with Section 807.06, except as noted in this special provision. The Contractor shall install conduits underground by means of trenching or directional drilling. Except as noted, the plans depict conduit routing and schematic form only. The contractor shall determine final routing based on actual field conditions at each site, including utility locator service markings, to assure no conflicts with existing utilities. In addition to notifying the IUPPS "Call Before You Dig" service, the Contractor shall notify the INDOT ITS Division and the INDOT District to request the ITS locates and highway lighting locates 48 hours in advance of excavation work. The cost of notifying IUPPS, the INDOT ITS division, and the INDOT District office shall be considered incidental to the contract. All conduits shall be placed a minimum of 3 feet below existing grade, except for immediately adjacent to hand holes/vaults or as noted on plans. All conduits shall be stubbed out a minimum of 6 inches into each handhole or vault.

Construction limits shall be restored by grading soil smooth and seeding as necessary to prevent erosion on steep grades. Restoring construction limits will be considered incidental to the conduit installation.

Warning tape shall be furnished and installed in all the trenches containing conduit, as depicted in the plan details.

Trenching:

Conduit identified to be installed in a trench may be trenched or plowed at the Contractor's discretion and as permitted by the site conditions. Except as revised herein, conduit trenches shall be in accordance with the INDOT

Standard Specifications Section 807.04. Common trenches shall be used for multiple conduits as shown on the plans.

Conduit may be installed by directional drilling at locations called out to be as trenched on the plans with no additional compensation.

Conduit pushes as shown on the plan shall be in accordance with standard specification section 805.11 and 807.06. The Contractor shall verify the existing pavement conditions prior to construction to avoid cracking the pavement.

All flexible roadside delineators disturbed during trenching operations shall be restored or replaced at no additional cost to the contract.

Hand Trenching:

Conduit identified as Hand Trench is located in areas where sensitive existing crossing utilities have been identified and will likely require positive identification of the existing utility prior to trenching above or below the existing utility line or where surface features such as riprap would inhibit trenching. The method of positive identification of the existing utility line is at the discretion of the Contractor and shall be accomplished with no additional compensation. Any material that is removed to accomplish Hand Trenching shall be restored or replaced in kind by the Contractor without additional compensation.

Conduit type, number, and size shall be as identified on the plans.

Conduit identified as Hand Trench may be trenched or plowed at the Contractor's discretion and as permitted by site conditions. Except as revised herein, conduit trenches shall be in accordance with 807.04. Common trenches shall be used for multiple conduits, as shown on the plans.

Conduit may be installed by directional drilling at locations called out to be as hand trenched on the plans with no additional compensation.

All flexible roadside delineators disturbed during hand trenching operation shall be restored or replaced at no additional cost to the contract.

Offset Trenching:

Conduit identified as Offset Trench is in areas where the trench is located behind obstructions. This type of trenching shall utilize a long reach hydraulic driven trenching machine to reach over and beyond the obstruction and complete trench as the same as TRENCH. This trenching machine is typically attached to and powered by an excavator.

Conduit may be installed by directional drilling at locations called out to be offset trench on the plans with no additional compensation.

Bridge Transition Conduit:

Conduit identified as transition is located in areas where the conduit quantity and type changes to accommodate a bridge crossing.

Unless otherwise specified, transition conduit shall be flexible conduit in accordance with 807.02.

Directional Drilling:

The Contractor shall determine all utility locations near the path of the proposed drill, including depth. The Contractor shall use this information to avoid damage to utilities and/or facilities within the work area. The Contractor shall provide this information, including the sources, to the Engineer a minimum

of five working days prior to drilling. The Contractor shall not drill until the Engineer approves that submittal.

Prior to drilling, the Contractor shall expose all utilities for which it is customary and safe to do so.

The diameter of the drilled hole shall conform to the outside diameter of the conduit or conduits as closely as practical. The Contractor shall pressure grout as directed by the Engineer, to fill any voids, which develop during the installation operation. The Contractor shall remove and replace any conduit damaged in the directional drilling operations at no expense to the project.

The use of water and other fluids in connection with the drilling operation will be permitted only to the extent necessary to lubricate cuttings. Jetting shall not be permitted, and the use of water alone as a drilling fluid shall not be permitted. The Contractor shall use a drilling fluid/slurry consisting of at least 10% high grade, processed Bentonite to consolidate excavated material, seal the walls of the hole, and furnish lubrication for the subsequent removal of material and immediate installation of the conduit.

The Contractor shall provide a means of collecting and containing drilling fluid/slurry that returns to the surface, such as slurry pit, or a method approved by the Engineer. The Contractor shall include the following procedures: Provide measures to prevent drilling fluids from entering storm sewer systems. Prevent drilling fluid/slurry from accumulating on or flowing onto sidewalks, other pedestrian walkways, driveways, or streets. Immediately remove any slurry that is inadvertently deposited on pedestrian walkways. Transport waste drilling slurry from the site and dispose of it. Do not allow slurry to enter wetlands. Protect wetlands from slurry using appropriate soil erosion control measures approved by the Engineer.

The Contractor shall use a digital walkover locating system to track the drill head during the bore. At minimum, the locating system shall be capable of determining the pitch, roll, heading, depth, and horizontal position of the drill head at any point along the bore. During each drilling operation, the Contractor shall locate the drill head every 10 feet along the bore and prior to crossing any underground utility or structure. Upon completion of the drilling operation and conduit installation, the Contractor shall furnish the Engineer with an as-built profile drawing and plan drawing for the drilled conduit showing the horizontal and vertical locations of the installed conduit.

Conduit identified to be installed between 1,000 feet and 1,500 feet indicates a long continuous bore. Equipment required to directional drill at this distance may be different from other types of directional drilling equipment needed on shorter distance directional drills. These areas of directional drilling are inaccessible to equipment that cannot drill between the handholes and vaults shown on the plans in a single set-up. Alternate means of accomplishing the directional drill may be proposed by the Contractor and shall require approval of the Engineer.

Conduit on Structure or Bridge Attached:

Fiberglass conduit shall be provided for all above ground locations where the conduit is to be attached to a bridge, as shown on the plans and in accordance with 807.02 except as revised herein. Fiberglass conduit runs shall be continuous between handholes or points of conduit transition with the exception that expansion joints shall be provided for every 200 feet of exposed conduit, or as recommended by the conduit manufacturer. Fiberglass fittings and expansion joints shall be of the same material from the same manufacturer as the fiberglass conduit. If rebar is struck while drilling lag screw holes into

the bridge, drilling shall cease immediately and the hole shall be patched using an epoxy compound approved by the Engineer for patching concrete.

The bridge attachment details shown in the plans represent only one of the methods available for attaching fiberglass conduit to a bridge. The details shown in the plans were chosen because it is assumed to be the most cost-effective method to meet the following goals for this contract. It is not the designer's desire that the plan details should limit the contractor from exploring other options. Regardless of the method used to attach the conduit to the bridge, all materials and workmanship shall be of top quality.

The conduit shall be securely supported at a maximum spacing of 10 feet, or as recommended by the manufacturer, whichever is less.

The conduit shall be allowed to expand and contract without grinding against sharp edges or rough surfaces (such as concrete). Lateral movement shall not be restricted by the conduit attached hardware.

All metallic portions of conduit attachment hardware shall be constructed of non-corrosive aluminum, stainless steel, or galvanized steel.

Nothing may be attached to any bridge that reduces the under-bridge clearance. Drilling or welding of the steel bridge girders will not be permitted. Attaching conduit or hangers to the bridge barrier wall or bridge retaining wall will not be permitted due to the potential for damage from vehicle impacts.

Conduit Under Structure:

PVC conduit, Schedule 80 shall be provided for all locations where the conduit is to be attached under a bridge or structure. The under-structure conduit shall be as shown on the plans and according to 807.02 except as revised herein. Conduit runs shall be continuous between junction boxes, handholes, or points of conduit transition with the exception that expansion joints shall be provided for every 200 feet of exposed conduit, or as recommended by the conduit manufacturer. Fittings and expansions joints shall be of the same material and from the same manufacturer as the conduit. If rebar is struck while drilling lag screw or anchor bolt holes into the bridge deck, drilling shall cease and the hole shall be patched using an epoxy compound approved by the Engineer for patching concrete.

The conduit shall be securely supported at a maximum spacing of 8 feet, or as recommended by the manufacturer, whichever is less.

The conduit shall be allowed to expand and contract without grinding against sharp edges or rough surfaces. Lateral movement shall not be restricted by the conduit attachment hardware except as provided as part of the expansion attachment system such as split stop rings.

All metallic portions of conduit attachment hardware shall be constructed of stainless steel or galvanized steel.

Nothing may be attached to any bridge or structure that reduces the under-bridge clearance for vehicles or vessels passing under the bridge or structure. Areas not permissible for vehicles or vessels passing under may be reduced in clearance for the purpose of extending the conduit from under the structure to the outside of the structure as shown on the plans. These locations are typically under the slope wall and at the beginning and end points of the structure where the conduit transitions from underground to under structure. Drilling or welding of the steel girders will not be permitted. Attaching conduit or hangers to the bridge barrier wall or bridge railing will not be permitted.

Install New Conduit Into Existing Handholes:

At locations shown on the plans, the Contractor shall install new conduit into existing handholes or vaults. The Contractor shall use the following procedure:

Remove concrete by cutting, chiseling, or core drilling as required to install new conduit without damaging the existing conduits. It shall be the Contractor's responsibility to protect the cables inside the handhole during this operation.

After removing the concrete, the area shall be washed with pressurized water and then dried with compressed air.

Position new conduits and apply an approved concrete bonding compound on the exposed concrete surfaces as recommended by the concrete manufacturer.

Place grout in all open spaces to prevent dirt and water entry into the handhole.

Perform necessary work to install the new conduit entrance, including but not limited to excavating around edges of the handhole, and replacing crushed stone base removed to install conduit. Take necessary precautions to prevent damage to the existing conduits and cables located in these existing handholes. The Contractor shall be solely responsible for any damage or displacement of the cable, conduit, or handhole arising out of or related to the Contractor's activities. With the exception of concrete pavement removal, breaking into existing handholes will be considered incidental to the installation of conduit and cable and will not be paid for separately.

Modifications to Existing Cabinet Conduits:

At locations indicated on the Plans, the Contractor shall furnish and install conduit, cables, and/or equipment into existing cabinets. The Contractor shall take necessary precautions to maintain uninterrupted operation of all existing equipment inside the cabinet throughout the entire installation. The Contractor shall perform all necessary work to install any new conduit. The Contractor shall be solely responsible for any damage or displacement of existing cables, conduit, or equipment in the cabinet arising out of or related to the Contractor's activities. Installing new conduit, cable, and equipment into existing cabinets will be considered incidental to the cost of providing the conduit, cable, and equipment will not be paid for separately. If existing empty conduits can be located by the Contractor at the existing cabinet, the Contractor may utilize the spare conduit for entry to the cabinet. Utilizing an existing empty conduit is the preferred method for entry to an existing cabinet.

HDPE Conduit Splicing:

All HDPE conduit splices shall be fusion splices, unless mechanical splices are approved in writing ty the INDOT ITS Technology Deployment Division Director.

Reattaching Existing Cabling:

Some locations within this contract require the Contractor to disconnect and pull existing cables free from an old conduit and then reconnect the cables to existing or new equipment. The cost of disconnecting, pulling back, re-pulling, and reconnecting existing cables shall be included in the bid price of the new conduit.

The conduit shall be cleaned by rodding and swabbing to remove all dirt and other foreign materials and capped until conductors are installed.

For all empty HDPE conduit installed under this contract and designated

for future use or cable installation by others, the Contractor shall proof the conduit system with a mandrel, as per Table below, to remove any obstruction or debris. The Contractor shall perform the conduit proofing in the presence of the Engineer. The Contractor shall apply a pressure of 100-110 PSI to the conduit, close to the air output valve and stop compressor, and measure air pressure loss. The maximum allowable air pressure loss within 2 minutes of pressurization is 20 psi. The contractor shall record the Conduit Test form attached to this special provision.

Conduit Size (in)	Mandrel Diameter (in)	Minimum Mandrel Length (in)	Maximum Mandrel Length (in)	Proof (%)
1	0.60	1.0	4	80
1 ¼	0.86	1.5	4	80
1 ½	1.12	1.8	4	80
2	1.62	2.4	6	80
3	2.5	3.25	8	80
4	3.5	4.25	8	85
6	5.5	6.25	10	85
8	7.5	8.25	12	85

Conduit Testing Form

Date: _____ Route: _____ Direction: _____

Starting Station: _____ Ending Station: _____

Starting Mile Post: _____ Ending Mile Post: _____

Conduit #	Conduit Color Marking (Color/Stripe)	Conduit Size (inches)	Cleaned (Rodded and Swabbed) (Check Mark)	Pressure Test Starting Pressure (PSI)	Pressure Test End Pressure (PSI) (2 mins)	Capped (Check Mark)
1						
2						
3						
4						
5						
6						

Contractor: _____

Engineer: _____

~~**Method of Measurement**~~

~~Conduits of the type, size, and installation method specified shall be measured for payment per linear foot of conduit provided complete and in place.~~

~~**Basis of Payment**~~

~~Conduit will be paid for at the contract unit price per linear foot. Payment will be made under:~~

~~Pay Item~~	~~Pay Unit Symbol~~
~~Conduit, 3 HDPE, 1 ¼ in., SCH 80, Trench~~	~~LFT~~
~~Conduit, 3 HDPE, 1 ¼ IN., SCH 80, Hand Trench~~	~~LFT~~
~~Conduit, 3 HDPE, 1 ¼ IN., SCH 80, Offset Trench~~	~~LFT~~
~~Conduit, 3 HDPE, 1 ¼ IN., SCH 80, Bore~~	~~LFT~~
~~Conduit, 3 HDPE, 1 ¼ IN., SCH 80, Bore, 1,000 FT. – 1,500 FT~~	~~LFT~~
~~Conduit, 3 HDPE, 2 IN., SCH 80, Bore~~	~~LFT~~
~~Conduit, 3 HDPE, 2 IN., SCH 80, Trench~~	~~LFT~~

~~Conduit, 3 HDPE, 2 IN., SCH 80, Bore LFT~~
~~Conduit, 2 PVC, 2 IN., Trench LFT~~
~~Conduit, PVC, 3 IN., Bore LFT~~
~~Conduit, PVC, 4 IN., Trench LFT~~
~~Conduit, 1 Steel, Galvanized, 2 IN., Trench LFT~~
~~Conduit, Steel, Galvanized, 3 IN., Trench LFT~~
~~Conduit, Fiberglass, 3 IN., Bridge Attach LFT~~
~~Conduit, Transition, 3 IN LFT~~
~~Conduit, 1 Flexible, 2 IN., Overhead Sign Structure LFT~~
~~Conduit, 4 HDPE, 1 ¼ IN., SCH 80, Trench LFT~~
~~Conduit, 4 HDPE, 1 ¼ IN., SCH 80, Offset Trench LFT~~
~~Conduit, 4 HDPE, 1 ¼ IN., SCH 80, Bore LFT~~

~~The cost of materials, labor, equipment, transportation, placement, and all incidentals shall be included in the cost of the conduit.~~

~~The cost of all fittings, caps, bends, sweeps, expansion joints, split stop rings, anchor brackets, installation equipment, trenching, backfilling, epoxy adhesive kits, fusion splices, couplers, connectors, conduit brackets/hangers, anchor bolts, lag screws, lag screw holes, epoxy patch for concrete holes, attachment hardware, warning tape, erosion control, restoring disturbed areas, other supporting equipment, and all other incidentals necessary for installation shall be included in the cost of the conduit.~~

~~The cost to locate, expose, and document the existing utilities shall be included in the cost of the conduit.~~

~~The cost for rodding and swabbing conduits and for mandrel and pressure testing conduits shall be considered incidental to the cost of the conduit. No additional payment will be made for rodding, swabbing, mandrel and pressure testing of the conduit.~~

~~The cost for containing and removing drilling fluid/slurry and protecting wetlands from drilling fluid/slurry shall be included in the cost of the conduit.~~

~~Conduit that is directionally drilled or bored in locations identified as trench shall be paid for under the conduit trench pay items as if the conduit had been trenched.~~

~~Conduit that is directionally drilled or bored in locations identified hand trench shall be paid for under the conduit hand trenching pay item as if the conduit had been trenched.~~

~~Conduit that is installed via an allowed method different from the identified method will not receive any additional payment for additional traffic control, access costs, equipment placement, or any other items beyond what is required for the identified conduit installation method.~~

~~Conduit that is placed as hand trench shall be paid as identified for the number, type and size under the applicable trench or bore pay item.~~

FIBER OPTIC BACKBONE CABLE

Description

The Contractor shall provide outdoor-rated, single-mode, armored, fiber optic cable of the number of fibers specified as shown on the plans and as directed by the Engineer. Other ancillary components required to complete the fiber optic cable plant, including but not limited to, moisture and water sealants, cable caps, fan-out kits, etc., shall be incidental to the fiber optic cable item and will not be paid for separately.

Materials

The single-mode, fiber optic cable shall incorporate a single tube, 12-fiber ribbon design or a loose, buffer tube design. The cable shall conform to the requirements of Rural Utility Service (RUS) 7 CFR 1755.900 (PE-90) for a single sheathed, armored cable, and shall be new, unused, and of current design and manufacture. The number of fibers in each cable shall be as specified on the plans.

Minimum Bending Radius:

The cable shall be capable of withstanding a minimum-bending radius of fifteen (15) times its outer diameter during operation and ten (10) times its outer diameter during installation without changing the characteristics of the optical fibers.

Environmental Requirements:

The cable shall meet all of the specified requirements under the following conditions:

- Shipping/storage temperature: -40˚F to +158˚F (-50˚C to +70˚C)
- Installation temperature: -30˚F to +158˚F (-30˚C to +70˚C)
- Operating temperature: -40˚F to +158˚F (-40˚C to +70˚C)
- Relative humidity from 0% to 95%, non-condensing

All backbone cables shall be suitable for installation in outdoor handholes, manholes, or vaults subject to immersion in water and ice.

Construction Requirements

Experience Requirements:

Personnel involved in the installation, splicing, and testing of the fiber optic cables shall meet the following requirements:

- Shall have installed two systems where fiber optic cables are outdoors in conduit and where the systems have been in continuous satisfactory operation for at least two years. The Contractor shall submit as proof, photographs or other supporting documents, and the names, addresses, and telephone numbers of the operating personnel who can be contacted regarding the installed fiber optic systems.
- A minimum of three years of experience in the installation of fiber optic cables, including fusion splicing, terminating, and testing single mode fibers.
- Shall have installed one fiber optic cable system (which may be one of the two in the preceding paragraph), which the Contractor can arrange for demonstration to the Department representatives and the Engineer, if requested.
- Installers shall be familiar with the cable manufacturer’s recommended procedures for installing the cable. This shall include knowledge of splicing procedures for the fusion splicer being used on this project and knowledge of all hardware such as breakout (furcation) kits and splice closures. The Contractor shall submit documented procedures to the Engineer for approval and to be used by Construction inspectors.
- Personnel involved in testing shall have been trained by the manufacturer of the fiber optic cable test equipment to be used in fiber optic cable testing procedures. Proof of this training shall be submitted to the Engineer for approval. In addition, the Contractor shall submit documentation of the testing procedures for approval by

the Engineer.

Installation in Conduit:

The Contractor shall provide a cable-pulling plan, identifying where the cable will enter the underground system and the direction of pull. This plan shall address locations where the cable is pulled out of a handhole, coiled in a figure eight, and pulled back into the handhole. The plan shall address the physical protection of the cable during installation and during periods of downtime. The cable-pulling plan shall be provided to the Engineer for approval a minimum of 10 working days prior to the start of installation. The Engineer's approval shall be for the installation operation on the freeway and does not include an endorsement of the proposed procedures. The Contractor is responsible for the technical adequacy of the proposed procedures.

During cable pulling operations, the Contractor shall ensure that the minimum bending of the cable is maintained during the unreeling and pulling operations. Entry guide chutes shall be used and the ends of the conduit shall be fitted with bells to protect and guide the cable into the handhole conduit ports. Bells shall be removed after installation of the cable. Lubricating compound shall be used to minimize friction. Corner rollers (wheels), if used, shall not have radii less than the minimum installation-bending radius of the cable. A series array of smaller wheels can be used for accomplishing the bend if the cable manufacturers specifically approve the array.

The pulling tension shall be continuously measured and shall not be allowed to exceed the maximum tension specified by the manufacturer of the cable. Fuse links and breaks can be used to ensure that the cable tensile strength is not exceeded. The pulling system shall have an audible alarm that sounds whenever a pre-selected tension level is reached. Tension levels shall be recorded continuously and shall be given to the Engineer upon request.

The number of handholes/manholes/vaults and their locations shall be as shown on the Plans, or as requested by the Engineer.

The cable shall be pulled into the conduit as a single component, absorbing the pulling force in all tension elements.

The steel strength member(s) and Aramid yarn shall be attached directly to the pulling eye during cable pulling. "Basket grip" or "Chinese-finger type" attachments, which only attach to the cable's outer jacket, shall not be permitted. A breakaway swivel, rated at 95% of the cable manufacturer's approved maximum tensile loading, shall be used on all pulls. When simultaneously pulling fiber optic cable with other cables, separate grooved rollers shall be used for each cable.

Three hundred (300) feet of slack fiber shall be installed at all location where splices are being made, one hundred and fifty (150) feet on each side of the splice enclosure and tie-wrapped and coiled as indicated on the plans. Five (5) feet of slack fiber shall be included at all other handholes or vaults not containing splices. Slack cable shall be pulled from the adjacent cabinet or shelter after installation and secured inside of the vault.

Construction Documentation Requirements:

Installation Practices for Outdoor Fiber Optic Cable Systems: The Contractor shall examine the proposed cable plant design. At least one month prior to starting installation of the fiber optic cable plant, the Contractor shall prepare and submit to the Engineer for review and approval, ten (10) copies of the Contractor's "Installation Practices for Outdoor Fiber Optic Cable Systems" manual, or as required by the Engineer. This manual shall address the

Contractor's proposed practices covering all aspects of the fiber optic cable plant. This submittal shall include all proposed procedures, list of installation equipment, and splicing and test equipment. Test and quality control procedures shall be detailed as well as procedures for corrective action.

Operation and Maintenance Documentation:

After the fiber optic cable plant has been installed, ten (10) complete sets of Operation and Maintenance Documentation shall be provided, or as required by the Engineer. The documentation shall, as a minimum, include the following:

- Complete and accurate as-built diagrams showing the entire fiber optic cable plant including locations of all splices.
- Final copies of all approved test procedures.
- Complete performance data of the cable plant showing the losses at each splice location and each terminal connector.
- Complete parts list including names of vendors.

Testing Requirements: The Contractor shall submit detailed test procedures for approval by the Engineer. All fibers shall be tested bi-directionally at both 1310 nm and 1550 nm with both an Optical Time Domain Reflectometer (OTDR) and a power meter and optical source. Any discrepancies between the measured results and these specifications shall be resolved to the satisfaction of the Engineer.

A Certified Technician utilizing an Optical Time Domain Reflectometer (OTDR) and Optical Source/Power Meter shall conduct the installation test. The Technician is directed to conduct the test using the standard operating procedures defined by the manufacturer of the test equipment. All fibers installed shall be tested in both directions.

The Contractor shall provide the date, time, and location of any tests required by this specification to the Engineer at least 5 days before performing the test. Upon completion of the cable installation, splicing, and termination, the Contractor shall test all fibers for continuity, events above 0.1 dB, and total attenuation of the cable. The test procedure shall be as follows:

Optical Time Domain Reflectometer:

The method of connectivity between the OTDR and the cable shall be a factory patch cord or launch cable of a length equal to the "dead zone" of the OTDR. Optionally, the Technician can use a factory "fiber box" of 328 ft (100 m) minimum with no splices within the box. The tests shall be conducted at 1310 nm and 1550 nm for all fibers.

At the completion of the test, the Contractor shall provide two copies of documentation of the test results along with a Comma Separated File(CSV) to the Project Engineer. The test documentation shall be bound and shall include the following:

- Cable & Fiber Identification:
  - Cable ID
  - Cable Location beginning point
  - Cable Location end point
  - Fiber ID
  - Rube/Ribbon Color
  - Fiber color

- Operator Name
- Date & Time
- Setup Parameters
- Wavelength
- Pulse width (OTDR)
- Refractory index (OTDR)
- Range (OTDR)
- Scale (OTDR)
- Setup Option chosen to pass OTDR "dead zone"
- Test Results:
  - OTDR Test
  - Total Fiber Trace
  - Splice Loss/Gain
  - Events > 0.10 dB
- Physical Length (Cable Marking)
- Fiber Length (OTDR)
- Test results and traces shall also be provided on a CD or flash drive
- Optical Source/Power Meter
- Total Attenuation

These results shall be provided in tabular form. The following shall be the criteria for the acceptance of the cable:

- The test results shall show that the dB/km loss does not exceed +3% of the factory test or 1% of the cable's published production loss.
- However, no event shall exceed 0.10 dB. If any event is detected above 0.10 dB, the Contractor shall replace or repair the fiber including that event point.

The total dB loss of the cable, less events, shall not exceed the manufacturer's production specifications as follows:

- 0.5 dB/km at 1310 nm
- 0.4 dB/km at 1550 nm

If the total loss exceeds these specifications, the Contractor shall replace or repair that cable run at the Contractor's expense, both labor and materials. Elevated attenuation due to exceeding the pulling tension during installation shall require the replacement of the cable run at the Contractor's expense, including labor and materials.

The aforementioned tests shall be completed on the reel before installation and completed after the complete installation.

Splicing Requirements: Splices shall be made at locations shown on the Plans. Any other splices shall be permitted only with the written approval of the Engineer.

All optical fibers shall be spliced as indicated on the Plans. If no information is provided, mainline splices shall concatenate the fibers from the two cable segments, that is, the colors of the buffer tubes and fibers shall be the same across the splice. For splices that breakout the individual fibers, the fibers shall be spliced in accordance with the Plans.

Slack Storage of Fiber Optic Cables: As part of this item, slack fiber shall be supplied as necessary to allow splicing of the fiber optic cables to occur in a controlled environment, such as a splicing van or tent. After splicing has been completed, the slack fiber shall be stored underground in vaults.

Where identified on the plans or as directed by the Engineer, additional lengths of fiber shall be stored as maintenance coils. The aggregate lengths of the maintenance coils and the slack fiber shall be used to repair and maintain the fiber optic cable.

Label the destination of each cable in each handhole, vault. Label the destination of each cable at a fiber distribution panel (FDP) located in cabinets, DMSs, and shelters. As a minimum, FDP face plate shall indicate the destination (i.e., dms-465-022-0-nb).

Fiber optic cable shall be tagged inside handholes with a vinyl label containing the text: "CAUTION – FIBER OPTIC CABLE."

Identification of installed Fiber Optic Cables: The backbone fiber optic cable shall be labeled as "Destination (i.e. CDP-S2)" - "Route (i.e. 465)" – "Destination (i.e. CDP-S3" and "Count" – "Fiber Type (SM or MM)" depending on the location of the fiber and type of fiber. Labels shall be permanent wrap-around type, machine printed and shall be installed within 2 feet from each installed splice enclosure, termination shelf, or conduit penetration into a handhole, cabinet or other structure.

~~**Method of measurement**~~

~~Fiber optic cable will be measured per foot of cable provided in conduit, handhole, vault, cabinet, or shelter.~~

~~**Basis of payment**~~

~~Fiber optic cable will be paid at the contract unit price per lineal foot. Payment will be made under:~~

~~Pay Item~~	~~Pay Unit Symbol~~
~~Fiber Optic Cable, Armored, ##F Single Mode~~	~~LFT~~
~~Fiber Optic Cable, Armored, ##F Single Mode~~	~~LFT~~

~~The cost of materials, labor, equipment, transportation, placement, and all incidentals shall be included in the cost of the pay item.~~

~~The bid price shall include all necessary preparation work, pulling equipment and materials, testing, labor, and incidentals necessary to complete the work.~~

GROUNDING

Description

This work includes solid grounding of electrical systems and equipment. It includes basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified herein may be supplemented in other sections of these specifications. All ground wires shall be tinned copper.

The Contractor shall design a ground system for each type of remote site and submit Plans in the form of a design drawing for approval by the Engineer. The design shall be certified by a Professional Engineer in the State of Indiana.

The work shall be completed in accordance with 807 and 922.07. This work shall also comply with Motorola R-56, Motorola Standards and Guidelines for Communications Sites 2000, Chapter 6, External Grounding. Where conflicts exist between Motorola R-56 and specifications, the more stringent requirement shall prevail.

Materials

Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, or manufacturers with equal products, the following:

- O-Z/Gedney Co.
- Alltec Corporation
- American Electric/Blackburn
- Thomas & Betts Corp.

Grounding and Bonding Products: Products of types indicated and of sizes and ratings to comply with the NEC. Where types, sizes, ratings, and quantities indicated in these Specifications, Plans, Motorola R-56, or 807 are in excess of the NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern. Conductor materials shall be copper.

Wire and Cable Conductors:

- Aluminum wire and cable shall not be used.
- In general, conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.
- Equipment Grounding Conductor shall be green insulated.
- Grounding Electrode Conductor shall be solid copper wire.
- Bare Copper Conductors shall be solid copper wire: ASTM B-3.
- Assembly of Stranded Conductors in accordance with ASTM B-8.
- Tinned Conductors in accordance with ASTM B-33.

Miscellaneous Conductors:

- Ground Bus shall be bare annealed copper bars of rectangular cross section.

Connector Products:

- In general shall be listed and labeled as grounding connectors for the materials used.
- Pressure Connectors shall be high-conductivity-plated units.
- Bolted Clamps shall be heavy-duty units listed for the application.
- Exothermic Welded Connections shall be provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.

Grounding Electrodes: Ground Rods shall be copper-clad steel with high-strength steel core and electrolytic-grade copper outer sheath, molten welded to core. Electrolytic ground rods maybe used, if required by soil conditions, with the approval of the Engineer. Ground rods shall be 5/8 in. by 10 ft.

Construction Requirements: Electrical systems and equipment shall be grounded in accordance with Motorola R-56 and NEC requirements except where exceed by the plans or the specifications.

Listing and Labeling:

Products provided shall be listed and labeled. The terms "listed" and "labeled" shall be in accordance with NEC, Article 100.

Electrical Component Standard:

Components and installation shall comply with NFPA 70 of the NEC.

UL Standard:

Grounding and bonding equipment shall comply with UL 467, Grounding and Bonding Equipment.

Equipment Grounding Conductor Application:

Equipment grounding conductors shall comply with NEC Article 250 for size and quantity, except where larger sizes or more conductors are indicated on the plans or by Motorola R-56.

Connections:

In general make connections in such a manner as to minimize galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be compatible and prevent galvanic action. The following requirements shall also apply:

- Use electroplated or hot-tin-coated materials to ensure high conductivity and make contact points closer in order of galvanic series.
- Make connections with clean bare metal at points of contact.
- Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.
- Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.
- Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to the contact surfaces.

Exothermic Welded Connections:

Use for connections to structural steel, for all underground connections, and for all connections to ground rods and plate electrodes. Comply with manufacturer’s written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic conduits terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Noncontinuous, metallic conduits shall be bonded, in an electrical manner, at one end with grounding bushings and bare grounding conductors.

Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque-tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A.

Ground Rod Installations:

Ground rounds shall be driven into the earth. The top of the ground rod shall be a minimum of 12 inches below finished grade. Conductor terminations to the ground rod shall be made by exothermic welds, rated for underground installation.

Compression-Type Connections:

Use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard

method to make a visible indication that a connector has been adequately compressed on the ground conductor.

Moisture Protection:

Where insulated ground conductors terminated underground insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.

Field Quality Control:

The procedures for performing resistance testing of the site grounding electrode system shall comply with the following:

The resistance of a grounding electrode system shall be measured after its installation and before it is bonded to the power company neutral wire or any other utility, such as the telephone ground or metallic pipes.

Resistance testing shall be done using the Three-Point/Fall-of-Potential method. The Three-Point/Fall-of-Potential test is the most widely accepted and recommended test method. This procedure is documented in ANSI/IEEE STD 81 and shall be referred to for more details. The testing shall be done in accordance with Motorola R-56. An instrument designed specifically to measure the resistance of a point to each ground shall be used and the instructions provided with the instrument shall be followed for proper measurement method. All measurements shall be recorded along with the location of each ground rod and submitted to the Engineer.

Upon completion of all grounding requirements outlined in these Special Provisions and other applicable documents, the ground resistance for Configuration G sites shall be 4 Ohms or less, all Configuration J shall be 25 Ohms or less, and all other sites shall be 10 Ohms or less.

Deficiencies:

Where ground resistances exceed specified values, the Contractor shall modify the grounding system to reduce resistance values. Additional costs for materials and labor used in these modifications will be considered incidental to the cost of the grounding system.

Reporting:

Prepare test reports of the ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

Cleaning and Adjusting:

Restore surface features at areas disturbed by excavation and reestablish original grades except as otherwise indicated.

Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work to their original condition. Include necessary topsoil, fertilizing, liming, seeding, sodding, sprigging, or mulching. Maintain disturbed surfaces, restore vegetation, and restore disturbed paving.

Inspection:

The grounding system will be inspected by the Engineer using the checklist from Motorola R-56 Appendix F pages 601 through 643, as applicable.

~~Method of Measurement~~

~~Grounding will not be measured for payment.~~

~~**Basis of Payment**~~

~~Grounding will not be paid for separately, and will be considered incidental to the cost of electrical equipment, cabinets, and ATMS equipment. No separate payment will be made for equipment grounding unless otherwise specifically stated herein.~~

HANDHOLES

SECTION 805.03, BEGIN LINE 30, INSERT AS FOLLOWS:

ATMS Handholes shall be as shown on the plans. The handhole covers shall be bolted into place with stainless steel bolts and washers. The cover frame shall be installed in the handhole with a butyl rubber sealant in tape/coil form for a proper seal between the handhole and frame and to prevent it from moving out of place. The sealant shall comply with ASTM C990 for butyl rubber sealants.

The cover for the ATMS handhole shall be marked with logo imprints of "Traffic Management System," "Traffic Management Fiber," or "Traffic Management Power" horizontally across the cover. Covers labeled "Traffic Management Power" shall be provided whenever the handhole is used for power distribution cables. Covers labeled "Traffic Management Fiber" shall be provided whenever the handhole is used for backbone fiber. Covers labeled "Traffic Management System" shall be provided in all other handholes.

~~SECTION 805.16, BEGIN LINE 664, INSERT AS FOLLOWS:~~

~~Pay Item:~~

~~Handhole, ATMS EACH~~

ITS COMPONENT ACCEPTANCE

ITS Component Acceptance will occur after all components are installed and integrated with the existing traffic management system. The Contractor shall submit a written request stating that the project ITS components are ready for inspection and acceptance. INDOT ITS will inspect and verify all ITS components installed on this project are acceptable. All deficiencies will be noted and a written inspection punch list form noting all deficiencies shall be presented to the Contractor. Participation of the Department in the testing does not constitute ITS Component Acceptance. Provision of a punch list after initial ITS inspection does not constitute ITS Component Acceptance. After all deficiencies are corrected, the Contractor shall provide a written request for reinspection; noting how all deficiencies were corrected. Upon reinspection and verification that all punch list items have been corrected, INDOT ITS will issue written verification showing the date of ITS Component Acceptance.

ITS DOCUMENTATION AND SUBMITTALS

Description

The Contractor shall provide four types of documentation and submittals for this contract: wiring diagrams and system schematics, submittal data, as-built documentation, and manuals and maintenance documentation. The Contractor shall submit working drawings in accordance with 105.02 and the following additional requirements.

All documentation shall be provided in electronic format and delivered to

INDOT ITS via email as practical. If files exceed the size limits of the contractor's or the department's email service, the contractor shall contact INDOT ITS to discuss appropriate methods of electronic file transfer. All electronic files shall be readable using standard Microsoft Office products or Adobe Acrobat Reader.

All documentation shall also be provided in physical form. Such physical documentation shall be no smaller than 8½ in. by 11 in. or no larger than 24 in. by 36 in except as approved by the engineer. Standard bound manuals shall be exempted from this requirement. The Department shall maintain the right to reproduce unlimited copies of any documentation for exclusive use on this contract.

All 8½ in. by 11 in. documentation, except standard bound manuals, shall be bound in logical groupings in three ring loose-leaf binders. Binders may also include 11 in. by 17 in. documentation if Z-folded. One copy of each bound grouping of documentation shall be provided labeled in a legible and permanent manner. One copy of all 24 in. by 36 in. documentation and a single reduced set no smaller than 11 in. by 17 in. shall be provided.

All documentation submitted shall be of reproducible quality as determined by the Engineer. All unsatisfactory items will be returned to the Contractor who shall make the submittal again in satisfactory reproducible form as determined by the Engineer.

All literature from manufacturers shall be original documents provided by the manufacturers. Black and white copies of color originals are not acceptable. No facsimile reproductions of any type shall be accepted.

Wiring Diagrams

Wiring diagrams and system schematics shall be prepared and meet the following requirements:

- Include wire designations by color or labels for every piece of field equipment in every cable segment between the equipment.
- Include appropriate designations for every cable and conduit segment. All conduits carrying electrical cables shall be marked or labeled at all maintenance points and points of access. Designations shall include terminology such as, "Power Distribution - 480 VAC", "Video Coax", etc. All designations shall be submitted to the Engineer for approval prior to submittal.
- Show locations of all cable splices.
- Show connections to all communications equipment at the remote sites, CDP sites, and at the Traffic Management Center.
- All radio equipment documentation packages shall include system diagrams, interconnection drawings, parameter lists and optimization procedures.

Submittal Data

Submittal Data shall be prepared and meet the following requirements:

Prior to the purchase or fabrication of any equipment or material proposed for use on this project, the Contractor shall submit for review by the Engineer catalog cut sheets and specifications for all standard, off-the-shelf items; working drawings shall be submitted for all non-catalog or custom items. An electronic copy of all submittals and working drawings shall be provided in .pdf format. ~~In lieu of electronic copies the Contractor may choose to submit ten paper copies of submittals and working drawings~~. Every submittal shall be accompanied by transmittal letter providing following information:

- Submittal number

- ~~Pay item number~~
- Manufacturer and model number
- Description

Submittals and working drawings will be approved or rejected in writing, and a memorandum stating the disposition will be returned to the Contractor. Certain items will require verification of performance, which shall be provided with the catalog cut sheets, working drawings, and specifications. See individual equipment specifications for requirements.

The purpose of the submittal and working drawing data is to show specifically and in detail how the Contractor intends to satisfy the requirements of these specification and the plans. If preprinted literature is utilized to satisfy some or all of these requirements, there shall be no statements on the literature which conflict with these specifications or plans. Any such statements will be crossed off and initialed by the Contractor and an appropriate statement be attached indicating how the requirements of these specification or the plans will be fulfilled.

The Contractor shall label each item of submittal and working drawing data with the bid item number or other description of the items to which it applies. Each submittal of catalog cut sheets, specifications, or working drawings, shall contain sufficient information and details to allow the Engineer to evaluate the particular component.

Copies of the catalog cut sheets, specifications, and working drawings shall be submitted by the Contractor to the Engineer and INDOT ITS. All catalog cut sheets and specification submittal data shall be submitted within 30 calendar days following issuance of the Notice to Proceed. All working drawings shall be submitted within 90 calendar days following issuance of the Notice to Proceed. Failure to submit catalog cut sheets, specifications and working drawings within this time frame shall result in **liquidated damages of $1000 per day** to be withheld from Contractor payment.

All submittals will be returned to the Contractor within 30 days of submission. All submittals returned to the Contractor as rejected shall be resubmitted for approval within 14 calendar days from the notice of rejection. Failure to resubmit documentation within the 14 calendar days from notice of rejection will result in **liquidated damages of $1000 per day** to be withheld from Contractor payment.

The Contractor may submit alternatives to the Plans and Special Provisions to the Department for consideration. Any alternative submitted shall be identified with benefits stated and documented.

The Contractor shall submit the following items at a minimum. Any item included in this list that is not a deliverable of the contract may be removed from the requirements with approval by the Engineer. This list does not preclude the submittal of other items as required in the specifications. The submittal requirement items are as follows:

- Vaults
- Handholes
- Handhole and vault rings & lids
- Cable duct markers, concrete
- Cable duct markers, flexible (including decal design)
- All conduits
- All electrical and grounding cables

- Cell Modems
- Conduit splicing methods and materials
- Dynamic Message Sign Structure
- Dynamic Message Sign Structure Foundation
- DMS Panels and Signs
- ITS Cabinet
- Wireless Vehicle Detection System
- Monopole
- Monopole Foundation
- Camera Assemblies
- Computers

As-Built Documentation

Documentation of the work, as-built, shall be provided by the Contractor prior to acceptance of the work. The Contractor shall draw in the final as-built locations for the cabinets, poles, conduits including burial depth, and device locations. These drawings shall be returned in ~~both~~ electronic ~~and paper~~ format.

As part of the final as-built documentation the Contractor shall provide GPS coordinates accurate within 3 ft. of a CCTV, DMS, Cabinet, or Service point location. The coordinates shall be noted on the plans and in a single spreadsheet form provided to the Department.

As part of the final as-built documentation the Contractor shall provide GPS coordinates accurate within 3 ft. of all handhole and vault locations. The coordinates shall be noted on the plans and in a single comma separated value, CSV, file provided to the Department. The CSV file shall be supplied to the Department including the Latitude and Longitude of all handhole and vault locations in decimal degree format. Each record shall include the type of object, Latitude, Longitude, Road Name, direction of roadway travel, and Nearest Mile Marker to the nearest tenth of a mile. The following is an example of the record format;

Example record: Vault, 39.40247778, -86.44611111, I-69, NB, 136.7

This would be the location record for a vault placed along I-69, on the NB side of the road, at the 136.7 mile marker near the interchange with SR 39.

Component and wiring diagrams shall be provided for all custom manufactured equipment as well as a complete parts listing indicating the manufacturer and model of all electronic components.

In addition to the documentation specified elsewhere, prints of schematic diagrams applicable to the equipment contained in cabinets or the communication shelters shall be provided by the Contractor. An 11 in. by 17 in. laminated wiring diagram, and an 11 in. by 17 in. laminated site drawing shall also be supplied in a weatherproof holder and mounted at each new cabinet and communication shelter.

Manuals and Maintenance Documentation

Two manuals shall be supplied for each individual component of the system. A reproducible form of the manual shall also be provided. The manuals supplied for the off-the-shelf items shall be those supplied by the equipment manufacturer.

Manuals shall include, at a minimum, the following material:

- Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
- Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions.
- Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
- Servicing instructions and schedules.

The Contractor shall provide a maintenance history for each piece of electronic equipment provided on this contract. This history shall include the equipment type, model and serial numbers, date of manufacture, date and location of installation, date of all associated tests required by these specifications and the performance of the equipment during these tests.

Any maintenance activity performed on the unit because of a failure shall be documented, and shall include: an explanation of all failures, date that the equipment was removed from a cabinet, the repairs that were made, the date and nature of any tests made to check the correct operation of the unit, and the date and the location where the unit was reinstalled in the field.

After each repair conducted, prior to acceptance, the warranty period shall be renewed. No more than one repair shall be allowed prior to acceptance. If a second repair is required, the equipment shall be replaced in kind with a new warranty period.

~~**Method of Measurement**~~

~~ATMS Documentation and Submittals will not be measured.~~

~~**Basis of Payment**~~

~~System documentation will be considered incidental to the cost of equipment being provided on this contract and will not be paid for separately.~~

ITS EQUIPMENT WARRANTY

Unless otherwise specified in the individual equipment special provisions, equipment warranties shall be provided for a period of time that is customary and normal for the manufacturer but shall not be less than one year from date of final acceptance of the contract. Final acceptance will not be provided without ITS Component Acceptance.

The warranty shall cover, at a minimum, all work and materials for all ITS equipment components and hardware including, but not limited to, all communication equipment including Switches, radios, antennas, SFP’s, and all connecting cables; all end devices including microwave detectors, Travel Time Signs, camera assemblies, and camera interfaces; and all ancillary equipment including support structures, step-down transformers, power strips, remote power switches, and UPSs. Documentation shall be provided for all equipment to show compliance with warranty requirements.

ITS POWER SERVICE DROP

Description

Work under this item shall include furnishing and installing all equipment necessary to provide a complete service point power entry for ATMS equipment. Electrical service, where required, shall be provided by power utility which services the location of the service point. Provide a 100 Amp, 120/240 VAC, 1-phase, 3-wire service or a 100 Amp and 480 VAC 1-phase, 2-wire service or as indicated on the plans.

Materials

The service drops shall be sized and equipped as shown on the Plans. Meter sockets shall be installed in accordance with the requirements of the utility. Grounding shall be in accordance with Standard Specification 807.12 and shall be part of the service installation.

The service drop or metered panel shall be a Service Entrance rated, NEMA 3R Load Center with integral meter base rated 120/240VAC similar to the GE TSM1610CSCU, Square D RC1624M100S, or Siemens MC2040B1150, or with a separate meter base when rated at 480VAC as indicated in the plans. The panel shall be equipped with a Main Circuit Breaker sized as indicated on the plans or sized for the service provided. Provide a minimum of sixteen, 1 inch, 1-pole circuit breaker spaces in the panel for branch circuits. The enclosure shall be padlockable.

Circuit breakers shall be single or two-pole as required by the branch circuit. Circuit breakers shall have a minimum 10,000 AIC for 240V circuit breakers, and 65,000 AIC for 480V circuit breakers. Panels shall be fully rated; series rated shall not be allowed.

Construction Requirements

The service point shall be installed at locations as indicated in the Plans and shall also be closely coordinated with the utility's requirements. Work under this item includes overhead and underground service power drops. The Contractor shall pay for all costs required by the utility for service installation.

After coordination with the electric utility's representative, the Contractor shall contact the ITS Technology Support Director at jessicakruger@indot.in.gov to set up the Service Point Account with the Utility Company in the Department's name so that the Department will be responsible for paying for energy consumption after service is connected for permanent service drops. The Contractor shall pay for any utility construction costs and any associated utility expenses. The Contractor shall pay all utility expenses including energy consumption for temporary service drops. The Service drops shall be in accordance with these Special Provisions and with 807.15.

All electrical work associated with the service power drop installations shall be in accordance with the Plans, Standard Specifications, and the manufacturer's written instructions and applicable requirements of NEC standards. As identified in the plans or per the Engineer request, where the proposed service point is more than 500 ft. from the ATMS remote site, a separate, lockable, subpanel shall be provided at the ATMS site.

All subpanels shall have their own ground rod which is also connected to the site's grounding system. The grounding conductors and ground rod shall be bonded to all non-current carrying metal on the subpanel.

Any location that incurs a new customer set-up charge from the power

utility shall be considered as part of the installation. The installation is not complete until power is available at the service point site.

~~Method of Measurement~~

~~Service points will be measured for payment per unit each complete and in place. Circuit Breakers when identified as the method for power service connection to an existing ITS service point shall be measured for payment per unit each complete and in place.~~

~~Basis of Payment~~

~~Service Points shall be paid for at the contract unit price per each as follows:~~

~~Payment will be made under:~~

~~Pay Item~~	~~Pay Unit Symbol~~
~~Service Point, ATMS, Circuit Breaker~~	~~EACH~~
~~Service Point, ATMS, 120/240V, Overhead~~	~~EACH~~
~~Service Point, ATMS, 120/240V, Underground~~	~~EACH~~
~~Service Point, ATMS, Subpanel~~	~~EACH~~
~~Service Point, ATMS, Metered Panel~~	~~EACH~~

~~Terminations, connections, service conductors, circuit breakers when not identified as the power source to an existing ITS Service Point, ground rods, ground wires, fittings, switches, service cabinets, utility current transformer cabinets, PT cabinets, CT cabinets, weatherheads, meter sockets, cables, conduits down to first below grade bend, poles, aluminum channels, braces, and mounting surfaces, and other miscellaneous items shall be incidental to this work and no separate payment will be made. Utility charges that are a standard fee for new service installations are incidental to this work, except as provided below.~~

~~The cost of the ground rod for a subpanel location shall be considered incidental to the cost of the subpanel.~~

~~Padlocks are to be in accordance with the padlock specification and are paid for separately.~~

ITS, CELLULAR MODEM ASSEMBLY

Description

The modem shall provide communication between the ITS Controller and the TMC.

Materials

The ITS, Cellular Modem shall consist of the following components:

- One cellular modem gateway
  - CRADLEPOINT COR SERIES ROUTER MODEL # IBR900-1200
  - Direct wire GPIO cable
- One, Five-in-one antenna
  - AG60 SERIES W/CABLE (2 X CELLULAR 3G/4G/LTE/GPS/ 2 X WiFi 2.4GHZ FOR CRADLEPOINT IBR900)

The ITS, Cellular Modem shall provide all the needed features and components to provide data communications between the ITS field cabinet and the Department Traffic Management Centers.

Construction Requirements

The ITS, Cellular Modem shall be installed in accordance with the manufacturer's instructions. All materials shall be installed in a neat and professional manner. All installation services will comply with all warranty provisions and warranty contract maintenance services in accordance with these specifications. All installation services shall comply with all local and state electrical codes, and Motorola R-56 requirements. All wiring entry and exits shall be made at the side or underneath components; no exposed top entry or exits are permitted. This requirement extends to all enclosures, junction boxes, support arms, or any other externally exposed devices. Cable termination shall be in accordance with the manufacturer's recommendations. Connectors outside of cabinets shall be sealed in accordance with the manufacturer's recommendations. The contractor shall de-burr all holes made in metal poles or cabinets and install grommets for cable protection.

~~**Method of Measurement**~~

~~The ITS, Cellular Modem will be measured for payment per the number of units furnished and installed complete and in place and after passing component and subsystem testing.~~

~~**Basis of Payment**~~

~~ITS, Cellular Modem will be paid for at the contract unit price per each. Payment will be made under:~~

~~**Pay Item**~~	~~**Pay Unit Symbol**~~
~~ITS, Cellular Modem Assembly~~	~~EACH~~

~~The unit price includes the cellular gateway modem, cellular gateway modem power supply, antenna, cables, environmental enclosure, housing, mount, all mounting hardware, support arms, connections, Ethernet cables, and incidentals necessary to complete the work.~~

PADLOCKS

Description

This work shall consist of furnishing and installing padlocks for all cabinets, fence gates, and enclosures specified in these Special Provisions.

Materials

The padlock shall be classified as a high security padlock with hardened shackle, laminated body, 4 pin cylinder (minimum) and come complete with a weather cover to protect the lock body and cylinder from sand, dirt, water and ice. A wafer cylinder shall not be used.

NO keys shall be provided to the Department with each padlock supplied. All padlocks shall be keyed alike and be identical to the keys currently in use by the Department. The main body width of the padlock shall not exceed 3" and have a shackle length of 2.25" to 3.75" and a shackle diameter of 5/16".

For padlock information, contact, Brian Stoner, ITS Technology Deployment Division Maintenance Supervisor Indiana Department of Transportation (317) 690-5534 bstoner1@indot.in.gov

~~**Method of measurement**~~

~~The Padlocks will be measured per item provided by the unit of EACH.~~

~~**Basis of payment**~~

~~The Padlocks will be paid for at the contract unit price of EACH. Payment will be made under:~~

~~Pay Item~~	~~Pay Unit Symbol~~
~~ITS,Padlock~~	~~EACH~~

VAULT, ATMS

Description

This work consists of furnishing and installing ATMS vaults for communications cable access as shown on the plans.

Materials

Materials for the ATMS vault shall be as shown in the plans and in accordance with 807.03. All vault covers are required to be bolted into place to prevent accidental removal by mowing crews or other unintentional means. The cover frame shall be installed in the vault with a butyl rubber sealant in tape/coil form for a proper seal and to prevent the frame from moving out of place. The sealant shall comply with ASTM C990 for butyl rubber sealants.

The vault rings and covers shall be as shown on the plans and in accordance with 807.09 except the message displayed on the lid shall read "TRAFFIC MANAGEMENT FIBER". Fabrication of these vault covers shall not commence until working drawings that the Contractor shall have submitted have been approved by the Engineer.

Construction Requirements ATMS vaults shall be installed at all planned and potential future fiber optic cable splicing locations and at additional locations as shown on the plans.

Material surrounding the buried conduit splices and ATMS vaults shall be tamped and added in such a manner so that there are no voids or depressions formed. Conduit entrance and exit points in the new ATMS vaults shall be sealed watertight.

ATMS vaults shall be precast. The top of the vault shall be flat and level with the surrounding ground. The vault shall be placed such that final grading will provide a minimum of 4 inches of soil over the concrete box. Clean applicable surfaces before installing butyl sealant on the cover frame prior to installation in the vault. Adhesive primer shall be used when moisture is present on surfaces. Follow manufacturer's instructions for proper installation. When the installation is completed, all disturbed portions of the construction area shall be cleaned and any excess excavation or other materials shall be properly disposed of as soon as possible.

~~Method of Measurement~~

~~The completed work as described for ATMS vault will be measured by the unit of each and shall include furnishing and installation of a new vault, a bolt down cover, butyl sealant, excavation, and all other accessories, grading, and re-seeding necessary for a complete installation.~~

~~Basis of Payment~~

~~Payment for the work included in this special provision will be paid for at the Contract unit price per each.~~

~~Payment will be made under:~~

~~Pay Item~~	~~Pay Unit Symbol~~

~~Vault, ATMS EACH~~

~~The cost of materials, labor, equipment, transportation, placement, and all incidentals shall be included in the cost of the pay item.~~

~~All earthwork preparation and grading necessary for installation of the vault shall be considered incidental to this work. All final clean-up and disposal of excess excavation shall be considered incidental to this work.~~

WIRELESS VEHICLE DETECTION SYSTEM

Description

This work shall consist of furnishing and installing wireless vehicle detection systems for vehicle detection.

Materials

The wireless vehicle detection system, WVDS, is comprised of wireless magnetometer detectors, contact closure cards, receiver processors, and wireless repeaters installed for a signalized intersection. The system shall be capable of monitoring vehicles on a roadway via detection of changes in inductance caused by the presence or passage of a vehicle and shall provide detector outputs to a traffic signal controller.

The WVDS shall include magnetometer detectors, a minimum of two receiver processors, the required mounting equipment, cables, rack mounted cards, set-up and operating software, all connectors, and miscellaneous equipment necessary for the installation and operation of the system. If required, the WVDS shall also include wireless repeaters.

Only models from the Department’s approved materials list for traffic signal and ITS devices shall be used.

Ethernet cable for wireless vehicle detectors shall be outdoor rated and UV shielded.

Construction Requirements

Prior to the installation, the Contractor shall test all wireless magnetometer detectors and demonstrate proper operation and communication between the wireless magnetometer detectors and the receiver processor and wireless repeater, if required.

Prior to the installation, the Contractor shall demonstrate that each wireless magnetometer detector is within range of its corresponding receiver processor, using wireless repeaters as necessary. All wireless magnetometer detectors assigned to either a receiver processor or wireless repeater shall be located within a 120° arc measured from the receiver processor or wireless repeater.

The Contractor shall install each wireless magnetometer detector in the roadway according to the manufacturer’s recommendations with one wireless magnetometer detector programmed to count vehicles for each through travel lane. Holes cored in the pavement shall be cleaned and dried before installing wireless magnetometer detectors. The cored pavement shall be backfilled according to the manufacturer’s recommendations.

Receiver processors and wireless repeaters shall be mounted on traffic signal steel strain, pedestal, cantilever poles, or square steel sign posts. If a square steel sign post is used, it shall have a length of no more than 24 ft and a Type 3 object marker shall be installed on the post, with a mounting

height of 4 ft, measured from the edge of the traveled way to the bottom of the object marker. The mounting height of receiver processors above the pavement surface shall be per the manufacturer's specifications. The mounting height of wireless repeaters above the pavement surface shall be per the manufacturer's specifications.

The minimum distance between a receiver processor and wireless repeater mounted on the same structure shall be 2 ft. This distance may be increased to enable better communication between the devices.

After installation, the Contractor shall demonstrate successful communication between each wireless magnetometer detector, receiver processor, and wireless repeater to the Engineer.

~~Method of Measurement~~

~~Wireless magnetometer detectors, contact closure cards, receiver processors and wireless repeaters will be measured by the number of units installed.~~

~~Basis of Payment~~

~~Wireless magnetometer detectors, contact closure cards, receiver processors and wireless repeaters will be paid for at the contract unit price per each.~~

~~Pay Item~~	~~Pay Unit Symbol~~
~~Contact Closure Card~~	~~EACH~~
~~Receiver Processor~~	~~EACH~~
~~Wireless Magnetometer Detector~~	~~EACH~~
~~Wireless Repeater~~	~~EACH~~

~~The cost of coring the pavement, sealant, and all work necessary for proper installation and operation of the wireless magnetometer detectors shall be included in the cost of the wireless magnetometer detector.~~

~~The cost of cables, connectors, set-up and operating software, access boxes, rack mounted expansion cards, and all hardware necessary to complete the installation shall be included in the cost of the contact closure cards.~~

~~The cost of required mounting equipment, cables, connectors, and miscellaneous equipment necessary for proper installation and operation of the receiver processors shall be included in the cost of the receiver processors.~~

~~The cost of required mounting equipment, connectors, and miscellaneous equipment necessary for proper installation and operation of the wireless repeaters shall be included in the cost of the wireless repeaters.~~

SURGE PROTECTION DEVICES FOR ATMS COMMUNICATIONS, VIDEO, AND 24V

Description

This Section includes Surge Protection Devices (SPDs) for data, communications, 24V power, and video equipment. Surge Protective Devices shall be used for the protection of all data, communications, video circuits, and low voltage power at 24V or less including POE cables from the effects of lightning induced currents and other transients.

Materials

Data and Communications Cables:

Plug-in jack or terminal connected SPDs shall protect all low-voltage

signal pairs. The SPDs shall meet or exceed the following minimum requirements:

1. The SPDs shall be UL Listed 497B.
2. The protectors shall suppress a peak surge current of up to 10K amps.
3. The protectors shall have a response time less than 5 nanoseconds.
4. The protector shall clamp the voltage between the two wires at 8 volts and clamp the voltage between each wire and ground at 50 volts.
5. The first stage of protection shall be a three-element gas discharge tube, and the second stage shall consist of silicon clamping devices.
6. It shall be possible to replace the protector using standard tools.
7. The SPD housing shall be metallic and be grounded.

Coaxial Video Cables:
Cables carrying video signals shall be equipped with surge protectors that shall meet or exceed the following minimum characteristics:

1. The clamping voltage shall be 11 volts between the shield and center conductor signal line.
2. The response time shall be five nanoseconds or less.
3. Bipolar silicon avalanche diode technology shall be used in a single stage device.
4. The module shall dissipate a minimum of 50 Joules.
5. The module shall have BNC connectors.
6. The housing shall be metallic and grounded.
7. The module shall pass signals from DC to 80 MHz with less than 0.5 dB insertion loss.

24V Power Cables:
Cables carrying 24V power shall be equipped with surge protectors that shall meet or exceed the following minimum characteristics:

1. The clamping voltage shall be 50V.
2. The response time shall be five nanoseconds or less.
3. Bipolar silicon avalanche diode technology shall be used in a single stage device.
4. The module shall dissipate a minimum of 50 Joules.
5. The module shall pass signals from DC to 80 MHz with less than 0.5 dB insertion loss.

Construction Requirements

Examine conditions for compliance with requirements for installation tolerances, characteristics, and other conditions affecting performance of transient voltage surge suppressors. Do not proceed with installation until unsatisfactory conditions have been corrected.

Conductors between the SPD and the point of attachment shall be kept as straight and short as possible.

The SPDs ground shall be bonded to the cabinet's grounding bar. Ground each SPD's enclosure.

Tighten electrical connectors and terminals according to manufacturer's published torque tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A.

Install an appropriate SPD at all data, communication, video, and low voltage connections or termination.

~~**Method of Measurement**~~

~~Transient voltage surge suppressors for data, communications, 24V and video will not be measured for payment.~~

~~**Basis of Payment**~~

~~Transient Voltage Surge Suppressors for data, communications, 24V and video will not be paid for separately, and will be considered incidental to the cost of equipment being provided on this contract~~.

SURGE PROTECTION DEVICES FOR POWER AT LINE VOLTAGE

Description

Surge Protective Devices (SPDs) for circuits and equipment rated 1,000V and less. SPD's are used for the protection of all electrical circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and capacitive load switching.

The following sections of the Standard Specifications contain requirements that relate to this section: 807, Highway Illumination; and 922.07, Ground Rod and Connections.

The selection and installation of SPDs shall also be in accordance with the Plans and Motorola R-56.
Surge Protective Devices shall conform to these following

Requirements:

1. The device shall be UL 1449, 2nd Edition (or later revision) listed or recognized. Devices may also conform to the international CE certification mark.
2. SPDs shall be selected based on the operating voltage and number of phases of the circuits to be protected.
3. The minimum pulse life or durability requirements and the voltage protection level shall be as specified in Table 9-2 of R-56 for the respective Maximum Continuous Operating Voltage (MCOV) and Type listed.
4. Each module shall have indicator lamps visible from the front of the device showing that the module has power applied and that the protection integrity has not been compromised.
5. The SPDs shall include a set of form "C" dry contacts for remote alarm reporting capability, except for Type 3 devices. This set of

contacts shall operate when there is an input power failure or the integrity of any module has been compromised. This contact set shall be isolated from the AC power circuitry to safeguard the alarm circuit or reporting device in case of a catastrophic event.
6. Each module or subassembly shall be modular in design to allow for easy field replacement.
7. Module components shall not be encapsulated.
8. Maximum Continuous Operating Voltage: 110 percent of nominal system operating voltage.

Provide electrically operated equipment that is listed and labeled as defined in the NEC, Article 100. Listing and labeling shall comply with; NFPA 70, UL 1283, UL 1449, ANSI C62.41 and ANSI C62.45.

Materials

SPDs shall be manufactured in the U.S.A. by a manufacturer engaged in the design and manufacture of such devices for a period of at least 2 years.

Subject to compliance with requirements, provide products by one of the following:
1. EFI Electronics, 65 AR for 120/240 volt, Omni-Phase OSW for 240/480 volt.
2. Advanced Protection Technologies, Inc.
3. Transtector
4. Polyphaser
5. Innovative Technology, Inc.
6. Current

Technology

Common Mode AC power SPDs shall not be utilized. This may constitute a personnel safety hazard and could constitute an NFPA 70 violation by creating a neutral-ground bond at a location other than at the main service disconnect. Common Mode surge suppression devices may be used on telephone or data circuits.

Type 1 Panel Type Surge Protective Devices: Specific requirements are as follows:
1. The device shall consist of primary modules using Silicon Avalanche Diode (SAD) technology and secondary modules using Metal Oxide Varistor (MOV) technology.
2. A SAD and MOV module shall be installed from each phase conductor to the neutral conductor (L-N, Normal Mode).
3. Module or devices of any type shall not be connected between any phase conductor and the equipment grounding conductor or ground (L-G, Common Mode).
4. The primary modules shall consist of a SAD module providing 250 Joules per phase, per polarity, minimum energy absorption.
5. The secondary module shall consist of a MOV module, with 5000 Joules per phase of energy absorption. This module shall be equal to, and have the same specifications and performance characteristics, as modules utilized in the Type 1A and 2 devices. 6. True sine wave

tracking with let through voltage no greater than L-N 70V, L-L 80V, L-G 90, and N-G 90V.

Type 3 Individual Equipment Surge Protective Devices: Specific requirements are as follows:
1. Install Type 3 SPDs on each critical load when the load requires greater than 10 ft. of conductor length from the panel with Type 1 SPDs. Where the load requires between 10 ft. and 50 ft. of conductor length for a Type 1 device, a Type 3 device is optional. Where the load requires greater than 50 ft. of conductor length or 25 ft. of circuit length from the Type 1 device, a Type 3 device is required.
2. All individual equipment devices shall provide a minimum of 25 Joules using SAD technology.
3. Normal Mode (L-N) circuit protection.
4. Individual SPDs with the plug manufactured as a part of the device shall be plugged into a single simplex receptacle outlet and shall incorporate a single simplex receptacle outlet for the load connection. Individual plug-in units with a duplex receptacle outlet shall not be used.
5. Multi-receptacle outlet strips with SPDs may also incorporate data circuit secondary protection devices within the same housing.
6. Multi-receptacle outlet strips SPDs shall incorporate an independent grounding point on the exterior of the device. This point shall be rated for attachment of a #6 AWG equipment conductor.
7. Multi-receptacle device housings shall be metallic and shall be provided with mounting ears, tabs or brackets. Devices may be suitable for standard EIA 19-in. rack mounting.
8. Each device shall have an indicator lamp visible from the front of the device showing that the module has power applied and that the protection integrity has not been compromised. Alarm relay contacts to remotely report device failure may be offered but are not required.
9. Each multiple receptacle outlet strip type device incorporating telephone or data circuit protection shall be UL 1459 and UL 497A listed or recognized. Devices may conform to the international CE certification mark.

Construction Requirements

Examine conditions for compliance with requirements for installation tolerances, power characteristics, and other conditions affecting performance of transient voltage surge suppressors. Do not proceed with installation until unsatisfactory conditions have been corrected.

Install a circuit breaker sized in accordance with the manufacturer’s requirements for each line connection.
Follow manufacturer's installation instructions for each SPD.
Conductors between the SPD and the point of attachment shall be kept as straight and short as possible. The conductor shall be 5 ft. or less in length measured terminal to terminal. In no case shall the length be longer than indicated in the manufacturer’s installation instructions.

Connect SPD circuit in line-to-neutral configuration if a neutral conductor is available.

A Type 1 SPD ground shall be bonded to the service entrance ground where installed at a utility service point or to the panel's equipment grounding conductor. Type 2 or Type 3 SPDs shall be connected to the nearest equipment grounding conductor.

Ground each transient voltage surge suppressor enclosure.
Tighten electrical connectors and terminals according to anufacturer's published torque tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A. To be installed as shown on the Plans.

Install a Type 1 SPD at each utility service point, each circuit breaker panel, and where otherwise indicated.
Install a Type 3 SPD such that all permanently installed electronic equipment is protected at the receptacle, hardwired connection or other point where the equipment is connect to electric power.

~~Method of Measurement~~
~~Transient voltage surge suppressors will not be measured for payment.~~

~~Basis of Payment~~
~~Transient Voltage Surge Suppressors will not be paid for separately, and will be considered incidental to the cost of equipment being provided on this contract.~~

ROADWAY WEATHER INFORMATION SYSTEM

Description

This work shall consist of the installation of 1 surface sensors and 1 atmospheric sensors in the Road Weather Information System, RWIS, at the Department's identified site.

Materials

The new materials at the RWIS Site which communicates with RWIS network shall be in accordance with the following:

All equipment furnished on this Project shall be in current manufacture at the time of the Project and shall be the manufacturer's latest model meeting the project requirements.

Non-Invasive Road Sensor

The non-invasive road weather sensor shall work with an optical principal and measure surface conditions such as wetness, ice, snow, or frost as well as water film height, ice percentage and freeze point temperature. It shall also provide friction coefficient of the road. The sensor shall support remote firmware upgrades without the need for personnel to be on-site.

The non-invasive road sensor shall be found on the Department's

qualified products list.

Additional Materials and Equipment Requirements

If any component of the current RWIS tower is compromised during the construction project the component shall be replaced meeting the following material requirements. New RWIS components shall meet the following material requirements.

In order to be able to add future measuring points or capabilities into the system, which could be, but not limited to, data communication, visualization and alerting by the system, the entire data structure of the system shall be provided. This includes but is not limited to sensor protocols, RPU protocols, and Administrative rights to the system. This shall allow a third party, other than the manufacturer to perform integration both into the data structure and software visualization.

RPU

The RPU, remote process unit, shall be a ruggedized industrial PC with an operating system utilizing Windows-CE. The unit shall have an integrated LCD touch screen, size shall be a minimum of 7 in. The integrated LCD touch screen display allows any person at the site to work on the RWIS site without the need for a service laptop in case of onsite-activities such as setups, firmware-uploads data views, extensions, or parameter settings. The RPU shall be fully NTCIP compliant. The RPU shall be password protected.

Integration of new sensors shall be accomplished by plugging in digital or analog modules along a DIN rail. The Modules shall allow for:

- Galvanic isolation between sensor supply and communication
- Host communication via RS232 (PC /GPRS-modem), RS485 (EAK)
- Small housing with top hat rail mounting and bus-connection
- Firmware update via RS232
- Common power supply (24V) for UMB modules and (heated) sensors
- Online data-transfer (no memory)
- Network with up to 32 modules
- Communication-watchdog for reliable sensor function (reset)
- Overvoltage protection for all interfaces
- LED indication for operation mode
- Power Supply – 20 to 28 VDC
- Power consumption 10 VA
- Ambient temperature –22 ° F to 140 ° F
- Relative humidity < 90 % RH
- USB Interface USB2.0B
- Shall have the following interfaces: CDMA Modem, GPRS modem, Ethernet connectivity and UMB bus interface
- Display size 7 inch
- Display resolution 800 x 480 pixel
- **DIN Rail and Modules**
- Power supply 12…26VDC
- Power consumption <100 mA
- Ambient temperature -22° F … 140° F
- Relative Humidity <95% RH
- Protection type IP20
- Module width 23mm

- RS232 connector DSUB9
- Sensor connector Screw type

Atmospheric Sensors

Temperature/Relative Humidity/Barometric Pressure

To allow for ease of installation, maintenance and upgrades, the sensors form factor shall be of one integrated unit. Multiple sensors will not be allowed. The sensor shall support remote firmware upgrades without the need for personnel to be on-site. The sensor shall be found on the Department's Qualified products list.

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Camera

Camera shall be selected from the Department's Qualified Products List. The camera shall be connected to the cabinet by two UV rated CAT 6 cables.

Tower

The tower for the RWIS assembly shall be a three-sided truss type aluminum tower with a fold over feature for ease of maintenance. The total height of the tower shall be 30 ft.

The tower and equipment shall be attached to each other and to the foundation with stainless steel nuts, bolts and washers. Each sensor will have quick disconnects at the top and bottom of the tower for ease of maintenance. Each tower shall be supplied with transient lightning protection, grounding rods.

With all specified equipment in place, the tower and foundation shall be designed in accordance with ANSI/TIA-222-H, including fatigue loading methodology. Prior to procuring the tower, the design of the tower and foundation shall be submitted to the Engineer for approval prior to beginning construction. Calculations and drawings for the tower assembly and foundation shall be included with the submittal. The calculations and drawings shall be stamped by a professional engineer licensed in the State of Indiana. There shall also be a tower mounted cabinet that meets the tower manufacturer's specifications.

The top of the tower foundation shall extend a minimum of 2 in. above ground level. A steel reinforced concrete service pad shall also be provided and shall extend outward on the cabinet door side of the tower. The minimum dimensions of the service pad shall be 3 ft wide by 4 ft long by 4 in. thick.

The tower assembly for a separate noninvasive sensor shall meet the construction requirements listed in this USP. The tower shall be a KW Industries THSPXX-X.XX-X that meets the tower height requirements or an approved alternative.

With all specified equipment in place, the tower and foundation shall be designed in accordance with ANSI/TIA-222-H, including fatigue loading methodology. Prior to procuring the tower, the design of the tower and foundation shall be submitted to the Engineer for approval prior to beginning construction. Calculations and drawings for the tower assembly and foundation shall be included with the submittal. The calculations and drawings shall be stamped by a professional engineer licensed in the State of Indiana.

Construction Requirements

The Contractor shall be responsible for locating and installing all utilities necessary for the installation of the sensors and subsurface temperature probe. Every facet of the RWIS shall be compatible with the existing system. The location of the roadway sensor and probe may vary depending upon the utilities and functionality. The new location of the sensors and probe shall be agreed upon by the Contractor and the Project Engineer with the approval of the District Operations Engineer.

~~**Method of Measurement**~~

~~The roadway weather information system will be measured per each system installed, complete in place. Sensors and subsurface temperature probes will not be measured separately.~~

~~**Basis of Payment**~~

~~Roadway weather information systems will be paid for at the contract unit price per each system installed, complete each in place.~~

~~Payment will be made under:~~

~~**Pay Item**~~	~~**Pay Unit Symbol**~~
~~Roadway Weather Information System~~	~~EACH~~

~~The cost of the sensors, subsurface temperature probe, transportation, placement, as-built plans and all incidentals shall be included in the cost of Roadway Weather Information System.~~

The RWIS shall be tested and verified with tests results provided to the Department ~~and shall be included in the cost of Roadway Weather Information System~~.

200-R-401 RECYCLED FOUNDRY SAND

(Revised 05-20-23)

Description

Recycled foundry sand, RFS, consists of a mixture of residual materials used from ferrous or non-ferrous metal castings and natural sands. The Contractor shall have the option of incorporating RFS into applicable operations in accordance with 105.03.

Materials

RFS sources are to be selected from the qualified products list, QPL, of Recycled Foundry Sand. RFS may be substituted for B borrow or borrow upon the approval by the Department's Geotechnical Services Division.

The Contractor shall provide a copy of the Indiana Department of Environmental Management's, IDEM, waste classification certification for Type III or IV residual sands prior to use. The IDEM certification shall clearly identify the stockpiles with regard to their extent and geographical location.

A type A certification in accordance with 916 shall be provided for recycled foundry sand. The results of the gradation test shall be shown on the certification for recycled foundry sand. Consultants on the Department's list of Qualified Geotechnical Consultants shall perform the testing of RFS materials.

RFS use is restricted to the following additional requirements:

1. RFS derived from Type III residual sand shall not be allowed within 100 ft, horizontally, of a stream, river, lake, reservoir, wetland, or any other protected environmental resource area.

2. RFS derived from Type III or Type IV residual sand shall not be placed within 150 ft, horizontally, of a well, spring, or other ground source of potable water.

3. RFS shall not be allowed adjacent to metallic pipes or other metallic structures.

4. RFS shall not be used as encasement material.

5. RFS shall not be used in MSE wall applications.

6. RFS placement shall be at least 2 ft above ground water elevation.

If RFS is used in embankment, excavation and replacement operations as a replacement for B borrow or borrow, the following additional restrictions will be required.

1. Borrow: RFS shall be in accordance with 203.

2. B borrow: RFS shall be in accordance with 211.

Construction Requirements

RFS shall be transported in a manner that prevents the release of fugitive dust and loss of material. Adequate measures shall be taken during construction operations to control fugitive dust from RFS. RFS shall not be applied when wind conditions result in problems in adjacent areas or result in a hazard to traffic on any adjacent roadway. The spreading of RFS shall be limited to an amount that shall be encased within the same workday. If weather causes stoppage of work or exposes the RFS to washing or blowing, additional RFS may be spread when the work resumes. Spraying with water, limewater, or other sealing type sprays will be considered to be acceptable methods for dust control.

When RFS is used as borrow or B borrow, the lift thickness and compaction of the materials shall be in accordance with 203.23. The dynamic cone penetrometer, DCP, criteria will be determined by a test section in accordance with ITM 514. The DCP testing will be performed in accordance with ITM 509. The moisture content shall be controlled in accordance with 203.23. The test section shall be constructed in the presence of a representative of the Department's Geotechnical Services Division. When RFS is used as B borrow, the DCP criteria for the granular soils shall be used in accordance with 203.23. Nuclear density testing of RFS will not be allowed.

When RFS is used in embankment construction, the sideslopes of the RFS shall be encased with 1 1/2 ft of non-RFS borrow materials. All RFS shall be encased with a minimum of 1 ft of non-RFS borrow materials prior to the completion of construction operations in a calendar year. The encasement materials shall be placed and compacted concurrently with the RFS lifts. Encasement materials not meeting the AASHTO M 145 Classifications of A-6 and A-7 shall be submitted to the Department's Geotechnical Services Division for approvals.

Method of Measurement

RFS applications will be measured in accordance with the respective uses for borrow or B borrow.

Basis of Payment

RFS will be paid for at the contract unit price in accordance with the respective uses for borrow or B borrow.

No payment will be made for the transportation, handling, or any special construction requirements such as alternative compaction means or encasement activities, when using RFS materials.

The cost of the use of water, limewater, sprays, or other activities necessary for dust control, shall be included in the cost of the respective pay item.

The cost of geotechnical testing for the use of RFS materials shall be included in the cost of the respective pay item.

RECYCLED FOUNDRY SAND SOURCE QUALIFICATION CRITERIA

The following procedures covers the requirements for Recycled Foundry Sand sources or otherwise prescribed subject matter to qualify, be added, maintained, and removed from a Department's QPL.

The procedures for qualification may involve hazardous materials, operations, and equipment. These procedures do not purport to address all

of the safety problems associated with the use of the product. The source's responsibility is to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

General Requirements

1. A source, requesting addition to the QPL, shall provide to the Division of Materials and Tests the following:

   (a) Name and location of source or manufacturer

   (b) List of material and specification reference for the material being requested for consideration

   (c) Average monthly production of the material by size, type or grade

   (d) Name, address, and phone number of responsible contact person

   (e) Facility layout or production process of the material

   (f) Quality parameters of the material

   (g) Raw material sampling and testing frequency

   (h) Procedures for conforming materials which provides a positive linkage between the furnished materials and the quality control test data

   (i) Procedures for non-conforming materials

   (j) Procedures for marking and tracking materials

   (k) Procedures for documentation maintenance

   (l) Finished material sampling and testing frequency

   (m) Procedures for reviewing and updating the source operations

   (n) Testing laboratory quality system

   (o) Names, titles and qualifications of sampling and testing personnel

   (p) Location and phone number of the laboratory testing office

   (q) Sample management describing procedures for samples identification, maintenance of the samples prior to testing, sample retention and disposal of samples

   (r) Testing report procedures

   (s) Methods used to identify improper test results and procedures followed when testing deficiencies occur

(t) Statistical analysis of test results, and

(u) Maintenance of test records.

The application shall be signed and dated by the source's or manufacturer's representative at the time the application is submitted for acceptance. The application shall be maintained to reflect the current status and revisions shall be provided to the Department in writing.

2. Testing may be required which will be performed outside the Department's laboratories. A recognized laboratory shall be the following:

(a) a State transportation agency testing laboratory,

(b) a testing laboratory regularly inspected by the AASHTO re:source, or

(c) a testing facility approved by the Department.

Qualification Requirements

In addition to the general requirements, the source shall also submit the following to the Division of Materials and Tests.

(a) Name of Testing Facility

(b) Dates samples were obtained

(c) Dates samples were tested

(d) Test method used for IDEM classification

(e) Letter from IDEM indicating the waste classification of the materials

(f) Test results for TCLP and neutral leachate

(g) Stockpile sampling locations, including depths and available historical testing results

(h) Gradation test results

(i) Recycled Foundry Sand (RFS) Source Certification.

The Recycled Foundry Sand (RFS) source certification is included as Attachment A. A new approval submission shall be required when re-sampling is required in accordance with 329 IAC 10-9-4(e)(2). (In accordance with 329 IAC 10-9-4 (e)(2) for foundry waste, re-sampling is conducted: at two-year intervals whenever the process changes or according to a schedule for re-sampling by the IDEM Commissioner based on variability noted in previous sampling and other factors affecting the predictability of waste characteristics.)

When metal concentration of the Type III residual sand exceeds 80% of the allowable limits within IDEM classification, an indemnification clause is required. The "Recycled Foundry Sand (RFS) Indemnification Clause" is included as Attachment B.

Maintaining Qualification

Test reports shall be generated in accordance with specification requirements for the material and submitted monthly to the Division of Materials and Tests. If the material is not produced by the source in a given month, the monthly submittal shall state:

"No _____ was manufactured during _____."
Material month/year

Samples of material may be obtained randomly for verification at the source or at the point of incorporation into the work in accordance with 106.02.

The source shall provide written notification of any changes, revisions or updates of their operations, source name or address, contact person or product name to the Division of Materials and Tests.

To maintain approval, a summary of new stockpile test results for the acceptance analysis shall be submitted monthly indicating testing every 2,000 t. Tested and approved RFS stockpiles shall be properly signed for easy identification. If no new stockpiles are created in a given month, a letter indicating, "no new RFS stockpiles for month/year were created" shall be submitted to the Division of Materials and Tests.

Removal from QPL

A source will be removed from the QPL for the following, but not limited to, reasons:

(a) test failures determined by Department verification sampling,

(b) monthly test reports not provided for three consecutive months,

(c) test reports generated by the source which indicate non-compliance with specification requirements, or

(d) performance of the product no longer meets the intended purpose.

Attachment A

RECYCLED FOUNDRY SAND (RFS) SOURCE CERTIFICATION

This is to certify recycled foundry sand (RFS) stockpiles geographically located as follows:
RFS _____
_____

RFS was produced by the _____ _____ Company located in _____ (City), and _____ (State) and was shipped for use on Indiana Department of Transportation projects is Type _____ (III or IV) material according to the IDEM's restricted waste criteria. If any metal concentration exceeds 80% of the allowable limits for a Type III material the foundry shall provide the Department with an acceptable indemnification clause. The _____ RFS source also agree that processes and stockpiles associated with the production of such RFS may be inspected and sampled

at regular intervals by properly identified representatives of the Department or a duly assigned representative.

_____(Date of Signing)_____ (RFS Producer)

_____ (Title)

_____ (Signature)

State of _____ SS: County of _____

Subscribed and sworn to before me by _____

of the firm of _____ this _____ day of _____ 20__

_____ Notary Public

My Commission Expires: _____

This certification has been reviewed and approved by:

_____
(INDOT Representative) Date

Attachment B

RECYCLED FOUNDRY SAND (RFS) INDEMNIFICATION CLAUSE

_____ RFS producer shall indemnify, defend, exculpate, and hold harmless the State of Indiana, its officials, and employees from any liability of the State of Indiana for loss, damage, injury, or other casualty of whatever kind or to whomever caused, arising out of or resulting from a violation of the federal or Indiana Occupational Safety and Health Acts (OSHA), the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), or any other environmental law, regulation, ordinance, order or decree (collectively referred to hereinafter as "Environmental Laws"), as a result of the supply, testing, and application of residual sand or other materials supplied under this Contract by _____ source, whether due in whole or in part of the negligent acts or omissions of: (1) _____ Foundry, its agents, officers, or employees, or other persons engaged in the performance of the contract; or (2) the joint negligence of them and the State Of Indiana, its officials, agents, or employees.

This contract shall include, but not be limited to, indemnification from: (1) any environmental contamination liability due to the supply, testing, and application of residual sand in road base, embankments, or other projects designated by the Department as agreed to by the parties, and (2) any liability for the clean up or removal of residual sand, or materials incorporating such sand, pursuant to any Environmental Law.

The RFS producer also agrees to defend any such action on behalf of the State of Indiana, to pay all reasonable expenses and attorneys fees for such defense, and shall have the right to settle all such claims. Provided, however, that no liability shall arise for any such fees or expenses incurred prior to the time that _____ Foundry shall

have first received actual and timely written notice of any claim against the State which is covered by this Indemnification Agreement. If timely written notice of any claim hereunder is not received by _____ Foundry, and _____ Foundry is thereby prejudiced in its ability to defend or indemnify, then to the extent of such prejudice, this Indemnification Agreement shall be void.

This Indemnification Agreement does not create any rights in any third party, and is solely for the benefit of the State of Indiana and its agents, officials, and employees.

205-R-740 PUMP AROUND

(Adopted 09-16-21)

Description

This work shall consist of furnishing, installing, and maintaining a pump around in accordance with 105.03.

The pump around shall be part of the temporary stormwater control plan and shall be constructed with the other temporary stormwater control measures in accordance with 205.

Materials

Materials shall be in accordance with 205.02.

The pump around dikes shall be constructed of non-erodible materials. Sandbag dikes shall be covered with impervious plastic sheeting, placed on the open channel side of the dikes. Sheet piling shall be watertight. Pump around and dewatering hoses shall be made of impervious material.

Construction Requirements

The Contractor may use an alternate method for the channel work as shown on the plans, pending the approval of the Engineer. If an alternate method is proposed, the Contractor shall make the appropriate permit application or amendment.

Traversing the channel reach with equipment within the work area where no work is proposed shall be avoided. If equipment is required to traverse such a reach for access to another area, timber mats or similar measures shall be used to minimize disturbance to the channel. A temporary channel crossing shall be used only when necessary and as approved.

The stormwater control measures adjacent to the channel area shall be installed before construction on the pump around can begin. All work shall stay within the construction limits. Disturbance within that area shall be minimized.

Work shall not be conducted during rain events.

Pump Around

The pump around shall be in accordance with the following:

Dewatering of the channel shall be performed by using a mechanical pump. The intake suction hose shall be floated as long as possible to prevent the pump from pulling sediment from the bottom of the pooled area.

Sandbag dikes shall be installed at the upstream and downstream ends of the work area as shown in the details, and the channel flow shall be pumped around the work area. The pump shall discharge onto a stable velocity dissipater consisting of riprap or sandbags or other approved medium.

Water trapped within the work area shall be pumped to a sediment filtering measure such as a dewatering basin, filter bag, or other approved device. The sediment filtering measure shall be located such that the water drains back into a stabilized area and into the channel below the downstream dike.

Dewatering Filter Bag

A dewatering filter bag shall be securely connected to the end of the discharge hose.

The dewatering filter bag shall be a single-use or reusable type of bag and shall be constructed of non-woven, polypropylene geotextile material. The bag shall have the following minimum specifications:

Permittivity – 1.4 sec^{-1}
Grab Tensile – 205 lbs
Weight – 8 oz/sq yd
Apparent Opening Size – 80 US Sieve.

The dewatering filter bag shall be placed on a flat surface and on riprap or sandbags to help increase the flow through the dewatering bag and help dissipate the velocity.

Water shall be pumped from the channeled area at a rate not to exceed the maximum manufacturer's recommended flow rate of the dewatering filter bag.

Dewatering filter bags shall be placed in a location in which runoff from the bag will pass through additional sediment control measures prior to leaving the site.

Following the completion of the dewatering, the sediment accumulated within the dewatering filter bag shall be removed from the bag and placed in an upland area.

Maintenance and Inspection

The diversion measures shall be inspected within 24 hours of each rainfall event and at least once every seven calendar days. The sediment and debris from the channel or upstream clean water dike shall be removed. The dikes shall be repaired as needed. All outlets shall be checked and repaired as needed to prevent washouts. The dewatering filter bag shall be checked and cleaned.

Removal

Pump around shall be removed after construction in the main channel is complete and permanent stormwater control features have been established. Any areas disturbed by the pump around measures shall be returned to their original condition and re-vegetated as needed.

~~**Method of Measurement**~~

~~Pump around will be measured by the number of units installed, complete in place.~~

~~**Basis of Payment**~~

~~The acceptable quantities of pump around will be paid for at the contract unit price per each.~~

~~Payment will be made under:~~

~~Pay Item~~	~~Pay Unit Symbol~~
~~Pump Around~~	~~EACH~~

~~The cost of furnishing all materials, equipment, labor, installation, maintenance, and removal required for dewatering and~~

operation of the temporary pump around shall be included in the cost of pump around.

The cost of temporary channel crossings if required shall be included in the cost of the pump around.

206-R-719 DEWATERING

(Revised 04-25-21)

Description

The Contractor shall design, furnish, install, test, operate, monitor, and maintain a dewatering system of sufficient scope, size, and capacity to prevent groundwater flow into excavations and allow water and construction operations to proceed on dry, stable subgrades.

Materials

Materials shall be in accordance with the following requirements.

Sediment filter bags shall consist of nonwoven, needle punched polypropylene geotextile consisting of strong, rot resistant, chemically stable long-chain synthetic polymer materials which are dimensionally stable relative to each other including the selvedges. The plastic yarn or fibers used in the geotextile shall consist of at least 85% by weight of polyolefins, polyesters, or polyamides. The plastic yarn or fibers shall have stabilizers and inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure.

The geotextile shall be in accordance with the physical requirements as follows:

PROPERTY	TEST METHOD	REQUIREMENTS*
Tensile Strength	Grab Tensile Strength, ASTM D4632	200 lb
Elongation	Grab Tensile Strength, ASTM D4632	15%
Bursting Strength	ASTM D3786	350 psi
Seam Strength	Grab Tensile Strength, ASTM D4632	180 lb
Puncture Resistance	ASTM D4833	110 lb
Trapezoid Tearing Strength	ASTM C4533	80 lb
Deterioration in Tensile Strength due to Ultraviolet Degradation at 150 h	ASTM D4355	70% strength retained
Apparent Opening Size, AOS	ASTM D4751	No. 80 standard sieve or filter
Flow Rate	ASTM D4491	80 gal./min/sq ft

* The value in the weaker principal direction shall be used. All numerical values represent minimum average roll value and test results from any sampled roll in a lot shall meet or exceed the minimum values in the table. Lots shall be sampled according to ASTM D4354.

The size of the filter bag shall be appropriate for the site conditions.

Construction Requirements

Dewatering operations shall be maintained to ensure stability of excavations and constructed slopes and that the excavation does not flood. Surface water shall be prevented from entering excavations by grading, dikes, or other means. Water from work area dewatering pumps shall be discharged through a sediment filter bag, or other approved device. The filter bag shall be located such that discharge water flows back into a stabilized area downstream of the work area. Dewatering shall be accomplished without damaging existing buildings or structures adjacent

to excavation. The dewatering system shall be removed when no longer needed.

The Contractor shall comply with water disposal requirements of authorities having jurisdiction.

The operation of the dewatering pumps and the condition and efficiency of the sediment filter bags shall be closely monitored. Sediment filter bags which do not perform properly or reach their capacity shall be replaced immediately.

The Contractor shall dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Disposal of water shall not inconvenience others. Sumps, sedimentation tanks, flow-control devices, and temporary sediment and erosion control shall be provided in accordance with 205 and as required by authorities having jurisdiction. Sediment in filter bags shall be removed once it has accumulated to the design volume and be disposed of in accordance with 202.

Method of Measurement

Dewatering will not be measured, regardless of how many times the system is moved, replaced or relocated. Sediment filter bags will not be measured regardless of the number of times a day a filter bag may become filled and replaced.

Basis of Payment

Dewatering shall be considered incidental to the work being performed and shall be included in the cost of other items.

The cost of the pump, materials, installation, inspection, maintenance, sediment filter bags, filter stone, secondary containment, removal and proper disposal, and all necessary incidentals shall be included in the cost of other items.

502-R-761 PORTLAND CEMENT CONCRETE PAVEMENT, PCCP

(Adopted 07-20-23)

The Standard Specifications are revised as follows:

SECTION 502, BEGIN LINE 114, DELETE AS FOLLOWS:

[C] Beams shall be standard cured in a water tank in accordance with AASHTO T 23 and 505.01(a). The water does not need to be saturated with calcium hydroxide. ~~Minimum flexural strength for opening to traffic shall be in accordance with 506.12.~~

504-R-757 LONGITUDINAL TINING

(Revised 02-15-24)

The Standard Specifications are revised as follows:

SECTION 504, BEGIN LINE 15, DELETE AND INSERT AS FOLLOWS:

504.03 Finishing *and Surface Texturing*

(a) Finishing

PCCP shall be finished with equipment in accordance with 508.04. The operations shall be controlled so that an excess of mortar and water is not worked to the top. Long-handled floats may be used to smooth and fill in open textured areas in the PCCP.

Hand methods of finishing may be used when finishing equipment breaks down or in tight working areas where field conditions limit the use of mechanical devices. Hand placed concrete shall be further finished by means of a longitudinal float or a transverse smoothing float in accordance with 508.08(a).

The edges of formed PCCP adjacent to HMA or compacted aggregate shall be tooled. A continuous radius with a uniform smooth dense mortar finish shall be produced.

~~The PCCP surface shall be textured with a double thickness burlap drag or a minimum 4 ft wide turf drag.~~

~~The textured surface of PCCP shall be tined, unless otherwise specified. Tining shall consist of transverse grooves that are between 3/32 and 1/8 in. in width, between 1/8 and 3/16 in. in depth, and be spaced as follows: 5/8 in., 1 in., 7/8 in., 5/8 in., 1 1/4 in., 3/4 in., 1 in., 1 in., 1 in., 1 in., 3/4 in., 7/8 in., 1 3/4 in., 7/8 in., 3/8 in., 1 in., 1 in., 1 1/4 in., 1 1/2 in., 7/8 in., 3/4 in., 7/8 in., 1 in., 7/8 in., 1 in. The grooving pattern shall be repeated across the pavement. The tining grooves shall be formed in the plastic concrete without tearing the surface and without bringing pieces of the coarse aggregate to the top of the surface.~~

~~Texturing and curing operations may be performed by a single machine subject to satisfactory performance.~~

~~Areas of PCCP which are not finished in accordance with these requirements shall be corrected by retexturing.~~

~~Retexturing shall consist of cutting longitudinal or transverse grooves in the PCCP surface by means of saw blades or other approved devices. The grooves shall be spaced 3/4 in. center to center and be 1/8 in. in width and depth. Alternative patterns may be used, subject to approval. The PCCP surface, after cutting, shall not be polished.~~

(b) Surface Texturing

The PCCP surface shall be textured with a double thickness burlap drag or a minimum 4 ft wide turf drag followed by tining oriented either longitudinal or transverse to the direction of travel as specified herein, all before the PCCP permanently sets. The

PCCP surface of mailbox approaches and private and commercial driveways shall be broom finished before the PCCP permanently sets.

Tining the textured surface shall be completed using a mechanical device in accordance with 508.06. The Contractor shall oversee the tining operation to ensure the forming of straight, uniform grooves in the textured, plastic PCCP surface without tearing the concrete surface, without allowing the tine groove edges to slump at the edges, and without bringing pieces of the coarse aggregate to the top of the PCCP surface. Wander and overlap of the tining, and any wavy pattern in the tining shall be prevented. Presence of wander, overlap, or wavy pattern in the tining will be cause for retexturing.

For tight working areas, form work, and where field conditions such as small or irregularly shaped areas limit the use of mechanical devices, as determined by the Engineer, the Contractor may request to use a hand tool that is in accordance with 508.06 and has tines and spacing in accordance with 504.03(b)1 or 2 below, as applicable for the application.

Texturing and curing operations may be performed by a single machine subject to satisfactory performance.

1. Longitudinal Tining

Tining shall be in the longitudinal direction, parallel with the direction of travel, on all PCCP that is uniform in width, including mainline and shoulders. Tining shall be completed using a mechanical device in accordance with 508.06 that has 1/8 in. wide tines, spaced at 3/4 in. center-to-center, and produces a uniform, nominal depth tine groove 1/8 in. ± 1/16 in. deep in the plastic PCCP. The mechanical device shall be able to tine the full width of the PCCP in one operation. Tining shall be completed prior to the application of curing materials. String line or other controls for line and grade shall be used to ensure straight tining parallel with the direction of travel. Tining shall not be performed within 3 in. of pavement edges or longitudinal joints.

2. Transverse Tining

Tining shall be in the transverse direction, perpendicular to the direction of travel, on PCCP on all approaches, ramps, tapered areas, and gore areas. Tining shall be completed using a mechanical device in accordance with 508.06 that has 1/8 in. wide tines, spaced center-to-center as follows: 3/8 in., 9/16 in., 5/8 in., 7/16 in., 3/8 in., 1/2 in., 9/16 in., 5/8 in., 7/16 in., 3/8 in., 13/16 in., 1/2 in., and produces a uniform, nominal depth tine groove 1/8 in. ± 1/16 in. deep in the plastic PCCP. The tining pattern shall be repeated across the PCCP surface perpendicular to the direction of travel.

(c) Retexturing

Areas of PCCP which are not finished and textured in accordance with the requirements herein shall be corrected by retexturing. Retexturing shall be done in the same longitudinal or transverse direction as the orientation of the existing tining. It shall consist of cutting longitudinal or transverse grooves in the PCCP surface by means of saw blades or other approved devices. The grooves shall be spaced in accordance with 504.03(b)1 or 2 above as appropriate. The PCCP surface, after cutting, shall not be polished.

504.04 Curing

Curing materials shall be applied to exposed surfaces and sides of newly placed PCCP within 30 minutes after the finishing operations have been completed, or as soon as marring of the concrete does not occur. Paving operations shall be immediately suspended if sufficient curing materials are not available on site.

SECTION 504, BEGIN LINE 127, INSERT AS FOLLOWS:

504.06 Basis of Payment

The cost of finishing the PCCP surface furnishing and placing curing materials shall be included in the cost of the PCCP. *Retexturing shall be at no additional cost to the Department.*

SECTION 508, BEGIN LINE 217, DELETE AND INSERT AS FOLLOWS:

508.06 ~~Texturing~~*Tining* Equipment

~~Mechanical texturing equipment~~*The mechanical device* shall ~~be capable of forming transverse~~*have automated elevation and steering controls to ensure the forming of straight* grooves of uniform depth and alignment in the plastic PCCP, without tearing the surface. The ~~texturing comb~~*mechanical device* shall have *a single row of* steel tines spaced as specified.

Hand tools consisting of fluted floats, rakes with spring steel tines, or finned floats with a single row of fins shall produce grooves which conform to the same requirements as those specified for the grooves formed by the mechanical ~~equipment~~*device*.

506-R-762 PCCP PATCHING

(Revised 10-19-23)

The Standard Specifications are revised as follows:

SECTION 506, BEGIN LINE 274, DELETE AND INSERT AS FOLLOWS:

506.05 Trial Batch

A trial batch shall be produced and tested by the Contractor's *ACI*-~~c~~*C*ertified *Concrete Field Testing* ~~t~~*T*echnician*, Grade I,* to verify that the CMDS is in accordance with the concrete mix criteria. Concrete produced at a plant shall be batched within the proportioning tolerances of 502.10. An ~~American Concrete Institute~~*ACI*-~~c~~*C*ertified ~~c~~*C*oncrete ~~f~~*F*ield ~~t~~*T*esting ~~t~~*T*echnician, ~~g~~*G*rade ~~1~~*I,* shall be on site to direct all sampling and testing. The trial batch shall be produced at the plant prior to production.

SECTION 506, BEGIN LINE 317, DELETE AND INSERT AS FOLLOWS:

(a) Beams for Validation of CMDP

At least one set, consisting of ~~three~~*two* beams per set, will be made once per every 150 cu yds of concrete placed and tested for compliance with either the 3-day or 7-day flexural strength requirements in accordance with 506.04*(b) or 502.04(a) respectively*, for the purpose of CMDP validation. Air content and relative yield will be measured on each sample of concrete from which beams are made.

SECTION 506, BEGIN LINE 581, DELETE AS FOLLOWS:

(b) For Patches Greater than 15 ft in Length

Traffic shall not be allowed on the PCCP until a modulus of rupture ~~of 425 psi~~ from flexural strength testing *in accordance with the appropriate value in the table below* is achieved. The modulus of rupture will be determined by averaging two beams.

Concrete Mix in accordance with:	*Minimum Modulus of Rupture, psi*
502.04(a)	*550*
506.04(b)	*425*

509-R-763 PORTLAND CEMENT CONCRETE PAVEMENT, PCCP, JOINT REPAIR

(Revised 10-19-23)

The Standard Specifications are revised as follows:

SECTION 509, BEGIN LINE 157, DELETE AND INSERT AS FOLLOWS:

509.05 Quality Control Plan

A QCP shall be in accordance with sections 1.1 through 4.7 of ITM 803, except that the ~~Quality Control~~*QC* Technician shall be an ACI-Certified *Concrete Field Testing* Technician, ~~Level~~*Grade* I ~~or higher~~. The QCP shall be submitted to the Engineer a minimum of 15 days prior to commencing PCCP joint repair. Work shall not begin until written notice has been received that the QCP was accepted by the Engineer. At a minimum, the QCP shall contain the following information concerning aspects of producing, placing, finishing, and curing the joint repair concrete for joint restoration:

SECTION 509, BEGIN LINE 196, INSERT AS FOLLOWS:

(g) Process control of the concrete shall address *the following concrete properties as appropriate for the mix:* sampling and testing for slump, relative yield, air content, water cementitious ratio, and temperature. The frequency of tests shall be the first batch of the day and not less than three times per day including the first. If volumetric batching of concrete is utilized, the yield will be checked as described in 722.05(a) at the beginning of the day and not less than two times per day including the first load from each mobile mixer. The QCP shall include details as to actions in response to test results.

SECTION 509, BEGIN LINE 551, DELETE AND INSERT AS FOLLOWS:

~~The labor necessary for concrete sampling shall be furnished as required by the Engineer~~*If additional manpower for concrete sampling is deemed necessary by the Engineer, the Contractor shall furnish the additional labor.* Testing for slump, air content, and relative yield, as appropriate for the mix, will be on the first batch of the day and a minimum of once per every 400 cu ft thereafter. Beams or cylinders will be made for evaluating the quality of the delivered mix at least once for every three days of production or whenever slump, relative yield, or air content are failing the upper limit. The beams or cylinders will be tested for compliance with strength requirements, at an age consistent with the mixtures intended use as defined in 509.04. Beams or cylinders for this purpose shall be cured in accordance with Section 10.1 of AASHTO T 23 and 505.01(a).

603-R-414 POLYVINYL CHLORIDE COATED CHAIN LINK FENCE

(Revised 05-23-13)

Description

This work shall consist of the furnishing and placement of polyvinyl chloride, PVC, coated chain link fence and gates in accordance with 105.03.

MATERIALS

Materials

Materials shall be in accordance with the following:

Chain Link Fabric, PVC, Class 2b	ASTM F668
Concrete, Class B	702
Concrete, Packaged Dry	901.08
Fence Posts	910.13
Gates	ASTM F1043
Tension Wire	ASTM F1664

The fence fabric shall be No. 9 gauge wire with 2 in. mesh. Tension wire shall be No. 9 gauge wire.

The color of all fence materials including the fabric, tension wire, posts, bars, gates, and miscellaneous hardware shall be in accordance with ASTM F668 and in accordance with the plans.

All caps, beveled tension and brace bands, and connectors used in construction of PVC coated chain link fence shall be pressed steel, malleable or cast steel, galvanized and PVC coated in accordance with ASTM F668.

All gate hardware shall meet the requirements for industrial fences. Hardware subject to movement and not vinyl-clad shall be field painted with touchup paint specifically formulated for this purpose.

CONSTRUCTION REQUIREMENTS

General

Construction operations shall be in accordance with 603.03, 603.04, 603.05, and 603.06.

~~**Method of Measurement**~~

~~PVC coated chain link fence, and resetting PVC coated chain link fence will be measured by the linear foot. Measurement will be made along the top of the fence from outside to outside of end posts for each continuous run of fence.~~

~~PVC coated gates will be measured as complete units of the size and type specified.~~

~~**Basis of Payment**~~

~~The accepted quantities of PVC coated chain link fence and resetting PVC coated chain link fence will be paid for at the contract unit price per linear foot, complete in place. PVC coated gates will be paid for at the contract unit price per each of the size specified, complete in place.~~

~~Payment will be made under:~~

Pay Item	Pay Unit Symbol
Fence, Chain Link, PVC Coated, _____ (height) in	LFT
Fence Gate, Chain Link, PVC Coated _____ (height) in. x _____ (length) in	LFT
Fence, Chain Link, PVC Coated, Reset	LFT

The cost of adding grounding in accordance with the National Electric Safety Code including all materials, and labor shall be included in the cost of the fence.

The cost of PVC fence, corner, end, line, and pull posts shall be included in the cost of the fence.

The cost of PVC fence, posts and miscellaneous hardware shall be included in the cost of the gate.

The cost of all miscellaneous hardware related to the type of fence including brace connections, caps, clips, clamps, hinges, rivets, ties, truss rods, diagonal braces and stretcher bars shall be included in the cost of the fence.

The cost of concrete for posts, braces or anchors shall be included in the cost of the fence and gates.

The cost of removal, storage, re-installation, and the replacement of damaged or missing parts shall be included in the cost of the resetting fence.

621-R-398 CAPPING CUT AND FILL SLOPES STEEPER THAN 3:1

(Revised 05-23-13)

Description

This work shall consist of:

(a) covering soil slopes with a cohesive soil to establish vegetation;

(b) use of soil reinforcement materials and blankets for mulching seed as shown on the plans and in accordance with these requirements;

(c) use of water absorption chemicals to hold water and keep moisture available for seed germination; and

(d) soil testing for pH, nutrient supply, and organic matter percentage.

Materials

The materials shall be in accordance with the following:

(a) Mulch Blankets

The mulch blankets shall be excelsior blankets or straw mats in accordance with 621.05(d) or 621.05(f).

(b) Water Absorption Gels

Water absorption gels developed for horticultural use shall be incorporated into the top 1 1/2 in. of the capping soil according to the manufacturer's recommendations. The Contractor shall supply a copy of the manufacturer's recommendation to the Engineer prior to the placement of the capping soil.

(c) Capping Soil

The capping soil shall be a type A4, A5, A6, or A7 AASHTO classification, that has a pH range of 6 to 7 and an organic content of 5 to 10% by volume or 2 to 3% by dry weight. The soil shall be tested by an approved laboratory and the results shall be furnished to the Engineer prior to the placement of the soil.

Construction Requirements

All slopes steeper than 3:1 designated for seeding shall be ripped to a depth of 2 in. and then covered with a 6 in. layer of capping soil. The capping soil shall be evenly spread over all areas and shall have the water absorption gels incorporated. The capping soil shall be tracked into place such that the cap adheres to the existing soil and forms the desired contours for the slope. All debris in the capping soil shall be in accordance with 203.09. All areas shall be fine graded to produce a smooth surface which conforms to the contours and cross sections desired.

~~**Method of Measurement**~~

~~Existing soils stripped and stockpiled for use as a capping soil will be measured as common excavation in accordance with 203.27. Capping soil obtained from off the right-of-way will be measured as borrow in accordance with 203.27. Erosion control blankets will be measured in accordance with 621.13. Water absorption gels will not be measured for payment.~~

Basis of Payment

Existing soils stripped, stockpiled, and then redistributed as a capping soil will be paid for as common excavation in accordance with 203.28. Capping soil obtained from off the right-of-way will be paid for as borrow in accordance with 203.28. Erosion control blankets will be paid for in accordance with 621.14.

The cost of the water absorption gel shall be included in the cost of the erosion control blanket.

715-R-764 PIPE CULVERTS, AND STORM AND SANITARY SEWERS

(Revised 07-18-24)

The Standard Specifications are revised as follows:

SECTION 715, BEGIN LINE 41, DELETE AND INSERT AS FOLLOWS:

(a) Type 1 Pipe

Type 1 pipe shall be used for culverts under mainline pavement and public road approaches and shall be in accordance with the following:

Clay Pipe, Extra Strength 907.08
Corrugated Aluminum Alloy Pipe and Pipe-Arches..... ~~908.04~~[B]
Corrugated Polyethylene Pipe, Type S..... *[A]
Corrugated Polypropylene Pipe ..... *[A]
Corrugated Steel Pipe and Pipe-Arches ..... ~~908.02~~[B]
Non-Reinforced Concrete Pipe, Class 3..... 907.01
Polymer Precoated Galvanized Corrugated Steel
Pipe and Pipe-Arches ..... ~~908.08~~[B]
Profile Wall Polyethylene Pipe, Closed ..... *[A]
Profile Wall Polyethylene Pipe, Ribbed..... *[A]
Profile Wall PVC Pipe ..... *[A]
Reinforced Concrete Horizontal Elliptical Pipe 907.03
Reinforced Concrete Pipe..... 907.02
Smooth Wall Polyethylene Pipe ..... *[A]
Smooth Wall PVC Pipe..... *[A]
Spiral Rib Steel Pipe ..... ~~908.02~~[B]
Structural Plate Pipe and Pipe-Arches..... 908.09

*[A] All thermoplastic pipes shall be from the QPL of Thermoplastic Pipe and Liner Pipe Sources in accordance with 907.16.

[B] *Metal pipes shall be from the QPL of Metal Pipe Sources in accordance with 908.01.*

(b) Type 2 Pipe

Type 2 pipe shall be used for storm sewers and shall be in accordance with the following:

Clay Pipe, Extra Strength 907.08
Corrugated Polyethylene Pipe, Type S..... *[A]
Corrugated Polypropylene Pipe ..... *[A]
Fully Bituminous Coated and Lined Corrugated Steel
Pipe and Pipe-Arches ..... ~~908.07~~[B]
Non-Reinforced Concrete Pipe, Class 3..... 907.01
Polymer Precoated Galvanized Corrugated Steel
Pipe and Pipe-Arches Type IA and Type IIA..... ~~908.08~~[B]
Profile Wall Polyethylene Pipe, Closed ..... *[A]
Profile Wall Polyethylene Pipe, Ribbed..... *[A]
Profile Wall PVC Pipe ..... *[A]
Reinforced Concrete Horizontal Elliptical Pipe 907.03
Reinforced Concrete Pipe..... 907.02

Smooth Wall Polyethylene Pipe ..... ~~*~~[A]
Smooth Wall PVC Pipe ..... ~~*~~[A]

~~*~~[A] All thermoplastic pipes shall be from the QPL of Thermoplastic Pipe and Liner Pipe Sources in accordance with 907.16.

[B] *Metal pipes shall be from the QPL of Metal Pipe Sources in accordance with 908.01.*

(c) Type 3 Pipe

Type 3 pipe shall be used for culverts under all drives and field entrances. All Type 1 pipe materials are acceptable.

(d) Type 4 Pipe

Type 4 pipe shall be used for drain tile and longitudinal underdrains and shall be in accordance with the following:

Clay Pipe*~~*~~ 907.08
Corrugated Polyethylene Drainage Tubing ..... ~~*~~[A]
Corrugated Polyethylene Pipe, Type S*~~*~~ ..... ~~*~~[A]
Corrugated Polyethylene Pipe, Type SP ..... ~~*~~[A]
Drain Tile*~~*~~ 907.10
Non-Reinforced Concrete Pipe 907.01
Perforated Clay Pipe*~~*~~ 907.09
Perforated PVC Semicircular Pipe ..... ~~*~~[A]
Profile Wall PVC Pipe ..... ~~*~~[A]

~~*~~[A] All thermoplastic pipes shall be from the QPL of Thermoplastic Pipe and Liner Pipe Sources in accordance with 907.16.

~~*~~* These materials shall be used for drain tiles only.

(e) Type 5 Pipe

Type 5 pipe shall be used for broken-back pipe runs where coupled or jointed pipe is desirable and shall be in accordance with the following:

Corrugated Aluminum Alloy Pipe and Pipe-Arches ..... ~~908.04~~[B]
Corrugated Polyethylene Pipe, Type S ..... ~~*~~[A]
Corrugated Polypropylene Pipe ..... ~~*~~[A]
Corrugated Steel Pipe and Pipe-Arches ..... ~~908.02~~[B]
Fully Bituminous Coated and Lined Corrugated Steel Pipe and Pipe-Arches ..... ~~908.07~~[B]
Polymer Precoated Galvanized Corrugated Steel Pipe and Pipe-Arches ..... ~~908.08~~[B]
Profile Wall Polyethylene Pipe, Closed ..... ~~*~~[A]
Profile Wall Polyethylene Pipe, Ribbed ..... ~~*~~[A]
Profile Wall PVC Pipe ..... ~~*~~[A]
Smooth Wall Polyethylene Pipe ..... ~~*~~[A]
Smooth Wall PVC Pipe ..... ~~*~~[A]
Spiral Rib Steel Pipe ..... ~~908.02~~[B]

~~*~~[A] All thermoplastic pipes shall be from the QPL of Thermoplastic Pipe and Liner Pipe Sources in accordance with 907.16.

[B] *Metal pipes shall be from the QPL of Metal Pipe Sources in accordance with 908.01.*

SECTION 715, BEGIN LINE 142, INSERT AS FOLLOWS:

(i) Underdrain Outlet Pipe

Pipe for underdrain outlets and drain tile outlets shall be PSM PVC pipe, profile wall PVC pipe, smooth wall polyethylene pipe, or smooth wall PVC pipe from the QPL of Thermoplastic Pipe and Liner Pipe Sources in accordance with 907.16 and 907.24. Schedule 40 PVC pipe in accordance with 907.24*(b)* is also allowable.

SECTION 715, BEGIN LINE 165, DELETE AND INSERT AS FOLLOWS:

(l) Roadway Drain Casting Extensions

Pipe used for extending roadway drain castings located in a bridge deck shall be in accordance with ~~907.23~~*907.24(b)*, 907.28, or 908.10. Pipe support brackets and all hardware shall be galvanized in accordance with ASTM A153, class D or ASTM B695, class 40, type I. A Type C certification in accordance with 916 shall be provided for the pipe brackets.

SECTION 907, BEGIN LINE 216, DELETE AND INSERT AS FOLLOWS:

907.16 Thermoplastic Pipe Requirements

A QPL of ~~t~~*T*hermoplastic ~~p~~*P*ipe and ~~l~~*L*iner ~~p~~*P*ipe *Sources* will be maintained by the Department. The QPL will specify the manufacturer and thermoplastic pipe designation. All of these materials shall comply with the applicable AASHTO or ASTM requirements listed in the following table and will only be accepted from qualified manufacturers. The manufacturer is defined as the plant which produces ~~the~~ thermoplastic pipe. The manufacturer shall become qualified by establishing a history of satisfactory quality control of these materials as evidenced by the test results performed by the manufacturer's testing laboratory.

Summary of Thermoplastic Pipe Specification Requirements				
Pipe Material	Standard Specification	AASHTO	ASTM	Manufacturer Requirement
Corrugated Polyethylene Drainage Tubing	907.17(a)	M 252		ITM 806, Procedure O
Corrugated Polyethylene Pipe	907.17(b)	M 294*		ITM 806, Procedure O
Corrugated Polypropylene Pipe	907.19	M 330		ITM 806, Procedure O
Perforated PVC Semicircular Pipe	907.18		D3034	ITM 806, Procedure A
Profile Wall HDPE Liner Pipe	907.25(b)		F894	ITM 806, Procedure A or 916, Type A Certification
Profile Wall PVC Liner Pipe	907.25(c)		F949	ITM 806, Procedure A or 916, Type A Certification
Profile Wall PVC Pipe	907.22 907.24(c)	M 304		ITM 806, Procedure O
Profile Wall Polyethylene Pipe	907.20		F894	ITM 806, Procedure A
~~Schedule 40~~ PVC *Plastic*	907.24(b)		D1785	916,

Pipe*, Schedule 40*			~~or~~ ~~D2665~~	Type C Certification
Slotted Vane Drain Pipe	*908.14*	*M 278*	*F679*	*ITM 806, Procedure A*
Smooth Wall Polyethylene Pipe	907.21 907.24(d)		F714	ITM 806, Procedure A
Smooth Wall PVC Pipe	907.23 907.24(e)	M 278	F679	ITM 806, Procedure A
Solid Wall HDPE Liner Pipe	907.25(a)		F714	ITM 806, Procedure Q or 916, Type A Certification
Type PSM PVC Pipe and Fittings	907.24(a)		D3034	ITM 806, Procedure A
* Pipe in accordance with AASHTO M 294 shall be manufactured with virgin materials.				

SECTION 907, BEGIN LINE 291, DELETE AND INSERT AS FOLLOWS:

(b) ~~Schedule 40~~ PVC *Plastic* Pipe, *Schedule 40*

~~Pipe~~*PVC plastic pipe* shall be in accordance with ASTM D1785 *when Schedule 40 is specified* ~~or D2665~~ and shall have a minimum pipe stiffness of 150 psi at 5% deflection when determined in accordance with ASTM D2412. Material furnished under this specification shall reference ASTM D1785 ~~or ASTM D2665~~ in the product print line. A Type C certification in accordance with 916 shall be provided for the ~~s~~Schedule 40 PVC *plastic* pipe.

SECTION 908, BEGIN LINE 3, DELETE AND INSERT AS FOLLOWS:

908.01 ~~Blank~~*Metal Pipe Requirements*

A QPL of Metal Pipe Sources for the identified pipe materials specified in the table below will be maintained by the Department. The QPL will specify the manufacturer and pipe designation. The manufacturer is defined as the plant which produces the metal pipe or pipe-arch. The manufacturer shall establish and maintain a history of satisfactory quality control of these materials. This history will be based on achieving and maintaining a "Compliant" status with the AASHTO PEAS program in accordance with ITM 806, Procedure O.

SUMMARY OF METAL PIPE SPECIFICATION REQUIREMENTS				
Pipe Material	*Standard Specification*	*AASHTO*	*ASTM*	*Manufacturer Requirement*
***Required** to be furnished from a manufacturer on the QPL include:*				
Corrugated Aluminum Alloy Pipe and Pipe-Arches	*908.04*	*M 196*		*ITM 806, Procedure O*
Corrugated Steel Pipe and Pipe-Arches	*908.02*	*M 36*		*ITM 806, Procedure O*
Fully Bituminous Coated Corrugated and Lined Steel Pipe and Pipe-Arches	*908.07*	*M 36*		*ITM 806, Procedure O*
Polymer Precoated Galvanized Corrugated Steel Culvert Pipe and Pipe-Arches	*908.08*	*M 245*		*ITM 806, Procedure O*

Slotted Drain Pipe	*908.14*	*pipe: M 36*	*grate: A36, Grade 36*	*ITM 806, Procedure O*
***Not required** to be furnished from the QPL:*				
Cast Iron Soil Pipe	*908.10*		*A74*	*Buy America Certification*
Steel Pipe	*908.11*		*A139, grade B or A53 Type E, grade B*	*Type C Certification; Buy America Certification*
Structural Plate Pipe, Pipe-Arches, and Arches; Aluminum Alloy	*908.09(b)*	*M 219*		*Certified Mill Report; Fabricator Certification; Buy America Certification*
Structural Plate Pipe, Pipe-Arches, and Arches; Steel	*908.09(a)*	*M 167 and LRFD Bridge Construction Specifications*		*Certified Mill Report; Fabricator Certification; Build America Certification*

720-R-646 CURB INLET CASTING

(Revised 05-20-23)

The Standard Specifications are revised as follows:

SECTION 910, AFTER LINE 405, INSERT AS FOLLOWS:

Where a 6 in. curb height is specified, a monolithic frame and curb box may be used in place of one with modular components, provided the monolithic casting's dimensions match those shown on the plans.

801-C-157 CERTIFICATION OF TEMPORARY TRAFFIC CONTROL DEVICES

(Revised 05-23-13)

Category I Devices

The Contractor shall certify that the following temporary traffic control devices to be used do not exceed the maximum values shown in the table below, and are considered crashworthy at Test Level 3 in accordance with NCHRP 350.

Device	Composition	Max. Weight	Max. Height
Single Piece Traffic Cones	Rubber	20 lb	36 in.
	Plastic	20 lb	48 in.
Tubular Markers	Rubber	13 lb	36 in.
	Plastic	13 lb	36 in.
Single Piece Drums	High Density Plastic	77 lb	36 in.
	Low Density Plastic	77 lb	36 in.
Delineators	Plastic, Fiberglass	N/A	48 in.

No lights, signs, flags, or other auxiliary attachments are included in the weight of the devices listed above. Reflective sheeting or reflective buttons are included on delineators. Maximum weights, including ballast, do not exceed the values shown in the table. "Single piece" refers to the construction of the body of the drum exclusive of a separate base, if any.

Type A or type C warning lights in accordance with the following specifications will be allowed on drums if they are firmly attached with vandal resistant 1/2 in. diameter by 4 in. cadmium plated steel bolt with nut and a 1 1/2 in. high cup washer.

1. The weight shall be no more than 5 lb.

2. The lens diameter shall be 7 to 8 in.

3. The height of the light shall be 11 to 14 in.

Category II Devices

Category II temporary traffic control devices include type III barricades, vertical panels, portable sign standards, and other light-weight traffic control devices.

Category II temporary traffic control devices shall be in accordance with the NCHRP 350, Test Level 3.

A form will be provided at the preconstruction conference for the Contractor to complete and return to the Engineer prior to the placement of category I or II traffic control devices.

801-R-542 WORKSITE ADDED PENALTY SIGNS

(Revised 03-16-17)

Worksite Added Penalty signs shall be placed as shown on the plans or as directed by the Engineer. The signs shall typically be placed in advance of the first Road Construction Ahead signs at either end of the project. The actual location and quantity of the signs will be determined by the Engineer in coordination with the Worksite Traffic Control Supervisor.

The XW2-6-A Worksite Added Penalty sign, 78 in. by 42 in., shall be installed on all projects in all cases not otherwise described below.

The XW2-6 Worksite Added Penalty sign, 60 in. by 36 in., shall only be installed on projects in urban areas that have a posted speed limit of 35 MPH or less and also meet one of the following conditions:

1. The existing surfaces outside the edge of pavement make installation of driven posts impractical, or

2. The width of the Right-of-Way outside of the edge of pavement is not sufficient to accommodate the larger XW2-6-A, Worksite Added Penalty sign, 78 in. by 42 in.

The XW2-6a-B Speeding and XW2-6b-B Reckless Driving signs, 48 in. by 48 in., shall be used in series with each other and shall only be used on projects that meet one of the following conditions:

1. Rural projects where the width of the Right-of-Way outside of the edge of pavement is not sufficient to accommodate the larger XW2-6-A Worksite Added Penalty sign, 78 in. by 42 in., or

2. Contracts using only moving operations where construction signs are set and removed each day to accommodate the changing location of the work.

The XW2-6a-A Speeding and XW2-6b-A Reckless Driving signs, 36 in. by 36 in., shall be used in series with each other and shall only be used on projects in urban area where the width of the Right-of-Way outside of the edge of pavement is not sufficient to accommodate the larger XW2-6-A Worksite Added Penalty sign, 78 in. by 42 in.

~~Worksite Added Penalty, Speeding, Reckless Driving signs will be measured and paid for as Construction Sign, Type A in accordance with 801.17 and 801.18.~~

801-T-150d TRAFFIC CONTROL DEVICE REPORT

(Adopted 09-01-05)

CONTRACT: _____ PROJECT: _____ DATES: _____ thru _____

LOCATION	DESCRIPTION	DATE PLACED	* Use "✓" if O.K.							DATE REMOVED	*REMARKS
			S	M	T	W	T	F	S		

* If device is not O.K., describe deficiency under Remarks.

Date Corrective Action Taken: _____ Report Prepared By: _____ , Title: _____

801-T-198 TRAFFIC CONTROL FOR TRAFFIC BREAKS

(Revised 05-20-23)

The Standard Specifications are revised as follows:

SECTION 801, BEGIN LINE 868, DELETE AND INSERT AS FOLLOWS:

801.16 Temporary Traffic Control Zone

A temporary traffic control zone is a work zone with frequently changing operation, a maximum duration of seven calendar days; mobile operation; or a temporary traffic ~~stoppage~~*break*.

SECTION 801, BEGIN LINE 903, DELETE AND INSERT AS FOLLOWS:

(c) Traffic Control for ~~Temporary~~ Traffic ~~Stoppage~~*Breaks*

Traffic shall not be allowed to pass directly beneath personnel or equipment working on an overhead structure. *Traffic breaks, when approved by the Engineer, may be implemented for moving equipment or materials over the traveled way. Traffic breaks shall be accomplished by temporary stoppage, rolling slowdown or other approved method.* Traffic ~~stoppage~~*breaks* ~~during an overhead operation~~ shall not exceed 20 minutes at one time. There shall be enough time between consecutive ~~stoppages~~*breaks* to allow traffic to return to normal flow.

Three working days prior to commencing work which necessitates ~~temporary stoppage~~*breaks* of traffic, written notice shall be given to the Department and the Indiana State Police that highway traffic shall be stopped*, slowed or diverted* temporarily at a specific location, time, and date to accomplish specified work. Traffic shall be safely controlled during the ~~stoppage~~*traffic break*. The following minimum requirements shall be met.

1. On Multi-Lane Divided Highways

Advance warning signs *and pilot vehicles* shall be located as specified or as otherwise directed. ~~For each direction of road closure two flaggers shall be located at the site of the work and a minimum of two additional flaggers shall be used to warn approaching traffic~~.

2. On Non-Divided Highways

Advance warning signs shall be located as specified or as otherwise directed. For each direction of road closure, *a minimum of* one flagger shall be located at the site of the work and a minimum of one additional flagger shall be used to warn approaching traffic.

801-T-207 TEMPORARY TRAFFIC BARRIERS

(Revised 07-20-23)

The Standard Specifications are revised as follows:

SECTION 108, BEGIN LINE 211, DELETE AND INSERT AS FOLLOWS:

Temporary drainage structures, temporary ~~concrete median~~*traffic* barrier~~s~~, and other temporary devices required and used for the maintenance of traffic shall remain the property of the Contractor. All costs for furnishing, placing, maintaining, removal, and disposal of temporary drainage structures shall be included in the contract lump sum price for maintaining traffic. If there is no pay item for maintaining traffic, these costs shall be included in the various pay items listed in the proposal, unless otherwise provided.

SECTION 801, BEGIN LINE 77, DELETE AND INSERT AS FOLLOWS:

A worksite traffic supervisor certified by the American Traffic Safety Service Association, ATSSA, or approved equal certifying organization, shall direct all field layout, placement, operation, inspection, maintenance, and removal of temporary traffic control devices. The certified worksite traffic supervisor, CWTS, shall ensure that all traffic control devices~~, except temporary concrete barrier,~~ meet acceptable standards as outlined in the plans, specifications, and ATSSA's "Quality Standards for Temporary Traffic Control Devices" prior to installation. *A copy of the ATSSA's "Quality Standards for Temporary Traffic Control Devices" shall be provided to the Engineer upon request.* The CWTS shall also, prior to installation, ensure that all traffic control devices can be installed in accordance with the plans, specifications, and the MUTCD. All problems shall be reported to the Engineer so a resolution can be worked out prior to installation. The field layout will be reviewed and is subject to approval by the Engineer prior to placement of any temporary traffic control devices. The CWTS shall be present for the initial setup and all phase changes during the life of the project. The CWTS may designate responsible Contractor personnel to perform day to day operation, inspection, and maintenance of the temporary traffic control devices. These responsible personnel shall work under the direction of the CWTS and their names shall be given to the Engineer on the project. A copy of the CWTS's certification shall be provided to the Engineer prior to the start of construction or placement of temporary traffic control devices or if the worksite traffic supervisor changes.

SECTION 801, BEGIN LINE 139, INSERT AS FOLLOWS:

A temporary traffic control device will be deemed to be in non-compliance when considered Unacceptable. A type of temporary traffic control device will be deemed to be in non-compliance when 25% or more of the individual devices *or temporary concrete barrier segments* are considered Marginal. Damages may be assessed in accordance with 105.14 for non-compliance.

The quality assurance unit for placed temporary concrete barrier shall be the total number of segments installed. Temporary concrete barrier segments that are deemed non-compliant shall be promptly repaired or replaced.

SECTION 801, BEGIN LINE 186, DELETE AND INSERT AS FOLLOWS:

Temporary drainage structures, temporary ~~concrete median~~*traffic* barrier ~~units~~, and other temporary devices required and used for traffic maintenance shall remain the property of the Contractor.

SECTION 801, BEGIN LINE 354, DELETE AND INSERT AS FOLLOWS:

801.10 Temporary Traffic Barriers

Temporary traffic barrier shall be one of the following four types as shown on the plans.

The application for each temporary traffic barrier type shall be as follows:

Temporary Traffic Barrier Type Designation	*Application*
Type 1	*Used to separate two-way traffic*
Type 2	*Used to separate traffic from the work zone*
Type 3	*Used in the same manner as Type 1 and remains in place after contract completion.*
Type 4	*Used to accommodate the closing or shifting of traffic lanes on a daily basis to better facilitate the changing volumes of traffic during the peak hours of a day.*

Type 1

~~Type 1 temporary traffic barriers shall be used to separate two-way traffic and~~ *Barriers used as Type 1 temporary traffic barrier* shall be precast concrete in accordance with applicable requirements of 707 and 602 and as shown on the plans. ~~Type 1 barriers may also be used to separate traffic from the work area~~*Barriers acceptable for use as Type 1 may also be used as Type 2.*

The surfaces of individual precast ~~units~~*concrete barrier segments* shall vary no more than 1/4 in. in 10 ft from the specified cross-section, as measured from a longitudinal straightedge. The maximum variation in the vertical and horizontal alignment of ~~adjacent units~~*abutting segments* shall be 1/4 in. across the joint, as measured from a 10 ft longitudinal straightedge. ~~Sections that have obvious defects or visual cracks shall not be used. Sections that develop any of these conditions during the contract shall be repaired with concrete or replaced within a reasonable amount of time.~~ *Segment condition and maintenance shall be in accordance with 801.03.*

~~Type 1 barrier units precast prior to 2003 shall not be used after January 1, 2012. Units precast after March 1, 2003~~*Precast concrete barrier segments manufactured prior to March 1, 2003 shall not be used. Each barrier segment* shall be clearly marked with the name or trademark of the manufacturer, the year of manufacture, and "INDOT". The markings shall be indented on an end or on the top of each barrier ~~section~~*segment*. ~~Units precast~~*Segments manufactured* after January 1, 2007 shall be from the QPL of Certified Precast Concrete Producers.

Type 2

~~Type 2 barriers may be used to separate traffic from the work area.~~ Type 2

temporary traffic barriers shall meet the appropriate test level 2 or 3 MASH or NCHRP 350 *or MASH* crash test standards and shall be approved for use by the FHWA*criteria*. A copy of the MASH or NCHRP 350 crash test FHWA eligibility letter shall be provided to the Engineer prior to placing the unit*report confirming the product is NCHRP 350 or MASH compliant for the test level specified, or a copy of the FHWA eligibility letter, shall be furnished to the Engineer prior to the installation of the barrier.*

The unit*barrier* selected shall be appropriate for the location considering the maximum posted speed limit on the project *prior to construction* and the allowable area for deflection. The unit*barrier* shall be installed according to the manufacturer's recommendations.

If concrete barriers are used as Type 2 barriers, they shall be in accordance with the requirements for Type 1 barriers.

Type 3

Type 3 temporary traffic barriers shall be those Type 1 temporary traffic barriers that are to*Barriers used as Type 3 temporary traffic barrier shall be in accordance with the requirements for barrier used as Type 1. They shall* be left in place at the completion of the contract and shall become the property of the Department. They shall be in like-new condition at the completion of the contract. All necessary delineation and required anchor systems shall be left in place.

Type 4

Type 4 temporary traffic barriers shall be those types that are intended to be readily moveable to accommodate the shifting of traffic lanes on a daily basis to better facilitate the changing volumes of traffic during the peak hours of a day.*Barrier used as* Type 4 temporary traffic barriers shall *be readily moveable and* meet the appropriate test level 3 MASH or NCHRP 350 *or MASH* crash test standards and shall be approved for use by the FHWA*criteria*. A copy of the MASH or NCHRP 350 crash test FHWA eligibility letter shall be provided to the Engineer prior to placing the unit*report confirming the product is NCHRP 350 or MASH compliant for the test level specified, or a copy of the FHWA eligibility letter, shall be furnished to the Engineer prior to the installation of the barrier*.

(a) Placement

Temporary traffic barriers shall be located as shown on the plans or as directed. Temporary traffic barriers used to close a lane of traffic shall be flared at the rates as shown on the plans for the applicable regulatory speed within the construction zone. If field conditions are such that the required flare rate cannot be utilized, the tapered alignment may be altered, with approval, to a 10:1 flare rate with a 20 ft minimum offset from the edge of the through traffic lane to the approaching end of the flared temporary traffic barrier. If field conditions are such that that the 10:1 flare rate cannot be utilized, the tapered alignment may be further altered, with approval, to a 6:1 flare rate with the 20 ft minimum offset. Flare rates for ends of temporary traffic barriers at locations where a lane of traffic is not being closed to traffic or where the lane has already been closed shall be the same as above, however the minimum offset from the edge of the through traffic lane may be 10 ft. The use of flare rates sharper than those shown on the plans may require additional traffic control devices as directed.

~~Type 2 barriers shall not be intermixed with Type 1 or Type 3 barriers in any run. Type 2 barriers from different manufacturers shall not be intermixed in any run~~*Each run of temporary traffic barrier shall be installed and maintained such that abutting segments form a smooth continuous plane, except for the start and end of a flared section.*

The cross slope or side slope leading to and on which temporary traffic barrier is placed shall be 10:1 or flatter. For roadways other than freeways or interstates, if field conditions are such that the required slopes cannot be utilized, the temporary traffic barrier may be placed on a side slope of no steeper than 4:1, subject to approval prior to placement.

Temporary traffic barrier shall be flared at the rates as shown on plans for the applicable regulatory speed within the construction zone.

Where temporary traffic barrier is exposed to oncoming traffic and the approaching end is within the construction clear zone distance as shown on plans, an appropriate end treatment shall be placed in accordance with 801.10(e). Where required slopes and barrier flare rates are satisfied, the barrier may be extended beyond the construction clear zone distance without an end treatment.

Where temporary traffic barrier is placed adjacent to the front face of guardrail or concrete barrier, the approaching end of the temporary traffic barrier, including the end treatment, shall overlap a minimum distance beyond the end of the guardrail or concrete barrier as follow:

1. *15 ft if adjacent guardrail terminated with a crashworthy end treatment,*
2. *40 ft if adjacent guardrail terminated with a cable terminal anchor,*
3. *100 ft if adjacent concrete barrier or cut guardrail.*

Where temporary traffic barrier is placed behind guardrail, no portion of the barrier shall be within 10 ft, measured from the front face of the guardrail. The approaching end of the barrier shall overlap a minimum distance beyond the end of the guardrail as described above. If field conditions are such that the required slopes or flare rate cannot be utilized, the temporary traffic barrier shall be placed adjacent to the front face of guardrail as described in this section.

Precast concrete barriers shall not be intermixed with precast concrete barriers of a different size or shape or with any non-concrete barrier in any run. Non-concrete barriers shall not be intermixed with barriers from different manufacturers in any run.

(b) Connection

Precast concrete barriers used as Type 1, *Type 2,* ~~and~~*or* Type 3 *temporary traffic* barrier*s* ~~sections~~ shall be connected *as shown on the plans and* as follows:

1. Smooth Bar Hooks

~~1~~*a*. The ~~adjacent~~*abutting* barrier ~~sections~~*segments* shall be placed end to end, with sufficient overlapping of the smooth bar hooks to allow placement of the connecting bolt or threaded rod and the top spacer.

~~2~~*b*. The ~~adjacent~~*abutting* ~~sections~~*segments* shall then be moved in opposite directions for a sufficient distance to develop the maximum contact between the smooth bar hooks and the connecting bolt or threaded rod.

~~3~~*c*. The bottom spacer and nut shall then be placed as shown on the plans. The nut shall be sufficiently tightened to eliminate all gaps between the adjacent bolt heads, spacers, nuts, and washers which form the connection.

2. J-J Hook

a. The abutting barrier segments shall be placed in accordance with the manufacturer's recommendations such that the J-J hooks are engaged.

b. The abutting barrier segments shall then be moved in opposite directions for a sufficient distance to develop the maximum separation between the barrier sections.

~~Type 1 and Type 3 precast units which have previously been cast meeting earlier Department standards may be used. The Contractor will be allowed to mix Type 1 and Type 3 units in a run as long as the units are in good condition and the connecting devices are compatible. If units meeting earlier Department standards are used, a 1 in. bolt will be allowed to link the units together. The spacer detail shall, however, be in accordance with the current standard. Units cast after March 1, 2003 shall be linked with the 1 1/4 in. bolt~~*Precast concrete barrier connecting devices shall not be intermixed.*

~~Type 2 t~~*T*emporary traffic barriers *other than precast concrete as described as Type 1* shall be connected as recommended by the barrier manufacturer.

(c) Anchorage

~~Type 1 and Type 3 temporary traffic barriers shall be anchored in accordance with the methods shown on the plans, at the locations described herein. Type 2 barriers shall be anchored as recommended by the barrier manufacturer and at locations described herein. Temporary concrete traffic barriers shall be anchored when located on or within 60 ft of a bridge, and along tapered alignments Anchoring at locations in addition to those described herein will be required when directed~~*Temporary traffic barriers shall be anchored at the locations shown on the plans. Anchoring for precast concrete barriers described as Type 1 shall be as shown on the plans.*

Anchoring all other barriers shall be in accordance with the associated NCHRP 350 or MASH crash test. A copy of the anchorage installation details shall be furnished to the Engineer prior to installation of the barrier.

Chemical anchor systems with removable bolts, or mechanical anchors may be used to anchor ~~Type 1~~ barriers to bridge decks, concrete pavement, and concrete shoulders. Mechanical anchors may be ferrous or non-ferrous material. ~~All anchors shall have a shear strength of 10,000 lb and an ultimate pullout strength of 6,500 lb.~~

SECTION 801, BEGIN LINE 475, DELETE AND INSERT AS FOLLOWS:

(d) Delineation

~~Type 1~~*Temporary traffic* barriers used to separate two-way traffic shall be delineated with top mounted temporary barrier delineators and with side mounted delineators. The top mounted delineators shall be two-sided, shall be yellow, and shall be placed on every other section of barrier wall. The top mounted delineators shall be mounted perpendicular to the direction of traffic flow. The side mounted delineators shall be yellow and shall be mounted in accordance with 602.03(f).

Temporary traffic barriers in locations other than separating two-way traffic shall be delineated with either Type C construction warning lights or top mounted temporary barrier delineators and with side mounted barrier delineators. The Type C lights or the top mounted barrier delineators shall be spaced at the number of feet equal to the number of miles per hour in the ~~posted~~*regulatory* speed limit with a minimum spacing of 20 ft. Bi-directional lenses will be required on the warning lights when the barrier is adjacent to a lane that is carrying alternating one-way traffic. The color of the barrier delineators shall be white when located on the right side of the traffic lane, and yellow when located on the left side of the traffic lane. The color of the barrier delineators shall be white when located adjacent to a lane that is carrying alternating one-way traffic.

SECTION 801, BEGIN LINE 499, DELETE AND INSERT AS FOLLOWS:

(e) End Treatment

Where possible, the ends of temporary traffic barriers shall be ~~flared~~ in accordance with 801.10(a). Where conditions do not allow the temporary traffic barrier to be ~~flared~~ in accordance with 801.10(a), appropriate end treatments shall be ~~incorporated to protect vehicles from the ends of the barriers~~. ~~The end treatments shall have re-direct capability and shall meet the appropriate test level 2 or 3 NCHRP 350 crash test standards and be approved for use by the FHWA~~*installed. All end treatments shall be installed parallel to traffic and the first segment of temporary traffic barrier immediately downstream shall be parallel to the end treatment. The end treatments shall be in accordance with 801.10.1.*

SECTION 801, BEGIN LINE 512, DELETE AND INSERT AS FOLLOWS:

801.10.1 Construction Zone Energy Absorbing Terminal, CZ

The construction zone energy absorbing terminal, CZ, shall ~~have passed NCHRP 350 level 3 crash test~~*meet the test level 3 NCHRP 350 or MASH crash test criteria* for all Interstate and other construction sites having a ~~construction zone~~*regulatory* speed limit *prior to construction* in excess of 45 mph.~~ and level 2~~ *The CZ shall meet test level 2* for non-Interstate construction sites having a *regulatory speed limit prior to* construction ~~zone speed limit~~ of 45 mph or less. ~~All energy absorbing terminal, CZ, shall have redirect capabilities and shall be approved by the FHWA.~~

All energy absorbing terminal, CZ, shall have redirect capabilities. A copy of the crash test report confirming the product is NCHRP 350 or MASH compliant for the test level specified, or a copy of the FHWA eligibility letter, shall be furnished to the Engineer prior to the installation of the unit.

805-T-078 ELECTRICAL INSULATION SEALANT

(Revised 05-18-17)

The electrical insulation sealant for cable or wire splices as described in 805.05 shall be chosen from the following list:

(a) Star brite liquid electrical tape, manufactured by Star brite, Inc.

(b) 3M Scotchkote Electrical Coating, manufactured by 3M Company

(c) 10 Plyseal Insulating Mastic, manufactured by Plymouth Rubber Europa S.A.

(d) or approved equal.

805-T-191 MAGNETOMETERS AND MICROLOOP DETECTORS

(Revised 04-25-21)

Description

This work shall consist of furnishing and installing magnetometer or microloop vehicle detection, as specified in the plans.

Materials

Materials for microloop detectors shall be selected from the QPL of Traffic Signal and ITS Devices. The microloop detectors selected shall be capable of counting vehicles in addition to detecting vehicle presence.

Each microloop detector location shall include the following items:

1. Non-invasive probe, lead-in cable and carriers for microloop detector as shown on the plans;

2. 3-in. diameter schedule 80 HDPE conduit containing the probes, lead-in cable and carriers;

3. Buried service wire encapsulation kit compatible with microloop detector for all splicing between the lead-in cable and the home run cable;

4. Installation kit, one for each conduit containing probes;

5. All mounting hardware, conduit bushings, wiring, connectors, grounding wires, ground rods, and grounding cables necessary to complete the microloop detector location installation.

Testing

Before installation of magnetometer or microloop probes the Contractor shall confirm the adequacy of the magnetic field intensity, to be sure that the range is suitable for their operation.

The Contractor shall demonstrate that the microloop count data recorded in the controller’s detector log is within 5% of count data obtained visually over a 15-minute period for every detector installation. The test shall be performed by the Contractor in the presence of the Engineer. If detector sensitivity or calibration settings are adjusted in order to meet this test, the new settings shall be recorded on the wiring diagram in the cabinet.

Installation

Arrangement of probes shall be located at maximum distance from metal objects as per manufacturer’s recommendation. Probes shall be installed with their long dimension vertical, and with the cable end at the top. Probes shall be firmly supported, so the lateral and vertical motion is restricted. Probes shall be connected in series. The splice shall be soldered by means of hot iron, or pouring or dripping without flames, with rosin core solder and shall be insulated and waterproofed in accordance with the manufacturer’s specifications.

Conduit for the microloop detector probes shall be directionally pushed beneath the pavement at the depth and slope determined by the manufacturer to ensure proper carrier and probe installation. The Contractor shall repair any damage to the pavement that occurs during the

installation. The microloop detector probe location in each lane shall be per the manufacturer's recommendation.

Method of Measurement

Magnetometer detector and microloop detector probe will be measured by the number of units installed.

Conduit and signal cable will be measured in accordance with 805.15.

Basis of Payment

If specified as pay items, magnetometer detector and microloop detector probe will be paid for at the contract unit price per each.

Conduit and signal cable will be paid for in accordance with 805.16.

Payment will be made under:

Pay Item	Pay Unit Symbol
Magnetometer Detector	EACH
Microloop Detector Probe	EACH

The cost of coring the pavement, sealant, and all work necessary for proper installation and operation of the in-pavement sensors shall be included in the cost of magnetometer detector.

The cost of the detector unit, lead-in cable, and all work necessary for proper installation shall be included in the cost of magnetometer detector or microloop detector probe.

The cost of all hardware and work required to provide and install signal cable from microloop detector probe, including extra-low voltage (home-run), from the handhole adjacent to the detector probe to the controller cabinet shall be included in the cost of signal cable.

901-M-065 PCC MATERIALS

(Adopted 05-18-23)

The Standard Specifications are revised as follows:

SECTION 901, BEGIN LINE 346, INSERT AS FOLLOWS:

901.04 Silica Fume Used as a Pozzolanic Mineral Admixture

(a) General

Silica fume will be accepted from one of the suppliers on the QPL of Pozzolan Sources. Silica fume from more than one of these suppliers shall not be mixed or used alternatively in the same construction unless authorized in writing. *Repulpable bags, shreddable bags, or any other type of bags or packaging shall not be incorporated into the concrete mixture.* Silica fume will be subject to random assurance sampling and testing by the Department. Failure of the random samples to meet the specified requirements will be cause for removal of the silica fume supplier from the QPL.

921-M-067 PAVEMENT MARKING MATERIALS

(Adopted 06-15-23)

The Standard Specifications are revised as follows:

SECTION 921, BEGIN LINE 104, DELETE AND INSERT AS FOLLOWS:

(e) Pavement Marking Beads

~~A Type C certification in accordance with 916 shall be provided for the pavement marking beads~~*Pavement marking beads and supplemental elements shall be selected from the QPL of Pavement Marking Beads.*

SECTION 921, BEGIN LINE 124, DELETE AS FOLLOWS:

4. Supplemental Elements

These shall be for wet weather retro-reflectivity and shall be used for thermoplastic and multi-component longitudinal line markings but shall not exhibit a characteristic of toxicity referenced in AASHTO M 247.~~ The supplemental elements shall be selected from the QPL of Pavement Marking Beads.~~

~~A Type C certification in accordance with 916 shall be furnished for the supplemental elements.~~

922-T-196 CONTROLLER CELLULAR MODEM

(Revised 05-20-23)

The Standard Specifications are revised as follows:

SECTION 922, AFTER LINE 524, INSERT AS FOLLOWS:

8. Cellular Modems

a. Service Provider

All data, power and antenna cables, and all supplemental hardware shall be provided. The modem shall be compatible with the Department's current cellular carriers/providers, the traffic control device communications software, and the closed loop communications software that it is supplied for.

b. Modem Hardware

Cell modems shall be selected from the QPL of Traffic Signal and ITS Devices.

c. Modem Antenna

The modem antenna shall be selected from the QPL of Traffic Signal and ITS Devices. The antenna connectors for cellular service, GPS, and WiFi shall be configured to connect to the cellular modem.

d. Modem Software

The modem configuration shall be editable and viewable with MS-Windows provided software or with proprietary software that is included and designed to run on a MS-Windows operating system. The software shall auto-detect connection parameters and display settings when connected.

e. Installation and Support

~~*The Department will supply the SIM card for the cellular modem*~~.

The serial number shall be clearly labeled on the exterior of the modem. The cellular modem shall be installed, configured, and tested to allow data communication directly to a secondary controller. All data, power and antenna cables, and all supplemental mounting hardware shall be installed. The modem shall be powered by the cabinet power supply from a terminal location on the cabinet back panel or the power distribution panel. The antenna shall be mounted externally and the mounting location shall include a watertight seal.

The cellular modem shall include three years of product and licensing support, from the date of installation, to ensure all features are enabled. The cellular modem shall be preloaded onto the Department's Traffic Management Enterprise Cloud Manager, ECM, account.
