

Recurring Special Provisions

Division 800 – Traffic Control Devices and Lighting

City of Fort Wayne

Public Works

Table of Contents

801 Traffic Controls for Construction and Maintenance Operations1

 801.02 Materials 1

 801.03 General Requirements 1

 801.03.01 Coordination with INDOT Right of Way or Roadways.....2

 801.10 Temporary Traffic Barriers3

 801.10.1 Construction Zone Energy Absorbing Terminal, CZ.....4

 801.11 Temporary Crossovers4

 801.12 Temporary Pavement Marking.....4

 801.15 Electronic Devices.....5

 801.16 Temporary Traffic Control Zone.....7

 801.18 Basis of Payment7

802 Signs 7

 802.01 Description7

 802.03 Location of Signs and Sign Structures8

 802.05 Excavation and Backfill8

 802.07 Installing Supports.....8

 802.13 Bus (Citilink) Signs 9

804 Delineators9

 804.01 Description9

805 Traffic Signals10

 805.03 General Requirements10

 805.05 Placing Signal Heads.....11

 805.08 Controller Cabinet, Signal Service, and Detector Housing12

 805.09 Loop Wire Detector Installation.....13

 805.12 PVC, HDPE, and Fiberglass Conduit.....14

 805.14 Final Clean Up & Inspections.....14

 805.15 Method of Measurement.....15

 805.16 Basis of Payment.....16

807 Highway Illumination	20
807.02 Materials.....	20
807.03 Working Drawings	20
807.05 Backfilling.....	20
807.06 Placing Conduit.....	21
807.07 Connection in Base of Light Pole	21
807.08 Placing Wire and Cable.....	22
807.10 Concrete Foundations for Light Poles.....	23
807.11 Placing Light Poles.....	23
(c) New Light Pole & Luminaire Identification	24
807.12 Grounding.....	24
807.13 Luminaires.....	24
807.14 Sign, Underpass, Roadway, High Mast Lighting Location, and Luminaire Identification ..	26
807.15 Service Point Power Entry	26
807.18 Method of Measurement	27
808 Pavement Traffic Markings	27
808.01 Description	27
808.03 General Requirements	27
808.04 Longitudinal Markings and Milled Corrugations.....	28
808.07 Pavement Marking Material Application, Equipment, and Performance Requirements	28
808.10 Removal of Pavement Markings	30
808.13 Basis of Payment.....	30

SECTION 801 – TRAFFIC CONTROLS FOR CONSTRUCTION AND MAINTENANCE OPERATIONS

801.02 Materials

Non-ground mounted temporary traffic sign backing material and supports shall both be certified to meet NCHRP 350 crash test standards and approved for use by the FHWA. A copy of the FHWA acceptance letter shall be provided to the Engineer/Project Manager upon
40 request. Roll-up materials will not be allowed except as specified in 801.16.

50 Wood posts for temporary panel signs shall be dense southern yellow pine or design calculations shall be provided to the Engineer/Project Manager identifying the type of wood and verifying the location and size of the holes to be drilled through the posts to provide break-away capability.

CONSTRUCTION REQUIREMENTS

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801.03 General Requirements

The applicable requirements of the MUTCD shall apply to the installation and materials for traffic control devices subject to the requirements of 107.08 and 107.12.

When the plans do not include a maintenance of traffic plan, the Contractor shall be responsible to place and maintain minimum construction signage to ensure proper traffic control and notification is in place for the workzone. Two-way traffic is to be maintained in workzones unless otherwise approved by the Engineer/Project Manager. Single traffic lanes shall not be implemented on two-way roadways that do not provide a clear line of sight for opposing vehicles unless traffic is being flagged.

If requested, the Contractor may need to provide to the Engineer/Project Manager a Maintenance of Traffic Plan for review and approval before work starts or a permit is issued on projects that do not include a detail Maintenance of Traffic Plan. Any special conditions for the Maintenance of Traffic Plan will be communicated to the Contractor or will be included with the Unique Special Provisions.

Unless otherwise detailed in the plans, all items and equipment for signage, including signs, placement and maintenance will be paid for and included under the item, **Maintenance of Traffic**. ~~will may provide such a plan to the Contractor or the Contractor may submit a plan for review.~~

The Contractor shall be responsible for the field layout, placement, operation, maintenance, and removal of temporary traffic control devices. 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, maintenance, and removal of temporary traffic control
80 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 Work Zone Traffic Control Devices" prior to installation. 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/Project Manager so a resolution can be worked out prior to installation. The field layout will be reviewed and concurred with by the Engineer/Project Manager 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

90 Contractor personnel to perform day to day operation 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/Project Manager on the project. A copy of the CWTS's certification shall be provided to the Engineer/Project Manager prior to the start of construction or placement of temporary traffic control devices or if the worksite traffic supervisor changes.

Temporary traffic control devices shall be maintained to ensure visibility and to protect the public. All reflective sheeting backgrounds and lights shall be kept clean of foreign matter. ~~The Contractor shall complete and submit a "Traffic Control Device Report" when a temporary traffic control device has been installed, removed, relocated, repaired, or at a minimum of once per week based on field observations. This report is supplied in the Proposal Book for the contract and is to ensure that the traffic control devices are looked at daily. The report shall be completed or reviewed~~
120 ~~by the CWTS. Each report shall be signed by the person who filled it out and initialed by the CWTS that it was reviewed. The Engineer will sign and date the report when received. The Engineer will not be responsible for the report's completeness and accuracy.~~

801.03.01 Coordination with INDOT Right of Way or Roadways

If not obtained by the City of Fort Wayne Division of Public Works, the Contractor shall apply for and obtain a permit from the INDOT for any work, maintenance of traffic or placing of equipment or excavations which may affect or alter the motoring public or existing conditions of INDOT Right of Way.

Notification and permitting of work shall be coordinated with INDOT prior to start of any work and should be communicated with City personnel. INDOT representatives will be invited to the pre-construction meeting.

For the cost of permitting to be waived, the contractor shall provide, as a part of the permit application, the City of Fort Wayne Project Number and City Project Manager associated with the project. Required Fee Bond and Waiver Form as well as Additional Disclosure Form must accompany any online permit submittal through the INDOT EPS.

801.10 Temporary Traffic Barriers

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

Type 2

Type 2 barriers may be used to separate traffic from the work zone. Type 2 temporary traffic barriers shall meet the appropriate test level 2 or 3 NCHRP 350 crash test standards and shall be approved for use by the FHWA. A 350 crash test letter of approval from the FHWA shall be provided the Engineer/Project Manager prior to placing the unit. The unit selected shall be appropriate for the location considering the maximum posted

360 speed limit on the project and the allowable area for deflection. The unit 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 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. Type 4 temporary traffic barriers shall meet the appropriate test level 3 NCHRP 350 crash test standards and shall be approved for use by the FHWA. A 350 crash test letter of approval from the FHWA shall be provided the Engineer/Project Manager prior to placing the unit.

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801.10.1 Construction Zone Energy Absorbing Terminal, CZ

490 The construction zone energy absorbing terminal, CZ, shall have passed NCHRP 350 level 3 crash test for all Interstate and other construction sites having a construction zone speed limit in excess of 45 mph and level 2 for non-Interstate construction sites having a 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. A copy of the crash test results and a copy of the FHWA approval letter shall be furnished to the Engineer/Project Manager prior to the installation of the unit. The Contractor may also use the Guard Rail Energy Absorbing Terminal CZ, manufactured by Energy Absorption Systems, Inc. until January 1, 2011. All units of this type in use shall be replaced with a compliant product immediately after this date regardless of the date of letting. No additional payment will be made for this replacement.

500 The unit's nose cover shall be reflectorized to provide improved visibility.

Assembly and installation of the unit shall be supervised or performed at all times by an installer trained and certified by the unit's manufacturer. The size, assembly, and installation shall be in accordance with the manufacturer's recommendations at the locations shown on the plans. When required for bi-directional traffic protection, transition panels and all other necessary hardware shall be included in the installation. A copy of the installer's certificate shall be provided to the Engineer/Project Manager prior to the start of work.

801.11 Temporary Crossovers

520 Temporary crossovers shall be either type A or type B as shown on the plans and shall be constructed in accordance with the applicable sections of 207, 402 or 502. If applicable, a CMDS shall be submitted to the Engineer/Project Manager for approval. Utilization of the Department provided spreadsheet is not required. When required to maintain median drainage, a 15 in. diameter pipe shall be placed at the centerline of the median under the crossover. If the crossover is to remain in place for future construction, the pipe shall have appropriate grated box ends in accordance with 715.

801.12 Temporary Pavement Marking

550 Temporary pavement markings shall be new materials placed in accordance with 808.04 and 808.05. However, when temporary markings are to be in place for 14 calendar days or less the dashed line pattern used on center line and lane lines may be 4 ft line segments on 40 ft centers and gore areas shall be marked by outline only and may be 5 in. wide lines. Temporary pavement markings shall be placed to maintain the pre-existing lane designations and number of lanes when appropriate, and shall be delineated with white or yellow tape for the correct lane lines. Spacing near intersections may require gap distances of 20 ft on center or less to properly designate the lanes. No-passing zones on all undivided two-way roadways shall be identified

with signs and centerline markings. All temporary markings shall be maintained and replaced until they are no longer applicable. Temporary markings shall be removed and not left in place longer than 5 days after placement of permanent pavement markings. Removal or adjustment of temporary pavement markings shall be done within 48 hours of notification from the Engineer/Project Manager.

580 Temporary pavement markings which are to be in service from December 1 through the following March 31 shall be painted markings. Such markings shall be placed in the standard pavement marking pattern and applied prior to the suspension of the work, or within seven work days after the Contractor is directed to place the markings. Adjustments to these dates to accommodate actual seasonal suspension and continuance of work are subject to approval by the Engineer/Project Manager upon written request.

801.15 Electronic Devices

(b) Portable Changeable Message Signs, PCMS

This shall consist of furnishing, installing, and maintaining a trailer-mounted, portable sign upon which varying electronically generated messages will be displayed to traffic. The message being relayed to traffic shall be legible and easily understood for a minimum distance of 650 ft.

710 The messages shall be as shown on the plans or as approved or directed by the Engineer/Project Manager. Messages shall be formatted in accordance with the Department's Guidelines for Portable Changeable Message Signs. Only upper case letters shall be used. Each message phase shall be displayed for at least 2 s. Display time for an entire message shall not exceed 8 s.

Placement of PCMSs shall be as shown on the plans or as directed by the Engineer/Project Manager. A minimum clearance of 7 ft from pavement to the bottom of the PCMS shall be provided. Units shall be level and PCMSs shall be turned away from traffic, placed in stand-by mode, or left blank until there is a valid message to be displayed.

720 When in use PCMSs shall be turned approximately 3° from perpendicular towards oncoming traffic to minimize glare. A drum shall be placed immediately in front of the PCMS trailer at both corners for delineation.

(c) Temporary Worksite Speed Limit Sign Assembly

740 A worksite speed limit authorized for intermittent use shall only be activated when workers are present at the site. The intermittent worksite speed limit shall only be used in the area of work. A worksite speed limit authorized for continuous use shall not include the flashing strobe lights or the S4-4 "WHEN FLASHING" plaque.

The worksite speed zone signage shall be placed and maintained by the Contractor. The worksite speed limit will be as shown on the plans or as directed by the Engineer/Project Manager and at least 10 mph below the posted speed limit for the roadway under construction.

(d) Temporary Traffic Signals

770 **1. Fixed Temporary Signals**

780 The Contractor shall obtain permits from local officials, companies, or individuals for the use of poles, right-of-way, or other property incidental to the installation of fixed temporary signals. Although entering into the contract implies permission and authority to install conduit under pavement, sidewalks, and alleys, all damage to underground utilities or interruption of such service shall be the responsibility of the Contractor.

The location, spacing, and timing of fixed temporary signals will be determined by the Engineer/Project Manager.

800 **2. Portable Signals**

Portable signals shall be selected from the Department's list of approved ~~Portable Signals~~ approved by the Engineer/Project Manager before installation. Prior to the activation, the Contractor shall provide a completed inspection checklist to the Engineer/Project Manager certifying that the portable signal is functioning properly and a copy of the signal timing plan.

The portable signal shall be equipped with remote monitoring. Unless otherwise shown on the plans, ~~Microwave or Doppler~~ Pre-timed or actuated vehicle detection ~~as shown on the Department's list of approved Portable Signals~~ shall be provided. A minimum of three drums shall be placed immediately in front of the portable signal trailer for delineation.

810 A technician certified by the manufacturer shall be available 24 h a day to respond within 2 h for the maintenance of the traffic signal equipment. ~~Copy of the certification shall be provided to the Engineer/Project Manager prior to the placement of the portable signals.~~ Maintenance of the portable signal includes adjustments to the phasing or timing as indicated on the plans or directed by the Engineer/Project Manager. The Contractor shall replace portable signals that cannot be returned to normal operation or that fail two times during the contract.

The Contractor shall provide a record of any modifications to the signal timing plan, failures, and all maintenance issues, to the Engineer/Project Manager prior to final acceptance and when otherwise requested. The report shall indicate the date, time, and nature of each event.

801.16 Temporary Traffic Control Zone

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(b) Maintenance of Traffic for Mobile Operations

Signs, flagging, flashing arrow signs, and other required traffic control devices shall be furnished in accordance with the details shown on the plans or as directed. The Engineer/Project Manager reserves the right to stop work at any time to relieve traffic congestion.

Flagging operations shall be conducted under the supervision of either the designated CWTS or a flagger certified by ATSSA or approved equal certifying organization. The person supervising the flagging operation shall ensure that the flaggers are trained in proper flagging procedures and that the flagging operation is in compliance with the applicable sections of the MUTCD.

801.18 Basis of Payment

Add the following under 801.18 Basis of Payment:

Maintenance of Traffic will be paid under a lump sum basis. The pay quantity for this item shall be the percentage of Work completed at the time of billing (i.e., 10 percent of the lump sum amount for Maintenance and Protection of Traffic will be earned at 10 percent of earned Contract amount).

Add under the Pay Item list:

Pay Item	Pay Unit Symbol
Maintenance of Traffic.....	LS

Maintenance of Traffic shall include all labor, equipment and incidental work in the cost of the pay item.

SECTION 802 – SIGNS

802.01 Description

This work shall consist of furnishing the material for and erecting traffic signs in accordance with 105.03. Signs shall be installed as required unless written approval is obtained from the Engineer/Project Manager to make modifications at specific locations.

CONSTRUCTION REQUIREMENTS

802.03 Location of Signs and Sign Structures

40 Sign and sign structure locations shall be staked, and the Engineer/Project Manager will either approve the locations or give written notice of necessary changes. The provisions of 109.03 will not apply to posts ordered prior to approval of staked locations.

Two days notice shall be provided for inspection and approval of staked locations. All signs shall be adjusted to eliminate specular reflection.

802.05 Excavation and Backfill

The finished pavement or shoulder section shall not be damaged during excavation.

60 The Engineer/Project Manager shall be notified in writing of class X material in accordance with 206.02 encountered within the limits of the traffic sign supports foundation excavation. The Engineer/Project Manager will determine the design for the installation of the foundations. Excavation of class X material shall be in accordance with 206.

The excavation for sign posts shall be made as nearly as possible to neat lines. Sign post encasement shall not be formed except in sandy soil, or as directed.

802.07 Installing Supports

(c) V-LOC Anchoring System

V-Loc Anchoring systems shall be placed at locations noted on the plans. For placement on existing concrete surfaces, work shall consist of core-drilling to the correct size, installing socket flush with the surrounding surface and setting in new concrete. For installation during concrete placement, V-LOC shall be poured flush with the concrete surface at locations noted on the plans. V-LOC Anchoring Systems shall be included with the cost of the Sign Post Item.

Installation of V-LOC shall be oriented with the point facing towards traffic at a 45 degree angle away from the road for proper sign orientation.

Material shall be V-LOC Post Anchors for Square Posts, 2" x 2" with wedge.

Placement on Existing Concrete Installation, TAPCO 200-VS1
Placement with New Concrete Installation, TAPCO 200-VS1P

802.13 Bus (Citilink) Signs

Prior to the removal of any sign post or utility pole that has a Citilink sign on it, Citilink Operations must be notified of the removal. 260-432-4977.

If traffic is being maintained through the workzone, the Bus Stop signage shall be removed by the contractor and installed on a temporary sign post at or near the same location unless otherwise directed by the contract. Access to the temporary bus stop location shall be maintained if remaining in place.

If the project is closed to traffic or the bus stop is inaccessible until the project is completed, and the sign is required to be removed, the sign shall be removed and retained by the contractor. At the reopening of the new roadway, the contractor shall install the sign at the same location or as shown on the plans. If the sign is unable to be placed at the same location, the new sign placement must be coordinated through the project and Citilink Operations for final acceptance.

If Bus Stop signs are damaged or unreplaceable, the contractor shall notify the Project Manager and/or the City of Fort Wayne Signs & Markings Division at 260-427-1224.

Cost for maintaining access to the stop and related sign work shall be included in 801-06775 Maintaining Traffic.

SECTION 804 – DELINEATORS

804.01 Description

This work shall consist of furnishing and erecting delineators in accordance with 105.03 and 107.12. Delineators shall be installed as required unless approval is obtained from the District Traffic Engineer to make modifications.

SECTION 805 – TRAFFIC SIGNALS

CONSTRUCTION REQUIREMENTS

805.03 General Requirements

The Contractor shall maintain existing traffic signals in operation until the Engineer/Project Manager determines that the progress of the work necessitates their removal. The new installation shall not interfere with the operation of the existing signal. The work shall proceed in such a manner that the signals are not out of service at any two adjacent intersections at any time. When the operation of an existing traffic signal needs to be interrupted before the new signal is placed in operation, the traffic shall be controlled

60 at all times. The work shall be scheduled so that the interruption is limited to a minimum amount of time and at off peak hours. The new span and catenary installation shall not interfere with the operation of the existing traffic signal. Traffic shall be controlled at all times during the changeover when the existing traffic signal is turned off and the new signal is turned on. This changeover shall take place such that the interruption is limited to a minimum amount of time.

All existing painted metallic signal equipment to be reused, such as pedestals, bases, controller cabinets, signal weatherheads, pipe arms, shall be cleaned and painted with two coats of highway yellow enamel in accordance with 909.02(c). Existing metallic signal heads to be reused shall be painted with two coats of black or highway

90 yellow enamel as directed by the Engineer/Project Manager and in accordance with 909.02(c).

Aluminum poles and signal support structures shall not be painted.

Existing concrete foundations, which have not been used in the new installation, shall be removed to a minimum of 4 in. below the adjacent grade. The openings shall be filled with concrete and the surface finished and broomed, if they are located in sidewalk areas. Otherwise, they shall be filled with acceptable material conforming with the surrounding area.

100 Existing signal handholes to be removed, shall be filled after removing rings and covers, with B borrow with a minimum of 4 in. of concrete on top to bring it up to grade in a sidewalk area. Surfaces shall be finished and broomed. Otherwise, they shall be filled with acceptable material conforming with the surrounding area.

The signal controller timings will be provided and the Engineer/Project Manager shall be present when the signal intersection is to be placed in operation.

120 Before starting work, the Contractor shall provide the names of the Level II Traffic Signal Construction Technicians, the Level II Traffic Signal Field Technicians and Work Zone Temporary Traffic Control Technicians who have been assigned to perform signal related work, and a photocopy of each such person's certification card. If the Level II Traffic Signal Construction or Field Technicians or Work Zone Temporary Traffic Control Technicians are dismissed from the work, all signal related work requiring such certified personnel on the project site shall cease until the names and photocopies of certification cards for replacement personnel are provided to the Engineer/Project Manager.

Prior to activating any new traffic signal installation, the contractor must notify the Traffic Engineering & Operations Departments at least 2 days prior to operation. A representative from Traffic Operations must be present when the signal is first activated to ensure signal is working properly.

The traffic signal controllers shall be Siemens Eagle Signal Controller EPAC 300 M-60 Series TS2-Type 2. The communication interface panel shall be wired in accordance with the City of Fort Wayne instructions. The cabinet assembly unit and the City of Fort Wayne's Intelligent Transportation Management System running ITS Siemens' TACTICS Software.

805.05 Placing Signal Heads

Signal cantilever arm and span mounted signal heads shall have 17.5 ft minimum and 22.5 ft maximum clearance over the roadway unless there are visual obstructions which require lowering the signal head. A signal head over the roadway shall not have a clearance of less than 15 ft. Such signal heads shall be located over the intersection as shown on the plans. Such signal heads shall have a uniform clearance, which will be determined. Signal heads not mounted over a paved roadway, on the top or side of a pole, shall not be less than 10 ft or more than 15 ft above the sidewalk or, if none, above the pavement grade at the center of the roadway. Signal faces shall be directed to the proper approach lane in each direction. Flasher signal faces that supplement signs shall be mounted with the bottom of the housing at not less than 3 ft or more than 13 ft above the edge of pavement. Flasher signal faces that supplement signs shall be directed towards oncoming traffic. Pedestrian signal faces shall be mounted with the bottom of the housing at not less than 7 ft or more than 10 ft above the sidewalk. The pedestrian signal shall be in line with the pedestrian's vision at the appropriate crosswalk being used. Pedestrian push-buttons shall be mounted at a height of 3 1/2 to 4 ft above the sidewalk as shown on the plans. A pedestrian actuated signal sign shall be mounted immediately above the push-button. Push buttons shall have no more than a 10" side reach from the clearspace.

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805.08 Controller Cabinet, Signal Service, and Detector Housing

270 Installation

Three document packets shall be prepared in accordance with 922.02(b) for each cabinet. Each packet shall be labeled with the name of the contract number, the intersection, the commission number of the signal, and the date of installation. One paper packet shall be placed in the cabinet, one paper packet shall be submitted to the Engineer/Project Manager, and one electronic packet shall be submitted to the Electronic Technician Supervisor at the Department's Logistical Support Center within two days after the signal is turned on. Information in the packets shall include all approved changes to the signal installation. All detector loop lead-in tags and detector rack labels shall reflect all approved changes to the signal installation.

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Additional detector loop amplifier units and detector racks shall be supplied as directed by the Engineer/Project Manager. Additional detector racks shall include all cables or harnesses including, but not limited to a SDLC cable for each added rack, interface panels and a BIU to provide a complete and functional installation. Additional auxiliary BIU panels shall include all cables or harnesses including, but not limited to a SDLC cable for each additional auxiliary BIU panel, terminal strip on BIU panel and BIU to provide a complete and functional installation.

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For signal cabinets installed by the Contractor, where no detector loop or lead-in work is included in the contract, the Contractor shall perform detector loop tagging, testing and vehicle simulator testing in accordance with 805.09, only to the extent of documenting the test readings and confirming that all existing detector loops are connected correctly and all detector related equipment in the cabinet is operating correctly.

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The controller cabinet shall be mounted securely on a pole, pedestal, or concrete foundation. All cabinets on concrete foundations shall be installed with the anchor bolts inside. Controller cabinets on poles or pedestals shall be mounted at a height of 38 in. \pm 2 in. Pole mounted controller cabinets shall be fastened with two stainless steel bands as shown in the plans. Signal cables and lead-in cable shall be run in conduit from the controller cabinet to the signal support base and to detector housing as indicated on the plans. Galvanized steel elbows shall be used on the detector housing as shown on the plans.

The Contractor shall wire the entrance switch and bring service cable up the riser and out the weatherhead and leave 4 ft of cable outside the weatherhead. For aerial service drops, Single Strand THHN Black wire shall be used from the meter to the weatherhead. The utility company, at their option, may bring the service cables to the load side of the entrance switch. Meter bases, if required, shall be obtained from the power company.

805.09 Loop Wire Detector Installation

(a) Layout

Prior to installation, loop layout shall be approved in writing by the District Traffic Engineer. The Contractor shall notify the District Traffic Engineer a minimum of two business days prior to the date that loop layout approval is required. All roadway centerlines, edge-lines and stop-bars pertinent to loop layout shall be accurately and clearly identified at the time loop layouts are reviewed for approval. An outline shall be painted where the loops are to be placed. The Contractor shall ensure that the final installed location of each loop matches the intention and functionality of the approved layout for loop spacing, lane width and geometry.

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(b) Installation

All loops and lead-in cables shall be tagged according to the plans and 805.07.

The slots shall be saw-cut as shown on the plans. A diamond cutting blade shall be used for sawing all loops. All saw-cut loops shall have individual saw cuts to the detector housing. Joints shall be overlapped such that the saw cut at the corner is full depth. Prior to installing roadway loop wire in the roadway saw cuts, the saw cuts shall be cleaned in accordance with the manufacturer's requirements for the joint sealant to be used. After proper cleaning, the loop wire shall be installed. All loops shall be wired

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clockwise as viewed from above. Loops shall be wired with four turns or as specified then gently tamped with a blunt non-metallic tool. Backer rod 2 to 4 in. in length shall be spaced every 12 in. around the saw cut above the wire and gently tamped to hold the loop wire snug in the bottom of the saw cut. Backer rod shall not be continuous around the saw cut. After installation of the loop wire, the saw cut shall be sealed with a joint sealant material. The sealant shall be poured into the saw cut making a water tight seal. The joint sealant material shall be installed in accordance with the manufacturer's recommendations and 906.02. However, the joint configuration shall not apply. A copy of the sealant manufacturer's written application instructions shall be submitted to the Engineer/Project Manager prior to any sealant operations. If the Contractor elects

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(d) Testing and Acceptance

All testing and acceptance procedures performed by the Contractor shall be performed in the presence of the Department personnel assigned by the Engineer/Project Manager. The Contractor shall notify the Engineer/Project Manager a minimum of two business days prior to the date testing is to be performed.

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The Contractor shall meter all new loop wire detectors or a new bank of loop wire detectors by means of instruments capable of measuring electrical values for installed loop wires and lead-in cables. The instruments shall measure inductance in microhenries, resistance in ohms, induced AC voltage in volts, and leakage resistance in megohms. All measuring tests shall be performed at the detector housing before the loop wire is spliced to the lead-in cable, and at the cabinet after the loop wire is spliced to the lead-in cable.

3. Acceptance Criteria

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The Contractor shall record all test readings, in triplicate, on tabular forms provided by the Department or by copying the one included elsewhere herein. The Contractor shall complete, sign, and date the forms before submitting them to the District Traffic Engineer. The District Traffic Engineer will use these forms for recording the Department's readings on the corresponding space provided.

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805.12 PVC, HDPE, and Fiberglass Conduit

The method of installing PVC, HDPE and rigid fiberglass conduit underground shall be the same as for steel conduit where applicable except trenches for the conduit in areas with class X material as described in 206.02 shall be backfilled with 2 in. of natural sand before the conduit is placed in the trench. Materials excavated may be used for backfill, if approved. If the Engineer/Project Manager deems it necessary, approved B borrow shall be placed over the conduit to a depth of 12 in. and the remainder of the trench shall be filled with excavated material.

805.14 Final Clean Up & Inspections

When the installation is completed, all disturbed portions of sidewalk, pavement, shoulders, driveways, and sod, shall be cleaned and any excess excavation or other materials shall be disposed. All cutting in the sidewalk and pavement areas shall be done with a saw. Sidewalk removal and replacement shall be to the nearest tool joint. Unless otherwise directed, cuts in pavement areas shall be no greater than 12 in. in width.

Contractor shall complete signal installation, including all underground conduit, wiring, foundations, pole placement, signal detection, communications, signal heads, cabinet and hardware, testing, site restorations, etc. and notify the Engineer/Project Manager that work is complete and ready for a punch list inspection of work. Inspection will be made by the department and notification of any discrepancies from plans or standards will be communicated to the contractor for repairs or modifications. All work from the punch list inspection must be completed before notification that punch list items have been completed and a final inspection will be made. Any work not completed from the original punch list that is not completed at final inspection is subject to retainage being withheld for re-inspections not being completed and requiring additional site reviews of incomplete work.

805.15 Method of Measurement

805.15 Method of Measurement Controller and cabinet; controller cabinet foundation; disconnect hanger; handhole, signal; loop detector delay amplifier; loop detector rack; pedestrian push button; pedestrian signal head; signal cantilever structure, combination arm; signal cantilever structure, drilled shaft foundation type; signal cantilever structure, dual arm; 590 signal cantilever structure, single arm; signal cantilever structure, single arm, combination arm; signal cantilever structure, spread footing foundation type; signal detector housing; signal pole; signal pole foundation; signal service; span catenary and tether; traffic signal head; and traffic signal head, retrofit; will be measured by the number of units installed.

The pay length for a signal cantilever arm or combination arm will be the length shown in the Schedule of Pay Items.

Conduit of the type specified will be measured by the linear foot from outside to 600 outside of foundations. All signal cable will be measured by the linear foot, except IC wiring for signal loops which shall be paid as a part of the item..

Saw cut for roadway loop detector and sealant ~~will be measured by the linear foot for the full depth of slot cut in the pavement as shown on the plans or as directed~~ and IC wiring for loops up to the Detector Housings will not be paid for separately, but will be included in the item, Roadway Signal Loop.

If class X material is encountered during foundation excavation, measurement will be made in accordance with 206.10.

Traffic signal installation, flasher installation, miscellaneous equipment for traffic signals, and final cleanup in accordance with 805.14 will not be measured for payment. 610 Reinforcing bars will not be measured for payment.

Traffic signal equipment removal will be measured per each installation to be removed. Transportation of salvageable signal equipment will not be measured.

805.16 Basis of Payment

Traffic signal installation and flasher installation, all of the type, new or modernized, and the location number specified, will be paid for at a contract lump sum price.

440 If specified as pay items, controller and cabinet; controller cabinet foundation; disconnect hanger; handhole, signal; loop detector delay amplifier; loop detector rack; pedestrian push button; pedestrian signal head; signal cantilever structure, single arm; signal cantilever structure, combination arm; signal cantilever structure, single arm, combination arm; signal cantilever structure, dual arm; signal cantilever structure, drilled shaft foundation type; signal cantilever structure, spread footing foundation type; signal detector housing; signal pole; signal pole foundation; signal service; span 805.16 866 catenary and tether; traffic signal head; and traffic signal head, retrofit; will be paid for at the contract unit price per each.

450 Conduit of the type specified will be paid for at the contract unit price per linear foot. The cost of any backfill, ground wire, or expansion fittings shall be included in the cost of conduit.

Saw cut for roadway loop detector and sealant, and signal cable extending from the Detector Housing will be paid for at the contract unit price ~~per linear foot~~ each.

The removal of existing traffic signal equipment designated to be removed will be paid for at the contract unit price per each for traffic signal equipment, remove for each location removed. When designated as a pay item, the transportation of 640 salvageable signal equipment will be paid for at the contract lump sum price for transportation of salvageable signal equipment.

Class X excavation will be paid for in accordance with 206.11.

Miscellaneous equipment for traffic signals will be paid for at a contract lump sum price.

Payment will be made under:

460	Pay Item	Pay Unit Symbol
	Conduit, _____ type	LFT
	Conduit, Intercept	EACH
	Controller and Cabinet, _____ type	EACH
	Controller Cabinet Foundation, _____ type	EACH
	Disconnect Hanger	EACH
	Flasher Installation, _____, Location No. _____ type	LS
470	Handhole, Signal, _____ type	EACH
	Loop Detector Delay Amplifier, _____, _____ Channel	EACH
	Loop Detector Rack	EACH
	Miscellaneous Equipment for Traffic Signals	LS
	Pedestrian Push Button, _____ type	EACH
	Pedestrian Signal Head, _____, _____ type lens size	EACH 670
	Saw Cut for Roadway Loop Detector and Sealant	LFT
	Roadway Signal Loop.....	EACH
	Signal Cable, _____, Copper, _____ C/ _____ type conductors/size	LFT
	Signal Cantilever Structure, Combination Arm _____ ft	EACH
	Signal Cantilever Structure, Drilled Shaft Foundation, _____ type	EACH
	Signal Cantilever Structure, Dual Arm _____ ft, _____ ft	EACH
	Signal Cantilever Structure, Single Arm _____ ft	EACH
480	Signal Cantilever Structure, Single Arm _____ ft, length	EACH
	Combination Arm _____ ft	EACH
	Signal Cantilever Structure, Spread Footing Foundation, _____ type	EACH
	Signal Detector Housing	EACH
	Signal Pole, _____, _____ ft	EACH
490	Signal Service	EACH

Signal Pole Foundation, _____ in. x _____ in. x _____ in.	EACH
Span, Catenary, and Tether	EACH
Span, Catenary, and Tether, Remove	EACH
Traffic Signal Head, Remove	EACH
Traffic Signal Equipment, Remove	EACH
Traffic Signal Head, _____, Section, _____ no. lens size	EACH
Traffic Signal Head, _____ Section, Retrofit	EACH
no.	
Traffic Signal Installation, _____, Location No. _____ type	LS
Transportation of Salvageable Signal Equipment	LS

The cost of the controller and cabinet, conduit, foundations, vehicle detection, pedestrian signals, signal heads, signal poles, signal service, signal cable and all equipment or materials required to complete the installation shall be included in the cost of traffic signal installation.

The cost of Conduit, Intercept shall include exposing old conduit runs and tying in new run to existing conduit with like material or material approved by City. Connection shall be waterproof and maintain continuous path for pulling wire. Cost of excavation, exposing, saw cutting for clean edges, connection materials and backfilling shall be included in the cost of the item.

710 The cost of the controller and cabinet, conduit, foundations, signal heads, signal poles, signal service, signal cable and all equipment or materials required to complete the installation shall be included in the cost of flasher installation. For a solar powered flasher, the cost of the solar panel, battery cabinet, program timing module, signal heads, wiring, and all hardware required to complete the installation shall be included in the cost of flasher installation.

The cost of the controller assembly, standard loop detector racks, all wiring, hardware, and associated equipment required to operate the intersection shall be included in the cost of controller and cabinet.

The cost of concrete, conduits, grounding bushings, ground rod, ground wire, drainage, anchor bolts, and all hardware required to complete the installation shall be included in the cost of controller cabinet foundation.

The cost of all work and hardware required to properly install loop detector delay amplifier, counting or non-counting, as shown on the plans or as directed shall be included in the cost of loop detector delay amplifier.

The cost of concrete reinforcing pipe and ring or polymer concrete box, cover and attachment hardware, handhole bottom if required, and aggregate as shown on the 730 plans shall be included in the cost of handhole, signal.

The cost of any supplementary loop detector rack, all wiring, hardware, detector panel, BIU, and associated equipment shall be included in the cost of the loop detector rack. The cost of the push button, pedestrian actuated signal sign, any accessible pedestrian signal components, and all hardware required to complete the installation shall be included in the cost of pedestrian push button.

The cost of signal face hook-up wire, pole plates and arms for side mounts, pipe arms, signal brackets, bulbs, weatherhead, and all additional hardware required to assemble a combination of pedestrian signal indications as shown on the plans shall be included in the cost of pedestrian signal head.

550 The cost of the slot cut on the pavement, backer rod, loop sealant, and all testing in accordance with 805.09 shall be included in the cost of ~~saw cut for roadway loop and sealant~~ **Roadway Signal Loop.**

The costs of all work and hardware required to properly install overhead or underground signal cable as shown on the plans or as directed shall be included in the cost of signal cable and signal interconnect cable.

The costs of the independent shelf mount unit or card-rack unit, and power module shall be included in the cost of loop detector delay amplifier.

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The costs of concrete reinforcing pipe, ring and cover, eye bolts, hardware, handhole bottom, and aggregate under the handhole bottom as shown on the plans shall be included in the cost of handhole, signal.

The costs of aluminum casting, enclosure concrete, steel conduit and elbow, and all hardware required to complete the installation shall be included in the cost of signal detector housing.

The costs of steel pole bands or straight eye bolts, span, catenary, and tether of wire

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rope cables, cable rings, type A support cable, wire rope clips, safety cable, thimble, service sleeve, and all hardware required to complete the installation as shown on the plans shall be included in the costs of span, catenary, and tether for signal, or span and catenary for flasher.

The cost of all work required to complete the removal of both span, catenary and tether and signal heads shall be included in the cost of the pay item.

The costs of excavation, backfill, final cleanup in accordance with 805.14, and necessary incidentals shall be included in the costs of the pay items.

740 The cost of the push button, pedestrian actuated signal sign, any accessible pedestrian signal components, including push button extensions if required, and all hardware required to complete the installation shall be included in the cost of pedestrian push button.

SECTION 807 – HIGHWAY ILLUMINATION

MATERIALS

807.02 Materials

All flexible conduit shall be galvanized steel, polyvinyl jacketed, and watertight.

Reinforcing bars shall be epoxy coated.

All lighting standards shall conform with The City of Fort Wayne Standard Details, and shall be sourced from an approved vendor to ensure compatibility with existing materials.

CONSTRUCTION REQUIREMENTS

807.03 Working Drawings

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When requested, sufficient design data shall be furnished with the drawings to verify that conventional lighting standards are in accordance with wind load, deflection, vibration, and breakaway requirements. All of the above shall be based on the lighting-standards details shown on the plans. After approval, the Engineer/Project Manager shall be advised of where changes to the Installation Summary sheets are being made because of existing roadside conditions. Where necessary, additional lighting standard working drawings shall be submitted for approval.

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If a lighting standard is designed to support a larger luminaire than that specified, such information shall be shown on the working drawings. A Type-C certification from the manufacturer shall be furnished with the working drawings stating that the breakaway devices are in accordance with the breakaway criteria of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

807.05 Backfilling

Wherever practicable, all suitable materials removed from the excavated areas shall be used in refilling cable-duct and conduit trenches. No excavated materials shall be wasted without authorization. Materials authorized to be wasted shall be disposed of as approved. Backfill for trenches shall be placed in layers not to exceed 6 in., loose measurement. The first layer shall be sand or earth containing no particles or lumps that would be retained on a 1/4 in. sieve. All open cut trench beneath road, trail, walk or ramp surfaces shall be backfilled with approved granular material, mechanically compacted in lifts no more than 1' in depth. The second layer shall contain no particles or lumps that would be retained on a 1 in. sieve. ~~Subsequent layers shall contain no particles or lumps that would be retained on a 3 in. sieve.~~ The second layer and each subsequent layer shall be compacted with pneumatic hand tamps to the satisfaction of the Engineer/Project Manager to prevent any future settlement of the backfilled area. Backfilling of cable-duct and conduit trenches around lighting standard foundations, handholes, manholes, and other structures shall be in accordance with the applicable provisions of 211. Finish grading of earthwork shall be accomplished in a satisfactory manner.

807.06 Placing Conduit

Conduit shall be placed as shown on the plans and in accordance with applicable provisions of 805.11. Conduit shall be of a size to readily enable the passage of the cable-duct being used.

Conduits shall be placed at a minimum depth of 24" – 30" or as directed. Contractor may use 1.5" or 2" HDPE bore tube designed for use in buried electrical applications, or Schedule 80 PVC conduit. Conduit service risers shall include an RMC sweep 90, and 10 LFT of RMC up the pipe. The remaining length of riser shall be RMC or Schedule 80 PVC.

All Wire placed between the service point and the first light assembly or handhole splice on the **circuit** shall be type XHHW-2.

Conduit installed under pavement shall extend a minimum of 2 ft beyond the edge of the paved surface or improved shoulder. The ends of such conduit shall terminate a nominal 2 ft below the ground surface. The ends shall be pitched so as to provide a positive drain to the surrounding soil. The ends shall be protected by threaded cap fittings until the time of installation of cable or cable-duct. Threaded bushing fittings shall be used on all ends before cable installation.

190 **807.07 Connections in Base of Light Pole**

Conductors shall be electrically bonded to each other, as required to satisfy circuit requirements, by means of compression type fittings of the style and type shown on the plans. Inhibitor compound shall be used on each compression connection. Conductor identification shall be maintained by connecting like color connectors.

200 A multiple conductor compression fitting shall be used to connect supply conductors and an insulating link used to provide an extension as shown on the plans. These fittings shall be covered with snap-on fiber or plastic covers designed to protect them from electrical contact. Taping will not be allowed. The bare extension of the supply conductor from the multiple fitting to the insulation link shall be no longer than necessary to admit the application of the snap-on cover for the multiple fitting.

The pole circuits shall be connected by means of easily separated, single conductor connector kits. The connector kit on the “hot” side of the pole circuit shall be fused. The connector kit for the neutral side shall not be fused. Fuses shall be of the “KTK” series with a rated capacity three times the operating amperage of the luminaire. If the required capacity is not a standard size, the next larger size fuse shall be used. Wire connector kits may be deleted if directed by the City of Fort Wayne’s Street Light Engineering Department.

807.08 Placing Wire and Cable

(a) Underground Through Cable-duct

260 All underground distribution conductors shall be continuous runs between splice points. Unless otherwise authorized, splice points shall be inside the bases of lighting standards, ~~inside handholes~~, in service distribution boxes, at point of connection to power supply in switch boxes, or in junction boxes. All splices shall be made with the proper connector in accordance with 807.07. Splices in handholes are prohibited unless authorized by Street Light Engineering.

807.08 (f) WIRE, 3C/6 XHHW-2 IN TRAY CABLE IN 1.5” HDPE BORE TUBE

Item shall include all parts, materials, labor, and equipment required to place bore tube or PVC conduit as planned or directed. Wire shall be XHHW Type 2.

Bore tube shall be SDR 11, 1.5” HDPE or approved equal, and meet ASTM F-2160. Tube shall be placed at a depth of 24”, unless otherwise directed. All coupled

bore tube joints shall be joined with epoxy type adhesive or other approved method. If contractor elects to place PVC conduit, all joints shall be glued with “gray” PVC adhesive. All fittings and joints shall be cleaned and primed prior to assembly. PVC pipe shall be Schedule 80.

If contractor elects to open-cut for wire and conduit installation, bottom 12” of trench shall be backfilled with special borrow “B” or other approved granular material, compacted in place.

Pay quantity shall be measured from center of light pole to center of light pole or in-ground hand hole

Item shall include all required reseeding/sodding/restoration.

807.08 (g): RISER ASSEMBLY, 2”, GALVANIZED, WITH 1800W P/C AND BRACKET

Item shall include all materials, equipment, and labor required to complete installation of 1.5” or 2” riser assembly as planned or directed. Riser shall include an RMC 90 degree sweep “ELL” at the base of pole. Item shall include grommet in ELL fitting, #6 solid copper ground wire with 1-10’ ground rod. First 10’ stick up the pole out of the ELL shall be RMC. The remainder of the riser pipe may be RMC or Schedule 80 PVC. All wire shall be type XHHW-2. Wire shall be Service Wire Company Brand, Type XHHW-2 (Type-2) or approved equal. Riser shall include weatherhead. Photocell shall be mounted on a bracket and accessible to ground crews for testing/activating with standard “stick”. Photocell shall be rated at a minimum of 1800 watts. SLO shall complete terminations at top of pole.

807.10 Concrete Foundations For Light Poles

(b) Precast Foundations

400 Precast foundations shall be complete with reinforcing bars, tie bars, anchor bolts, and entry sleeves located to provide a level mounting for the lighting standard after installation. The grounding coil, as shown on the plans, may be used for grounding lighting standards set on precast foundations. Foundation backfill shall consist of coarse aggregate No. 53. Pre-Cast foundations shall be prohibited unless specified by Street Light Engineering.

807.11 Placing Light Poles

(a) Lighting Standards Under 80 ft in Height

The lighting standard assembly shall consist of a metal pole, a shoe base, a frangible breakaway base or coupling where shown on the plans, and a metal mast arm for attaching the luminaire. Breakaway bases shall only be used when/as directed. The unit shall be assembled on the ground. Pole circuit wiring shall be installed and the luminaire shall be attached prior to erection. The
420 factory finish of the pole assembly shall be protected from mars, blemishes, scratches, or other damage. Slings and chokers for lifting purposes shall be of nylon or other approved material. Chains, metal rope, or other abrasive materials shall not be used for lifting devices. If damage to the factory finish occurs, repair or replacement shall be as directed.

807.11 (c) New Light Pole & Luminaire Identification

A pole identification label shall be installed on each pole. Pole identification labels will be provided by the City and installed by contractor. Install labels at a mounting height of 6'-0" and face it toward the roadway. City will provide a plan identifying the poles and corresponding numbers to the contractor prior to installation.

807.12 Grounding

As an acceptable substitute to this process, a mechanical ground grid connection
480 of an approved type may be used. Tap type clamps, parallel type clamps, U-bolt flat clamps, and crossover clamps will not be accepted. Mechanically-bonded grounding shall be approved by Street Light Engineering prior to installation.

807.13 Luminaires

(a) Installation

1. Roadway Luminaires

Item shall include all materials, equipment, and labor required to furnish and install luminaire(s) as specified on the plan sheets or on the bid tab pay item list.

Each luminaire shall be leveled in both directions in the horizontal plane after the light standard has been erected and adjusted. Rotary adjustment of the mast arm and vertical adjustment of roadway luminaires to obtain an installed level position in both directions shall be accomplished by means of the bolted saddle arrangement used to

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attach the luminaires to the mast arm. Lamp socket positions may be shown on the plans by type of Illuminating Engineering Society of North American, IES, and light pattern. The specified lamp socket position or comparable arrangement of LEDs shall be used to obtain the desired light pattern delivery. Proper connections shall be made to provide operation at the voltage being supplied. Replacements needed because of faulty or incorrect voltage connections shall be made with no additional payment. ~~All roadway luminaires provided for an intersection, interchange, or contiguous highway segment shall be the same model.~~

Poles and luminaires that need to be reset as part of the project will be reset, replumbed and terminated. The bid item shall include all labor, materials, and equipment to plumb and reset existing direct-bury luminaires and poles as planned or directed. Item shall include wire terminations as described in pay item. Street Light Engineering shall determine if/when this pay item applies to any work involving pay items. Poles out of plumb due to electrical work shall not qualify for payment under this pay item.

2. Sign Luminaires

Sign luminaires shall be connected to a phase conductor and a neutral conductor. The luminaires shall be alternately connected to opposite phase conductors to balance the load. The connections in the base of the sign structure shall be in accordance with 807.06. Conductor splicing shall be in junction boxes, in-ground handholes, inside handholes of sign structures, and circuit breaker enclosures. All sign luminaires provided for an interchange or contiguous highway segment shall be the same model.

All Sign lighting shall be of the "Down Lighting" variety. Illuminated sign boards shall be shielded to eliminate light passing above 90 degrees from the top of the sign. Sign lighting shall not cause light trespass levels in excess of 5 fc when measured 5 ft from residential property lines. Sign lighting shall not cause glare to passing motorists, or create a dangerous silhouette effect due to beam direction.

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3. Underpass Luminaires

Underpass luminaires shall be mounted on the vertical side surfaces of bridge bent structures or suspended by means of pendants supported by angle-iron struts or clips fastened to the structural beam members of the bridge. All parts of the pendant pipe assembly shall be hot-dipped galvanized after threads are cut. Silicone caulking compound shall be applied to the threads during assembly of the pendant. Underpass luminaires may require separately mounted ballasts which shall be installed in close proximity to the luminaires.

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Underpass luminaires shall be connected to a phase conductor and a neutral conductor. The luminaires shall be alternately connected to opposite phase conductors to balance the load. Conductor splicing will only be allowed in junction boxes, in-ground handholes, and circuit breaker enclosures. ~~All underpass luminaires provided for an interchange shall be the same model.~~

(b) Warranty

A non-prorated manufacturer’s written warranty, against loss of performance, defects in materials and defects in workmanship, shall be provided to and in favor of the Department. For roadway, underpass, and high mast luminaires, the warranty shall cover a period of 10 years from the date of installation of the luminaire; for sign luminaires the period shall be five years. The warranty shall cover all components of the luminaire, including but not limited to ballast, driver, and light source. Loss of performance is defined to include, but is not limited to, the luminaire or any of its components falling out of compliance with the specification in place at the time of installation, which includes but is not limited to the following: there is no light output from 10% or more of the LEDs, LED junction temperature exceeds 158°F under any circumstance, the luminaire is operating below the lumen maintenance curve, or the color temperature shifts more than 500K outside of the specified color temperature range. The warranty shall stipulate that replacement luminaires shall be shipped to the appropriate Department District Office, at no cost to the Department, within 30 days after the manufacturer’s receipt of failed luminaires. Warranty documents shall include the manufacturer’s name, address to which failed luminaires are to be shipped for replacement, contact person and contact person’s telephone number and e-mail address. Warranty documents shall be submitted to the Engineer/Project Manager ~~with the type C certification~~. Warranty documents shall provide the estimated life cycle of the lamp, LEDs, plasma emitter and power driver, and will be specified in agreement between the City of Fort Wayne and the manufacturer.

807.14 Sign, Underpass, Roadway, High Mast Lighting Location, and Luminaire Identification

A luminaire identification sticker shall be provided on each luminaire and on the light pole or tower that supports the luminaire. Luminaire identification tags will be provided by Street Light Engineering, and installed by the contractor. The sticker shall be titled “LUMINAIRE” and contain the following information: light source type, manufacturer, model, wattage, date of installation, and warranty period. The pole/tower sticker shall be attached underneath the light pole ID tag, shall face the roadway, and shall have 3/4 in. lettering, and be no greater than 8 in. by 8 in.

807.15 Service Point Power Entry

The service voltages supplied by the local utility shall be checked for compliance with the planned voltages. If a discrepancy exists, it will be resolved as directed before work is started or any electrical equipment is purchased.

(a) Types of Service Points

Service point installations shall be of two types as shown on the plans. Service points serving residential circuits shall be per City of Fort Wayne details and specifications.

807.18 Method of Measurement

780 Cable-duct and conductor in underground duct or conduit will be measured by the linear foot as follows:

~~(a) From the face of the concrete foundation to the center of the handhole or face of the next concrete foundation. An allowance of 5 lft will be made for each entry at foundations. An allowance of 2 lft will be made at handholes for connection purposes.~~

790 ~~(b) From lighting standard bases or handholes to switch boxes at underpasses. An allowance of 4 lft will be made at the switch box for electrical connections.~~

~~(c) From end to end of the conduit when the cable is in conduit under a roadway surface or shoulder. No measurement will be made of cable duct in conduit where it is part of a service point, sign installation, or underpass lighting system.~~

(a) Conduit and wire quantities shall be measured from center of pole foundation or handhole to center of pole foundation or handhole. Any allowances shall be per project special provisions.

SECTION 808 – PAVEMENT TRAFFIC MARKINGS

808.01 Description

This work shall consist of furnishing and installing, or removing, pavement traffic markings and snowplowable raised pavement markers in accordance with the MUTCD, these specifications and as shown on the plans. Markings shall be installed as required unless written approval is obtained from the District Traffic Engineer to make modifications at specific locations.

CONSTRUCTION REQUIREMENTS

808.03 General Requirements

30 Permanent pavement markings shall be placed on the surface course in a standard pavement marking pattern. Center lines shall be placed on two-way two-lane roads, lane lines shall be placed on multi-lane divided roads, and both center lines and lane lines shall be placed on multi-lane undivided roads.

The pavement shall be cleaned of all dirt, oil, grease, excess sealing material, excess pavement marking material and all other foreign material prior to applying new pavement traffic markings. New paint pavement markings may be placed over sound existing markings of the same color. New thermoplastic, preformed plastic, or multi-component markings may be applied over sound existing markings of a compatible type if allowed by manufacturer's recommendations, a copy of which shall be supplied
40 to the Engineer/Project Manager prior to placement; otherwise, existing markings shall be removed in accordance with 808.10 prior to placement of the new markings. Removal of pavement marking material shall be in accordance with 808.10. The pavement surface shall be dry prior to applying pavement traffic markings.

808.04 Longitudinal Markings and Milled Corrugations

All longitudinal lines shall be clearly and sharply delineated, straight and true on tangent, and form a smooth curve where required. Lines shall be square at both ends, without mist, drip or spatter.

A solid line shall be continuous. A broken line shall consist of 10 ft line segments with 30 ft gaps. A dotted line shall consist of 3 ft line segments with 9 ft gaps unless otherwise indicated on the plans.
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All lines shall be gapped at intersections unless otherwise specified or directed.

The actual repainting limits for no-passing zone markings will be determined by the Engineer/Project Manager.

160 808.07 Pavement Marking Material Application, Equipment, and Performance Requirements

All double line markings, such as a no passing zone or the center line of an undivided multi-lane roadway, shall be applied in one pass. When a hand-propelled machine is used, the single pass application of double line markings will not be required and control points shall be spaced at a maximum of 10 ft longitudinally.

170 For contracts with completion dates when conditions do not enable application of the specified marking materials, or grooving for durable marking materials, other materials may be substituted with an appropriate unit price adjustment if approved by the Engineer/Project Manager.

Markings shall be installed in accordance with the manufacturer's recommendations, except that the minimum requirements stated herein shall also apply. Products specifically designed for application temperatures below the stated minimums herein are not required but may be used if approved by the Engineer/Project Manager. When directed, the Contractor shall provide the Department with original copies of all necessary current manufacturer's installation manuals prior to beginning installation work, and no installation work shall begin prior to the Department's receipt of these manuals. These manuals shall become the property of the Department.

The markings shall meet or exceed the following performance criteria:

1. Color. The daytime and nighttime color of the applied markings shall be in accordance with ASTM D 6628 when determined in accordance with ASTM E 811 and E 1349.
- 190 2. Durability. The pavement markings shall have a minimum resistance to wear of 97% in accordance with ASTM D 913.
- 200 3. Retro-reflectivity. Contracts with 50,000 ft or more of longitudinal paint line or 10,000 ft or more for each type of longitudinal durable marking line applied shall have retro-reflectivity measured, except markings placed on seal coat pavements placed in accordance with 404. Longitudinal lines shall meet required minimum initial and retained average retro-reflectivity measurements.

All other contracts and markings, except parking lines, shall meet the required longitudinal line minimum measurements and will be measured by the Department at the discretion of the Engineer/Project Manager, except that quality adjustments will not apply. Retained retro-reflectivity is the value at the time of the warranty expiration in accordance with 808.09 and will be measured by the Department at the discretion of the Engineer/Project Manager.

210 Retro-reflectivity testing equipment shall be furnished, calibrated, and operated in accordance with ITM 931. The markings shall be tested in a period of not less than 14 days to not more than 30 days after the materials are applied. The retro-reflectivity

equipment shall remain the property of the Contractor. The measurement of retro-reflectivity shall be supervised or performed at all times by an operator trained and certified by the unit's manufacturer. A report as described in the ITM and including the specified test results and calculations shall be prepared and provided to the Engineer/Project Manager within three days of each day of testing.

808.10 Removal of Pavement Markings

530 All damage to the pavement caused by pavement marking removal shall be repaired by approved methods with no additional payment.

All temporary pavement markings shall be removed within 14 days of placement of permanent pavement markings.

808.13 Basis of Payment

660 ~~Payment for furnishing, calibrating, and operating retro reflectivity testing equipment will be paid for at the contract price for lump sum. The cost of report preparation shall be included in the cost of retro reflectivity testing. Adjustments to the contract payment with respect to retro reflectivity of performance based pavement markings will be included in a quality adjustment in accordance with 109.05.1. The Engineer may waive retro reflectivity testing due to weather limitations. Retro reflectivity testing will be waived for markings applied after October 31 and before April 1. If retro reflectivity testing is waived, no payment will be made for retro reflectivity testing. If retro reflectivity testing is not waived by the Engineer due to weather or waived by the seasonal time restriction and retro reflectivity testing is not performed, no payment will be made for retro reflectivity testing and payment for the marking items will be made at 70% of the unit price.~~

Payment will be made under:

Pay Item	Pay Unit Symbol
Curb Painting, _____ color	LFT
Grooving for Pavement Markings.....	LFT
Line, _____, _____, _____, _____ in.....	LFT
material type color width	
Line, Remove	LFT
Pavement Message Marking, _____, _____	EACH
material message	
Pavement Message Marking, Remove	SYS

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Prismatic Reflector.....	EACH
Retro Reflectivity Testing.....	LS
Snowplowable Raised Pavement Marker	EACH
Snowplowable Raised Pavement Marker, Remove	EACH
Transverse Marking, _____, _____, _____, _____ in.	LFT
material type color width	
Transverse Marking, Remove	LFT