DIVISION 200

SECTION 207

TRAFFIC SYSTEMS

207.01 Description

This specification includes the requirements for the installation, equipment, and materials associated with traffic system installation. Unless otherwise shown on the Plans or specified in the Special Provisions, all materials shall be new.

207.02 Related Documents

All traffic signal construction and equipment and workmanship shall meet or exceed the Section 730 Standard Specifications for Road and Bridge Construction issued by Tennessee Department of Transportation except as noted herein Section 207.

207.03 Foundation Concrete

The concrete for the foundations for the traffic signal supports, luminaire supports, and a traffic signal controller base shall be Class A Portland cement concrete, TDOT Section 730.10.

207.04 Materials and Installation

A. One inch (1") (25mm) PVC Conduit, two inch (2") (50mm) PVC Conduit, four inch (4") (100mm) PVC Conduit.

1. Plastic conduit shall be placed as shown on the drawings and shall be Schedule 40 type.

2. Conduit shall be jointed using a solvent welded slipfitter coupling to make a watertight joint.

3. Where plastic conduit runs are placed parallel to other conduit runs or cross over one another, they shall be separated by a minimum of three inches (3") (75mm) of sand or soil cushion. All bending of conduit shall be carefully done to avoid damage. Free ends of conduit shall be capped to prevent the entry of moisture, dirt, or rocks.

4. Plastic conduit shall terminate ten inches (10") (3m) from the top of pull box.

B. Pull Boxes

1. Pull boxes shall be of the type shown on the plans and installed at locations shown. The contractor may, at his own expense, install such additional pull boxes that he may deem necessary to facilitate the work, with the approval of the Engineer.

2. The pull boxes shall be of the type as manufactured by "Armorcast" , "Quazite" or approved equal.

   a. Pull boxes shall be: Type "B" – thirty inches by seventeen inches by eighteen inches (30" x 17" x 18") (.75m x 425mm x 450mm) (LxWxD).

   a. Pull boxes shall bear the wording "City of Spring Hill" on the covers.

   iii. Pull boxes shall be placed on a crushed stone base, as shown on the details or described in Section 730.12.

   a. This item includes excavation, placing of the pull box, electrical bond, backfill and repair of surface to the original condition.

C. Traffic Signal and Communication Cable

1. Cable shall be installed as shown on the plans and wiring schematics. For proper function of the signals, conductors shall be stranded copper conductors with spade type crimped terminals. Cable shall conform to International Municipal Signal Association (IMSA) Specification 20-1, 1984.

2. Cables shall be used as follows:

   i. 3C No. 14 AWG

      a. From controller cabinet junction box to pedestrian pushbutton on shaft. Direct runs to each support, no splices in pull boxes.

   ii. 5C No. 14 AWG

      a. From terminal compartment or base of shaft to inboard signals on mast arms.

   iii. 7C No. 14 AWG

      a. From terminal compartment or base of shaft to signals at end of mast arm uprights.

   iv. 15C No. 14 AWG

a. Direct runs from traffic signal controller cabinet and pull box to terminal compartment or base of signal support shaft.

b. No splices in pull boxes.

v. 6 Pair, No. 16 AWG Signal Communication Cable. For signal interconnect system.

3. At the controller cabinet and pullbox and base of support poles, cables shall be tagged to show their routing. Individual wires shall be tagged with branded type wire markers that conform to the terminal they hook to.

4. There shall be no splices of cables in pull boxes. Cable conductors shall terminate only at terminal block or base of signal supports.

5. Cable within cabinets, pull boxes, etc., shall be neatly arranged. Powdered soapstone, talc, or other approved lubricants shall be used when inserting cable in conduit. Before proceeding to pull cable in the underground conduit runs, the contractor shall clean all dirt or accumulations of moisture from conduit runs.

6. Cabinet pullbox and cabinet terminated by City staff (when applicable).

D. No. 6 AWG, No. 8 AWG, and No. 10 AWG

1. Conductors shall be used for electrical service to the controller, street lighting, and equipment bonding and ground.

2. The conductor shall be stranded copper. The insulation for the conductor shall be THWN with a 600-volt rating.

3. Conductors shall be joined in pole bases or pull boxes using watertight connectors. Connectors shall be readily accessible in pole bases through the hand hole.

4. Fused connector shall be used only in pole bases to connect the service wires to the luminaire drop wire (3C No. 12 AWG). All drop wires from luminaries shall be 3C No. 12 AWG cable to the connectors in the pole bases. All fuses shall be the midget ferrule type rates at 10 amps.

E. Controller, Controller Cabinet and Base

1. The traffic signal controller shall be a 8 phase base mounted McCain ATCex2 NEMA with the following:

i. Conflict Monitor unit – Signal Monitor EDI SSM-16LE(ip) Enhanced NEMA MMU.

ii. Load Switches – Power Distribution & Control Inc. (PDC SSS86I/O)

iii. Pre-emption shall be Sonem 2000

2. The controller cabinet shall meet the requirements of Section 730.25 (F) and sized to house all equipment for the intersection. The cabinet shall be completely NEMA compatible with the following features:

   i. All necessary panels and harnesses for local and telemetry.

   ii. Wire for eight (8) channels of intersection detection (Veh phase 1-8), eight (8) channels of system detection, and four (4) channels of Sonem 2000 accoustic opticom detectors.

   iii. Surge Arresters EDCD-No SHP or approved equal.

   iv. Heating element mounted on insulated spacers against cabinet wall (not directly to cabinet metal). Heating element terminals to be unexposed or electrically insulated to prevent accidental short-circuiting.

   v. Terminals of mercury switch to be unexposed or electrically insulated to prevent accidental short-circuiting.

   vi. Provide a separate 15-amp single pole branch circuit (12 AWG THWN) and circuit breaker for the cabinet-heating unit.

   vii. On-Auto time switch.

3. The base and concrete apron shall be sized appropriately for the equipment. The anchor bolt size and location shall comply with manufacturer's recommendations.

4. Auxiliary Equipment

   i. The following auxiliary equipment shall be placed in the cabinet, and wiring provided.

      a. Model – US Robotics Sportstem 56 K

      b. The opticom unit shall meet Sonem 2000.

F. Traffic Signals, 3 Color, 1 Way, 12-12-12 and 12-12-12 w/BP and meet TDOT Section 730.24.

1. Traffic signals to be furnished and installed by the contractor are shown on the plan. Typical signal mounting is shown on the detail sheet.

2. The traffic signal indications shall meet or exceed the general specifications and definitions for adjustable signal heads as specified in the Institute of Transportation Engineers Technical Report No. 1, USAS D-10.1-1966, UDC 656.057, with latest revisions, or as specified or altered herein.

3. All mast arm mounted signals shall have minimum road clearance of nineteen feet (19') (6m) to the bottom of the signal backplate.

4. The signal indication housing shall be made from die cast aluminum which is free of flaws, cracks, blow holes or other imperfections. Signal indication housings shall be constructed so that they can be individually attached to each other, are one piece, interchangeable, adjustable, and have holes top and bottom to receive a one and a half inch (1½") (37.5mm) fitting. Color: Federal Highway Yellow.

5. The optical unit shall consist of an LED lens of the appropriate size. The lens shall be of the color as shown on the plans. Each lens shall be a true to color.

   The twelve-inch (12") (300mm) diameter signals have LED traffic signal 120-volt bulbs.

6. Each signal indication shall have a tunnel (open bottom) visor made from sheet aluminum no less than 0.050 inch (0.050") (1mm) thick. The length of tunnel visors shall be twelve inch (12") (300mm) for twelve inch (12") (300mm) diameter indications.

7. Backplates shall be supplied that fit the signal heads and form a five-inch (5") (125mm) border around them. The backplates shall be louvered, made from aluminum and painted with a flat black synthetic backing enamel. Holes shall be drilled in the backplates so that they can be attached to the signal heads supplied.

8. All mast arm signals shall be supported with Astro-Brac as manufactured by Pelco Products Inc or approved equal.

9. All brackets used for assembling and mounting signal indications are to be entirely weather-tight. All mounting brackets shall be made from no less than one and a half inches (1½") (37.5mm) I.P.S. pipe so that the traffic signal control wires can be threaded through them.

10. All mounting brackets shall be fabricated so that when placed in use they supply plumb or level support and are securely attached to the supporting structure.

11. A terminal compartment (12 terminals) shall be furnished with each mounting bracket for shaft mounted signals.

G. Traffic Signal/Luminaire Support, Signal Mast Arms, Luminaire Arms

1. The complete mast arm signal and luminaire support assembly shall consist of a tapered round shaft, a "sweep type" tapered round mast arm, anchor bolts, and necessary nuts and associated appurtenances to provide a complete installation.

2. The design shall be as to latest edition of Tennessee Department of Transportation Department Standard Specifications for Road and Bridge Construction. Shop drawings shall be approved by the City of Spring Hill prior to manufacturing the signal supports. The shop drawings shall show assumed signal head and sign placement, with loading, in addition to the requirements of Section 501.03.

3. Supports shall be designed for a section head at end of all mast arms, with two inboard signals. Sign area design shall be for a minimum of seven and a half square foot (7.5 ft^2) ($7m^2$) of sign near the end of support, and ten square foot (10 ft^2) ($9m^2$) street sign at the connection of the shaft and mast arm.

4. Wire hand holes, four inches by six inches (4" x 6") (100mm x 150mm) (7.5 ft^2) ($7m^2$) shall be located on the shaft, one approximately eighteen inches (18") (450mm) above the base and one opposite the mast arm connection for feeding wire into the mast arm.

5. Finish shall be galvanized. Any damage in shipment shall be repaired or replaced to the satisfaction of the Engineer.

H. Vehicle Detection.

1. Vehicle Detection equipment shall be manufactured by Wavetronics. Wavetronic equipment shall be installed unless otherwise specified by the owner.

I. Pedestrian Signal, ICC Unit (When applicable)

1. The pedestrian signal supplies shall be the unit as manufactured by Indicator Control Corp., Rancho Dominguez, California 90221, or approval equal.

2. The general construction of the Pedestrian Indications shall include a single piece cast aluminum housing, a sealed message module with a polycarbonate message lens, a single piece cast aluminum swing-down doorframe, and black-out egg crate type sun visor with clam shell mounting.

3. The approximate overall dimension of the signal shall be eighteen and a half inches (18½") (462mm) wide, eighteen and three/fourths inches (18¾") (460mm) high1, and nine inches (9") (225mm) deep, including egg crate type visor and hinges.

4. The message module shall be sealed into an integral assembly with a one-piece sponge neoprene gasket fitted around the perimeter to provide positive protection of the enclosed lighting from handling, weather, and moisture. The message display shall be Don't Walk-Walk.

5. The message module shall be provided with electrical contacts which will plug directly into recessed contacts in the transformer enclosure when the module is in proper position, thus totally eliminating secondary high tension leads. Removal and insertion of the module shall not require the use of tools.

6. Each signal shall be provided with an egg crate type visor designed to eliminate sun phantom.

7. The case for pedestrian signals shall be dust proof, weatherproof, corrosion-resistant, and shall provide for easy access to and replacements of all components.

8. The case, doorframe, and egg crate visor (aluminum portion only) shall be thoroughly cleaned, and a chromate conversion coating applied inside and out per Military Specification MIL-C-5541. A synthetic enamel conforming to Military Specification IIE-520 shall then be electrostatically applied. The final finish shall be Flat Black for the door and face, and Federal Highway Yellow on other exterior areas.

J. Pedestrian Push Buttons

1. Pedestrian push buttons shall be furnished and installed by the contractor.

2. Pedestrian push buttons shall be installed on poles as indicated on the panels. Push buttons shall be located so that the arrow on the sign points in the direction of the pedestrian crossing, and so that the buttons are on the side of the pole most accessible to the pedestrian.

3. Signal standards shall be field drilled and tapped as required for wire entry and mounting of push buttons. The holes shall be treated with "Galvicon" (or an approved equal), per the manufacturer's directions, to protect against corrosion.

4. The pedestrian sign shall have the message as shown on the plans.

K. Opticom Cable

1. The Opticom control wire shall be M-138 Detector Cable as supplied by the 3M Company. The wire is 3-conductor No. 20 AWG, shielded cable with drain wire.

L. Aluminum Signs

1. Stop and yield signs shall be fabricated with 3m high intensity, all other sign faces and legends shall be fabricated 3M Reflective Engineering Grade, meeting FHWA specification FP74 level A.

2. All sign panels shall be .080 (2mm) thick anodized aluminum for signs less than six square feet (6 ft^2) (5.5m^2). Signs six square feet (6 ft^2) (5.5m^2) or larger shall have panels of .100 (2mm) thick anodized aluminum.

3. All standard signs shall be in accordance with the Manual of Uniform Traffic Control Devices (MUTCD).

4. Sign attachments shall be Type "C" or "C", as shown on the plans, as to sign size. The signs are to be mounted on the mast arms and shafts as shown on the plans.

5. Ground mount signs shall be placed as directed by the Engineer. Mounting as to post size and attachment devices shall be to City Standards.

M. Luminaries, LED Cirrus Cobra Head (Specgrade Cirrus) or Equal.

1. Luminaries shall be placed on each traffic signal/luminaire support. Luminaire assemblies shall be slipfitter type end mounting on a two-inch pipe tenon. Type II or III light distribution, semi-cutoff shall be used on all luminaries. All luminaries shall be wired for 120 volts.

2. A photoelectric cell shall be part of each assembly, all units set to come on and off at approximately the same time.

3. Foot candle rating as per TDOT standards.

207.05 Electric Service

A. Service shall be from the location shown on the plans.

B. Service equipment shall be for120/240 volt, single phase service and include a meter base, surge protector and circuit breaker in NEMA 3R weathertight enclosure(s), of the type fabricated by Midwest Electrical Products.

C. The main circuit breaker shall be 60 ampere, two pole. Branch circuit breakers shall be 40 ampere single pole for traffic signals and 30 ampere single pole for roadway lighting. The meter base shall be the manual bypass type as required by the local electric power company.

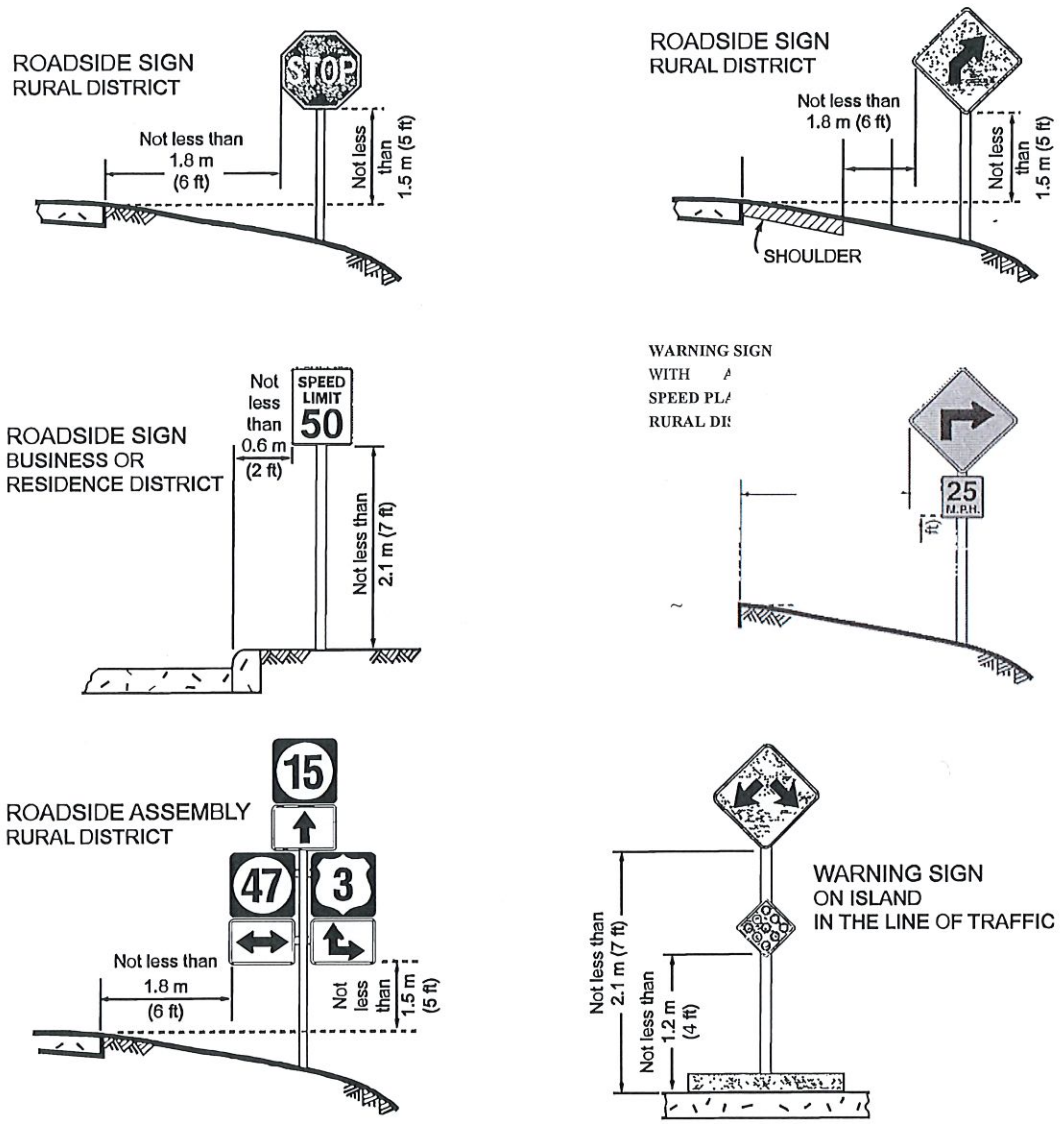
207.06 Pavement Markings

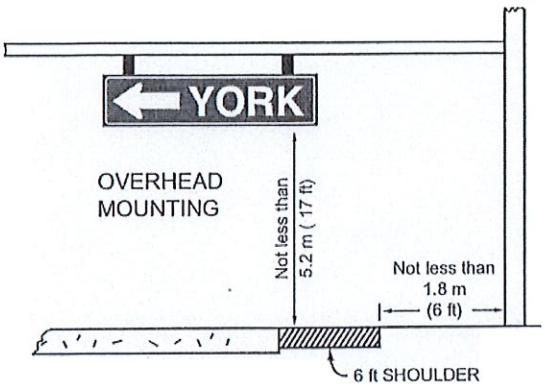
A. Pavement markings shall be preformed for the crosswalk bars, arrows and messages, and pavement marking paint for lane lines, centerlines and other lines, as shown on the plans.

i. The preformed pavement markings shall be Stamark Pavement Marking, as manufactured by the 3M Company or approved equal. The markings shall be placed as shown on the plans or as directed by the Engineer.

ii. Paint pavement markings shall meet the specifications of the Tennessee Department of Transportation for yellow and white paint, and shall be applied as to the same specification. The removal of the pavement markings in place shall be included under this item. Removal and placement of the pavement markings shall be as shown on the plans or as directed by the Engineer.

Figure 2A-1. Height and Lateral Location of Signs for Typical Installations




YORK
OVERHEAD
MOUNTING
Not less than
5.2 m (17 ft)
Not less than
1.8 m
(6 ft)
6 ft SHOULDER