

## SECTION 02892

# TRAFFIC SIGNAL

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Materials and procedures for installing traffic signals.
- B. Materials and procedures for installing traffic counting loop detectors.

#### 1.2 RELATED SECTIONS

- A. Section 02741: Hot Mix Asphalt (HMA)
- B. Section 02748: Prime Coat/Tack Coat
- C. Section 03055: Portland Cement Concrete
- D. Section 03211: Reinforcing Steel and Welded Wire
- E. Section 03310: Structural Concrete
- F. Section 03575: Flowable Fill
- G. Section 16135: Electrical Junction Boxes
- H. Section 16525: Highway Lighting

#### 1.3 REFERENCES

- A. AASHTO M 111: Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- B. AISI, Type 201
- C. ANSI/UL 467
- D. ASTM A 123: Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- E. ASTM A 325: Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

- F. ASTM A 307: Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
- G. ASTM A 570: Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
- H. ASTM B 85: Aluminum-Alloy Die Castings
- I. ASTM B 117: Operating Salt Spray (Fog) Apparatus
- J. ASTM B 766: Electrodeposited Coatings of Cadmium
- K. ASTM D 638: Tensile Properties of Plastic
- L. ASTM D 2240: Rubber Property-Durometer Hardness
- M. ASTM D 3005: Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape
- N. International Municipal Signal Association (IMSA): 20-1, 50-2, 51-1, 51-3, 51-5, 51-7, 60-6
- O. Institute of Traffic Engineers (ITE), Technical Report No. 1, and 4
- P. Military Spec. Mil-C-5541, and TTE-529
- Q. NEC 250-1: National Electric Code
- R. NEMA TC-2, TC-3, UL Listed
- S. REA (Rural Electrical Association) Bulletin 17551-100
- T. UL 6
- U. UL 510
- V. UL E-50076
- W. 3M - 8982/Gel

#### **1.4 SUBMITTALS**

- A. Certified test report of wire compliance as specified. IMSA 20-1, 50-2, 51-1, 51-3, 51-5, 51-7, 60-6.

- B. Submit samples of materials for approval when requested.
- C. Submit two copies of the following within 15 days after receiving a Notice to Proceed:
  1. List of equipment and materials (name of manufacturer, size, and identification number).
  2. Detailed shop drawing, wiring diagrams, and certifications.
  3. Manufacturers' warranties, guarantees, instruction sheets, and parts lists.

**1.5 ACCEPTANCE**

- A. Signal Warranties and Guarantees
  1. The notice of acceptance for traffic signal work is not given until six months after the date of the inspection.
  2. During this period, all manufacturer's warranties and guarantees on Contractor- furnished electrical and mechanical equipment are enforced.
  3. At the end of the period and after all electrical and mechanical defects within the scope of warranties and guarantees are corrected, the Engineer makes written acceptance of the work completed and relieves the Contractor of further responsibility for that portion of the project.
  4. Partial acceptance does not void or alter any terms of the Contract
- B. The six-month warranty period for signal work does not affect the processing of a semi- final estimate when the Contract is 95 percent or more complete, or after completion of work on the project.
- C. Detector Loop Circuit: Conduct the following acceptance tests before and after backfill for approval by the Engineer.
  1. Loop Resistance Formula:  $R_t = R_l + R_d$ 
    - $R_t$ = Resistance of loop as measured at pull box.
    - $R_l$ = Resistance of loop lead in wire (from the loop to junction box per meter) equals 0.0213 ohms, measured from loop to pull box splice.
    - $R_d$  = Resistance of Loop = P.T.R<sub>c</sub> (See Loop Resistance Table below)
    - P = Perimeter of loop in meters.
    - T= Number of turns in the loop.
    - R<sub>c</sub>= Resistance of #14 AWG copper wire per yard equals 0.0107 ohms.

**Table 1**

<b>Loop Resistance</b>			
<b>Loop Type</b>			<b>R<sub>d</sub> Loop Resistance (ohms)</b>
<b>Width (ft)</b>	<b>Length (ft)</b>	<b>Turns</b>	
5	6	4	.29
5	10	4	.39
6	6	4	.31
6	10	4	.41
6	12	4	.47
6	14	3	.39
6	16	3	.43

2. A minimum reading between the conductor and ground of 100 MΩ when tested with a 500 V megger meter.
3. An inductance between 65 FH and 1000 FH.
4. Signal Power Circuits:
  - a. Continuity of grounding conductors to maintain a 1000 W load at each pole to maintain less than 2 V drop.
  - b. Insulations resistance of supply conductors to ground no less than 40 MΩ (500 V megger meter).

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- A. Use electrical components as listed and defined by the National Electric Code (NEC).

### **2.2 SIGNAL POLE AND TRAFFIC SIGNAL LIGHT SUPPORT ARM**

- A. Post mounted Tapered Signals Pole: Standard Drawing SL 5.
  1. Steel, as specified. ASTM A 570, Grade 33.  
Allowable stresses:  $F_b = 21,750 \text{ psi } (0.66F_y)$   
 $F_v = 10,900 \text{ psi } (0.33 F_y)$
  2. Galvanized as specified. AASHTO M 111.

3. Wind load: 80 mph wind with 105 mph gusts.
- B. Foundation:
1. Concrete: Class AA(AE) Concrete. Refer to Section 03055.
  2. Reinforcing steel: Coated steel. Refer to Section 03211.

## 2.3 BOLTS AND NUTS

- A. Anchor bolts and nuts: Follow Standard Drawing SL 5.
1. Steel as specified. ASTM A 307.
  2. Zinc-plated or galvanized, as specified.
    - a. Zinc-plated as specified. ASTM B 766.
    - b. Galvanized steel: ASTM A 123.
  3. Nuts; free running, by hand, for total thread length.
- B. Slip Bolts as specified.
1. Zinc plated: ASTM B 766.
  2. Steel: ASTM A 325.

## 2.4 WIRE

- A. Copper, as specified. International Municipal Signal Association (IMSA).
- B. Size as specified. American Wire Gauge (AWG).
- C. Service Cable:
1. Single-conductor, as specified. Type THWN, THW, THHW.
- D. Interconnect cable:
1. Twisted pair filled shielded cable, as specified.
  2. IMSA 60-6.
- E. Signal Cable:
1. Multi-colored cables, as specified.
  2. IMSA 20-1
- F. Ground Wire:
1. Solid, bare, soft-drawn, copper wire, as specified.
  2. NEC 250-1.
- G. Splice Sealing: Rural Electrical Association (REA) Bulletin 17551-100.
1. Rigid body re-enterable gel-filled enclosure. Meet 3M-8982/gel, or equivalent.

2. Mastic rubber pads and overwrap with vinyl electric tape.
  3. ASTM D 3005, Type I or II. UL 510.
- H. Color Coding Tape:
1. Vinyl electric tape, as specified.
  2. UL 510.

## 2.5 TRAFFIC SIGNAL HEAD

- A. Use Standard Drawing SL 8.
- B. 12 inch vehicular signal heads:
1. With tunnel hoods and mounting brackets, square doors,
  2. Capable of adjusting a full 360 degrees around a vertical axis in one direction.
- C. Assembly:
1. Designed to use standard 3 inch Light Center Length (LCL) traffic signal lamps, 1950 lm/150 W lamps.
  2. Sections:
    - a. Separate, interchangeable, and expandable without tie rods.
    - b. Stainless steel bolts, screws hinge pins, and door-locking devices in any exposed sections.
  3. Die-cast aluminum parts, including the doors, as specified: ASTM B 85. Clean, smooth parts free from flaws, cracks, blow holes, or other imperfections.
  4. Moisture and dust resistant.
  5. All surfaces inside and out of signal housing, door, and outside of visor painted with electrostatically-applied, fused-polyester paint in Highway Yellow. Paint inside of visor flat black.
  6. Integrally round serrated boss openings in the top and bottom of each section that receives 1-1/2 inch supporting pipe frame.
  7. Rain-tight top opening and an ornamental cap for closing the bottom opening.
  8. Visor securely mounted at a minimum of four points.
- D. Optical Unit: Watertight and dust resistant, mounted so various parts swing open for easy access.
1. Glass lens: Meet current applicable specification for traffic signals. Institute of Traffic Engineers (ITE) Report No. 1.
  2. Reflector:
    - a. One-piece parabolic, alzak finished specular aluminum as specified. ITE Technical Report No. 1.

- b. Designed to minimize “sun phantom” false illumination.
  - 3. Lampholder:
    - a. Positively positioned and easily rotated without tools.
    - b. Vibration resistant, weatherproof, molded construction.
    - c. Lamp filament positioned at the focal center of the reflector.
    - d. Use stranded, No. 18 AWG, 220 degrees F. minimum, 600 V wire leads.
  - 4. Traffic Signal Lamps: ITE R-4
    - a. 3 inch LCL, Incandescent
    - b. 136 watt, 122.5 V.
    - c. 10,000 hour rated life, 1750 lm.
- E. Louvered back plate
  - 1. Constructed from minimum 0.049 inch aluminum.
  - 2. Both sides primed and painted flat black.
  - 3. Designed to be attached to the signal head used.

## 2.6 PEDESTRIAN SIGNAL HEAD

- A. Follow Standard Drawing SL 9.
- B. Includes a housing, swing down door assembly, parabolic reflector, message lens, sunshield, two signal lamps and two sockets.
  - 1. Housing:
    - a. Dustproof and weatherproof.
    - b. Die cast, single piece aluminum alloy.
    - c. 1-1/2 inch top and bottom openings with integrally-cast shurlock boss when used with pipe mount brackets.
    - d. Use stainless steel screws springs, and assembly hardware.
  - 2. Swing down door assembly:
    - a. Capable of being opened without tools.
    - b. Made of a single piece aluminum alloy, die cast with two hinge lugs at the bottom and two latch slots at the top of the door.
  - 3. Reflectors:
    - a. Single-piece of polycarbonate plastic sheet, double-parabolic, vacuum-formed, 1/4 inch minimum thickness, textured.
    - b. Lamp side texture conforms to C-64 or C-66 pattern or equivalent for light uniformity.
    - c. Aluminum-coat lamp side by vacuum deposition.
  - 4. Message lens: 3/16 inch thick tempered glass lens.
  - 5. Sunshield:
    - a. Eggcrate-type with 15 vertical and 26 horizontal members.
    - b. Two anti-vandal, integral locking strips.

- c. Minimum thickness of 0.030 inch.
    - d. Finish: 100 percent impregnated black, polycarbonate plastic, with a flat finish on both sides.
  - 6. Electrostatically apply a synthetic enamel as specified.
    - a. Gloss black case and door frame.
    - b. Flat black sunshield.
    - c. Oven-cure finish for a minimum of 20 minutes at 350 degrees F.
  - 7. Signal lamps: Meet ITE R-4.
    - a. 2-1/2 inch LCL, incandescent, 69 W.
    - b. 8000 hour rated-life.
    - c. 690 lm, 122.5 V.
  - 8. Sockets: high temperature ceramic lamp socket with brass screw shell.
- C. All components compatible with 116 W lamps.
- D. Symbol messages blank out under ambient light conditions when the pedestrian signal is not energized.
- E. Optical unit does not allow erroneous messages from lamp failure or light spill over.

## **2.7 ELECTRICAL CONDUIT**

- A. Conduit and fittings:
  - 1. Schedule 40 PVC rated at 190 degrees F. as specified. NEMA TC-2, TC-3. UL Listed.
  - 2. Rigid steel as specified. UL 6.
  - 3. Galvanized as specified. ANSI C80.1.
- B. Casing: Smooth steel with a minimum 1/4 inch wall thickness as specified.

## **2.8 DETECTOR CIRCUIT**

- A. Wire:
  - 1. Detector Lead-In Wire (feeder): as specified. IMSA 50-2.
  - 2. PVC Sensor Loop Wire - No. 14, single-conductor, stranded wire as specified. IMSA 51-3.
  - 3. Saw Cut Sensor Loop Wire.
  - 4. No. 14, single-conductor, stranded wire encased in a polyethylene tube as specified. IMSA 51-7.
- B. Traffic loop embedding sealant:
  - 1. Isophthalic, acid-based, unsaturated, polyester resin.

2. With sufficient adhesion, strength, and flexibility to:
  - a. Withstand normal movement in asphaltic and concrete pavements
  - b. Protect the loop wire from moisture penetration, fracture and shear.
3. Cured sealant resistant to motor oils, gasoline, anti-freeze solution, brake fluid, and de-icing chemicals.
4. Meet the physical property requirements in Table 2.

**Table 2**

<b>Traffic Loop Embedding Sealant</b>		
<b>Physical Properties</b>	<b>Test</b>	
Shore D Hardness	ASTM D 2240	74
Specific Gravity		1.13 - 1.20
Styrene Monomer, percent		28 - 32
Viscosity: Pa·s	Brookfield Model LVF #3 Spindle @ 60 rpm	0.7-0.9
Gel Time	MEK Peroxide 46-709	11 - 15 minutes
Tensile Elongation, % @ Break	ASTM D 638	50
Pot life, minimum		5 minutes
Tensile Strength	ASTM D 638	2,000 psi

## 2.9 LUMINAIRE

- A. Housing:
  1. Die-cast aluminum
  2. Reflectors, sockets, mounting cradles, and clamps fitted to the upper housing.
- B. Integral ballast: Pre-wired with quick disconnect plugs mounted on a removable, hinged power door.
- C. Power Door: Ballast assembly interchangeable with all luminaires, regardless of wattage.
- D. Optical assembly: Formed aluminum reflectors with a chemically bonded, non-breakable, glass finish on both the inside and outside surfaces.
- E. Mogul base sockets:
  1. Adjustable with split-shell, tempered-brass lamp grips.
  2. Free-floating, spring loaded center contacts.

- 3. Heat- and impact-resistant glass prismatic refractors.
- F. Mounting adjustment:
  - 1. 10 degrees above horizontal for the reflector and refractor.
  - 2. 5 degrees adjustment from vertical on the bracket arm.
- G. Weight: no more than 75 lbs.
- H. Projected area: no more than 3 square feet.
- I. Ballast: high pressure sodium type that will:
  - 1. Maintain a minimum power factor of 90 percent.
  - 2. Maintain lamp wattage of not more than 5 percent for nominal line and lamp voltage.
  - 3. Maintain regulation of not more than 35 percent for a 10 percent line voltage variation.
  - 4. Start and operate the lamp at ambient temperatures down to -40 degrees F.
  - 5. Sustain lamp operation for a minimum of 4 seconds at a voltage dip of 35 percent.
- J. Lamp: high pressure sodium lamp that uses clear bulbs and has:
  - 1. Apparent color temperature of 2100 K.
  - 2. CIE chromaticity of X = 0.512, Y = 0.420.
  - 3. Rated-life of not less than 24 000 hours per 10 hour start.

**2.10 GROUND ROD**

- A. Copper-coated steel as specified.
- B. ANSI/UL 467.

**2.11 MESSENGER**

- A. 3/8 inch diameter galvanized, stranded steel cable.
- B. Minimum breaking strength of 10,800 lbs, as specified.
- C. ASTM A 123.

**2.12 MOUNTING BANDS AND BUCKLES**

- A. As specified.

- B. American Iron and Steel Institute, (AISI) Type 201.

### **2.13 POWER SOURCE**

- A. Pole Mount: Standard Drawing SL 6.
  - 1. Service disconnect:
    - a. Single pole 40 amp 120 volt AC metered for signal.
    - b. Double pole 20 amp 240 volt un-metered for lighting.
  - 2. Provide a manual EUSERC approved circuit closing link by-pass release meter socket.
  - 3. Unmetered street lighting circuit.
  
- B. Underground Service Pedestal: As specified. ASTM B 117, and ASTM A 123 (Cabinet). UL E 50076
  - 1. Enclosure: 0.120 inch galvanized steel or anodized aluminum.
    - a. 0.080 inch galvanized steel or anodized aluminum covers.
    - b. Finished surface with an environmental green, baked enamel over zinc-chromate primer as specified, or anodized aluminum. ASTM B 117.
    - c. Bottom access opening.
    - d. Electrical Utility Service Equipment Requirements Committee (EUSERC) approved circuit-closing by-pass release meter socket.
    - e. Baffled ventilation louvers.
  
- C. Circuit Breaker: Main Breaker
  - 1. Six space metered.
  - 2. Six space unmetered bus.
  
- D. Detachable, pad-mount base.

### **2.14 FLOWABLE FILL**

- A. Refer to Section 03575.

### **2.15 HOT MIX ASPHALT**

- A. 1/2 inch maximum. Refer to Section 02741.

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

- A. Conform to the National Electrical Code (NEC).
- B. Pick up State-furnished materials at the Department's Division of Safety Warehouse, 4501 South 2700 West, Salt Lake City, UT.
- C. Saw cut concrete or other improved surfaces to be removed in the sidewalk area, and replace with in-kind materials to match the existing grade.
- D. Attach brackets with a banding machine with stainless steel bands. Do not drill holes in poles except as shown on the plans. Follow Standard Drawings SL 9 and SL 2.
- E. Do not disconnect or remove an existing signal system until the replacement system is functioning.
- F. Contact power company at least 30 days before the connection date, and verify the exact location, voltage, procedure, and materials required by the power company.

### **3.2 CONSTRUCT POLE FOUNDATION**

- A. Follow Standard Drawings SL 4 and SL 10.
- B. Concrete: AA(AE) required. Refer to Section 03055.
- C. Structural Concrete: Refer to Section 03310.
- D. Reinforcing Steel and Welded Wire: Refer to Section 03211.
- E. Do not weld reinforcing steel, anchor bolts, or conduit.
  - 1. Use tie wire to secure conduit.
  - 2. Use template to align and secure anchor bolts.
- F. Place the concrete directly into the excavation, and use minimum forming above ground.

### **3.3 TRENCH FOR CONDUIT**

- A. Paved Surface (asphalt concrete):
  - 1. Do not use backhoe.

2. Make the trench 6 inches wide or less.
  3. Use flowable fill to within 3 inches of the existing roadway surface.
  4. Evenly apply tack coat before final backfill.
  5. Match the composition, density, and elevation ( $\pm 3/16$  inch) of the existing surface in the final 3 inches of backfill.
- B. Unpaved Surface:
1. Use backfill that matches the composition, density, and elevation ( $\pm 3/16$  inch) of the existing surface.
  2. Install conduits that cross finished curbs and gutters, sidewalks, concrete flatwork, textured or decorative surfaces by jacking, drilling, or pushing. Entirely replace any damaged section at no additional cost to Department.
  3. Dispose of surplus material daily.
- C. Trenching under Railroad (Subject to agreement with railroad):
1. Install smooth steel casing a minimum depth of 4 ft under railroad track to house conduit.
  2. 6 inch diameter casing with a minimum  $7/32$  inch wall thickness, and a minimum yield strength of 34,950 psi.
- D. Minimum cover of conduit:
1. Minimum cover for all roadway crossings: 2 ft.
  2. Minimum cover off roadway without concrete encasement or capping: 18 inches.
  3. Minimum cover off roadway with concrete encasement or capping with minimum thickness of 2 inches: 12 inches.

### 3.4 INSTALL CONDUIT

- A. Place all conduits in the same trench before surfacing.
- B. Above ground use galvanized rigid steel; under ground use PVC.
- C. Seal uncapped conduit ends inside junction box with at least 2 inches of duct caulking.
- D. In future-use conduit, install No. 14 single conductor copper, type THHN pull wire.
  1. On each end of conduit install cap with  $7/32$  inch hole for pull wire.
  2. Leave 20 inches of wire outside of the cap, fastened securely.
  3. Place future-use conduit in top portion of trench for easier access later.

- E. Secure conduit on structures with standard galvanized iron conduit clamps using at least 5/16 inch diameter concrete expansion anchors at maximum 5 ft spacing.
- F. Use conduit expansion fittings at structure expansion joint crossings.

### **3.5 INSTALL WIRING**

- A. Conductors:
  - 1. Clean and dry the inside of the conduit before installing conductors.
  - 2. Install grounding conductor in all power circuit conduits.
  - 3. Use powered soapstone, talc or other approved lubricants when pulling conductors in conduit.
  - 4. Tape the ends of unused conductors and label them as spares.
  - 5. Use conductors that are color coded as specified. Meet IMSA 20-1.
- B. Ground wire:
  - 1. In all non-metallic conduit, a ground wire must run continuously and be grounded at each junction box, except in those conduits used solely for interconnect and detector circuits.
  - 2. Bond the ground wire to the ground rod in each junction box except in circuits with less than 50 V.
- C. Neatly arrange wiring within cabinets, junction boxes, fixtures, etc.
- D. Terminate all terminal connections by a mechanical (spade) connector.
- E. Wire splicing:
  - 1. Splice wires only in detection circuits where the wire type changes in the junction boxes.
  - 2. Mechanically secure or solder, individually insulate, and water seal all splices. Encapsulate in a rigid body re-enterable gel filled enclosure, or cover with mastic rubber pads and overwrap with vinyl electric tape.

- F. Mark cabinet cables with vinyl electrical color coding tape as specified according to Table 3. Meet UL 510.

**Table 3**

<b>Cables Marked with Colored Tape</b>				
	<b>Northbound P2</b>	<b>Southbound P3</b>	<b>Eastbound P4</b>	<b>Westbound P1</b>
<b>Signal Circuit</b>	Blue	Red	Yellow	Orange
<b>Detector Circuit</b>	Blue	Red	Yellow	Orange
	<b>Circuit Coding</b> One band, Through, 2 bands, Left Turn, 3 bands, "Q's", Four bands, Dilemma			
<b>Pedestrian</b>	Blue & Green	Red & Green	Yellow & Green	Orange & Green
<b>Pedestrian Button Circuit (3)</b>	Blue & White	Red & White	Yellow & White	Orange & White

- G. Connect conductors according to Table 4.

**Table 4**

<b>Color-Coded Conductors</b>		
	<b>North-South</b>	<b>East-West</b>
<b>Seven-Conductor Pedestrian Circuit</b>	Red - Don't Walk Green - Walk White - Neutral	Black - Spare Orange - Don't Walk Blue - Walk White with Black Tracer - Neutral
<b>Three-Conductor Pedestrian Head Circuit</b>	Red - Pedestrian Call White - Common	Black - Pedestrian Call White - Common
<b>Seven-Conductor Signal Circuit</b>	White - Neutral Red - Red Through Orange - Yellow Through Green - Green Through Blue - Green Arrow White with Black Tracer - Yellow Left Black - Left red or spare	

### 3.6 INSTALL DETECTOR LOOPS

- A. Follow Standard Drawings SL 11 and SL 13.
- B. One turn is once around the perimeter of the loop with the same conductor.
  - 1. Use number of turns as specified in Table 1 (Loop Resistance Table).
  - 2. Do not allow twists in the loop.
- C. Loop lead-in from loop to junction box:
  - 1. Minimum of 3 twists per yard in saw cut.
  - 2. Minimum of 10 twists per yard for conduit.
  - 3. Do not interweave with other loop lead-ins.
  - 4. Each lead-in requires a separate conduit.
- D. For Detector Lead-in (feeder) from the junction box to controller cabinet, carry shield across all splices.
- E. Saw cut loop:
  - 1. Round the corners with a minimum of 2 inch drill.
  - 2. Remove all loose material and wash and dry all saw cuts.
  - 3. Place all loop wire in a 1/4 inch polyethylene tube.
  - 4. Seat the conductor with no damage at the bottom of the slot.
  - 5. Fill the saw cut with embedding sealant, surround the polyethylene tube to the level of the existing roadway surface  $\pm$  1/4 inch. Remove any excess embedding sealant.
- F. PVC loop:
  - 1. Trench 2 inch maximum width with 4 inch minimum to 6 inch maximum cover.
  - 2. Anchor sensor loops to prevent movement or floating.
  - 3. Apply a tack coat to the sides and the bottom of the remaining 3 inches of trench and backfill with hot mix asphalt. Refer to Sections 02741 and 02748.
  - 4. Loops in new pavement preformed and placed 1 3/4 inches below the surface of the base course and backfill with surrounding material.

### 3.7 INSTALL POWER SOURCE

- A. Verify the exact location, voltage, procedure, and materials required by the power company.
- B. Follow Standard Drawing SL 6.

### **3.8 INSTALL LUMINAIRE**

- A. As specified.
- B. Follow Standard Drawing SL 1.

### **3.9 INSTALL SIGNAL HEAD**

- A. Do not install signal heads at the intersection until ready for operation.
- B. If turn on is not immediate, completely cover the signal heads with non-transparent, non-paper material tied securely around head.
- C. Install directed and veiled optically-programmed signals following the manufacturer's instructions. Mask each section of the signal with prescribed materials.
- D. Use louvered back plates on all signal heads except Type V and VI. Use a minimum of four 1/8 inch stainless steel screws per section to mount the back plates, or according to manufacturer's instructions.

### **3.10 REMOVE AND SALVAGE EXISTING EQUIPMENT**

- A. Light poles, signal poles, messenger cable, signal and pedestrian heads, controller cabinets, other items as specified on the plans remain the property of the Department.
- B. Transport items to the specified location.
- C. Remove foundations to a depth of at least 6 inches below the existing surface.
- D. Backfill all holes with local material and compact to the density of the surrounding area.

END OF SECTION

**Change One**  
**Revised Articles**  
**1.5 A, B**