Special Specification 6410
Preventive Maintenance of Traffic Signals

1. DESCRIPTION

Replace damaged signal parts, signal heads and illumination parts. Repair signal assemblies and maintain controller cabinets. Clean camera lenses and inspect signal installations at intersections and interchanges.

Record and inform the Engineer of damage observed and repairs performed.

2. LICENSES AND CERTIFICATION

Provide personnel with electrical licensing and electrical certification in accordance with Item 7, “Legal Relations and Responsibilities,” and all applicable Special Provisions to Item 7, “Legal Relations and Responsibilities.”

3. MATERIALS

Furnish materials in accordance with the following:

- Item 618, “Conduit”
- Item 620, “Electrical Conductors”
- Item 625, “Zinc-Coated Steel Wire Strand”
- Item 628, “Electrical Services”
- Item 636, “Signs”
- Item 682, “Vehicle and Pedestrian Signal Heads”
- Item 684, “Traffic Signal Cables”
- Item 685, “Roadside Flashing Beacon Assemblies”
- Item 686, “Traffic Signal Pole Assemblies (Steel)”
- Item 687, “Pedestrian Pole Assemblies”
- Item 688, “Pedestrian Detectors and Vehicle Loop Detectors.”

Materials must conform to the contract referenced standard specifications, special provisions, plans and standards. Furnish all materials required to repair breaks or shorts in electrical conductors and cables including, but not limited to all concrete, wire mesh, conductors and pipe casing.

Return removed material deemed salvageable upon completion of the work and before final payment at the location shown on the plans or as directed. Dispose of material deemed unsalvageable in accordance with federal, state and local regulations.

When performing maintenance on luminaires, verify if fixtures are covered under the manufacturer’s warranty. If warranty applies, coordinate with the Department and follow any necessary procedures to have the manufacturer replace or repair fixtures.

4. EQUIPMENT

Furnish equipment, tools, machinery and labor necessary for completion of the work described. Required equipment includes, but is not limited to an aerial device capable of reaching overhead work, arrow board, truck-mounted attenuator, items related to barricade and construction standard sheets, trenching machine, boring machine, underground conductor detectors, underground fault detectors, splicing tools, etc. Use only
equipment, tools and machinery in good repair and operating condition. Immediately repair or replace any equipment that may affect safety or quality of work, as directed.

5. **WORK METHODS**

Conform to the most current version of the National Electrical Code (NEC), local utility requirements, the requirements of this Item and the pertinent requirements of the following Items:

- Item 618, “Conduit”
- Item 620, “Electrical Conductors”
- Item 624, “Ground Boxes”
- Item 625, “Zinc-Coated Steel Wire Strand”
- Item 628, “Electrical Services”
- Item 636, “Signs”
- Item 682, “Vehicle and Pedestrian Signal Heads”
- Item 684, “Traffic Signal Cables”
- Item 685, “Roadside Flashing Beacon Assemblies”
- Item 686, “Traffic Signal Pole Assemblies (Steel)”
- Item 687, “Pedestrian Pole Assemblies”
- Item 688, “Pedestrian Detectors and Vehicle Loop Detectors.”

Work orders will be issued to the Contractor detailing work locations and type of work.

Worksheets will be provided to the Contractor to document all devices inspected, cleaned or repaired and to report other deficiencies that require attention. Submit completed worksheets to the Engineer. No payment will be made to the Contractor for any locations where a worksheet is not submitted.

5.1. **Preventive Maintenance.** Perform the following work for each traffic signal installation:

5.1.1. **Cables.** Inspect cable (tray, heliax, coaxial, signal) for damage or deterioration, proper attachment, excess slack and tangled cables. Re-lash, tighten and straighten span cables as necessary. Document span and signal cables that show signs of damage or deterioration. Submit written notification to the Engineer of necessary repairs.

5.1.2. **Pole and Mast Arms.** Inspect pole bases, foundations and mast arms. Check welds on pole for fatigue or cracking. Tighten bolts as needed. Remove debris from pole bases. Remove all unnecessary signs. Replace missing hand-hole covers.

5.1.3. **Span Wire.** Inspect steel wire (span, tether, messenger), brackets, set screws, clamps and fittings and service sleeves. Tighten, align, or replace as directed. Check clearance between roadway and signal heads, and adjust to 18 ft. or as directed.

5.1.4. **Conduit.** Inspect conduit affixed to poles and reattach as necessary. Ensure conduit ends are sealed with an approved sealant.

5.1.5. **Pedestrian Push Buttons.** Inspect pedestrian push buttons for proper operation and report damage or malfunctions to the Engineer. Replace as directed.

5.1.6. **Ground Boxes.** Inspect ground boxes, clean out debris and replace or install missing lid bolts. Seal conduit ends as necessary with approved sealant. If necessary, backfill with gravel to insure compliance with Item 624.

5.1.7. **Illumination.** Test Illumination circuits. Notify Engineer of test results and recommend repairs as appropriate.
5.1.8. **Signal/Pedestrian Heads.** Inspect signal and pedestrian head lenses, reflectors, visors and back plates for visibility or damage. Clean lenses and appropriate components with soft cloth, soap and water. Relamp each signal section and pedestrian head when existing lamp is observed to be more than 50% inoperable and as directed. Ensure correct alignment of signal heads as directed. Install signal back plates as directed.

Pass the wiring to each signal head from the mast arm through the signal head bracing or attachment hardware to the signal head. Exposed cable or wiring is not permitted.

5.1.9. **Detector Loops.** Inspect all detector loops in the roadway surface for exposed wires, or deterioration. Seal exposed wires with an approved sealant.

5.1.10. **Electrical Services.** Clean service enclosure, and check operation of photocell, condition of breakers and field wiring connection.

5.1.11. **Signs.** Clean signs with an approved cleaning solution. Document damaged signs.

5.1.12. **Radar Detection.** Clean surface of radar unit and tighten all mounting brackets. Re-aim sensor as directed. Inspect junction boxes and cable terminations for proper connection if the sensor has failed.

5.1.13. **VIVDS.** When Video Detection Cameras are present at the intersection, clean camera lenses with a soft cloth that has been dampened with water. Tighten any loose brackets. Check camera connections and report if loose or corroded.

5.2. **Illumination.** Replace as necessary any lamps, photoelectric cells and heads.

5.3. **Pedestrian Push Buttons.** Replace push buttons. Push buttons must meet the requirements of the Americans with Disability Act (ADA).

5.4. **Signal Heads/Countdown Pedestrian Heads.** Replace complete traffic or countdown pedestrian signal head, brackets and back plates as directed. Undamaged LED signal sections or material deemed salvageable by the Engineer will remain the property of the Department and must be delivered to the locations as shown on the plans.

Pass the wiring to each signal head from the mast arm through the signal head bracing or attachment hardware to the signal head. Exposed cable or wiring is not permitted.

Ensure correct alignment of signal heads as directed.

5.5. **LED Signal Lamp.** Install, replace, or remove LED lamp in accordance with Item 682, “Vehicle and Pedestrian Signal Heads,” as shown on the plans or as directed.

5.6. **Splices.** Splices will not be permitted except as shown on the plans, unless the Engineer approves each individual splice. Ensure allowed splices are water tight. Insulate splices using heavy duty heat shrinkable tubing with factory applied sealant.

5.7. **Controller Cabinet.** Perform the following maintenance services to the controller cabinet as shown on the plans or as directed:

- clean filters,
- replace filters,
- lubricate hinges and lock with graphite spray,
- check weatherproof seal (gasket),
- check anchor bolts and tighten as necessary,
- check for water accumulation and duct sealant,
- check ground rod and entire grounding system,
- check wiring schematics and records,
check operation of fan and heater,
check ground fault receptacle,
clean all shelves in cabinet with soft, damp cloth and remove any foreign residue from shelves,
measure voltages at service inputs in cabinet,
check and record any current being drawn,
vacuum cabinet interior,
remove all graffiti and unauthorized signs or stickers from controller cabinets and signal poles,
replace cabinet lamp as necessary,
apply pesticides as directed,
test Malfunction Management Unit (MMU) and deliver printed report to the engineer or their representative,
clean terminals of all 12-V batteries, and
test charge level of all 12-V batteries and advise if battery needs replacement.

5.8. **Signal Related Signs.** Install, repair, replace, remove, or modify small post-mounted or overhead signs.

5.9. **Tunnel Visor.** Install or replace tunnel visor.

6. **MEASUREMENT**

This Item will be measured as follows.

6.1. **Preventive Maintenance.** This Item will be measured by each traffic signal or beacon location regardless of the number of signal heads included at the installation. Any roadside flashers (advance warning) associated with a given signal or beacon location are considered part of the main signal or beacon installation. For the purpose of this Item, a diamond intersection will be considered as 2 installations (locations) if it has 2 controller cabinets.

6.2. **Back Plate.** By each back plate replaced.

6.3. **Photoelectric Cell.** By each photoelectric cell replaced.

6.4. **Illumination Head.** By each illumination head replaced.

6.5. **Pedestrian Push Buttons.** By each pedestrian push button replaced.

6.6. **Signal Heads/Countdown Pedestrian Heads.** By each traffic or countdown pedestrian signal head replaced.

6.7. **Removal, Replacement or Installation of LED Signal Lamp.** By each LED Signal lamp unit removed, replaced or installed.

6.8. **Splices.** By each splice regardless of the number of conductors in a cable.

6.9. **Controller Cabinet.** By each controller cabinet maintained.

6.10. **Replace Span Cable.** By the foot of span cable replaced.

6.11. **Fuse.** By each fuse replaced.

6.12. **Breakaway Fuse Holder.** By each breakaway fuse holder replaced.

6.13. **Illumination Lamp.** By each illumination lamp replaced.

6.15. **Replacement or Installation of Signal Related Signs.** By the square foot of sign assembly replaced or installed.

6.16. **Installation or Replacement of Tunnel Visor.** By each tunnel visor installed or replaced.

7. **PAYMENT**

The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Preventive Maintenance,” “Illumination Head (Replace),” “Illumination Lamp (Replace),” “Sign Assembly (Remove),” “Sign Assembly (Replace),” “Sign Assembly (Install),” “Tunnel Visor (Install),” “Tunnel Visor (Replace),” “Photo Cell (Replace),” “Back Plate (Replace),” of the type specified,” “Pedestrian Push Button (Replace),” “Fuse (Replace),” “Breakaway Fuse Holder (Replace),” “Traffic Signal Head (Replace),” of the type specified,” “Countdown Pedestrian Head (Install),” of the type specified,” “LED Signal Lamp (Replace),” of the type specified,” “Solder and Weatherproof Wire Splice,” “Maintain Controller Cabinet,” and “Span Cable (Replace).” This price is full compensation for inspections, repairs and replacement and for furnishing labor, tools, equipment and incidentals.