

## **ATTACHMENT A**

### **SPECIAL PROVISION**

Replace Section 660 with the following:

## **SECTION 660 SIGNALS AND LIGHTING**

### **660-1.01 DESCRIPTION**

Furnish traffic signal poles, pedestrian poles, traffic controller cabinet, 5 emergency vehicle preemption sensors detectors, and 4 radar vehicle detector sensors. Installation will be done by others. Wireless interconnect system and pan-tilt-zoom camera will be furnished and completed by others.

**Delivery Location:** Deliver materials to

Alaska Department of Transportation and Public Facilities  
Southcoast Region,  
6860 Glacier Highway,  
Juneau, Alaska 99801

### **660-1.02 DEFINITIONS**

Use the definitions in NEMA TS 2-2003 V02.06, *Traffic Controller Assemblies With NTCIP Requirements*, Section 1, Definitions, along with the following:

1. **Electrolier.** The complete assembly of pole, mast arm, luminaire, ballast, and lamp.
2. **Luminaire.** The assembly which houses the light source and controls the light emitted from the light source. Luminaires consist of hood (including socket, lamp, and ballast), reflector, and glass globe or refractor.
3. **Lighting Standard.** The pole and mast arm which supports the luminaire.
4. **Vehicle.** Any motor vehicle licensed for highway use by the State of Alaska.

**660-2.01 MATERIALS.** Use materials that conform to Section 740, the Materials Certification List, the Plans, specifications, and the following:

Paint	Subsection 708-2.01
Anchor Plate	ASTM A709
Galvanizing	Subsection 716-2.07
Achor Bolts	Section 740-2.02

1. **Equipment List(s) and Drawings.** Within 30 days after the Contract award, submit 8 collated copies of a portfolio of equipment and materials proposed for installation to the Department for review and approval. Include a table of contents in the portfolio(s) that includes each item's intended use(s) and the following:
  - a. **Materials on the Qualified Products List:** The Qualified Products List does not apply to the 660 items. Provide catalog cuts of materials to the Engineer for review and approval.
  - b. **Materials Not on the Qualified Products List:** Catalog cuts that include the manufacturer's name, type of product, size, model number, conformance specifications, and other data as may be required, including manufacturer's maintenance and operations manuals, or sample articles.
  - c. **Pole Package.** A complete set of design, fabrication, and installation proposals for each signal and lighting pole. Include stamped engineering calculations, mill certifications, shop drawings, welding plans, equipment lists, and pole installation plans.

2. **As-Built Plans.** Furnish a list of equipment, including manufacturer, brand, and model number installed in each controller cabinet.

Place 1 copy of the controller cabinet diagram, detector assignment sheet and the intersection and phase diagram as reviewed by the Engineer in clear plastic envelopes and attach to the inside of each controller cabinet.

3. **Warranties, Guarantees, and Instruction Sheets.** Deliver to the Engineer all manufacturers' warranties, guaranties, instruction sheets, and parts furnished with materials used in the work before the Department assumes maintenance responsibilities. A representative of the communications equipment manufacturer must be present at the same time to supervise system turn on and adjustment.

## **CONSTRUCTION REQUIREMENTS**

### **660-3.01 GENERAL**

1. **Scheduling of Work.** Contact the regional DOT&PF Traffic Signal Technician 24 hours in advance of planned delivery. Contact shall be made through the Engineer.

Protect metallic materials against corrosion. Hot-dip galvanize ferrous metals such as bolts, braces, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts not of corrosion resistant steel, according to ASTM A 123 or A 153, except where other equivalent protection treatment is specifically approved in writing by the Engineer.

2. **Welding.** Complete welding according to Subsection 504-3.01.8. Welding and approved shop drawings.

Submit shop drawings of the proposed work with the welding plans for approval. The shop drawings shall include material specifications, component dimensions, the types of welds that will be made, and the proposed type and extent of weld inspection.

Repair the holes that were used to mount equipment, in reused poles and mast arms by welding in disks flush with the adjoining surface. For the disk material, use steel that matches the ASTM designation, grade, and thickness of the steel used to fabricate each pole. Cut disks that match the dimensions of the hole being repaired from pieces of steel plate bent to match the pole's radius at the hole. Grind the welds smooth and flush with the adjoining pole and disk surfaces. Repair the damaged finish according to Subsection 660-3.01.8.

3. **Repairing Damaged Finishes.** Examine new, reused, and State furnished equipment for damage to its finish before putting the equipment into service. Repair the damaged finishes found according to the following:

- a. **Galvanized.** Repair damaged areas more than 12 inches away from welds and slip fit areas, by applying minimum 7.8 mils of zinc based alloy applied according to ASTM A780.

If the damaged areas are within 12 inches of welds and slip fit areas, make the repair by applying a minimum 7.8 mils of zinc rich paint applied according to ASTM A780.

- b. **Painted.** Repair damage to painted finishes according to the following
  - (1) Wash the equipment with a stiff bristle brush using a solution containing two tablespoons of heavy duty detergent powder per gallon of water. After rinsing, wire brush surfaces to remove poorly bonded paint, rust, scale, corrosion, grease, or dirt. Remove dust or residue remaining after wire brushing before priming.
  - (2) Factory or shop cleaning methods may be used for metals if equal to the methods specified herein.
  - (3) Immediately after cleaning, coat bare metal with pretreatment, vinyl wash primer, followed by 2 prime coats of zinc chromate primer for metal.
  - (4) Give signal equipment, excluding standards, a spot finishing coat on newly primed areas, followed by 1 finishing coat over the entire surface.
  - (5) Give nongalvanized standards 2 spot finish coats on newly primed areas.

Paint coats may be applied either by hand brushing or by approved spraying machines. Perform the work in a neat and workmanlike manner. The Engineer reserves the right to require the use of brushes for the application of paint, should the work done by the paint spraying machine prove unacceptable.

9. **Regulation and Code.** Complete work according to the standards of the NEC, the NESC, and local safety codes as adopted and amended by the Authority Having Jurisdiction.
10. **Failed Equipment and Workmanship.** For the term of the Contract, from initial equipment installation through final acceptance, Subsection 105-1.16, when directed, promptly replace failed equipment, equipment components and repair failed workmanship.

### **660-3.02 FOUNDATIONS**

Furnish anchor rods for mast arm poles that conform to ASTM F1554, the grade and supplementary Charpy V-Notch requirements listed in the Plans. Furnish each anchor bolt with three nuts and two washers.

**660-3.03 CONDUIT.** Reserved.

**660-3.04 JUNCTION BOXES.** Reserved.

**660-3.05 WIRING.** Wire all cabinets with conductors sized to handle the amperage drawn under full cabinet use. Make wiring neat in cabinets by cabling wires together with self-clinching nylon ties. Use rubber grommets wherever conductors penetrate posts or mast arms. Terminate all spare conductors on terminal blocks. Attach all conductors, including spares, to terminal blocks with "spade" type terminal lugs.

Furnish additional terminal blocks if enough locations are unavailable in existing terminal blocks. Run signal cabling continuously without splices from the controller cabinet to the termination lugs in the signal housing.

Separate the neutral for pedestrian push button circuits from the signal light circuit neutral.

**660-3.06 BONDING AND GROUNDING.** Fabricate poles with a grounding lug in the handhole.

Bond and ground branch circuits according to the NEC and the following requirements: Make noncurrent carrying but electrically conductive components, including: metal conduits, junction box lids and frames, cabinets, transformer cases, and metal posts and poles, mechanically and electrically secure to an equipment grounding conductor. Make fixtures mounted on metal poles, including signal components and luminaires, mechanically and electrically secure to the pole.

**660-3.07 TRAFFIC CONTROLLER ASSEMBLIES.** Prepare each solid-state, traffic controller assembly to operate various traffic signal devices as shown on the Plans. The controller must provide right-of-way, clearance, and other indications using duration and sequence as determined by preset programming.

Details of operation for the complete controller assembly must be according to the traffic phases; preferential phase sequence and concurrence; signal indications; signal indication sequence; detection requirements; and other details shown on the Plans or as specified herein.

#### **1. Shop Tests**

The Controller Assembly manufacturer shall conduct a pretest of the cabinet and controller assembly. The pretest includes but is not limited to:

- a. Ensure the cabinet is free of paint scratches, dents, sharp edges, and other physical defect.
- b. Ensure cabinet hinges, heater, ventilation system, lighting, and door locking mechanism function properly.
- c. Ensure that there are no shorts between AC+, AC-, and GND anywhere in the cabinet.
- d. Check that there is no continuity between AC+ and DC+.

- e. Check for continuity between any green wire connection point and GND.
- f. Ensure devices within the cabinet are labeled properly.

The Controller Assembly manufacturer shall conduct a final test of the cabinet and controller assembly. Qualified Cabinet Test Technicians shall conduct the final test. The final test includes but is not limited to ensuring proper operation of: flash colors & combination, standard controller phasing, pedestrian pushbutton isolation, MMU, circuit breaker/fuse operation, telemetry operation, detector rack operation, EVP operation, UPS operation, and, proper police & auxiliary panel operation.

Upon completing the final test the cabinet shall be run, "burned in," under full loads for a period of not less than 48 hours with a test timing plan in effect which utilizes full cabinet phases and functionality.

In the course of testing, a component found to function incorrectly or exhibit physical damage must be replaced with an equivalent new component before delivery. Should the cabinet fail during burn in, the cause of the failure must be remedied and the test restarted with another 48 hours of burn in. With prior approval of the Engineer, other equivalent test procedures may be substituted.

Upon completion of the pretest, final test, and burn in, the Controller Assembly manufacturer shall issue a letter of certification stating that the required tests have been completed, note defects found and the remedial action taken. Further, the certification shall state the assembly conforms to the NEMA TS 2-2003 v02.06, Traffic Controller Assemblies with NTCIP Requirements, Section 2 Environmental Requirements. Submit the certification letter and copies of the test results to the Engineer.

## **2. Controller Cabinet Installation.**

Controller cabinets will be installed by others.

- a. Where the cabinet is mounted on a concrete pedestal foundation, place a 1-inch drain hole or pipe with screen in the foundation, connecting to the cabinet and emptying above the ground line.
- b. Place a 3/8-inch fillet of silicone caulking between each controller cabinet and the concrete slab foundation to prevent dust and dirt from entering the cabinet.
- c. When called for in the Plans or Special Provisions, add 2 inches of approved foam insulation within the bottom of the cabinet between the control equipment and the concrete base. Design all wiring, terminals, and other items to allow sufficient room for the insulation.
- d. On Precast Controller Foundations. When called for in the Plans or Special Provisions, place a 3/8-inch thick, 2-piece exterior grade plywood board on the bottom of the cabinet and under the foam insulation. Place the plywood within the controller cabinet, and do not extend under it. Make holes to allow for the conduits entering the cabinet. Place a pliable sealant composed of a silicon caulking compound between the plywood board and the cabinet and between the plywood board and all the conduits.
- e. Place a ground rod in the Type III junction box next to the cabinet or in the foundation of the cabinet if it is precast foundation.
- f. See Subsection 660-3.05 and Section 740 for wiring requirements.

## **3. Controller Operation.** Provide the following operations.

- a. Wire the controller cabinet to flash the yellow signals on the main street or highway, and the red signals on the cross streets and left turn lanes.
- b. Make the flashing circuit independent of the controller unit. They must remain in operation upon shutdown of the controller or removal of the controller from the cabinet.

- c. Wire the controller cabinet so that removal of the conflict monitor causes the intersection to go into flashing operation.
- d. Accomplish transfer to flashing operation by relays between the normal load switching device and the field terminals.
- e. Do not operate pedestrian pushbuttons at more than 24 volts.
- f. Controller Priorities. Prioritize the drives, controls and equipment so that each device, control, or item of equipment overrides the operation of those items listed below it:
  - (1) Power failure
  - (2) Power restart
  - (3) Flashing
  - (4) Railroad preemptor
  - (5) Emergency vehicle preemptor
  - (6) Phase selector
  - (7) Interconnect
  - (8) Time switch
  - (9) Normal controller unit operation

Provide the following preemption operations when called for on the Plans or as specified in the Special Provisions.

- a. **General.** Preemption units must use the controller unit functional inputs and timings to the largest extent possible. Signal load switching control must remain with the controller unit.
- b. **Railroad Preemption.** Not applicable.
- c. **Emergency Equipment Preemption.** The Emergency Equipment Preemption Routine must consist of 3 functional intervals in the order listed below:

**(1) Enter Preemption Interval.**

- (a) Energize a 120 VAC alarm circuit which may be used for a sign, bell, or beacon.
- (b) Immediately advance to the pedestrian clearance interval of any walk that is being displayed. On any phase other than the track clearance phase(s), abbreviate the pedestrian clearance interval by a timer with a minimum range of 0-30 seconds.
- (c) Following the pedestrian clearance period, the controller must advance into and time normally the vehicle clearance intervals.
- (d) If the preemption call is received while in the preempt phase(s), skip step (b) and (c) above.

- (2) **Preempt Phase Interval.** Hold the controller in the preempt phase(s) until the call is removed.
- (3) **Leaving Preemption Interval.** When the preemption call is removed, the controller unit must immediately revert to normal operation.

**660-3.08 SIGNAL AND LIGHTING INSTALLATION REQUIREMENTS.** Reserved.

**660-3.09 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS.** Reserved.

**660-3.10 FALSEWORK LIGHTING.** Reserved.

**660-3.11 TRAFFIC SIGNAL MODIFICATIONS.** Reserved.

**660-4.01 METHOD OF MEASUREMENT.** Section 109.

**660-5.01 BASIS OF PAYMENT.**

Payment includes design, manufacture, and delivery of signal poles, pedestrian poles, mast arms, anchor bolts, handhole covers, and associated fasteners. Payment also includes design, manufacture, testing, and delivery of functional traffic controller cabinet. Traffic controller cabinets shall include cabinet, controller unit, standard auxiliary equipment, and special auxiliary equipment specified. Including sensors and cabling for the radar vehicle detection system, and Opticom preemption system detectors. Provide sufficient length of radar sensor cables to connect the radar sensors to the cabinet-mounted detection equipment when installed in the configuration shown in the plans. Remanufactured or rebuilt equipment will not be permitted.

## SECTION 740

### SIGNALS AND LIGHTING MATERIALS

#### SPECIAL PROVISION

Replace Subsection 740-2.10 with the following:

#### **740-2.10 CONTROLLER UNIT.**

Actuated Controller Unit (CU).

Provide solid state, Type A2N Actuated Controller Units (CU) meeting the requirements of Section 3 of the NEMA Standard Publication TS 2-2003 V02.06, Traffic Controller Assemblies with NTCIP Requirements.

1. The CU must meet the referenced National Transportation Communications for ITS Protocol (NTCIP) and comply with publication TS 3.2 the Simple Transportation Management Framework, and shall meet the requirements for Conformance Level 2
2. The software shall comply with NEMA TS 3.3, the Class B Profile, and shall include both an EIA/TIA 232-E and an FSK modem interface for NTCIP based communications.
3. The CU shall implement conformance groups and optional object groups as defined in NEMA TS 3.4 and TS 3.5 for A2N level 2.
4. The CU shall be compatible with the regional TACTICS traffic management software.

Use Siemens Eagle EPAC M60 controller with SEAPAC 3.34 software installed. Provide 2MB DataKey with controller.

#### **740-2.11 CONTROLLER CABINET.** Replace the first two paragraphs with the following:

Provide a controller cabinet that meets the requirements of NEMA Standard TS 2-2003 V02.06 Traffic Controller Assemblies with NTCIP Requirements (NEMA TS-2), Section 5 Terminals and Facilities and Section 7 Cabinets. Cabinet enclosure shall be UL listed. The cabinet assembly shall be completely manufactured in the United States of America.

Cabinet shall be a 'Stretch P' size, with an integrated battery backup system. Construct cabinet out of sheet aluminum. Apply 2 factory finishing coats of aluminum paint to the outside of the controller cabinets. Do not paint the inside of the cabinet. Provide Western Systems Stretch Plus with UPS cabinet or approved equal.

Remove the first three sentences of subparagraph number 1.d.(5) and replace with the following:

Furnish the cabinet with an LED light fixture, 4000 Kelvin minimum color temperature and at least 300 lumens.

Remove subparagraph number 1.d.(7)(b) and replace with the following: a hinged clear plastic shield. Signal operators must lift the shield up to access the control panel.

Add the following after subsection numbered 1.d.(7): (8) Receptacle. Install a convenience outlet with independent ground fault circuit protection. Use a duplex, 3-prong NEMA Type 5-20R grounding type outlet. The outlet shall be installed in the cabinet and not on the door. The heater shall be plugged into the receptacle connected to the thermostat.

(9) Cabinet Drawer. Install a sliding cabinet drawer beneath one of the cabinet shelves. The drawer shall have nominal dimensions of 16" W x 12" D x 1.75" H. The drawer shall contain the maintenance log and all as-builts and manuals for the traffic signal and cabinet components.

Remove subsection number 1.e. Police Panel Assembly

**740-2.12 STANDARD AUXILIARY EQUIPMENT.** Add the following:

Provide equipment meeting the requirements of Section 6 of the NEMA Standard Publication TS 2-2003 V02.06, Traffic Controller Assemblies with NTCIP Requirements (NEMA TS-2).

Add the following to subparagraph number 1: The flasher shall be PDC SSF87 or approved equal.

Add the following to subparagraph number 2: The load switches shall be shall be PDC SSS87 or approved equal.

Add the following after subparagraph number 3.c.: d. The conflict monitor shall be a SmartMonitor MMU-16LEip Series, manufactured by Eberle Design, Inc.

Add the following to subparagraph number 4: The flash transfer relay shall be shall be Detrol Controls Model 295 or approved equal.

Replace Subsection 740-2.13 with the following:

**740-2.13 SPECIAL AUXILIARY EQUIPMENT.**

Provide equipment meeting the requirements of the cited Sections of the NEMA Standard Publication TS 2-2003 V02.06, Traffic Controller Assemblies with NTCIP Requirements (NEMA TS-2).

1. Inductive Loop Detector Units. Reserved
2. Local Coordination Units. Provide actuated coordination that conforms to the requirements of NEMA TS-2, Section 3.6 Actuated Coordination.
1. System Modem/Interface Unit. The cabinet shall come with an 8 pair copper ethernet switch. Four ports of 10/100TX and an optional 1000base SFP port. The ethernet switch shall support all of the following minimum requirements; EFMplus technology, virtual local area networks (VLAN) tagging (IEEE 802.1q) and dynamic bridging (IEEE 802.1). The copper ethernet device shall provide for communication over copper pairs split into two directions and the high speed link shall be over bonded copper pairs (IEEE 802.3ah 2Base-TL). The copper ethernet switch shall be an Actelis Networks model ML688 or approved equivalent. The following items shall be supplied with the copper ethernet switch:
  - a. Two quad DSL cables
  - b. One AC power adapter for the ethernet switch
  - c. Four Cat6 patch cables 3 feet
  - d. One SFP Optics 100base FX SM 1310nm 15km LC
  - e. Carrier-class element management system
3. Preemption Units. Provide preemption that conforms to the requirements of NEMA TS-2, Section 3.7 Preemption and the following:
  - a. EVP Infrared Opticom  
Install the following components of the GTT Company's Opticom Priority Control System according to GTT's written installation instructions at the signalized intersections listed on the Plans.
    - (1) The system must be capable of sending a signal to the controller when an Opticom signal from a vehicle-mounted "GTT OPTICOM Emitter" has been received and maintained for a period of 1.7 seconds.
    - (2) Unless otherwise shown on the Plan use Opticom Traffic Control Systems Opticom Detector Model 721 preemption detectors.



- (3) Furnish the appropriate number of Opticom Traffic Control Systems 764 Phase Selectors to meet the number of channels of detection for each intersection. Use rack mounted phase selectors.
  - (4) The controller cabinet shall be wired with a Model 768 Auxiliary Interface Panel for the full utilization of all auxiliary detector and green sensing operations of the 764 Phase Selectors. Wire the cabinet with a Model 757 Auxiliary harness for interface between cabinet terminal blocks and Model 768 Auxiliary Interface panel.
  - (5) Install Model 138 detector lead in cable between the end of each signal mast arm and the controller cabinet. Furnish enough slack in these cables for them to extend 2 feet beyond the end of each signal mast arm and to leave 10 feet of slack in the controller cabinet. Seal both ends of each lead in cable with mastic lined, heat shrink tubing end caps.
  - (6) The controller, rather than the phase selector or auxiliary logic, must perform interval timing, signal sequences, and phase skips.
  - (7) Mount detectors according to manufacturer recommendations or as approved by the Engineer. Mount and aim detectors to provide maximum emergency vehicle recognition. Detector locations shown on the Plans are approximate and subject to change as directed by the Engineer.
4. Bus Interface Unit (BIU). Provide BIU's that fully meet the requirements of NEMA TS-2 Section 8. Unless otherwise called for in the Plans provide six BIU's that meet the NEMA designation BIU2. In addition, all BIUs shall provide separate front panel indicator LED's for DC power status and SDLC Port 1 transmit and receive status. The (BIU)'s shall be Eberle Design, Inc. model BIU700 or approved equivalent.
  5. Power supply. Provide a shelf mounted power supply that conforms to the requirements of NEMA TS-2 Section 5.3. The (PS) shall be Eberle Design, Inc. model PS250 or approved equivalent.
  6. Radar Detection System.
    - a. System Hardware. For vehicle detection, provide a Wavetronix digital wave radar vision system or approved equivalent that consist of the following components:
      - (1) Stop bar detector (SBD). For all approaches, provide an above-ground stop bar detector (SBD) equivalent to the Wavetronix SmartSensor Matrix® that will detect all vehicles, including bicycles for reliable and accurate presence detection.
        - (a) Physical Properties. The SBD shall not exceed 5 lbs. in weight. The SBD shall not exceed 14 in. x 12 in. x 4 in. in its physical dimensions. All external parts of the SBD shall be ultraviolet-resistant, corrosion resistant, and protected from fungus growth and moisture deterioration.
        - (b) Enclosure. The SBD shall be enclosed in a Lexan EXL polycarbonate. The enclosure shall be classified "f1" outdoor weather ability in accordance with UL 746C, watertight according to the NEMA 250 Standard, and conform to test criteria set forth in the NEMA 250 standard for type 4X enclosures.
        - (c) Power. The SBD shall consume less than 10 W, operate with a DC input between 9 VDC and 28 VDC, and have an onboard surge protection.
        - (d) Communication. The SBD shall have two half-duplex RS-485 com ports support for dedicated detection comms; and for configuration, verification, or traffic display without disrupting detection comms. The SBD shall support the upload of new firmware into the SBD's non-volatile memory over Ethernet communication port. Both communication ports shall support all of the following baud rates: 9600, 19200, 38400, 57600 and 115200 bps.

- (e) Operating Conditions. The SBD shall maintain accurate performance in all weather conditions, including: Rain, freezing rain, snow, wind, dust, fog and changes in temperature and light, including direct light on sensor at dawn and dusk. SBD operation shall continue in rain up to 1 in. (2.5 cm) per hour; capable of continuous operation over an ambient temperature range of -40°F to 165°F, and a relative humidity range of 5% to 95% (non-condensing).
  - (f) Testing. Each SBD shall be Federal Communications Commission (FCC) certified under CFR 47, Part 15, section 15.249 as an intentional radiator and a FCC certification shall be displayed on an external label on each SBD according to the rules set forth by the FCC. The SBD shall also be tested under IEC 61000-4-5 class 4 and NEMA TS2-2003 Testing. The SBD shall comply with the applicable standards stated in the NEMA TS2-2003 Standard. Third party test results shall be made available when requested.
  - (g) Manufacturing. The SBD shall be manufactured and assembled in the U.S.A.
  - (h) Support. The SBD manufacturer shall provide both training and technical support services.
    - Training. The manufacturer-provided training shall be sufficient to fully train installers and operators in the installation, auto-configuration, and use of the SBD to ensure accurate SBD performance.
    - Technical Assistance. A manufacturer-provided technical representative shall be available to assist with the physical installation, alignment, and configuration of each supplied SBD. Technical support shall be provided thereafter to assist with troubleshooting, maintenance, or replacement of SBDs should such services be required.
  - (i) Documentation. SBD documentation shall include an instructional training guide, a comprehensive user guide, as well as an installer quick-reference guide and a user quick-reference guide. The SBD manufacturer shall supply the following documentation and specification test results at the time of the bid submittal:
    - i. FCC CFR 47 certification
    - ii. IEC 61000-4-5 class 4 test report
- (3) Click 650 cabinet interface device (CIB). For each signal cabinet, provide a Click 650 that will provide a streamlined communication for SmartSensor Matrix to traffic controllers in one compact case. This module communicates directly to the controller through SDLC, and supports contact closure devices as well. It also provides power, surge protection, and Ethernet connectivity for all sensors.
- (a) Included components.
    - i. Click 650, AC power cord, Extra fuse, Terminal blocks for attaching to cable, and 4 jumper cables
  - (b) Physical.
    - i. Weight: 4.9 lbs.
    - ii. Physical dimensions: 7.8 in. × 10.3 in. × 3.9 in.
    - iii. Ambient operating temp: -29°F to 165°F
    - iv. Humidity: up to 95% RH
  - (c) Mounting.
    - i. Shelf-mount
  - (d) Power.
    - i. Power supply voltage: 90 to 260 VAC
    - ii. AC frequency: 50–60 Hz

- iii. Max power: 75 W @ 80°C
  - iv. 24 VDC output on sensor connectors
- (e) Connections and Communications.
  - i. One RJ-45 10/100 Ethernet jack
  - ii. One SDLC port
  - iii. Four terminal block connectors on back of device for connecting to sensors
  - iv. Four RJ-11 jacks on faceplate of device for connecting to contact closure devices
  - v. Four communication ports on faceplate
    - DB-9 port for communicating via RS-232
    - Two RJ-11 jacks for communicating via RS-485
    - USB mini-B connector
    - T-bus port
- (f) Testing.
  - i. Complies with the applicable standards stated in the NEMA TS2- 2003 Standard
  - ii. FCC-compliant
  - iii. Passes manufacturer's test before shipping
- b. SmartSensor Manager Matrix (SSMM) software
- c. SmartSensor Manager Advance software for automatic and manual sensor configurations
- d. SmartSensor Mount
  - (1) General. Provide traffic sensor mounting assembly equivalent to the Wavetronix SmartSensor mount.
  - (2) Mounting. The mounting assembly shall provide at least two axes of rotation to ensure proper installation.
    - (a) The mounting assembly shall be able to support at least a 15-lb. load.
    - (b) The mounting assembly shall feature a symmetric hole pattern that mates with fixed and rotational SmartSensor back plates.
    - (c) The mounting assembly shall have two contact points with the pole.
    - (d) The mounting assembly shall be slotted for 3/4" banding.
  - (3) Construction. The mounting assembly shall be constructed of 0.1875" thick or thicker aluminum with 316 stainless steel hardware. The mounting assembly shall be powder coated for oxidation resistance.
- e. Installation Kit
  - (1) General. Provide an installation kit equivalent to the Wavetronix Install Kit, for use while installing and configuring radar vehicle sensing devices or continuous tracking advance detectors, equivalent to the Wavetronix SmartSensor products, or in-cabinet contact closure and communication connectivity devices equivalent to the Wavetronix Click! Products.
- f. Smartsensor Cable Junction Box
  - (1) For each radar sensor, provide a Type 4X cable junction box enclosure to connect the Wavetronix 6-conductor pigtail cable to the APT Matrix 2 homerun cable.
- g. Wavetronix SmartSensor 6-conductor cable. For each detector provide a cable of length indicated in the plans.

- h. APT Matrix Type 2 Home Run cable. For each detector provide a cable of length to run from the in-line terminal enclosure at the pole base handhole to the Click 650 unit inside the controller cabinet. Provide 15 feet of neatly coiled slack cable in the base of the controller foundation. Provide sufficient slack at pole, so the in-line terminal enclosure can be pulled out of the handhole for maintenance work.
- 7. Uninterruptible Power Supply (UPS). Furnish traffic controller cabinet with a shelf-mount UPS capable of powering the entire cabinet for a minimum of 4 hours. UPS shall feature a standard 120 volt outlet on the front panel, SNMP adaptor for connection to the TCP/IP signal interconnect network, bypass switch, and display screen showing battery status, system status, and event logs. Wire UPS to provide continuous power conditioning to the signal system. UPS shall be rated to operate from -40° to 165° F. The Clary UPS Module (SP1250LX-N) has been used in other cabinets in the region.
- 8. Cabinet Data Recorder. Furnish a cabinet data recorder device that is wired into the cabinet SDLC and records a rolling 30 minute record of cabinet communications, including data from the controller, MMU, and BIUs. Data recorder shall include software to translate the SDLC recordings into easy to understand graphics and text for cabinet troubleshooting. Device shall have removable memory that is readable by a standard PC via USB. Provide dongle or memory reader if required. Provide ATSI TS2 Frame Grabber or approved equal.