ITEM: 683.80328108 – POLE MOUNTED FIELD EQUIPMENT CABINET
ITEM: 683.80338108 – BASE MOUNTED FIELD EQUIPMENT CABINET

DESCRIPTION:
This work shall consist of furnishing and installing Field Equipment Cabinets at the locations shown in the plans and as directed by the State Regional Transportation Management Center (TMC) Engineer. These cabinets shall be certified Model 336S (TMS) or Model 334 (TMS) with additional modifications as specified in this contract item. This cabinet meets all Caltrans and Federal Highway Administration (FHWA) requirements. These cabinets shall house ITS, control and communications equipment furnished and installed under other contract items.

MATERIALS:
All materials furnished, assembled, fabricated, or installed shall be new, corrosion resistant, and in strict accordance with the standards set by the New York State Department of Transportation (NYSDOT) and shall be in the NYSDOT Transportation Management Equipment Qualified Parts List (QPL), July 2017 (or the latest revision) or as approved by the Regional Traffic Management Center (TMC) Engineer.

The pole mounted field equipment cabinet shall comply with specifications for the Model 336S (TMS) Traffic Management System Cabinet as stated in the “Transportation Electrical Equipment Specifications” (TEES), March, 2009 or latest revisions and all addenda thereof as referenced in the NYSDOT Transportation Management Equipment QPL. For simplicity this Cabinet will also be referred to elsewhere in the Contract Documents as the Model 336S Cabinet. The contractor shall submit a certificate of compliance for each cabinet to Regional TMC Engineer for review and approval.

The base mounted field equipment cabinet shall comply with specifications for the Model 334 (TMS) Traffic Management System Cabinet as stated in the “Transportation Electrical Equipment Specifications” (TEES), March, 2009 or latest revisions and all addenda thereof as referenced in the NYSDOT Transportation Management Equipment QPL. For simplicity this Cabinet will also be referred to elsewhere in the Contract Documents as the Model 334 Cabinet. The contractor shall submit a certificate of compliance for each cabinet to Regional TMC Engineer for review and approval.

Each of the cabinet configurations covered by this specification shall be provided complete with all internal components and all mounting hardware necessary to provide for the installation of control and communications equipment as described in the plans and Special Specifications.

Cabinets shall also be furnished with pre-drilled and taped rails for standard 19 inch rack mount installation. Two adjustable height shelves shall be supplied for supporting electronic equipment. The cabinet shall be supplied with a Corbin #2 dead bolt lock or equal. The key shall be removable in the lock position only. The cabinet shall be suitable for pole mounting and must be supplied with all required stainless steel mounting hardware.

The Contractor shall provide a combination of standard and optional Model 336S equipment as required to support the ITS, control and communications equipment to be installed. The Contractor shall obtain the cabinet and internal equipment from manufacturers listed in the NYSDOT “Qualified Products List” or applicable document as specified by the Regional TMC Engineer.

The Contractor shall submit a detailed dimensional drawing and cabinet equipment general layout...
ITEM: 683.80328108 – POLE MOUNTED FIELD EQUIPMENT CABINET
ITEM: 683.80338108 – BASE MOUNTED FIELD EQUIPMENT CABINET

of each type of component used in the cabinet with data sheet or cut sheet submitted for review by the Regional TMC Engineer. Only cabinets with approved layouts will be accepted under this Contract. Terminology used in this specification with respect to the Model 336S or 334 Cabinet is as defined in the TEES.

After cabinet general layout and component approval, the contractor shall submit the detail schematic drawing for review by the Regional TMC Engineer. Upon approval, the contractor will construct the cabinet according to the approved layout and schematic.

Field Equipment Cabinet Requirements:
Provisions shall be made in the Field Equipment Cabinet for the installation of the following equipment:

a. A cabinet configuration for a field installation will include at least the following equipment which is provided under other contract items:
   - ITS Network Equipment such as an Ethernet Switch, Router, Firewall, Modem or a service provider network interface unit as shown on the Contract drawings.
   - ITS Communication physical Hardware Equipment such as Fiber Optic Patch Panel, Ethernet Patch panel, Terminal block
   - ITS Field Equipment such as CCTV camera interface, Dynamic Message Sign (DMS) interface, traffic detector station, and power distribution unit (PDU) as shown on the Contract drawings

b. Power Service Panel assembly with:
   - Main Circuit Breaker (MCB) – The MCB shall be: 100 Amps or 2 x (the cabinet proposed equipment loads), whichever is greater. The MCB shall be double pole with auxiliary NO+NC contact signal output. The MCB shall be a UL approved part.
   - Secondary Circuit Breakers (CB) - A minimum of 8 secondary CBs shall be UL 489 approved. The trip and frame sizes shall be plainly marked (marked on the breaker by the manufacturer), and the Amperes rating shall be marked and visible from the front of the breaker. Contacts shall be silver alloy and enclosed in an arc-quenching chamber. Overload tripping shall not be influenced by an ambient air temperature range of from 0.4 °F to 122 °F. The minimum Interrupting Capacity of a secondary breaker shall be 5,000 Amperes RMS when the primary is a UL approved fuse. In case both primary and secondary are circuit breakers, both breakers in shall be concert provide the rated 5000 Amps RMS capacity. For circuit breakers 80 amperes and above, the minimum interrupting capacity shall be 10,000 amperes, RMS
   - Spare Circuit Breakers – A minimum of two spare 15 Amp secondary CBs shall be provided.
   - Power Surge Suppressor (PSS) – A PSS with a minimum rating of 30 A or 2 x (the cabinet proposed equipment loads), whichever is greater. The PSS shall be a UL approved part. The suppressor terminals shall be nickel plated brass studs of sufficient external length to provide space for connection of two appropriately sized conductors and shall be so mounted that the terminals cannot be turned in the case. The suppressors shall be designed for operation at the proper current rating (minimum 30 amp.) The Contractor shall calculate the current loads of the proposed equipment cabinet and if 2 x total proposed equipment load greater than 30
ITEM: 683.80328108 – POLE MOUNTED FIELD EQUIPMENT CABINET
ITEM: 683.80338108 – BASE MOUNTED FIELD EQUIPMENT CABINET

A, a higher rated PSS shall be furnish and installed. PSS shall have 120/240 Volts, 60 Hertz, operation input and shall be approved by UL and EIA. The ground connection of the device shall be connected only to AC neutral and not connected to earth ground directly.

- Surge Protection - A three-electrode gas tube type that is capable of withstanding 15 pulses of peak current, each of which will rise in 8 μs and fall in 20 μs to 0.5 of the peak voltage at 3-minute intervals. Peak current rating shall be 20 kA. It shall have the following ratings:
  - Impulse Breakdown: Less than 1,000 Volts in less than 0.1 μs at 10 KV/μs.
  - Standby Current: Less than 1 mA.
  - Striking Voltage: Greater than 212 Volts

- Radio Frequency Interference - All cabinets shall be equipped with a Radio Frequency Interference (RFI) filtering device installed at the input power point. The device shall provide a minimum attenuation of 50 dB over a frequency range of 200 kHz to 75 MHz. The suppressor or device shall be hermetically sealed in a substantial metal case filled with a suitable insulation compound.

- Power Terminal Blocks - The terminal blocks shall be barrier type, rated at 50 A for main incoming and other 20 A with 600 VAC RMS minimum. The terminal screws shall be 0.313 in minimum length nickel plated brass binder head type with screw inserts of the same material. Screw size is called out under the associated file, panel or assembly. The terminals of the Block shall be labeled AC+, AC-, AC+ In, AC+ Out, neutral, and EQ GND and shall be covered with a clear insulating material to prevent inadvertent contact. The Terminating Lugs shall be large enough to accommodate # 2 conductors or larger cable as specified on the plan. An AWG #8 Jumper Conductor shall be provided between AC+ In and AC+ Out.

- Cabinet Power Panel/Distribution Wiring Diagram - The diagram shall be Microstation format 11”x17” and should be signed by the Contractor.
  c. Two duplex receptacles wired from a 15 A circuit breaker (UL approved). The receptacles shall have a dedicated CB.
  d. One duplex GFI receptacle wired from a 15 A circuit breaker (UL approved). The GFI receptacle shall have a dedicated CB.
  e. Cabinet Terminal blocks with proper size and proper number of terminals. A minimum of 50% of the terminals of each block shall be spare for future use. The Terminal blocks include: Communication Cable Terminal: COM-TER, Low Voltage Control cables Terminal: CON-TER, Contact Closure Terminal: COT-TER and as required by the project 120/240 VAC Relay Contact Terminal: REL-TER.
  f. Cabinet Neutral and ground buses with minimum 20 terminals each.
  g. Fuses - All Fuses shall be 3AG Slow Blow type and resident in a holder. Fuse size rating shall be labeled on the chassis or beside the holder. Fuses shall be easily accessible and removable without use of tools. Minimum one spare fuse shall be provided for each fuse size.
  h. Door Alarm Contacts - Each door shall be furnished with a set of magnetic contact switches that shall provide a closed circuit path when the door is fully closed and an open circuit path when the door is open. On Field Traffic detection cabinets with a field controller, the wire pairs from each switch shall be connected to provide separate inputs to the field Controller.
i. Sun Shields - A sun shield shall be provided on the top, the two sides and the doors of the Field Equipment Cabinet to reduce the cabinet internal ambient temperature. The shield shall be in the form of 1/8” aluminum sheets installed on 1 inch spacers, mounted with tamper-proof hardware to the cabinets. The Sun Shield shall be the same color as the Field Equipment Cabinet. The areas described above shall be covered, except for the handle and the padlock locations. The top sun shield shall be crowned, in a similar manner to the cabinet top, to provide drainage.

j. Ventilation Fan: In order to maintain air flow in the cabinet when the assembly is operated during high temperature days, a thermostatically controlled ventilation fan sufficient to produce a minimum of 100 cubic feet of air per minute shall be provided. The fan shall engage when cabinet temperature reaches 90 °F and disengage when cabinet temperature falls below 73 °F.

k. Heating - An appropriately sized cabinet heater (not less than 250W) shall be provided and located near the bottom of the Field Equipment Cabinet. An adjustable thermostat shall be provided to turn the heater on at 0 °F and turn the heater off at 50 °F. Both Heater and Thermostat shall be UL listed.

l. A surge and transient noise suppressor in the form of a varistor shall be installed across the thermostats that are used to control the fans and cabinet heaters.

m. Lighting - Two LED tube fixtures with standard size LED tube shall be provided at the front and back of each cabinet. The lights shall be configured to turn on upon door opening.

n. Minimum of two Cabinet Shelves shall be mounted in the rack in a particular height. The Contractor shall coordinate with the Regional TMC for the position of the shelf as per cabinet field equipment and the ITS devices designated to the cabinet. Each shelf shall have a minimum 50 LB load capacity.

o. One anodized aluminum drawer of approximate dimensions indicated in the plans that shall slide into and out of support/roller structure mounted in the cabinet rack. The drawer shall house cabinet and equipment documentation.

p. Cabinet Interface Cables as per required with the cabinet equipment.

q. PVC channels/ wire duct for cable management. The channel/wire duct shall be applicable for routing and organizing the wire in a control panel application. The channel/wire duct shall be PVC-UL 94 V-O rated and a RoHS certify and meet the requirement of DIN Standard 43659.

r. Cabinet Grounding - A solid copper ground bus bar shall be permanently affixed to the inside surface of a cabinet wall. The point of contact between the ground bus and cabinet wall shall have less than 1 ohm resistance. The copper ground bus bar shall have a minimum of 20 connector points, each capable of securing at least one #10 AWG conductor. A.C. return and equipment ground wiring shall return to the ground bus bar. Where multiple bus bars are used, they shall be bonded to each other with bare stranded #10 copper wires. When installed, the cabinets shall be grounded in accordance with Sub-section 680-3.12 of the New York State Standard Specifications.

s. Conductor Color - Conductor Color identification shall be as follows:
   - AC - (Neutral) circuits: White.
   - Equip. Ground: Solid green or continuous green color with one or more yellow stripes.
ITEM: 683.80328108 – POLE MOUNTED FIELD EQUIPMENT CABINET
ITEM: 683.80338108 – BASE MOUNTED FIELD EQUIPMENT CABINET

- DC logic ground: Solid white or continuous white with a red stripe.
- AC + (Line) circuits: Solid black or continuous black with colored stripe.
- DC logic ungrounded or signal: any color not specified.

t. Labeling - All conductors, except those which can be readily traced, shall be labeled. Labels attached to each end of the conductor shall identify the destination of the other end of the conductor. The Label material shall be heat and high temperature resistance label. The contractor shall submit a sample of proposed labels to the Regional TMC for review and approval. The label information shall be exactly match with Field Equipment Cabinet wiring and equipment layout.

u. Workmanship - Workmanship shall conform to the requirements of this specification and be in accordance with the highest industry standards.

v. The Cabinet shall be furnished and assemble with ITS device Data, Power, Video and Ethernet surge protection units. All surge protectors shall be UL listed and be applicable for outdoor application use.

w. Rack mounted industrial Ethernet patch panel with 12 Rj-45 connector - The Ethernet patch panel shall be a 19” standard rack mounted unit with twelve (12) Cat. 6 RJ-45 ports. The panel shall have:
   - Designed for use with CAT6 Patch Panels
   - 12 CAT6 Ports
   - Meets or Exceeds TIA/EIA 568-A and 568-B Standard
   - 110 Style Punch Down
   - 568-A/B Wiring Code
   - UL Listed

x. Cabinet Finish: The cabinet shall be finished as shown on the Plan. The Contractor shall coordinate with the Regional TMC color number and paint code. The Cabinet finishing details shall be approved by the Regional TMC.

y. Cabinet Installation: The cabinet installation shall comply with NYSDOT standard sheet 680-05, Base-Pole Mounted Cabinet Installation Details. The minimum pedestal height shall be 18”.

z. Contractor shall submit general layout plan, electrical/power schematic drawing and overall schematic equipment drawing with the bill of quantity for approval prior to build the cabinet. All wire and equipment label shall be consistence with the schematic drawing.

Mechanical Cable and Conduit Seal Requirements:
Contractor shall install a mechanical cable and conduit sealing system in order to prevent the passage of fire smoke, gasses, dust and water. Mechanical systems can also be used as a cable retention device.

The mechanical seal assembly shall consist of a metal frame, a compression mechanism, and insert modules with peelable layers for a variety of penetrating items, electrical, data or communications cables, pipe, duct and tubing. The peelable modules shall be compressed to form a water, gas and dust tight firestop seal.

The mechanical sealing system shall meet the following technical requirements:
ITEM: 683.80328108 – POLE MOUNTED FIELD EQUIPMENT CABINET
ITEM: 683.80338108 – BASE MOUNTED FIELD EQUIPMENT CABINET

a. Shall contain sealing modules that have multiple, peelable layers in order to accommodate different cable / pipe ODs.
b. Comply with F- and T-ratings as required by local codes, code official, and as tested in accordance with ASTM E814 or UL1479.
c. Designs should also have a L Rating (CFM/FT2) of <1 at Ambient and <1 at 4000.
d. Designs should be water and gas tight to 14.5 psi.
e. Seals for enclosures shall provide the appropriate NEMA rating.
f. Shall provide cable retention where applicable and as recommended by manufacturer.
g. Shall be asbestos free, lead free.
h. Shall be moisture resistant and not dissolve in water.
i. Shall be Halogen free.

The sealing system shall meet the following standards:

a. American Society for Testing and Materials (ASTM) standard test methods for:
   - ASTM E84: Surface Burning Characteristics of Building Materials
   - ASTM E814: Fire Tests of Through-Penetration Firestops

b. Underwriters Laboratories Inc. (UL)
   - UL 263: Fire Test of Building Construction Materials
   - UL 723: Surface Burning Characteristics Test of Building Materials
   - UL 1479: Fire Test of Through-Penetration Firestops

c. National Fire Protection Association (NFPA)
   - NFPA 70 - National Electrical Code

d. National Electrical Manufacturers Association (NEMA) Standard 1-10-79 For Type 1-6p and 11-13 Enclosures

CONSTRUCTION DETAILS:

The Field Equipment Cabinets shall be installed on the poles or ground mounted as shown on the plans along with conduit fittings necessary to bring cables into the cabinet. The ground mounted cabinet shall have a cabinet base pedestal, which will be paid under the item 680.5002: Concrete Base for the Controller Cabinet as designated in the contract drawing.

Prior to cabinet installation, the Contractor shall submit an approved cabinet wiring schematic for each cabinet specified to the Regional TMC Engineer. The schematic shall depict the wiring required for the equipment complement of that specific cabinet. No cabinet shall be installed without an approved schematic. Prior to field installation of the cabinet, the Contractor shall send a full assembled cabinet type to the Regional TMC for the assembly work inspection. The contractor shall address the Regional TMC Engineer’s comments and modify the cabinet assembly as per comments.

The AC service to be run to the cabinet shall be terminated. The cost of providing the AC service connection is included in other bid items as designated in the contract plans. In addition, the cabinet shall be connected to an adequate grounding. Power shall be activated and Voltage, Current, Ground shall be measured and meter operation shall be tested to verify that proper line service is being obtained. A copy of the field office Electrical inspection and acceptance shall be provided to the
ITEM: 683.80328108 – POLE MOUNTED FIELD EQUIPMENT CABINET
ITEM: 683.80338108 – BASE MOUNTED FIELD EQUIPMENT CABINET

Regional TMC.

The contractor shall terminate any inbound and outbound (if required), fiber optic, telephone, or wireless antenna leads and Ethernet cables in the cabinet. Any twisted pair communication cable shall be terminated on the communication termination blocks (COM-TER). Any Ethernet cable shall be terminated in the Ethernet Patch panel. Labels and Lugs shall be installed at the end of each conductor suitable for connection to the barrier terminal blocks.

The mechanical sealing system shall be installed and inspected in accordance with manufacturer’s detailed installation procedures.

The cabinet shall have a lockout/tagout electrical disconnect clearly identified nearby and accessible so that the cabinet can be de-energized for safe maintenance. The electrical disconnect shall be corrosion resistant or be installed within a 4x enclosure. Any exposed terminals within the cabinets shall be protected from accidental contact. This is to comply with our department Health and Safety lockout/tagout policy

Documentation:

Submittal of two Cabinet Drawing Packages shall be sent to the TMC for review and approval.

These submittals are:

A. Cabinet Assembly Submittal - The contractor shall provide this submittal a minimum of 30 days prior to cabinet integration and wiring and equipment assembly to the Regional TMC Engineer for review and approval. The cabinet assembly drawings package shall include but not limited to:

- Cabinet Manufacturer’s Cut Sheet
- Cabinet Layout (all physical dimensions and assembly details shall be included)
- Cabinet Mounting details (including foundation, cabinet base details and pole mounting details)
- Cabinet Equipment Placement/Layout
- Cabinet Power Panel/Distribution Wiring Diagram (all AC and DC power distribution shall be included)
- Cabinet Communication, control wiring Diagram (all equipment connections and interfaces shall be included)
- Cabinet equipment, cables and wiring labeling details

B. Final Cabinet Drawing Package - The Cabinet Drawing Package shall be approved by Regional TMC Engineer prior to final acceptance of the Field Equipment Cabinet. The final cabinet drawing package shall be submitted 60 days prior the project closing date to Regional TMC for review and acceptance. If the submittal will not be accepted, the contractor shall respond to the comments and resubmit the final cabinet drawing package. The cabinet drawings package shall include but not limited to:

- Cabinet, pull boxes and cables Location Layouts
- Cabinet Layout (all physical dimensions and assembly details shall be included)
- Cabinet Mounting details (including foundation, cabinet base details and pole mounting details)
- Cabinet Equipment Placement/Layout
ITEM: 683.80328108 – POLE MOUNTED FIELD EQUIPMENT CABINET

ITEM: 683.80338108 – BASE MOUNTED FIELD EQUIPMENT CABINET

- Cabinet Power Panel/Distribution Wiring Diagram (all AC and DC power distribution shall be included)
- Cabinet Communication, control wiring Diagram (all equipment connections and interfaces shall be included)
- Cabinet connection to ITS device
- Cabinet Test Plan and Test Results
- Cabinet equipment, cables and wiring labeling details

All Cabinet drawings shall be 11” x 17” size. All drawing shall be submitted in hard copy, electronic, and CADD/Microstation (latest version used by NYSDOT) formats.

Field Equipment Cabinet Test:

The Field equipment cabinet testing shall be performed after complete installation of the cabinet, all ITS devices, all pull boxes and cables and power and communication service connection at active at the cabinet. This test shall include the following items:

Cabinet Testing requirements:

1. Verify the approved Cabinet Layout Drawing matches the physical layout of the cabinet
2. Verify the approved Cabinet Wiring Drawing matches the physical wiring of the cabinet
3. Verify the approved Cabinet equipment list matches the physical equipment of the cabinet
4. Measure the Power Voltage, Current and power consumption Wattage of the cabinet (average measurement in a minimum period of 10 minutes)
5. Measure the Cabinet Ground Resistance (As per NYSDOT Standard Section 645.3.08; 5 Ohm or less)
6. Check the Cabinet Terminal connection and wiring
7. Check the Device ground connections to the cabinet grounding
8. Check the main CB and secondary CBs installation
9. Check the Cabinet Receptacles installation
10. Check the Surge Protectors installation
11. Check the Ethernet patch panel installation
12. Check all the cabinet equipment and wiring labels
13. Check all input/output cable terminations in the cabinet
14. Check all equipment mounting or placement on shelves. All equipment should be in safe, fix on the shelf (with a mounting bracket or hardware) and be in a secure position.
15. Checking the Cabinet Fan installation
16. Checking the Cabinet Heater installation
17. Checking the cabinet LED Lights installation
18. Checking the Cabinet Thermostats installation
19. Checking the Cabinet conduit entry. All conduit entries should be sealed with an adequate plug to prevent rodent intrusion
20. Check the cable Slack in the Cabinet and in the Cabinet pull boxes ( FO cable 50’, Electrical Cable 6’ and other cables as per the Regional TMC direction)
21. Check the Cabinet cable and wiring installation workmanship
22. Check the Cabinet lock and key (All keys must be turned over to the Regional TMC representative at the test day)
23. Check the Cabinet mounting to pole or Foundation
ITEM: 683.80328108 – POLE MOUNTED FIELD EQUIPMENT CABINET
ITEM: 683.80338108 – BASE MOUNTED FIELD EQUIPMENT CABINET

24. Check the Cabinet Work Pad installation
25. Check the Cabinet ID sticker installation

The contractor shall submit the test forms, procedure and schedule to the Regional TMC for review and approval. The testing shall be coordinated with the Regional TMC and a witness from the Regional TMC shall be present during the testing. The accepted test forms shall be signed by the Contractor, Project Field Office representative and the Regional TMC representative.

WARRANTY

The Contractor shall provide warranties and guarantees to the State of New York Department of Transportation in accordance with Article 104-08 of the Standard Specifications.

METHOD OF MEASUREMENT:

Each Pole or Base Mounted Field Equipment Cabinet will be measured as the number of complete units furnished, installed and tested.

BASIS OF PAYMENT:

The unit price bid for each Field Equipment Cabinet shall include the cost of furnishing all labor, materials, tools, pedestal, equipment and incidentals as necessary to complete the work.

Progress payments will be made as follows:

Twenty Five percent (25%) of the bid price of each item will be paid upon satisfactory completion and approval of the of Field Equipment Cabinet Assembly Submittal, Sixty percent (60%) will be paid upon satisfactory completion of Field Equipment Cabinet Test; Fifteen percent (15%) will be paid upon satisfactory completion of 90-Day Operational Test of the Field Equipment Cabinet.