

SECTION 18310

SIGNAL SHELTERS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section includes requirements for new factory-wired equipment shelters and relocating existing equipment shelters.

1.02 REFERENCE STANDARDS

- A. Code of Federal Regulations (CFR), Title 49, Transportation:
 - 1. Part 234 Grade Crossing Signal System Safety
 - 2. Part 236 Rules, Standards, and Instructions for Railroad Signal System
- B. American Railway Engineering and Maintenance of Way Association (AREMA):
 - 1. Communications and Signals Manual of Recommended Practices (C&S Manual). When following the recommendations of the AREMA C&S Manual substitute the word "shall" for the word "should" in the applicable Manual Part.

1.03 SUBMITTALS

- A. Submit proposed Installation Test Procedures.
- B. Submit load calculations, indicating sizes of load center panel, voltage drops, and all other 240/120 Vac equipment.
- C. Submit Contractor's Inspection and Acceptance Procedure.

1.04 QUALITY ASSURANCE

- A. The Contractor shall provide documentation of acceptance "in good condition" before removing and transporting existing shelters to the job site.
- B. The Contractor shall provide documentation of Factory Acceptance Testing before transporting new shelters to the job site.
- C. Each shelter and case will be inspected after they have been installed and the Contractor shall correct any deficiencies. This inspection will be conducted in conformance with the requirements of the Contractor's accepted Inspection and Acceptance Procedure.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Properly fasten and brace equipment shipped within shelters and cases to prevent damage during transit. Replace any equipment damaged during transit or prior to in-service operation at no cost to the Owner.
- B. Package all vital relays, batteries, and electronic plug-in modules in separate containers for shipment and do not install until the shelter is set at its final location.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Furnish factory-wired equipment shelters or junction cases, as described herein and as shown on the Contract Drawings. These shelters shall be complete with all the equipment shown on the Contract Drawings. Wiring shall conform to NEMA Standard ICS-70, or National Electrical Code (NEC), and the recommendations of the AREMA C&S Manual, as applicable.
- B. Equipment shelters shall be products manufactured by P.T.M.W., Invensys Rail, GETSGS, or equal.
- C. Equipment shelters shall be the size and layout shown on the Contract Drawings.
- D. Equipment shelters shall be rain-tight and dust-tight, National Electrical Manufacturers Association (NEMA) 3R, ventilated, and have hinged doors with three point latch and handle.
- E. Equipment shelters shall be constructed of 12-gauge galvanized steel for floors, walls, and doors. Roofs shall be no less than 14-gauge galvanized steel with a minimum of 50 lb/ft² loading.
- F. The entire structure shall be powder coated on the outside with TGIC Polyester Powder (or equal polyester powder) with a nominal thickness of four mils, but no less than three mils at any point on the surface of the enclosure in accordance with AREMA C&S Manual Part 1.5.10. The exterior color shall be light gray.
- G. The steel instrument enclosures shall be complete with moveable shelves, wire chase, and backboard.
- H. The equipment shelters shall provide access to underground and aerial cable entrance behind the main terminal rack. The top and sides shall be lined with heat and cold insulating material and constructed to prevent sweating. Provide ventilation openings as required for the size of the shelter proposed. No ventilation opening shall be made in the roof of the shelter. Provide lift rings to facilitate the movement of the shelter.
- I. Provide ventilation openings in each door. The exterior of the ventilation openings shall be hooded to minimize the entrance of precipitation. Equip the interior of ventilation opening with sliding plate to allow the adjustment of airflow and with a replaceable dust filter. The doors shall be hinged and gasketed so that they will

provide a dust proof and weatherproof seal. Provide doors with exterior and interior handles, (interior handles not required on cases) welded to a three point locking device to ensure that the door cannot be locked until it is in the fully closed position. Provide doors with a two-position retaining device to secure the door when open.

- J. Door openings shall be 32 inches wide by 86 inches tall unless otherwise specified on the Contract Drawings.
- K. Provide thermostatically controlled exhaust fans, operated from 120 Vac and fused separately, in each shelter, as shown on the Contract Drawings. The thermostat that activates the fan control shall be adjustable and operate in the range of 70 degrees to 130 degrees Fahrenheit. Locate fans relative to the fresh air inlets to draw air over the equipment and size to renew the air within the shelter every 3 minutes. Exhaust fans shall have removable dust filters. Dust filters shall be either replaceable or cleanable.
- L. Hinges shall be separate castings, securely fastened to the shelter and door. The hinges shall be equipped with bronze hinge pins, shall be lubricated by the manufacturer before the case is shipped, and shall have grease fittings for later lubrication.
- M. Furnish equipment shelters with interior lighting and duplex 120 Vac power receptacles. Equip shelters and cases with double tube fluorescent lights, minimum 40 watts each, as required to provide complete illumination for all passages and sides, and operated from a switch conveniently placed near each entrance door. Furnish convenience outlets as part of each switch.
- N. Shelter lighting and receptacle loads shall be fed from a ground fault interrupt circuit breaker used exclusively for these loads. Signaling logic and signal appliance power loads shall be fed from separate circuit breakers. The signal logic power and signal appliance power shall be ungrounded. The Contractor shall size circuit breakers and wiring.
- O. Furnish shelters complete with a 120/240 Vac power distribution panel, circuit protective devices, and all appurtenances necessary to supply the ac power required at each site.

2.02 EQUIPMENT MOUNTING

- A. General:
 - 1. Mount equipment as shown in the Contract Drawings.
 - 2. Mount all equipment in such a manner that a seismic event within the parameters of Section 18000, General Signal Requirements, will not cause damage or excessive motion.
- B. Relay Plugboards:
 - 1. Design plugboards for insertion of removable type contacts. The method of attaching the wires to the removable contacts shall be solderless connections. Design plugboard so that the removable contact will have a

direct connection with the contact and coil prongs. The plugboards shall be in accordance with the applicable sections of AREMA C&S Manual, Part 6.2.1.

2. All wires shall be of sufficient length to permit them to be moved to any contact on the same relay.
3. Equip the plugboards for vital relays with a registration plate to prevent relays of the wrong type, contact arrangement, or operating characteristics from being inserted.

2.03 IDENTIFICATION

- A. Stencil a white identification number at the top of the front and rear frames of each rack or panel.
- B. There shall be an identifying nameplate for each relay, or other instrument mounted on the rack or panel.
- C. Equip the back and front of the relay plugboards with a tag, as specified in Section 18360, Signal Systems Miscellaneous Products. This tag shall indicate the nomenclature of the relay.
- D. Identify terminals and both ends of all wires with a wraparound tag printed with the circuit nomenclatures and terminal designations as shown on the Contract Drawings and as specified in Section 18360, Signal Systems Miscellaneous Products.
- E. Wire and cable conductor identification tags for terminal board mounting shall be as specified in Section 18360, Signal Systems Miscellaneous Products.

2.04 CABLE ENTRANCE TERMINAL BOARDS

- A. Cable Entrance Terminal Boards shall be 3/4-inch Type AB exterior (five ply) plywood, mounted on a rack and painted with a fire retarding paint.
- B. Cable Entrance Terminal Boards shall be located as shown on the Contract Drawings.
- C. Multiple-unit terminal blocks for wire and cable conductors shall be in accordance with AREMA C&S Drawing 14.1.6. Furnish each binding post with two binding nuts, one clamp nut, and three washers.
- D. Provide Invensys Rail or equal test links on all terminal pairs where conductors enter shelters.
- E. Equip binding posts and exposed terminals of other apparatus for circuits exceeding 50 volts or greater (ac or dc) with insulating nuts and sleeves.
- F. Cable entrance facilities shall be located as shown on the Contract Drawings.
- G. Lightning arresters shall be as specified in Section 18360, Signal Systems Miscellaneous Products.

2.05 CABLE ENTRANCE PIPES

- A. Cable entrance pipes shall be supplied by Contractor as specified in Section 18360, Signal Systems Miscellaneous Products.

2.06 GROUNDING

- A. Shelter shall be fitted with four 36-inch long No. 2 ground wires cadwelded to exterior of the shelter at each corner. Cadwelding shall take place prior to powder coating the structure.
- B. Grounding material shall be supplied by Contractor and installed as specified in Section 18450, Grounding.

2.07 INTERNAL WIRING

- A. Internal wiring shall be in accordance with Section 18370, Signal Wire and Cable.
- B. Minimum wire conductor sizes shall be as shown on the Contract Drawings unless otherwise approved by the Engineer.
- C. Adhering to minimum wire size specifications does not relieve the Contractor's responsibility of using wire sized large enough to safely and effectively provide power to the circuit it serves.
- D. Solderless terminals, for stranded wire, shall be in accordance with Section 18360, Signal Systems Miscellaneous Products.
- E. Solid terminal connectors shall be used for all short terminal jumpers.
- F. Wire shall conform to the requirements in Section 18370, Signal Wire and Cable.

2.08 PAINTING - INSULATION

- A. All instrument enclosures shall be furnished complete with a layer of rigid insulation on the walls, doors, and ceiling. Instrument shelters shall have a minimum 2-inch thick layer of rigid closed cell foam insulation rated R13. Instrument cases shall have a minimum 1/2-inch thick layer of rigid closed cell foam insulation rated R3.3. Insulation shall be suitable for residential installation.
- B. The interior including the ceiling, walls, terminal boards, and shelves shall be finished with a primer and two coats of white latex enamel paint.
- C. All paint shall be fire-retarding type.
- D. Contractor shall apply typical legend for control point shelters, highway grade crossing shelters and cases as indicated on Caltrain Standard Drawings (SD-5000 series). Contractor shall consult with manufacturer of shelter prior to paint application.

2.09 EQUIPMENT RACKS

- A. Equipment racks shall be the manufacturer's standard for the type of equipment furnished and shall be sized in conformance to the Contract Drawings.
- B. Equipment racks shall include all necessary supports for wire and equipment.
- C. Secure equipment racks by bolts attached to a threaded mounting plate structurally secured to the floor of the shelter. Attach stabilizing straps to the top of the racks as needed. Racks and mounting shall be secure enough to withstand a seismic event as specified in Section 18000, General Signal Requirements.

2.10 OTHER EQUIPMENT

- A. Wiring Raceway (Wire Routing): Internal case wiring shall be contained within surface-mounted plastic raceway. Raceway shall be of a polycarbonate, low smoke type with a solid snap-on cover and flexible sidewalls. The sidewalls shall be of "finger" type construction allowing for insertion and removal of wire runs with terminations attached. The manufacturer shall determine sizes. Fill capacity shall not exceed 60 percent.
- B. Panel Board: Furnish a single-phase, three-wire 120/240 VAC, 60 Hz panel board for each shelter furnished under this Contract. Size panel board as shown on the Contract Drawings. The capacity rating shall be in accordance with the Contractor's load calculations and the Contract Drawings.
- C. Service meters shall conform to local codes.

2.11 GALVANIZED SHELTER FOUNDATIONS

- A. All shelters shall be equipped with telescoping foundations complete with galvanized bolts, washers, nuts, and associated hardware. Galvanizing shall conform to Section 18360, Signal Systems Miscellaneous Products, and AREMA C&S Manual, Part 15.3.1.
- B. Galvanized steel foundations for cases shall be constructed of steel angle and plate welded together. Foundations shall be constructed of 2-1/2 inch by 2-1/2 inch by 1/4-inch steel angle and 1/4-inch steel plate.
- C. Bolt spacing shall be to manufacturer's standards for the equipment to be supported by the foundation.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Mount shelters and cases level and plumb and secure thereon with the hardware provided. Do not use shims, spacers, or other filler devices to level and plumb shelters or cases.
- B. Install cable entrance pipes through the cable knockout holes provided in the floor of the shelter behind the terminal board(s) as shown on Contract Drawings. Fill pipes

with a substance designed for the purpose that prevents entrance of debris, rodents, and other pests.

- C. Ground shelters as specified in Section 18450, Signal Grounding.
- D. Locate shelter as indicated on the Contract Drawings. If conditions do not allow placement as shown on the Contract Drawings, submit alternate placement for Engineer's approval.
- E. Install relays on the relay plugboards corresponding to the relay nomenclature and identification plate, and securely fasten in place with the hardware provided by the relay manufacturer.
- F. Place batteries on rubber matting on the floor of the house or bottom shelf of the case. Coat battery posts with approved grease and securely fasten battery connectors to the battery posts. Strap batteries or otherwise secure using a method approved by the manufacturer so that they will not tip or move in the event of an earthquake.
- G. Mark each grade crossing warning device case or shelter with the street name, milepost location, emergency response number, and DOT inventory number per PCJPB Standards.
- H. Install pullboxes and conduits. Provide slotted pullbox covers to accommodate the cable chute at new house locations. Place the house so the chute aligns with the slotted cover.
- I. Make any modifications to the cable chute required to fit the pullbox and accommodate the cable installation. If it is necessary to cut the cable chute, ensure no rough edges, sharp edges, burrs, or other surfaces exist which have the potential to injure the cable.
- J. Install foundations, including telescoping foundations, for shelters including Owner-furnished shelters.

3.02 AC POWER

- A. Wall mount load center as shown on the Contract Drawings. Mounting height from floor, wire terminations, and clearances shall be in accordance with the NEC.
- B. Install service meters as described in Section 18500, Service Meters.

3.03 FIELD QUALITY CONTROL

- A. Test the functioning of the equipment contained within the instrument shelter in accordance with the requirements of Section 18600, Signal Systems Testing, CFR Title 49, Parts 234 and 236, and the recommendations of AREMA C&S Manual Part 2.4.1.

END OF SECTION