

## **SECTION 17100**

### **COMMUNICATIONS FACILITIES**

#### **PART 1 – GENERAL**

##### **1.01 DESCRIPTION**

- A. Section includes requirements for facilities to house equipment for the Station Communications.

##### **1.02 REFERENCE STANDARDS**

- A. American National Standards Institute (ANSI):
  - 1. TIA/EIA-568 Commercial – Building Telecommunication Cabling Standard
  - 2. TIA/EIA-J-STD-607 Commercial Building Grounding and Bonding Requirements for Telecommunications
- B. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
  - 1. ASHRAE Handbook of Fundamentals, Chapter 26
  - 2. ASHRAE Publication SPCDX (Climate Data for Region X)
  - 3. Gdl 16 Specifying Outside, Return, and Relief Dampers for Variable Air Volume Systems
  - 4. Gld 19P Ventilation and Indoor Air Quality
- C. ASTM International (ASTM):
  - 1. A653 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - 2. B3 Specification for Annealed Copper Wire
- D. American Society of Civil Engineers (ASCE):
  - 1. ASCE 7 Minimum Design Loads for Buildings and Other Structures
- E. California Building Code (CBC)
- F. California Electric Code (CEC)
- G. Illuminating Engineering Society of North America (IES):
  - 1. RP-7 Practice for Industrial Lighting
- H. International Building Code (IBC)

- I. Institute of Electrical and Electronics Engineers (IEEE):
  - 1. 142 Recommended Practice for Grounding of Industrial and Commercial Power Systems (IEEE Green Book)
- J. International Organization of Standardization (ISO):
  - 1. 9001 Recommended Practices and Procedures, Quality Assurance (QA) and Quality Control (QC)
- K. National Fire Protection Association (NFPA):
  - 1. 70 National Electrical Code (NEC)
  - 2. 72E Standard on Automatic Detectors
  - 3. 101 Life Safety Code
- L. National Electrical Contractors Association (NECA):
  - 1. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting
- M. National Electrical Manufacturers Association (NEMA):
  - 1. AB 1 Molded Case Circuit Breakers and Molded Case Switches
  - 2. CC1 Power Connections
  - 3. PB1 Panelboards
  - 4. FB1 Fittings, Cast metal Boxes and Conduit Bodies for Conduit and Cable Assemblies
  - 5. VE1 Metallic Cable Tray Systems
- N. Underwriters Laboratories, Inc. (UL):
  - 1. 50 Safety Enclosures for Electrical Equipment
  - 2. 67 Panelboards
  - 3. 467 Grounding and Bonding
  - 4. 497 Protectors for Paired Conductor Communication Circuits
  - 5. 969 Marking and Labeling Systems
- O. Uniform Building Code (UBC)

### 1.03 DEFINITIONS

- A. "Facilities" shall mean conditioned space required to house station communications equipment primarily at larger stations, where said equipment cannot be confined to an outdoor Communications Interface Cabinet (CIC), also sometimes referred to as Station Communications Cabinet (SCC). This space is commonly referred to as the Communications Equipment Room (CER). Communications Facilities are divided into two types. The facilities required to house the CER shall be a prefabricated shelter ("House") (Type I) or a space within a new or existing building within or near the station (Type II).
- B. Communications Facility, Type I: A stand-alone prefabricated structure, located near (within 500 feet) of the passenger station, that shall house all the required network communications equipment to service the station. Included in this facility shall be the communications carrier equipment (owned or leased) required to link the Central Headquarters in San Carlos, and the Central Control Facility (CCF) with the station, as well as the station subsystem distribution equipment.
- C. Communications Facility, Type II: This facility shall be a room within a combined structure to be built or remodeled as an integral part of a station. This Communications Equipment Room (CER) shall contain all the required network and subsystems communications equipment to service the passenger station.

### 1.04 SYSTEM DESCRIPTION

- A. Both Type I and Type II Facilities equipment and infrastructure shall include the following: Fiber Slack Enclosure (FSE), Fiber Distribution Panel (FDP), Main Distribution Frame (MDF), Uninterruptible Power Supply (UPS), AC Distribution Panel, lightning protection and grounding, HVAC, static dissipative tile (SDT) floor, Intrusion Alarm Panel, and other support systems as described in detail in this Section.
- B. Design, provide and install Type I Facilities (herein after known as Houses) as described herein. Each house shall be prefabricated for communications equipment in accordance with this Section and the Contract Drawings.
- C. Type II Facility is a room within a combined electrical/mechanical/communications structure, typically located within the station. Refer to the Contract Drawings for location of such room or rooms, if applicable. The Communications Equipment Room (CER) shall be dedicated to station communications and will have controlled access. Refer to the Contract Documents which indicate new or existing normal and emergency power system, fire alarm system, and HVAC system which will serve the CER. Design, provide and install all required communications equipment in accordance with this Section and the Contract Drawings.
- D. Communications Facilities, Types I and II shall be equipped with proper fire extinguishers and fire monitoring systems as described in these specifications.
- E. Communication Facilities Type I shall be sized and configured and Type II shall be configured based on the following guidelines:

1. An unobstructed area of open wall shall be dedicated for wall mounted termination and wiring blocks, panels, building entrance protectors, and outside plant cable splice enclosures. This area commonly referred to as the Main Distribution Frame (MDF) also serves as the MPOE termination point. Adequate space shall be planned so that initial (day-one) installation will not consume more than 50 percent of the total available MDF space.
2. Open equipment racks or cabinets shall house communication equipment, UPS, and other network and distribution equipment. Each rack or cabinet shall be assigned by system type such as network carrier, video server, or UPS. Adequate space shall be planned to allow system equipment expansion per rack or cabinet. At least 50 percent of the available mounting space of each rack or cabinet placed shall be reserved for future equipment. Should any rack or cabinet exceed 50 percent on initial installation, the facility floor plan shall reserve an empty rack or cabinet for future equipment deployment.
3. An unobstructed work clearance of three (3) feet to the front and rear of equipment racks and cabinets, and the MDF, shall be provided.
4. Adequate heating, ventilation and, if required by calculations, air-conditioning shall be sized and provided for the Communication Facilities. The HVAC equipment power and thermo calculations shall be based on the initial (day-one) installation load plus additional 50 percent of the similar load (reserved to accommodate future growth).
5. Building or room access doors shall not hinge or swing into equipment areas. The design of the building and the room access doors shall accommodate intrusion detection and access control systems.
6. The design of the building or room (including equipment to be installed inside) shall meet California Building Code (CBC), International Building Code (IBC), Uniform Building Code (UBC), Seismic Zone 4 and other requirements listed within these Specifications,

#### **1.05 SUBMITTALS**

- A. Refer to Section 17000, Basic Communications Technical Requirements, for related and additional submittal requirements.
- B. Preliminary Design Review (PDR) Technical Requirements:
  1. Include the following information as part of the PDR submittal package for Type 1 Communications Houses:
    - a. Drawings showing the House dimensions, layout (plan and elevations), and external architecture.
    - b. Architectural and Construction Details, including House and foundation reinforcing drawings.

- c. Calculations signed and sealed including structural, heating/cooling, seismic (for overall building and floor, ceiling, and wall mounted infrastructure and bracing), lighting, and electrical power requirements.
  - d. Lightning Protection and Grounding Arrangement such as ground grid and room halo.
  - e. Cable Trays and Battery Racks.
  - f. Ac and dc Power Distribution, UPS Equipment and Lighting.
  - g. Fire, Access Control and Intrusion Alarm Subsystems Equipment Location, including the fire extinguisher.
  - h. Cable and conduit Entrance/Exit (and other protrusions) Details including firestop and water/moisture protection.
  - i. External Interface Details for Power and Communications Connections.
  - j. Plan and Elevation Drawings for MDF and wall-mount distribution panels, Equipment Cabinets, Racks, Lighting and Cable Trays.
  - k. HVAC equipment details.
  - l. Product specifications for lighting, cable trays, HVAC equipment.
  - m. Additional Product Data Sheets, as required for subcomponents.
  - n. SDT data and details.
2. Include the following information as part of the PDR submittal package for the Type II Communications Facilities:
- a. Dimension drawings, plans and elevations, showing layout of equipment.
  - b. Ac and dc Power Distribution, including interface details for Power Connections, UPS equipment, and Lighting.
  - c. Calculations signed and sealed including structural, heating/cooling, seismic (for floor, ceiling, and wall mounted infrastructure and bracing), lighting and electrical power requirements.
  - d. Product specifications for all provided materials.
  - e. Fire, Access Control and Intrusion Alarm Panel equipment.
  - f. Plan and Elevation Drawings for MDF and wall-mount distribution panels, Equipment Cabinets, Racks, Lighting and Cable Trays.

- g. Cable Trays and Battery Racks.
  - h. Cable and Conduit Entrance/Exit (and other protrusions) Details including firestop and water/moisture protection.
  - i. HVAC equipment details.
  - j. Grounding Arrangement such as ground grid, room halo, and Telecommunication Main Ground Buss-bar (MGB).
  - k. SDT data and details.
- C. Final Design Technical Requirements: Submit, after Preliminary Design approval, the following information as part of the Communications Facilities Final Design submittal package:
- 1. Updated Preliminary Design information. All drawings, calculations and design information required for the final design.
  - 2. Final and detailed wiring drawings ready for construction and installation.
  - 3. Final equipment list.
  - 4. Final equipment installation details.
  - 5. Final cable and equipment identification.
- D. Installation Work Plans: Submit the following installation document for each site scheduled for installation activity. The installation Work plan shall include:
- 1. Site Plans and Foundation Drawings:
    - a. Drawings showing plan and elevation details of the foundation and the ductbank, including the man-hole interface.
    - b. Site plans for the Communications Houses.
    - c. Installation Plan to include:
      - i. Planned access dates and times for each location
      - ii. Safety rules, regulations and procedures
      - iii. Caltrain resources required
      - iv. Daily preparation and cleanup procedures
    - d. Delivery and Installation Procedures and Inspection Sheets:
      - i. The procedures submitted shall include descriptions of the equipment used for transport and setting of the Communications Facility.

- ii. Complete Inspection Sheets and submit to the Engineer within seven days after installation of the Facility.
- E. Calculations and Certifications:
  - 1. Provide calculations as listed in the Preliminary Design and Final Design. Calculations shall be signed and sealed by a California Licensed Professional Engineer.
  - 2. Certifications: Copy of the following certifications shall be included:
    - a. ISO certification for all proposed manufacturers
    - b. Certificates and permits for all Facilities
- F. Product Samples:
  - 1. Provide sample color chips of the facilities finish coat for Engineer approval.
  - 2. Provide pictures and facilitate factory visit for a typical sample Communications facility for Engineer approval.
  - 3. Submit sample of address signage for Engineer approval.
  - 4. Submit sample of Access Control identification for Engineer approval.
- G. Manufacturer Qualifications: Submit evidence that manufacturer complies with manufacturer qualifications specified in Section 17050, Basic Communications Equipment, Materials, and Methods.
- H. Test Plan and Procedures: In accordance with these Specifications, specifically with the format and requirements detailed in Sections 17000, Basic Communications Technical Requirements, and 17050, Basic Communications Equipment, Materials, and Methods, as a minimum, submit, no later than 60 days prior to the schedule test, the following plan and procedures to satisfy the Communications Facilities testing requirements
  - 1. Test program plan: Include all the required information for the Communications Facilities in the Test Program Plan as outlined in Section 17000, Basic Communications Technical Requirements.
  - 2. Factory and Inspection Test Procedure: Submit a complete factory test and inspection procedure to satisfy all the requirements outlined in Article entitled "Source Quality Control" of this Section.
  - 3. Field Test Procedure: Submit a complete field test procedure to satisfy all the requirements outlined in Article entitled "Field Quality Control" of this Section.
- I. Test Records: Submit the Test Records and Results for review 14 days after the completion of each test, in accordance with these Specifications.

- J. As-Built Documentation: Submit complete As-Built documentation and drawings, as specified in Section 17000, Basic Communications Technical Requirements, for all Communications Facilities and contents.

## **1.06 QUALITY ASSURANCE**

- A. Applicable Standards and Codes:
  - 1. Fabrication, inspection, installation and testing shall comply with all applicable Standards and Codes as listed herein.
  - 2. Equipment and methods shall comply with applicable codes and standards listed under Reference Standards herein.
- B. Material and Workmanship Requirements:
  - 1. Equipment provided under this Section shall be UL listed.
  - 2. Grounding shall be in accordance with local standards, Section 17060, Grounding of Communications Equipment, and these Specifications except as modified herein. Each piece of equipment shall be grounded in accordance with ANSI/TIA/EIA-J-STD-607-A.
  - 3. Products shall be manufactured by firms regularly engaged in manufacturing products described in these Specifications.
  - 4. Factory testing shall be performed by persons having five or more years of relevant testing experience
  - 5. Do not use discontinued product models, refurbished equipment, products at their end-of-life, end-of-sale, or end-of-service.
  - 6. Products specified herein are subject to the Engineer approval based on the Contractor's ability to demonstrate adherence to the requirements of these Specifications and Engineer approval of the manufacturer's quality ISO-9001 process.

## **PART 2- PRODUCTS**

### **2.01 TYPE 1 COMMUNICATIONS FACILITY CONSTRUCTION**

- A. Structural and Architectural:
  - 1. Communications House shall be prefabricated, climatized, self-supporting and transportable. The houses shall be weathertight and be free from defective materials and workmanship, water leakage and seepage, and condensation.
  - 2. The minimum headroom inside Communication House shall be 10 feet.
  - 3. Communications House roof shall be fabricated from 14 gage, and walls, floor, and doors shall be fabricated from 12 gage galvanized steel conforming to ASTM A653.

4. Following assembly, any areas exposed to outside atmosphere that have been affected by cutting or welding shall be spot galvanized with a primer that forms a dry film of no less than 90 percent pure zinc.
5. Exterior roof shall be finished with 2 to 3 mils thick white polyester powder coat. Underfloor and exterior walls shall be finished with 2-3 mils thick anti-graffiti grey polyurethane powder coat.
6. Exterior seams shall be caulked with grey RTV silicone.
7. House shall be insulated with 2 inch thick fiberglass-faced polyisocyanurate rigid insulation on walls and doors, and 4 inch fiberglass faced rigid insulation above trusses.
8. Design loading for floor shall be at least 200 pounds per square foot.
9. House shall be equipped with lifting lugs for shipping and installation.
10. Interior walls shall be covered with 3/4 inch thick MDO plywood as shown on the Contract drawings.
11. Interior walls and ceiling shall be finished with 2 coats of white fire retardant paint.
12. Steps: Reinforced concrete steps shall be provided if the lowest point of the doorway entrance is greater than one foot above ground level.
13. Doors shall be 32 inches wide and a minimum of 84 inches high. Doors shall include the following features:
  - a. Hinges: Vandal-resistant bolt on stainless steel hinges with grease fittings.
  - b. Lock: Heavy duty three point locking system with interior safety override handle and exterior handle with a heavy duty security hasp.
  - c. Prop rod to hold door open at 90 and 160 degrees.
  - d. Louvered vent with winter cover, fine copper screening, and reusable filter.
  - e. Weatherstripping: Provide weatherstripping and flashing for openings such as doors and removable panels to exclude water entry under all weather conditions. Where necessary, use EDPM extruded rubber gasket providing weathertight seal.
  - f. Heavy duty security hasp.
14. Flooring:
  - a. Flooring shall be formed of STD, 1/8 inch thick by 12 inches square, Armstrong Excelon SDT or Engineer approved equal.

- b. STD adhesive and grounding strips, followed by the tile, shall be placed directly on the floor in the manner and under the conditions recommended by the manufacturer. Tile shall be polished using the SDT polish recommended by the manufacturer. Tile color shall be submitted for Engineer approval.
  - c. Grounding strips to be grounded to the MGB in accordance with tile manufacturer's recommendations.
- B. Foundation:
- 1. The foundation system shall be pad mount style for buried or pad foundations. Concrete mix shall be as specified in Section 03300, Cast-in-Place Concrete.
  - 2. The foundation shall be designed and installed in accordance with these Specifications.
  - 3. The slab shall be reinforced as shown on the approved Contractor-provided design drawings. Slab reinforcement shall include provisions for leave-outs for conduit penetrations.
  - 4. At each corner of the slab, a No. 2 AWG bare solid tinned copper ground wire shall be welded to the reinforcing bars. The other end of this ground wire shall be welded to the nearest ground rod as required by these Specifications and as shown on the site specific drawings.
- C. Ductbanks:
- 1. Provide a ductbank from the Communications/Signals manhole to the Communications House penetrations for underground conduits. Ductbank shall be reinforced concrete as specified in Section 02500, Underground Ductwork and Structures.
  - 2. The Contractor shall locate a plastic warning tape, as specified in Section 02300, Earthwork, between the ductbank and the finished grade surface and 12 inches above ductbank.
  - 3. Conduit spacing within the ductbanks shall be accomplished with manufactured plastic conduit spacers.
  - 4. All conduits within ductbanks shall be Schedule 40 PVC. Where conduits transition to occupied spaces (e.g. the Communications House), galvanized rigid steel conduits shall be used.
  - 5. The depth of the manhole will vary from site to site. Be responsible for the excavation of ductbank as required to interface with the manhole. Provide the interface with the manhole as shown on Contract Drawings.
- D. Address Signage:
- 1. Communications Facility shall be provided with an address signage on the side of the exterior door for identification.

2. The sign shall have a white, reflective background with 3 inch black lettering.

## **2.02 TYPE I COMMUNICATIONS FACILITY EQUIPMENT**

### **A. Electrical:**

1. Electric power for the Communications House shall be obtained from the Local Electrical Utility as shown on the Contract Drawings. Provide and install the cable and conduit required for the main ac feed to the Communications House as shown on the Contract Drawings.
2. Equip the Communications Facility with a 120/240Vac single phase electrical panel board rated according to the Engineer approved calculations. As a minimum, the electrical panel shall be 100 Amp panel board. A transient voltage surge suppressor, meeting the requirement of NEC Article 280, shall be provided for the panel board. The electrical panel shall be equipped with a main circuit breaker rated according to the Engineer approved calculations. As a minimum, a 100 Amp main circuit breaker shall be provided. Sixteen branch breaker slots shall be provided with a minimum of 16 breakers equipped. Breakers shall be labeled with the corresponding equipment or system circuit feeds. One (1) 120/240 Vac EPD surge protector shall be provided.
3. Duplex 20A receptacles shall be provided at intervals of approximately 6 feet along walls. Electrical boxes shall be in accordance with these Specifications.
4. L5-30 locking 30A receptacles shall be provided where required by the specified Uninterruptable Power Supply (UPS).
5. Six (6) fluorescent tube fixtures, 24 inches in length, with 4 tubes per fixture and wrap lens, shall be provided.
  - a. The light level shall be adequate for reading with an average level of 50 foot-candles.
  - b. A 20A SPST light switch located adjacent to the door shall operate the fixtures.
6. All indoor power cable runs shall be in electrical metallic tubing (EMT) conduit and secured with single-hole straps.
7. Two electro-tin plated solid copper grounding buss bars, the Telecommunications Main Grounding Bus-bar (MGB), shall be installed at a height of 18 inches, and attached with insulated brackets as required by these Specifications. Equipment, cables, racks, and cable trays, shall be grounded to this buss-bar as required by these Specifications and the Contract Drawings.

8. Ground test stations shall be provided, along the bottom and inside wall of the house and shall be interconnected by an insulated copper cable sized at no less than 250 kcmil.
  9. UPS and batteries as required by these Specifications.
  10. A separate 120V ac power panel shall be provided for power output from the UPS. Main lugs rated at 225 Amp shall be provided. Thirty breaker slots shall be provided with a minimum of 12 breakers equipped. All active slots shall be labeled with the equipment to which the circuit feeds. Ac power to individual equipment racks shall be individual home runs from the UPS breaker panel, and shall be enclosed in EMT conduit.
  11. A Main Distribution Frame (MDF) shall be provided at the entrance way for the cable entrance conduits as shown on the Site specific drawings. The MDF shall conform to these Specifications.
  12. Equipment cabinets shall be provided for and equipped complete with communication equipment as required on the Contract Drawings. Cabinets shall conform to these Specifications and site specific drawings.
  13. FSE shall be provided as shown on the site specific drawings. Enclosure shall conform to these specifications.
  14. A room halo ring ground shall be provided. The halo shall be made from No. 4 AWG bare stranded copper conductor, and be bonded to the MGB as required by these Specifications.
  15. A 120 Vac battery backup green Light Emitting Diode (LED) type exit light shall be provided and installed over the doorway. The LED lamp life shall be rated for 25 years. The battery shall be a Ni-cad type and shall have 90 minutes capacity.
  16. Telephones shall be installed and tested as required by these Specifications and the Contract Drawings.
- B. Heating, Ventilation and Air Conditioning (HVAC): Equip communications house with HVAC equipment rated according to the approved thermo calculations in the design submittals. As a minimum, HVAC equipment shall be equipped with a thermostatically controlled 5000 watt resistant heater and 18,300 BTU air conditioner. Temperatures within the house shall be regulated within the range of 60 degrees Fahrenheit (F) to 80 degrees F with ambient temperatures in the range specified by the Specifications.
1. The temperature within the equipment cabinets shall not exceed ambient air temperature within the house by more than 10 degrees F.
  2. The outside of each air conditioner shall be protected with a hinged, heavy gauge, hot-dipped, galvanized vandal-resistant security mesh cage. The cage shall be constructed with a slot on the frame that, when in its closed position, will not pinch the air conditioner's condensation drainage tube.

- a. The cage shall be constructed of an angle iron frame and be enclosed with 1-1/2 inch x 10- gauge steel expanded metal to form a five-sided box.
  - b. The cage shall be hinged to swing horizontally open to allow for 90 degrees maintenance access. Two locking hasps shall be provided to hold the cage in the closed position. A mechanical device shall be provided for securing the cage in the 90 degrees opened position. Cage design shall allow for a single maintenance technician to gain access and perform any maintenance activity on the HVAC unit.
  - c. The cage shall be attached to the wall using tamper-proof screw/bolts with anchors cast into the wall during manufacturing to ensure mounting integrity.
  - d. The cage shall have an oversized width, additional 1 foot minimum, on the hinged right side to accommodate air conditioner maintenance.
3. An exhaust fan with manual and thermostatic control shall be provided. The thermostatic control of the exhaust fan shall prevent simultaneous operation of the fan and air conditioner Compressor. The exhaust fan shall include rain hood and controlled louvers with 1/4 inch wire mesh screen. The fan shall be rated according to approved thermo calculations and shall as a minimum have 1000 CFM capacity.
  4. All penetrations through the walls, floor, and roof shall be sealed to prevent water from entering the House.
  5. The HVAC system shall provide separate alarm contacts for unit failure and both high and low temperature, which will be connected to the local UPS Alarm dry contacts (and to RTU in the future) and programmed for monitoring. An LED indication shall be provided within the House to show when the alarm is active.
  6. The HVAC system, upon a Fire Alarm condition as detected by the House's Fire and Intrusion Alarm Subsystem equipment, shall automatically and within four seconds, initiate actions to:
    - a. Shut off the air conditioning unit(s)
    - b. Close dampers
- C. Cabinet Ventilation: Cabinets that contain heat-generating equipment shall be provided with adequate ventilation. In particular, cabinets and compartments housing essential electronic equipment, shall be designed to provide adequate ventilation so that for any device inside its maximum temperature stays below its rated operating temperature with a margin of at least 10 degrees Celsius. If required in order to avoid overheating, the Contractor shall provide forced air ventilation inside such enclosures, including alarms.

- D. Cable Tray: Cable trays shall be provided in accordance with the Engineer approved House layout plans. Cable trays shall be as required in the Specifications and Contract Drawings.
- E. Fire and Intrusion Alarm Subsystems: Provide fire detection and alarm system conforming to NFPA 72E, complete with ionization detectors, dual ion zone module, control panel, end-of-line device, power supplies and all other items of material and equipment required for a complete installation. The Fire and Intrusion Alarm Subsystems, shall be installed and tested as required by the Specifications.
- F. Equip house with a 20 pound dry chemical fire extinguisher.
- G. Exterior lighting shall include a weatherproof, wall mounted area lighting fixture above each doorway. The exterior lighting shall be on a separate circuit, and shall be controlled by a switch with three positions as follows: ON, OFF and AUTO. In the AUTO position, the exterior lighting shall be controlled by a photoelectric cell.
- H. Communications System Equipment: Additional communications system equipment such as LAN/WAN, PAS, VMS, TVM, Clipper CID and/or CCTV, including all related hardware integral with the cabinets, shall be installed in the communications house as shown on Contract Drawings and as described in the Specifications.

### **2.03 TYPE II COMMUNICATIONS EQUIPMENT FACILITIES**

- A. Provide and install the following equipment at each Type II Facility:
  - 1. UPS and batteries as required by the Specifications.
  - 2. A 120V ac power panel fed from the output of the above UPS. Panel shall have 30 breaker slots and be provided with a minimum of 12 breakers sized as shown on the Contract Drawings.
  - 3. An electro-tin plated solid copper grounding buss-bar, the Telecommunications Main Grounding Bus-bar (MGB), shall be installed at a height of 24 inches, attached with insulated brackets as required by the Specifications.
  - 4. Equipment, cables, racks, and cable trays shall be grounded as required by these Specifications and the Contract drawings.
  - 5. A Main Distribution Frame (MDF) shall be provided at the entrance way for the cable entrance conduits as required by these Specifications and as shown on the Contract Drawings.
  - 6. FSE shall be provided as shown on the Contract Drawings. Enclosures shall conform to the Specifications.
  - 7. Fiber Distribution Panel (FDP) shall be provided as required by these Specifications and as shown on the Contract Drawings.

8. A room halo ground ring shall be provided. The halo shall be made from No. 4 AWG bare stranded copper conductor, and be bonded to the MGB as required by the Specifications.
  9. Cable trays shall be provided in accordance with the Authority approved facility room layout plans. Cable trays shall be as required by these Specifications and the Contract Drawings.
  10. Equipment cabinets shall be provided for and equipped complete with communication equipment as required by the Specifications and Contract Drawings.
  11. Equipment cabinets shall have fans located in the top to provide for air circulation. Cabinet ventilation openings shall have replaceable filters to prevent the intrusion of dirt.
  12. Access Control and Intrusion Alarm Control Panel equipment shall be installed and tested as required by the Specifications.
  13. Fire detection equipment (as an integral part of the combined facility fire detection system), including the fire extinguisher shall be provided in accordance with the Specifications.
  14. Telephones shall be installed and tested as required by these Specifications.
  15. Flooring: As specified for Type 1 Communications Facility Construction in this Section.
  16. All exposed wiring shall be run in conduits as required by these Specifications.
  17. A 120Vac battery backup green LED type exit light shall be provided and installed over each doorway. The LED lamp life shall be rated for 25 years. The battery shall be a NiCad type and shall have 90 minutes capacity.
  18. Electrical service equipment shall include the following:
    - a. HVAC equipment
    - b. Interior Lighting
    - c. Access Control, Fire Detection and Alarm system
    - d. MGB and related grounding cables
- B. Cabinet Ventilation: Cabinets that contain heat-generating equipment shall be provided with adequate ventilation. In particular, cabinets and compartments housing essential electronic equipment shall be designed to provide adequate ventilation so that for any device inside its maximum temperature stays below its rated operating temperature with a margin of at least 10 degrees Celsius. If

required in order to avoid overheating, the Contractor shall provide forced air ventilation inside such enclosures, including alarms.

- C. Communications System Equipment: Additional communications system equipment such as WAN/LAN, PAS, VMS, TVM, Clipper CID, and/or CCTV, including all related hardware integral with the cabinets, shall be installed in the communications house as shown on Contract Drawings and as described in the Specifications.

#### **2.04 SOURCE QUALITY CONTROL**

- A. Monitor the fabrication of the Houses to ensure that all structural requirements are adhered to.
- B. Inspection: Inspect the Communications House prior to shipment to a site. Notify the Engineer no later than 21 days prior to this inspection.
- C. Perform the following Factory Inspection (Communications Facilities, Type 1 only). Provide the Engineer at least 21 days written notification prior to each test and inspection.
  - 1. Provide Factory inspection procedure for Authority approval at least 21 days prior to scheduled inspection.
  - 2. Inspect the House at the Factory for cracks and other damage, and repair to the satisfaction of the Engineer.
  - 3. Inspect the House at the Factory for level and plumb; proper operation of doors and dampers; proper location and installation of HVAC equipment breaker panels, lighting fixtures, electrical outlets, fire and intrusion sensors and equipment; cable trays, and other equipment.
  - 4. Inspections shall verify:
    - a. Conformance to standards, methods, and quality.
    - b. Correct location, positioning, seating, mounting, orientation, and labeling.
    - c. Secured cable and wire connections.
    - d. Proper routing and termination of wire and cable.
    - e. Proper equipment grounding.
    - f. Correct and complete labeling and tagging of wire, cable, terminal, connectors and equipment.
    - g. Conformance to installation requirements.
  - 5. Provide inspection results for Engineer approval 14 days after the completion of an inspection,

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Foundation and Placement of the Communications House:
1. Perform site preparation in accordance with Section 02110, Site Clearing.
  2. Refer to Section 02300, Earthwork, for requirements for excavation and backfill for the Communications House site.
  3. The foundation and anchor bolt locations shall be of depth and size to support the prefabricated shelter in accordance with the approved drawings. Concrete formwork and concrete reinforcement shall be in accordance with Contractor-provided design and Division 3, Concrete, Specifications Section.
  4. Install the House level and plumb on the foundation. Apply waterproof, non-hardening sealing compound between the foundation and house base perimeter.
  5. Provide and install a ballast skirt surrounding the House. The skirt material shall be consistent with the ballast specified in Section 20110, Ballast and Walkway Aggregate. Ballast shall be a minimum depth of 12 inches and at least five feet wide, extending from the communication house foundation outward and consistent with the other wayside structures sharing the common location.
  6. A ballast path shall extend from the Communications House door to the nearest driveway, parking area, or improved access point. The path material shall be consistent with the ballast specified in Section 20110, Ballast and Walkway Aggregate. Ballast shall be a minimum depth of 12 inches and at least 3 feet wide, and consistent with the other wayside structures sharing the common location.
- B. Cable Entrance Conduits:
1. Install eight 4-inch schedule 40 PVC conduits from a Communication System Manhole (CSMH) to the House, and stubbing up through the House floor foundation. As the conduits enter the communications house, provide a matching coupling and Galvanized Rigid Steel (GRS) conduit above the floor. Provide an additional conduit, for ground conductors, which will pass through the slab and extend approximately 18 inches beyond the edge of the slab. These conduits shall be installed in the pattern provided on site specific drawings and as required by the Specifications.
  2. The cable entrance conduits shall sweep into the House through the foundation. The sweep radius at the entrance conduits shall be greater than the minimum radius required for the fiber optic cable as required by these Specifications.

3. The entrance conduits shall be encased in a concrete reinforced ductbank as shown on the Contract Drawings and as required by these Specifications. Provide the interface with the CSMH as shown on Contract Drawings.
  4. Seal around the conduits with a permanent, waterproof and fire-stopper sealing compound as required by these Specifications. After all cables have been installed, fill the conduit openings with fire-stopper duct sealant in order to prevent moisture from entering the House.
  5. The cable entrance conduits shall be as required by these Specifications.
- C. Grounding:
1. Install, as a minimum, one ground rod outside each corner of the House, and the connecting ground wire, as shown on the Contract Drawings.
  2. Grounding shall be as required by these Specifications and the Contract Drawings.
  3. The electrical power systems shall be grounded as required by these Specifications, and as shown in the Contract Drawings.

### **3.02 FIELD QUALITY CONTROL AND TESTING**

- A. Perform the following field inspections and tests on all Communications Facilities. Give the Engineer at least 21 days written notification prior to each test and inspection.
1. Field Inspection:
    - a. Prior to installation, inspect with the Engineer the foundation and conduit stub-ups and anchors to verify that they conform to Contract Drawings. Record discrepancies on a discrepancy list; immediately submit the list to the Engineer; and proceed to correct discrepancies.
    - b. Field inspection shall include inspection of each installed communications facility. Process inspections are required.
    - c. The inspection shall confirm that:
      - i. The installation drawings and procedures define the installation adequately and in sufficient detail, such that if the procedures are followed, the resulting installation will meet Engineer approved standards, practices and procedures for workmanship, maintainability, referenced installation standards, installation requirements, these Specifications, the site specific drawings, and the installation requirements of local jurisdictions.
      - ii. Should the Engineer decide that the installation drawings and procedures are inadequate, revise any such

drawings and procedures prior to performing installation Work.

- iii. The installation drawings and procedures shall adequately provide for the safety of installation personnel. If not, the installation procedures shall be revised prior to performing installation Work.
  - d. Inspection shall verify:
    - i. Conformance to installation requirements
    - ii. Conformance to standards, methods and quality
    - iii. Proper routing and termination of wire and cable
    - iv. Secured cable and wire connections
    - v. Proper grounding of all equipment
    - vi. Correct and complete labeling and tagging of wire, cable, terminal, connectors and equipment.
  - e. Provide all the inspection records and results required in this Section to the Engineer within 14 days after each inspection.
2. Field Tests: Perform the following field tests:
- a. Verify operation of main circuit breaker and all feeder circuit breakers.
  - b. Measure resistance to ground from all ground points, including those located in equipment cabinets. Measured resistance shall not exceed 3 ohms as required by these Specifications.
  - c. Verify operation of all lighting.
  - d. Verify operation of HVAC equipment, including heaters, air conditioner, exhaust fan as well as all thermostatic controls.
  - e. Verify operation and reporting of the communications facility alarm indications including those related to fire, intrusion, power and HVAC (visual and audio) both locally and at the Central Control Facility (CCF).
  - f. Verify operation of dampers and HVAC unit in the event of fire alarm conditions.
  - g. Verify operation of all equipment controls and indicators.
  - h. Provide all test records and results required in this Section to the Engineer within 14 days after each test.

- B. End-To-End Acceptance Test: Acceptance testing will be limited to the field tests described above. There is no requirement for End-to-End Acceptance Test for the Communications Facilities.
- C. System Integration Test: System Integration Test will be directed by the Engineer. Provide qualified technical staff to support this test as required by these Specifications and the Engineer.

**END OF SECTION**