

SECTION 13127

PREFABRICATED STRUCTURES - ELECTRICAL BUILDING

PART 1 GENERAL

1.1 Scope of Work

- A.** The work covered by this specification consists of all labor, material, equipment and services for the design, fabrication, supply, delivery and guarantee of the electrical building requirements for the New Centre Pump Station in Lake Havasu City, Arizona.
- B.** It is intended that the Contractor supplies a completely assembled electrical building, which will be installed outdoors. The vendor shall install all power and control equipment and provide all interconnecting cabling and terminations for a complete electrical installation, including a clean agent fire suppression system.
- C.** The Owner or his representative will conduct a thorough commissioning and testing program to completely check and confirm correct installation of the equipment and systems. Proposals shall include all costs to cover this activity and shall provide assistance to the Owner's commissioning crew during this phase of the work.
- D.** The Contract Drawings form a part of this specification.
- E.** Without limiting the definition of the work, the Contract shall include:
 - 1.** Preparation of design and shop drawings.
 - 2.** Supply and installation of self supporting, self leveling sub-floors for all facilities.
 - 3.** Fire wall separation as required.
 - 4.** A clean agent fire suppression system approved and permitted by the Lake Havasu City Fire Department and adheres to city code.
 - 5.** Supply and installation of the facility's exterior pre-finished wall and roof panel systems and insulation.

- 6.** Supply of structural steel skid, supports, landings and guardrails to meet OSHA requirements.
- 7.** Supply and installation of all interior floor and wall finishes.
- 8.** Supply and installation of windows and doors.
- 9.** Supply and installation of electrical wiring for convenience outlets and lighting.
- 10.** Supply and installation of lighting fixtures.
- 11.** Supply and installation of telephone and computer networking boxes and receptacles.
- 12.** Supply and installation of heating, ventilating and air-conditioning equipment, ducting and controls.
- 13.** Supply and installation of portable fire extinguishers (electrical rated).
- 14.** Supply and installation of building signage.
- 15.** Supply and installation of all equipment complete with required seismic restraints.
- 16.** Supply and installation of all wiring for equipment.
- 17.** Supply and installation of cable tray and supports as covered in the specifications, shown on the drawings or as required to suit the installations.
- 18.** Supply and installation of Lighting and Small Power Panel-Boards as covered in the specifications, shown on the drawings or as required to suit the installations.
- 19.** The Contractor shall commission the building based on the Manufacturer's recommendations.
- 20.** Provide Electrical Inspection approval by UL. Building shall include a UL approval nameplate.
- 21.** Provide complete protection from damage during shipping to site of electrical building and all equipment and components.
- 22.** Instructions for handling the electrical building during transportation.

- F. It is not intended that Manufacturers depart from their standard design; however, any deviations from these specifications shall be listed and explained in the submittal. A lack of such a listing shall indicate that no such deviations exist.

1.2 Related Work Specified Elsewhere

- A. This specification shall be read in conjunction with the following specifications:
 - 1. Concrete Reinforcement Section 03200
 - 2. Concrete Structures Section 03300
 - 3. Miscellaneous Steel Structures Section 05120
 - 4. General Requirements Section 16010
 - 5. Conduit, Fittings and Accessories Section 16111
 - 6. Wire, Cable and Accessories Section 16120
 - 7. Motors, Accessories, Variable Frequency Drives Section 16159
 - 8. Starters, Relays, Switches, Circuit Breakers and Transient Voltage Surge Suppressors Section 16150
 - 9. Grounding Section 16450
 - 10. Lighting Devices, Switches and Receptacles Section 16500
 - 11. General Requirements – Instrument & Control Section 16900
 - 12. Control Panels – Instruments and Control Section 16901

1.3 Codes and Standards

- A. All equipment, materials and devices covered by this specification shall comply with and shall be designed, manufactured and tested in accordance with the latest applicable Standards, Acts and Regulations, including:
 - 1. IBC International Building Code 2003

- 2.** ASTM American Society for Testing Materials
- 3.** AISC American Institute of Steel Construction
- 4.** SMACNA Sheet Metal and Air Conditioning Contractor’s National Association
- 5.** MBMA Metal Building Manufacturer’s Association
- 6.** NAAMM National Association of Architectural Metal Manufacturers
- 7.** ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers
- 8.** AWS American Welding Society
- 9.** FM Factory Mutual
- 10.** UL Underwriter’s Laboratories
- 11.** MBMA Metal Building Systems Code of Standard Practice
- 12.** FM Data Sheet 1-28 Factory Mutual Loss Prevention “Wind loads to roof systems and roof deck”
- 13.** ANSI America National Standards Institute
- 14.** IEEE Institute of Electrical and Electronics Engineers
- 15.** IES Illuminating Engineering Society
- 16.** ASME American Society of Mechanical Engineers
- 17.** OSHA Occupational Safety and Health Administration
- 18.** NEMA National Electrical Manufacturers Association
- 19.** NFPA National Fire Protection Association
- 20.** NEC National Electrical Code

B. In the event of conflicting requirements between codes and standards, the most stringent will prevail.

C. All custom designed building structures shall be designed and certified by Professional Engineer registered in the state of Arizona. Review of the structural design by the Owner or his representative is for general

compliance with the project requirements and not for the adequacy of the structural design.

1.4 Design Criteria

A. The electrical building shall be modular and have all equipment installed and connected prior to shipping to site. The following gives the general equipment installation intent.

- 1.** The facilities are to be of modular construction and pre-assembled at the manufacturer's factory.
- 2.** All Electrical Controls and Instrumentation equipment shall be installed, wired and completely tested prior to shipping the building to site.
- 3.** The building shall be installed outdoors.
- 4.** The building shall be watertight.
- 5.** Foundation design loadings are shown on the Contract Drawings. The Contractor shall verify that the maximum point reactions at foundation level, as stated on the Contract Drawings, are not exceeded. The Contractor shall inform the Engineer if reactions exceed the maximum.
- 6.** Building design loads to comply with IBC, including loads resulted from seismic restraints and attachments such as cable trays and mechanical units.
- 7.** Building shall be insulated and comply with the Building Code requirements for Environmental Separation.
- 8.** Components shall be of non-combustible construction and shall meet a minimum of one-hour fire rating except as indicated on the drawings. All openings will have provision to be sealed and made water and dust tight using approved fire retardant materials.
- 9.** Electrical building will have two means of egress at opposite ends of the building.
- 10.** Electrical building shall be pressurized at a rate of 7% (minimum) of the gross building volume per minute as

required to maintain building pressure of 15 Pa. Heating, ventilating, air conditioning (HVAC) unit(s) shall be provided by the supplier.

- 11.** Electrical building temperature shall be maintained at $72\text{ }^{\circ}\text{F} \pm 4\text{ }^{\circ}\text{F}$ and 50% relative humidity $\pm 5\%$. Building temperature shall not exceed 86 $^{\circ}\text{F}$ maximum or be lower than 50 $^{\circ}\text{F}$ minimum.
- 12.** Airflow design velocities for ductwork and accessories shall be selected in accordance with ASHRAE Handbooks.
- 13.** HVAC and dust filtering equipment shall be placed to avoid interference with outgoing cables.
- 14.** The units shall incorporate durable, serviceable and easily maintainable materials, systems and components.
- 15.** The structure shall be self-supporting and designed for road shipment, lifting and transporting to site. Provide any special lifting bars and slings. Any special equipment shall be designed and approved by a Professional Engineer.
- 16.** Steel construction shall be used throughout for support structure and wall surfaces.
- 17.** Flooring shall be minimum 1/4" plain steel plate on structural steel floor beams, seal welded. Openings for cables or equipment shall be provided as shown on the drawings. Underside of flooring shall have sprayed on insulation with surface protection, sheet metal or equal material.
- 18.** The area beneath the building floors, especially under electrical equipment, shall be left as clear as possible to facilitate cable and service entry from below. For bottom cable entries (indicated on the drawings), floor openings shall be provided with continuous under-floor removable gasketed gland cable termination plates.
- 19.** The outdoor building shall have a minimum roof pitch of $\frac{1}{2}$ inch to the foot, (42 mm to the meter). Building shall include a concealed roof rain catchment system complete with down-pipes to grade level.

- 20.** The Drawings form part of this Specification. These Drawings show the overall requirements; final arrangements and details will be by the building supplier.
- 21.** Minimum/maximum clear dimensions for the buildings are indicated on the drawings.
- 22.** All components and members of the building shall be designed to facilitate bolted connections in the field. No field welding is permitted.
- 23.** Required color schemes are to be advised. Interior of building shall be white.
- 24.** Cable tray mounted in building shall be supported from the roof with a minimum clearance of 12 inches from top of tray to bottom of roof.
- 25.** Mounting of all equipment shall meet Seismic restraint for area noted in Section 1.5, Site Design Data.
- 26.** A conventional fire suppression system, controlling a total flood HFC-227ea or fire suppression system utilizing a power limited, fully supervised automatic detection and manual initiations system.
- 27.** The fire suppression system shall be furnished and installed complete in place. The system shall include but not be limited to a control panel, smoke detector, agent release station, agent abort station, alarm, discharge and pre-discharge strobes, agent release module, clean agent storage cylinder, discharge nozzles, junction box, as well as all piping, conduit and wiring.

1.5 Site Design Data

- A.** Structural General Notes, for climatic and seismic design information.
- B.** All equipment shall be anchored, supported and braced to the building structures to meet the requirements of the Building Code for the Seismic Zone specified.

1.6 Submittals

- A.** Complete shop drawings shall be submitted to the Owner or his representative for approval. Construction and shop drawings shall be sealed by a Professional Engineer registered in the State of Arizona.
- B.** Submit the following drawings for review by the Owner or his representative:
 - 1.** Structural Steel drawings
 - 2.** Framing including openings
 - 3.** Base plates
 - 4.** Anchoring requirements (including maximum anchor reactions)
 - 5.** Wall panels with details
 - 6.** Roof panels with details
 - 7.** Roof edge details indicating rain catchments/down pipes
 - 8.** Flashing sealants and accessories
 - 9.** Windows
 - 10.** Man doors, frames and hardware
 - 11.** Canopies over doors
 - 12.** Equipment doors and framing
 - 13.** Paint Specification and color sample for wall and roof cladding panels
 - 14.** Power and Control Layouts
 - 15.** Lighting layouts
 - 16.** Guarantees and warranties associated with equipment and building components that are part of this contract
 - 17.** Clean Agent Fire Suppression System
- C.** Submittal of drawings does not relieve the Manufacturer or Contractor of contractual or code responsibilities with respect to this design.

1.7 Quality Assurance

A. ISO 9001 & 9002

Manufacturers shall indicate the status, relative to the ISO quality assurance program, of all facilities where components of the equipment will be fabricated and/or assembled.

B. Manufacturer's Quality Assurance Program

- 1.** If ISO certification is not available, the Manufacturer shall provide data on its own quality assurance programs and those of its major sub-suppliers, the use of non-destructive testing, criteria for repair and repair methods.
- 2.** The Manufacturer may use its own personnel and facilities or any independent testing organization acceptable to the federal and state agencies as well as the Owner. The Owner reserves the right to witness or perform any of the tests to verify the quality control. However, this will not relieve the Manufacturer or Contractor from the responsibility of any inspection and testing.

C. Access

The Manufacturer shall provide free access for the Owner during working hours to the fabrication shop or its sub-contractor's shop to monitor the fabrication progress and quality.

1.8 Acceptable Manufacturers

- A.** Protect Controls, Inc.
303 Little York Road
Houston, TX, 77076
Telephone: (713) 691-5183
Fax: (713) 691-0159
- B.** Eaton Electrical
Asheville, NC
Telephone: (828) 687-3349
Fax: (828) 687-3349
- C.** Powell Electrical Mfg. Co.
8550 Moseley
PO Box 12818
Houston, TX, 77217

- D. Or approved equal.

1.9 Warranty

- A. The equipment shall be fully guaranteed for the duty specified for 12 months after the equipment is commissioned at site.

PART 2 PRODUCTS

2.1 Floors

- A. Provide ¼ inch (8 mm) flat plain steel plate floor secured to sub-floor structure.
- B. Floor shall be galvanized steel.
- C. Vinyl mats for walkways shall be supplied.
- D. Provide anchor bolts to hold down the prefabricated structures.
- E. Provide framed floor openings as required.

2.2 Walls

- A. Walls shall be modular construction with no interior obstructions.
- B. Wall panels shall have a minimum 16 gauge exterior and 18 gauge interior steel faces with insulating core.
- C. Panel surfaces shall have factory applied, satin finish, polyurethane paint system.
- D. Provide framed wall openings for cable tray.

2.3 Roof / Ceiling

- A. Roof / ceiling panels shall be self-supporting, panelized, insulated, modular construction.
- B. Construction and finishes shall be similar to wall panels.
- C. Install water-proof membrane over installed roof panels.
- D. Roof design shall include provision for mounting cable trays, lighting fixtures and other equipment noted or shown on the drawings.

2.4 Grounding

- A.** Metal parts of the building must be electrically bonded together inherently by the method of fastening and the structure shall have grounding lugs mounted at opposite corners of the structure suitable for the connection to the #4/0 copper grounding conductor on site.
- B.** Provide bare copper ground bus in the electrical building with two lugs for 4/0 AWG copper grounding conductor. Connect bus to the ground lugs with 4/0 AWG copper grounding conductors.
- C.** Provide and install connection of electrical distribution equipment ground bus to ground grid with two separate ground wires each. This includes the following equipment:
 - 1.** Electrical distribution equipment (MCCs, VFDs, small power transformers)
 - 2.** Lighting and Small Power Panel-boards
 - 3.** PLC I/O Panel
- D.** Bond together and ground all non-current carrying parts of electrical equipment as specified herein, shown on the drawings, and/or required by the Electrical Code at each installation.
- E.** The metal framework and/or decking of all structures shall be bonded to ground with #4/0 AWG ground wire where this is not otherwise accomplished by the structural steel.

2.5 Windows

- A.** Windows where required, shall be fixed double glazed glass.
- B.** The exterior panes shall be tempered or wire reinforced safety type glass and tinted.

2.6 Flashing

- A.** All flashing shall be made of matching material in a flat sheet.

2.7 Doors

- A.** Provide doors with a minimum openings of 36 inch wide x 84 inch high (910 mm wide x 2100 mm high), or as indicated on the drawings.
- B.** All doors shall be dust and weather sealed.
- C.** All doors shall have locksets. All locks shall be keyed the same.
- D.** All doors shall have door closers and panic bar type hardware on the inside.
- E.** All doors shall open outward.

2.8 Insulation

- A.** Thermal insulation shall be to a minimum of R20 and shall include a vapor barrier.

2.9 Ventilation and Heating

- A.** Ventilation of building shall meet code requirements.
- B.** Equipment shall be mounted on vibration damping devices.
- C.** If sound levels are over NC-40 due to HVAC related noise, air ducts shall have silencers at points of entry into building.
- D.** All HVAC equipment shall have particulate filters with 30% efficiency in accordance with ASHRAE standard 52-76.
- E.** Ceiling or wall mounted electrical unit heaters shall be supplied with built in thermostats.
- F.** Provide fire dampers as required to meet the Building Code.
- G.** All ductwork shall be fabricated with galvanized steel in accordance with SMACNA Standards. Duct insulation shall be included as required.

2.10 Air-conditioning

- A.** Ventilation of building shall meet code requirements.
- B.** Equipment shall be mounted on vibration damping devices.

- C.** If sound levels are over NC-40 due to HVAC related noise, air ducts shall have silencers at points of entry into building.
- D.** All HVAC equipment shall have particulate filters with 30% efficiency in accordance with ASHRAE standard 52-76.
- E.** Ceiling or wall mounted electrical unit heaters shall be supplied with built in thermostats.
- F.** Provide fire dampers as required to meet the Building Code.
- G.** All ductwork shall be fabricated with galvanized steel in accordance with SMACNA Standards. Duct insulation shall be included as required.

2.11 Lighting

- A.** Provide Surface mounted fluorescent tube fixtures in electrical building.
- B.** Provide minimum lighting level of 35 foot-candles (350 lux) in electrical building. Light shall be evenly distributed throughout the interior space in the building.
- C.** Provide building with lighting switches at each door.
- D.** Provide emergency lighting fixtures to permit safe egress from building.
- E.** Provide building with 70W HPS fixtures above each door complete with an integral photocell.
- F.** Provide all lighting and small power distribution panel-boards.

2.12 Power Distribution

- A.** Supply and install all power cabling between components installed in the electrical building.
- B.** Supply and install all control cabling between components installed in the electrical building.
- C.** Supply and install all lighting, small power and control power transformers and panel-boards.

- D.** Provide all cabling for interconnection of equipment using MC type cables, routed in cable trays. Cable trays shall be NEMA heavy-duty, hot-dipped galvanized steel, Class 20A minimum, ladder type with 12 inch rung spacing and 6 inch side walls.
- E.** Provide all wiring to lighting and building services.
- F.** Provide a minimum 12 circuit 120/208 volt lighting panel in Electrical Building to service lighting, outlets, and equipment. Panels shall include a 60A main breaker. Each panel shall have six (6) spare 15 amp breakers for equipment.
- G.** Provide a minimum of six convenience receptacles distributed throughout the building.
- H.** All receptacles shall be protected with GFI type circuit breakers.

2.13 Communication System

- A.** Provide one telephone jack and one computer network jack in the building.

2.14 Fire Protection

- A.** The building shall have a minimum of one (1) 20 lb dry chemical hand held fire extinguisher rated 10A:60B.C by each door.

2.15 Control System and Cabling System

The Manufacturer shall include the following in their supply:

- A.** Install control system equipment. This includes (where applicable):
 - 1.** Control System Input/Output (I/O) Panels
 - 2.** UPS / Battery banks
 - 3.** Motor Control Centers (MCCs)
 - 4.** Variable frequency drives (VFDs)
 - 5.** Switchgear and Starters
- B.** Supply and install inter-wiring between each 480 volt motor control center starter, VFD and adjacent control system I/O panels.

- C.** Cable shall be a multi-conductor, 14 AWG, 600 volt, 75°C MC type cable. Multiconductor, PE/PVC/PVC cable. This interconnecting cabling shall be routed in the electrical building cable tray system. Cable shall be UL approved.
- D.** Cables shall meet the IEEE Flame retardant and the Low Gas Emitting standards. For cable ratings refer to the Single Line Diagram(s).
- E.** Where required, data cables shall meet requirements of equipment manufacturers.

2.16 Signage

- A.** Provide "Danger Signs" on all doors into electrical building. Signs shall indicate the maximum voltage level in the building and shall meet the code requirements.

2.17 Finishes and Color

- A.** Submit information, data sheets and color samples on all finishes to be incorporated into the Work.
- B.** The Owner will make final color selection.

2.18 Distribution Panel Boards

- A.** Electrical Building
 - 1.** Provide surface mounted panel-boards as shown on the drawings. The panel-boards shall be Schneider – Square-D complete with main breaker and bolt-on branch breakers.
 - 2.** Provide GFI breaker for all receptacles. Include a minimum of ten (10) 15 amp GFI breakers for each 120/208 volt lighting panel.
 - 3.** Provide dry type transformers with rating as shown on the drawings.
 - 4.** All cabling from MCC to transformer and from transformer to panel-boards shall be provided by this Vendor.

2.19 Clean Agent Fire Suppression System

- 1.** A conventional fire suppression system, controlling a total flood HFC-227ea or fire suppression system utilizing a power limited, fully supervised automatic detection and manual initiations system.
- 2.** The Fire suppressions system design and installation will be the responsibility of the contractor.
- 3.** The system will need to be approved and permitted by the Lake Havasu City Fire Department.

PART 3 EXECUTION

3.1 Product Delivery, Storage and Handling

- A.** Provide drawings and signage to indicate, centre of gravity and proper handling method(s) for the structures.
- B.** Provide bracing and restraints to permit shipment of the equipment to site without damage. Provide indication of all shipping material and bracing to be removed from the installation at site prior to start-up.
- C.** An impact recorder shall be installed with each shipment.
- D.** Protruding or exposed fittings, fixtures, openings, etc., shall be protected to prevent damage due to dust, moisture, excessive heat or vibration prior to and during shipping.
- E.** All loose parts required for assembly shall be properly boxed, labeled and securely fastened for shipment to site.
- F.** Provide complete protection from damage during shipping. Close all openings with appropriate material to prevent any rain, water or any dust or debris from entering the structure.
- G.** The Vendor shall supply three (3) copies of the Purchaser's Manual.
- H.** Vendor shall ensure that each "shipping package" shall meet all State and government regulations with respect to size and weight restrictions. Where over-sized loads are included, any cost of "escorts" for shipping shall be included in the proposal.

3.2 Installation

- A.** The Contractor shall obtain any necessary permits, certificates and approvals for execution of his work and shall pay for all fees including any inspection and/or re-inspection fees.
- B.** All work shall be done to highest quality of best trade practices.
- C.** The Owner shall have the right to reject any work that, in his opinion, does not conform to acceptable standards of quality, appearance and performance. The Contractor at no additional cost to the Owner shall rectify said unacceptable work.
- D.** Qualified tradesmen experienced in this type of work shall perform all work.

3.3 Site Erection

- A.** Site installation of the electrical building will be by the Contractor.
- B.** Vendor shall quote costs for on-site supervision to assist the site construction staff (if needed)

3.4 Acceptance

- A.** Inspection and acceptance of the work will be made by the Owner or his representative to verify conformance with drawings and specifications.

PART 4 MEASUREMENT AND PAYMENT

4.1 Measurement

- A.** No measurement will be made for this item, Electrical Building.

4.2 Payment

- A.** Payment will be made at the contract lump sum price bid and shall be considered full payment for providing labor and materials to perform this work.

**** END OF SECTION 13127 ****