



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

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February 23, 2015

ADDENDUM NUMBER FOUR

RFQ # 7549284

TITLE: Electrical Upgrades to the DOT Building, DOA

Closing Date and Time: 3/2/15 at 3:00 PM

Per the issuance of this ADDENDUM #4 (6) pages, including this cover sheet)



Specification Change /Addition / Clarifications

The attached Section 16102 – Basic Materials and Methods-Exterior was inadvertently not attached to the previous Addendum #3.

This section was mentioned in response to question #1 on the previous addendum.

SECTION 16102 - BASIC MATERIALS AND METHODS - EXTERIOR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 01 Specification Sections, shall apply to this Section of the Specifications.

1.2 WORK INCLUDED

- A. Furnish all labor, materials, equipment, and incidentals required, and install, complete, and ready for operations all exterior electrical work, as shown on the Drawings and as specified herein.

1.3 RELATED WORK

- A. Applicable requirements of other Sections of Division 16 shall apply to this Section.

1.4 SUBMITTALS

- A. Shop Drawings for equipment specially manufactured or modified for this project.
- B. Product Data for:
 - 1. Raceways and fittings.
 - 2. Ground materials.
- C. Manufacturer's installation instructions.

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of underground feeders, structures, etc.
- B. Submit record documents under provisions in Division 01.

PART 2 - PRODUCTS

2.1 RIGID GALVANIZED STEEL CONDUIT

- A. Rigid galvanized steel conduit shall conform to Section 16100.

2.2 UNDERGROUND DUCT (DIRECT BURIED)

- A. The underground direct buried duct bank system shall be a complete system consisting of ducts and spacers, as indicated and required.
- B. Non-metallic conduits shall be heavy wall rigid polyvinyl chloride Schedule 40 PVC pipe, Type II for direct burial and shall be laid in trench as indicated. The conduit shall conform to UL Standard 651, NEMA TC2-1978 and Federal Specification WC-1094 A and shall be Carlon Plus 40 or approved equal.
- C. Preformed duct spacers shall be provided to insure duct separation. Spacers shall be of precast concrete, high impact polystyrene or steel, Carlon "Snap-Loc" or approved equal.
- D. Preformed duct spacers shall be provided to insure duct separation. Spacers shall be of precast concrete, high impact polystyrene or steel, Carlon "Snap-Loc" or approved equal.
- E. The electrical duct conduit system shall be as manufactured by Carlon Systems or an approved equal.

2.3 CABLES

- A. 600-volt cables shall conform to Section 16100.

2.4 INSULATING TAPE

- A. Plastic insulating tape, capable of performing in a continuous temperature environment of 80 degrees C, conforming to UL 510.

2.5 BURIED WARNING AND IDENTIFICATION TAPE

- A. Provide detectable aluminum foil plastic-backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried cable and conduit. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 2 inches minimum width, color coded for the utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall be CAUTION BURIED ELECTRIC, TELEPHONE CABLE BELOW, or similar. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material.

2.6 GROUNDING AND BONDING EQUIPMENT

- A. Ground rods shall be copper clad steel with diameter adequate to permit driving to full length of the rod, but not less than 3/4 inch in diameter and 10 feet long unless otherwise indicated. Ground rods shall conform to UL 467, and shall be manufactured by Blackburn, Erico or approved equal.
- B. Ground wire shall be sized as indicated.
- C. Grounding conductors shall be stranded-bare copper conforming to ASTM B 8, Class B, for sizes No. 6 AWG and larger, and shall be solid-bare copper conforming to ASTM B 1

for sizes No. 8 and smaller. Cable sheaths, cable shields, conduit, and equipment shall be grounded with No. 6 AWG.

- D. Ground connections shall be exothermic weld type, such as Cadweld, as manufactured by Erico. Mechanical type connectors shall be as manufactured by Thomas & Betts Co., Burndy or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Underground electrical work shall conform to NFPA 70, "National Electrical Code" and ANSI C 2, "National Electrical Safety Code."

3.2 CONDUIT INSTALLATION SCHEDULE

- A. Verify requirements before proceeding with work.
- B. Rigid Steel Conduit: Through concrete slabs and foundations, exposed outdoor locations; conduit transitions rising from underground, and where indicated.
- C. PVC Schedule 40: Direct-buried except wall and slab penetrations.

3.3 UNDERGROUND DUCTBANK INSTALLATION

- A. Stake out the routing of the underground conduits as soon as field conditions permit, subject to the approval of Engineer. Finished grades shall be indicated at stakes. The Engineer reserves the right to make any reasonable change in location without additional cost to the Owner.
- B. Trenches shall be excavated and ducts installed at least 18 inches below finished grade and shall slope at least 3 inches per 100 feet of run.
- C. PVC conduit shall not be installed at temperatures below 32°F.
- D. Entire trenches between ends of conduits shall be opened and accurately graded. The conduits shall be installed by the "built-up" method using approved spacers or separators under and between the conduits. Spacers shall be installed 6 feet on center along the entire length of the conduits and within 2 feet either side of conduits joints. Conduits shall be laid so that all joints are staggered a minimum of 6 inches. The conduit ends and couplings shall be kept clean by wiping off dirt and moisture with a clean cloth. Apply approved PVC solvent cement coating the entire interior of the joint. Joints which must be cut in the field shall be made with an approved hand-type machine made for the purpose by the conduit manufacturer.
- E. Sweep bends may be made up of one or more curved or straight sections of combinations thereof. Manufactured bends shall have a minimum radius of 18 inches for use with conduits of less than 3 inches in diameter and a minimum radius of 36 inches for ducts of 3 inches in diameter and larger.

- F. For duct line connections to existing structures, core drill the structure wall to the dimensions required and preserve steel in the structure wall.
- H. During construction, protect partially completed duct lines with suitable conduit plugs to prevent entry of debris such as mud, sand, and dirt. As each section of a duct line is completed draw a stiff bristle brush having the same diameter of the duct through the duct, until duct is clear of particles of earth, sand, and gravel; then immediately install end plugs.
- I. A mandrel swab shall be drawn through underground conduits immediately after they have been laid. Install pull cords in each conduit immediately after swabbing and plug with tapered plastic plugs to prevent entry of debris. Provide plugs with tabs for attaching pull cords and polyester tapes or rope pull cords with a tensile strength of at least 1200 lb.
- J. The conduits shall be swabbed again just prior to the cable installation.
- K. Underground conduits shall be rigid steel from a point five feet beyond the building, at the equipment, and at the transition from underground to exposed. Where underground conduits enter equipment, they shall be sealed with compound bushings. Compound bushings shall be of malleable iron, hot dipped galvanized finished manufactured by O.Z. Gedney Type "FR," "KR," "CSBG," or approved equal.

3.4 CABLE INSTALLATION

- A. Install cable in accordance with the cable manufacturer's recommendations.
- B. Test duct lines and conduits with a mandrel and thoroughly swab out to remove foreign material before pulling cables. Pull cables down grade with the feed-in point at the structures of the highest elevation. Use flexible cable feeds to convey cables into the duct runs
- C. Lubricants for assisting in the pulling of jacketed cables shall be those specifically recommended by the cable manufacturer. Cable lubricants shall be soapstone, graphite, or talc for rubber or plastic jacketed cables. The lubricant shall not be deleterious to the cable sheath, jacket, or outer coverings.
- D. Cable pulling tension shall not exceed the maximum pulling tension recommended by the cable manufacturer. Cable shall be pulled with an attached dynamometer. Pulling tension results shall be submitted to the Owner/Engineer.
- E. Protect terminations of cables from accidental contact, deterioration of coverings and moisture by providing terminating devices and materials. Install terminations in accordance with the manufacturer's requirements. Cable terminations shall be made with materials and methods as indicated or specified or as designated by the written instructions of the cable manufacturer and termination kit manufacturer.

- H. When cutting cable, use heat shrink adhesive coated caps on cable ends or tape cable ends immediately after cutting to prevent moisture from entering the cable.

3.5 GROUNDING SYSTEMS

- A. Noncurrent-carrying metallic parts associated with electrical equipment shall have a maximum resistance to solid earth ground not exceeding 5 ohms.
- B. Provide cone pointed driven ground rods driven full depth plus 6 inches, installed to provide an earth ground of the appropriate value for the particular equipment being grounded.
- C. Make grounding connections which are buried or otherwise normally inaccessible, excepting specifically those connections for which access for periodic testing is required, by exothermic weld or compression connector.
 - 1. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.
 - 2. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.

END OF SECTION 16102