ITEM 599.2212 10 M - CONDUIT AND WIRING – SB BRIDGE

DESCRIPTION

This work shall consist of removing existing conduit and wiring, sealing off source of water entry to electrical room, redressing submarine cable armored jackets, and furnishing, installing, terminating, connecting and testing conduit and wiring for equipment and for interconnections between various equipment, fixtures, and devices in accordance with the contract documents and as directed by the Engineer. All necessary accessories, supports, fittings, attachments, hardware shall also be included to complete the conduit and wiring system.

MATERIALS

A. General. The Contractor shall submit the following documents:

a. Catalog cuts, product specification/performance sheets
b. Conduit and wiring layout, tabulation spreadsheets indicating the size, conductor count, specific equipment served, and wire numbers
c. Drawings of conduit and wiring layout showing conduit and wiring interconnecting between junction boxes, enclosures, cabinets and equipment being served, as tabulated on spreadsheets
d. Test results as required herein.

Materials shall meet the requirements of the following sections of the Standard Specifications of the New York State Department of Transportation:

Flexible Liquid-Tight Steel Conduit	723-24
Single Conductor Cable	723-70

B. PVC Coated Galvanized Steel Conduit. The sizes of conduits shall be as indicated on the drawings. The minimum size of conduits, run exposed or concealed, shall not be smaller than 21mm (3/4-inch).

Rigid conduits and fittings shall be hot-dip galvanized steel, conforming to ANSI Standard C80.1 and UL Standard UL6, and shall have a factory-applied, polyvinyl-chloride (PVC) exterior coating with a nominal 40 mil thickness. The galvanized surfaces of the conduit and fittings shall be coated with an epoxy-acrylic primer before plastic coating. A Urethane coating shall be applied to the interior with a nominal 2-mil thickness. The Urethane interior coating shall afford sufficient flexibility to permit field bending without cracking or flaking of the interior coating. Conduit clamps, U-bolts, couplings, fittings, and elbows used with PVC coated conduits shall have the same coating as the conduit. Breaks, scars, or other interruptions in the PVC coating shall be repaired as per the conduit manufacturer's recommendations.

Conduit "C" bodies, "L" bodies, pulling elbows and couplings shall have flexible PVC sleeves which extend to overlap the PVC coating on the conduit. Sleeves shall be 40-mil, nominal thickness.

All conduit joints shall be threaded, using standard taper thread. Straight or clamp joints shall not be used. All thread cuts after galvanizing shall be thoroughly cleaned, degreased and coated with an approved compound to provide cold galvanizing of the threaded area. A clear urethane coating shall be applied to all conduit joints and threads after installation.

C. Electrical Flexible Cable. The cable shall be type W, U.L. listed, rated 90 degrees Celsius for wet or dry locations and 2000 volts, designed for hard usage with oil, weather and sun-light resistant and chlorinated polyethylene jacket suitable for outdoor use. Conductors shall be bare annealed copper

per ASTM B-3, flexible and rope-lay-stranded per UL-44, and shall have color-coded conductors with synthetic rubber (ethylene propylene diene monomer) insulation. The complement and size of conductors in each cable shall be as shown in plans.

D. Junction and Pull Boxes. All boxes shall be Nema 4X stainless steel, properly sized per requirements of the National Electrical Code (NEC) for wire pulling based upon the size of conduits entering boxes. All supports, attachments and fastening hardware shall be stainless steel.

E. Wire Coding. Wires shall be color-coded for phase identification, per NEC, Section 210-5. The white neutrals shall be of same size as phase wires. Conductors which have the insulation removed for termination or for splicing shall be marked with appropriately colored insulating tape for phase identification. In addition, the name of the manufacturer, insulation type, voltage rating and wire size shall be clearly and permanently imprinted throughout the length of each conductor.

F. Ground Rods, and Ground Rod Clamps. Ground rods of 25mm (one-inch) diameter shall be furnished in 3.048-meter (10-foot) lengths and installed for grounding, as indicated on the drawings. Ground rods shall consist of a high-strength steel core, molten welded exterior of copper and a cold formed point on driving end. Ground rod clamps shall consist of a high strength cast bronze body and a bronze hex-head set screw, suitable for direct burial, or otherwise indicated in plans.

G. Terminal Blocks. Terminal blocks shall be UL-listed for the wire sizes shown in plans, shall be heavy-duty, 600-volt, tubular screw type, provided with pressure-sensitive marking tape. The terminal block housing shall be flame-retardant, phenolic or equivalent, designed such that the contact block is protected between the molding barriers from adjacent circuits or live parts. Individual contacts shall be tubular screw type, constructed of electrical grade copper with zinc plated steel screws. Terminal blocks shall be mounted on track in cabinets or enclosures, and 20% spares shall be provided.

CONSTRUCTION DETAILS

This work shall be in accordance with the applicable requirements of the latest edition of the following codes and standards:

1. National Fire Protection Association, National Electrical Code (NEC)
2. National Electrical Contractors Association, NECA 1, Standard Practices for Good Workmanship in Electrical Contracting
3. Rules of the New York State Public Service Commission
4. Local power company and any other local rules, regulations and ordinances which may apply.

A. General. The work of conduit and wiring shall also conform to the applicable requirements of the following sections of the Standard Specifications of the New York State Department of Transportation:

Storage of Materials	106-06
Conduit	670-3.07
Single Conductor Cable	670-3.12
Tests	670-3.16

Materials shall be handled, stored and protected in accordance with the manufacturer's recommendations. Equipment, materials and components intended for indoor installation shall not be stored outdoors. Damage to material caused by the Contractor’s operations shall be repaired at no expense to the State.

The Contractor shall remove all conduit, wiring, boxes, supports and appurtenances required for replacement and removal. The removed materials shall become the properties of the Contractor and shall be properly disposed of away from the construction site.

Basis of Acceptance

All shop drawings submitted shall follow the general guidelines and procedures given in the New York State Steel Construction Manual. No installation or rehabilitation work may take place until the shop drawings and procedures have been approved by the Engineer.

B. Conduit and Fittings.

The Contractor shall perform the following work for conduit:

a. The final connection of the rigid steel conduit to the electrical equipment subject to vibration, shall be made with liquid-tight, flexible metal conduit and with suitable liquid-tight connectors. Flexible conduits are used, only where final connection to equipment with rigid conduit is not practicable, or where equipment is subject to vibration, such as to equipment with adjustable mountings or to all machinery.
b. Liquid-tight unions shall be installed where standard threaded couplings cannot be used.
c. All nicks, cuts, exposed surfaces of conduit joints and abrasions to PVC coating on the rigid conduit shall be repaired with the factory-supplied repair compound. The compound shall form uniform coating and adhere to the original coating.
d. Burrs on conduit ends shall be removed and the conduit termination shall be equipped with an insulated bushing to avoid abrasion on the wire insulation.
e. Conduits shall be supported at not more than 1.8-meter intervals, unless otherwise indicated, with at least one support between couplings. Supports shall be provided on each side of the conduit bends or elbows not more than 3 feet on each side of each outlet panel, pull box or other conduit termination. Conduit supports and hardware shall be stainless steel.
f. Conduits shall be securely fastened to junction and pull boxes, and cable trays with full number of threads projecting through tapped bosses. Gasketed or O-ring, water-proof conduit hubs shall be used on the outside boxes where tapped bosses are not possible.
g. Conduits crossing each expansion joint of the bridge structures shall be provided with expansion/deflection fittings or other means to compensate for expansion or contraction. Expansion/deflection fittings shall allow sufficient movement, as required at each location.
h. All conduit connections shall be tightly connected to provide good electrical conductivity for grounding throughout the entire length of the conduit run, including flexible conduits.

C. Conductors and Wiring.

The Contractor shall perform the following work for wiring:

a. Identify all power conductors by color-coding as follows:

Phase A - Black
Phase B - Red
Phase C - Blue
Neutral - White
Ground - Green

b. Verify that circuits are wired as indicated on drawings, and are continuous and free of shorts, opens and unintentional grounds. Energize and test the operation of each circuit to ensure the continuity of circuit and that the circuit is properly connected without any unintentional shorts.

D. Electrical Flexible Cables. Flexible cables shall be installed for wiring from the fixed part to the moving part of the bridge by suspension at each end with sufficient length in the loop to compensate for the movement of the span and to ensure no sharp bends in the cables as the span moves. Cables shall be supported at each end of the loop by stainless steel cable-grip wire mesh.

E. Repairs.

a. The work of sealing off the source of water entry to the electrical equipment room shall include, but not be limited, to the following:
   - At an appropriate time during the construction, the Contractor shall remove the existing junction box mounted on the ceiling above the existing switchboard of the electrical equipment room.
   - Investigate to find the source of the water entry.
   - Repair the damage as required.
   - Seal off the source of the water entry with an appropriate water-proof sealant.
   - Verify that the water entry source has been completely sealed off.

b. The work of redressing the protective jacket of the armored wires of the existing submarine cables shall include, but not be limited to, the following:
   - Remove the deteriorated jacket on the existing submarine cables.
   - Remove surface rust on the submarine cable armored wires.
   - Clean and prepare the surfaces of the cables, and paint with a rust-inhibiting primer.
   - Spirally wrap exposed sections of the cables with tarred jute.

METHOD OF MEASUREMENT

This work will be measured for payment on a lump sum basis.

BASIS OF PAYMENT

The lump sum price bid shall include the cost of removing existing materials, furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.