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**EXAMPLE SPECIFICATION LANGUAGE FOR SUBMARINE
CABLE INSTALLATION**

SECTION 03200 - SUBMARINE CABLE FOR MOVABLE BRIDGE

Section 03200, which is not in the Standard Specifications, is included for this project by Special Provision.

Description

03200.00 Scope - Identify and mark any existing power and communication cables (if any) in the channel prior to any cable installation. Use divers or other approved means to locate any existing cables and conduits in the channel. Plan an approved route across the channel which will avoid interference and damage to other utilities and which will not pass through the existing bridge fender system. Assume complete responsibility for any damage to existing utilities occurring resulting from the execution of this contract.

Install submarine cables either by horizontal directional drilling or by plowing.

Install one submarine type combined power and control cable, and one submarine type variable frequency drive cable, across the channel between Pier 2 and Pier 3; and one submarine type high voltage power cable, across the channel between Pier 1 and Pier 3. Install the submarine cables in a continuous and un-spliced length at a minimum depth of 3 feet in the main channel outside of the fender system of the bridge.

Install submarine cable supports according to plans on Pier 1, Pier 2, and Pier 3. Extend the cables up the pier. Install approved submarine cable clamps on each pier. Terminate the cables steel wires on these submarine cable clamps. Install the cables remaining conductors and fibers through conduits to junction boxes and terminate on terminal strips.

Notify and coordinate all work with all local, state and federal agencies having jurisdiction over the waterway and with all utilities using the waterway. Perform in-water work during In-Water Work periods, within a time period and in a manner approved by these agencies.

Coordinate all work with the local Project Manager. Schedule work in advance and perform work at approved times. Unless otherwise approved, perform work during normal business hours.

Equipment and Materials

03200.10 General - Provide all material, equipment, and labor required for completion of this specification. Supply three submarine cables described in Section 03200.20. Secure these cables to the piers with approved corrosion resistant hardware and terminate at locations indicated in the drawings.

Provide for the storage and security of all the Contractor's equipment and materials. Do not store equipment either on the bridge or on ODOT's property without written approval.

Perform all on-site electrical and optical testing described by other sections of this specification prior to installing these cables.

03200.20 General Submarine Cable Features

1. Provide Submarine Cables conforming to the following: annealed uncoated copper conductors within the cable conforming to ASTM B-3, stranded to meet ASTM B-8, class B stranding, and ICEA S-95-658, NEMA WC-70.
2. Provide cross-linked Polyethylene (XLPE) insulation of the conductors within the cable, meeting ICEA S-95-658, Nema WC70. Provide 30 mils minimum insulation thickness for conductors in the #14 - #9 AWG range, and 45 mils minimum insulation thickness for conductors in the #8 - #2 Awg range.
3. Cable together inner cable components with an approved material and the cabled core wrapped with a moisture-resistant binder tape. Provide lay length and directions conforming to ICEA S-95-658
4. Provide cables with a weather and UV-resistant high density polyethylene (HDPE) inner jacket.
5. Provide cables armored with galvanized steel wire coated HDPE per ICEA S-95-658 NEMA WC70 of an approved wire size.
6. Provide cables with Weather and UV resistant high density polyethylene (HDPE) outer jacket per ICEA S-95-658, NEMA WC70.

Field verify the length of all submarine cables required prior to ordering those cables and submit the results of those measurements to the agency. Assume full responsibility for ordering sufficient cable lengths. The agency will not approve ordering less than the "nominal" lengths of cable given below without approving the measuring procedures of the contractor.

03200.21 Variable Frequency Drive Submarine Cable

Provide an approved shielded 600V cable with 4 - #2 Awg copper conductors and a 30 Awg TC braid meeting the requirements of Subsection 03200.20 above. Provide this cable in a nominal 1.92" outer diameter. Field verify the length of cable required prior to ordering the cable and submit the results of those measurements. The nominal minimum length of this cable is 500 feet.

03200.22 Multi-Conductor combined Power & Control Cable With Fiber

Provide a composite multi-conductor 600V combined fiber optic and copper conductor cable meeting the requirements of Section 03200.00 above with the following:

1. 3 each #6 Awg copper conductors
2. 5 each #8 Awg copper conductors
3. 3 each #10 Awg copper conductors
4. 32 each #12 Awg copper conductors
5. 1 each 24 pair Multi-Mode Fiber Optic Cable

Provide a fiber optic component cable having an approved 62.5/125um core/cladding enhanced grade multi-mode, and graded index glass fiber. Provide dielectric materials

in the fiber optic component cable. Provide a cable that is resistant to water and suitable for use both installation in the submarine cable environment and in the vertical riser application required as the submarine cable extends up the pier from the bay to the roadway above it.

Provide installed fiber optic cable meeting or exceeding the following performance specifications

1. Maximum attenuation of 3dB/Km at 850nm wavelength
2. Minimum bandwidth of 100Mhz*Km at 850nm wavelength
3. Max attenuation of .9 dB/Km at 1,300 nm wavelength
4. Minimum bandwidth of 500 Mhz*Km at 1,300 Nm wavelength
5. Capable of a bend radii of 20x component cable diameter Installation
6. Have a minimum Crush resistance of 850 Lbs/in
7. EIA/TIA-598 Color Coding

Verify the suitability of the fiber-optic cable with the fiber optic equipment installed under this specification. The nominal minimum length of this cable is 500 feet.

03200.23 5KV High Voltage Shielded Submarine Cable

Provide a composite 3 conductor #4 Awg Copper 5KV rated shielded and jacketed submarine cable meeting the requirements of Subsection 03200.00 above. The nominal minimum length of this cable is 1,000 feet.

Installation

03200.50 General - Complete all installation according to the plans, special provisions, and specifications as directed. Install each cable in one continuous length with no splices between the junction boxes on Pier 1, Pier 2, and Pier 3.

Preliminary Survey - Use divers or other approved means to determine the existence and route of any utilities and conduct a preliminary survey. Contract drawings may not accurately identify the existence and location of other cables. Become familiar with all other utilities utilizing the channel and assume full responsibility for both determining the location of their cables (if any) and avoiding damage to them. Create and submit drawings indicating any cables and the route taken by all these cables. ODOT will provide, on request, scaled plan drawings, which the Contractor may use to plot the cable routes on.

Submit these drawings, along with a minimum of three copies, to the contracting officer a minimum of 5 working days prior to the pre-installation meeting. Plot a proposed installation route on these drawings.

Mark the path of the installed cable with buoys or approved visual indications so that the surveyed cable path can be followed during installation.

Pre-installation Meeting - Schedule a pre-installation meeting in Astoria and submit drawings indicating the route the existing utilities take across the Main Channel along with the route of the cables to be removed and the planned route of the cables to be installed. Be prepared to discuss all planned aspects of cable installation at this

meeting. Invite all interested parties, including officials from government regulation agencies and utilities, to the meeting. Schedule the meeting a minimum of 7 working days prior to installing any cables.

Navigation Channel Installation (Plowing) – Install the submarine cable using a plow driven and controlled from a barge. Plow the submarine cable to a minimum depth of five feet in the navigation channel. Provide divers in the water during plowing operations

Installation (Horizontal Directional Drilling) – Install the submarine cable using horizontal directional drilling equipment capable of being controlled accurately enough to provide a minimum burial depth of five feet in the navigation channel and three feet in all other locations.

Installation Survey - Survey the location of each cable as it is being installed. Identify the path of the cable with points at 20-foot maximum spacing and +/- 2 foot accuracy. Survey may be completed using GPS equipment meeting the specified accuracy, subject to approval by the Engineer. Create and submit survey drawings indicating the path of all cables, referenced to benchmark located on the north end of New Young's Bay Bridge No. 08306.

Installation on Pier - Secure the cable to Pier 1, Pier 2, and Pier 3 according to plans. Install approved junction boxes and submarine clamps on Pier 1, Pier 2, and Pier 3 and extend the cable vertically to them.

03200.80 Measurement – No measurement of quantities will be made for work performed under this Section.

03200.90 Payment – The accepted quantities of submarine cables will be paid for at the Contract Lump Sum amount for the item "Submarine Cables". Payment for providing and installing submarine cables as specified will be made at the Contract lump sum amount for the bid item "Submarine Cables".

Payment will be payment in full for furnishing and placing all materials, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.