

ITEM 10599.1302 M - CHANNEL SUBMARINE CABLE

DESCRIPTION. The work specified in this item includes furnishing and installing new submarine cables between spans of both the east and west bridges. Four new submarine cables shall be provided in the channel. The cables, terminal cabinets, cable supports, armor clamps, bell ends, cable terminators, brackets, and hardware shall be provided as needed for installation.

Quality Assurance

1. Codes and Standards. All installations shall conform to all Federal, State, and local codes, ordinances, and laws having jurisdiction over this project. In the event of a conflict between these Specifications and the above mentioned codes, the more stringent of the two shall govern.
2. Referenced Standards. Comply with the provisions of the following regulatory and directive documents:
 - a. New York State Department of Transportation (NYDOT) Standard Specifications for Construction and Materials, 1995, as amended.
 - b. American National Standards Institute (ANSI): C80.1, Rigid Steel Conduit, Zinc Coated.
 - c. American Society for Testing and Materials (ASTM):

A 525	Sheet Steel, Zinc Coated (Galvanized) by the Hot Dip Process, General Requirements.
B 3	Soft or Annealed Copper Wire
B 8	Stranded Copper Wire, Specter Conductors, Hard, Medium Hard, or Soft
B 33	Tinned Soft or Annealed Copper Wire for Electrical Purposes
 - d. American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications for Movable Highway Bridge.
 - e. National Electrical Code (NEC).
 - f. National Electrical Safety Code (NESC).

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- g. National Electrical Manufacturers Association (NEMA).
- h. U.S. Department of Labor - OSHA.
- i. LIPA Rules and Regulations, Construction Standards (CS 8016).

The New York Board of Fire Underwriters will arrange and pay for the inspection. Furnish certificates of inspection for the Department and LIPA.

Comply with local codes which are more stringent than the above.

3. Submarine Cable Field Quality Control.

Sounding Elevations: Before the commencement of any cable laying work in or near the waterway, sounding elevations of the waterway bottom based on the National Ocean Survey datum shall be taken for the full length of the cable paths and for a distance of 18 meters upstream and downstream of the proposed cables' centerline. These soundings shall be taken on a 3 meter grid and shall be submitted to the Department of Public Works and the U.S. Coast Guard as soon as they are plotted.

Upon completion of the installation of bridge cable, an inspection of the waterway bottom shall again be performed to insure that all bridge construction waste materials have been completely removed from the waterway. This inspection shall consist of sounding elevations on a 3 meter grid and should cover the area surveyed previously. These soundings shall also be submitted to the Department of Public Works and the U.S. Coast Guard.

- 4. Closing of Waterway. At no time during the repairs shall the waterway be completely closed to navigation without prior written approval of the U.S. Coast Guard.
- 5. Obstruction of Navigation. During the progress of work should any material, machinery, or equipment be lost, dumped, thrown overboard, or sunk so as to obstruct, interfere with or hazard navigation, immediate notice shall be given to the Coast Guard and the object shall be removed immediately. Until removal can be effected, the obstruction shall be properly marked in order to protect navigation. Notice to the Coast Guard shall give a description and location of any such object and the action taken or being taken to protect navigation.

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6. Spillage of Oil and Hazardous Substance. Spillage of oil and hazardous substance is specifically prohibited by Section 311 of the Federal Water Pollution Control Act of 1972, as amended. Measures shall be taken including:
 - a. proper maintenance of construction equipment;
 - b. arrangement of fuel/hazardous substance handling areas so as to ensure that any spills are contained before trenching navigable waterways or their adjoining shorelines;
 - c. instructions to personnel not to dispose of oil/hazardous substances into drains or the navigable waterways directly or onto adjoining shorelines and any other procedure to prohibit spillage; and
 - d. if in spite of such planning, oil/hazardous substances are spilled into a navigable waterway or adjoining shoreline, the U.S. Coast Guard shall be notified immediately at 1-800-424-8802. A supply of an absorbent material shall be retained so that it may be rapidly deployed to soak up any possible spillage, pending Coast Guard arrival on scene. The use of chemical dispersing agents and emulsifiers is not authorized without prior, specified, Federal approval.

SUBMITTALS. Except as otherwise noted herein, eight copies of individual shop drawings shall be submitted.

Final approval of shop drawings, details, and catalog cuts will not be given until the Contractor affixes a statement to each submittal indicating his review of the applicable Contract drawings and confirming compatibility.

It shall be the Contractor's responsibility to verify the field dimensions given on the drawings. Dimensions given on the drawings are nominal and intended for guidance. Before cable orders are placed with any manufacturer, the Contractor shall determine the true length of each cable between the submarine cable terminal cabinets. Splicing or joining of conductors between these points will not be allowed.

The Contractor shall be responsible for ascertaining and ordering the correct continuous length of submarine cables, including sufficient excess length to accommodate pulling eyes, adequate slack for submarine cable settling, cable clamping, connections, and for samples.

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The Contractor shall submit seven (7) copies of his/her schedule and sequence of operations to the Department for approval at least 45 days prior to any work over or in the waterway. In addition, a sketch of the project area shall be submitted showing the following:

1. the waterway;
2. the bridge;
3. the location of any restrictions that will be placed in the waterway such as barges, anchors, and anchor lines; and
4. the location, height above mean high water, and detailed description of any scaffolding or netting to be used.

The schedule for submarine cables shall also include the daily hours of operation and whether or not waterborne equipment will remain in the waterway at night. The Contractor shall be required to comply with all provisions of the Inland Navigation Rules, copies of which are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Refer to Stock No. 022-003-92759-0. One (1) copy of the Plan and Schedule of Operations, approved by the Department and the U.S. Coast Guard will be returned to the Contractor with U.S. Coast Guard approval stamp and/or comments as appropriate. No deviation from the approved Plan and Schedule of Operation may be made unless the modification has previously been submitted and approved.

MATERIALS.

General. Materials, Construction Details, and Methods of Measurement and Basis of Payment specified herein and/or required by the Plans shall be in compliance with the latest edition of the NYDOT Standard Specifications for Construction and Materials, as amended, except as specified or added to in these Technical Special Provisions.

All metal parts of the electrical installation shall be of corrosion resisting material such as an aluminum, bronze, or stainless steel. Cast iron, malleable iron or steel with a hot-dip galvanized finish shall be used where specified herein or permitted by the Engineer.

Notwithstanding any reference in the Specifications of any article, device, product, material, fixture, form, or type of construction by name, make, or catalog number, such reference shall be interpreted as establishing a standard of quality and to inform the Contractor as to the type of material, quality, and fit required but shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device,

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product, material, fixtures, form, or type of construction which in the judgement of the Engineer, expressed in writing, is equal to the specified quality.

Submarine Cables. The submarine cables shall comprise two different types of cables. Type A cables shall contain at least the following conductors: 2 No. 1 AWG; 12 No. 2 AWG; 6 No. 6 AWG; and 80 No. 10 AWG. Type B cables shall contain at least the following conductors: 140 No. 10 AWG; 2 RG-11/U Coaxial Cables; and 6 No. 16 Twisted/Shielded Pair.

Materials and construction of the submarine cables shall conform to referenced requirements of NEMA Publication No. WC7, latest revision. All conductors shall be soft annealed copper wire conforming to the requirements of NEMA Publication No. WC7. All conductors shall have Class B concentric stranding. The insulation of each conductor shall be a moisture-resisting, cross-linked, polyethylene compound conforming to the requirements of NEMA WC7, Part 3.7. The thickness of insulation shall be as given under Column A of Table 3-1 for 2,000 volts rated circuit voltage. The insulation shall incorporate mineral fillers (not carbon) to inhibit treeing.

In each cable, the insulated conductors shall be cabled to a full circular section using non-hygroscopic fillers, where necessary, to fill out the section. Each layer of the conductors shall be covered with a single serving of binder tape. Conductors in each layer shall be identified by coloring or marking the outer surface of the insulation. Over the cabled conductors, there shall be applied one layer of binder tape followed by a homogeneous synthetic sheath conforming to the requirements of NEMA WC7, Part 4.4.2, Polyethylene, Black. The thickness of the sheath shall be in accordance with the requirements of Table 4-7. Over the sheath, there shall be applied cable armor consisting of a single layer of galvanized plow steel wire, each wire covered with a layer of polyethylene. A high-density polyethylene jacket shall be placed over the armor. The polyethylene jacket, jacket thickness, and armor jacket shall conform to NEMA WC7, Parts 4.4.2, 4.4.3, and 4.5.8. Any variations in cable construction or materials shall be submitted to the Engineer for review and approval.

Approved moisture-resistant filler material suitable for submarine cable application shall be used in the interstices between and over the insulated conductors to give the complete cable a circular cross-section.

Binder tape of approved, suitable, flame-resistant, and moisture-resistant fabric material with a thickness not less than 10 mils shall be applied over the multi-conductor/filler assembly and overlapped not less than 10 percent of its width between turns.

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Connectors, Terminals, and Tape.

1. Connectors, Terminal Lugs, and Fittings: For 12 AWG to 4/0 AWG insulated cable compression type tin plated copper connectors and terminal lugs having conductor insulation grip. Terminal blocks shall be heavy duty, 600 volt, tubular screw type.
2. Bundling Straps: Self-locking steel barb on one end with tapered strap of self-extinguishing nylon of minus 54 degrees C to 121 degrees C temperature rating. For outdoor use: ultraviolet resistant nylon strap with the above characteristics.
3. Insulating Tape:

- a. Plastic Tape: Vinyl plastic tape with rubber-based pressure-sensitive adhesive, pliable at a low temperature of minus 17.8 degrees C and having the following minimum properties:

Thickness	0.22 mm
Breaking Strength	357 kg/m (width)
Elongation	200 percent
Dielectric Breakdown	10,000 volts
Insulation Resistance	1,000,000 megohms
(Indirect method of electrolytic corrosion)	

- b. Rubber Tape: Silicon rubber tape with silicon pressure-sensitive adhesive and having the following minimum properties:

Thickness	0.38 mm
Breaking Strength	232 kg/m (width)
Elongation	525 percent
Dielectric Breakdown	13,000 volts
Insulation Resistance	1,000,000 megohms
(Indirect method of electrolytic corrosion)	

CONSTRUCTION. Prior to commencing installation, it is pointed out that:

1. During construction, it will be mandatory to keep the bridge in operation. It will be the Contractor's responsibility to maintain service in accordance with the Special

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Provisions and provide necessary labor and materials for splicing, rerouting, and temporarily supporting the necessary cables.

All electrical work requiring bridge closure shall be carefully planned and coordinated with other work such as machinery and structural work and shall meet the complete bridge closure schedule proposed in the Contractor's schedule of rehabilitation.

2. There will be outages during critical changeovers. These service outages shall be scheduled in advance and shall be at the convenience of the Nassau County Department of Public Works, even if this work requires to be done at premium time.

Installation.

1. Enclosures: Perform circuit wiring as specified elsewhere herein.

Neatly route, harness, and support conductors in gutters, slotted wire duct, wiring spaces, and compartments. Bending radii not less than recommended by conductor manufacturer.

2. Conductors and Wiring: Install wiring and conductors only when the raceway has been completed. Thoroughly clean the inside of all conduits of any dirt, moisture, or other foreign materials before pulling wire and cable. Pull wires and cables in conduits after an application of suitable lubricant that will have no injurious effect on the insulation of the conductor. No oil or grease shall be used.

Secure joints in circuit wiring mechanically and electrically. Conductors shall be terminated on terminal blocks.

Identify control wiring by color-coded, plastic-coated, self-sticking printed markers, permanently attached stamped metal foil markers, or equivalent means. The identification of each control wire shall consist of a number and a letter based on the existing control schematic. Provide conductor identification within each enclosure where a tap, splice, or termination is made. Identify control circuit terminals of equipment also. Terminal and conductor identification must be shown on approved shop drawings. Hand lettering or marking is not acceptable.

Verify that circuits are wired as indicated and are continuous and free of shorts. Energize and test each circuit, including lights and outlets. Check voltage at outlets. Test other electrical equipment as recommended by manufacturer. Measure grounded

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conductor resistance to true ground and resistance between insulation and ground. Resistance must be within limits specified below. Troubleshoot and correct as necessary.

Repeat the test specified above in the presence of and to the satisfaction of the Engineer.

- a. Test operation of each circuit and circuit control a minimum of 10 times and operation of each circuit continuously for a minimum of 1/2 hour.
- b. Acceptable Resistances;

Grounded Conductor to True Ground: 10 ohms, maximum.

Between Insulation and Ground: 100 megohms, minimum.

3. Conduit Seals. Install watertight seals for conduit penetrations of slabs on grade on exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

Nameplates. All compartment doors and visual components shall be identified with nameplates. Nameplates shall be white laminated phenolic plates engraved with black letters. Lettering shall be vertical. Letter size and stroke shall be consistent and coordinated with the panel layout. Where nameplates are not suitable due to location or nature of the information, stamped metal tags shall be used.

Submarine Cable. The submarine cable shall be furnished in accordance with the details in the Plans and as specified herein. Cable ends shall be sealed and provided with pulling connections. If a length of cable is cut from the reel, the cable end shall be immediately resealed to prevent the entrance of moisture.

On receipt, cable protective covering shall be inspected for evidence of damage during shipment. Report immediately to the Engineer if evidence of damage is found.

Unloading shall be accomplished so that equipment used does not contact cable surface. If unloading is accomplished by crane, either a cradle supporting the reel flanges or a shaft through the arbor hole should be used. If a fork lift is utilized, the forks shall lift the steel at 1.57 R to the flanges and shall be long enough to make complete lifting contact with both flanges. Under no circumstance shall be forks contact the cable surface.

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Under no circumstance shall reels be dropped from the delivering vehicle to the ground.

Store reels on a hard surface so that flanges do not sink into the earth and allow the weight of the reel and cable to rest on the cable surface.

Store reels in an area where construction equipment, falling or flying objects, or other materials will not contact the cable.

Store cable in an area where chemicals or petroleum products will not be spilled or sprayed on the cable.

When a reel of cable is rolled from one point to another, care shall be taken to see that there are no objects on the surface area, which could contact or damage the cable surface.

Store cable in an area away from open fires or sources of high heat.

The submarine cables shall be installed in accordance with the Plans and details on the Plans and as described below.

The Contractor shall provide all tools and cable laying equipment capable of maintaining proper tension. The Engineer will have the right to approve the cable laying equipment and control.

Cables shall be protected from damage by punctures to prevent the entrance of moisture at all times.

Cable tension shall not exceed 44.5 kN.

Under static conditions, the cable shall never be bent to a radius less than 1.52 m for a bend of no more than 1.57 R.

The cable shall be buried to at least 0.9 m below the river bottom and have a minimum of 1.0 m of cover upon completion. The cable shall be embedded by means of jetting or other approved equipment capable of burying the cable in a self-covering slit without exerting undue strain or otherwise damaging the cable. Pre-trenching and backfilling or any method of cable embedment which would radically change the natural contour of the river bottom or cause excessive silting is not acceptable.

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Unless the equipment used to bury the cable assures a specified depth of cover by inherent design, the Engineer will require verification of the depth of embedment by independent suitable means, which shall be mutually agreed upon before the Contract is awarded. Such verification will be at the Contractor's expense and certification will be required.

METHOD OF MEASUREMENT. Measurement for the foregoing work will be made on a lump sum basis.

BASIS OF PAYMENT. The Contract lump sum price bid and payment for Channel Submarine Cable shall be full compensation for furnishing and installing all equipment and materials described and specified in this Section to install submarine cables across the channel and into each submarine cable junction box. Items incidental to the Channel Submarine Cable include cable clamping equipment, all connections to terminal strips in submarine cable junction boxes, and all incidentals to provide a working system.