

REQUEST FOR QUOTATION

Contact person/Telephone/Email Larry Waxman/212-435-4639/lwaxman@panynj.gov	Collective# Bid Due Date 0000047000 09/14/2016 Bids must be received no later than 11:00 AM on the above Bid Due Date. Deliver Goods/Services To: Path ATTN: GLEN SMILEY ACADEMY STREET
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Quantity	Description	Unit Price	Total
	JERSEY CITY, NJ NJ 07302 PATH ELECTRICAL CABLE. FURNISH AND DELIVER PER ATTACHED GENERAL PROVISIONS (ONE PAGE) AND SPECIFICATIONS PSC CR02495-120 DATED 05/26/2016 (EIGHT PAGES). QUOTE FOB DELIVERED PRICING ON ALL ITEMS. IN THE EVENT OF AN ORDER ADVISE DELIVERY IN _____ DAYS A.R.O. WITH BID RESPONSE ADVISE ELECTRICAL CABLE TO BE OFFERED: MANUFACTURER: _____ PLANT LOCATION: _____ MAKE/MODEL/PART NUMBER: _____ INCLUDE WITH YOUR BID RESPONSE TWO COPIES OF CATALOG CUTS/SPECIFICATIONS/DRAWINGS FOR PORT AUTHORITY REVIEW AND APPROVAL. NOTES: A. BIDDERS(S) ARE TO QUOTE NOT MORE THAN TWO (2) DECIMAL PLACES TO THE RIGHT OF THE DECIMAL POINT. IN THE EVENT THAT THIS REQUIREMENT IS NOT FOLLOWED, THE PORT AUTHORITY WILL NOT CONSIDER ANY VALUES PAST THE SECOND DECIMAL POINT AND DEFAULT TO TWO DECIMAL POINTS. THE		
	PLEASE QUOTE FULLY DELIVERED PRICES	PAYMENT TERMS	Total Delivered Price

This Quotation is subject to the terms and conditions set forth on the back page hereof. Bidder is advised to read these before signing. We have read the instructions and, if favored with an order, we agree to furnish the items enumerated herein at the prices and under the conditions indicated.

Signed _____
 Firm Name _____
 Telephone number _____ Date _____
 Fax Number _____
 Federal Taxpayer ID _____

Bidder
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NOTICE TO BIDDERS: Unless the following term of assurance that the above offer is irrevocable is signed, the offer submitted herein shall not be deemed to be complete.
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	PORT AUTHORITY WILL NOT ROUND UP OR DOWN ANY VALUES. EXAMPLE OF TWO DECIMAL POINTS: \$123.45 Bidders quoting 1000/Mft or Kft are not acceptable. Bidders are to quote "Per Foot (FT)" following the decimal point instructions. All item quantities stated are per FT. B. ALL PRICES QUOTED SHALL BE FIRM AND FIXED WITHOUT ADJUSTMENT FOR THE ENTIRE IRREVOCABLE BID PERIOD OF 90 DAYS AFTER THE BID OPENING DATE INCLUDING THE DELIVERY PERIOD WITHOUT ADJUSTMENT. C. THE ONLY ADJUSTMENT ALLOWED IS THE DELIVERED FOOT QUANTITY THAT IS WITHIN THE SPECIFIED TOLERANCE. THE DELIVERED QUANTITY WILL THEN BE ADJUSTED BY THE AWARDED UNIT PRICE TO EQUAL THE NEW LINE ITEM VALUE. THIS WILL ALLOW A CHANGE ORDER TO BE ISSUED TO MATCH THE VENDOR INVOICE. D. ALL PRICES SHALL BE FOB DELIVERED ON A FLAT BED TRUCK THAT INCLUDES A HYDRAULIC OR SIMILAR HOISTING MACHINE CAPABLE OF UNLOADING ALL REELS. CABLE AND REELS TO BE MARKED WITH PO#, REEL NUMBER, MANUFACTURER, FEET PER REEL ON THE NON-RETURNABLE WOOD REELS, TESTING, DRAWINGS ETC.		
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	<p>E. TOTAL CABLE TOLERANCE: PER REEL TOLERANCE MINUS ZERO (0) PERCENT (%) PER REEL AND PLUS FIVE (5) PERCENT (%) PER REEL. The TOTAL RUN TOLERANCE: PLUS FIVE (5) PERCENT (%) MINUS ZERO (0) PERCENT (%).</p> <p>PLEASE FOLLOW RETURN TO BID INSTRUCTIONS. REPLY ONLY ON P.A./PATH REQUEST FOR QUOTATION FORM AS ATTACHING YOUR COMPANY'S TERMS & CONDITIONS MAY CAUSE YOUR BID TO BE DEEMED NON RESPONSIVE AND OR DELAY AN AWARD ISSUED.</p> <p>A price preference of 10 % is available for NY/NJ Minority and Women Business Enterprises (M/WBE) or 5% for NY/NJ Small Business Enterprises (SBE) certified by the Port Authority (PA) by the day before bid opening for awards not exceeding \$1,000,000. My firm was certified as a _____ on _____.</p> <p>QUESTIONS ONLY CONTACT: LARRY WAXMAN TEL: 212 435 4639 OR EMAIL: Lwaxman@panynj.gov</p>		
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	<p>This is a Formal Bid Invitation</p> <p>Bid Submission Instructions:</p> <p>Sealed Bids must be submitted to and received at the following address by the due date and time listed on this Request for Quotation, where they will be publicly opened and read:</p> <p>The Port Authority of NY & NJ Attn: Bid Custodian Procurement Department 4 World Trade Center 150 Greenwich Street, 21st Floor New York, NY 10007</p> <p>Clearly mark the outside of your envelope/package with "BID ENCLOSED", the Collective/Bid Number and Due Date, and your complete company name and address.</p>		
	<p>Bids are only accepted Monday through Friday, excluding Port Authority holidays, between the hours of 8 A.M. & 5 P.M., via regular mail, express delivery service or hand delivery. Express carrier deliveries by commercial vehicles can be made via vendors approved by Silverstein Properties, the 4 World Trade Center (4WTC) Property Manager, through the</p>		
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	<p>Vehicle Security Center (VSC). Presently, UPS is the only delivery vendor with approved recurring delivery times. There is extensive security at the World Trade Center Site. Individuals must present a valid government-issued photo ID to enter 4 WTC. Individuals without packages or carrying small packages or boxes that can be conveyed by hand or on a hand truck may enter through the lobby. All envelopes, packages and boxes may be subject to additional security screening.</p> <p>There is no parking available at 4 WTC/150 Greenwich Street, and parking in the surrounding area is extremely limited. The Port Authority assumes no responsibility for delays, including, but not limited to delays caused by any delivery service, building access procedure or security requirement.</p> <p>A valid government-issued photo ID is required to gain access into the building to attend the bid opening or hand deliver a bid. Bids that are not received by the bid custodian by the scheduled bid opening date will be considered late.</p> <p>If any Addenda are posted or sent as part of this Bid, the Bidder shall complete, sign and include with its Bid the addenda form(s). In the event any Bidder fails to conform to these instructions, its Bid will nevertheless be construed as though the Addenda had been acknowledged. If the Bidder downloaded this solicitation document, it is the responsibility of the Bidder to periodically check the Port Authority website at</p>		
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	http://www.panynj.gov/business-opportunities/bid-proposaladvertisements.html and download any addenda that might have been issued in connection with this solicitation.			
9,500 FT	MULTI-CONDUCTOR CABLES			
PLEASE QUOTE FULLY DELIVERED PRICES		PAYMENT TERMS		Total Delivered Price

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TERMS AND CONDITIONS

1. The Port Authority (PA) reserves the right to request information relating to seller's responsibility, experience and capability to perform the work.
2. Unless otherwise provided, complete shipment of all items must be in one delivery FOB delivery point. Payment will not be made on partial deliveries unless authorized in advance by the party to be charged and the discount, if any, will be taken on the total order.
3. PA payment terms are net 30 days. Cash discounts for prompt payment of invoices may be taken but will not be considered in determining award, except in the case of tie bids.
4. Separate unit and total FOB delivered prices must be shown.
5. Sales to the PA and to PATH are currently exempt from New York and New Jersey State and local taxes and generally from federal taxation. The seller certifies that there are no federal, state, municipal or any other taxes included in the prices shown hereon.
6. The PA shall have the absolute right to reject any or all proposals or to accept any proposal in whole or part and to waive defects in proposals.
7. Unless the phrase "no substitute" is indicated, bidder may offer alternate manufacturer / brands, which shall be subject to Port Authority approval. Please indicate details of product being offered with bid.
8. Acceptance of seller's offer will be only by Purchase Order Form signed by the PA. No change shall be made in the agreement except in writing.
9. If the seller fails to perform in accordance with the terms of this purchase order, the PA may obtain the goods or services from another contractor and charge the seller the difference in price, if any, a reletting cost of \$100, plus any other damages to the PA.
10. Upon request, sellers are encouraged to extend the terms and conditions of any terms agreement with the PA to other government and quasi-government entities by separate agreement.
11. By signing this quotation or bid, the seller certifies to all statements on Form PA 3764A regarding non-collusive bidding; compliance with the PA Code of Ethics; and the existence of investigations, indictments, convictions, suspensions, terminations, debarments and other stated occurrences to assist the PA in determining whether there are integrity issues which would prevent award of the contract to the seller. The PA has adopted a policy set forth in full on PA 3764A, that it will honor a determination by an agency of the State of New York or New Jersey that a bidder is not eligible to bid on or be awarded public contracts because the bidder has been determined to have engaged in illegal or dishonest conduct or to have violated prevailing wage legislation. The Terms and Conditions of PA 3764A apply to this order. A copy can be obtained by calling (212) 435-4600 or at <http://www.panynj.gov/business-opportunities/become-vendor.html>
12. The vendor may subcontract the services or use a supplier for the furnishing of materials required hereunder to such persons or entities as the Manager, Purchasing Services may from time to time expressly approve in writing. All further subcontracting shall also be subject to such approval.
13. The successful bidder (vendor) shall not issue nor permit to be issued any press release, advertisement, or literature of any kind, which refers to the Port Authority or that goods will be, are being or have been provided to it and/or that services will be, are being or have been performed for it in connection with this Agreement, unless the vendor first obtains the written approval of the Port Authority. Such approval may be withheld if for any reason the Port Authority believes that the publication of such information would be harmful to the public interest or is in any way undesirable.
14. Neither the Commissioners of the Port Authority, nor Directors of PATH, nor any of them, nor any officer, agent or employee thereof, shall be charged personally by the Contractor with any liability, or held personally liable to the Contractor under any term or provision of this Agreement, or because of its execution or attempted execution, or because of any breach, or attempted or alleged breach, thereof.

THE PORT AUTHORITY TRANS-HUDSON CORPORATION
GENERAL PROVISIONS
MULTI-CONDUCTOR CONTROL CABLES

Scope:

As directed by PATH, the Vendor shall furnish and deliver reels of cable for Multi-Conductor Control Cables. All cable shall be in compliance with all General Provisions herein and with the attached Technical Specifications Section CR02495-120 (hereinafter referred to as Specifications or Section).

Furnish and deliver the following assortment of Cable reels:

<u>Reel#</u>	<u>Cable Size</u>	<u>Rated Voltage</u>	<u>Reel Lengths</u>	<u>Reel Name</u>	<u>PATH Specification</u>
1-10	24/C #12 AWG	600V	600 ft. ea.	Multi-Ctrl 600 FT	CR02495-120 PSC-C 05/26/16
11-17	24/C #12 AWG	600V	500 ft. ea.	Multi-Ctrl 500 FT	CR02495-120 PSC-C 05/26/16

Total Cable: 9,500 ft.

General Notes:

1. The ensuing Purchase Order is solely for furnishing and delivering the cable specified. Cable terminations or connectors are not required.
2. Cable shall be of Jacketed Type as indicated in the Technical Specifications.
3. Cable shall be compliant with NFPA 130 cable requirements for Railroads.
4. Cable length tolerances shall be -0% to +5% of the lengths indicated for each cable reel.
5. Cable reel dimensions shall not exceed 66 inches in diameter and 44 inches in depth.
6. All cable reels shall be of wood construction and be non-returnable.
7. All cable reels shall have a PATH-approved cable end seal cap to prevent moisture ingress.
8. The Vendor shall allow PATH the opportunity to witness, upon request, all factory testing of the cable.

Attached Technical Specifications:

<u>PATH Spec #</u>	<u>Title</u>	<u>Date</u>
CR02495-120	Multi-Conductor Control Wire (2000 Volts & 600 Volts or Less)	PSC-C 05/26/16

Delivery Requirements:

FOB Destination. Partial deliveries are not acceptable. Pricing shall include, but not be limited to, costs for any multiple shipments necessary to complete the delivery of all reels, for shop tests, and for inspections.

Deliver all cable reels within ¹⁴ weeks of receipt of Purchase Order. Indicate delivery lead-time on the Bid.

Deliver to PATH, 120 Academy Street, Jersey City, NJ 07302. Notify Glen Smiley at 201-216-6962 two weeks prior to delivery. Provide hydraulic or similar hoisting machine capable of unloading all reels, which will be conducted at the direction and supervision of PATH.

PSC CR02495-120

MULTI-CONDUCTOR CONTROL WIRE (2000 VOLTS & 600 VOLTS or LESS)

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for multi-conductor control wire used in electrical systems.

1.02 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Wires, cables, splices and terminations for wiring systems of 2000 Volts & 600 volts or less shall be furnished and installed in accordance with this Section, and as indicated on the General Provisions.
- B. Components of the wiring system of 2000 Volts & 600 volts or less shall also be manufactured and installed to meet all of the applicable requirements of NFPA 70, NFPA 130 and all local codes.

1.03 RELATED SECTIONS

- A. None

1.04 REFERENCES

- A. ASTM International (ASTM)
 - 1. B1 - Standard Specification for Hard-Drawn Copper Wire
 - 2. B2 - Standard Specification for Medium-Hard-Drawn Copper Wire
 - 3. B3 - Standard Specification for Soft or Annealed Copper Wire
 - 4. B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
 - 5. B33 - Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes
 - 6. B174 - Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors
 - 7. D2802 - Standard Specification for Ozone-Resistant Ethylene-Alkene Polymer Insulation for Wire and Cable

8. D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape
 9. E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
- B. Association of American Railroads (AAR)
1. RP585 – Wire and Cable Specification
- C. Insulated Cable Engineers Association (ICEA)
1. S-73-532 – Standard for Control, Thermocouple Extension and Instrument Cable
 2. S-95-658 – Standard for Non-Shielded Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy
 3. T-27-581 – Standard Test Methods
 4. T-30-520 – Guide for Conducting Vertical Tray Flame Test
 5. T-33-655 – Guide for Low Smoke, Halogen-Free Polymeric Jackets
- D. International Electrotechnical Commission (IEC)
1. 331 – Fire-Resisting Characteristics of Electrical Cable
- E. International Organization for Standardization (ISO)
1. 9001 – Quality Management Systems - Requirements
- F. Institute of Electrical and Electronics Engineers (IEEE)
1. 837 – IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding
 2. 1202 – Standard for Flame Propagation Testing of Wire and Cable
-
- G. Military Specifications (MIL)
1. MIL-DTL-24643 – General Specification for Cables and Cords, Electric, Low Smoke, for Shipboard Use
- H. Ministry of Defense, UK (DEF STAN)
1. 02 - 713 - Determination of Toxicity Index of Products of Combustion From Small Specimens of Materials
- I. National Fire Protection Association (NFPA)
1. 70 - National Electrical Code
 2. 130 – Standard for Fixed Guideway, Transit and Passenger Rail Stations
 3. 502 – Standard for Road Tunnels, Bridges and Other Limited Access Highways

- J. Underwriters Laboratories Inc. (UL)
 - 1. 44 - Thermoset-Insulated Wires and Cables
 - 2. 62 – Standard for Flexible Cords and Cables
 - 3. 83 – Standard for Thermoplastic-Insulated Wires and Cables
 - 4. 467 – Standard for Grounding and Bonding Equipment
 - 5. 510 – Standard for Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
 - 6. 854 – Standard for Service-Entrance Cables
 - 7. 1581 – Reference Standard for Electrical Wires, Cables, and Flexible Cords
 - 8. 1685 - Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
 - 9. 2196 – Test for Fire-Resistive Cables

1.05 SUSTAINABLE DESIGN REQUIREMENTS

- A. Not Applicable

1.06 QUALITY ASSURANCE

- A. Wires and cables that were manufactured more than two years prior to date of the bid are not acceptable.
- B. The cable manufacturer shall be ISO 9001/Q9001 certified for a Quality System for wire and cable manufacturing.
- C. All wires and cables, for which there are established UL standards, shall bear the UL label.

1.07 SUBMITTALS

- A. Submit Catalog Cuts for the following in accordance with the requirements of "Shop Drawings, Catalog Cuts, and Samples" of GENERAL PROVISIONS:
 - 1. Wires and cables for each type and size.
- B. Submit certified shop / factory test reports for wires and cables.
 - 1. Certified Test reports must be approved by the Engineer prior to delivery or acceptance of the manufactured cable at the delivery location indicated in the General Provisions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements of this Section, provide wires and cables materials of manufacturers as indicated in the General Provisions.

2.02 WIRES AND CABLES

A. General

1. Definitions
 - a. Wire shall be defined as a solid or stranded conductor smaller than No. 6 AWG with or without insulation.
 - b. Cable shall be defined as a single conductor No. 6 AWG or larger, or two or more conductors of any size wire under a common covering.
2. Locations, types, sizes and numbers of wires and cables are indicated in the General Provisions.
3. The wires and cables must be suitable for use in wet and dry locations, as applicable for the installation, with temperature ratings that correspond to the conditions of application. Wires and cables shall be suitable for installation indoors or outdoors, in conduits, trays, underground ducts or direct burial in earth, as applicable for the installation shown on the General Provisions, and as allowed by applicable codes and this Section.
4. Unless otherwise indicated on the General Provisions, cable insulation shall be rated for conductor temperatures not exceeding 90 degrees C for normal operation, 130 degrees C for emergency overload conditions and 250 degrees C for short circuit conditions in accordance with ICEA standards S-95-658 and S-73-532. Temperature ratings shall be for both wet and dry locations.
5. Unless otherwise shown on the General Provisions, solid conductors shall be soft or annealed copper, conforming to ASTM B33 (tinned) or ASTM B3 (uncoated). Unless otherwise specified in this Section or unless otherwise shown on the General Provisions, stranded copper conductors shall be concentric stranding conforming to ASTM B 8.
6. Polyvinyl Chloride (PVC): PVC-insulated power wiring and items containing PVC shall not be installed in subway areas, railroad tunnels, railroad stations, and areas defined on the General Provisions as subject to NFPA 130 jurisdiction.
7. Cable insulations and jackets are designed as Low-Smoke, Zero-Halogen (LSZH) shall be thermoset, low-smoke, low-toxicity, non-halogen, flame retardant type and shall meet the following performance characteristics:
 - a. Cables shall pass the flame propagatory and smoke release criteria according to the test method of UL 1685.
 - b. The halogen content of cable jackets shall not exceed 0.2 percent according to the test method of MIL-DTL-24643. The Authority classifies 0.2 percent or less halogen content as "non-halogen."

- c. The toxicity index of cable jackets shall not exceed 2.0 according to the test method of NES 713.
 - d. The cable jackets shall comply with ICEA T-33-655 for smoke generation.
 - e. The acid gas content of cable jackets shall not exceed a maximum of 3.0 percent according to the test method of MIL-DTL-24643.
8. Use the following additional performance characteristics for wires and cables that will be installed in subway areas, railroad or vehicular tunnels, railroad stations, and areas defined as being under the jurisdiction of NFPA 130, where stringent flame retardant, low-smoke, low-toxicity, zero-halogen and good circuit integrity during a fire are required.
- a. All insulated conductors shall be UL listed as type XHHW-2, in accordance with UL 44. In addition, all one-conductor cables shall be listed for and marked with the following UL designations: "VW-1," "LS" or "ST1" (limited smoke), "Oil and Gas Resistant," and for 1/0 and larger, "CT USE."
 - b. Single conductor wire and cable shall utilize thermoset Low-Smoke, Zero-Halogen, Cross-Linked Polyolefin insulation conforming to ICEA S-73-532 and S-95-658. The insulation shall be comprised of a single layer of homogeneous material. Jackets or other additional coverings shall not be allowed for single conductors because of the increase in cable size. All single conductor wires and cables shall follow the dimensional requirements of NFPA 70, Table 5.
 - c. Wires shall pass the flame propagatory criteria according to the test method of UL 1581 (VW-1).
 - d. The halogen content of both the wire and cable insulation and cable jacket(s) shall not exceed 0.2 percent according to the test method of MIL-DTL-24643. The Authority classifies 0.2 percent or less halogen content as "non-halogen."
 - e. The toxicity index of both the wire and cable insulation and cable jacket(s) shall not exceed 2.0 according to the test method of DEF STAN 02-713.
 - f. The acid gas content of both wire and cable insulation and cable jacket(s) shall not exceed a maximum of 2.0 percent according to the test method of MIL-DTL-24643.
 - g. The wire and cable insulation materials shall pass the smoke generation test in accordance with ASTM E662. All wires and cables shall pass the smoke release criteria according to the test method in UL 1685 for "LS" or "ST1" classification as "limited smoke." Wire and cable insulation when tested on a specimen of 80 mils thick slab shall not exceed the following values:
 - 1) Flaming Avg. Ds (4 minutes) 50
 - 2) Flaming Avg. Dm (20 Minutes) 200
 - 3) Non-Flaming Avg. Ds (4 minutes) 50
 - 4) Non-Flaming Avg. Dm (20 minutes) 200
 - h. All single conductor wires shall provide a minimum of 15-minute circuit integrity when tested in accordance with UL 2196. UL qualification is

required and shall be predicated upon a No. 12 AWG sample in conduit without the water spray.

- i. Wires and cables shall pass the following flame propagation requirements:
 - 1) All single conductor wires and cables shall pass the "UL VW-1" vertical flame test, according to UL 1581.
 - 2) All single conductor wires and cables shall pass the vertical flame test stated in AAR RP583, paragraph 5.9.4.
- j. Water Resistance
 - 1) All wires and cables shall be rated for wet applications at 90 degrees C as defined by the requirements for type "XHHW-2" stated in UL 44 when tested in accordance with UL 1581.
 - 2) The mechanical water absorption of the insulation shall not be greater than 4 mg/sq. in. when tested in accordance with UL 1581.
 - 3) All wires shall be suitable for prolonged exposure to water by evidence of long term insulation resistance qualification testing in 90-degree C water. Testing shall be in accordance with UL 44 and UL 1581. After a minimum of one-year exposure to 90-degree C water, the insulation resistance measurements must exceed an insulation resistance reading of 4.0 megohms/1000 ft. Sample used for testing shall be either 14 or 12 AWG with a nominal 30 mils of LSZH insulation.
- k. Overload Stability
 - 1) To ensure overload stability, all wires and cables shall pass the following tests defined in AAR Standard RP585:
 - a) Electrical Overload – Single Conductor (paragraph 5.9)
 - b) Bundle Overload (paragraph 5.9.1)
 - c) 125 degrees C Penetration Test (paragraph 5.9.2)
- l. The insulation shall demonstrate heat stability by retaining 95 percent of its original tensile strength and elongation values after aging seven days at 158 degrees C, as per AAR Standard RP585.
- m. Multi-Conductor Cables: Where multi-conductor cables are utilized, use the following additional criteria:
 - 1) Multi-conductor control cables shall utilize stranded class "B" or "C" conductors in accordance with ASTM B8. All conductors shall utilize thermoset low-smoke, zero-halogen cross-linked polyolefin insulation, conforming to ICEA standard S-95-658 and S-73-532, and be listed as type "XHHW-2." Insulated conductors shall be cabled with a suitable binder tape, and covered with a low-smoke, zero-halogen cross-linked polyolefin jacket. All cables shall be UL listed Type TC in accordance with UL 1277. All individual insulated conductors utilized in multi-conductor cables shall meet all of the requirements set forth in this Section for single conductor cables for subway areas, railroad or vehicular tunnels, railway stations and areas defined on the General Provisions as under the jurisdiction of NFPA 130, except that UL print is not required on the individual conductor insulation.

- 2) The halogen content of the cable jacket(s) shall comply with 2.02.A.8.d of this Section.
- 3) The toxicity index of the cable jacket(s) shall comply with 2.02.A.8.e of this Section.
- 4) The acid gas content of the cable jacket(s) shall comply with 2.02.A.8.f of this Section.
- 5) The cable jacket materials shall pass the smoke generation test in accordance with ASTM E662. Cable jacket when tested on a specimen of 80 mils thick slab shall not exceed the following values:
 - a) Flaming avg. DS (4 minutes): 50
 - b) Flaming avg. DM (20 minutes): 150
 - c) Non-Flaming avg. DS (4 minutes): 50
 - d) Non-Flaming avg. DM (20 minutes): 250
- 6) All multi-conductor wire and cables shall provide a minimum of 15-minute circuit integrity when tested in accordance with IEC-331. Qualifications shall be predicated on a 2/C No.14 AWG sample tested at 240 Volts.
- 7) All multi-conductor cables shall pass the UL vertical flame test criteria according to the test methods stated in UL 1685 for IEEE 1202 type of flame exposure. Test sample used shall be 2/c No.14 AWG.
- 8) All multi-conductor wires and cable shall be listed for, and be marked with, the following UL designations on the cable jacket: "Type TC" (Tray Cable), "LS" or "ST1" (Limited Smoke), "Sun Res" (Sun Resistant) or "XHHW-2"/ "90 degrees C Wet and Dry," "IEEE 1202."

9. Color-Coding and Cable Identification

- a. Insulation or covering of wires and cables shall be factory color-coded by the use of colored compounds or coatings. The color-code shall be followed consistently throughout the performance of the Work.
- b. Circuit identification for multi-conductor cable shall be accomplished by either Method 1 (colored compounds) or Method 3 (printed color designations) per ICEA with a K2 scheme, unless otherwise stated in the General Provisions.

B. Control Wires and Cables

1. Unless otherwise shown on the General Provisions, control wires and cables shall be as follows:
 - a. Single conductor wires and cables shall be ASTM B8, Class B stranded, type XHHW or XHHW-2 flame retardant, cross-linked-polyolefin insulation. Both shall conform to UL 44 and ICEA S-73-532.
 - b. Multi-Conductor cables shall be ASTM B8, Class B or Class C stranded, Control Cable Type B, conforming to ICEA S-73-532. Color-coded as per ICEA S-73-532. Method No. 1 for NFPA 70 applications (with

white and green) or ICEA S-73-532 for paired conductor cables. Select from the following list of cable types.

- 1) Individual ethylene-propylene rubber insulation with overall flame retardant, cross-linked-polyolefin jacket; conforming to ICEA S-73-532, UL 44 and UL 1581.
- 2) Individual flame retardant, cross-linked-polyolefin insulation with and overall flame retardant, cross-linked-polyolefin jacket; conforming to ICEA S-73-532.

C. 2000 Volt rated Control Cable

1. Multi conductor control cable shall utilize class B strand in accordance with ASTM B8. All individual conductors shall utilize thermoset, low smoke, and zero halogen cross-linked polyolefin insulation at 2kV rating conforming to ICEA S-95-658 and be listed as Type RHW-2.
2. The insulated conductors shall be cabled with a suitable binder tape and covered with a low smoke zero halogen, black cross linked polyolefin overall jacket. Circuit identification shall be either Method 1 (colored compounds) or Method 3 (printed color designation) per ICEA with a K2 color scheme unless otherwise noted in the General Provisions.

2.03 FACTORY TESTS

- A. For quantities as shown on the General Provisions, regular dielectric-withstand and insulation-resistance in water tests for wires and cables shall be performed in accordance with UL44.
- B. Flame tests for wires and cables shall be performed in accordance with UL 1685, UL 2196 and AAR RP-585.
- C. The test results shall be certified for each reel/coil/box of wire or cable.
- D. Factory inspection and witnessing of tests by the Engineer shall be required for all wires and cables furnished under this Contract. The Engineer reserves the right to require additional testing, or to waive factory inspection or witnessing of tests. The Vendor / Manufacturer shall notify the Engineer eight (8) weeks in advance of the scheduling of such factory tests.
 1. The Engineer reserves the right to require independent third-party testing of a representative sample of the cable manufacturer with the testing results submitted to the Engineer for approval.

END OF SECTION