

THE PORT AUTHORITY OF NY & NJ

**PROCUREMENT DEPARTMENT
2 MONTGOMERY STREET, 3RD FL.
JERSEY CITY, NJ 07302**

6/3/2014

ADDENDUM # 1

To prospective Bidder(s) on Bid #37996 – 500 MCM D.C. Traction Power Cable

Due back on 6/20/2014, no later than 11:00AM

I. CHANGES/MODIFICATIONS

The specification labeled, "DC Traction Power Cable, Revision 03/20/2008" is to be removed in its entirety and replaced with the attached specification titled, "PATH Specification for Single Conductor Traction Cable, Revised 02/10/2012".

This communication should be initialed by you and annexed to your Bid upon submission.

In case any Bidder fails to conform to these instructions, its Bid will nevertheless be construed as though this communication had been so physically annexed and initialed.

THE PORT AUTHORITY OF NY & NJ

KATHY LESLIE WHELAN, ASSISTANT DIRECTOR
COMMODITIES AND SERVICES DIVISION
PROCUREMENT DEPARTMENT

BIDDER'S FIRM NAME: _____

INITIALED: _____

DATE: _____

QUESTIONS CONCERNING THIS ADDENDUM MAY BE ADDRESSED TO RENE MUNOZ, WHO CAN BE REACHED AT (201) 395-7366 or at REMunoz@panynj.gov.

PS11A11

**PORT AUTHORITY TRANS HUDSON CORPORATION
SPECIFICATION FOR SINGLE CONDUCTOR TRACTION CABLE**

Revised 2/10/2012

59.1.0 GENERAL

59.1.1 Scope

This specification covers PATH's requirements for furnishing single conductor cable for use in transit tracks for D.C. traction cable. Where reference is made to the cable, the following shall prevail:

Insulation	type EPR with 0.140 inch thickness
Jacket	For 250 and 500 MCM, low smoke zero halogen with 0.065 inch thickness. For 2000 MCM, low smoke zero halogen with 0.095 inch thickness.
Conductor	bare annealed copper and class C stranded
Strands	250 MCM shall have 61 strands of copper 500 MCM shall have 127 strands of copper 2000 MCM shall have 169 strands of copper

59.1.2 References

The following is a listing of the publications referenced in this Section:

American Society for Testing and Materials (ASTM)

ASTM E 662	Test Method for Specific Optical Density of Smoke Generated by Solid Materials
ASTM B 1	Hard-Drawn Copper Wire
ASTM B 2	Medium-Hard-Drawn Copper Wire
ASTM B 3	Soft or Annealed Copper Wire
ASTM B 8	Concentric-Lay-Stranded Copper Conductors Hard, Medium-Hard, or Soft
ASTM B 33	Tinned Soft or Annealed Copper Wire for Electrical Purposes
ASTM D 1373	Medium-Voltage Rubber Insulating Tape
ASTM D 2802	Ozone-Resistant Ethylene-Propylene-Rubber Insulation for Wire and Cable
ASTM D 3005	Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape

Federal Specifications (FS)

FS HH I 553	Insulation Tape, Electrical (Rubber, Natural and Synthetic)
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Insulated Cable Engineers Association (ICEA)

ICEA S 95 658 Standard for non-shielded cable rated 2000 volts or less for the distribution of electrical energy

Institute of Electrical and Electronics Engineers (IEEE)

IEEE 48 High Voltage AC Cable Terminators, Test Procedure and Requirements

IEEE 383 Type Test of Class E Electric Cables, Field Splices and Connections for Nuclear Power Generating Stations.

IEEE 404 Standard for type Test of Cable Joints for Use with Extruded Dielectric Cable Rated 5,000 through 46,000 Volts, and Cable Joints for Use with Laminated: Dielectric Cable Rated 2,500 through 500,000 Volts

Military Specifications (MIL)

MIL C 24643 Cable and Cord, Electrical Low Smoke for Shipboard Use.

National Fire Protection Association (NFPA)

NFPA 70 National Electrical Code

NFPA 130 Standard for Fixed Guideway Transit Systems

NFPA 258 Standard Research Method for Determining Smoke Generation of Solid Materials

Naval Engineer Standards (NES)

NES 713 Determination of the Toxicity Index of the Products of Combustion for Small Specimens of Material

Underwriters Laboratories Inc. (UL)

UL 44 Rubber-Insulated Wires and Cables

UL 467 Grounding and Bonding Equipment

UL 510 Insulating Tape

UL 1685 Standards for Safety Vertical Tray Fire Propagation and Smoke Release Test for Electrical and Optical Fiber Cables

UL 1581 Reference Standard for Electrical Wires, Cables, and Flexible Cords.

59.1.3 QUALITY ASSURANCE

- A. The manufacturer shall have a minimum of three (3) years experience in manufacturing cable of the type and size described herein and the Contractor shall have the manufacturer provide a list of installations and contracts for which he has produced such materials.
- B. Tests requiring certified reports and those requiring factory or field inspection shall be conducted and reported to PATH in conformance with standards herein specified.
- C. Cables which have been manufactured prior to award of the order, shall not be used.
- D. The cable shall be manufactured and tested under the control of a quality assurance system that conforms to the requirements of ISO 9000.

59.2.0 TECHNICAL REQUIREMENTS

59.2.1 CABLES

- A. Type, size and numbers of cables are shown on the Bid Documents.
- B. Conductors shall be soft or annealed copper conforming to ASTM B33 (tinned), ASTM B 189 (lead or lead alloy coated) or ASTM B3 (uncoated).
- C. The conductor insulation shall be either low smoke, zero halogen Ethylene Propylene Rubber (EPR) with overall jacket or Low Smoke Zero Halogen Cross-linked Polyolefin (LSZH XLPO) insulation without overall jacket conforming to ICEA 95-658.
- D. Cable jackets over EPR insulation shall be thermoset, low smoke, low toxicity, non-halogen, flame retardant cross-linked polyolefin.
- E. Cable jacket and insulation material, and cable construction as a whole, shall meet the following performance characteristics:
 - 1. Cables shall pass the flame propagatory criteria according to the test method of UL 1685.
 - 2. The halogen content of the cable jackets shall not exceed 0.2 percent according to the test method of MIL-C-24643. PATH classifies 0.2 percent or less halogen content as "non-halogen".
 - 3. The toxicity index of cable jackets shall not exceed 2.0 according to the test method of NES 713.
 - 4. The cable jackets shall comply with ICEA T-33-665 for smoke

- generation.
5. The acid gas content of cable jackets shall not exceed a maximum of 2.0 percent according to the test method of MIL-C-24643.
 6. The cable insulation materials shall pass the smoke generation test in accordance with ASTM E 662. Cable insulation when tested on a specimen of 80 mils thick slab shall not exceed the following values.

	<u>EPR</u>	<u>LSZH XLPO</u>
Flaming Avg. DS (4 minutes)	100	50
Flaming Avg. Dm (20 minutes)	200	150
Non-Flaming Avg. Ds (4 minutes)	100	50
Non-Flaming Avg. Dm (20 minutes)	350	250

7. The cable jacket materials shall pass the smoke generation test in accordance with ASTM E 662. Wire and cable jacket when tested on a specimen of 80 mils thick slab shall not exceed the following values:

Flaming Avg. Ds (4 minutes)	50
Flaming Avg. Dm (20 minutes)	150
Non-Flaming Avg. Ds (4 minutes)	50
Non-Flaming Avg. Dm (20 minutes)	250

F. Pulling Devices and End Seals

1. Unless otherwise shown on the Bid Documents, cables shall be provided with factory fitted pulling devices and end caps to be used shall be submitted to the Engineer for approval.
2. For pulling tensions up to 1000 pounds per grip, basket grips may be utilized.
3. All cables shall be end-sealed, at both ends of each length, with a heat-shrinkable cap to prevent the entrance of moisture.

G. Identification

- a. The following information shall be durably printed on the jacket surface and repeated at intervals not exceeding 24 inches:

Manufacturer's Name
 Manufacturing Plant No.
 Size of Conductors
 Insulation Material and thickness
 Jacket Material LS-Non-Hal/No acid
 2000 volts (rated voltage)

DC Traction Power-Cable
Sequential Footage
Date of Manufacture
UL Listing (where applicable)
Property of PATH

- b. Each reel shall carry a tag identifying the manufacturer, cable type, size, voltage, and length of cable on reel.

59.2.2. Jacketed, Single Conductor D.C. Traction Power Cable

- A. Voltage ratings shall be for 2,000 volts D.C. continuously, rated for 90 degree C operations, and capable of withstanding frequent spikes of 3,000 volts as is typical to occur in an electrical railroad system.
- B. General Construction
 - a. Copper conductor, (bare, or tin coated,) Class C stranded as shown on the Bid Document in accordance with ASTM B 8 and ASTM B 33.
 - b. An opaque separating tape shall be applied over the conductor that shall prevent migration of the insulation into the conductors, so as to aid in stripping and terminating. The successful manufacturer of the cable shall be able to omit the separating tape if they can demonstrate (with samples and prior application on a transit or railroad) to PATH that their process prevents migration of the insulation into the conductor. The separating tape may be omitted if at the time of bid, the Vendor can demonstrate to PATH that their process prevents migration of the insulation into the conductor with samples and prior applications on other transit systems or railroads. This approval must be obtained prior to bidding by submitting samples to PATH, attention John Wargo, 120 Acadrmy Street, Consolidated Maintenance Shop, Jersey City, New Jersey, 07302.
 - c. The insulation shall be ethylene propylene rubber concentricity extruded over the separating tape. The insulation thickness shall be 0.140 inches and the thickness at any point shall not be less than 90 percent of that value. The insulation shall otherwise conform to ICEA S 95-658. The insulation shall conform to Type II of these standards and Appendix A of this specification.
 - d. The insulated conductor shall be covered with an oil resistant, flame resistant, low smoke, non-halogenated crosslinked pololefin material. The jacket thickness shall be 0.065 inches for 250 and 500 MCM cables and 0.095 inches for 2000 MCM cables. The minimum point shall not be less than 90 % of the minimum average wall specified. The jacket material shall meet or exceed the physical properties in accordance with Appendix B of

this specification.

59.3.0 TESTING

59.3.1 Factory Tests

- A. Factory inspection and witnessing of tests by PATH shall be required for all cables furnished under this order. PATH reserves the right to revise the shop test schedule, to waive factory inspection or witnessing of tests. The Contractor shall notify PATH 14 days in advance of the scheduling of such factory tests.

Contact:

The Port Authority of New York and New Jersey
Attention: Joe Marsano
Port Authority Technical Center
241 Erie Street
Jersey City, New Jersey 07302
201-216-2986

and PATH
120 Academy Street
Consolidated Maintenance Shop
Jersey City, NJ 07306
Attention: John Wargo
201-216-7094

- B. AC and DC Withstand Tests: Each length of insulated conductor shall be wound on reels and immersed in room temperature water for a minimum of six hours, and then subjected to test voltages. For the 0.140 inch insulation test voltage shall be 17 kV ac and 51 kV dc. The ac test voltage shall be applied for 5 minutes and the dc test voltage applied for ten minutes., without showing signs of failure. The voltage shall be applied between conductor and water (ground). The application of voltage shall be in accordance with ICEA standards. The dc test may be applied either prior to the ac test or following the IR test.
- C. Insulation Resistance test: Immediately after the ac test and while the insulated conductor is still submerged, an insulation resistance test shall be performed in each length of conductor. The insulation resistance constant "K" shall not be less than 35,000 megohms-1000 ft. when corrected to 60 degrees F. The apparatus and method shall be in accordance with ICEA standards.

- D. Flame tests for cables shall be performed in accordance with IEEE 383.
- E. Smoke generation tests for cables shall be performed in accordance with ASTM E662.
- F. Halogen content test shall be performed in accordance with MIL C 24643.
- G. Toxicity index test shall be performed in accordance with NES 713.
- H. The flame, smoke generation, halogen content and toxicity index tests shall be performed per cable production run as long as the same batch of compound is being used. A minimum of two (2) tests shall be performed for each. Test samples as chosen by the Engineer.
- I. The test results shall be certified and submitted to the Engineer for each reel of cable.
- J. The cost of the shop tests shall be borne by the Contractor.

59.3.2. Independent Laboratory Tests

- A. The following tests shall be performed by an Independent Laboratory in conformance with AEIC or ICEA standards:
 - a. Regular AC and DC dielectric-withstand and insulation resistance.
 - b. Dissection and dimensional analysis.
 - c. Microscopic examination for voids, contaminants and protrusions.
 - d. Hot creep test to determine state of cure of insulation.
 - e. Any other additional test that PATH may require in order to assure the quality of the cable.
- B. In the event that the cable does not conform and is rejected by PATH, the cost of the independent lab test shall be borne by the Contractor.
- C. The independent laboratory selected by PATH, will provide PATH and manufacturer all test results in writing within 14 days after receiving test cable specimens.

59.3.3 FIELD TESTS

- A. A copy of all test reports, together with an outline of the test method used shall be given to PATH. If, in the opinion of PATH, the tests do not meet the requirements of good practice or codes, the Contractor shall promptly replace, at his own expense, the material or equipment involved or by other approved means review his work so that subsequent tests will indicate acceptable standards.

- B. Should the foregoing tests reveal any defects, Contractor shall promptly correct such defects and rerun the tests until the entire installation is satisfactory to PATH in all aspects.

59.4.0 Quality Assurance

59.4.1 Inspection

- a. PATH's Inspector shall have free entry to the manufacturer's plant during normal working hours. PATH reserves the right to inspect the cable during any or all processes of manufacturing. The vendor shall notify PATH seventy-two (72) hours in advance of all operations, failure to notify PATH is cause for rejection. Notification shall be sent to:
The Port Authority of New York and New Jersey
Port Authority Technical Center
241 Erie Street
Jersey City, New Jersey 07302
Attention Joe Marsano
201-216-2986
and
PATH
120 Academy Street
Consolidated Maintenance Shop
Jersey City, NJ 07306
Attention John Wargo
201-216-7094
- b. Prior to shipping, the Contractor must send a two foot long sample of each cable size and all cable test reports to the above PATH address.

59.4.2 Quality Program

- A. The manufacturer shall establish and maintain a quality program plan for the entire production process of cable. The quality program plan will be subject to audit for conformance. The program shall be in accordance with the current ANSVASQC Standard C-1 Specification of General Requirements for a Quality Program.
- B. The manufacturer shall make available all required documents needed to assure that cable is produced in accordance with the quality program plan.

59.5.0 Shipment and Acceptance

59.5.1 Shipment

- A. All cable shall be shipped to the locations indicated in the Bid Documents.

- B. Cables shall be shipped on an open bed flat truck.
- C. Cables reels shall not exceed 66” in diameter and 42” deep. Reels shall be wooden and non-returnable.
- D. Each reel of cable shall have a color painted plate embedded on both sides which will depict the length of cable on that reel.
- E. Must supply the following:
 - 3000 feet Cable, 500MCM, reel lengths of 500 feet, as per attached specifications. Delivery tolerance Plus 5% or minus 0%.

59.5.2 Acceptance

- A. Final acceptance of cable will be subject to verification of count and inspection.
- B. The manufacturer shall assume the expense of handling and transporting rejected material.

59.5.3 Place of Delivery

- A. Store material in a clean, dry space and protect from weather.
- B. Unless otherwise shown on the Contract Drawings, cables shall be provided with factory fitted pulling devices and end caps to prevent the entrance of moisture into the cable.
- C. Cable reel sizes shall be limited to the maximum dimensions shown on the Contract Drawings.

The vendor shall deliver the cable to the location noted below.

PATH Consolidated Shops
120 Academy Street
Jersey City, New Jersey 07302

Attention: John Wargo
201-216-7094

59.5.4 Times of Delivery

Delivery will be limited to weekdays between the hours of 7:00 AM and 2:00 PM. No deliveries will be permitted on legal holidays or weekends.

59.6.1 Submittals

- a. Per 59.1.3.A, At the time of the bid, the vendor shall submit proof that he has a minimum of 3 years experience in the manufacturing of cable of the type and size specified in the specifications.
- b. Per 59.1.3. A, Quality Assurance of the specifications, at the time of bid, the vendor shall submit a list of installations and contracts for which he has produced the products described in the specifications.
- c. Two weeks prior to delivery of the cable, the contractor shall submit required certified reports and those requiring factory or field inspection to John Wargo, 120 Academy Street, Consolidated Maintenance Shop, Jersey City, NJ, 07302

APPENDIX A
PHYSICAL AND ELECTRICAL CHARACTERISTICS
OF ETHYLENE PROPYLENE

When samples from completed cables are tested in accordance with NEMA WC 8 (ICEA S-68-516), the vulcanized ethylene propylene (EP) insulation (HEPR per IEC 60502) shall meet the following guaranteed values:

Properties tested for control of Product	Guaranteed Values
A. Physical Requirements - Unaged	
Tensile Strength, minimum at Room Temp.	1200 psi (8.3 N/mm ²)
Elongation, % minimum	250
200 % Modulus, minimum	1000 psi (6.9 N/mm ²)
B. Aging Requirements After 168 hours at 136 ⁰ C	
Tensile Strength, % of unaged, minimum	90
Elongation, % of unaged, minimum	85
C. Insulation Resistance Constant (k), minimum	50,000
D. Degree of Cure	
Heat Distortion 1 hour at 121 ⁰ C, Maximum	10.0
Hot Creep & Set (Method ICEA T-28-562)	
Hot Creep, % Elongation, maximum	50.0
Set, % maximum	5.0

Properties, demonstrated by qualification testing, that are inherent to the formulation.

E Physical Requirement Unaged	
100% Hot Modulus, at 130 ⁰ C, minimum	200 psi (1.4N/, mm ²)
F. Aging Requirements After 168 hours at 150 ⁰ C	
Tensile Strength, % of unaged, minimum	90
Elongation, % of unaged, minimum	85
G Ozone Resistance	
After 24 hours at 0.025 to 0.030%	No Cracks
H. Electrical Characteristics	
SIC at 80 V/mil at 15.6 ⁰ C, maximum	1.0
% Power Factor at 15.6 ⁰ C and 80 V/mil, maximum	0.5
After 24 hours water immersion at 90C	
Dielectric Constant, SIC, 80 V/mil, maximum	3.0
Power Factor, PF %	1.5
After 26 weeks water immersion at 90C	
Dielectric Constant, SIC, 80 V/mil, maximum	3.1
Power Factor, PF%	1.5
Stability Factor, (PF at 80-40 V/mil), maximum	0.2
I. Mechanical Water Absorption	
7 days at 70C, maximum	5.0 mg/in. ² (0.77mg/cm ²)

APPENDIX B

PHYSICAL AND ELECTRICAL CHARACTERISTICS

OF THE THERMOSET XLPO JACKET

When tested in accordance with ICEA and UL requirements the XLPO jacket shall meet the guaranteed values below:

Properties test for control of product.	Guaranteed Values
A. Physical Requirements Unaged	
Tensile Strength, Minimum	1700 psi (11.8 N/mm ²)
Elongation at Rupture, %, Minimum	160
B. Aging Requirements	
Air Oven Test at 121C for 168 hours	
Tensile Strength, % of unaged value, Minimum	60
Elongation, % of unaged value, Minimum	60
Oil Immersion, at 121C for 18 hours (IRM 902)	
Tensile Strength, % of unaged value, Minimum	60
Elongation, % of unaged value, Minimum	50
Properties, demonstrated by qualification testing, that are inherent to the formulation.	
C. Aging Requirements	
Air Oven Test at 100C for 168 hours	
Tensile Strength, % of unaged value, Minimum	100
Elongation, % of unaged value, Minimum -	75
Air Oven Test at ISOC for 168 hours	
Tensile Strength, % of unaged value, Minimum	60
Elongation, % of unaged value, Minimum	60
Oil Immersion, at 70C for 4 hours (IRM 902)	
Tensile Strength, % of unaged value, Minimum	80
Elongation, % of imaged value, Minimum	80
Oil Immersion, at 120C for 18 hours (IRM 902)	
Tensile Strength, % of unaged value, Minimum	60
Elongation, % of unaged value, Minimum	60
D. Oxygen Index. ASTM D-2863, Minimum	35
E. Ozone Resistance. 24 hours @150ppm Ozone	No Cracks
F. Tear Strength. Minimum	(35 Lbs/in.) (6.25 kgs/cm.)
G. Cold Bend 1 hour at - 40C, Minimum	No Cracks
H. Durometer, Shore A, Minimum	90
I. Gravimetric Water Absorption	
7 days at 70C, Maximum	(20mg./in ²) (3.08mg./cm. ²)

J.	Acid Gas Equivalent MIL-C-24643 %,Maximum	0.2
K.	Toxicity Index NEW 713 Maximum	2
L.	Smoke Index NES 711 Maximum	25