CITY OF TAMPA

Bob Buckhorn, Mayor **CONTRACT ADMINISTRATION DEPARTMENT**

David L. Vaughn, AIA, Director

ADDENDUM NO. 1

DATE: November 7, 2014

Contract 15-C-00001; Howard F. Curren AWTP Transformer Replacement – Phase III

Bidders on the above referenced project are hereby notified that the following addendum is made to the Contract Documents. BIDS TO BE SUBMITTED SHALL CONFORM TO THIS NOTICE.

Item 1: Insert the attached Section 16310 – 15KV Insulated Power Cable.

Item 2: Attached for reference is the pre-bid meeting sign-in sheet.

All other provisions of the Contract Documents and Specifications not in conflict with this Addendum shall remain in full force and effect. Questions are to be e-mailed to Contract Administration@tampagov.net.

Jim Greiner

Jim Greiner, P.E., Contract Management Supervisor

SECTION 16310

15 KV INSULATED POWER CABLE

PART 1 - GENERAL

1.01 GENERAL

A. This Specification describes requirements for a 15 KV ethylene propylene rubber (EPR) insulated, shielded power cable suitable for use in wet or dry locations.

B. Cable shall be suitable for installation in wet or dry locations in metallic or non-metallic conduit, above ground or underground.

1.02 STANDARDS AND CODES

A. All cable herein specified shall be manufactured and tested in accordance with all requirements of the latest editions of the following codes, standards, and references. When reference is made within this specification to a particular section or part of these standards, the referenced requirement shall take precedence over other standards covering the same material.

1. Insulated Cable Engineers Association (ICEA Pub. No. S-68-516).

2. National Electrical Code (NFPA 70).

3. National Electrical Manufacturer's Association (NEMA Pub. No. WC7).

4. American Society for Testing Materials (ASTM B-3, B-8 and B-496).

5. Underwriters Laboratories, Inc. (UL 1072).

6. American National Standards Institute, Inc. (ANSI).

7. Association of Edison Illuminating Companies (AEIC CS6-87).

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable cable shall include cables manufactured by Kerite or equal.

2.02 CONDUCTORS

A. Conductor material shall be annealed uncoated copper in conformance with ASTM B-3, B-8 and B-33.

B. Conductors shall be either concentric stranded in conformance with ASTM B-8 or compact-round-stranded in conformance with ASTM B-496.

C. Conductors shall be compressed, Class B stranded unless otherwise specified.

2.03 CONDUCTOR SHIELD

A. The conductor strand shield shall be an extruded semi-conducting EPR-based material in conformance with Paragraph 2.7, ICEA S-68-516 or an extruded energy suppression and stress control material having the necessary characteristics to perform the function of the semi-conducting material. The minimum average thickness shall be 18 mils. A non-metallic semi-conducting tape shield is not acceptable.

2.04 INSULATION

A. Insulation shall be an ethylene propylene rubber compound, listed by Underwriters Laboratories and rated at 105°C for normal operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions.

1. Other synthetic rubber-based are acceptable if they meet the above operating temperatures and are unaffected by ozone and electric discharge resistance as proven by the insulations ability to withstand continuous exposure to 44 KV (60 Hertz, 25°C, 20% R.H.) for 250 hours when tested in accordance with the method described in ASTM D2275-89 “Standard Test Method for Voltage Endurance of Solid Electrical Insulating Materials Subjected to Partial Discharges (Corona) on the Surface”.

2. The insulation material shall meet the electrical and physical requirements specified in Part 3, ICEA S-68-516.

3. The average insulation thickness shall be not less than 220 mils. The minimum thickness at any point shall not be less than 90% of the specified average.

2.05 INSULATION SHIELDING

A. The insulation shield shall consist of a non-metallic conducting material applied directly over the insulation and a 5 mil bare copper tape. The non-metallic component shall be a helically applied conducting tape conforming to the requirements of ICEA S-68-516 and Tables 14.2 and 14.3 of UL-1072. The 5 mil

bare copper tape shall be helically applied with a minimum 15% overlap, directly over the non-metallic tape. The tape shall be continuous.

1. The non-metallic conducting material covering shall be in intimate contact with the insulation, but shall be easily removable without damaging the insulation and shall leave no residue which cannot be readily removed.

2.06 JACKET

A. The outer jacket shall be extruded black-colored polyvinyl chloride (PVC).

1. Polyvinyl chloride shall be in conformance with Paragraph 4.4.5 and Table 4-6, ICEA S-68-516.

2. The minimum average jacket thickness shall be not less than 80 mils; the minimum thickness at any point shall be not less than 80% of the average thickness.

3. The surface of the jacket shall be printed as required by UL Standard 1072.

PART 3 – EXECUTION

3.01 ELECTRICAL AND PHYSICAL TESTS

A. Qualification tests in compliance with Section B, AEIC CS6-87 are required for each shielded cable furnished.

B. All materials used in construction of the cables shall be tested in compliance with the applicable paragraphs of ICEA S-68-516.

C. All completed cables shall successfully pass the following tests prescribed in ICEA publication S-68-516:

1. Paragraph 6.5 – Aging

2. Paragraph 6.27 – Voltage

3. Paragraph 6.28 - Insulation Resistance
4. Paragraph 6.29 - Partial Discharge Extinction (Corona) Level (shielded cables only).

5. Paragraph 6.23 - Discharge Resistance.

D. Test methods and frequency of tests shall be as prescribed in Part 6, ICEA S-68-516.

E. The dimensions of all extruded layers shall be verified.

3.02 CABLE INDENTIFICATION

A. The following information shall be indicated, by means of a surface legend printed in compatible ink of contrasting color, at intervals not to exceed 24 inches over the entire length of the cable:

1. Manufacturer's name
2. Conductor material
3. Conductor size
4. Maximum rated voltage
5. Insulation material
6. Letter designating cable type
7. Shielded or non-shielded
8. Cable Tension Limits.

3.03 REEL IDENTIFICATION

A. Each reel shall have printed on reel or a firmly attached weatherproof (metal or plastic) tag indicating:

1. Manufacturer's name
2. Conductor material
3. Conductor size
4. Insulation type and thickness
5. Jacket thickness
6. Temperature rating

7. Length of cable

8. Manufacturer's cable type

9. Voltage class

10. Purchaser's purchase order number and item number

11. Cable weight

12. Reel weight

13. Cable Tension Limits

3.04 REEL PROTECTION

A. Each reel shall be lagged with suitable lagging to protect cable from damage during shipping. Cable ends shall be sealed to prevent the entrance of water.

3.05 PULLING AND INSTALLATION

A. Medium voltage cables shall be pulled into ducts using a cable lubricant recommended by the manufacturer.

B. The complete cable pulling setup, including winches, cable reel support frames, turning sheaves and guides, and the like, shall be approved by the Engineer before the cables are pulled in.

C. A pulling tension meter shall be connected to the pulling setup. The pulling equipment shall be arranged and pulling methods shall be applied so that pulling tensions do not exceed the manufacturer's permissible limits for the cable furnished.

D. Cables in manholes shall be securely tied and neatly bundled and racked.

E. The cables shall be handled carefully to avoid twists and kinks or other damage to the insulation. All conduit and duct lines shall be mandrel led as specified herein and shall be swabbed to remove any accumulated moisture or debris before cables are pulled in. Cable pulling ropes shall be of nylon or a plastic fiber material or equal. Steel pulling ropes will not be permitted.

F. Cable reels shall be stored on concrete or other hard surfaces, or shall be lagged with 2 x 4 wood lagging providing 100% coverage.

G. Splices in the manholes shall be limited to those splices specifically designated in

the drawings and specifications.

H. All medium voltage cables installed in manholes and pull boxes shall be fireproofed (arc-proofed). Fireproofing (arc-proofing) shall be approximately 30 mils thick by 3" wide and applied tightly around each cable spiral in one-half lapped wrapping or in a butt jointed wrapping with a second wrapping covering joints in the first wrapping. Irregularities in cables, such as at splices, shall be smoothed with insulation putting before applying fireproofing tape. Tape shall be installed with coated side toward the cable and extended not less than 1" into the conduit. Random wrapping of glass cloth electrical tape shall be installed around installed fireproofing tape to prevent unraveling. Fireproofing (arc-proofing) tape shall consist of a flexible, conformable fabric which has one side coated with a flame retardant, flexible, polymeric coating and/or a chlorinated elastomer, shall be noncorrosive to the cable sheath, and shall not support combustion.

3.06 SPLICES AND TERMINATIONS

A. All medium voltage cable splices and terminations shall be made in strict accordance with the cable manufacturer's recommendations, with splice and termination kits approved for those purposes.

B. Splices and plug connections shall be made up with closed end compression connectors and lugs. Fittings and compression tools shall be of the circular or hexagonal compression type. Indentor-type compression fittings will not be acceptable. Lugs shall be Burndy type YA-AT Hylug, T & B or equal, and splice sleeves shall be Burndy type YS-AT Hylink, T & B or equal. Mechanical splices or lugs will not be acceptable. Lug bolting at bus bars or terminal spades shall be made up with a flat Belleville or equal washer and a locknut.

C. Cable shields shall be grounded to the transformer grounding pad within the transformer compartment.

3.07 ACCEPTANCE CHECKS AND TESTS

A. Perform tests in accordance with the manufacturer's recommendations. Provide cable tension log and include the following visual and electrical inspections.

B. Test equipment and labor and technical personnel shall be provided as necessary to perform the acceptance tests. Arrangements shall be made to have tests witnessed by the City's representative.

C. Visual Inspection:

1. Inspect exposed sections of cables for physical damage.

2. Inspect shield grounding, cable supports, splices, and terminations.

3. Verify that visible cable bends meet manufacturer's minimum published bending radius.

4. Verify installation of fireproofing tape and identification tags.

D. Electrical Tests :

1. Tests shall be performed on new cables as specified herein.

2. Test new cable after installation, splices, and terminations have been made, but before connection to equipment and existing cable.

3. Perform resistance measurements through bolted connections with a low-resistance ohmmeter.

4. Perform a shield-continuity test on each power cable by ohmmeter method.

5. Perform an insulation-resistance test utilizing a megohmmeter with a voltage output of at least 2500 volts. Individually test each conductor with all other conductors and shields grounded. Test duration shall be one minute. See Table 100.1 for minimum insulation resistance values.

6. Perform an acceptance test on cables by means of direct voltage (dc), alternating voltage (ac), partial discharge (pd), or very low frequency (VLF). The selection can be made only after an evaluation of the alternative methods. Test procedure shall be as follows, and the results for each cable test shall be recorded as specified herein. Test voltages shall not exceed 80 percent of cable manufacturer's factory test value or the maximum test voltage in Table 100.6.

a. Insure that the input voltage to the test set is regulated.

b. Current-sensing circuits in test equipment, when available, shall measure only the leakage current associated with the cable under test and shall not include internal leakage of the test equipment.

c. Record wet- and dry-bulb temperatures or relative humidity and temperature.

d. Test each cable section individually.

e. Test each conductor individually with all other conductors

grounded. Ground all shields.

f. Terminations shall be adequately corona-suppressed by guard ring, field reduction sphere, or other suitable method, as necessary.

g. Insure that the maximum test voltage does not exceed the limits for terminators specified in ANSI/IEEE 48, IEEE 386, or manufacturer's specifications.

h. Raise the conductor to the specified maximum test voltage and hold for 15 minutes. Refer to Table 100.6.

i. If performed by means of direct voltage (dc), reduce the test set potential to zero and measure residual voltage at discrete intervals.

j. Apply grounds for a time period adequate to drain all insulation stored charge.

7. Test Values

a. The values associated with the testing methods shall be in accordance with the applicable Table 100.6.

b. Compare bolted connection resistances to values of similar connections.

c. Bolt-torque levels should be in accordance with Table 100.12 unless otherwise specified by the manufacturer.

d. Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.

e. Shielding shall exhibit continuity. Investigate resistance values in excess of ten ohms per 1000 feet of cable.

f. If test is performed by means of direct voltage (dc), graphic plots may be made of leakage current versus step voltage at each increment and leakage current versus time at final test voltages.

g. Residual voltage at the end of each interval should be approximately the same for each phase and/or parallel conductor.

E. Thermographic Survey

All current-carrying devices within the scope of this project shall be inspected.

1. Visual and Mechanical Inspection

a. Perform thermographic survey when load is applied to the system.

b. Remove all necessary covers prior to thermographic inspection. Use appropriate caution, safety devices, and personal protective equipment.

2. Test Parameters

a. Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1º C at 30º C.

b. Equipment shall detect emitted radiation and convert detected radiation to visual signal.

c. Thermographic surveys should be performed during periods of maximum possible loading.

3. Test Results

a. Recommended actions based on temperature rise can be found in table 100.18.

F. Provide a comprehensive report that describes the identification and location of cables tested, the test equipment used, and the date tests were performed; identifies the persons who performed the tests; and identifies the following:

1. Description of equipment / cables to be tested

2. Insulation resistance and leakage current results for each cable section tested.

3. Temperature difference between the area of concern and the reference area.

4. Probable cause of temperature difference.

5. Areas inspected. Identify inaccessible and/or unobservable areas and/or equipment.

6. Identify load conditions at time of inspection.

7. Provide photographs and/or thermograms of the deficient areas.

8. The report shall provide conclusions and recommendations for corrective action.

G. Final Acceptance: Final acceptance shall depend upon the satisfactory performance of the cables under test. No cable shall be energized until recorded test data have been approved by the City's representative. Final test reports shall be provided to the City within one (1) week of testing to minimize downtime of any electrical system.

3.08 TEST INSTRUMENT CALIBRATION

A. The method(s) used to calibrate instrument(s) should be an approved method, method used should be documented in field test reports. All test equipment shall be in good mechanical and electrical condition. The accuracy shall be directly traceable to the National Institute of Standards and Technology (NIST). Instruments shall have been calibrated within the past 12 months. Dated calibration labels shall be visible on all test equipment or calibration certification shall be included in the project report. Records, which show date and results of instruments calibrated or tested, shall be kept up-to-date. Up-to-date instrument calibration instructions and procedures shall be maintained for each test instrument. The calibrating standard shall be of higher accuracy than that of the instrument tested.

3.09 GUARANTEE

A. The cable manufacturer shall guarantee the cable, in writing, against factory incurred defects for 40 years.

B. In the event the cable is defective in design, material or workmanship for the 40 year design life of the cable, the cable manufacturer shall, at its own expense, replace the defective portion of the cable with another cable meeting the original design specifications for the failed cable. Such replacement cable shall carry the same guarantee as the cable removed by the manufacturer.

END OF SECTION

CONTRACT 15-C-00001; AWTP TRANSFORMER REPLACEMENT PH. III PRE-BID MEETING 11/4/2014

E-Mail to **Register as a Plan Holder** and E-Mail All **Questions** to; **ContractAdministration@tampagov.net**

Sign-In Sheet Please Print — City of Tampa, Contract Administration Department

	Name	Organization	E-Mail OR Phone
1	*Jody Gray*	*Tampa Contract Administration Dept.*	jody.gray@tampagov.net
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4	Mark Johnson	COT / CAD	813-393-6736
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9	JACK FERRAS	COT/WASTEWATER	813-274-8095
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