



State of Delaware
Department of Natural Resources and Environmental Control
Delaware Division of Parks and Recreation
89 Kings Highway
Dover, Delaware 19901

ADDENDUM No. FOUR

Project Name: Hunter Barn New Restrooms
Bellevue State Park

Project No.: B-26E

Contract No.: 2018-BH-100

Date of Issue: October 23, 2018

Notice No. 1: Attach this addendum to the Project Manual for this project. It modifies and becomes part of the Bidding Documents. Work or material not specifically mentioned herein is to be as described in the main body of the specification and as shown on the drawings.

Bids Due: Thursday, November 1, 2018 at 1:30 PM
Auditorium
DNREC, Division of Parks and Recreation
89 Kings Highway, Dover DE 19901

Specifications:

- 1 Replace the following specifications with those included with this Addendum:
 - A. Section 237223 – Packaged Air-to-Air Energy Recovery Units.
 - B. Section 238127 – Small Split System Heating and Cooling.
 - C. Section 238216 Air Coils.
 - D. Section 337149.13 – Overhead Medium Voltage Transmission Wiring.

Attachments
End Addendum Four

SECTION 23 72 23
PACKAGED AIR-TO-AIR ENERGY RECOVERY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged, dessicant air-to-air energy recovery units.
- B. Service accessories.

1.02 REFERENCE STANDARDS

- A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2012.
- B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012.
- C. AHRI 1060 I-P - Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment; 2011.
- D. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2012, with 2015 amendments.
- E. ASHRAE Std 84 - Method of Testing Air to Air Heat/Energy Exchangers; 2013.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- I. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; 2006
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's installation instruction, product data, and engineering calculations.
- C. Shop Drawings: Show design and assembly of energy recovery unit and installation and connection details.
- D. Closeout Submittals: Submit manufacturer's operation and maintenance instructions.
- E. Maintenance Materials: Furnish the following for Division of Natural Resources and Environmental Control's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Spare Parts: One of each kind of filter.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Firm regularly engaged in manufacturing energy recovery units..
 - 2. Products in satisfactory use in similar service for not less than five years.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store in manufacturer's unopened packaging.
- B. Store products to be installed indoors in dry, heated area.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Warranty ventilator to be free from defects in material and workmanship and of all parts for period of 1-1/2 years from date of Substantial Completion.
- C. Warranty energy recovery wheel to be free from defects in material and workmanship for 3 years under circumstances of normal use.
- D. Warranty motor to be free from defects in material and workmanship for 7 years under circumstances of normal use.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Energy Recovery Ventilators:
 - 1. RenewAire: www.RenewAire.com
 - 2. LG Electronics: www.lg.com

2.02 ENERGY RECOVERY UNITS

- A. Energy Recovery Units: Dessicant static plate type; prefabricated packaged system designed by manufacturer.
 - 1. Access: Hinged and/or screwed access panels on front.
 - 2. Lifting holes at the unit base.
 - 3. Framing: Welded extruded aluminum tubular frame capable of supporting components and casings.
 - 4. Permanent name plate listing manufacturer mounted inside door near electrical panel.

2.03 CASING

- A. Wall, Floor, and Roof Panels:
 - 1. Panels: Removable.
 - 2. Construction: 1 inch thick, double wall box construction, with formed edges of exterior wall overlapping formed edges of interior wall.
 - 3. Exterior Wall: galvanized steel sheet.
 - a. 0.040 inch thick aluminum.
 - 4. Interior Wall: Galvanized sheet metal.
 - a. 22 gage galvanized sheet metal.
 - 5. Insulation:
 - a. 1 inch insulated fiberglass.
 - b. Panel Cores: Mineral wool board.
 - c. Flame Spread Index: 25, maximum, when tested in accordance with ASTM E84, NFPA 255, and UL 723.
 - d. Smoke Developed Index: 50, maximum, when tested in accordance with ASTM E84, NFPA 255, and UL 723.
 - 6. Roof Panel: Weatherproof.
 - 7. Coating: Polyurethane enamel.
- B. Access Panels: Provide access to components through a large, airtight closed cell foam gasket and easily removable panel. Door pressure taps, with captive plugs, shall be provided for cross-core pressure measurement allowing for airflow measurement.
- C. Doors:
 - 1. Construct doors of same construction and thickness as wall panels.
 - 2. Height: 80 inches.

2.04 FANS

- A. Provide separate fans for exhaust and supply blowers.
- B. Fans:
 - 1. Individually driven with a dedicated motor.

2. Backward inclined.
 3. AMCA-rated.
- C. Housings: 12 gage aluminized steel with plenums integral to general housing and constructed to Class 1 fan standards.
- D. Motors:
1. Motors: Premium efficiency, EISA compliant for energy efficiency, totally enclosed fan cooled (TEFC).
 2. Efficiency: High.
 3. Speed: Single.
 4. Control: Constant Speed.
 5. Fan Motor: UL listed and labeled.
- E. Drives:
1. Fans: Belt driven.
 2. Horsepower: .75.
 3. Speed Control: Provide with Adjustable Sheave and fixed Sheave once final balancing has been established..
 4. Service Factor: 1.2.

2.05 TOTAL ENERGY PLATE

- A. Sensible Recovery Efficiency: 72%.
- B. Latent Recovery Efficiency: 37%.
- C. Plate Effectiveness: Rated in accordance with ASHRAE Std 84 and AHRI 1060.
- D. Flame Spread Index: 25, maximum, when tested in accordance with ASTM E84, NFPA 255, and UL 723.
- E. Smoke Developed Index: 50, maximum, when tested in accordance with ASTM E84, NFPA 255, and UL 723.
- F. Energy Recovery Media Face:
1. Conform to NFPA 90A.
- G. Desiccant:
1. Type: 3A.
 2. Performance:
 - a. Desiccant: Non-dissolving, permanent, and resistant to damage from compressed air, low temperature steam, hot water or by vacuum cleaning.

2.06 FILTERS

- A. Exhaust and Fresh Air Streams: MERV 8 filters constructed to meet ASHRAE Std 52.2.

2.07 DAMPERS

- A. Exhaust Back-Draft Damper: Factory installed, galvanized steel.
1. High performance, backdraft dampers suitable for application in HVAC systems with velocities to 3000 feet per minute.
 2. Louvers, Dampers, and Shutters: AMCA 500-D and AMCA 500-L.
 3. Damper Capacity: Demonstrate damper capacity to withstand HVAC system operating conditions.
 4. Fabrication:
 - a. Frame: 20 gage, 3 inch roll formed galvanized steel channel with rear flange, prepunched mounting holes, and welded corner clips for maximum rigidity.
 - b. Blades:
 - 1) Style: Single-piece, overlap frame.

- 2) Material: Roll formed 28 gage galvanized steel.
 - 3) Width: Maximum 6 inches.
- B. Return Air Damper:
1. Factory installed, adjustable volume control, opposed blade damper for regulating airflow, based on external static pressure.
 2. Return Air Damper: Structural hat channels, reinforced at corners.
 3. Roll-formed Frames: Structurally superior to 13 gage U-channel frames.
 4. Blades: Single skin, 16 gage.
- C. Motorized Dampers: Provide motorized dampers at outside air inlet, exhaust air outlet, and supply air outlet.
1. Type: Motorized two position parallel blade damper with blade seals.
 2. Motorized Damper: Roll-formed structural hat channels, reinforced at the corners,
 3. Blades: Single skin, 16 gage.

2.08 VIBRATION ISOLATION

- A. Vibration Isolation: Provide whole unit vibration isolation with the energy recovery unit assembly.

2.09 POWER AND CONTROLS

- A. Motor Control Panels: UL listed.
- B. Include necessary motor starters, fuses, transformers and overload protection according to NFPA 70.
- C. Provide single-point field connection to power supply.
- D. Install wiring in accordance with NFPA 70.
- E. Provide unit controller with stand alone controls capable of performing the sequence of operation on the drawings. Coordinate with controls contractor to ensure unit controller can communicate with building controller.

2.10 SERVICE ACCESSORIES

- A. Electrical Components: Factory wired for single point power connection.
1. 60 Hz power connection.
 2. Isolate electrical box from the airflow.
 3. Protect all integral wires and connections.
 4. Electrical Components: UL Listed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that structure is ready for installation of unit, that openings in deck for ductwork, if required, are correctly sized and located, and that mechanical and electrical utilities supplying unit are of correct capacities and are accessible.

3.02 SYSTEM STARTUP

- A. Provide services of manufacturer's authorized representative to provide start up of unit.

3.03 CLEANING

- A. Clean filters, air plenums, interior and exposed-to-view surfaces prior to Substantial Completion.

END OF SECTION

SECTION 23 81 27
SMALL SPLIT-SYSTEM HEATING AND COOLING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air-source heat pumps.
- B. Air cooled condensing units.
- C. Indoor ductless fan & coil units.
- D. Indoor dedicated outside air units.
- E. Accessory Equipment.

1.02 RELATED REQUIREMENTS

- A. Section 23 31 00 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008.
- B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.
- D. ASHRAE Std 23.1 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; 2010.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Design Data: Indicate refrigerant pipe sizing.
- D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- F. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Division of Natural Resources and Environmental Control s name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience and approved by manufacturer.
- C. Provide manufacturer's start up for proof of operational system, and provide findings to engineer.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturers warranty for compressors.

PART 2 PRODUCTS

2.01 MULTI-ZONE SPLIT SYSTEM MANUFACTURERS

- A. Diaken: www.Diaken.com
- B. Basis of Design: LG Electronics: www.lg.com
- C. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SYSTEM DESIGN

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory and assembled, pre-wired indoor and outdoor units; UL listed. The intent is to have matching manufacturer indoor and outdoor units. No mix manufacturer systems.
 - 1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator.
 - 2. Provide refrigerant lines internal to units, factory cleaned, dried, pressurized and sealed.

2.03 INDOOR UNITS FOR DUCTLESS SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer. The intent is to have matching manufacturer indoor and outdoor units. No mix manufacturer systems.
 - 1. Cabinet: Galvanized steel.
 - a. Finish: White.
 - 2. Fan: Line-flow fan direct driven by a single motor.
 - 3. Filter return air with washable, antioxidant pre-filter and a pleated anti-allergy enzyme filter.
- B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with AHRI 210/240 and UL listed.
- C. Accessories:
 - 1. Duct ventilation connection kit.
 - 2. Provide disconnect switch.

2.04 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Refrigerant: R-410A.
 - 2. Cabinet: Steel with powder coat paint finish and louvered panels surrounding the unit.
 - 3. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL listed.
- B. Multi Zone Compressor: Scroll, modulating, AHRI 520 mounted integral with condenser, with lubrication, crankcase heater, high pressure control, motor overload protection, reversing valve for heat pump operation, and service valves and drier.
- C. Cooling Coil Compressor: Scroll, single stage, AHRI 520 mounted integral with condenser, with lubrication, crankcase heater, high pressure control, motor overload protection, reversing valve for heat pump operation, and service valves and drier.
- D. Air Cooled Condenser: ARI 520; Aluminum fin and copper tube coil, with direct drive fan, and galvanized fan guard.
- E. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
 - 1. Provide thermostatic expansion valves.
- F. Operating Controls:

1. Low Ambient Kit for Multi Zone Condensers: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig and off when pressure drops below 140 psig for operation to 0 degrees F.
- G. Accessories:
 1. Provide Disconnect Switch
 2. Provide Hail/Snow Guard

2.05 ACCESSORY EQUIPMENT

- A. Outside air connection kit on ceiling cassette ductless indoor units.
- B. Return air grille kit on indoor units.
- C. Return air thermistor on indoor units.
- D. Disconnect switch - One per indoor unit.
- E. Controls: Provide the following control interfaces:
 1. The AC Smart control system shall be provided with a central control panel(s) and shall be capable fo the following:
 - a. Supervisory Alarms - Displayed on interface screen at central control panel.
 - b. Trouble shooting - Displayed on interface screen at central control panel.
 - c. Night setback control and temperature settings for each indoor unit fan coil.
 - d. Intent is for the VRF heat pump to operate under stand alone controls with future BAS integrations capabilities. Provide AC Smart with Bacnet controller.
 - 1) Connection to internet/BAS shall be in separate project.The control panel shall be provided by the equipment manufacturer and shall be mounted in a lockable control cabinet provided by the mechanical contractor. The lockable control cabinet shall be large enough to accomodate the control panel power supply (low voltage xfmr), a 450 Watt UPS (provided by Mechanical Contractor), and future network connections.
- F. Condensing units controls: Provide with PI485 communications card.
- G. Room Thermostat - One per indoor unit: In addition to temperature sensors integral with indoor/evaporator units. LG model PREMTBVC1. Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
 1. Automatic switching from heating to cooling.
 2. Preferential rate control to minimize overshoot and deviation from setpoint.
 3. Provide vandal proof cover.
 4. Programming based on every day of the week. Occupied/Un-occupied Schedule.
 5. Thermostat Display:
 - a. Actual room temperature.
 - b. Programmed temperature.
 - c. Day of week.
 - d. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.
- C. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION

SECTION 23 82 16

AIR COILS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refrigerant coils.
- B. Electric coils.

1.02 RELATED REQUIREMENTS

- A. Section 23 31 00 - HVAC Ducts and Casings: Installation of duct coils.
- B. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.
- C. Shop Drawings: Indicate coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.
- D. Certificates: Certify that coil capacities, pressure drops, and selection procedures meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- C. Manufacturer/vendor shall fully coordinate with other trades to ensure all parts and pieces are provided to achieve the sequence of operation, and communicate with the controls system. Provide additional items not indicated as needed.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.
- B. Protect coils from entry of dirt and debris with pipe caps or plugs.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 REFRIGERANT COILS

- A. Manufacturers:
 - 1. Luvata UK Ltd: www.luvata.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Tubes: 5/8 inch OD seamless copper arranged in parallel or staggered pattern, expanded into fins, silver brazed joints.

- C. Fins: Aluminum _____.
- D. Casing: Die formed channel frame of 14 gage, 0.0747 inch galvanized steel with mounting holes. Insulation .75 x 1.5 lb/Density. Angle Iron lifting lugs.
- E. Drain Pan: .060 Stainless Steel with Schedule 40 Stainless Steel drain. Slope towards drain.
- F. Access Panel: Provide side access panel for coil inspection and cleaning.
- G. Testing: Air test under water at 300 psi for working pressure of 250 psi; clean, dehydrate, and seal with dry nitrogen charge.
- H. Configuration: Down feed with bottom suction to prevent trapping of oil.

2.02 ELECTRIC COILS

- A. Manufacturers:
 - 1. INDEECO (Industrial Engineering and Equipment Company): www.indeeco.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Assembly: UL listed and labelled, with terminal control box and hinged cover, splice box, coil, casing, and controls.
- C. Coil: Heating elements shall be open coil, 80% nickel, 20% chromium, Grade A resistance wire. Coils shall be machine crimped into stainless steel terminals extending 1" minimum past the airstream. Terminal hardware shall be stainless steel. Coils shall be supported by ceramic bushings staked into supporting brackets.
- D. Coil Elements shall be protected using stainless steel wire mesh screen.
- E. Frame and terminal box shall be 304 stainless steel. Terminal box shall be Nema 1.
- F. Controls: Automatic reset thermal cut-out, duct temperature sensor, built-in SCR modulating control, control circuit transformer and fuse, manual reset thermal cut-out, air flow proving device.
- G. Provide stand alone controls to achieve the sequenc of operation.

END OF SECTION

SECTION 33 71 49.13

OVERHEAD MEDIUM-VOLTAGE TRANSMISSION WIRING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Line conductors and accessories.
- B. Insulators.
- C. Cutouts and arresters.
- D. Pole Mounted Distribution transformers.

1.02 REFERENCE STANDARDS

- A. ANSI C29.2A - American National Standard for Insulators -- Wet-Process Porcelain and Toughened Glass -- Distribution Suspension Type; 2013.
- B. ANSI C29.3 - American National Standard for Wet Process Porcelain Insulators -- Spool Type; 2015.
- C. ANSI C29.4 - American National Standard for Wet-Process Porcelain Insulators -- Strain Type; 2015.
- D. ANSI C29.5 - American National Standard for Wet-Process Porcelain Insulators -- Low- and Medium-Voltage Types; 2015.
- E. ASTM B1 - Standard Specification for Hard-Drawn Copper Wire; 2013.
- F. ASTM B2 - Standard Specification for Medium-Hard-Drawn Copper Wire; 2013.
- G. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.
- H. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.
- I. ASTM B228 - Standard Specification for Concentric-Lay-Stranded Copper-Clad Steel Conductors; 2011a (Reapproved 2016).
- J. ASTM B232/B232M - Standard Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated Steel-Reinforced (ACSR); 2017.
- K. IEEE C2 - National Electrical Safety Code; 2012.
- L. IEEE C37.42 - IEEE Standard Specifications for High-Voltage (>1000 V) Expulsion-Type Distribution-Class Fuses, Fuse and Disconnecting Cutouts, Fuse Disconnecting Switches, and Fuse Links, and Accessories used with These Devices; 2009.
- M. IEEE C62.11 - Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits (>1 kV); 2012.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog data for insulators, cutouts, transformers and arresters.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of IEEE C2.
- B. Installer Qualifications: Company specializing in applying work of this Section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 LINE HARDWARE

- A. Bolt-Type Insulator Pins: galvanized.

- B. Pole-Top Insulator Pins: galvanized.
- C. Spool Insulator Bolts: galvanized.
- D. Washers: galvanized.
- E. Hot-Line Clamps: Screw type with concealed threads. Fill thread chamber with corrosion-resistant compound.
- F. Secondary Racks: With spool insulators.
- G. Ground Wire: Soft drawn copper conductors, 4 AWG minimum size.

2.02 INSULATORS

- A. Insulators: Radio interference free wet process porcelain insulators with minimum wet flashover rating of 80 kV.
- B. Line Post Insulators: ANSI C29.7. Include mounting stud of length suitable for each mounting arrangement used.
- C. Insulator Brackets: Hot dipped galvanized steel designed to hold vertical-post-type or pin-type insulators with one bolt attachment to pole.
- D. Spool Insulators: ANSI C29.3, _____.
- E. Pin Insulators: ANSI C29.5, _____.
- F. Guy Strain Insulators: ANSI C29.4, _____.

2.03 LINE CONDUCTORS

- A. Medium Voltage Overhead Line Conductors: Bare copper.
- B. Secondary Conductors: Copper, single conductor cable.
 - 1. Insulation for Phase Conductors: 600 volt cross-linked polyethylene.
- C. Copper Conductors: ASTM B1, hard-drawn solid copper.
- D. Connectors, Splices, and Conductor Securing and Protecting Components: Items include wire clamps, ties, conductor armor, fittings, connectors, and terminals. Listed for the specific applications and conductor types and combinations of materials used. Descriptions as follows for various applications:
 - 1. Copper to Copper: Copper alloy, complying with UL 486A-486B.
 - 2. Aluminum Composition to Aluminum Composition: Aluminum alloy, complying with UL 486A-486B.
 - 3. Copper to Aluminum Composition: Type suitable for this purpose, complying with UL 486A-486B.
 - 4. Connectors and Splices for Secondary Conductors: Listed and labeled for the conditions and materials involved in each application.
 - 5. Taps for Medium-Voltage Line Conductors: Hot-line clamps, screw type, with concealed threads and bare, hard-drawn copper stirrups. Listed for the combination of materials being connected.
 - 6. Splices under Tension: Compression type with strength exceeding the conductors spliced.

2.04 DISTRIBUTION TRANSFORMERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB.
 - 2. Cooper Industries; Cooper Power Systems Division.
 - 3. General Electric Company/GE Prolec; Distribution Transformer.
 - 4. Howard Industries, Inc.
- B. Description: Single-phase, two-winding, single-bushing, liquid-filled, self-cooled, pole-mounting distribution type, suitable for external fuse and surge suppressor protection; complying with

IEEE C 57.12.00, and tested according to IEEE C 57.12.90 and with the following additional requirements:]

1. Cooling Class: OA.
 2. Temperature Rise: 65 deg C.
 3. Insulating Liquid: Mineral oil, ASTM D 3487, Type II.
 4. Identification: Label the transformer as "non-PCB" and place manufacturer's name and type of fluid on the nameplate.
- C. BIL: 95 kV.
- D. Retain first paragraph below if only one voltage is used and it is not indicated on Drawings. Insert a secondary-voltage paragraph if only one voltage is used and it is not indicated on Drawings.
- E. Primary Voltage: 6900 volts. Contractor to verify existing system voltage
- F. Taps: Two, 2.5 percent above and below high-voltage and full-load rated. Tap changer shall have an external operating handle.
- G. Mounting Brackets: Single, integral; suitable for pole mounting, individually or in cluster, or on crossarm.
- H. NEMA TP 1 includes standards to calculate avoided cost of electricity due to reduction of transformer losses when Contractor offers transformers with better than the minimum efficiencies. Revise first paragraph below to comply with requirements of NEMA TP 1 if bidding documents include bid modifications due to avoided costs of electricity.
- I. Minimum Efficiency: Class 1, as defined by NEMA TP 1, based on test results that comply with requirements of NEMA TP 2.
- J. Retain first paragraph below for locations with contaminated atmosphere. Consult manufacturers and revise to suit local conditions.
- K. Bushings: Creepage distance shall exceed nominal value standard for unit rating by at least 75 percent.
- L. Retain first two paragraphs below for installations in corrosive environments.
- M. Hardware: Stainless steel.
- N. Tank and Cover: Stainless steel, complying with ASTM A 167, Type 304 or 304L, with paint coating exterior finish system complying with IEEE C57.12.28, including manufacturer's standard color finish coat.
- O. Show transformer kiloampere capacity using 2-1/2-inch numerals placed near the low-voltage bushings.

2.05 ARRESTERS AND CUTOUTS

- A. Surge Arresters: IEEE C62.11 Distribution-Class Surge Arresters: Porcelain-enclosed, gapless, metal-oxide type complying with IEEE C62.11 and NEMA LA 1.
- B. Fused Cutouts: IEEE C37.42; drop-out fused cutouts rated 100 amperes at 14.4 kV ungrounded.
- C. Fuses: Type K, rated size as required .

2.06 GUYS AND ANCHORS

- A. Guy Strand Assemblies: Cable and attachment assemblies shall have uniform minimum breaking strength of the cable.
 1. Cable: Seven strands. Zinc-coated steel, complying with ASTM A 475. Breaking strength shall be not less than 10,000 lb.
 2. Cable Termination:

- a. Retain one of first two subparagraphs below. If retaining both, show pole attachment method on Drawings.
 - b. Thimble eye.
 - c. Hooks and guy strain plates, complying with IEEE C135.1.
 - d. Preformed galvanized-steel guy grips, matching material, galvanizing, and strength of the guy strand assembly.
- B. Anchor and Anchor-Rod Assemblies: Hot-dip galvanized steel.
1. Power-installed screw-type anchors.
 - a. 15-inch screw; with rod 96 inches long by 1-1/2 inches in diameter. Rated at 10,000 lb when installed.
 - b. Guy anchors shall have strength and holding area as required for anchor load and soil conditions at location of that anchor.
- C. Strain Insulators: Epoxy-bonded fiberglass of length to meet clearance requirements.
- D. Guy Markers: Round, of vinyl or PVC material, yellow color, 96 inches long. Shatter resistant at temperatures below 0 deg F.

PART 3 EXECUTION

3.01 INSTALLATION

- A. GUY INSTALLATION
1. Install guys to resist unbalanced loads, including those developed at angles, corners, and dead ends. Install two or more guys if a single guy will not provide adequate strength. Install separate guys if unbalanced loads are separated by 36 inches (900 mm) or more. Comply with IEEE C2.
 - a. Coordinate first subparagraph below with "Guys and Anchors" Article.
 - b. Unless a thimble eye is used, at the pole end, install a minimum of two guy hooks and two guy strain plates.
 - c. At the anchor end, attach guy strand assembly with preformed grips.
 2. Coordinate first paragraph below with Drawings.
 3. Protect guy strands from damage. Replace damaged guy strands. Install guy insulators where required to comply with IEEE C2 clearance requirements.
 4. Retain first paragraph below unless anchor selection is based on specific survey at each guy location or where selected strength of guy assembly indicated is adequate for conditions encountered in Project.
 5. Install guys with a lead-to-height ratio of 1 to 1 unless otherwise indicated. The minimum lead-to-height ratio shall be 1/2 to 1. When less than 1 to 1, increase guy strength by the ratio of the sine of the lead angle indicated to the sine of the lead angle provided.
 6. Install screw-type guy anchors aligned in soil with guy. Set with anchor rod pointing at guy attachment on pole and rod projecting 6 to 9 inches (150 to 230 mm) from ground.
 7. Install strain insulators to provide a minimum of 12 inches (300 mm) of clearance between the nearest energized surface and the strain insulator fitting farthest from the pole. When loaded to the tension indicated, fiberglass strain insulators shall be loaded to not more than two-thirds of manufacturer's published rating.
 8. Guy Markers: Install at anchor end of guys to visually mark the guy wire at all accessible locations. Clamp to guy strand or anchor at top and bottom of marker.
- B. HARDWARE AND ACCESSORIES INSTALLATION
1. Install washers against wood and under nuts, including eyenuts and locknuts.
 2. Install nuts and locknuts wrench-tight on threaded connections.
- C. INSULATOR INSTALLATION
1. Coordinate first paragraph below with Drawings.
 2. Medium-Voltage Line Application: Install [pin] [or] [post] type, except install suspension type at corners, angles, dead ends, and other locations where horizontal forces exceed rated values for pin or line-post-type units.

- a. Install suspension insulators and hardware that have mechanical strength exceeding rated breaking strength of attached conductors.
 - b. Retain subparagraph below for projects using armless construction.
 - c. Install horizontal line-post insulators for armless construction.
 3. Post-Insulator Conductor Support: Where installed horizontally and for line angles more than 15 degrees, install clamp-top conductor clamps.
 4. Install spool-type insulators for secondary lines mounted on clevis attachments or secondary racks.
 5. Guy Strain Type: Install [porcelain] [fiberglass-reinforced] units.
- D. SURGE ARRESTERS
1. Install surge arresters to protect [distribution] [metering equipment] [reclosers], [group-operated, load-interrupter switches], [aerial-to-underground transitions], and other items indicated.
 - a. Units Installed 6000 Feet (1800 m) or More above Sea Level: Use arresters specifically rated for this service.
- E. CUTOFF, SWITCH, AND FUSE INSTALLATION
1. Hook-Stick-Operated Switches: Install to maximize safe operating access.
 2. Group-Operated, Load-Interrupter Switches and Air-Break Switches: Install operating handle 42 inches (1067 mm) above finished grade.
- F. Ground Resistance: Comply with Division 26 Section "Grounding and Bonding for Electrical Systems." Measure resistance of each separate grounding electrode, including pole grounds. Also measure resistance of separate grounding electrode systems before bonding together.
1. Perform tests and obtain acceptable results before energizing any portion of overhead electrical distribution system.
 2. Results and Follow-up: If ground resistance for a single ground electrode or pole ground, tested individually, exceeds 25 ohms, add a ground electrode not less than 10 feet away and interconnect with No. 2 AWG, minimum, bare conductor buried at least 12 inches below furnished grade.
- G. Install in accordance with IEEE C2.

END OF SECTION

HUNTERS BARN RESTROOM FACILITIES
Project # B-26E, Contract # 2018-B-100

Bellevue State Park
September 19, 2018
Reissued Addendum Four October 23, 2018