SECTION 260505 – COMMON WORK RESULTS FOR ELECTRICAL, COMMUNICATIONS AND ELECTRONIC SAFETY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Safety considerations for outdoor substations.
2. Supporting devices for electrical components.
3. Electrical identification.
4. Electricity-metering components.
5. Lock-out/tag-out devices.
6. Safety accessories.
7. Touchup painting.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, including lock-out/tag-out devices and safety accessories.

B. Lock-Out/Tag-Out (LOTO) Schedule: Identify which LOTO model is intended to be used for each applicable electrical equipment.

1.3 QUALITY ASSURANCE

A. Comply with the OBO Electrical Code (NFPA 70 “National Electrical Code” as amended by OBO).

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100 by testing agency acceptable to Project Director/COR based upon input from OBO/PDCS/DE/EE, and marked for intended use.

1.4 COORDINATION

A. Coordinate arrangement, mounting and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated
2. To provide for ease of disconnecting the equipment with minimum interference to other installations

3. To allow right of way for piping and conduit installed at required slope
4. So connecting raceways, cables, wireways, cable trays, and busways will be cleat of obstructions and of the working and access space of other equipment

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

PART 2 - PRODUCTS

2.1 OUTDOOR SUBSTATIONS

A. Metal Enclosures: Use metal enclosures around all live parts.

B. Locks: Provide on gates with key interlocks on switchgear doors to prevent access to live parts.

C. Clearances: Conform to clearance requirements in the Electrical Code of Overseas Buildings Operations and National Electrical Safety Code (ANSI C.2).

2.2 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to Project Director/COR.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 14-mm-diameter slotted holes at a maximum of 50 mm o.c., in webs.

D. Slotted-Steel Channel Supports: Comply with Metal Framing Manufacturers Association MFMA-4 and Division 05 Section "Metal Fabrications" for slotted channel framing.

1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

E. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 14-mm- diameter holes at a maximum of 200 mm o.c., in at least one surface.

1. Fittings and Accessories: Products of the same manufacturer as channels and angles.
2. Rated strength: Selected to suit specified load criteria

F. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

G. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

H. Expansion Anchors: Carbon-steel wedge or sleeve type.

I. Toggle Bolts: All-steel springhead type.

J. Powder-Driven Threaded Studs: Heat-treated steel.

2.3 ELECTRICAL IDENTIFICATION

A. Refer to Division 26 Section “Identification for Electrical Systems.”

2.4 EQUIPMENT FOR ELECTRICITY METERING FOR GOVERNMENT USE

A. [Meter: Electronic kilowatt-hour measuring to record electricity used.]

B. [Meter: Electronic kilowatt-hour/demand measuring to record electricity used and highest peak demand over a time period according to electric utility. Meter is designed for use on the type and rating of circuit indicated for its application.]

1. Kilowatt-Hour Display: Digital liquid crystal.
2. Kilowatt-Demand Display: Digital, liquid-crystal type to register highest peak demand.
3. Enclosure: NEMA 250, Type 1, minimum, with hasp for padlocking or sealing.
4. Memory Backup: Self-contained to maintain memory throughout power outages of 72 hours, minimum.
5. Sensors: Current-sensing type, with current or voltage output, selected for optimum range and accuracy for the ratings of the circuits indicated for this application.
6. Type: Solid core.
7. Accuracy: Nationally recognized testing laboratory certified to meet ANSI C12.16 specifications.
8. Demand Signal Communication Interface: Match signal to building automation system input that conveys data on instantaneous/integrated demand level measured by meter used for load switching to control demand.

C. **Current-Transformer Cabinets: Listed or recommended by metering equipment manufacturer for use with sensors indicated.]**

2.5 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 1.3- or 3.5-mm (0.05- or 0.14-inch) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.6 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Sealing Elements: **[EPDM] [NBR]** interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Stainless steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 LOCK-OUT/TAG-OUT (LOTO) DEVICES

A. Provide lockout tag-out devices to securely de-energize equipment in the Sections identified below. A set of LOTO devices shall be selected by the Contractor to positively lock-out all of the models of equipment in these Sections. Provide five of each model of LOTO device for each model of LOTO device in the set.

1. Division 26 Section “Engine Generators.”
2. Division 26 Section “Variable Frequency Motor Controllers.”
3. Division 26 Section “Power Factor Correction Equipment.”
4. Division 26 Section “Resistive Load Bank.”
5. **[Division 26 Section “Low-Voltage Automatic Voltage Regulators.”]**
6. **[Division 26 Section “Medium-Voltage Automatic Voltage Regulators.”]**
7. Division 26 Section “Medium Voltage Switchgear.”
8. Division 26 Section “Secondary Unit Substations.”
9. Division 26 Section “Enclosed Switches and Circuit Breakers.”
10. Division 26 Section “Transfer Switches.”
11. Division 26 Section “Fused Power Circuit Devices.”

12. Division 26 Section “Enclosed Controllers.”
13. Division 26 Section “Low-Voltage Switchgear.”
14. Division 26 Section “Double-ended Low-Voltage Switchgear.”
15. Division 26 Section “Paralleling Low-Voltage Switchgear.”
16. Division 26 Section “Switchboards.”
17. Division 26 Section “Panelboards.”
18. Division 26 Section “Motor-Control Centers.”
19. Division 26 Section “Enclosed Bus Assemblies.”
20. Division 26 Section “Medium-Voltage Transformers.”

2.8 SAFETY ACCESSORIES

A. Supply safety accessories identified below to assist in safely de-energizing AVR and transformer. Provide prior to system and testing and commissioning.

1. Two live–line tools conforming to ASTM F711; one 1200 mm (4 foot) and one 1800 mm (6 foot) in length.
2. Non-contact voltage proximity detector. Detector shall have both audio and visual alerts and warning indicators. Detector shall be instrument rated for AVR and transformer voltages. Detector shall be compatible with live-line tool.
3. Two pair voltage-rated (VR) gloves and leather protectors conforming to ASTM D120 Class 2 (voltage rating of 17,000 AC and 25,500 DC); one pair glove size 8.5, and one pair glove size 9.5. Provide canvas bags for glove storage.
4. Two sets VR rubber sleeves similar voltage rating as VR gloves, with canvas storage bags.
5. Two arc flash protection suits, conforming to ASTM F1506, and rated for NFPA 70E hazard class 4 (40 cal); one sized large and one sized medium.
6. Two sets safety grounds capacity rated for application conforming to ASTM F855. Ground cluster connectors shall acceptably secure clamp onto phase conductor and ground conductor.
7. Retrieval stick conforming to ASTM F711; 1800 mm (6 foot) in length.

2.9 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Division 03 Section "Cast-in-Place Concrete."

B. Concrete: As required for footings/foundations in Division 03 Section "Cast-in-Place Concrete."

2.10 TOUCH-UP PAINT

A. Equipment Not Exposed to Harsh Environment: Equipment manufacturer's paint.

B. Equipment Enclosures Not Exposed to Harsh Environment: Manufacturer’s standard finish for indoor installations in non-harsh environments.

C. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

D. Paints for Applications Exposed to Harsh Environments: For all outdoor applications and for indoor applications in harsh environment refer to Division 09 Section "High Performance Coatings." Metallic materials shall be protected against corrosion.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to raceways and piping systems installed at a required slope.

F. Electrical equipment shall be designed and rated to operate in project-specific unusual environmental conditions such as wind-blown sand, salt atmosphere, flooding, ultraviolet rays due to altitude, high winds such as hurricanes and tornadoes, etc. Where standard ratings are not available to match environmental conditions, equipment shall be derated as required to compensate for factors such as high altitude and ambient temperature. Equipment installed in conditioned spaces shall be designed and rated for the conditioned ambient.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 90-kg design load.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 6-mm diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 40-mm and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 600 mm from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
2. Existing Concrete: Expansion bolts.

3. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
4. Steel: Welded threaded studs or spring-tension clamps on steel.
5. Field Welding: Comply with AWS D1.1.
6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
7. Light Steel: Sheet-metal screws.
8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 NOT USED

3.5 NOT USED

3.6 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 100 mm (4 inches) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated.

3.7 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for electrical components.
2. Electricity-metering components.
3. Concrete bases.
4. Touchup painting.
5. Sleeves and Seals

B. Test the Government's electricity-metering installation for proper operation, accuracy, and usability of output data.

1. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
2. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.
3. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.
4. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.
5. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

3.8 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 09 painting sections.

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.9 DEMONSTRATION

A. Demonstrate, to Project Director/COR and appropriate post electrical staff, the operation of each Lock-out/tag-out (LOTO) model and safety accessories. Identify which LOTO model is used for each applicable electrical equipment, referencing LOTO Schedule. Coordinate with training in Division 26 Section “Overcurrent Protective Device Coordination Study.” Refer to Division 01 Section “Demonstration and Training.”

END OF SECTION 260505