Technical Exhibit Electrical Distribution FM-V

The Contractor shall inspect all low voltage transformers while energized and complete the following tasks annually:

- Operating temperature. 150 degrees centigrade is maximum operating temperature for transformers rated 80 degrees C rise. 220 degrees centigrade is maximum operating temperature for transformers rated 150 degrees centigrade rise.
- Cleanliness of ventilation louvers in enclosures and excessive accumulation of dust on top of non-ventilated enclosures. Vacuum louvers without de-energizing transformer if dust and lint are on outside.
- Area ventilation and temperature. If ambient temperature exceeds maximum allowed, transformer shall be de-rated accordingly. Advise KO/COR if de-rating is required.
- Loading. Make certain load is within rating of transformer. Redistribute load, if possible. Measure secondary current under load on lines and neutral to check capacity of conductors. Advise KO/COR if redistribution is required.

The Contractor shall inspect and maintain low voltage transformers while de-energized and complete the following tasks annually in Option Year 2:

- Clean insulators, core and windings. Use bottle of dry air or nitrogen with pressure regulator, hose and small nozzle to blow off dust. Restrict pressure to 30 psi max. Clean with soft bristle brush as required.
- Inspect following components Wedges and clamping rings for proper clamping of windings. Tighten as required.
- Primary and secondary buses and conductors for tightness of connections and evidence of excessive heat.
- Porcelain insulators for chips, cracks and water streaks.
- Insulating material for breaks and damage due to excessive heat.
- Windings for damage to insulation, including overheating.
- Tap connections for tightness and correctness to provide proper voltage.
- Core assembly for loose and/or dislocated lamination, localized or general overheating and for integrity of ground strap.
- Ventilating channels between core and windings and between windings. For clogging with lint, dust or tape to hold spacers, etc., in place during assembly. Clean as required to allow proper air flow.

The inspection shall include the following tasks:

- Inspect each capacitor case for leaks, bulges, or discoloration.
- Clean capacitor cases, the insulating bushings, and all connections that are dirty or corroded.
- Remove any obstructions at ventilation openings in capacitor housing to ensure

that adequate ventilation is provided and maintained.

The Contractor shall inspect and maintain indoor low voltage switchgear/switchboards and conduct the following tasks annually:

- Inspect components:
  - Fronts of circuit breakers. Control wiring not internals.
  - Protective and control relays. Proper indicating lamps should light. Repair/replace lamps as required.
  - Auxiliary devices, wiring and terminal blocks.
  - Insulators and insulating materials.
  - Cable connection
- Inspect the following conditions:
  - Loading. Make certain loads are within ampacity rating of breakers and their overcurrent trip coils.
  - Cleanliness. Moderate amount of dry non-conductive dust not harmful.
  - Dryness. Evidence of condensation or water leaks. Correct leaks and condensation.
  - Rodents and reptiles. Block openings as necessary.
  - Overheating of parts. Discoloration and/or oxidation indicate possible problem. Conduct infrared survey. Components should be loaded under normal load while being scanned. Make necessary repairs.

The Contractor shall inspect and maintain indoor low voltage switchgear/switchboards while de-energized and conduct the following tasks once annually in the Base Year and Option Year 3:

- Completely clean, inspect, tighten, and adjust all components.
- Structure and enclosure. Wire brush and prime paint rust spots. Finish paint.
- Ventilating louvers. Clean as required.
- Buses, splices and bolts. Check bolts for manufacturer's recommended torque. Tighten as required.
- Insulators and insulting materials. Clean and inspect for cracks.
- Breaker disconnect studs. Inspect for pitting and evidence of overheating. Lubricate, unless manufacturer's instructions specify that they should not be lubricated.
- Breaker disconnect finger clusters. Inspect for proper adjustment and overheating.
- Inspect retainer rings for stress cracks in corners. Lubricate, unless manufacturer's instructions specify that they should not be lubricated.
- Cable connections. Inspect for evidence of overheating. Use Belleville washers on aluminum lugs.
- Drawout breaker racking mechanisms. Check for alignment and ease of operation. Re-adjust or repair as necessary.
- Controls, interlocks and closing power rectifiers. Make functional tests.

Repair/replace as necessary.
- Fuse clips and fuses. Check clips for adequate spring pressure and proper fuse rating. Repair/replace as necessary.
- Grounding. Check all listed components and conditions in the above list. Make necessary repairs.

The Contractor shall test indoor low voltage switchgear/switchboards while de-energized and conduct the following tasks once annually in Option Year 2:
- Functionally trip breakers with protective relays. Inject test current into current transformers (CT) and relay circuits.
- Calibrate and test overcurrent trip devices. Use high current test equipment on breakers lacking CT trip circuits and adjust trips to operate IAW manufacturer's and specially prepared time current coordination curves. Adjust for proper conformance.

The Contractor shall inspect and maintain outdoor low voltage switchgear/switchboards while de-energized and conduct the following tasks once annually in the Base Year and Option Year 3:
- All tasks required for indoor equipment above.
- Space heaters. Operate during cool weather.
- Special emphasis on condensation and water. Rust spots on underside of roof indicative of condensation.
- Air filters behind ventilating louvers. Clean or replace as required.

The Contractor shall inspect, maintain and repair or replace, as necessary, low voltage drawout type circuit breakers while withdrawn and de-energized and conduct the following tasks annually:

- Main contacts for pitting, spring pressure, overheating, alignment, overtravel or wipe. Adjust or replace accordingly.
- Arcing contacts. For alignment, overtravel or wipe and for arc erosion. Adjust or replace accordingly.
- Moving parts and linkages for freedom of movement.
- Closing mechanism. For quick and positive closing action.
- Tripping mechanism for freedom of movement and reliability to open breaker contacts.
- Interlocks and safety devices. Functionally test to prove proper operation.
- Primary disconnect finger clusters for proper adjustment and spring pressure. Lubricate, unless manufacturer's instructions specify that they not be lubricated.
- Secondary disconnect contacts for alignment and spring pressure. Lubricate.
- Closing and trip coils for general condition and evidence of overheating.
- Spring charging motor and mechanism proper operation and oil leaks for gear (stored energy type) motor.

- Shunt trip device. For freedom of movement. Functionally test.
- Undervoltage trip device. For freedom of movement. Functionally test.
- Ant single phase or blown fuse lockout devices (fused breakers only) for general condition.
- Auxiliary contacts for proper operation with closing and opening of breaker.
- Closing (x and y) relays (electrically operated breakers) for contact erosion. Dress or replace as required.
- Current transformers for general condition.
- Connection bolts for tightness.
- Structure or frame for proper alignment and loose or broken parts.
- Fuses and mountings. General condition and tightness.
- Frame grounding device for operation. Connect before and disconnect after primary fingers.
- Position indicators for proper operation.
- Auxiliary wiring for general condition and tightness of terminal screws.
- Arc chutes. For broken parts, missing arc splitters and amount of metal spatter an burning on interior surfaces. Snuffer screens must be clean.
- Operation counter (if so equipped) for proper operation. Record number of operations.
- Insulators and insulating materials for cracks, breaks and overheating.

The Contractor shall test low voltage drawout type circuit breakers while withdrawn and de-energized and conduct the following tasks once annually in Option Year 2:

- Overcurrent trip devices (electromechnical, series types). Pass specified currents from high current test set through coils of series type O.C. trip devices. Trip devices should open breaker contacts.
- Overcurrent trip devices (electromechanical, 5 amp CT type). Test 5 amp, type O.C. trip devices in similar manner using reduce current proportional to ratio of CT's in switchgear that normally supply current to the O.C. trip coils.
- Overcurrent trip devices (solid state type). Use manufacturer's instructions and test set specifically designed for solid sat trip device being tested, or use primary injection from high current test set.

The Contractor shall test the system with low voltage drawout type circuit breakers installed and conduct the following task annually:

- Electrically operated breaker. After above maintenance and testing has been satisfactorily completed, install electrically operated breaker in proper switchgear cell and rack it into "TEST" position. Operate closing control devices to assure that breaker closed and latches without trip free operations. Operate trip control devices to assure that breaker trips open in a reliable manner. Functionally test all electrical interlock and safety devices. After satisfactorily passing all operational tests, the breaker may be racked into the "CONNECTED" position and placed in normal service.

The Contractor shall inspect, maintain and repair, as necessary, medium voltage buses conduct the following tasks annually:

- Condition of enclosure
- Evidence of water drips on enclosure
- Adequate grounding

The Contractor shall inspect, maintain and repair, as necessary, medium voltage buses while de-energized and conduct the following tasks once annually in the Base Year and Option Year 3:

- Clean and check conditions of sleeving over buses.
- Check for evidence of internal moisture.
- Check condition of enclosure.
- Check grounding connections.

The Contractor shall inspect, maintain and repair, as necessary, low voltage buses and bus ducts while de-energized with joint covers removed and conduct the following tasks once annually in the Base Year and Option Year 3:

- Check for evidence of overheated joints. Discoloration and/or oxidation indicate possible need for repair or replacement.
- Check switches attached to plug in type bus duct. For condition of contacts, operating mechanism, fuse clips, fuses and load cables. Make necessary adjustments.
- Check condition of enclosure. Close all unused holes.
- Check for proper ventilation. All ventilation louvers should be open.
- Check for evidence of internal moisture from water leaks or condensation. Repair leaks.
- Clean and inspect insulators. Check for cracks, chips and breaks.

The Contractor shall inspect, maintain, repair or replace, as necessary, low voltage fused switch panelboards while de-energized and conduct the following tasks annually:

- Switches for overheating. Check each switch to detect overheating. Arrangements shall be made to shut down any overheated switch to determine cause and repair by DMO.
- Portion of enclosure over supply cable. Feel enclosure. If overheated, remove terminals for overheating cover and inspect supply cables and terminals for evidence of overheating. Discoloration and/or oxidation indicate possible problem.
- Loading. Constant load in switch should not exceed 80 percent (80%) of switch nameplate rating, unless switch is rated for 100 percent (100%) continuous operation. Redistribute loads if possible.
- Enclosure for general condition. Arrange to have unused conduit knock out holes plugged with knock out closures.

- Ground connections for integrity. Correct as required.
- Directory. For accuracy of loads served. Correct as required.
- Evidence of water dripping on striking. Stop water leaks.
- Clean interior of enclosure and switches.
- Inspect fuses for overheating. Replace fuses. Tighten loose connections.
- Inspect fuse clips for overheating and weakness.
- Inspect fuses for proper ampere rating for cable size, and for interrupting adequacy for fault current capability of supply system. Fuse ampere rating should not exceed NEC of cables. Fuse interrupting rating should exceed fault current available from system. Replace with proper fuse.
- Check connection bolts for tightness. Do not overtighten and strip threads. AL/CU set screw type connectors tend to loosen. Set screws in many old style AL/CU connectors are unplated aluminum on which threads tend to gall and cause set screws to bind before they tighten sufficiently against cables. Replace this connector, if necessary.
- Open and close switches. Inspect contact surfaces and operating mechanism. Repair or replace burned contacts. Make certain switch contacts close fully.
- Inspect all insulating materials for cracks, breaks, cleanliness and thermal damage.
- Inspect arc chutes for broken parts and missing arc chute. Repair or replace as required. Check door/switch mechanical interlocks to ensure that switch door cannot be opened when switch handles is in "ON" position unless interlock defeat mechanism is operated. Additionally ensure that switch handle cannot be thrown to "ON" position while switch door is open unless interlock defeat mechanism is operated.
- Check padlock devices to ensure that switch handle cannot be thrown to "ON" position with padlock in lockout device.
- Check door latches to ensure that doors do not open when operating handle is in "ON" position.
- Check directory for accuracy. Write correct entries on directory. Check enclosure and wire brush and prime paint rust spots. Finish paint as required.

The Contractor shall inspect, maintain, repair or replace, as necessary, molded case, circuit breaker type panelboards while de-energized and conduct the following tasks annually:

- All tasks required above for low voltage fused switch panelboards shall be done to fused switch panelboards with the following exceptions:
  - Circuit breakers usually cannot be opened for inspection and maintenance.
  - Breakers usually operate at a higher temperature
  - Breakers usually contain no fuses.
  - Breakers are often not equipped with external door or operating handle other than handle integral with breaker.

The Contractor shall inspect and maintain power conditioner units and conduct the following tasks annually:

- Confirm that the exterior of unit is undamaged including cables and receptacles, if furnished.
- Confirm that service and ventilation clearances are adequate.
- Inspect all wire and conductor insulation for damage.
- Check all transformer terminal connections and mounting bolts for tightness.
- Check all breaker connections for tightness. Retorque to manufacturer's specifications if necessary.
- Check all terminal block connections for tightness. Retorque to manufacturer's specifications if necessary.
- Check that the cooling fan blades move freely, and that the intake and exhaust air screens are clean and free of obstructions.
- Measure the neutral current to determine if harmonics is causing neutral current to reach ampacity of neutral conductor.
- Perform Infrared scan of electrical connections.

The Contractor shall inspect and maintain emergency power supply units and conduct the following tasks annually:

- Emergency units should be disconnected from normal power and allowed to operate for 90 minutes.
- Check all electrical connections for tightness and signs of corrosion. Take corrective action as needed.
- Test batteries for the proper voltage level.

The Contractor shall inspect and maintain motor control centers while de-energized and conduct the following tasks annually:

- Visually inspect panel for evidence of abnormal conditions, broken parts, or broken conductors.
- Inspect, maintain, and clean motor starters and combination circuit breaker/starter with vacuum, low pressure (not over 25 PSIG) compressed air, and clean dry cloth. Inspect for loose, missing, broken, or corroded hardware and pivotal points, springs, and other mechanical parts. Clean and adjust movable and stationary contacts as required. Tighten connectors and terminals. Replace badly pitted or burnt contacts. Operate circuit breaker 4 to 6 times to ensure free movement. Operate push to test pushbuttons. Always replace contacts with matched sets.
- Operate controls to ensure that all controls are working properly and all high or low limit devices and alarms are working.
- Clean exterior of panels at completion of work.
- Replace defective operating coils.

The Contractor shall inspect and maintain motor control centers while de-energized and conduct the following tasks annually:

- Visually inspect panel for evidence of abnormal conditions, broken parts, or broken conductors.
- Inspect, maintain, and clean motor starters and combination circuit breaker/starter with vacuum, low pressure (not over 25 PSIG) compressed air, and clean dry cloth. Inspect for loose, missing, broken, or corroded hardware and pivotal points, springs, and other mechanical parts. Clean and adjust movable and stationary contacts as required. Tighten connectors and terminals. Replace badly pitted or burnt contacts. Operate circuit breaker 4 to 6 times to ensure free movement. Operate push to test pushbuttons. Always replace contacts with matched sets.
- Operate controls to ensure that all controls are working properly and all high or low limit devices and alarms are working.
- Clean exterior of panels at completion of work.
- Replace defective operating coils.