260700 TESTING, INSPECTION, AND CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. TEST WIRING AND CONNECTIONS FOR CONTINUITY AND GROUNDS BEFORE CONNECTING; DEMONSTRATE INSULATION RESISTANCE BY MEGGER TEST AS REQUIRED. INSULATION RESISTANCE BETWEEN CONDUCTORS AND GROUNDS FOR SECONDARY DISTRIBUTIONS SYSTEMS SHALL MEET NEC REQUIREMENTS.

B. VERIFY AND CORRECT AS NECESSARY: VOLTAGES, TRIP SETTINGS AND PHASING ON EQUIPMENT FROM SECONDARY DISTRIBUTION SYSTEM TO POINTS OF USE. TEST SECONDARY VOLTAGES AT PANELBOARDS, AND AT OTHER LOCATIONS ON DISTRIBUTION SYSTEMS AS NECESSARY. TEST SECONDARY VOLTAGES UNDER NO-LOAD AND FULL-LOAD CONDITIONS.

C. PROVIDE NECESSARY TESTING EQUIPMENT AND TESTING.

D. FAILURE OR DEFECTS IN WORKMANSHIP OR MATERIALS REVEALED BY TESTS OR INSPECTION SHALL BE CORRECTED PROMPTLY AND RETESTED. REPLACE DEFECTIVE MATERIAL.

E. CLEAN PANELS. PANELBOARD INTERIORS SHALL BE CLEANED AND VACUUMED.

F. BEFORE ENERGIZING ANY MOTOR, IT SHALL BE VISUALLY INSPECTED FOR SERVICEABILITY. VERIFY THAT PROPER ALIGNMENT HAS BEEN PERFORMED. CHECK NAMEPLATE FOR ELECTRICAL POWER REQUIREMENTS.

G. CHECK BOLT TORQUES FOR FEEDER TERMINATIONS AND OTHER ASSOCIATED EQUIPMENT IN THIS SECTION BY CALIBRATED TORQUE WRENCH METHOD.

H. TEST RUN ALL MOTORS PREFERABLY UNCOUPLED OR UNLOADED, BEFORE PLACING INTO REGULAR SERVICE. A CHECK ON THE MOTOR FOR ROTATION, SPEED, CURRENT AND TEMPERATURE RISE SHALL BE MADE AND RESULTS RECORDED.

PART 3 - INSTALLATION

1. FEEDER TESTING
   a. PERFORM TESTS AND INSPECTIONS AND PREPARE TEST REPORTS.
   b. TESTS AND INSPECTIONS:
      1) AFTER INSTALLING CONDUCTORS AND CABLES AND BEFORE ELECTRICAL CIRCUITRY HAS BEEN ENERGIZED, TEST ALL FEEDER CONDUCTORS, FOR COMPLIANCE WITH REQUIREMENTS.
      2) PERFORM EACH VISUAL AND MECHANICAL INSPECTION AND ELECTRICAL TEST STATED IN NETA ACCEPTANCE TESTING SPECIFICATION. CERTIFY COMPLIANCE WITH TEST PARAMETERS.
      3) PERFORM FIELD QUALITY CONTROL TEST REPORTS FOR EACH FEEDER AND RECORD RESULTS IN FORM BELOW.
      4) INFRARED SCANNING: AFTER SUBSTANTIAL COMPLETION, BUT NOT MORE THAN 60 DAYS AFTER FINAL ACCEPTANCE, PERFORM AN INFRARED SCAN OF EACH FEEDER IN UNIT SUBSTATIONS AND DISTRIBUTION PANEL. REMOVE EQUIPMENT COVERS SO CONDUCTORS AND BUSSING ARE ACCESSIBLE TO PORTABLE SCANNER.
   a. FOLLOW-UP INFRARED SCANNING: PERFORM AN ADDITIONAL FOLLOW-UP INFRARED SCAN OF EACH SPLICE 11 MONTHS AFTER DATE OF SUBSTANTIAL COMPLETION.
   b. INSTRUMENT: USE AN INFRARED SCANNING DEVICE DESIGNED TO MEASURE TEMPERATURE OR TO DETECT SIGNIFICANT DEVIATIONS FROM NORMAL VALUES. PROVIDE CALIBRATION RECORD FOR DEVICE.
   c. RECORD OF INFRARED SCANNING: PREPARE A CERTIFIED REPORT THAT IDENTIFIES SPLICES CHECKED AND THAT DESCRIBES SCANNING RESULTS. INCLUDE NOTATION OF DEFICIENCIES DETECTED, REMEDIAL ACTION TAKEN, AND OBSERVATIONS AFTER REMEDIAL ACTION.
   c. TEST REPORTS: PREPARE A WRITTEN REPORT TO RECORD THE FOLLOWING:
      1) TEST PROCEDURES USED.
      2) TEST RESULTS THAT COMPLY WITH REQUIREMENTS.
      3) TEST RESULTS THAT DO NOT COMPLY WITH REQUIREMENTS AND CORRECTIVE ACTION TAKEN TO ACHIEVE COMPLIANCE WITH REQUIREMENTS.
   d. REMOVE AND REPLACE MALFUNCTIONING UNITS AND RETEST AS SPECIFIED ABOVE.

2 PANELBOARDS
   a. PERFORM TESTS AND INSPECTIONS.
   b. ACCEPTANCE TESTING PREPARATION:
      1) TEST INSULATION RESISTANCE FOR EACH PANELBOARD BUS, COMPONENT, CONNECTING SUPPLY, FEEDER, AND CONTROL CIRCUIT.
      2) TEST CONTINUITY OF EACH CIRCUIT.
   c. TESTS AND INSPECTIONS:
      1) PERFORM EACH VISUAL AND MECHANICAL INSPECTION AND ELECTRICAL TEST STATED IN NETA ACCEPTANCE TESTING SPECIFICATION. CERTIFY COMPLIANCE WITH TEST PARAMETERS.
      2) CORRECT MALFUNCTIONING UNITS ON-SITE, WHERE POSSIBLE, AND RETEST TO DEMONSTRATE COMPLIANCE; OTHERWISE, REPLACE WITH NEW UNITS AND RETEST.
      3) PERFORM THE FOLLOWING INFRARED SCAN TESTS AND INSPECTIONS AND PREPARE REPORTS:
   a. INITIAL INFRARED SCANNING: AFTER SUBSTANTIAL COMPLETION, BUT NOT MORE THAN 60 DAYS AFTER FINAL ACCEPTANCE, PERFORM AN INFRARED SCAN OF EACH PANELBOARD. REMOVE FRONT PANELS SO JOINTS AND CONNECTIONS ARE ACCESSIBLE TO PORTABLE SCANNER.
   b. FOLLOW-UP INFRARED SCANNING: PERFORM AN ADDITIONAL FOLLOW-UP INFRARED SCAN OF EACH PANELBOARD 11 MONTHS AFTER DATE OF SUBSTANTIAL COMPLETION.
   c. INSTRUMENTS AND EQUIPMENT:
      (1) USE AN INFRARED SCANNING DEVICE DESIGNED TO MEASURE TEMPERATURE OR TO DETECT SIGNIFICANT DEVIATIONS FROM NORMAL VALUES. PROVIDE CALIBRATION RECORD FOR DEVICE.
   d. PANELBOARDS WILL BE CONSIDERED DEFECTIVE IF THEY DO NOT PASS TESTS AND INSPECTIONS.
   e. PREPAIRE TEST AND INSPECTION REPORTS, INCLUDING A CERTIFIED REPORT THAT IDENTIFIES PANELBOARDS INCLUDED AND THAT DESCRIBES SCANNING RESULTS. INCLUDE NOTATION OF DEFICIENCIES DETECTED, REMEDIAL ACTION TAKEN, AND OBSERVATIONS AFTER REMEDIAL ACTION.

260943 LIGHTING CONTROL SYSTEM FUNCTIONAL TESTING

1. LIGHTING SYSTEM FUNCTIONAL TESTING. CONTROLS FOR AUTOMATIC LIGHTING SYSTEMS SHALL COMPLY WITH THIS SECTION.

2. FUNCTIONAL TESTING. PRIOR TO ISSUING THE FINAL ELECTRICAL AFFIDAVITS, THE REGISTERED DESIGN PROFESSIONAL SHALL BE PROVIDED WITH FORMAL EVIDENCE THAT THE LIGHTING CONTROL SYSTEMS HAVE BEEN TESTED TO ENSURE THAT CONTROL HARDWARE AND SOFTWARE ARE CALIBRATED, ADJUSTED, PROGRAMMED AND IN PROPER WORKING CONDITION IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS AND MANUFACTURER'S INSTRUCTIONS. FUNCTIONAL TESTING SHALL BE IN ACCORDANCE WITH SECTIONS 3, 4 AND 5 FOR THE APPLICABLE CONTROL TYPE.

3. OCCUPANT SENSOR CONTROLS. WHERE OCCUPANT SENSOR CONTROLS ARE PROVIDED, THE FOLLOWING PROCEDURES SHALL BE PERFORMED:
   A. CERTIFY THAT THE OCCUPANT SENSOR HAS BEEN LOCATED AND AIMED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS.
   B. FOR PROJECTS WITH SEVEN OR FEWER OCCUPANT SENSORS, EACH SENSOR SHALL BE TESTED.
   C. FOR PROJECTS WITH MORE THAN SEVEN OCCUPANT SENSORS TESTING SHALL BE DONE FOR EACH UNIQUE COMBINATION OF SENSOR TYPE AND SPACE GEOMETRY. WHERE MULTIPLES OF EACH UNIQUE COMBINATION OF SENSOR TYPE AND SPACE GEOMETRY ARE PROVIDED, NOT LESS THAN 10 PERCENT, BUT IN NO CASE LESS THAN ONE, OF EACH COMBINATION SHALL BE TESTED UNLESS THE CODE OFFICIAL REQUIRES A HIGHER PERCENTAGE TO BE TESTED. WHERE 30 PERCENT OR MORE OF THE TESTED CONTROLS FAIL, ALL REMAINING IDENTICAL COMBINATIONS SHALL BE TESTED.

   FOR OCCUPANT SENSOR CONTROLS TO BE TESTED, VERIFY THE FOLLOWING:
      C.1. WHERE OCCUPANT SENSOR CONTROLS INCLUDE STATUS INDICATORS, VERIFY CORRECT OPERATION.
      C.2. THE CONTROLLED LIGHTS TURN OFF OR DOWN TO THE PERMITTED LEVEL WITHIN THE REQUIRED TIME.
      C.3. FOR AUTO-ON OCCUPANT SENSOR CONTROLS , THE LIGHTS TURN ON TO THE PERMITTED LEVEL WHEN AN OCCUPANT ENTERS THE SPACE.
      C.4. FOR MANUAL-ON OCCUPANT SENSOR CONTROLS , THE LIGHTS TURN ON ONLY WHEN MANUALLY ACTIVATED.
      C.5. THE LIGHTS ARE NOT INCORRECTLY TURNED ON BY MOVEMENT IN ADJACENT AREAS OR BY HVAC OPERATION.

4. TIME-SWITCH CONTROLS. WHERE TIME-SWITCH CONTROLS ARE PROVIDED, THE FOLLOWING PROCEDURES SHALL BE PERFORMED:
   A. CONFIRM THAT THE TIME-SWITCH CONTROL IS PROGRAMMED WITH ACCURATE WEEKDAY, WEEKEND AND HOLIDAY SCHEDULES.
   B. PROVIDE DOCUMENTATION TO THE OWNER OF TIME- SWITCH CONTROLS PROGRAMMING INCLUDING WEEKDAY, WEEKEND, HOLIDAY SCHEDULES, AND SET-UP AND PREFERENCE PROGRAM SETTINGS.
   C. VERIFY THE CORRECT TIME AND DATE IN THE TIME SWITCH.
   D. VERIFY THAT ANY BATTERY BACK-UP IS INSTALLED AND ENERGIZED.
   E. VERIFY THAT THE OVERRIDE TIME LIMIT IS SET TO NOT MORE THAN 2 HOURS.
   F. SIMULATE OCCUPIED CONDITION. VERIFY AND DOCUMENT THE FOLLOWING:
      F.1. ALL LIGHTS CAN BE TURNED ON AND OFF BY THEIR RESPECTIVE AREA CONTROL SWITCH.
      F.2. THE SWITCH ONLY OPERATES LIGHTING IN THE ENCLOSED SPACE IN WHICH THE SWITCH IS LOCATED.
   G. SIMULATE UNOCCUPIED CONDITION. VERIFY AND DOCUMENT THE FOLLOWING:
      G.1. NONEXEMPT LIGHTING TURNS OFF.
      G.2. MANUAL OVERRIDE SWITCH ALLOWS ONLY THE LIGHTS IN THE ENCLOSED SPACE WHERE THE OVER- RIDE SWITCH IS LOCATED TO TURN ON OR REMAIN ON UNTIL THE NEXT SCHEDULED SHUTOFF OCCURS.

5. DAYLIGHT RESPONSIVE CONTROLS. WHERE DAY- LIGHT RESPONSIVE CONTROLS ARE PROVIDED, THE FOLLOWING SHALL BE VERIFIED:
   A. CONTROL DEVICES HAVE BEEN PROPERLY LOCATED, FIELD CALIBRATED AND SET FOR ACCURATE SETPOINTS AND THRESHOLD LIGHT LEVELS.
   B. DAYLIGHT CONTROLLED LIGHTING LOADS ADJUST TO LIGHT LEVEL SET POINTS IN RESPONSE TO AVAILABLE DAYLIGHT.
   C. THE LOCATIONS OF CALIBRATION ADJUSTMENT EQUIPMENT ARE READILY ACCESSIBLE ONLY TO AUTHORIZED PERSONNEL.

6. THE ELECTRICAL CONTRACTOR IS TO PROVIDE FORMAL DOCUMENTATION THAT THE ABOVE REQUIRED TESTING HAS OCCURRED. THE ELECTRICAL CONTRACTOR IS TO SUBMIT A LIST OF ALL THE SPACES AND AREAS WITHIN THE SCOPE OF THIS PROJECT WITH LIGHTING CONTROLS. THE LIST IS TO BE ON THE CONTRACTORS LETTER HEAD AND SIGNED BY THE ELECTRICAL CONTRACTORS REPRESENTATIVE WHO'S LICENCES WAS USED TO OBTAIN THE PERMIT. THE LIST WILL INDICATE EACH AND EVERY ROOM DEFINED BY NAME AND NUMBER AND THE RESULTS OF THE REQUIRED TESTING. LIGHTING CONTROL SYSTEMS SHALL BE COMMISSIONED BY THE AUTHORIZED MANUFACTURERS FACTORY TECHNICIAN. FORMAL DOCUMENTATION IS TO BE INCLUDED IN THIS DOCUMENT BY THE MANUFACTURERS REPRESENTATIVE THAT THE SYSTEM(S) IS FULLY TESTED AND IN PERFECT OPERATING CONDITION. DOCUMENTATION IS TO BE ON THE MANUFACTURERS LETTER HEAD AND SIGNED.

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REVISIONS

ELECTRICAL SPECIFICATIONS SHEET 2

E-3

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DRAWING PRINTED FULL SIZE (100%) - 24"x36" DRAWING PRINTED HALF SIZE (50%) WALL FIT ON A SHEET 18"x24" WITH 1.5" OF EXTRA SPACE ON ALL FOUR SIDES. DRAWING PRINTED NEAR 1 THIRD SIZE (37.5%) – 11.25"x15.5" WILL FIT TIGHTLY ON 11"x17". INDIVIDUAL "12", "14", "16" AND "120" VIEW SCALES WILL TRANSLATE BY WALL TO% TRUE THE NUMERATOR 1 TO 1. EXAMPLE 1/8"=1'-0" AT 37.5% WILL BE 3/64"=1'-0" FOR SCALES 24"x36", 18"x24" THE TRANSLATION IS CLOSE ENOUGH TO USE THE DENOMINATOR EQUIVALENT AND CHANGE THE NUMERATOR TO 1. EXAMPLE 3/4"=1'-0" AT 37.5% WILL BE NEARLY 1/32"=1'-0"