ELECTRICAL SPECIFICATIONS

SUPPLEMENTARY CONDITIONS FOR ELECTRICAL WORK

A. CODES AND REGULATIONS
   1. CONFORM TO ALL APPLICABLE CODES AND REGULATIONS INCLUDING NATIONAL ELECTRICAL CODE. OBTAIN PERMITS AND PAY FEES AND INSPECTION COSTS.
   2. CONFORM TO ALL RULES AND REGULATIONS OF OSHA AS APPLIED TO CONSTRUCTION PROJECT.
   3. OBTAIN, BECOME FAMILIAR WITH AND COMPLY WITH ALL LANDLORD SPECIFICATIONS.

B. SCOPE
   1. INCLUDE ALL LABOR, EQUIPMENT, TOOLS AND MATERIALS FOR ELECTRIC DISTRIBUTION, AS SHOWN ON DRAWINGS.
   2. EXTEND NEW POWER SERVICE TO THE BUILDING DISTRIBUTION AS SHOWN ON DRAWINGS.
   3. ALL ELECTRICAL WORK, INCLUDING POWER WIRING FROM PANEL IN BUILDING AND WIRING OF OTHER ITEMS INDICATED.
   4. FURNISH AND INSTALL NEW LIGHTING AS INDICATED ON DRAWINGS.
   5. ANY INSTALLATION COSTS ASSESSED BY UTILITY COMPANIES FOR INCOMING SERVICE INSTALLATION SHALL BE INCLUDED IN BID AND PAID FOR BY THE ELECTRICAL CONTRACTOR.

C. SHOP DRAWINGS SUBMITTALS
   1. THE CONTRACTOR SHALL SUBMIT FIVE SETS OF SHOP DRAWINGS. THE SHOP DRAWINGS OF THE FOLLOWING EQUIPMENT USING THE INDICATED NUMBERING SYSTEM AND TITLES, SHALL BE SUBMITTED THROUGH THE ARCHITECT TO THE ENGINEER AND THEN RESUBMITTED FOR FINAL APPROVAL IF NECESSARY. SHOP DRAWINGS SHALL BE SUBMITTED FOR THE FOLLOWING ITEMS:
      A. WIRING DEVICES
      B. PANELBOARDS, SWITCHBOARDS AND SAFETY SWITCHES
      C. CONTACTORS, TIME SWITCHES AND PHOTOCELL
      D. LIGHTING FIXTURES
   2. ALL SUBMITTED SHOP DRAWINGS (MANUFACTURERS' EQUIPMENT DESCRIPTIVE SHEETS OR VENDORS' PREPARED DRAWINGS) SHALL HAVE THE GENERAL CONTRACTOR'S OR SUBCONTRACTOR'S "STAMP OF APPROVAL" INDICATING THAT THE ITEM SUBMITTED IS AS CALLED FOR ON THE PLANS AND SPECIFICATIONS, IS APPROVED BY THE GENERAL CONTRACTOR OR SUBCONTRACTOR, THE DATE OF APPROVAL AND INITIALED BY THE PERSON APPROVING THE SUBMITTAL AND THE NAME OF THE COMPANY SUBMITTING SAID EQUIPMENT FOR APPROVAL.
   3. SUBMIT BOUND BROCHURES COMPLETE WITH A TABLE OF CONTENTS. LOOSE OR STAPLED TOGETHER SHEETS ARE NOT ACCEPTABLE. ANY SUBMITTALS NOT IN BROCHURE FORM OR NOT AS SPECIFIED SHALL BE RETURNED AT THE CONTRACTORS EXPENSE FOR RESUBMITTAL.
   4. ALL DESCRIPTIVE LITERATURE SHALL BE SUBMITTED IN A THREE HOLE BROCHURE WITH A COVER IDENTIFYING THE FOLLOWING:
      A. NAME OF THE JOB.
      B. LOCATION OF THE JOB, ADDRESS, CITY AND STATE.
      C. NAME AND ADDRESS OF THE COMPANY SUBMITTING THE BROCHURES.
      D. DATE OF THE SUBMITTAL.
   5. EVERY EFFORT SHALL BE MADE IN CHECKING THE SHOP DRAWINGS TO DETECT AND CORRECT ALL ERRORS, OMISSIONS AND INACCURACIES. FAILURE TO DO THIS WILL NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY FOR THE PROPER AND COMPLETE INSTALLATION IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

D. CONDUIT INSTALLATION
   1. ALL WIRING TO BE INSTALLED IN CONDUIT IN ACCORDANCE WITH THE N.E.C. SO THE REQUIRED CONDUCTORS MAY BE PULLED WITHOUT INJURY OR STRAIN. CONDUIT SHALL BE PROPERLY SUPPORTED.
   2. ALL CONDUITS TO BE CONCEALED IN BUILDING NEW CONSTRUCTION WHERE AVAILABLE.
   3. EXPOSED CONDUIT MAY BE RUN ON EXISTING MASONRY WALLS IN WORKROOMS. VERIFY ALL LOCATIONS WITH OWNER PRIOR TO ROUGH-IN.
   4. INTERIOR WIRING TO BE INSTALLED IN ELECTRICAL METALLIC TUBING (EMT) WITH SET SCREW TYPE COUPLINGS AND CONNECTORS. EMT IS NOT APPROVED FOR INSTALLATION IN CONCRETE SLABS OR UNDERGROUND.
   5. CONDUIT ON BUILDING EXTERIOR SHALL BE RIGID ALUMINUM OR GALVANIZED STEEL WITH WEATHER-TIGHT FITTINGS AND DEVICES.
   6. BURIED CONDUIT SHALL BE RIGID SCHEDULE 40 PVC WITH SOLVENT WELD FITTINGS. INSTALL CODE SIZED GROUND CONDUCTOR IN ALL PVC CONDUIT. PENETRATIONS OF FLOOR SLABS SHALL BE MADE WITH RIGID GALVANIZED STEEL. IN EQUIPMENT ROOMS OR WET LOCATIONS, THREE INCH HIGH CONCRETE CURBS SHALL ENCASE CONDUITS TO SURFACE PANELS OR DEVICES AT THE FLOOR LINE.
   7. NO CONDUIT TO BE RUN EXPOSED ON EXTERIOR OF BUILDING WALLS OR ON THE FLOORS WITHOUT THE WRITTEN CONSENT OF THE ARCHITECT.
   8. PROVIDE ALL PULL BOXES AND FITTINGS WHEREVER NECESSARY OR SHOWN. ALL STRAIGHT CONDUIT RUNS SHALL NOT EXCEED 100 FEET WITHOUT PULL BOX, NOT OVER 75 FEET FOR RUN WITH ONE RIGHT ANGLE BEND AND NOT OVER 50 FEET FOR RUN WITH TWO RIGHT ANGLES.
   9. ALL CONDUIT SHALL BE PROPERLY SUPPORTED IN ACCORDANCE WITH THE N.E.C. CONDUIT SHALL BE INDEPENDENTLY SUPPORTED FROM STRUCTURE AND NOT FROM DUCTWORK, CEILING HANGERS OR CEILING SUPPORT WIRES.
   10. FINAL CONNECTION TO LIGHT FIXTURES AND EQUIPMENT SHALL BE MADE WITH FLEXIBLE STEEL CONDUIT ("GREENFIELD" – 6' MAXIMUM LENGTH) IN DRY AREAS AND LIQUID TIGHT FLEXIBLE METALLIC CONDUIT ("SEALTITE") IN DAMP OR WET AREAS.
   11. ALL EMPTY CONDUITS ARE TO BE PROVIDED WITH PULL WIRES AND NYLON BUSHINGS AT BOTH ENDS.

OUTLET BOXES
   1. SUPPORT ALL BOXES FROM BUILDING STRUCTURE INDEPENDENT OF THE CONDUIT SYSTEM.
   2. FLUSH DEVICE BOXES IN MASONRY WALLS SHALL BE DESIGNED FOR THE PURPOSE WITH RAISED COVER.
   3. WIRING DEVICE BOXES FOR SURFACE CONDUIT WORK SHALL BE FS SERIES CAST BOXES.
   4. DEVICES ON BUILDING EXTERIOR SHALL BE WEATHERPROOF NEMA 3R.

TESTING AND PLACING IN SERVICE
   1. ANY MATERIAL OR EQUIPMENT FAILING A TEST SHALL BE REPAIRED OR REPLACED AT THE CONTRACTOR'S EXPENSE.
   2. TESTS SHALL INCLUDE THE FOLLOWING:
      A. MEASURE THE LOAD ON EACH PHASE OF THE MAIN SERVICE AND EACH PHASE OF EVERY FEEDER UNDER FULL LOAD CONDITIONS.
      B. MEASURE THE NO-LOOD AND FULL-LOAD VOLTAGES (PHASE TO PHASE, PHASE TO NEUTRAL AND PHASE TO GROUND FOR EACH PHASE OF EACH SERVICE, OF EACH SEPARATELY DERIVED SYSTEM AND AT EACH PANELBOARD OR TRANSFORMER).
      C. MEASURE THE GROUND RESISTANCE OF THE MAIN SERVICE GROUNDING ELECTRODE AND THE GROUND RESISTANCE OF EACH SEPARATELY DERIVED SYSTEM'S GROUNDING ELECTRODE. ALL GROUNDS SHALL BE MEASURED TO BE 10 OHMS OR LESS.
      D. MAKE INSULATION RESISTANCE TESTS ON ALL DRY TYPE TRANSFORMERS AND MOTORS.

QUALITY ASSURANCE
   1. ALL PRODUCTS SHALL BE NEW AND OF THE TYPE AND QUALITY SPECIFIED. WHERE MATERIALS, EQUIPMENT, APPARATUS OR OTHER PRODUCTS ARE SPECIFIED BY MANUFACTURER, BRAND NAME, TYPE OF CATALOG NUMBER, SUCH DESIGNATION SHALL ESTABLISH THE STANDARDS OF THE DESIRED QUALITY AND STYLE. IT IS THE INTENT OF THESE SPECIFICATIONS TO ESTABLISH A STANDARD OF QUALITY OF MATERIALS AND EQUIPMENT INSTALLED.

WIRE & CABLE
   1. WIRE & CABLE SHALL BE AS FOLLOWS:
      A. #12 AWG AND #10 AWG SOLID OR STRANDED CONDUCTOR COPPER, 600 VOLT, TYPE THWN, XHHW, OR THW (75 DEGREES C).
      B. #8 AWG TO AND INCLUDING #600 KCMIL AWG, STRANDED CONDUCTOR, COPPER, 600 VOLT, TYPE THWN, XHHW OR THW (75 DEGREES C).
      C. #14 AWG MAY BE USED FOR LOW VOLTAGE CONTROL WIRING ONLY.
   2. COLOR CODING SHALL BE USED FOR ALL WIRE AND CABLES IN ACCORDANCE WITH N.E.C. CODING STANDARDS. CONTROL CONDUCTORS SHALL BE CONTINUOUSLY COLOR CODED. GROUND CONDUCTOR SHALL BE GREEN.
   3. JOINTS IN #10 AWG AND SMALLER WIRE SHALL BE MADE WITH "SCOTCH LOCKS" (OR EQUAL) AND BE INSULATED WITH SCOTCH #33 ELECTRICAL TAPE.
   4. JOINTS IN #8 AWG AND LARGER SHALL BE MADE WITH PRESSURE TYPE MECHANICAL CONNECTOR AND INSULATED WITH ELECTRICAL TAPE TO 150 PERCENT OF THE INSULATING VALUE OF THE CONDUCTOR.
   5. ALL BELOW GRADE LEVEL JOINTS SHALL BE MADE WITH BURNDY TYPE YSG COMPRESSION CONNECTORS AND SHRINK WRAP INSULATED.
   6. COLOR CODE CONDUCTORS (EXCEPT CONTROL AND INSTRUMENTATION CONDUCTORS) AS FOLLOWS:

      120/208 VOLT SYSTEM

PHASE A	MATCH EXISTING
PHASE B	MATCH EXISTING
PHASE C	MATCH EXISTING
NEUTRAL	MATCH EXISTING
GROUND	MATCH EXISTING

      A. #12 AND #10 CONDUCTORS SHALL HAVE CONTINUOUS INSULATION COLOR AS LISTED ABOVE.
      B. COLOR CODE CONDUCTORS LARGER THAN ABOVE, WHICH DO NOT HAVE CONTINUOUS INSULATION COLOR BY APPLICATION OF AT LEAST TWO LAPS OF COLORED TAPE ON EACH CONDUCTOR AT ALL POINTS OF ACCESS INCLUDING JUNCTION BOXES. COLOR TAPE SHALL BE THE EQUAL OF 3M PRODUCTS SCOTCH #35.
      C. CONDUCTORS SHALL BE SOFT ANNEALED COPPER INSULATED FOR 600 VOLTS UNLESS SPECIFICALLY INDICATED OTHERWISE. ALUMINUM CONDUCTORS ARE NOT ALLOWED ON THIS PROJECT.
   7. INSULATION TYPE SHALL BE TYPE THHN OR THWN. THHN SHALL NOT BE USED IN WET OR DAMP LOCATIONS.
   8. FLEXIBLE CORD SHALL BE HEAVY DUTY TYPE SO WITH AN EQUIPMENT GROUND CONDUCTOR IN ADDITION TO THE CURRENT CARRYING CONDUCTORS.
   9. INSULATE SPLICING CONNECTORS TO AT LEAST 200 % OF THE WIRE INSULATION. USE PRE-STRETCHED TUBING CONNECTOR INSULATORS, 3M PST FOR #2 AND LARGER CONDUCTORS.
   10. FORM AND TIE ALL WIRING IN PANELBOARDS.
   11. THERE SHALL BE NO WIRENUT JOINTS OR SPLICES MADE INSIDE SWITCHBOARDS/PANELBOARDS OR DISCONNECT SWITCHES.
   12. BRANCH CIRCUIT WIRE SIZES (AND CONDUITS) SHALL BE INCREASED FROM THOSE INDICATED ON THE PLANS TO PREVENT EXCESSIVE VOLTAGE DROP. BRANCH CIRCUITS SHALL BE INSTALLED WITH WIRES OF SUFFICIENT SIZE SO THAT VOLTAGE DROP BETWEEN THE PANEL AND THE LOADS DOES NOT EXCEED LIMIT OF 2.5%

I. LIGHTING AND POWER PANELBOARDS
   1. PROVIDE DEAD-FRONT SAFETY TYPE LIGHTING AND POWER PANELBOARDS AS INDICATED, WITH SWITCHING AND PROTECTIVE DEVICES IN QUANTITIES, RATINGS, TYPES AND ARRANGEMENT AS SHOWN, EQUIPPED WITH COPPER BUS BARS, FULL-SIZED NEUTRAL BAR, WITH BOLT-IN TYPE MOLDED CASE BRANCH CIRCUIT BREAKERS FOR EACH CIRCUIT, WITH TOGGLE HANDLES THAT INDICATE A TRIPPED POSITION. PROVIDE TYPED DIRECTORY.
   2. PROVIDE ENGRAVED NAMEPLATE FOR EACH PANELBOARD INDICATING VOLTAGE, PHASE, PANEL NAME, AND FEEDER ORIGIN.

J. GROUNDING
   1. ENTIRE POWER SYSTEM SHALL BE EFFECTIVELY GROUNDED, INCLUDING ALL EXPOSED NON- CURRENT CARRYING PARTS OF ELECTRICAL EQUIPMENT IN FULL ACCORDANCE WITH N.E.C. ARTICLE 250.
   2. A GREEN PIGTAIL SHALL BE INSTALLED FROM GROUNDING SLOTS WHERE RECEPTACLE ATTACHMENT BAR IS NOT IN DIRECT CONTACT WITH THE OUTLET BOX.
   3. PROVIDE GROUND RODS AND CAD WELD GROUNDING CONDUCTOR TO BUILDING STEEL WHERE INDICATED ON PLANS.
   4. EXTEND GROUND TO DOMESTIC WATER MAIN.

K. LIGHTING
   1. FURNISH AND INSTALL LIGHTING FIXTURES AS SHOWN AND SCHEDULED ON THE DRAWINGS.
   2. ALL FIXTURES TO INCLUDE LUMINAIRES.
   3. COORDINATE FIXTURE TYPE, TRIM AND BASEPLATES WITH WALL FINISHES UPON WHICH THE LIGHT FIXTURE IS INSTALLED UPON. CONSTRUCTION.

L. TEMPORARY SERVICE
   1. THIS CONTRACTOR TO PROVIDE ALL TEMPORARY LIGHTING AND POWER AS REQUIRED FOR ALL TRADES.
   2. ALL TEMPORARY WIRING INSTALLED SHALL BE REMOVED BY THIS CONTRACTOR.

M. AS-BUILT DRAWINGS
   1. SUBMIT TO THE ARCHITECT ONE SET OF REPRODUCIBLE (MYLAR) ELECTRICAL DRAWINGS SHOWING THE AS BUILT CONDITIONS.

NAMEPLATES
   1. GENERAL: FURNISH AND MOUNT ON EACH PANELBOARD, SWITCHBOARD (INCLUDING BRANCH SWITCHES), LARGE JUNCTION BOX SAFETY SWITCH, STARTER, REMOTE CONTROL PUSH BUTTON STATION AND ALL SIMILAR CONTROLS, A NAMEPLATE DESCRIPTIVE OF THE EQUIPMENT OR EQUIPMENT CONTROLLED.
   2. PROVIDE BLACK AND WHITE NAMEPLATES CONSTRUCTED FROM LAMINATED PHENOLIC WITH A BLACK CENTER CORE. LETTERS SHALL BE ENGRAVED IN THE PHENOLIC TO FORM BLACK LETTERS 3/8" HIGH ON A WHITE BACKGROUND. FASTEN THE NAMEPLATES WITH SCREWS AND AN ADHESIVE TYPE FASTENER.

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