

SECTION 16000 – ELECTRICAL SPECIFICATIONS

GENERAL

I. GENERAL

- A. THE CONTRACTOR SHALL FURNISH ALL MATERIAL, LABOR & EQUIP. NECESSARY TO COMPLETELY INSTALL ELECTRICAL & RELATED WORK INDICATED ON THE DRAWINGS AND IN THESE SPECIFICATIONS.
II. CODE
A. ALL EQUIPMENT, WIRING AND THE ENTIRE INSTALLATION SHALL BE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE (N.E.C.), O.S.H.A. REQUIREMENTS, LIFE SAFETY CODE AND ALL APPLICABLE LOCAL AND STATE LAWS AND ORDINANCES.
III. LOCATION OF EQUIPMENT
A. THE CONTRACTOR SHALL NOTE THAT THE ELECTRICAL DRAWINGS ARE INTENDED TO INDICATE ONLY THE EXTENT DIAGRAMMATICALLY, GENERAL CHARACTER AND LOCATION OF THE WORK.
IV. ROUGH-IN
A. VERIFY FINAL LOCATIONS FOR ROUGH-INS WITH SHOP DRAWINGS, FIELD MEASUREMENTS AND WITH THE REQUIREMENTS OF THE ACTUAL EQUIPMENT TO BE CONNECTED PRIOR TO ROUGH-IN.
V. INSTALLATION
A. ALL EQUIPMENT AND MATERIALS SHALL BE INSTALLED IN A NEAT AND FIRST CLASS MANNER, LEVEL AND PLUMB, AND SECURELY SUPPORTED.
VI. CUTTING AND PATCHING
A. ALL CUTTING AND PATCHING REQUIRED FOR INSTALLATION OF ELECTRICAL WORK SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR.
VII. ELECTRICAL SUBMITTALS
A. REFER TO THE CONDITIONS OF THE CONTRACT (GENERAL AND SUPPLEMENTARY) AND DIVISION 1 SECTION: SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES FOR SUBMITTAL DEFINITIONS, REQUIREMENTS AND PROCEDURES.
VIII. IDENTIFICATION NAMEPLATES
A. FURNISH AND INSTALL NAMEPLATES ON ALL ITEMS OF ELECTRICAL EQUIPMENT.
IX. WARRANTIES
A. GUARANTEE ALL ELECTRICAL SYSTEM MATERIALS AND WORKMANSHIP TO BE FREE FROM DEFECTS FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF FINAL ACCEPTANCE.
X. CLEANING
A. REGULARLY REMOVE REFUSE AND DEBRIS ACCUMULATING FROM ELECTRICAL CONNECTIONS AND PRIOR TO ACCEPTANCE OF THIS WORK, LEAVE THE PREMISES "BROOM CLEAN".
XI. TEST AND ADJUSTMENT
A. FURNISH ALL LABOR, INSTRUMENTS, AND OTHER SERVICES REQUIRED FOR COMPLETE AND SATISFACTORY TEST AND ADJUSTMENT OF ELECTRICAL SYSTEMS AND RELATED WORK FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR.

IMPROPERLY SHALL BE REMEDIED BY THIS CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.

RACEWAYS

I. RACEWAYS

- A. EXTENT OF RACEWAY WORK IS INDICATED DIAGRAMMATICALLY ON THE DRAWINGS AND IN THE SCHEDULES.
1. WHEN SIZE IS NOT INDICATED ON PLANS, CONDUIT SHALL BE SIZED FOR CONDUCTORS IN ACCORDANCE WITH TABLES 3(A)(B)(C), CHAPTER 9 OF THE N.E.C.
2. THE ROUTING AND METHOD OF INSTALLATION OF ALL CONDUITS SHALL BE CO-ORDINATED SO AS NOT TO INTERFERE WITH OTHER EQUIPMENT INSTALLATIONS AND SHALL MEET WITH THE COMPLETE SATISFACTION OF THE OWNER'S REPRESENTATIVE.
3. THE USE IF INTERMEDIATE METAL CONDUIT (IMC), ELECTRICAL NON-METALLIC TUBING (ENT), ARMORED CABLE (AC), OR MANUFACTURED CABLE ASSEMBLIES SHALL NOT BE INCORPORATED INTO THE WORK.
4. THE USE OF MC CABLE FOR LIGHTING IN DIMMING AREAS AND RECEPTACLES IS ACCEPTABLE. ALL KITCHEN CIRCUITS SHALL BE RUN IN CONDUIT
5. USE ONLY THE TYPES OF RACEWAYS SPECIFIED HERE IN.
B. TYPES OF RACEWAYS SPECIFIED IN THIS SECTION INCLUDE THE FOLLOWING:
1. ELECTRICAL METALLIC TUBING (EMT); MINIMUM TRADE SIZE 1/2".
2. FLEXIBLE METAL CONDUIT, MINIMUM TRADE SIZE 1/2".
3. LIQUID-TIGHT FLEXIBLE METAL CONDUIT (SEALTIGHT) MINIMUM TRADE SIZE 1/2".
4. RIGID METAL CONDUIT, MINIMUM TRADE SIZE 1/2".
5. RIGID NONMETALLIC CONDUIT (PVC), SCHEDULE 40, MINIMUM TRADE SIZE 3/4".
6. METAL CLAD CABLE (MC) MINIMUM TRADE SIZE 1/2".
C. FITTINGS
1. FITTINGS FOR EMT SHALL BE STEEL SET SCREW OR COMPRESSION TYPE WITH FACTORY INSTALLED INSULATED THROAT CONNECTORS. DIE CAST OR POT METAL FITTINGS ARE NOT ACCEPTABLE.
2. FITTINGS FOR FLEXIBLE CONDUIT SHALL BE STEEL OR CAST IRON.
3. FITTINGS FOR RIGID CONDUIT SHALL BE STEEL THREADED TYPE.
4. FITTINGS FOR PVC SHALL BE SCHEDULE 40 GLUE-ON TYPE.

II. INSTALLATION OF RACEWAYS

- A. ALL CONDUITS SHALL BE INSTALLED CONCEALED, EXCEPT IN EQUIPMENT ROOM, CHASES OR AS INDICATED ON THE DRAWINGS. ALL CONDUITS, EXPOSED AND CONCEALED SHALL BE RUN PARALLEL AND PERPENDICULAR TO BUILDING LINES AND SHALL BE GROUPED TOGETHER AS MUCH AS POSSIBLE, EVEN ABOVE LAY-IN CEILINGS.
B. A SEPARATE GROUNDING CONDUCTOR SHALL BE INSTALLED IN ALL RUNS. WHERE SIZES LARGER THAN #12 AWG ARE REQUIRED BY THE NEC, THE CONDUCTOR SHALL BE SIZED AS INDICATED IN THE NEC. ALL GROUNDING CONDUCTORS SHALL HAVE A GREEN OUTER COVERING, OR GREEN MARKING TAPE OVER THEIR ENTIRE EXPOSED LENGTHS.
C. MECHANICALLY FASTEN TOGETHER METAL CONDUITS, ENCLOSURES, AND RACEWAYS FOR CONDUCTORS TO FORM A CONTINUOUS ELECTRICAL CONDUCTOR. CONNECT TO ELECTRICAL BOXES, FITTINGS AND CABINETS TO PROVIDE ELECTRICAL CONTINUITY AND FIRM MECHANICAL ASSEMBLY.
D. AVOID USE OF DISSIMILAR METALS THROUGH SYSTEM TO ELIMINATE POSSIBILITY OF ELECTROLYSIS.
E. INSTALL EXPANSION FITTINGS IN RACEWAYS EVERY 200' LINEAR RUN OR WHEREVER STRUCTURAL EXPANSION JOINTS ARE CROSSED.
F. PROVIDE NYLON PULL CORD IN ALL EMPTY CONDUITS.
G. CONDUIT INSTALLATION
1. USE RIGID METAL CONDUIT FOR ALL WEATHER EXPOSED WORK, FOR ALL STUB-UPS IN KITCHEN AREA, FOR ALL ROOF PENETRATIONS THROUGH PATIO PLUGS AND FOR FREEZER/ COOLER PENETRATIONS.
2. USE E.M.T. FOR ALL INTERIOR CONCEALED AND FOR EXPOSED WORK NOT SUBJECT TO MECHANICAL INJURY.
3. USE P.V.C. FOR ALL UNDERGROUND WORK OR WORK INSTALLED IN CONCRETE. USE RIGID METAL CONDUIT ELBOW AT STUP-UP LOCATIONS.
4. USE FLEXIBLE METAL CONDUIT FROM OUTLET BOXES TO RECESSED LIGHTING FIXTURE AND FINAL SERVICE CONNECTION TO ITEMS SUBJECT TO MOVEMENT OR VIBRATION.
5. USE LIQUID-TIGHT FLEXIBLE CONDUIT FOR FINAL 24" CONNECTION TO ITEMS WHICH SUBJECTED TO ONE OR MORE OF THE FOLLOWING CONDITIONS:
a. EXTERIOR LOCATION.
b. MOIST OR HUMID ATMOSPHERE WHERE CONDENSATE CAN BE EXPECTED TO ACCUMULATE.
c. CORROSIVE ATMOSPHERE.
d. SUBJECTED TO WATER SPRAY OR DRIPPING OIL, WATER OVERSPREADS.
e. FINAL CONNECTION TO ROTATING OR VIBRATING EQUIPMENT.
6. CUT CONDUITS STRAIGHT, PROPERLY REAM AND CUT THREADS FOR HEAVY WALL CONDUIT DEEP AND CLEAN.
7. FIELD BEND CONDUIT WITH BENDERS DESIGNED FOR THE PURPOSE SO AS NOT TO DISTORT NOR VARY INTERNAL DIAMETER.

CONDUCTORS

I. CONDUCTORS

- A. WIRE SHALL BE COPPER WITH MIN INSULATION.
B. THE USE OF AWG, OR EMT, OR ANY MANUFACTURED CABLE ASSEMBLY (EXCEPT MC) SHALL NOT BE INCORPORATED INTO THE WORK.
C. MC CABLE SHALL BE ACCEPTABLE FOR USE ON ALL 20 AMP 120V BREAKER CIRCUITS, ALL CIRCUITS 30 AMPS AND ABOVE AND ALL 208 VOLTS SHALL BE IN RACEWAY.
D. WIRING SHALL BE IN CONDUIT.
E. COLOR CODING OF CONDUCTORS SHALL BE AS FOLLOWS:
1. 120/208V SYSTEMS: PHASE A- BLACK, PHASE B- RED, PHASE C- BLUE, NEUT. - WHITE, GND. - GREEN.
2. 277/480V SYSTEM: PHASE A - BROWN, PHASE B - ORANGE, PHASE C - YELLOW, NEUT. - NATURAL GRAY, GND. - GREEN.
F. AWG #10 AND SMALLER SHALL BE SOLID. AWG #8 AND LARGER SHALL BE STRANDED.

II. WIRE CONNECTIONS

- A. ALL FEEDER AND SUB-FEEDER WIRING CONNECTIONS SHALL BE MADE WITH COMPRESSION CONNECTORS BY SQUARE D OR ACCEPTABLE EQUIVALENT.
B. ALL BRANCH WIRING CONNECTIONS SHALL BE 3M SCOTCH LOCK CONNECTORS OR ACCEPTABLE EQUIVALENT.
C. WHERE CABLE CONNECTIONS REQUIRE INSULATION, SCOTCH #33, ELECTRICAL TAPE SHALL BE USED FOR WRAPPING.

BOXES AND FITTINGS

I. BOXES AND FITTINGS

- A. EXTENT OF ELECTRICAL BOX AND ASSOCIATED FITTING WORK IS INDICATED BY DRAWINGS AND SCHEDULES.
II. OUTLET BOXES

- A. CEILING: 4" SQUARE, 2-1/8" DEEP FOR EXPOSED OR FURRED WORK; 3" DEEP FOR BOXES POURED IN CONCRETE. PROVIDE CONCRETE POUR BOXES OF THE TYPE SPECIALLY DESIGNED FOR THE APPLICATION. PROVIDE PLASTER RINGS WHERE REQUIRED.
B. WALL: 4" SQUARE, 2-1/8" DEEP BOXES; PROVIDE EXTENSION RINGS OR COVERS OF SUFFICIENT DEPTH TO BRING COVERS FLUSH WITH THE FINISHED SURFACE.
C. MASONRY: FOR FLUSH MOUNTED BOXES IN EXPOSED MASONRY OR TILE, PROVIDE COVERS WITH SQUARE CORNERS ON THE RAISED PORTION AND WITH SUFFICIENT DEPTH TO TRIM OUT FLUSH WITH FINISHED SURFACE.
D. EXPOSED AND KITCHEN EQUIPMENT: PROVIDE FS OR FD BOXES WITH SUITABLE WEATHERPROOF COVERS.

III. PULL AND JUNCTION BOXES

- A. PROVIDE BOXES WHERE REQUIRED TO FACILITATE THE PULLING OF WIRES OR CABLES. BOXES SHALL BE IN ACCORDANCE WITH ARTICLE 370 OF N.E.C.

IV. ACCESSORIES

- A. PROVIDE CORROSION-RESISTANT KNOCKOUT CLOSURES, CONDUIT LOCKNUTS AND MALLEABLE IRON CONDUIT BUSHINGS, OFFSET CONNECTORS, OF TYPES AND SIZES, TO SUIT RESPECTIVE INSTALLATION REQUIREMENTS AND APPLICATIONS.
V. INSTALLATION OF BOXES AND FITTINGS

- A. POSITION RECESSED OUTLET BOXES ACCURATELY TO ALLOW FOR SURFACE FINISH THICKNESS.
B. FASTEN ELECTRICAL BOXES FIRMLY AND RIGIDLY TO SUBSTRATES OR STRUCTURAL SURFACES TO WHICH ATTACHED OR SOLIDLY EMBED ELECTRICAL BOXES IN CONCRETE OR MASONRY.

VI. LOCATIONS OF OUTLETS

- A. IN GENERAL THE VARIOUS OUTLETS ARE TO BE LOCATED AT THE FOLLOWING HEIGHTS ABOVE FINISHED FLOOR TO THE CENTER LINE OF BOX, UNLESS NOTED OTHERWISE AT AN INDIVIDUAL OUTLET ON THE DRAWINGS:
1. WALL SWITCHES (VERT. MID.) 46"
2. RECEPTACLES (VERT. MID.) 18"
3. PHONE OUTLETS (VERT. MID.) 18"
4. OUTLETS ABOVE COUNTERS (HORZ. MID.) 6" ABOVE BACKSPASH.
B. OUTLET MOUNTING HEIGHTS INDICATED ON THE DRAWINGS AT OUTLETS TAKE PRECEDENCE. REFER TO DRAWINGS FOR DETAILS OF OTHER EQUIPMENT MOUNTING HEIGHTS. MOUNTING HEIGHTS FOR FLUSH OUTLETS IN BLOCK WALLS MAY BE CHANGED FOR INSTALLATION. CONSULT OWNER'S REPRESENTATIVE IN FIELD PRIOR TO ANY SUCH INSTALLATION.

CONNECTIONS FOR EQUIPMENT

I. CONNECTIONS FOR EQUIPMENT

- A. GENERAL: FOR EACH ELECTRICAL CONNECTION INDICATED PROVIDE COMPLETE ASSEMBLY OF MATERIALS INCLUDING BUT NOT NECESSARILY LIMITED TO, PRESSURE CONNECTORS, TERMINALS (LUGS), ELECTRICAL TAPPING TAPE, HEAT-SHRINKABLE INSULATING TUBING, CABLE TIE, SOLDERLESS WIRE NUTS, AND OTHER ITEMS AND ACCESSORIES AS NEEDED TO COMPLETE SPLICES AND TERMINATIONS OF TYPES INDICATED.

WIRING DEVICES

I. WIRING DEVICES

- A. THE EXTENT OF WIRING DEVICE WORK IS INDICATED BY THE DRAWINGS AND SCHEDULES.
B. PROVIDE WIRING DEVICES WHICH ARE U.L. LISTED AND LABELED.
II. ACCEPTABLE MANUFACTURERS
A. HUBBELL CO.
B. GENERAL ELECTRIC CO.
C. LEVITON MFG. CO.
III. FABRICATED WIRING DEVICES
SWITCHES SHALL BE 20 AMP, 120/277 VOLT RATED, HUBBELL #1221 - COLOR - PER PLANS.
RECEPTACLES SHALL BE 20 AMP 125 VOLT RATED, HUBBELL #5362 - COLOR - PER PLANS. FOR OTHER APPLICATIONS REFER TO THE DRAWINGS.
PROVIDE SMOOTH FINISH PLATES FOR ALL DEVICES WITH APPROPRIATE MOUNTING ARRANGEMENTS FOR GAUGED DEVICES. FOR TELEPHONE AND COMPUTER/AMX AND MICROPHONE OUTLETS PROVIDE BUSHED HOLE COVER PLATES. PLATES SHALL BE COLOR - PER PLANS.

MOTOR DISCONNECTS

I. DISCONNECT SWITCHES

- A. ACCEPTABLE MANUFACTURERS
1. SQUARE D COMPANY
2. SIEMENS
B. HEAVY-DUTY SAFETY SWITCHES: PROVIDE SURFACE MOUNTED, HEAVY DUTY TYPE, SHEET STEEL ENCLOSED SWITCHES, OF TYPES, SIZES AND WITH ELECTRICAL CHARACTERISTICS INDICATED: INCORPORATING QUICK-MAKE QUICK-BREAK TYPE SWITCHES; SWITCH BLADE SHALL BE VISIBLE IN OFF POSITION WITH THE DOOR OPEN. EQUIP. WITH OPERATING HANDLE WHICH IS INTEGRAL PART OF ENCLOSURE BASE AND WHOSE OPERATING POSITION IS CLEARLY INDICATED AND IS PADLOCKABLE IN THE OFF POSITION. CONSTRUCT CURRENT CARRYING PARTS OF HIGH-CONDUCTIVITY COPPER AND SILVER- TUNGSTEN TYPE SWITCH CONTACTS. PROVIDE NEMA TYPE 3R ONLY.

PANELBOARDS

I. DESCRIPTION OF WORK

- A. TYPES OF PANELBOARDS FOR THIS PROJECT ARE AS FOLLOWS:
1. 120/208V-3 PHASE 4W-SN; SQ. D "NO" AS SCHEDULED.

II. ACCEPTABLE MANUFACTURERS

- 1. SQUARE D CO. (BOLT ON BREAKERS)
2. SIEMENS (BOLT ON BREAKERS)
3. GENERAL ELECTRIC (BOLT ON BREAKERS)
4. WESTINGHOUSE (BOLT ON BREAKERS)

III. PANELBOARDS

- A. PROVIDE DEAD-FRONT SAFETY CONSTRUCTED FACTORY-ASSEMBLED CIRCUIT BREAKER TYPE PANELBOARDS IN SIZES AND RATINGS AS INDICATED. EQUIP. WITH PANELBOARD UNIT DEVICE, OF TYPES, RATINGS AND CHARACTERISTICS INDICATED. BUSS STRUCTURE AND MAIN LUGS OR MAIN BREAKER SHALL HAVE CURRENT RATINGS AS SHOWN ON THE PANELBOARD SCHEDULE, SUCH RATINGS SHALL BE ESTABLISHED BY TEST CONDUCTED IN ACCORDANCE WITH UNDERWRITERS LABORATORIES STANDARD UL 67. THE USE OF CONDUCTOR DIMENSIONS WILL NOT BE ACCEPTED IN LIEU OF ACTUAL HEAT TEST. BUS BAR CONNECTIONS TO THE BRANCH CIRCUIT BREAKERS SHALL BE "PHASE-SEQUENCE" TYPE. THREE-PHASE, FOUR WIRE BUSSING SHALL BE SUCH THAT ANY THREE ADJACENT SINGLE-POLE BREAKERS ARE INDIVIDUALLY CONNECTED TO EACH OF THE THREE DIFFERENT PHASES IN SUCH A MANNER THAT TWO OR THREE-POLE BREAKERS CAN BE INSTALLED AT ANY LOCATION. ALL CURRENT CARRYING PARTS OF THE BUSS ASSEMBLY SHALL BE PLATED COPPER WITH CONDUCTIVITY OF NOT LESS THAN 98%.
B. PANELBOARD ENCLOSURE: PROVIDE GALVANIZED SHEET STEEL CABINET TYPE ENCLOSURES, IN TYPES AND NEMA TYPES AS INDICATED, CODE GAUGE MINIMUM 16-GAUGE THICKNESS. CONSTRUCT WITH ALL KNOCKOUTS AND WIRING GUTTERS. PROVIDE FRONTS WITH ADJUSTABLE TRIM CLAMP DOORS IN FLUSH LOCKS AND KEYS. ALL PANELBOARD ENCLOSURES KEYED ALIKE, WITH OPERATED FRONT DOOR HINGES. EQUIP WITH INTERIOR CIRCUIT DIRECTORY FRAME, AND CARD STOCK CLEAR PLASTIC COATING. PROVIDE BAKED GRAY ENAMEL FINISH OVER A RUST INHIBITOR COATING. PANEL ENCLOSURES FABRICATED BY SAME MANUFACTURER AS PANELBOARDS. MINIMUM DEPTH OF 3-3/4" & MINIMUM WIDTH OF 20" FOR "NO" PANELS.

LIGHTING FIXTURES

I. LIGHTING FIXTURES

- A. HANDLE LIGHTING FIXTURES CAREFULLY TO PREVENT DAMAGE, BREAKING AND SCORING. DO NOT INSTALL DAMAGED FIXTURES OR REPAIRS TO EXISTING FIXTURES WITH NEW.
B. STORE LIGHTING FIXTURES IN CLEAN DRY PLACE. PROTECT FROM WEATHER, DIRT, FUMES, WATER CONSTRUCTION DUST AND PHYSICAL DAMAGE.
C. SHIP FIXTURES FACTORY ASSEMBLED, WITH PARTS REQUIRED FOR A COMPLETE INSTALLATION.
D. FLUORESCENT BALLAST SHALL BE CLASS P ELECTRONIC, LOW-ENERGY RAPID START SOUND RATED A. PROVIDE HID LAMP BALLAST CAPABLE OF OPERATING LAMP TYPES WITH RATINGS INDICATED, REACTOR TYPE, HIGH-POWER FACTOR CORE AND COIL ASSEMBLY ENCAPSULATED IN NON MELT RESIN, INSTALL CAPACITOR OUTSIDE BALLAST ENCAPSULATION FOR EASY FIELD REPLACEMENT.
E. PROVIDE FLUORESCENT LAMPS OF TYPES INDICATED.
F. PROVIDE HID LAMPS IN WATTAGES AND TYPES INDICATED.
G. PROVIDE INCANDESCENT LAMPS IN THE SIZES AND RATED AS INDICATED AND 130 VOLT RATED.
H. PROVIDE FIXTURES AND/OR FIXTURE OUTLET BOXES WITH HANGERS TO PROPERLY SUPPORT FIXTURE WEIGHT.
I. INSTALL FLUSH MOUNTED FIXTURES TO ELIMINATE LIGHT LEAKAGE BETWEEN FRAME AND FINISHED SURFACE. AT DATE OF SUBSTANTIAL COMPLETION REPLACE LAMPS IN ALL FIXTURES WHICH ARE OBSERVED TO BE INOPERATIVE OR NOTICEABLY DIMMED AFTER CONTRACTORS USE AS JUDGED BY THE OWNER'S REPRESENTATIVE



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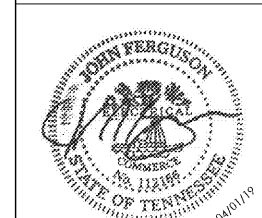


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SHEET TITLE

SPECIFICATIONS

SHEET NUMBER

E-2