



SECTION 16000
ELECTRICAL WORK

PART 1: GENERAL

THE GENERAL AND SUPPLEMENTARY GENERAL CONDITIONS SHALL APPLY TO ALL WORK OF THIS SECTION.

1-01 SCOPE OF WORK:

- A. THIS PORTION OF THE WORK INCLUDES THE FURNISHING OF ALL LABOR AND MATERIAL NECESSARY FOR A COMPLETE WIRING SYSTEM TO OUTLETS AND ALL EQUIPMENT SHOWN ON THE DRAWINGS OR COVERED BY THIS SECTION OF THE SPECIFICATIONS.
 1. COMPLETE SYSTEM OF BRANCH CIRCUIT WIRING AND EQUIPMENT FOR LIGHTS, PLUGS AND POWER.
 2. FURNISH AND INSTALL POWER PANEL, FIXTURES, LAMPS, WALL SWITCHES AND CONVENIENCE OUTLETS.
 3. ALL HANGERS, ANCHORS, SLEEVES, CHASES AND SUPPORTS FOR FIXTURES, ALL ELECTRICAL EQUIPMENT MATERIALS.
 4. FURNISH, INSTALL AND CONNECT SWITCHES ETC., REQUIRED FOR EQUIPMENT COVERED BY OTHER SECTIONS OF THESE SPECIFICATIONS.
 5. PROVISION OF FIRE ALARM SYSTEM PER PLANS.

1-02 WORK NOT INCLUDED:

- A. THE FOLLOWING WORK SHALL BE DONE UNDER THE HEATING AND VENTILATING SECTION OF THE SPECIFICATIONS. FURNISH CONTROL EQUIPMENT (THE LOW VOLTAGE CONTROL AND INTERLOCK; FURNISH AND INSTALL MOTORS).

1-03 RULES AND REGULATIONS:

- A. ALL WORK AND MATERIALS SHALL BE IN FULL ACCORDANCE WITH THE LATEST AND REGULATIONS OF THE STATE FIRE MARSHAL; TITLE 24, PART 3; THE SAFETY ORDERS OF THE DIVISION OF INDUSTRIAL SAFETY; THE CALIFORNIA ELECTRICAL CODE; AND OTHER APPLICABLE STATE LAWS OR REGULATIONS. NOTHING IN THESE PLANS OR SPECIFICATIONS IS TO BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THESE CODES.

1-04 EXAMINATION OF SITE AND PLANS:

- A. BEFORE SUBMITTING A PROPOSAL, EACH BIDDER SHALL CAREFULLY EXAMINE THE ELECTRICAL, DRAWINGS AND SPECIFICATIONS. HE SHALL ALSO VISIT THE SITE AND FULLY INFORM HIMSELF AS TO ALL EXISTING CONDITIONS AND LIMITATIONS APPLYING TO THE WORK.

- B. IF, AFTER SUCH EXAMINATION AND STUDY, IT APPEARS THAT ANY CHANGE FROM THE DRAWINGS AND SPECIFICATIONS SHALL BE ALLOWED, THE BIDDER SHALL SO STATE IN WRITING TOGETHER WITH ANY CHANGE IN COST INVOLVED.

- C. BY THE ACT OF SUBMITTING A PROPOSAL, EACH BIDDER SHALL BE DEEMED TO HAVE MADE SUCH EXAMINATION OF THE DRAWINGS AND PREMISES, AND IT WILL BE ASSUMED THAT HE IS THEREFORE FAMILIAR WITH AND ACCEPTS, AND HAS BASED HIS PROPOSAL UPON SUCH EXISTING CONDITIONS AND LIMITATIONS APPLYING TO THE WORK.

1-05 WORKMANSHIP AND MATERIALS:

- A. ALL WORKMANSHIP SHALL BE FIRST CLASS IN ALL RESPECTS AND CARRIED OUT IN A MANNER SATISFACTORY TO AND MEETING THE APPROVAL OF THE ARCHITECT. ALL WORKMEN EMPLOYED IN MAKING THE INSTALLATION SHALL BE SKILLED IN THEIR PARTICULAR TRADES.
- B. ALL MATERIALS, APPLIANCES, AND EQUIPMENT SHALL BE NEW AND THE BEST OF THEIR RESPECTIVE KINDS, FREE FROM ALL DEFECTS OF THE MAKE, PROVIDED, THIS SHALL APPLY TO ALL PARTS OF THE WORK WHETHER OR NOT THIS PARTICULAR PARAGRAPH IS REFERRED TO BY NUMBER.
- C. ALL APPARATUS, CONDUIT SYSTEMS, ETC., SHALL BE INSTALLED AND INTERCONNECTED SO AS TO FORM COMPLETE SYSTEMS AS HEREIN PROVIDED AND SHOWN ON THE ACCOMPANYING DRAWINGS, THE DRAWINGS FURNISHED BY THE ARCHITECT TO SUPPLEMENT AND EXPLAIN THOSE ACCOMPANYING THESE SPECIFICATIONS.
- D. THIS CONTRACTOR SHALL FURNISH AND INSTALL ALL WORK NECESSARY TO MAKE COMPLETE WORKING SYSTEMS, EXCEPTING ONLY THOSE PORTIONS THAT ARE SPECIFICALLY MENTIONED HEREIN FURNISHED BY OTHER CONTRACTORS.

PART 2: PRODUCTS

2-01 SERVICE:

- A. EXISTING POWER SERVICE IS 2,000 AMP 277/480 VOLT THREE PHASE 4 WIRES.

2-02 PANELBOARDS:

- A. ALL THE PANELBOARD SHALL BE OF THE DEAD FRONT, DEAD REAR, COMPLETELY BUSSED AND WITH CIRCUIT BREAKERS AS PER LAYOUT ON PLANS AND AS BUILT BY SQUARE D, WESTINGHOUSE OR APPROVED EQUAL.
- B. THE PANELBOARD SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE STANDARD SET UP BY THE UNDERWRITER'S LABORATORIES, INC. PANEL FRONTS SHALL BE MONOTRIM TYPES WITH CONCEALED MOUNTING SCREWS.
- C. THE PANELBOARDS SHALL BE EQUIPPED WITH HINGED DOORS, TYPE WRITTEN CIRCUIT DIRECTORIES. ALL FINISH SHALL BE PRIME COAT. PROVIDE HINGED YALE LOCKS ON ALL PANELS KEYPED ALIKE. FURNISH SIX (6) KEYS.

- D. DETAILED DRAWINGS OF THE PANELBOARDS CONSTRUCTION SHALL BE SUBMITTED TO THE ARCHITECT/ ENGINEERS AND UTILITY POWER COMPANY FOR APPROVAL BEFORE ITS CONSTRUCTION IS STARTED. SIX (6) COPIES REQUIRED.

2-03 WIRE:

- A. ALL WIRE INSTALLED IN THIS CONTRACT SHALL BE OF A STANDARD MANUFACTURER AS APPROVED BY THE NATIONAL BOARD OF FIRE UNDERWRITERS AND OF THE SIZE AS INDICATED ON THE DRAWINGS. ALL WIRE SHALL BEAR THE UNDERWRITER'S LABEL AND SHALL BE BROUGHT TO THE JOB IN UNBROKEN PACKAGES AND APPROVED BY THE ARCHITECT BEFORE IT IS INSTALLED.
- B. ALL CIRCUIT WIRE SHALL BE TYPE "THHN" COPPER UNLESS OTHERWISE NOTED. ALL FEEDERS SHALL BE "THWN" COPPER.
- C. NUMBER 12 B&S GAUGE WIRE SHALL BE THE SMALLEST GAUGE WIRE USED, ALL RUNS OVER 80 FEET FROM PANEL TO FIRST OUTLET SHALL BE INCREASED TO NEXT SIZE.
- D. NO WIRE SHALL BE DRAWN INTO CONDUIT UNTIL ALL WORK OF ANY NATURE THAT MAY CAUSE INJURY IS COMPLETED. NO BLOCKS, TACKLE OR OTHER MECHANICAL MEANS, SHALL BE USED IN PULLING IN WIRES AND CARE SHALL BE TAKEN IN PULLING WIRES THAT NO DAMAGE OCCURS TO THE INSULATION OR WIRE.
- E. ALL WIRE #6 B&S GAUGE OR LARGER SHALL BE STRANDED.
- F. ALL WIRING SHALL BE DONE WITH IDENTIFIED NEUTRALS.
- G. ALL SPLICED SHALL BE WITH "SCOTCHLOK" SPRING CONNECTORS. NO WIRE NUTS WILL BE PERMITTED.

2-04 CONDUIT:

- A. AN IRON PIPE CONDUIT SYSTEM SHALL BE INSTALLED FOR THE CONNECTIONS FOR ALL OUTLET BOXES, JUNCTION BOXES, PANELBOARD CABINETS, GUTTERS, ETC. CONDUIT SHALL BE RUN CONTINUOUS BETWEEN OUTLETS, ECT., AND WITH MINIMUM NUMBER OF BENDS.
- B. ALL CONDUIT INSTALLED IN CONCRETE SLABS, CONCRETE WALLS, UNDERGROUND OR IN DAMP OR HAZARDOUS AREAS, AND ALL CONDUIT CONTAINING WIRES LARGER THAN #4 AWG SHALL BE RIGID FULL WEIGHT. ALL OTHER CONDUIT MAY BE GALVANIZED ELECTRICAL METALLIC TUBING WITH GLAND RING WATERTIGHT TYPE. PVC SCHEDULE 40 MAY BE USED FOR UNDERGROUND RUNS. PROVIDE GREEN GROUND WIRE SIZED PER CODE FOR ALL RUNS.
- C. ALL CONDUITS SHALL BE SHERARDUCT, G.E. WHITE, BUCKEYE OR EQUAL. STUB UPS FROM PVC SCHEDULE 40 SHALL BE RIGID STEEL ELBOWS.

2-05 OUTLET:

- A. IN GENERAL, THE LOCATIONS OF ELECTRICAL OUTLETS SHALL BE AS SHOWN ON THE DRAWINGS, HOWEVER, THE CONTRACTOR SHALL MAKE ANY CHANGES NECESSARY TO SUIT CONDITIONS ON THE JOB OR RE-ARRANGEMENT OF BUILT-IN FIXTURES AND EQUIPMENT AS DIRECTED BY THE ARCHITECT OR HIS REPRESENTATIVE.

- B. IT SHOULD BE INCUMBENT UPON THE CONTRACTOR TO STUDY THE GENERAL BUILDING PLANS WITH RELATION TO SPACES SURROUNDING EACH OUTLET IN ORDER THAT HIS WORK MAY FIT THE WORK OF OTHERS AND THAT WHEN FIXTURES OR OTHER EQUIPMENT ARE INSTALLED THEY WILL SYMMETRICALLY LOCATED ACCORDING TO ROOM LAYOUT. REFER ALL CONFLICTS AND DISCREPANCIES PROMPTLY TO THE ARCHITECT.

- C. ALL OUTLETS SHALL BE STANDARD ONE TO TWO PIECES GALVANIZED KNOCKOUT OUTLET BOXES, NATIONAL, STEEL CITY, APPLETON, OR EQUAL, AND APPROVED MAKE.

- D. ALL OUTLETS SHALL BE STANDARD ONE OR TWO PIECES GALVANIZED KNOCKOUT AND ALL OF A MANUFACTURE AS APPROVED.

- E. NO OUTLET BOX SHALL BE SMALLER THAN 4-INCH DIAMETER AND 1-1/2 INCH IN DEPTH.

- F. ALL SPECIAL OUTLETS SHALL BE AS HEREINAFTER SPECIFIED.

2-06 PLATE FINISHES:

- A. ALL WALL SWITCHES, CONVENIENCE, TELEPHONE AND SPECIAL, ALSO BLANK COVERS FOR THE VARIOUS BOXES REQUIRED TO BE SO EQUIPPED, SHALL HAVE STAINLESS STEEL PLATES TO SUIT SIERRA OR EQUAL.
- B. GANG TYPE PLATES SHALL BE USED FOR MULTIPLE UNITS.
- C. PLATES FOR SWITCHES AND RECEPTACLES LOCATED OUTDOORS SHALL BE WEATHERPROOF (FLIP LID TYPES).

2-07 MATERIAL:

- A. TUMBLER SWITCHES SHALL BE LEVITON #1221-I SERIES, OR EQUAL 20 AMP. QUIETIE. MOTION DETECTOR SWITCHES SHALL BE HUBBELL #WSS-277 FOR 277V AND HUBBELL #WSS-120 FOR 120V.
- B. ALL CONVENIENCE RECEPTACLES SHALL BE LEVITON #5252-I.
- C. 208 VOLT, 3 WIRE RECEPTACLES SHALL BE HUBBELL #6810 OR EQUAL.
- D. EXTERNALLY OPERATED SWITCHES SHALL BE TYPE "C", SQUARE D, TRUMBELL OR EQUAL.

2-08 LIGHTING FIXTURES:

- A. NOT APPLY.

2-09 GROUNDING:

- A. ALL CONDUIT SYSTEM, SUPPORTS, CABINETS, SWITCHBOARDS, ETC., AND NEUTRAL CONDUCTORS MUST BE PERMANENTLY AND EFFECTIVELY GROUNDED BY MEANS OF APPROVED GROUND CLAMPS IN ACCORDANCE WITH THE ELECTRICAL SAFETY ORDERS OF THE DEPARTMENT OF INDUSTRIAL RELATIONS.

- B. THIS CONTRACTOR SHALL EXERCISE EVERY PRECAUTION TO OBTAIN GOOD CONTACTS AT ALL PANEL BOXES, PULL BOXES, ETC. WHERE IT IS NOT POSSIBLE TO OBTAIN GOOD CONTACT, THE CONDUITS SHALL BE BONDED AROUND THE BOXES WITH A #6 B&S GAUGE, RUBBER COVERED DOUBLE BRAIDED WIRE WITH APPROVED GROUND CLAMPS.
- C. ALL EQUIPMENT CASES, MOTOR FRAMES, ETC., SHALL BE COMPLETELY GROUNDED TO SATISFY THE REQUIREMENTS OF THE ELECTRICAL SAFETY ORDERS.

PART 3: EXECUTION

3-01 WORK ASSOCIATED WITH OTHER CONTRACTORS:

- A. IN PREPARING THE ELECTRICAL BID, THE ELECTRICAL CONTRACTOR SHALL STUDY THE MECHANICAL PLANS AND SPECIFICATIONS IN PARTICULAR AND THE PLANS FOR THE WHOLE CONTRACT IN GENERAL IN ORDER TO DETERMINE THE SCOPE OF THE ELECTRICAL WORK INVOLVED IN CONNECTION WITH THE OTHER TRADES CONCERNED WITH THE CONTRACT. THE BID OF THE ELECTRICAL CONTRACTOR SHALL TAKE INTO ACCOUNT ALL THE ELECTRICAL WORK ASSOCIATED WITH THE GENERAL CONTRACT AND NO EXTRA WILL BE SUBSEQUENT ALLOWED FOR THE FAILURE OF THE ELECTRICAL CONTRACTOR TO ANTICIPATE THESE REQUIREMENTS.
- B. ALL ELECTRICAL LINE AND LOW VOLTAGE CONDUIT WIRING BY ELECTRICAL CONTRACTOR. ALL LINE VOLTAGE WIRING EXTERNAL OF CONTROL EQUIPMENT SHALL BE INSTALLED UNDER ELECTRICAL WORK. DISCONNECT SWITCHES SHALL BE PROVIDED AT ALL MOTOR LOCATIONS NOT IN SIGHT OF PANELBOARD TO DISCONNECTS OR OVER 50 FEET AWAY FROM SAME.
- C. THE ELECTRICAL WORK DONE IN CONJUNCTION WITH THE MECHANICAL AND OTHER TRADES SHALL BE DONE IN ACCORDANCE WITH DIAGRAMS AND INSTRUCTIONS OF THE EQUIPMENT MANUFACTURERS, WHICH SHALL BE FURNISHED, TO ELECTRICAL CONTRACTOR BY THE OTHER TRADE INVOLVED. ELECTRICAL CONTRACTOR IS NOT EXPECTED TO INTERPRET SUCH DIAGRAMS BUT SHALL REFER ANY DISCREPANCIES TO THE MECHANICAL CONTROL INVOLVED FOR INTERPRETATION.
- D. THE ELECTRICAL CONTRACTOR SHALL FURNISH DISCONNECT SWITCHES FOR MOTORS WHERE REQUIRED BY APPLICABLE CODE IF THEY ARE NOT FURNISHED BY OTHERS.
- E. THERMAL OVERLOAD SWITCHES (G.E.-CR. 1061 OR EQUAL) SHALL BE FURNISHED FOR ALL FRACTIONAL HORSEPOWER MOTORS WHERE SUCH PROTECTION IS NOT INCLUDED AS PART OF ANOTHER CONTRACT.
- F. ALL MOTOR AND CONTROL LOCATIONS SHOWN ON THE PLANS AND APPROXIMATE ONLY AND THE ELECTRICAL CONTRACTOR SHALL VERIFY THE EXACT LOCATIONS WHICH THE MECHANICAL CONTRACTOR IS CONNECTED WITH.
- G. ALL WIRE SHALL BE #12 AWG IN CONDUIT UNLESS OTHERWISE NOTED

3-02 EXCAVATING AND BACKFILL:

- A. THE ELECTRICAL CONTRACTOR SHALL DO ALL EXCAVATING AND BACKFILLING IN CONNECTION WITH ELECTRICAL WORK. BACKFILLING SHALL BE DONE IN LAYERS OF APPROXIMATE 12-INCH WATER TAMPED FOR EACH LAYER. ALL DISTURBED

- SURFACES SHALL BE RESTORED TO CONDITION, PROPERLY TAMPED TO ELIMINATE ANY SETTLEMENT. SEE SECTION 0223 BACKFILLING.

3-03 DRAWING OF RECORD:

- A. ARCHITECT WILL FURNISH THE ELECTRICAL CONTRACTOR, AT COST, WITH REPRODUCIBLE TRACINGS OF ELECTRICAL DRAWINGS INCLUDED IN THIS CONTRACT. THE ELECTRICAL CONTRACTOR SHALL LEGIBLY INDICATE EXACTLY THEREON, THE LOCATIONS OF ELECTRICAL FIXTURES, CONDUIT RUNS, NUMBER AND SIZE BOXES OUTLETS, ETC., INSTALLED BY HIM OR HER.
- B. THESE DRAWINGS SHALL ALSO SERVE AS WORK PROGRESS SHEETS AND THE CONTRACTOR SHALL MAKE NEAT AND LEGIBLE NOTATIONS THEREON DAILY AS THE WORK PROCEEDS.
- C. THESE SHALL BE AVAILABLE AT ALL TIMES FOR INSPECTION AND SHALL BE KEPT AT A LOCATION DESIGNATED BY THE ARCHITECT.
- D. AT COMPLETION OF THE WORK THESE RECORD DRAWINGS SHALL BE SIGNED BY THE CONTRACTOR (WITH DATE) AND RETURNED TO THE OFFICE OF THE ARCHITECT.

3-04 IDENTIFICATION OF SWITCHES AND APPARATUS:

- A. ALL PANELBOARD CIRCUITS, EXTERNALLY OPERATED SWITCHES AND APPARATUS USED FOR THE OPERATION OF OR CONTROL OF CIRCUITS, APPLIANCES OR EQUIPMENT SHALL BE PROPERLY IDENTIFIED WITH BAKELITE NAMEPLATES 1" X 3". ALL SUCH NAMEPLATES BE SUBMITTED TO THE ARCHITECT BEFORE BEING SECURED ON THE APPARATUS. CARD HOLDERS IN ANY FORM ARE NOT ACCEPTABLE.

3-05 CLEANING AND LABELING:

- A. THIS CONTRACTOR SHALL THOROUGHLY CLEAN ALL RECEPTACLES, PANELBOARDS AND OTHER PARTS OF THE WORK, DELIVERING THE SAME IN PERFECT CONDITION. ALL CIRCUIT BREAKERS, SWITCHES, CIRCUITS AND PANELBOARDS LABELED WITH STENCIL OR OTHER APPROVED METHOD INDICATING THEIR EXACT FUNCTION.

3-06 COMPLETING WORK:

- A. AT COMPLETION OF HIS WORK, THIS CONTRACTOR SHALL REMOVE ALL WASTE MATERIALS AND DEVICES RESULTING FROM HIS WORK, LEAVING EVERYTHING IN A COMPLETE AND SATISFACTORY CONDITION. HE SHALL DELIVER ALL KEYS TO THE OWNERS REPRESENTATIVE. UP-TO-DATE RECORD DRAWINGS SHALL BE KEPT BY THIS CONTRACTOR AND DELIVERED TO THE OWNER ON REPRODUCIBLE SEPIAS AT THE END OF THE CONTRACT.

3-07 GUARANTEES:

- A. AS A CONDITION PRECEDENT TO THE ISSUANCE OF THE FINAL CERTIFICATE OF A COMPLETE PAYMENT, DELIVER TO THE ARCHITECT SPECIAL WRITTEN GUARANTEE IN EFFECT THAT SHOULD IT DEVELOP DEFECTIVE MATERIALS OR FAULTY WORKMANSHIP ANY SUCH FAILURE SHALL IMMEDIATELY BE MADE GOOD BY THIS CONTRACTOR AT HIS OWN EXPENSE.

END OF SECTION

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