

SECTION 16050 – BASIC MATERIALS AND METHODS

PART 1 – GENERAL

- 1.1 WORK INCLUDED
 - A. LABOR, MATERIAL, EQUIPMENT AND SERVICES NECESSARY TO CONSTRUCT AND INSTALL A COMPLETE ELECTRICAL SYSTEM AS SHOWN ON THE PLANS AND AS SPECIFIED HEREIN. ALL GENERAL CONDITIONS AND REQUIREMENTS OUTLINED ELSEWHERE IN THESE SPECIFICATIONS OR DRAWINGS SHALL BE APPLIED TO THIS ELECTRICAL SECTION.
 - B. MATERIALS AND EQUIPMENT SHALL BE FURNISHED AND INSTALLED IN SUPPORT OF ELECTRICAL WORK DESCRIBED IN THESE PLANS AND SPECIFICATIONS INCLUDING BUT NOT LIMITED TO, RACEWAYS, BOXES, ENCLOSURES, FEEDERS, BRANCH CIRCUITING, SWITCHES, TERMINAL CABINETS, SLEEVES, GUTTERS, PANELS, TRANSFORMERS, SWITCHGEAR, LIGHTING FIXTURES, CONTROLS, RELAYS, CONTACTORS, IN ORDER TO COMPLETE AND MAKE FULLY FUNCTIONAL THE SYSTEMS DESCRIBED.
 - C. COMPLETE FIRE SPRINKLER MONITORING SYSTEM AS SHOWN AND/OR REQUIRED BY THE (LOCAL AUTHORITY HAVING JURISDICTION, CALIFORNIA STATE FIRE MARSHALL) INCLUDING MONITORING EQUIPMENT AND WIRING FOR CENTRAL STATION CONNECTION. PROVIDE FIRE ALARM SYSTEM DESIGN AND SUBMIT FOR APPROVAL BY THE AHJ.
 - D. LIGHTING SYSTEMS, BOTH INTERIOR AND EXTERIOR AS SHOWN ON THE PLANS AND AS SPECIFIED HEREIN, INCLUDING CONTROLS, OCCUPANCY SENSORS, PHOTOCELL CONTROLS, LAMPS, DIMMERS, RACKS, DIMMING BALLASTS, SUPPORTS, FASTENERS, STRAPS, AND MISCELLANEOUS MOUNTING HARDWARE AND SUPPORT STRUCTURES FOR SUCH EQUIPMENT.
 - E. ELECTRICAL, TELEPHONE AND CATV UTILITY COMPANY SITE WORK AS REQUIRED BY THE SERVING COMPANIES. ALL UTILITY COMPANY CONDUITS, RACEWAYS, TRENCHING, BACKFILLING, UTILITY VAULTS, EQUIPMENT PADS AND SUBSTRUCTURES SHALL MEET BOTH THE RESPECTIVE UTILITY COMPANIES REQUIREMENTS AS WELL AS THOSE OF THE AUTHORITY HAVING JURISDICTION, WHICHEVER IS MORE RESTRICTIVE. IN NO CASE SHALL WORK BE COMPLETED AND COVERED WITHOUT THE WRITTEN APPROVAL OF THE SERVING UTILITY COMPANIES BOTH ON AND OFF SITE.
 - F. DUCT BANKS AND RACEWAYS FOR ALL POWER AND COMMUNICATIONS SYSTEMS AS SHOWN AND/OR REQUIRED. DUCT BANKS SHALL INCLUDE ALL TRENCHING, RACKING, CONDUIT, CONCRETE, BACKFILL, BOXES, PADS, SUBSTRUCTURES REQUIRED FOR A FULLY DEVELOPED AND USEABLE PATHWAY FOR CABLES, CONDUCTORS, AS SHOWN ON SITE, ETC.
 - G. HVAC AND PLUMBING ELECTRICAL: CONDUIT, CONDUCTORS AND TERMINATIONS FOR ALL LINE VOLTAGE POWER, LINE VOLTAGE CONTROLS AND FUSIBLE AND/OR NON-FUSIBLE SAFETY DISCONNECT SWITCHES FOR HVAC EQUIPMENT, INCLUDING BUT NOT LIMITED TO AIR CONDITIONERS, FURNACES, FANS, HEAT PUMPS, COOLING TOWERS, SYSTEM PUMPS, CONDENSING UNITS. PROVIDE PROTECTIVE EQUIPMENT UNLESS OTHERWISE NOTED, INCLUDING PROTECTIVE DEVICES.
 - H. PLUMBING ELECTRICAL: CONDUIT, CONDUCTORS AND TERMINATIONS FOR PLUMBING EQUIPMENT WITH POWER REQUIREMENTS INCLUDING NECESSARY FUSIBLE AND/OR NON-FUSIBLE SAFETY DISCONNECT DEVICES. PROVIDE MOTOR STARTERS WHERE REQUIRED UNLESS PROVIDED BY MECHANICAL SPECIFICATION.
 - I. POWER AND LIGHTING DISTRIBUTION: FURNISH AND INSTALL POWER AND LIGHTING DISTRIBUTION SYSTEMS INCLUDING BUT NOT LIMITED TO PANELS, FEEDERS, TRANSFORMERS, BRANCH CIRCUITS, DEVICES, FIXTURES, DISCONNECT SWITCHES, CONTACTORS, CONTROLS, ETC. FOR A COMPLETE WORKING SYSTEM.
 - J. DATA SYSTEMS INFRASTRUCTURE INCLUDING ALL BOXES, RACEWAYS, DEDICATED BRANCH CIRCUITS, SLEEVES AND PENETRATIONS, ETC. AS DESCRIBED AND AS SHOWN IN PLANS AND/OR REQUIRED FOR A COMPLETE AND OPERATING SYSTEM.
 - K. ALLOCATION OF TIME TO ADEQUATELY TRAIN THE OWNER ON THE USE AND OPERATION OF ALL SYSTEMS INSTALLED WITHIN THE FACILITY OR ON THE PROPERTY. MINIMUM TWO WEEK ADVANCE NOTICE SHALL BE COORDINATED WITH THE OWNER AND HIS REPRESENTATIVES.
- 1.2 RELATED SECTIONS UNDER OTHER DIVISIONS
 - A. MECHANICAL WIRING: CONTROL CIRCUIT WIRING, ENERGY MANAGEMENT CONTROLS AND INTERLOCKS FOR MECHANICAL EQUIPMENT SHALL BE INSTALLED BY MECHANICAL CONTRACTOR.
 - B. PAINTING OF ELECTRICAL EQUIPMENT WHERE EXPOSED AND REQUIRED BY THE ARCHITECT TO BE PAINTED AS DESCRIBED ELSEWHERE IN THE SPECIFICATION.
 - C. IRRIGATION SYSTEM: PROVIDE ALL LINE VOLTAGE (50 VOLTS OR ABOVE) CONNECTIONS TO IRRIGATION SYSTEM EQUIPMENT, TIME CLOCKS AND OR POWERED SATELLITE CONTROLS. COORDINATE LOCATIONS OF THIS WORK WITH THE LANDSCAPE CONTRACTOR.
 - D. HVAC CONTROL RACEWAY: RACEWAYS, BOXES, AND CONTROL WIRING FOR THERMOSTATS, TEMPERATURE SENSORS AND CONTROL COMPONENTS SPECIFIED WITHIN THE MECHANICAL SPECIFICATIONS, SHALL BE FURNISHED AND INSTALLED AS REQUIRED BY DIVISION 15 AND INSTALLED IN ACCORDANCE WITH THE MINIMUM WIRING METHODS ALLOWED FOR BRANCH CIRCUIT WIRING IN DIVISION 16.
- 1.3 SYSTEM DESCRIPTION
 - A. THE ELECTRICAL PLANS INDICATE THE GENERAL LAYOUT AND ARRANGEMENT; THE ARCHITECTURAL DRAWINGS AND FIELD CONDITIONS SHALL DETERMINE EXACT LOCATIONS. FIELD VERIFY ALL CONDITIONS AND MODIFY AS REQUIRED TO SATISFY DESIGN REQUIREMENTS AS WELL AS CODE MINIMUMS. MAINTAIN ALL REQUIRED WORKING CLEARANCES AS DESCRIBED IN CEC ARTICLE 110 AS WELL AS OTHER APPLICABLE ARTICLES.
 - B. DISCREPANCIES SHALL BE BROUGHT IMMEDIATELY TO THE ATTENTION OF THE ARCHITECT FOR CLARIFICATION. THE ARCHITECT SHALL APPROVE ANY CHANGES. PRIOR TO ROUGH-IN, REFER TO ARCHITECTURAL PLANS THAT SHALL TAKE PRECEDENCE OVER ELECTRICAL PLANS WITH RESPECT TO LOCATIONS.
 - C. VERIFY ALL POWER AND COMMUNICATIONS UTILITY COMPANY REQUIREMENTS PRIOR TO COMMENCEMENT OF UTILITY WORK. MAKE PROPER ADJUSTMENTS TO THE CONSTRUCTION TO SATISFY THE SERVING UTILITY REQUIREMENTS IF THEY DIFFER FROM THE CONSTRUCTION DOCUMENTS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT EACH UTILITY COMPANY FOR OBTAINING FINALIZED UTILITY DESIGN DRAWINGS AND/OR APPROVAL, AND FOR SCHEDULING INSPECTION OF UTILITY INFRASTRUCTURE INSTALLATIONS.
 - D. CHARGES IMPOSED BY THE ELECTRIC AND COMMUNICATIONS UTILITY COMPANIES SHALL BE PAID BY OWNER DIRECTLY TO UTILITY COMPANIES.
- 1.4 SUBMITTALS AND SHOP DRAWINGS
 - A. BEFORE CONSTRUCTION, SUBMIT IN ACCORDANCE WITH THE GENERAL CONDITIONS OF THIS SPECIFICATION: A COMPLETE LIST OF ALL MATERIALS PROPOSED TO BE FURNISHED AND INSTALLED UNDER THIS SECTION.
 - B. MANUFACTURERS' SPECIFICATIONS, CATALOG CUTS AND SHOP DRAWINGS AS REQUIRED TO DEMONSTRATE COMPLIANCE WITH THE SPECIFICATIONS. IDENTIFY SPECIFIC INTENDED USE FOR EACH COMPONENT WHERE SUBMITTAL MAY BE AMBIGUOUS. SUBMIT ENTIRE BOUND SUBMITTAL AT ONE TIME; PARTIAL SUBMITTALS WILL NOT BE ACCEPTED. AT A MINIMUM, SUBMITTALS WILL BE REQUIRED FOR THE FOLLOWING:
 - 1. UTILITY SERVICE SITE WORK EQUIPMENT INCLUDING DUCTS, CONDUITS, FITTINGS, CONCRETE MANHOLES, CONCRETE AND FIBERGLASS PULL, MANHOLE, BOXES, VAULTS, TRENCH RACKS, ACCESSORIES, ETC.
 - 2. DISTRIBUTION EQUIPMENT INCLUDING METERING EQUIPMENT, PANELS AND BREAKERS, MOTOR CONTROLS, GROUNDING, TRANSIENT VOLTAGE SURGE SUPPRESSORS, ETC.
 - 3. ELECTRICAL EQUIPMENT INCLUDING DISCONNECTS, FUSES, RACEWAYS, STRAPS AND RACKS, FITTINGS, CONDUCTORS, BOXES, GUTTERS, DEVICES, PLATES, ETC.
 - 4. LIGHTING EQUIPMENT INCLUDING FIXTURES, BALLASTS, LAMPS, MOUNTING ACCESSORIES, COLOR CHARTS (WHERE REQUIRED), ETC.
 - 5. LIGHTING CONTROL EQUIPMENT INCLUDING DIMMERS, SWITCHES, ACCESSORIES, OCCUPANCY SENSING EQUIPMENT, TIME CLOCKS, CONTACTORS, PHOTOCELLS, ETC.
 - 6. COMPLETE SYSTEM COMPONENT SUBMITTALS AND SHOP DRAWINGS FOR:
 - A. FIRE SPRINKLER MONITORING SYSTEM

- 7. CONDUIT INCLUDING ALL FITTINGS, ETC.
- 8. WIRING AND CABLE, TERMINATIONS, ETC.
- 9. FIRE RATING PENETRATION MATERIALS, DETAILS, ETC.
- C. THE INTENT OF THESE SPECIFICATIONS IS TO ESTABLISH A STANDARD OF QUALITY FOR MATERIALS AND EQUIPMENT. THEREFORE, SOME ITEMS ARE IDENTIFIED BY MANUFACTURER OR TRADE NAME DESIGNATION. SUBSTITUTIONS SHALL BE SUBJECT TO THE ARCHITECT'S APPROVAL. SAMPLES OF THE PROPOSED AND SUBSTITUTE MATERIALS MAY BE REQUIRED FOR INSPECTION PRIOR TO APPROVAL. COSTS, IF ANY, FOR EVALUATION OF SUBSTITUTIONS SHALL BE THE CONTRACTOR'S RESPONSIBILITY. THE DECISION OF THE ARCHITECT SHALL BE FINAL. WHERE THE SUBSTITUTION WILL AFFECT OTHER TRADES, COORDINATE ALL CHANGES WITH THOSE TRADES CONCERNED AND PAY ANY ADDITIONAL COSTS INCURRED BY THEM AS A RESULT OF THIS SUBSTITUTION. APPROVAL OF SUBSTITUTIONS SHALL NOT RELIEVE THE CONTRACTOR FROM PROVIDING AN OPERATIONAL SYSTEM IN ACCORDANCE WITH ALL APPLICABLE CODES AND ORDINANCES.
- 1.5 DELIVERY, STORAGE AND HANDLING
 - A. STORAGE OF EQUIPMENT FOR THE JOB IS THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR AND SHALL BE SCHEDULED FOR DELIVERY TO THE SITE, AS THE EQUIPMENT IS REQUIRED. DAMAGE TO THE EQUIPMENT DELIVERED TO THE SITE OR IN TRANSPORT TO THE JOB SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR.

PART 2 – PRODUCTS

- 2.1 MATERIALS
 - A. MATERIALS SHALL BE NEW AND BEAR THE LABEL OF OR BE LISTED BY A NATIONALLY RECOGNIZED TESTING LABORATORY. THE QUALITY AND SUITABILITY OF ALL MATERIALS SHALL CONFORM TO THE STANDARDS AND PRACTICES OF THIS TRADE.
 - B. SUPPLIED MATERIALS SHALL BE OF A CURRENT MANUFACTURED PRODUCT LINE. DISCONTINUED PRODUCTS ARE NOT ACCEPTABLE. WHERE PRODUCTS ARE IDENTIFIED ON THE CONTRACT DOCUMENTS BY PART NUMBER, SUPPLY THE CURRENT PRODUCT MODEL OR SERIAL NUMBER WHICH MEETS THE SPECIFICATION AND INTENDED USE OF THE SPECIFIED COMPONENT.
- 2.2 SUPPORTING DEVICES
 - A. HANGERS: KINDORF B-905-2A CHANNEL, H-119-D WASHER, C105 STRAP, 3/8-INCH ROD WITH CEILING FLANGE.
 - B. CONCRETE INSERTS: KINDORF D-255, CAST IN CONCRETE FOR SUPPORT FASTENERS FOR LOADS UP TO 800 LBS.
 - C. PIPE STRAPS: TWO-HOLE GALVANIZED OR MALLEABLE IRON.
 - D. LUMINAIRE CHAIN: CAMPBELL CHAIN 75031, 90-LB. TEST WITH STEEL HOOKS.

PART 3 – EXECUTION

- 3.1 INSTALLATION
 - A. PROFESSIONALISM AND APPEARANCE OF INSTALLATIONS SHALL BE IN ACCORDANCE WITH ACCEPTED PRACTICES OF THIS TRADE. INSTALLATION METHODS SHALL CONFORM TO MANUFACTURERS' SPECIFICATIONS AND RECOMMENDATIONS. THE CONTRACTOR SHALL MAN THE JOB WITH QUALIFIED JOURNEMEN AND HELPERS IN THIS TRADE FOR THE DURATION OF THE JOB. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COMMUNICATE WITH AND KEEP THE JOB SUPERINTENDENT APPRAISED OF CHANGES OR CLARIFICATIONS, ETC.
 - B. EMPLOYMENT OF ANY PERSON ON ANY JOB IN THE CAPACITY OF AN ELECTRICIAN IS NOT PERMITTED UNLESS SUCH PERSON HAS QUALIFIED FOR AND HOLDS A VALID JOURNEYMAN CERTIFICATE, POCKET CARD OR GENERAL JOURNEYMAN ELECTRICIAN CERTIFICATE ISSUED BY THE STATE OF CALIFORNIA DIVISION OF APPRENTICESHIP STANDARDS EXCEPT, CONTRACTOR MAY EMPLOY ELECTRICAL HELPERS OR APPRENTICES ON ANY JOB OF ELECTRICAL CONSTRUCTION, NEW OR EXISTING, WHEN THE WORK OF SUCH HELPERS OR APPRENTICES IS PERFORMED UNDER THE DIRECT AND CONSTANT PERSONAL SUPERVISION OF A JOURNEYMAN ELECTRICIAN HOLDING A VALID POCKET CARD ACCEPTED BY THE STATE OF CALIFORNIA DIVISION OF APPRENTICESHIP STANDARDS.
 - 1. EACH POCKET CARD CARRYING JOURNEYMAN ELECTRICIAN WILL BE PERMITTED TO BE RESPONSIBLE FOR THE QUALITY OF WORKMANSHIP FOR A MAXIMUM OF ONE (1) FULLER OR APPRENTICE DURING ANY SAME TIME PERIOD, PROVIDED THE NATURE OF WORK IS SUCH THAT GOOD SUPERVISION CAN BE MAINTAINED AND THE QUALITY OF WORKMANSHIP IS THE BEST, AS EXPECTED BY OWNER AND IMPLIED BY THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE.
 - 2. BEFORE EACH JOURNEYMAN ELECTRICIAN COMMENCES WORK, DELIVER TO OWNER AT THE PROJECT SITE, A PHOTOCOY OF THE JOURNEYMAN'S VALID POCKET CARD.
 - C. MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS' SPECIFICATION AND RECOMMENDATIONS. THEY MUST CONFORM TO THE APPROVAL AHJ ADOPTED CODES AND STANDARDS, BUT NOT LESS THAN THE 2007 CEC AND ALL APPLICABLE CODES AND STANDARDS, INCLUDING BUT NOT NECESSARILY LIMITED TO CALIFORNIA ELECTRICAL CODE TITLE 24, NFPA, NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION, ANS, IEC, CEC, AND ANY OTHER ADOPTED ORDINANCES OF APPLICABLE AGENCIES HAVING JURISDICTION. REFER TO GENERAL CONDITIONS OF SPECIFICATIONS.
 - D. ELECTRICAL CONTRACTOR SHALL LAY WORK OUT IN ADVANCE IN ORDER TO AVOID UNNECESSARY CUTTING, CHASING, AND DRILLING OF FLOORS, WALLS, CEILINGS AND OTHER SURFACES. WORK OF THIS NATURE SHALL BE CAREFULLY DONE SO AS NOT TO DAMAGE WORK ALREADY PERFORMED BY OTHER TRADES. ANY DAMAGE WHICH RESULTS MUST BE PROPERLY REPAIRED AT NO EXTRA COST TO THE OWNER. SUCH ALTERATIONS SHALL NOT DEPRECIATE THE INTEGRITY OF THE STRUCTURE. APPROVAL FOR CUTS OR PENETRATIONS IN STRUCTURAL MEMBERS SHALL BE BY THE ARCHITECT.
 - E. SUPPORTING DEVICES:
 - 1. VERIFY MOUNTING HEIGHT OF ALL LUMINAIRES OR ITEMS PRIOR TO INSTALLATION WHEN HEIGHTS ARE NOT DETAILED.
 - 2. INSTALL VERTICAL SUPPORT MEMBERS FOR EQUIPMENT AND LUMINAIRES, STRAIGHT AND PARALLEL TO BUILDING WALLS. PROVIDE INDEPENDENT SUPPORTS TO STRUCTURAL MEMBER FOR ELECTRICAL LUMINAIRES, MATERIALS, OR EQUIPMENT INSTALLED IN OR ON CEILING, WALLS OR IN VOID SPACES OR OVER FURRED OR SUSPENDED CEILINGS.
 - 3. DO NOT USE OTHER TRADE'S FASTENING DEVICES AS SUPPORTING MEANS FOR ELECTRICAL EQUIPMENT, MATERIALS OR LUMINAIRES. DO NOT USE SUPPORTS OR FASTENING DEVICES TO SUPPORT OTHER THAN ONE PARTICULAR ITEM.
 - 4. SUPPORT CONDUITS WITHIN 18-INCHES OF OUTLETS, BOXES, PANELS, CABINETS AND DEFLECTIONS. MAXIMUM DISTANCE BETWEEN SUPPORTS NOT TO EXCEED 8-FOOT SPACING.
 - 5. SECURELY SUSPEND ALL JUNCTION BOXES, PULL BOXES OR OTHER CONDUIT TERMINATING HOUSINGS LOCATED ABOVE SUSPENDED CEILING FROM THE FLOOR ABOVE OR ROOF STRUCTURE TO PREVENT SAGGING AND SWAYING.
 - 6. PROVIDE SEISMIC BRACING PER UBC REQUIREMENTS FOR THIS BUILDING LOCATION.
 - F. SUPPORTING DEVICES: SAFETY FACTOR OF 4 REQUIRED FOR EVERY FASTENING DEVICE OR SUPPORT FOR ELECTRICAL EQUIPMENT INSTALLED. SUPPORT TO WITHSTAND FOUR TIMES WEIGHT OF EQUIPMENT IT SUPPORTS. BRACING TO COMPLY WITH SEISMIC ZONE 4 REQUIREMENTS.
 - G. COORDINATE WORK WITH OTHER TRADES AS REQUIRED TO ELIMINATE ANY DELAYS DURING CONSTRUCTION. COORDINATE CHANGES WITH OTHER PRIME CONTRACTORS TO AVOID CONSTRUCTION CONFLICTS.
 - H. ENGINEER'S FIELD OBSERVATION: SITE VISITS DURING CONSTRUCTION FOR FIELD OBSERVATIONS AND REPORTS WILL BE CONDUCTED BY ELECTRICAL ENGINEER WHEN DIRECTED BY ITEMS AND NEEDS. ALL FIELD OBSERVATIONS AND REPORTS SHALL BE SUBMITTED TO THE ARCHITECT FOR FORWARDING TO THE CONTRACTOR. A WRITTEN RESPONSE TO ALL ITEMS SHALL BE SUBMITTED FOR OWNER'S REVIEW ONCE COMPLETE. WHEN ELECTRICAL ENGINEERING REPRESENTATIVE PERFORMS A FIELD OBSERVATION, THE ELECTRICAL CONTRACTOR SHALL BE PRESENT AND AVAILABLE TO REMOVE EQUIPMENT COVERS AS NEEDED.
 - I. DRAWINGS OF RECORD: PROVIDE A FULL AND ACCURATE SET OF FIELD RECORD DRAWINGS MARKED UP IN A NEAT AND UNDERSTANDABLE MANNER SUBMITTED TO THE OWNER REPRESENTATIVE, CONSTRUCTION MANAGER, OR ARCHITECT UPON COMPLETION OF THE WORK AND PRIOR TO ISSUANCE OF A CERTIFICATE OF COMPLETION. THE DRAWINGS SHALL DIMENSION ALL ELECTRICAL FACILITIES INCLUDING BUT NOT LIMITED TO UNDERGROUND CONDUIT, VAULTS, BOXES AS WELL AS CONDUIT ROUTING SCALED TO WITHIN 12" OF ACTUAL FIELD CONDITIONS AND SHALL BE KEPT UP TO DATE ON A DAILY BASIS REFLECTING CHANGES OR DEVIATIONS. ELECTRICAL FACILITIES SHALL BE ACCURATELY DRAWN ON THE PLAN TO SCALE. REFER TO THE GENERAL CONDITIONS OF THESE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS. RECORD DRAWINGS SHALL BE REQUIRED TO IDENTIFY BOTH HORIZONTAL AND VERTICAL DIMENSIONS TO VISIBLE AND FIXED POINTS SUCH AS CONCRETE, ASPHALT, BUILDINGS, SIDEWALKS, ETC.
- 1. IDENTIFICATION: PROVIDE ENGRAVED LAMINATED PLASTIC NAMEPLATES FOR ALL, PANELBOARDS, FIRE ALARM TERMINAL CABINETS, TELEPHONE AND CABLE TELEVISION BACKBOARDS, CONTROL PANELS, TIME CLOCKS, CONTACTORS AND STRAPS AND SAFETY DISCONNECT SWITCHES ACCURATELY IDENTIFYING EACH DEVICE. LABELS SHALL BE ATTACHED TO THE EQUIPMENT BY MEANS OF SCREWS OR RIVETS. SELF-ADHERING LABELS WILL NOT BE ACCEPTABLE. REFER TO SECTION 16141, EQUIPMENT LABELS AND NAMEPLATES AND WARNING SIGNS.

- J. SAFETY: THE ELECTRICAL CONTRACTOR IS RESPONSIBLE TO MAINTAIN EQUIPMENT IN A SAFE AND RESPONSIBLE MANNER. KEEP DEAD FRONT EQUIPMENT IN PLACE WHILE EQUIPMENT IS ENERGIZED. CONDUCT CONSTRUCTION OPERATIONS IN A SAFE MANNER FOR EMPLOYEES AS WELL AS OTHER WORK PERSONS OR ANYONE VISITING THE JOB SITE. PROVIDE BARRIERS, TRENCH PLATES, FLAGS, TAPE, ETC. THE CONTRACTOR SHALL HOLD ALL PARTIES HARMLESS OF NEGLIGENCE SAFETY PRACTICES THAT MAY CAUSE INJURY TO OTHERS ON OR NEAR THE JOB SITE.
- K. GUARANTEES: EQUIPMENT AND LABOR SHALL BE GUARANTEED AND WARRANTED FREE OF DEFECTS, UNLESS OTHERWISE STATED TO BE MORE RESTRICTIVE, FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE BY THE OWNER. A WRITTEN WARRANTY SHALL BE PRESENTED TO THE ARCHITECT AT THE TIME OF COMPLETION PRIOR TO FINAL ACCEPTANCE. EQUIPMENT DEEMED TO BE DAMAGED, BROKEN OR FAILED SHOULD BE REPAIRED OR REPLACED AT NO ADDITIONAL COST TO THE OWNER. MATERIALS OR SYSTEM REQUIRING LONGER THAN A ONE-YEAR WARRANTY AS DESCRIBED HEREIN SHALL BE SEPARATELY WARRANTED IN SEPARATE LETTERS OF GUARANTEE STATING THE DURATION OF WARRANTY.
- L. OPERATING AND INSTALLATION MANUALS: PROVIDE TWO COPIES EACH OF MANUALS, OPERATING AND INSTALLATION INSTRUCTIONS FOR EQUIPMENT INDICATED IN SUBMITTAL PACKAGES. INSTRUCT THE OWNER'S REPRESENTATIVE AS TO THE OPERATION AND LOCATION OF EQUIPMENT NECESSARY TO ALLOW THEM TO OPERATE THE FACILITY UPON FINAL ACCEPTANCE. THIS INSTRUCTION PERIOD SHALL BE PREARRANGED WITH THE OWNER'S REPRESENTATIVE PRIOR TO OCCUPANCY OF THE FACILITY AND THE WEEKS PRIOR TO TRAINING SCHEDULED.

END OF SECTION 16050

SECTION 16110 – RACEWAYS

PART 1 – GENERAL

- 1.1 WORK INCLUDED
 - A. INSTALLATION OF ALL WIRE, CABLE, CONDUCTOR, PULL ROPES, FIBER OPTIC CABLE RACEWAY, CONDUIT, INNERDUCT, CABLE SLEEVE AND DUCT AS DESCRIBED ON THE PLANS AND/OR AS SPECIFIED HERE-IN. THIS SCOPE SHALL INCLUDE PATHWAYS TO BE INSTALLED UNDERGROUND ON SITE AND OFFSITE, UNDERSLAB, ABOVE GRADE, BOTH CONCEALED AND EXPOSED, OVERHEAD CONCEALED AND EXPOSED AS APPROPRIATELY APPLIED. RACEWAYS SHALL BE INSTALLED IN ACCORDANCE WITH THEIR INTENDED AND ALLOWED USES AND AS SPECIFIED HERE-IN WHICHEVER IS MORE RESTRICTIVE. SIZE AND CAPACITY OF ALL RACEWAY SHALL BE AS SPECIFIED HERE-IN OR AS DEPICED ON THE DRAWINGS, BUT SHALL NOT BE LESS THAN THAT REQUIRED BY CODE. LARGER RACEWAY SIZES MAY BE SPECIFIED THAN CODE WOULD PERMIT. THE SPECIFICATIONS SHALL GOVERN.
 - B. LISTED PRODUCTS FOR TERMINATION, COUPLING, EXTENDING, BENCHING SUPPORTS OF RACEWAYS SHALL BE USED.
 - C. RACEWAYS DESCRIBED BY THIS SECTION SHALL INCLUDE, BUT NOT BE LIMITED TO, POWER FOR SITE UTILITIES AND LIGHTING, SITE AND BUILDING COMMUNICATIONS, CONTROLS, FIRE ALARM, DATA SYSTEM, POWER DISTRIBUTION, LIGHTING, LIGHTING CONTROLS, VIDEO, CATV, VOICE COMMUNICATIONS, HVAC AND OTHER BUILDING LOW VOLTAGE/COMMUNICATIONS SYSTEMS CONTROLS AS MAY BE REQUIRED. RACEWAYS AND DUCT PATHS REQUIRED FOR UTILITY COMPANIES SHALL BE INSTALLED PER PLANS UNLESS UTILITY COMPANY REQUIREMENTS ARE MORE RESTRICTIVE AT WHICH TIME THOSE REQUIREMENTS SHALL TAKE PRECEDENCE.
 - D. PROTECTION OF AND CLEANLINESS OF PATHWAYS AND RACEWAYS MUST BE ASSURED DURING THE CONSTRUCTION PROCESS IN ORDER TO ELIMINATE THE POSSIBILITY OF DEBRIS ENTERING THE CONDUIT, DUCT, PATHWAY RESULTING IN DECREASED WIRE CAPACITY AND POTENTIAL DAMAGE TO INSTALLED CONDUCTORS AND CABLES.
 - E. PATHWAYS ARE SHOWN IN A DIAGRAMMATIC WAY AND ARE GENERALLY ACCURATE AS TO ROUTING, HOWEVER, IT IS THE CONTRACTOR'S RESPONSIBILITY AS A MEANS AND METHODS PROCESS TO COORDINATE WITH ALL OTHER TRADES THAT REQUIRE SPACE WITHIN A BUILDING. THE CONTRACTOR SHALL OBTAIN APPROVAL FOR INSTALLATION OF RACEWAYS ROUTING THROUGH STRUCTURAL FOOTINGS, RETAINING WALLS, COLUMNS, BEAMS, PERLINS, GRADE BEAMS, ETC.
 - F. IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSURE THAT ALL RACEWAY AND PATHWAY SYSTEMS PENETRATE FIRE ASSEMBLIES AND SOUND RATED ASSEMBLIES IN AN APPROVED MANNER USING THE APPROPRIATE AND LISTED PRODUCTS FOR THE PURPOSE.
 - G. TRENCHING AND BACKFILLING FOR ALL UNDERGROUND CONDUIT SYSTEMS INSTALLED BY THE ELECTRICAL CONTRACTOR SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. CONDUITS SHALL HAVE MINIMUM COVER REQUIREMENT OF 36" BELOW FINISH GRADE WITH THE EXCEPTION OF SITE LIGHTING CONDUITS WHICH MAY BE 24" BELOW FINISH GRADE MINIMUM. MORE STRINGENT DEPTH REQUIREMENTS MAY BE IMPOSED BY THE LOCAL AGENCY AND UTILITY COMPANY AND SHALL BE ADHERED TO, AND / OR THIS SPECIFICATION OR AS DETAILED ON THE PLANS. JOINT TRENCHING MAY BE UTILIZED WHERE PRACTICABLE AND WHERE PERMITTED BY THIS SPECIFICATION. CONCRETE, NATIVE MATERIAL AND SAND SHALL BE USED AS BACKFILL MATERIAL AND SHALL BE COMPACTED IN ACCORDANCE WITH AND COORDINATED WITH THE GRADING AND SITE PREPARATION REQUIREMENTS. CONDUITS SHALL REST IN A MINIMUM OF 4" BED OF SAND PRIOR TO BACKFILL AND COMPACTION. LOCATIONS OF EXISTING UNDERGROUND (UG) UTILITY SYSTEMS SHALL BE DETERMINED BY CALLING UNDERGROUND SERVICE ALERT (USA) AT LEAST 48 HOURS PRIOR TO ANY EXCAVATION. ALSO REFER TO SECTION 16402, UNDERGROUND ELECTRICAL CONSTRUCTION AND SERVICE.
 - H. MINIMUM CONDUIT SIZE SHALL BE 1/2 INCH EXCEPT IF PLAN SHOWS OR CODE REQUIRES LARGER SIZE. EXCEPTION: USE MINIMUM 3/4" FOR UNDERSLAB AND BELOW GRADE APPLICATIONS OUTSIDE OF BUILDING EXTERIOR WALLS.
 - I. ALL ELECTRICAL, CONTROL, COMMUNICATIONS SYSTEMS SHALL BE INSTALLED IN METALLIC CONDUIT SYSTEM. THIS SHALL INCLUDE BUT NOT BE LIMITED TO ALL SYSTEMS DESCRIBED IN SECTION C ABOVE EXCEPT FOR VOICE AND DATA SYSTEMS WHICH SHALL BE INSTALLED AS DESCRIBED ON THESE PLANS AND AS SPECIFIED HERE-IN BUT SHALL NOT BE LESS THAN THE RECOMMENDATIONS OF EIA/TIA STANDARDS.
 - J. ALL LINE VOLTAGE WIRING WITHIN THE BUILDING SHALL BE INSTALLED IN METALLIC CONDUIT.
 - K. ALL CONDUIT, CONCRETE PADS, UNDERGROUND CONCRETE OR FIBERGLASS SUBSTRUCTURES SHALL BE FURNISHED AND INSTALLED WITH THE APPROVED MATERIALS AND TYPE FOR THE APPLICATION. PROVIDE PROPER TRAFFIC CONTROL DURING CONSTRUCTION AS WELL AS BARRIERS AND PROTECTION OF ALL EXCAVATIONS AND TRENCHING.
 - L. EMPTY OR FUTURE CONDUITS SHALL BE PROPERLY PLUGGED WITH PLASTIC CAPS OR INSERTS WITH A 3/8 INCH POLYETHYLENE PULL ROPE. PLASTIC OR "DUCT" TAPE WILL NOT BE ACCEPTABLE.
 - M. EXTERIOR INSTALLATIONS: AFTER CONDUCTORS ARE INSTALLED, SEAL CONDUIT ENDS TO PREVENT ENTRANCE OF FOREIGN MATERIAL USING PLIABLE DUCT SEAL, CAPS OR WATERPROOF EXPANDING FOAM.
 - N. UNDERGROUND CONDUITS ENTERING BUILDING SHALL HAVE THE OPEN END OF CONDUIT WITHIN BUILDING ABOVE THE ELEVATION OF THE CONDUIT OUTSIDE THE BUILDING SUCH THAT WATER CANNOT ENTER BUILDING THROUGH CONDUIT. IF SUCH A CONDITION EXISTS, A PULL BOX OUTSIDE OF BUILDING FOOTPRINT SHALL BE INSTALLED AND CONDUIT ROUTED BEFORE CONDUIT ENTERS BUILDING THROUGH TOP OF PULL BOX. IS BELOW FINISH FLOOR OF BUILDING AND MOISTURE MAY EXIT BOX BEFORE ENTERING BUILDING.
 - O. NO SINGLE CONDUIT RUN OF ANY TYPE SHALL EXCEED 300 DEGREES OF RADIUS BEND FROM TERMINATION BOX TO TERMINATION BOX.
 - P. SEPARATE RACEWAY SYSTEM: PROVIDE A SEPARATE DEDICATED RACEWAY SYSTEM FOR EACH SYSTEM INSTALLED, DO NOT COMBINE DIFFERENT SYSTEMS INTO A RACEWAY OR CABLE TRAY SYSTEM, UNLESS OTHERWISE NOTED OR ALLOWED.
 - Q. SPARE, FUTURE CONDUITS: CONDUITS LABELED CONDUIT ONLY, SPARE, OR FOR FUTURE USE, SHALL BE PROVIDED WITH A PULLROPE, CAPPED AT EACH END, LABELED AS SPARE WITH DESTINATION MARKED, AND TURNED OVER TO THE OWNER IN AN UNUSED STATE. CONTRACTOR SHALL NOT UTILIZE THESE CONDUITS FOR THE INSTALLATION OF CABLING OR CONDUCTORS AS PART OF THIS SCOPE OF WORK. CONTRACTOR TO VERIFY AND INSTALL AT NO ADDITIONAL COST TO THE OWNER, ADDITIONAL CONDUITS AS REQUIRED FOR THE INSTALLATION OF THE SYSTEMS BEING INSTALLED.
- PART 2 – PRODUCTS
 - 2.1 MATERIALS
 - A. HEAVY WALL RIGID NON-METALLIC CONDUIT, SHALL BE PVC SCHEDULE 40 MANUFACTURED IN ACCORDANCE WITH NEMA STANDARD TC-2, UL-651 AND WC 1094A SPECIFICATIONS. APPROVED MANUFACTURERS ARE CARLON, CERTAINTED, R&G SLOAN E OR EQUAL.
 - B. EXTRA HEAVY WALL NON-METALLIC CONDUIT, SHALL BE PVC SCHEDULE 80 MANUFACTURED IN ACCORDANCE WITH NEMA STANDARD TC-2, UL-651 AND WC 1094A SPECIFICATIONS. APPROVED MANUFACTURERS ARE CARLON, CERTAINTED, R&G SLOAN E OR EQUAL.

- C. GALVANIZED RIGID STEEL (GRS) CONDUIT SHALL BE HOT DIPPED GALVANIZED, ZINC COATED AND SHALL COMPLY WITH UNDERWRITERS LABORATORIES UL-6, ANSI SPECIFICATION C-80.1 AND FEDERAL SPECIFICATION WW-C-581E.
- D. ELECTRICAL METALLIC TUBING (EMT) SHALL BE ZINC COATED, WITH A PROTECTIVE COATING APPLIED TO THE INSIDE SURFACE AND SHALL COMPLY WITH UNDERWRITER LABORATORIES UL-797 ANSI SPECIFICATION C-80.3 AND FEDERAL SPECIFICATION WW-C-563A.
- E. ELECTRICAL NON-METALLIC TUBING (ENT), SHALL BE LISTED TO REQUIREMENTS OF U.L. 1653, IN ACCORDANCE WITH CEC ARTICLE 362, AND MEET REQUIREMENTS OF BI NATIONAL STANDARD CAN/CSA-C22.2 NO. 227.1-U.L. 1653. ENT SHALL BE RATED FOR 90 DEGREES C CONDUCTORS AND SHALL BE RECOGNIZED FOR USE IN 2-HOUR FIRE RESISTANCE NON-LOAD BEARING AND LOAD BEARING WALL ASSEMBLIES. ENT SHALL BE RECOGNIZED FOR THROUGH-PENETRATION FIRESTOP SYSTEMS AS CLASSIFIED TO MEET U.L. AND IFC BUILDING CODES.
- F. FLEXIBLE METAL CONDUIT (FMC) SHALL BE CONTINUOUS WOUND REDUCED WALL GALVANIZED STEEL PRODUCED TO UL STANDARDS AS MANUFACTURED BY ALFLEX, AMERICAN FLEXIBLE CONDUIT OR EQUAL.
- G. LIQUID TIGHT FLEXIBLE METAL CONDUIT SHALL HAVE A THERMOPLASTIC COVER OVER A GALVANIZED STEEL CORE CONTAINING AN INTEGRAL COPPER GROUND IN SIZES TO 1-1/4" AND SHALL BE IN COMPLIANCE WITH UL STANDARDS AND CEC ARTICLE 350. APPROVED MANUFACTURERS ARE ANACONDA (TYPE UA), ELECTRI-FLEX LIQUATITE OR EQUAL.

PART 3 – EXECUTION

- 3.1 INSTALLATION
 - A. CONDUIT SYSTEMS LISTED BELOW ARE FOR USE IN INSTALLATIONS WHERE THEY ARE PERMITTED TO BE USED BY CEC AND/OR OTHER OCCUPANCY RESTRICTIONS. THE BELOW INSTALLATION METHODS DO NOT INTEND TO SUGGEST THAT THESE MATERIALS BE INSTALLED IN CONFLICT WITH ANY APPLICABLE CODE. SPECIAL ATTENTION TO APPLICATIONS SHALL BE MADE IN WET LOCATIONS, HAZARDOUS LOCATIONS, ETC. REQUIREMENTS WHICH ARE MORE RESTRICTIVE THAN THE CEC MAY BE CALLED FOR BY THE DRAWINGS AND / OR THESE SPECIFICATIONS. THESE REQUIREMENTS MUST BE ADHERED TO. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE TO USE THE PROPER CONDUIT SYSTEM FOR THE APPLICATION. EXPOSED CONDUIT IS NOT ALLOWED BELOW CEILINGS OR ABOVE SLAB OF FLOOR, WITHOUT THE PERMISSION AND APPROVAL OF THE ARCHITECT. ALL CONDUITS SHALL BE CONCEALED EXCEPT IN MOUNTED, EXPOSED CONDUIT (WHERE ALLOWED) SHALL BE RUN SQUARE AND PLUMB WITH BUILDING LINES IN AN APPROVED MANNER. SUPPORT ROOFMOUNT CONDUITS, WHERE ALLOWED, WITH MINIMUM 12 INCH WIDE REDWOOD BLOCKS SET IN MASTIC UNLESS OTHERWISE DETAILED IN ROOF REQUIREMENTS OR AS SPECIFIED IN ROOFING SPECIFICATION, BY THE ARCHITECT. STRAP CONDUITS TO BLOCKS WITH PROPER SIZED CONDUIT STRAPS. SPACING OF SUPPORT SHALL BE A MINIMUM AS PROVIDED FOR IN THE CEC. ALL EXPOSED CONDUIT MOUNTED BELOW 8 FEET ABOVE FINISHED GRADE SHALL BE STRAPPED AT A MINIMUM OF 5 FOOT SPACING.
 - B. NON-METALLIC RIGID CONDUIT SHALL BE USED IN CONCRETE SLABS, BELOW CONCRETE SLABS ON GROUND, OUTSIDE OF A BUILDING, UNDERGROUND SLAB OR FOUNDATION. MAINTAIN MINIMUM DEPTH REQUIREMENTS AND COVER WITH APPROPRIATE FILL MATERIAL. MINIMUM 4 INCHES OF BEDDING AND COVER OF BACKFILL MATERIAL 1/2 INCH SIZE GRAIN AND SMALLER MAXIMUM. CONDUIT SHALL BE HEAVY WALL SCHEDULE 40 OR 80, RIGID PVC ONLY. RIGID UTILITY P&C DUCT SHALL NOT BE USED IN ANY APPLICATION. PROPERLY SIZED GROUNDING CONDUCTORS SHALL BE INSTALLED PER CEC ARTICLE 250, IN ALL NON-METALLIC CONDUIT BRANCH CIRCUIT AND FEEDER RUNS. PVC CONDUIT SHALL BE FORMED OR FIELD BENT ONLY WITH THE USE OF PROPERLY APPROVED BENDING TOOLS SUCH AS TO NOT DECREASE THE INTERNAL BORE OF THE CONDUIT. ALL CONDUITS SHALL BE RUN SQUARE AND REAMED OR BURLED AND COVERED APPROVED AND COVERED SHALL BE USED ON ALL PVC FITTINGS TO ATTAIN WATERTIGHT JOINTS. ALL NON-METALLIC CONDUIT RUNS OVER 150 FEET IN LENGTH AND OVER 1 1/4" TRADE SIZE CONDUIT SHALL UTILIZE GALVANIZED RIGID STEEL ELBOWS.
 - C. GALVANIZED RIGID STEEL (GRS) CONDUIT SHALL BE USED WHERE EXPOSED LESS THAN 8 FEET – 0 INCHES ABOVE FINISHED GRADE TO 18 INCHES BELOW FINISHED GRADE AND WHERE SUBJECT TO PHYSICAL DAMAGE. CONDUITS SHALL BE CUT SQUARE AND REAMED TO REMOVE BURRS AND SHARP EDGES. STRAP CONDUIT BELOW 8' ABOVE GRADE AT 5 FOOT INTERVALS. UNLESS OTHERWISE NOTED, THREADLESS SETSCREW AND THREADLESS WEATHERTIGHT FITTINGS MAY BE USED IN LIEU OF THREADED FITTINGS. ALL THREADED ENDS ENTERING A JUNCTION BOX OF ANY TYPE SHALL REQUIRE ONE LOCKWUT ON THE INSIDE AND ONE ON THE OUTSIDE OF THE END OF THE CONDUIT. PLASTIC BUSHING OR PLASTIC BUSHING OR GROUNDING BUSHING WHERE NECESSARY FOR PROPER GROUNDING. WHERE EXPOSED TO MOISTURE, A WATERTIGHT HUB OR OTHER APPROVED METHOD SHALL BE REQUIRED. ALL CONDUITS SHALL BE STUBBED UP STRAIGHT AND UNIFORM INTO JUNCTION BOXES, PANELS, CABINETS, ETC., AND SHALL BE (GRS) PROPERLY SUPPORTED AND STRAPPED. ALL GRS CONDUIT LOCATED BELOW GRADE, SHALL BE TAPE WRAPPED.
 - D. ELECTRICAL METALLIC TUBING (EMT) SHALL BE USED AS ALLOWED BY CODE AND AS PERMITTED BY THIS SPECIFICATION. IT SHALL NOT BE IN CONTACT WITH SOIL OR THE CONCRETE SLAB ON THE GROUND FLOOR OF ANY STRUCTURE. CONNECTORS AND COUPLINGS SHALL BE DIECAST INSULATED SET SCREW TYPE WHERE INSTALLED IN INDOOR NOT LOCATIONS NOT SUBJECT TO MOISTURE. WHERE THE POTENTIAL FOR MOISTURE IS PRESENT, COMPRESSION TYPE WEATHERTIGHT FITTINGS ARE REQUIRED. ONE HOLE CONDUIT STRAPS ARE PERMITTED FROM 1/2 INCH TO 1 INCH AND TWO HOLE CONDUIT STRAPS ARE REQUIRED FOR SIZE 1-1/4 INCH AND LARGER. EMT SHALL NOT BE ALLOWED IN AREAS SUBJECT TO SEVERE PHYSICAL DAMAGE. INSTALL COPPER GROUND WIRE SIZED PER CEC 250-122 IN ALL EMT CONDUITS.
 - E. FLEXIBLE CONDUIT MAY BE USED WHERE CONCEALED IN BUILDING CONSTRUCTION OR ABOVE DROPPED CEILINGS, BUT SHALL MEET THE FOLLOWING CRITERIA: NO INDIVIDUAL CIRCUIT PATH FROM DISTRIBUTION PANEL TO LAST DEVICE SHALL EXCEED A CUMULATIVE LENGTH OF 30 FEET OF FLEXIBLE CONDUIT FROM START TO END. FLEXIBLE CONDUIT SHALL NOT EXCEED A TOTAL PLASTIC BUSHING OR GROUNDING BENDING DEGREES IN ANY ONE RUN BETWEEN CONDUIT TERMINATIONS. SQUEEZE TYPE OR JAKE TYPE STEEL FLEX FITTINGS OF A GROUNDING TYPE ARE REQUIRED. FLEXIBLE CONDUIT MUST BE SUPPORTED IN ACCORDANCE WITH CEC. WHERE EXPOSED TO THE WEATHER, MOISTURE, OR SPRAY DOWN FLEXIBLE CONDUIT SHALL BE OF THE LIQUIDTIGHT TYPE. FITTINGS SHALL BE MANUFACTURED FOR USE WITH LIQUIDTIGHT FLEXIBLE CONDUIT. ALL MOTOR CONNECTIONS SHALL BE MADE WITH LIQUIDTIGHT FLEX. FLEXIBLE CONDUIT MAY NOT BE USED WHERE EXPOSED EXCEPT FOR LAST 2 FEET OF EQUIPMENT CONNECTION AND UNLESS OTHERWISE NOTED OR APPROVED. A COPPER GROUND WIRE SIZED PER CEC 250-122 SHALL BE INSTALLED IN ALL FLEXIBLE CONDUIT RUNS. FLEXIBLE CONDUIT MAY NOT BE USED EXPOSED. WEATHERPROOF LIQUID TIGHT CONDUIT SHALL NOT BE USED AT ROOF LEVEL FOR EQUIPMENT CONNECTIONS WITH LENGTHS EXCEEDING 24 INCHES NOR SHALL IT BE USED TO CIRCUMVENT A RIGID CONDUIT SYSTEM IN A HORIZONTAL DIRECTION. CONNECT RECESSED LIGHTING FIXTURES TO CONDUIT RUNS WITH A MAXIMUM OF SIX FEET OF FLEXIBLE METAL CONDUIT EXTENDING FROM JUNCTION BOX TO FIXTURE.
 - F. UNDERGROUND CONDUITS AND TRANSITION TO ABOVE GRADE/SLAB SHALL BE AS FOLLOWS:
 - 1. PVC ELBOWS ALLOWED IF TOP OF ELBOW IS MINIMUM 18" BFG OR BELOW TOP OF SLAB. OTHERWISE, GRS ELBOWS ARE REQUIRED.
 - 2. GRS ELBOWS ARE REQUIRED IF CONDUIT RUN IS 150" OR GREATER.
 - 3. GRS RISERS ARE REQUIRED FROM ELBOW BELOW GRADE TO EQUIPMENT (DEVICE, OUTLET, PANEL, CABINET, ETC.) ABOVE GRADE.
 - 4. GRS ELBOWS/RISERS TO BE PVC COATED OR 10 MIL TAPED WRAPPED (1/2" LAPPED) TO 3" ABOVE FINISH GRADE OR TOP OF SLAB.
 - G. CONDUIT SUPPORTS: CONDUIT RUNS MAY BE SUPPORTED BY ONE-HOLE AND TWO-HOLE STRAPS OR SUPPORTS AS MANUFACTURED BY UNISTRUT, MINERALLAC, CADDY OR EQUALS. SUPPORTS MAY BE FASTENED BY MEANS OF ANCHORS, SHIELDS, BEAM CLAMPS, TOGGLE BOLTS, OR OTHER APPROVED METHODS APPROPRIATE FOR THE APPLICATION AND SIZE OF CONDUIT. PIPE NAILERS (J-HOOKS) MAY ONLY BE USED FOR 1 INCH CONDUIT AND SMALLER AND ONLY IN WOOD FRAME CONSTRUCTION. CONDUIT SUPPORT METHODS ARE SUBJECT TO REVIEW BY THE ENGINEER AND AUTHORITY HAVING JURISDICTION FOR ADEQUACY. INSTALLATIONS DEEMED INADEQUATE SHALL BE CORRECTED BY THE CONTRACTOR AT NO COST TO THE OWNER.
 - H. BENDS AND OFFSETS SHALL BE MADE WITH APPROVED TOOLS FOR THE TYPE OF CONDUIT BEING UTILIZED. BENDS SHALL BE MADE WITHOUT KINKING OR DESTROYING THE SMOOTH BORE OF THE CONDUIT. PARALLEL CONDUITS SHALL BE RUN STRAIGHT AND TRUE WITH BENDS UNIFORM AND SYMMETRICAL. MINIMUM RADIUS SHALL BE PER CEC 344-24.

PROJECT

ACCESSIBILITY IMPROVEMENTS

ROLLING HILLS APARTMENTS

TEMPLETON, CA

CLIENT JOB # ARCHITECT JOB #

0708B

FRASER SEIPLE ARCHITECTS

PROJECT MANAGER JT

DRAWN BY DM

DATES FIRST SUBMITTAL 5/28/10
 PLAN CHECK 1 8/16/10

SIGNED

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SHEET TITLE

ELECTRICAL SPECIFICATIONS

SHEET #

E5.0