

- I. CONDUIT SUB-UTCS BELOW GRADE SHALL BE CAPPED WITH PLASTIC CAP, AND IDENTIFIED BY PLACING A PULL BOX MARKED WITH CORRECTLY IDENTIFIED UTILITY SUCH AS "ELEC", "TEL", ETC. DIMENSION FOR EXACT LOCATION ON FIELD RECORD DRAWINGS. PROVIDE LIDS FOR PROPER FIELD APPLICATION (I.E. TRAFFIC, INCIDENTAL, PEDESTRIAN).
- J. CONDUIT SEALS: WHERE BELOW GRADE CONDUITS ENTER STRUCTURE THROUGH SLAB OR RETAINING WALL OF BUILDING OR BASEMENT, SEAL THE INSIDE OF EACH CONDUIT AS FOLLOWS:
 1. PROVIDE DAMMING MATERIAL AROUND CONDUCTORS 3 INCH INTO CONDUIT.
 2. FILL 3 INCHES OF CONDUIT WITH 3M #2123 SEALING COMPOUND.
 3. WRAP CONDUCTORS WHERE THEY EXIT THE CONDUIT WITH 3M #2229 "SCOTCH SEAL" MASTIC TAPE. LAP TAPE TO APPROXIMATE DIAMETER OF THE RACEWAY AND WRAP OUTSIDE OF CONDUIT OPENING WITH (MINIMUM) ONE TURN.
 4. USE CONDUIT SEALING BUSHINGS TYPE CSB (0-2/GEDNEY) OR EQUAL.
 5. EMPTY CONDUITS SHALL BE SEALED WITH STANDARD NON-HARDENING DUCT SEAL COMPOUND AND THEN CAPPED TO PREVENT ENTRANCE OF MOISTURE AND GASES AND TO MEET FIRE RESISTANCE REQUIREMENTS.
- K. PROVIDE CABLE DRIP LOOP MINIMUM 12" HIGH.
- L. MARKER TAPE: PLACE PLASTIC YELLOW MARKER TAPE AT 12 INCHES BELOW FINISH GRADE ALONG AND ABOVE BURIED CONDUITS. LABEL TAPE "CAUTION: ELECTRICAL LINES BELOW" OR SIMILAR WORDING.
- M. ELECTRICAL AND COMMUNICATIONS SYSTEMS RACEWAYS ROUTED UNDERGROUND SHALL NOT OCCUPY THE SAME TRENCH AS PLUMBING UTILITIES SUCH AS SEWER, WATER, STORM DRAIN, GAS OR OTHER WET OR DRY GASEOUS UTILITY SYSTEM. A MINIMUM OF 12" OF UNDISTURBED EARTH IS REQUIRED. WHERE UTILITIES MUST CROSS IN CROSS PROXIMITY TO EACH OTHER DUE TO PHYSICAL CONSTRAINTS, 6" MINIMUM CROSSING DISTANCES ARE ALLOWED, HOWEVER 18" ON ALL SIDES OF A UTILITY CROSSING MUST BE CONCRETE ENCASED.
- N. DUCT BANK DEFINED HERE-IN SHALL BE FOUR OR MORE CONDUITS IN A COMMON TRENCH, CONDUIT SPACERS AND SADDLES SHALL BE REQUIRED IN ALL TRENCHES WHERE MORE THAN TWO CONDUITS OVER 2 INCH IN DIAMETER TRAVEL IN THE SAME TRENCH. PROPER SPACING BETWEEN SYSTEMS AS OUTLINED ABOVE SHALL BE REQUIRED AND SPACERS SHALL BE LOCATED EACH FIVE FEET (MAXIMUM) ALONG TRENCH ROUTE FROM POINT TO POINT.
- O. CONDUITS, ROUTED BELOW FOOTINGS, SLABS, GRADE BEAMS, COLUMNS, AND OTHER STRUCTURAL ELEMENTS SHALL BE INSTALLED IN STRICT COMPLIANCE WITH STRUCTURAL DETAILS AND CRITERIA SHOWN ON STRUCTURAL PLANS. CLEARANCES BELOW STRUCTURAL ELEMENTS AND SLEEVES THROUGH STRUCTURAL ELEMENTS MUST BE CAREFULLY PLANNED TO AVOID CONFLICT AND MUST BE APPROVED BY THE STRUCTURAL ENGINEER IF CONFLICT ARISES.
- P. ALL CONDUIT OR RACEWAYS PASSING THROUGH FIRE RATED WALLS, FLOORS, OR CEILING SHALL BE INSTALLED WITH A LISTED PENETRATION METHOD WHICH PROTECTS THE OPENING TO THE SAME RATING AS THE ASSEMBLY AND IS NON HARDENING.

END OF SECTION 16110
SECTION 16120 – POWER WIRE, CABLE AND CONDUCTORS
PART 1 – GENERAL

- 1.1 SUMMARY
 - A. SECTION INCLUDES:
 1. WIRES AND CABLES.
 2. CONNECTORS.
 3. LUGS AND PADS.
 - B. SYSTEM DESCRIPTION
 - A. PROVIDE WIRES, CABLES, CONNECTORS, LUGS, STRAIN RELIEFS, RACKING INSULATORS FOR A COMPLETE AND OPERATIONAL ELECTRICAL SYSTEM.
 - 1.2 SUBMITTALS
 - A. PROVIDE PRODUCT DATA FOR THE FOLLOWING EQUIPMENT:
 1. WIRES.
 2. CABLES.
 3. CONNECTORS.
 4. LUGS.
 5. SPLICE KITS.
 6. STRAIN RELIEF FITTINGS.
 7. CABLE RACKING AND INSULATORS.
 - B. PROVIDE THE INSULATION CABLE TESTING REPORT IN THE PROJECT CLOSEOUT DOCUMENTATION, REFER TO CLOSEOUT REQUIREMENTS IN THE GENERAL CONDITIONS PORTION OF THIS SPECIFICATION.
 - 1.3 REGULATORY REQUIREMENTS
 - A. CONFORM TO REQUIREMENTS OF THE CEC, LATEST ADOPTED VERSION WITH AMENDMENTS BY LOCAL AUTHORITY HAVING JURISDICTION (AHJ).
 - B. FURNISH PRODUCTS LISTED BY UL OR OTHER TESTING FIRM ACCEPTABLE TO AHJ.
 - PART 2 – PRODUCTS
 - 2.1 MANUFACTURERS
 - A. WIRES AND CABLES: CAROL, GENERAL CABLE, OKONITE, ROME, SOUTHWIRE, OR APPROVED EQUAL.
 - B. CONNECTORS: BURNDY, ILSCO, THOMAS & BETTS, OR APPROVED EQUAL.
 - C. WIRE CONNECTORS SHALL BE MINIMUM 75 DEGREE CENTIGRADE RATED AND PROPERLY SIZED FOR THE NUMBER OF CONDUCTORS BEING CONNECTED. TERMINATED, SPLICED ETC. ALL ABOVE GRADE CONNECTORS SHALL BE SOLDERLESS LUG OR PLASTIC WIRE NUT TYPE, SCREW ON, PRESSURE CABLE TYPE (WIRE NUT OR SPRING NUT TYPE), 600 VOLT, 105 DEGREE C, WITH SKIRT TO COVER ALL PORTIONS OF STRIPPED WIRES. CONNECTOR SHALL BE U.L. RATED FOR NUMBER AND SIZE OF CONDUCTORS BEING JOINED TOGETHER AS A SPLICE.
 - D. SPLICES:
 1. BRANCH CIRCUIT SPLICES: IDEAL, SCOTCH-LOCK, 3M, OR APPROVED.
 2. FEEDER SPLICES: COMPRESSION BARREL SPLICE WITH TWO LAYERS SCOTCH 23 AND FOUR LAYERS OF SCOTCH 33+ AS VAPOR BARRIER.
 3. SCREW TERMINAL LUGS.
 4. KEARNEY SPLIT BOLT.
 - 2.2 WIRES AND CABLES FOR LINE VOLTAGE SYSTEMS AND CONTROLS. WIRE AND CABLE SHALL BE:
 - A. COPPER, 600 VOLT RATED THROUGHOUT. CONDUCTORS 14AWG TO 10AWG, SOLID OR STRANDED. CONDUCTORS 8AWG AND LARGER, STRANDED.
 - B. PHASE COLOR TO BE CONSISTENT AT ALL FEEDER TERMINATIONS; A-B-C, TOP TO BOTTOM, LEFT TO RIGHT, FRONT TO BACK. PHASING TAPE SHALL BE PERMITTED ON SIZES #6 AND LARGER.
 - C. COLOR CODE CONDUCTORS AS FOLLOWS:

PHASE	240 VOLT DELTA
A	BLACK
B	BLUE
NEUTRAL	WHITE
GROUND	GROUND GREEN
 - D. ALL CONDUCTORS SHALL BE COPPER UNLESS OTHERWISE NOTED. MINIMUM SIZE FOR INDIVIDUAL CONDUCTORS SHALL BE #12 AWG UNLESS OTHERWISE NOTED. SIZES #8 AWG AND LARGER SHALL BE STRANDED CONDUCTOR. INDIVIDUAL CONDUCTORS SHALL BE INSULATED WITH TYPE, XHHW, THW, THHN/THWN 600-VOLT INSULATION UNLESS OTHERWISE NOTED. CONTROL, SIGNAL, COMMUNICATION CONDUCTORS SHALL BE AS DICATED BY THE VENDOR OF THAT EQUIPMENT OR AS SPECIFIED HERE-IN. PROPER INSULATION TYPE SHALL BE USED FOR THE PROPER ENVIRONMENTAL APPLICATION (I.E., WATERPROOF, WET LOCATION, PLENUM, TEMPERATURE RATED). IF A CONDITION EXISTS WHERE THE APPLICATION IS UNCERTAIN, CONTACT THE ENGINEER FOR DIRECTION. CONTRACTOR IS RESPONSIBLE TO FOLLOW SPECIFIC CABLING REQUIREMENTS DESCRIBED IN OTHER SECTIONS OF THIS SPECIFICATION RELATIVE TO VARIOUS COMMUNICATIONS AND CONTROLS SYSTEMS AS WELL AS THE RESPECTIVE RISER DIAGRAMS SHOWN ON PLANS. IF A DISCREPANCY OCCURS, COMMUNICATE SUCH DISCREPANCY TO THE ARCHITECT AND ENGINEER IMMEDIATELY FOR RESOLUTION.
 - E. INSULATION TYPES THWN, THHN OR XHHW. MINIMUM INSULATION RATING OF 90C FOR BRANCH CIRCUITS.
- 2.3 CONNECTORS
 - A. COPPER PADS: DRILLED AND TAPPED FOR MULTIPLE CONDUCTOR TERMINALS.
 - B. LUGS: INDENT/COMPRESSION TYPE FOR USE WITH STRANDED BRANCH CIRCUIT OR CONTROL CONDUCTORS.
 - C. SOLID CONDUCTOR BRANCH CIRCUITS: SPRING CONNECTORS, WIRE NUTS, FOR CONDUCTORS 18 THROUGH 8AWG.

- 2.4 LUGS AND PADS
 - A. AMPACITY: CROSS-SECTIONAL AREA OF PAD FOR MULTIPLE CONDUCTOR TERMINATIONS TO MATCH AMPERE RATING OF PANELBOARD BUS OR EQUIPMENT LINE TERMINALS.

- PART 3 – EXECUTION
 - 3.1 INSTALLATION
 - A. INSTALLATION: CONDUCTORS SHALL NOT BE INSTALLED UNTIL AFTER CONDUIT SYSTEMS ARE PERMANENTLY IN PLACE. USE AN APPROVED NON HARDENING TYPE WIRE PULLING LUBRICANT IF LUBRICANT IS TO BE USED. MAINTAIN ALL CONDUITS AND WIRE PULLS FREE FROM FOREIGN MATERIAL. IF DUE TO FIELD CONDITIONS, MORE THAN ONE PIECE OF BEND ARE REQUIRED; A PULL BOX SHALL BE FURNISHED AND INSTALLED FOR EASE OF INSTALLATION. SAID PULL BOXES MUST BE SIZED AND RATED FOR THE APPROPRIATE APPLICATION AND MUST REMAIN EASILY ACCESSIBLE UPON COMPLETION OF THE PROJECT (APPROVAL OF THE LOCATION SHALL BE OBTAINED FROM THE ARCHITECT PRIOR TO INSTALLATION). SHOW THESE PULLBOXES ON THE FIELD RECORD DRAWINGS. CONDUCTORS INSTALLED IN UNDERGROUND RACEWAYS ON SITE SHALL BE DUCT SEALED AND TAPED WHERE THEY EXIT THE RACEWAY TO PREVENT THE ENTRANCE OF FOREIGN MATERIAL AND MOISTURE AFTER THE CONDUCTORS ARE INSTALLED. PROPER DRAINAGE SHALL BE PROVIDED FOR UNDERGROUND PULL AND SPLICE BOXES.
 - B. INSULATION: USE PROPER INSULATION TYPES WHERE TEMPERATURE AND ENVIRONMENT ARE A FACTOR.
 - C. SPLICES AT OR BELOW GRADE LEVEL SHALL BE MADE WITH WET LOCATION RATED AND APPROVED MECHANICAL CONNECTORS AND SHALL BE ENCAPSULATED IN EPOXY OR PLASTIC MOLDED POURED KITS. THE CONNECTIONS MUST BE ASSURED TO BE WATERTIGHT. SPLICES AT OR BELOW GRADE SHALL ALWAYS BE AVOIDED AND MINIMIZED. PRIOR APPROVAL IS REQUIRED FOR FEEDER SPLICES BELOW GRADE. SUBMIT PROPOSED MATERIALS AND EXHIBIT SHOWING LOCATION OF INTENDED SPLICES FOR ENGINEER'S REVIEW AND APPROVAL IF GRANTED.
 - D. LABELING: ALL CONDUCTORS IN PANELS, SWITCHBOARDS, TERMINAL CABINETS, VAULTS, PULL BOXES, AND JUNCTION BOXES SHALL BE LABELED WITH TAPE NUMBER MARKERS INDICATING CIRCUIT NUMBER AND IDENTIFYING SYSTEM. ALL LABELING SHALL BE PERMANENT. IN MANHOLES AND VAULTS, PROVIDE EMBOSSED BRASS TAGS IDENTIFYING SYSTEM SERVICED AND FUNCTION. SEE SECTION 16141, EQUIPMENT LABELS AND NAMEPLATES AND WARNING SIGNS.
 - E. ALL CONDUCTORS, WIRING, CABLE WHERE INSTALLED BELOW FLOOR, SLAB OR UNDERGROUND SHALL BE CONSIDERED WET LOCATIONS, AND SHALL BE RATED ACCORDINGLY. NON WATERPROOF CABLING IS NOT ALLOWED IN ANY BELOW GRADE OR WET APPLICATION.
 - F. CABLES ROUTED TOGETHER IN CABLE TRAY SHALL BE STACKED, ORGANIZED AND TIE WRAPPED TOGETHER IN A NEAT AND WORKMAN LIKE MANNER. RANDOM CABLE ROUTING IS NOT ACCEPTABLE.
 - G. CABLE AND CONDUCTORS ROUTED THROUGH PULL BOXES AND VAULTS SHALL BE PROPERLY SUPPORTED ON PORCELAIN OR EQUAL INSULATORS MOUNTED ON STEEL RACK INSERTS. BEND RADIUS OF CABLE OR CONDUCTOR SHALL NOT BE LESS THAN SIX TIMES THE OVERALL CABLE DIAMETER.
 - H. WIRES AND CABLES:
 1. CONDUCTOR INSTALLATION:
 - A. INSTALL CONDUCTORS IN RACEWAYS HAVING ADEQUATE, CODE SIZE CROSS-SECTIONAL AREA FOR WIRES INDICATED.
 - B. INSTALL CONDUCTORS WITH CARE TO AVOID DAMAGE TO INSULATION.
 - C. DO NOT APPLY GREATER TENSION ON CONDUCTORS THAN RECOMMENDED BY MANUFACTURER DURING INSTALLATION.
 - D. USE OF PULLING COMPOUNDS IS PERMITTED. CLEAN RESIDUE FROM EXPOSED CONDUCTORS AND RACEWAY ENTRANCES AFTER CONDUCTOR INSTALLATION.
 2. CONDUCTOR SIZE AND QUANTITY:
 - A. INSTALL NO CONDUCTORS SMALLER THAN 12AWG UNLESS OTHERWISE SHOWN.
 - B. PROVIDE ALL REQUIRED CONDUCTORS FOR A FULLY OPERABLE SYSTEM.
 3. PROVIDE DEDICATED NEUTRALS (ONE NEUTRAL CONDUCTOR FOR EACH PHASE CONDUCTOR) IN THE FOLLOWING SINGLE PHASE CIRCUITS:
 - A. DIMMER CONTROLLED CIRCUITS.
 - B. GROUND FAULT AND ARC FAULT PROTECTED CIRCUITS WHERE A GFI AND ARC FAULT BREAKERS ARE USED IN PANELBOARDS.
 - C. OTHER ELECTRONIC EQUIPMENT WHICH PRODUCES A HIGH LEVEL OF HARMONIC DISTORTION INCLUDING BUT NOT LIMITED TO COMPUTERS, PRINTERS, PLOTTERS, COPY MACHINES, FAX MACHINES, WHERE INDICATED.
 4. CONDUCTORS IN CABINETS:
 - A. CABLE AND TRAIN ALL WIRES IN PANELS AND CABINETS FOR POWER AND CONTROL NEATLY AND UNIFORMLY. USE PLASTIC TIES IN PANELS AND CABINETS.
 - B. TIE AND BUNDLE FEEDER CONDUCTORS IN WIREWAYS OF PANELBOARDS.
 - C. HOLD CONDUCTORS AWAY FROM SHARP METAL EDGES.
 - D. CONNECTORS: RETIGHTEN MECHANICAL TYPE LUGS AND CONNECTORS FOR CONDUCTORS TO EQUIPMENT PRIOR TO NOTICE OF COMPLETION.
 - 3.2 FIELD QUALITY CONTROL
 - A. TESTS:
 1. TEST CONDUCTOR INSULATION ON FEEDERS OF 400 AMP AND GREATER FOR CONFORMITY WITH 1000 VOLT MEGOHMMETER. USE INSULATED CABLE ENGINEERS ASSOCIATION TESTING PROCEDURES. MINIMUM INSULATION RESISTANCE ACCEPTABLE IS 1 MEGOHM FOR SYSTEMS 600 VOLTS AND BELOW.
 2. TEST REPORT: PREPARE A TYPED TABULAR REPORT INDICATING THE TESTING INSTRUMENT, THE FEEDER TESTED, AMPERAGE RATING OF THE FEEDER, INSULATION TYPE, VOLTAGE, THE APPROXIMATE LENGTH OF THE FEEDER, CONDUIT TYPE, AND THE MEASURED RESISTANCE OF THE MEGOHMMETER TEST. SUBMIT REPORT WITH OPERATING AND MAINTENANCE MANUAL.

END OF SECTION 16120
SECTION 16130 – BOXES AND GUTTERS
PART 1 – GENERAL

- 1.1 SUMMARY
 - A. SECTION INCLUDES:
 1. OUTLET BOXES.
 2. WEATHERPROOF OUTLET BOXES.
 3. JUNCTION AND PULL BOXES.
 4. CABINETS, TERMINATION CABINETS.
 5. GUTTERS.
 6. CONCRETE BOXES AND VAULTS.
 - B. COLOR COMPLIANCE: COMPLY WITH CEC AS APPLICABLE TO CONSTRUCTION AND INSTALLATION OF ELECTRICAL KES AND FITTINGS AND SIZE BOXES ACCORDING TO CEC 312, 314 AND 366 EXCEPT AS NOTED OTHERWISE.
 - C. OUTLETS TO BE FLUSH MOUNTED: MAINTAIN INTEGRITY OF INSULATION AND VAPOR BARRIER. UNLESS OTHERWISE NOTED, FLUSH MOUNT ALL OUTLET BOXES.
 - D. PROVIDE PUTTY PADS OF PROPER TYPE AROUND OUTLET BOXES AND/OR AS DETAILED ON PLAN TO MEET SOUND TRANSMISSION RESTRICTIONS AND FIRE RATINGS OF WALLS.
- 1.2 SUBMITTALS
 - A. PROVIDE SHOP DRAWINGS AND PRODUCT DATA FOR THE FOLLOWING EQUIPMENT:
 1. OUTLET BOXES.
 2. WEATHERPROOF OUTLET BOXES.
 3. JUNCTION AND PULL BOXES.
 4. CABINETS, TERMINATION CABINETS.
 5. GUTTERS.
 6. CONCRETE BOXES AND VAULTS.
 7. PUTTY PADS.
 - B. REGULATORY REQUIREMENTS
 - A. CONFORM TO REQUIREMENTS OF THE CEC, LATEST ADOPTED VERSION WITH AMENDMENTS BY LOCAL AHJ.
 - B. FURNISH PRODUCTS LISTED BY UL OR OTHER INDEPENDENT AND NATIONALLY RECOGNIZED TESTING FIRM.
- PART 2 – PRODUCTS
 - 2.1 MANUFACTURERS
 - A. OUTLET BOXES: BOWERS, RACO, STEEL CITY OR APPROVED.
 - B. WEATHERPROOF OUTLET BOXES: BELL, RED DOT, CARLON OR APPROVED.
 - C. JUNCTION AND PULL BOXES: CIRCLE AW, HOFFMAN, WIREGUARD OR APPROVED.
 - D. BOX EXTENSION ADAPTER: BELL, RED DOT, CARLON OR APPROVED.
 - E. CONDUIT FITTINGS: 0-2 GEDNEY, THOMAS & BETTS, OR APPROVED.
 - F. VAULTS: CHRISTY, BROOKS, UTILITY VAULT OR APPROVED EQUAL.
 - G. PUTTY PADS: 3M, HILTI, OR APPROVED EQUAL.

- 2.2 OUTLET BOXES
 - A. NEMA 1 GUTTER, JUNCTION AND PULL BOXES SHALL BE FABRICATED FROM CODE GAGE STEEL FINISHED IN GREY ENAMEL WITH SCREW COVER FRONTS AND CONCENTRIC KNOCKOUTS IN ALL SIDES.
 - B. NEMA 3R GUTTER, JUNCTION AND PULL BOXES SHALL BE FABRICATED FROM CODE GAGE GALVANIZED STEEL WITH SCREW COVER FRONTS AND CONCENTRIC KNOCKOUTS IN THE BOTTOM ONLY. ANY PENETRATIONS TO THE SIDE, TOP OR BACK SHALL BE WEATHERPROOFED IN AN APPROVED MANNER SUCH AS "MYERS" GASKETED TYPE HUB OR EQUAL.
 - C. STEEL OUTLET BOXES AND PLASTER RINGS SHALL BE GALVANIZED RIGID ASSEMBLIES, MORE THAN ONE PIECE OF PRESSED OR FACTORY WEDDED CONSTRUCTION CONTAINING THE SIZE AND NUMBER OF KNOCKOUTS REQUIRED. STEEL OUTLET BOXES SHALL BE MANUFACTURED, SIZED AND INSTALLED IN ACCORDANCE WITH CEC ARTICLE 314. DEVICE OUTLET: INSTALLATION OF ONE OR TWO DEVICES AT COMMON LOCATION, MINIMUM 4 INCH SQUARE, MINIMUM 1 1/2 INCHES DEEP. SINGLE OR 2 GANG FLUSH DEVICE PLASTER RING. RACO SERIES 681 AND 686 OR EQUAL.
 - D. LUMINAIRE OUTLET: MINIMUM 4" SQUARE WITH CORRECT PLASTER RING DEPTH, MINIMUM 1-1/2" DEEP WITH 3/8-INCH LUMINAIRE STUD IF REQUIRED. PROVIDE PROPER DEPTH PLASTER RING ON BRACKET OUTLETS AND ON CEILING OUTLETS.
 - E. MULTIPLE DEVICES: THREE OR MORE DEVICES AT COMMON LOCATION. INSTALL 1 PIECE GANG BOXES WITH 1 PIECE DEVICE PLASTERING. INSTALL ONE DEVICE PER GANG UNLESS OTHERWISE ALLOWED.
 - F. MASONRY BOXES: OUTLETS IN CONCRETE, RACO SERIES 690 OR EQUAL.
 - G. CONSTRUCTION: PROVIDE GALVANIZED STEEL INTERIOR OUTLET WIRING BOXES, OF THE TYPE, SHAPE AND SIZE, INCLUDING DEPTH OF BOX, TO SUIT EACH RESPECTIVE LOCATION AND INSTALLATION; CONSTRUCTED WITH STAMPED KNOCKOUTS IN BACK AND SIDES, AND WITH THREADED HOLES WITH SCREWS FOR SECURING BOX COVERS OR WIRING DEVICES. BOXES SHALL BE PROPERLY SECURED TO THE STRUCTURE SUCH THAT THEY ARE FLUSH WITH THE FINISH SURFACE. BOXES SHALL BE MADE STRUCTURALLY SECURE BY MEANS OF THE PROPER FASTENING DEVICES.
 - H. ACCESSORIES: PROVIDE OUTLET BOX ACCESSORIES AS REQUIRED FOR EACH INSTALLATION, INCLUDING MOUNTING BRACKETS, WALLBOARD HANGERS, EXTENSION RINGS, PLASTER RINGS, LUMINAIRE STUDS, CABLE CLAMPS AND METAL STRAPS FOR SUPPORTING OUTLET BOXES, COMPATIBLE WITH OUTLET BOXES BEING USED AND MEETING REQUIREMENTS OF INDIVIDUAL WIRING SITUATIONS.
- 2.3 WEATHERPROOF OUTLET BOXES
 - A. CONSTRUCTION: PROVIDE CORROSION-RESISTANT CAST IRON, WITH ZINC FINISH, WEATHERPROOF OUTLET WIRING BOXES, OF THE TYPE, SHAPE AND SIZE, INCLUDING DEPTH OF BOX, WITH THREADED CONDUIT ENDS, CAST METAL FACE PLATE WITH SPRING-HINGED WATERPROOF CAP SUITABLY CONFIGURED FOR EACH APPLICATION, INCLUDING FACE PLATE GASKET, BLANK COVER AND CORROSION PROOF FASTENERS. WEATHERPROOF BOXES TO BE CONSTRUCTED TO HAVE SMOOTH SIDES, ZINC, GALVANIZED FINISH.
 - B. SURFACE MOUNTED DIE CAST ALUMINUM DEVICE BOXES SHALL BE PROVIDED WITH SCREW HOLES TO ACCOMMODATE CAST DEVICE COVERS.
- 2.4 JUNCTION AND PULL BOXES
 - A. CONSTRUCTION: PROVIDE GALVANIZED SHEET STEEL JUNCTION AND PULL BOXES, WITH SCREW-ON COVERS; OF THE TYPE SHAPE AND SIZE, TO SUIT EACH RESPECTIVE LOCATION AND INSTALLATION; WITH WELDED SEAMS AND EQUIPPED WITH STEEL NUTS, BOLTS, SCREWS AND WASHERS.
 - B. LOCATION:
 1. INSTALL JUNCTION BOXES ABOVE ACCESSIBLE CEILING FOR DROPS INTO WALLS FOR RECEPTACLE OUTLETS FROM OVERHEAD.
 2. INSTALL JUNCTION BOXES AND PULL BOXES AS REQUIRED TO FACILITATE THE INSTALLATION OF CONDUCTORS AND LIMITING THE ACCUMULATED ANGULAR SUM OF BENDS BETWEEN BOXES, CABINETS AND APPLIANCES TO 300 DEGREES.
 3. LOCATIONS: JUNCTION BOXES SHALL BE LOCATED ONLY WHERE NECESSARY AND ONLY IN EQUIPMENT ROOMS, CLOSETS, AND ACCESSIBLE ATTIC AND UNDERFLOOR SPACES. A HORIZONTAL DISTANCE OF 24 INCHES SHALL SEPARATE OUTLET BOXES ON OPPOSITE SIDES OF OCCUPANCY SEPARATION WALLS, FIRE-RATED WALLS OR PARTITIONS.
 4. LABELING: JUNCTION BOX COVERS SHALL BE MARKED WITH INDELIBLE INK INDICATED THE CIRCUIT NUMBERS PASSING THROUGH THE BOX.
- 2.5 BOX EXTENSION ADAPTER
 - A. CONSTRUCTION: CAST IRON WITH GASKET.
 - B. LOCATION: INSTALL OVER FLUSH WALL OUTLET BOXES TO PERMIT FLEXIBLE RACEWAY EXTENSION FROM FLUSH OUTLET TO FIXED OR MOVABLE EQUIPMENT. BELL 940 SERIES, RED DOT I/HA SERIES OR EQUAL.
- 2.6 CONDUIT FITTINGS
 - A. REQUIREMENTS: PROVIDE CORROSION-RESISTANT PUNCHED-STEEL BOX KNOCKOUT CLOSURES, CONDUIT LOCKNUTS AND PLASTIC CONDUIT BUSHINGS OF THE TYPE AND SIZE TO SUIT EACH RESPECTIVE USE AND INSTALLATION.
 - B. STEEL BOXES MAY ALLOW FOR FIELD KNOCK-OUT MODIFICATIONS, BUT SHALL IN ALL OTHER WAYS CONFORM TO CODE REQUIREMENTS.
 - 2.7 EXTERIOR IN-GRADE BOXES FOR NON-UTILITY COMPANY USE SHALL BE:
 - A. PRECAST CONCRETE OR POLYMER CONCRETE TYPE WITH FULL BOTTOMS AND DRAINING INTO GRAVEL DRYWELL. ACCEPTABLE MANUFACTURERS ARE UTILITY VAULT AND CHRISTY. OPEN BOTTOM SPLICE/PULL BOXES 24" X 36" AND SMALLER SHALL BE OPEN BOTTOM, WITH MINIMUM 12" OF GRAVEL BELOW FOR DRAINAGE.
 - B. FLUSHMOUNT IN HARDCAPE AND 1" ABOVE GRADE IN SOFTSCAPE.
 - C. PROVIDED WITH CORRECT TRAFFIC TYPE LID, I.E., FULL VEHICULAR, INTERMEDIATE INCIDENTAL VEHICULAR OR PEDESTRIAN-RATED AS APPLICABLE STAMPED WITH "ELECTRIC", "LIGHTING", COMMUNICATIONS", ETC. COVER IDENTIFICATION AS SHOWN ON THE DRAWINGS OR AS APPLICABLE. ALL BOXES OR VAULTS LOCATED IN STREETS, DRIVEWAYS, SIDEWALKS WIDER THAN 8 FT, AND TURF AREAS WHERE MOWING TAKES PLACE SHALL BE TRAFFIC RATED.
 - D. PROVIDED WITH BRASS HOLD-DOWN BOLTS IN COVER.
 - E. PROVIDED WITH NECESSARY BOX EXTENSIONS TO GAIN PROPER DEPTH.
 - F. SEAL ALL CONDUIT IN UNDERGROUND BOXES WITH DUCT SEAL AFTER CONDUCTORS HAVE BEEN INSTALLED.
 - 2.8 IN-GRADE UTILITY COMPANY BOXES AND VAULTS
 - A. IN-GRADE BOXES AND PADS FOR UTILITY COMPANY, SHALL BE AS SPECIFIED BY THE RESPECTIVE UTILITY COMPANY WITH ALL OF THE COMPANY'S REQUIREMENTS AND CONSTRUCTION METHODS MET.
 - 2.9 PUTTY PADS
 - A. INTUMESCENT MOLDABLE FIRESTOP PUTTY DESIGNED TO PROTECT ELECTRICAL OUTLET BOXES.
 - B. DESIGNED TO INSTALL AROUND OUTSIDE OF OUTLET BOXES.
- PART 3 – EXECUTION
 - 3.1 INSTALLATION
 - A. LOCATION: LOCATE BOXES AND CONDUIT BODIES SO AS TO ENSURE ACCESSIBILITY OF ELECTRICAL WIRING.
 - B. ANCHORING: SECURE BOXES RIGIDLY TO THE SUBSTRATE UPON WHICH THEY ARE BEING MOUNTED, OR SOLIDLY EMBED BOXES IN CONCRETE OR MASONRY.
 - C. SPECIAL APPLICATION: PROVIDE WEATHERPROOF OUTLETS FOR LOCATIONS EXPOSED TO WEATHER OR MOISTURE.
 - D. KNOCKOUT CLOSURES: PROVIDE KNOCKOUT CLOSURES TO CAP UNUSED KNOCKOUT HOLES WHERE BLANKS HAVE BEEN REMOVED.
 - E. MOUNT CENTER OF OUTLET BOXES UNLESS OTHERWISE REQUIRED BY ADA, OR NOTED ON DRAWINGS, THE FOLLOWING DISTANCES ABOVE THE FLOOR:
 1. CONTROL SWITCHES: 48 INCHES.
 2. RECEPTACLES: 18 INCHES.
 3. TELECOM OUTLETS: 18 INCHES.
 4. OTHER OUTLETS: AS INDICATED IN OTHER SECTIONS OF SPECIFICATIONS OR AS DETAILED ON DRAWINGS.
 - F. COORDINATE ALL ELECTRICAL DEVICE LOCATIONS WITH THE ARCHITECTURAL FLOOR PLAN AND INTERIOR AND EXTERIOR ELEVATIONS TO PREVENT MOUNTING DEVICES WITHIN ELEMENTS THAT THEY MAY CONFLICT SUCH AS CABINETRY, MIRRORS, PLANTERS, ETC.
 - G. SIZE OUTLET AND JUNCTION BOXES TO MINIMUM WIRE FILL SPACE REQUIREMENTS. UPSIZE BOX AS REQUIRED TO ALLOW EASE OF WIRE INSTALLATION AND DEVICE INSTALLATION.
 - H. OUTLET AND JUNCTION BOXES IN FIRE RATED WALLS SHALL BE GAUGED AND SPACED SO AS NOT TO EXCEED THE MAXIMUM PENETRATION ALLOWED BY THE ASSEMBLY WITHOUT COMPROMISING THE FIRE RATING. IF A CONFLICT ARISES RELATIVE TO A SPECIFIC CONDITION, THE CONTRACTOR SHALL FOLLOW THE REQUIREMENTS OF THE FIRE AUTHORITY AND ASK FOR GUIDANCE FROM THE DESIGN TEAM. AT NO TIME SHOULD A LARGER BOX BE INSTALLED PRIOR TO RESOLUTION OF CONFLICT.

END OF SECTION 16130

SECTION 16140 – WIRING DEVICES

- PART 1 – GENERAL
 - 1.1 DESCRIPTION
 - A. THIS SECTION SPECIFIES THE FURNISHING, INSTALLATION AND CONNECTION OF WIRING DEVICES.
 - 1.2 RELATED WORK
 - A. SECTION 16050, BASIC MATERIALS AND METHODS.
 - B. SECTION 16110, RACEWAYS.
 - C. SECTION 16120, POWER WIRE, CABLE AND CONDUCTORS.
 - D. SECTION 16450, GROUNDING.
- PART 2 – PRODUCTS
 - 2.1 RECEPTACLES
 - A. GENERAL: ALL RECEPTACLES SHALL BE LISTED BY UNDERWRITERS LABORATORIES, INC.
 1. MOUNTING STRAPS SHALL BE PLATED STEEL, WITH BREAK-OFF PLASTER EARS AND SHALL INCLUDE A SELF-GROUNDING FEATURE (THIS FEATURE DOES NOT SUBSTITUTE FOR A GROUNDING CONDUCTOR TERMINATED ON GROUNDING STRAP OF DEVICE). TERMINAL SCREWS SHALL BE BRASS, BRASS PLATED OR A COPPER ALLOY METAL.
 2. RECEPTACLES SHALL BE OF A SCREW TERMINAL TYPE, "PRESSURE TYPE QUICK WIRE" TERMINATIONS ARE NOT ALLOWED.
 - B. DUPLEX RECEPTACLES SHALL BE PREMIUM SPECIFICATION GRADE, STYLE LINE/DECOR SINGLE PHASE, 20 AMPERE, 120 VOLTS, 2-POLE, 3-WIRE, AND CONFORM TO THE NEMA 5-20R CONFIGURATION IN NEMA WD 6. THE DUPLEX TYPE SHALL HAVE BUSSING BREAK-OFF FEATURE FOR TWO-CIRCUIT OPERATION. THE UNGROUNDED POLE OF EACH RECEPTACLE SHALL BE PROVIDED WITH A SEPARATE TERMINAL.
 1. BODIES SHALL BE WHITE IN COLOR. CONTRACTOR TO VERIFY DEVICE COLOR WITH ARCHITECT PRIOR TO PROCUREMENT.
 2. SWITCHED DUPLEX RECEPTACLES SHALL BE WIRED SO THAT ONLY THE TOP RECEPTACLE IS SWITCHED. THE REMAINING RECEPTACLE SHALL BE UNSWITCHED.
 - C. GROUND FAULT INTERRUPTER DUPLEX RECEPTACLES: SHALL BE AN INTEGRAL UNIT SUITABLE FOR MOUNTING IN A STANDARD OUTLET BOX.
 - A. GROUND FAULT INTERRUPTER SHALL BE COMMERCIAL GRADE AND CONSIST OF A DIFFERENTIAL CURRENT TRANSFORMER, SOLID STATE SENSING CIRCUITRY AND A CIRCUIT INTERRUPTER SWITCH. IT SHALL BE RATED FOR OPERATION ON A 60 HZ, 120 VOLT, 20-AMPERE BRANCH CIRCUIT. DEVICE SHALL MEET CEC REQUIREMENTS. DEVICE SHALL HAVE A MINIMUM NOMINAL TRIPPING TIME OF 1/30TH OF A SECOND. DEVICES SHALL MEET UL 943.
 - C. RECEPTACLES; 20, 30 AND 50 AMPERE, 250 VOLTS: SHALL BE COMPLETE AND MATCH WITH APPROPRIATE CORD GRIP PLUG. DEVICES SHALL MEET UL 231.
 - D. WEATHERPROOF RECEPTACLES: SHALL CONSIST OF A DUPLEX RECEPTACLE, MOUNTED IN A BOX WITH A GASKETED, WEATHERPROOF, CAST METAL COVER PLATE AND CAP OVER EACH RECEPTACLE OPENING. THE CAP SHALL BE PERMANENTLY ATTACHED TO THE COVER PLATE BY A SPRING-HINGED FLAP. COVER PLATES ON OUTLET BOXES MOUNTED FLUSH IN THE WALL SHALL BE GASKETED TO THE WALL IN A WATERTIGHT MANNER.
 - 2.2 SWITCHES AND DIMMERS
 - A. STYLE LINE/DECOR ROCKER SWITCHES SHALL BE TOTALLY ENCLOSED TUMBLER TYPE WITH BODIES OF PHENOLIC COMPOUND. TOGGLE HANDLES COLOR TO MATCH RECEPTACLE DEVICE COLOR UNLESS OTHERWISE SPECIFIED.
 1. SWITCHES INSTALLED IN HAZARDOUS AREAS SHALL BE EXPLOSION PROOF TYPE IN ACCORDANCE WITH THE CEC AND AS SHOWN ON THE DRAWINGS.
 2. SHALL BE SINGLE UNIT TOGGLE, BUTT CONTACT, QUIET AC TYPE, HEAVY-DUTY GENERAL-PURPOSE USE WITH AN INTEGRAL SELF GROUNDING MOUNTING STRAP WITH BREAK-OFF PLASTERS EARS AND BE OF A SCREW TERMINAL TYPE.
 3. SHALL BE COLOR CODED FOR CURRENT RATING, LISTED BY UNDERWRITERS LABORATORIES, INC., AND MEET THE REQUIREMENTS OF NEMA WD 1, HEAVY-DUTY AND UL 20.
 4. RATINGS:
 - A. 120 VOLT CIRCUITS: 20 AMPERES AT 120-277 VOLTS AC.
 - B. 277 VOLT CIRCUITS: 20 AMPERES AT 277 VOLTS AC.
 5. THE SWITCHES SHALL BE MOUNTED ON THE STRIKE PLATE SIDE OF DOORS.
 6. INCORPORATE BARRIERS BETWEEN SWITCHES WITH MULTI-GANG OUTLET BOXES WHERE REQUIRED BY THE CEC.
 7. ALL TOGGLE SWITCHES SHALL BE OF THE SAME MANUFACTURER.
 - B. DIMMERS: INCANDESCENT LAMP LOADS. WALL-MOUNTED INCANDESCENT DIMMERS SHALL BE SPECIFICATION GRADE WITH CAPABILITY OF RAISING AND LOWERING THE LIGHTING FROM COMPLETELY OFF TO FULL INTENSITY. DIMMERS SHALL MAINTAIN FULL LOAD RATING EVEN WHEN TWO OR MORE UNITS ARE INSTALLED ADJACENT TO ONE ANOTHER. ALL WALL-MOUNTED DIMMERS SHALL BE OF THE SAME MANUFACTURER AND OF A "SLIDE" TYPE. COLOR SHALL MATCH ALL OTHER WIRING DEVICES ON PROJECT.
 - C. DIMMERS: FLUORESCENT LAMP LOADS. WALL-MOUNTED FLUORESCENT LAMP DIMMERS SHALL BE SPECIFICATION GRADE AND SHALL BE CAPABLE OF RAISING AND LOWERING THE LIGHTING FROM FIVE PERCENT LIGHT OUTPUT. DIMMERS SHALL HAVE LOW END INTENSITY ADJUSTMENT AND MAINTAIN FULL LOAD RATING EVEN WHEN TWO OR MORE UNITS ARE INSTALLED ADJACENT TO ONE ANOTHER. ALL WALL-MOUNTED DIMMERS SHALL BE OF THE SAME MANUFACTURER AND OF A "SLIDE" TYPE. DIMMING BALLAST SHALL BE PROVIDED FOR EACH LAMP OR PAIR OF LAMPS. DIMMERS SHALL HAVE ADEQUATE CAPACITY FOR THE LOAD SERVED AND THE ENVIRONMENT IN WHICH INSTALLED.
 - 2.3 WALL PLATES
 - A. WALL PLATES FOR SWITCHES, RECEPTACLES, AND COMMUNICATIONS OUTLETS SHALL BE THERMO PLASTIC.
 - B. STANDARD NEMA DESIGN, SO THAT PRODUCTS OF DIFFERENT MANUFACTURERS WILL BE INTERCHANGEABLE. DIMENSIONS FOR OPENINGS IN WALL PLATES SHALL BE ACCORDANCE WITH NEMA WD1.
 - C. FOR RECEPTACLES AND/OR SWITCHES GANGED TOGETHER, WALL PLATES SHALL BE A SINGLE GANGED PLATE.
 - D. WALL PLATES FOR DATA TELEPHONE OR OTHER COMMUNICATION OUTLETS SHALL MATCH RECEPTACLE AND SWITCH DEVICE COLOR.
 - E. SURFACE MOUNTED BOXES, NEMA1, SHALL BE INDUSTRIAL GRADE RAISED GALVANIZED STEEL COVERS. IN SHOP AREAS ALL RECEPTACLES SHALL BE DUST PROOF AND/OR WATERPROOF WHERE APPLICABLE.
 - F. WATERPROOF DEVICE COVERS SHALL BE CAST IRON, 4-CORNER SCREW TYPE, FOR FS AND FD TYPE MOUNTING. DEVICE COVERS SHALL BE ZINC GALVANIZED FINISH. WEATHERPROOF COVERS SHALL BE LOCKABLE.
- PART 3 – EXECUTION
 - 3.1 INSTALLATION
 - A. INSTALLATION SHALL BE IN ACCORDANCE WITH THE CEC, NECA "STANDARD OF INSTALLATION", AND AS SHOWN AS ON THE DRAWINGS.
 - B. GROUND TERMINAL OF EACH RECEPTACLE SHALL BE BONDED TO THE OUTLET BOX WITH AN APPROVED GREEN BONDING JUMPER, AND ALSO BE CONNECTED TO THE GREEN EQUIPMENT GROUNDING CONDUCTOR.
 - C. GENERAL: DEVICES SHALL BE OF THE TYPE SPECIFIED HEREIN. ALL DEVICES SHALL BE INSTALLED WITH "PIGTAILED" LEADS FROM THE OUTLET BOX. NO DEVICE SHALL BE USED IN THE "FEED THROUGH" APPLICATION. SCREW TERMINALS SHALL BE USED TO CONNECT ALL DEVICES TO THE CIRCUIT AND SHALL BE GROUNDED BY MEANS OF A GROUND WIRE WHERE GROUNDING TERMINALS ARE PROVIDED IN THE DEVICE.
 - D. INSTALLATION: DEVICES AND PLATES SHALL BE INSTALLED IN A "PLUMB" CONDITION AND MUST BE FLUSH WITH THE FINISH SURFACE OF THE WALL WHERE BOXES ARE RECESSED.
 - E. MOUNTING HEIGHTS: ALL CONTROL AND CONVENIENCE DEVICES SHALL COMPLY WITH CALIFORNIA CODE OF REGULATIONS TITLE 24 AND ADA WITH RESPECT TO ACCESSIBILITY REQUIREMENTS. MOUNTING HEIGHTS INDICATED ON PLANS SHALL HAVE PRECEDENCE.
 - F. INSTALL SWITCHES WITH THE OFF POSITION DOWN.
 - G. CLEAN DEBRIS FROM OUTLET BOXES.
 - H. PROVIDE EXTENSION RINGS AS REQUIRED TO BRING OUTLET BOXES FLUSH WITH FINISHED SURFACE OR CASEWORK.
 - I. TEST EACH RECEPTACLE DEVICE FOR PROPER POLARITY.

END OF SECTION 16140

PROJECT

ACCESSIBILITY IMPROVEMENTS

ROLLING HILLS APARTMENTS

TEMPLETON, CA

CLIENT JOB # ARCHITECT JOB #
0708B



PROJECT MANAGER JT

DRAWN BY DM

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

SIGNED

Thoma ENGINEERING
THOMA ELECTRIC, INC.
P.O. Box 1167 • 5662 Empire St.
San Luis Obispo, CA 93406
Phone: (805) 543-3850
Fax: (805) 543-3029
cod@thomaelec.com

EXPIRES: 06/30/11
THOMA #10-8055

The use of these plans and specifications shall be restricted to the original site for which they were prepared and publication thereof is expressly limited to such use. Reproduction or publication by any method, in whole or in part, is prohibited. Title to these plans and specifications remain with the architect without prejudice. Visual contact with these plans and specifications shall constitute prima facie evidence of the acceptance of these restrictions.

Written dimensions on these drawings shall have precedence over scaled dimensions. Contractors shall verify and be responsible for all dimensions and existing conditions on the job and shall report any discrepancies to the architect for resolution prior to commencing work.

SHEET TITLE

ELECTRICAL SPECIFICATIONS

SHEET #
E5.1