

ELECTRICAL SPECIFICATIONS

GENERAL SPECIFICATIONS

- THE FOLLOWING ARE ABBREVIATED SPECIFICATIONS. ALL ITEMS NECESSARY FOR A COMPLETE AND OPERABLE JOB (TO THE SATISFACTION OF OWNER) WHETHER SHOWN OR IMPLIED SHALL BE HELD AS THE RESPONSIBILITY OF THIS CONTRACTOR
- IMPORTANT NOTE:** "CONTRACTOR" REFERENCED IN THESE SPECIFICATIONS SHALL INDICATE WORK BY ELECTRICAL CONTRACTOR OR ANY OF HIS SUBCONTRACTORS UNLESS NOTED OTHERWISE.
- DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT ONLY. COORDINATE INSTALLATION WITH OTHER TRADES TO VERIFY THE ACTUAL SPACE CONDITIONS, HEADROOM, ETC. THAT IS TO BE MAINTAINED. NO ADDITIONAL PAYMENT WILL BE APPROVED FOR FAILURE TO COMPLY.
- CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ALL NECESSARY PARKING FOR PERSONNEL AROUND BUILDING.
- CONTRACTOR'S SCOPE OF WORK SHALL INCLUDE ALL ITEMS DEFINED IN THE CONTRACT DOCUMENTS. THE CONTRACT DOCUMENTS INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING: THE CONTRACT, SPECIFICATIONS, AND CONSTRUCTION DRAWINGS. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIAL, AND EQUIPMENT NECESSARY TO INSTALL ALL ELECTRICAL DEVICES, FIXTURES, LAMPS, EQUIPMENT, SPECIAL SYSTEMS, CONDUIT, WIRING ETC. AS SHOWN OR IMPLIED ON THE DRAWINGS AND PROVIDE A COMPLETE OPERATIVE SYSTEM TO THE SATISFACTION OF OWNER.
- CONTRACTOR SHALL PROVIDE ON-SITE SUPERVISION AT ALL TIMES WHILE THE WORK IS BEING PERFORMED AND SHALL DIRECT ALL WORK, USING HIS BEST SKILL AND ATTENTION. HE SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, PROCEDURES AND SEQUENCES FOR COORDINATING ALL PORTIONS OF THE WORK UNDER THE CONTRACT.
- CONTRACTOR SHALL PROVIDE TEMPORARY WATER, POWER AND TOILET FACILITIES AS REQUIRED BY THE CITY OR GOVERNING AGENCY.
- INSTALLATION OF ALL ELECTRICAL EQUIPMENT, DEVICES, CONDUITS, ETC. MUST BE COORDINATED WITH ALL OTHER TRADES. COORDINATE SHUTDOWN TIMES AND WORKING HOURS WITH BUILDING OWNER, INCLUDING OFF HOURS, WEEKEND, AND HOLIDAY WORK AS REQUIRED.
- ANY DISCREPANCIES FOUND WITHIN THE CONTRACT DOCUMENTS SHALL BE REPORTED TO THE OWNER IN WRITING PRIOR TO THE AWARD OF THE CONTRACT AND AN ADDENDUM WILL BE ISSUED TO COVER SAME.
- GUARANTEE - CONTRACTOR SHALL FURNISH OWNER WITH A WRITTEN GUARANTEE TO PROMPTLY REMEDY ALL DEFECTS WITHOUT CHARGE FOR A PERIOD OF ONE YEAR AFTER FINAL ACCEPTANCE AND INSPECTION.
- MATERIALS - ALL MATERIALS AND EQUIPMENT SHALL BE NEW IN ORIGINAL CONTAINERS/WRAPPIINGS, SHALL BE SPECIFICATION GRADE AND LABELED OR LISTED BY U.L. OR AN ACCREDITED TESTING ORGANIZATION AS REQUIRED BY LOCAL INSPECTORS.
- ALL EQUIPMENT SHALL BE DESIGNED TO OPERATE ON VOLTAGE AND PHASE SPECIFIED. CONTRACTOR FURNISHING EQUIPMENT OTHER THAN INDICATED SHALL BE RESPONSIBLE FOR ANY CHANGES IN CONDUCTORS, RACEWAYS, SWITCHES, MAIN FEEDERS, AND APPURTENANCES AND PAY ALL ASSOCIATED COSTS. REQUIREMENTS FOR ANY INCREASE IN CAPACITIES SHALL BE REVIEWED BY ENGINEER.

LICENSES, CERTIFICATIONS OF INSPECTION

- CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFICATION OF ALL GOVERNING AGENCIES THAT REQUIRE SITE INSPECTION OF THE WORK AND/OR SIMPLY NOTIFICATION. THE CONTRACTOR SHALL OBTAIN AND PAY FOR PERMITS, LICENSES AND INSPECTIONS NECESSARY FOR PERFORMANCE OF THE WORK.
- CONTRACTOR AND ALL OF HIS SUBCONTRACTORS THAT DO ANY WORK ON THIS PROJECT SHALL BE CURRENTLY LICENSED BY ALL AGENCIES WHICH GOVERN OVER THE LAND(S) ON WHICH CONSTRUCTION IS TO BE PERFORMED. CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS AS REQUIRED. **ALL COSTS SHALL BE BORNE BY CONTRACTOR.**
- THE CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS, LICENSES AND INSPECTIONS INCIDENTAL TO WORK UNDER THIS CONTRACT. WHEN THE WORK IS COMPLETED, THE REQUIRED CERTIFICATES OF APPROVAL SHALL BE FURNISHED TO THE BUILDING OWNER. CONTRACTOR MUST BE LICENSED IN THE STATE, COUNTY AND CITY OF THE PROJECT SITE.
- CITY APPROVED PLANS SHALL BE KEPT IN A PLAN BOX AND SHALL NOT BE USED BY WORKMEN. ALL CONSTRUCTION SETS SHALL REFLECT SAME INFORMATION. AT ALL TIMES THESE ARE TO BE UNDER THE CARE OF THE CONSTRUCTION MANAGER.

CODES AND ORDINANCES

- ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH APPLICABLE CODES AND ORDINANCES, INCLUDING SUCH AS PERTAIN TO THE SAFETY AND HEALTH RELATIONS. CODES AND ORDINANCES SHALL TAKE PRECEDENCE OVER THE DRAWINGS AND SPECIFICATIONS ONLY IN CASE OF CONFLICT.

FIELD REPORTS AND CONST. PROGRESS MEETINGS

- PROVIDE WRITTEN PROGRESS REPORTS TO THE OWNER AS DIRECTED DURING PRE-BID MEETING.

SHOP DRAWING SUBMITTALS

- CONTRACTOR SHALL SUBMIT ELECTRONIC SET OF SHOP DRAWINGS AND CATALOG DATA FOR ALL MATERIAL AND EQUIPMENT USED FOR ACCEPTANCE BEFORE SUCH ITEMS ARE ORDERED OR FABRICATED FOR THE JOB. SHOP DRAWINGS NOT STAMPED WITH CONTRACTOR APPROVAL WILL BE RETURNED FOR REPROCESSING.
- SSL (SOLID STATE LIGHTING) SUBMITTAL REQUIREMENTS, PRODUCT SUBMITTALS SHALL BE ACCOMPANIED BY PRODUCT SPECIFICATIONS SHEETS AND OTHER DOCUMENTATION THAT INCLUDES THE DESIGNED PARAMETERS AS DETAILED IN THIS SPECIFICATION. THESE PARAMETERS INCLUDE (BUT NOT LIMITED TO):
 - MAXIMUM POWER IN WATTS
 - L80 IN HOURS, WHEN EXTRAPOLATED FOR THE WORSE CASE OPERATING TEMPERATURE. TM21 REPORT SHALL BE SUBMITTED TO DEMONSTRATE THIS.
 - PRODUCT SUBMITTALS SHALL BE ACCOMPANIED BY PERFORMANCE DATA THAT IS DERIVED IN ACCORDANCE WITH THE APPROPRIATE IESNA TESTING STANDARDS AND TESTED IN A LABORATORY THAT IS NVLAP ACCREDITED FOR ENERGY EFFICIENT LIGHTING PRODUCTS.
 - LUMINAIRE SHALL BE TESTED PER IESNA LM 79-08.

POST CONSTRUCTION AND PROJECT CLOSEOUT DOCUMENTATION

- AS-BUILT REQUIREMENTS:** DO NOT USE RECORD DOCUMENTS FOR CONSTRUCTION PURPOSES. TO PROTECT RECORD DOCUMENTS FROM DETERIORATION AND LOSS, STORE IN A SECURE, FIRE-RESISTANT LOCATION. PROVIDE ACCESS TO RECORD DOCUMENTS FOR THE OWNER'S REFERENCE DURING NORMAL WORKING HOURS. MAINTAIN A CLEAN, UNDAMAGED SET OF BLUE OR BLACK LINE PRINTS OF CONTRACT DRAWINGS AND SHOP DRAWINGS. MARK THE SET TO SHOW THE ACTUAL INSTALLATION WHERE THE INSTALLATION VARIES SUBSTANTIALLY FROM THE WORK AS ORIGINALLY SHOWN. MARK DRAWINGS THAT ARE MOST CAPABLE OF SHOWING CONDITIONS FULLY AND ACCURATELY. WHERE SHOP DRAWINGS ARE USED, RECORD A CROSS-REFERENCE AT THE CORRESPONDING LOCATION ON THE CONTRACT DRAWINGS. GIVE PARTICULAR ATTENTION TO CONCEALED ELEMENTS THAT WOULD BE DIFFICULT TO MEASURE AND RECORD AT A LATER DATE. MARK RECORD SETS WITH RED ERASABLE PENCIL. USE OTHER COLORS TO DISTINGUISH BETWEEN VARIATIONS IN SEPARATE CATEGORIES OF THE WORK. MARK NEW INFORMATION THAT IS IMPORTANT TO THE OWNER BUT WAS NOT SHOWN ON THE CONTRACT DRAWINGS, DETAILS OR SHOP DRAWINGS. NOTE RELATED CHANGE ORDER NUMBERS WHERE APPLICABLE. NOTE RELATED RECORD DRAWING INFORMATION AND PRODUCT DATA. UPON COMPLETION OF THE WORK, SUBMIT ONE (1) COMPLETE SET OF RECORD DOCUMENTS TO THE CONSTRUCTION MANAGER FOR THE OWNER'S RECORDS. CONTRACTOR SHALL SUBMIT AS-BUILT SET OF PLANS TO THE ENGINEER WITHIN 7 DAYS OF COMPLETION OF CONSTRUCTION.

EXISTING CONDITIONS AND DEMOLITION

- SITE VISIT - CONTRACTOR SHALL VISIT THE SITE AND FAMILIARIZE HIMSELF WITH ALL CONDITIONS AFFECTING HIS WORK. NO EXTRAS WILL BE PERMITTED FOR LACK OF KNOWLEDGE OF EXISTING CONDITIONS. QUANTITIES OF MATERIALS SHALL BE PER CONTRACTOR'S MEASUREMENTS.

BASIC ELECTRICAL MATERIALS AND METHODS

- TRASH REMOVAL:** CONTRACTOR SHALL REMOVE ALL TRASH CREATED BY HIMSELF OR HIS SUBCONTRACTORS DUE TO CONSTRUCTION. THE CONTRACTOR SHALL ALSO REMOVE TRASH CREATED BY OTHER SUBCONTRACTORS INCLUDING CABLE REELS, CARDBOARD BOXES AND PACKING. PROMPTLY CLEAN-UP ALL SOILING, DEBRIS AND OTHER UNSIGHTLY OR HAZARDOUS CONDITIONS, CAUSED BY WORK OR DELIVERIES UNDER THIS CONTRACT, FROM THE BUILDING GROUNDS, ENTRIES, CORRIDORS, STAIRWAYS, OR OTHER PUBLIC AREAS OF THE BUILDING. ALL SHALL BE REMOVED FROM THE SITE IN A TIMELY FASHION TO A LEGAL DISPOSAL FACILITY.
- SIGNAGE:** CONTRACTOR SHALL MAINTAIN SECURITY AROUND PERIMETER OF CONSTRUCTION SITE DURING ALL HOURS BY INSTALLING A TEMPORARY RIBBON FOR INTERIOR WORK TO IDENTIFY CONSTRUCTION AREAS AS REQUIRED. SIGNAGE SHALL BE POSTED WITH NOTIFICATIONS OF "NO TRESPASSING" AND "CONSTRUCTION AREA".
- CHECK ACCURACY OF ALL DIMENSIONS IN THE FIELD.** UNLESS SPECIFICALLY NOTED, DO NOT FABRICATE ANY MATERIALS OFF SITE. NOR DO ANY CONSTRUCTION UNTIL THE ACCURACY OF DRAWING DIMENSIONS HAVE BEEN VERIFIED AGAINST ACTUAL FIELD DIMENSIONS.
- CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NECESSARY CUTTING, SUBSEQUENT PATCHING, AND REQUIRED FLASHING FOR ALL ITEMS NECESSARY FOR ELECTRICAL PART OF THE CONTRACT. PATCH, PAINT, AND REPAIR ANY AREA DAMAGED TO THE SATISFACTION OF THE BUILDING OWNER.
- COORDINATE ALL LOCATIONS OF FLOOR BOXES, RECEPTACLES, AND OTHER DEVICE BACKBOXES WITH CASEWORK AND FURNITURE LAYOUTS. REFER TO THE ARCHITECTURAL DRAWINGS FOR ADDITIONAL INFORMATION AND FIELD VERIFY EXACT LOCATIONS AND CONDUIT ROUTING METHODS WITH ARCHITECT PRIOR TO ROUGH-IN.
- THE CONTRACTOR SHALL PROVIDE ALL NECESSARY BLOCKING, BACKING, FRAMING, HANGERS OR OTHER SUPPORT FOR THE MOUNTING AND SUPPORT OF ALL ITEMS REQUIRING THE SAME.

ELECTRICAL EQUIPMENT

- ALL ELECTRICAL EQUIPMENT SHALL BE PROVIDED BY THE SAME MANUFACTURER. PROVIDE EQUIPMENT BY ONE OF THE FOLLOWING: EATON CORPORATION, CUTLER-HAMMER PRODUCTS; GENERAL ELECTRIC COMPANY, ELECTRICAL DISTRIBUTION & CONTROL DIVISION; SIEMENS ENERGY & AUTOMATION, INCORPORATED; OR SQUARE D COMPANY.
- ALL EQUIPMENT SHALL BE DESIGNED TO OPERATE ON VOLTAGE AND PHASE SPECIFIED. CONTRACTOR FURNISHING EQUIPMENT OTHER THAN INDICATED SHALL BE RESPONSIBLE FOR ANY CHANGES IN CONDUCTORS, RACEWAYS, SWITCHES, MAIN FEEDERS, AND APPURTENANCES AND PAY ALL ASSOCIATED COSTS. REQUIREMENTS FOR ANY INCREASE IN CAPACITIES SHALL BE REVIEWED BY ENGINEER.

FIRESTOPPING AND SEALING ELECTRICAL PENETRATIONS

- CONTRACTOR SHALL FURNISH AND INSTALL FIRESTOPPING FOR SEALING AROUND ELECTRICAL PENETRATIONS THROUGH FIRE OR SMOKE BARRIERS, AND FLOORS.
- PROVIDE A FIRESTOPPING WORKSHEET TO ANY/ALL AGENCIES WHICH GOVERN THE PROJECT.
- PROVIDE SHOP DRAWINGS OF EACH CONDITION REQUIRING PENETRATION SEALS AND THE PROPOSED UL SYSTEMS MATERIALS, ANCHORAGE, METHODS OF INSTALLATION, AND ACTUAL ADJACENT CONSTRUCTION. SUBMITTAL PACKAGE SHALL ALSO INCLUDE A COPY OF THE UL ILLUSTRATION OF EACH PROPOSED SYSTEM INDICATING MANUFACTURER APPROVED MODIFICATIONS (IF APPLICABLE) AND THE MANUFACTURER'S SPECIFICATIONS, RECOMMENDATIONS, INSTALLATION INSTRUCTIONS, AND MAINTENANCE INSTRUCTIONS.
- FIRESTOPPING MATERIALS SHALL BE INTUMESCENT SAFETY BARRIERS DESIGNED TO BLOCK THE SPREAD OF FIRE AND SMOKE THROUGH PENETRATIONS CREATED BY ELECTRICAL INSTALLATIONS IN FIRE RATED WALLS AND FLOORS. MATERIALS SHALL BE FLEAME, TOXIC FUME, AND WATER RESISTANT AND SHALL HAVE A MINIMUM 3 HOUR FIRE RATING. FIRE RATING SHALL BE DEFINED BY TESTS CONDUCTED BY ASTM, UL OR OTHER TESTING AND INSPECTION AGENCIES ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION.
- PROVIDE MATERIALS BY THE FOLLOWING MANUFACTURERS TO SUIT THE APPLICATION: SPECIFIED TECHNOLOGIES, INC (STI), SOMERVILLE, NJ; TREMCO, INC., BEACHWOOD, OH; OR 3M INC., MINNEAPOLIS, MN

FAULT CURRENT, COORDINATION STUDY, AND ARC FLASH

- CONTRACTOR SHALL CONDUCT A FAULT CURRENT CALCULATION AND COORDINATION STUDY TO ENSURE THE CORRECT ARC RATING OF NEW ELECTRICAL PANELBOARDS AND THE SETTINGS OF ANY ADJUSTABLE BREAKERS. THE RESULTS OF THESE STUDIES SHALL BE SUBMITTED WITH THE PANELBOARD SHOP DRAWINGS. ANY PANELS SUBMITTED WITHOUT THIS DOCUMENTATION WILL BE REJECTED WITHOUT BEING REVIEWED AT THE CONTRACTOR'S EXPENSE.
- CONTRACTOR SHALL PROVIDE AN ARC-FLASH STUDY AND LABEL ALL EQUIPMENT AS REQUIRED PER THE N.E.C.

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

- ALL RACEWAYS AND EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH THE N.E.C. AND ANY LOCAL CODES.
- ALL CONDUITS SHALL CONTAIN A CODE SIZE GROUNDING CONDUCTOR.
- INSULATED GROUNDING CONDUCTORS SHALL COMPLY WITH DIVISION 26 SPEC SECTION "CONDUCTORS AND CABLES."
- EQUIPMENT GROUNDING CONDUCTORS SHALL BE INSULATED WITH GREEN-COLORED INSULATION.
- ISOLATED GROUND CONDUCTORS SHALL BE INSULATED WITH GREEN-COLORED INSULATION WITH YELLOW STRIPE. ON FEEDERS WITH ISOLATED GROUND, USE COLORED TAPE, ALTERNATING BANDS OF GREEN AND YELLOW TAPE TO PROVIDE A MINIMUM OF THREE BANDS OF GREEN AND TWO BANDS OF YELLOW.
- GROUNDING ELECTRODE CONDUCTORS SHALL BE STRANDED CABLE.
- MATERIALS AND CONNECTION COMPONENTS FOR GROUNDING AND BONDING SHALL BE MANUFACTURED BY ERICO, THOMAS & BETTS, OR BURNDY.

ELECTRICAL IDENTIFICATION

- PROVIDE NAMEPLATES FOR ALL MAJOR ELECTRICAL EQUIPMENT. REFER TO NAMEPLATE DETAIL FOR REQUIREMENTS.
- PROVIDE ALL FEEDERS AND BRANCH CIRCUIT WIRING WITH COLOR CODED VINYL TAPE WRAPPED A MINIMUM OF 1.5 TIMES AROUND CIRCUMFERENCE OF JACKET/SHELDING TO DESIGNATE PHASE.
- COLOR CODING OF CONDUCTORS FOR 208/120V, 3 PHASE, 4 WIRE SHALL BE AS FOLLOWS: PHASE A-BLACK; PHASE B-RED; PHASE C-BLUE; NEUTRAL-WHITE.

CONDUCTORS AND CABLES

- WIRING - ALL CONDUCTORS SHALL BE EQUAL TO OR BETTER THAN MINIMUM #12 AWG FOR POWER, #14 AWG FOR CONTROL. STRANDED COPPER 600V AC THHN/THWN, XHHW, SPECIFICATION. PROVIDE 75°C RATED CONDUCTORS FOR AMPACITIES ABOVE 100A AND 60°C RATED CONDUCTORS FOR AMPACITIES OF 100 AMPS OR LESS. PROVIDE SOLID OR STRANDED FOR #10 AWG AND SMALLER, STRANDED FOR #8 AWG AND LARGER.
- ALL WIRING SHALL BE INSTALLED IN CONDUIT.
- WIRE SIZE OF BRANCH CIRCUITS SHALL BE ADJUSTED TO COMPENSATE FOR VOLTAGE DROP BASED UPON ACTUAL CONDUIT ROUTING. CONTRACTOR SHALL MAINTAIN VOLTAGE DROP AS RECOMMENDED BY N.E.C. (NOT TO EXCEED 3%).
- PROVIDE A SEPARATE NEUTRAL FOR EACH BRANCH CIRCUIT, FEEDER, ETC. NEUTRALS ARE NOT PERMITTED TO BE SHARED.
- BRANCH CIRCUITS SERVING ISOLATED GROUND RECEPTACLES SHALL INCLUDE AN ADDITIONAL ISOLATED GROUNDING CONDUCTOR FROM THE RECEPTACLE AND WILL TERMINATE ON THE ISOLATED/INSULATED GROUND BAR IN PANEL SERVING THEM.
- PROVIDE WIRE AND CABLE AND ASSOCIATED CONNECTORS WHICH COMPLY WITH REQUIREMENTS NOTED IN THE CONTRACT DOCUMENTS.
- PROVIDE WIRE AND CABLE MANUFACTURED BY ONE OF THE FOLLOWING: AMERICAN INSULATED WIRE CORPORATION; NEXANS; CERROWIRE; SOUTHWIRE; OR ENCORE WIRE.
- PROVIDE CONNECTORS MANUFACTURED BY ONE OF THE FOLLOWING: AMP INCORPORATED; GENERAL SIGNAL, O-Z/GEDNEY UNIT; SQUARE D COMPANY, ANDERSON; ILSCO; OR BURNDY.
- MC OR AC CABLE SHALL BE ALLOWED ONLY IF APPROVED BY OWNER AND ENGINEER IN WRITING, IN CONCEALED SPACES UNLESS NOT PERMITTED BY CODE. IF ALLOWED BY LOCAL JURISDICTION, CABLE MUST CONTAIN A GREEN CU CODE SIZE GROUND CONDUCTOR. ALL DEVICES AND BOXES MUST BE GROUND TO GROUND CONDUCTOR.

RACEWAY AND BOXES

- RACEWAYS INTERIOR - UNLESS NOTED OTHERWISE, (EXCEPT FOR GROUNDING CONDUCTORS) ALL INTERIOR CONDUIT SHALL BE EMT, ALL EMT CONDUIT FITTINGS SHALL BE ZINC PLATED STEEL SET-SCREW TYPE. CONDUITS SHALL BE INSTALLED IN WALLS AND CEILING SPACES IN FINISHED ROOMS, AND MOUNTED EXPOSED IN UNFINISHED SPACES. ANY CONDUIT EXPOSED TO POSSIBLE DAMAGE SHALL BE R.G.S. THE ROUTING OF ANY/ALL EXPOSED CONDUITS SHALL BE VERIFIED BY THE ARCHITECT PRIOR TO ROUGH-IN. THE USE OF MC CABLE SHALL NOT BE PERMITTED (EXCEPT FOR 6' LIGHTING FIXTURE WHIPS). WHERE SIZE IS SPECIFIED, IT SHALL BE USED. WHERE NOT SPECIFIED ON THE DRAWINGS, CONTRACTOR SHALL SIZE CONDUIT PER N.E.C. BASED ON WIRING REQUIREMENTS. THE CONTRACTOR SHALL PROVIDE JUNCTION AND/OR PULL BOXES WHERE SHOWN ON THE DRAWINGS, OR AS REQUIRED, WHETHER SHOWN ON THE DRAWINGS OR NOT. EXPANSION JOINTS SHALL BE PROVIDED AS REQUIRED.**
- RACEWAYS EXTERIOR - UNLESS NOTED OTHERWISE, ALL EXPOSED CONDUIT SHALL BE A MINIMUM OF 3/4" R.G.S. AND CONVERTED 6" BELOW FINISHED GRADE TO BE PVC, SCHEDULE 40. PROVIDE WEATHERPROOF FLEX CONNECTIONS WHERE REQUIRED. CONTRACTOR SHALL PROVIDE JUNCTION AND/OR PULL BOXES WHERE SHOWN ON THE DRAWINGS, OR AS REQUIRED, WHETHER SHOWN ON THE DRAWINGS OR NOT, AND SIZED PER N.E.C. PROVIDE NON-METALLIC ENCLOSURE WITH OPEN BOTTOM AND GASKETED COVER MANUFACTURED BY QUIAZITE OR EQUIVALENT WITH DRIVE-OVER COVER ABLE TO WITHSTAND OCCASIONAL NON-DELIBERATE LIGHT VEHICULAR TRAFFIC. LABEL COVER TO SUIT INSTALLATION (I.E. "POWER" "TELEPHONE", "LIGHTING", ETC.) AND INSTALL PER MANUFACTURER'S RECOMMENDATIONS. UNDERGROUND CONDUITS SHALL BE ENCASED IN CONCRETE UNDER ALL ROADS, DRIVES, PARKING LOTS, AND 5 FEET PAST EDGES OF SAME.**
- ALL CONDUIT SHALL BE A MINIMUM OF 3/4".
- CONTRACTOR SHALL PROVIDE 3/4" MINIMUM EMPTY CONDUIT WITH PULLWIRE FOR CONTROL WIRING BETWEEN HVAC EQUIPMENT AND REMOTE LOCATED CONTROL PANELS. COORDINATE EXACT REQUIREMENTS WITH MECHANICAL CONTRACTOR.
- PROVIDE METAL CONDUIT AND TUBING MANUFACTURED BY ONE OF THE FOLLOWING: ALFLEX CORPORATION; ANAMET INCORPORATED; ANACONDA METAL HOSE; ANIXTER BROTHERS INCORPORATED; CAROL CABLE COMPANY INCORPORATED; ELECTRO-FLEX COMPANY; GRINNELL COMPANY, ALLIED TUBE AND CONDUIT DIVISION; MONOGRAM COMPANY, AFC; REPUBLIC CONDUIT; OR WHEATLAND TUBE COMPANY.
- PROVIDE NONMETALLIC CONDUIT AND TUBING MANUFACTURED BY ONE OF THE FOLLOWING: ANAMET INCORPORATED, ANACONDA METAL HOSE; CANTEX INDUSTRIES, HARSCO CORPORATION; CONDUX INTERNATIONAL, ELECTRICAL PRODUCTS; HUBBELL INCORPORATED, RACO, INCORPORATED; THOMAS & BETTS CORPORATION, CARLON ELECTRICAL PRODUCTS; OR O-Z/GEDNEY, UNIT OF GENERAL SIGNAL.

- PROVIDE CONDUIT BODIES AND FITTINGS MANUFACTURED BY ONE OF THE FOLLOWING: CROUSE-HINDS, DIVISION OF COOPER INDUSTRIES; EMERSON ELECTRIC COMPANY, APPLETON ELECTRIC COMPANY; HUBBELL INCORPORATED, KILLARK ELECTRIC MANUFACTURING COMPANY; THOMAS & BETTS CORPORATION, CARLON ELECTRICAL PRODUCTS; OR O-Z/GEDNEY, UNIT OF GENERAL SIGNAL.
- PROVIDE METAL WIREWAYS MANUFACTURED BY ONE OF THE FOLLOWING: HOFFMAN ENGINEERING COMPANY; KEYSTONE/REES, INCORPORATED; OR SQUARE D COMPANY.
- PROVIDE NONMETALLIC WIREWAYS MANUFACTURED BY ONE OF THE FOLLOWING: WIREMOLD COMPANY (THE), ELECTRICAL SALES DIVISION; OR THOMAS & BETTS, CARLON ELECTRICAL PRODUCTS.
- PROVIDE SURFACE METAL RACEWAY MANUFACTURED BY ONE OF THE FOLLOWING: WIREMOLD COMPANY (THE), ELECTRICAL SALES DIVISION; SUPERSTRUT, (THOMAS & BETTS); OR HUBBELL, INCORPORATED.
- PROVIDE SURFACE NONMETALLIC RACEWAY MANUFACTURED BY ONE OF THE FOLLOWING: THOMAS & BETTS, CARLON ELECTRICAL PRODUCTS; PANDUIT CORPORATION; WIREMOLD COMPANY (THE) ELECTRICAL SALES DIVISION; HUBBELL INCORPORATED.
- PROVIDE BOXES, ENCLOSURES, AND CABINETS MANUFACTURED BY ONE OF THE FOLLOWING: CROUSE-HINDS, DIVISION OF COOPER INDUSTRIES; HOFFMAN ENGINEERING COMPANY, FEDERAL-HOFFMAN INCORPORATED; HUBBELL INCORPORATED, RACO INCORPORATED; THOMAS & BETTS, CARLON ELECTRICAL PRODUCTS; O-Z/GEDNEY, UNIT OF GENERAL SIGNAL; ROBROY INDUSTRIES INCORPORATED, ELECTRICAL DIVISION; OR SCOTT FETZER COMPANY, ADALET-PLM.

WIRING DEVICES

- COLOR OF WIRING DEVICES SHALL BE AS SELECTED BY ARCHITECT WITH MATCHING UNBREAKABLE NYLON COVERPLATE UNLESS OTHERWISE NOTED IN THE SYMBOL LEGEND.
- DEVICES GANGED TOGETHER SHALL BE PROVIDED WITH A COMMON COVERPLATE.
- GALVANIZED STEEL COVER PLATES SHALL BE USED ON EXPOSED WORKBOXES IN UNFINISHED AREAS.
- ALL AREAS THAT HAVE A TOGGLE-TYPE LIGHT SWITCH AND RECEPTACLE MOUNTED BESIDE A DOOR OPENING AT 46" AFF TO CENTERLINE OF DEVICE (OR 44" TO BOTTOM) SHALL BE FURNISHED WITH A TWO-GANG BACKBOX AND A COMMON FACEPLATE. IF LIGHTING IS 277V, PROVIDE A BARRIER BETWEEN THE TWO DEVICES TO SEPARATE THE VOLTAGE WITHIN THE BACKBOX.
- ANY DEVICES THAT ARE TO BE INSTALLED BACK-TO-BACK IN A COMMON WALL SHALL BE SEPARATED BY 8" MINIMUM TO MINIMIZE SOUND TRANSFER.
- PROVIDE WIRING DEVICES MANUFACTURED BY ONE OF THE FOLLOWING: COOPER WIRING DEVICES; HUBBELL, INCORPORATED, WIRING DEVICES DIVISION; LUTRON ELECTRONICS, INCORPORATED (DIMMER SWITCHES); PASS & SEYMOUR (P&S)/LEGRAND, WIRING DEVICES DIVISION; LEVITON; OR SENSORSWITCH.
- ALL RECEPTACLES SHALL BE HOSPITAL GRADE.**
- RECEPTACLES SHALL BE INSTALLED WITH THE GROUND PRONG UP WHEN MOUNTED VERTICALLY OR MOUNTED WITH THE GROUND PRONG TO THE RIGHT WHEN MOUNTED HORIZONTALLY.
- ANY DEVICES THAT ARE TO BE INSTALLED BACK-TO-BACK IN A COMMON WALL SHALL BE SEPARATED BY 8" MINIMUM TO MINIMIZE SOUND TRANSFER.

OCCUPANCY SENSORS FOR AUTOMATIC INTERIOR LIGHTING CONTROL

- COLOR OF LIGHTING CONTROL DEVICES SHALL BE WHITE IF MOUNTED ON THE CEILING AND SHALL MATCH OTHER WIRING DEVICES IF WALL MOUNTED.
- PROVIDE DEVICES AS DESCRIBED ON THE ELECTRICAL SYMBOLS LEGEND.
- PROVIDE ALL POWER PACKS AND CONTROL WIRING AS REQUIRED BY MANUFACTURER FOR A FULLY FUNCTIONAL SYSTEM.
- PROVIDE OCCUPANCY SENSORS AND OCCUPANCY WALL SWITCHES AND ALL ASSOCIATED COMPONENTS FROM ONE MANUFACTURER.
- PROVIDE INDOOR OCCUPANCY SENSORS AS MANUFACTURED BY ONE OF THE FOLLOWING: HUBBELL; LEVITON MFG. COMPANY, INC; WATTSTOPPER (THE); OR SENSORSWITCH.

SAFETY SWITCHES

- ALL DISCONNECT SWITCHES SHALL BE HEAVY-DUTY CONSTRUCTION WITH LOCKABLE HANDLES SIZED AS NOTED ON THE DRAWINGS AND/OR RISER DIAGRAM. ALL FUSIBLE SWITCHES SHALL BE PROVIDED WITH DUAL ELEMENT FUSES SIZED PER THE EQUIPMENT MANUFACTURER'S RECOMMENDATION.

PANELBOARDS

- PANELBOARDS SHALL BE FULLY RATED WITH BOLT-ON BREAKERS, COPPER BUS, AND AIC RATED TO WITHSTAND AVAILABLE FAULT CURRENT. REFER TO FAULT CURRENT AND COORDINATION STUDY SPECIFICATION SECTION FOR REQUIREMENTS. LOAD CENTER CONSTRUCTION IS NOT ACCEPTABLE. A TYPED PANELBOARD SCHEDULE SHALL BE INSTALLED IN THE FRONT COVER OF THE PANEL. APPROVED MANUFACTURERS: SQUARE D, GENERAL ELECTRIC, CUTLER-HAMMER, AND SEIMENS. SURFACE MOUNT OR RECESS MOUNT PER DRAWINGS.
- CIRCUITS SHALL BE REARRANGED AS REQUIRED TO MAINTAIN THE MOST BALANCED LOADS ON EACH PHASE WITHIN EACH PANEL.
- PROVIDE A TYPED PANELBOARD SCHEDULE AND INSTALL IT ON INSIDE COVER OF EACH PANEL. HANDWRITTEN PANELBOARD SCHEDULES ARE NOT ACCEPTABLE.
- PROVIDE AN UPDATED, TYPED PANELBOARD SCHEDULE FOR INSIDE OF FRONT COVER TO REPLACE EXISTING SCHEDULE FOR ANY PANELBOARD THAT HAS BEEN MODIFIED DUE TO WORK ASSOCIATED WITH THIS PROJECT.

FUSES

- FUSES SHALL BE DUAL ELEMENT, TIME DELAY CURRENT LIMITING. CONTRACTOR SHALL COORDINATE FUSE SIZES WITH EQUIPMENT MANUFACTURER'S REQUIREMENTS AND PER THE N.E.C.
- CONTRACTOR SHALL PROVIDE A FUSE CABINET AND 10% SPARE FUSES OF EACH TYPE USED.
- PROVIDE FUSES MANUFACTURED FROM ONE OF THE FOLLOWING: COOPER BUSSMAN, INCORPORATED; EAGLE ELECTRIC MANUFACTURING COMPANY INCORPORATED, COOPER INDUSTRIES INCORPORATED; FERRAZ SHAWMUT INCORPORATED.

INTERIOR LIGHTING

- REFER TO ELECTRICAL DRAWINGS FOR LIGHTING FIXTURE SCHEDULE FOR SPECIFIC REQUIREMENTS.
- CONTRACTOR SHALL PROVIDE 10% REPLACEMENT LAMPS FOR EACH TYPE AND WATTAGE USED ON PROJECT NOT TO EXCEED TEN (10) LAMPS NOR FEWER THAN TWO (2).

EXTERIOR LIGHTING

- REFER TO ELECTRICAL DRAWINGS FOR LIGHTING FIXTURE SCHEDULE FOR SPECIFIC REQUIREMENTS.
- CONTRACTOR SHALL PROVIDE 10% REPLACEMENT LAMPS FOR EACH TYPE AND WATTAGE USED ON PROJECT NOT TO EXCEED TEN (10) LAMPS NOR FEWER THAN TWO (2).

SOLID STATE LIGHTING (SSL)

- SOLID STATE LIGHTING (SSL) GENERAL REQUIREMENTS: SOLID STATE LIGHTING (SSL) GENERAL REQUIREMENTS: THE DRIVER'S MANUFACTURER'S MAXIMUM CASE TEMPERATURE SHALL NOT BE EXCEEDED AT THE MAXIMUM OPERATING AMBIENT. THERMAL MANAGEMENT SHALL NOT BE PASSIVE BY DESIGN. THE USE OF FANS OR OTHER MECHANICAL DEVICES SHALL NOT BE ALLOWED.

1.1 LED SOURCES

- LED'S SHALL BE MANUFACTURED BY, NICHIA, SAMSUNG, OSRAM, CREE OR PHILLIPS.
- LUMEN OUTPUT: MINIMUM INITIAL LUMEN OUTPUT OF THE LUMINAIRE SHALL BE PER BASIS OF DESIGN PRODUCT FOR THE LUMENS EXITING THE LUMINAIRE IN THE 0-90 DEGREE ZONE - AS MEASURED BY IESNA STANDARD LM-79-08 IN AN ACCREDITED LAB. EXACT TESTED LUMEN OUTPUT SHALL BE CLEARLY NOTED ON SHOP DRAWINGS.
- LUMEN OUTPUT SHALL NOT DECREASE BY MORE THAN 20% OVER THE MINIMUM OPERATIONAL LIFE OF 50,000 HOURS.
- INDIVIDUAL LED'S SHALL BE CONNECTED SUCH THAT A CATASTROPHIC LOSS OR THE FAILURE OF ONE LED WILL NOT RESULT IN THE LOSS OF THE ENTIRE LUMINAIRE.
- LED BOARDS SHALL BE SUITABLE FOR FIELD MAINTENANCE OR SERVICE FROM BELOW WITH PLUG-IN CONNECTORS. LED BOARDS SHALL BE UPGRADABLE.
- COLOR SHIFT OVER 6,000 HOURS SHALL BE <0.007 CHANGE IN U_v AS DEMONSTRATED IN IES LM80 REPORT.

1.2 POWER SUPPLY AND DRIVE

- DRIVER SHALL BE UL LISTED.
- DRIVER DISCONNECT SHALL BE PROVIDED WHERE REQUIRED TO COMPLY WITH CODES.
- THE ELECTRONICS/POWER SUPPLY ENCLOSURE SHALL BE INTERNAL TO THE SSL LUMINAIRE AND BE ACCESSIBLE PER UL REQUIREMENTS.
- THE SURGE PROTECTION WHICH RESIDES WITHIN THE DRIVER SHALL PROTECT THE LUMINAIRE FROM DAMAGE AND FAILURE FOR TRANSIENT VOLTAGES AND CURRENTS AS DEFINED IN ANSI/IEEE C64.1 2002 FOR LOCATION CATEGORY A, WHERE FAILURE DOES NOT MEAN A MOMENTARY LOSS OF LIGHT DURING THE TRANSIENT EVENT.

FIRE ALARM SYSTEM

- CONTRACTOR SHALL PROVIDE A COMPLETE FIRE ALARM SUBMITTAL PACKAGE TO LOCAL OFFICIALS FOR APPROVAL PRIOR TO COMMENCING WORK. SUBMITTAL SHALL BE CREATED BY A NICET CERTIFIED FIRE ALARM DESIGNER, LEVEL III MINIMUM, AND SHALL INCLUDE FLOOR PLANS, WIRING DIAGRAMS, DEVICE CUT SHEETS, BATTERY CALCULATIONS, ETC.
- IF BUILDING HAS AN EXISTING FIRE ALARM SYSTEM, CONTRACTOR SHALL CONTACT OWNER AND FIRE ALARM MONITORING COMPANY A MINIMUM OF 72 HOURS PRIOR TO COMMENCING ANY ASSOCIATED WORK ON THE FIRE ALARM.