

ELECTRICAL CONDUCTORS

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GROUNDING

- A. INSULATED CONDUCTORS: COPPER WIRE OR CABLE INSULATED FOR 600 V UNLESS OTHERWISE REQUIRED BY APPLICABLE CODE OR AUTHORITIES HAVING JURISDICTION.
- B. BARE COPPER CONDUCTORS:
1. SOLID CONDUCTORS: ASTM B 8.
 2. STRANDED CONDUCTORS: ASTM B 8.
 3. BONDING CABLE: 28 KMI, 14 STRANDS OF NO. 17 AWG CONDUCTOR, 1/4 INCH (6 MM) IN DIAMETER.
 4. BONDING CONDUCTOR: NO. 4 OR NO. 6 AWG, STRANDED CONDUCTOR.
 5. BONDING JUMPER: COPPER TAPE, BRADED CONDUCTORS TERMINATED WITH COPPER FERRULES, 1-5/8 INCHES (41 MM) WIDE AND 1/16 INCH (1.6 MM) THICK.
- C. GROUNDING BUS: PREFRIBRILATED RECTANGULAR BARS OF ANNEALED COPPER, 1/4 BY 1/8 (6.3 BY 100 MM) IN CROSS SECTION, WITH 9/32-INCH (7/14-MM) HOLES SPACED 1-1/8 INCHES (29 MM) APART. COPPER BUS SHALL BE SUPPLIED WITH AN ANTI-OXIDANT COMPLY WITH UL 891 FOR USE IN SWITCHBOARDS, 600 V, LEXAN, IMPULSE TESTED AT 5000 V.
- D. CONDUCTORS LISTED AND LABELED BY AN NRTL, ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION FOR APPLICATIONS IN WHICH USED AND FOR SPECIFIC TYPES, SIZES, AND COMBINATIONS OF CONDUCTORS AND OTHER ITEMS CONNECTED.
- E. BOLTED CONNECTORS FOR CONDUCTORS AND PIPES: COPPER OR COPPER ALLOY, PRESSURE TIGHT WITH AT LEAST TWO BOLTS.
- F. WELDED CONNECTORS: EXOTHERMIC-WELDING TYPES OF TYPES RECOMMENDED BY KIT MANUFACTURER FOR MATERIALS BEING JOINED AND INSTALLATION CONDITIONS.
- G. BUS-BAR CONNECTORS: MECHANICAL TYPE, COLD SILICON BRONZE, SOLDERLESS COMPRESSION-TYPE WIRE TERMINALS, LONG-BAR, TWO-BOLT CONNECTION TO GROUND BUS BAR.
- H. CONDUCTORS: INSTALL SOLID CONDUCTOR FOR NO. 8 AWG AND SMALLER, AND STRANDED CONDUCTOR FOR NO. 6 AWG AND LARGER UNLESS OTHERWISE INDICATED.
- I. ISOLATED GROUNDING CONDUCTORS: GREEN-COLORED INSULATION WITH CONTINUOUS YELLOW STRIP OR BANDS ON ALL SURFACES. ISOLATED CONDUCTORS EXCEPT AT TEST WELLS AND AS OTHERWISE INDICATED, CONNECTIONS TO GROUND RINGS OF GREEN AND YELLOW TAPE, WITH AT LEAST THREE BANDS OF GREEN AND TWO BANDS OF YELLOW.
- J. CONDUCTOR TERMINATIONS AND CONNECTIONS:
- PIPE AND EQUIPMENT GROUNDING CONDUCTOR TERMINATIONS: BOLTED CONNECTIONS.
- ELECTRICAL EQUIPMENT TERMINATIONS: WELDED CONNECTIONS EXCEPT AT TEST WELLS AND AS OTHERWISE INDICATED, CONNECTIONS TO GROUND RINGS AT TEST WELLS: BOLTED CONNECTIONS, CONNECTIONS TO STRUCTURAL STEEL: WELDED CONNECTIONS.
- K. EQUIPMENT GROUNDING:
- INSTALL EQUIPMENT GROUNDING CONDUCTORS TO COMPLY WITH THE NEC AND AS INDICATED ON THE DRAWINGS.

ELECTRICAL HANGERS AND SUPPORTS

- A. COMPLY WITH NECA 1 AND NECA 101 FOR APPLICATION OF HANGERS AND SUPPORTS FOR ELECTRICAL EQUIPMENT AND SYSTEMS EXCEPT IF REQUIREMENTS IN THIS SECTION ARE STRICTER. MAXIMUM SUPPORT SPACINGS AND MINIMUM HANGER ROD SIZE FOR RACEWAYS:
 - 1. SPACING: APPROX. 4' ON CENTER FOR SCHEDULE 40 STEEL. WHERE ITS TABLE LISTS MAXIMUM SPACINGS LESS THAN STATED IN NFPA 70. MINIMUM ROD SIZE SHALL BE 1/4" (M6) (6 MM) IN DIAMETER, MULTIPLE RACEWAYS OR CABLES.
 - 2. INSTALL TRAPEZE-TYPE SUPPORTS FOR RACEWAYS.
 - 3. CAPACITY CAN BE INCREASED BY AT LEAST 25 PERCENT IN FUTURE WITHOUT EXCEEDING THE SUPPORT FACTOR.
 - 4. SUPPORTS SHALL BE INSTALLED TO SUPPORT SYSTEMS WITH TWO-BOLT CONDUIT CLAMPS, SPRING-CLAMP CLAMPS DESIGNED FOR SUPPORTING SINGLE CONDUITS WITHOUT BOLTS MAY BE USED FOR 1-1/2" (38-MM) AND SMALLER RACEWAYS.
 - 5. SUPPORTS SHALL BE INSTALLED TO SUPPORT SYSTEMS ABOVE SUSPENDED CEILINGS AND FOR FASTENING RACEWAYS TO TRAPEZE SUPPORTS.
- B. SUPPORT INSTALLATION: COMPLY WITH NECA 1 AND NECA 101 FOR INSTALLATION REQUIREMENTS EXCEPT AS SPECIFIED IN THIS ARTICLE.
- C. RACEWAY SUPPORT METHODS: IN ADDITION TO METHODS DESCRIBED IN NECA 1, EMT, IMC, AND RMC MAY BE SUPPORTED BY OPENINGS THROUGH STRUCTURE MEMBERS, AS PERMITTED IN NFPA 70.
- D. STRENGTH OF SUPPORT ASSEMBLIES: WHERE NOT INDICATED, SELECT SIZES OF COMPONENTS SO STRENGTH WILL BE ADEQUATE TO CARRY PRESENT AND FUTURE STATIC LOADS WITHIN THE ALLOWED DEFLECTION LIMIT AND TO DEVELOP THE FULL TENSILE STRENGTH OF THE DETERMINING SHALL BE WEIGHT OF SUPPORT COMPONENTS PLUS 200 LB (90 KG).
- E. MOUNTING AND ANCHORAGE OF SURFACE-MOUNTED EQUIPMENT COMPONENTS: ANCHOR AND FASTEN ELECTRICAL ITEMS AND THEIR SUPPORTS TO BUILDING STRUCTURAL ELEMENTS BY THE FOLLOWING METHOD: APPROXIMATELY 4" (100 MM) FROM THE EDGE.
 - 1. TO WOOD: FASTEN WITH LAG SCREWS OR THROUGH BOLTS.
 - 2. TO NEW CONCRETE: BOLT TO REINFORCING.
 - 3. TO EXISTING CONCRETE: APPROXIMATELY 4" (100 MM) FROM THE EDGE. USE ANCHOR AND EXPANSION ANCHOR FASTENERS ON SOLID MASONRY.
 - 4. TO EXISTING CONCRETE: EXPANSION ANCHOR FASTENERS.
 - 5. TO EXISTING CONCRETE: APPROXIMATELY 4" (100 MM) FROM THE EDGE. USE THREADED STUDS PROVIDED WITH LOCK WASHERS AND NUTS MAY BE USED IN EXISTING STANDARD-HEDGE CONCRETE 4 INCHES (100 MM) THICK OR GREATER. DO NOT USE BOLT TO ANCHORAGE TO THREADED-AGGREGATE CONCRETE OR FOR SLABS LESS THAN 4 INCHES (100 MM) THICK.
 - 6. TO STEEL: WELDED THREADED STUDS COMPLYING WITH AWS D1.1/D1.1M, WITH LOCK WASHERS AND NUTS OR BEAM CLAMPS (MSS TYPE 19, 20, 21, OR 22) COMPLYING WITH MSS SP-69.
 - 7. TO LIGHT STEEL: SHEET METAL SCREWS.
 - 8. DRILL HOLES FOR EXPANSION ANCHORS AND THREADED STUDS AT LOCATIONS AND TO DEPTHS THAT ALLOW REINFORCING BARS.

ELECTRICAL CONDUIT

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- AP. FLEXIBLE CONDUIT CONNECTIONS: USE MAXIMUM OF 48 INCHES (1219 MM) OF FLEXIBLE CONDUIT FOR RECESSED AND SEMIRECESSED LIGHTING FIXTURES, EQUIPMENT SUBJECT TO VIBRATION, NOISE TRANSMISSION, OR MOVEMENT; AND FOR TRANSFORMERS AND MOTORS.
1. USE LMC IN DUCTS OR IN LARGE DUCTS.
- AR. RECESSED BOXES IN MASONRY WALLS: SAW-CUT OPENING FOR BOX IN CENTER OF CELL OF MASONRY BLOCK, AND INSTALL BOX FLUSH WITH SURFACE OF WALL.
- AS. SET METAL FLOOR BOXES LEVEL AND FLUSH WITH FINISHED FLOOR SURFACE.
- AS. FITTINGSTOP
- APPLY FITTINGSTOP TO ELECTRICAL PENETRATIONS OF FIRE-RATED FLOOR AND WALL ASSEMBLIES TO RESTORE ORIGINAL FIRE-RESISTANCE RATING OF ASSEMBLY. PROVIDE SLEEVES FOR FLOOR PENETRATIONS EXTENDING 2" ABOVE FLOOR EXCEPT IN FINISHED AREAS WHERE COORDINATED WITH ARCHITECT.

TRANSFORMERS

- 3. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
 - a. ACME ELECTRIC CORPORATION; POWER DISTRIBUTION PRODUCTS DIVISION.
 - b. EXTON ELECTRICAL, INC.; CULLEN-HAMMER PRODUCTS.
 - c. GENERAL ELECTRIC COMPANY.
 - d. SEMENS ENERGY & AUTOMATION, INC.
 - e. SOLA/VALLEY.
 - f. SQUARE D; SCHNEIDER ELECTRICS.
- 4. GENERAL TRANSFORMER REQUIREMENTS
 - a. CONTINUOUS - FACTORY-ASSEMBLED AND -TESTED, AIR-COOLED UNITS FOR 60-HZ SERVICE.
 - b. GRAIN-ORIENTED, NON-ALLOYED, HOT-ROLLED STEEL.
 - c. DISPERSION WINDINGS WITHOUT SPICES EXCEPT FOR TAPS.
 - d. INTERNAL COIL CONNECTIONS: BRIDGED AND PRESSURE TIE.
 - e. COIL MATERIAL: COPPER.
- 5. COMPLY WITH NEMA ST 20, AND LIST AND LABEL AS COMPLYING WITH UL 1561, ONE LEG PER PHASE.
- 6. ENCLOSURE - VENTILATED, NEMA 250, TYPE 2, CORE AND COIL SHALL BE ENCAPSULATED WITH RESIN COMPOUND, SEALING OUT MOISTURE AND AIR.
- 7. ENCLOSURE - VENTILATED, NEMA 250, TYPE 3R, CORE AND COIL SHALL BE ENCAPSULATED WITH RESIN COMPOUND, SEALING OUT MOISTURE AND AIR.
- 8. TRANSFORMER ENCLOSURE FINISH: COMPLY WITH NEMA 250, FINISH COLOR: GRAY.
- 9. TAPS FOR TRANSFORMERS SMALLER THAN 7.5 KVA: ONE 5 PERCENT TAP ABOVE NORMAL FULL CAPACITY.
- 10. TAPS FOR TRANSFORMERS 7.5 TO 24 KVA: ONE 5 PERCENT TAP ABOVE AND ONE 5 PERCENT TAP BELOW NORMAL FULL CAPACITY.
- 11. TAPS FOR TRANSFORMERS 25 KVA AND LARGER: PENDING TWO 2.5 PERCENT TAPS ABOVE AND TWO 2.5 PERCENT TAPS BELOW NORMAL FULL CAPACITY.
- 12. INSULATION CLASS: 220 DEG C, UL-COMPONENT-RECOGNIZED INSULATION SYSTEM WITH A MAXIMUM OF 150 DEG C RISE ABOVE 40 DEG C AMBIENT TEMPERATURE.
- 13. ENERGY EFFICIENCY FOR TRANSFORMERS RATED 15 KVA AND LARGER: COMPLYING WITH DOE-2006-10 EPR PART 43.3
- 14. **K-Factor Rating:** TRANSFORMERS INDICATED TO BE **K-FACTOR** RATED SHALL COMPLY WITH UL 1561 REQUIREMENTS FOR NONSINGULATED LOAD CURRENT-HANDLING CAPABILITY TO THE DEGREE DEFINED BY DESIGNATOR **K-FAC**. UNIT SHALL NOT OVERHEAT WHEN CARRYING FULL-LOAD CURRENT WITH HARMONIC DISTORTION CORRESPONDING TO DESIGNATED **K-FACTOR**. INDICATE VALUE OF **K-FACTOR** ON TRANSFORMER NAMEPLATE.
- 15. **ELECTROSTATIC SHIELDING:** EACH WINDING SHALL HAVE AN INDEPENDENT, SINGLE, FULL-WIDTH COPPER ELECTROSTATIC SHIELD ARRANGED TO MINIMIZE INTERWINDING CAPACITANCE, ARRANGE COIL LEADS AND COIL TERMINALS TO MINIMIZE CAPACITIVE COUPLING BETWEEN INPUT AND OUTPUT TERMINALS. INCLUDE SPECIAL TREATMENT FOR GROUNDING THE SHIELD. SHEILD EFFECTIVENESS: CAPACITANCE COUPLING OF 20 PIC TO 1 MUH; COMMON MODE NOISE ATTENUATION: MINIMUM OF MINUS 120 DBA AT 0.5 TO 1.5 KHZ; MINIMUM OF MINUS 65 DBA AT 1.5 TO 100 KHZ. NORMAL-MODE NOISE ATTENUATION: MINIMUM OF MINUS 52 DBA AT 15 TO 10 KHZ.
- 16. **FUNGUS PROOF:** PERMANENT TREATMENT FOR COIL AND CORE.
- 17. **LOG RATING:** ALL LOG CONNECTIONS SHALL BE RATED FOR CONNECTION OF 75 DEG C INSULATION COORDINATION.

PANELBOARDS

- ENCLOSURES: FLUSH- AND SURFACE-MOUNTED CABINETS; RATED FOR ENVIRONMENTAL CONDITIONS AT INSTALLED LOCATION; INDOOR DRY AND CLEAN LOCATIONS: NEMA 50, 100, 250, 300, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700, 2800, 2900, 3000, 3100, 3200, 3300, 3400, 3500, 3600, 3700, 3800, 3900, 4000, 4100, 4200, 4300, 4400, 4500, 4600, 4700, 4800, 4900, 5000, 5100, 5200, 5300, 5400, 5500, 5600, 5700, 5800, 5900, 6000, 6100, 6200, 6300, 6400, 6500, 6600, 6700, 6800, 6900, 7000, 7100, 7200, 7300, 7400, 7500, 7600, 7700, 7800, 7900, 8000, 8100, 8200, 8300, 8400, 8500, 8600, 8700, 8800, 8900, 9000, 9100, 9200, 9300, 9400, 9500, 9600, 9700, 9800, 9900, 10000, 10100, 10200, 10300, 10400, 10500, 10600, 10700, 10800, 10900, 11000, 11100, 11200, 11300, 11400, 11500, 11600, 11700, 11800, 11900, 12000, 12100, 12200, 12300, 12400, 12500, 12600, 12700, 12800, 12900, 13000, 13100, 13200, 13300, 13400, 13500, 13600, 13700, 13800, 13900, 14000, 14100, 14200, 14300, 14400, 14500, 14600, 14700, 14800, 14900, 15000, 15100, 15200, 15300, 15400, 15500, 15600, 15700, 15800, 15900, 16000, 16100, 16200, 16300, 16400, 16500, 16600, 16700, 16800, 16900, 17000, 17100, 17200, 17300, 17400, 17500, 17600, 17700, 17800, 17900, 18000, 18100, 18200, 18300, 18400, 18500, 18600, 18700, 18800, 18900, 19000, 19100, 19200, 19300, 19400, 19500, 19600, 19700, 19800, 19900, 20000, 20100, 20200, 20300, 20400, 20500, 20600, 20700, 20800, 20900, 21000, 21100, 21200, 21300, 21400, 21500, 21600, 21700, 21800, 21900, 22000, 22100, 22200, 22300, 22400, 22500, 22600, 22700, 22800, 22900, 23000, 23100, 23200, 23300, 23400, 23500, 23600, 23700, 23800, 23900, 24000, 24100, 24200, 24300, 24400, 24500, 24600, 24700, 24800, 24900, 25000, 25100, 25200, 25300, 25400, 25500, 25600, 25700, 25800, 25900, 26000, 26100, 26200, 26300, 26400, 26500, 26600, 26700, 26800, 26900, 27000, 27100, 27200, 27300, 27400, 27500, 27600, 27700, 27800, 27900, 28000, 28100, 28200, 28300, 28400, 28500, 28600, 28700, 28800, 28900, 29000, 29100, 29200, 29300, 29400, 29500, 29600, 29700, 29800, 29900, 30000, 30100, 30200, 30300, 30400, 30500, 30600, 30700, 30800, 30900, 31000, 31100, 31200, 31300, 31400, 31500, 31600, 31700, 31800, 31900, 32000, 32100, 32200, 32300, 32400, 32500, 32600, 32700, 32800, 32900, 33000, 33100, 33200, 33300, 33400, 33500, 33600, 33700, 33800, 33900, 34000, 34100, 34200, 34300, 34400, 34500, 34600, 34700, 34800, 34900, 35000, 35100, 35200, 35300, 35400, 35500, 35600, 35700, 35800, 35900, 36000, 36100, 36200, 36300, 36400, 36500, 36600, 36700, 36800, 36900, 37000, 37100, 37200, 37300, 37400, 37500, 37600, 37700, 37800, 37900, 38000, 38100, 38200, 38300, 38400, 38500, 38600, 38700, 38800, 38900, 39000, 39100, 39200, 39300, 39400, 39500, 39600, 39700, 39800, 39900, 40000, 40100, 40200, 40300, 40400, 40500, 40600, 40700, 40800, 40900, 41000, 41100, 41200, 41300, 41400, 41500, 41600, 41700, 41800, 41900, 42000, 42100, 42200, 42300, 42400, 42500, 42600, 42700, 42800, 42900, 43000, 43100, 43200, 43300, 43400, 43500, 43600, 43700, 43800, 43900, 44000, 44100, 44200, 44300, 44400, 44500, 44600, 44700, 44800, 44900, 45000, 45100, 45200, 45300, 45400, 45500, 45600, 45700, 45800, 45900, 46000, 46100, 46200, 46300, 46400, 46500, 46600, 46700, 46800, 46900, 47000, 47100, 47200, 47300, 47400, 47500, 47600, 47700, 47800, 47900, 48000, 48100, 48200, 48300, 48400, 48500, 48600, 48700, 48800, 48900, 49000, 49100, 49200, 49300, 49400, 49500, 49600, 49700, 49800, 49900, 50000, 50100, 50200, 50300, 50400, 50500, 50600, 50700, 50800, 50900, 51000, 51100, 51200, 51300, 51400, 51500, 51600, 51700, 51800, 51900, 52000, 52100, 52200, 52300, 52400, 52500, 52600, 52700, 52800, 52900, 53000, 53100, 53200, 53300, 53400, 53500, 53600, 53700, 53800, 53900, 54000, 54100, 54200, 54300, 54400, 54500, 54600, 54700, 54800, 54900, 55000, 55100, 55200, 55300, 55400, 55500, 55600, 55700, 55800, 55900, 56000, 56100, 56200, 56300, 56400, 56500, 56600, 56700, 56800, 56900, 57000, 57100, 57200, 57300, 57400, 57500, 57600, 57700, 57800, 57900, 58000, 58100, 58200, 58300, 58400, 58500, 58600, 58700, 58800, 58900, 59000, 59100, 59200, 593

LIGHTING FIXTURES

- GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS:
- 1. RECESSED FIXTURES: COMPLY WITH NEMA LE 4 FOR CEILING COMPATIBILITY FOR RECESSED FIXTURES.
 - 2. INCANDESCENT FIXTURES: COMPLY WITH UL 1586. WHERE LER IS SPECIFIED, TEST TO NEMA LE 5A.
 - 3. FLOURESCENT FIXTURES: COMPLY WITH UL 1586. WHERE LER IS SPECIFIED, TEST ACCORDING TO NEMA LE 5 AND NEMA LE 5A AS APPLICABLE.
 - 4. LED FIXTURES:
 - a. LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
 - b. HIGH BURNING TIME: 100% VIRGIN ACRYLIC PLASTIC, 25% MACADAM EPOXY TO ENSURE COLOR CONSISTENCY AMONG LUMINAIRES.
 - 5. METAL PARTS: ALL METAL PARTS OF THE FIXTURE SHALL BE FINISHED WITH A TREATMENT TO PREVENT WEARING AND SAGGING. DOORS, FRAMES, AND OTHER INTERNAL ACCESS: SMOOTH FINISHING, FREE OF LOOSE LEAVES UNDER OPERATING CONDITIONS. DESIGNED TO PERMIT REMOVAL WITHOUT USE OF TOOLS. DESIGNED TO PREVENT DOORS, FRAMES, LENSES, DIFFUSERS, AND OTHER COMPONENTS FROM FALLING ACCIDENTLY DURING REMOVAL AND REINSTALLATION. PREVENTING PARTS FROM FALLING ONTO DIFFUSERS AND GLASSES.
 - 6. 100% VIRGIN LUMINOUS: 100% VIRGIN ACRYLIC PLASTIC, HIGH RESISTANCE TO YELLOWING AND OTHER CHANGES DUE TO AGING, EXPOSURE TO HEAT, AND UV RADIATION.
 - 7. LENS THICKNESS: AT LEAST 0.125 INCH (3.175 MM) MINIMUM UNLESS OTHERWISE INDICATED.
 - 8. UV STABILIZED:
 - a. GLASS: ANNEALED CRYSTAL GLASS UNLESS OTHERWISE INDICATED.
 - b. UV-APPLIED LABELS: COMPLY WITH UL 1586. INCLUDE RECOMMENDED LAMPS AND LAMP LIFE. SHALL INCLUDE THE FOLLOWING INFORMATION: MANUFACTURER'S DESIGNATED PERSONNEL, BUT NOT SEEING FROM NORMAL VIEWING ANGLES WHEN LAMPS ARE IN PLACE. LABEL SHALL INCLUDE THE FOLLOWING LABEL AND BALLAST CHARACTERISTICS:
 - i. "USE ONLY" AND INCLUDE THE FOLLOWING INFORMATION:
 - ii. LAMP DIMETER CODE (T-4, T-5, T-8, T-12, ETC.), TUBE CONFIGURATION (TWIN, QUAD, TRIPLE, ETC.), BASE TYPE, AND NORMAL WATTAGE FOR FLUORESCENT AND COMPACT FLUORESCENT LUMINAIRES.
 - iii. LAMP TYPE, WATTAGE, BALL TYPE (ED17, B056, ETC.) AND COATING (CLEAR OR COATED) FOR HID LUMINAIRES.
 - iv. START TYPE (PREHEAT, RAPID START, INSTANT START, ETC.) FOR FLUORESCENT AND COMPACT FLUORESCENT LUMINAIRES.
 - v. BALLAST TYPE (M8R, M57, ETC.) FOR HID LUMINAIRES.
 - vi. LOT AND CRI FOR LED LUMINAIRES.
 - 9. ELECTROMAGNETIC-INTERFERENCE FIXTURES: FACTORY-INSTALLED TO SUPPRESS CONDUCTED ELECTROMAGNETIC INTERFERENCE (EMI) BY MIL-STD-1275 FOR ALL LIGHTING FIXTURES WITH FILTERS ON EACH BALLAST TO REQUIRE A FILTER.

BALLASTS

- A. BALLASTS FOR LINEAR FLUORESCENT LAMPS, GENERAL REQUIREMENTS FOR ELECTRONIC BALLASTS:
 - 1. COMPLY WITH UL 935 AND WITH ANSI C82.11.
 - 2. DESIGNED FOR TYPE AND QUANTITY OF LAMPS SERVED.
- B. BALLASTS SHALL BE DESIGNED FOR FULL LIGHT OUTPUT UNLESS ANOTHER BF, DIMMER, OR BI-LEVEL CONTROL IS INDICATED:
 - 1. BI-LEVEL CONTROL: 0.50 OR HIGHER.
 - 2. SOUND RATING: CLASS A.
 - 3. TOTAL HARMONIC DISTORTION RATING: LESS THAN 10 PERCENT.
 - 4. TRANSIENT VOLTAGE PROTECTION: IEEE C62.41.1 AND IEEE C62.41.2, CATEGORY A OR BETTER.
 - 5. OPERATING FREQUENCY: 60 KHZ OR HIGHER.
 - 6. LAMP CURRENT CREST FACTOR: 1.7 OR LESS.
 - 7. BF: 0.88 OR HIGHER.
 - 8. PF: 0.95 OR HIGHER.
- C. 1 PARALLEL LAMP CIRCUITS: MULTIPLE LAMP BALLASTS SHALL COMPLY WITH ANSI C82.11 BALLASTS SHALL BE CONNECTED TO MAINTAIN FULL LIGHT OUTPUT ON SURVIVING LAMPS IF ONE OR MORE LAMPS FAIL.
- D. LUMINAIRES CONTROLLED BY OCCUPANCY SENSORS SHALL HAVE PROGRAMMED-START BALLASTS.
- E. ELECTRONIC PROGRAMMED-START BALLASTS FOR T8 AND T5 AND T5HO LAMPS: COMPLY WITH ANSI C82.11 AND FORMERLY USED C82.11.
 - 1. AUTOMATIC LAMP STARTING AND SHUTDOWN CIRCUIT FOR T5 DIAMETER LAMPS.
 - 2. AUTOMATIC LAMP STARTING AND LAMP REPLACEMENT.
- F. ELECTRONIC BALLASTS FOR T8 AND T5HO LAMPS: ENERGY SAVING, HIGH-POWER FACTOR, CLASS P, HAVING AUTOMATIC-RESET THERMAL PROTECTION.
- G. BALLAST MANUFACTURER CERTIFICATION: INDICATED BY LABEL.
- H. BALLASTS FOR PARALLEL LAMP CIRCUITS: MULTIPLE LAMP BALLASTS WIRED WITH BALLAST ARRANGEMENTS AND BUNDLED EXTENSION WIRING TO SUE THE FINAL INSTALLATION CONDITIONS OF THE PROJECT OR THE PROJECT SPECIFICATIONS SHALL BE USED.
- I. BALLASTS FOR COMPACT FLUORESCENT LAMPS.
- J. DESCRIPTION: ELECTRONIC PROGRAMMED-RAPID-START TYPE, COMPLYING WITH UL 935 AND ANSI C82.11 AND FORMERLY USED C82.11. QUANTITY OF LAMPS INDICATED. BALLAST SHALL BE DESIGNED FOR FULL LIGHT OUTPUT UNLESS DIMMER OR BI-LEVEL CONTROL IS INDICATED:
 - 1. LAMP END-LIFE: LAMP LIFE: 10,000 HOURS.
 - 2. AUTOMATIC LAMP STARTING AND LAMP REPLACEMENT.
 - 3. SOUND RATING: CLASS A.
 - 4. TOTAL HARMONIC DISTORTION RATING: LESS THAN 20 PERCENT.
 - 5. TRANSIENT VOLTAGE PROTECTION: IEEE C62.41.1 AND IEEE C62.41.2, CATEGORY A OR BETTER.
 - 6. OPERATING FREQUENCY: 20 KHZ OR HIGHER.
 - 7. LAMP CURRENT CREST FACTOR: 1.7 OR LESS.
 - 8. PF: 0.95 OR HIGHER OR LESS, OTHERWISE INDICATED.
 - 9. POWER FACTOR: 0.95 OR HIGHER.
- K. INTERFERENCE: COMPLY WITH 47 CFR 18, CH. I, SUBPART C, FOR LIMITATIONS ON ELECTROMAGNETIC AND RADIO INTERFERENCE FOR NON-PROTECTIVE PURPOSES.

FLUORESCENT LAMPS:

28. RAPID-START LAMPS, RATED 32 W MAXIMUM, NOMINAL LENGTH OF 48 INCHES (1220 MM), 80 INITIAL LUMENS (MINIMUM), CR 85 (MINIMUM), COLOR TEMPERATURE 3000 K, AND AVERAGE RATED LIFE 20,000 HOURS UNLESS OTHERWISE INDICATED.
29. RAPID-START LAMPS, RATED 32 W MAXIMUM, NOMINAL LENGTH OF 48 INCHES (1220 MM), 1300 INITIAL LUMENS (MINIMUM), CR 85 (MINIMUM), COLOR TEMPERATURE 3000 K, AND AVERAGE RATED LIFE 20,000 HOURS UNLESS OTHERWISE INDICATED.
30. RAPID-START LAMPS, RATED 32 W MAXIMUM, NOMINAL LENGTH OF 48 INCHES (1220 MM), 1300 INITIAL LUMENS (MINIMUM), CR 85 (MINIMUM), COLOR TEMPERATURE 3000 K, AND AVERAGE RATED LIFE 20,000 HOURS UNLESS OTHERWISE INDICATED.
- C. 15. RAPID-START LAMPS, RATED 28 W MAXIMUM, NOMINAL LENGTH OF 45.2 INCHES (1150 MM), 80 INITIAL LUMENS (MINIMUM), CR 85 (MINIMUM), COLOR TEMPERATURE 3000 K, AND AVERAGE RATED LIFE 20,000 HOURS UNLESS OTHERWISE INDICATED.
- 15A. RAPID-START, HIGH-OUTPUT LAMPS, RATED 54 W MAXIMUM, NOMINAL LENGTH OF 45.2 INCHES (1150 MM), 80 INITIAL LUMENS (MINIMUM), CR 85 (MINIMUM), COLOR TEMPERATURE 4100 K, AND AVERAGE RATED LIFE OF 20,000 HOURS UNLESS OTHERWISE INDICATED.
- COMPACT FLUORESCENT LAMPS: 4-FPN CR 80 (MINIMUM), COLOR TEMPERATURE 3000 K, AND AVERAGE RATED LIFE OF 20,000 HOURS UNLESS OTHERWISE INDICATED.
13. 13 W, T4, DOUBLE OR TRIPLE TUBE, RATED 900 INITIAL LUMENS (MINIMUM).
14. 18 W, T4, DOUBLE OR TRIPLE TUBE, RATED 1400 INITIAL LUMENS (MINIMUM).
15. 26 W, T4, DOUBLE OR TRIPLE TUBE, RATED 1800 INITIAL LUMENS (MINIMUM).
16. 32 W, T4, DOUBLE OR TRIPLE TUBE, RATED 2400 INITIAL LUMENS (MINIMUM).
5. 42 W, T4, DOUBLE TUBE, RATED 3200 INITIAL LUMENS (MINIMUM).
6. 57 W, T4, DOUBLE TUBE, RATED 4300 INITIAL LUMENS (MINIMUM).
7. 70 W, T4, DOUBLE TUBE, RATED 5200 INITIAL LUMENS (MINIMUM).

1 LED 1 AMP

- A. MINIMUM LUMENS PER SCHEDULED FIXTURE.
- B. MINIMUM ALLOWABLE EFFICACY OF 85 LM/W.
- C. CRI OF MINIMUM 80. CCT PER SCHEDULED FIXTURE.
- D. RATED LAMP LIFE OF 50,000 HOURS TO L70.
- E. DIMMABLE FROM 100 PERCENT TO 1 PERCENT OF MAXIMUM LIGHT OUTPUT.
- F. INTERNAL DRIVER.
- G. USER-REPLACEABLE LAMPS:
 - 1. BULB SHAPE COMPLYING WITH ANSI C78.79.
 - 2. LAMP BASE COMPLYING WITH ANSI C81.61 OR IEC 60061-1.

WIRING DEVICES

- A. MANUFACTURERS:
1. COOPER WIRING DEVICES;
 2. HUBBELL INCORPORATED; WIRING DEVICES-KELLUMS
 3. LEVITON MFG. COMPANY INC.
 4. PASS & SENOIR/LEGAND; WIRING DEVICES & ACCESSORIES
- B. ALL WIRING DEVICES TO BE WHITE OR COLOR AS SELECTED BY ARCHITECT.
- C. STRAIGHT BULB RECEPTACLES:
- CONVENIENCE RECEPTACLES, 125 V, 20 A; COMPLY WITH NEMA WD 1, NEMA WD 6, RECONFIGURATION, AND UL 498 PRODUCTS. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
1. LEVITON, 16341-W (SINGLE), 16362-W (DUPLX).
 2. ANY EQUIVAL BY ABOVE LISTED MANUFACTURERS.
- D. ISOLATED-GROUND, DUPLEX CONVENIENCE RECEPTACLES, 125 V, 20 A; COMPLY WITH NEMA WD 1, NEMA WD 6, RECONFIGURATION, AND UL 498 PRODUCTS. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
1. LEVITON, 16362-4G-0.
 2. ANY EQUIVAL BY ABOVE LISTED MANUFACTURERS.
- DESCRIPTION: STRAIGHT BULB; EQUIPMENT GROUNDING CONTACTS SHALL BE CONNECTED TO THE GREEN GROUND BOND TERMINAL OF THE SERVICE OR WITH WHATEVER ELECTRICAL ISOLATION FROM MOUNTING STRAP. STRAP SHALL BE INTEGRAL TO RECEPTACLE CONSTRUCTION AND NOT DEPENDENT ON REMOVABLE PARTS.
- E. GFCI RECEPTACLES
- GENERAL DESCRIPTION: STRAIGHT BULB, FEED-THROUGH, COMPLY WITH NEMA WD 1, NEMA WD 6, RECONFIGURATION, AND UL 943 CLASS A; AND INCLUDE INDICATOR LIGHT THAT IS LIGHTED WHEN SERVICE IS TRIPPED. DUPLEX GFCI CONVENIENCE RECEPTACLES, 125 V, 20 A; PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
1. LEVITON, 7899-W.
 2. ANY EQUIVAL BY ABOVE LISTED MANUFACTURERS.
- F. SNAP SWITCHES, COMPLY WITH NEMA WD 1 AND 20, SWITCHES, 120/277 V, 20 A; PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
1. LEVITON, 562W (2W BREAKER), 562W (2W POLE), 5623-2 (THREE WAY).
 2. ANY EQUIVAL BY ABOVE LISTED MANUFACTURERS.

- WALL-BOX DIMMERS, DIMMER SWITCHES: MODULAR, FULL-WAVE, SODI-STATE TYPES WITH INTEGRAL, QUOTE ON-OFF SWITCHES, WITH AUDIOBLE FREQUENCY AND EMULATED SUPPRESSION FILTERING. CONTROL CIRCUITS SHALL BE OF THE FOLLOWING TYPE: SINGLEPOLE OR THREE-WAY SWITCHING. COMPLY WITH UL 1472.
1. INCANDESCENT LAMP DIMMERS: 120 V; CONTROL SHALL PROVIDE SQUARE-LAW DIMMING CHARACTERISTICS TO PREVENT FLICKER. DIMMER SWITCHES SHALL BEPUSH-TO-ON TYPE. WALL PLATE SHALL REQUIRE NO DERATING WHEN GANGED WITH OTHER DEVICES.
2. FLOURESCENT LAMP DIMMER SWITCHES: MODULAR, COMPATIBLE WITH DIMMER BALLASTS, INCLUDING AUTOMOTED TRIAC-CONTROLLED, DIMMER-BALLAST COMBINATION CAPABLE OF CONSISTENT DIMMING AT LOW END NOT GREATER THAN 20 PERCENT OF FULL BRIGHTNESS.
3. ACCEPTABLE MANUFACTURERS: LUTRON, LEVITON.
- H. VACUANCY/OCCUPANCY SENSORS, WALL-SWITCH SENSORS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
1. LUTRON, MS-BIOZ, (PROGRAMMED FOR VACANCY OR OCCUPANCY OPERATION AS SHOWN) OR ANY EQUIVALENT. WALL PLATE SHALL BE OF THE FOLLOWING TYPE: PLATE FINISH DESCRIPTION: DUAL TECHNOLOGY TYPE, 120/277 V, ADJUSTABLE TIME DELAY UP TO 20 MINUTES, 180-DEGREE FIELD OF VIEW, WITH A MAXIMUM COVERAGE AREA OF 900 SQ. FT. (81 SQ. M). MANUAL ON/AUTO-OFF or AUTO-ON /AUTO-OFF-AUTO.
- I. WALL PLATES, SINGLE AND COMBINATION TYPES TO MATCH CORRESPONDING WIRING DEVICES. MEETING SPECIFICATIONS: 1. WALL PLATES SHALL BE OF THE FOLLOWING TYPE: PLATE FINISH DESCRIPTION: 1. MATERIAL FOR FINISHED SPACES: SMOOTH, HIGH-IMPACT THERMOPLASTIC 0.03-INCH-(1-MM)-THICK. 2. MATERIAL FOR UNFINISHED SPACES: SMOOTH, HIGH-IMPACT THERMOPLASTIC 0.03-INCH-(1-MM)-THICK. 3. MATERIAL FOR DAMP LOCATIONS: THERMOPLASTIC WITH SPRING-LOADED LIFT COVER, AND LISTED AND LABELED FOR USE IN "NET LOCATIONS". 4. WEATHER-RESISTANT, THERMOPLASTIC WITH LOCKABLE COVER. 5. WEATHER-RESISTANT, THERMOPLASTIC WITH LOCKABLE COVER AND 250, COMPLYING WITH TYPE 3R

DEVICE MOUNTING HEIGHTS

- IN GENERAL, UNLESS OTHERWISE NOTED ON THE ARCHITECTURAL DRAWINGS OR IN THE ELECTRICAL DRAWINGS, MOUNTING HEIGHTS SHALL BE AS FOLLOWS: (HEIGHTS SHOWN ARE ABOVE FINISHED FLOOR TO CENTER LINE OF OUTLET)
- | | |
|---|-----------|
| WALL SWITCHES | 48 INCHES |
| ELECTRICAL, VOICE/DATA OUTLETS | 18 INCHES |
| CLOCK OUTLETS | 90 INCHES |
| RECEPTACLES (MOUNTED ABOVE A COUNTER) | 42 INCHES |
| FIRE ALARM PULL STATIONS | 42 INCHES |
| FIRE ALARM SYSTEM AUDIO/VISUAL STROBES | 80 INCHES |
| FIRE ALARM SYSTEM VISUAL STROBES | 80 INCHES |
| WALL MOUNTED TELEPHONE | 42 INCHES |

FIRE ALARM

- D. DO NOT INTERRUPT FIRE-ALARM SERVICE TO FACILITIES OCCUPIED BY OWNER OR OTHERS UNLESS PERMITTED UNDER THE FOLLOWING CONDITIONS AND THEN ONLY AFTER ARRANGING TO PROVIDE TEMPORARY GUARD SERVICE ACCORDING TO THE REQUIREMENTS INDICATED.
- E. NOTIFY ARCHITECT AND OWNER NO FEWER THAN TWO DAYS IN ADVANCE OF PROPOSED INTERRUPTION OF FIRE-ALARM SERVICE; DO NOT PROCEED WITH INTERRUPTION OF FIRE-ALARM SERVICE WITHOUT ARCHITECT'S AND OWNER'S WRITTEN PERMISSION.
- F. MAINTAIN EXISTING EQUIPMENT FULLY OPERATIONAL, UNTIL NEW EQUIPMENT HAS BEEN TESTED AND ACCEPTED. AS NEW EQUIPMENT IS INSTALLED, LABEL IT "NOT IN SERVICE" UNTIL IT IS ACCEPTED. RELocate LABELS FROM NEW EQUIPMENT WHEN PUT INTO SERVICE AND LABEL EXISTING FIRE-ALARM EQUIPMENT "NOT IN SERVICE" UNTIL REMOVED FROM THE BUILDING.
- G. AFTER ACCEPTANCE OF NEW FIRE-ALARM SYSTEM, REMOVE EXISTING DISCONNECTED FIRE-ALARM EQUIPMENT AND WIRING.
- H. COMPLY WITH NFPA 72 FOR INSTALLATION OF FIRE-ALARM EQUIPMENT.
- I. VERIFY THAT EXISTING FIRE-ALARM SYSTEM IS OPERATIONAL BEFORE MAKING CHANGES OR CONNECTIONS. CONNECT NEW EQUIPMENT TO EXISTING CONTROL PANEL IN EXISTING PART OF THE BUILDING, CONNECT NEW EQUIPMENT TO EXISTING MONITORING EQUIPMENT AT THE SUPERVISING STATION, ADJUST, MODIFY, AND SUPPLEMENT EXISTING CONTROL AND MONITORING EQUIPMENT AS NECESSARY TO EXTEND AND IMPROVE EXISTING CONTROL AND MONITORING FUNCTIONS TO THE NEW POINTS. NEW COMPONENTS SHALL BE CAPABLE OF MERGING WITH EXISTING CONFIGURATION WITHOUT DEGRADING THE PERFORMANCE OF EITHER SYSTEM.
- J. COMPLY WITH NFPA 72, "SMOKE-SENSING FIRE DETECTORS" SECTION IN THE "INITIATING DEVICES" CHAPTER, FOR SMOKE-DETECTORS EXCEEDING COMPLY WITH NFPA 72, "HEAT-SENSING FIRE DETECTORS" SECTION IN THE "INITIATING DEVICES" CHAPTER, FOR HEAT-DETECTORS. SPACING: SMOOT CLEAR SPACE SPACING SHALL NOT EXCEED 30 FEET (9 M). SPACING OF DETECTORS FOR IRREGULAR AREAS, FOR IRREGULAR CELING CONSTRUCTION, AND FOR HIGH CEILING SPACES SHALL BE DETERMINED ACCORDING TO APPENDIX A OR APPENDIX B IN NFPA 72.
- K. LOCATE DETECTORS NOT CLOSER THAN 3 FEET (1 M) FROM AIR-SUPPLY DIFFUSER OR RETURN-AIR OPENING.
- L. LIGHTING FIXTURES: LOCATE DETECTORS NOT CLOSER THAN 12 INCHES (300 MM) FROM ANY PART OF A LIGHTING FIXTURE.
- M. DUCT SMOKE DETECTORS: COMPLY WITH NFPA 72 AND NFPA 90A. INSTALL SAMPLING TUBES SO THEY EXTEND THE FULL WIDTH OF DUCT.
- N. REMOTE STATION AND ALARM INDICATORS: INSTALL NEAR EACH SMOKE DETECTOR AND EACH SPRINKLER WATER-FLOW SWITCH AND VALVE-TWIST SWITCH THAT IS NOT READILY VISIBLE FROM NORMAL VIEW POSITION.
- O. AUDIBLE/ARM-INDICATING DEVICES: INSTALL NOT LESS THAN 6 INCHES (150 MM) BELOW THE CEILING. INSTALL BELLS OR BELL RINGS ON FLUSH-MOUNTED BACK BOXES WITH THE DEVICE-OPERATING MECHANISM CONCEALED BEHIND A GRILLE.
- P. VISIBLE ALARM-INDICATING DEVICES: INSTALL ADJACENT TO EACH ALARM BELL OR ALARM HORN AND AT LEAST 6 INCHES (150 MM) BELOW THE CEILING.
- Q. PROVIDE FIELD TESTING AS REQUIRED BY THE AUTHORITIES HAVING JURISDICTION.
- R. VISUAL ALARMS SHALL BE PROVIDED IN EACH OF THE FOLLOWING AREAS: RESTROOMS AND ANY OTHER GENERAL USE AREAS, MEETING ROOMS, HALLWAYS, LOBBIES, AND ANY OTHER AREA OF COMMON USE.
- S. AUDIBLE ALARMS SHALL PRODUCE A SOUND THAT EXCEEDS THE AMBIENT SOUND LEVEL IN A ROOM OR SPACE BY AT LEAST 15 DBA OR EXCEEDS ANY MAXIMUM SOUND LEVEL WITH A DURATION OF 5 SECONDS BY 5 DBA. EXCEEDS ANY MAXIMUM SOUND LEVEL WITH A DURATION OF 5 SECONDS BY 5 DBA. EXCEEDS ANY MAXIMUM SOUND LEVEL WITH A DURATION OF 5 SECONDS BY 5 DBA.
- T. VISUAL ALARM SIGNAL APPLIANCES SHALL BE INTEGRATED INTO THE BUILDING OR FACILITY ALARM SYSTEM. IF SINGLE STATION AUDIBLE ALARMS ARE PROVIDED THEN SINGLE STATION VISUAL SIGNALS SHALL BE PROVIDED.
- U. VISUAL ALARMS SHALL COMPLY WITH THE FOLLOWING REQUIREMENTS:
 1. THE LAMP SHALL BE A KENOX STYLE OR EQUIVALENT.
 2. THE COLOR SHALL BE RED OR WHITE.
 3. MAXIMUM PULSE DURATION SHALL BE 0.2 SECONDS WITH MAXIMUM DUTY CYCLE OF 40%.
 4. INTENSITY SHALL BE A MINIMUM OF 75 CANDLE.
 5. FLASH RATE SHALL BE A MINIMUM OF 1 HZ AND A MAXIMUM OF 3 HZ.
 6. THE APPLIANCE SHALL BE PLACED 80" ABOVE THE HIGHEST FLOOR LEVEL WITHIN THE SPACE OR 6" BELOW THE CEILING, WHICHEVER IS LOWER.
- V. IN GENERAL, NO PLACE IN ANY ROOM OR SPACE SHALL BE MORE THAN 50' FROM THE SIGNALS IN LARGE ROOMS OR ROOMS EXCEEDING 100' ACROSS, WITHOUT OBSTRUCTIONS ABOVE THE FLOOR. SUCH AS FLOORS, CEILINGS MAY BE PLACED AROUND THE PERIMETER, SPACING A MAXIMUM 100' APART, IN LIEU OF SUPPLEMENTING ALARMS FROM THE CEILING.
- W. NO PLACE IN COMMON CORRIDORS OR HALLWAYS SHALL BE MORE THAN 75' FROM THE SIGNALS. SIGNALS SHALL NOT BE GREATER THAN 15' FROM THE END OF A CORRIDOR OR

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FEDERAL CREDIT UNION

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Deer Park, Texas 77571

uities B & C

E/B/E Project Number : 26081

	DATE
ISSUED FOR CLIENT APPROVAL	06/24/2026
ISSUED FOR BIDDING	06/24/2026
ISSUED FOR PERMIT	06/24/2026
ISSUED FOR CONSTRUCTION	07/13/2026

REVISIONS

MARK	DESCRIPTION	DATE
	50% REVIEW SET	05/19/2020
	90% REVIEW SET	06/12/2020
	FINAL REVIEW SET	07/02/2020
	PERMIT SET	07/13/2020

[illegible]

DRAWING TITLE	
MEP SPECIFICATIONS	
DRAWING TEAM P.M.: JG MECHANICAL: CC ELECTRICAL: JG PLUMBING: CC CHECKED-BY: JG	SHEET NO. MEP-3.00