SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL
1.1 RELATED DOCUMENTS
A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.
B. 1.2 SUMMARY
A. THIS SECTION INCLUDES THE FOLLOWING:
1. ELECTRICAL EQUIPMENT COORDINATION AND INSTALLATION.
2. SLEEVES FOR RACEWAYS AND CABLES.
3. SLEEVE SEALS.
4. GROUT.
5. DUCT SEAL.
6. COMMON ELECTRICAL INSTALLATION REQUIREMENTS.
1.3 REFERENCES
A. EXCEPT AS HEREIN SPECIFIED OR AS INDICATED ON THE DRAWINGS, THE WORK OF THIS SECTION SHALL COMPLY WITH
1. NECA 1 - STANDARDS PRACTICES FOR GOOD WORKMANSHIP IN ELECTRICAL CONSTRUCTION.
2. NEC - NATIONAL ELECTRICAL CODE (NFPA 70)
1.4 SUBMITTALS
A. PRODUCT DATA: FOR SLEEVE SEALS.
1.5 DELIVERY, STORAGE AND HANDLING
A. DELIVER MATERIALS IN ORIGINAL, UNBROKEN, BRAND MARKED CONTAINERS OR WRAPPING AS APPLICABLE.
B. HANDLE AND STORE MATERIALS IN A MANNER WHICH WILL PREVENT DETERIORATION, DAMAGE, CONTAMINATION WITH FOREIGN MATTER, AND DAMAGE BY WEATHER OR ELEMENTS, AND ACCORDING TO MANUFACTURER'S DIRECTIONS.
C. STORE MATERIALS INDOORS AND PROTECT FROM WEATHER. WHEN NECESSARY TO STORE OUTDOORS, ELEVATE MATERIALS ABOVE GRADE AND ENCLOSE WITH DURABLE, WEATHERTIGHT WRAPPING.
D. REJECT DAMAGED, DETERIORATED OR CONTAMINATED MATERIAL AND IMMEDIATELY REMOVE FROM THE SITE. REPLACE REJECTED MATERIALS WITH NEW MATERIALS AT NO ADDITIONAL COST TO OWNER.
1.6 COORDINATION
A. COORDINATE ARRANGEMENT, MOUNTING, AND SUPPORT OF ELECTRICAL EQUIPMENT:
1. TO ALLOW MAXIMUM POSSIBLE HEADROOM UNLESS SPECIFIC MOUNTING HEIGHTS THAT REDUCE HEADROOM ARE INDICATED.
2. TO PROVIDE FOR EASE OF DISCONNECTING THE EQUIPMENT WITH MINIMUM INTERFERENCE TO OTHER INSTALLATIONS.
3. TO ALLOW RIGHT-OF-WAY FOR PIPING AND CONDUIT INSTALLED AT REQUIRED SLOPE.
4. SO CONNECTING RACEWAYS, CABLES, WIREWAYS, CABLE TRAYS, AND BUSWAYS WILL BE CLEAR OF OBSTRUCTIONS AND OF THE WORKING AND ACCESS SPACE OF OTHER EQUIPMENT.
B. COORDINATE INSTALLATION OF REQUIRED SUPPORTING DEVICES AND SET SLEEVES IN CAST-IN-PLACE CONCRETE, MASONRY WALLS, AND OTHER STRUCTURAL COMPONENTS AS THEY ARE CONSTRUCTED.
PART 2 - PRODUCTS
2.1 SLEEVES FOR RACEWAYS AND CABLES
A. STEEL PIPE SLEEVES: ASTM A53/A53M, TYPE E, GRADE B, SCHEDULE 40, GALVANIZED STEEL, PLAIN ENDS.
2.2 GROUT
A. NONMETALLIC, SHRINKAGE-RESISTANT GROUT: ASTM C1107, FACTORY-PACKAGED, NONMETALLIC AGGREGATE GROUT, NONCORROSIVE, NONSTAINING, MIXED WITH WATER TO CONSISTENCY SUITABLE FOR APPLICATION AND A 30-MINUTE WORKING TIME.
2.3 DUCT SEAL
A. DESCRIPTION: UL LISTED, PLIABLE, NON-HARDENING, NON-CORROSIVE, WEATHER-PROOF PUTTY MATERIAL, DESIGNED AS A MOISTURE BARRIER FOR WEATHER-SEALING SERVICE ENTRIES, ELECTRICAL CABLES, AND CONDUIT DUCTS.
1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, AVAILABLE MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
a. ARNCO CORP. - HYDRA-SEAL
b. ILSCO CORP. - DS DUCT SEAL
c. JM CLIPPER - DUXSEAL
d. OZ/GEDNEY CO. - DUX
e. RECTORSEAL - DUCT SEAL COMPOUND
f. THOMAS & BETTS CORP. - DX.
g. OR EQUAL.
PART 3 - EXECUTION
3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION
A. COMPLY WITH NECA 1 AND NEC.
B. HEADROOM MAINTENANCE: IF MOUNTING HEIGHTS OR OTHER LOCATION CRITERIA ARE NOT INDICATED, ARRANGE AND INSTALL COMPONENTS AND EQUIPMENT TO PROVIDE MAXIMUM POSSIBLE HEADROOM CONSISTENT WITH THESE REQUIREMENTS.
C. EQUIPMENT: INSTALL TO FACILITATE SERVICE, MAINTENANCE, AND REPAIR OR REPLACEMENT OF COMPONENTS OF BOTH ELECTRICAL EQUIPMENT AND OTHER NEARBY INSTALLATIONS. CONNECT IN A MANNER AS TO FACILITATE FUTURE DISCONNECTING WITH MINIMUM INTERFERENCE WITH OTHER ITEMS IN THE VICINITY.
D. RIGHT OF WAY: GIVE TO PIPING SYSTEMS INSTALLED AT A REQUIRED SLOPE.
3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS
A. ELECTRICAL PENETRATIONS OCCUR WHEN RACEWAYS, CABLES, WIREWAYS, CABLE TRAYS, OR BUSWAYS PENETRATE CONCRETE SLABS, CONCRETE OR MASONRY WALLS, OR FIRE-RATED FLOOR AND WALL ASSEMBLIES.
B. CONCRETE SLABS AND WALLS: INSTALL SLEEVES FOR PENETRATIONS UNLESS CORE-DRILLED HOLES OR FORMED OPENINGS ARE USED. INSTALL SLEEVES DURING ERECTION OF SLABS AND WALLS.
C. USE PIPE SLEEVES UNLESS PENETRATION ARRANGEMENT REQUIRES RECTANGULAR SLEEVED OPENING.
D. FIRE-RATED ASSEMBLIES: INSTALL SLEEVES FOR PENETRATIONS OF FIRE-RATED FLOOR AND WALL ASSEMBLIES UNLESS OPENINGS COMPATIBLE WITH FIRESTOP SYSTEM USED ARE FABRICATED DURING CONSTRUCTION OF FLOOR OR WALL.
E. CUT SLEEVES TO LENGTH FOR MOUNTING FLUSH WITH BOTH SURFACES OF WALLS.
F. EXTEND SLEEVES INSTALLED IN FLOORS 2 INCHES ABOVE FINISHED FLOOR LEVEL.
G. SIZE PIPE SLEEVES TO PROVIDE 1/4-INCH ANNULAR CLEAR SPACE BETWEEN SLEEVE AND RACEWAY OR CABLE, UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
H. SEAL SPACE OUTSIDE OF SLEEVES WITH GROUT FOR PENETRATIONS OF CONCRETE AND MASONRY. PROMPTLY PACK GROUT SOLIDLY BETWEEN SLEEVE AND WALL SO NO VOIDS REMAIN. TOOL EXPOSED SURFACES SMOOTH; PROTECT GROUT WHILE CURING.
I. INTERIOR PENETRATIONS OF NON-FIRE-RATED WALLS AND FLOORS: SEAL ANNULAR SPACE BETWEEN SLEEVE AND RACEWAY OR CABLE, USING JOINT SEALANT APPROPRIATE FOR SIZE, DEPTH, AND LOCATION OF JOINT. COMPLY WITH REQUIREMENTS IN DIVISION 07 SECTION "JOINT SEALANTS."
J. FIRE-RATED-ASSEMBLY PENETRATIONS: MAINTAIN INDICATED FIRE RATING OF WALLS, PARTITIONS, CEILINGS, AND FLOORS AT RACEWAY AND CABLE PENETRATIONS. INSTALL SLEEVES AND SEAL RACEWAY AND CABLE PENETRATION SLEEVES WITH FIRESTOP MATERIALS.
K. ROOF-PENETRATION SLEEVES: ROOF PENETRATIONS SHALL BE MADE USING EMT, IMC, AND RMC. SEAL ALL PENETRATIONS OF INDIVIDUAL RACEWAYS WITH FLEXIBLE BOOT-TYPE FLASHING UNITS APPLIED IN COORDINATION WITH ROOFING WORK.
L. ABOVEGROUND, EXTERIOR-WALL PENETRATIONS: SEAL PENETRATIONS USING STEEL PIPE SLEEVES AND MECHANICAL SLEEVE SEALS. SELECT SLEEVE SIZE TO ALLOW FOR 1-INCH ANNULAR CLEAR SPACE BETWEEN PIPE AND SLEEVE FOR INSTALLING MECHANICAL SLEEVE SEALS.
M. UNDERGROUND, EXTERIOR-WALL PENETRATIONS: INSTALL CAST-IRON PIPE SLEEVES. SIZE SLEEVES TO ALLOW FOR 1-INCH ANNULAR CLEAR SPACE BETWEEN RACEWAY OR CABLE AND SLEEVE FOR INSTALLING MECHANICAL SLEEVE SEALS.
3.3 SLEEVE-SEAL INSTALLATION
A. INSTALL TO SEAL EXTERIOR WALL PENETRATIONS.
B. USE TYPE AND NUMBER OF SEALING ELEMENTS RECOMMENDED BY MANUFACTURER FOR RACEWAY OR CABLE MATERIAL AND SIZE. POSITION RACEWAY OR CABLE IN CENTER OF SLEEVE. ASSEMBLE MECHANICAL SLEEVE SEALS AND INSTALL IN ANNULAR SPACE BETWEEN RACEWAY OR CABLE AND SLEEVE. TIGHTEN BOLTS AGAINST PRESSURE PLATES THAT CAUSE SEALING ELEMENTS TO EXPAND AND MAKE WATERTIGHT SEAL.
3.4 FIRESTOPPING
A. APPLY FIRESTOPPING TO PENETRATIONS OF FIRE-RATED FLOOR AND WALL ASSEMBLIES FOR ELECTRICAL INSTALLATIONS TO RESTORE ORIGINAL FIRE-RESISTANCE RATING OF ASSEMBLY.
3.5 DUCT SEAL INSTALLATION
A. WHERE CONDUITS PENETRATE INTO THE BUILDING, SEAL DUCT OPENINGS AT CONDUIT TERMINATION POINTS WITH DUCT SEAL FOR ALL CONDUITS ENTERING THE BUILDING TO PREVENT MIGRATION OF WATER AND GASES INTO THE BUILDING AND TO PREVENT THE CONDENSATION OF WATER VAPOR INSIDE THE ENCLOSURES WHERE THE CONDUITS TERMINATE.
B. DUCT SEAL SHALL BE APPLIED AFTER ALL CABLES HAVE BEEN INSTALLED.
C. INSTALL SEALING MATERIAL IN STRICT ACCORDANCE WITH THE SEALANT MANUFACTURER'S PRINTED INSTRUCTIONS.
D. WHERE CONDUIT WILL BE SIMULTANEOUSLY EXPOSED TO DIFFERENT TEMPERATURES, SUCH AS WHERE IT PASSES THROUGH THE OUTSIDE WALL OF A HEATED BUILDING OR BETWEEN TWO DIFFERENT ROOMS, THE INSIDE OF THE CONDUIT SHALL BE SEALED WITH DUCT SEAL. SILICONE OR SIMILAR CALKING SHALL NOT BE USED AS A SUBSTITUTE FOR DUCT SEAL.

SECTION 26 05 20 - CONDUCTORS AND CABLES - 600V AND BELOW

PART 1 - GENERAL
1.1 RELATED DOCUMENTS
A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS APPLY TO THIS SECTION.
1.2 SUMMARY
A. THIS SECTION INCLUDES THE FURNISHING AND INSTALLATION OF ALL ELECTRICAL CONDUCTORS, CABLES, SPLICES, AND CONNECTORS.
B. MAJOR SYSTEMS INCLUDE:
1. 600V AND BELOW SERVICE ENTRANCE, FEEDERS AND ELECTRICAL DISTRIBUTION.
2. BRANCH CIRCUIT WIRING.
3. SYSTEM WIRING.
1.3 REFERENCES
A. EXCEPT AS HEREIN SPECIFIED OR AS INDICATED ON THE DRAWINGS, THE WORK OF THIS SECTION SHALL COMPLY WITH THE STANDARDS OF THE FOLLOWING ORGANIZATIONS AS APPLICABLE TO MATERIALS, CONSTRUCTION AND TESTING OF WIRE CABLES:
1. NEMA - NATIONAL ELECTRICAL MANUFACTURER ASSOCIATION STANDARDS.
2. IEEE STANDARDS.
3. INSULATED CABLE ENGINEERS ASSOCIATION - STANDARDS.
4. ASTM STANDARDS.
5. NEC - NATIONAL ELECTRIC CODE
1.4 QUALITY ASSURANCE
A. FABRICATION AND INSTALLATION PERSONNEL QUALIFICATIONS:
1. TRAINED AND EXPERIENCED IN THE FABRICATION AND INSTALLATION OF THE MATERIALS AND EQUIPMENT.
2. KNOWLEDGEABLE OF THE DESIGN AND THE REVIEWED SUBMITTALS.
B. MANUFACTURERS: FIRMS REGULARLY ENGAGED IN THE MANUFACTURE OF ELECTRICAL CONDUCTOR AND CABLE PRODUCTS OF THE TYPES AND RATINGS REQUIRED, WHOSE PRODUCTS HAVE BEEN IN SATISFACTORY USE IN SIMILAR SERVICE FOR NOT LESS THAN 5 YEARS.
1.5 DELIVERY, STORAGE AND HANDLING
A. DELIVER ALL MATERIALS IN ORIGINAL, UNBROKEN, BRAND MARKED CONTAINERS OR WRAPPING AS APPLICABLE.
B. HANDLE AND STORE MATERIALS IN A MANNER WHICH WILL PREVENT DETERIORATION OR DAMAGE, CONTAMINATION WITH FOREIGN MATTER, DAMAGE BY WEATHER OR ELEMENTS, AND IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS.
C. STORE MATERIALS INDOORS AND PROTECT FROM WEATHER. WHEN NECESSARY TO STORE OUTDOORS, ELEVATE MATERIALS ABOVE GRADE AND ENCLOSE WITH DURABLE, WATERTIGHT WRAPPING.
D. REJECT DAMAGED, DETERIORATED, OR CONTAMINATED MATERIALS AND IMMEDIATELY REMOVE FROM THE SITE. REPLACE REJECTED MATERIALS WITH NEW MATERIALS AT NO ADDITIONAL COST TO OWNER.
PART 2 - PRODUCTS
2.1 MATERIALS
A. GENERAL: EXCEPT AS OTHERWISE INDICATED, PROVIDE CONDUCTORS, CABLES, AND CONNECTORS OF MANUFACTURER'S STANDARD MATERIALS, AS INDICATED BY PUBLISHED PRODUCT INFORMATION; DESIGNED AND CONSTRUCTED AS RECOMMENDED BY THE MANUFACTURER AND AS REQUIRED FOR THE INSTALLATION.
B. POWER WIRE:
1. ALL CONDUCTORS AND CABLES SHALL BE NEW WITH A MINIMUM WIRE SIZE OF NO. 12 AWG. MANUFACTURER'S NAME, TYPE, AND SIZE SHALL BE PERMANENTLY MARKED ON THE OUTER COVERING AT REGULAR INTERVALS AND DELIVERED IN COMPLETE COILS OR REELS.
2. PROVIDE FACTORY FABRICATED CONDUCTORS OF SIZE, RATING, MATERIAL, AND TYPE AS INDICATED FOR EACH SERVICE. WHERE NOT INDICATED, PROVIDE PROPER SELECTION AS DETERMINED BY INSTALLER TO COMPLY WITH INSTALLATION REQUIREMENTS AND WITH NEC STANDARDS, FROM ONLY FOLLOWING TYPES AND CONDUCTORS:
a. TYPE THHN/THWN, 600 VOLT, 75/90 DEGREES C RATED WITH NYLON JACKET: STRANDED COPPER FOR ALL SIZES.
b. BARE CONDUCTORS: STRANDED COPPER FOR ALL SIZES.
C. METAL CLAD (TYPE MC) CABLES:
1. TYPE THHN/THWN INSULATED COPPER CONDUCTORS, WITH INSULATED GREEN GROUNDING CONDUCTOR ROUTED WITH THE CIRCUIT CONDUCTORS.
2. HIGH STRENGTH, LIGHTWEIGHT, GALVANIZED STEEL FLEXIBLE INTERLOCKING ARMOR, UL LISTED AND LABELED FOR UL STANDARDS 1569 AND 83.
3. THERMOPLASTIC INSULATED BUSHING FOR EACH CABLE END.
4. MANUFACTURERS: MCTUFF LIGHTWEIGHT STEEL MC METAL CLAD CABLES BY AFC CABLE SYSTEMS; OR EQUAL.
D. CONTROL CABLE: NO. 14 AWG MINIMUM, TYPE THHN/THWN.
E. POWER WIRING CABLE ACCESSORIES: FOR CONNECTORS:
1. WING NUTS BY IDEAL.
2. STAN-KON BY THOMAS & BETTS.
3. SCOTCHLOX SPRING BY MINNESOTA MINING & MANUFACTURING COMPANY.
4. COMPRESSION TYPE 53200 BY THOMAS & BETTS.
5. HYDENT BY BURNDY.
6. INSULATED MULTI-CABLE MECHANICAL CONNECTOR BLOCKS BY POLARIS, OR ILSCO.
PART 3 - EXECUTION
3.1 INSTALLATION
A. GENERAL:
1. INSTALL ELECTRICAL CONDUCTORS, CABLES, AND CONNECTORS AS INDICATED ON THE DRAWINGS, IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS, THE APPLICABLE REQUIREMENTS OF NEC AND THE NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION'S "STANDARD OF INSTALLATION," AND IN ACCORDANCE WITH RECOGNIZED INDUSTRY PRACTICES TO ENSURE THAT PRODUCTS SERVE THE INTENDED FUNCTIONS.
2. CONDUCTORS AND CABLES SHALL BE SIZED IN ACCORDANCE WITH THE DRAWINGS OR, IN THE ABSENCE THEREOF, IN ACCORDANCE WITH NEC REQUIREMENTS. EXCEPT AND INDICATED HEREIN, CONDUCTOR SIZES GREATER THAN NO. 12 AWG ARE INDICATED ON THE DRAWINGS.
B. VOLTAGE DROP COMPENSATION:
1. PROVIDE NO. 10 AWG CONDUCTORS IN LIEU OF NO. 12 AWG CONDUCTORS TO COMPENSATE FOR VOLTAGE DROP AS FOLLOWS:
a. FOR EACH 277V, 20 AMPERE BRANCH CIRCUIT THAT EXCEEDS 200 FEET IN LENGTH BETWEEN THE BRANCH CIRCUIT PANELBOARD AND THE LAST OUTLET.
b. FOR EACH 120V, 20 AMPERE BRANCH CIRCUIT THAT EXCEEDS 100 FEET IN LENGTH BETWEEN THE BRANCH CIRCUIT PANELBOARD AND THE LAST OUTLET.
2. WHEN CONDUCTOR SIZE IS INCREASED TO COMPENSATE FOR VOLTAGE DROP, PROVIDE EQUIPMENT GROUNDING CONDUCTOR INCREASED IN SIZE IN ACCORDANCE WITH NEC.
C. INSTALLATION PROCEDURES:
1. INSTALL INTERIOR CONDUCTORS AFTER BUILDING IS ENCLOSED AND WATER TIGHT.
2. EACH CONDUIT SHALL BE FREE OF MOISTURE AND DEBRIS BEFORE CONDUCTORS ARE INSTALLED.
3. REMOVE MOISTURE FROM CONDUITS BY SWABBING.
4. INSTALL CONDUCTORS SO INSULATION IS NOT DAMAGED. REPLACE ALL CONDUCTORS THAT ARE DAMAGED.
5. INSTALL CONDUCTORS AND CABLES ONLY IN CODE CONFORMING RACEWAY.
6. PULL CONDUCTORS TOGETHER WHERE MORE THAN 1 CONDUCTOR IS BEING INSTALLED IN A RACEWAY.
7. USE HEAT SHRINK TUBING FOR ALL INSTRUMENT SIGNAL CABLE TERMINATIONS.
8. USE MANUFACTURER-APPROVED PULLING COMPOUND OR LUBRICANT, WHERE NECESSARY. COMPOUND SHALL NOT DETERIORATE CONDUCTOR AND INSULATION. COMPOUNDS SHALL BE UL LISTED.
9. USE A PULLING MEANS, INCLUDING FISH TAPE, CABLE OR ROPE, AND BASKET-WEAVE WIRE/CABLE GRIPS, THAT WILL NOT DAMAGE THE RACEWAY OR THE WIRE.
10. KEEP CONDUCTOR SPLICES TO A MINIMUM.
11. INSTALL SPLICES AND TAPS WHICH HAVE EQUIVALENT OR BETTER MECHANICAL STRENGTH AND INSULATION AS THE CONDUCTOR.
12. USE SPLICE AND TAP CONNECTORS WHICH ARE COMPATIBLE WITH THE CONDUCTOR MATERIAL.
13. MAKE ALL JOINTS, SPLICES, AND CONNECTIONS ONLY AT ACCESSIBLE JUNCTION OR OUTLET BOXES, NEVER INSIDE CONDUIT OR FITTING. MAKE SPLICES IN NO. 10 AWG AND SMALLER WIRE WITH INSULATED SPIRAL MECHANICAL CONNECTORS.
14. MAKE SPLICES IN NO. 8 AWG AND LARGER COPPER WIRE WITH COMPRESSION TYPE MECHANICAL CONNECTORS.
15. ALL SPLICES LOCATED IN HANDHOLES AND WET LOCATIONS SHALL BE RATED FOR WET LOCATIONS.
16. INSULATE ALL JOINTS AT SPLICES WITH "SCOTCH" AND ELECTRICAL PRESSURE SENSITIVE TAPE TO 150% CONDUCTOR INSULATION VALUE.
17. MAKE CONDUIT [illegible] FOR PARALLEL FEEDS IDENTICAL.
18. WHERE EXPOSED CABLES ARE INSTALLED, CABLES SHALL BE INSTALLED PARALLEL AND PERPENDICULAR TO EXPOSED STRUCTURAL MEMBERS [illegible] LINES.
19. DO NOT [illegible], STRAP OR [illegible] FEEDER OR BRANCH CIRCUIT CONDUCTORS TOGETHER [illegible] PANELS, SWITCHBOARDS, VARIABLE SPEED DRIVES, MOTOR CONTROL [illegible]ERS, AUTOMATIC TRANSFER SWITCHES, BOXES, AND WIREWAYS.
20. FEEDERS AND SERVICE ENTRANCE CONDUCTORS ENTERING ELECTRICAL EQUIPMENT SHALL BE ADEQUATELY SECURED WITH CABLE CLEATS.
21. USE COLOR CODED CONDUCTORS AS FOLLOWS:
a. PHASES: BLACK-RED-BLUE (UNDER 150V TO GROUND).
b. PHASES: BROWN-ORANGE-YELLOW (OVER 150V TO GROUND).
c. NEUTRAL: WHITE [illegible] (FEEDERS); WHITE (BRANCH CIRCUITS).
d. GROUND: GREEN [illegible]FIED (FEEDERS); GREEN (BRANCH CIRCUITS).
22. SUPPORT CONDUCTORS IN VERTICAL RACEWAYS IN ACCORDANCE DIVISION 26 SECTION "HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS."
23. OUTLETS:
a. LEAVE AT LEAST 6 INCHES OF FREE CONDUCTOR AT ALL OUTLETS EXCEPT WHERE CONDUCTORS ARE INTENDED TO LOOP WITHOUT JOINTS THROUGH OUTLETS FOR FIXTURES OR WIRING DEVICE HOOK-UPS.
b. FREE ENDS AND LOOPS AT BOXES AND ENCLOSURES SHALL BE PUSHED BACK INTO BOXES AND PROTECTED BY BLANK COVER PLATES OR OTHER MEANS UNTIL INTERIOR PAINTING AND DECORATING WORK IS COMPLETED.
24. LIGHTS AND OUTLETS SHALL BE GROUPED ON CIRCUITS AS INDICATED ON THE DRAWINGS. DIFFERENT TYPES OF CIRCUITS SUCH AS FEEDERS, BRANCH CIRCUITS, CONTROL CIRCUITS, AND SIGNAL CIRCUITS, SHALL NOT BE MIXED IN COMMON CONDUIT RUNS, BUT SHALL BE RUN SEPARATELY, ALTHOUGH MORE THAN 1 CIRCUIT OF THE SAME SYSTEM MAY BE RUN IN COMMON CONDUIT RUNS.
25. TYPE MC CABLE MAY ONLY BE USED FOR BRANCH CIRCUIT WIRING, AND SWITCH LEGS WHEN LOCATED ABOVE DROPPED CEILINGS, AND IN STUD WALLS. TYPE MC CABLE SHALL ORIGINATE FROM ACCESSIBLE JUNCTION BOXES ABOVE CEILINGS. DO NOT USE TYPE MC CABLE IN HAZARDOUS OR WET LOCATIONS OR FOR FEEDERS. DO NOT INSTALL TYPE MC CABLE DIRECTLY INTO PANELBOARDS.

3.2 FIELD QUALITY CONTROL
A. GENERAL:
1. PRIOR TO ENERGIZATION, CHECK CONDUCTORS AND CABLES FOR CONTINUITY OF CIRCUITRY AND FOR SHORT CIRCUITS. CORRECT MALFUNCTIONS WHEN DETECTED.
2. SUBSEQUENT TO CONDUCTOR AND CABLE HOOK-UPS, ENERGIZE CIRCUITRY AND DEMONSTRATE FUNCTIONING IN ACCORDANCE WITH REQUIREMENTS.

SECTION 26 05 27 - GROUNDING AND BONDING

PART 1 - GENERAL
1.1 RELATED DOCUMENTS
A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.
1.2 SUMMARY
A. THIS SECTION INCLUDES THE FURNISHING AND INSTALLATION OF A COMPLETE AND CONTINUOUS GROUNDING SYSTEM.
1.3 DESIGN AND PERFORMANCE REQUIREMENTS
A. ALL EQUIPMENT, RACEWAY SYSTEMS, INTERIOR WIRING SYSTEMS WITH NEUTRALS, RECEPTACLES, AND POWER OUTLETS, MOTORS AND MOTORIZED EQUIPMENT SHALL BE GROUNDED.
1.4 QUALITY ASSURANCE
A. FABRICATION AND INSTALLATION PERSONNEL QUALIFICATIONS:
1. TRAINED AND EXPERIENCED IN THE FABRICATION AND INSTALLATION OF THE MATERIALS AND EQUIPMENT.
2. KNOWLEDGEABLE OF THE DESIGN.
B. GROUNDING SYSTEM SHALL BE IN ACCORDANCE WITH THE CURRENT NATIONAL ELECTRICAL CODE.
C. GROUNDING SYSTEM RODS, CONNECTORS AND CLAMPS SHALL BE UL LABELED.
PART 2 - PRODUCTS
2.1 MATERIALS
A. GENERAL: A PORTION OF THE REQUIRED MATERIALS FOR GROUNDING SYSTEMS ARE SPECIFIED IN THE DIVISION 26 - ELECTRICAL SECTIONS.
PART 3 - EXECUTION
3.1 DISTRIBUTION SYSTEM GROUNDING
A. CIRCUIT GROUNDING: INSTALL GROUNDING BUSHINGS, GROUNDING STUDS, AND GROUNDING JUMPERS AT DISTRIBUTION CENTERS, PULL BOXES, MOTOR CONTROL CENTERS, AND PANELBOARDS.
B. BONDING JUMPERS:
1. PROVIDE GREEN INSULATION, SIZE CORRELATED WITH OVERCURRENT DEVICE PROTECTING THE WIRE, ATTACHED TO GROUNDING BUSHINGS ON CONDUITS, TO LUGS ON BOXES, AND OTHER ENCLOSURES.
2. BOND TO NEUTRAL ONLY AT SERVICE NEUTRAL BAR.
C. FMC AND LTFMC: INSTALL SEPARATE GROUNDING CONDUCTOR IN FMC AND LTFMC. CONNECT EACH END TO A GROUNDING BUSHING.
D. RECEPTACLES AND POWER OUTLETS: GROUND RECEPTACLES AND POWER OUTLETS TO THE CONDUIT SYSTEM WITH A TYPE THHN GREEN GROUNDING CONDUCTOR SIZED IN ACCORDANCE WITH NEC ARTICLE 250 AND CONNECTED BETWEEN THE DEVICE GROUNDING SCREW AND OUTLET BOX.
E. METALLIC CONDUIT: WHEN GROUNDING CONDUCTORS ARE ENCLOSED IN METALLIC CONDUIT, THE CONDUIT SHALL BE BONDED TO THE GROUNDING CONDUCTORS AT BOTH ENDS.
F. NONMETALLIC CONDUIT: INSTALL SEPARATE GROUND CONDUCTOR IN CONDUIT RUNS.
G. GROUND MOTOR BASES AND FRAMES BY PULLING A SEPARATE CONDUCTOR IN WITH THE MOTOR FEEDER.
H. EXPANSION JOINTS: INSTALL A BONDING JUMPER AROUND EXPANSION FITTINGS IN METALLIC CONDUIT TO MAINTAIN GROUND CONTINUITY.
I. SEPARATELY DERIVED SYSTEMS: GROUNDING OF SEPARATELY DERIVED SYSTEMS, I.E., SECONDARY TRANSFORMERS, SHALL BE IN ACCORDANCE WITH NEC, ARTICLE 250. USE SUITABLE GROUND LUGS AND CLAMPS APPROVED FOR THIS PURPOSE.

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL
1.1 RELATED DOCUMENTS
A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.
1.2 SUMMARY
A. THIS SECTION INCLUDES THE FURNISHING AND INSTALLATION OF HANGERS AND SUPPORTS FOR ELECTRICAL EQUIPMENT AND SYSTEMS.
1.3 DEFINITIONS
A. ELECTRICAL SUPPORTS: ANGLES, CHANNELS, BRACKETS, AND MOUNTING ACCESSORIES FOR SUPPORTING ALL CONDUIT, LUMINAIRES, SWITCHES, AND OTHER ELECTRICAL EQUIPMENT WHICH ARE HUNG OR MOUNTED ABOVE FLOOR.
1.4 DESIGN AND PERFORMANCE REQUIREMENTS
A. THIS SECTION DEFINES GENERAL CRITERIA FOR THE SELECTION AND INSTALLATION OF SUPPORTING DEVICES, BUT DOES NOT COVER ALL TYPES SPECIFICALLY REQUIRED FOR THE PROJECT.
B. CHOOSE OR DESIGN SUPPORTING DEVICES IN ACCORDANCE WITH THESE GENERAL CRITERIA.
1.5 QUALITY ASSURANCE
A. FABRICATION AND INSTALLATION PERSONNEL QUALIFICATIONS:
1. TRAINED AND EXPERIENCED IN THE FABRICATION AND INSTALLATION OF THE MATERIALS AND EQUIPMENT.
2. KNOWLEDGEABLE OF THE DESIGN AND THE REVIEWED SUBMITTALS.
B. REGULATORY AGENCIES REQUIREMENTS:
1. PROVIDE SUPPORTING DEVICES LISTED BY UNDERWRITERS' LABORATORY FOR THEIR APPLICATION AS INSTALLED.
2. COMPLY WITH NATIONAL ELECTRICAL CODE (NFPA 70) AS APPLICABLE TO CONSTRUCTION, INSTALLATION, AND REQUIREMENTS FOR SUPPORTING DEVICES.
1.6 DELIVERY, STORAGE, AND HANDLING
A. DELIVER ALL MATERIALS IN ORIGINAL, UNBROKEN, BRAND MARKED CONTAINERS OR WRAPPING AS APPLICABLE.
B. HANDLE AND STORE MATERIALS IN A MANNER WHICH WILL PREVENT DETERIORATION OR DAMAGE, CONTAMINATION WITH FOREIGN MATTER, DAMAGE BY WEATHER OR ELEMENTS, AND IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS.
C. STORE MATERIALS INDOORS AND PROTECT FROM WEATHER. WHEN NECESSARY TO STORE OUTDOORS, ELEVATE MATERIALS ABOVE GRADE AND ENCLOSE WITH DURABLE, WATERTIGHT WRAPPING.
D. REJECT DAMAGED, DETERIORATED, OR CONTAMINATED MATERIAL AND IMMEDIATELY REMOVE FROM THE SITE. REPLACE REJECTED MATERIALS WITH NEW MATERIALS AT NO ADDITIONAL COST TO OWNER.
PART 2 - PRODUCTS
2.1 MATERIALS
A. CONDUIT SUPPORTS:
1. SINGLE RUNS: GALVANIZED CONDUIT STRAPS OR RING BOLT TYPE HANGERS WITH SPRING CLIPS. DO NOT USE PLUMBER'S PERFORATED STRAPS.
2. MULTIPLE RUNS: CONDUIT RACK WITH 25% SPARE CAPACITY.
3. VERTICAL RUNS: CHANNEL SUPPORT WITH CONDUIT FITTINGS.
4. MANUFACTURERS:
a. COOPER B-LINE; A DIVISION OF COOPER INDUSTRIES
b. ERICO INTERNATIONAL CORPORATION.
c. ALLIED SUPPORT SYSTEMS; POWER-STRUT UNIT.
d. GS METALS CORP.
e. MICHIGAN HANGER CO., INC.; O-STRUT DIV.
f. NATIONAL PIPE HANGER CORP.
g. THOMAS & BETTS CORPORATION.
h. UNISTRUT; TYCO INTERNATIONAL, LTD.
i. WESANCO, INC.
j. OR EQUAL.
B. MOUNTING, ANCHORING AND ATTACHMENT COMPONENTS
1. MECHANICAL-EXPANSION ANCHORS: INSERT-WEDGE-TYPE, ZINC-COATED STEEL, FOR USE IN HARDENED PORTLAND CEMENT CONCRETE WITH TENSION, SHEAR, AND PULLOUT CAPACITIES APPROPRIATE FOR SUPPORTED LOADS AND BUILDING MATERIALS WHERE USED.
2. POWDER-ACTUATED FASTENERS: THREADED-STEEL STUD, FOR USE IN HARDENED PORTLAND CEMENT CONCRETE, STEEL, OR WOOD, WITH TENSION, SHEAR, AND PULLOUT CAPACITIES APPROPRIATE FOR SUPPORTED LOADS AND BUILDING MATERIALS WHERE USED.
3. MANUFACTURERS:
a. HILTI, INC.
b. ITW CONSTRUCTION PRODUCTS.
c. [illegible] FASTENING, LLC.
d. [illegible]
C. SUPPORTS [illegible] CONDUCTORS IN VERTICAL CONDUIT:
1. INSTALL IN COMPLIANCE WITH NEC ARTICLE 300.19.
2. FACTORY-FABRICATED ASSEMBLY CONSISTING OF THREADED BODY AND INSULATING WEDGING PLUG OR PLUGS FOR NON-ARMORED ELECTRICAL CONDUCTORS OR CABLES IN RISER CONDUITS. PLUGS SHALL HAVE NUMBER, SIZE AND SHAPE OF CONDUCTOR GRIPPING PIECES AS REQUIRED TO SUIT INDIVIDUAL CONDUCTORS OR CABLES SUPPORTED. BODY SHALL BE MALLEABLE IRON.
PART 3 - EXECUTION
3.1 INSTALLATION
A. GENERAL:
1. LAYOUT TO MAINTAIN HEADROOM, NEAT MECHANICAL APPEARANCE, AND TO SUPPORT EQUIPMENT LOADS.
2. SECURE ENGINEER'S APPROVAL BEFORE WELDING OR BOLTING TO STEEL FRAMING OR ANCHORING TO CONCRETE STRUCTURE.
3. WHERE EQUIPMENT IS TO BE SUSPENDED FROM CAST-IN-PLACE CONCRETE CONSTRUCTION, SET APPROVED CONCRETE INSERTS IN FORMWORK TO RECEIVE HANGER RODS. WHERE EQUIPMENT IS TO BE SUSPENDED FROM METAL DECK AND BEAM OR JOIST CONSTRUCTION, SUPPORT EQUIPMENT FROM BEAMS OR JOISTS ONLY.

SECTION 26 05 34 - RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL
1.1 RELATED DOCUMENTS
A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.
1.2 SUMMARY
A. THIS SECTION INCLUDES THE FURNISHING AND INSTALLATION OF CONDUITS AND FITTINGS FOR ELECTRICAL WIRING.
1.3 QUALITY ASSURANCE
A. FABRICATION AND INSTALLATION PERSONNEL QUALIFICATIONS:
1. TRAINED AND EXPERIENCED IN THE FABRICATION AND INSTALLATION OF THE MATERIALS AND EQUIPMENT.
2. KNOWLEDGEABLE OF THE DESIGN.
B. REGULATORY AGENCIES REQUIREMENTS:
1. NEMA - NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION - STANDARDS PERTAINING TO RACEWAYS
2. NEC - NATIONAL ELECTRIC CODE - AS APPLICABLE TO CONSTRUCTION AND INSTALLATION OF CONDUIT SYSTEM.
3. PROVIDE CONDUIT WHICH IS LISTED AND LABELED BY UNDERWRITERS' LABORATORIES.
1.4 DELIVERY, STORAGE AND HANDLING
A. DELIVER ALL MATERIALS IN ORIGINAL, UNBROKEN, BRAND MARKED CONTAINERS OR WRAPPING AS APPLICABLE.
B. HANDLE AND STORE MATERIALS IN A MANNER WHICH WILL PREVENT DETERIORATION OR DAMAGE (E.G., BENDING, END DAMAGE, FINISH SCORING), CONTAMINATION WITH FOREIGN MATTER, DAMAGE BY WEATHER OR ELEMENTS, AND IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS.
C. STORE MATERIALS INDOORS AND PROTECT FROM WEATHER. WHEN NECESSARY TO STORE OUTDOORS, ELEVATE MATERIALS ABOVE GRADE AND ENCLOSE WITH DURABLE, WATERTIGHT WRAPPING. PROVIDE COLOR CODED END CAP THREAD PROTECTORS ON EXPOSED THREADS OF THREADED METAL CONDUIT.
D. REJECT DAMAGED, DETERIORATED, OR CONTAMINATED MATERIAL AND IMMEDIATELY REMOVE FROM THE SITE. REPLACE REJECTED MATERIALS WITH NEW MATERIALS AT NO ADDITIONAL COST TO OWNER.
PART 2 - PRODUCTS
2.1 MATERIALS
A. RIGID STEEL CONDUIT (RSC): GALVANIZED STEEL, HEAVY WALL CONDUIT WITH THREADED FITTINGS, 1/2-INCH TRADE SIZE MINIMUM, INSULATED BUSHINGS.
B. INTERMEDIATE METAL CONDUIT (IMC): GALVANIZED STEEL, REDUCED WALL CONDUIT WITH THREADED FITTINGS, 1/2-INCH TRADE SIZE MINIMUM, INSULATED BUSHINGS.
C. ELECTRICAL METALLIC TUBING (EMT):
1. THIN WALL, HOT GALVANIZED, STEEL TUBING, 1/2-INCH TRADE SIZE MINIMUM WITH INSULATED THROAT STEEL CONNECTOR.
2. FITTINGS: STEEL COMPRESSION OR SETSCREW TYPE (DIE CAST FITTINGS ARE EXPRESSLY PROHIBITED).
D. SURFACE METAL RACEWAY (SMR):
1. ONE-PIECE STEEL RACEWAY WITH A FACTORY ASSEMBLED BASE AND COVER. FINISH SHALL BE IVORY SCRATCH RESISTANT, SUITABLE FOR FIELD PAINTING. MANUFACTURER: V700 SURFACE METAL RACEWAY AS MANUFACTURED BY WIREMOLD; OR EQUAL.
2. TWO-PIECE STEEL RACEWAY INCLUDING A BASE AND SNAP-ON COVER. FINISH SHALL BE IVORY BAKED ENAMEL, SUITABLE FOR FIELD PAINTING. MANUFACTURER: V2400 SURFACE METAL RACEWAY AS MANUFACTURED BY WIREMOLD; OR EQUAL.
3. TWO-PIECE STEEL RACEWAY INCLUDING A BASE (DIVIDED INTO TWO COMPARTMENTS OF 1/3 AND 2/3 THE WIDTH OF THE RACEWAY) AND SNAP-ON COVER. FINISH SHALL BE IVORY SCRATCH RESISTANT, SUITABLE FOR FIELD PAINTING. MANUFACTURER: V2400D AS MANUFACTURED BY WIREMOLD; OR EQUAL.
4. TWO-PIECE, MULTIPLE CHANNEL STEEL RACEWAY INCLUDING A BASE AND SNAP-ON COVER. BASE SHALL BE DIVIDABLE INTO 2 COMPARTMENTS BY MEANS OF A REMOVABLE BARRIER SECTION. FINISH SHALL BE IVORY SCRATCH RESISTANT, SUITABLE FOR FIELD PAINTING. MANUFACTURER: V4000 OR V6000 AS MANUFACTURED BY WIREMOLD; OR EQUAL.
5. UL LISTED.
6. FITTINGS, COUPLINGS, JUNCTION BOXES, AND ACCESSORIES AS REQUIRED. COLOR TO MATCH RACEWAY.
E. RIGID NONMETALLIC CONDUIT (RNMC):
1. SCHEDULE 40, RIGID POLYVINYLCHLORIDE, RATED FOR 90 DEGREES C CONDUCTORS, 1/2-INCH TRADE SIZE MINIMUM, SOLVENT CEMENT CONNECTORS AND COUPLINGS.
2. NONMETALLIC STRAP HANGERS ALLOWING THERMAL EXPANSION MOVEMENT.
3. CONDUIT TO MEET NEMA TC-2; FITTINGS TO MEET NEMA TC-3.
4. EXPANSION COUPLING: NONMETALLIC TO COMPENSATE FOR THERMAL EXPANSION.
F. FLEXIBLE METAL CONDUIT (FMC): 1/2-INCH TRADE SIZE MINIMUM WITH GALVANIZED STEEL FLEXIBLE CONDUIT INSULATED THROAT STEEL CONNECTORS.
G. LIQUID TIGHT FLEXIBLE METAL CONDUIT (LTFMC): 1/2-INCH TRADE SIZE MINIMUM. GALVANIZED STEEL FLEXIBLE CONDUIT WITH FLEXIBLE, MOISTURE-PROOF PVC JACKET AND LIQUID TIGHT CONNECTORS.
1. IN CORROSIVE LOCATIONS, LTFMC FITTINGS SHALL BE PVC COATED.
H. ENCASED BURIAL (EB): PVC, RATED FOR 90 DEGREE C CONDUCTORS, 2-INCH 6-INCH TRADE SIZE, SOLVENT CEMENT CONNECTORS AND COUPLINGS. MEET NEMA TC-6 AND TC-8.
I. JOINT COMPOUND FOR RSC AND IMC: LISTED FOR USE IN CABLE CONNECTOR ASSEMBLIES, AND COMPOUNDED FOR USE TO LUBRICATE AND PROTECT THREADED RACEWAY JOINTS FROM CORROSION AND ENHANCE THEIR CONDUCTIVITY.
J. CONDUIT HUBS FOR RSC AND IMC:
1. SUITABLE FOR ENVIRONMENT SERVED.
2. GROUNDING SCREW.
3. O-RING GASKET.
4. MATERIAL: MALLEABLE IRON WITH ZINC ELECTROPLATE.
5. MANUFACTURER:
a. COOPER MYERS HUBS.
b. THOMAS & BETTS.
c. KILLARK.
PART 3 - EXECUTION
3.1 INSTALLATION
A. UNLESS OTHERWISE SPECIFIED OR INDICATED ON THE DRAWINGS, CONCEAL CONDUIT TO THE EXTENT POSSIBLE.
1. IN FINISHED AREAS WHERE CONDUIT CANNOT PHYSICALLY BE CONCEALED DUE TO EXISTING CONDITIONS, SURFACE MOUNT CONDUIT. FINISHED AREAS ARE GENERALLY, BUT NOT ALWAYS: ABOVE GRADE, HEATED SPACES WITH FINISHED WALLS (E.G., PAINTED, DRYWALL, ETC.), FINISHED FLOORS (E.G., PAINTED CONCRETE, CARPET, TILE, ETC.), AND FINISHED CEILINGS (E.G., DRYWALL, SUSPENDED CEILING GRIDS, WOOD, ETC.).
B. EXPOSED CONDUIT PERMITTED IN:
1. SERVICE EQUIPMENT ROOMS.
2. ROOMS WITHOUT FINISHED CEILINGS (OVERHEAD ONLY).
3. UNFINISHED ROOMS.
C. INSTALL CONDUIT PRODUCTS IN ACCORDANCE WITH:
1. THE DRAWINGS.
2. THE MANUFACTURER'S WRITTEN INSTRUCTIONS.
3. APPLICABLE REQUIREMENTS OF NEC AND NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION'S "STANDARD OF INSTALLATION."
4. RECOGNIZED INDUSTRY PRACTICES TO ENSURE THAT PRODUCTS SERVE INTENDED FUNCTION.
D. CONDUIT JOINTS: CUT SQUARE, REAMED SMOOTH AND DRAWN UP TIGHT.
E. THREADED CONDUIT JOINTS, EXPOSED TO WET, DAMP, CORROSIVE OR OUTDOOR CONDITIONS: APPLY LISTED COMPOUND TO THREADS OF RACEWAY AND FITTINGS BEFORE MAKING UP JOINT. FOLLOW COMPOUND MANUFACTURER'S WRITTEN INSTRUCTIONS.
F. BENDS:
1. NUMBER PER RUN FOR CONDUIT THAT SUPPORT FEEDER AND BRANCH CIRCUITS: DO NOT EXCEED THE EQUIVALENT OF 4 QUARTER BENDS (360 DEGREES) BETWEEN PULL POINTS.
2. NUMBER PER RUN FOR CONDUIT THAT SUPPORTS DATA/COMMUNICATIONS CABLING: DO NOT EXCEED THE EQUIVALENT OF 2 QUARTER BENDS (180 DEGREES) BETWEEN PULL POINTS.
3. MAKE BENDS AND OFFSETS SO AS NOT TO REDUCE THE INNER DIAMETER OF THE CONDUIT.
4. TO THE EXTENT POSSIBLE, AVOID USING LARGE JUNCTION BOXES AS 90 DEGREE JUNCTIONS.
G. ROUTING:
1. CONCEALED CONDUITS: RUN IN A DIRECT LINE WITH LONG SWEEP BENDS AND OFFSETS.
2. EXPOSED CONDUITS: RUN PARALLEL TO, AND AT RIGHT ANGLES TO, BUILDING LINES.
3. RUN CONTINUOUS FROM OUTLET TO OUTLET AND FROM OUTLETS TO CABINETS, PULL OR JUNCTION BOXES.
4. SECURE TO ALL BOXES AND CABINETS WITH LOCKNUTS AND BUSHINGS IN SUCH A MANNER THAT EACH SYSTEM IS ELECTRICALLY CONTINUOUS THROUGHOUT.
H. CAP CONDUIT ENDS TO PREVENT ENTRANCE OF FOREIGN MATERIALS DURING CONSTRUCTION.
I. PROVIDE INSULATED BUSHINGS ON ALL THREADED CONDUIT RUN TERMINATIONS AND WHERE ENTERING THE BOTTOM OF OPEN-BOTTOM SWITCHBOARDS, MOTOR CONTROL CENTERS, TRANSFORMERS, PRIMARY SWITCHES, AND SIMILAR EQUIPMENT.
J. WHERE ENTERING THE BOTTOM OF OPEN-BOTTOM EQUIPMENT (I.E., SWITCHBOARDS, PANELBOARDS, MOTOR CONTROL CENTERS, TRANSFORMERS, AND SIMILAR EQUIPMENT) CONDUIT SHALL NOT BE INSTALLED FLUSH WITH THE FLOOR/EQUIPMENT PAD AND SHALL NOT RISE MORE THAN 3 INCHES ABOVE THE BOTTOM OF THE ENCLOSURE.
K. CONDUIT ENTERING CONTROL PANELS SHALL NOT OBSTRUCT INTERNAL COMPONENTS AND SHALL ALLOW FOR NEAT AND WORKMANLIKE WIRE MANAGEMENT.
L. COMPLETELY INSTALL ALL CONDUIT SYSTEMS BEFORE INSTALLING CONDUCTORS.
M. PROVIDE LISTED SEALANT IN UNDERGROUND AND ABOVE GRADE CONDUIT THAT IS EXPOSED TO TEMPERATURE DIFFERENCES TO PREVENT THE PASSAGE OF AIR AND CONDENSATION.
N. SUPPORT:
1. ADEQUATELY SUPPORT CONDUIT FROM STRUCTURAL ELEMENTS OF THE BUILDING.
2. DO NOT DRILL OR TAP STRUCTURAL BUILDING STEEL WITHOUT APPROVAL FROM ENGINEER.
3. DO NOT REST CONDUIT ON, NOR SUPPORT IT FROM, CEILING SUSPENSION SYSTEMS, CEILING TILES OR MECHANICAL EQUIPMENT INCLUDING, BUT NOT NECESSARILY LIMITED TO DUCTWORK AND FANS.
4. CONDUIT SHALL BE SUPPORTED IN ACCORDANCE WITH THE NEC AND DIVISION 26 SECTION "HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS."
O. PROVIDE CONDUIT EXPANSION COUPLINGS WHERE CONDUITS CROSS BUILDING OR STRUCTURE EXPANSION JOINTS.
P. INSTALL PULL WIRES IN EMPTY RACEWAYS. USE POLYPROPYLENE OR MONOFILAMENT PLASTIC LINE WITH NOT LESS THAN 200 POUND (90 KG) TENSILE STRENGTH. LABEL AND LEAVE AT LEAST 12 INCHES OF SLACK AT EACH END OF PULL WIRE.
Q. FMC AND LTFMC INSTALLATION:
1. PROVIDE SEPARATE GROUNDING CONDUCTOR IN ACCORDANCE WITH DIVISION 26 SECTION "GROUNDING AND BONDING."
2. CONNECTION TO LIGHT FIXTURES SHALL NOT EXCEED 6 FEET IN LENGTH WITHIN AN ACCESSIBLE CEILING AND 3 FEET IN LENGTH WHERE EXPOSED. CONNECTION TO SOLENOIDS, PRESSURE SWITCHES, MOTORS, FANS, HVAC EQUIPMENT, AND SIMILAR EQUIPMENT SHALL NOT EXCEED 3 FEET IN LENGTH.
R. RIGID NONMETALLIC CONDUIT INSTALLATION:
1. PROVIDE SEPARATE GROUNDING CONDUCTOR IN ACCORDANCE WITH DIVISION 26 SECTION "GROUNDING AND BONDING."
2. SUPPORT CONDUIT IN ACCORDANCE WITH THE NEC.
3. PROVIDE EXPANSION COUPLINGS WHERE LENGTH CHANGE DUE TO TEMPERATURE VARIATION EXCEEDS 1/4-INCH.
4. WHEN PENETRATING CONCRETE SURFACES OR GRADE, MAKE A TRANSITION TO RIGID STEEL CONDUIT 6 INCHES (MINIMUM) BELOW THE SURFACE. PROVIDE CORROSION PROTECTION BY COATING THE RSC WITH A BITUMINOUS COATING FROM INSIDE THE ENCASING MATERIAL TO 4 INCHES OF EXPOSED CONDUIT; VINYL CORROSION PROTECTION TAPE MAY BE INSTALLED, BUT MUST BE REVIEWED WITH THE ENGINEER PRIOR TO INSTALLATION.
5. WHERE UNDERGROUND OR CONCRETE ENCASED CONDUIT IS 2 INCH AND LARGER PROVIDE RIGID STEEL ELBOWS.
6. IN AREAS OF ASSEMBLY, WHERE RNMC IS INSTALLED, CONDUITS SHALL BE ENCASED IN A MINIMUM OF 2 INCHES OF CONCRETE.
S. UNDERGROUND INSTALLATION:
1. AS INDICATED ON THE DRAWINGS, INCLUDING ALL EXCAVATING, PUMPING, BACKFILLING, SHORING AND REMOVAL OF SURPLUS EXCAVATED MATERIAL.
2. UNDERGROUND OBSTRUCTIONS:
a. LOCATE ALL THAT MAY INTERFERE WITH EXCAVATION.
b. BE RESPONSIBLE FOR ALL DAMAGE TO EXISTING UNDERGROUND SYSTEMS AND ASSUME ALL COST OF REPAIRING THE SAME.
3. BACKFILLING:
a. USE ONLY CLEAN SAND THOROUGHLY COMPACTED TO PREVENT SETTLING OF TRENCHED AREAS.
b. IN THE EVENT THAT BACKFILLED AREAS DO SETTLE, FILL AND COMPACT TO FINISH GRADE, AND REPAIR ALL DAMAGE CAUSED BY SETTLING.
4. REPAIR ALL DISTURBED SURFACE TO MATCH EXISTING.
5. UNLESS OTHERWISE INDICATED ON THE DRAWINGS, INSTALL TOP OF CONDUIT 30 INCHES BELOW GRADE WHEN LOCATED OUTSIDE THE WALLS OF THE BUILDING
6. PROVIDE WARNING RIBBON 12 INCHES ABOVE CONDUITS THAT [illegible] SERVICE CONDUCTORS.
3.2 CONDUIT SCHEDULE
A. FEEDERS, BRANCH CIRCUITS AND SYSTEM CONDUCTORS:
1. UNDERGROUND AND IN OR BELOW CONCRETE: RSC, IMC, RNMC.
2. ABOVE SLAB OR GRADE:
a. EXPOSED CONDUIT BELOW 10'-0" AFF: RSC OR IMC WHERE SUBJECT TO PHYSICAL DAMAGE. EMT WHERE NOT SUBJECT TO PHYSICAL DAMAGE.
b. EXPOSED CONDUIT ABOVE 10'-0" AFF: EMT.
c. CONCEALED IN WALLS: EMT.
d. CONCEALED ABOVE CEILING: EMT.
e. EXPOSED CONDUIT SERVING ROOF MOUNTED EQUIPMENT: RSC, IMC, EMT.
B. DATA/COMMUNICATIONS CONDUITS IN DRY LOCATIONS NOT SUBJECT TO PHYSICAL DAMAGE AND NOT INSTALLED UNDERGROUND NOR BELOW CONCRETE: EMT.
1. DATA/COMMUNICATIONS CONDUITS SHALL BE BONDED.
2. DATA/COMMUNICATIONS SLEEVES, PROVIDE PLASTIC BUSHING.
3. DATA/COMMUNICATIONS CONDUITS SHALL BE 3/4-INCH MINIMUM.
C. CONNECTION TO EQUIPMENT:
1. LIGHTING FIXTURES AND CONTROL DEVICES (INCLUDING, BUT NOT NECESSARILY LIMITED TO SOLENOIDS, PRESSURE SWITCHES, AND FIELD INSTRUMENTS):
a. DRY LOCATIONS: FMC.
b. WET OR DAMP LOCATIONS: LTFMC.
2. VIBRATING EQUIPMENT (INCLUDING, BUT NOT NECESSARILY LIMITED TO MOTORS AND TRANSFORMERS):
a. MOTORS:
1) DRY LOCATIONS: FMC.
2) WET OR DAMP LOCATIONS: LTFMC.
b. TRANSFORMERS:
1) DRY LOCATIONS: FMC.
2) WET OR DAMP LOCATIONS: LTFMC.
D. PROVIDE SEPARATE RACEWAY SYSTEMS FOR:
1. NORMAL POWER WIRING.
2. EMERGENCY POWER WIRING.
3. DATA/COMMUNICATION WIRING.
4. FIRE ALARM SYSTEM WIRING.
5. A.C. SIGNAL AND CONTROL WIRING.
6. LOW VOLTAGE SIGNAL AND CONTROL WIRING.
7. ANALOG INSTRUMENTATION WIRING.
8. SPECIAL SYSTEMS WIRING.
E. FOR CONDUITS THAT ENTER NEMA TYPE 2, 3, 3R, 4, 4X, AND 12 ENCLOSURES, PROVIDE CONDUIT HUBS WITH O-RING GASKETS. HUBS SHALL BE SUITABLE FOR THE ENVIRONMENT SERVED AND SHALL MATCH THE CONDUIT TYPE. GROUNDING HUBS SHALL BE USED WITH NON-METALLIC ENCLOSURES.

SECTION 26 05 35 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL
1.1 RELATED DOCUMENTS
A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.
1.2 SUMMARY
A. THIS SECTION INCLUDES THE FURNISHING AND INSTALLATION OF ALL ELECTRICAL BOXES AND THE MAJOR ITEMS LISTED BELOW:
1. OUTLET BOXES.
2. JUNCTION BOXES.
3. PULL BOXES.
1.3 REFERENCES
A. EXCEPT AS HEREIN SPECIFIED OR AS INDICATED ON THE DRAWINGS, THE WORK OF THIS SECTION SHALL COMPLY WITH THE FOLLOWING:
1. NEMA - NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION: STANDARDS AS APPLICABLE TO NONMETALLIC FITTINGS FOR UNDERGROUND INSTALLATION.
2. NECA - NATIONAL ELECTRICAL CONTRACTOR'S ASSOCIATION'S: APPLICABLE PORTIONS OF "STANDARD OF INSTALLATION".
1.4 QUALITY ASSURANCE
A. FABRICATION AND INSTALLATION PERSONNEL QUALIFICATIONS:
1. TRAINED AND EXPERIENCED IN THE FABRICATION AND INSTALLATION OF THE MATERIALS AND EQUIPMENT.
2. KNOWLEDGEABLE OF THE DESIGN AND THE REVIEWED SUBMITTALS.
B. REGULATORY AGENCIES REQUIREMENTS:
1. PROVIDE BOXES WHICH ARE LISTED AND LABELED BY UNDERWRITERS' LABORATORIES.
2. NEC - NATIONAL ELECTRICAL CODE (NFPA 70) - AS APPLICABLE TO CONSTRUCTION AND INSTALLATION OF ELECTRICAL BOXES.
1.5 DELIVERY, STORAGE AND HANDLING
A. DELIVER ALL MATERIALS IN ORIGINAL, UNBROKEN, BRAND MARKED CONTAINERS OR WRAPPING AS APPLICABLE.
B. HANDLE AND STORE MATERIALS IN A MANNER WHICH WILL PREVENT DETERIORATION OR DAMAGE, CONTAMINATION WITH FOREIGN MATTER, DAMAGE BY WEATHER OR ELEMENTS, AND IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS.
C. STORE MATERIALS INDOORS AND PROTECT FROM WEATHER. WHEN NECESSARY TO STORE OUTDOORS, ELEVATE MATERIALS ABOVE GRADE AND ENCLOSE WITH DURABLE, WATERTIGHT WRAPPING.
D. REJECT DAMAGED, DETERIORATED, OR CONTAMINATED MATERIALS AND IMMEDIATELY REMOVE FROM THE SITE. REPLACE REJECTED MATERIALS WITH NEW MATERIALS AT NO ADDITIONAL COST TO OWNER.
PART 2 - PRODUCTS
2.1 MATERIALS
A. INTERIOR OUTLET BOXES:
1. GALVANIZED STEEL OUTLET 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.
2. IN AREAS REQUIRING EXPOSED RNMC, PROVIDE NONMETALLIC OUTLET BOXES OF TYPE, SHAPE AND SIZE TO SUIT EACH LOCATION. EACH BOX IS TO HAVE CONDUIT HUBS WITH REMOVABLE PLUGS AND A NON-METALLIC COVER. EACH BOX SHALL BE COMPATIBLE WITH RNMC.
B. INTERIOR OUTLET BOX ACCESSORIES:
1. AS REQUIRED FOR EACH INSTALLATION, INCLUDING MOUNTING BRACKETS, WALLBOARD HANGERS, EXTENSION RINGS, FIXTURE STUDS, CABLE CLAMPS, AND METAL STRAPS FOR SUPPORTING OUTLET BOXES. ACCESSORIES SHALL BE COMPATIBLE WITH OUTLET BOXES BEING USED AND MEET THE REQUIREMENTS OF INDIVIDUAL WIRING SITUATIONS.
2. CHOICE OF ACCESSORIES IS INSTALLER'S OPTION.
C. WEATHERPROOF OUTLET BOXES: CORROSION-RESISTANT CAST METAL, WEATHERPROOF OUTLET BOXES, OF THE TYPE, SHAPE, AND SIZE, INCLUDING DEPTH OF BOX, SUITABLE FOR EACH APPLICATION, WITH THREADED CONDUIT ENDS.
D. FOR CEILINGS: 4-INCH OCTAGONAL BOXES FOR RECEIVING 3 OR LESS 1/2-INCH CONDUITS.
E. FOR FLUSH MOUNTING IN WALLS:
1. 4-INCH SQUARE BOXES WITH MATCHING PLASTER COVER FOR SINGLE OR 2 GANG OUTLETS.
2. FOR LARGER BOXES USE SOLID TYPE OR SPECIAL UNITS.
3. IN MASONRY, USE DEEP BOXES.
F. SURFACE MOUNTED: 4-INCH SQUARE.
G. JUNCTION AND PULL BOXES: SHEET STEEL JUNCTION AND PULL BOXES, WITH SCREW-ON COVERS; OF THE TYPE AND SHAPE AND SIZE TO SUIT EACH RESPECTIVE LOCATION AND INSTALLATION; WITH WELDED SEAMS AND EQUIPPED WITH STAINLESS STEEL NUTS, BOLTS, SCREWS, AND WASHERS. DRY INTERIOR LOCATION BOXES SHALL HAVE BAKED ENAMEL FINISH. DAMP LOCATION AND EXTERIOR BOXES SHALL HAVE GALVANIZED FINISH.
H. FLUSH MOUNTED PULL BOXES: PROVIDE OVERLAPPING COVERS WITH FLUSH-HEAD COVER RETAINING SCREWS, PRIME COATED.
PART 3 - EXECUTION
3.1 INSTALLATION
A. GENERAL:
1. INSTALL ELECTRICAL BOXES AS INDICATED, IN COMPLIANCE WITH NEC REQUIREMENTS AND IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND RECOGNIZED INDUSTRY PRACTICES TO ENSURE THAT THE BOXES AND FITTINGS SERVE THE INTENDED PURPOSES.
2. PROVIDE WEATHERPROOF OUTLET BOXES FOR INTERIOR AND EXTERIOR LOCATIONS EXPOSED TO WEATHER OR MOISTURE.
3. PROVIDE KNOCKOUT CLOSURES TO CAP UNUSED KNOCKOUT HOLES WHERE BLANKS HAVE BEEN REMOVED.
4. LOCATE BOXES AND CONDUIT BODIES SO AS TO ENSURE ACCESSIBILITY OF ELECTRICAL WIRING.
5. SECURE BOXES RIGIDLY TO THE SUBSTRATE UPON WHICH THEY ARE BEING MOUNTED, OR SOLIDLY EMBED BOXES IN CONCRETE OR MASONRY.
6. MOUNT OUTLET BOXES FLUSH IN AREAS OTHER THAN MECHANICAL ROOMS, ELECTRICAL ROOMS, AND ABOVE REMOVABLE CEILINGS.
7. ADJUST POSITION OF OUTLETS IN FINISHED MASONRY WALLS TO SUIT MASONRY COURSE LINES.
8. DO NOT INSTALL BOXES BACK-TO-BACK IN SAME WALL. COORDINATE CUTTING OF MASONRY WALLS TO ACHIEVE NEAT OPENINGS FOR BOXES.
9. DO NOT USE SECTIONAL OR HANDY BOXES.
10. FOR BOXES MOUNTED IN EXTERIOR WALLS INSTALL INSULATION BEHIND OUTLET BOXES TO PREVENT CONDENSATION IN BOXES.
11. FOR OUTLETS MOUNTED ABOVE COUNTERS, BENCHES, AND SPLASHBACKS, COORDINATE LOCATION AND MOUNTING HEIGHTS WITH BUILT-IN UNITS. ADJUST OUTLET MOUNTING HEIGHT TO AGREE WITH REQUIRED LOCATION FOR EQUIPMENT SERVED.
12. OUTLET BOXES IN FINISHED AREAS SHALL BE LOCATED AS INDICATED ON THE DRAWINGS AND SO SET THAT THE FACE PLATES WILL BE FLUSH WITH THE FINISH ON WHICH IT IS MOUNTED. WHERE 2 OR MORE DEVICES OF ANY KIND ARE SET SIDE BY SIDE, SET THEM IN GANG BOXES UNLESS OTHERWISE NOTED ON THE DRAWINGS.
13. LOCATE PULL BOXES AND JUNCTION BOXES ABOVE REMOVABLE CEILINGS OR IN ELECTRICAL ROOMS, UTILITY ROOMS, OR STORAGE AREAS SUCH THAT BOXES WILL BE ACCESSIBLE AFTER COMPLETION OF BUILDING.
14. ALL BOXES SHALL HAVE COVERS INSTALLED AT COMPLETION OF CONSTRUCTION.

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL
1.1 RELATED DOCUMENTS
A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.
1.2 SUMMARY
A. THIS SECTION INCLUDES THE FURNISHING AND INSTALLATION OF PROPER IDENTIFICATION FOR ELECTRICAL SYSTEM COMPONENTS.
B. ITEMS REQUIRING IDENTIFICATION OR LABELING INCLUDE:
1. CABLES AND CONDUCTORS.
2. CONDUIT SYSTEMS.
3. CONTROLS:
a. MOTOR STARTERS.
b. VARIABLE FREQUENCY DRIVES.
c. LIGHTING CONTROL RELAY PANELS.
d. LIGHTING CONTACTORS.
4. DISTRIBUTION EQUIPMENT:
a. DISCONNECT SWITCHES.
b. ENCLOSED CIRCUIT BREAKERS.
c. SWITCHBOARDS.
d. TRANSFORMERS.
e. PANELBOARDS.
f. MOTOR CONTROL CENTERS.
5. HIGH VOLTAGE EQUIPMENT.
6. FIRE ALARM SYSTEM EQUIPMENT.
1.3 SUBMITTALS
A. NAMEPLATE SCHEDULE IDENTIFYING EACH DEVICE TO BE LABELED AND PROJECT SPECIFIC LABEL TEXT.
PART 2 - PRODUCTS
2.1 ELECTRICAL LABELS
A. PROVIDE ENGRAVED LAMINATED PLASTIC NAMEPLATE TO IDENTIFY EACH PIECE OF ELECTRICAL EQUIPMENT:
1. NAMEPLATE SHALL HAVE 3/8-INCH MINIMUM BLACK LETTERS ON A WHITE BACKGROUND.
2. PUNCHED OR DRILLED FOR MECHANICAL FASTENERS.
B. PROVIDE PRINTED LABELS BY BRADY OR T&B TO IDENTIFY CONDUCTORS.
PART 3 - EXECUTION
3.1 INSTALLATION
A. GENERAL:
1. ATTACH NAMEPLATES DIRECTLY TO EACH PIECE OF ELECTRICAL EQUIPMENT. IN FINISHED AREAS OF BUILDING, INSTALL NAMEPLATES BEHIND ENCLOSURE DOOR WHERE POSSIBLE.
2. WHERE SEVERAL CONDUCTORS PASS THROUGH A PULL BOX, JUNCTION BOX, OR ENCLOSURE, PROVIDE WIRE LABELS. GROUP WIRES BEFORE LABELING.
B. CABLES AND CONDUCTORS: IN ACCORDANCE WITH DIVISION 26 SECTION "CONDUCTORS AND CABLES - 600V AND BELOW."
C. CONDUIT SYSTEMS:
1. JUNCTION BOXES USED FOR FIRE ALARM SYSTEM WIRING SHALL BE RED.
2. PROVIDE LABEL INSIDE EACH JUNCTION AND PULL BOX IDENTIFYING CIRCUIT NUMBERS FOR ALL CONDUCTORS CONTAINED INSIDE THE BOX. LABELING SHALL BE PRINTED NEATLY WITH PERMANENT, WATERPROOF, BLACK INK MARKER.
D. CONTROLS: FOR EACH OF THE FOLLOWING CONTROL DEVICES, PROVIDE LABEL ATTACHED TO ENCLOSURE COVER. LABEL SHALL IDENTIFY:
1. MOTOR STARTERS: NAME OF EQUIPMENT SERVED AND LOAD (EXAMPLE, "EF-5, 5 HP").
2. VARIABLE FREQUENCY DRIVES: NAME OF EQUIPMENT SERVED AND LOAD (EXAMPLE, "P-1, 25 HP").
3. LIGHTING CONTROL RELAY PANELS:
a. NAME OF DEVICE AS INDICATED ON RELAY PANEL RISER DIAGRAM (EXAMPLE, "RP-1").
b. EQUIP INTERIOR OF ENCLOSURE DOOR WITH A CIRCUIT DIRECTORY FRAME, TYPEWRITTEN CARD, AND CLEAR PLASTIC COVER. DIRECTORY SHALL IDENTIFY LOAD DESCRIPTION FOR EACH CIRCUIT, INCLUDING SPARES. HAND LETTERING IS NOT ACCEPTABLE.
4. LIGHTING CONTACTORS: NAME OF DEVICE AND EQUIPMENT SERVED/CONTROLLED (EXAMPLE, "LC-1, SITE LIGHTING").
E. DISTRIBUTION EQUIPMENT: FOR EACH OF THE FOLLOWING PIECES OF DISTRIBUTION EQUIPMENT, PROVIDE LABEL ATTACHED TO ENCLOSURE COVER. LABEL SHALL IDENTIFY:
1. DISCONNECT SWITCHES: NAME OF EQUIPMENT SERVED, NUMBER OF POLES, AMPERE RATING/FUSE SIZE (WHERE APPLICABLE), AND LOAD (EXAMPLE, "RTU-1, 3P30/25, 8 TON").
2. ENCLOSED CIRCUIT BREAKERS: NAME OF DEVICE AS INDICATED ON ONE LINE DIAGRAM, NUMBER OF POLES, AND CIRCUIT BREAKER SIZE (EXAMPLE, "MCB, 3P200").
3. SWITCHBOARDS:
a. NAME OF DEVICE AS INDICATED ON ONE LINE DIAGRAM AND VOLTAGE-PHASE (EXAMPLE, "MSWBD, 480Y/277V-3Ø").
b. PROVIDE LABEL NEAR EACH FEEDER/BRANCH BREAKER IDENTIFYING NAME OF EQUIPMENT SERVED, NUMBER OF POLES, AND CIRCUIT BREAKER SIZE (EXAMPLE, "TRANSFORMER T-LPA, 3P80").
4. TRANSFORMERS: NAME OF DEVICE AS INDICATED ON ONE LINE DIAGRAM, KVA RATING, PRIMARY VOLTAGE:SECONDARY VOLTAGE, SOURCE TRANSFORMER IS FED FROM, AND LOAD TRANSFORMER FEEDS (EXAMPLE, "T_LPA, 45 KVA, 480:208Y/120V, FED FROM MSWBD, FEEDS PANEL LPA").
5. PANELBOARDS:
a. NAME OF DEVICE AS INDICATED ON ONE LINE DIAGRAM, VOLTAGE-PHASE, AND AREA SERVED (EXAMPLE, "LPA, 208Y/120V-3Ø, FIRST FLOOR LIGHTING").
b. EQUIP INTERIOR OF ENCLOSURE DOOR WITH A CIRCUIT DIRECTORY FRAME, TYPEWRITTEN CARD, AND CLEAR PLASTIC COVER. DIRECTORY SHALL IDENTIFY LOAD DESCRIPTION FOR EACH CIRCUIT, INCLUDING SPARES. HAND LETTERING IS NOT ACCEPTABLE.
6. MOTOR CONTROL CENTERS:
a. NAME OF DEVICE AS INDICATED ON ONE LINE DIAGRAM AND VOLTAGE-PHASE (EXAMPLE, "MCC-1, 480V_3Ø").
b. PROVIDE LABEL ON EACH MOTOR CONTROL CENTER COMPARTMENT IDENTIFYING TYPE OF DEVICE, DEVICE RATING, LOAD SERVED, AND LOAD CHARACTERISTICS (EXAMPLES, "MOTOR STARTER, SIZE 1, P-1, 10 HP OR CIRCUIT BREAKER, 3P20, HOIST, 1 TON"). PROVIDE LABELS FOR SPARE DEVICES AND SPACES.
F. FIRE ALARM SYSTEM EQUIPMENT: PROVIDE LABEL ATTACHED TO ENCLOSURE COVER. LABEL SHALL IDENTIFY NAME OF DEVICE AS INDICATED ON FIRE ALARM SYSTEM RISER DIAGRAM OR ELECTRICAL DRAWINGS (EXAMPLE, "FIRE ALARM CONTROL PANEL").

(CONTINUED ON SHEET E902)

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SHEET LEGEND

G000's	GENERAL INFORMATION & SCOPE OF WORK
N100's	EGRESS / ADA PLANS & DETAILS
A100's	FLOOR PLANS & CEILING PLANS
A200's	EXTERIOR & INTERIOR ELEVATIONS
A300's	BUILDING SECTIONS
A400's	ENLARGED PLANS
A500's	EXTERIOR & INTERIOR DETAILS
A600's	DOOR SCHEDULE, DOOR DETAILS, FINISH SCHEDULE, FINISH PLANS
Q100's	AUDITORIUM SIGHT LINE SECTIONS
Q120's	AUDITORIUM SEATING PLAN
S's	STRUCTURAL
M's	MECHANICAL
P's	PLUMBING
E's	ELECTRICAL
WF's	WAYFINDING DETAILS
FS's	CASEWORK & EQUIPMENT

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KEY PLAN:

SHEET TITLE:
ELECTRICAL SPECIFICATIONS

SHEET NUMBER:
E901