GENERAL ELECTRICAL SPECIFICATIONS

SECTION 16000: ELECTRICAL GENERAL PROVISIONS

PART 1 – GENERAL

1.01 WORK INCLUDED

A. PROVIDE ALL MATERIALS, LABOR AND EQUIPMENT REQUIRED TO FURNISH AND INSTALL A COMPLETE ELECTRICAL SYSTEM AS INDICATED ON DRAWINGS AND AS SPECIFIED HEREIN.

B. THE ELECTRICAL WORK INCLUDES PROVIDING THE NEW MATERIAL, FIXTURES, DEVICES, FINAL CONNECTIONS AND ACCESSORIES NECESSARY FOR A COMPLETE AND FUNCTIONING SYSTEM. THE WORK ALSO INCLUDES MAKING ALL FINAL CONNECTIONS TO EQUIPMENT FURNISHED BY OTHERS. ALL WORK SHALL BE IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE IN FORCE AND LOCAL CODES OR ORDINANCES AND SUBJECT TO INSPECTION AND APPROVAL FROM AUTHORITY HAVING JURISDICTION.

C. THE INTENT OF THE DRAWINGS IS TO INDICATE THE GENERAL EXTENT OF WORK REQUIRED FOR THE PROJECT. THE DRAWINGS FOR THE ELECTRICAL WORK ARE DIAGRAMMATIC, SHOWING THE LOCATION, TYPE DEVICES AND EQUIPMENT REQUIRED. THE DRAWINGS SHALL NOT BE SCALED FOR EXACT MEASUREMENTS. PROVIDE ALL FIXTURES, LAMPS, DEVICES, ACCESSORIES, OFFSETS, FINAL CONNECTIONS AND MATERIAL NECESSARY TO FACILITATE THE SYSTEM'S FUNCTIONING AS INDICATED BY THE DESIGN AND PER SPECIFIED AND OWNER SUPPLIED EQUIPMENT MANUFACTURERS RECOMMENDATIONS AND REQUIREMENTS.

D. IT IS THE INTENT THAT THE FOREGOING WORK SHALL BE COMPLETE IN EVERY RESPECT AND THAT ANY MATERIAL OR WORK NOT SPECIFICALLY MENTIONED OR SHOWN ON THE DRAWINGS, BUT NECESSARY TO FULLY COMPLETE THE WORK SHALL BE FURNISHED.

1.02 REGULATORY REQUIREMENTS

A. EQUIPMENT FURNISHED SHALL BE UL LISTED WHERE SUCH LABEL IS AVAILABLE. INSTALLATION SHALL CONFORM TO UL STANDARDS WHERE APPLICABLE.

B. ELECTRICAL WORK SHALL BE INSTALLED IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS, LATEST EDITION OF NEC AND NFPA CODES, IN EFFECT AT PROJECT LOCATION, STATE AND LOCAL ELECTRICAL AND BUILDING CODES AND SPECIAL CODES HAVING JURISDICTION OVER SPECIFIC PORTIONS WITHIN ENTIRE INSTALLATION.

C. OBTAIN PERMITS AND CERTIFICATES OF APPROVAL FROM ALL AUTHORITIES HAVING JURISDICTION OVER THE INSTALLATION AND PAY ALL FEES REQUIRED.

1.03 SUBMITTALS

A. SUBMIT LIST OF MATERIALS AND EQUIPMENT PRIOR TO MANUFACTURE, ORDER OR INSTALLATION AND WITHIN TWENTY DAYS AFTER AWARD OF CONTRACT FOR APPROVAL. INCLUDE EACH ITEM OF MATERIAL AND EQUIPMENT WHETHER OR NOT SHOP DRAWINGS ARE REQUIRED. LIST SHALL INCLUDE MANUFACTURER'S NAME, CATALOG NUMBER AND OTHER COMPLETE IDENTIFICATION AS WELL AS DIMENSIONS AND DETAILED DATA.
SUBMITTALS SHALL INCLUDE BUT NOT LIMITED TO THE FOLLOWING:
- LIGHTING FIXTURES
- SWITCHGEAR, PANEL BOARDS & BREAKERS
- WIRING DEVICES AND DEVICE PLATES
- ENCLOSED SWITCHES
- CONTACTORS & TIMECLOCKS

B. CERTIFIED SHOP DRAWINGS AND SUBMITTALS SHALL BEAR STAMP OF APPROVAL OF CONTRACTOR AS EVIDENCE THAT DRAWINGS HAVE BEEN CHECKED. DRAWINGS SUBMITTED WITHOUT THIS STAMP OF APPROVAL WILL NOT BE CONSIDERED AND WILL BE RETURNED FOR PROPER RESUBMISSION.

C. IF SUBMITTALS SHOW VARIANCES OR SUBSTITUTIONS FROM REQUIREMENTS OF CONTRACT, CONTRACTOR SHALL MAKE SPECIFIC MENTION OF SUCH VARIATION IN HIS LETTER OF TRANSMITTAL IN ORDER THAT, IF ACCEPTABLE, SUITABLE ACTION MAY BE TAKEN FOR PROPER ADJUSTMENT. OTHERWISE CONTRACTOR SHALL NOT BE RELIEVED OF RESPONSIBILITY FOR EXECUTING WORK IN ACCORDANCE WITH CONTRACT EVEN THOUGH SUCH SUBMITTALS HAVE BEEN APPROVED.

SECTION 16050: BASIC MATERIALS AND METHODS

PART 1 – GENERAL

1.01 COORDINATION

A. OBTAIN AND REVIEW SHOP DRAWINGS, PRODUCT DATA, AND MANUFACTURER'S INSTRUCTIONS FOR EQUIPMENT FURNISHED UNDER OTHER SECTIONS TO DETERMINE CONNECTION LOCATIONS AND REQUIREMENTS.

B. SEQUENCE ROUGH-IN OF ELECTRICAL CONNECTIONS TO COORDINATE WITH INSTALLATION AND START-UP OF EQUIPMENT FURNISHED UNDER OTHER SECTIONS.

PART 2 – PRODUCTS

2.01 SUBSTITUTIONS

A. WHERE SPECIFICATIONS LIST ONE OR MORE MANUFACTURERS AND DO NOT INCLUDE "OR APPROVED EQUAL", FURNISH MATERIALS MADE BY ONE OF MANUFACTURERS LISTED. WHERE "OR APPROVED EQUAL" IS INCLUDED, CONTRACTOR MAY SUBSTITUTE EQUAL PRODUCTS BY ANOTHER MANUFACTURER SUBJECT TO APPROVAL BY ENGINEER AND OWNER.

PART 3 – EXECUTION

3.01 INSTALLATION

A. MAKE ALL ELECTRICAL CONNECTIONS TO ALL EQUIPMENT IN ACCORDANCE WITH RESPECTIVE EQUIPMENT MANUFACTURER'S PUBLISHED INSTRUCTIONS.

B. PROTECT WORK AND MATERIALS FROM DAMAGE BY WEATHER, ENTRANCE OF WATER AND DIRT. CAP CONDUIT DURING INSTALLATION. AVOID DAMAGE TO MATERIALS AND EQUIPMENT IN PLACE.

C. SATISFACTORILY REPAIR OR REMOVE AND REPLACE DAMAGED WORK WITH NEW MATERIALS. DELIVER EQUIPMENT AND MATERIALS TO JOB SITE IN ORIGINAL, UNOPENED, LABELED CONTAINERS. STORE FERROUS MATERIALS TO PREVENT RUSTING. STORE FINISHED MATERIALS AND EQUIPMENT TO PREVENT STAINING AND DISCOLORING.

D. TRENCHES SHALL BE EXCAVATED 6" BELOW ELEVATION OF BOTTOM OF CONDUIT.

E. COORDINATE ALL CONDUIT ROUTING PRIOR TO CONSTRUCTION WITH ALL OTHER TRADES. FAILURE TO ROUTE CONDUIT THROUGH BUILDING WITHOUT INTERFERING WITH OTHER EQUIPMENT AND CONSTRUCTION SHALL NOT CONSTITUTE A REASON FOR AN EXTRA CHARGE. EQUIPMENT, CONDUIT AND FIXTURES SHALL FIT INTO AVAILABLE SPACES IN BUILDING AND SHALL NOT BE INTRODUCED INTO BUILDING AT SUCH TIMES AND MANNER AS TO CAUSE DAMAGE TO STRUCTURE. EQUIPMENT REQUIRING SERVICE SHALL BE READILY ACCESSIBLE.

3.02 TESTING AND EQUIPMENT SERVICING

A. MAKE TEST TO ENSURE THAT ENTIRE SYSTEM IS IN PROPER OPERATING CONDITION, AND THAT ADJUSTMENTS TO BREAKERS, FUSES, CONTROL EQUIPMENT AND APPARATUS HAVE BEEN MADE. CORRECT DEFECTS DISCOVERED DURING TESTS.

3.03 REMOVAL OF DEBRIS

A. REMOVE SURPLUS MATERIALS AND DEBRIS CAUSED BY, OR INCIDENTAL TO, ELECTRICAL WORK. REMOVE SUCH DEBRIS AT FREQUENT INTERVALS. KEEP JOB CLEAN DURING CONSTRUCTION.

3.04 IDENTIFICATION OF EQUIPMENT

A. IDENTIFY ELECTRICAL DISTRIBUTION EQUIPMENT, DISCONNECTS, AND CONTACTORS WITH BLACK LAMINATED PLASTIC NAME-PLATES, ATTACHED WITH TWO SCREWS, ENGRAVED WITH 1/4 " HIGH, WHITE LETTERS.

3.05 GUARANTEE-WARRANTY

A. GUARANTEE WORK TO BE FREE FROM DEFECTS OF MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE OF BUILDING. REPAIR AND REPLACE DEFECTIVE WORK AND OTHER WORK DAMAGED THEREBY WHICH BECOMES DEFECTIVE DURING TERM OF GUARANTEE-WARRANTY. FURNISH OWNER WITH THREE WRITTEN COPIES OF GUARANTEE/WARRANTY.

END OF SECTION

SECTION 16111: RACEWAY AND CONDUIT SYSTEMS

PART 1 – PRODUCTS

1.01 ACCEPTABLE MANUFACTURERS

A. RIGID IMC, AND EMT CONDUIT SHALL BE HOT-DIPPED, GALVANIZED, OR ELECTROGALVANIZED STEEL BY ALLIED, REPUBLIC, TRIANGLE, WHEATLAND, OR APPROVED EQUAL.

B. PVC CONDUIT SHALL BE CARLON, SCHEDULE 40, 90 DEGREES 'C' RATED, UNLESS OTHERWISE NOTED.

C. ASSOCIATED COUPLINGS, CONNECTORS AND FITTINGS SHALL BE STEEL AS MANUFACTURED BY RACO OR APPROVED EQUIVALENT. CATALOG NUMBERS USED BELOW ARE THOSE OF RACO.

D. ERICKSON COUPLINGS, SERIES 1502, SHALL BE USED WHERE NEITHER LENGTH OF CONDUIT CAN BE ROTATED.

E. INSULATED BUSHINGS SHALL BE SERIES 1402.

F. CONDUIT, CONNECTORS, COUPLINGS AND FITTINGS SHALL BE UL LISTED AND LABELED.

1.02 ELECTRICAL METALLIC TUBING (EMT)

A. USE ELECTRIC METALLIC TUBING (EMT) WHERE DRAWINGS CALL FOR CONDUIT TO BE:
1. CONCEALED IN WALLS.
2. INSTALLED ABOVE SUSPENDED CEILINGS.
3. INSTALLED EXPOSED, ABOVE 6 FEET.

1.03 INTERMEDIATE METAL CONDUIT (IMC)

A. USE INTERMEDIATE METAL CONDUIT (IMC) WHERE DRAWINGS CALL FOR CONDUIT TO BE:
1. INSTALLED FOR PANEL BOARD FEEDERS.
2. INSTALLED IN CONCRETE SLABS AT GROUND FLOOR.
3. INSTALLED EXPOSED BELOW 6 FEET.
4. INSTALLED IN WET LOCATIONS (INTERIOR AND EXTERIOR).

1.04 POLYVINYL CHLORIDE (PVC)

A. USE PVC FOR:
1. UNDERGROUND ELECTRICAL SERVICE ENTRANCE CONDUITS
2. TELEPHONE AND POWER SERVICE ENTRANCE CONDUITS.
3. EXTERIOR BRANCH CIRCUITS INSTALLED UNDERGROUND.

1.05 RIGID STEEL CONDUIT (RSC)

A. INSTALL UNDERGROUND FOR POWER SERVICE ENTRANCE ELBOWS PENETRATING FLOOR SLAB.
2. EXPOSED TO PHYSICAL DAMAGE.

1.06 FLEXIBLE METAL CONDUIT

A. PROVIDE FLEXIBLE METAL CONDUIT FOR TERMINATION AT EQUIPMENT SUBJECT TO MOTION AND VIBRATION.

B. LENGTH SHALL NOT EXCEED 6 FEET.

C. MAXIMUM LENGTH CONCEALED IN WALLS SHALL BE 3 FEET.

D. WHERE EXPOSED TO CONTINUOUS OR INTERMITTENT MOISTURE, CONDUIT SHALL BE U.L. TYPE EF LIQUID TIGHT.

PART 2 – EXECUTION

2.01 INSTALLATION

A. MINIMUM SIZE OF CONDUITS SHALL BE 3/4 INCH UNLESS OTHERWISE NOTED.

B. RUN CONCEALED CONDUITS IN DIRECT LINE WITH LONG SWEEP BENDS OR OFFSETS. RUN EXPOSED CONDUITS PARALLEL TO AND AT RIGHT ANGLES TO BUILDING LINES. GROUP MULTIPLE CONDUIT RUNS IN BANKS.

C. CAP ENDS OF CONDUITS TO PREVENT ENTRANCE OF WATER AND OTHER FOREIGN MATERIAL DURING CONSTRUCTION.

D. PROVIDE NO.12 AWG COPPER PULL WIRES OR NYLON CORD IN ALL EMPTY CONDUITS. STEEL WIRE NOT ACCEPTABLE AS PULL WIRE.

E. WHERE IMC CONDUIT ENTERS A CABINET, JUNCTION BOX, OR PULL BOX CONDUCTORS SHALL BE PROTECTED BY AN INSULATED BUSHING. LOCKNUTS SHALL BE INSTALLED ON CONDUIT OUTSIDE AND INSIDE ENCLOSURE.

F. IN AREAS WHERE ENCLOSED AND GASKET FIXTURES AND WEATHERPROOF DEVICES ARE SPECIFIED, WHERE RIGID CONDUIT ENTERS A SHEET METAL ENCLOSURE, JUNCTION BOX AND OUTLET BOX, AND NOT TERMINATED IN A THREADED HUB, A STEEL, OR MALLEABLE IRON NYLON INSULATED HUB, COMPLETE WITH RECESSED SEALING "O" RING OR SEALING LOCKNUT SHALL BE USED.

G. PROVIDE SEAL-OFF FITTING IN ALL CONDUITS ENTERING A COLD TEMPERATURE AREA SUCH AS FREEZERS AND DRY REFRIGERATORS.

H. IN CONCRETE SLABS, BLOCK UP CONDUIT FROM FORMS AND SECURELY FASTEN IN PLACE. ALL CONDUITS IN SLABS SHALL HAVE A MINIMUM OF 4" INCHES CONCRETE COVERAGE ABOVE.

I. FAILURE TO ROUTE CONDUIT THROUGH BUILDING WITHOUT INTERFERING WITH OTHER EQUIPMENT, AND CONSTRUCTION SHALL NOT CONSTITUTE A REASON FOR AN EXTRA CHARGE. EQUIPMENT, CONDUIT, AND FIXTURES SHALL FIT INTO AVAILABLE SPACES IN BUILDING AND SHALL NOT BE INTRODUCED INTO BUILDING AT SUCH TIMES AND MANNER AS TO CAUSE DAMAGE TO STRUCTURE OR EQUIPMENT. EQUIPMENT REQUIRING SERVICING SHALL BE READILY ACCESSIBLE.

J. CONDUIT SHALL BE SIZED TO COMPLY WITH "NEC" FOR NUMBER AND SIZE OF CONDUCTORS INSTALLED. EMT CONNECTORS AND COUPLINGS SHALL BE COMPRESSION TYPE. CLAMP CONDUIT TO BOXES WITH BUSHINGS INSIDE AND LOCKNUT OUTSIDE.

2.02 EMT (ELECTRICAL METALLIC TUBING)

A. DO NOT USE ELECTRIC METALLIC TUBING IN CINDER CONCRETE OR CINDER FILL OR WHERE CONDUIT SYSTEM IS IN CONTACT WITH DISSIMILAR METALS OR IN WET LOCATIONS.

2.03 PVC

A. USE THREADED FITTINGS FOR ALL CONNECTORS AND ADAPTERS.

B. PROVIDE 1/4-INCH NYLON PULL ROPE IN ALL PRIMARY POWER AND INCOMING TELEPHONE SERVICE ENTRANCE CONDUITS.

C. NO PVC SHALL EMERGE FROM THE GROUND OR THE CONCRETE SLAB OR ENCASEMENT. PVC SHALL CONVERT TO GALVANIZED RIGID METAL PRIOR TO ITS EMERGENCE.

2.04 FLEXIBLE METAL CONDUIT

A. WHERE FITTINGS FOR LIQUID TIGHT FLEXIBLE CONDUIT ARE BROUGHT INTO AN ENCLOSURE WITH A KNOCK-OUT, A GASKET ASSEMBLY, CONSISTING OF ONE PIECE "O" RING, WITH BUNA-N SEALING MATERIAL, SERIES 3400, SHALL BE INSTALLED ON OUTSIDE OF BOX. FITTINGS SHALL BE MADE OF EITHER STEEL OR MALLEABLE IRON ONLY AND SHALL HAVE INSULATED THROATS OR INSULATED BUSHINGS.

B. IN DRY LOCATIONS, WHERE FINAL CONNECTIONS TO MOTORS AND OTHER EQUIPMENT MAY BE MADE WITH FLEXIBLE METAL CONDUIT, FITTINGS SHALL BE OF STEEL OR MALLEABLE IRON ONLY WITH INSULATED THROATS OR INSULATED BUSHINGS, AND SHALL BE OF WEDGE AND SCREW TYPE HAVING AN ANGULAR WEDGE FITTING BETWEEN CONVOLUTIONS OF CONDUIT.

END OF SECTION

SECTION 16123: CONDUCTORS

PART 1 – PRODUCTS

1.01 CONDUCTORS

A. PROVIDE 98% CONDUCTIVITY COPPER CONDUCTORS WITH 600-VOLT INSULATION. FOR CONDUCTORS NO. 12 AWG AND NO. 10 AWG, PROVIDE SOLID TYPE. FOR ALL CONDUCTORS NO. 8 AWG AND LARGER, PROVIDE STRANDED TYPE. ALL CONDUCTORS SHALL HAVE THHN/THWN INSULATION UNLESS NOTED OTHERWISE.

B. CONDUCTORS SHALL BE MANUFACTURED BY TRIANGLE, AMERICAN, ROME, SOUTHWIRE OR APPROVED EQUAL.

C. NO MORE THAN (3) CIRCUIT CONDUCTORS SHALL BE UTILIZED WITH A SINGLE NEUTRAL.

D. ISOLATED GROUND CIRCUITS SHALL HAVE SEPARATE, DEDICATED GROUND AND NEUTRAL CONDUCTORS.

D. THE SIZE OF NEUTRAL CONDUCTOR SHALL NOT BE SMALLER THAN THE LARGEST PHASE CONDUCTOR WITHIN THE CONDUIT.

E. AC, MC AND BX CABLES ARE NOT PERMITTED.

PART 2 – EXECUTION

2.01 INSTALLATION

A. INSTALL PULL BOXES IN CIRCUITS OR FEEDERS OVER 100' LINEAR FEET IN LENGTH.

B. MAKE ALL SPLICES OR CONNECTIONS ONLY AT OUTLET, PULL OR JUNCTION BOXES.

C. ALL CONDUCTORS AND CONNECTIONS SHALL TEST FREE OF GROUNDS, SHORTS, AND OPENS PRIOR TO ENERGIZING CIRCUIT.

D. PROVIDE NO. 10 WIRE IN LIEU OF NO. 12 WIRE FOR ANY BRANCH CIRCUIT IN EXCESS OF 75' LINEAR FEET LENGTH TO PREVENT EXCESSIVE VOLTAGE DROP.

E. USE WING NUTS AS MANUFACTURED BY IDEAL, SCOTCHLOK TYPE Y, R, G, OR B, OR APPROVED EQUAL CONNECTORS FOR FIXTURE CONNECTIONS AT OUTLET BOXES.

F. MAKE FEEDER TAPS AND JOINTS WITH OZ TYPE T, PT, PM PTS, OR APPROVED EQUIVALENT CLAMP CONNECTORS AS MANUFACTURED BY KUPLER, OR WITH APPROVED COMPRESSION SLEEVES. WRAP CONNECTORS WITH NO. 10 ELECTRO-SEAL OR APPROVED EQUIVALENT PLASTIC FILLER AND VINYL TAPE.

G. LEAVE A MINIMUM OF 10" SLACK WIRE IN EVERY OUTLET BOX.

H. PROVIDE COLOR CODED WIRE, WITH A DIFFERENT COLOR FOR EACH PHASE AND NEUTRAL AND GROUND PER NEC. N.E.C. APPROVED COLORED TAPE IS ACCEPTABLE FOR FEEDERS USING LARGER THAN #6 CONDUCTORS.

I. ALL CONDUCTORS SHALL BE CONCEALED IN CONDUIT AND BE CONTINUOUS FROM ORIGIN AT PANEL TO EQUIPMENT TERMINATION WITHOUT SPLICES WHERE POSSIBLE. WHERE SPLICES AND TAPS ARE NECESSARY OR ARE REQUIRED, THEY SHALL BE MADE IN SPLICE BOXES WITH SUITABLE CONNECTORS.

J. LOW VOLTAGE COMMUNICATION AND CONTROLS WIRING NOT IN CONDUITS SHALL BE PLENUM RATED AND SUPPORTED PER MANUFACTURERS PUBLISHED RECOMMENDATIONS. ALL SUCH CONDUCTORS MUST BE APPROVED BY OWNER AND AUTHORITY HAVING JURISDICTION PRIOR TO INSTALLATION.

END OF SECTION

SECTION 16130: OUTLET AND JUNCTION BOXES

PART 1 – PRODUCTS

1.01 PROJECT CONDITIONS

A. VERIFY FIELD MEASUREMENTS ARE AS SHOWN ON DRAWING.

B. VERIFY LOCATIONS OF FLOOR BOXES AND OUTLETS IN WORK AREAS PRIOR TO ROUGH-IN WITH ARCHITECTS DIMENSIONED PLANS.

PART 2 – PRODUCTS

2.01 OUTLET BOXES

A. SHEET METAL OUTLET BOXES: GALVANIZED STEEL.

B. CAST BOXES: TYPE FS, CAST FERALLOY. PROVIDE GASKET COVER BY BOX MANUFACTURER.

C. MANUFACTURERS: NATIONAL, APPLETON, GENERAL ELECTRIC, RACO, OR STEEL CITY.

D. PROVIDE BOXES FOR FIXTURES WITH FIXTURE STUDS IN CENTER.

E. OUTLET BOXES FOR LIGHTING, SWITCHES AND RECEPTACLES IN INTERIOR AREAS WITH EXPOSED CONDUIT SHALL BE PRESSED STEEL AND IN EXTERIOR AREAS WITH EXPOSED CONDUIT SHALL BE CAST METAL WITH THREADED HUBS, "FS" TYPE. USE GALVANIZED STEEL FOR CONCEALED BOXES. BOXES SHALL BE 1-1/2" DEEP MINIMUM.

2.02 PULL AND JUNCTION BOXES

A. SHEET METAL BOXES: GALVANIZED STEEL.

B. SURFACE-MOUNTED CAST METAL BOX: TYPE 4; FLAT-FLANGED, SURFACE-MOUNTED JUNCTION BOX.
1. MATERIAL: GALVANIZED CAST IRON.
2. COVER: FURNISH WITH GROUND FLANGE, NEOPRENE GASKET, AND STAINLESS STEEL COVER SCREWS.

C. IN-GROUND CAST METAL BOX: INSIDE FLANGED, RECESSED COVER BOX FOR FLUSH MOUNTING.
1. MATERIAL: GALVANIZED CAST IRON.
2. COVER: NONSKID COVER WITH NEOPRENE GASKET AND STAINLESS STEEL COVER SCREWS.
3. COVER LEGEND: ELECTRIC.

D. MANUFACTURERS: NATIONAL, APPLETON, GENERAL ELECTRIC, RACO, OZ-GEDNEY OR STEEL CITY.

PART 3 – EXECUTION

3.01 INSTALLATION

A. INSTALL ELECTRICAL BOXES AS SHOWN ON DRAWINGS, AND AS REQUIRED FOR SPLICES, TAPS, WIRE PULLING, EQUIPMENT CONNECTIONS, AND COMPLIANCE WITH REGULATORY REQUIREMENTS ABOVE ACCESSIBLE CEILINGS.

B. INACCESSIBLE CEILING AREAS: INSTALL OUTLET AND JUNCTION BOXES NO MORE THAN 6 INCHES FROM CEILING ACCESS PANEL OR FROM REMOVABLE RECESSED LIGHT FIXTURE.

C. USE FLUSH MOUNTING OUTLET BOXES IN FINISHED AREAS.

D. USE STAMPED STEEL BRIDGES TO FASTEN FLUSH MOUNTING OUTLET BOX BETWEEN STUDS.

E. DO NOT FASTEN BOXES TO CEILING SUPPORT WIRES.

F. SUPPORT BOXES INDEPENDENTLY OF CONDUIT, EXCEPT CAST BOX THAT IS CONNECTED TO TWO RIGID METAL CONDUITS BOTH SUPPORTED WITHIN 12 INCHES OF BOX.

G. USE GANG BOX WHERE MORE THAN ONE DEVICE IS MOUNTED TOGETHER. DO NOT USE SECTIONAL BOX.

H. USE GANG BOX WITH PLASTER RING FOR SINGLE DEVICE OUTLETS.

I. USE CAST OUTLET BOX IN EXTERIOR LOCATIONS AND WET LOCATIONS.

3.02 OUTLET BOXES

A. SELECT BOXES ACCORDING TO INTENDED USE AND TYPE OF OUTLET. CEILING OUTLET BOXES SHALL BE 4" OCTAGONAL AND 1-1/2" DEEP. USE 2-1/8" DEEP OCTAGONAL BOXES OR 4" SQUARE BOXES WHERE REQUIRED. ALL CEILING OUTLET BOXES SHALL HAVE A FIXTURE STUD OF 'NO BOLT SELF-LOCKING' TYPE INSTALLED IF REQUIRED TO HANG THE FIXTURE SPECIFIED AT THE OUTLET.

3.03 JUNCTION BOXES

A. JUNCTION BOXES SHALL BE SIZED ACCORDING TO NUMBER OF CONDUCTORS IN BOX OR TYPE OF SERVICE TO BE PROVIDED. MINIMUM JUNCTION BOX SIZE 4-11/16" SQUARE AND 2-1/8" DEEP. PROVIDE SCREW COVERS FOR JUNCTION BOXES.

B. USE CODE GAUGE STEEL WITH SCREW COVERS FOR PULL BOXES WITH PRIME COAT AND PROVIDE WITH SCREW COVER. SIZE PULL BOXES ACCORDING TO THE NEC.

C. PROVIDE PULL BOX EVERY 100' OF CONDUIT RUN OR WHERE EXCESSIVE NUMBER OF BENDS NECESSITATES A BOX FOR EASE OF WIRE INSTALLATION.

D. PROVIDE CROUSE HINDS #GUP215 OR APPROVED EQUAL EXPLOSION PROOF JUNCTION BOXES AS REQUIRED PER PLANS IN CLASS 1 DIVISION 1 AREAS.

END OF SECTION

SECTION 16141: WIRING DEVICES AND PLATES

PART 1 – PRODUCTS

1.01 WALL SWITCHES

A. COLOR OF WIRING DEVICES AND COVER PLATES SHALL BE SELECTED BY ARCHITECT.

B. RATINGS: 20 AMPS, 120/277 VOLTS A.C. OR AS IDENTIFIED ON DRAWINGS.

C. DEVICES: (LEVITON CATALOG NUMBERS ARE LISTED UNLESS NOTED OTHERWISE):
1. SINGLE POLE TOGGLE SWITCHES:
A. 20 AMP IVORY DEVICE – #1221-2I
B. 20 AMP PILOT LIGHTS ILLUMINATED WITH LOAD ON – #1221-PL
2. DOUBLE POLE TOGGLE SWITCHES: 20 AMP IVORY DEVICE- #1222-2I
3. CROUSE HINDS #EDS2129 OR APPROVED EQUAL EXPLOSION PROOF SWITCH PER PLANS IN CLASS 1 DIVISION 1 AREAS.

1.02 RECEPTACLES

A. COLOR OF WIRING DEVICES AND COVER PLATES SHALL BE SELECTED BY ARCHITECT.

B. DEVICES: (LEVITON CATALOG NUMBERS ARE LISTED UNLESS OTHERWISE NOTED):
1. SPECIFICATION GRADE DEVICES
A. 20 AMP, 125 VOLTS A.C., RECEPTACLES
1. SINGLE DEVICE: #5361-I(IVORY)
2. DUPLEX DEVICE: 5362A-I OR GY(GREY)
3. ISOLATED GROUND DUPLEX DEVICE: IG5362IG-ORANGE
4. ISOLATED GROUND SINGLE DEVICE: IG5361IG-ORANGE

1.03 SPECIAL DEVICES:

A. MANUAL MOTOR STARTER SWITCH:
SQ. D CLASS 2510, TYPE F, FOR USE ON MOTORS UP TO 3/4 HORSEPOWER. PROVIDE NEMA 1 ENCLOSURE IN DRY LOCATIONS; PROVIDE NEMA 3R ENCLOSURE IN WET OR EXTERIOR LOCATIONS.

B. CROUSE HINDS #EFD OR APPROVED EQUAL MANUAL MOTOR STARTER FOR CLASS 1 DIV. 1 AREAS PER PLANS.

1.04 WALL PLATES

A. PROVIDE SPECIFICATION/COMMERCIAL GRADE STAINLESS STEEL LEVITON SERIES FOR SWITCHES, COMMUNICATION AND POWER OUTLETS.

B. PROVIDE BLANK PLATES ON ALL OUTLET BOXES FOR FUTURE OUTLETS OR OUTLETS WITHOUT DEVICES. BLANK PLATE STYLE SHALL MATCH DEVICE PLATES.

C. IMPACT RESISTANT CAST METAL LEVITON SERIES FOR WEATHERPROOF DUPLEX GFCI RECEPTACLES LOCATED OUTSIDE OR IN WET LOCATIONS. PROVIDE WITH 'WHILE IN USE' COVER

D. WHERE DEVICES ARE INSTALLED IN EXPOSED BOXES OR CONDUIT FITTINGS, PROVIDE PROPERLY DESIGNED PLATES AND EXPOSED WORK COVERS.

E. INSTALL GALVANIZED STEEL PLATES ON OUTLET BOXES AND JUNCTION BOXES IN UNFINISHED AREAS, ABOVE ACCESSIBLE CEILINGS, AND ON SURFACE-MOUNTED BOXES.

PART 2 – EXECUTION

2.01 INSTALLATION

A. MOUNTING:
1. MOUNT SWITCHES AND RECEPTACLES AT HEIGHT ABOVE FINISHED FLOOR AS INDICATED ON PLANS, AND LEGEND.
2. MOUNT SWITCHES ON STRIKE SIDE OF DOOR MAXIMUM 8" FROM DOOR FRAME. OUTLET BOX FOR SWITCH SHALL BE LOCATED CLEAR OF DOOR FRAME. COORDINATE WITH ARCHITECTURAL PLANS PRIOR TO ROUGH-IN.
3. INSTALL SWITCHES WITH OFF POSITION DOWN.
4. FOR GFCI TYPE RECEPTACLES, DO NOT USE THE FEED THRU FEATURE UNLESS OTHERWISE INDICATED ON PLANS.
5. USE JUMBO SIZED PLATES FOR OUTLETS INSTALLED IN MASONRY WALLS.
6. EACH RECEPTACLE SHALL BE PROVIDED WITH A #12 GREEN GROUNDING JUMPER BETWEEN THE GROUND TERMINAL OF THE RECEPTACLE AND THE OUTLET BOX.
7. THE GROUNDING CONDUCTOR TO EACH RECEPTACLE SHALL BE INSTALLED SUCH THAT THE REMOVAL OF THE DEVICE WILL NOT INTERFERE WITH THE CONTINUITY OF THE GROUND.

B. TESTING:
1. TEST EACH SWITCH AND VERIFY PROPER OPERATION WITH ENERGIZED CIRCUIT.
2. TEST EACH RECEPTACLE FOR PROPER POLARITY ON ENERGIZED CIRCUIT.
3. TEST EACH GFCI RECEPTACLE WITH GFCI RECEPTACLE TESTER AND VERIFY CIRCUIT IS OPENED BY GFCI DEVICE AT AMPERE RANGES ESTABLISHED BY MANUFACTURER.

END OF SECTION

SECTION 16170: GROUNDING AND BONDING

GROUNDING SYSTEM:
PERMANENTLY AND EFFECTIVELY GROUND ALL METALLIC CONDUITS, SUPPORTS, CABINETS, PANEL BOARDS AND SYSTEM GROUNDING NEUTRAL. MAINTAIN CONTINUITY OF EQUIPMENT GROUND THROUGHOUT THE SYSTEM. GROUND CLAMPS SHALL BE APPROVED TYPE, SPECIFICALLY DESIGNED FOR GROUNDING. WHERE GROUNDING CONDUCTOR IS ENCLOSED IN CONDUIT, GROUND CLAMP SHALL BE OF A TYPE WHICH GROUNDS BOTH CONDUCTOR AND CONDUIT. ALL CIRCUITS IN FLEXIBLE CONDUIT OR PLASTIC(PVC) CONDUIT SHALL INCLUDE A GROUND WIRE SIZED IN ACCORDANCE WITH NEC ART250. CONDUIT SHALL NOT BE ALLOWED AS A GROUNDING MEANS.

PART 1 – PRODUCTS

1.01 ROD ELECTRODES

A. MATERIAL: COPPER-CLAD STEEL.

B. DIAMETER: 3/4 INCH.

C. LENGTH: 10 FEET MINIMUM.

1.02 MECHANICAL CONNECTORS

A. MATERIAL: BRONZE.

1.03 WIRE

A. MATERIAL: STRANDED COPPER.

B. FOUNDATION ELECTRODES: 3/0 AWG.

C. GROUNDING ELECTRODE CONDUCTOR: SIZE TO MEET

PART 2 – EXECUTION

2.01 INSTALLATION

A. PROVIDE BONDING TO MEET REGULATORY REQUIREMENTS.

B. BOND TOGETHER EACH METALLIC RACEWAY, PIPE, DUCT AND OTHER METAL OBJECTS.

C. PROVIDE DEDICATED, ISOLATED GROUNDING CONDUCTOR FOR CIRCUITS SUPPLYING ALL ISOLATED GROUND OUTLETS. INSULATION SHALL BE GREEN WITH YELLOW STRIPE. SIZE PER NEC 250. ISOLATED GROUNDING CONDUCTOR SHALL RUN IN ADDITION TO EQUIPMENT GROUNDING CONDUCTOR AND THE BRANCH CIRCUIT CONDUCTORS IN SAME CONDUIT. TERMINATE ON THE ISOLATED GROUND BUS WITHIN THE PANEL BOARD SERVING LOAD.

END OF SECTION

2.02 GROUNDING

A. GROUND ELECTRICAL SYSTEM IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE ART.250 AND LOCAL AUTHORITIES HAVING JURISDICTION.

B. INSTALL A GREEN EQUIPMENT GROUNDING CONDUCTOR IN EACH RACEWAY, SIZED PER N.E.C. ART.250. TERMINATE ON EQUIPMENT GROUND BUS WITHIN PANEL BOARD SERVING LOAD.

C. INSTALL #6 AWG COPPER GROUNDING CONDUCTOR FROM GROUND BAR IN MAIN TELEPHONE BOX OR BOARD TO EQUIPMENT GROUND BUS IN MAIN DISTRIBUTION PANEL OR AT SERVICE ENTRANCE EQUIPMENT PER NEC.

D. ALL SEPARATE GROUNDING ELECTRODES SHALL BE BONDED TOGETHER PER NEC ART.250 AND BONDED BETWEEN THEIR ASSOCIATED WIRING SYSTEMS. THIS INCLUDES THE POWER SYSTEM, TELEPHONE SYSTEM, ETC.

2.03 FIELD QUALITY CONTROL

A. INSPECT GROUNDING AND BONDING SYSTEM CONDUCTORS AND CONNECTIONS FOR TIGHTNESS AND PROPER INSTALLATION.

END OF SECTION

SECTION 16190: SUPPORTING DEVICES AND HANGERS

PART 1 – PRODUCTS

1.01 ACCEPTABLE MANUFACTURERS

A. SUPPORTING DEVICES AND HANGERS SHALL BE MANUFACTURED BY RAYCO FASTENERS.

PART 2 – EXECUTION

2.01 INSTALLATION:

A. SECURE CONDUITS WITHIN 3' OF EACH OUTLET BOX, JUNCTION BOX, CABINET, FITTING, ETC., AND AT INTERVALS NOT TO EXCEED TEN FEET (10') AND IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE. IN SEISMIC ZONES, SUPPORT CONDUITS 1" AND UNDER AT 6' INTERVALS.

B. INSTALL CLAMPS SECURED TO STRUCTURE FOR FEEDER AND OTHER CONDUITS ROUTED AGAINST THE STRUCTURE. USE DROP RODS AND HANGERS OR RACKS TO SUPPORT CONDUITS RUN APART FROM THE STRUCTURE.

C. PROVIDE AND INSTALL SUITABLE ANGLE IRON, CHANNEL IRON OR STEEL METAL FRAMING WITH ACCESSORIES TO SUPPORT OR BRACE ELECTRICAL EQUIPMENT INCLUDING SAFETY SWITCHES, FIXTURES, PANEL BOARDS, ETC.

D. USE OF CHAINS