

ELECTRICAL SPECIFICATIONS

GENERAL REQUIREMENTS:

- 1. INSTALLATION STANDARDS AND PRACTICES
A. COORDINATE AND COMPLY WITH SPECIFICATIONS AND REQUIREMENTS IN ARCHITECTURAL PLANS, MECHANICAL PLANS AND IN CONTRACT FOR CONSTRUCTION.
B. FURNISH ALL LABOR, EQUIPMENT, SUPPLIES AND MATERIALS AND PERFORM ALL OPERATIONS INCLUDING EXCAVATIONS AND BACK FILLING, CUTTING, CHANNELING AND CHASING NECESSARY FOR THE INSTALLATION OF COMPLETE SYSTEMS.
C. PERFORM ALL WORK IN ACCORDANCE WITH THE RULES AND REGULATIONS OF ALL APPLICABLE MUNICIPAL, STATE, AND OTHER LOCAL CODES, AND THE VERSION OF THE NATIONAL ELECTRICAL CODE ADOPTED BY THE JURISDICTION.
D. ALL WORK SHALL BE PERFORMED IN A WORKMANLIKE MANNER, IN CONFORMANCE WITH MANUFACTURERS INSTALLATION RECOMMENDATIONS AND INDUSTRY PRACTICES.
E. SECURE ALL NECESSARY PERMITS, LICENSES AND INSPECTIONS AND PAY ALL FEES AND CHARGES.
F. COORDINATE AND SCHEDULE SUBTENDERS OF ELECTRIC SERVICE, FEEDERS AND CIRCUITS AROUND THE NEEDS OF THE OWNER OF THE FACILITY.
G. PROVIDE TEMPORARY POWER AS REQUIRED FOR CONSTRUCTION.
H. THE GENERAL ARRANGEMENT OF CONDUIT, WIRING AND EQUIPMENT SHALL BE AS SHOWN ON THE CONTRACT DRAWINGS, WITHOUT SUBSTANTIAL ALTERATION. THE DRAWINGS ARE GENERALLY DIAGRAMMATIC AND DUE TO THE SMALL SCALE OF THE DRAWINGS, ALL OFFSETS, FITTINGS AND ACCESSORIES ARE NOT NOTICED. ENGINEER AND OWNER RESERVE THE RIGHT TO MAKE REASONABLE CHANGES IN LOCATION OF DEVICES, EQUIPMENT, AND ROUTING OF CONDUIT, UP TO THE TIME OF ROUGH-IN AT NO ADDITIONAL COST.
I. THE CONTRACTOR SHALL VISIT THE SITE AND OBSERVE EXISTING CONDITIONS INCLUDING STRUCTURAL, FINISH AND OTHER CIRCUMSTANCES THAT AFFECT THE COMPLETION OF THE WORK. ACCOMMODATE WORK ACCORDINGLY AT NO ADDITIONAL COST TO THE OWNER.
J. REFER TO MECHANICAL, MECHANICAL AND ELECTRICAL EQUIPMENT AND CONTROL WIRING REQUIREMENTS IN GENERAL, CONTROL AND INTERLOCK WIRING FOR HVAC SYSTEMS IS UNDER DIVISION 16. CONTRACTOR SHALL CAREFULLY REVIEW THE CONTRACT DOCUMENTS AND COORDINATE EXCLUSIONS WITH OTHER TRADES.
K. REMOVE ALL LIGHTING FIXTURES, RECEPTACLES, ETC. IN THE EXISTING SPACE THAT INTERFERE WITH THE NEW CONSTRUCTION AND AS SHOWN ON THE DRAWINGS. REMOVE ALL CONDUCTORS BACK TO THE CLOSEST ACCESSIBLE JUNCTION POINT. MAINTAIN CONTINUITY OF CIRCUITS TO ANY DEVICES WHICH ARE TO REMAIN AS PART OF A NON-AFFECTED WALL OR PARTITION.
L. INDIVIDUAL HOME RUNS ARE SHOWN FOR CLARITY ONLY, ETC. CAN COMBINE THEM TOGETHER PER N.E.C. MULTIPLE CIRCUITS WITH COMMON NEUTRALS SHALL HAVE BREAKER HANDLE TIES.
M. THE CONTRACTOR SHALL STUDY THE ARCHITECTURAL AND ELECTRICAL DRAWINGS AND COORDINATE EXACT LOCATIONS OF THE VARIOUS ELECTRICAL DEVICES WITH DOOR SWINGS, GLASS PARTITIONS, ETC.
N. MANUFACTURERS AND MODEL NUMBERS INDICATED ON THE CONTRACT DRAWINGS SHALL BE FOR REFERENCE AND BASIS OF DESIGN ONLY. VERIFY ALL EQUIPMENT REQUIREMENTS, PERFORMANCE STANDARDS AND ACCESSORIES PRIOR TO ORDERING OF EQUIPMENT. ARIUM SHALL TAKE NO RESPONSIBILITY FOR EQUIPMENT THAT IS IMPROPERLY ORDERED OR INSTALLED.
O. ANY EXISTING FEEDERS THAT ARE REUSED OR MODIFIED AS A RESULT OF THE CONTRACT DRAWINGS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO BIDDING. WAIVER OF RESPONSIBILITY OR REQUESTS FOR ADDITIONAL PAYMENT BASED ON LACK OF KNOWLEDGE OF CONDITIONS AT THE SITE WILL NOT BE ACCEPTED.

2. SUBMITTALS:

- A. THE CONTRACTOR SHALL PREPARE AND SUBMIT CATALOG CUTS, SPECIFICATION SHEETS, DESCRIPTIVE DATA, ETC., FOR PANELBOARDS, DISCONNECT SWITCHES, WIRING DEVICES, WIRE AND CABLE, RACEWAY, FA EQUIPMENT AND ALL OTHER ELECTRICAL MATERIALS SPECIFIED.
B. PREPARE AND SUBMIT SHOP DRAWINGS AND/OR DIAGRAMS FOR ALL SPECIALLY FABRICATED ITEMS, MODIFICATIONS TO STANDARD ITEMS AND SYSTEMS WHERE DETAILED DESIGN IS NOT SHOWN ON THE CONTRACT DRAWINGS OR WHERE THE PROPOSED INSTALLATION DIFFERS FROM THAT SHOWN ON THE CONTRACT DRAWINGS. SHOP DRAWINGS SHALL INCLUDE PLANS, ELEVATIONS, SECTIONS, MOUNTING DETAILS OF COMPONENT PARTS, POINT TO POINT INTERCONNECTIONS DIAGRAMS, SINGLE LINE DIAGRAMS AND OTHER DRAWINGS NEEDED TO FULLY DESCRIBE THE FUNCTION, FABRICATION AND CONNECTION OF THE SYSTEM.

3. CUTTING AND PATCHING:

- A. ALL CUTTING AND PATCHING NECESSARY FOR THE INSTALLATION OF THE ELECTRICAL WORK SHALL BE DONE BY THE ELECTRICAL CONTRACTOR. ANY DAMAGE DONE TO THE WORK ALREADY IN PLACE BY REASON OF THIS WORK SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE. PATCHING SHALL BE UNIFORM IN APPEARANCE AND SHALL MATCH WITH THE SURROUNDING SURFACE.
B. IDENTIFICATION: PERMANENTLY IDENTIFY ALL MOTOR STARTERS, DISCONNECT SWITCHES, CONTROLS, PANELBOARDS, TERMINAL BOARDS, TRANSFORMERS AND OTHER EQUIPMENT IN ACCORDANCE WITH THE PROJECT NOMENCLATURE. IDENTIFICATION PLATES SHALL BE LAMINATED PLASTIC, BLACK WITH WHITE ENGRAVED LETTERS. UNLESS OTHERWISE INDICATED, USE 1/2" HIGH LETTERING, LETTERING FOR CONTROL CENTERS, CONTROL PANELS, METERS AND INSTRUMENT PANELS SHALL BE 3/4" HIGH. ATTACH IDENTIFICATION PLATES WITH CORROSION RESISTANT PHILLIPS HEAD STEEL SCREWS OR ADHESIVE APPLIED FOR THE PURPOSE.

4. HAZARDOUS MATERIALS:

- ENGINEER HAS NOT INVESTIGATED OR MADE ANY CONSIDERATION FOR THE POSSIBLE PRESENCE OF HAZARDOUS MATERIALS. IN THE EVENT THAT CONTRACTOR DISCOVERS POINTS IN, OR PRESUMED HAZARDOUS MATERIALS, THE OWNER SHALL BE IMMEDIATELY NOTIFIED AND SUCH MATERIALS SHALL NOT BE DISTURBED PENDING DIRECTION FROM OWNER.

5. RECORD DRAWINGS:

- UPON COMPLETION OF THE ELECTRICAL INSTALLATION, THE CONTRACTOR SHALL DELIVER TO THE OWNER ONE (1) SET OF PRINTS OF THE ELECTRICAL CONTRACT DRAWINGS WHICH SHALL BE LEGIBLY MARKED IN ERASABLE RED PENCIL TO SHOW ALL CHANGES AND DEPARTURES OF THE INSTALLATION AS COMPARED WITH THE ORIGINAL DESIGN. THEY SHALL BE SUITABLE FOR USE IN PREPARATION OF RECORD DRAWINGS.

6. TESTS:

- FURNISH ALL LABOR, MATERIALS, INSTRUMENTS, FUEL AND POWER REQUIRED TO PERFORM ALL NECESSARY TESTS. PERFORM TESTS ACCORDING TO NETA STANDARDS. ALL DEFECTIVE MATERIALS AND/OR WORKMANSHIP DISCOVERED AS A RESULT OF TESTS SHALL BE REPLACED AT NO EXPENSE TO THE OWNER AND THE TEST SHALL BE REPEATED. A THOROUGH TEST SHALL BE MADE TO DEMONSTRATE THAT THE SYSTEM IS FREE FROM GROUND FAULTS, SHORT CIRCUITS, AND OPEN CIRCUITS THAT THE RESISTANCE TO GROUND OF ALL NON-GROUNDING CIRCUITS, BEFORE AND AFTER CONNECTION OF EQUIPMENT MEETS THE REQUIREMENTS OF THE NEC.

7. GUARANTEE:

- THE MATERIAL AND WORKMANSHIP OF ALL PARTS OF THE ELECTRICAL INSTALLATION SPECIFIED HEREIN SHALL BE GUARANTEED UNCONDITIONALLY FOR A PERIOD OF ONE (1) YEAR FROM DATE OF ACCEPTANCE AGAINST MECHANICAL AND ELECTRICAL DEFECTS ARISING FROM FAULTY MATERIALS OR WORKMANSHIP. EITHER REPLACEMENT OR REPAIRS SHALL BE MADE PROMPTLY ON ANY DEFECTIVE MATERIALS OR WORKMANSHIP WITHOUT CHARGE DURING THAT PERIOD.

ELECTRICAL MATERIALS AND METHODS:

- 1. MATERIALS - GENERAL:
A. ALL MATERIALS SHALL BE NEW AND SUITABLE FOR THE CONDITIONS AND DUTIES IMPOSED ON THEM AFTER INSTALLATION. ALL SUCH MATERIAL SHALL BE AS FOUND IN THE APPROVED LIST OF THE NATIONAL BOARD OF FIRE UNDERWRITERS. ALL EQUIPMENT AND SYSTEMS SHALL BE UL APPROVED.
B. WHERE MATERIAL OR EQUIPMENT IS IDENTIFIED BY PROPRIETARY NAME, MODEL NUMBER AND/OR MANUFACTURER, FURNISH THE NEAREST EQUAL THEREOF, SUBJECT TO ACCEPTANCE BY THE ENGINEER. SUBSTITUTED ITEMS SHALL BE EQUAL OR BETTER IN QUALITY AND PERFORMANCE AND MUST BE SUITABLE FOR THE AVAILABLE SPACE, REQUIRED ARRANGEMENT AND APPLICATION. SUBMIT ANY AND ALL DATA NECESSARY TO DETERMINE THE SUITABILITY OF SUBSTITUTED ITEMS.

2. CONDUITS AND FITTINGS:

- A. GENERAL:
1. INSTALL ALL WIRING IN METAL RACEWAY, PROVIDE CABLES AND PROVIDE EMPTY CONDUIT FOR SPECIAL SYSTEMS DESCRIBED ELSEWHERE.
2. MINIMUM CONDUIT SIZE SHALL BE 3/4" AND 1" FOR UNDERGROUND CONDUITS.
3. IN FINISHED AREAS, INSTALL ALL RACEWAYS AND PERMITTED UNLESS OTHERWISE INDICATED. IF MC CABLE IS BUILDING STANDARD AND PERMITTED BY CODE, IT MAY BE USED FOR NEW CONCEALED BRANCH CIRCUITS (LESS THAN 60' CONDUIT).
4. BRANCH CIRCUITS SHALL BE RUN IN CONDUIT IN ALL AREAS WHERE THEY CANNOT BE CONCEALED. THESE SHALL INCLUDE, BUT NOT BE LIMITED TO, OPEN CEILING, UNFINISHED WALLS, MECHANICAL EQUIPMENT SPACES, ETC. EXPOSED CONDUIT SHALL BE RUN IN PLUMB, AND PARALLEL TO OR PERPENDICULAR TO THE WALLS IN A NEAT AND ORDERLY MANNER USING EVENLY SPACED HANGERS.
5. FOR HAZARDOUS LOCATIONS, PENETRATION OF EXTERIOR WALLS AND OTHER PARTITIONS WITH HIGH THERMAL TURBULENCE DIFFERENTIALS SUCH AS THOSE FOR COLD STORAGE, PROVIDE COMPOUND FILLED SEALING FITTINGS.
1. ALL CONDUITS WITH A NOMINAL DIAMETER OF 2 INCHES OR LARGER SHALL BE RIGID METAL CONDUIT.
B. MATERIALS:
1. PROVIDE HOT-DIP GALVANIZED, RUST STEEL CONDUIT FOR WORK EXPOSED TO WEATHER AND FOR EMBEDDED WORK IN CONCRETE OR MASONRY AND IN OR BELOW THE CONCRETE SLAB ON GRADE (ABOVE THE VAPOR BARRIER). USE THREADED FITTINGS W/UL LISTED LOCKNUTS & INSULATED BUSHINGS.
2. PROVIDE LIQUIDTIGHT FLEXIBLE CONDUIT (SEALIGHT) FOR CONNECTION TO EXTERIOR & KITCHEN EQUIPMENT.
3. PROVIDE GALVANIZED EMT WITH COMPRESSION FITTINGS UNLESS OTHERWISE NOTED.
C. INSTALLATION:
1. ALL SUPPORT PARTS AND HARDWARE SHALL BE GALVANIZED.
2. SUPPORT ALL RACEWAYS SO THAT STRAIN IS NOT TRANSMITTED TO OUTLET BOXES AND PULL BOXES, ETC. SUPPORTS SHALL BE SUFFICIENTLY RIGID TO PREVENT DISTORTION OF CONDUITS DURING WIRE PULLING.
3. SUPPORT SINGLE RUNS OF SUSPENDED FEEDER CONDUIT WITH "XNOROP" D-48 OR C-100 ADJUSTABLE HANGERS USING 3/8" RODS FOR CONDUITS UP TO 2" AND 1/2" RODS FOR CONDUITS LARGER THAN 2".
4. SUPPORT GROUPS OF SUSPENDED CONDUITS RUN IN PARALLEL ON TRAPEZOID HANGERS CONSTRUCTED OF "XNOROP" CHANNELS WITH 1/8" CONDUIT STRAPS AND SUSPENDED WITH 1/2" HANGER RODS. NO TIRES OR BUILDING WIRE SHALL BE USED FOR STRAPPING CONDUITS.
5. SUPPORT SURFACE RUNS OF CONDUIT USING ONE HOLD PIPE STRAP OR TWO HOLD PIPE STRAPS, STRAP SPACING MAXIMUM 6 FT. ON CENTERS.
6. FASTEN PIPE STRAPS AND HANGERS TO CONCRETE USING INSERTS OR EXPANSION BOLTS AND TO MASONRY USING TOGGLE BOLTS AND WASHERS. BRICK OR BLOCK CAN BE CUT AND FITTED CLOSE TO THE CONDUIT AND SO THAT THE STANDING WALL PLATE WILL COVER THE JOINT BETWEEN THE BRICK OR BLOCK AND THE BOX.
7. ALL BOXES USED FOR SUPPORTING FITTINGS SHALL BE FINISHED WITH WALL-BLAE IRON FUTURE STUDS OF "XNOROP" TYPE SECURED BY LOCKNUTS. PROVIDE SUPPORT FOR BOXES INDEPENDENT OF SUSPENDED CEILINGS.
8. JUNCTION AND PULL BOXES SHALL BE FURNISHED AND INSTALLED AS SHOWN OR WHERE REQUIRED TO FACILITATE PULLING OF WIRES AND CABLES. SUCH BOXES SHALL BE INSTALLED AT ACCESSIBLE LOCATIONS. ALL BOXES FOR CONCEALED WORK SHALL BE CONSTRUCTED OF 12 GAUGE GALVANIZED SHEET STEEL UNLESS OTHERWISE NOTED AND SHALL BE PROVIDED WITH MOUNTING BRACKETS AND FLAT COVER COVERS. BOXES FOR EXTERIOR WORK SHALL BE CAST ALUMINUM OR GALVANIZED CAST IRON WITH THREADED HUBS AND GASKETED COVERS.

3. BOXES:

- A. OUTLET BOXES FOR CONCEALED WORK SHALL BE ZINC-COATED SHEET STEEL NOT LESS THAN 4" OCTAGONAL OR SQUARE AND SUITABLE FOR SERVICE AND TYPE OF DEVICES. BOXES FOR OUTDOOR WORK SHALL BE NEMA 3R CAST ALUMINUM BOXES WITH GASKETED JOINTS, THREADED HUBS FOR CONDUIT ENTRY AND CORROSION RESISTANT FINISH.
B. OUTLET BOXES IN EXPOSED MASONRY WALLS SHALL BE PROVIDED WITH DEEP SQUARE-CUT DEVICE COVERS. THEY SHALL BE SET SO THAT THE BRICK OR BLOCK CAN BE CUT AND FITTED CLOSE TO THE COVER OPENING AND SO THAT THE STANDING WALL PLATE WILL COVER THE JOINT BETWEEN THE BRICK OR BLOCK AND THE BOX.
C. ALL BOXES USED FOR SUPPORTING FITTINGS SHALL BE FINISHED WITH WALL-BLAE IRON FUTURE STUDS OF "XNOROP" TYPE SECURED BY LOCKNUTS. PROVIDE SUPPORT FOR BOXES INDEPENDENT OF SUSPENDED CEILINGS.
D. JUNCTION AND PULL BOXES SHALL BE FURNISHED AND INSTALLED AS SHOWN OR WHERE REQUIRED TO FACILITATE PULLING OF WIRES AND CABLES. SUCH BOXES SHALL BE INSTALLED AT ACCESSIBLE LOCATIONS. ALL BOXES FOR CONCEALED WORK SHALL BE CONSTRUCTED OF 12 GAUGE GALVANIZED SHEET STEEL UNLESS OTHERWISE NOTED AND SHALL BE PROVIDED WITH MOUNTING BRACKETS AND FLAT COVER COVERS. BOXES FOR EXTERIOR WORK SHALL BE CAST ALUMINUM OR GALVANIZED CAST IRON WITH THREADED HUBS AND GASKETED COVERS.

4. WIRE AND CABLE (600 VOLT):

- A. BUILDING WIRE, UNLESS OTHERWISE INDICATED, SHALL BE 600 VOLT, TYPE THHN AND THWN INSULATION FOR INTERIOR USE AND TYPE USE, CROSS-LINKED POLYETHYLENE INSULATION FOR UNDERGROUND AND OUTSIDE BUILDING INSTALLATION. CONDUCTORS SHALL BE SECTD AND RUN AS INDICATED. CONDUCTORS SHALL BE SOFT DRAWN COPPER OF NOT LESS THAN 88% CONDUCTIVITY.
B. NO WIRE SMALLER THAN NUMBER TWELVE (12 AWG) SHALL BE USED UNLESS OTHERWISE INDICATED. THE WIRE SIZE INDICATED IN THE HOMERUN SHALL BE USED THROUGHOUT THE CIRCUIT. CONDUCTORS SHALL BE CONTINUOUS FROM OUTLET TO OUTLET AND FROM TERMINAL BOARD TO POINT OF FINAL CONNECTION, AND NO SPICE SHALL BE MADE EXCEPT WITHIN OUTLET OR JUNCTION BOXES. ALL WIRES NUMBER EIGHT (8 AWG) AND LARGER SHALL BE STRANDED AND SPICES SHALL BE OF THE TYPE INDENTED INTO CONDUCTOR.
C. A COLOR CODING SYSTEM SHALL BE USED FOR THROUGHOUT THE BUILDINGS NETWORK OF FEEDERS AND CIRCUITS. SELECTION SHALL BE BASED ON APPLICABLE WORK COVERED BY THIS CONTRACT.
D. ALL CONTROL WIRING SHALL BE COLOR CODED WITH WIRES OF COLORS DIFFERENT FROM THOSE TO DESIGNATE PHASE WIRES.

5. WIRING DEVICES:

- A. ALL DEVICES SHALL BE OF THE SAME MANUFACTURER. DEVICES SHALL BE GENERAL ELECTRIC, HUBBELL, ARROW HART OR APPROVED EQUAL.
B. WALL SWITCHES: TOGGLE SWITCHES SHALL BE OF THE SILENT MECHANICAL TYPE RATED 20 AMPERE, RATED FOR SUPPLIED VOLTAGE, MOUNT SWITCHES 48" TO CENTER OF OUTLET BOX ABOVE FLOOR.
C. RECEPTACLES: RECEPTACLES FOR WALL OUTLETS SHALL BE NEMA 5-20R, 125 VOLTS, DUPLEX, THREE-WIRE WITH THIRD WIRE GROUNDING. VERIFY EXISTING OUTLET LOCATIONS PRIOR TO ROUGH-IN. NEW MOUNT RECEPTACLES 18" ABOVE FINISHED FLOOR (UNLESS OTHERWISE NOTED). GROUND, PHASE AND NEUTRAL CONDUCTORS SHALL BE INSTALLED IN OUTLET BOXES OR MULTIOUTLET ASSEMBLY FOR RECEPTACLES SO THAT GROUND AND ELECTRICAL SERVICE WILL NOT BE DISTURBED TO OTHER RECEPTACLES ON THE SAME MULTIWIRE CIRCUIT IF RECEPTACLE IS REMOVED.
D. DEVICE PLATES: A DEVICE PLATE SHALL BE PROVIDED FOR EACH OUTLET REQUIRING ONE. ALL PLATES SHALL BE APPROVED BY THE ARCHITECT.
E. GFCI RECEPTACLES: GFCI RECEPTACLES SHALL BE STRAIGHT-BLADE, NON-FEED THRU, DUPLEX TYPE RECEPTACLE WITH INTEGRAL GROUND FAULT PROTECTION AND RATED FOR 20A, 120V.
F. WIRING DEVICES SHALL BE BLACK, UNLESS OTHERWISE INDICATED, AND SHALL BE APPROVED BY ARCHITECT. DEVICE PLATES SHALL BE STAINLESS STEEL UNLESS OTHERWISE NOTED, AND SHALL BE APPROVED BY THE ARCHITECT.
G. EXISTING WIRING DEVICES AND WALL PLATES SHALL BE REPLACED AS REQUIRED TO MATCH NEW.

6. GROUNDING:

- A. PROVIDE EQUIPMENT GROUNDING CONDUCTORS WHERE INDICATED IN ALL RACEWAYS AND CABLES SIZED IN ACCORDANCE WITH THE N.E.C.
B. PROVIDE GROUNDING ELECTRODE CONDUCTOR CONNECTED TO THE BUILDING GROUNDING SYSTEM FOR TRANSFORMER SECONDARY.

SERVICE AND DISTRIBUTION:

- 1. PANELBOARDS:
A. PROVIDE DISTRIBUTION AND BRANCH CIRCUIT PANELBOARDS WITH FEATURES AND RATINGS AS INDICATED ON THE DRAWINGS. THESE SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING: VOLTAGE, BUS RATING, FULLY RATED SYMMETRICAL AMPERES INTERRUPTING CAPACITY (AIC), PHASE, NUMBER OF WIRES, NUMBER OF POLES, MAIN CIRCUIT BREAKER, OR MAIN LOSS ONLY. PANELBOARDS SHALL COMPLY WITH NEMA IBS1 AND UL 87. PANELBOARDS SHALL HAVE FULLY RATED COPPER MAIN BUS BAR, FIFTY PERCENT COPPER GROUND BUS BAR AND FULL RATED INSULATED NEUTRAL BUS BAR, WHERE INDICATED.
B. CIRCUIT BREAKERS SHALL BE BOLT-ON FOR BOTH 480V AND 208V PANELBOARDS. CIRCUIT BREAKERS SHALL BE OF THE THERMAL MAGNETIC TYPE WITH ACCESSORIES (SHUNT TRIP, GROUND FAULT PROTECTION, ETC.) AS INDICATED ON THE PANELBOARD SCHEDULE. IN INSTANCES WHERE "SPACE" IS INDICATED ON THE SCHEDULE, PROVIDE FULLY EQUIPPED SPACE INCLUDING BUS FOR FUTURE INSTALLATION OF CIRCUIT BREAKERS.
C. PROVIDE A TYPED CIRCUIT DIRECTORY MOUNTED INSIDE FRONT DOOR OF PANEL ENCLOSURE. PANELBOARDS SHALL BE MANUFACTURED BY CUTLER HAMMER, GENERAL ELECTRIC, SQUARE D, OR SIEMENS.
D. THE CONTRACTOR SHALL BALANCE THE LOADING ON ALL PANELBOARDS AS CLOSELY AS POSSIBLE AND TO THE SATISFACTION OF THE ENGINEER.
E. THE CIRCUIT NUMBERS USED ON THE DRAWINGS ARE FOR IDENTIFICATION ONLY AND THE CIRCUIT NUMBER IN THE PANEL NEED NOT NECESSARILY CORRESPOND. EACH CIRCUIT IN THE PANELS, HOWEVER, SHALL BE ACCURATELY INDEXED AS SPECIFIED HEREIN. CIRCUITS SHALL BE ARRANGED IN PANELS SO THAT ALL LIGHTING CIRCUITS ARE TOGETHER, ALL MOTOR CIRCUITS ARE TOGETHER, ETC.
2. SAFETY SWITCHES:
A. SAFETY SWITCHES SHALL BE PROVIDED WITH RATINGS AND ACCESSORIES AS INDICATED ON THE CONTRACT DOCUMENTS. THESE INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING: AMPERE RATING, VOLTAGE RATING, NO. OF POLES, FUSIBLE OR NON-FUSIBLE, SAFETY SWITCHES SHALL BE MANUALLY OPERATED AND HAVE A QUICK-MAKE, QUICK-BREAK SWITCHING MECHANISM. SAFETY SWITCHES SHALL HAVE MECHANICAL LOSS SUITABLE FOR COPPER CONDUCTORS AND SHALL COMPLY WITH UL 88 AND NEMA 1-1.
B. FUSED SWITCHES RATED FOR 30A TO 600A SHALL BE EQUIPPED WITH CLASS R FUSE CLIPS AND SHALL HAVE A FUSE REJECTION CAPABILITY. FUSED SWITCHES RATED FOR 600A TO 1200A SHALL BE EQUIPPED WITH CLASS I FUSE CLIPS. SWITCHES SHALL HAVE UL LISTED SHORT CIRCUIT CURRENT RATING OF 200,000 RMS INTERRUPTING AMPS.
C. ENCLOSURE SHALL BE NEMA 1 FOR INDOOR INSTALLATIONS AND NEMA 3R FOR EXTERIOR INSTALLATIONS. ENCLOSURE SHALL HAVE CONVEY MARKINGS AND SHALL HAVE A BLACK OR RED OPERATING HANDLE. HANDLE SHALL BE CAPABLE OF BEING PADLOCKED IN THE "OFF" POSITION. ENCLOSURE DOOR SHALL HAVE DEFATABLE INTERLOCKS TO PREVENT OPENING OF THE SWITCH COVER WHEN THE SWITCH IS "ON" AND TO PREVENT TURNING THE SWITCH "ON" WHEN THE COVER IS OPEN.
D. SAFETY SWITCHES SHALL BE MANUFACTURED BY CUTLER HAMMER, GENERAL ELECTRIC, SIEMENS OR SQUARE D.
E. PROVIDE SAFETY SWITCH WITH PROVISIONS SUCH THAT THE SWITCH SHALL BE LOCKABLE IN THE "ON" POSITION.

ELECTRICAL NOTES:

- 1. REFER TO ARCHITECTURAL AND MECHANICAL DRAWINGS FOR RELATED INFORMATION.
2. REFER TO MECHANICAL PLANS FOR EXACT LOCATIONS OF HVAC EQUIPMENT AND CONTROL WIRING REQUIREMENTS.
3. THE CONTRACTOR SHALL COORDINATE CONNECTIONS AT HVAC AND OTHER EQUIPMENT SPECIFIED UNDER DIVISION 15 WITH THE MECHANICAL CONTRACTOR PRIOR TO INSTALLATION.
4. COORDINATION SHALL INCLUDE THE CONTRACTORS DETERMINATION OF THE FOLLOWING INFORMATION: METHOD OR TYPE OF TERMINATION FOR EACH CIRCUIT; THE VOLTAGE, AMPACITY AND NUMBER OF WIRES REQUIRED FOR EACH CIRCUIT; DISCONNECT SWITCH AND/OR MOTOR STARTER REQUIRED AT EACH TERMINATION POINT.
5. THE CONTRACTOR SHALL FULLY COORDINATE CONNECTIONS AT EQUIPMENT PROVIDED BY OTHERS AND SHALL VERIFY ALL ELECTRICAL REQUIREMENTS PRIOR TO INSTALLATION.
6. CONTRACTOR SHALL VERIFY ALL RATINGS, SIZES, FINISHES, ETC. OF ALL EQUIPMENT AND SHALL VERIFY ANY DISCREPANCIES IDENTIFIED IN DRAWINGS WITH ENGINEER PRIOR TO ORDERING AND INSTALLATION.
7. PLENUM WIRING SHALL COMPLY WITH NEC 300.22.
8. ELECTRICAL INSTALLATIONS SHALL BE PERFORMED IN ACCORDANCE WITH NFPA 70, THE NATIONAL ELECTRICAL CODE, AND EXECUTIVE REGULATION 24-64, AND ALL LOCAL CODES AND AUTHORITIES HAVING JURISDICTION. ALL ELECTRICAL EQUIPMENT SHALL BE CLEARLY LABELED, MARKED OR STAMPED WITH THE SYMBOL OF AN ELECTRICAL TESTING LABORATORY APPROVED BY THE LOCAL FIRE MARSHAL (REF M-C-50).
9. VERIFY ALL OUTLET LOCATIONS ON JOB PRIOR TO ROUGH-IN.
10. COORDINATE ALL OUTLET BOX LOCATIONS WITH MASONRY TO MINIMIZE CUTTING AND PATCHING OF BOTH BRICK AND BLOCK.
11. INDIVIDUAL HOME RUNS ARE SHOWN FOR CLARITY ONLY. ELECTRICAL CONTRACTOR MAY COMBINE THEM TOGETHER PER THE NEC. ALL BRANCH CIRCUITS SHALL BE #12 AWG THHN OR THWN COPPER CONDUCTORS UNLESS OTHERWISE NOTED AT THE HOME RUN OR INDICATED IN A SCHEDULE. MINIMUM CONDUIT SIZE SHALL BE 3/4".
12. EMERGENCY LIGHTING DEVICES AND EXIT SIGNS SHALL BE FED FROM LIGHTING BRANCH CIRCUITS SERVING GENERAL LIGHTING. EXTEND AN UNMATCHED BRANCH CIRCUIT TO EMERGENCY LIGHTING FIXTURES, EXIT SIGNS, AND NIGHT LIGHTING FIXTURES.

LIGHTING:

- 1. FURNISH AND INSTALL A COMPLETE LIGHTING FIXTURE FOR EACH LIGHTING FIXTURE SYMBOL SHOWN ON THE DRAWINGS.
2. ALL FIXTURES SHALL BE IN ACCORDANCE WITH ALL LOCAL MUNICIPAL AND STATE REQUIREMENTS GOVERNING SAME AND SHALL BE UL APPROVED.
3. SUPPORTS FOR ALL FIXTURES SEPARATELY FROM THE SUSPENDED CEILING SYSTEM. PROVIDE A MINIMUM OF TWO (2) GALVANIZED STEEL #12 GUAGE HANGER WIRES (ALTERNATE CORNERS) ON ALL RECESSED FIXTURES.
4. FIXTURES IN AREAS WHO CEILING SHALL BE RIGIDLY SUPPORTED USING THREADED ROD, U-CHANNELS OR SIMILAR MATERIALS.
5. ALL EXIT AND EMERGENCY LIGHTING CIRCUITS SHALL BE POWERED FROM INTEGRAL BATTERIES. MOUNT EXIT SIGNS 8" ABOVE FINISHED FLOOR, AND USE GENERAL LIGHTING CIRCUITS SERVING THE OCCUPIED AREAS.
6. MEANS OF EGRESS SHALL BE ILLUMINATED SO FAILURE OF A SINGLE ELEMENT OR BULB DOES NOT LEAVE AN AREA IN TOTAL DARKNESS.
7. ALL FLUORESCENT LIGHTING FIXTURES AND FIXTURES SERVED FROM MULTI-WIRE BRANCH CIRCUITS SHALL COMPLY WITH DISCONNECTING MEANS REQUIREMENTS SET FORTH IN NEC 410-120(f).
8. WALL MOUNTED OCCUPANCY SENSOR:
A. WALL MOUNTED OCCUPANCY SENSOR SHALL BE PASSIVE INFRARED AND SHALL HAVE 180 DEGREE COVERAGE FOR A MINIMUM OF 800 SQUARE FEET. OCCUPANCY SENSOR SHALL HAVE AN ADJUSTABLE TIME DELAY FROM 30 SECONDS TO 30 MINUTES AND SHALL FIT IN A STANDARD OUTLET BOX. SENSOR SHALL BE MANUFACTURED BY WATT STOPPER, SENSOR SWITCH, OR APPROVED EQUAL.
9. CEILING MOUNTED OCCUPANCY SENSOR:
A. PASSIVE INFRARED OCCUPANCY SENSOR
A.A. OPEN OFFICER/REAR AREA APPLICATION: LOW VOLTAGE PASSIVE INFRARED OCCUPANCY SENSOR SUITED FOR OPEN OFFICE OR LARGE AREA APPLICATIONS. SENSOR SHALL BE IMMUNE TO RF AND EM. SHALL HAVE AN EXTENDED RANGE FRESNEL LENS WITH 360 DEGREE COVERAGE FOR A MINIMUM OF 1000 SQUARE FEET OF OCCUPANCY DETECTION.
A.B. OCCUPANCY SENSORS SHALL BE MANUFACTURED BY WATT STOPPER, SENSOR SWITCH, OR APPROVED EQUAL.
10. DUPLEX RECEPTACLE, NEMA 5-20R, MOUNTING HEIGHT +18" AFF UNLESS OTHERWISE NOTED. SUBSCRIPT 'E' INDICATES GROUND FAULT CIRCUIT INTERRUPTER TYPE; SUBSCRIPT 'WP' INDICATES WEATHERPROOF ENCLOSURE.
11. SPECIAL RECEPTACLE, MOUNTING HEIGHT 18" AFF UNLESS OTHERWISE NOTED. SUBSCRIPT INDICATES NEMA RATING OF RECEPTACLE.
12. DATA RECEPTACLE, NEMA 5-20R, MOUNTING HEIGHT +18" AFF UNLESS OTHERWISE NOTED.
13. QUAD OUTLET MOUNTING HEIGHT 18" AFF UNLESS OTHERWISE NOTED. PROVIDE RING AND STRING ONLY.
14. TELEPHONE/DATA OUTLET MOUNTING HEIGHT 18" AFF UNLESS OTHERWISE NOTED. PROVIDE RING AND STRING ONLY.
15. TELEPHONE OUTLET MOUNTED 18" AFF; SUBSCRIPT 'W' INDICATES WALL OUTLET MOUNTED AT 48" AFF. PROVIDE RING AND STRING ONLY.
16. JUNCTION BOX.
17. FLOOR MOUNTED JUNCTION BOX.
18. CONDUIT UP.
19. 48RY17V SURFACE MOUNTED PANELBOARD.
20. 28RY120V SURFACE MOUNTED PANELBOARD.
21. TRANSFORMER.
22. ENCLOSED CIRCUIT BREAKER.
23. COMBINATION MAGNETIC MOTOR STARTER AND DISCONNECT SWITCH.
24. NFSS - SAFETY SWITCH - NON-FUSED TYPE; AMPS, POLES, NEMA ENCLOSURE AS SHOWN.
25. MOTOR CONNECTION.
26. SECURITY SYSTEM KEY PAD.
27. PUSH BUTTON RELEASE FOR DOOR.
28. HOMERUN TO PANEL. CONDUCTORS SHALL BE (2) #12 AWG, #12 GND, IN 3/4" CONDUIT UNLESS OTHERWISE INDICATED.
29. HOMERUN TO PANEL. CONDUCTORS SHOWN ARE AS FOLLOWS: LONG HASH MARK WITH DOT INDICATES GROUND CONDUCTOR; LONG HASH MARK INDICATES NEUTRAL CONDUCTOR; SHORT HASH MARKS INDICATE PHASE CONDUCTORS. ALL CONDUCTOR SHALL #12 AWG IN 3/4" CONDUIT, UNLESS OTHERWISE INDICATED.
30. CONDUIT ROUTED THROUGH OR UNDER FLOOR SLAB.

COMMUNICATION, DATA AND CONTROL SYSTEMS:

- 1. PLENUM CABLE, WHEN CONTROL AND SIGNAL WIRING IS INSTALLED W/O METAL RACEWAY IN PLENUMS IT SHALL COMPLY WITH 300.22, 2008 NEC.
2. TELEPHONE/DATA SYSTEM:
A. PROVIDE A WALL RING AND PULL STRING FOR EACH TELEPHONE OR DATA OUTLET WITH A 1/8" NYLON PULL WIRE TO THE NEAREST ACCESSIBLE CEILING.
B. MOUNT TELEPHONE/DATA OUTLETS 18" ABOVE FINISHED FLOOR (UNLESS OTHERWISE NOTED).
3. FIRE ALARM SYSTEM NOTES:
A. THE ELECTRICAL DRAWINGS SHOW DIAGRAMMATIC LOCATIONS OF FIRE ALARM SYSTEM DEVICES ONLY. ADDITIONAL DEVICES NOT SHOWN ON THE DRAWINGS MAY BE REQUIRED. THE FIRE ALARM CONTRACTOR SHALL BE RESPONSIBLE FOR DESIGN OF A FULL SYSTEM AND SHALL PROVIDE ALL DEVICES AND COMPONENTS AS REQUIRED FOR A COMPLETE WORKING SYSTEM THAT MEETS THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION. ASUME DRAWINGS SHALL NOT BE ALTERED BY THE CONTRACTOR FOR THE PURPOSE OF OBTAINING FIRE ALARM SYSTEM PERMITS. THE GENERAL CONTRACTOR AND THEIR FIRE ALARM CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING THE FIRE ALARM PERMIT INCLUDING PREPARATION OF ALL REQUIRED STAMPED AND UNSTAMPED DOCUMENTATION AND DRAWINGS BY THE AUTHORITY HAVING JURISDICTION.
B. REFER TO EXISTING FIRE ALARM SYSTEM DOCUMENTATION AND, IF APPLICABLE, SEPARATE FIRE ALARM SYSTEM SPECIFICATIONS FOR MODIFICATIONS TO THE EXISTING BUILDING FIRE ALARM SYSTEM.
C. ALL FIRE ALARM DEVICES, EQUIPMENT, AND INSTALLATION METHODS SHALL COMPLY WITH THE NATIONAL ELECTRICAL CODE, ARTICLE 760; NFPA 72, NATIONAL FIRE ALARM CODE; NFPA 101, LIFE SAFETY CODE; AMERICANS WITH DISABILITIES ACT; APPLICABLE BUILDING CODES; WITH LOCAL AND MUNICIPAL CODES AND WITH THE AUTHORITY HAVING JURISDICTION. THE FIRE ALARM SYSTEM AND ASSOCIATED COMPONENTS SHALL BE UL LISTED AND LABELED.
D. ALL NEW AND RELOCATED FIRE ALARM DEVICES SHALL BE CONNECTED TO THE EXISTING FIRE ALARM SIGNALING AND NOTIFICATION CIRCUITS IN THE RENOVATED AREA. ALL NEW FIRE ALARM DEVICES SHALL BE FULLY COMPATIBLE WITH THE EXISTING SYSTEM.
E. ALL NEW FIRE ALARM DEVICES SHALL BE WHITE IN COLOR.
F. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING EXPANDER PANELS AS REQUIRED AND FOR PROGRAMMING OF THE EXISTING SYSTEM. IT SHALL BE THE RESPONSIBILITY OF THE OWNER AND/OR CONTRACTOR TO DETERMINE IF THE EXISTING FIRE ALARM SYSTEM IS CAPABLE OF HANDLING ADDITIONAL DEVICES AND ZONES.
G. FIRE ALARM SYSTEM DEVICES SHALL BE INSTALLED PER MANUFACTURERS RECOMMENDED PROCEDURES. VISUAL NOTIFICATION APPLIANCES SHALL BE MOUNTED SUCH THAT THE ENTIRE LENS IS NOT LESS THAN 8" ABOVE FINISHED FLOOR OR 8" BELOW CEILING, WHICHEVER IS LOWER. AUDIBLE NOTIFICATION DEVICES SHALL BE MOUNTED SUCH THAT THE TOP OF THE DEVICE IS NOT LESS THAN 8" ABOVE FINISHED FLOOR AND BELOW THE FINISHED CEILING AT A HEIGHT NOT LESS THAN 6".

SYMBOLS AND ABBREVIATIONS:

Table with 2 columns: Symbol and Description. Includes symbols for AMPS, ABOVE FINISHED FLOOR, AMPERES INTERRUPTING CAPACITY, AUTOMATIC TRANSFER SWITCH, AMERICAN WIRE GAUGE, CONDUIT, DIESEL ENGINE GENERATOR SET, ENCLOSED CIRCUIT BREAKER, EMERGENCY, ELEVATOR SELECTOR SWITCH, EXISTING, FIRE ALARM ANNUNCIATOR PANEL, FIRE ALARM CONTROL PANEL.

Table with 2 columns: Symbol and Description. Includes symbols for LIGHTING FIXTURE, DOWNLIGHT, EMERGENCY LIGHTING UNIT, EXIT LIGHT FIXTURE, CEILING MOUNTED OCCUPANCY SENSOR, SINGLE POLE SWITCH, OCCUPANCY SENSOR, DUPLEX RECEPTACLE, DATA RECEPTACLE, QUAD OUTLET, TELEPHONE/DATA OUTLET, TELEPHONE OUTLET, JUNCTION BOX, FLOOR MOUNTED JUNCTION BOX, CONDUIT UP, SURFACE MOUNTED PANELBOARD, TRANSFORMER, ENCLOSED CIRCUIT BREAKER, COMBINATION MAGNETIC MOTOR STARTER AND DISCONNECT SWITCH, NFSS - SAFETY SWITCH - NON-FUSED TYPE, MOTOR CONNECTION, SECURITY SYSTEM KEY PAD, PUSH BUTTON RELEASE FOR DOOR, HOMERUN TO PANEL, HOMERUN TO PANEL.

FIRE ALARM SYSTEM:

Table with 2 columns: Symbol and Description. Includes symbols for VISUAL DEVICE, AUDIBLE DEVICE, COMBINATION AUDIBLE/VISUAL DEVICE, PHOTOELECTRIC SMOKE DETECTOR, DUCT SMOKE DETECTOR, MANUAL PULL STATION, FIRE ALARM ANNUNCIATOR PANEL, FIRE ALARM CONTROL PANEL, MAGNETIC HOLD OPEN.

FSS FUSED SAFETY SWITCH

Table with 2 columns: Symbol and Description. Includes symbols for NATIONAL ELECTRICAL CODE, NATIONAL FIRE PROTECTION ASSOCIATION NON-FUSED SAFETY SWITCH, PHASE PANELBOARD, RELOCATED, SWITCHBOARD, VOLTS, WIRE.

Table with 2 columns: Symbol and Description. Includes symbols for FLOOR MOUNTED RECEPTACLE, FLOOR MOUNTED TELECOM OUTLET, TIME CLOCK, PHOTOCELL, CANOPY MOUNTED EXTERIOR FIXTURE, WALL MOUNTED EXTERIOR FIXTURE, 1/4" FLUORESCENT TROFFER, DATA RECEPTACLE, QUAD RECEPTACLE, TELEPHONE/DATA OUTLET, TELEPHONE OUTLET, JUNCTION BOX, FLOOR MOUNTED JUNCTION BOX, CONDUIT UP, SURFACE MOUNTED PANELBOARD, TRANSFORMER, ENCLOSED CIRCUIT BREAKER, COMBINATION MAGNETIC MOTOR STARTER AND DISCONNECT SWITCH, NFSS - SAFETY SWITCH - NON-FUSED TYPE, MOTOR CONNECTION, SECURITY SYSTEM KEY PAD, PUSH BUTTON RELEASE FOR DOOR, HOMERUN TO PANEL, HOMERUN TO PANEL.

DRAWING LIST:

Table with 2 columns: Symbol and Description. Includes symbols for COVER SHEET - ELECTRICAL, FLOOR PLANS - ELECTRICAL, ELECTRICAL RISER DIAGRAM & SCHEDULES.

Table with 2 columns: REV. NO. and DATE. Includes revision history table.

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DWG NO. E-1