BASIC ELECTRICAL REQUIREMENTS

- ALL MATERIAL AND EQUIPMENT SHALL BE LISTED BY UNDERWRITERS LABORATORIES (UL) WHERE SUCH STANDARDS HAVE BEEN ESTABLISHED. EQUIPMENT NOT COVERED BY UL STANDARDS WILL BE ACCEPTED IF SUCH EQUIPMENT IS SUPPLIED IN ACCORDANCE WITH ALL OTHER NATIONALLY RECOGNIZED CODES AND STANDARDS.
- CONTRACTOR SHALL VISIT SITE PRIOR TO BID TO BECOME FAMILIAR WITH EXISTING CONDITIONS.
- UNLESS MORE STRINGENT PROVISIONS ARE SHOWN OR SPECIFIED, THE
- WORK SHALL COMPLY WITH APPLICABLE STANDARDS OF THE FOLLOWING.
- A. ANSI AMERICAN NATIONAL STANDARDS INSTITUTE B. ASTM AMERICAN SOCIETY FOR TESTING MATERIALS
- C. IEEE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS
- D. IES ILLUMINATION ENGINEERS SOCIETY E. NEC NATIONAL ELECTRICAL CODE
- F. NFPA NATIONAL FIRE PROTECTION ASSOCIATION
- G. NESC NATIONAL ELECTRICAL SAFETY CODE
- H NATIONAL EQUIPMENT MANUFACTURERS ASSOCIATION I NETA INTERNATIONAL ELECTRICAL TESTING ASSOCIATION
- DURING CONSTRUCTION, CLOSE OPEN ENDS OF WORK WITH TEMPORARY COVERS OR PLUGS AND PROTECT EQUIPMENT SUBJECT TO ADVERSE WEATHER CONDITIONS FROM ENTRY OF WATER, DIRT, AND OBSTRUCTING MATERIALS. PROVIDE TEMPORARY HEAT FOR EQUIPMENT SUBJECT TO DAMAGE FROM CONDENSATION, SUCH AS CIRCUIT BREAKERS, SWITCHGEAR AND TRANSFORMERS.
- CONCEAL ELECTRICAL CONSTRUCTION IN FINISHED SPACES WITHIN THE WALLS, IN CHASES, OR ABOVE THE FINISHED CEILING. EXPOSED WORK WITHIN FINISHED SPACES WILL NOT BE ALLOWED WITHOUT WRITTEN APPROVAL OF THE CONSTRUCTION MANAGER, ARCHITECT, ENGINEER, AND/OR OWNER.
- THE DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENTS, APPROXIMATE SIZES AND RELATIVE LOCATIONS OF PRINCIPAL EQUIPMENT AND MATERIALS TO BE PROVIDED. PROVIDE CONSTRUCTION OFFSETS AS REQUIRED FOR COORDINATED INSTALLATION. PROVIDE MINOR EQUIPMENT, DETAILS, MATERIALS, AND METHODS NOT USUALLY SHOWN BUT STANDARD. REFERENCED AND SPECIFIED, TO COMPLETE THE WORK. CONTRACTOR RESPONSIBLE FOR ALL TERMINATIONS
- IN FINISHED SPACES WITH OR WITHOUT CEILINGS, COORDINATE THE WORK WITH OTHER TRADES SO AS TO BE IN CONFORMANCE WITH THE REFLECTED CEILING PLANS. IN FINISHED SPACES WITHOUT CEILING, RUN WIRING PARALLEL WITH LINES OF BUILDING.
- COOPERATE WITH OTHER TRADES AND FURNISH IN WRITING, INFORMATION NECESSARY TO PERMIT THE WORK OF OTHER TRADES TO BE INSTALLED AND WITH LEAST POSSIBLE INTERFERENCES OR DELAY.
- WHERE PHYSICAL INTERFERENCES CANNOT BE RESOLVED READILY, PREPARE COMPOSITE DRAWINGS AT A SCALE OF NOT LESS THAN 1/4 INCH = 1 FT, CLEARLY SHOWING THE WORK OF THIS DIVISION IN RELATION TO THE WORK OF OTHER TRADES. OBTAIN WRITTEN ACCEPTANCE BY (A/E) (O/R) OF PROPOSED CHANGES AND DISTRIBUTE DRAWINGS TO OTHER TRADES AFFECTED. CORRECT INSTALLED WORK IN CONFLICT WITH WORK OF OTHER TRADES AT NO ADDITIONAL COST.
- SUBJECT TO ACCEPTANCE BY OWNER AND WITHOUT EXTRA COST, MAKE MODIFICATIONS IN THE LAYOUT AS REQUIRED TO PREVENT CONFLICT WITH WORK OF OTHER TRADES OR FOR THE PROPER EXECUTION OF THE
- FIRE STOPPING: SYSTEM OR DEVICES LISTED IN THE UL FIRE RESISTANCE DIRECTORY UNDER CATEGORIES XHCR AND XHEZ MAY BE USED, PROVIDING THAT IT CONFORMS TO CONSTRUCTION TYPE. PENETRATION TYPE. ANNULAR SPACE REQUIREMENTS AND FIRE RATING INCLUDED IN EACH SEPARATE INSTANCE, AND THAT THE SYSTEMS BE SYMMETRICAL FOR WALL APPLICATIONS. SYSTEMS OR DEVICES MUST BE ASBESTOS-FREE. MORTAR SYSTEMS MUST BE WARNOCK HERSEY APPROVED. 3-M IS THE DESIGN STANDARD. FIRE STOP ALL PENETRATIONS THRU RATED WALLS AND FLOORS.
- WARRANTY: PROVIDE MINIMUM 12 MONTHS FROM DATE OF INSTALLATION OR 18 MONTHS FROM DATE OF SHIPMENT ON ALL EQUIPMENT. EXTENDED WARRANTIES MAY BE REQUIRED, AND ARE INDICATED IN EQUIPMENT SECTIONS.
- EQUIPMENT MANUFACTURE LISTED ON DRAWING SCHEDULES IS THE BASIS OF DESIGN AND IS SHOWN ON PLANS. IF CONTRACTOR CHOOSES TO USE ONE OF THE OTHER MANUFACTURERS LISTED IN SPECIFICATION, CONTRACTOR IS RESPONSIBLE FOR VERIFYING FIT AND PROVIDING ALL NECESSARY MODIFICATIONS TO MEP SYSTEMS TO ACCOMMODATE PROPER INSTALLATION OF THIS EQUIPMENT AND COMPLIANCE WITH DESIGN INTENT.
- CONTRACTOR IS RESPONSIBLE FOR SECURING ALL PERMITS.
- CHANGE ORDERS: ALL CHANGE ORDER REQUESTS WILL BE IDENTIFIED PRIOR TO THE WORK BEING INSTALLED. CHANGE ORDERS REQUESTED AFTER INSTALLATION WILL NOT BE HONORED.
- ELECTRICAL CONTRACTOR SHALL REVIEW MECHANICAL AND PLUMBING DRAWINGS TO BECOME FAMILIAR WITH ENTIRE SCOPE OF WORK AND COORDINATION BETWEEN TRADES. IT IS THE ELECTRICAL CONTRACTORS RESPONSIBLE TO SECURE ALL DRAWINGS. PROVIDE POWER AND STARTING DEVICES TO MECHANICAL AND PLUMBING EQUIPMENT AS INDICATED ON MEP PLANS AND SCHEDULES.

SHOP DRAWING REQUIREMENTS

- SHOP DRAWINGS: CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL SPECIFIED EQUIPMENT. CONTRACTOR SHALL PROVIDE COORDINATED SHOP DRAWINGS FOR PANELS AND CONDUIT >3". VERIFY FINAL EQUIPMENT POWER REQUIREMENTS WITH OTHER TRADES AND EQUIPMENT FURNISHED BY OTHERS. NOTIFY ENGINEER WITH AND DISCREPANCIES. SHOWING COORDINATION WITH OTHER DISCIPLINES. NO EQUIPMENT, PANELS OR CONDUIT SHALL BE INSTALLED WITHOUT AN APPROVED SHOP DRAWING. WORK OR EQUIPMENT INSTALLED WITHOUT ENGINEER'S APPROVAL WILL BE SUBJECT TO REMOVAL AND REWORK PER THE ENGINEERS SOLE DISCRETION REGARDLESS OF DESIGN DOCUMENTS. ALL COST WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. CONTRACTOR SHALL ALLOW 10 BUSINESS DAYS FOR ENGINEERS REVIEW. ALL WORK SHALL BE INSTALLED PER THE APPROVED SHOP DRAWING. FIELD MODIFICATIONS TO THE APPROVED SHOP DRAWING SHALL BE SUBMITTED FOR ENGINEER APPROVAL PRIOR TO INSTALLATION.
- SHOP DRAWING SUBMISSION: SHOP DRAWING SUBMISSIONS SHALL LIST ON COVER PAGE IN BULLETED LIST FORMAT ALL EXCEPTIONS AND CLARIFICATIONS TO THE SPECIFICATION. IF EXCEPTIONS ARE NOT LISTED IT WILL BE ASSUMED THAT SUBMITTED EQUIPMENT MEETS ALL ASPECTS OF THE SPECIFICATION. SUBMISSION OF SHEETMETAL FABRICATION DRAWINGS IS INDICATION THAT DUCTWORK AND PIPING FIT AS DRAWN, UNLESS SHOP DRAWING CLEARLY IDENTIFIES CONFLICT. CONFLICT RESOLUTION AFTER APPROVED SHOP DRAWINGS WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. SUBMIT 4 COPIES.
- WHEN ENGINEERS SUBMITTAL REVIEW STAMP INDICATES THE FOLLOWING: REVIEWED, REVIEWED AS NOTED, REVISE & RESUBMIT FOR RECORD ONLY FABRICATION MAY BE UNDERTAKEN. CHANGES TO CONTRACT ARE NOT AUTHORIZED UNLESS STATED IN SEPARATE LETTER OR CHANGE ORDER.
- WHEN ENGINEERS SUBMITTAL REVIEW STAMP INDICATES THE FOLLOWING: NOT REVIEWED A REVIEW OF THE SUBMITTAL WAS NOT REQUIRED OR REQUESTED. SUBMITTAL DOES NOT MEET SPECIFICATION REQUIREMENTS FOR REVIEW.
- WHEN ENGINEERS SUBMITTAL REVIEW STAMP INDICATES THE FOLLOWING: REJECTED

- FABRICATION SHOULD NOT BE UNDERTAKEN. RESUBMIT CORRECTED COPIES FOR REVIEW. CORRECTIONS SHALL BE LIMITED TO ITEMS MARKED.
- GENERAL SHOP DRAWING INSTRUCTIONS: A. REVIEW IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS.
- B. THE CONTRACTOR IS RESPONSIBLE FOR DIMENSIONS TO BE CONFIRMED AND CORRELATED AT THE SITE; FOR FABRICATION PROCESSES OR TO THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES OF CONSTRUCTION AND FOR COORDINATION OF THE WORK OF ALL TRADES.
- C, SUBMISSION FOR REVIEW IMPLIES THAT THE CONTRACTOR HAS REVIEWED THE PRODUCT WITH ALL OTHER TRADES PRIOR TO SUBMITTING FOR REVIEW. CONTRACTOR IS RESPONSIBLE FOR ALL CHANGES AND MODIFICATIONS FOR ITEMS NOT COORDINATED.
- D. ALL EXEMPTIONS TO THE SPECIFICATION MUST BE SHOWN IN A CLEARLY BULLETED LIST ON THE COVER SHEET OF THE SUBMITTAL. CONTRACTOR IS RESPONSIBLE FOR FULL COMPLIANCE TO THE SPECIFICATIONS FOR ALL OTHER ITEMS NOT NOTED ON THE COVER SHEET OF THE SUBMITTAL.

SEQUENCING AND SCHEDULING

- SEQUENCING AND SCHEDULING A. COORDINATE ELECTRICAL EQUIPMENT INSTALLATION WITH OTHER BUILDING COMPONENTS. VERIFY FINAL LOCATIONS FOR ROUGH INS WITH FIELD MEASUREMENTS AND WITH THE REQUIREMENTS OF THE ACTUAL EQUIPMENT TO BE CONNECTED.
- B. ALL TIE-INS AND SHUTDOWNS TO EXISTING UTILITIES MUST BE APPROVED AND COORDINATED WITH OWNER AND SHALL BE DONE OUTSIDE THE NORMAL WORKING HOURS.
- C. ARRANGE FOR CHASES, SLOTS, AND OPENINGS IN BUILDING STRUCTURE DURING PROGRESS OF CONSTRUCTION TO ALLOW FOR ELECTRICAL
- D. COORDINATE INSTALLING REQUIRED SUPPORTING DEVICES AND SET SLEEVES IN POURED-IN-PLACE CONCRETE AND OTHER STRUCTURAL

COMPONENTS AS THEY ARE CONSTRUCTED.

- E. SEQUENCE, COORDINATE, AND INTEGRATE INSTALLING ELECTRICAL MATERIALS AND EQUIPMENT FOR EFFICIENT FLOW OF THE WORK. COORDINATE INSTALLING LARGE EQUIPMENT REQUIRING POSITIONING PRIOR TO CLOSING IN THE BUILDING.
- F. COORDINATE CONNECTING ELECTRICAL SERVICE TO COMPONENTS. FURNISHED UNDER OTHER SECTIONS.
- G. COORDINATE CONNECTING ELECTRICAL SYSTEMS WITH EXTERIOR UNDERGROUND AND OVERHEAD UTILITIES AND SERVICES. COMPLY WITH REQUIREMENTS OF GOVERNING REGULATIONS, FRANCHISED SERVICE COMPANIES, AND CONTROLLING AGENCIES.
- H. COORDINATE REQUIREMENTS FOR ACCESS PANELS AND DOORS WHERE ELECTRICAL ITEMS REQUIRING ACCESS ARE CONCEALED BY FINISHED
- I. COORDINATE INSTALLING ELECTRICAL IDENTIFICATION AFTER COMPLETION OF FINISHING WHERE IDENTIFICATION IS APPLIED TO FIELD-FINISHED SURFACES
- J. COORDINATE INSTALLING ELECTRICAL IDENTIFYING DEVICES AND MARKINGS PRIOR TO INSTALLING ACOUSTICAL CEILINGS AND SIMILAR FINISHES THAT CONCEAL SUCH ITEMS. BUILDING WIRE

<u>BUILDING WIRING - HEALTHCARE FACILITIES</u>

- DESCRIPTION: SINGLE CONDUCTOR, COPPER. SOLID CONDUCTOR FOR NO. 10 AWG AND SMALLER; STRANDED CONDUCTOR FOR LARGER THAN NO. 10 AWG.
- THERMOPLASTIC INSULATED WIRE (THWN): CONFORM TO NEMA WC 5. USE FOR BRANCH CIRCUITS AND FEEDERS IN DAMP OR WET LOCATIONS. ALL BELOW GRADE EMBEDDED CONDUITS SHALL BE CONSIDERED DAMP
- THERMOPLASTIC INSULATED WIRE (THHN): CONFORM TO NEMA WC 5. USE FOR BRANCH CIRCUITS AND FEEDERS IN DRY LOCATIONS
- CROSS-LINKED, POLYETHYLENE INSULATED WIRE (XHHW): CONFORM TO NEMA WC 7. CONFORM TO NEMA WC 5. USE FOR BRANCH CIRCUITS AND FEEDERS IN DRY LOCATIONS
- CONNECTORS AND SPLICES: UNITS OF SIZE, AMPACITY RATING, MATERIAL, TYPE, AND CLASS SUITABLE FOR SERVICE INDICATED. SELECT TO COMPLY WITH PROJECT'S INSTALLATION REQUIREMENTS.
- TYPE MC CABLE, HOSPITAL GRADE (THHN/THWN) FOR #12 OR #10 AWG BRANCH CIRCUITS. TYPE MC CABLE SHALL BE 2 OR 3 CONDUCTOR WITH GREEN INSULATED GROUND WIRE, UL LISTED AND AS SPECIFIED IN NEC ARTICLE 330.

CONDUIT AND RACEWAY

- RIGID GALVANIZED STEEL CONDUIT (RGS) SHALL BE UL LISTED AND AS DEFINED BY NBC ARTICLE 344, STEEL HEAVY -WALL HOT DIP GALVANIZED INSIDE AND OUTSIDE. JOINTS SHALL BE STANDARD PIPE THREAD; FURNISHED WITH COUPLING; SHIPPED WITH THREAD PROTECTOR THROUGH 2 INCH SIZE. MINIMUM SIZE SHALL BE 3/4 INCH. ALLOW ABLE MANUFACTURERS SHALL BE TRIANGLE, ALLIED, OR WHEATLAND OR ENGINEER APPROVED EQUAL. RGS CONDUIT SHALL BE USED IN ALL OUTDOOR APPLICATIONS AND OTHER LOCATIONS AS SPECIFIED ON THE DRAWINGS, UNLESS APPROVED OTHERWISE BY THE ENGINEER.
- INTERMEDIATE: METAL CONDUIT (IMC) SHALL BE UL LISTED AND AS DEFINED BY NBC ARTICLE 342 STEEL, HOT DIP GALVANIZED INSIDE AND OUTSIDE. JOINTS SHALL BE STANDARD PIPE THREAD' FURNISHED WITH COUPLING; SHIPPED WITH THREAD PROTECTOR THROUGH 2 INCH SIZE. MINIMUM SIZE SHALL BE 3/4 INCH. ALLOWABLE MANUFACTURERS SHALL BE TRIANGLE ALLIED OR WHEATLAND OR ENGINEER APPROVED EQUAL. IMC MAY BE USED IN LIEU OF RGS CONDUIT WHERE APPROVED BY THE ENGINEER.
- ELECTRICAL :METALLIC TUBING (EMT) SHALL BE UL LISTED AND AS DEFINED BY NBC ARTICLE 358, STEEL THIN WALL, ELECTRO GALVANIZED. MINIMUM SIZE SHALL BE 3/4 INCH. ALLOWABLE MANUFACTURERS SHALL BE TRIANGLE"" ALLIED, OR WHEATLAND OR ENGINEER APPROVED EQUAL. EMT SHALL BE USED FOR ALL INDOOR EXPOSED WIRING INSTALLATIONS EXCEPT AS PERMITTED FOR CONCEALED LOCATIONS.
- FLEXIBLE :METAL CONDUIT (FMC) SHALL BE UL LISTED, AND AS SPECIFIED IN NBC 348, STEEL, HOT DIP GALVANIZED WITH A MINIMUM SIZE OF 3/4 INCH. MANUFACTURES SHALL BE AFC ANACONDA, OR ENGINEER APPROVED EQUAL.
- LIQUID TIGHT FLEXIBLE :METAL CONDUIT SHALL BE UL LISTED AS DEFINED BY NBC 350, WITH A CORE OF GALVANIZED FLEXIBLE STEEL CONDUIT AND AN EXTRUDED PVC JACKET OF GRAY OR BLACK, MINIMUM SIZE 3/4 INCH. MANUFACTURES SHALL BE AFC ANACONDA, OR ENGINEER APPROVED EQUAL. CONTRACTOR SHALL USE FOR CONNECTIONS TO ALL TRANSFORMERS, MOTORS, AND OTHER VIBRATING EQUIPMENT, UNLESS FMC IS APPROVED BY THE
- RIGID NON-METALLIC CONDUIT SHALL BE UL LISTED, AS DEFINED BY NEC 352. PVC SCHEDULE 40, 90 DEGREE C, SUNLIGHT RESISTANT WITH CHEMICAL BOND JOINTS, MINIMUM SIZE OF 1 INCH. MANUF ACTURERS SHALL BE CARLON, SEDCO, OR ENGINEER APPROVED EQUAL. USE FOR ALL OUTDOOR DIRECT BURIED CONDUIT INSTALLATIONS. TRANSITIONS TO ABOVE GRADE SHALL BE SCHEDULE 80 PVC, RGS CONDUIT OR AS OTHERWISE APPROVED BY THE ENGINEER.
- <u>ELECTRICAL WIRING METHOD HEALTHCARE FACILITIES</u>

- INSTALL WIRES IN RACEWAY ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS AND NECA'S ""STANDARD OF INSTALLATION.""
- TYPE MC CABLE MAY BE UTILIZED FOR BRANCH CIRCUITS REQUIRING #10 AWG WIRE OR SMALLER WHERE CONCEALED IN THE CONSTRUCTION SUCH AS ABOVE DROP CEILINGS OR WITHIN WALLS. TYPE MC CABLE SHALL BE HOSPITAL GRADE AND SHALL NOT BE UTILIZED ON ANY OF THE CIRCUITS DESIGNATED AS PART OF THE EMERGENCY OR THE ESSENTIAL ELECTRICAL SYSTEM.
- CONDUCTOR SPLICES: SPLICES SHALL NOT BE ALLOWED IN CONTINUOUS RUNS OF CABLE WITHOUT PRIOR APPROVAL OF THE ENGINEER. WHERE APPROVED FOR USE, SPLICES SHALL COMPLY WITH
- THE FOLLOWING: A. INSTALL SPLICES AND TAPS THAT POSSESS EQUIVALENT OR BETTER MECHANICAL STRENGTH AND INSULATION RATINGS THAN
- UNSPLICED CONDUCTORS. B. USE SPLICE AND TAP CONNECTORS THAT ARE COMPATIBLE WITH
- WIRING AT OUTLETS: INSTALL WITH AT LEAST 12 INCHES (300 MM) OF SLACK CONDUCTOR AT EACH OUTLET.
- CONNECT OUTLETS AND COMPONENTS TO WIRING SYSTEMS AND TO GROUND AS INDICATED AND INSTRUCTED BY MANUFACTURER. TIGHTEN CONNECTORS AND TERMINALS, INCLUDING SCREWS AND BOLTS, ACCORDING TO EQUIPMENT MANUFACTURER'S PUBLISHED TORQUE-TIGHTENING VALUES FOR EQUIPMENT CONNECTORS. WHERE MANUFACTURER'S TORQUING REQUIREMENTS ARE NOT INDICATED, TIGHTEN CONNECTORS AND TERMINALS ACCORDING TO TIGHTENING REQUIREMENTS SPECIFIED IN UL 486A.
- FOR CIRCUITS WHICH ARE PART OF THE EMERGENCY SYSTEM, ALL INSTALLATION SHALL BE BUILDING WIRE IN CONDUIT OR TYPE MI CABLE AS SPECIFIED IN NEC 517.
- ELECTRICAL INSTALLATIONS SHALL FOLLOW INFECTIOUS CONTROL RISK ASSESSMENT (ICRA) GUIDELINES AND INSTRUCTIONS FOR ALL INSTALLATION WORK.

EQUIPMENT SUPPORTING METHODS

- INSTALL DEVICES TO SECURELY AND PERMANENTLY FASTEN AND SUPPORT ELECTRICAL COMPONENTS.
- RACEWAY SUPPORTS: COMPLY WITH NFPA 70 AND THE FOLLOWING REQUIREMENTS:
- A. CONFORM TO MANUFACTURER'S RECOMMENDATIONS FOR SELECTING AND INSTALLING SUPPORTS.
- B. INSTALL INDIVIDUAL AND MULTIPLE RACEWAY HANGERS AND RISER CLAMPS TO SUPPORT RACEWAYS. PROVIDE U BOLTS, CLAMPS, ATTACHMENTS, AND OTHER HARDWARE NECESSARY FOR HANGER
- ASSEMBLY AND FOR SECURING HANGER RODS AND CONDUITS. C. SUPPORT PARALLEL RUNS OF HORIZONTAL RACEWAYS TOGETHER ON
- TRAPEZE- OR BRACKET-TYPE HANGERS. D. SPARE CAPACITY: SIZE SUPPORTS FOR MULTIPLE CONDUITS SO CAPACITY CAN BE INCREASED BY A 25 PERCENT MINIMUM IN THE

RACEWAY SUPPORT AND MATERIAL:

- A SUPPORT INDIVIDUAL HORIZONTAL RACEWAYS WITH SEPARATE,
- MALLEABLE IRON PIPE HANGERS OR CLAMPS. B HANGER RODS: 1/4-INCH (6-MM) DIAMETER OR LARGER THREADED STEEL, EXCEPT AS OTHERWISE INDICATED.
- C SPRING STEEL FASTENERS: SPECIFICALLY DESIGNED FOR SUPPORTING SINGLE CONDUITS OR TUBING. MAY BE USED IN LIEU OF MALLEABLE IRON HANGERS FOR 1-1/2-INCH (38-MM) AND SMALLER RACEWAYS SERVING LIGHTING AND RECEPTACLE BRANCH CIRCUITS ABOVE SUSPENDED CEILINGS AND FOR FASTENING
- RACEWAYS TO CHANNEL AND SLOTTED ANGLE SUPPORTS. D IN VERTICAL RUNS, ARRANGE SUPPORT SO THE LOAD PRODUCED BY THE WEIGHT OF THE RACEWAY AND THE ENCLOSED CONDUCTORS IS CARRIED ENTIRELY BY THE CONDUIT SUPPORTS, WITH NO WEIGHT LOAD ON RACEWAY TERMINALS.
- VERTICAL CONDUCTOR SUPPORTS: INSTALL KELLUMS GRIP OR EQUIVALENT TYPE VERTICAL CABLE SUPPORT SIMULTANEOUSLY WITH CONDUCTORS AS REQUIRED BY NEC FOR VERTICAL CABLE RUNS.
- MISCELLANEOUS SUPPORTS: INSTALL METAL CHANNEL RACKS FOR MOUNTING CABINETS, PANEL BOARDS, DISCONNECTS, CONTROL ENCLOSURES, PULL BOXES, JUNCTION BOXES, TRANSFORMERS, AND OTHER DEVICES EXCEPT WHERE COMPONENTS ARE MOUNTED DIRECTLY TO STRUCTURAL FEATURES OF ADEQUATE STRENGTH.
- IN OPEN OVERHEAD SPACES, CAST BOXES THREADED TO RACEWAYS NEED NOT BE SEPARATELY SUPPORTED, EXCEPT WHERE USED FOR FIXTURE SUPPORT; SUPPORT SHEET-METAL BOXES DIRECTLY FROM THE BUILDING STRUCTURE OR BY BAR HANGERS. WHERE BAR HANGERS ARE USED, ATTACH THE BAR TO RACEWAYS ON OPPOSITE SIDES OF THE BOX AND SUPPORT THE RACEWAY WITH AN APPROVED FASTENER NOT MORE THAN 24 INCHES (610 MM) FROM THE BOX.
- SLEEVES: INSTALL FOR CABLE AND RACEWAY PENETRATIONS OF CONCRETE SLABS AND WALLS. EXCEPT WHERE CORE-DRILLED HOLES ARE USED. INSTALL FOR CABLE AND RACEWAY PENETRATIONS OF MASONRY AND FIRE-RATED GYPSUM WALLS AND OF ALL OTHER FIRE-RATED FLOOR AND WALL ASSEMBLIES. INSTALL SLEEVES DURING ERECTION OF CONCRETE AND MASONRY WALLS.
- FASTENING: UNLESS OTHERWISE INDICATED, SECURELY FASTEN ELECTRICAL ITEMS AND THEIR SUPPORTING HARDWARE TO THE BUILDING STRUCTURE. PERFORM FASTENING ACCORDING TO THE
- FOLLOWING: A. FASTEN BY MEANS OF WOOD SCREWS OR SCREW-TYPE NAILS ON WOOD; TOGGLE BOLTS ON HOLLOW MASONRY UNITS; CONCRETE INSERTS OR EXPANSION BOLTS ON CONCRETE OR SOLID MASONRY; AND BY MACHINE SCREWS, WELDED THREADED STUDS, OR SPRING-TENSION CLAMPS ON STEEL.
- B. THREADED STUDS DRIVEN BY A POWDER CHARGE AND PROVIDED WITH LOCK WASHERS AND NUTS MAY BE USED INSTEAD OF EXPANSION BOLTS, MACHINE SCREWS, OR WOOD SCREWS.
- C. WELDING TO STEEL STRUCTURE MAY BE USED ONLY FOR THREADED STUDS, NOT FOR CONDUITS, PIPE STRAPS, OR ANY OTHER ITEMS. D. IN PARTITIONS OF LIGHT STEEL CONSTRUCTION USE SHEET-METAL
- E. DRILL HOLES IN CONCRETE BEAMS SO HOLES MORE THAN 1-1/2 INCHES (38 MM) DEEP DO NOT CUT MAIN REINFORCING BARS. F. DRILL HOLES IN CONCRETE SO HOLES MORE THAN 3/4 INCH (19
- MM) DEEP DO NOT CUT MAIN REINFORCING BARS. G. FILL AND SEAL HOLES DRILLED IN CONCRETE AND NOT USED. H. SELECT FASTENERS SO THE LOAD APPLIED TO ANY FASTENER DOES NOT EXCEED 25 PERCENT OF THE PROOF-TEST LOAD.
- INSTALL CONCRETE PADS AND BASES FOR ALL FLOOR MOUNTED ELECTRICAL EQUIPMENT. SUCH AS BUT NOT LIMITED TO TRANSFORMERS, CABINETS, AND SWITCHBOARDS, UNLESS SPECIFICALLY NOTED OTHERWISE ON THE DRAWINGS. CONCRETE HOUSE KEEPING PADS SHALL BE MINIMUM 3"".

IDENTIFICATION

- INSTALL IDENTIFICATION DEVICES WHERE REQUIRED BY NEC OR OSHA REQUIREMENTS. ALL ELECTRICAL EQUIPMENT SHOWN ON THE SINGLE LINE OR RISER DIAGRAM SHALL BE IDENTIFIED DURING INSTALLATION WITH A SPECIFIC UNIT NAME AS SHOWN ON THE DRAWINGS, THE EQUIPMENT BEING FED, AND THE SOURCE OF POWER INCLUDING SOURCE BREAKER OR COMPARTMENT NUMBER.
- IDENTIFY ALL DISCONNECT SWITCHES, VARIABLE FREQUENCY DRIVES, TRANSFORMERS, JUNCTION BOXES, PULL BOXES, CONTROL PANELS

MOTOR STARTERS, MOTOR CONTROLLERS, ETC. WITH THE POWER SOURCE LOCATION AND EQUIPMENT BEING FED.

IDENTIFY ALL RECEPTACLES AND SWITCHES WITH THE PANEL AND

COORDINATE NAMES, ABBREVIATIONS, COLORS, AND OTHER DESIGNATIONS USED FOR ELECTRICAL IDENTIFICATION WITH CORRESPONDING DESIGNATIONS INDICATED ON THE CONTRACT DOCUMENTS OR REQUIRED BY CODES AND STANDARDS. USE CONSISTENT DESIGNATIONS THROUGHOUT THE PROJECT.

CIRCUIT FROM WHICH THEY ARE FED POWER.

- SELF-ADHESIVE IDENTIFICATION PRODUCTS: CLEAN SURFACES OF DUST, LOOSE MATERIAL, AND OILY FILMS BEFORE APPLYING.
- TAG OR LABEL POWER CIRCUITS FOR FUTURE CONNECTION AND CIRCUITS IN RACEWAYS AND ENCLOSURES WITH OTHER CIRCUITS. IDENTIFY SOURCE AND CIRCUIT NUMBERS IN EACH CABINET, PULL BOX, JUNCTION BOX, AND OUTLET BOX. COLOR CODING MAY BE USED FOR VOLTAGE AND PHASE INDICATION.
- IDENTIFY PATHS OF UNDERGROUND ELECTRICAL LINES: DURING TRENCH BACKFILLING, FOR EXTERIOR UNDERGROUND POWER, CONTROL, SIGNAL, AND COMMUNICATION LINES, INSTALL CONTINUOUS UNDERGROUND PLASTIC LINE MARKER WITH MAGNETIC LOCATER STRIP, LOCATED DIRECTLY ABOVE POWER AND COMMUNICATION LINES. LOCATE 6 TO 8 INCHES (150 TO 200 MM) BELOW FINISHED GRADE. WHERE MULTIPLE LINES INSTALLED IN A COMMON TRENCH OR CONCRETE ENVELOPE DO NOT EXCEED AN OVERALL WIDTH OF 16 INCHES (400 MM), USE A SINGLE LINE
- FOR PANEL BOARDS, PROVIDE FRAMED, TYPED CIRCUIT SCHEDULES WITH EXPLICIT DESCRIPTION AND IDENTIFICATION OF ITEMS CONTROLLED BY EACH INDIVIDUAL BREAKER.
- IDENTIFY CONDUCTORS AT EACH TERMINATION IN EACH PIECE OF EQUIPMENT, JUNCTION BOX, PANEL, DISCONNECT SWITCH, ETC. BY SPECIFIC COLOR INSULATION OR TAPE AS FOLLOWS: 208Y/120V SYSTEM PHASE A - BLACK, B - RED, C - BLUE 480Y/277V SYSTEM PHASE A - BROWN, B - ORANGE, C - YELLOW
- ALL EMERGENCY SYSTEM DEVICES SHALL BE SPECIFICALLY IDENTIFIED WITH THE WORD ""EMERGENCY"" WHEN UTILIZED ON THE PROJECT.

- WHERE ELECTRICAL WORK TO REMAIN IS DAMAGED OR DISTURBED IN THE COURSE OF THE WORK, REMOVE DAMAGED PORTIONS AND INSTALL NEW PRODUCTS OF EQUAL CAPACITY, QUALITY, AND FUNCTIONALITY.
- ACCESSIBLE WORK INDICATED TO BE DEMOLISHED: REMOVE EXPOSED ELECTRICAL INSTALLATION IN ITS ENTIRETY.
- ABANDONED WORK: CUT AND REMOVE BURIED RACEWAY AND WIRING INDICATED TO BE ABANDONED IN PLACE, 2 INCHES (50 MM) BELOW THE SURFACE OF ADJACENT CONSTRUCTION. CAP AND PATCH SURFACE TO MATCH EXISTING FINISH.
- REMOVE DEMOLISHED MATERIAL FROM THE PROJECT SITE.
- TEMPORARY DISCONNECTION: REMOVE, STORE, CLEAN, REINSTALL, RECONNECT, AND MAKE OPERATIONAL COMPONENTS INDICATED FOR RELOCATION.

CUTTING AND PATCHING

- CUT, CHANNEL, CHASE, AND DRILL FLOORS, WALLS, PARTITIONS, CEILINGS, AND OTHER SURFACES NECESSARY FOR ELECTRICAL INSTALLATIONS. PERFORM CUTTING BY SKILLED MECHANICS OF THE TRADES INVOLVED.
- REPAIR DISTURBED SURFACES TO MATCH ADJACENT UNDISTURBED
- FOR SURFACES AND STRUCTURES STILL UNDER ORIGINAL WARRANTY, CONTRACTOR SHALL SUBCONTRACT WITH THE ORIGINAL INSTALLER FOR REPAIR OF THESE SURFACES, SUCH AS TO RETAIN THE REMAINING WARRANTY.

TOUCHUP PAINTING

- THOROUGHLY CLEAN DAMAGED AREAS AND PROVIDE PRIMER, INTERMEDIATE, AND FINISH COATS TO SUIT THE DEGREE OF DAMAGE AT EACH LOCATION.
- FOLLOW PAINT MANUFACTURER'S WRITTEN INSTRUCTIONS FOR SURFACE

PREPARATION AND FOR TIMING AND APPLICATION OF SUCCESSIVE COATS

FIRESTOPPING MATERIALS

- MANUFACTURERS: 3M, HILTI, OR DOW CORNING
- PRODUCTS MAY BE IN THE FORM OF CAULK, PUTTY, FOAM, STRIP, SHEET OR DEVICES DESIGNED TO FILL HOLES, SPACES AND VOIDS (HEREINAFTER REFERENCED AS CAVITIES) AT ELECTRICAL PENETRATIONS. MATERIALS SHALL PROVIDE ADHESION TO SUBSTRATES AND MAINTAIN FIRE AND SMOKE SEAL UNDER NORMAL EXPECTED

MOVEMENTS OF SUBSTRATES, CONDUITS AND CABLES.

- INTUMESCENT TYPE MATERIALS CAPABLE OF EXPANDING UP TO 3 TO 10 TIMES ORIGINAL VOLUME WHEN EXPOSED TO TEMPERATURES BEGINNING AT 250 DEG. F. USE WITH RESTRICTING COLLARS, OTHER MATERIALS AND DEVICES WHEN NECESSARY TO FILL CAVITIES LEFT BY MATERIALS THAT WILL BURN OR MELT SUCH AS NONMETALLIC RACEWAYS AND CABLE INSULATION
- PROVIDE FIRE STOP MATERIAL AT ALL FIRE RATED WALLS AS INDICATED ON THE ARCHITECTURAL PLANS AND WALL SECTIONS OR AS NOTED ON THE ELECTRICAL DRAWINGS. WHETHER INDICATED ON THE DRAWINGS AS SUCH OR NOT, ALL ELECTRICAL AND MECHANICAL SYSTEMS ROOMS SHALL BE CONSIDERED AS 2 HOUR RATED. ALL FLOORS SHALL BE CONSIDERED AS 2 HOUR WHETHER INDICATED ON THE DRAWINGS AS SUCH OR NOT.
- SYSTEMS SHALL NOT BE LESS THAN HOURLY TIME DELAY RATINGS INDICATED IN THE CONTRACT DOCUMENTS FOR EACH RESPECTIVE FIRE-RATED FLOOR, WALL OR OTHER PARTITION OF BUILDING CONSTRUCTION. WHERE FIRE RATING IS NOT INDICATED ON THE CONTRACT DOCUMENTS, VERIFY RATING WITH ARCHITECT OR ENGINEER. **ELECTRICAL WIRING METHODS**

RECEPTACLES AND SWITCHES

MANUFACTURERS: ARROW HART DIV., COOPER INDUSTRIES; HUBBELL INC. LEVITON MFG. CO., INC.; PASS & SEYMOUR/LEGRAND OR ENGINEER APPROVED EQUAL. ALL DEVICES SHALL BE IVORY UNLESS OTHERWISE INDICATED BY ARCHITECT OR ON DRAWINGS. ARCHITECT/ENGINEER SHALL BE ENTITLED TO SPECIFY OTHER MANUFACTURER'S STANDARD COLORS DURING SUBMITTAL PROCESS AT NO ADDITIONAL COST TO THE PROJECT. ALL DEVICES AND WALL PLATES SHALL BE FROM A SINGLE COMMON MANUFACTURER FOR THE ENTIRE PROJECT FOR A UNIFORM COLOR THROUGHOUT. RECEPTACLES ON EMERGENCY POWER SHALL BE RED COLORS.

RECEPTACLES, STRAIGHT-BLADE AND LOCKING TYPE: COMPLY WITH UL

- STANDARD 498, ""ELECTRICAL ATTACHMENT PLUGS AND RECEPTACLES,"" HEAVY-DUTY PREMIUM SPECIFICATION GRADE, NEMA 5-20R, EXCEPT AS OTHERWISE INDICATED. PROVIDE OTHER CONFIGURATIONS AS INDICATED ON THE DRAWINGS
- DEVICES SHALL BE HOSPITAL GRADE WHERE INDICATED ON THE
- GROUND-FAULT CIRCUIT INTERRUPTER (GFCI) RECEPTACLES: UL STANDARD 943, ""GROUND FAULT CIRCUIT INTERRUPTERS,"" FEED-THROUGH TYPE, WITH INTEGRAL NEMA 5-20R DUPLEX RECEPTACLE ARRANGED TO PROTECT CONNECTED DOWNSTREAM RECEPTACLES ON THE SAME CIRCUIT. DESIGN UNITS FOR INSTALLATION IN A 2-3/4-INCH (70-MM) DEEP OUTLET BOX WITHOUT AN ADAPTER.
- ISOLATED GROUND RECEPTACLES: EQUIPMENT GROUNDING CONTACTS ARE CONNECTED ONLY TO THE GREEN GROUNDING SCREW TERMINAL OF THE DEVICE AND HAVE INHERENT ELECTRICAL ISOLATION FROM THE MOUNTING STRAP.
- TRANSIENT-VOLTAGE SURGE-SUPPRESSOR (TVSS) RECEPTACLES: DUPLEX TYPE, NEMA 5-20R CONFIGURATION, WITH INTEGRAL TRANSIENT-VOLTAGE SURGE PROTECTION IN A MINIMUM OF 3 MODES: LINE-TO-GROUND, LINE-TO-NEUTRAL, AND NEUTRAL-TO-GROUND; LISTED AS COMPLYING WITH UL STANDARD 1449 "TRANSIENT VOLTAGE SURGE SUPPRESSORS. II
 - A. SURGE PROTECTION COMPONENTS: MULTIPLE METAL-OXIDE VARISTORS, RATED FOR 500 V TRANSIENT SUPPRESSION VOLTAGE NOMINAL CLAMP LEVEL AND MINIMUM SINGLE TRANSIENT PULSE ENERGY DISSIPATION OF 140 J, LINE-TO-NEUTRAL, AND 70 J, LINE-TO-GROUND AND NEUTRAL-TO-GROUND.

DENOTES TRANSIENT-VOLTAGE SURGE-SUPPRESSOR TYPE UNIT.

FACE OF THE DEVICE INDICATES THE STATE OF THE DEVICE AS ACTIVE"" OR ""NO LONGER ACTIVE."" C. IDENTIFICATION: DISTINCTIVE MARKING ON FACE OF DEVICE

B. ACTIVE PROTECTION INDICATION: A LIGHT VISIBLE IN THE

- SNAP SWITCHES: QUIET-TYPE A.C. SWITCHES, NRTL LISTED AND LABELED AS COMPLYING WITH UL STANDARD 20 ""GENERAL USE SNAP SWITCHES""
- DIMMER SWITCHES: MODULAR FULL-WAVE SOLID-STATE UNITS WITH INTEGRAL, QUIET ON-OFF SWITCHES, AND AUDIBLE AND ELECTROMAGNETIC NOISE FILTERS.
 - A. WATTAGE RATING EXCEEDS CONNECTED LOAD BY 30 PERCENT MINIMUM, EXCEPT AS OTHERWISE INDICATED B. CONTROL: CONTINUOUSLY ADJUSTABLE SLIDE. SINGLE-POLE OR
 - 3-WAY SWITCH TO SUIT CONNECTIONS. C. INCANDESCENT LAMP DIMMERS: MODULAR DIMMER SWITCHES FOR INCANDESCENT FIXTURES; SWITCH POLES AND WATTAGE AS OTHERWISE INDICATED, 120 V, 60 HZ WITH CONTINUOUSLY ADJUSTABLE ROTARY KNOB, TOGGLE, OR SLIDE, SINGLE-POLE WITH SOFT TAP OR OTHER QUIET SWITCH. EQUIP WITH ELECTROMAGNETIC FILTER TO ELIMINATE NOISE, RF AND TV INTERFERENCE, AND 5-INCH (127-MM) WIRE CONNECTING LEADS.
 - D. FLUORESCENT LAMP DIMMERS: MODULAR DIMMER SWITCHES COMPATIBLE WITH DIMMER BALLASTS. TRIM POTENTIOMETER ADJUSTS LOW-END DIMMING. DIMMER-BALLAST COMBINATION IS CAPABLE OF CONSISTENT DIMMING TO A MAXIMUM OF 10 PERCENT OF FULL BRIGHTNESS.
- WALL PLATES: SINGLE AND COMBINATION TYPES, BRUSHED ALUMINUM THAT MATE AND MATCH WITH CORRESPONDING WIRING DEVICES. WHERE NYLON WALL PLATES ARE APPROVED IN WRITING, WALL PLATE AND WIRING DEVICES MUST BE FROM THE SAME MANUFACTURER

HOSPITAL GRADE RECEPTACLES

- MANUFACTURERS: ARROW HART DIV., COOPER INDUSTRIES; HUBBELL INC. LEVITON MFG. CO., INC.; PASS & SEYMOUR/LEGRAND OR ENGINEER APPROVED EQUAL.
- ALL DEVICES SHALL BE IVORY IN COLOR WITH A GREEN INDICATING DOT UNLESS OTHERWISE INDICATED BY ARCHITECT OR ON DRAWINGS. ARCHITECT/ENGINEER SHALL BE ENTITLED TO SPECIFY OTHER MANUFACTURER'S STANDARD COLORS DURING SUBMITTAL PROCESS AT NO ADDITIONAL COST TO THE PROJECT, ALL DEVICES AND WALL PLATES SHALL BE FROM A SINGLE COMMON MANUFACTURER FOR THE ENTIRE PROJECT FOR A UNIFORM COLOR THROUGHOUT. RECEPTACLES ON
- EMERGENCY POWER SHALL BE RED IN COLOR. HOSPITAL GRADE RECEPTACLES SHALL BE LISTED IN ACCORDANCE WITH UL, AND MANUFACTURED IN ACCORDANCE WITH NEMA STANDARD WD-1. RECEPTACLES SHALL BE DUPLEX, 2 POLE, 3 WIRE, WITH U SLOT GROUND, NEMA 5-20R, UNLESS NOTED OTHERWISE ON THE DRAWINGS. RECEPTACLES SHALL BE HEAVY DUTY, High ABUSE, CORROSION RESISTANT, HIGH IMPACT MOLDED NYLON BODY. IN ALL PEDIATRIC
- WALL PLATES: SINGLE AND COMBINATION TYPES, BRUSHED ALUMINUM THAT MATE AND MATCH WITH CORRESPONDING WIRING DEVICES. WHERE NYLON WALL PLATES ARE APPROVED IN WRITING, WALL PLATE AND WIRING DEVICES MUST BE FROM THE SAME MANUFACTURER

AREAS, PROVIDE TAMPER RESISTANT CONSTRUCTION.

- OUTLET BOXES MANUFACTURER: (+) STEEL CITY, RACO, OR APPLETON.
- PRESSED STEEL, ZINC COATED, 4 INCH SQUARE OR OCTAGON; GANGABLE 2"x3" WHERE REQUIRED: DEPTH AS REQUIRED FOR PROJECT AND SIZED IN ACCORDANCE WITH NEC 314
- EXTENSION RINGS: TO SUIT VARIOUS CONDITIONS.

OUTLET BOXES FOR TELECOMMUNICATIONS

- ALL OUTLET BOXES SUPPORTING STANDARD VOICE/DATA COMMUNICATIONS REQUIREMENTS SHALL BE FLUSH-MOUNTED DOUBLE-GANG, FOUR (4) INCH SQUARE, THREE (3) INCH DEEP MINIMUM, GALVANIZED STEEL BOXES WITH SINGLE GANG ADAPTERS FOR COVERS. ALL BOXES SHALL MINIMUM ONE 1" CONDUITS STUBBED TO THE NEAREST ACCESSIBLE CEILING OR CABLE TRAY.
- ALL OUTLET BOXES SUPPORTING VIDEO ONLY COMMUNICATIONS REQUIREMENTS SHALL BE SINGLE GANG, FOUR (4) INCH DEEP MINIMUM GALVANIZED STEEL BOXES. ALL BOXES SHALL HAVE ONE (1) 1" CONDUITS STUBBED TO THE ACCESSIBLE CEILING OR CABLE TRAY.
- ALL OUTLET BOXES SUPPORTING AUDIO/VIDEO/RGB COMPUTER VIDEO COMMUNICATIONS REQUIREMENTS SHALL BE FIVE (5) GANG, FOUR (4) INCH DEEP MINIMUM GALVANIZED STEEL BOXES. ALL BOXES SHALL HAVE FOUR (4) 1" CONDUITS STUBBED TO THE ACCESSIBLE CEILING OR CABLE TRAY.

PULL AND JUNCTION BOXES

- MANUFACTURER: (+) HOFFMAN, KEYSTONE, OR SQUARE ""D"".
- DESCRIPTION: GALVANIZED STEEL, GAUGE I ACCORDANCE WITH NEC; COVER: SAME MATERIAL AS BOX, SCREW ON TYPE, MAXIMUM SIZE 300 SQUARE INCHES IN ONE PIECE.

GROUNDING

MATERIAL: ALUMINUM AND COPPER. USE ONLY COPPER WIRE FOR BOTH INSULATED AND BARE GROUNDING CONDUCTORS IN DIRECT CONTACT WITH EARTH, CONCRETE, MASONRY, CRUSHED STONE, AND SIMILAR MATERIALS.

 ${
m N}_0$

ENTER CAMPUS
RE AND
MEDICI

KEY PLAN: GROUND FLOOR

ı	
	ISSUE DATES:
ı	

STATE APPROVALS

MARCH 20, 2015 △ BLDG. DEPT. REVIEW

> CHECKED BY: | JZ SCALE: AS NOTED PROJECT NO.: | P14110

DRAWN BY:

SHEET TITLE: ELECTRICAL **SPECIFICATION**

SHEET 1

DRAWING NO .: