

ELECTRICAL SPECIFICATIONS:

BASIC ELECTRICAL REQUIREMENTS

GENERAL REQUIREMENTS:

1. THE WORK OF EACH OF THE ELECTRICAL SECTIONS INCLUDES FURNISHING AND INSTALLING THE MATERIAL, EQUIPMENT, AND SYSTEMS COMPLETE AS SPECIFIED AND/OR INDICATED ON THE DRAWINGS. THE ELECTRICAL INSTALLATIONS, WHEN FINISHED, SHALL BE COMPLETE AND COORDINATED, READY FOR SATISFACTORY SERVICE.
2. THE WORK UNDER THIS CONTRACT SHALL BE DONE IN STRICT ACCORDANCE WITH ALL APPLICABLE MUNICIPAL, STATE, AND OTHER LOCAL CODES, THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE WITH LOCAL ORDINANCES, AND THE 2009 MARYLAND WITH DISABILITIES ACT.
3. THE CONTRACTOR SHALL MAKE APPLICATION AND PAY FOR ALL PERMITS, LICENSES AND INSPECTIONS AS REQUIRED UNDER THE ABOVE CODES.
4. THE GENERAL ARRANGEMENT OF CONDUIT, WIRING AND EQUIPMENT SHALL BE AS IDENTIFIED ON THE CONTRACT DRAWINGS. THE CONTRACTOR SHALL CAREFULLY INVESTIGATE THE SITE STRUCTURAL AND FINISHED CONDITIONS AFFECTING HIS WORK, AND SHALL ARRANGE SUCH WORK ACCORDINGLY, PROVIDING SUCH FITTINGS AND ACCESSORIES AS MAY BE REQUIRED TO MEET SUCH CONDITIONS.
5. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TEMPORARY WIRING, LIGHTING AND CONSTRUCTION POWER FOR ALL TRADES AS REQUIRED TO COMPLETE THE PROJECT.

MATERIAL AND WORKMANSHIP:

1. PROVIDE ALL MATERIAL AND EQUIPMENT NEW AND IN FIRST CLASS CONDITION. PROVIDE MARKINGS OR A NAMEPLATE FOR ALL MATERIAL AND EQUIPMENT IDENTIFY THE MANUFACTURER AND PROVIDING SUFFICIENT REFERENCE TO ESTABLISH QUALITY, SIZE AND CAPACITY. ALL WORKMANSHIP SHALL BE OF THE FINEST POSSIBLE BY EXPERIENCED MECHANICS OF THE PROPER TRADE. IN GENERAL, PROVIDE THE FOLLOWING QUALITY GRADES) FOR ALL MATERIALS AND EQUIPMENT:
 - a) COMMERCIAL SPECIFICATION GRADE
2. PROVIDE ALL HOISTS, SCAFFOLDS, STAGINGS, RUNWAYS, TOOLS, MACHINERY AND EQUIPMENT REQUIRED FOR THE PERFORMANCE OF THE ELECTRICAL WORK. STORE AND MAINTAIN MATERIAL AND EQUIPMENT IN CLEAN CONDITION, AND PROTECTED FROM WEATHER, MOISTURE, AND PHYSICAL DAMAGE.
3. FURNISH ONLY MATERIAL AND EQUIPMENT THAT ARE LISTED, LABELED, CERTIFIED, OR ALL THREE, BY A NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) WHENEVER ANY LISTING OR LABELING EXISTS FOR THE TYPES OF MATERIAL AND EQUIPMENT SPECIFIED.
4. AT A MINIMUM GENERAL WORK PRACTICES FOR ELECTRICAL CONSTRUCTION SHALL BE IN ACCORDANCE WITH NECA (LATEST EDITION), STANDARD PRACTICES FOR GOOD WORKMANSHIP IN ELECTRICAL CONSTRUCTION.

COORDINATION:

1. COORDINATE ALL WORK WITH OTHER DIVISIONS AND TRADES SO THAT THE VARIOUS COMPONENTS OF THE ELECTRICAL SYSTEMS ARE INSTALLED AT THE PROPER TIME AND IN THE AVAILABLE SPACE, AND ALLOW PROPER SERVICE ACCESS TO ALL EQUIPMENT. REFER TO ALL DRAWINGS, INCLUDING, BUT NOT LIMITED TO, ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND PLUMBING, AND TO RELEVANT EQUIPMENT SUBMITTALS AND DATA TO DETERMINE THE EXTENT OF CLEAR SPACES. MAKE ALL OFFSETS REQUIRED TO CLEAR EQUIPMENT, BEAMS AND OTHER STRUCTURE. MAKE ALL OFFSETS REQUIRED TO CLEAR EQUIPMENT, BEAMS AND OTHER STRUCTURE. MAKE ALL OFFSETS REQUIRED TO CLEAR EQUIPMENT, BEAMS AND OTHER STRUCTURE. MAKE ALL OFFSETS REQUIRED TO CLEAR EQUIPMENT, BEAMS AND OTHER STRUCTURE.

EQUIPMENT IDENTIFICATION:

1. PROVIDE EQUIPMENT IDENTIFICATION NAMEPLATES:
 - a) ON ALL PANELBOARDS, SWITCHES, DIMMERS, SWITCHES IN DISTRIBUTION PANELBOARDS AND SWITCHBOARDS.
 - b) WHERE INDICATED ON DRAWINGS
2. NAMEPLATES:
 - a) ENGRAVED CONTRASTING COLOR, THREE-LAYER, LAMINATED PLASTIC INDICATING THE NAME OF THE EQUIPMENT, LOAD, OR CIRCUIT AS DESIGNATED ON THE DRAWINGS, AND IN THE SPECIFICATION.
 - b) SELF-ADHERING WITH A WEATHERPROOF ADHESIVE.
 - c) ATTACHMENT METHOD SHALL BE ACCEPTABLE TO THE MANUFACTURERS OF THE EQUIPMENT TO WHICH THE NAMEPLATES ARE BEING APPLIED.
 - d) COLOR: BLACK BACKGROUND WITH WHITE LETTERS FOR NORMAL POWER.
 - e) LETTER HEIGHT: 1/4" MINIMUM.

WARRANTIES:

1. WARRANT EACH SYSTEM AND EACH ELEMENT THEREOF AGAINST ALL DEFECTS DUE TO FAULTY WORKMANSHIP, DESIGN OR MATERIAL FOR A PERIOD OF 12 MONTHS FROM DATE OF SUBSTANTIAL COMPLETION UNLESS SPECIFIC ITEMS ARE NOTED TO CARRY A LONGER WARRANTY IN THE CONSTRUCTION DOCUMENTS OR MANUFACTURER'S STANDARD WARRANTY EXCEEDS 12 MONTHS. REMEDY ALL DEFECTS OCCURRING WITHIN THE PERIOD(S), AS STATED IN THE GENERAL CONDITIONS AND DIVISION I.

2. ALSO WARRANT THE FOLLOWING ADDITIONAL ITEMS:
 - a) ALL RACENAYS ARE FREE FROM OBSTRUCTIONS, HOLES, CRUSHING, OR BREAKS OF ANY KIND.
 - b) ALL RACENAY SEALS ARE EFFECTIVE.
 - c) THE ENTIRE ELECTRICAL SYSTEM IS FREE FROM ALL SHORT CIRCUITS AND UNWANTED OPEN CIRCUITS AND GROUNDS.

3. THE ABOVE WARRANTIES SHALL INCLUDE LABOR AND MATERIAL, MAKE REPAIRS OR REPLACEMENTS WITHOUT ANY ADDITIONAL COSTS TO THE OWNER.

PENETRATIONS:

1. COORDINATE ALL ROOF PENETRATIONS WITH ENGINEER, OWNER, AND AS APPLICABLE, THE ROOFING CONTRACTOR PROVIDING A ROOF WARRANTY.
2. KEEP ALL RACENAY PENETRATIONS WITH MECHANICAL EQUIPMENT SEALS WHEREVER POSSIBLE. COORDINATE WITH DIVISION 15 WORK.
3. FLASH AND COUNTERFLASH ALL OPENINGS THROUGH ROOF, AND/OR PROVIDE PRE-FABRICATED MOLDED SEALS COMPATIBLE WITH THE ROOF CONSTRUCTION INSTALLED, OR AS REQUIRED BY THE ENGINEER, OWNER, OR ROOFING CONTRACTOR. ALL ROOF PENETRATIONS SHALL BE LEAKTIGHT AT TERMINATION OF THE WORK AND SHALL NOT VOID AND NEW OR EXISTING ROOF WARRANTIES.

FIRE-STOPPING THROUGH PENETRATIONS:

1. FIRE-RESISTANT THROUGH PENETRATION SEALS SHALL BE PART, FOAMED-IN-PLACE, SILICONE SEALANT, FORMULATED TO USE THROUGH-PENETRATION FIRE-STOPPING GROUND CABLE RACEWAYS, AND CABLE TRAY PENETRATIONS THROUGH FIRE-RATED WALLS, PARTITIONS AND ACCESSORIES SHALL HAVE FIRE-RESISTANT RINGS INDICATED, AS ESTABLISHED BY TESTING IDENTICAL TO THE RINGS INDICATED BY ASTM E 814, BY UNDERWRITERS LABORATORY, INC., OR AS ACCEPTABLE TO AHL.
2. ACCEPTABLE MANUFACTURERS:
 - a) HILTI, INC.
 - b) JOY TECH, INC.
 - c) JOY TECH, INC.
 - d) JOY TECH, INC.
 - e) JOY TECH, INC.
 - f) JOY TECH, INC.
 - g) JOY TECH, INC.
 - h) JOY TECH, INC.
 - i) JOY TECH, INC.
 - j) JOY TECH, INC.
 - k) JOY TECH, INC.
 - l) JOY TECH, INC.
 - m) JOY TECH, INC.
 - n) JOY TECH, INC.
 - o) JOY TECH, INC.
 - p) JOY TECH, INC.
 - q) JOY TECH, INC.
 - r) JOY TECH, INC.
 - s) JOY TECH, INC.
 - t) JOY TECH, INC.
 - u) JOY TECH, INC.
 - v) JOY TECH, INC.
 - w) JOY TECH, INC.
 - x) JOY TECH, INC.
 - y) JOY TECH, INC.
 - z) JOY TECH, INC.

BASIC ELECTRICAL MATERIALS AND METHODS

METALLIC CONDUIT AND TUBING; RACENAYS:

1. ELECTRICAL METALLIC TUBING, COUPLED AND FITTINGS (EMT), ANSIC80. UL 797. ONLY THESE PRODUCTS ALLOW REDUCED WALL THICKNESS.
2. RIGID METALLIC CONDUIT (RMC), ZINC-COATED STEEL ONLY. ALUMINUM, UL1 OR REDUCED WALL THICKNESS ARE NOT ALLOWED.
3. INTERMEDIATE METAL CONDUIT (IMC), HOT-DIP GALVANIZED RIGID STEEL CONDUIT, ANSIC80.8, UL 1242.

4. LIQUDTIGHT FLEXIBLE METAL CONDUIT (LFMC), FLEXIBLE STEEL CONDUIT WITH PVC JACKET, UL 360.
 5. RIGID METAL CONDUIT (RMC), HOT-DIP GALVANIZED RIGID STEEL CONDUIT (GRS), ANSIC80.1, UL6.
 6. PLASTIC COATED IMC, RMC, AND FITTINGS: NEMA RN 1 UL LISTED.
 7. IMC AND RMC FITTINGS: NEMA FB 1; COMPATIBLE WITH CONDUIT TYPE AND MATERIAL, UL LISTED.
- RACENAYS: NON-METALLIC CONDUIT AND TUBING:**

1. RIGID NONMETALLIC CONDUIT (RNC), SCHEDULE 40 PVC, 90 DEGREE RATED, NEMA TC-2 (UL 65), FITTINGS: NEMA TC 3, TC 6, UL 514, COMPATIBLE WITH CONDUIT TYPE AND MATERIAL, UL LISTED.
- RACENAY INSTALLATION ABOVE GROUND USE:**

1. INSTALL ALL CIRCULAR RACENAYS CONCEALED ABOVE SUSPENDED CEILINGS OR CONCEALED IN WALLS OR FLOORS WHEREVER POSSIBLE EXCEPT WHERE OTHERWISE INDICATED.
2. PROVIDE GRS FOR ALL CONDUIT RUNS EXPOSED TO WEATHER, OR EXPOSED TO OTHER HAZARDOUS CONDITIONS.

3. ALL OTHER RACENAY MAY BE EMT WHERE APPROVED BY LOCAL CODE. USE COMPRESSION TYPE FITTINGS FOR EMT, WITH ALL FITTINGS UL LISTED FOR THE DIVISION OF THE MEDIUM TO WHICH THEY ARE TO BE INSTALLED.

RACENAY INSTALLATION UNDERGROUND USE:

1. PROVIDE GRS INSTALLED BELOW GRADE WITH A CORROSION RESISTANT BONDED PLASTIC OR APPROVED MASTIC COATING. THIS SHALL NOT INCLUDE THE 90 DEGREE ELBOW GRADE AND THE ENTIRE VERTICAL TRANSITION TO ABOVE GRADE.
2. RIGID CONDUIT MAY BE USED UNDERGROUND WHERE PERMITTED BY LOCAL CODE AND WHERE NOT SPECIFICALLY RESTRICTED BY THESE DOCUMENTS. WHEN USED, PROVIDE COATED GRS, AS SPECIFIED ABOVE, FOR ALL BENDS GREATER THAN 90 DEGREE INCLUDING THE 90 DEGREE ELBOW BELOW GRADE AND THE ENTIRE VERTICAL RISERS FOR TRANSITIONS FROM BELOW TO ABOVE GRADE OR ABOVE SLAB.

RACENAY INSTALLATION EQUIPMENT CONNECTIONS:

1. USE FMC FOR FINAL CONNECTION TO EACH MOTOR AND TRANSFORMER, AND TO ANY DEVICE THAT WOULD OTHERWISE TRANSMIT MOTION, VIBRATION, OR NOISE TO THE RACENAY. PROVIDE FMC FOR SUNLIGHT, AND TO CONNECT TO KITCHEN AND FOOD SERVICE EQUIPMENT. PROVIDE ALL FMC AND LFMC WITH INSULATED BONDING CONDUCTOR.

GENERAL RACENAY INSTALLATION REQUIREMENTS:

1. INSTALL RACENAYS PARALLEL AND PERPENDICULAR TO BUILDING LINES.
2. EXCEPT WHERE APPROVED IN WRITING BY THE ENGINEER, INSTALL NO RACENAY IN A SLAB-ON-GRADE. LOCATE RACENAY BELOW GRANULAR FILL BELOW SLABS-ON-GRADE.
3. USE LONG RADIUS ELBOWS FOR ALL UNDERGROUND INSTALLATIONS, WHERE NECESSARY OR INDICATED.
4. SECURELY FASTEN RACENAYS IN PLACE WITH APPROVED STRAPS, HANGERS AND STEEL SUPPORTS AS REQUIRED. ATTACHED RACENAY SUPPORTS TO BUILDING STRUCTURE. HANG SINGLE RACENAYS FOR FEEDERS WITH MALLEABLE SPLIT RING HANGERS WITH RIGID AND TURNBUCKLE SUSPENSION FROM INSERTS SPACED NOT OVER 10 FEET APART IN CONSTRUCTION ABOVE.
5. REAM RACENAY ENDS THOROUGHLY. CLEAN RACENAY ENDS BEFORE INSTALLATION, AND KEEP CLEAN AFTER INSTALLATION. PLUG OR COVER OPENINGS AND BOXES AS REQUIRED TO KEEP RACENAYS CLEAN DURING CONSTRUCTION.
6. INSTALL APPROVED EXPANSION/DEFLECTION FITTINGS WHERE RACENAYS PASS THROUGH (IF EMBEDDED) OR ACROSS (IF EXPOSED) EXPANSION JOINTS. ALSO WHEN USING RNC OR RAC IN EXPOSED ENVIRONMENTS IN ACCORDANCE WITH THE NEG AND EXPANSION/CONTRACTION PROPERTIES OF RNC OR RAC.

1. INSTALL ALL PULL WIRE IN EACH EMPT RACENAY THAT IS LEFT OPEN FOR INSTALLATION OF CONDUCTORS OR CABLES UNDER OTHER DIVISIONS OR CONTRACTS. USE POLYPROPYLENE OR MONOFILAMENT PLASTIC LINE WITH TENSILE STRENGTH OF AT LEAST 200-LB TENSILE STRENGTH. LEAVE AT LEAST 24 INCHES OF SLACK AT EACH END.

CONDUCTORS AND CABLES; CONDUCTOR MATERIAL:

1. ANNEALED (SOFT) COPPER COMPLYING WITH IECIA 5-95-658, NEMA WC70.
2. TERMINATIONS, TINED COPPRESSION AND CRIMPING TOOLS LISTED FOR COPPER CONDUCTORS AT 75 DEGREES C MINIMUM.
3. CONDUCTOR INSULATION TYPES: 90-DEGREE C-PLATE TYPE THHN/THHN-2 OR XHHN-2 COMPLYING WITH IECIA 5-95-658, NEMA WC70.
4. SIZES OF CONDUCTORS AND CABLES INDICATED OR OTHERWISE ARE IN AMERICAN WIRE GAUGE (AWG - BROWN AND BLACK).
5. ALL FEEDER AND BRANCH CIRCUIT CONDUCTORS 10 AWG AND LARGER: STRANDED.
6. FEEDER CONDUCTORS SHALL BE SIZED FOR MAXIMUM VOLTAGE DROP OF 2% AT DESIGN LOAD. BRANCH CIRCUIT CONDUCTORS SHALL BE SIZED FOR A MINIMUM VOLTAGE DROP OF 3% AT DESIGN LOAD.
7. ALL CONDUCTORS 10 AWG AND SMALLER: SOLID COPPER.

8. ALL BRANCH CIRCUIT WIRING NOT SMALLER THAN NO. 12 AWG. IF NO CONDUCTOR SIZE INDICATED ON THE DRAWINGS FOR A BRANCH CIRCUIT, PROVIDE SIZE OF CONDUCTOR AND CONDUIT SIZED PER NFPA 70 AND BASED ON THE INDICATED VOLTAGE AND NUMBER OF CIRCUITS. IF CONDUCTORS AND CONDUIT IS NOT INDICATED ON THE DRAWINGS FOR A BRANCH CIRCUIT, PROVIDE THREE (3) NO. 12 AWG CONDUCTORS IN 3/4-INCH RACENAY, AND A 20A CIRCUIT BREAKER.
9. CONTROL WIRING: STRANDED COPPER CONDUCTORS 600V INSULATION OF 18 AWG MINIMUM SIZE. NO. 14 AWG, UNLESS NOTED OTHERWISE.

10. STRANDED FOR ALL FLEXIBLE CORDS AND CABLES, OR AS OTHERWISE INDICATED.
11. UNLESS INDICATED OTHERWISE, SPECIAL PURPOSE CONDUCTORS AND CABLES, SUCH AS LOW VOLTAGE CONTROL AND SHIELDED INSTRUMENT WIRING, SHALL BE AS RECOMMENDED BY THE SYSTEM EQUIPMENT MANUFACTURER.

1. TYPE MC CABLE, 600V (UNLACKETED), ANSIEIR and E814 UL STANDARDS 44 OR 63 (AS APPLICABLE), AND IECIA NFPA TO ARTICLE 330; ALUMINUM OR GALVANIZED STEEL INTERLOCKED ARMOR, THHN, OR XHHN-2 INSULATION ON ALL CONDUCTORS; COOR CODE: IECIA METHOD I, WITH GREEN INSULATED GROUNDING CONDUCTOR.

INSTALLATION OF CONDUCTORS AND CABLES:

1. INSTALL ALL WIRING IN APPROVED RACENAY AND ENCLOSURES.
2. SUPPORT ALL CONDUCTORS AND CABLES IN VERTICAL INSTALLATIONS, AS REQUIRED BY NFPA 70, BY INSTALLING CABLE SUPPORTS OR FLUG-TYPE CONDUIT RISER SUPPORTS, OR WIRE-MESH SAFETY GRIPS.
3. INSTALL ALL CONDUCTORS AND CABLE IN RACENAYS CONTINUOUS WITHOUT TAPS OR SPLICING. SPLICING ONLY IN APPROVED BOXES AND ENCLOSURES WITH APPROVED SOLDERLESS CONNECTING OR CRIMP CONNECTORS AND TERMINAL BLOCKS FOR CONTROL WIRING, AND KEEP TO THE MINIMUM REQUIRED. INSULATE ALL SPLICES, TAPS, AND JOINTS AS REQUIRED BY CODES.
4. ALL MATERIALS USED TO TERMINATE SPLICE OR TAP CONDUCTORS, DESIGNED FOR, PROPERLY SIZED FOR, AND UL LISTED FOR THE SPECIFIC APPLICATIONS AND CONDUCTORS INVOLVED, AND INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS, USING THE MANUFACTURER'S RECOMMENDED TOOLS.

5. WHERE WIRING IS INDICATED AS INSTALLED, BUT THE CONNECTION IS INDICATED "FUTURE" OR "BY OTHER DIVISION TRADES, OR CONTRACTS," LEAVE A MINIMUM 3'-FOOT "DIGITAL" AT THE BOX, TAPE THE ENDS OF THE CONDUCTORS, AND COVER THE BOX.

6. THE NUMBER OF CONDUCTORS IN A SPECIFIC RACENAY "HOME RUN" IS INDICATED WITH CROSS LINES (TICK MARKS) ON EACH CIRCUIT RUN ON THE DRAWINGS. IN GENERAL, THE DIRECTION OF BRANCH CIRCUIT "HOME RUN" ROUTING IS INDICATED ON THE DRAWINGS, COMPLETE WITH CIRCUIT NUMBERS AND PANELBOARD DESIGNATION. CONTINUE ALL SUCH "HOME RUN" WIRING TO THE DESIGNATED PANELBOARD, AS THOUGH "CIRCUIT RUNS" WERE INDICATED IN THEIR ENTIRETY.

7. COMMON OR SHARED NEUTRALS ARE NOT ALLOWED UNLESS SHOWN ON THE DRAWINGS TO BE USED OR SPECIFICALLY NOTED TO BE ALLOWED.

8. MULTI-WIRE BRANCH CIRCUITS (IE, SHARED NEUTRAL) SHALL BE PROVIDED AT THE POINT THE BRANCH CIRCUIT ORIGINATES. MULTI-POLE BREAKERS OR 3 SINGLE POLE BREAKERS WITH A HANDLE TIE ARE TWO SEPARATE BRANCH CIRCUITS.

9. WHEN MULTIPLE HOME RUNS ARE COMBINED INTO A SINGLE RACENAY SUCH THAT THE NUMBER OF CONDUCTORS EXCEEDS FOUR (CONDUCTOR COUNT IS MADE UP OF ANY COMBINATION OF PHASE AND NEUTRAL CONDUCTORS), THE FOLLOWING RESTRICTIONS APPLY, WHICH ARE IN ADDITION TO THOSE IN NFPA 70:

- a) MAXIMUM OF 16 CONDUCTORS IN A SINGLE RACENAY.
- b) FOR UP TO EIGHT CONDUCTORS IN A RACENAY, MINIMUM RACENAY SIZE: 3/4-INCH.
- c) FOR GREATER THAN EIGHT CONDUCTORS, MINIMUM RACENAY 1-INCH.
- d) DO NOT INSTALL ANY OTHER TYPE OF CIRCUIT IN THIS RACENAY.
- e) THE MINIMUM WIRE SIZE FOR ALL CONDUCTORS IN THIS RACENAY, NO.10 AWG.
- f) ONLY 15A AND 20A BRANCH CIRCUIT HOMERUNS MAY BE COMBINED INTO ONE RACENAY.

10. FOR USE MULTI-CONDUCTOR CIRCUITS, WITH A SHARED NEUTRAL, OR ANY GFCI CIRCUIT BREAKER OR RECEPTACLE CIRCUIT:
 - a) MAXIMUM OF 16 CONDUCTORS IN A SINGLE RACENAY.
 - b) DO NOT INSTALL ANY OTHER TYPE OF CIRCUIT IN THIS RACENAY.
 - c) ONLY 15A AND 20A BRANCH CIRCUIT HOMERUNS MAY BE COMBINED INTO ONE RACENAY.

11. FOR BRANCH CIRCUITS FED FROM GFCI CIRCUIT BREAKERS, LIMIT THE ONE-WAY CONDUCTOR LENGTH TO 100 FEET BETWEEN THE PANELBOARD AND THE MOST REMOTE RECEPTACLE OR LOAD ON THE GFCI CIRCUIT.

12. PROPERLY IDENTIFY ALL THERMAL BLOCKS AND WIRE TERMINALS FOR CONTROL WIRING WITH VINYL STICKERS OR MARKERS OR EQUIVALENTS. PROVIDE ENGINEER WITH A LIST OF PROPOSED IDENTIFYING NUMBERS FOR REVIEW PRIOR TO INSTALLING MARKERS.

13. PROVIDE AN EQUIPMENT GROUNDING CONDUCTOR OR BONDING JUMPER, AS APPLICABLE, IN ALL FEEDER AND BRANCH CIRCUITS, SIZED IN ACCORDANCE WITH NFPA 70 TABLE 250.66. THIS IS TO BE A SEPARATE CABLE, UNLESS INDICATED AS LARGER ON THE DRAWINGS.

14. VOLTAGE DROP FEEDER CIRCUITS SHALL NOT EXCEED 2 PERCENT VOLTAGE DROP IN BRANCH CIRCUITS SHALL NOT EXCEED 3 PERCENT.

15. WIRING SHALL HAVE INSULATION OF THE PROPER COLOR TO MATCH COLOR CODE SYSTEM IN THIS TABLE BELOW UNLESS THERE IS A COLOR SYSTEM CURRENTLY IN USE IN THE FACILITY. IN FACILITIES WHERE COLORS ARE TO BE IDENTIFIED IN THE FIELD, IDENTIFY ALL WIRING SIZES, WHERE PREFERRED TO COLOR INSULATION IS NOT AVAILABLE, USE VINYL PLASTIC ELECTRICAL TAPE OF THE PROPER COLOR AND EACH CONDUCTOR AT ALL TERMINATION POINTS, JUNCTION AND BOXES.

THE COLOR CODING SYSTEM LISTED BELOW SHALL BE USED THROUGHOUT:

SYSTEM	PHASE A	PHASE B	PHASE C	NEUTRAL	GROUND	ISOLATED
120/208V	BLACK	RED	BLUE	WHITE	GREEN	YELLOW W/ GREEN STRIPE
277/480V	BROWN	ORANGE	YELLOW	WHITE	GRAY	N/A

USE OF MC CABLE MAY ONLY BE USED:

1. IN LIEU OF FLEXIBLE CONDUIT AND WIRING FROM LIGHT FIXTURES IN ACCESSIBLE CEILINGS TO JUNCTION BOXES (ATTACHED TO BUILDING STRUCTURE) ABOVE THE CEILING. PROVIDE CABLE LENGTHS OF SUFFICIENT LENGTH TO ALLOW FOR RELOCATING EACH LIGHT FIXTURE WITHIN A 5 FOOT RADII OF ITS INSTALLED LOCATION, BUT NOT EXCEEDING 6 FEET IN UNSUPPORTED LENGTHS.
2. CONCEALED WITHIN IN STUD WALLS.
3. IN LIEU OF EMT, ONLY FOR 15A AND 20A BRANCH CIRCUITS (WITH UP TO FOUR (4) CONDUCTORS, NOT INCLUDING GROUND CONDUCTOR), AND ONLY IN DRY CONCEALED LOCATIONS ABOVE GRADE, EXCEPT WHERE SPECIFICALLY NOT PERMITTED BY NFPA 70.

- MC CABLE SHALL NOT BE USED FOR ANY USE NOT LISTED ABOVE. EXAMPLES OF THOSE USES INCLUDE, BUT ARE NOT LIMITED TO:

1. HOMERUNS TO PANELBOARDS, WHERE EXPOSED TO WEAR, WHERE EXPOSED TO DAMAGE, HAZARDOUS LOCATIONS.
2. NET LOCATIONS, WHEN RESTRICTED OTHERWISE, WHEN SPECIFICALLY DISALLOWED BY THE LOCAL A.H.J. WHEN SPECIFICALLY DISALLOWED BY THE LANDLORD, CIRCUITS THAT CAN BE SUPPLIED BY AN EMERGENCY OR STANDBY POWER SOURCE.

JUNCTION BOXES, PULL BOXES, CABINETS AND WIRERAYS:

1. PROVIDE JUNCTION BOXES, PULL BOXES, CABINETS AND WIRERAYS WHEREVER NECESSARY FOR PROPER INSTALLATION OF VARIOUS ELECTRICAL SYSTEMS ACCORDING TO NFPA 70 AND WHERE INDICATED ON THE DRAWINGS. SIZE AS REQUIRED FOR THE SPECIFIC FUNCTION OR AS REQUIRED BY NFPA 70, WHICHEVER IS LARGER. CONSTRUCTION SHALL BE OF A NEMA DESIGN SUITABLE FOR THE ENVIRONMENT INSTALLED.
2. JUNCTION BOXES INSTALLED BEHIND MALL CASES, AND IN OR ON OTHER STORE FIXTURES, EXCEPT WHERE OTHERWISE SPECIFIED, SHALL BE 4-INCH SQUARE OR LARGER, WITH GALVANIZED COVERS.

3. HORIZONTALLY MOUNT JUNCTION BOXES UNDER CENTER FIXTURES (AND CASES), HANDY BOXES OR 4-INCH SQUARE WITH TOPS OF BOXES NOT MORE THAN 3/8 INCH ABOVE THE FLOOR. SIZE JUNCTION BOXES TO ADEQUATELY CONTAIN ALL REQUIRED CONDUCTORS AND SPLICES.

OUTLET BOXES:

1. ALL OUTLETS INCLUDING LIGHT FIXTURE, SWITCH, RECEPTACLE, AND SIMILAR OUTLETS, NATIONAL ELECTRICAL AFFLETON STEEL CITY RAGO OR APPROVED EQUAL, GALVANIZED STEEL KNOCKOUT BOXES, SUITABLE IN DESIGN TO THE PURPOSE THEY SERVE AND THE SPACE THEY OCCUPY. SIZE AS REQUIRED FOR THE SPECIFIC FUNCTION OR AS REQUIRED BY NFPA 70, WHICHEVER IS LARGER. SET ALL OUTLET BOXES IN WALLS, COLUMNS, FLOORS OR CEILING SO THEY ARE FLUSH WITH THE FINISHED SURFACE, ACCURATELY SET, AND RIGIDLY SECURED IN POSITION. PROVIDE PLASTER RINGS, EXTENSION RINGS AND/OR MASONRY RINGS AS REQUIRED FOR FLUSH MOUNTING. PROVIDE APPROVED CAST OUTLET BOXES, WITH HUSS AND WEATHERPROOF COVERS, IN ALL AREAS SUBJECT TO DAMP, NET, OR HARSH CONDITIONS.

OUTLET LOCATIONS:

1. COORDINATE LOCATION OF OUTLET BOXES, OUTLETS ARE ONLY APPROXIMATELY LOCATED ON THE SMALL SCALE DRAWINGS, USE GREAT CARE IN THE ACTUAL LOCATION BY CONSULTING THE VARIOUS LARGE SCALE DETAILED DRAWINGS USED BY OTHER DIVISION TRADES, AND BY SECURING DEFINITE LOCATIONS FROM THE ARCHITECT.

MOUNTING HEIGHTS:

1. UNLESS NOTED OTHERWISE, INSTALL WIRING DEVICES AS INDICATED BELOW (NOTE: ALL DIMENSIONS ARE TO THE CENTER OF THE OUTLET BOX UNLESS NOTED OTHERWISE).

MOUNTING HEIGHTS - RECEPTACLES:

1. VERTICALLY ALIGNED WITH THE GROUND SLOT MOUNTED AT THE TOP, 18 INCHES ABOVE FINISHED FLOOR.
2. HORIZONTALLY ALIGNED, WITH NEUTRAL SLOT MOUNTED AT THE TOP, 18 INCHES ABOVE FINISHED FLOOR.
3. FOR 36 - INCH HIGH COUNTER TOPS: 48 INCHES ABOVE FINISHED FLOOR, VERTICALLY ALIGNED.
4. FOR 34 - INCH HIGH COUNTER TOPS: 44 INCHES ABOVE FINISHED FLOOR, VERTICALLY ALIGNED.
5. MECHANICAL AND ELECTRICAL EQUIPMENT ROOMS AND JANITORS CLOSETS: 44 INCHES ABOVE FINISHED FLOOR, VERTICALLY ALIGNED.
6. WEATHERPROOF EXTERIOR RECEPTACLES: 48 INCHES ABOVE FINISHED GRADE, VERTICALLY ALIGNED.
7. 600V RECEPTACLES: SAME AS GENERAL RECEPTACLES.
8. ISOLATED GROUND RECEPTACLES: SAME AS GENERAL.

9. CONCRETE BLOCK WALLS: DIMENSIONS ABOVE MAY BE ADJUSTED SLIGHTLY, AS REQUIRED TO COMPENSATE FOR VARIABLE JOINT DIMENSIONS, SUCH THAT BOTTOM OF TOP BOXES AS APPLICABLE, ARE AT BLOCK JOINTS.

MOUNTING HEIGHTS - SWITCHES:

1. GENERAL: 44 INCHES ABOVE FINISHED FLOOR.
2. ABOVE COUNTERS: SAME AS FOR RECEPTACLES.
3. CONCRETE BLOCK WALLS: 40 INCHES ABOVE FINISHED FLOOR (DIMENSION MAY BE ADJUSTED SLIGHTLY, AS REQUIRED TO COMPENSATE FOR VARIABLE JOINT DIMENSIONS, SUCH THAT BOTTOM OF BOXES ARE AT BLOCK JOINTS).
4. WALLS WITH MAINSCOTING: 6 INCHES MINIMUM ABOVE MAINSCOTING, BUT NOT EXCEEDING 48 INCHES ABOVE FINISHED FLOOR.

MOUNTING HEIGHTS - MULTI-OUTLET ASSEMBLIES:

1. 6 INCHES ABOVE COUNTER TOP.

MOUNTING HEIGHTS - TELEPHONE/DATA OUTLET BOXES:

1. GENERAL: MATCH MOUNTING HEIGHT OF ADJACENT WIRING DEVICE LISTED ABOVE.
2. WALL-MOUNTED TELEPHONE: 52 INCHES ABOVE FINISHED FLOOR.

WIRING DEVICES:

1. THE CATALOG NUMBERS LISTED FOR WIRING DEVICES ARE GENERALLY FOR 20A RATED DEVICES. WHERE 15A RATED DEVICES ARE INDICATED ON THE DRAWINGS OR REQUIRED FOR CIRCUIT RATING LIMITATIONS, PROVIDE WIRING DEVICES EQUIVALENT TO THOSE SPECIFIED FOR 20A, BUT RATED FOR 15A.
2. ALL RECEPTACLES LOCATED OUTDOORS OR IN DAMP OR WET LOCATIONS, SHALL BE LISTED AS WEATHER RESISTANT, DESIGNATED BY A "WR" ON THE FACEPLATE.

3. PROVIDE THE FOLLOWING WIRING DEVICES WHERE SHOWN ON DRAWINGS OR REQUIRED, MINOR CHANGES RELATIVE TO THE LOCATION OR ELECTRICAL EQUIPMENT MAY BE MADE TO COMPLY WITH STRUCTURAL AND BUILDING REQUIREMENTS AS DETERMINED IN THE COURSE OF CONSTRUCTION. PROVIDE ALL WIRING DEVICES OF THE SAME MANUFACTURER AND NOT MIXED ON THE PROJECT, TO THE MAXIMUM EXTENT FEASIBLE. PROVIDE COLOR OF TOGGLES AND RECEPTACLES AS REQUESTED BY THE ENGINEER. REFER TO DETAIL SHOWING RECEPTACLES TABLE.

TYPE OF DEVICE	HUBBELL	PAGE 4 SEYMOUR	LEVITON	COOPER WIRING DEVICES
SIMPLEX RECP	NBL 5361	5361	5341	5351
DUPLEX RECP	CR 5352	5352	5352	5352
RED DUPLEX RECP	5362-R	23642-RED	5352	5352
GFCI RECP	6FS552	2041	6040/6540	X6F20
SAFETY / RECP (20A / 125V)	NBL830056	TR63	8300-5C	TR 8300
WR/GFCI RECP	6FR5362-TR	2045 TRWR	W7844-T	TRWRV 20
QUAD RECP	NBL 420	420	2124	N/A
SINGLE POLE SW	CS 1221	FS 20 AC1	1221-2	2221
DOUBLE POLE SW	CS 1222	FS 20 AC2	1222-2	2222
THREE-WAY SW	CS 1223	FS 20 AC3	1223-2	2223
FOUR-WAY SW	CS 1224	FS 20 AC4	1224-2	2224

SWITCH AND OUTLET COVER PLATES:

1. SWITCH AND OUTLET PLATES: COLORED, SMOOTH NYLON BY THE SAME MANUFACTURER AS THE WIRING DEVICES, WHEREVER POSSIBLE. VERIFY DESIRED MATERIALS AND COLORS WITH ENGINEER BEFORE INSTALLATION. SWITCH PLATES IN UNFINISHED ROOMS AND SPACES: STAMPED STEEL, CADMIUM PLATED. INSTALL GROUPS OF SWITCHES UNDER ONE HUNGED PLATE, USUALLY HORIZONTALLY, OR WHERE REQUIRED BY DETAILS, VERTICALLY. SET ALL COVER PLATES PLUMB, PARALLEL, AND FINISHED FLUSH WITH THE WALL.

WEATHERPROOF COVER PLATES:

1. PROVIDE GFCI RECEPTACLES FOR DESIGNATED WEATHERPROOF RECEPTACLES, UNLESS INDICATED OTHERWISE ON THE DRAWINGS.
2. FOR EXTERIOR UNATTENDED, NET LOCATIONS OR OTHER LOCATIONS AS INDICATED, IN-USE NEMA 3R RECESSED OR FLUSH MOUNT, UL-LABELED PLATES MOLDED FROM A CLEAR HIGH IMPACT ULTRAVIOLET STABILIZED POLYCARBONATE MATERIAL FOR EASY VERIFICATION THAT CORDS ARE PLUGGED IN AND THAT THE GFCI IS FUNCTIONING. BACK BOX MUST BE SUITABLE FOR CONDUIT CONNECTING. COORDINATE BACK BOX WITH WALL DEPTH. INTERMATIC WPCOORC/RRC OR EQUAL.

3. FOR ATTENDED NET OR DAMP LOCATIONS, WEATHERPROOF COVER PLATES UL-LISTED FOR NET LOCATIONS WITH COVERS (S) CLOSED, DIE-CAST ALUMINUM OR TYPE 302 STAINLESS STEEL, SINGLE-COVER FOR SWITCHES AND VERTICALLY MOUNTED RECEPTACLES, DOUBLE-COVER FOR HORIZONTALLY MOUNTED RECEPTACLES, SELF-CLOSING COVERS.

4. COVER PLATES: BY THE SAME MANUFACTURER AS THE WIRING DEVICES; COMPLYING WITH NFPA 70 405.9 (A) OR (B) REQUIREMENTS FOR ATTENDED OR UNATTENDED USE AS APPLICABLE.

MRA

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