

ELECTRICAL SPECIFICATIONS

SECTION 16010 – GENERAL PROVISIONS

PART 1 – GENERAL

1.1 CODES AND STANDARDS – THE LATEST EFFECTIVE PUBLICATIONS OF ALL APPLICABLE STANDARDS, CODES, ETC., AS THEY APPLY, FORM PART OF THESE SPECIFICATIONS AS IF WERE WRITTEN FULLY HEREIN AND CONSTITUTE MINIMUM REQUIREMENTS. THE FOLLOWING WILL BE REFERRED TO THROUGHOUT IN ABBREVIATED FORMS.

- A. NATIONAL ELECTRICAL CODE, (NFPA 70) (NEC).
- B. INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE).
- C. RULES AND REGULATIONS OF LOCAL ELECTRICAL UTILITY COMPANY.
- D. NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA).
- E. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI).
- F. APPLICABLE LOCAL CODES.
- G. UNDERWRITER'S LABORATORIES, INC. (UL).
- H. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA).

1.2 SCOPE OF WORK – PROVIDE ALL WORK REQUIRED FOR THIS DIVISION INCLUDING ALL LABOR, MATERIALS, EQUIPMENT, APPURTENANCES AND SERVICES TO PROVIDE COMPLETE ELECTRICAL SYSTEMS AS SHOWN ON THE DRAWINGS AND SPECIFIED IN THIS DIVISION OF THE SPECIFICATIONS. THE WORD "PROVIDE" SHALL MEAN "FURNISH AND INSTALL COMPLETE AND READY FOR USE".

1.3 THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO BID TO DETERMINE THE EXTENT OF THE WORK. LACK OF KNOWLEDGE OF EXISTING CONDITIONS WILL NOT BE CONSIDERED A BASIS FOR CHANGE ORDERS. PRIOR TO ORDERING EQUIPMENT, VERIFY THAT EQUIPMENT TO BE PROVIDED UNDER THIS CONTRACT IS ACCEPTABLE AND CAN FIT INTO BLDG. AND ROOM. EXPENSE INCURRED BY THE CONTRACTOR, WHICH IN THE ENGINEER'S OPINION COULD HAVE BEEN AVOIDED BY THIS STEP, SHALL NOT BE A BASIS FOR CHANGE ORDERS.

1.4 DRAWINGS AND SPECIFICATIONS – THE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT, CHARACTER AND ARRANGEMENT OF EQUIPMENT, FIXTURES AND CONDUIT AND WIRING SYSTEMS. IT IS THE INTENTION OF THESE SPECIFICATIONS AND DRAWINGS TO FULLY COVER ALL WORK AND MATERIALS FOR A COMPLETE, FIRST-CLASS ELECTRICAL INSTALLATION, AND ANY DEVICES SUCH AS PULL BOXES AND DISCONNECT SWITCHES, USUALLY EMPLOYED IN THIS CLASS OF WORK, THOUGH NOT SPECIFICALLY MENTIONED OR SHOWN ON THE DRAWINGS OR IN THIS SPECIFICATION, BUT WHICH MAY BE NECESSARY FOR THE SATISFACTORY COMPLETION OF THE WORK, SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR AS A PART OF HIS TOTAL WORK UNDER THIS DIVISION. CONSULT THE SPECIFICATIONS AND DRAWINGS OF ALL OTHER TRADES AND PERFORM ALL ELECTRICAL WORK REQUIRED THEREIN. COOPERATE WITH ALL OTHER CONTRACTORS OR SUBCONTRACTORS TO FURNISH COMPLETE WORKABLE SYSTEMS.

1.5 DURING CONSTRUCTION, KEEP AN ACCURATE RECORD OF ALL DEVIATIONS BETWEEN THE WORK AS SHOWN ON THE CONTRACT DRAWINGS AND THAT WHICH IS ACTUALLY INSTALLED ON A SET OF BLUE LINE PRINTS OF THE ELECTRICAL DRAWINGS, AND NOTE CHANGES THEREON WITH RED MARKS, IN A NEAT AND ACCURATE MANNER. WHEN ALL REVISIONS HAVE BEEN SHOWN ON THESE PRINTS TO INDICATE THE WORK AS FINALLY INSTALLED, THE PRINTS SHALL BE DELIVERED TO THE ENGINEER, BEFORE FINAL PAYMENT.

1.6 PERMITS, INSPECTION AND TESTS – THE RIGHT IS RESERVED TO INSPECT AND TEST ANY PORTION OF THE INSTALLATION/EQUIPMENT DURING THE PROGRESS OF ITS ERECTION. THIS CONTRACTOR SHALL TEST ALL WIRING FOR CONTINUITY AND GROUNDS BEFORE CONNECTING ANY FIXTURES OR DEVICES. THIS CONTRACTOR SHALL TEST THE ENTIRE SYSTEM WHEN THE WORK IS FINALLY COMPLETED TO INSURE THAT ALL PORTIONS ARE FREE FROM SHORT CIRCUITS AND GROUNDS.

1.7 SECURE AND PAY FOR ALL REQUIRED PERMITS AND INSPECTIONS. INSPECTION CERTIFICATES FROM LOCAL AUTHORITIES HAVING JURISDICTION SHALL BE DELIVERED TO THE OWNER BEFORE FINAL PAYMENT.

1.8 SUBMITTALS – SUBMIT SHOP DRAWINGS, PRODUCT DATA AND SAMPLES WITHIN THIRTY (30) DAYS OF AWARD OF CONTRACT AND IN ACCORDANCE WITH THE GENERAL CONDITIONS AND SUPPLEMENTARY CONDITIONS. SUBMITTALS ARE REQUIRED FOR ALL ITEMS PROVIDED UNDER THIS SPECIFICATION. REVIEW OF SUBMITTALS BY THE ENGINEER AND ANY ASSOCIATED ACTION TAKEN BY THE ENGINEER DOES NOT RELIEVE THE CONTRACTOR OF ANY REQUIREMENTS SET FORTH BY THE CONTRACT DOCUMENTS.

PART 2 – PRODUCTS

2.1 MANUFACTURING STANDARDS – MATERIALS SHALL BE NEW AND APPROVED AND LABELED BY UL WHEREVER STANDARDS HAVE BEEN ESTABLISHED BY THAT AGENCY. DEFECTIVE EQUIPMENT OR EQUIPMENT DAMAGED IN THE COURSE OF INSTALLATION OR TEST SHALL BE REPLACED OR REPAIRED IN A MANNER MEETING THE APPROVAL OF THE OWNER. ALL ITEMS OF THE SAME TYPE AND RATING SHALL BE IDENTICAL.

2.2 TRADE NAMES – UNLESS SPECIFICALLY IDENTIFIED OTHERWISE, MANUFACTURER'S NAMES AND CATALOG NUMBERS INDICATED HEREIN AND ON THE DRAWINGS ARE NOT INTENDED TO BE PROPRIETARY DESIGNATIONS. THEY ARE TO INDICATE GENERAL TYPE AND QUALITY OF MATERIALS AND EQUIPMENT REQUIRED. EQUIPMENT AND MATERIALS BY OTHER MANUFACTURERS WHICH IN THE OPINION OF THE ENGINEER ARE OF EQUAL QUALITY AND WHICH WILL PRODUCE THE SAME RESULTS WILL BE CONSIDERED ACCEPTABLE.

2.3 MOTORS – MOTORS SHALL HAVE DISCONNECTING MEANS AND CONTROLLERS. CONTROLLERS SHALL HAVE THERMAL OVERLOAD PROTECTION. ALL THREE PHASE MOTORS SHALL BE PROTECTED BY PHASE OUTAGE PROTECTION RELAYS PROVIDED UNDER THIS DIVISION.

2.4 DISCONNECT SWITCHES AND POWER WIRING UP TO AND INCLUDING MOTOR CONNECTIONS FOR ALL EQUIPMENT PROVIDED UNDER OTHER DIVISIONS OF THIS SPECIFICATION SHALL BE INCLUDED IN THIS DIVISION. WHERE MANUAL MOTOR CONTROL SWITCHES FOR SINGLE PHASE MOTORS ARE INDICATED, THEY SHALL BE PROVIDED AND WIRED COMPLETE UNDER THIS DIVISION. MOTOR CONTROLLERS AND MOTOR STARTERS FURNISHED UNDER OTHER DIVISIONS SHALL BE SET IN PLACE AND CONNECTED TO SOURCE AND LOAD UNDER THIS DIVISION. IN GENERAL, MOTORS WILL BE PROVIDED WITH THE EQUIPMENT THEY DRIVE AND ARE NOT PART OF THIS WORK UNDER THIS DIVISION, EXCEPT THAT THEY SHALL BE CONNECTED HEREUNDER.

2.5 OBTAIN APPROVED SHOP DRAWINGS SHOWING WIRING DIAGRAMS, CONNECTION DIAGRAMS, ROUGHING-IN AND HOOKUP DETAILS, FROM OTHER INVOLVED CONTRACTORS FOR ALL EQUIPMENT AND COMPLY THEREWITH.

2.6 CONTROL, INTERLOCK, AND INTERNAL EQUIPMENT WIRING REGARDLESS OF VOLTAGE WILL BE PROVIDED UNDER THE RESPECTIVE DIVISION WHERE THE EQUIPMENT IS SHOWN UNLESS SPECIFICALLY SHOWN HERE.

2.7 ELECTRICAL SERVICE – A RENOVATED BUILDING ELECTRICAL SERVICE SHALL BE PROVIDED AS INDICATED AND IN ACCORDANCE WITH THE LATEST REQUIREMENTS OF THE POWER COMPANY.

2.8 GROUNDING – THE ENTIRE ELECTRICAL SYSTEM, INCLUDING EQUIPMENT FRAMES, CONDUIT, SWITCHES, CONTROLLERS, WIREWAYS, NEUTRAL CONDUCTORS, AND ALL OTHER SUCH EQUIPMENT SHALL BE PERMANENTLY AND EFFECTIVELY GROUNDED IN ACCORDANCE WITH THE NEC. GROUND RODS SHALL BE COPPER CLAD STEEL, 3/4" DIAMETER BY 10'-0" LONG. GROUNDING OF EACH TRANSFORMER SECONDARY SHALL BE PROVIDED AND EACH SHALL BE CONSIDERED AS A SEPARATE SERVICE GROUND. PROVIDE A SEPARATE GROUND CONDUCTOR IN ALL BRANCH CIRCUIT CONDUITS SIZED IN ACCORDANCE WITH THE NEC.

2.9 SCHEDULE OF WORK – THE SCHEDULE OF THE ELECTRICAL WORK SHALL BE ARRANGED TO SUIT THE PROGRESS OF WORK BY THE OTHER TRADES AND SHALL IN NO WAY RETARD PROGRESS OF CONSTRUCTION OF THE PROJECT.

2.10 WORK UNDER THIS DIVISION SHALL PROCEED IN ADVANCE OF THE WORK OF OTHERS WHENEVER POSSIBLE, ELIMINATING ALL CUTTING AND PATCHING. WHEN SUCH PROCEDURE IS IMPOSSIBLE, CUTTING AND PATCHING SHALL BE DONE IN AN APPROVED MANNER. CUTTING SHALL NOT ENDANGER STRUCTURAL INTEGRITY IN ANY WAY. PATCHING SHALL EXACTLY MATCH CONTIGUOUS WORK. ACTUAL WORK OF CUTTING AND PATCHING OF EXISTING SURFACES SHALL BE PERFORMED BY THE SUBCONTRACTOR WHO ORIGINALLY PREPARED THESE SURFACES, E.G., CUTTING AND PATCHING OF MASONRY WALL WILL BE PERFORMED BY THE MASONRY SUBCONTRACTOR. COSTS OF SUCH CUTTING AND PATCHING SHALL BE BORNE BY THE ELECTRICAL SUBCONTRACTOR. CUTTING SHALL BE CAREFULLY DONE AND DAMAGE TO BUILDING, PIPING, WIRING OR EQUIPMENT AS A RESULT OF CUTTING SHALL BE REPAIRED BY SKILLED MECHANICS OF TRADE INVOLVED.

2.11 STORAGE AND MATERIALS – SPACE WILL BE ASSIGNED TO THE CONTRACTOR BY THE OWNER FOR THE STORAGE OF MATERIALS. THIS CONTRACTOR WILL BE RESPONSIBLE FOR THE PROTECTION AND SAFEKEEPING OF

MATERIALS, TOOLS, AND EQUIPMENT. ALL MATERIALS AND EQUIPMENT SHALL BE KEPT IN ITS ASSIGNED PLACE UNTIL THE TIME OF ITS INSTALLATION. EXCESS MATERIALS, DIRT AND REFUSE SHALL BE PROMPTLY REMOVED FROM THE WORK SITE.

2.12 LABELING OF EQUIPMENT

A. ALL PANELBOARDS, CABINETS, SAFETY SWITCHES, MOTOR DISCONNECT SWITCHES, AND MOTOR CONTROLLERS SHALL BE IDENTIFIED BY MACHINE ENGRAVED LAMINATED PLASTIC DESIGNATION PLATES PERMANENTLY ATTACHED THERETO WITH SELF-TAPPING SCREWS OR RIVETS. ALL COMPONENT PARTS OF EACH ITEM OF EQUIPMENT OR DEVICE SHALL BEAR THE MANUFACTURER'S NAMEPLATE, GIVING NAME OF MANUFACTURER, DESCRIPTION, SIZE, TYPE, SERIAL AND MODEL NUMBER AND ELECTRICAL CHARACTERISTICS IN ORDER TO FACILITATE MAINTENANCE OR REPLACEMENT.

B. ALL SWITCHBOARDS, PANELBOARDS, INDUSTRIAL CONTROL PANELS, AND MOTOR CONTROL CENTERS SHALL BE FIELD MARKED TO WARN PERSONNEL OF THE POTENTIAL FOR ARC FLASH. LABELS SHALL STATE "WARNING – ARC FLASH AND SHOCK HAZARD APPROPRIATE PPE REQUIRED".

2.13 COORDINATION – COOPERATE AND COORDINATE EFFORTS WITH ALL CONTRACTORS ON THE PROJECT. THIS IS ESPECIALLY IMPORTANT IN DETERMINING EXACT LOCATIONS OF ALL SWITCHES, RECEPTACLES AND LIGHTING FIXTURES. ARRANGE LIGHTING FIXTURES IN ACCORDANCE WITH THE ARCHITECTURAL REFLECTED CEILING PLANS UNLESS OTHERWISE INDICATED. COORDINATE LIGHTING FIXTURE LOCATIONS WITH GRILLES, DIFFUSERS, ACCESS PANELS, ETC. VERIFY CEILING AND WALL CONSTRUCTION AND MATERIAL PRIOR TO ORDERING LIGHTING FIXTURES OR OTHER DEVICES TO ENSURE PROPER FIXTURE OR DEVICE IS FURNISHED TO MATCH CONSTRUCTION. THIS VERIFICATION MUST BE EXECUTED REGARDLESS OF INFORMATION PLACED ON THE DRAWINGS. ANY COST INCURRED WHICH IN THE OPINION OF THE OWNER, COULD HAVE BEEN AVOIDED BY THIS STEP SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR.

2.14 GUARANTEE OF WORK – CONTRACTOR GUARANTEES BY HIS ACCEPTANCE OF THE CONTRACT THAT ALL WORK INSTALLED IS FREE FROM ANY AND ALL DEFECTS IN WORKMANSHIP AND/OR MATERIALS, AND THAT THE APPARATUS WILL DEVELOP CAPACITIES AND CHARACTERISTICS SPECIFIED, AND THAT IF, DURING THE PERIOD OF ONE YEAR OR AS OTHERWISE SPECIFIED, FROM DATE OF CERTIFICATE OF COMPLETION AND ACCEPTANCE OF THE WORK ANY SUCH DEFECTS IN WORKMANSHIP, MATERIAL OR PERFORMANCE APPEAR, HE WILL, WITHOUT COST TO THE OWNER, REMEDY SUCH DEFECTS WITHIN A REASONABLE TIME TO BE SPECIFIED IN NOTICE. IN DEFAULT THEREOF, THE OWNER MAY HAVE SUCH WORK DONE AND CHARGE COST TO CONTRACTOR. EQUIPMENT GUARANTEES FROM DATE OF "START-UP" WILL NOT BE RECOGNIZED.

SECTION 16210 – RACEWAY, FITTINGS AND BOXES

A. RACEWAYS – CONDUIT SHALL BE HOT-DIPPED, ZINC COATED OR SHERARIZED RIGID STEEL (RS), ELECTRICAL METALLIC TUBING (EMT).

B. FLEXIBLE CONDUIT SHALL BE GALVANIZED, CONTINUOUS SPIRAL, SINGLE STRIP TYPE. FLEXIBLE CONDUIT SHALL BE COVERED WITH PVC JACKET IN WET OR DAMP LOCATIONS. PROVIDE SUITABLE FITTINGS WITH GROUND CONNECTOR.

C. FITTINGS – ALL CONDUIT ENTERING OR LEAVING OUTLET, JUNCTION OR PULL BOXES, AND CABINETS AND ALL CONDUIT STUBS SHALL HAVE BUSHINGS. PROVIDE INSULATING BUSHINGS WHERE REQUIRED BY NEC. PROVIDE EXPANSION FITTINGS WITH BONDING JUMPER WHERE CONDUITS CROSS EXPANSION JOINTS.

1. FITTINGS FOR RS SHALL BE THREADED TYPE.

2. FITTINGS FOR EMT SHALL BE THREADLESS, APPROVED FOR THE CONDITIONS ENCOUNTERED AND MAY BE CAST SETSCREW TYPE OR COMPRESSION TYPE.

D. OUTLET BOXES AND JUNCTION BOXES – OUTLET BOXES SHALL BE PRESSED STEEL, ELECTRO-GALVANIZED OR CADMIUM PLATED WITH CLEAN CUT, EASILY REMOVABLE KNOCKOUTS. EXCEPT AS NOTED HEREINAFTER MINIMUM SIZE OUTLET BOX SHALL BE 4" SQUARE, 1 1/2" DEEP, AND SHALL BE INCREASED IN DIMENSIONS TO ACCOMMODATE CONDUCTORS, CONDUITS, AND DEVICES AS REQUIRED BY THE NEC. SMALLER BOXES MAY BE USED WHERE REQUIRED BY STRUCTURAL CONDITIONS. PROVIDE SUITABLE PLASTER-RINGS TO MATCH WALL CONSTRUCTION AND DEVICE. CEILING AND BRACKET OUTLET BOXES SHALL BE NOT LESS THAN 4" OCTAGONAL, 1 1/2" DEEP EXCEPT THAT SMALLER BOXES MAY BE USED WHERE REQUIRED BY PARTICULAR FIXTURE TO BE INSTALLED.

E. JUNCTION OR PULL BOXES NOT OVER 100 CUBIC INCHES IN VOLUME SHALL BE STANDARD OUTLET BOXES. JUNCTION BOXES OVER 100 CUBIC INCHES IN VOLUME SHALL BE CONSTRUCTED OF CODE GAUGE, GALVANIZED SHEET STEEL. JUNCTION BOXES SHALL HAVE REMOVABLE COVERS AND SHALL BE ACCESSIBLE AFTER COMPLETION OF WORK.

F. RACEWAY AND FITTING INSTALLATION – RUN CONDUITS CONCEALED WITHIN FINISHED WALLS, CEILINGS AND FLOORS. CONDUITS MAY BE RUN EXPOSED IN MECHANICAL ROOMS AND SPACES WITH EXPOSED CONSTRUCTION. CONDUIT SHALL BE SUPPORTED AT INTERVALS OF NOT MORE THAN 8'. RUN EXPOSED CONDUIT PARALLEL OR PERPENDICULAR TO WALLS, STRUCTURAL MEMBERS, OR INTERSECTIONS OF VERTICAL PLANES AND CEILING. CONDUIT LARGER THAN 1" NOMINAL DIAMETER SHOWN IN FLOOR SLAB SHALL BE RUN UNDER THE SLAB. CONDUIT 1" AND SMALLER MAY BE RUN IN THE FLOOR SLAB WHERE PRACTICABLE.

G. SUPPORT CONDUITS BY PIPE STRAPS, WALL BRACKETS, STRAP HANGERS, OR CEILING TRAPEZE.

H. CONDUIT RUN OUTSIDE OF BUILDING SHALL BE BURIED A MINIMUM OF 24" BELOW FINISHED GRADE.

I. DO NOT INSTALL EMT OUTDOORS, OR UNDERGROUND, OR ENCASED IN CONCRETE, OR IN HAZARDOUS AREAS, OR IN AREAS SUBJECT TO SEVERE PHYSICAL DAMAGE.

J. CONDUIT RUN UNDERGROUND, UNDER SLAB, OR WITHIN CONCRETE ENCASEMENT MAY BE POLYVINYL CHLORIDE (PVC) OR RS OR IMC CONDUIT PROTECTED WITH 2 COATS OF BITUMASTIC PAINT. CONVERT PVC TO RS OR IMC BEFORE RISING THROUGH FLOOR SLAB OR RISING OUT OF SOIL. CONDUIT RUN BENEATH SLAB SHALL BE PROPERLY SUSPENDED FROM SLAB SUCH THAT SUB-SLAB SETTLEMENT WILL NOT ADVERSELY AFFECT ELECTRICAL SYSTEM.

K. SLEEVES – ALL ELECTRICAL SYSTEM CONDUIT SHALL HAVE SLEEVES WHERE CONDUIT PASSES THROUGH CONCRETE SLABS EXCEPT CONCRETE SLABS IN CONTACT WITH GRADE. ALL CONDUIT 1 1/4 INCH AND LARGER RUNNING CONCEALED ABOVE CEILING SHALL HAVE SLEEVES WHERE THE CONDUIT PASSES THROUGH MASONRY, TILE AND GYPSUM WALL CONSTRUCTION. SLEEVES SHALL BE CONSTRUCTED OF GALVANIZED STEEL PIPE, SCHEDULE 40. PROVIDE ESCUTCHEON PLATES FOR ALL EXPOSED CONDUIT PASSING THROUGH WALLS, FLOORS AND CEILINGS. WHERE PLATES ARE PROVIDED FOR CONDUITS PASSING THROUGH SLEEVES, WHICH EXTEND ABOVE THE FLOOR SURFACE, PROVIDE DEEP RECESSED PLATES TO CONCEAL THE SLEEVES. TERMINATE SLEEVES FLUSH WITH WALL, PARTITIONS AND CEILINGS. IN AREAS WHERE CONDUITS ARE CONCEALED, AS IN CHASSES, TERMINATE SLEEVES FLUSH WITH FLOOR. IN FINISHED AREAS, WHERE CONDUITS ARE EXPOSED, EXTEND SLEEVES 1/2 INCH ABOVE FINISHED FLOOR, EXCEPT IN ROOMS HAVING FLOOR DRAINS EXTEND SLEEVES 1 INCH ABOVE FLOOR. FASTEN SLEEVES SECURELY IN FLOORS, WALLS, SO THAT THEY WILL NOT BECOME DISPLACED WHEN CONCRETE IS POURED OR WHEN OTHER CONSTRUCTION IS BUILT AROUND THEM. WHERE SLEEVES PASS THROUGH FLOORS OR FIRE RATED WALLS PROVIDE PROPER SEALANT AROUND CONDUIT TO MAINTAIN FIRE RATING.

SECTION 16220 – CONDUCTORS

A. CONDUCTORS AND INSULATION – WIRE AND CABLE SHALL BE SOFT DRAWN, ANNEALED COPPER WITH 600 VOLT COLOR CODED INSULATION. MINIMUM WIRE SIZE SHALL BE #12 AWG. INSULATION FOR CONDUCTOR SIZES #12 AND #10 SHALL BE TYPE THW OR RHW FOR INSTALLATION IN ORDINARY DRY LOCATIONS AND TYPE THWN FOR INSTALLATION IN WET LOCATIONS. WET LOCATIONS WILL INCLUDE SERVICE CONDUITS, CONDUIT UNDERGROUND, RACEWAYS INSTALLED IN CONCRETE FLOOR SLABS IN DIRECT CONTACT WITH THE EARTH AND RACEWAYS REGULARLY SUBJECT TO MOISTURE OR CONDENSATION. CONDUCTOR SIZES LARGER THAN #10 SHALL HAVE TYPE XHHW-2 INSULATION. CONDUCTORS NO. 8 AWG AND LARGER DIAMETER SHALL BE STRANDED. CONDUCTORS NO. 10 AWG AND SMALLER DIAMETER SHALL BE SOLID, EXCEPT THAT CONDUCTORS FOR REMOTE-CONTROL AND SIGNAL CIRCUITS, CLASSES 1, 2, AND 3, MAY BE STRANDED.

B. BRANCH CIRCUIT CONDUCTORS IN FLUORESCENT FIXTURE RACEWAYS AND DROPS TO SINGLE FLUORESCENT FIXTURES SHALL BE TYPE THHN OR XHHW.

C. PROVIDE A SEPARATE GROUND CONDUCTOR IN ALL RACEWAYS SIZED IN ACCORDANCE WITH THE NEC.

D. JOINTS AND TERMINATIONS – FOR CONDUCTORS #12 AND #10 ALL FIXTURE AND BRANCH CIRCUITS JOINTS IN JUNCTION AND OUTLET BOXES SHALL BE MADE WITH UL LISTED PRESSURE TYPE CONNECTORS RATED AT 600 VOLTS AND 105 DEGREES C. CONNECTORS SHALL BE IDEAL INDUSTRIES "WING-NUT" OR BUCHANAN "B-CAP", 3M "SCOTCH-LOK" CONNECTORS OR EQUAL. WIRE #8 AND LARGER SHALL BE JOINED OR TERMINATED WITH SOLDERLESS PRESSURE CONNECTORS PROPERLY TAPED IN LAYERS TO FORM A MOISTURE-TIGHT JOINT.

SECTION 16230 – WIRING DEVICES

A. WIRING DEVICES SHALL BE "SPECIFICATION GRADE" AS MANUFACTURED BY GENERAL ELECTRIC, SLATER (MEDALIST), ARROW-HART, BRYANT, HUBBELL OR PASS & SEYMOUR.

B. LOCAL SWITCHES SHALL BE SINGLE POLE, DOUBLE POLE, THREE WAY AND FOUR WAY AS SHOWN ON THE DRAWINGS, BLACK PLASTIC CLIP WITH RED PLASTIC COVER AND IVORY PLASTIC HANDLE, BACK OR SIDE WIRED, 20 AMPERE, 120_277 VOLTS.

C. DUPLEX CONVENIENCE RECEPTACLES SHALL BE IVORY PLASTIC, 20 AMPERE, 125 VOLTS, 2 POLE, 3 WIRE NEMA AND ASA STANDARD, GROUNDING TYPE.

D. WEATHERPROOF RECEPTACLES SHALL BE IN CAST METAL BOX WITH GASKETED, WEATHERPROOF, CAST-METAL COVER PLATE AND GASKETED CAP OVER EACH RECEPTACLE OPENING. CAPS SHALL BE PROVIDED WITH A SPRING-HINGED FLAP.

E. GROUND FAULT CIRCUIT INTERRUPTING RECEPTACLES SHALL CONFORM TO NEC, SHALL BE UL LISTED, BROWN PLASTIC, SHALL HAVE A "PUSH-TO-TEST" BUTTON AND VISIBLE INDICATION OF A TRIPPED CONDITION.

F. DEVICE PLATES ON UNFINISHED WALLS AND ON FITTINGS, SHALL BE ZINC-COATED SHEET STEEL HAVING ROUNDED OR BEVELED EDGES. ON FINISHED WALLS, PLATES SHALL BE SATIN FINISHED TYPE 302, ALLOY 18-8 STAINLESS STEEL WITH BEVELED EDGES.

SECTION 16250 – SAFETY SWITCHES

A. SAFETY SWITCHES – SAFETY SWITCHES SHALL BE RATED AT 240 VOLTS WITH NUMBER OF POLES AND CURRENT RATING AS INDICATED. SWITCHES SHALL BE FUSED OR NON-FUSED TYPE AS INDICATED, NEMA TYPE HD, WITH FULL COVER INTERLOCKS AND QUICK-MAKE, QUICK-BREAK MECHANISM.

SECTION 16310 – PANELBOARDS

A. PANELBOARDS – PANELBOARDS SHALL BE DEAD-FRONT, CIRCUIT BREAKER EQUIPPED WITH TRIP RATINGS AND FRAME SIZES AS SHOWN ON THE DRAWINGS. ALL CURRENT-CARRYING PARTS OF THE BUS ASSEMBLY SHALL BE PLATED.

B. EACH PANELBOARD SHALL BE PROVIDED WITH A HINGED COVER WITH A FLUSH LATCH AND LOCK WITH TWO KEYS AND KEYS THE SAME AS ALL OTHER PANELBOARDS. EACH PANEL SHALL BE EQUIPPED WITH TYPED WRITTEN DIRECTORY CARD, CARD HOLDER, TRANSPARENT PROTECTION AND COMPLETE IDENTIFYING DATA ON INSIDE OF DOOR.

C. EACH PANEL SHALL BE EQUIPPED WITH TYPED WRITTEN DIRECTORY CARD, CARD HOLDER, TRANSPARENT PROTECTION AND COMPLETE IDENTIFYING DATA ON INSIDE OF DOOR.

D. PANELBOARDS SHALL BE EQUAL TO SQUARE-D, TYPE NOOD, NF, OR I-LINE (HCN, HCM, HCP, HCW, HCWM, HCP-SU, HCR-U), OR EQUAL PRODUCTS BY CUTLER HAMMER, SIEMENS, OR G.E.

SECTION 16323 – MOTORS AND MOTOR CONTROL

A. MOTORS: MOTORS SHALL COMPLY WITH ALL APPLICABLE NEMA AND UL REQUIREMENTS. DETERMINE SPECIFIC MOTOR CHARACTERISTICS AND PROVIDE CORRECTLY SIZED STARTERS AND OVERLOAD HEATERS.

B. MOTOR SIZES: PROVIDE SIZE FOR DUTY TO BE PERFORMED, NOT EXCEEDING THE FULL-LOAD NAMEPLATE CURRENT RATING WHEN DRIVEN EQUIPMENT IS OPERATED AT SPECIFIED CAPACITY UNDER MOST SEVERE CONDITIONS LIKELY TO BE ENCOUNTERED. WHEN MOTOR SIZE PROVIDED DIFFERS FROM SIZE INDICATED OR SPECIFIED, MAKE ADJUSTMENTS TO WIRING, DISCONNECT DEVICES, AND BRANCH CIRCUIT PROTECTION TO ACCOMMODATE EQUIPMENT ACTUALLY PROVIDED.

C. MOTOR CONTROLLERS: MOTOR CONTROLLERS SHALL COMPLY WITH ALL APPLICABLE UL AND NEMA STANDARDS. CONTROLLERS SHALL HAVE THERMAL OVERLOAD PROTECTION IN EACH PHASE. MOTOR CONTROLLERS SHALL HAVE UNDERVOLTAGE PROTECTION. CONNECTIONS TO HAND-OFF-AUTO SELECTOR SWITCH SHALL BE SUCH THAT ONLY NORMAL AUTOMATIC REGULATORY CONTROL DEVICES ARE BYPASSED WHEN SWITCH IS IN "HAND" POSITION. SAFETY CONTROL DEVICES, SUCH AS LOW AND HIGH PRESSURE CUTOUTS, HIGH TEMPERATURE CUTOUTS, AND MOTOR OVERLOAD PROTECTIVE DEVICES, SHALL BE CONNECTED IN MOTOR CONTROL CIRCUIT IN "HAND" AND "AUTOMATIC" POSITIONS. CONTROL CIRCUIT CONNECTIONS TO HAND/OFF/AUTOMATIC SELECTOR SWITCH OR TO MORE THAN ONE AUTOMATIC REGULATORY CONTROL DEVICE SHALL BE MADE IN ACCORDANCE WITH INDICATED OR MANUFACTURER'S APPROVED WIRING DIAGRAM. OVERLOAD PROTECTIVE DEVICES SHALL PROVIDE ADEQUATE PROTECTION TO MOTOR WINDINGS; BE THERMAL INVERSE-TIME-LIMIT TYPE; AND INCLUDE MANUAL RESET-TYPE PUSHBUTTON ON OUTSIDE OF MOTOR CONTROLLER CASE.

D. MANUAL MOTOR STARTERS AND MOTOR RATED SWITCHES: PROVIDE NUMBER OF POLES INDICATED. PROVIDE MOTOR OVERLOAD PROTECTION WHEN SPECIFICALLY INDICATED ON THE DRAWINGS OR WHERE REQUIRED BY THE NEC AND IN CONJUNCTION WITH THE ACTUAL MOTOR TYPE PROVIDED. VOLTAGE AND AMPERAGE RATINGS SHALL BE COORDINATED WITH THE ACTUAL ELECTRICAL SYSTEMS AND MOTOR LOADS CONNECTED.

SECTION 16410 – LIGHTING FIXTURES

A. FIXTURES – FIXTURES SHALL BE AS INDICATED.

B. LAMPS – UNLESS OTHERWISE NOTED, LAMPS SHALL BE 130 VOLTS INSIDE FROSTED FOR INCANDESCENT AND ENERGY SAVING COOL WHITE RAPID START FOR FLUORESCENT.

C. BALLASTS – FLUORESCENT BALLASTS SHALL BE ETL AND UL APPROVED AND SHALL BE ENERGY SAVING ELECTRONIC TYPE COMPATIBLE WITH LAMPS SPECIFIED. FIXTURES SHALL BE DESIGNED FOR USE WITH THESE ELECTRONIC BALLASTS AND SHALL HAVE THERMAL CHARACTERISTICS THAT WILL MINIMIZE OPERATION OF BALLAST OVER-HEAT DEVICES UNDER ALL NORMALLY EXPECTED OPERATION CONDITIONS. BALLASTS SHALL HAVE A CLASS A SOUND RATING.

D. BALLASTS WHICH ARE NOT QUIET AND HUM-FREE WILL BE REJECTED AND SHALL BE REPLACED.

E. BALLASTS IN UNCONDITIONED SPACES OR OUTDOORS SHALL BE RATED FOR OPERATION IN HIGH OR LOW TEMPERATURE ENVIRONMENTS.

F. NO FIXTURES SHALL BE HUNG WITH ZIP-CLIPS.

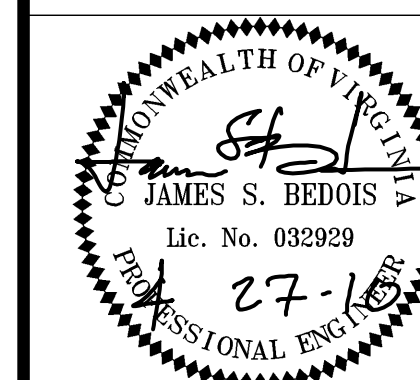
SECTION 16710 – TELEPHONE CONDUIT SYSTEMS

A. PROVIDE SYSTEM OF EMPTY CONDUIT AND EQUIPMENT CABINET FOR EXTENSION OF TELEPHONE SERVICE.

ELECTRICAL SPECIFICATIONS

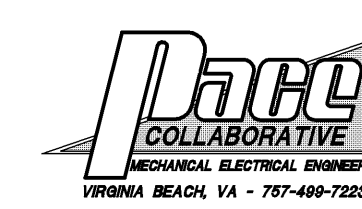
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