ELECTRICAL SPECIFICATIONS

SECTION 16050 – BASIC ELECTRICAL MATERIALS AND METHODS

GENERAL

MATERIALS AND INSTALLATION SHALL COMPLY WITH THE LATEST ADOPTED EDITION OF THE NATIONAL ELECTRICAL CODE, OTHER APPLICABLE NFPA SECTIONS, STATE AND LOCAL CODES, AND RECOGNIZED INDUSTRY STANDARDS AND PRACTICES.

LISTING AND LABELING: PROVIDE PRODUCTS THAT ARE UL LISTED AND LABELED.

NEMA COMPLIANCE: COMPLY WITH CONSTRUCTION AND INSTALLATION REQUIREMENTS OF APPLICABLE NEMA STANDARDS.

SUBMITTALS: SUBMIT PRODUCT DATA AND SHOP DRAWING ON THE FOLLOWING EQUIPMENT FOR APPROVAL:

WIRING DEVICES.
FIRE ALARM DEVICES.

MAINTAIN A SET OF REDLINED AS–BUILT DRAWINGS AND DELIVER TO OWNER UPON COMPLETION OF PROJECT.

PROTECT ADJACENT MATERIALS INDICATED TO REMAIN. INSTALL AND MAINTAIN DUST AND NOISE BARRIERS TO KEEP DIRT, DUST, AND NOISE FROM BEING TRANSMITTED TO ADJACENT AREAS. REMOVE PROTECTION AND BARRIERS AFTER DEMOLITION OPERATIONS ARE COMPLETE.

LOCATE, IDENTIFY, AND PROTECT ELECTRICAL SERVICES WITHIN OR PASSING THROUGH DEMOLITION AREA AND SERVING OTHER AREAS OUTSIDE THE DEMOLITION LIMITS. MAINTAIN SERVICES TO AREAS OUTSIDE DEMOLITION LIMITS. WHEN SERVICES MUST BE INTERRUPTED, INSTALL TEMPORARY SERVICES FOR AFFECTED AREAS. COORDINATE POWER INTERRUPTIONS ONE WEEK IN ADVANCE WITH OWNER. IF POWER INTERRUPTIONS DISTURB NORMAL OPERATIONS, THEN POWER INTERRUPTIONS ARE ONLY ALLOWED DURING NON–BUSINESS OR NON–OPERATION HOURS.

SELECTIVE DEMOLITION: DEMOLISH, REMOVE, DEMOUNT, AND DISCONNECT ABANDONED ELECTRICAL MATERIALS AND EQUIPMENT INDICATED TO BE REMOVED. SALVAGE AND DELIVER TO OWNER ITEMS INDICATED TO BE SALVAGED, OTHERWISE, REMOVE FROM SITE AND LEGALLY DISPOSE OF ALL DEMOLISHED ITEMS.

PATCH AND REPAIR SURFACES THAT ARE DISTURBED OR DAMAGED AS A RESULT OF ELECTRICAL INSTALLATION. RESTORE SURFACES TO ORIGINAL CONDITION.

INSTALLATION OF FIRE–STOPPING SEALANT: INSTALL UL–LISTED SEALANT, INCLUDING FORMING, PACKING, AND OTHER ACCESSORY MATERIALS, TO FILL OPENINGS AROUND ELECTRICAL SERVICES PENETRATING FLOORS AND WALLS, TO PROVIDE FIRE–STOPS WITH FIRE–RESISTANCE RATINGS INDICATED FOR FLOOR OR WALL ASSEMBLY IN WHICH PENETRATION OCCURS. COMPLY WITH INSTALLATION REQUIREMENTS ESTABLISHED BY TESTING AND INSPECTING AGENCY.

SECTION 16100 – RACEWAYS, BOXES, AND CABINETS

PRODUCTS

RIGID STEEL CONDUIT: ANSI C80.1.

INTERMEDIATE METAL CONDUIT: ANSI C80.6.

ELECTRICAL METALLIC TUBING AND FITTINGS: ANSI C80.3 WITH SET–SCREW OR COMPRESSION–TYPE FITTINGS. CAST FITTINGS ARE NOT ALLOWED.

FLEXIBLE METAL CONDUIT: ZINC–COATED STEEL.

LIQUIDTIGHT FLEXIBLE METAL CONDUIT: FLEXIBLE STEEL CONDUIT WITH PVC JACKET.

FITTINGS: NEMA FB 1, COMPATIBLE WITH CONDUIT/TUBING MATERIALS AND SUITABLE FOR USE AND LOCATION.

SHEET METAL BOXES: NEMA OS 1.

EXECUTION

OUTDOORS WIRING METHODS: USE THE FOLLOWING WIRING METHODS:

EXPOSED: RIGID OR INTERMEDIATE METAL CONDUIT.
CONCEALED: RIGID OR INTERMEDIATE METAL CONDUIT.
CONNECTION TO VIBRATING EQUIPMENT (INCLUDING MOTOR–DRIVEN EQUIPMENT): LIQUIDTIGHT FLEXIBLE METAL CONDUIT.
BOXES AND ENCLOSURES: NEMA TYPE 3R OR TYPE 4.

INDOORS WIRING METHODS: USE THE FOLLOWING WIRING METHODS:

CONNECTION TO VIBRATING EQUIPMENT, INCLUDING MOTOR–DRIVEN EQUIPMENT: FLEXIBLE METAL CONDUIT (MAXIMUM OF 6 FEET), EXCEPT IN WET OR DAMP LOCATIONS USE LIQUIDTIGHT FLEXIBLE METAL CONDUIT.
DAMP OR WET LOCATIONS: RIGID STEEL CONDUIT.
EXPOSED: ELECTRICAL METALLIC TUBING, RIGID OR INTERMEDIATE METAL CONDUIT WHERE SUBJECT TO PHYSICAL DAMAGE.
CONCEALED: ELECTRICAL METALLIC TUBING.

CONCEAL CONDUIT AND EMT, UNLESS OTHERWISE INDICATED, WITHIN FINISHED WALLS, CEILINGS, AND FLOORS.

INSTALL RACEWAYS LEVEL AND SQUARE AND AT PROPER ELEVATIONS. RUN PERPENDICULAR AND AT RIGHT ANGLES TO BUILDING AND STRUCTURAL ELEMENTS. RUN PARALLEL OR BANKED RACEWAYS TOGETHER, ON COMMON SUPPORTS WHERE PRACTICAL. MAKE BENDS IN PARALLEL OR BANKED RUNS FROM SAME CENTER LINE TO MAKE BENDS PARALLEL.

SUPPORT RACEWAYS AS FOLLOWS, IN COMPLIANCE WITH DIVISION 16 SECTION "SUPPORTING DEVICES": TWO SUPPORTS PER 10' RUN, WITHIN 12" OF A COUPLING, FITTING OR BEND GREATER THAN 45 DEGREES, AND WITHIN 12" OF EVERY BOX WHICH THE RACEWAY IS ENTERING OR EXITING.

RUN CONCEALED RACEWAYS WITH A MINIMUM OF BENDS IN THE SHORTEST PRACTICAL DISTANCE CONSIDERING THE TYPE OF BUILDING CONSTRUCTION AND OBSTRUCTIONS, EXCEPT AS OTHERWISE INDICATED.

JOINTS AND TERMINATIONS: JOIN RACEWAYS WITH FITTINGS DESIGNED AND APPROVED FOR THE PURPOSE AND MAKE JOINTS AND TERMINATIONS TIGHT.

MAKE RACEWAY TERMINATIONS TIGHT. USE BONDING BUSHINGS OR WEDGES AT CONNECTIONS SUBJECT TO VIBRATION. USE BONDING JUMPERS WHERE JOINTS CANNOT BE MADE TIGHT. USE INSULATING BUSHINGS TO PROTECT CONDUCTORS.

INSTALL PULL CORDS IN ALL EMPTY RACEWAYS.

PROVIDE GROUNDING CONNECTIONS FOR RACEWAY, BOXES, AND COMPONENTS 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 TORQUES SPECIFIED IN UL STANDARD 486A.

ELECTRICAL SPECIFICATIONS

SECTION 16120 – WIRES AND CABLES

PRODUCTS

WIRES AND CABLES: TYPE THHN/THWN COPPER CONDUCTOR.

SOLID CONDUCTOR FOR 10 AWG AND SMALLER; STRANDED CONDUCTOR FOR LARGER THAN 10 AWG.

CONNECTORS AND SPLICES: UL–LISTED FACTORY–FABRICATED WIRING CONNECTORS OF SIZE, AMPACITY RATING, MATERIAL, AND TYPE AND CLASS FOR APPLICATION AND FOR SERVICE INDICATED. SELECT TO COMPLY WITH PROJECT'S INSTALLATION REQUIREMENTS AND AS SPECIFIED IN THE "EXECUTION" SECTION BELOW.

EXECUTION

INSTALL WIRES AND CABLES AS INDICATED, ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS AND THE NECA "STANDARD OF INSTALLATION."

PULL CONDUCTORS INTO RACEWAY SIMULTANEOUSLY WHERE MORE THAN ONE IS BEING INSTALLED IN THE SAME RACEWAY.

CONDUCTOR SPLICES: KEEP TO A MINIMUM.

INSTALL SPLICES AND TAPES THAT POSSESS EQUIVALENT OR BETTER MECHANICAL STRENGTH AND INSULATION RATINGS THAN CONDUCTORS BEING SPLICED. USE SPLICE AND TAP CONNECTORS THAT ARE COMPATIBLE WITH CONDUCTOR MATERIAL.

WIRING AT OUTLETS: INSTALL WITH AT LEAST 12 INCHES (300 MM) OF SLACK CONDUCTOR AT EACH OUTLET.

CONNECT OUTLETS AND COMPONENTS TO WIRING 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 TORQUES SPECIFIED IN UL STANDARD 486A.

SECTION 16140 – WIRING DEVICES

PRODUCTS

WIRING DEVICES: COMPLY WITH NEMA STANDARD WD 1, "GENERAL PURPOSE WIRING DEVICES."

COLOR: AS SELECTED BY ARCHITECT/OWNER, EXCEPT AS OTHERWISE INDICATED OR REQUIRED BY CODE.

STANDARD DUPLEX RECEPTACLES: 20A DEVICES; PROVIDE NYLON OR LEXAN FACE, BACK AND SIDE WIRING. COMPLY WITH FEDERAL SPECIFICATION W–C–596 AND HEAVY–DUTY GRADE OF UL STANDARD 498, "ELECTRICAL ATTACHMENT PLUGS AND RECEPTACLES." PROVIDE NRTL LABELING OF DEVICES TO VERIFY THESE COMPLIANCES.

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.

SNAP SWITCHES: QUIET–TYPE A.C. SWITCHES, NRTL LISTED AND LABELED AS COMPLYING WITH UL STANDARD 20 "GENERAL USE SNAP SWITCHES," AND WITH FEDERAL SPECIFICATION W–S–896.

TELEPHONE JACK: RJ–45, 8–POSITION, MODULAR, LATCHING–PLUG TYPE, FLUSH IN FACE OF WALL PLATED.

WALL PLATES: SINGLE AND COMBINATION TYPES THAT MATE AND MATCH WITH CORRESPONDING WIRING DEVICES. FEATURES INCLUDE THE FOLLOWING:

COLOR: MATCHES WIRING DEVICE EXCEPT AS OTHERWISE INDICATED.
PLATE–SECURING SCREWS: METAL WITH HEADS COLORED TO MATCH PLATE FINISH.

MATERIAL: LEXAN OR NYLON EXCEPT AS OTHERWISE INDICATED.

EXECUTION

INSTALL DEVICES AND ASSEMBLIES PLUMB AND SECURE. PROTECT DEVICES AND ASSEMBLIES DURING PAINTING AND INSTALL RECEPTACLES ON THE SAME CIRCUIT. DESIGN UNITS FOR INSTALLATION IN A 2–3/4–INCH (70–MM) DEEP OUTLET BOX WITHOUT WALL PLATES WHEN PAINTING IS COMPLETE.

ARRANGEMENT OF DEVICES: EXCEPT AS OTHERWISE INDICATED, MOUNT FLUSH, WITH LONG DIMENSION VERTICAL, AND GROUNDING TERMINAL OF RECEPTACLES ON TOP. GROUP ADJACENT SWITCHES UNDER SINGLE, MULTIGANG WALL PLATES.

SECTION 16190 – SUPPORTING DEVICES

PRODUCTS

MANUFACTURED SUPPORTING DEVICES:

RACEWAY SUPPORTS: CLEVIS HANGERS, RISER CLAMPS, CONDUIT STRAPS, THREADED C–CLAMPS WITH RETAINERS, CEILING TRAPEZE HANGERS, WALL BRACKETS, AND SPRING STEEL CLAMPS.

FASTENERS: TYPES, MATERIALS, AND CONSTRUCTION FEATURES AS FOLLOWS:

EXPANSION ANCHORS: CARBON STEEL WEDGE OR SLEEVE TYPE. TOGGLE BOLTS: ALL STEEL SPRINGHEAD TYPE.
POWDER–DRIVEN THREADED STUDS: HEAT–TREATED STEEL, DESIGNED SPECIFICALLY FOR THE INTENDED SERVICE.

FABRICATED SUPPORTING DEVICES: SHOP– OR FIELD–FABRICATED SUPPORTS OR MANUFACTURED SUPPORTS ASSEMBLED FROM U–CHANNEL COMPONENTS.

STEEL BRACKETS: FABRICATED OF ANGLES, CHANNELS, AND OTHER STANDARD STRUCTURAL SHAPES. CONNECT WITH WELDS AND MACHINE BOLTS TO FORM RIGID SUPPORTS.

EXECUTION

INSTALL SUPPORTING DEVICES TO FASTEN ELECTRICAL COMPONENTS SECURELY AND PERMANENTLY IN ACCORDANCE WITH NEC REQUIREMENTS. COORDINATE WITH THE BUILDING STRUCTURAL SYSTEM AND WITH OTHER ELECTRICAL INSTALLATION.

RACEWAY SUPPORTS: COMPLY WITH THE NEC AND THE FOLLOWING REQUIREMENTS:

CONFORM TO MANUFACTURER'S RECOMMENDATIONS FOR SELECTION AND INSTALLATION OF SUPPORTS.

ELECTRICAL SPECIFICATIONS

SECTION 16190 – SUPPORTING DEVICES (CONTINUED)

STRENGTH OF EACH SUPPORT SHALL BE ADEQUATE TO CARRY PRESENT AND FUTURE LOAD MULTIPLIED BY A SAFETY FACTOR OF AT LEAST FOUR, BUT IN NO CASE SHALL BE LESS THAN 200 LBS IN THE STRENGTH OF EACH SUPPORT.

INSTALL INDIVIDUAL AND MULTIPLE (TRAPEZE) RACEWAY HANGERS AND RISER CLAMPS AS NECESSARY TO SUPPORT RACEWAYS. PROVIDE U–BOLTS, CLAMPS, ATTACHMENTS, AND OTHER HARDWARE NECESSARY FOR HANGER ASSEMBLY AND FOR SECURING HANGER RODS AND CONDUITS.

MISCELLANEOUS SUPPORTS: SUPPORT MISCELLANEOUS ELECTRICAL COMPONENTS AS REQUIRED TO PRODUCE THE SAME STRUCTURAL SAFETY FACTORS AS SPECIFIED FOR RACEWAY SUPPORTS. INSTALL METAL CHANNEL RACKS FOR MOUNTING CABINETS, PANELBOARDS, DISCONNECTS, CONTROL ENCLOSURES, PULL BOXES, JUNCTION BOXES, TRANSFORMERS, AND OTHER DEVICES.

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 TYPE OF FASTENER NOT MORE THAN 24 INCHES FROM THE BOX.

FASTENING: UNLESS OTHERWISE INDICATED, FASTEN ELECTRICAL ITEMS AND THEIR SUPPORTING HARDWARE SECURELY TO THE BUILDING STRUCTURE, INCLUDING BUT NOT LIMITED TO CONDUITS, RACEWAYS, CABLES, CABINETS, PANELBOARDS, BOXES, AND CONTROL COMPONENTS IN ACCORDANCE WITH THE FOLLOWING:

FASTEN BY MEANS OF TOGGLE BOLTS ON HOLLOW MASONRY UNITS, CONCRETE INSERTS OR EXPANSION BOLTS ON CONCRETE OR SOLID MASONRY, AND MACHINE SCREWS, WELDED THREADED STUDS, OR SPRING–TENSION CLAMPS ON STEEL. THREADED STUDS DRIVEN BY A POWDER CHARGE AND PROVIDED WITH LOCK WASHERS AND NUTS MAY BE USED INSTEAD OF EXPANSION BOLTS AND MACHINE SCREWS. DO NOT WELD CONDUIT, PIPE STRAPS, OR ITEMS OTHER THAN THREADED STUDS TO STEEL STRUCTURES. IN PARTITIONS OF LIGHT STEEL CONSTRUCTION, USE SHEET METAL SCREWS.

HOLES CUT TO DEPTH MORE THAN 3/4 INCH IN CONCRETE SHALL NOT CUT THE MAIN REINFORCING BARS. FILL HOLES THAT ARE NOT USED.

ENSURE THAT THE LOAD APPLIED TO ANY FASTENER DOES NOT EXCEED 25 PERCENT OF THE PROOF TEST LOAD. USE VIBRATION– AND SHOCK–RESISTANT FASTENERS FOR ATTACHMENTS TO CONCRETE SLABS.

SECTION 16452 – GROUNDING

PRODUCTS

GROUNDING AND BONDING PRODUCTS: TYPES AS INDICATED. WHERE TYPES, SIZES, RATINGS, AND QUANTITIES INDICATED DIFFER FROM NEC REQUIREMENTS, THE MORE STRINGENT REQUIREMENTS AND THE GREATER SIZE, RATING, AND QUANTITY INDICATIONS GOVERN.

CONDUCTOR MATERIALS: COPPER.

EQUIPMENT GROUNDING CONDUCTOR: GREEN INSULATED.

SOLID CONDUCTORS: ASTM B–3.
ASSEMBLY OF STRANDED CONDUCTORS: ASTM B–8.
TINNED CONDUCTORS: ASTM B–33.

EXECUTION

EQUIPMENT GROUNDING CONDUCTOR APPLICATION: COMPLY WITH NEC ARTICLE 250 FOR SIZES AND QUANTITIES OF EQUIPMENT GROUNDING CONDUCTORS, EXCEPT WHERE LARGER SIZES OR MORE CONDUCTORS ARE INDICATED. INSTALL EQUIPMENT GROUNDING CONDUCTORS IN ALL FEEDER AND BRANCH CIRCUIT RACEWAYS.

SIGNAL AND COMMUNICATIONS: FOR TELEPHONE, ALARM, AND COMMUNICATION SYSTEMS, PROVIDE A #4 AWG MINIMUM GREEN INSULATED COPPER CONDUCTOR IN RACEWAY FROM THE GROUNDING ELECTRODE SYSTEM TO EACH TERMINAL CABINET OR CENTRAL EQUIPMENT LOCATION.

INSTALLATION, GENERAL: GROUND ELECTRICAL SYSTEMS AND EQUIPMENT IN ACCORDANCE WITH NEC EXCEPT WHERE GROUNDING IN EXCESS OF NEC REQUIREMENTS IS INDICATED.

CONNECTIONS: MAKE CONNECTIONS IN SUCH A MANNER AS TO MINIMIZE POSSIBILITY OF GALVANIC ACTION OR ELECTROLYSIS. SELECT CONNECTORS, CONNECTION HARDWARE, CONDUCTORS, AND CONNECTION METHODS SO METALS IN DIRECT CONTACT WILL BE GALVANICALLY COMPATIBLE.

TIGHTEN GROUNDING AND BONDING CONNECTORS AND TERMINALS, INCLUDING SCREWS AND BOLTS, IN ACCORDANCE WITH MANUFACTURER'S PUBLISHED TORQUE TIGHTENING VALUES FOR CONNECTORS AND BOLTS. WHERE MANUFACTURER'S TORQUING REQUIREMENTS ARE NOT INDICATED, TIGHTEN CONNECTIONS TO COMPLY WITH TIGHTENING TORQUE VALUES SPECIFIED IN UL 486A AND UL 486B.

COMPRESSION–TYPE CONNECTIONS: USE HYDRAULIC COMPRESSION TOOLS TO PROVIDE THE CORRECT CIRCUMFERENTIAL PRESSURE FOR COMPRESSION CONNECTORS. USE TOOLS AND DIES RECOMMENDED BY THE MANUFACTURER OF THE CONNECTORS. PROVIDE EMBOSSING DIE CODE OR OTHER STANDARD METHOD TO MAKE A VISIBLE INDICATION THAT A CONNECTOR HAS BEEN ADEQUATELY COMPRESSED ON THE CONDUCTOR.

TESTS: SUBJECT THE COMPLETED GROUNDING SYSTEM TO A MEGGER TEST AT EACH LOCATION WHERE A MAXIMUM GROUND RESISTANCE LEVEL IS SPECIFIED, AT SERVICE DISCONNECT ENCLOSURE GROUND TERMINAL, AND AT GROUND TEST WELLS. MEASURE GROUND RESISTANCE WITHOUT THE SOIL BEING MOISTENED BY ANY MEANS OTHER THAN NATURAL PRECIPITATION OR NATURAL DRAINAGE OR SEEPAGE AND WITHOUT CHEMICAL TREATMENT OR OTHER ARTIFICIAL MEANS OF REDUCING NATURAL GROUND RESISTANCE. PERFORM TESTS BY THE 2–POINT METHOD IN ACCORDANCE WITH SECTION 9.03 OF IEEE 81, "GUIDE FOR MEASURING EARTH RESISTIVITY, GROUND IMPEDANCE AND EARTH SURFACE POTENTIALS OF A GROUNDING SYSTEM."

GROUND/RESISTANCE MAXIMUM VALUES SHALL BE AS FOLLOWS:

EQUIPMENT RATED 500 KVA AND LESS: 10 OHMS.

DEFICIENCIES: WHERE GROUND RESISTANCES EXCEED SPECIFIED VALUES, AND IF DIRECTED, MODIFY THE GROUNDING SYSTEM TO REDUCE RESISTANCE VALUES. WHERE MEASURES ARE DIRECTED THAT EXCEED THOSE INDICATED IN THE PROVISIONS OF THE CONTRACT, COVERING CHANGES WILL APPLY.

ELECTRICAL SPECIFICATIONS

SECTION 16515 – LIGHTING

PRODUCTS

COMPLY WITH THE REQUIREMENTS SPECIFIED BELOW AND IN THE LIGHTING FIXTURE SCHEDULE.

METAL PARTS: FREE FROM BURRS AND SHARP CORNERS AND EDGES.

SHEET METAL COMPONENTS: STEEL, EXCEPT AS INDICATED. COMPONENTS ARE FORMED AND SUPPORTED TO PREVENT WARPING AND SAGGING.

DOORS, FRAMES, AND OTHER INTERNAL ACCESS: SMOOTH OPERATING AND FREE FROM LIGHT LEAKAGE UNDER OPERATING CONDITIONS. ARRANGE TO PERMIT RELAMPING WITHOUT USE OF TOOLS. ARRANGE DOORS, FRAMES, LENSES, DIFFUSERS, AND OTHER PIECES TO PREVENT ACCIDENTAL FALLING DURING RELAMPING AND WHEN SECURED IN THE OPERATING POSITION.

REFLECTING SURFACES: MINIMUM REFLECTANCES AS FOLLOWS, EXCEPT AS OTHERWISE INDICATED:

WHITE SURFACES: 85 PERCENT.
SPECULAR SURFACES: 83 PERCENT.
DIFFUSING SPECULAR SURFACES: 75 PERCENT.

LENSES, DIFFUSERS, COVERS, AND GLOBES: 100 PERCENT VIRGIN ACRYLIC PLASTIC OR WATER WHITE, ANNEALED CRYSTAL GLASS EXCEPT AS INDICATED.

PLASTIC: HIGHLY RESISTANT TO YELLOWING AND OTHER CHANGES DUE TO AGING, EXPOSURE TO HEAT AND UV RADIATION. LENS THICKNESS: 0.125 INCHES, MINIMUM.

SINGLE–STEM HANGERS: 1/2–INCH STEEL TUBING WITH SWIVEL BALL FITTING AND CEILING CANOPY. FINISH SAME AS FIXTURE.

TWIN–STEM HANGERS: TWO, 1/2–INCH STEEL TUBES WITH SINGLE CANOPY ARRANGED TO MOUNT A SINGLE FIXTURE. FINISH SAME AS FIXTURE.

ROD HANGERS: 3/16–INCH DIAMETER CADMIUM PLATED, THREADED STEEL ROD.

FLUORESCENT FIXTURES: CONFORM TO UL 1570, "FLUORESCENT LIGHTING FIXTURES."

BALLASTS: CONFORM TO UL 935, "FLUORESCENT LAMP BALLASTS."
CERTIFICATION: BY ELECTRICAL TESTING LABORATORY (ETL).
LABELING: BY CERTIFIED BALLAST MANUFACTURERS ASSOCIATION (CBM).
TYPE: CLASS P, HIGH–POWER–FACTORY TYPE EXCEPT AS INDICATED OTHERWISE.
SOUND RATING: A RATING, EXCEPT AS INDICATED OTHERWISE.
VOLTAGE: MATCH CONNECTED CIRCUITS.

ELECTRONIC BALLASTS: SOLID–STATE, FULL–LIGHT–OUTPUT, ENERGY–SAVING TYPE COMPATIBLE WITH ENERGY–SAVING LAMPS. CONFORM TO FCC REGULATIONS PART 15, SUBPART J, FOR ELECTROMAGNETIC INTERFERENCE. CONFORM TO IEEE C62.41, "GUIDE FOR SURGE VOLTAGES IN LOW–VOLTAGE AC POWER CIRCUITS," CATEGORY A, FOR RESISTANCE TO VOLTAGE SURGES FOR NORMAL AND COMMON MODES.

MINIMUM POWER FACTOR: .70
MINIMUM OPERATING FREQUENCY: 20,000 HZ.
THIRD HARMONIC CONTENT OF BALLAST CURRENT: LESS THAN 20 PERCENT.
AVERAGE INPUT: THE FOLLOWING IS THE AVERAGE REQUIRED WATTAGE WHEN TESTED ACCORDING TO ANSI C82.2, "FLUORESCENT LAMP BALLASTS, METHODS OF MEASUREMENT."

EXIT SIGNS: CONFORM TO UL 924, "EMERGENCY LIGHTING AND POWER EQUIPMENT," AND THE FOLLOWING:

SIGN COLORS: CONFORM TO LOCAL CODE.
MINIMUM HEIGHT OF LETTERS: CONFORM TO LOCAL CODE.
ARROWS: INCLUDE AS INDICATED.
LAMPS FOR AC OPERATION: LED.

EMERGENCY FLUORESCENT POWER SUPPLY: CONFORM TO UL 924, "EMERGENCY LIGHTING AND POWER EQUIPMENT."

INTERNAL TYPE: SELF–CONTAINED, MODULAR, BATTERY–INVERTER UNIT FACTORY–MOUNTED WITHIN THE FIXTURE BODY, CAPABLE OF OPERATING WITH SWITCHED FIXTURE.

TEST SWITCH AND LED INDICATOR LIGHT: VISIBLE AND ACCESSIBLE WITHOUT OPENING FIXTURE OR ENTERING CEILING SPACE.
BATTERY: SEALED, MAINTENANCE–FREE, NICKEL–CADMIUM TYPE, WITH A MINIMUM NOMINAL 10–YEAR LIFE.
CHARGER: FULLY–AUTOMATIC, SOLID–STATE, CONSTANT–CURRENT TYPE.
OPERATION: RELAY AUTOMATICALLY TURNS 2 LAMPS ON WHEN SUPPLY CIRCUIT VOLTAGE DROPS TO 80–PERCENT OF NOMINAL OR BELOW. RELAY DISCONNECTS LAMP AND BATTERY AUTOMATICALLY RECHARGES WHEN NORMAL VOLTAGE IS RESTORED.

LAMPS: PROVIDE LAMPS FOR EACH FIXTURE INDICATED. CONFORM TO ANSI STANDARDS, C78 SERIES APPLICABLE TO EACH TYPE OF LAMP. LAMPS SHALL BE TCLIP COMPLIANT. WHERE LAMPS ARE NOT INDICATED, PROVIDE LAMPS RECOMMENDED BY MANUFACTURER.

STEEL PARTS FINISH: MANUFACTURER'S STANDARD FINISH APPLIED OVER CORROSION–RESISTANT PRIMER, FREE OF STREAKS, RUNS, HOLIDAYS, STAINS, BLISTERS, AND DEFECTS. REMOVE FIXTURES SHOWING EVIDENCE OF CORROSION DURING PROJECT WARRANTY PERIOD AND REPLACE WITH NEW FIXTURES.

OTHER PARTS: MANUFACTURER'S STANDARD FINISH.

EXECUTION

INSTALLATION: UNLESS OTHERWISE INDICATED, INSTALL LIGHTING FIXTURES AS FOLLOWS:

SETTING AND SECURING: SET UNITS PLUMB, SQUARE, AND LEVEL WITH CEILING AND WALLS, AND SECURE ACCORDING TO MANUFACTURER'S PRINTED INSTRUCTIONS AND APPROVED SHOP DRAWINGS. SUPPORT FOR RECESSED AND SEMIRECESSED FIXTURES: INSTALLED UNITS MAY BE SUPPORTED FROM SUSPENDED CEILING SUPPORT SYSTEM. INSTALL CEILING SYSTEM SUPPORT RODS OR WIRES AT A MINIMUM OF FOUR RODS OR WIRES PER FIXTURE LOCATED NOT MORE THAN 6 INCHES FROM FIXTURE CORNERS.

LAMPING: LAMP UNITS ACCORDING TO MANUFACTURER'S INSTRUCTIONS.
ADJUSTING AND CLEANING: CLEAN FIXTURES UPON COMPLETION OF INSTALLATION. USE METHODS AND MATERIALS RECOMMENDED BY MANUFACTURER.

ELECTRICAL SPECIFICATIONS

SECTION 16476 – DISCONNECTS, CIRCUIT BREAKERS, AND FUSES

PRODUCTS

ENCLOSED NONFUSIBLE SWITCH: NEMA KS 1, HEAVY DUTY TYPE, HANDLE LOCKABLE WITH 2 PADLOCKS, ENCLOSURE CONSISTENT WITH ENVIRONMENT WHERE LOCATED, MINIMUM FAULT CURRENT RATING OF 200,000 SYMMETRICAL RMS AMPERES.

FUSES: NEMA FU 1 NONRENEWABLE CARTRIDGE FUSE, CLASS AS SPECIFIED OR INDICATED, CURRENT RATING AS INDICATED, VOLTAGE RATING CONSISTENT WITH CIRCUIT VOLTAGE.

BRANCH CIRCUITS: CLASS RK5 NON–TIME DELAY.

EXECUTION

CONNECT ENCLOSED SWITCHES AND COMPONENTS TO WIRING SYSTEM 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 TORQUES SPECIFIED IN UL STANDARD 486A.

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PROJECT PHASE
BID DOCUMENTS

PROJECT TITLE
A.O.C. TENANT BUILD-OUT

2001 COMMERCE PARK DR., SUITE 2001-B
ANNAPOLIS, MD 21401

REVISIONS

SYMBOL	DATE	ISSUED FOR
1	10.21.11	PERMIT REVISION

PROJECT NUMBER	11-160
DATE	9.1.11
SCALE	AS NOTED

DRAWING TITLE
ELECTRICAL SPECIFICATIONS

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