SECTION 16000

ELECTRICAL REQUIREMENTS

PART 1.00 - GENERAL

1.01 SCOPE:

A. THESE SPECIFICATIONS AND THE ACCOMPANYING DRAWINGS ARE INTENDED TO INCLUDE ALL OF THE LABOR, MATERIALS, EQUIPMENT, AND FIXTURES TO PROVIDE A COMPLETE AND PROPERLY OPERATING ELECTRICAL SYSTEM FOR THE PROJECT.

1.02 GENERAL REQUIREMENTS:

A. ALL WORK SHALL BE PERFORMED BY SKILLED ELECTRICIANS IN ACCORDANCE WITH THE BEST PRACTICES OF THE TRADE, MEETING THE REQUIREMENTS OF THE NATIONAL ELECTRIC CODE AND APPLICABLE STATE AND LOCAL CODES.

B. PAY FOR AND OBTAIN NECESSARY PERMITS AND CERTIFICATES OF INSPECTION.

C. ALL MATERIALS SHALL BE NEW AND OF THE QUALITY INDICATED BY THE BRAND NAMES. SUBSTITUTIONS OF MATERIAL OF EQUAL QUALITY BY OTHER FIRST-LINE MANUFACTURERS MAY BE ACCEPTABLE PROVIDED A LIST OF SUCH SUBSTITUTIONS IS APPROVED BY THE ARCHITECT/ENGINEER. A SUBSTITUTION LIST SHALL BE SUBMITTED IN TRIPLICATE WITHIN TEN (10) DAYS BEFORE BIDS ARE DUE. CONTRACTORS MAY OBTAIN A LIST OF APPROVED SUBSTITUTIONS SEVEN (7) DAYS BEFORE BID. DISCONTINUED REMNANT PRODUCTS ARE NOT ACCEPTABLE.

D. THE DRAWINGS ARE DIAGRAMMATIC AND ARE NOT INTENDED TO SHOW ALL DETAILS OF THE WORK, HOWEVER, ALL OUTLETS AS INDICATED MUST BE ACCURATELY LOCATED PARTICULARLY APPLIANCE OUTLETS, WHICH SHALL BE LOCATED FROM THE DIMENSIONS GIVEN ON THE DRAWINGS AND FIELD VERIFIED. REVIEW THE ARCHITECTURAL, PLUMBING, AND HEATING AND VENTILATING PLANS IN ORDER TO COORDINATE THIS WORK WITH OTHER TRADES; AND COOPERATE WITH THEM IN THE ENTIRE INSTALLATION.

1.03 RECORD DRAWINGS:

A. PROVIDE COMPLETE RECORD DRAWINGS OF THE ELECTRICAL INSTALLATION WITH ALL DEVICES LOCATED AND CIRCUITS PLAINLY LABELED. PROVIDE A NEW TYPE-WRITTEN PANEL DIRECTORY INDICATING THE LOAD SERVED BY EACH CIRCUIT BREAKER.

1.04 GUARANTEE:

A. FURNISH A GUARANTEE IN WRITING THAT ALL WORK EXECUTED UNDER THIS SECTION IS FREE FROM DEFECTS OF MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE, AND THAT REPAIR AND/OR REPLACEMENT OF ANY DEFECTIVE WORK AND ALL DAMAGES CAUSED THEREBY, WHICH MAY OCCUR DURING THE TERM OF THE AFOREMENTIONED GUARANTEE WILL BE MADE AT NO EXPENSE TO THE OWNER.

PART 2.00 - PRODUCTS

2.01 GENERAL:

A. ALL MATERIAL SHALL BE NEW WITH REQUIRED UNDERWRITER'S LABORATORIES LABEL AND MANUFACTURER'S LABEL OR NAMEPLATE GIVING COMPLETE ELECTRICAL DATA.

2.02 CONDUIT AND FITTINGS:

A. ALL WIRING SHALL BE RUN IN CONDUIT UNLESS OTHERWISE NOTED. DURING CONSTRUCTION, CONDUIT SHALL BE KEPT FREE OF ALL FOREIGN MATTER BY USE OF CAPPED BUSHINGS ON ALL OPEN ENDS. PAPER OR WOOD PLUGS ARE NOT ACCEPTABLE FOR THIS PURPOSE.

1. FEEDERS SHALL UTILIZE EMT CONDUIT ABOVE SLAB, SCHEDULE 40 PVC CONDUIT BELOW SLAB OR OUTDOOR WHERE NOT SUBJECT TO PHYSICAL DAMAGE. WHERE SUBJECT TO PHYSICAL DAMAGE OR AS OTHERWISE REQUIRED BY CODE, TYPE IMC OR RGS CONDUIT SHALL BE USED.
2. FOR BRANCH CIRCUIT RATED 30 AMPERES AND LESS, TYPE MC FLEXIBLE CONDUIT SHALL BE USED. WHERE PERMITTED BY LOCAL AUTHORITY HAVING JURISDICTION, TYPE NM OR NMC NON-METALLIC SHEATHED CABLE MAY BE USED.

B. FITTINGS:

1. COUPLINGS AND CONNECTORS SHALL BE STEEL SET SCREW TYPE.
2. FLEX CONDUIT CONNECTORS SHALL BE T & B "TITE-BITE" TYPE OR APPROVED EQUIVALENT WITH ANTI-SHORT BUSHINGS AND INSULATED THROATS.
3. EXPANSION FITTINGS COMPLETE WITH GROUNDING TYPE FITTINGS SHALL BE PROVIDED AT ALL EXPANSION JOINT CROSSINGS.

2.03 WIRE AND CABLES:

A. ALL WIRES AND CABLES SHALL BE SOFT-DRAWN SOLID COPPER RATED 600 VOLTS, 75 DEGREE C, TYPE THHN OR THWN. WIRES IN FIXTURE RACEWAYS OR HEATING UNITS SHALL HAVE TEMPERATURE RATINGS VERIFIED TO BE SUITABLE FOR THE APPLICATION.

1. FOR 120/208V SYSTEMS AS FOLLOWS: NEUTRAL WHITE; LEG ONE, BLACK; LEG TWO, RED; LEG THREE, DARK BLUE; AND GROUND GREEN.
2. FOR 277/480V SYSTEMS AS FOLLOWS: NEUTRAL NATURAL GRAY; LEG ONE, BROWN; LEG TWO, ORANGE; LEG THREE, YELLOW; AND GROUND GREEN.

B. WIRE SHALL BE COLOR CODED LEFT TO RIGHT, FRONT TO BACK:

C. NO WIRE SMALLER THAN #12 AWG SHALL BE USED FOR LIGHTING OR POWER CIRCUITS. STRANDED CABLE SHALL BE USED FOR #8 AWG AND LARGER; WIRE SMALLER THAN #8 SHALL BE SOLID.

D. CONDUCTORS FOR CIRCUITS LONGER THAN 50' FROM THE PANEL TO THE FIRST OUTLET SHALL BE INCREASED ONE WIRE SIZE TO THE FIRST OUTLET.

E. UNDER NO CIRCUMSTANCES SHALL CABLE OR WIRE BE STAPLED. CABLE SHALL BE PROPERLY CLAMPED AND MECHANICALLY STRAIGHT, WHERE POSSIBLE. WIRE IN CONDUIT SHALL BE CLAMPED OR SUSPENDED AS CALLED FOR UNDER THE NATIONAL ELECTRIC CODE AND/OR LOCAL CODES.

2.04 GROUNDING:

A. THE CONDUIT SYSTEM AND THE NEUTRAL CONDUCTORS OF THE WIRING SHALL BE GROUNDED IN ACCORDANCE WITH ARTICLE #250 OF THE NATIONAL ELECTRICAL CODE. A SEPARATE GREEN GROUNDING CONDUCTOR SHALL BE REQUIRED IN ALL RACEWAYS.

2.05 LOCAL SWITCHING:

A. ALL WALL SWITCHES SHALL BE TOTALLY ENCLOSED TYPE RATED AT 20 AMPS, 120/277 VOLTS.

2.06 RECEPTACLES:

A. ALL WALL RECEPTACLES SHALL BE NEMA 5-15R CONFIGURATION. FOR SINGLE RECEPTACLE ON A CIRCUIT PROVIDE NEMA 5-20R.

1. MULTIOUTLET RACEWAYS SHALL BE PLUGMOLD 2000 OR EQUAL.
2. GROUND FAULT INTERRUPTING RECEPTACLES SHALL BE PROVIDED WHERE INDICATED OR REQUIRED BY CODE.
3. RECEPTACLES LOCATED IN BEDROOMS SHALL BE PROVIDED WITH ARC FAULT INTERRUPTING PROTECTION.

2.07 WALL PLATES:

A. FURNISH AND INSTALL SMOOTH NYLON WALL PLATES OF APPROPRIATE TYPE AND SIZE AT ALL WIRING AND CONTROL DEVICES.

B. TELEPHONE AND DATA PLATES SHALL BE AS REQUIRED BY OWNER.

2.08 FIXTURES:

A. ALL FIXTURES SHOWN ON FIXTURE SCHEDULE SHALL BE FURNISHED AND INSTALLED, COMPLETE WITH ALL MOUNTING ACCESSORIES AND LAMPS.

B. ALL CEILING TYPES SHALL BE FIELD VERIFIED FOR PROPER TRIMS REQUIRED FOR FIXTURES.

C. ALL FLUORESCENT FIXTURES SHALL BE PROVIDED WITH ENERGY SAVING BALLAST AND LAMPS.

D. ALL INCANDESCENT FIXTURES SHALL BE PROVIDED WITH LONG LIFE 130V RATED LAMPS.

E. ALL H.I.D. LAMPS SHALL BE PHOSPHOROUS COATED TYPE.

2.09 PANELBOARDS:

A. ALL PANEL BOARDS SHALL BE PROVIDED AS SCHEDULED ON THE DRAWINGS.

1. REQUIRED INTERRUPTING RATING SHALL BE AS SCHEDULED AND FIELD VERIFIED WITH LOCAL UTILITY.
2. ALL BUSSING SHALL BE 98% CONDUCTIVITY COPPER.
3. RECESSED PANELS SHALL BE PROVIDED WITH THREE (3) SPARE 3/4" CONDUITS WITH PULL CORDS STUBBED TO ACCESSIBLE CEILING SPACE.

B. CIRCUIT BREAKERS SHALL BE BOLT-ON TYPE, RATINGS AS SCHEDULED.

1. ALL ONE AND TWO POLE BREAKERS 30 AMPERES AND LESS SHALL BE SWITCHING DUTY TYPE.
2. ALL BREAKERS SERVING HVAC OR REFRIGERATION EQUIPMENT SHALL BE HACR RATED.
3. ALL 120V, 15 OR 20 AMP BREAKERS SERVING BEDROOM OUTLETS SHALL BE ARC FAULT INTERRUPTING TYPE.

2.10 DISCONNECT SWITCHES:

A. FURNISH AND INSTALL ALL DISCONNECT SWITCHES OF SIZE NOTED ON THE DRAWINGS. THESE SWITCHES SHALL BE HEAVY DUTY, QUICK-MAKE, QUICK BREAK TYPE IN NEMA 1 ENCLOSURE FOR INDOOR APPLICATION, NEMA 3R FOR OUTDOOR. PROVIDE FUSING PER NAMEPLATE OF EQUIPMENT SERVED.

2.11 COMMUNICATION SYSTEM:

A. COMMUNICATION SYSTEM PROVISIONS SHALL BE AS INDICATED ON THE DRAWINGS. GENERALLY, THE ELECTRICAL CONTRACTOR SHALL PROVIDE A SYSTEM OF BACKBOARDS, CABINETS, AND RACEWAYS READY FOR INSTALLATION OF WIRING TO BE INSTALLED UNDER SEPARATE CONTRACT.

B. TELEPHONE BACKBOARD SHALL BE 3/4" PLYWOOD WITH FINISH GRADE FRONT, PAINTED WITH TWO COATS OF FIRE RETARDANT GRAY PAINT.

C. OUTLETS SHALL BE 2"X4"X2-1/8" BOX WITH SINGLE GANG PLASTER RING.

D. IF CEILING SPACE IS ACCESSIBLE BETWEEN OUTLETS AND BACKBOARD OR CABINET, EACH OUTLET SHALL BE PROVIDED WITH 1-3/4", UON, CONDUIT STUBBED TO CEILING. FOR LOCATIONS WITH INACCESSIBLE CEILING SPACE BETWEEN OUTLETS AND BACKBOARD, UP TO THREE (3) OUTLETS MAY BE CONNECTED TOGETHER WITH 3/4", UON, CONDUIT AND HOMERUNNED TO SERVING BACKBOARD.

PART 3.00 - EXECUTION

3.01 GENERAL:

A. CONTRACTOR SHALL VISIT THE SITE PRIOR TO PROJECT START-UP TO FAMILIARIZE HIMSELF WITH THE EXISTING CONDITIONS. EXISTING CONDITIONS AFFECTING THE SCOPE OF WORK SHALL NOT JUSTIFY A CHANGE IN THE BID PRICE ONCE THE CONTRACT HAS BEEN AWARDED.

3.02 TEST:

A. MAKE ALL NECESSARY TESTS TO INSURE THAT THE ENTIRE INSTALLATION HAS SUFFICIENT INSULATION RESISTANCE AND IS FREE FROM IMPROPER GROUNDS AND FROM SHORTED AND/OR OPEN CIRCUITS. ALL LOADS MUST BE BALANCED IN EVERY PHASE. CHECK TO SEE THAT ALL LIGHTS AND OUTLETS FUNCTION PROPERLY.

3.03 UTILITY SERVICES:

A. ALL SERVICES SHALL BE IN ACCORDANCE WITH LOCAL UTILITY REQUIREMENTS.

1. PROVIDE METER BASE/CT CABINET/METER ARRANGEMENT PER LOCAL ELECTRIC UTILITY REQUIREMENTS.
2. COORDINATE WITH LOCAL TELEPHONE UTILITY FOR TELEPHONE SERVICE TERMINATIONS BOTH AT SERVICE LOCATION WITHIN THE PROJECT AND AT THE SERVICE CONNECTION POINT OUTSIDE THE BUILDING AT THE PROPERTY LINE.

B. FOR UNDERGROUND SERVICES WITH PAD MOUNTED TRANSFORMER, PROVIDE CONCRETE PAD PER LOCAL UTILITY REQUIREMENTS. IN ADDITION, COORDINATE WITH THE UTILITY TO PROVIDE ANY PRIMARY CONDUIT, TERMINATIONS, ETC., AS REQUIRED.

3.04 EXCAVATION:

A. REQUIRED EXCAVATION AND BACKFILL FOR INSTALLATION OF ALL ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

3.05 CUTTING AND PATCHING:

A. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH THE GENERAL CONTRACTOR AS REQUIRED TO PROVIDE SLEEVES AND OPENINGS AS NECESSARY FOR THE INSTALLATION OF ELECTRICAL EQUIPMENT AND WORK.

B. ANY ELECTRICAL WORK PENETRATING THE ROOF SHALL BE IN AN APPROVED MANNER TO MAINTAIN THE ROOF WARRANTY AND SHALL BE ACCEPTABLE TO THE ARCHITECT. SERVICES TO ROOF TOP HVAC EQUIPMENT SHALL BE ROUTED THROUGH UNIT CURBS WHERE POSSIBLE.

C. ALL CUTTING AND PATCHING REQUIRED FOR ELECTRICAL WORK SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR. FINISHED CONDITION MUST MATCH THE SURROUNDING INSTALLATION TO THE SATISFACTION OF THE ARCHITECT AND OWNER.

3.06 MECHANICAL COORDINATION:

A. ALL EQUIPMENT NAMEPLATES SHALL BE FIELD VERIFIED PRIOR TO WIRING INSTALLATION. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER OF ANY DEVIATIONS FROM THE CONTRACT DOCUMENTS' REQUIREMENTS.

B. THE MECHANICAL AND PLUMBING CONTRACTORS SHALL PROVIDE ALL STARTERS AND DISCONNECTS AS REQUIRED FOR EQUIPMENT SUPPLIED UNDER DIVISION 15. THE ELECTRICAL CONTRACTOR SHALL INSTALL ALL NON-FACTORY MOUNTED STARTER/DISCONNECTS AND PROVIDE POWER WIRING FROM SERVING POWER PANELS TO MOTOR/EQUIPMENT TERMINATIONS. ALL CONTROL WIRING SHALL BE UNDER DIVISION 15 SCOPE OF WORK.

C. HVAC SHUTDOWN:

1. IF A FIRE ALARM SYSTEM IS PROVIDED IN THE FACILITY, THE ELECTRICAL CONTRACTOR WILL SUPPLY ALL DUCT MOUNTED SMOKE DETECTORS AND CONNECT THEM TO THE FIRE ALARM SYSTEM. THE MECHANICAL CONTRACTOR SHALL MOUNT THE DETECTORS AND PROVIDE ACCESS PANELS IN THE DUCT AS REQUIRED. HVAC SHUTDOWN WIRING SHALL BE BY THE MECHANICAL CONTRACTOR FROM THE DETECTOR AUXILIARY CONTACTS TO UNIT SHUTDOWN TERMINALS.
2. FOR FACILITIES WITHOUT A FIRE ALARM SYSTEM, THE MECHANICAL CONTRACTOR SHALL PROVIDE AND INSTALL ALL DUCT DETECTORS AND INSTALL SHUTDOWN WIRING AS REQUIRED. THE ELECTRICAL CONTRACTOR SHALL PROVIDE 120V CONNECTIONS ONLY TO THE DETECTORS AND ASSOCIATED MONITORING PANEL.

3.07 CLEAN UP:

A. LEAVE THIS PORTION OF THE WORK IN A CLEAN AND FINISHED CONDITION.

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Issued For Construction

Issue Date: 12/17/2019

Revisions

#	Revision	Date:

E0.2 Electrical Specifications

Sheet Data:

Project #: Project Number

Drawn By Author

Checked By Checker

Sheet Title:

Electrical Specifications

Drawing Number:

E0.2

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