ELECTRICAL SPECIFICATIONS

A. SCOPE OF WORK

1. FURNISH ALL LABOR AND MATERIAL TO COMPLETE ALL ELECTRICAL WORK SHOWN ON THE DRAWINGS, SPECIFIED HEREIN OR REQUIRED TO COMPLETE THE CONSTRUCTION OF THE BUILDING AS SHOWN.
2. THE LISTING OF ARTICLE OR MATERIAL, OPERATION OR METHOD, REQUIRES THAT THE CONTRACTOR SHALL PROVIDE AND INSTALL, UNLESS NOTED TO BE SUPPLIED BY OTHERS, EACH ITEM LISTED OF QUALITY OR SUBJECT TO QUALIFICATION NOTED. EACH OPERATION SHALL BE PERFORMED ACCORDING TO STANDARD PRACTICE, MANUFACTURER'S INSTRUCTIONS AND CONDITIONS STATED, PROVIDING, THEREFORE, ALL NECESSARY LABOR, EQUIPMENT AND INCIDENTALS.
3. THE ELECTRICAL CONTRACTOR SHALL SCHEDULE HIS WORK TO CONFORM TO THE PROGRESS OF THE OTHER TRADES AND CONTRACTORS EMPLOYED ON THIS PROJECT. THE PRINCIPAL ITEMS OF WORK INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:
   - A. PROVIDE ELECTRICAL SERVICE EQUIPMENT INCLUDING MAIN DISTRIBUTION SWITCHBOARD, SECONDARY UNDERGROUND CONDUITS, UTILITY METERING PROVISIONS, SERVICE DUCTBANK, CABLES, ETC.
   - B. PROVIDE LIGHTING FIXTURES AS SHOWN ON DRAWINGS. THIS SHALL INCLUDE ALL ASSOCIATED LAMPS, BOXES, SWITCHES, CONTACTORS, AND BRANCH CIRCUIT WIRING AND MATERIALS REQUIRED FOR A COMPLETE INSTALLATION.
   - C. PROVIDE DEVICES (RECEPTACLES, SWITCHES, ETC.) AS SHOWN ON DRAWINGS. THIS SHALL INCLUDE ALL ASSOCIATED BRANCH CIRCUIT WIRING AND MATERIAL REQUIRED FOR A COMPLETE INSTALLATION.
   - D. POWER FEEDERS TO HVAC EQUIPMENT INCLUDING MAKE UP AIR UNITS, AND EXHAUST FANS. (CONSULT HVAC CONTRACTOR FOR PHASE AND VOLTAGE OF EQUIPMENT AND ACTUAL NAMEPLATE RATINGS FOR FEEDER MINIMUM CONDUCTOR AMPACITIES (MCA) AND MAXIMUM OVER CURRENT PROTECTION DEVICES (MOCP) INFORMATION PRIOR TO INSTALLATION AND PRIOR TO PURCHASING ELECTRICAL EQUIPMENT.
   - E. PROVIDE POWER DISTRIBUTION EQUIPMENT (TRANSFORMERS, PANELBOARDS, DISCONNECT SWITCHES, ETC.) AS SHOWN ON DRAWINGS OR AS REQUIRED FOR THIS PROJECT. THIS SHALL INCLUDE ALL WIRING AND ASSOCIATED MATERIAL REQUIRED FOR A COMPLETE INSTALLATION.
   - F. PROVIDE TESTING OF ALL ELECTRICAL EQUIPMENT, INCLUDING MEGGER TESTS FOR PANEL/TRANSFORMER FEEDERS, INSULATION RESISTANCE TESTS FOR PANELS, & EARTH RESISTANCE TESTING FOR ADEQUATE GROUNDING.
   - G. PROVIDE EMERGENCY LIGHTING, BATTERY UNITS, REMOTE HEADS, EXIT LIGHTS, AND ALL ASSOCIATED WIRING, CONDUIT, JUNCTION BOXES, CONNECTIONS, ETC. AS REQUIRED FOR A COMPLETE INSTALLATION.
   - H. PROVIDE BACKBOXES AND CONDUIT TO ABOVE ACCESSIBLE CEILING OR TO CEILING LEVEL FOR EXPOSED CEILING SYSTEMS FOR ALL THERMOSTATS SHOWN ON MECHANICAL DRAWINGS.
   - I. PROVIDE SITE LIGHTING FIXTURES INCLUDING LIGHTS, POLES, CONCRETE BASES, PHOTOCELLS, CONTACTORS, TIME CLOCKS, WIRING, CONDUIT, AND CONNECTIONS AS REQUIRED FOR A COMPLETE INSTALLATION.
   - J. PROVIDE TIMERS, PHOTOCELLS, AND CONTACTORS FOR CONTROL OF EXTERIOR LIGHTING AND HVAC EQUIPMENT NOT PROVIDED BY OTHERS.

B. INSTALLATION

1. THIS CONTRACTOR SHALL VISIT THE JOB SITE TO DETERMINE PRESENT CONDITIONS AND VERIFY EXACT LOCATION OF EQUIPMENT AND LOCAL REGULATIONS PRIOR TO START OF WORK.
2. UNLESS SPECIFICALLY NOTED OTHERWISE, ALL WORK AND MATERIAL SHOWN SHALL BE PERFORMED, FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR.
3. THE COMPLETE INSTALLATION SHALL BE DONE IN STRICT ACCORDANCE WITH ALL APPLICABLE NATIONAL, STATE AND CITY CODES, RULES, REGULATIONS AND ORDINANCES.
4. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR SUBMITTING APPLICATIONS IN CONNECTION WITH ANY PERMITS, TESTS AND INSPECTIONS THAT MAY BE REQUIRED.
5. GUARANTEE ALL WORKMANSHIP, MATERIAL AND PERFORMANCE FOR A PERIOD OF ONE (1) YEAR FROM DATE OF FINAL ACCEPTANCE.
6. THE EXACT MOUNTING LOCATIONS OF APPARATUS, DEVICES, EQUIPMENT AND CONDUITS SHALL BE ASCERTAINED FROM OWNER OR THEIR REPRESENTATIVE IN THE FIELD, AND THE WORK SHALL BE LAID OUT ACCORDINGLY. SHOULD THE CONTRACTOR FAIL TO ASCERTAIN SUCH LOCATIONS, THE WORK SHALL BE CHANGED AT HIS OWN EXPENSE WHEN SO ORDERED BY OWNER. THE OWNER RESERVES THE RIGHT TO MAKE MINOR CHANGES IN THE LOCATION OF CABLE, CONDUIT AND EQUIPMENT INSTALLED BY THIS CONTRACTOR UP TO THE TIME OF INSTALLATION, WITHOUT ADDITIONAL COST.
7. ALL CONDUCTORS SHALL BE COPPER, THHN/THWN-2 INSULATION UNLESS OTHERWISE NOTED. ALL WIRING SHALL BE IN EMT OR MC CABLE RUN CONCEALED IN FINISHED AREAS AND NOT SUBJECT TO PHYSICAL DAMAGE. RUN EMT IN UNFINISHED CEILING AREAS. RUN ALL CONDUIT CONCEALED IN BLOCK WALLS AND RECESS ALL DEVICES IN BLOCK WALLS TO THE EXTENT POSSIBLE AND/OR PRACTICAL.

C. DRAWINGS AND SPECIFICATIONS

1. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC AND ARE INTENDED TO SHOW THE APPROXIMATE LOCATIONS OF EQUIPMENT AND CONDUIT ROUTING. DIMENSIONS GIVEN ON THE PLANS SHALL BE VERIFIED IN THE FIELD. DRAWINGS MAY NOT BE SCALED TO OBTAIN EXACT DIMENSIONS.
2. THIS CONTRACTOR SHALL FURNISH SUCH LABOR AND MATERIALS AS HEREIN-AFTER SPECIFIED AND AS REQUIRED TO COMPLETE ALL ELECTRICAL CONNECTIONS IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS FOR ALL MECHANICAL AND PLUMBING EQUIPMENT AND OWNER'S EQUIPMENT AS SHOWN AND/OR SPECIFIED.

D. VISIT TO THE SITE

1. THE CONTRACTOR SHALL VISIT THE SITE OF THE WORK AND FAMILIARIZE HIMSELF WITH ALL CONDITIONS AFFECTING HIS WORK, AND THE SUBMISSION OF HIS PROPOSAL SHALL BE CONSTRUED AS INDICATING SUCH KNOWLEDGE. NO ADDITIONAL PAYMENT WILL BE MADE ON CLAIMS THAT ARISE FROM LACK OF SUCH KNOWLEDGE OF EXISTING CONDITIONS.

E. MATERIALS AND WORKMANSHIP

1. ALL WORK SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER BY COMPETENT WORKMEN, SKILLED IN THEIR RESPECTIVE TRADE.
2. UNLESS SPECIFICALLY SPECIFIED OR INDICATED OTHERWISE ALL MATERIALS SHALL BE NEW AND FREE FROM DEFECTS.
3. ALL MATERIALS SHALL MEET OR EXCEED STANDARDS SPECIFIED BY UL, NEMA, ANSI, AND IEEE WHEREVER SUCH STANDARDS HAVE BEEN ESTABLISHED.
4. THE CONTRACTOR SHALL REMOVE ALL DEBRIS AND EXCESS MATERIALS ASSOCIATED WITH HIS WORK AND LEAVE THE WORK AREA CLEAN AT END OF EACH WORK DAY.
5. ALL ELECTRICAL EQUIPMENT AND MATERIAL SHALL BEAR THE UNDERWRITER'S LABORATORIES LABEL.

F. DEFINITIONS

1. "INSTALL" SHALL MEAN TO PLACE, FIX IN POSITION, SECURE, ANCHOR, ETC. INCLUDING NECESSARY APPURTENANCES AND LABOR SO THE EQUIPMENT OR INSTALLATION WILL FUNCTION AS SPECIFIED AND INTENDED.
2. "FURNISH" SHALL MEAN TO PURCHASE AND SUPPLY EQUIPMENT OR COMPONENTS.
3. "PROVIDE" SHALL MEAN "FURNISH AND INSTALL".
4. "OR APPROVED EQUAL" AND "OR EQUAL" SHALL MEAN EQUAL IN TYPE, DESIGN, QUALITY, ETC. AS DETERMINED BY THE OWNER AND APPROVED BY ENGINEER.

G. CODES, PERMITS, AND INSPECTIONS

1. INSTALL ALL WORK IN FULL SHALL BE DONE ACCORDANCE WITH CODES, RULES, AND REGULATIONS OF MUNICIPAL, CITY, COUNTY, STATE AND PUBLIC UTILITY AND ALL OTHER AUTHORITIES HAVING JURISDICTION OVER THE PREMISES. THIS SHALL INCLUDE ALL DEPARTMENT OF INDUSTRIAL RELATIONS, OSHA AND THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE, AS INTERPRETED BY THE LOCAL INSPECTION DIVISION. ALL THESE CODES, RULES AND REGULATIONS ARE HEREBY INCORPORATED INTO THIS SPECIFICATION.
2. COMPLY WITH SPECIFICATION REQUIREMENTS WHICH ARE IN EXCESS OF CODE REQUIREMENTS AND NOT IN CONFLICT WITH SAME.
3. THE CONTRACTOR SHALL SECURE ALL PERMITS AND CERTIFICATES OF INSPECTION INCIDENTAL TO HIS WORK, REQUIRED BY THE FOREGOING AUTHORITIES ALL SUCH CERTIFICATES SHALL BE DELIVERED TO THE OWNER.

H. LABELING AND NAMEPLATES

1. PERMANENTLY LABEL PANELBOARDS, TIME SWITCHES, CONTACTORS, PULL BOXES, JUNCTION BOXES, AND SAFETY SWITCHES INDICATING EQUIPMENT OR PANELS AND AREAS WHICH THEY SERVE.
2. PANELBOARDS SHALL BE LABELED AS SHOWN ON DRAWINGS, UNLESS DIRECTED OTHERWISE BY OWNER/FACILITIES MGMT. NAMEPLATE DETAIL IS FOR FACILITIES THAT DO NOT ALREADY HAVE EXISTING PANEL NAMEPLATE NOMENCLATURE & CONTENT REQUIREMENTS.
3. IDENTIFY AS TO USE ON FACE OF EQUIPMENT BY MEANS OF LAMINATED BLACK AND WHITE PHENOLIC LABEL WITH 3/8" LETTERS ENGRAVED THROUGH BLACK TO WHITE.
4. ALL SWITCHBOARDS AND PANEL BOARDS SHALL BE MARKED TO INDICATE THE DEVICE OR EQUIPMENT WHERE THE POWER SUPPLY ORIGINATES.

I. TESTS AND VOLTAGE RECORD

1. ELECTRICAL CONTRACTOR SHALL TEST ALL WIRING AND CONNECTIONS FOR CONTINUITY AND GROUNDS. WHEN THE INSULATION RESISTANCE TEST SHALL INDICATE THE POSSIBILITY OF FAULTY INSULATION, THE CONTRACTOR SHALL LOCATE THE POINTS OF SUCH FAULTY INSULATION AND PULL OUT THE CONDUCTOR, REPLACE SAME WITH NEW, AND DEMONSTRATE. BY FURTHER TEST THE ELIMINATION OF SUCH FAULT.
2. RECORD FEEDER LOAD CURRENTS AND LINE VOLTAGES MEASURED AT EACH PANELBOARD. ADJUST SINGLE PHASE LOAD CONNECTIONS TO BALANCE FEEDER LOADS WITHIN 10%. PROVIDE THE OWNER WITH A COMPLETE COPY OF ALL LOAD AND VOLTAGE RECORDS.

J. BRANCH CIRCUIT WIRING

1. PROVIDE A SYSTEM OF PANELS, CONDUITS, FITTINGS, BOXES, SUPPORTS AND ALL OTHER MISCELLANEOUS MATERIALS REQUIRED FOR EQUIPMENT INDICATED ON PLANS, COMPLETE AND READY FOR OPERATION BY THE OWNER.
2. HOME RUNS FROM 20A OUTLETS 200 FT. OR OVER AT 277 VOLTS, OR 100 FT. OR OVER AT 120 VOLTS SHALL BE #10 WIRE.
3. ALL FIXTURE AND BRANCH CIRCUIT WIRING CONNECTIONS OR SPLICES SHALL BE MADE IN JUNCTION AND OUTLET BOXES WITH U.L. LISTED PRESSURE TYPE. CONNECTORS AND LISTED FOR 600 VOLTS (1,000 VOLTS WHEN ENCLOSED IN FIXTURE). IDEAL INDUSTRIES WIRE NUTS OR APPROVED EQUAL MAY BE USED FOR JOINTS IN WIRE OF #8 GAUGE OR LESS.

K. CONDUCTORS

1. SIZES OF CONDUCTORS FOR FEEDERS ARE GIVEN ON THE DRAWINGS, AND NO WIRE SMALLER THAN #12 GAUGE SHALL BE USED FOR BRANCH LIGHTING OR POWER CIRCUITS. ALL WIRING SHALL HAVE THE U.L. LABEL, AND BE OF 98% CONDUCTIVITY COPPER. ALUMINUM WIRE OR ALUMINUM CABLE IS NOT ACCEPTABLE UNLESS SPECIFICALLY SHOWN ON DRAWINGS.
2. THE GAUGE OF ALL WIRE SHALL BE IN ACCORDANCE WITH B & S STANDARD.
3. ALL WIRE AND CABLE FOR BRANCH LIGHTING OR SMALL POWER CIRCUITS SHALL HAVE "NEC" TYPE "THHN" 600 VOLT INSULATION.
4. WIRE AND CABLE ABOVE #8 GAUGE SHALL BE STRANDED TYPE "THHN" INSULATED 600 VOLTS.

L. CONDUIT AND CABLES

1. ALL EXPOSED CONDUIT SHALL BE ELECTRICAL METALLIC TUBING (EMT) UNLESS OTHERWISE SPECIFICALLY STATED HEREIN.
2. CONDUIT AND EMT SHALL BE DELIVERED TO THE BUILDING IN 10 FOOT LENGTHS AND EACH LENGTH SHALL HAVE THE APPROVED UNDERWRITER'S LABORATORIES LABEL.
3. CONDUIT SHALL BE RUN CONCEALED IN ALL FINISHED AREAS OF THE BUILDING AND MAY BE RUN EXPOSED IN UNFINISHED AREAS AT CEILING OR JOIST LEVEL. RUN CONCEALED IN BLOCK WALLS THE EXTENT THAT IS PRACTICAL.
4. EMT CONNECTORS AND COUPLINGS SHALL SET-SCREW WHERE ACCEPTABLE TO OWNER AND LOCAL CODES, MADE OF STEEL AS MANUFACTURED BY THOMAS & BETTS, STEEL CITY OR APPLETON. BENDS AND OFFSETS SHALL BE MADE WITH A HICKY OR POWER BENDER WITHOUT KINKING OR DESTROYING THE SMOOTH BORE OF THE CONDUIT. PARALLELED CONDUITS SHALL RUN STRAIGHT AND WITH OFFSETS UNIFORM AND SYMMETRICAL. CONDUIT TERMINALS AT BOXES AND CABINETS SHALL BE RIGIDLY SECURED WITH LOCKNUTS AND BUSHINGS AS REQUIRED BY THE NATIONAL ELECTRICAL CODE. INSULATED BUSHINGS SHALL BE USED ON ALL CONDUIT 1-1/4" TRADE SIZE AND LARGER.
5. CONDUIT SHALL BE SECURELY FASTENED IN PLACE AT NO MORE THAN 10 FT. CONDUIT HANGERS, SUPPORTS, OR FASTENINGS SHALL BE PROVIDED AT EACH CONDUIT ELBOW AND AT THE END OF EACH STRAIGHT RUN TERMINATING AT A BOX OR CABINET. CONDUIT SHALL NOT BE SUSPENDED FROM THE CEILING OR CEILING SUSPENSION WIRES.
6. HORIZONTAL AND VERTICAL CONDUIT RUNS SHALL BE SUPPORTED BY ONE-HOLE MALLEABLE STRAPS, OR OTHER APPROVED METAL DEVICE WITH SUITABLE BOLTS, OR BEAM CLAMPS FOR MOUNTING TO BUILDING STRUCTURE OR SPECIAL BRACKETS. CONDUIT SHALL BE SUPPORTED FROM STRUCTURAL STEEL OR JOIST AND INDEPENDENT OF OTHER PIPING. DO NOT SUPPORT CONDUIT FROM METAL ROOF DECK, OR ANY OTHER SUPPORT DEVICE OF ANOTHER TRADE. NON-METALLIC SHEATHED CABLE (ROMEX) OR AC CABLE SHALL NOT BE USED.
7. TYPE MC CABLE MAY BE USED ONLY WHEN CONCEALED IN FINISHED WALLS OR ABOVE CEILING AND WHEN NOT SUBJECT TO PHYSICAL DAMAGE UNLESS ITS USE IS NOT APPROVED BY OWNER OR LOCAL CODES.
8. ONLY SHORT RUNS OF FLEXIBLE METAL CONDUIT LESS THAN 30" IN LENGTH SHALL BE USED FOR TERMINAL CONNECTIONS TO MOTORS, OTHER VIBRATING EQUIPMENT, OR FOR EQUIPMENT WHICH IT IS NOT PRACTICAL TO MAKE FINAL CONNECTION WITH RIGID CONDUIT. FLEXIBLE CONDUIT EXPOSED TO WEATHER SHALL BE LIQUID TIGHT FLEXIBLE METALLIC CONDUIT.
9. ALL FINAL CONNECTIONS TO VIBRATING OR MOTORIZED EQUIPMENT, INCLUDING GENERATORS & DRY-TYPE TRANSFORMERS, SHALL BE MADE WITH FLEXIBLE METAL CONDUIT SUITABLE FOR THE ENVIRONMENT WHICH IT IS TO BE LOCATED (FMC OR LFMC).
10. THE CONDUIT SYSTEM SHALL CONFORM TO ALL THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE AND LOCAL CODES.
11. ALL VERTICAL RUNS SHALL BE HARD PIPED CONDUIT AND NOT MC CABLE.
12. ALL MC CABLE AT JOIST LEVEL SHALL BE TIED TO THE JOIST IN A NEAT AND PROFESSIONAL MANNER AND ALL RUNS BETWEEN JOISTS SHALL BE TIED TO BRIDGING.

M. GROUNDING

1. THIS CONTRACTOR SHALL PROVIDE A COMPLETE SYSTEM OF GROUNDING FOR ALL EQUIPMENT AND STRUCTURES. A GOOD MECHANICAL AND ELECTRICAL CONNECTION SHALL BE MADE WITH APPROVED GROUNDING CONNECTORS.
2. ELECTRICAL SYSTEM AND EQUIPMENT GROUNDS SHALL COMPLY WITH ALL LOCAL, STATE AND NEC CODES AND REGULATIONS.
3. PANELS, CONDUIT SYSTEMS, MOTOR FRAMES, LIGHTING FIXTURES AND OTHER EQUIPMENT THAT IS PART OF THIS INSTALLATION SHALL BE PROPERLY BONDED AND GROUNDED IN ACCORDANCE WITH ALL APPLICABLE CODES.
4. MAIN GROUNDING SYSTEM SHALL BE SIZED TO CONFORM WITH TABLE 250-66 OF THE NATIONAL ELECTRIC CODE. PROVIDE CONDUIT TO PROTECT GROUND WIRE FROM PHYSICAL DAMAGE IF LESS THAN 6 FEET ABOVE FINISHED FLOOR.

N. LIGHTING/APPLIANCE PANELBOARDS AND DISTRIBUTION PANELS

1. 208/120V PANELS SHALL BE SQUARE "D" CO. TYPE "NQ" OR APPROVED EQUAL BY G.E., SIEMENS, OR CUTLER HAMMER, WITH TYPE "QOB" BOLT-ON BRANCH CIRCUIT BREAKERS.
2. 480/277V PANELS SHALL BE SQUARE "D" CO. TYPE "NF" OR APPROVED EQUAL BY G.E., SIEMENS, OR CUTLER HAMMER WITH BOLT-ON BRANCH CIRCUIT BREAKERS.
3. SHORT CIRCUIT RATINGS OF NEW PANELS SHALL BE AS NOTED ON DRAWINGS, OR AS OTHERWISE DIRECTED BY LOCAL UTILITY COMPANY. UL TESTED AND CERTIFIED SERIES RATINGS ARE ACCEPTABLE WITH WRITTEN DOCUMENTATION SHOWING SERIES RATINGS BUT ONLY IF ACCEPTABLE TO OWNER AND ALL APPLICABLE CODES.
4. ALL BREAKERS SHALL BE BOLTED TO BUS AND CAPABLE OF INTERCHANGING ONE, TWO OR THREE POLE UNITS. MULTIPLE UNITS SHALL HAVE COMMON TRIP. PROVIDE SPARE BREAKERS IN EACH PANEL AS SHOWN. ALL BUSSING SHALL BE ALUMINUM UNLESS SPECIFICALLY NOTED OTHERWISE.

O. GENERAL FOR ALL PANELS

1. CARDHOLDERS WITH CIRCUIT DIRECTORY MUST BE PROVIDED FOR EACH PANEL. DIRECTORY SHALL BE CLEAR AND DESIGNATION SHALL MATCH IDENTIFICATION ON EQUIPMENT. PANELBOARDS (POWER PANELS AND LIGHTING PANELS) SHALL BE WITH IDENTIFICATION LABELED ON PANEL DOOR. PROVIDE ENGRAVED LAMINATED PHENOLIC NAMEPLATES WITH 1/2" LETTERS.
2. ALL PANELS, SAFETY SWITCHES, STARTERS AND IN GENERAL, ALL EQUIPMENT REQUIRING LUGS SHALL BE EQUIPPED WITH SOLDERLESS TYPE U.L. APPROVED LUGS.
3. PROVIDE ALL NECESSARY UNISTRUT, CHANNEL, BACKING AND SUPPORTS TO MOUNT PANELBOARDS SECURELY IN PLACE.
4. SCREW FASTENED HANDLE LOCK-ON DEVICES ARE REQUIRED ON CIRCUIT BREAKERS PROTECTING THE FOLLOWING EQUIPMENT:
   - A. EMERGENCY, EXIT, SECURITY, AND NIGHT LIGHTS.
   - B. HEATING AND COOLING CONTROL CIRCUITS.
   - C. ALL TIME SWITCHES.
   - D. FIRE ALARM CONTROL PANEL & POWER SUPPLIES

P. TOGGLE SWITCHES AND RECEPTACLES

1. SINGLE POLE AND THREE WAY SWITCHES SHALL BE RATED 20 AMPERE, 277/120 VOLTS, COLOR SELECTION BY ARCHITECT, HUBBELL OR EQUAL.
2. SWITCHES SHALL BE MOUNTED 42" ABOVE FINISHED FLOOR TO CENTERLINE. DUPLEX RECEPTACLES SHALL BE AS SPECIFIED ON DRAWINGS.

Q. DISCONNECT SWITCHES

1. AN APPROVED HORSEPOWER RATED, HEAVY DUTY, DISCONNECT SWITCH SHALL BE PROVIDED WITHIN SIGHT OF EACH MOTOR AND EACH HEATING UNIT. PROVIDE FUSED SWITCHES WHERE BRANCH CIRCUIT FUSES ARE NOT SIZED FOR OVERLOAD PROTECTION.
2. SWITCHES ON THE ROOF SHALL BE WEATHERPROOF MOUNTED ON UNISTRUT.
3. SWITCHES SHALL BE LABELED ON THEIR COVER IDENTIFYING THE EQUIPMENT TO BE PROTECTED.
4. PROVIDE WEATHERPROOF JUNCTION BOX AND DISCONNECT IN ACCORDANCE WITH NEC 600 FOR ALL EXTERIOR BUILDING SIGNS (WHERE APPLICABLE).

R. MOTORS AND WIRING

1. PROVIDE DISCONNECT SWITCHES (EXCEPT WHERE SPECIFICALLY SPECIFIED BY (OTHERS) AND RUN POWER CIRCUITS FROM THE PANELBOARD THROUGH DISCONNECT SWITCHES & CONTROL DEVICES TO MOTOR TERMINALS.
2. PROVIDE ALL STARTERS, CONTROLS PUSH BUTTON STATIONS, ETC. NOT SUPPLIED BY OTHERS REQUIRED FOR THE PROPER AND INTENDED OPERATION OF MOTORS AND OR MOTORIZED EQUIPMENT SUPPLIED BY OTHERS.
   - A. THE ABOVE ELECTRICAL EQUIPMENT SHALL BE MOUNTED SECURELY TO WALL OR FRAMES AND THE ELECTRICAL CONTRACTOR SHALL FURNISH ALL NECESSARY BRACKETS, STRUCTURAL PIECES, EXPANSION BOLTS AND OTHER ACCESSORIES REQUIRED.
   - B. WOODEN PLUGS SHALL NOT BE PERMITTED FOR ANCHORING.
3. REFER ALSO TO MECHANICAL SPECIFICATIONS FOR WORK BY MECHANICAL CONTRACTOR WHICH MAY RESULT IN ADDITIONAL WORK FOR THIS ELECTRICAL CONTRACTOR.
4. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL POWER WIRING AND CONNECTIONS TO ALL HVAC EQUIPMENT.

S. DRY TYPE TRANSFORMERS

1. DRY TYPE TRANSFORMERS MUST MEET THE LATEST DEPARTMENT OF ENERGY STANDARDS FOR EFFICIENCY.
2. PROVIDE SQUARE D CLASS 7400, TYPE "EX" OR APPROVED EQUAL BY GE, EATON OR SIEMENS.
3. PROVIDE ALUMINUM WINDINGS UNLESS SPECIFICALLY NOTED OTHERWISE.
4. PROVIDE 6 2.5% TAPS. 2 ABOVE & 4 BELOW.
5. TRANSFORMER TO HAVE 220 CLASS INSULATION & 150 DEGREES C RISE

T. SWITCHBOARD

1. MANUFACTURERS
   - A. MANUFACTURER SHALL BE BY SQUARE D COMPANY TYPE QED-2 OR APPROVED EQUAL BY EATON, G.E. OR SIEMENS.
   - B. THE MANUFACTURE OF THE SWITCHBOARD SHALL BE THE SAME AS THE MANUFACTURER OF THE CIRCUIT BREAKERS OR THE SWITCHES MOUNTED IN THE SWITCHBOARD.
   - C. ALL NEW PANELBOARDS AND SWITCHBOARDS ON THIS PROJECT SHALL BE BY THE SAME MANUFACTURE AS THE SWITCHBOARD FOR THE PURPOSES OF STOCKING COMMON BREAKER TYPES, SERIES RATINGS, ETC.
   - D. SEISMIC REQUIREMENTS: THE PROJECT IS UNDER SEISMIC DESIGN CATEGORY B, PER ASCE 7, SECTION 13.1.4 EXCEPTIONS: THE SWITCHBOARD IS EXCEPT FROM MEETING SEISMIC REQUIREMENTS.
2. GENERAL
   - A. SHORT CIRCUIT CURRENT RATING: SWITCHBOARDS SHALL BE RATED WITH A MINIMUM SHORT CIRCUIT CURRENT RATING OF 65,000 RMS SYMMETRICAL AMPERES AT 480 VAC MAXIMUM.
   - B. SWITCHBOARD SHALL BE RATED AT 2,000 AMPS, 480/277 VOLTS, 3 PHASE, 4 WIRE.
   - C. FUTURE PROVISIONS: ALL UNUSED SPACES PROVIDED, UNLESS OTHERWISE SPECIFIED, SHALL BE FULLY EQUIPPED FOR FUTURE DEVICES, INCLUDING ALL APPROPRIATE CONNECTORS AND MOUNTING HARDWARE.
   - D. ENCLOSURE: TYPE 1 GENERAL PURPOSE. SECTIONS SHALL BE ALIGNED FRONT AND REAR.
     1. THE SWITCHBOARD ENCLOSURE SHALL BE PAINTED ON ALL EXTERIOR SURFACES. THE PAINT FINISH SHALL BE A MEDIUM GRAY, ANSI #49, APPLIED BY THE ELECTRO-DEPOSITION PROCESS OVER AN IRON PHOSPHATE PRE-TREATMENT.
     2. ALL FRONT COVERS SHALL BE SCREW REMOVABLE WITH A SINGLE TOOL AND ALL DOORS SHALL BE HINGED WITH REMOVABLE HINGE PINS.
     3. TOP AND BOTTOM CONDUIT AREAS SHALL BE CLEARLY INDICATED ON SHOP DRAWINGS.
   - E. NAMEPLATES: PROVIDE 1 INCH HIGH X 3 INCHES ENGRAVED LAMINATED (GRAVOPLY) NAMEPLATES FOR EACH DEVICE. FURNISH BLACK LETTERS ON A WHITE BACKGROUND FOR ALL VOLTAGES.
   - F. BUS COMPOSITION: SHALL BE ALUMINUM UNLESS OTHERWISE NOTED. PLATING SHALL BE APPLIED CONTINUOUSLY TO ALL BUS WORK. THE SWITCHBOARD BUSSING SHALL BE OF SUFFICIENT CROSS-SECTIONAL AREA TO MEET UL STANDARD 891 TEMPERATURE RISE REQUIREMENTS. THE PHASE AND NEUTRAL THROUGH-BUS SHALL HAVE AN AMPACITY AS SHOWN IN THE PLANS. THE NEUTRAL SHALL BE OF EQUIVALENT AMPACITY AS THE PHASE BUS BAR. TAPERED BUS IS NOT ACCEPTABLE. FULL PROVISIONS FOR THE ADDITION OF FUTURE SECTIONS SHALL BE PROVIDED. BUSSING SHALL INCLUDE ALL NECESSARY HARDWARE TO ACCOMMODATE SPLICING FOR FUTURE ADDITIONS.
   - G. BUS CONNECTIONS: SHALL BE BOLTED WITH GRADE 5 BOLTS AND CONICAL SPRING WASHERS.
   - H. GROUND BUS: SIZED PER NFPA70 AND UL 891 TABLES 25.1 AND 25.2 AND SHALL EXTEND THE ENTIRE LENGTH OF THE SWITCHBOARD. PROVISIONS FOR THE ADDITION OF FUTURE SECTIONS SHALL BE PROVIDED.
   - I. ACCESSIBILITY: FRONT
   - J. MAIN DEVICE
   - K. ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS.
     1. CIRCUIT BREAKER TRIP SYSTEM SHALL BE A MICROPROCESSOR-BASED TRUE RMS SENSING DESIGN WITH SENSING ACCURACY THROUGH THE THIRTEENTH (13TH) HARMONIC. SENSOR AMPERE RATINGS SHALL BE AS INDICATED ON THE ASSOCIATED DRAWINGS.
     2. THE INTEGRAL TRIP SYSTEM SHALL BE INDEPENDENT OF ANY EXTERNAL POWER SOURCE AND SHALL CONTAIN NO LESS THAN INDUSTRIAL GRADE ELECTRONIC COMPONENTS.
     3. CIRCUIT BREAKERS SHALL BE EQUIPPED WITH BACK-UP THERMAL AND MAGNETIC TRIP SYSTEM.
     4. THE AMPERE RATING OF THE CIRCUIT BREAKER SHALL BE DETERMINED BY THE COMBINATION OF AN INTERCHANGEABLE RATING PLUG, THE SENSOR SIZE AND THE LONG-TIME PICKUP ADJUSTMENT ON THE CIRCUIT BREAKER. THE SENSOR SIZE, RATING PLUG AND SWITCH ADJUSTMENTS SHALL BE CLEARLY MARKED ON THE FACE OF THE CIRCUIT BREAKER. CIRCUIT BREAKERS SHALL BE UL LISTED TO CARRY 100% OF THEIR AMPERE RATING CONTINUOUSLY WHEN APPLIED IN QED SWITCH-BOARDS.
     5. THE FOLLOWING TIME/CURRENT RESPONSE ADJUSTMENTS SHALL BE PROVIDED. EACH ADJUSTMENT SHALL HAVE DISCRETE SETTINGS AND SHALL BE INDEPENDENT FROM ALL OTHER ADJUSTMENTS.
        - a. LONG TIME PICKUP & LONG TIME DELAY
        - b. SHORT TIME PICKUP & SHORT TIME DELAY (I^2T IN & I^2T OUT)
        - c. INSTANTANEOUS PICKUP
        - d. GROUND FAULT PICKUP & GROUND FAULT DELAY (I^2T IN AND I^2T OUT)
   - L. BRANCH DEVICES: ADJUSTABLE INSTANTANEOUS-TRIP CIRCUIT BREAKERS: MAGNETIC TRIP ELEMENT WITH FRONT-MOUNTED, FIELD-ADJUSTABLE TRIP SETTING.
   - M. PROVIDE ENERGY REDUCTION MAINTENANCE SWITCH FOR ALL BREAKERS 1,200 AMPS AND LARGER, PER NEC 240.87.

U. GUARANTEE

1. IN ADDITION TO WARRANTIES OF EQUIPMENT BY MANUFACTURER THIS CONTRACTOR SHALL ALSO GUARANTEE EQUIPMENT PROVIDED BY HIM AND SHALL BE HELD FOR A PERIOD OF ONE (1) YEAR TO MAKE GOOD ANY DEFECTS IN MATERIALS AND WORKMANSHIP OCCURRING DURING THIS PERIOD, AT HIS SOLE EXPENSE. THE ONE (1) YEAR PERIOD SHALL START FROM DATE OF FINAL ACCEPTANCE BY OWNER.

V. FIELD DRAWING

1. KEEP ONE (1) SET OF WORKING DRAWINGS AND SHOP DRAWINGS AT THE JOB SITE FOR SOLE PURPOSE OF RECORDING ALL CHANGES MADE DURING CONSTRUCTION. AFTER COMPLETION OF THE WORK AND BEFORE REQUESTING FINAL PAYMENT, THE ABOVE MENTIONED DRAWINGS SHALL BE DELIVERED TO THE OWNER.

W. SUBSTITUTION

1. WHENEVER ALTERNATE MATERIALS ARE SPECIFIED, IT IS WITH THE UNDERSTANDING THAT ANY ONE OF THE MATERIALS IS ACCEPTABLE TO THE OWNER. MATERIALS AND EQUIPMENT OTHER THAN THOSE SPECIFIED ARE NOT TO BE ASSUMED TO BE SATISFACTORY SUBSTITUTES WITHOUT PRIOR APPROVAL OF THE OWNER AND ARCHITECT/ENGINEER.

X. SHOP DRAWINGS

1. ONLY MANDATORY SHOP DRAWINGS AS LIMITED/OUTLINED HEREIN SHALL BE SUBMITTED.
2. NO WORK SHALL BE COMMENCE UNTIL THE MANDATORY SHOP DRAWINGS HAVE BEEN APPROVED BY THE ARCHITECT/ENGINEER. THE ARCHITECT/ENGINEER SHALL REVIEW SHOP DRAWINGS BEFORE A COPY IS SUBMITTED TO THE OWNER FOR RECORD PURPOSES.
3. ONLY MATERIAL AND EQUIPMENT MANUFACTURERS OF PRODUCTS OR SYSTEMS LISTED BELOW SHALL FURNISH MANDATORY SHOP DRAWINGS FOR APPROVAL BY THE ARCHITECT/ ENGINEER PRIOR TO CONTRACTORS PURCHASING EQUIPMENT. SHOP DRAWINGS ARE TO CONTAIN THE FOLLOWING:
   - A. MANUFACTURER'S NAME, MATERIAL DESCRIPTION, SIZES AND DIMENSIONS AND OTHER PERTINENT INFORMATION TO CONFIRM AS A MINIMUM STANDARD FOR EQUIPMENT LISTED IN THE SCHEDULES ON THE DRAWINGS AND OR IN THE SPECIFICATIONS.
4. SUBMIT AN ELECTRONIC COPY (ADOBE .PDF AND/OR AUTOCAD .DWG FILE FORMAT) OF ALL REQUIRED ELECTRICAL SHOP DRAWINGS.
5. THE FOLLOWING S