ELECTRICAL SPECIFICATIONS

SECTION 16001 - GENERAL ELECTRICAL PROVISIONS

A. EACH CONTRACTOR SHALL GIVE ALL REQUISITE NOTICES, OBTAIN AND PAY FOR ALL PERMITS, DEPOSITS AND FEES NECESSARY FOR THE INSTALLATION OF WORK UNDER THESE SPECIFICATIONS. TWO (2) COPIES OF CERTIFICATES OF APPROVAL SHALL BE OBTAINED FROM ALL AUTHORITIES ISSUING SAME AND SHALL BE TURNED OVER TO OWNER PRIOR TO FINAL ACCEPTANCE OF THE WORK.

B. ALL WORK SHALL CONFORM WITH ALL APPLICABLE CODES AND ORDINANCES. IT SHALL BE EACH CONTRACTOR'S RESPONSIBILITY TO INQUIRE INTO, UNDERSTAND, AND COMPLY WITH ALL APPLICABLE ORDINANCES, LAWS, CODES AND/OR REGULATIONS.

C. SHOULD A BIDDER FIND DISCREPANCIES IN OR OMISSIONS FROM THE DRAWINGS OR SPECIFICATIONS, OR SHOULD HE BE IN DOUBT AS TO THEIR MEANING, HE SHOULD AT ONCE NOTIFY THE ARCHITECT WHO WILL SEND WRITTEN INSTRUCTIONS TO ALL BIDDERS.

D. BEFORE SUBMITTING A BID, BIDDERS WILL BE HELD RESPONSIBLE TO HAVE VISITED THE SITE OF THE WORK AND FULLY INFORM THEMSELVES AS TO ALL EXISTING CONDITIONS AND LIMITATIONS, INCLUDING RULES, FRINGE BENEFITS, TRAVEL PAY, AND OTHER EXPENSES PREVAILING IN THE LOCAL LABOR MARKET, AND NO ALLOWANCES SHALL SUBSEQUENTLY BE MADE ON BEHALF OF THE BIDDER BY REASON OF ANY ERROR ON HIS PART.

E. PROVIDE ALL LABOR AND MATERIAL FOR A COMPLETE INSTALLATION OF ALL ELECTRICAL WORK. ALL ELECTRICAL WORK TO BE RUN IN CONDUITS AND OR RACEWAYS TO LOCATIONS INDICATED ON THE PLANS.

F. ALL WORK MUST BE DONE IN A WORKMANLIKE MANNER TO THE COMPLETE SATISFACTION OF THE OWNER. ALL MATERIALS SHALL BE NEW OF THE QUALITY SPECIFIED AND FREE FROM DEFECTS AND IN FIRST CLASS CONDITION. ALL CONDUIT SHALL BE RUN STRAIGHT, PLUMB AND TRUE TO GRADE. ALL EXPOSED VERTICAL CONDUITS SHALL BE PLUMB. EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS FOR EACH PIECE OF EQUIPMENT USED. ALL MATERIAL AND EQUIPMENT SHALL BE OF THE STANDARD SPECIFIED.

G. DIMENSIONS GIVEN ON THE PLANS SHALL TAKE PRECEDENCE OVER SCALED DIMENSIONS.

H. BEFORE ORDERING ANY MATERIALS OR DOING ANY WORK, EACH CONTRACTOR SHALL VERIFY ALL MEASUREMENTS AND DIMENSIONS AT THE BUILDING SITE AND SHALL BE RESPONSIBLE FOR THE CORRECTNESS OF SAME. ANY DIFFERENCES THAT MAY BE FOUND SHALL BE SUBMITTED TO THE PROJECT MANAGER AND OWNER FOR CONSIDERATION BEFORE PROCEEDING WITH WORK.

I. PROVIDE AND INSTALL A COMPLETE AND OPERATING ELECTRICAL INSTALLATION IN ACCORDANCE WITH THESE SPECIFICATIONS AND ACCOMPANYING CONTRACT DRAWINGS. THIS SHALL INCLUDE ALL REQUIRED LABOR, EQUIPMENT, AND SUPERVISION.

J. WITHOUT LIMITING OR RESTRICTING THE VOLUME OF WORK AND SOLELY FOR THE CONVENIENCE OF THE ELECTRICAL CONTRACTOR, THE WORK TO BE PERFORMED SHALL, IN GENERAL, CONSIST OF THE FOLLOWING:
1. A COMPLETE ELECTRICAL DISTRIBUTION SYSTEM INCLUDING SERVICE ENTRANCE EQUIPMENT AND FEEDERS, PANELS, BRANCH CIRCUITS, BOXES, WIRING DEVICES, COVERPLATES, ETC.
2. METERING AS REQUIRED BY UTILITY CO. INCLUDING C.T. CABINET, METER SOCKET, CONDUIT ETC. AS REQUIRED. ELECTRICAL CONTRACTOR SHALL CONTACT UTILITY CO. AND INCLUDE ALL COSTS INVOLVED INCLUDING TRANSFORMER PAD, EXCAVATION, ETC. AS REQUIRED. TAP FEES AND ONE-TIME UTILIZED SERVICE CHARGES WILL BE PAID BY OWNER (OR DEVELOPER WHERE APPLICABLE).
3. THE WIRING OF MECHANICAL EQUIPMENT SHOWN ON MECHANICAL DRAWINGS. WORK SHALL INCLUDE ALL POWER AND CONTROL WIRING, DISCONNECT SWITCHES, ETC. AS REQUIRED.
4. LIGHT FIXTURES AND LAMPS SHALL BE INSTALLED AS SHOWN ON THE PLANS INCLUDING ALL DEVICES, EQUIPMENT, ETC. REQUIRED FOR MOUNTING. INCLUDE ALL PAINTING AS REQUIRED.
5. A COMPLETE CONDUIT SYSTEM FOR TELEPHONE INCLUDING SERVICE ENTRANCE CONDUIT, CABINETS, BRANCH CONDUITS, OUTLET BOXES, CABLES, COVERPLATES, ETC. ELECTRICAL CONTRACTOR SHALL CONTACT TELEPHONE CO. AND INCLUDE ALL COSTS INVOLVED FOR THE SERVICE ENTRANCE.
6. A COMPLETE EMERGENCY LIGHTING SYSTEM AS SHOWN ON THE DRAWINGS.
7. A CONDUIT SYSTEM FOR THE CASH REGISTER AND DATA SYSTEMS INCLUDING OUTLET BOXES, ETC.
8. A COMPLETE CONDUIT SYSTEM FOR FIRE ALARM AND SECURITY SYSTEMS INCLUDING OUTLET BOXES, ETC.
9. INSTALLATION OF THE ENERGY MANAGEMENT SYSTEM (EMS) AS SHOWN ON THE DRAWINGS INCLUDING ALL WIRING, JUNCTION BOXES, OUTLET BOXES, COVERPLATES, ETC. AS REQUIRED TO FORM A COMPLETE SYSTEM.
10. ALL CONDUIT FOR TELEPHONE/DATA SHALL BE RUN WITH A PULL STRING.

K. ALL ITEMS OF LABOR, MATERIAL AND EQUIPMENT NOT SPECIFIED IN DETAIL OR SHOWN ON DRAWINGS, BUT INCIDENTAL TO OR NECESSARY FOR THE COMPLETE INSTALLATION AND PROPER OPERATION OF THE WORK SHALL BE FURNISHED AS IF CALLED FOR IN DETAIL BY THE SPECIFICATIONS OR DRAWINGS.

L. BEFORE ENERGIZING ANY CIRCUITS TEST FOR GROUNDS AND SHORTS. TEST CIRCUITS WITH A "MEGGER" TESTER TO DETERMINE THAT INSULATION VALUES CONFORM TO APPLICABLE NEMA STANDARDS. CHECK MOTOR CONTROLLERS TO DETERMINE THAT PROPERLY SIZED OVERLOAD DEVICES ARE INSTALLED. CHECK MOTORS FOR PROPER ROTATION. TEST OTHER ELECTRICAL EQUIPMENT FOR PROPER OPERATION. PROVIDE REPORT OF FINDINGS.

M. THE ELECTRICAL CONTRACTOR SHALL DO ALL ELECTRIC POWER WIRING AND CONTROL WIRING INCLUDING SETTING OF ALL MOTORS NOT DIRECTLY CONNECTED TO DRIVEN EQUIPMENT AND SETTING OF ALL CONTROLS EXCEPT THOSE FACTORY MOUNTED ON EQUIPMENT OR PANELBOARDS. THE MECHANICAL CONTRACTOR SHALL INSTALL AND SET ALL CONTROLS AND APPURTENANCES INSTALLED IN PIPES AND DUCTWORK. THE MECHANICAL CONTRACTOR SHALL FIELD INSTALL ETM AND DUCT SENSORS IN EXISTING HVAC EQUIPMENT. SEE MECHANICAL AND ELECTRICAL DRAWINGS FOR FURTHER DETAILS AND REQUIREMENTS.

N. ALL EXPOSED CONDUIT, EQUIPMENT, HANGERS, ETC., WILL BE PAINTED BY CONTRACTOR WHEN REQUIRED.

O. OWNER SHALL PROVIDE THE FOLLOWING EQUIPMENT FOR WHICH THE CONTRACTOR SHALL PROVIDE ELECTRICAL WORK:
1. EXTERIOR SIGNS
2. POS TERMINALS (ALSO REQUIRES ISOLATED GROUND SYSTEM BY CONTRACTOR.)
3. SENSORMATIC (WHEN INDICATED ON DRAWINGS)
4. ENERGY MANAGEMENT SYSTEM COMPONENTS

P. ITEMS PURCHASED THROUGH A NATIONAL ACCOUNT (REFER TO RESPONSIBILITY MATRIX ELSEWHERE IN THE DOCUMENTS).
1. LIGHT FIXTURES (AND LAMPS WHERE INDICATED).

Q. PROVIDE TEMPORARY POWER AS NEEDED FOR CONSTRUCTION WORK. COORDINATE WITH UTILITY COMPANY.

R. ALL PAINTING OF EXPOSED ELECTRICAL COMPONENTS, INCLUDING CONDUITS, HANGERS, JUNCTION BOXES AND OTHER WORK IN FINISHED AREAS, INCLUDING ANY EQUIPMENT ROOMS, WILL BE DONE UNDER THE GENERAL CONSTRUCTION CONTRACT. EXPOSED PIPE AND EQUIPMENT ON EXTERIOR SHALL BE PAINTED.

S. PERFORM ALL REQUIRED CUTTING AND PATCHING NECESSARY TO COMPLETE THE WORK. PROVIDE LISTED FIRE STOP SYSTEM FOR ALL PENETRATIONS THROUGH RATED WALLS, FLOORS, CEILINGS, ETC.

T. CONTRACTOR SHALL GUARANTEE ALL MATERIAL, EQUIPMENT AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE BY THE OWNER. REPLACE ALL DEFECTIVE MATERIAL AND WORKMANSHIP AND ALL OTHER WORK AND EQUIPMENT DAMAGED THEREBY WITHOUT COST TO OWNER. IN ADDITION TO THE ONE (1) YEAR GUARANTEE, THE CONTRACTOR SHALL FURNISH ANY WARRANTIES OR GUARANTEES THAT NORMALLY COME WITH SPECIFIC PIECES OF EQUIPMENT THAT EXCEED THE ONE (1) YEAR GUARANTEE.

U. PROVIDE A COMPLETE SET OF AS-BUILT DRAWINGS ON COMPLETION OF THE PROJECT.

SECTION 16050 - ELECTRICAL MATERIALS & METHODS

A. SHOP DRAWINGS: PROVIDE ALL PHYSICAL AND PERFORMANCE CHARACTERISTICS OF ALL EQUIPMENT SPECIFIED.
1. PANELBOARDS, LIGHTING CONTACTORS, TRANSFORMERS, AND SERVICE EQUIPMENT.
2. SWITCHES, OUTLETS, AND AUTOMATIC LIGHTING CONTROLS.

B. THE CONTRACTOR SHALL REVIEW, APPROVE AND SUBMIT SEVEN (7) COPIES OF ALL SHOP DRAWINGS. IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO CHECK AND SUBMIT ALL SHOP DRAWINGS LISTED WITHIN THE SPECIFICATIONS TO THE ARCHITECT WITHIN SEVEN (7) CALENDAR DAYS OF THE PROJECT START DATE SO AS NOT TO DELAY THE PROJECT, OR DELAY THE WORK OF THE OWNER OR ANY SEPARATE CONTRACTOR.

C. NONE OF THESE ITEMS LISTED ABOVE SHALL BE INSTALLED ON THE CONSTRUCTION UNTIL REVIEW HAS BEEN MADE BY THE ARCHITECT / ENGINEER. THIS CONTRACTOR SHALL CHECK SHOP DRAWINGS AND ALL CONTRACTORS' EQUIPMENT TO ASCERTAIN PROPER LOCATION OF ALL EQUIPMENT AND CONNECTIONS.

D. ALL WORK INCLUDING ACCESSORIES, HANGERS, ETC., SHALL BE COMPLETELY SATISFACTORY AND ACCEPTABLE IN OPERATION, PERFORMANCE AND CAPACITY.

E. ANY WORK WHICH DOES NOT COMPLY WITH THE DRAWINGS AND/OR SPECIFICATIONS REQUIREMENTS, OR WHICH IS DAMAGED WILL BE HELD TO BE DEFECTIVE MATERIAL AND SHALL BE REMOVED AND REPLACED WITH PROPER AND ACCEPTABLE MATERIALS, EQUIPMENT AND/OR APPURTENANCES OR PUT IN PROPER AND ACCEPTABLE WORKING ORDER, SATISFACTORY TO THE OWNER, WITHOUT ADDITIONAL COST TO THE OWNER.

F. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, EQUIPMENT, HANGERS, ALL MOUNTING HARDWARE AND SERVICES NECESSARY FOR THE INSTALLATION OF ALL WORK REQUIRED FOR THIS CONTRACT. HE SHALL ERECT ALL STRUCTURAL STEEL REQUIRED FOR THE PROPER SUPPORT OF EQUIPMENT REQUIRING SAME. ALL SUPPORTS, BRACKETS, AND CLAMPS AND OTHER ITEMS SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE BEST PRACTICES OF THE TRADE AND RECOGNIZED CODES.

G. MATERIALS - ALL EQUIPMENT SHALL BE LISTED AND LABELED BY AN APPROVED TESTING AGENCY SUCH AS UL OR ETL. STRUCTURAL STEEL MEMBERS AND HANGERS SHALL ALSO CONFORM TO ASTM STANDARD SPECIFICATION A-36.

H. ALL MATERIAL TO BE PAINTED SHALL BE CLEANED AND PRIMED BEFORE FINAL PAINTING.

I. THE ELECTRICAL CONTRACTOR SHALL VERIFY DIMENSIONS AND CLEARANCES REQUIRED FOR THE FINAL LOCATION OF ALL EQUIPMENT. OUTLETS, EQUIPMENT OR WIRING IMPROPERLY PLACED BECAUSE OF THE ELECTRICAL CONTRACTOR'S FAILURE TO OBTAIN THIS INFORMATION SHALL BE RELOCATED AND REINSTALLED WITHOUT ADDITIONAL EXPENSE TO OWNER. THE ELECTRICAL CONTRACTOR SHALL DETERMINE THE ACTUAL DIRECTION OF ALL DOOR SWINGS BEFORE INSTALLING LIGHT SWITCHES. IMPROPERLY LOCATED SWITCHES SHALL BE RELOCATED WITHOUT ADDITIONAL EXPENSE TO OWNER.

J. UNLESS OTHERWISE MENTIONED OR INDICATED, MOUNTING HEIGHTS OF OUTLETS ARE SHOWN ON THE DRAWINGS OR IN THE SPECIFICATIONS. ALL DIMENSIONS GIVEN SHALL BE CONSIDERED TO BE FROM CENTER OF OUTLET OR BOTTOM OF LIGHT FIXTURE TO FINISHED FLOOR.

K. IT WILL BE THE SOLE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR TO PROPERLY ROUGH FOR THE ELECTRICAL CONDUIT, WIRING, AND EQUIPMENT UNDER THIS CONTRACT AND ANY COST INVOLVED IN THE RELOCATION OF THE ABOVE WILL BE THE ENTIRE RESPONSIBILITY OF THE CONTRACTOR. NO ADDITIONAL COST WILL BE PAID FOR ANY RELOCATION OF ROUGH-IN. FIELD VERIFY ALL GRADES, LOCATIONS, AND DIMENSIONS.

L. CONTRACTOR SHALL CARRY OUT ALL NEW WORK WITH A MINIMUM OF NOISE. ALL SITE AREAS AND NEW EQUIPMENT, FLOORS AND WALLS, SHALL BE ADEQUATELY PROTECTED FROM DUST AND DIRT CAUSED BY THE WORK. PROTECTION SHALL INCLUDE SUITABLE TEMPORARY BARRIERS OR COVERINGS. THE EXTERIOR AND INTERIOR PREMISES OF EACH BUILDING SHALL BE KEPT AS CLEAN AS POSSIBLE DURING CONSTRUCTION. ANY DAMAGES TO SURFACES OR EQUIPMENT AS A RESULT OF THE CONTRACTOR'S NEGLIGENCE SHALL BE REPLACED OR CORRECTED BY THIS CONTRACTOR AS REQUIRED.

M. THE CONTRACTOR SHALL MAKE FINAL CONNECTIONS BETWEEN ALL EQUIPMENT FURNISHED UNDER THIS CONTRACT. THE ELECTRICAL CONTRACTOR SHALL PROVIDE, INSTALL AND CONNECT ALL POWER WIRING OF CABLES TO ALL EQUIPMENT FURNISHED BY OTHERS.

N. DUE TO THE SCHEMATIC NATURE AND SMALL SCALE OF THE ELECTRICAL DRAWINGS, IT IS NOT POSSIBLE TO INDICATE ALL EXACT LOCATIONS, OFFSETS, FITTINGS, ACCESS PANELS, PULL BOXES, AND MISCELLANEOUS PARTS WHICH MAY BE REQUIRED TO FORM A COMPLETE SYSTEM. THE DRAWINGS ARE GENERALLY INDICATIVE OF THE WORK TO BE INSTALLED. THIS CONTRACTOR SHALL CAREFULLY INVESTIGATE THE STRUCTURAL AND FINISH CONDITIONS AFFECTING THE WORK AND ARRANGE ALL WORK ACCORDINGLY, FURNISHING NECESSARY PARTS AND EQUIPMENT AS MAY BE REQUIRED TO MEET THE VARIOUS CONDITIONS.

O. COORDINATE WORK WITH OTHER TRADES. WHERE NECESSARY, REPOSITION WORK TO AVOID INTERFERENCE AT NO ADDITIONAL COST TO OWNER. COORDINATE REVISED LOCATIONS WITH OWNER.

P. ALL OVERLOAD DEVICES, INCLUDING EQUIPMENT FURNISHED UNDER OTHER CONTRACTS, SHALL BE SET AND ADJUSTED TO SUIT THE LOAD CONDITIONS.

Q. AFTER ALL TESTS AND ADJUSTMENTS HAVE BEEN MADE, THE CONTRACTOR SHALL FULLY INSTRUCT THE OWNER'S REPRESENTATIVES IN ALL DETAILS OF OPERATION AND MAINTENANCE OF EQUIPMENT INSTALLED UNDER THIS CONTRACT. PROVIDE OWNER WITH TWO INSTRUCTION MANUALS ON EACH SYSTEM. INSTRUCTION MANUALS SHALL CONTAIN ALL SHOP DRAWINGS, SPARE PARTS LIST, MANUFACTURER'S INSTALLATION INSTRUCTIONS, GUARANTEES, ETC. INSTRUCTION SHALL BE FURNISHED UNTIL OWNER IS SATISFIED.

R. THIS CONTRACTOR SHALL CAREFULLY EXAMINE THE ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND PLUMBING DRAWINGS. IF ANY DISCREPANCIES OCCUR BETWEEN THE DRAWINGS OR BETWEEN THE DRAWINGS AND THE SPECIFICATIONS, HE SHALL REPORT SUCH DISCREPANCIES TO THE PROJECT MANAGER IN WRITING AND OBTAIN WRITTEN INSTRUCTIONS AS TO THE MANNER IN WHICH TO PROCEED. NO DEPARTURES FROM THE CONTRACT DRAWINGS SHALL BE MADE WITHOUT PRIOR WRITTEN APPROVAL OF THE OWNER.

S. THE CONTRACTOR SHALL REPAIR, REPLACE AND MAINTAIN IN SERVICE ANY NEW OR EXISTING UTILITIES, FACILITIES OR SERVICES (UNDERGROUND, OVERHEAD, INTERIOR OR EXTERIOR) DAMAGED, BROKEN OR OTHERWISE RENDERED INOPERATIVE DURING THE COURSE OF CONSTRUCTION. THE METHOD USED BY THE CONTRACTOR IN REPAIRING, REPLACING OR MAINTAINING THE SERVICES SHALL BE APPROVED BY OWNER.

T. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, EQUIPMENT AND SERVICES NECESSARY TO REPAIR ALL PAVEMENT DISTURBED UNDER THE CONTRACT.

U. PRIOR TO THE START-UP OF ANY SYSTEMS, ELECTRICAL CONTRACTOR SHALL CAREFULLY CHECK ALL DEVICES AND MANUFACTURER'S INSTRUCTIONS FOR THE PROPER PROCEDURE OF START-UP.

V. CHECK SERVICE ENTRANCE VOLTAGES AND INFORM ELECTRIC UTILITY OF ANY OVER-VOLTAGE OR UNDER-VOLTAGE CONDITIONS. CHECK GROUND CONDITIONS AND GROUNDING RESISTANCE. CHECK SYSTEM FOR PROPER PHASING. PERFORM ANY TESTS REQUIRED BY UTILITY ON SERVICE FEEDERS.

W. BALANCE ALL SINGLE PHASE LOADS AT PANELBOARDS. THE TOTAL CONNECTED LOAD ON EACH LEG OF THE PANEL SHALL NOT VARY MORE THAN 10 PERCENT. IF NECESSARY EXCHANGE THE CIRCUIT WIRES FROM THE CIRCUIT BREAKERS UNTIL THE ABOVE CONDITIONS ARE SATISFIED. RELABEL ANY CIRCUITS AND/OR RECONFIGURE ANY PANEL BOARD DIRECTORIES TO INDICATE THE NEW SCHEME.

X. REPLACE ALL BURNED OUT LAMPS AT THE COMPLETION OR WORK.

Y. ELECTRICAL CONTRACTOR SHALL MEGGER TEST EACH MOTOR WINDING BEFORE ENERGIZING THE MOTOR. THE INSULATION RESISTANCE SHALL BE RECORDED BASED ON WINDING TEMPERATURES AND VOLTAGE INFORMATION FURNISHED BY OWNER. ELECTRICAL CONTRACTOR SHALL SUBMIT RECORDED INSULATION RESISTANCE AND NOTIFY OWNER OF ALL MOTORS WITH LOW INSULATION RESISTANCE IN ORDER THAT THESE MOTORS MAY BE REPLACED.

Z. IN ADDITION TO ANY OTHER TESTS HEREIN SPECIFIED, THE SYSTEMS, AFTER COMPLETION, SHALL BE TESTED IN OPERATION FOR AT LEAST FIFTEEN (15) DAYS AND SHOWN TO BE IN SATISFACTORY OPERATING CONDITION.

AA. SHOULD ANY OF THE EQUIPMENT OR APPARATUS FURNISHED BY THE CONTRACTOR REQUIRE THE SERVICE OF A FACTORY REPRESENTATIVE FOR INSTALLATION OR PLACING IN PROPER SERVICE AND/OR ADJUSTMENT, THE CONTRACTOR SHALL PROVIDE SAME WITHOUT ADDITIONAL COST TO THE OWNER.

BB. WHERE REQUIRED IN PENETRATIONS OF FIRE RATED WALLS, CEILINGS OR FLOORS, ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL NELSON FLAMESEAL FIRESTOP PUTTY OR EQUAL FIRESTOP SYSTEM.

CC. SLEEVES THROUGH EXTERIOR WALLS BELOW GRADE SHALL HAVE THE SPACE BETWEEN CONDUIT AND SLEEVE CAULKED WATERTIGHT.

DD. THIS ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER DIRECTION OF ROTATION OF ALL MOTORS AND SHALL CHANGE CONNECTIONS AS REQUIRED TO PROVIDE FOR PROPER ROTATION.

EE. ELECTRICAL CONTRACTOR SHALL DO ALL POWER WIRING AND LINE VOLTAGE WIRING AND LINE VOLTAGE CONTROL WIRING INDICATED AND COVERED UNDER THE MECHANICAL AND PLUMBING SPECIFICATIONS AND DRAWINGS.

FF. REFER TO MECHANICAL AND PLUMBING DRAWINGS FOR SCHEMATIC WIRING DIAGRAMS OF ALL EQUIPMENT. USE MANUFACTURER'S INSTRUCTIONS FOR ACTUAL FIELD CONSTRUCTION.

GG. ELECTRICAL CONTRACTOR SHALL REFER TO MECHANICAL AND PLUMBING DRAWINGS FOR ADDITIONAL ELECTRICAL WORK TO BE INCLUDED IN HIS BID. THIS CONTRACTOR SHALL WIRE BETWEEN PUMPS AND STARTERS. PROVIDE ALL INTERCONNECTING WIRING BETWEEN RELAYS AND SWITCHES AS REQUIRED.

SECTION 16060 - GROUNDING & BONDING

A. FURNISH AND INSTALL A COMPLETE GROUNDING SYSTEM AS INDICATED ON THE DRAWINGS, SPECIFIED, OR REQUIRED BY THE NATIONAL ELECTRICAL CODE, NATIONAL SAFETY CODE AND/OR LOCAL CODES OR ORDINANCES.

B. PROVIDE CONTINUOUS GROUND CONNECTIONS TO ALL EQUIPMENT, DEVICES, METAL PIPING, AND STRUCTURAL STEEL. PROVIDE SERVICE GROUND CONNECTIONS TO THE BUILDING STRUCTURAL STEEL, A GROUND ROD, THE COLD WATER PIPING SYSTEM AND A UFER GROUND. PROVIDE JUMPERS FOR ANY SECTION OF THE COLD WATER PIPING SYSTEM THAT MAY BE INTERRUPTED BY THE REMOVAL OF EQUIPMENT IN THE SYSTEM. PROVIDE BONDING JUMPER FOR ANY METALLIC UNDERGROUND GAS LINES.

C. DOMESTIC AND FIRE PROTECTION METALLIC WATER PIPES, MISCELLANEOUS METAL TANKS, AND PIPING SHALL BE CONNECTED TO THE GROUNDING SYSTEM.

D. CONDUITS SHALL BE EFFECTIVELY GROUNDED TO THE METAL FRAMEWORK OF SWITCHES, GENERATORS, TRANSFORMERS, MOTORS, MOTOR STARTERS, PANEL-BOARDS AND JUNCTION BOXES BY MEANS OF DOUBLE LOCKNUTS OR GROUNDING BUSHINGS AND BONDING JUMPERS.

E. GROUNDING OR BONDING JUMPERS SHALL BE SIZED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS.

F. WHERE APPLICABLE, COORDINATE GROUNDING ELECTRODE SYSTEM WITH LANDLORD'S SERVICE GROUND SYSTEM.

G. ALL CONNECTIONS TO APPARATUS AND CONDUITS SHALL BE MADE WITH APPROVED SOLDERLESS CONNECTORS. CONNECTORS SHALL BE SECURELY BOLTED OR CLAMPED TO THE EQUIPMENT. ALL CONTACT SURFACES SHALL BE THOROUGHLY CLEANED BEFORE CONNECTIONS ARE MADE IN ORDER TO INSURE A GOOD METAL-TO-METAL CONTACT. THE GROUNDING SYSTEM SHALL BE CONTINUOUS THROUGHOUT.

H. ALL CONNECTIONS TO GROUND CONDUCTORS SHALL BE MADE ACCESSIBLE FOR VISUAL INSPECTION.

I. IN ALL NON-METALLIC CONDUIT THE ELECTRICAL CONTRACTOR SHALL PROVIDE A CODE SIZE, GREEN COLORED, COPPER WIRE IN ADDITION TO THE CONDUCTORS REQUIRED FOR NORMAL OPERATION.

SECTION 16070 - SUPPORTS & HANGERS

A. ALL FASTENINGS, SUPPORTS, HANGERS, CLAMPS AND ANCHORS SHALL BE OF THE TYPE MADE FOR THE SPECIFIC PURPOSE FOR WHICH THEY ARE TO BE USED.

B. A SYSTEM OF UNISTRUT OR KINDORF STEEL SUPPORTING SYSTEMS OR OTHER APPROVED HANGERS SHALL BE INSTALLED FROM THE BUILDING STRUCTURAL SYSTEM TO SUPPORT EQUIPMENT AND LIGHTING FIXTURES AS REQUIRED. OVERALL BUILDING ROOF LOADING SHALL NOT EXCEED 2 POUNDS PER SQUARE FOOT AVERAGE. PROVIDE NECESSARY AUXILIARY SUPPORTING STEEL TO HANG ELECTRICAL EQUIPMENT.

C. TOGGLE BOLTS OR MACHINE BOLT FASTENINGS SHALL BE USED FOR HOLLOW TILE, TERRA COTTA OR LATH CONSTRUCTION. MACHINE SCREWS SHALL BE USED FOR STRUCTURAL STEEL FASTENING. METALLIC (LEAD) EXPANSION SHIELD AND MACHINE SCREWS SHALL BE USED FOR SOLID MASONRY FASTENING. LAG SCREWS OR BOLTS SHALL BE USED FOR WOOD FASTENING. HANGERS FOR HORIZONTAL CONDUIT RUNS SHALL BE ADJUSTABLE CLEVIS TYPE. PERFORATED STRAP IRON HANGERS ARE NOT PERMITTED. TRAPEZE TYPE HANGERS MAY BE USED WHERE CONDUIT IS RUN IN PARALLEL GROUPS.

D. PROVIDE CONCRETE EQUIPMENT FOUNDATIONS AND REINFORCING FOR THESE BASES WHERE REQUIRED FOR EQUIPMENT MOUNTING.

E. COORDINATE ALL WORK WITH OTHER TRADES.

F. ALL CONDUIT AND EQUIPMENT SHALL BE FIRMLY INSTALLED TO PREVENT SWAYING, VIBRATING, OR SAGGING BY STEEL HANGERS OR FABRICATED SUPPORTS OF APPROVED DESIGN.

SECTION 16080 - ELECTRICAL IDENTIFICATION

A. ALL SWITCHGEAR, PANELS, TIME CLOCKS, THERMAL OVERLOAD FAN SWITCHES, EQUIPMENT CONTROL SWITCHES, CIRCUIT BREAKERS, SAFETY SWITCHES, MOTOR STARTERS AND SIMILAR ITEMS SHALL BE IDENTIFIED BY NAME, FUNCTION AND/OR CONTROL.

B. NAMEPLATES SHALL BE AT LEAST 1" X 3" WITH CHARACTERS NOT LESS THAN 1/4". THEY SHALL BE MADE UP OF TWO LAMINATED BLACK PLASTIC SHEETS BONDED WITH A MIDDLE SHEET OF WHITE PLASTIC AND CHARACTERS ENGRAVED IN ONE BLACK SHEET TO THE DEPTH OF THE WHITE PLASTIC. SECURELY FASTEN LABELS SO THAT THEY ARE VISIBLE AND AS INDICATED ON THE DRAWINGS.

SECTION 16120 - CONDUCTORS AND CABLES

A. ALL WIRING SHALL BE IN CONDUIT. ROMEX AND DIRECT BURIAL WIRING SYSTEMS ARE NOT ACCEPTABLE. MC AND AC CABLE ARE ALLOWED INDOORS WHERE CONCEALED OR IN STORES WITH BLACK-PAINTED STRUCTURE WHERE NEATLY ATTACHED TO STRUCTURAL MEMBERS IN JOIST SPACE.

B. ALL CONDUCTORS SHALL BE A PURE COPPER 98%, WITH INSULATION RATED AT 600 VOLTS MINIMUM. INSULATION RATING FOR BRANCH CIRCUIT #10 AND #12 AWG - TYPE "THWN" 75 DEGREES CENTIGRADE. BRANCH CIRCUIT #8 OR LARGER - TYPE "THWN" OR "THHN" 75 DEGREES CENTIGRADE. FEEDERS (MOTOR OR PANEL) - TYPE "THWN" OR "THHN" 75 DEGREES CENTIGRADE. RUNS WITHIN CONTINUOUS LIGHT FIXTURES - TYPE "THHN" 90 DEGREES CENTIGRADE.

C. MINIMUM WIRE SIZE - 20 AMP BRANCH CIRCUITS SHALL BE #12 UP TO 75 FEET AND #10 OVER 75 FEET. DISTANCE SHALL BE MEASURED FROM THE PANEL-BOARD CIRCUIT BREAKER TO THE FIRST OUTLET.

D. COLOR CODING (UNLESS REQUIRED OTHERWISE BY LOCAL CODE):
1. 208Y/120 VOLT CIRCUITS SHALL BE COLOR CODED AS FOLLOWS: A PHASE BLACK, B PHASE RED, C PHASE BLUE, NEUTRAL - WHITE.
2. 480Y/277 VOLT CIRCUITS SHALL BE COLOR CODED AS FOLLOWS: A PHASE BROWN, B PHASE ORANGE, C PHASE YELLOW, NEUTRAL - GRAY.

E. BRADY MARKERS SHALL BE INSTALLED ON ALL CIRCUITS IN RELAY AND CONTACTOR ENCLOSURES.

F. LOW VOLTAGE WIRING SHALL BE OF SIZE AND INSULATION RECOMMENDED BY THE MANUFACTURER OF THE EQUIPMENT BEING SERVED.

G. THE CONTRACTOR SHALL PROVIDE SERVICE ENTRANCE AS SHOWN ON THE DRAWINGS AND PER ELECTRICAL UTILITY REQUIREMENTS, INCLUDING TRANSFORMER PAD (IF REQUIRED), CONDUIT, CABLE, DISCONNECTION MEANS AND DEVICES AS SHOWN ON DRAWINGS, TO THE POINT OF CONNECTION WITH THE ELECTRIC UTILITY. SERVICE ENTRANCE CONDUCTORS SHALL BE COPPER AND SIZED PER ELECTRIC UTILITY REQUIREMENTS. HOWEVER, SERVICE ENTRANCE CONDUCTORS MAY BE ALUMINUM ALLOY CONDUCTORS IF PERMITTED BY THE ELECTRIC UTILITY AND BY THE LOCAL JURISDICTION. IF PROVIDED, ALUMINUM ALLOY CONDUCTORS SHALL BE COMPACT STRANDED CONDUCTORS AA-8000 SERIES IN SIZES WITH CURRENT-CARRYING CAPACITY EQUIVALENT TO THE COPPER SIZES INDICATED ON THE DRAWINGS, EQUAL TO PRODUCTS BY ALCAN CABLE STABILOY. USE MECHANICAL SCREW TYPE OR COMPRESSION TYPE DUAL RATED CONNECTORS PER THE MANUFACTURER'S RECOMMENDATIONS. COORDINATE WITH THE MANUFACTURER OF THE SERVICE ENTRANCE EQUIPMENT FOR PROPER LUGS.

H. IN COLD CLIMATE AREAS PROVIDE SELF-REGULATING HEAT TRACE IN GUTTERS AND DOWNSPOUTS. THE HEATING CABLE SHALL BE SUITABLE FOR WET LOCATIONS AND RATED AT 6 W/FT. THE CABLE SHALL BE BY RAYCHEM, THERMON, OR APPROVED EQUAL. CABLE SYSTEM SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS AND ALL APPLICABLE CODES. THE CIRCUIT(S) SUPPLYING THE CABLE SHALL HAVE GROUND FAULT PROTECTION.

I. LIGHTING AND CONVENIENCE OUTLET HOMERUNS ARE INDICATED ON THE DRAWINGS SEPARATELY AS WORK FOR CLARITY AND THEIR TERMINAL POINT AT THE CIRCUIT IS SHOWN SCHEMATICALLY. THE CONTRACTOR IS PERMITTED TO GROUP HOMERUN CIRCUITS IN ACCORDANCE WITH THE NEC AND TO CONNECT TO CIRCUIT BOXES AT ANY CONVENIENT POINT AS PERMITTED BY THE NEC.

J. LOW VOLTAGE WIRING RUN EXPOSED IN CEILING SPACES SHALL BE RUN IN BAR JOISTS AND PROPERLY SECURED. EXPOSED WIRING SHALL BE NEATLY INSTALLED AND KEPT CONCEALED WHERE POSSIBLE.

K. ALL CIRCUITS SHALL BE TAGGED AT PANEL AND AT OUTLETS USING NUMBERED TAGS TO SIMPLIFY FINAL HOOK-UP.

SECTION 16130 - RACEWAYS AND BOXES

A. ALL INTERIOR AND EXPOSED EXTERIOR SECONDARY WIRING SHALL BE RUN IN RIGID STEEL CONDUIT AND/OR ELECTRICAL METALLIC TUBING AS SPECIFIED HEREIN. ALL HOMERUNS TO THE PANELS SHALL BE 3/4" MINIMUM SIZE CONDUIT. RUNOUTS TO INDIVIDUAL OUTLETS OR LIGHT FIXTURES MAY BE 1/2". WHEREVER THE "CONDUIT" APPEARS HEREIN IT SHALL REFER TO EITHER RIGID CONDUIT OR ELECTRICAL METALLIC TUBING WHICHEVER IS APPLICABLE. RIGID CONDUIT SHALL CONFORM TO FEDERAL SPECIFICATIONS WWC-591D AND ASTM C80.1. ELECTRICAL METALLIC TUBING SHALL CONFORM TO FEDERAL SPECIFICATIONS WW-C-563 AND ASTM C80.2. ALL CONDUIT TO BE LISTED UNDER UL STANDARD 6 AND SHALL BEAR UL LABEL.

B. UNDERGROUND FEEDER CONDUITS WHERE NOTED SHALL BE PVC TYPE DB SUITABLE FOR DIRECT BURIAL CONFORMING TO NEMA STANDARD TC-6. ALL OTHER CONDUIT SHALL BE METALLIC AS DESCRIBED. PVC CONDUIT MAY BE USED ONLY BELOW SLAB IF ALLOWED BY LOCAL CODE AND APPROVED BY OWNER. CONDUIT ENTERING AND LEAVING SLAB SHALL BE GALVANIZED RIGID STEEL. PVC NOT ALLOWED ABOVE SLAB. PROVIDE GROUND WIRE IN PVC CONDUITS.

C. THE CONTRACTOR MAY FURNISH AND INSTALL ELECTRICAL METALLIC TUBING IN LIEU OF RIGID CONDUIT IN ALL DRY INTERIOR LOCATIONS EXCEPT WHERE SUBJECT TO DAMAGE.

D. RIGID CONDUIT SHALL BE INSTALLED IN ALL AREAS AND LOCATIONS WHERE EMT IS NOT PERMITTED.

E. COMPRESSION OR SETSCREW FITTINGS SHALL BE USED FOR EMT. INDENTER CONNECTORS ARE NOT ALLOWED.

F. PROVIDE CODE-SIZED GREEN GROUND WIRE IN EMT CONDUIT.

G. FLEXIBLE LIQUID-TIGHT METALLIC CONDUIT SHALL BE USED FOR CONNECTIONS TO MOTORS. THE CONDUIT SHALL BE OF THE SAME SIZE AS THE CONDUIT TO WHICH IT IS CONNECTED. FLEXIBLE CONDUIT (FEDERAL SPECIFICATIONS EWW-C-566) SHALL BE USED FOR FINAL CONNECTION BETWEEN RECESSED LIGHTING FIXTURES, EXHAUST FANS AND THEIR RESPECTIVE JUNCTION BOXES. ALL CONNECTORS TO BE OF A NEMA APPROVED TYPE.

H. FLEXIBLE CONDUIT SHALL BE USED FOR THE FOLLOWING APPLICATIONS:
1. FINAL CONNECTIONS TO MOTORS 18" MIN., 36" MAX.
2. FINAL CONNECTIONS TO OUTLETS ON VIBRATING EQUIPMENT.
3. FINAL CONNECTIONS TO RECESSED LIGHT FIXTURES.
4. SHORT CONNECTIONS WHERE RIGID CONDUIT OR EMT IS NOT PRACTICAL.

I. ALL UNDERFLOOR ELECTRICAL WIRING EXCEPT SERVICE ENTRANCES SHALL BE IN RIGID OR INTERMEDIATE CONDUIT. EMT CONDUIT SHALL NOT BE USED BELOW THE FLOOR. PVC SCHEDULE 40 CONDUIT IS ACCEPTABLE BELOW THE FLOOR SLAB IF ALLOWED BY LOCAL CODE AND APPROVED BY OWNER. CIRCUITS IN PVC CONDUIT MUST BE PROPERLY GROUNDED.

J. ALL ELECTRICAL WIRING ABOVE THE SLAB SHALL BE IN EMT (UNLESS OTHERWISE NOTED ON PLANS) OR HEAVIER IF REQUIRED. ALL HOMERUNS TO THE PANEL SHALL BE IN 3/4" MINIMUM SIZE CONDUIT. TELEPHONES, INTERCOM, ALARM SYSTEM BRANCHES AND SINGLE CIRCUIT BRANCHES MAY BE 1/2" CONDUIT. EACH ALARM SYSTEM TRUNK SHALL BE 3/4" CONDUIT MIN TO ALARM CONTROL. METAL OR PLASTIC BUSHINGS SHALL BE INSTALLED ON ALL CONNECTORS 1 1/4" OR LARGER.

K. ALL OUTLET BOXES SHALL BE OF SHEET STEEL, ZINC COATED AT LEAST 1 1/2" DEEP AND CAREFULLY SIZED AS TO THE NUMBER OF CONDUCTORS AND DEVICES AND ACCORDING TO APPROPRIATE SECTIONS OF THE N.E.C. BOXES SHALL HAVE KNOCK OUTS FOR CONDUIT TERMINATIONS AND MOUNTING LUGS AND EARS FOR COVERS. BOXES ARE TO BE RIGIDLY SECURED IN POSITION SET TRUE AND SQUARE.

L. CONCEALED OUTLET BOXES SHALL NOT BE LESS THAN FOUR INCHES SQUARE OR RECTANGULAR AND PROVIDED WITH THE PROPER SIZE KNOCKOUTS FOR THE CONDUITS USED. ALL UNUSED KNOCKOUTS MUST REMAIN CLOSED. BOXES IN PLASTER CONSTRUCTION SHALL BE PROVIDED WITH APPROVED COVERS OR PLASTER RINGS.

M. ALL OUTLETS OCCURRING IN OTHER THAN PLASTER CONSTRUCTION SHALL BE PROVIDED WITH FLUSH RECTANGULAR SQUARE-CORNERED BOXES MADE FOR THE PURPOSE. WHERE DEVICES ARE GANGED, GANG-TYPE BOXES SHALL BE INSTALLED.

N. BOXES SHALL BE OF UNIT CONSTRUCTION AND OF SIZE REQUIRED BY THE N.E.C. FOR THE NUMBER OF DEVICES SHOWN. THE SHAPE OF THE BOX SHALL BE SUCH AS TO PERMIT SURFACING MATERIALS TO BE CUT IN STRAIGHT LINES AND TO FIT CLOSELY AROUND THE BOX. THE BOX SHALL BE SO PLACED THAT THE COVER PLATE WILL BE FLUSH WITH THE FINISHED WALL SURFACE.

O. ALL BOXES FOR LIGHTING OUTLETS SHALL BE ROUND OR OCTAGONAL AND PROVIDED WITH FIXTURE STUDS OF A SIZE SUITABLE FOR THE WEIGHT OF THE FIXTURE TO BE SUPPORTED. IN NO CASE SHALL THE FIXTURE STUD BE LESS THAN 3/8 INCH. THE STUD SHALL BE OF INTEGRAL CONSTRUCTION WITH THE BOX.

P. OUTLET BOXES USED FOR EXTERIOR OUTLETS OR FOR EXPOSED INTERIOR CONDUIT RUNS SHALL BE OF CAST RUST-RESISTING METAL. GASKETED "IN-USE" COVERS SHALL BE PROVIDED WHERE THE OUTLET IS EXPOSED TO WEATHER OR MOISTURE.

Q. JUNCTION AND PULL BOXES SHALL BE FABRICATED FROM GALVANIZED METAL OF CODE GAUGE THICKNESS AND BE OF AMPLE SIZE TO PROPERLY ACCOMMODATE THE CONDUCTORS PASSING THROUGH OR CONTAINED THEREIN. FLUSH MOUNTED BOXES SHALL BE FITTED WITH A COVER WHICH OVERLAPS THE BOX ALL AROUND.

R. CONDUITS TERMINATING IN STEEL BOXES SHALL BE PROVIDED WITH APPROVED LOCKNUTS INSIDE AND OUTSIDE OF THE BOX WITH AN APPROVED BUSHING. ALL CONDUIT TO BE SQUARE CUT AND REAMED TO REMOVE BURRS.

S. RIGID STEEL CONDUITS IN WET, DAMP OR WEATHERPROOF (WP) AREAS SHALL HAVE ALL COUPLINGS SEALED WITH WEATHERPROOF SEALING COMPOUND.

T. CONDUITS SHALL BE SECURELY SUPPORTED FROM BUILDING STRUCTURE AT MAXIMUM 8 FT. INTERVALS FOR 3/4" AND 1" CONDUITS AND ON 10 FT. CENTERS FOR LARGER CONDUITS, BY APPROVED PIPE HANGERS ON SUPPORTING ASSEMBLIES. ALL AS PER N.E.C. REQUIREMENTS.

U. BOXES SHALL NOT BE PLACED IN LOCATIONS MADE INACCESSIBLE BY PIPING, DUCTS, CONDUITS, OR OTHER EQUIPMENT. JUNCTION AND PULL BOXES SHALL HAVE ATTACHED TO THEM A MANUFACTURER'S LABEL, UNDERWRITER'S LABEL AND AN INDICATION OF THE METAL GAUGE. BOXES SHALL BE INSTALLED EVERY 100 FEET IN ALL MAJOR FEEDERS.

V. THE ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL SLEEVES WHERE REQUIRED TO PROTECT EQUIPMENT OR FACILITIES IN THE INSTALLATION. EACH SLEEVE SHALL EXTEND THROUGH ITS RESPECTIVE FLOOR, WALL OR PARTITION AND SHALL BE CUT FLUSH WITH EACH SURFACE UNLESS OTHERWISE REQUIRED. WHERE CONDUITS PASS THROUGH WATERPROOFED FLOOR OR WALLS, DESIGN OF SLEEVES SHALL BE SUCH THAT WATERPROOFING CAN BE FLASHED INTO AND AROUND THE SLEEVES. WHERE CONDUITS PASS THROUGH ROOFS, SLEEVES SHALL BE INSTALLED BY ELECTRICAL CONTRACTOR AND FLASHED AND MADE WATERTIGHT BY THE GENERAL CONTRACTOR UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS.

W. THE ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL INSERTS OF AN APPROVED METALLIC TYPE FOR ALL HANGERS. WHERE TWO OR MORE PARALLEL CONDUITS ARE INSTALLED, CONTINUOUS INSERTS MAY BE USED. WHERE REQUIRED TO DISTRIBUTE THE LOAD ON THE INSERTS, A PIECE OF REINFORCING STEEL OF SUFFICIENT LENGTH SHALL BE PASSED THROUGH THE INSERT.

SECTION 16140 - WIRING DEVICES

A. ALL OUTLETS TO FINISH FLUSH WITH FINISHED SURFACES AND TO BE CHECKED FOR LOCATION WITH OWNER'S PLANS BEFORE INSTALLATION. ALL OUTLETS TO BE INSTALLED VERTICALLY.

B. ALL EXTERIOR AND TOILET ROOM OUTLETS SHALL HAVE GROUND FAULT INTERRUPTION PROTECTION.

C. DUPLEX RECEPTACLES IN ALL AREAS EXCEPT IN WP LOCATIONS AND SPECIFIED OTHERWISE SHALL BE OF THE GROUNDED 3 WIRE NEMA TYPE WD-101965 WITH FEDERAL SPEC LABEL, RATED AT TWENTY (20) AMPERES AT 125 VOLTS EQUAL TO HUBBELL NO. 5362-WHI. FURNISH WITH WHITE NYLON COVERPLATE. RECEPTACLES TO BE WHITE FINISH.

D. ALL RECEPTACLES IN WP LOCATIONS SHALL BE TWENTY (20) AMPERE FLUSH NYLON FACE GROUND FAULT INTERRUPTER, 3 SLOT, WEATHERPROOF/WEATHER RESISTANT DUPLEX TYPE COMPLETE WITH CAST ALUMINUM COVERPLATE, AND GASKET EQUAL TO HUBBELL NO. GFR-5362-WHI WITH MX4280S COVER.

E. ALL TOILET ROOM OUTLETS AND OUTLETS WITHIN 6' OF A SINK SHALL BE HUBBELL #GF-5362-WHI WITH MATCHING WHITE COLOR NYLON COVERPLATE.

F. ALL CASH REGISTER AND RECEPTACLES MARKED "IG" SHALL BE ISOLATED GROUND RECEPTACLES AND BE RATED AT TWENTY (20) AMPERES AT 125V, EQUAL TO HUBBELL IG-5362. ISOLATED GROUND RECEPTACLE FACE SHALL BE SOLID ORANGE. FURNISH AND INSTALL WITH WHITE NYLON COVERPLATE.

G. TOGGLE SWITCHES SHALL BE THE A.C. HEAVY DUTY, SPECIFICATION GRADE, 120/277 VOLTS, FLUSH TOGGLE TYPE SWITCH RATED AT 20 AMPERES, UNDERWRITERS' APPROVED AND MEETING NEMA STANDARD WD-1-1965 AND FEDERAL SPECIFICATIONS W-S-896D (TYPE III). ALL SWITCHES SHALL BE SINGLE POLE OR MULTI-POLE AS REQUIRED AND SHALL BE EQUAL TO GENERAL ELECTRIC NO'S. GE5951-7, GE5953-7 AND GE594-7, OR HUBBELL NO'S. 1221-WHI, 1223-WHI AND 1224-WHI. SWITCHES TO HAVE WHITE HANDLES.

H. THE APPROXIMATE SCHEMATIC LOCATION OF CEILING, SWITCH AND OTHER OUTLETS IS GIVEN ON THE DRAWINGS. THE EXACT LOCATION SHALL BE DETERMINED AT THE BUILDING AS THE WORK PROGRESSES. THE CONTRACTOR SHALL VERIFY ALL DOOR SWINGS AT JOB SITE. IN NO CASE SHALL SWITCHES BE LOCATED BEHIND DOOR SWINGS. ANY SWITCH SO LOCATED SHALL BE CHANGED AT CONTRACTOR'S EXPENSE. THE CONTRACTOR SHALL ALSO FIELD VERIFY ALL EQUIPMENT LOCATIONS AND ADJUST DEVICE AND OUTLET LOCATIONS TO AVOID INACCESSIBILITY. CONTRACTOR TO RELOCATE INACCESSIBLE OUTLETS AT NO ADDITIONAL COST TO OWNER.

I. UNLESS OTHERWISE INDICATED, OR OTHERWISE DECIDED AT THE SITE, OUTLET BOXES IN WALLS SHALL BE LOCATED WITH CENTERLINE AT ELEVATION ABOVE THE FINISHED FLOOR AS SHOWN ON TABLE:
1. WALL SWITCH OUTLETS 4'-0"
2. CONVENIENCE OUTLETS 1'-6"
3. SPECIAL OUTLETS ABOVE COUNTERTOPS
4. TELEPHONE OUTLETS 1'-6"

J. THE PROJECT MANAGER AND OWNER RESERVE THE RIGHT TO CHANGE THE LOCATION OF ANY OUTLET, BEFORE IT HAS BEEN INSTALLED WITHOUT ADDITIONAL COST TO OWNER.

K. ALL SWITCHES MOUNTED VERTICALLY SHALL HAVE THE "ON" POSITION AT THE TOP AND ALL HORIZONTAL MOUNTED SWITCHES SHALL HAVE THE "ON" POSITION AT THE LEFT.

SECTION 16200 - ELECTRICAL POWER

A. THE BUILDING SERVICE WILL BE 277/480 VOLT, 3 PHASE, 4 WIRE OR AS NOTED ON THE ELECTRICAL DRAWINGS. THE CONTRACTOR SHALL COORDINATE THE SERVICE AND METERING REQUIREMENTS WITH THE LOCAL POWER COMPANY, AND INSTALL IN ACCORDANCE WITH THEIR REQUIREMENTS.

B. SWITCHGEAR AND PANELS SHALL BE EQUIPPED WITH COPPER BUS BARS. CIRCUIT BREAKER CONNECTIONS TO THE BUS SHALL BE BOLT-ON. MULTIPOLE CIRCUIT BREAKERS SHALL BE COMMON TRIP TYPE. SEE PANEL SCHEDULES FOR AIC RATINGS. PANELBOARDS SHALL BE LISTED BY UNDERWRITERS LABORATORIES AND BEAR UL LABEL. PANELS SHALL BE MANUFACTURED BY SQUARE D, CUTLER-HAMMER, WESTINGHOUSE, SIEMENS, OR GENERAL ELECTRIC.

C. ALL DOORS ON LIGHTING, POWER AND MISCELLANEOUS PANELBOARDS, TELEPHONE CABINETS AND ALL OTHER ELECTRICAL SYSTEMS HAVING LOCKED APPARATUS SHALL BE SIMILARLY KEYED.

D. IN GENERAL, CABINETS SHALL BE INSTALLED SO THAT THE OPERATING HANDLE OF THE TOP BRANCH CIRCUIT PROTECTOR WILL NOT EXCEED 78" ABOVE FINISHED FLOOR AND THE BOTTOM OF THE CABINET BE NOT LESS THAN 12" ABOVE FINISHED FLOOR.

E. SAFETY SWITCHES SHALL BE OF SIZES NOTED ON THE DRAWINGS, FUSIBLE OR NON-FUSIBLE, IN NEMA 1 ENCLOSURE FOR INDOOR USE OR NEMA 3R ENCLOSURE FOR EXTERIOR USE. SWITCHES TO BE WESTINGHOUSE TYPE G-300 FOR 208V OR H-600 FOR 480V OR EQUAL.

F. ALL SWITCHES SHALL BE OF PROPER VOLTAGE, PHASE, AND HORSEPOWER RATING FOR THE LOAD SERVED AND HAVE DUAL INTERLOCKS DESIGNED TO INTERLOCK THE SWITCH BOX DOOR WITH THE SWITCH OPERATING MECHANISM. OPERATING HANDLE SHALL BE LOCKABLE IN THE "ON" AND "OFF" POSITIONS.

G. PROVIDE DISCONNECTING MEANS TO MEET CODE FOR ALL EQUIPMENT. THE MECHANICAL CONTRACTORS WILL FURNISH CERTAIN DISCONNECTS AS NOTED ON MECHANICAL DRAWINGS, ALL OTHER DISCONNECTS SHALL BE FURNISHED BY THE ELECTRICAL CONTRACTOR.

H. FUSIBLE SAFETY SWITCHES SHALL BE EQUIPPED WITH CLASS R REJECTION CLIPS AND BUSSMANN "LOW-PEAK" FUSES FOR DISTRIBUTION EQUIPMENT AND "FUSETRON" FUSES FOR LOCAL MOTOR PROTECTION. PROVIDE TYPE LPJ FUSES FOR SERVICE EQUIPMENT.

I. BRANCH CIRCUITS SHALL NOT BE LOADED ABOVE 80% OF CIRCUIT BREAKER CAPACITY, EXCEPT LIGHTING AND CONTINUOUSLY LOADED CIRCUITS SHALL NOT BE LOADED MORE THAN 70% OF CIRCUIT BREAKER CAPACITY.

J. ADJUST FOR VOLTAGE DROP TO PREVENT MORE THAN 2% FOR FEEDERS AND 3% FOR BRANCH CIRCUITS.

K. COORDINATE EQUIPMENT ELECTRICAL REQUIREMENTS WITH MECHANICAL AND PLUMBING SUBCONTRACTORS.

L. BALANCE LOADS ON EACH PHASE AT PANELBOARDS WITHIN 10 PERCENT. IF THEY VARY MORE THAN 10 PERCENT THE BRANCH CIRCUIT CONNECTIONS SHALL BE REDISTRIBUTED AT THE PANELS BY EXCHANGING THE CIRCUIT WIRES FROM THE BRANCH CIRCUIT PROTECTIVE DEVICES UNTIL THE ABOVE CONDITIONS ARE SATISFIED. RE-LABEL ANY WIRING CIRCUITS EXPERIENCING SUCH CHANGES, AND/OR RECONFIGURE ANY PANEL BOARD DIRECTORIES TO INDICATE THE NEW SCHEME.

M. EVERY OUTLET, DEVICE, BOX AND SYSTEM REQUIRING POWER SHALL BE CIRCUITED TO THE RESPECTIVE PANELS AS SHOWN ON PLAN. IN INSTANCES WHERE A SPECIFIC CIRCUIT HAS NOT BEEN ASSIGNED TO A BOX REQUIRING SAME, A CIRCUIT SHALL BE PROVIDED FOR THE LOAD SERVED AS DIRECTED BY THE PROJECT MANAGER AT NO ADDITIONAL COST TO OWNER.

N. PROVIDE A SPARE 1" CONDUIT FOR EACH SIX SPACES OR SPARE CIRCUIT BREAKERS IN EACH RECESSED MOUNTED PANEL. MINIMUM 1 SPARE CONDUIT PER PANEL. EXTEND SPARE CONDUITS TO A POINT ABOVE SUSPENDED CEILING OR ACCESSIBLE JOIST SPACE.

O. PROVIDE ACCURATE TYPEWRITTEN PANEL DIRECTORIES FOR EACH PANEL AT COMPLETION OF PROJECT.

P. LIGHTING CONTACTORS SHALL BE SQUARE D CLASS 8903 OR APPROVED EQUAL. PROVIDE CONTROL MODULES AS REQUIRED FOR CONTROL CONFIGURATION AND VOLTAGE. STANDARD CONTROL SYSTEM USES NORMALLY CLOSED, ELECTRICALLY HELD CONTACTORS. VERIFY EXACT CONFIGURATION REQUIRED. REPLACE ANY CONTACTORS GENERATING EXCESSIVE NOISE.

SECTION 16210 - ENERGY MANAGEMENT SYSTEM (EMS)

A. SEE DRAWINGS FOR EMS ITEMS FURNISHED BY OWNER'S EMS VENDORS.

B. THE CONTRACTOR SHALL PROVIDE MATERIAL AND LABOR FOR ALL CONDUITS, WIRING, RELAYS, OUTLETS, PULL STRINGS, HIGH VOLTAGE CONNECTIONS AND ETC., AS OUTLINED ON THE DRAWINGS.

C. THE ENERGY MANAGEMENT SYSTEM WORK SHOWN ON THE DRAWINGS SHALL BE PART OF THE ELECTRICAL CONTRACTOR'S WORK AND SHALL BE INCLUDED IN HIS BID.

D. THE SYSTEM GENERALLY HANDLES TEMPERATURE CONTROL AND CONTROL OF LIGHTING ALONG WITH OTHER MISCELLANEOUS FUNCTIONS.

E. OWNER'S COMMISSIONING CONTRACTOR WILL FURNISH EMS DEVICES TO BE INSTALLED BY THE ELECTRICAL CONTRACTOR. MOST OF THE EMS EQUIPMENT WILL BE NOVAR EQUIPMENT SALVAGED FROM OTHER STORES.

F. CONTRACTOR SHALL PROVIDE ALL WIRING & CONDUITS, AND MAKE ALL TERMINATIONS TO TERMINAL POINTS TO EMS EQUIPMENT TERMINALS, AND MAKE ALL TERMINATIONS TO ALL CONTROL BOARDS AND REMOTE MOUNTED EMS DEVICES.

G. MODIFICATIONS TO INTERNAL INDIVIDUAL HVAC UNIT WIRING, IF REQUIRED FOR INTERFACING WITH THE CONTROL SYSTEM, SHALL BE PERFORMED BY THE CONTRACTOR.

I. THE SYSTEMS COMMISSIONING CONTRACTOR WILL BE RESPONSIBLE FOR THE FOLLOWING:
1. VERIFY PROPER INSTALLATION OF ENERGY MANAGEMENT COMPONENTS
2. VERIFY PROPER INSTALLATION OF ENERGY MANAGEMENT RELATED WIRING
3. SET ENERGY MANAGEMENT MODULE ADDRESSES FOR HVAC CONTROLLERS
4. VERIFY EMPLOYEE LEVEL & CUSTOMER LEVEL LIGHTING SPLITS
5. VERIFY OUTDOOR LIGHTING OPERATION
6. VERIFY SIGN OPERATION
7. VERIFY FIELD SWITCH SETTINGS AND CALIBRATION OF VERIS WATTS TRANSDUCER/PHASE LOSS MONITOR.

J. THE CONTRACTOR SHALL COMPLETE THE OWNER ELECTRICAL PRE-VISIT CHECKLIST FORM AND SEND IT TO THE COMMISSIONING CONTRACTOR AS DIRECTED. THE CONTRACTOR IS RESPONSIBLE FOR THE COMPLETION OF ALL REQUIREMENTS IN THE CHECKLIST. (THE CHECKLIST WILL BE INCLUDED IN THE BID PACKAGE.)

SECTION 16270 - TRANSFORMERS

A. DRY TYPE TRANSFORMERS SHALL BE PROVIDED AT LOCATIONS SHOWN ON PLAN. TRANSFORMERS SHALL HAVE KVA AND VOLTAGE RATINGS AS INDICATED ON PLAN. 120/208 VOLT SECONDARY TRANSFORMER SHALL HAVE 480 VOLT DELTA PRIMARY, 60 CYCLE, 150° C. RISE, VENTILATED, 3 PHASE. TRANSFORMERS SHALL BE WESTINGHOUSE, SQUARE D, CUTLER-HAMMER, ITE OR GENERAL ELECTRIC. TRANSFORMERS SHALL MEET THE EFFICIENCY REQUIREMENT OF NEMA TP-1 AND THE EPA ENERGY STAR PROGRAM.

B. TRANSFORMER SHALL BE QUIET TYPE CONSTRUCTION AND HAVE FOUR (4) 2 1/2% TAPS, TWO (2) ABOVE AND TWO (2) BELOW NORMAL. SOUND LEVELS MUST FALL WITHIN ASA-NEMA STANDARD LEVELS ACCORDING TO KVA SIZE. ALL TRANSFORMERS SHALL BE UL LISTED WITH STANDARD FULL TEMPERATURE 150° C CLASS INSULATION.

C. TRANSFORMER SHALL BE SECURELY MOUNTED. PROVIDE VIBRATION ISOLATION PADS EQUAL TO MASON SUPER W AT MOUNTING POINTS TO ELIMINATE VIBRATION AND NOISE. PROVIDE FLEXIBLE CONDUIT CONNECTIONS TO TRANSFORMERS.

D. GROUND NEUTRAL OF TRANSFORMER SECONDARY TO NEAREST SUITABLE GROUNDING ELECTRODE AS DEFINED BY THE INSPECTION AUTHORITY AND THE NEC. PROVIDE BONDING JUMPER TO CONNECT THE NEUTRAL OF TRANSFORMER SECONDARY TO METAL CASE ENCLOSURE OF THE TRANSFORMER.

SECTION 16500 - LIGHTING

A. LIGHTING FIXTURES AND LAMPS SHALL BE FURNISHED UNDER A NATIONAL ACCOUNT ARRANGEMENT. SEE VENDOR LIST ON COVER SHEET FOR CONTACT INFORMATION. THE EQUIPMENT SHALL BE SHIPPED READY FOR FIELD CONNECTIONS.

B. THE CONTRACTOR SHALL INSTALL ALL LIGHT FIXTURES AND SHALL FURNISH AND INSTALL ALL SUITABLE PENDANTS, CANOPIES, COVERS, CEILING ROUNDELS, OPENING FLANGES, UNISTRUT, HANGERS, PLASTER RINGS OR FRAMES, IF RECESSED, AND NECESSARY RUBBER CORDS OR CHAINS WHICH ARE NOT INCLUDED IN THE CATALOG NUMBERS IN THE LIGHT FIXTURE SCHEDULE OR ON PLAN DETAILS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER SIZE OPENINGS FOR RECESSED FIXTURES AND SHALL FURNISH AND INSTALL ALL WOOD OR METAL FRAMES PROPERLY SET IN PLACE AND ANCHORED.

C. THE CONTRACTOR SHALL FURNISH ALL LIGHTING FIXTURES AS AN INTEGRAL PART OF THEIR SCOPE OF WORK FOR BTS AND RTS PROJECTS. FOR ALL OTHER PROJECTS LIGHTING FIXTURES SHALL BE FURNISHED BY [illegible] PROGRAM.

D. THE LIGHTING PACKAGE WILL BE SHIPPED READY FOR 277/480V. THE ELECTRICIAN SHALL INCLUDE IN HIS BID THE COST TO INTERNALLY CHANGE THE TAPS IN THE FIELD TO 120/208V, IF REQUIRED.

E. PRIOR TO BIDDING CONFIRM UNISTRUT, SUPPORT, AND HANGER LOCATIONS AND REQUIREMENTS WITH THE STRUCTURAL DRAWINGS. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE MANPOWER, EQUIPMENT AND MATERIALS FOR THE INSTALLATION OF THE FIXTURES TO BE COMPLETE AND READY FOR THE FINAL INSPECTIONS, WHICH IN ALL CASES SHALL BE SCHEDULED FOR THE MONDAY FOLLOWING THE FIXTURE DATE. THIS MAY REQUIRE SOME WORK TO BE PERFORMED ON THE WEEKEND AND/OR IN OFF-STANDARD HOURS (OVERTIME). ALL CONDUIT DROPS AND FLEXIBLE CONDUIT TO MILLWORK AND STORE FIXTURES SHALL BE PAINTED TO MATCH WALLS. ALL HORIZONTAL CONDUIT IN SALES AND RECEIVING AREAS SHALL BE INSTALLED IN THE JOIST SPACE. IF THE STRUCTURE IS PAINTED BLACK THE CONDUIT MAY BE INSTALLED ON THE BOTTOM CHORD. IF THE STRUCTURE IS PAINTED WHITE THE CONDUIT SHALL BE ATTACHED TO THE BOTTOM OF THE TOP CHORD OF THE JOISTS. FOR WOOD STRUCTURES, ALL CONDUIT MUST BE INSTALLED AT THE PURLINS AND OFFSET AROUND BEAMS.

F. DURING THE RECEIVING PROCESS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR AN ACCURATE CARTON COUNT, AS WELL AS FOR CHECKING THE CONDITION OF THE MERCHANDISE BEFORE THE FREIGHT BILL IS SIGNED. ANY EXCEPTIONS, SUCH AS SHORTAGES, DAMAGES, ETC., SHALL BE LEGIBLY NOTED ON THE FREIGHT BILL AND SIGNED BY THE DRIVER. THE CONTRACTOR SHALL THEN FILE A FREIGHT CLAIM WITH THE CARRIER. THE CONTRACTOR SHALL BE RESPONSIBLE TO FURNISH REPLACEMENT MATERIAL FOR ANY SHORTAGES OR DAMAGES.

G. CONCEALED DAMAGE IS DAMAGE NOT NOTED ON THE ORIGINAL FREIGHT BILL, BUT IS DISCOVERED ONLY UPON OPENING THE CARTON. THE CONTRACTOR SHALL BE RESPONSIBLE TO OPEN ALL CARTONS AND REPORT ANY CONCEALED DAMAGE WITHIN SIX (6) DAYS OF THE INITIAL DELIVERY DATE. TO REPORT CONCEALED DAMAGE, THE CONTRACTOR SHALL CONTACT THE CARRIER, ADVISE THEM AS TO THE NATURE OF THE CONCEALED DAMAGE, AND FOLLOW THE NECESSARY PROCEDURE TO FILE A FREIGHT CLAIM ON BEHALF OF THE OWNER. THE CONTRACTOR SHALL BEAR THE COST OF REPLACEMENT OF THE CONCEALED DAMAGED MATERIAL THAT IS NOT REPORTED WITHIN THE ABOVE TIME FRAME AND IN THE ABOVE PRESCRIBED MANNER.

H. FIXTURES AND/OR FIXTURE OUTLET BOXES SHALL BE PROVIDED WITH HANGERS TO ADEQUATELY SUPPORT THE COMPLETE WEIGHT OF THE FIXTURE. DESIGN OF HANGERS AND METHOD OF FASTENING OTHER THAN SHOWN ON THE DRAWINGS OR SPECIFIED SHALL BE SUBMITTED TO THE PROJECT MANAGER FOR APPROVAL.

I. FIXTURES MOUNTED ON OUTLET BOXES SHALL BE RIGIDLY SECURED TO A FIXTURE STUD IN THE OUTLET BOX. ACCESSORIES OR EXTENSION PIECES SHALL BE INSTALLED WHERE REQUIRED TO FACILITATE PROPER INSTALLATION.

J. UNLESS OTHERWISE DIRECTED, ALL PENDANT FIXTURES WITHIN THE SAME ROOM OR AREA SHALL BE INSTALLED PLUMB AND AT A UNIFORM HEIGHT FROM THE FINISHED FLOOR. ADJUSTMENT OF HEIGHT SHALL BE MADE DURING INSTALLATION.

K. FLUSH MOUNTED RECESSED FIXTURES SHALL BE INSTALLED SO AS TO COMPLETELY ELIMINATE LIGHT LEAKAGE BETWEEN THE FRAME AND THE FINISHED SURFACE. FIXTURE HOUSING, FRAME OR CANOPY SHALL PROVIDE A SUITABLE COVER FOR THE FIXTURE OUTLET BOX OR FIXTURE OPENING. WHERE SLOPING CEILINGS OCCUR, ALL RECESSED FIXTURES SHALL BE OF A TYPE DESIGNED FOR THE APPLICATION AND SHALL BE MOUNTED TO PROVIDE PROPER LIGHTING.

L. IN INSTANCES WHERE SUSPENDED CEILING CONSTRUCTION IS INSTALLED, PROVIDE AND INSTALL APPROPRIATE AND ADEQUATE AUXILIARY SUPPORTS. AUXILIARY SUPPORTS SHALL BE RIGIDLY ATTACHED TO SUBSTANTIAL BUILDING CONSTRUCTION. ADDITIONAL WIRES SHALL BE PROVIDED SO THAT SUPPORTS WILL NOT DEFLECT MORE THAN 1/360 OF THE SPAN WITH TWICE THE FIXTURE WEIGHT. PROVIDE "SCISSOR CLIPS" ON THE "T" BAR CONSTRUCTION FOR INSTALLATION OF SURFACE MOUNTED FLUORESCENT FIXTURES. PROVIDE SUPPLEMENTARY SUPPORT WIRES OR CLIPS AS REQUIRED BY CODE.

M. ELECTRICAL CONTRACTOR SHALL FURNISH ALL NECESSARY ADDITIONAL AUXILIARY SUPPORTING STEEL FOR FIXTURES NOT MOUNTED ON BUILDING FRAMEWORK, AND WHERE NECESSARY TO SPAN THE CEILING CHANNELS OF HUNG CEILING CONSTRUCTION.

N. AT COMPLETION OF WORK, ALL LIGHTING EQUIPMENT SHALL BE DUSTED AND CLEANED AND LEFT IN CONDITION READY FOR USE.

O. CIRCUITING SHALL BE PERFORMED AS SHOWN ON DRAWINGS, WITH WIRING RUN THROUGH LIGHTING CONTACTORS TO DESIGNATED CIRCUITS. NEUTRAL CONDUCTORS MAY BE SHARED PER NEC IF CONTRACTOR PROVIDES COMMON TRIP CIRCUIT BREAKERS.

P. CONTRACTOR MAY USE MODULAR WIRING AT HIS EXPENSE. INSTALLATION SHALL BE JUDGED UNOBTRUSIVE BY OWNER, WITH EXCESS LENGTHS NEATLY COILED AND TIED TO JOISTS.

Q. SEE LIGHT FIXTURE SCHEDULE FOR FIXTURES FURNISHED WITH CORDS. PER NEC 400.7(A)(2) CONNECT TO JBOX AT JOIST SPACE NEAR FIXTURES. TRIM EXCESS CABLE FOR NEAT APPEARANCE. WHERE REQUIRED BY LOCAL AUTHORITIES PROVIDE TWIST LOCK PLUG AND PATCHING RECEPTACLE.

SECTION 16720 - LOW VOLTAGE SYSTEMS

A. TELEPHONE SYSTEM EQUIPMENT, INSTRUMENTS, AND JACKS WILL BE FURNISHED AND INSTALLED BY OWNER. CONTRACTOR SHALL FURNISH AND INSTALL CONDUIT, JUNCTION BOXES, AND CABLE AT ALL OUTLET LOCATIONS AND WITHIN CONCEALED SPACES (WALLS).

B. PRIOR TO SUBMITTING HIS PROPOSAL, THE CONTRACTOR SHALL CONTACT THE LOCAL TELEPHONE COMPANY AND FORMALLY REQUEST DETAILED INSTRUCTIONS ON THE COMPANY'S REQUIREMENTS. THE CONTRACTOR SHALL INCLUDE ALL INSTRUCTIONS IN PREPARING THE PROPOSAL AS THE SYSTEM MUST BE INSTALLED TO SUIT THE CURRENT AND FUTURE REQUIREMENTS OF THE COMPANY WITHOUT ADDITIONAL COST TO OWNER. ALL CONDUITS AND EQUIPMENT SHALL BE INSTALLED ACCORDING TO THE RULES AND REGULATIONS OF THE TELEPHONE COMPANY.

C. THE SECURITY SYSTEM WILL BE INSTALLED BY OWNER'S LOSS VENDOR AND LOCATED WITHIN THE MIS AREA OR MANAGER'S OFFICE. THE ELECTRICAL CONTRACTOR SHALL PROVIDE POWER, CONDUIT, BOXES, ETC. AS SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL CONTACT OWNER'S SECURITY VENDOR LISTED IN THE NATIONAL ACCOUNTS LIST FOR DETERMINATION OF SCOPE OF WORK REQUIRED.

D. PROVIDE LOCK-ON BREAKERS FOR CIRCUITS SERVING SECURITY AND FIRE ALARM EQUIPMENT.

E. THE COMPUTER / CASH REGISTER DATA WIRING WILL BE INSTALLED BY OWNER'S INFORMATION SYSTEMS VENDOR. THE ELECTRICAL CONTRACTOR SHALL PROVIDE POWER, CONDUIT, BOXES, ETC. AS SHOWN ON THE DRAWINGS.

F. FURNISH AND INSTALL A SYSTEM OF RACEWAYS AND BOXES FOR COMPUTER/CASH REGISTER SYSTEMS AS SHOWN ON THE DRAWINGS. EQUIPMENT AND INSTRUMENTS FOR THESE SYSTEMS WILL BE FURNISHED BY OWNER.

G. PROPER PRACTICES SHALL BE OBSERVED FOR HORIZONTAL AND BACKBONE CABLING TO ENSURE INITIAL AND CONTINUING PERFORMANCE OF THE CABLING SYSTEM OVER ITS LIFE CYCLE.

H. TRANSMISSION PERFORMANCE OF INSTALLED COMPONENTS THAT MEET REQUIREMENTS OF DIFFERENT PERFORMANCE CATEGORIES (I.E., CABLES, CONNECTORS AND PATCH CORDS THAT ARE NOT RATED FOR THE SAME TRANSMISSION CAPABILITY) SHALL BE CLASSIFIED BY THE LEAST PERFORMING COMPONENT IN THE LINK.

I. FREE-STANDING EQUIPMENT RACKS, CABINETS, AND CLOSURES SHALL PROVIDE FOR PROPER SERVICE CLEARANCES AS PER APPLICABLE CODES AND REGULATIONS.

J. ALL MANUFACTURED PATHWAY SYSTEMS SHALL BE INSTALLED PER MANUFACTURERS INSTALLATION INSTRUCTIONS.

K. HORIZONTAL AND BUILDING BACKBONE CABLES SHALL BE INSTALLED IN "DRY" LOCATIONS THAT PROVIDE PROTECTION FROM MOISTURE LEVELS ABOVE THE INTENDED OPERATING RANGE OF INSIDE PLANT CABLE.

L. NON-CONTINUOUS CABLE SUPPORT MECHANISMS SUCH AS HANGERS, RINGS, AND HOOKS SHALL NOT BE SPACED FARTHER THAN 1.5 M (5 FT) APART. ALL MANUFACTURED RACEWAYS USED FOR CABLES SHALL BE INSTALLED ACCORDING TO THE RACEWAY MANUFACTURER'S SPECIFICATIONS.

M. TELECOMMUNICATIONS CABLES SHALL BE SUPPORTED WITH DEVICES DESIGNED FOR THIS PURPOSE AND SHALL BE INSTALLED INDEPENDENTLY OF ANY OTHER STRUCTURAL COMPONENT.

N. CABLES ROUTED VERTICALLY, AS IN BACKBONE OR HORIZONTAL CABLES ROUTED BETWEEN FLOORS, SHALL BE SUPPORTED WITH CLAMPS OR OTHER MECHANISMS. THESE SUPPORTS SHALL OCCUR AT LEAST TWO TIMES PER FLOOR.

O. THE NUMBER OF HORIZONTAL CABLES, REGARDLESS OF MEDIA TYPE, PLACED IN A CABLE SUPPORT OR PATHWAY (HANGERS, TRAYS, RACEWAYS ETC.) SHALL BE LIMITED, SUCH THAT THE GEOMETRIC SHAPE OF THE CABLES IS NOT ALTERED DURING THE WARRANTY PERIOD.

P. MAXIMUM PATHWAY (CABLE TRAY/WIREWAY) CAPACITY SHALL NOT EXCEED A CALCULATED FILL RATIO OF 50% TO A MAXIMUM OF 150 MM (6 IN) INSIDE DEPTH.

Q. MAXIMUM PATHWAY, (PERIMETER AND FURNITURE) CAPACITY SHALL NOT EXCEED A 40% FILL. A MAXIMUM OF 60% FILL IS ALLOWED TO ACCOMMODATE UNPLANNED ADDITIONS AFTER INITIAL INSTALLATION. MAXIMUM CAPACITY FOR CATEGORY 6A.

R. FOR OPEN CEILING CABLING PATHWAYS, CABLE SUPPORT SYSTEMS SHALL BE DESIGNED AND INSTALLED TO BE A MINIMUM OF 75 MM (3 IN) ABOVE THE CEILING GRID WHICH SUPPORTS THE TILES.

S. SHARP EDGES OR BURS ON PATHWAYS SHALL NOT COME INTO CONTACT WITH CABLES. EXPOSED METAL EDGES SHALL BE FITTED WITH BUSHINGS OR OTHER MEANS OF PROTECTION SO THAT CABLE JACKETS ARE NOT DAMAGED DURING OR AFTER INSTALLATION.

T. IN ADDITION TO MEETING THE PERFORMANCE REQUIREMENTS STATED IN OTHER SECTIONS OF THIS DOCUMENT, ADDITIONAL CARE SHALL BE TAKEN TO ASSURE THAT CABLES ARE SUITABLE FOR THE ENVIRONMENT IN WHICH THEY ARE INSTALLED. (E.G., TEMPERATURE SHALL NOT ADVERSELY AFFECT PERFORMANCE AND IN THE CASE OF WET LOCATIONS LIKE UNDERGROUND OR AERIAL SITUATIONS, A MOISTURE BLOCKING GEL MUST BE PART OF THE CABLE CONSTRUCTION)

U. THE MAXIMUM CABLE PULLING TENSIONS OR MINIMUM BEND RADII SHALL NOT EXCEED MANUFACTURER'S SPECIFICATIONS.

V. CABLES SHALL BE INSTALLED IN PATHWAYS AND SPACES THAT PROVIDE PROTECTION FROM THE ELEMENTS (I.E., MOISTURE) AND OTHER HAZARDS FROM THE ENVIRONMENT.

W. CABLE STACKING OF ANY RECOGNIZED MEDIA TYPE SHALL NOT BE PERMITTED.

X. CABLES SHALL NOT BE PLACED INTO A RACEWAY, CABINET, ENCLOSURE, OR OTHER FIXTURE WITH A BEND DELIMITER OR EDGE WHICH IS BEYOND THE CABLE MANUFACTURER'S BEND RADII REQUIREMENTS.

Y. THE PROCESS OF INSTALLING TRUNKING CABLE ASSEMBLIES IS SIMILAR TO TYPICAL CABLE INSTALLATIONS. HOWEVER, SPECIAL CARE SHALL TO BE TAKEN TO AVOID DAMAGE TO THE CONNECTORS ON THE ENDS OF THE ASSEMBLIES. CARE SHALL ALSO BE TAKEN WHEN ROUTING TO AVOID KINKING OF THE OUTER JACKET OF THE ASSEMBLIES.

Z. THE PULLING GRIP HEAD END OF THE TRUNKING ASSEMBLIES CAN GET QUITE LARGE IN DIAMETER. PATHWAYS FOR DISTRIBUTING THE TRUNKING CABLES SHALL BE SIZED TO INSURE THAT THERE IS SUFFICIENT SPACE FOR THE PULLING GRIP END TO PASS THROUGH WITHOUT DAMAGING THE CONNECTORS OR EXCEEDING THE PULLING TENSION.

AA. THE MINIMUM BEND RADIUS UNDER NO LOAD CONDITIONS FOR 4-PAIR UNSHIELDED TWISTED PAIR (UTP, F/UTP AND S/FTP) CABLE SHALL NOT BE LESS THAN FOUR TIMES THE CABLE DIAMETER. THE MINIMUM BEND RADIUS UNDER NO LOAD CONDITIONS FOR MULTIPAIR, HYBRID AND BUNDLED CABLES SHALL NOT BE LESS THAN TEN TIMES THE CABLE DIAMETER.

AB. THROUGHOUT ALL CABLE INSTALLATIONS AND ALL RECOGNIZED MEDIA TYPES, THE MOST SEVERE CABLE BEND RADII REQUIREMENTS (CABLE MANUFACTURER'S) SHALL BE MET.23)

AC. THE MINIMUM BEND RADIUS OF UTP PATCH CORDS/EQUIPMENT CABLES SHALL BE 6 MM (0.25 IN) AND 50 MM (2.0 IN) FOR F/UTP AND S/FTP CABLE CORDS.

AD. WHEN HORIZONTAL CABLES COMING FROM THE TR AND ER ARE EXPOSED IN THE WORK AREA OR OTHER LOCATIONS WITH PUBLIC ACCESS, THEY SHALL BE PROTECTED WITH TUBING, CONDUIT, SURFACE RACEWAY OR OTHER APPROPRIATE PATHWAYS.

AE. THE CONNECTING HARDWARE SHALL BE SECURELY MOUNTED ON WALLS, FLOORS, RACKS, MODULAR FURNITURE OR OTHER STABLE AND ACCESSIBLE SURFACES.

AF. CONNECTING HARDWARE AND ALL OTHER CABLING SYSTEM COMPONENTS SHALL BE INSTALLED TO PROVIDE OPTIMAL SIGNAL PERFORMANCE BY PROPER CABLE PREPARATION, TERMINATION PRACTICES, ORIENTATION, AND MOUNTING THAT ARE ALL IN FULL COMPLIANCE WITH MANUFACTURER'S GUIDELINES.

AG. CONNECTING HARDWARE SHALL BE INSTALLED TO PROVIDE ORDERLY, WELL-ORGANIZED CABLE MANAGEMENT.

AH. IN ORDER TO AVOID ALTERING THE TWIST RATE AND HENCE THE INTEGRITY OF THE BALANCED SIGNAL, THE INSTALLER SHALL COMPLETE THE TERMINATION ON BALANCED TWISTED-PAIR HARDWARE SUCH THAT A MINIMUM AMOUNT OF JACKET HAS BEEN REMOVED.

AI. ALL BALANCED TWISTED-PAIR CABLING RUNS SHALL BE CONNECTED STRAIGHT THROUGH WITH NO TRANSPOSITIONS OF PAIRS OR CONDUCTORS. WHEN CROSS-OVERS ARE REQUIRED FOR CERTAIN APPLICATIONS, THEY SHALL BE PROVIDED EXTERNAL TO THE CABLING SYSTEM

AJ. THE AMOUNT OF UNTWISTING IN A PAIR AS A RESULT OF TERMINATION TO CONNECTING HARDWARE SHALL BE NO GREATER THAN 13 MM (0.5 IN) FOR CATEGORY 5E CABLES OR HIGHER, AND SHALL BE NO GREATER THAN 75 MM (3 IN) FOR CATEGORY 3 CABLES.

AK. DUE TO THE COMBINED NEGATIVE EFFECTS ON LINK PERFORMANCE REGARDING MULTIPLE CROSS-CONNECT BLOCKS AND PATCH PANELS IN CLOSE PROXIMITY, THE OWNER CABLING SYSTEM REQUIRES THAT BALANCED TWISTED-PAIR LINKS SHALL PASS THROUGH NO MORE THAN TWO PIECES OF CONNECTING HARDWARE IN A CROSS- CONNECT.

AL. WHEN CABLES OF DIFFERENT TRANSMISSION PERFORMANCE CATEGORIES ARE USED, CABLES WITH DIFFERENT PERFORMANCE CATEGORIES SHALL TERMINATE IN DIFFERENT TERMINATION FIELDS.

AM. CABLING INSTALLATION SHALL BE TESTED, CERTIFIED AND SHOWN TO BE IN SATISFACTORY OPERATING CONDITION.

ARCHITECTURAL DESIGN·GUILD
2710 Sutton Blvd.
St. Louis, MO 63143
www.adg-stl.com
P.: 314.644.1234
F.: 314.644.4373
COF. #3 2 7 8 6
EXP. 2/28/2019

ALL ARCHITECTURAL AND ENGINEERING DRAWINGS ARE IN CONFIDENCE AND DISSEMINATION MAY NOT BE MADE WITHOUT PRIOR WRITTEN CONSENT OF THE ARCHITECT. ALL COMMON LAW RIGHTS OF COPYRIGHT AND OTHERWISE ARE HEREBY SPECIFICALLY RESERVED

OWNER

Office DEPOT OfficeMax

6600 NORTH MILITARY TRAIL
BOCA RATON, FL 33496

PHONE: (561) 438-6299
FAX: (561) 438-7237

PROJECT

Office DEPOT
STORE #0409
BOCA RATON, FL

4901 N. FEDERAL HIGHWAY
BOCA RATON, FL 33431

ISSUE DATE: 11/09/2018
STORE NUMBER: #0409
LEASABLE AREA: 29,701 S.F.
GROSS FLOOR AREA: 28,752 S.F.
JOB NUMBER: 2018.0120.00

ISSUE

	ISSUED FOR BID	11/09/18

SEAL

JOHN M. BRUNS LICENSE No. 54430 STATE OF FLORIDA PROFESSIONAL ENGINEER

JOHN M. BRUNS
#54430 | EXP. 02/28/2019

SHEET

ELECTRICAL SPECIFICATIONS

DRAWN: JEC
CHECKED: JMB

E501

FILE NAME: [2018.0120 E501 - Electrical Specifications.dwg] DATE: [11/9/18] TIME: [4:02 PM] USER: [Stephanie Raney]

!"#$%&\'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

Order Plans @ www.DDLine.com