

SECTION 280000 - ELECTRICAL SPECIFICATIONS

PART 1 GENERAL

- 1.1 PROVIDE ALL LABOR AND MATERIAL FOR ALL SYSTEMS AS INDICATED ON THE DRAWINGS AND SPECIFIED HEREIN, OR REASONABLY IMPLIED, TESTED AND READY FOR USE BY THE OWNER.
- 1.2 REFER TO THE ARCHITECTURAL, STRUCTURAL, MECHANICAL AND OTHER CONTRACT DOCUMENTS FOR THE PROJECT. ELECTRICAL WORK AND/OR COORDINATION ITEMS INDICATED ON THESE DOCUMENTS ARE A PART OF THE ELECTRICAL SCOPE OF WORK.
- 1.3 DISCREPANCIES BETWEEN EACH DIVISION'S DOCUMENTS OR BETWEEN THE DOCUMENTS AND THE EXISTING BUILDING OR SITE CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE BEFORE SUBMITTING A BID.
- 1.4 THE ELECTRICAL SCOPE OF WORK INCLUDES, BUT IS NOT LIMITED TO THE FOLLOWING EQUIPMENT OR SYSTEMS:
 - A. LIGHTING AND LIGHTING CONTROLS
 - B. WIRING DEVICES
 - C. POWER DISTRIBUTION EQUIPMENT
 - D. BRANCH CIRCUIT PANELBOARDS
 - E. UTILITY SERVICE INSTALLATION DRAWINGS
 - F. FIRE DETECTION AND ALARM SYSTEM
 - G. SECURITY SYSTEM
 - H. PROTERRA BUS CHARGING SYSTEM
 - I. GROUNDING AND GROUNDING SYSTEMS
 - J. NEW POWER AND COMMUNICATIONS UTILITY SERVICES
 - K. CONNECTIONS AND POWER CIRCUITS FOR EQUIPMENT PROVIDED UNDER ANOTHER DIVISION, OR BY THE OWNER.

- 1.5 SUBMITTALS, OR SHOP DRAWINGS ARE REQUIRED FOR THE FOLLOWING EQUIPMENT OR SYSTEMS:
 - A. LIGHTING AND LIGHTING CONTROLS
 - B. WIRING DEVICES
 - C. POWER DISTRIBUTION EQUIPMENT
 - D. BRANCH CIRCUIT PANELBOARDS
 - E. UTILITY SERVICE INSTALLATION DRAWINGS
 - F. FIRE DETECTION AND ALARM SYSTEM
 - G. PROVIDE SUBMITTALS ONLY FOR EQUIPMENT LISTED ABOVE. ALL SUBMITTALS MUST BE REVIEWED FOR PROPER CONTENT AND ACCURACY BY THE CONTRACTOR BEFORE SUBMISSION TO THE ENGINEER.
 - H. SUBMITTALS SHALL BE REVIEWED ONLY FOR GENERAL COMPLIANCE AND NOT FOR DIMENSIONS, QUANTITIES, ETC. THE SUBMITTALS THAT ARE RETURNED SHALL BE USED FOR PROCUREMENT. THE RESPONSIBILITY OF CORRECT PROCUREMENT REMAINS SOLELY WITH THE CONTRACTOR. THE SUBMITTAL REVIEW SHALL NOT RELIEVE THE CONTRACTOR OF RESPONSIBILITY FOR ERRORS OR OMISSIONS AND DEVIATIONS FROM THE CONTRACT REQUIREMENTS. ELECTRONIC COPIES ARE REQUIRED. REFER TO DIVISION 1 FOR EXACT QUANTITIES AND OTHER SUBMITTAL REQUIREMENTS.

- 1.6 RECORD DRAWINGS AND OPERATION AND MAINTENANCE MANUALS ARE REQUIRED TO BE SUBMITTED TO THE OWNER'S REPRESENTATIVE AND APPROVED BEFORE A FINAL CONTRACT PAY REQUEST. RECORD DRAWINGS INCLUDE A CLEAN SET OF CONTRACT DRAWINGS IDENTIFYING CHANGES OR DEVIATIONS MADE TO THE ORIGINAL DESIGN, AND MUST INCLUDE FEEDER ROUTINGS. OPERATION AND MAINTENANCE MANUALS (3 SETS) SHALL INCLUDE A COPY OF ALL APPROVED SUBMITTALS, EQUIPMENT MAINTENANCE INSTRUCTIONS, TEST REPORTS, INSPECTION REPORTS, EQUIPMENT WARRANTIES, AND THE CONTRACTORS' ONE-YEAR WARRANTY ON EQUIPMENT AND LABOR. REFER TO DIVISION 1 FOR EXACT QUANTITIES AND OTHER SUBMITTAL REQUIREMENTS.
- 1.7 OBTAIN AND PAY FOR LOCAL PERMITS, LICENSES AND INSPECTION FEES NECESSARY FOR THE WORK. PERMANENT AND TEMPORARY UTILITY SERVICE INSTALLATION CHARGES ARE NOT INCLUDED IN THE BASE-BID WORK; SUCH CHARGES ARE INCLUDED AS AN ALLOWANCE OF \$10,000 IN THE CONTRACT. THE UN-USED PORTION OF THIS ALLOWANCE SHALL BE RETURNED TO THE OWNER AT THE COMPLETION OF THE PROJECT. THIS CONTRACTOR IS RESPONSIBLE FOR CONTACTS WITH UTILITY COMPANIES, AND FOR ARRANGEMENT OF WORK ORDERS.

- 1.8 SUBMISSION OF A BID ASSUMES KNOWLEDGE OF ALL DOCUMENTS AVAILABLE RELATED TO THE WORK, AS WELL AS EXISTING CONDITIONS MADE AVAILABLE FOR REVIEW AND INSPECTION DURING THE BIDDING PERIOD. THIS CONTRACTOR SHALL INFORM THE OWNER'S REPRESENTATIVE OF ANY UNKNOWN AND/OR CONCEALED CONDITIONS AFFECTING THE NEW WORK, AS THEY ARE DISCOVERED.

- 1.9 WHEREVER THE WORD "PROVIDE" IS USED, IT SHALL MEAN: FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR.

- 1.10 THE ELECTRIC SERVICE, THE ELECTRICAL DISTRIBUTION SYSTEM AND ALL NON-CURRENT CARRYING METAL PARTS OF THE ELECTRICAL SYSTEM SHALL BE GROUNDED IN ACCORDANCE WITH ARTICLE 250 OF THE NATIONAL ELECTRICAL CODE, AND ALL OTHER APPLICABLE CODES AND STANDARDS. ALL BRANCH CIRCUITS AND FEEDERS SHALL BE GROUNDED BY MEANS OF AN INSULATED GROUNDING CONDUCTOR INSTALLED WITHIN EACH RACEWAY. THE ENTIRE GROUNDING SYSTEM SHALL BE TESTED FOR CONTINUITY AT THE COMPLETION OF THE WORK.

- 1.11 THE NEW MATERIAL AND LABOR SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR FROM THE ACCEPTANCE BY THE OWNERS' REPRESENTATIVE. NOTE THAT CERTAIN SPECIFIED ITEMS OF EQUIPMENT MAY CARRY A LONGER PERIOD OF WARRANTY.

- 1.12 PROVIDE A PERMANENT NAMEPLATE OR PLAQUE TO IDENTIFY THE MAXIMUM FAULT CURRENT AMPERES AVAILABLE AT THE MAIN SERVICE DISCONNECTING MEANS, IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE ARTICLE 110.

PART 2 PRODUCTS

- 2.1 ALL MATERIAL, EQUIPMENT INSTALLATION AND LABOR SHALL BE IN ACCORDANCE WITH THE LATEST APPLICABLE NATIONAL, STATE AND LOCAL CODES AND NFPA PUBLICATIONS, AS INTERPRETED BY THE AUTHORITY HAVING JURISDICTION. THIS CONTRACTOR MUST ADHERE TO PROPER INSTALLATION TECHNIQUES IN ACCORDANCE WITH INDUSTRY STANDARDS AS DEFINED BY ANSI AND NECA. IN ADDITION, OSHA REQUIREMENTS AND ANY SITE SPECIFIC SAFETY STANDARDS SHALL BE FOLLOWED FOR SAFETY OF PERSONNEL ON SITE. NEW EQUIPMENT SHALL BE UL AND/OR CSA LISTED.
- 2.2 WIRING DEVICES SHALL BE "SPECIFICATION GRADE" AND SHALL BE OF ONE MANUFACTURER, WITH MATCHING PLASTIC PLATES. HUBBELL DEVICES ARE LISTED; LEVITON AND PASS & SEYMOUR DEVICES WITH EQUAL SPECIFICATIONS MAY BE SUPPLIED. IVORY DEVICES AND PLATES SHALL BE PROVIDED, UNLESS OTHERWISE REQUESTED. THE OWNERS' REPRESENTATIVE WILL CONFIRM COLORS OF DEVICES AND PLATES DURING THE SUBMITTAL APPROVAL PROCESS. UNLESS NOTED OTHERWISE, STANDARD DEVICES SHALL BE:
 - A. LIGHT SWITCHES: 120/277 VOLT, QUIET TYPE, HUBBELL #1221 (SINGLE POLE), #1223 (THREE-WAY) AND #1224 (FOUR-WAY).
 - B. GENERAL PURPOSE RECEPTACLES: 125 VOLT, 20 AMPERE, 2-POLE, 3-WIRE, DUPLEX TYPE, NEMA 5-20R, HUBBELL #5362.
 - C. GFCI RECEPTACLES: 125 VOLT, 20 AMPERE, 2-POLE, 3-WIRE DUPLEX TYPE, NEMA 5-20R, HUBBELL #GFR-5362, SELF-TESTING AND FEED-THRU TYPE CAPABLE OF PROTECTING DOWNSTREAM CIRCUIT DEVICES.

- D. TAMPER RESISTANT RECEPTACLES: 125 VOLT, 20 AMPERE, 2-POLE, 3-WIRE DUPLEX TYPE, NEMA 5-20R, HUBBELL #BR20-TR SERIES.
- E. EXTERIOR RECEPTACLES: PROVIDE A GFCI RECEPTACLE WITH A TAYMAC #MX4380S, METAL EXTRA DUTY "IN-USE" COVER AND HORIZONTAL MOUNTED BOX.
- F. OTHER SPECIAL PURPOSE DEVICES MAY BE SPECIFIED ON THE PLANS. THESE INCLUDE FLOOR OUTLETS AND SURFACE RACEWAY SYSTEMS.
- G. LINE-VOLTAGE WALL OCCUPANCY SENSORS: WATTSTOPPER #DW-100 SERIES, DUAL TECHNOLOGY, 120/277 VOLT, 800W/1200W RATED, WITH ON/OFF BUTTON. SENSOR SWITCH TYPE WSD-PDT IS CONSIDERED AN EQUIVALENT.
- H. WIRING DEVICES SHALL BE PROVIDED WITH A GROUNDED WIRE CONNECTED TO THE DEVICE AND/OR THE OUTLET BOX.

- 2.3 ALL WIRING SHALL BE COPPER, 90 DEGREE C. RATED, TYPE THHN, THWN OR XHHW, WITH 600-VOLT INSULATION UNLESS INDICATED OTHERWISE ON THE DRAWINGS. THE MINIMUM WIRE SIZE IS #12 FOR 120 AND 277 VOLT BRANCH CIRCUITS, #10 SHALL BE USED FOR CIRCUIT LENGTHS GREATER THAN 150 FEET.

- A. FOR NEW DISTRIBUTION SYSTEMS, COLOR CODE BRANCH CIRCUIT AND FEEDER CONDUCTORS AS FOLLOWS:
 - 1. 208Y/120 VOLT, 3 PHASE, 4 WIRE SYSTEM
 - A. PHASE A-BLACK
 - B. PHASE B-RED
 - C. PHASE C-BLUE
 - D. NEUTRAL-WHITE
 - E. GROUND-GREEN
 - 2. 480Y/277 VOLT, 3 PHASE, 4 WIRE SYSTEM
 - A. PHASE A-BROWN
 - B. PHASE B-ORANGE
 - C. PHASE C-YELLOW
 - D. NEUTRAL-WHITE WITH TRACER
 - E. GROUND-GREEN
 - 3. IN ADDITION TO THESE REQUIREMENTS, ALSO PROVIDE COLOR CODING OF CONDUCTORS AT ALL JUNCTION OR PULLBOXES.

- 2.4 ALL WIRING SHALL BE INSTALLED IN CONDUIT, AS PERMITTED BY THE NATIONAL ELECTRICAL CODE. AT THE CONTRACTOR'S OPTION, AND AS PERMITTED BY THE NATIONAL ELECTRICAL CODE, TYPE MC CABLE, OR A MANUFACTURED WIRING SYSTEM MAY BE USED FOR 20 AMPERE AND 30 AMPERE BRANCH CIRCUITS IN STUD WALLS AND ABOVE ACCESSIBLE LAY-IN CEILING OF CONDUIT AND WIRE. HOMERUNS TO PANELS SHALL BE IN CONDUIT. PVC CONDUIT MAY BE USED FOR EXTERIOR UNDERGROUND CIRCUITS AND FOR INTERIOR CIRCUITS AND FEEDERS LOCATED UNDER THE GROUND FLOOR SLAB. FLEXIBLE CONDUIT SHALL BE USED FOR CONNECTIONS TO MOTORS, EQUIPMENT, TRANSFORMERS, LIGHTING FIXTURES, AND FOR BRANCH CIRCUIT WIRING INSTALLED IN CASEWORK. EXPOSED CONDUIT IN HIGH TRAFFIC AREAS SHALL BE RIGID GALVANIZED OR IMC, FROM THE FLOOR TO A LEVEL OF 8'-0" ABOVE THE FLOOR.

- 2.5 LIGHTING FIXTURES AND ASSOCIATED BALLASTS AND TRANSFORMERS, AND LIGHTING CONTROLS SHALL BE AS INDICATED ON THE DRAWINGS, COMPLETE WITH PROPER LAMPS, ACCESSORIES AND SUPPORTS AS RECOMMENDED BY THE MANUFACTURER AND IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE, ARTICLES 410 AND 411, OR ANY LOCAL CODES THAT MAY APPLY.

- A. IMMEDIATELY PRECEDING THE FINAL INSPECTION, THIS CONTRACTOR SHALL THOROUGHLY CLEAN ALL FIXTURES OF DUST, DIRT, GREASE, FINGERMARKS, ETC. ALL LAMPS SHALL BE OPERATING AT THE TIME OF OWNER'S ACCEPTANCE.

- 2.6 SWITCHBOARDS, PANELBOARDS, TRANSFORMERS, DISCONNECTS, AND OTHER POWER DISTRIBUTION EQUIPMENT SHALL BE PROVIDED FROM ONE MANUFACTURER WHEREVER POSSIBLE. APPROVED MANUFACTURERS ARE SQUARE D, GENERAL ELECTRIC, SIEMENS, ITC OR CUTLER HAMMER. CIRCUIT BREAKERS SHALL BE BOLT-ON TYPE, UNLESS INDICATED OTHERWISE ON THE DRAWINGS, WITH INTERRUPTING RATINGS EQUAL TO OR GREATER THAN FAULT CURRENTS AVAILABLE AT THE POINT OF SERVICE, 10 KAIC MINIMUM FOR 208Y/120 VOLT SYSTEMS, 14 KAIC MINIMUM FOR 480Y/277 VOLT SYSTEMS. OTHER CIRCUIT BREAKER RATINGS SUCH AS HACR, HID, SWD, GFCI AND SHUNT-TRIP FEATURES SHALL BE PROVIDED WHERE REQUIRED BY CODE OR AS INDICATED ON THE DRAWINGS. BALANCE THE LOAD ON EACH PANEL AND DISTRIBUTION SYSTEM INSTALLED.

- A. BRANCH CIRCUIT PANELS SHALL BE SURFACE MOUNTED AS INDICATED, LOCKABLE AND KEYPED ALIKE, AND SHALL HAVE A DOOR-IN-DOOR COVER.
- B. BUSSING FOR PANELBOARDS OR SWITCHBOARDS SHALL BE COPPER.
- C. SWITCHBOARDS AND DISTRIBUTION PANELS SHALL BE PROVIDED WITH BUSSED PROVISION SPACE EQUAL TO 20% (MINIMUM) OF THE ACTIVE DEVICE SPACE UTILIZED IN EACH SECTION.
- D. CIRCUIT BREAKERS SERVING FIRE ALARM EQUIPMENT BRANCH CIRCUITS SHALL BE PROVIDED WITH A RED DISCONNECT HANDLE AND SHALL CARRY THE IDENTIFICATION OF "FIRE ALARM CIRCUIT".

- 2.7 FUSIBLE AND NON-FUSED DISCONNECT SWITCHES SHALL BE HEAVY DUTY WITH QUICK MAKE/ QUICK BREAK OPERATION, WITH A NEMA 1 RATING (INTERIOR) OR NEMA 3 RATING (EXTERIOR) UNLESS OTHERWISE NOTED OR REQUIRED BY CODE. PROVIDE DIFFERENT ENCLOSURES IF NEEDED, BASED ON THE CONDITIONS AFFECTING THE EQUIPMENT. FUSES SHALL BE DUAL ELEMENT - TIME DELAY, BUSSMAN TYPE LPN-RK (250 VOLT) OR LPS-RK (600 VOLT) FOR 600 AMPERES AND BELOW, AND BUSSMAN TYPE KRP-C ABOVE 600 AMPERES. EQUIVALENT FUSES BY FERRAZ-SHAWMUT OR LITTELFUSE ARE ACCEPTABLE.

- 2.8 TRANSFORMERS SHALL BE D.O.E. 2016 COMPLIANT, 150°C RISE DRY-TYPE, CORE AND COIL, IN A NEMA 1 VENTILATED ENCLOSURE WITH FOUR (4) TWO-AND-ONE-HALF PERCENT PRIMARY TAPS, SOUND RATINGS AND INSULATION SYSTEMS SHALL BE IN ACCORDANCE WITH NEMA STANDARDS.

- 2.9 NAMEPLATES SHALL BE PROVIDED FOR IDENTIFICATION OF ALL POWER DISTRIBUTION EQUIPMENT, AND SHALL BE ENGRAVED PHENOLIC WITH WHITE LETTERING AND BLACK BACKGROUND, UNLESS DIRECTED OTHERWISE BY THE OWNER'S REPRESENTATIVE. PANELBOARD BRANCH CIRCUITS SHALL BE IDENTIFIED WITH TYPEWRITTEN DIRECTORIES.

- A. SPARE CIRCUIT BREAKERS SHALL BE IDENTIFIED AS SUCH, AND SHALL BE LEFT IN THE "OFF" POSITION AT THE CONCLUSION OF THE WORK.

- 2.10 THE OWNER'S TELECOMMUNICATIONS SYSTEM "HEAD-END" EQUIPMENT IS FURNISHED AND INSTALLED UNDER ANOTHER CONTRACT WITH THE OWNER. THE ELECTRICAL CONTRACTOR SHALL PROVIDE:
 - A. 120 VOLT POWER CIRCUITS AND ASSOCIATED RECEPTACLES AS SHOWN ON THE PLANS.
 - B. 4 11/16" SQUARE FLUSH OUTLET BOXES WITH SINGLE-GANG PLASTER RING AT DEVICE LOCATIONS, AND A BLANK COVER PLATE FOR ALL BOXES WITHOUT FACEPLATES. PROVIDE EACH BOX WITH A 3/4" EMT CONDUIT, STUBBED UP TO AN ACCESSIBLE LOCATION, 12" MINIMUM ABOVE LAY-IN GRID CEILINGS OR UP TO THE STRUCTURAL DECK IN EXPOSED CEILING AREAS. PROVIDE CAT5 CABLE WITH TERMINATION AT OUTLET AND A 15' SERVICE LOOP IN THE SERVER ROOM TO BE TERMINATED BY OWNER'S I.T. VENDOR.
 - C. PROVIDE 3/4" THICK FIRE RETARDANT PAINTED PLYWOOD BACKBOARDS AS LOCATED ON THE PLANS.
 - D. PROVIDE A 12" X 2" COPPER GROUND BAR AT EACH PLYWOOD BACKBOARD, AND A #6 COPPER GROUND CONDUCTOR CONNECTED TO THE BUILDING GROUNDING ELECTRODE SYSTEM.
 - E. CONDUITS, BOXES AND OTHER RACEWAYS SHALL BE INSTALLED TO SUPPORT THE OWNERS' TELECOMMUNICATIONS CABLEING SYSTEM. IT IS THE RESPONSIBILITY OF THE OWNERS' REPRESENTATIVE TO PROVIDE THE CONTRACTOR WITH THE EXACT CONDUIT REQUIREMENTS FOR THESE SYSTEMS BEFORE ROUGH-IN WORK BEGINS.

- 2.11 PROVIDE A COMPLETE CLOSED CIRCUIT, ELECTRICALLY SUPERVISED, ZONED, ADDRESSABLE FIRE ALARM SYSTEM AS SPECIFIED HEREIN, AND INDICATED ON THE CONTRACT DOCUMENTS. THE SYSTEM SHALL INCLUDE BUT NOT BE LIMITED TO, ALL CONTROL PANELS, POWER SUPPLIES, BATTERY BACKUPS, ANNUNCIATORS, SIGNAL INITIATING DEVICES, AUDIBLE AND VISUAL ALARM DEVICES, CONDUIT, WIRE, FITTINGS AND ALL ACCESSORIES REQUIRED TO PROVIDE A COMPLETE OPERATING SYSTEM.

- A. THE SYSTEM SHALL COMPLY WITH THE APPLICABLE PROVISIONS OF THE CURRENT NFPA 72 STANDARDS AND SHALL MEET ALL REQUIREMENTS OF THE LOCAL AUTHORITIES HAVING JURISDICTION. ALL EQUIPMENT AND DEVICES SHALL BE NEW, LISTED BY UNDERWRITERS LABORATORIES, INC. AND APPROVED. THE FIRE ALARM SYSTEM SHALL BE INSTALLED AND WIRED BY A CERTIFIED FIRE ALARM SYSTEM TECHNICIAN, IN ACCORDANCE WITH STATE REQUIREMENTS.

- B. WIRING SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, LOCAL CODES AND THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD NUMBER 72, UNLESS OTHERWISE SPECIFIED BY LOCAL CODES. THE MINIMUM WIRE SIZE SHALL BE 14 AWG FOR AC POWER SUPPLY CIRCUITS, 16-AWG FOR SIGNAL INITIATING CIRCUITS.

- C. CONDUCT TESTS OF THE SYSTEM IN THE PRESENCE OF THE OWNER OR THEIR AGENT. ALL MATERIALS AND INSTALLATION SHALL BE GUARANTEED TO BE FREE OF DEFECTS IN MATERIAL AND WORKMANSHIP FOR ONE (1) YEAR. THE CONTRACTOR SHALL TURN OVER TO THE OWNER, SYSTEM WIRING DIAGRAMS AND MAINTENANCE DATA.

- D. SYSTEM SHALL BE MANUFACTURED BY SIMPLEX, NOTIFIER, SIEMENS, HONEYWELL OR SILENT KNIGHT-FARENHYT.
 - 1. NOTE: PROVIDE ALL DEVICES AND COMPONENTS FOR A COMPLETE AND OPERABLE SYSTEM, AS DETERMINED BY THE SYSTEM MANUFACTURER/SUPPLIER.

- 2.12 LIGHTING CONTROL SYSTEM SHALL BE AS INDICATED ON THE DRAWINGS.

- 2.13 SECURITY SYSTEM SHALL BE AS INDICATED ON THE DRAWINGS.

PART 3 EXECUTION

- 3.1 COORDINATE THE ELECTRICAL WORK WITH ALL OTHER TRADES ON SITE, INCLUDING CORE DRILL LOCATIONS AND FEEDER ROUTINGS. PROVIDE LAYOUT DRAWINGS FOR ELECTRICAL DISTRIBUTION ROOMS AND CLOSETS AND SUBMIT COPIES TO THE OWNER'S REPRESENTATIVE FOR REVIEW AND APPROVAL BEFORE ROUGHING-IN CONDUITS AND EQUIPMENT.

- 3.2 CUTTING AND PATCHING OF WALLS, FLOORS AND CEILINGS SHALL BE PROVIDED BY SKILLED MECHANICS IN THE TRADE. FINAL FINISHING AND PAINTING IS BY THE GENERAL TRADES CONTRACTOR.

- 3.3 IT IS THE PURPOSE OF THE CONTRACT DOCUMENTS TO INDICATE THE APPROXIMATE LOCATIONS OF ALL EQUIPMENT, OUTLETS, ETC. THE EXACT LOCATION OF EQUIPMENT AND OUTLETS MAY BE ADJUSTED FROM TIME TO TIME AS THE WORK PROGRESSES. THIS CONTRACTOR SHALL CONFIRM THE EXACT LOCATIONS AND ARRANGE THE WORK ACCORDINGLY. THE OWNER'S REPRESENTATIVE RESERVES THE RIGHT TO EFFECT REASONABLE CHANGES IN THE LOCATION OF OUTLETS UP TO THE TIME OF ROUGH-IN WITHOUT ADDITIONAL COST. ALL GFCI RECEPTACLES SHALL BE INSTALLED IN A READILY ACCESSIBLE LOCATION, VISIBLE FOR TESTING AND INSPECTION.

- 3.4 SERVE AND CONNECT ALL ELECTRICAL EQUIPMENT FURNISHED BY OTHER DIVISIONS OR OWNER. COORDINATE ALL OUTLET LOCATIONS AND CONNECTION REQUIREMENTS WITH THE CONTRACTOR FURNISHING THE EQUIPMENT. BEFORE CONNECTING ANY PIECE OF EQUIPMENT, CHECK THE NAMEPLATE RATING AGAINST THE INFORMATION SHOWN ON THE CONTRACT DOCUMENTS AND CALL ANY DISCREPANCIES TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE. CAREFULLY STUDY ALL MANUFACTURERS' EQUIPMENT WIRING DIAGRAMS AND MAKE CONNECTIONS ACCORDINGLY.

- 3.5 LOCATE AND PROVIDE ALL OPENINGS IN FLOORS, CEILINGS, AND WALLS TO ALLOW FOR CONDUIT PENETRATIONS.

- A. SUBMIT TO THE OWNER'S REPRESENTATIVE ALL LOCATIONS AND SIZES OF OPENINGS WHICH MUST BE PROVIDED FOR THE WORK BEFORE DRILLING OR SETTING ANY SLEEVES.

- B. FINAL LOCATIONS AND SIZES OF ALL OPENINGS SHALL BE SUBJECT TO THE OWNER'S REPRESENTATIVE FINAL APPROVAL.

- C. PROVIDE ALL FIRE STOPS AND SMOKE AND FIRE BARRIERS AROUND ALL CONDUIT PENETRATIONS PROVIDED UNDER THIS WORK. ALL FIRE BARRIERS SHALL BE UL LISTED AND RECOGNIZED SUITABLE BY FACTORY MUTUAL AND NFPA. FIRE BARRIERS SHALL RESTORE ALL PENETRATIONS TO BE AT LEAST THE MINIMUM FIRE RATING OF THE SURFACE PENETRATED. BARRIERS SHALL COMPLETELY FILL THE OPENING AND SHALL BE SECURELY ANCHORED TO PREVENT ACCIDENTAL REMOVAL. ALL SMOKE AND FIRE BARRIERS SHALL BE MADE USING ONLY RECOGNIZED MATERIALS AND WILL BE ACCEPTABLE SUBJECT TO THE OWNER'S REPRESENTATIVE FINAL APPROVAL. SMOKE AND FIRE BARRIERS MAY BE STI FIRE SEAL, DUPONT OR US GYPSUM.
- D. SEAL EXTERNAL WALL PENETRATIONS WHERE CONDUIT PASSES FROM A COLDER AREA TO A WARMER AREA.

- 3.6 MOUNTING HEIGHTS OF DEVICES ARE AS INDICATED ON THE PLANS, OR AS SHOWN ON THE ARCHITECTURAL INTERIOR ELEVATIONS. OUTLET BOXES FOR DEVICES SHALL NOT BE MOUNTED BACK-TO-BACK IN STUD WALL CONSTRUCTION. ADJACENT DEVICES SHALL BE INSTALLED IN GANGED BOXES WITH COMMON COVER PLATES WHEREVER POSSIBLE. UNLESS OTHERWISE NOTED, RECEPTACLES SHALL BE MOUNTED VERTICALLY, WITH THE GROUND PIN ABOVE THE PHASE AND NEUTRAL PIN.

- 3.7 ALL BOXES AND CONDUITS SHALL BE CONCEALED IN FINISHED AREAS OF NEW CONSTRUCTION. CONDUIT SYSTEMS SHALL BE SUPPORTED FROM THE STRUCTURE, INDEPENDENT OF DUCTWORK AND OTHER TRADES. HANGERS, STRAPS AND CLAMPS SHALL BE APPROVED FOR THE PURPOSE. JUNCTION BOXES, OUTLET BOXES AND PULL BOXES SHALL BE LOCATED IN ACCESSIBLE AREAS AND SHALL BE PERMANENTLY MARKED ACCORDING TO THE CIRCUIT OR SYSTEM SERVED.

- 3.8 SUSPENDED CEILING SYSTEMS, INCLUDING THE ASSOCIATED SUPPORT WIRES, SHALL NOT BE USED FOR CONDUIT SUPPORT. CONDUITS SHALL NOT INTERFERE WITH CEILING TILE INSTALLATION OR REMOVAL AND SHALL NOT REST ON OR BE ATTACHED TO THE T-BARS OF THE SYSTEM.

- 3.9 RENOVATION WORK MAY REQUIRE THE INSTALLATION OF SURFACE MOUNTED CONDUIT OR SURFACE RACEWAYS WHERE CONCEALING CONDUIT IS NOT POSSIBLE. THE ROUTING AND LOCATION OF SUCH RACEWAYS SHALL BE APPROVED BY THE OWNERS' REPRESENTATIVE.

- 3.10 PROVIDE THE PROPER CONNECTION AND/OR DISCONNECT AND OVER-CURRENT PROTECTION FOR OWNER AND DIVISION 5 EQUIPMENT, BASED UPON THE CONTRACT DOCUMENTS. VERIFY THIS INFORMATION WITH THE UNIT NAMEPLATE OR FIELD WIRING SCHEMATIC BEFORE ROUGH IN.

- 3.11 ELECTRICAL EQUIPMENT SHALL BE STORED IN A HEATED AND VENTILATED SPACE UNTIL READY FOR DELIVERY TO THE FINISHED EQUIPMENT SPACE ON THE SITE.

- 3.12 FOR FEEDERS AND EQUIPMENT CIRCUITS 40 AMPERE RATED AND ABOVE, THE INTENT OF THE DESIGN IS TO INSTALL A MAXIMUM OF THREE (3) CURRENT-CARRYING CONDUCTORS IN A SINGLE CONDUIT (RACEWAY), UTILIZING THE FULL CONDUCTOR AMPACITIES ALLOWED AND DEFINED IN THE NATIONAL ELECTRICAL CODE ARTICLE 310. COMBINING OF FOUR (4) OR MORE CURRENT-CARRYING CONDUCTORS IN A SINGLE RACEWAY MUST BE REVIEWED AND APPROVED BY THE OWNER'S REPRESENTATIVE.

- 3.13 UNLESS SPECIFICALLY REQUESTED BY THE OWNER'S REPRESENTATIVE, CEILING AND WALL MOUNTED OCCUPANCY SENSORS SHALL BE SET WITH DEFAULT TIMES, AS FOLLOWS:
 - A. STORAGE AREAS - 5 MINUTES
 - B. PUBLIC RESTROOMS - 30 MINUTES
 - C. ALL OTHER SPACES - 10 MINUTES

CIRCUIT BREAKER PANEL SCHEDULE														
PANEL		HA		AMP		200		VOLTAGE		480/277V-3Ø-4W				
INTERRUPTING CAPACITY		42,000		SPACES		42		AMPS RMS SYM		42,000		MAIN M.L.O. MOUNTING SURFACE		
LOAD DESCRIPTION	CONTINUOUS LOAD		NON-CONTINUOUS LOAD (80%)		RECEPTACLE LOAD		Ø ON DIS	Ø ON PANEL	Ø ON DIS	RECEPTACLE LOAD		NON-CONTINUOUS LOAD (80%)		LOAD DESCRIPTION
	ØA	ØB	ØC	ØA	ØB	ØC				ØA	ØB	ØC	ØA	
TRANSFORMER #1-LA	4.2	3.9	3.0	1.0	1.3	70/3	1	A	30/3				6.0	RTU-1
WAITING LIGHTING	0.4					20/1	7	A	30/3				6.0	SPARE
CORRIDOR LTG	0.2					20/1	9	B	10	20/1				SPARE
EXT. DOWNLTG			0.4			20/1	11	C	12	20/1				SPARE
EXT. WALL LTG	0.3					20/1	13	A	14	20/1				SPARE
SITE POLE LTG		1.6				20/1	15	B	16	20/1				SPARE
BOH LIGHTING		0.2				20/1	17	C	18	20/1				SPARE
SPARE						20/1	19	A	20	20/1				SPARE
SPARE						20/1	21	B	22	20/1				SPARE
SPARE						20/1	23	C	24	20/1				SPARE
SPARE							25	A	26					SPARE
SPARE							27	B	28					SPARE
SPARE							29	C	30					SPARE
SPARE							31	A	32					SPARE
SPARE							33	B	34					SPARE
SPARE							35	C	36					SPARE
SPARE							37	A	38					SPARE
SPARE							39	B	40					SPARE
SPARE							41	C	42					SPARE
										KW SUB-TOTALS KW		6.0 6.0 6.0		

CONNECTED LOAD PER PHASE			
PHASE A	14.3	KWC	
	51.6	AMPS	
PHASE B	14.0	KWC	
	50.4	AMPS	
PHASE C	13.9	KWC	
	50.4	AMPS	

TOTAL CONNECTED LOAD	
42.2	KWC
50.8	AMPS

TOTAL DEMAND LOAD	
41.0	KWD
49.3	AMPS

CIRCUIT BREAKER PANEL SCHEDULE														
PANEL		LA		AMP		100		VOLTAGE		208/120V-3Ø-4W				
INTERRUPTING CAPACITY		10,000		SPACES		42		AMPS RMS SYM		10,000		MAIN 100A M.C.B. MOUNTING SURFACE		
LOAD DESCRIPTION	CONTINUOUS LOAD		NON-CONTINUOUS LOAD (80%)		RECEPTACLE LOAD		Ø ON DIS	Ø ON PANEL	Ø ON DIS	RECEPTACLE LOAD		NON-CONTINUOUS LOAD (80%)		LOAD DESCRIPTION
	ØA	ØB	ØC	ØA	ØB	ØC				ØA	ØB	ØC	ØA	
AHU-1 / CU-1	1.5					20/2	1	A	2	20/2			1.2	AHU-2 / CU-2
BWH-1		1.5				20/1	5	C	6	20/1			1.0	VENDING
EF-1 / EF-2	0.1					20/1	7	A	8	20/1		1.0		VENDING
SPARE						20/1	9	B	10	20/				