

ELECTRICAL SPECIFICATIONS

PART 1 GENERAL

- 1.1. **SCOPE OF WORK:** FURNISH AND INSTALL ALL LABOR, MATERIALS, TOOLS, ETC., TO PROVIDE A COMPLETE AND OPERATIONAL ELECTRICAL INSTALLATION, AS INDICATED ON THE PLANS. CONTRACTOR SHALL REFER TO THE WORK INDICATED ON THE MECHANICAL, ARCHITECTURAL, STRUCTURAL PLANS, ETC., AS WORK SHOWN THEREON MAY AFFECT OR INCLUDE ADDITIONAL ELECTRICAL WORK. ALL MATERIALS INCLUDED IN THE WORK SHALL BE NEW UNLESS SPECIFICALLY NOTED OTHERWISE. EACH ITEM SHALL BE LISTED OR LABELED BY A U.S.A. NATIONALLY RECOGNIZED TESTING LABORATORY TO ASSURE ITS SUITABILITY AND APPROVAL FOR THE PURPOSE SHOWN. ALL LABOR SHALL BE PERFORMED BY QUALIFIED AND SKILLED WORKERS, IN A NEAT AND WORKMANLIKE MANNER, AND IN ACCORDANCE WITH INDUSTRY STANDARDS AND PRACTICES.
- 1.2. **CONTRACT DRAWINGS:** IN GENERAL, DRAWINGS ARE SCHEMATIC IN NATURE AND ARE INTENDED AS A GUIDE TO THE CONTRACTOR, BUT DO NOT NECESSARILY SHOW ALL DETAILS, ETC. ALL DRAWINGS SHALL BE THOROUGHLY INSPECTED BY THE CONTRACTOR. THE CONTRACTOR'S WORK SHALL CONFORM TO THE INFORMATION CONTAINED IN THIS SPECIFICATION AND/OR AS INDICATED IN THE LATEST REVISION OF THE DRAWINGS REFERRED TO THEREIN. THE CONTRACTOR SHALL CONSULT WITH THE ENGINEER REGARDING ALL QUESTIONS, UPON WHICH HE MAY BE IN DOUBT, BEFORE PROCEEDING WITH FABRICATION OF PARTS AFFECTED. AT HIS OWN EXPENSE, THE CONTRACTOR SHALL PREPARE ALL ADDITIONAL DETAIL OR FIELD INSTALLATION DRAWINGS NECESSARY. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS INDICATED ON THE ENGINEER'S LAYOUT DRAWINGS AND DETERMINE IF ANY CHANGES ARE REQUIRED TO AVOID INTERFERENCE. MAJOR CHANGES SHALL NOT BE MADE WITHOUT THE APPROVAL OF THE ENGINEER. WHILE THE DRAWINGS SHALL BE ADHERED TO AS CLOSELY AS POSSIBLE, THE CONTRACTOR HAS THE RIGHT TO VARY THE RUN OF CONDUITS, LOCATION OF EQUIPMENT, ETC. DURING PROGRESS OF THE WORK AS MAY BE FOUND NECESSARY OR DESIRABLE TO AVOID INTERFERENCES OR CLEARANCE ISSUES. MAJOR REVISIONS SHALL BE VERIFIED WITH THE ENGINEER.
- 1.3. **VERIFICATION:**
  - A. BEFORE INSTALLING EQUIPMENT OR RUNNING ANY CONDUITS, WIRING, ETC., WITHIN THE BUILDING, THIS CONTRACTOR SHALL ASSURE HIMSELF THAT THESE ITEMS AND MATERIALS CAN BE INSTALLED AS CONTEMPLATED, WITHOUT INTERFERING WITH ITEMS IN WORK/AREA, COLUMNS, BEAMS, PIPING, FIXTURES, ETC. ANY NECESSARY MAJOR DEVIATION SHALL BE REFERRED TO THE ENGINEER FOR ADJUSTMENT BEFORE MATERIALS ARE INSTALLED. WHEN THE CONTRACTOR DETERMINES THE MAKE OF EQUIPMENT TO BE PROVIDED FOR THE JOB, IT SHALL BE HIS RESPONSIBILITY TO VERIFY AND COORDINATE UNIT DIMENSIONS WITH THE GENERAL CONTRACTOR AND ALL OTHER INTERESTED CONTRACTORS ON THE JOB. IT SHALL ALSO BECOME THE CONTRACTOR'S RESPONSIBILITY TO CHANGE AS NECESSARY, THROUGH THE ENGINEER, ALL REQUIRED COMPONENTS WITH WORK TOGETHER FOR THE EQUIPMENT SUPPLIER. ANY ADDITIONAL COST WILL BE THE SOLE RESPONSIBILITY OF THIS CONTRACTOR.
  - B. LOCATIONS OF EXISTING EQUIPMENT IN PLACE AS SHOWN ON THE DRAWINGS, ARE TAKEN FROM SITE INVESTIGATIONS OR FROM AS-BUILT AND RECORD DRAWINGS AND ARE DEEMED RELIABLE ONLY IN SO FAR AS GENERAL LAYOUT IS CONCERNED. THE RESPONSIBILITY FOR CHECKING IN PLACE ITEMS SHALL BE THE CONTRACTOR'S.

- 1.10. **CUTTING & PATCHING:** PROVIDE CUTTING AND PATCHING OF ALL MATERIALS NECESSARY FOR THE INSTALLATION AS INDICATED OR SPECIFIED. NEATLY REMOVE AND LEGALLY DISPOSE OF ELECTRICAL COMPONENTS AND ITEMS NO LONGER IN USE. PROTECT THE STRUCTURE, FURNISHINGS, FINISHES AND MATERIALS ADJACENT TO THE AREA OF CUTTING AND PATCHING. PATCH AND REPAIR SHALL MATCH EXISTING FIRE RATED CONSTRUCTION MATERIALS AND METHODS AND RE-FINISH EXISTING INTERIOR AND EXTERIOR SURFACES AND EQUIPMENT USING NEW MATERIALS AND METHODS, TO MATCH ADJACENT WORK, UTILIZING EXPERIENCED INSTALLERS. PATCHING OF FIRE RATED PARTITIONS, CEILINGS AND OTHER ASSEMBLIES, SHALL COMPLETE WITH THREADED RIGID STEEL CONDUIT FITTINGS, DOUBLE-LOCKING NUTS AND BUSHINGS AT BOXES AND CABINETS, IN DRY INTERIOR LOCATIONS, CONDUIT IN TRADE SIZES 2 INCH THRU 4 INCH DIA., MAY BE INTERMEDIATE METAL CONDUIT, INSTALLED PER NEC 342, COMPLETE WITH THREADED FITTINGS, DOUBLE LOCK-NUTS AND BUSHINGS AT BOXES AND CABINETS. FIELD CUT THREADS SHALL BE COATED WITH Z.R.C. COLD GALVANIZING SPRAY OR OTHER RUST-INHIBITING MATERIAL AFTER INSTALLATION. INTERIOR CONDUIT WITHIN WALLS AND ABOVE SUSPENDED CEILINGS, IN TRADE SIZES 1/2 INCH THRU 2 INCH DIA., SHALL BE ELECTRICAL METALLIC TUBING, INSTALLED PER NEC 358, COMPLETE WITH STEEL COMPRESSION OR SET-SCREW FITTINGS. CONNECTIONS OF THE EXISTING FACILITIES AND ONLY AFTER WRITTEN APPROVAL FROM THE ARCHITECT AND/OR ENGINEER.
- 1.11. **CONNECTIONS TO EXISTING WORK:** PLAN THE INSTALLATION OF NEW WORK AND CONNECTIONS TO EXISTING WORK TO INSURE MINIMUM INTERFERENCE WITH THE REGULAR OPERATION OF THE EXISTING FACILITIES. SUBMIT TO THE ARCHITECT AND/OR ENGINEER, FOR THEIR APPROVAL, A PROGRESS SCHEDULE INDICATING ALL NECESSARY TEMPORARY SHUTDOWNS OF EXISTING SERVICES. ALL SHUTDOWNS SHALL BE MADE AT SUCH TIMES AS WILL NOT INTERFERE WITH REGULAR OPERATION OF THE EXISTING FACILITIES AND ONLY AFTER WRITTEN APPROVAL FROM THE ARCHITECT AND/OR ENGINEER.
- 1.12. **NEW WORK:** UNLESS OTHERWISE NOTED, ALL WORK INDICATED THROUGHOUT THESE DRAWINGS SHALL BE CONSIDERED AS NEW WORK AND SHALL BE INCLUDED AS AN INTEGRAL PART OF THIS CONTRACT.
- 1.13. **AS-BUILT DRAWINGS:** CONTRACTOR SHALL ACCURATELY AND NEATLY RECORD ANY DEVIATIONS FROM THE PLANS AND SPECIFICATIONS, INCLUDING FINAL CONDUIT ROUTING, BRANCH CIRCUIT NUMBERING, EQUIPMENT SIZES, SINGLE LINE DIAGRAM, ETC. UNDERGROUND FEEDERS AND DUCTBANKS SHALL BE LOCATED BY DIMENSION TO ASSIST IN FUTURE EXCAVATION. AS-BUILTS SHALL BE REGULARLY STAMPED DURING THE COURSE OF CONSTRUCTION, AND DELIVERED TO THE OWNER WITHIN 30 DAYS OF PROJECT ACCEPTANCE, WITH A COPY TO THE ENGINEER.
- 1.14. **CLOSE-OUT:** CONTRACTOR SHALL PROVIDE FIELD TESTING, CHECK-OUT AND SYSTEM DEMONSTRATIONS TO OWNER TO ASSURE PROPER PERFORMANCE AND ADJUSTMENT OF ITEMS PROVIDED UNDER THE CONTRACT. REMOVE ALL DEBRIS CREATED BY THE ELECTRICAL WORK AND CLEAR ALL FIXTURES, PANELS, BOXES, ETC., INSIDE AND OUTSIDE. PROVIDE A HARDBOUND BINDER WHICH INCLUDES: COPIES OF EACH SHOP DRAWING, FIELD TEST REPORT, PREVENTATIVE MAINTENANCE PROCEDURES FOR EACH ITEM REQUIRING MAINTENANCE, OPERATION & INSTRUCTION MANUALS, LITERATURE SUPPLIED WITH ELECTRICAL EQUIPMENT, AND A LIST OF ALL CONTRACTOR'S PURCHASE ORDERS WITH SUPPLIERS NAMES, ADDRESSES AND PHONE NUMBERS, FOR ALL MATERIALS. INCLUDE NAME AND ADDRESS OF A QUALIFIED SERVICE AGENCY FOR EACH SYSTEM. PROVIDE AT LEAST 4 HOURS OF INSTRUCTION TO PERSONNEL SELECTED BY THE OWNER. WITH THE COOPERATION OF THE ARCHITECT, OBTAIN SIGNIFICANT EQUIPMENT, TRAIN THEM ON EQUIPMENT FUNCTIONS, REVIEW MAINTENANCE PROCEDURES AND COORDINATE INFORMATION AVAILABLE IN THE CLOSE-OUT BINDER.

PART 2 PRODUCTS

- 1.4. **SITE VISIT:** ALL CONTRACTORS, BIDDING THE WORK INDICATED THROUGHOUT THE CONTRACT DOCUMENTS, ARE REQUIRED TO VISIT AND THOROUGHLY EXAMINE THE PROJECT SITE AND ITS ASSOCIATED DRAWINGS. CONTRACTORS SHALL BECOME FAMILIAR WITH ALL EXISTING CONDITIONS UNDER WHICH THIS WORK MUST BE PERFORMED. ALL CONTRACTORS SHALL REPORT ANY DISCREPANCIES TO THE ARCHITECT AND/OR ENGINEER PRIOR TO SUBMITTING A BID PROPOSAL. FAILURE TO DO SO SHALL BE DEEMED AS ACCEPTANCE OF EXISTING CONDITIONS. NO ADDITIONAL COMPENSATION WILL BE CONSIDERED FOR ANY DEVIATIONS OR DISCREPANCIES TO THESE PLANS AFTER A CONTRACTOR HAS BEEN SELECTED.
- 1.5. **GUARANTEE:** THE CONTRACTOR GUARANTEES, BY THEIR ACCEPTANCE OF THE CONTRACT, THAT ALL WORK WILL BE FREE FROM DEFECTS IN WORKMANSHIP AND/OR MATERIALS FOR A PERIOD OF ONE YEAR FOLLOWING PROJECT COMPLETION UNLESS NOTED OTHERWISE. AND THAT ALL APPARATUS WILL DEVELOP CAPACITY AND CHARACTERISTICS SPECIFIED, SHOULD ANY DEFECTS IN WORKMANSHIP AND/OR MATERIALS REQUIRE REDESIGN OF ANY PART OF THE ELECTRICAL, MECHANICAL, PLUMBING OR ARCHITECTURAL LAYOUT, ALL SUCH REDESIGN AND ALL NEW DRAWINGS AND DETAILING REQUIRED THEREOF, CALCULATIONS, SUBMITTALS, ETC., AS WELL AS REPAIRS (TO MATCH EXISTING ADJACENT CONDITIONS) SHALL WITH THE APPROVAL OF THE ARCHITECT AND/OR ENGINEER, BE PREPARED BY THE CONTRACTOR AT THEIR OWN EXPENSE. WHERE SUCH APPROVED DETAILING REQUIRES A DIFFERENT QUANTITY AND ARRANGEMENT OF CONDUIT, WIRING, STARTERS, PANELS, ETC., AND/OR EQUIPMENT FROM THAT SPECIFIED OR DETAILED ON THE DRAWINGS, WITH THE APPROVAL OF THE ARCHITECT AND/OR ENGINEER, THE CONTRACTOR SHALL FURNISH AND INSTALL ALL SUCH MATERIALS AND/OR EQUIPMENT REQUIRED BY THE SYSTEM AT NO ADDITIONAL COST TO THE OWNER.
- 1.6. **SUBMITTALS:** PRIOR TO RELEASING ANY ORDER FOR MATERIAL FOR THIS PROJECT, THE CONTRACTOR SHALL SUBMIT FOR REVIEW, DETAILED DRAWINGS AND/OR EQUIPMENT CUT SHEETS, SHOWING DIMENSIONS, SIZES, WEIGHTS, ELECTRICAL RATINGS AND OPERATING CHARACTERISTICS, CAPACITIES, MATERIALS, COLORS, AND FINISH IN REQUIREMENTS FOR ALL LIGHTING FIXTURES, FLOOR BOXES, DISTRIBUTION EQUIPMENT, MOTOR CONTROL, ALARM AND COMMUNICATION SYSTEMS AND COMPONENTS, AND POWER GENERATION SYSTEMS. PRIOR TO SUBMITTING, CONTRACTOR SHALL THOROUGHLY REVIEW EACH SUBMITTAL AND CHECK FOR COMPLIANCE WITH THE CONTRACT DOCUMENTS AND MARK EACH SUBMITTAL WITH APPROVAL STAMP TO SHOW THAT SUBMITTALS HAVE BEEN REVIEWED AND APPROVED BY THE CONTRACTOR. FAILURE OF CONTRACTOR TO COMPLY FULLY WITH THIS SECTION WILL RESULT IN REJECTION OF SUBMITTALS. SUBMITTALS SHALL BE MADE SUFFICIENTLY IN ADVANCE OF THE REQUIRED ORDER RELEASE DATE, TO ALLOW THE ENGINEER AMPLE TIME TO REVIEW SUCH INFORMATION. MULTIPLE COMPONENTS INTENDED TO FUNCTION TOGETHER, SHALL BE COORDINATED AND SUBMITTED AS A UNIT. SUBMITTALS SHALL CLEARLY HIGHLIGHT, ENCLOSE OR OTHERWISE IDENTIFY COMPONENTS SELECTED.
  - A. APPROVAL STAMP: STAMP EACH SUBMITTAL WITH A UNIFORM, APPROVAL STAMP. STAMP SHALL INCLUDE PROJECT NAME, CONTRACTOR'S NAME, LOCATION SECTION, NAME OF REVIEWER, DATE OF CONTRACTOR'S APPROVAL, AND STATEMENT CERTIFYING THAT SUBMITTAL HAS BEEN REVIEWED, CHECKED, AND APPROVED FOR COMPLIANCE WITH THE CONTRACT DOCUMENTS.
- 1.7. **PRODUCT SUBSTITUTIONS:** THE MANUFACTURERS LISTED ARE INCLUDED AS A BASIS OF DESIGN. SUBMISSION OF ALTERNATE MANUFACTURERS OF SIMILAR EQUIPMENT IS SUBJECT TO ENGINEER APPROVAL. UNITS OF EQUIPMENT, OTHER THAN THOSE LISTED AS A BASIS OF DESIGN, MUST BE PROVEN TO BE PHYSICALLY ACCEPTABLE, IN ADDITION TO MEETING ALL PERFORMANCE AND EQUIPMENT SPECIFICATIONS. LIABILITY OF NON-COMPLIANCE SHALL LIE WITH THE CONTRACTOR/SUBMITTER. BIDDERS DESIRING CONSIDERATION FOR THE USE OF MATERIAL, EQUIPMENT, ETC. NOT NAMED IN THE SPECIFICATIONS MAY SUBMIT THE CHANGE IN WRITING AT LEAST TEN (10) DAYS PRIOR TO BID OPENING, INCLUDING THE SPECIFICATIONS AND DESCRIPTION TO THE ARCHITECT FOR REVIEW. IF APPROVED, THE CHANGE WILL BE ISSUED IN AN ADDENDUM AT LEAST FIVE (5) DAYS PRIOR TO THE OPENING OF BIDS.
- 1.8. **PERMITS AND CODES:** CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH PERMITS, PLAN APPROVALS, TAXES & INSURANCE. ALL WORK SHALL CONFORM TO ALL LOCAL CODES AND ORDINANCES, AS WELL AS THE LATEST ADOPTED EDITION OF THE FOLLOWING: 1) NATIONAL ELECTRICAL CODE; 2) NATIONAL ELECTRICAL SAFETY CODE; 3) STATE BUILDING CODE; 4) ANSI STANDARDS; 5) IEEE STANDARDS; 6) UNDERWRITERS LABORATORY LISTINGS; 7) ASTM STANDARDS; 8) NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION STANDARDS; 9) STATE FIRE CODE; 10) APPLICABLE NFPA CODES. COPY OF THE FINAL ELECTRICAL INSPECTION DOCUMENT FROM THE AUTHORITY HAVING JURISDICTION, SHALL BE SUBMITTED TO THE OWNER AND ENGINEER AT PROJECT COMPLETION.
- 1.9. **COORDINATION:** CONTRACTOR SHALL COORDINATE THEIR PORTION OF THE WORK WITH THAT OF OTHER CONTRACTORS, ALL AFFECTED UTILITY COMPANIES, THE OWNER, AND THE OPERATIONS OF THE OWNER. PROVIDE ADEQUATE AND TIMELY INPUT TO THE CONTRACTOR PREPARING "COORDINATION DRAWINGS" WHERE SPECIFIED ELSEWHERE.) COORDINATE WITH POWER UTILITY COMPANY PRIOR TO BEGINNING ANY SERVICE WORK. ALL CONFLICTS, SCHEDULING AND PROCEDURES SHALL BE RESOLVED IN THE BEST INTEREST OF THE OWNER AND THE SUCCESSFUL COMPLETION OF THE PROJECT. AT PROJECT COMMENCEMENT, SUBMIT A TIME SCHEDULE OF PROPOSED WORK, INCLUDING SIGNIFICANT EQUIPMENT DELIVERY DATES, SEQUENCE OF WORK AREAS, PROPOSED SHUTDOWNS, CUT-OVERS AND UTILITY TIE-INS. UPDATE SCHEDULE AS WORK PROGRESSES. ALL SHUTDOWN WORK SHALL BE PERFORMED AT TIMES WHICH WILL NOT INTERFERE WITH THE REGULAR OPERATION OF THE FACILITY AND THE OWNER. CONTRACTOR SHALL NOTIFY ALL AFFECTED PARTIES IN WRITING AT LEAST SEVEN DAYS PRIOR TO SHUTDOWNS AND CUT-OVERS. UTILITY COMPANY BACKCHARGES WILL BE PAID DIRECTLY BY THE OWNER.

- 2.1. **FIRE-RATING:** OPENINGS AROUND CONDUITS OR IN SLEEVES FOR CONDUITS PENETRATING FIRE-RATED FLOOR SLABS, WALLS, PARTITIONS, CEILINGS, OR SMOKE PARTITIONS, SHALL BE SEALED AT BOTH SIDES OF THE PENETRATION. INSULATION SHALL NOT EXTEND THROUGH SLEEVES. PACK OR BRUSHED STAMPED STEEL IN FINISHED AREAS (COORDINATE WITH DEVICE COLOR). COORDINATE WITH THE ARCHITECT/OWNER, GALVANIZED IN INDUSTRIAL AREAS, AND GASKETED. FLAP-TYPE "EXTRA DUTY WEATHERPROOF-IN-USE" TYPE IN OUTDOOR AREAS. COVER PLATE COLOR SHALL MATCH OR COORDINATE WITH DEVICE OR AS SELECTED BY THE ARCHITECT/OWNER. WIRING DEVICES AND COVER PLATES SHALL BE AS MANUFACTURED BY ACUTY, HUBBELL, PASS & SEYMOUR, LEVITON OR COOPER.
- 2.2. **LABELS:** PROVIDE ENGRAVED PLASTIC NAMEPLATES, SECURELY FASTENED TO EQUIPMENT, FOR ALL NEW PANELS, STARTERS, TERMINAL CABINETS, DISCONNECTS, CONTROL PANELS, LARGE PULL BOXES, AND OTHER MAJOR COMPONENTS. NAMEPLATES SHALL BE 1 BY 3 INCHES, MINIMUM, BLACK LETTERS ON WHITE FIELD. EMERGENCY AND STANDBY POWER EQUIPMENT NAMEPLATES SHALL HAVE WHITE LETTERS ON RED FIELD. LETTERING SHALL INCLUDE IDENTIFY VOLTAGE AND PHASE. ALL PANELBOARD AND SWITCHBOARD NAMEPLATES SHALL INDICATE THE SOURCE OF SUPPLY PER NEC 408.4. SEE NEC 110.21B FOR FIELD INSTALLED WARNING LABEL REQUIREMENTS.
- 2.3. **GROUNDING, WIRE, RACEWAYS, BOXES AND SUPPORTS:**
  - A. **GROUNDING:** GROUND AND BOND ALL METAL RACEWAYS, BOXES, FIXTURES, ENCLOSURES, ETC., PER NEC ARTICLE 250. ALL FEEDERS AND BRANCH CIRCUITS SHALL INCLUDE AN INSULATED EQUIPMENT GROUNDING CONDUCTOR, ROUTED WITH THE CIRCUIT, SIZED PER NEC 250.122.
  - B. **WIRE:** FURNISH AND INSTALL ALL WIRE, TERMINATIONS AND CONNECTION DEVICES AS SHOWN OR REQUIRED, UNLESS OTHERWISE NOTED, ALL LINE VOLTAGE CIRCUITS SHALL BE STRANDED, COPPER, 600 VOLT INSULATED: (75 DEGREES C THRU) 3/4 INCH F.W. CIRCUITS #4 AWG THRU #2 AWG, 90 DEGREES C XHHW-2 FOR CIRCUITS #1 AWG AND LARGER). CONDUCTORS #3/0 AWG AND LARGER MAY BE STRANDED ELECTRICAL GRADE STANDARD OR COMPACT STRANDED ALUMINUM CONDUCTORS WITH 90 DEGREES C RATED XHHW-2 INSULATION, PROPERLY UPSIZED FOR THE AMPACITY EQUIVALENT TO THE COPPER CONDUCTORS SHOWN; CONDUIT SHALL ALSO BE UPSIZED FOR ALUMINUM CONDUCTORS. ALL CONNECTIONS AND TERMINATIONS SHALL MEET THE SPECIFICATIONS OF MATERIAL USED PER 110.14. BRANCH CIRCUIT WIRING SHALL BE #12 AWG MINIMUM, WHERE THE 120 VOLT CIRCUIT LENGTH EXCEEDS 100 FEET, OR THE 277 VOLT CIRCUIT LENGTH EXCEEDS 250 FEET, FROM THE PANEL TO THE FARTHEST DEVICE. UTILIZE #10 AWG MINIMUM. SEE CHART THIS SHEET FOR MINIMUM CONDUCTOR SIZES FOR LONGER BRANCH CIRCUITS. PHASE CONDUCTORS FOR 240 VOLT (AND LOWER) SYSTEMS SHALL BE BLACK, RED & BLUE RESPECTIVELY FOR PHASES A, B & C; ASSOCIATED NEUTRALS WHITE. PHASE CONDUCTORS FOR 480 VOLT SYSTEMS SHALL BE BROWN, ORANGE & YELLOW RESPECTIVELY FOR PHASES A, B & C; ASSOCIATED NEUTRALS GRAY. CONNECTIONS AND TAPS FOR WIRE #4 AWG AND LARGER SHALL BE MADE WITH SOLDERLESS PRESSURE TYPED CONNECTORS AND LUGS. PROVIDE AN ENGRAVED NAMEPLATE OR PLAQUE DOCUMENTING THE WIRING SYSTEM COLOR CODING AT EACH NEW PANELBOARD. ALL LOW VOLTAGE CABLE SHALL BE MULTI-CONDUCTOR, COPPER, WITH WIRE SIZE, SHIELD, JACKET, COLOR-CODED INSULATION, TERMINATIONS, ETC. AS RECOMMENDED BY THE SYSTEM SUPPLIER. INSULATING AND JACKET MATERIALS SHALL BE SUITABLE FOR THE INSTALLATION ENVIRONMENT (I.E. UNDERGROUND, PLENUM, HIGH AMBIENT TEMPERATURE, ETC.).
  - C. **BRANCH CIRCUITS:** BRANCH CIRCUIT WIRING SHALL CORRESPOND TO THE CIRCUIT NUMBERING SHOWN ON THE PLANS, BUT THE CONTRACTOR WILL BE PERMITTED MINOR CHANGES TO OPTIMIZE THE PIPING REQUIRED. THE QUANTITY OF CIRCUITS SHALL NOT BE REDUCED, NOR SHALL SEPARATE CIRCUITS BE COMBINED. ROUTING SHALL BE AT THE DISCRETION OF THE CONTRACTOR BUT THE INSTALLATION SHALL MEET ALL OTHER SPECIFIED CRITERIA. PROVIDE A NEUTRAL CONDUCTOR TO EACH LOCAL SWITCH OR HANDLE TIES (SEE NEC 210.4B). THE QUANTITY OF CURRENT CARRYING CONDUCTORS IN A CONDUIT SHALL BE LIMITED TO NINE. THE AMPACITY OF BRANCH CIRCUITS ROUTED ACROSS ROOFS OR OTHERWISE EXPOSED TO SUNLIGHT, SHALL BE PROPERLY UPSIZED AS REQUIRED TO MEET THE DERATING FACTORS OF NEC 310.15(B)(2). WHERE "HOME RUNS" ARE SHOWN ON PLAN, THE QUANTITY OF THESE RUNS SHALL BE MAINTAINED AS A MINIMUM. 120/208 VOLT BRANCH CIRCUITS AND 277/480 VOLT BRANCH CIRCUITS SHALL NOT BE ROUNDED THROUGH COMMON RACEWAYS, UNLESS SPECIFICALLY NOTED ON THE PLANS.

- B. **RACEWAYS:** UNLESS NOTED OTHERWISE, ALL NEW LINE VOLTAGE WIRING SHALL BE INSTALLED IN SPECIFIED RACEWAYS. RACEWAYS SHALL BE INSTALLED, CONCEALED WITHIN NEW AND EXISTING CONSTRUCTION, UNLESS NOTED OTHERWISE. RACEWAYS INSTALLED UNDERGROUND, CAST IN CONCRETE, WITHIN EXTERIOR WALLS, EXPOSED OUTDOORS OR EXPOSED IN UNFINISHED SPACES BELOW TO FEET AFF, SHALL BE HOT-DIPPED GALVANIZED RIGID METAL CONDUIT. HOT-DIPPED GALVANIZED INTERMEDIATE METAL CONDUIT OR SCHEDULE 40 PVC (UNDERGROUND ONLY), 3/4 INCH TRADE SIZE MINIMUM, INSTALLED PER NEC 344 OR 352. RIGID AND INTERMEDIATE METAL CONDUIT SHALL BE COMPLETED WITH THREADED RIGID STEEL CONDUIT FITTINGS, DOUBLE-LOCKING NUTS AND BUSHINGS AT BOXES AND CABINETS, IN DRY INTERIOR LOCATIONS, CONDUIT IN TRADE SIZES 2 INCH THRU 4 INCH DIA., MAY BE INTERMEDIATE METAL CONDUIT, INSTALLED PER NEC 342, COMPLETE WITH THREADED FITTINGS, DOUBLE LOCK-NUTS AND BUSHINGS AT BOXES AND CABINETS. FIELD CUT THREADS SHALL BE COATED WITH Z.R.C. COLD GALVANIZING SPRAY OR OTHER RUST-INHIBITING MATERIAL AFTER INSTALLATION. INTERIOR CONDUIT WITHIN WALLS AND ABOVE SUSPENDED CEILINGS, IN TRADE SIZES 1/2 INCH THRU 2 INCH DIA., SHALL BE ELECTRICAL METALLIC TUBING, INSTALLED PER NEC 358, COMPLETE WITH STEEL COMPRESSION OR SET-SCREW FITTINGS. CONNECTIONS OF THE EXISTING FACILITIES AND ONLY AFTER WRITTEN APPROVAL FROM THE ARCHITECT AND/OR ENGINEER.
- C. **BOXES:** FLUSH DEVICE BOXES SHALL BE DEEP, GALVANIZED, STAMPED STEEL BOXES, WITH PLASTER RINGS WHERE REQUIRED. EXPOSED DEVICE BOXES SHALL BE CAST MALLEABLE IRON TYPE FD WITH THREADED HUBS. INTERIOR PULL AND JUNCTION BOXES SHALL BE NEW 1 GALVANIZED OR PAINTED STAMPED STEEL WITH SCREW COVERS. IN FIRE RATED WALLS AND CEILINGS, BOXES SHALL BE TWO-GANG MAXIMUM, AND CAREFULLY LOCATED TO MAINTAIN FIRE RATINGS; I.E. NO MORE THAN 100 SQUARE INCHES OF BOXES IN 100 SQUARE FEET OF WALL/CEILING WITH BOXES ON OPPOSITE SIDES OF WALL SEPARATED BY 24 HORIZONTAL INCHES MINIMUM, UNLESS WRAPPED WITH FIRE PROOFING PUTTY.
- D. **SUPPORTS:** FURNISH AND INSTALL ALL REQUIRED MISCELLANEOUS STEEL SUPPORTS FOR MOUNTING OF PANELS, RACEWAYS, FIXTURES, CABINETS, BOXES, ETC. ALL EQUIPMENT SHALL BE RIGIDLY SUPPORTED FROM THE BUILDING STRUCTURE, WITH ELECTRICAL EDGENT, AND FOR TWICE THE ACTUAL LOAD OR WEIGHT. ALL INTERIOR SUPPORTS SHALL BE PAINTED STEEL STRUT WITH MATCHING FITTINGS AND HARDWARE, PLATED THREADED ROD, AND AUXILIARY STRUCTURAL STEEL.

2.4. EQUIPMENT, GEAR AND WIRING DEVICES

- A. **WIRING DEVICES:** DEVICES SHALL BE INDUSTRIAL GRADE, COMPLETE WITH THERMOPLASTIC FACE OR HANDLE, OF THE TYPE, RATING, AND CONFIGURATION AS INDICATED ON THE PLANS. DEVICES SHALL BE SUPPLIED FROM A SINGLE MANUFACTURER, WHEREVER POSSIBLE, TO STANDARDIZE ON COLOR AND REPLACEMENTS. DEVICE COLOR SHALL BE WHITE (USED WITH PLASTIC CP) OR GRAY (USED WITH BRUSH S.S. CP), OR AS SELECTED BY THE ARCHITECT/OWNER, TO MATCH THE BUILDING FINISHES. COVER PLATES SHALL BE SHOWN HIGH GLOSS MATCHING FINISHES. PACK OR BRUSHED STAMPED STEEL IN FINISHED AREAS (COORDINATE WITH DEVICE COLOR). COORDINATE WITH THE ARCHITECT/OWNER, GALVANIZED IN INDUSTRIAL AREAS, AND GASKETED. FLAP-TYPE "EXTRA DUTY WEATHERPROOF-IN-USE" TYPE IN OUTDOOR AREAS. COVER PLATE COLOR SHALL MATCH OR COORDINATE WITH DEVICE OR AS SELECTED BY THE ARCHITECT/OWNER. WIRING DEVICES AND COVER PLATES SHALL BE AS MANUFACTURED BY ACUTY, HUBBELL, PASS & SEYMOUR, LEVITON OR COOPER.

PART 3 EXECUTION

- 3.1. **GENERAL:**
  - G. ALL EQUIPMENT INSTALLATION PROCEDURES SHALL BE BASE ON FUNDAMENTAL ENGINEERING AND CONSTRUCTION PRINCIPLES IN CONFORMANCE WITH ALL APPLICABLE CODES, STANDARDS AND ORDINANCES.
  - H. THE ELECTRICAL CONTRACTOR SHALL INSTALL ALL ELECTRICAL EQUIPMENT IN CONFORMANCE WITH MANUFACTURER ISSUED INSTRUCTIONS AND RECOMMENDATIONS.
  - I. PROVIDE ONE (1) YEAR WARRANTY ON ALL LABOR AND MATERIAL UNLESS NOTED OTHERWISE.
  - J. COORDINATE LOCATIONS OF ALL ELECTRICAL PANELS AND EQUIPMENT WITH NEW OR EXISTING OVERHEAD PIPING AND DUCT WORK TO AVOID INTERFERENCES AND MEET REQUIRED DEDICATED ELECTRICAL SPACE AND CLEARANCES.
- 3.2. **DEMOLITION:** ELECTRICALLY DISCONNECT THE MECHANICAL EQUIPMENT AND APPLANCES SHOWN OR SCHEDULED FOR REMOVAL, TO ACCOMMODATE SUCH BY OTHERS. REMOVE THE LIGHT FIXTURES, DEVICES, PANELS, STARTERS, ETC., INDICATED FOR DEMOLITION, AND ALL ASSOCIATED WIRING, NO LONGER IN SERVICE, BACK TO ITS ELECTRICAL SOURCE. REMOVE ALL EXPOSED CONDUIT, BOXES AND RACEWAYS ASSOCIATED THEREWITH. . . CUT OFF FLUSH WITH ADJACENT FINISHED SURFACE AND PERMANENTLY PLUG, ANY CONCEALED RACEWAYS WHICH ARE NOT RE-USEABLE. NEATLY CAP FOR FUTURE USE, AND LABEL WITH TERMINUS. ANY MATERIALS REMOVED, ALL OTHER MATERIALS NOT CLAIMED BY THE OWNER OR REUSED SHALL BE PROPERLY REMOVED FROM SITE AND DISPOSE OF.
- 3.3. **RENOVATIONS:** REWORK THE EXISTING ELECTRICAL INSTALLATION AS REQUIRED TO ACCOMMODATE THE FINISHED AND OPERATING SYSTEMS AS INDICATED ON THE PLANS. NEW RACEWAYS SHALL BE CONCEALED IN FINISHED SPACES WHEREVER PRACTICALLY POSSIBLE. EXISTING BOXES AND ENCLOSURES SHALL NOT BE RENDRED INACCESSIBLE DUE TO THE NEW WORK OF ANY TRADE. PANEL DIRECTORIES IN RENOVATED AREAS SHALL BE NEATLY UPDATED. INTERRUPTIONS TO EXISTING SYSTEMS SHALL BE PERFORMED AT OFF HOURS, UNLESS SCHEDULED OTHERWISE WITH THE OWNER.

ELECTRICAL LEGEND

A12	ALPHANUMERIC LABEL INDICATES PANEL AND CIRCUIT TO WHICH ITEM IS CONNECTED (I.E. PANEL A, CIRCUIT 12)
AFB	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
CCT	CIRCUIT
C.P.	COVER PLATE
E.C.	ELECTRICAL (SUB) CONTRACTOR
EXT.G.	EXISTING
F.B.O.	FURNISHED BY OTHERS, INSTALLED AND/OR WIRED BY ELECTRICAL CONTRACTOR
G.C.	GENERAL (SUB) CONTRACTOR
HP	HORSEPOWER
L.D.	LOCATE AS DIRECTED
MAX	MAXIMUM
M.C.	MECHANICAL (HVAC, PLBG, FP, OR TC) (SUB) CONTRACTOR
MH	MOUNTING HEIGHT TO BOTTOM OF DEVICE, BOX, OR FIXTURE, UNO
MN	MINIMUM
OR EQ	OR EQUAL
PAF	PAINTED AFTER FABRICATION
R/M	REMOVE
R/L	RELOCATE/RELOCATED
TW/LK	TWIST/TURN TO LOCK TYPE RECEPT/PLUG
UNO	UNLESS NOTED OTHERWISE
W/	COMPLETE WITH
WG	WITH WIRE GUARD
WP	WEATHERPROOF DEVICE, ENCLOSURE OR COVER PLATE.
XP	EXPLOSION-PROOF DEVICE OR ENCLOSURE, RATED FOR CLASS I, DIV 1, UNO
⊕	INDICATES NOTE-SEE TABULATION ON SAME SHEET
⊖	INDICATES NOTE-SEE SCHEDULE-SHOWN TO SCALE (APPROX.)
⊕ ⊖	EXIT SIGN-SINGLE OR DOUBLE FACE AS NUMBERED-ARROWS AS NOTED-CEILING OR WALL MOUNTED AS SHOWN-SEE SCHEDULE
⊕ ⊖	INDICATES FIXTURE CONNECTED TO EXISTING GENERATOR EMERGENCY CIRCUIT.
\$	LOCAL SWITCH-1 POLE-20A-120/277V-W/C-P.-M.H. 44" HUBBELL #HBL1221BK OREG.
⊕ ⊖	TRANSFER RELAY, WALL MOUNTED, FOR EMERGENCY LIGHTING CONTROL. CONNECTED TO ALLOW ON/OFF CONTROL, BUT TO TRANSFER TO EMERGENCY CIRCUIT UPON LOSS OF POWER. UL924 RATED. LVS #EPC-0-F-L-S SERIES OREG.
⊕ ⊖	WIRE TICKS INDICATE BRANCH CIRCUIT PHASE, NEUTRAL, & GROUND WIRES, RESPECTIVELY
⊕ ⊖	JUNCTION BOX-REQUIRED WHERE SHOWN
⊕ ⊖	EXISTING ITEMS ARE TO REMAIN-UNO
⊕ ⊖	EXISTING ITEMS SHOWN DASHED ARE TO BE REMOVED-UNO

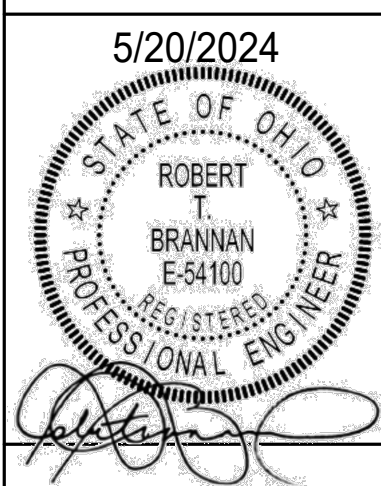
FIXTURE SCHEDULE

MARK	LAMP CATEGORY	LAMP QTY/TYPE	VOLTS	DESCRIPTION	MFR. AND CATALOG SERIES	VA
A	LED	60.92W 9123 LUMENS 4000K	277	HIGH BAY LED INDUSTRIAL FIXTURE, SUSPENDED FROM EXISTING STRUCTURE AT ROOF, VIA ADJUSTABLE AIRCRAFT CABLE, M.H. AT 15'-0", GLARE CONTROL LENS, MEDIUM DISTRIBUTION, WHITE FINISH, ELECTRONIC DRIVER.	LITHONIA CPHB-3000LM-SEF-GCL-MD-40K-80CRI-IBC12M100	68
B	LED	58.52W 7124 LUMENS 4000K	277	2'X4' RECESSED LED CLEANROOM TROFFER, HIGH PERFORMANCE, HOUSING IS 20 GAGE COLD ROLL STEEL, WHITE TRIM, ELECTRONIC LED DRIVER.	LITHONIA 2SRFL-F-L48-7000LM-1AW-AFL-MVOLT-40K-80CRI-DWAM-REV	65
C	LED	66.86W 7555 LUMENS 4000K	277	1'X6' VAPOR TIGHT SURFACE MOUNTED LED LINEAR FIXTURE, FROSTED POLYCARBONATE LENS, POLYCARBONATE HOUSING WITH 20 GAGE COLD ROLL STEEL COVER, POLYCARBONATE LATCHES, ELECTRONIC LED DRIVER.	LITHONIA VAP-4000LM-FST-MD-40K-80CRI-REV	74
C1	LED	32.9W 3887 LUMENS 4000K	277	1'X6' VAPOR TIGHT SURFACE MOUNTED LED LINEAR FIXTURE, FROSTED POLYCARBONATE LENS, POLYCARBONATE HOUSING WITH 20 GAGE COLD ROLL STEEL COVER, POLYCARBONATE LATCHES, ELECTRONIC LED DRIVER.	LITHONIA VAP-4000LM-FST-MD-40K-80CRI-REV	36
D	LED	20W 2200 LUMENS 4000K	277	6" LED INDUSTRIAL FIXTURE FOR WELDING BOOTHS, 40" SINGLE SWING ARM SQUARE MOUNT PLATE, ON/OFF SWITCH BACK OF LAMP, TEMPERED GLASS LENS, SAFETY YELLOW POWER COATED	SOLAS RAY LIGHTING DLY-020-40-11-90-SSA05-REV	22
E1	LED	INCLUDED	277	EXIT LIGHT, WALL MOUNTED, SINGLE FACE, 6 INCH RED LETTERS, 5 WATTS MAX PER FACE, POLYCARBONATE HOUSING, ARROWS AS SHOWN, WHITE FINISH, UNIVERSAL MOUNTING CANOPY.	LITHONIA LOMS-S-W-3-R-MVOLT-REV	5
DA	TB FLOOR	32W 3000 LUMENS PER LAMP 3500K	277	REMOVE EXISTING SIX TB LINEAR FLOURESCENT HIGH BAY INDUSTRIAL FIXTURE AND RETURNED TO OWNER, CONDUIT AND WIRING SHALL REMAIN.	-	175
DB	TB FLOOR	32W 3000 LUMENS PER LAMP 3500K	277	REMOVE EXISTING TWO TB LINEAR FLOURESCENT TROFFER FIXTURE AND RETURNED TO OWNER, CONDUIT AND WIRING SHALL REMAIN.	-	58
DC	TB FLOOR	32W 3000 LUMENS PER LAMP 3500K	277	REMOVE EXISTING TWO TB LINEAR FLOURESCENT SURFACE MOUNT FIXTURE AND RETURNED TO OWNER, CONDUIT AND WIRING SHALL REMAIN.	-	59
DE	-	INCLUDED	277	REMOVE EXISTING EXIT LIGHT AND RETURNED TO OWNER, CONDUIT AND WIRING SHALL REMAIN.	-	5

ELECTRICAL DRAWING LIST

DWG NO.	TITLE	FILE NO.
E-1	ELECTRICAL SPECIFICATIONS, FIXTURE SCHEDULE & LEGEND	24004965E1.dwg
E-2	ELECTRICAL LIGHTING FLOOR PLAN	24004965E2.dwg

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5/20/2024  
 TRANSFER RELAY, WALL MOUNTED, FOR EMERGENCY LIGHTING CONTROL. CONNECTED TO ALLOW ON/OFF CONTROL, BUT TO TRANSFER TO EMERGENCY CIRCUIT UPON LOSS OF POWER. UL924 RATED. LVS #EPC-0-F-L-S SERIES OREG.

Client	MONROE COUNTY COMMUNITY COLLEGE
Project	CAREER TECHNOLOGY CENTER WELDING LAB LIGHTING
Drawing	ELECTRICAL SPECIFICATIONS, FIXTURE SCHEDULE & LEGEND
Scale	AS INDICATED
Date	03/21/24
Job No.	24004965
TRD	TRD
Drawn by	JTH
Checked by	JTH
Approved by	RTB
Status	Not For Construction
REVISIONS	

