GENERAL ELECTRICAL NOTES:

GENERAL: UNLESS SPECIFICALLY INDICATED OTHERWISE, ALL WORK SHOWN ON THE ELECTRICAL DRAWINGS IS NEW WORK TO BE PROVIDED UNDER THIS CONTRACT.

DEMOLITION: SEE "ELECTRICAL GENERAL DEMOLITION NOTES" SHEET E.001 FOR ADDITIONAL DEMOLITION REQUIREMENTS.

COORDINATION: COORDINATE AND COOPERATE WITH ALL TRADES ON THE PROJECT.

RECORD DRAWINGS: SECURE AN EXTRA SET OF ELECTRICAL DRAWINGS TO BE KEPT ON SITE AND MARK, DAILY, THE DRAWINGS IN RED AS THE PROJECT PROGRESSES IN ORDER TO KEEP AN ACCURATE RECORD OF ALL DEVIATIONS BETWEEN THE WORK SHOWN ON THE DRAWINGS AND THE WORK WHICH IS ACTUALLY INSTALLED. THESE MARKED DRAWINGS SHALL REFLECT ANY AND ALL CHANGES AND REVISIONS TO THE ORIGINAL DESIGN WHICH EXISTS IN THE COMPLETED WORK. DELIVER THE MARKED DRAWINGS TO THE <ARCHITECT/ENGINEER> AT PROJECT CLOSE-OUT.

TESTS: TEST ALL WIRING FOR CONTINUITY AND GROUNDS BEFORE CONNECTING ANY FIXTURES OR DEVICES. PERFORM INSULATION RESISTANCE TESTS ON ALL WIRING #8 OR LARGER TO ENSURE THAT ALL PORTIONS ARE FREE FROM SHORT-CIRCUITS AND GROUNDS.

INSPECTIONS: ARRANGE ALL NECESSARY INSPECTIONS. DELIVER ALL REQUIRED INSPECTION CERTIFICATES TO THE OWNER.

GROUNDING: PROVIDE GROUNDING IN ACCORDANCE WITH THE NEC FOR THE ELECTRICAL SYSTEM INCLUDING EQUIPMENT FRAMES CONDUITS, SWITCHES, CONTROLLERS, WIRE-WAYS, NEUTRAL CONDUCTORS, AND OTHER EQUIPMENT. PROVIDE A GROUNDING CONDUCTOR IN ALL POWER CIRCUITS.

LABELS: PROVIDE LABELS FOR ALL PANELBOARDS, CABINETS, SAFETY SWITCHES, MOTOR-DISCONNECT SWITCHES, AND MOTOR CONTROLLERS. LABELS SHALL BE MACHINE ENGRAVED, LAMINATED PLASTIC, PERMANENTLY ATTACHED WITH SELF-TAPPING SCREWS OR RIVETS. DO NOT USE SELF-ADHESIVE LABELS.

J-BOX LABELING: LABEL ALL JUNCTION BOXES WITH PERMANENT MARKER IDENTIFYING CIRCUIT NUMBER AND PANELBOARD OF CIRCUITS WITHIN.

PANEL DIRECTORY: PROVIDE TYPEWRITTEN PANELBOARD DIRECTORY CARD IN EACH PANELBOARD INCLUDING EXISTING PANELBOARDS MODIFIED FOR THIS PROJECT WITH CIRCUIT LOAD INFORMATION AND ROOM NUMBER CLEARLY IDENTIFIED. USE ACTUAL ROOM NUMBERS IN THE BUILDING, NOT THE ROOM NUMBERS SHOWN ON THE CONTRACT DRAWINGS, AS THEY ARE OFTEN DIFFERENT.

MOTOR COORDINATION: MOTORS, MOTOR STARTERS, CONTROLLERS, INTEGRAL DISCONNECT SWITCHES, AND CONTACTORS SHALL BE PROVIDED WITH THEIR RESPECTIVE PIECES OF EQUIPMENT BY THE EQUIPMENT SUPPLIER. COMMUNICATE WITH THE TRADES PROVIDING THE EQUIPMENT, VERIFYING ALL REQUIREMENTS, PROVIDE ALL ELECTRICAL CONNECTIONS REQUIRED THEREIN, AND INSTALL MOTOR STARTERS.

MOTOR DISCONNECTS: ALL MOTORS SHALL HAVE DISCONNECTING MEANS.

MOTOR FUSE PROTECTION: WHERE FUSE PROTECTION IS SPECIFICALLY REQUIRED BY THE EQUIPMENT MANUFACTURER, PROVIDE FUSE SWITCHES IN LIEU OF NON-FUSE SWITCHES OR IN LIEU OF ENCLOSED CIRCUIT BREAKERS, OR OTHER DEVICES INDICATED.

CONNECTION DETAILS: SECURE APPROVED SHOP DRAWINGS SHOWING WIRING DIAGRAMS, ROUGH-IN AND HOOK UP DETAILS FROM OTHER INVOLVED CONTRACTORS FOR EQUIPMENT WHICH MUST BE CONNECTED ELECTRICALLY.

EQUIPMENT DETAILS: MECHANICAL EQUIPMENT WILL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR. THE LOCATIONS SHOWN ON THE ELECTRICAL DRAWINGS ARE APPROXIMATE. COORDINATE WITH THE MECHANICAL CONTRACTOR TO DETERMINE THE EXACT LOCATION OF EACH PIECE OF EQUIPMENT AND DETERMINE THE EXACT ROUGH-IN AND CONNECTION REQUIREMENTS.

STARTER MOUNTING: WHERE AN INDIVIDUALLY MOUNTED SAFETY SWITCH, STARTER OR CIRCUIT BREAKER IS SHOWN ADJACENT TO ITS RESPECTIVE LOAD AND NOT MOUNTED ON A WALL, PROVIDE ALL SUPPORTS, BRACKETS, ANCHORING, ETC. NECESSARY TO PROPERLY SUPPORT THE DEVICE.

LIGHTING ARRANGEMENT: ARRANGE LIGHTING FIXTURES IN ACCORDANCE WITH THE ARCHITECTURAL REFLECTED CEILING PLANS.

LIGHTING COORDINATION: COORDINATE LIGHTING FIXTURES WITH GRILLES, DIFFUSERS, SPRINKLER HEADS, AND ACCESS PANELS, ETC.

MATERIAL COORDINATION: VERIFY CEILING AND WALL CONSTRUCTION AND MATERIAL PRIOR TO ORDERING LIGHT FIXTURES OR OTHER DEVICES TO ENSURE PROPER FIXTURES OR DEVICE IS FURNISHED TO MATCH CONSTRUCTION.

MOUNTING HEIGHTS: MOUNTING HEIGHTS INDICATED ARE FROM THE FINISHED FLOOR TO THE CENTERLINE OF THE WIRING DEVICE UNLESS OTHERWISE NOTED. MOUNTING HEIGHTS OF LIGHTING FIXTURES AND FIRE ALARM DEVICES ARE TO THE BOTTOM OF THE FIXTURE OR DEVICE UNLESS OTHERWISE NOTED.

DEVICE LOCATIONS: COORDINATE LOCATIONS OF SWITCHES, RECEPTACLES, AND TELE/DATA OUTLETS WITH OTHER WALL MOUNTED DEVICES SUCH AS THERMOSTATS AND CONTROL STATIONS. DO NOT MOUNT WIRING DEVICES BACK TO BACK. PROVIDE MINIMUM OF ONE STUD SEPARATION.

EWC RECEPTACLES: RECEPTACLES FOR ELECTRIC WATER COOLERS (EWC) SHALL BE INSTALLED OUT OF VIEW AND BEHIND THE EWC ENCLOSURE. VERIFY THE MOUNTING HEIGHT WITH THE EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN.

DEVICE COORDINATION: THOROUGHLY REVIEW AND COORDINATE ALL CASEWORK, DOOR SWINGS, AND CABINET DRAWINGS AND ARCHITECTURAL ELEVATIONS WITH DEVICE LOCATIONS PRIOR TO ROUGH-IN OF OUTLET BOXES.

BARRIERS: WHERE A MULTIPLE GANG BOX HAS CIRCUITS OF DIFFERENT VOLTAGES OR SYSTEMS WHICH ARE REQUIRED TO BE SEPARATED, PROVIDE THE CODE-REQUIRED SEPARATION USING A FULL HEIGHT AND DEPTH BARRIER PLATE.

FIRE PROOFING: FOR ANY WALL OR FLOOR PENETRATIONS THROUGH FIRE RATED STRUCTURES PROVIDE FIRE-PROOFING TO SEAL ALL THE PENETRATIONS AFTER THE CONDUIT HAS BEEN INSTALLED. FIRE PROOFING FOR PENETRATIONS SHALL BE UL APPROVED PER THE THE PENETRATION MADE IN ORDER TO MAINTAIN FIRE RATED INTEGRITY OF THE STRUCTURE.

CLEAN UP: ON PROJECT CLOSE-OUT, CLEAN ALL ELECTRICAL DEVICES, LIGHTING FIXTURES, LAMPS AND LENSES, AND REMOVE ALL PAINT SPATTERS FROM DEVICES, FIXTURES, AND PLATES. REPLACE ALL INOPERATIVE LAMPS.

OWNER FURNISHED EQUIPMENT: CONTRACTOR SHALL OBTAIN CUT SHEETS, INSTALLATION DATA, AND ROUGH-IN REQUIREMENTS FOR OWNER FURNISHED, CONTRACTOR INSTALLED EQUIPMENT AND COORDINATE ROUGH-IN AND POWER REQUIREMENTS WITH THE OWNER'S REPRESENTATIVE PRIOR TO STARTING ANY ASSOCIATED WORK.

CONDUIT ROUTING: ALL CONDUIT RUN OVERHEAD SHALL BE RUN AT THE BOTTOM OF THE FLOOR, ROOF STRUCTURE, OR LOWEST CHORD OF JOIST SPACE (AS APPLICABLE) ABOVE IN ORDER TO AVOID CONFLICTS WITH OTHER TRADES.

WIRING DEVICES: ALL RECEPTACLES AND SWITCHES SHALL BE LABELED WITH PLASTIC LAMINATED LABEL WITH THE PANELBOARD DESIGNATION AND CIRCUIT NUMBER FROM WHICH IT IS FED.

EQUIPMENT DEMONSTRATION: PROVIDE A DEMONSTRATION OF THE OPERATION OF ALL ELECTRICAL COMPONENTS UPON REQUEST OF THE OWNER.

CEILING PLENUM: ALL WIRING THAT WILL NOT BE RUN IN CONDUIT SHALL BE PLENUM RATED.

ELECTRICAL GENERAL DEMOLITION NOTES:

GENERAL: DEMOLITION DRAWINGS ARE BASED ON EXISTING PLANS AND FIELD INVESTIGATION PRIOR TO DEMOLITION. VISIT THE EXISTING BUILDING PRIOR TO BID IN ORDER TO BECOME FAMILIAR WITH THE EXISTING CONDITIONS AND IN ORDER TO AVOID CONFLICTS.

DASHED ITEMS: ALL ITEMS SHOWN DASHED ON DEMOLITION PLANS ARE EXISTING AND SHALL BE REMOVED COMPLETE INCLUDING BOXES, CONDUIT, WIRE, FASTENERS, AND ASSOCIATED APPURTENANCES UON.

SOLID ITEMS: ALL ITEMS SHOWN SOLID ON DEMOLITION PLANS ARE EXISTING TO REMAIN.

CIRCUITING TO REMAIN: EXISTING CIRCUITING TO REMAIN SHALL BE REROUTED OR RECONNECTED, AS REQUIRED, WHERE AFFECTED BY NEW WORK IN ORDER TO MAINTAIN CONTINUITY OF CIRCUIT.

REUSE OF EXISTING CIRCUITRY: EXISTING CIRCUITRY SERVING LIGHTING FIXTURES AND/OR RECEPTACLES FOR A GIVEN AREA SHALL BE REUSED WHERE CONVENIENT TO SERVE THE NEW LAYOUT. PROVIDE CIRCUIT MODIFICATIONS INDICATED OR AS OTHERWISE REQUIRED TO MAINTAIN THE CONTINUITY OF THE EXISTING CIRCUITS THAT REMAIN.

EXISTING CONDUIT: ALL EXISTING CONDUITS AND WIRING THAT WILL NOT BE REUSED SHALL BE REMOVED WHERE THEY WILL BE EXPOSED UPON COMPLETION OF NEW WORK. EXISTING CONDUIT TO REMAIN CONCEALED IN WALLS SHALL BE ABANDONED. EXISTING CONDUIT TO REMAIN BELOW FLOOR SLAB SHALL BE CUT OFF ONE INCH BELOW ROUGH FLOOR AND GROUTED FLUSH. ALL EXISTING WIRING IN CONDUITS TO BE ABANDONED SHALL BE DISCONNECTED FROM POWER SOURCE AND REMOVED.

REPAIR DAMAGE: EXERCISE CARE IN REMOVAL OF DEMOLITION ITEMS. REPAIR, AT NO ADDITIONAL COST TO OWNER, ANY DAMAGE CAUSED TO EXISTING CONSTRUCTION AND/OR EQUIPMENT TO REMAIN.

ASSOCIATED APPURTENANCES: REMOVE ALL ELECTRICAL APPURTENANCES (DISCONNECTS, STARTERS, WIRING, CONDUIT, ETC.) ASSOCIATED WITH EQUIPMENT TO BE REMOVED BY OTHERS.

KNOCKOUT PLUGS AND COVERS: ALL CONDUIT REMOVED SHALL BE REMOVED IN ITS ENTIRETY, INCLUDING FITTINGS, MOUNTING DEVICES, MOUNTING HARDWARE, ETC. PROVIDE CONDUIT PLUGS AND BLANKS FOR ALL OPENINGS CREATED BY THE REMOVAL OF CONDUIT. PROVIDE BLANK COVER PLATES FOR ALL OPENED OUTLET BOXES CREATED BY THE REMOVAL OF THE EQUIPMENT AND/OR DEVICES.

DEMOLISHED MATERIALS: ALL MATERIALS REMOVED UNDER DEMOLITION, NOT TO BE RELOCATED OR DESIGNATED TO BE TURNED OVER TO THE OWNER, SHALL BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED COMPLETELY FROM THE SITE.

SCHEDULE OUTAGES: ALL WORK AND ALL POWER OUTAGES IN THE EXISTING BUILDING SHALL BE SCHEDULES AT TIMES CONVENIENT TO THE OWNER.

NOTIFICATION: NOTIFY THE OWNER PRIOR TO TURNING OFF ANY CIRCUITS.

EXISTING CIRCUITS: IF DURING THE COURSE OF CONSTRUCTION, IT IS DETERMINED BY THE CONTRACTOR THAT AN EXISTING CIRCUIT BECOMES SPARE, THE CONTRACTOR SHALL UPDATE THE PANELBOARD DIRECTORY TO INDICATE SUCH, EVEN IF IT IS NOT EXPLICITLY MARKED ON THE ELECTRICAL PLANS.

POWER

- Φ SINGLE RECEPTACLE, 20A, 120V, 18"AFF, UON.
- Φ E DUPLEX RECEPTACLE, 20A, 120V, 18"AFF, UON. SUBSCRIPT "E" DENOTES RECEPTACLE ON EMERGENCY POWER. EMERGENCY RECEPTACLE SHALL BE RED.
- J JUNCTION BOX - ABOVE CEILINGS OR FLUSH IN WALLS.
- E EQUIPMENT CONNECTION.
- DISCONNECT SWITCH - SIZE AS INDICATED ON PLANS
  30/2/20/3R — NEMA RATING (IF OTHER THAN 1)
  FUSE SIZE (AMPS), N.F. INDICATES NON-FUSED
  No. OF POLES
  SIZE (AMPS)
- MOTOR CONNECTION.
- COMBINATION MOTOR STARTER AND DISCONNECT SWITCH, MOUNT WITHIN SITE OF MOTOR 5'-0"AFF, MAXIMUM, UON.
- ELECTRICAL PANELBOARD
- T DRY-TYPE TRANSFORMER
- ELECTRICAL CIRCUIT RUN IN CONDUIT AND CIRCUIT HOMERUN TO PANELBOARD (PANEL AND CIRCUIT DESIGNATION AS INDICATED). AS A MINIMUM CONDITION, EACH SINGLE PHASE CIRCUIT SHALL HAVE 1 #12 PHASE CONDUCTOR, 1 #12 NEUTRAL CONDUCTOR, AND 1 #12 GROUNDING CONDUCTOR IN 3/4" CONDUIT. PROVIDE ADDITIONAL PHASE CONDUCTORS AS REQUIRED FOR "MULTIPLE PHASED" ELECTRICAL LOADS. PROVIDE ADDITIONAL "SWITCH LEG" CONDUCTORS TO PROVIDE THE LIGHT FIXTURE CONTROL INDICATED. MULTIPLE SINGLE PHASE CONDUCTORS SHALL BE GROUPED TOGETHER IN A COMMON CONDUIT IN ACCORDANCE WITH THE NEC AND AT THE CONTRACTOR'S DISCRETION. NEUTRAL AND GROUNDING CONDUCTORS SHALL BE SHARED AS ALLOWED BY THE NEC. CONDUIT LARGER THAN 3/4" AND CONDUCTORS LARGER THAN #12 SHALL BE AS INDICATED.

GENERAL

- 1 KEYED NEW WORK NOTE.

LIGHTING

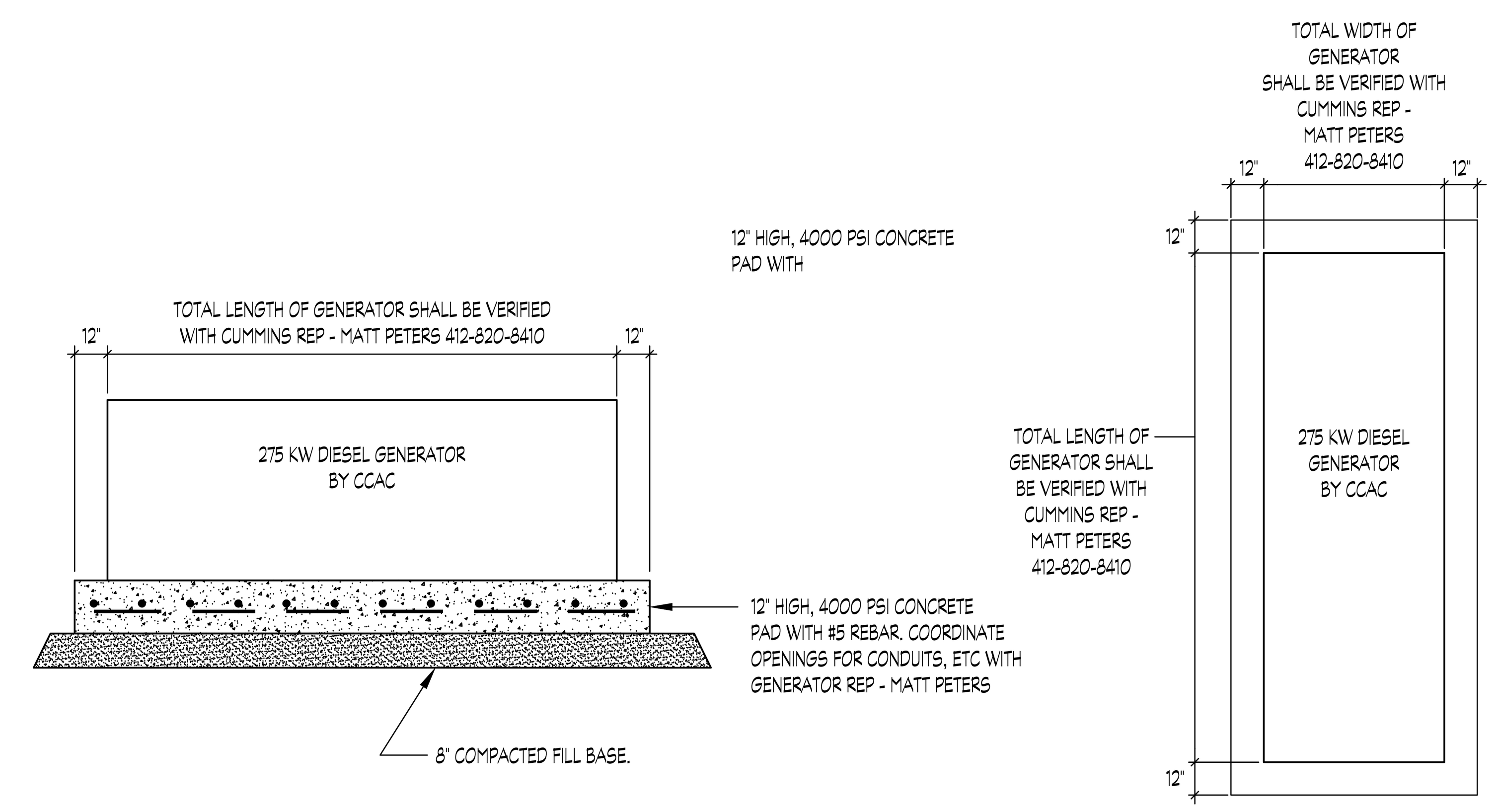
- LED LIGHTING FIXTURE.
- $T SINGLE POLE DIGITAL TIMER SWITCH, 20A, 120/277V, 44"AFF UON.

FIRE ALARM

- SD ADDRESSABLE FIRE ALARM SYSTEM PHOTO-ELECTRIC SMOKE DETECTOR, CEILING MOUNTED.

ABBREVIATIONS

A	AMPERE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
AIC	AMPERE INTERRUPTING CURRENT
ATS	AUTOMATIC TRANSFER SWITCH
AV	AUDIO/VISUAL
BFG	BELOW FINISHED GRADE
C	CONDUIT
CATV	CABLE ANTENNA TELEVISION
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
CFL	COMPACT FLUORESCENT
CKT	CIRCUIT
EBU	EMERGENCY BATTERY UNIT
EC	EMPTY CONDUIT
EC	ELECTRICAL CONTRACTOR
ECB	ENCLOSED CIRCUIT BREAKER
EF	EXHAUST FAN
ERU	ENERGY RECOVERY UNIT
EQUIP	EQUIPMENT
ETR	EXISTING TO REMAIN
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EXIST	EXISTING
FHP	FRACTIONAL HORSE POWER
FLA	FULL LOAD AMPS
FPC	FIRE PROTECTION CONTRACTOR
FPVAV	FAN POWERED VARIABLE AIR VOLUME
GC	GENERAL CONTRACTOR
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GND	GROUND
HID	HIGH INTENSITY DISCHARGE
HP	HORSE POWER/HEAT PUMP
HVAC	HEATING, VENTILATING, AND AIR CONDITIONING
IG	ISOLATED GROUND
JB	JUNCTION BOX
KVA	KILO-VOLT AMPERE
KW	KILO-WATT
LC	LIGHTING CONTACTOR
LTG	LIGHTING
MAU	MAKE UP AIR UNIT
MCA	MINIMUM CIRCUIT AMPS
MC	MECHANICAL CONTACTOR
MC	METAL CLAD
MCB	MAIN CIRCUIT BREAKER
MFR	MANUFACTURER
MLO	MAIN LUGS ONLY
MTD	MOUNTED
NEC	NATIONAL ELECTRICAL CODE
NF	NON-FUSED
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NTS	NOT TO SCALE
OC	ON CENTER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
P	POLE
PC	PLUMBING CONTRACTOR
PCP	PUMP CONTROL PANEL
PF	POWER FACTOR
PL	PROPERTY LINE
PNL	PANEL
PNLBD	PANELBOARD
Ø	PHASE
PRI	PRIMARY
RECP	RECEPTACLE
RTU	ROOF TOP UNIT
SE	SERVICE ENTRANCE
SEC	SECONDARY
TBB	TELEPHONE BACKBOARD
TR	TAMPER RESISTANT
TRT	TRIPLE TUBE FLUORESCENT LAMP
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSER
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
V	VOLTS
VAC	VOLTS ALTERNATING CURRENT
VAV	VARIABLE AIR VOLUME
VDC	VOLTS DIRECT CURRENT
VFD	VARIABLE FREQUENCY DRIVE
W	WATTS/WIRE
WG	WIRE GUARD
WP	WEATHERPROOF
XFMR	TRANSFORMER
EX	EXISTING TO REMAIN
EXR	EXISTING TO BE RELOCATED



1 / E001 GENERATOR PAD DETAIL
NTS

Allen&Shariff
DESIGN | BUILD | MANAGE
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PROJECT NAME

CCAC WEST HILLS CENTER - UPS AND GENERATOR UPGRADES

1000 McKee Road
Oakdale, PA 15071-1099

CCAC Project #13-CO-003n5a

SEAL

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DAVID C. PRICE
ENGINEER
No. PE081572
[illegible]

NO.	DATE	REVISIONS/ADDENDUMS

DESIGNED:	MWM
DRAWN:	MWM
CHECKED:	DEB
DATE:	10-25-2018
SCALE:	AS SHOWN

DRAWING TITLE
ELECTRICAL DATA SHEET

DRAWING NUMBER
E001

PROJECT NUMBER: 1841063

PART 1 - GENERAL

CODES AND STANDARDS - THE LATEST EFFECTIVE PUBLICATIONS OF ALL APPLICABLE STANDARDS, CODES, ETC., AS THEY APPLY, FORM PART OF THESE SPECIFICATIONS AS IF WERE WRITTEN FULLY HEREIN AND CONSTITUTE MINIMUM REQUIREMENTS. THE FOLLOWING WILL BE REFERRED TO THROUGHOUT IN ABBREVIATED FORMS.

NATIONAL ELECTRICAL CODE, (NFPA 70) (NEC).
INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE).
NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA).
AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI).
APPLICABLE STATE AND LOCAL CODES.
APPLICABLE STANDARDS OF UNDERWRITER'S LABORATORIES, INC. (UL).
APPLICABLE STANDARDS OF NATIONAL FIRE PROTECTION ASSOCIATION (NFPA).
THE INTERNATIONAL BUILDING CODE (IBC).
THE INTERNATIONAL FIRE CODE (IFC)
THE AMERICANS WITH DISABILITIES ACT (ADA).
INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA).
THE INTERNATIONAL ENERGY CONSERVATION CODE (IECC).
ASHRAE 90.1

1. SCOPE OF WORK - PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, APPURTENANCES AND SERVICES TO PROVIDE A COMPLETE ELECTRICAL INSTALLATION AS SHOWN ON THE DRAWINGS AND AS DESCRIBED IN THESE SPECIFICATIONS.
2. SITE VISIT - THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING HIS BID TO BECOME FAMILIAR WITH THE EXISTING CONDITIONS AND DETERMINE THE EXTENT OF WORK. LACK OF KNOWLEDGE OF EXISTING CONDITIONS WILL NOT BE CONSIDERED A BASIS FOR CHANGE ORDERS. PRIOR TO ORDERING EQUIPMENT, CONTRACTOR SHALL VERIFY THAT EQUIPMENT TO BE PROVIDED UNDER THIS CONTRACT IS ACCEPTABLE AND CAN FIT INTO BUILDING AND ROOM. EXPENSE INCURRED BY THE CONTRACTOR, WHICH IN THE ENGINEER'S OPINION COULD HAVE BEEN AVOIDED BY THIS STEP, SHALL NOT BE A BASIS FOR CHANGE ORDERS.
3. DRAWINGS AND SPECIFICATIONS - THE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT, CHARACTER AND ARRANGEMENT OF EQUIPMENT, FIXTURES AND CONDUIT AND WIRING SYSTEMS. IT IS THE INTENTION OF THESE SPECIFICATIONS AND DRAWINGS TO FULLY COVER ALL WORK AND MATERIALS FOR A COMPLETE, FIRST-CLASS ELECTRICAL INSTALLATION, AND ANY DEVICES SUCH AS PULL BOXES AND DISCONNECT SWITCHES, USUALLY EMPLOYED IN THIS CLASS OF WORK THOUGH NOT SPECIFICALLY MENTIONED OR SHOWN ON THE DRAWINGS OR IN THIS SPECIFICATION, BUT WHICH MAY BE NECESSARY FOR THE SATISFACTORY COMPLETION OF THE WORK, SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR AS A PART OF HIS TOTAL WORK UNDER THIS DIVISION. CONSULT THE SPECIFICATIONS AND DRAWINGS OF ALL OTHER TRADES AND PERFORM ALL ELECTRICAL WORK REQUIRED THEREIN. COOPERATE WITH ALL OTHER CONTRACTORS OR SUBCONTRACTORS TO FURNISH COMPLETE WORKABLE SYSTEMS.
4. DURING CONSTRUCTION - KEEP AN ACCURATE RECORD OF ALL DEVIATIONS BETWEEN THE WORK AS SHOWN ON THE CONTRACT DRAWINGS AND THAT WHICH IS ACTUALLY INSTALLED ON A SET OF PRINTS OF THE ELECTRICAL DRAWINGS, AND NOTE CHANGES THEREON WITH RED MARKS, IN A NEAT AND ACCURATE MANNER. WHEN ALL REVISIONS HAVE BEEN SHOWN ON THESE PRINTS TO INDICATE THE WORK AS FINALLY INSTALLED, THE PRINTS SHALL BE DELIVERED TO THE ENGINEER, BEFORE FINAL PAYMENT.
5. PERMITS, INSPECTION AND TESTS - THE RIGHT IS RESERVED TO INSPECT AND TEST ANY PORTION OF THE INSTALLATION/EQUIPMENT DURING THE PROGRESS OF ITS ERECTION. THIS CONTRACTOR SHALL TEST ALL WIRING FOR CONTINUITY AND GROUNDS BEFORE CONNECTING ANY FIXTURES OR DEVICES. THIS CONTRACTOR SHALL TEST THE ENTIRE SYSTEM WHEN THE WORK IS FINALLY COMPLETED TO INSURE THAT ALL PORTIONS ARE FREE FROM SHORT CIRCUITS AND GROUNDS.
6. SECURE AND PAY - FOR ALL REQUIRED PERMITS AND INSPECTIONS. INSPECTION CERTIFICATES FROM LOCAL AUTHORITIES HAVING JURISDICTION SHALL BE DELIVERED TO THE OWNER BEFORE FINAL PAYMENT.
7. SUBMITTALS - SUBMIT SHOP DRAWINGS, PRODUCT DATA AND SAMPLES WITHIN THIRTY (30) DAYS OF AWARD OF CONTRACT AND IN ACCORDANCE WITH THE GENERAL CONDITIONS AND SUPPLEMENTARY CONDITIONS. SUBMITTALS ARE REQUIRED FOR ALL SAFETY SWITCHES, ENCLOSED CIRCUIT BREAKERS, PANELBOARDS, TRANSIENT VOLTAGE SURGE SUPPRESSORS, TRANSFORMERS, LIGHTING FIXTURES, FIRE ALARM SYSTEM, AND SPECIALTY DEVICES PROVIDED UNDER THIS SPECIFICATION. REVIEW OF SUBMITTALS BY THE ENGINEER AND ANY ASSOCIATED ACTION TAKEN BY THE ENGINEER DOES NOT RELIEVE THE CONTRACTOR OF ANY REQUIREMENTS SET FORTH BY THE CONTRACT DOCUMENTS.
8. PROVIDE ALL CUTTING, PATCHING, PAINTING AND REFINISHING REQUIRED FOR INSTALLATION OF THE ELECTRICAL WORK.
9. DAILY AND WHEN DIRECTED BY THE OWNER OR ENGINEER REMOVE ALL DEBRIS FROM THE PREMISES.
10. DEFINITIONS:
"FURNISH" SHALL MEAN TO PURCHASE, DELIVER TO JOB SITE, AND UNLOAD FROM TRUCK AT JOB SITE. "INSTALL" SHALL MEAN TO MOUNT IN PLACE, MAKE ALL NECESSARY CONNECTIONS AS SPECIFIED ON PLANS, AND ON SHOP DRAWINGS.
"PROVIDE" SHALL MEAN TO FURNISH AND INSTALL.
11. ELECTRICAL CONTRACTOR SHALL COORDINATE ALL EQUIPMENT VOLTAGES WITH MECHANICAL CONTRACTORS PRIOR TO EQUIPMENT ORDER.

PART 2 - PRODUCTS

1. MANUFACTURING STANDARDS - MATERIAL SHALL BE NEW AND APPROVED AND LABELED BY UL WHEREVER STANDARDS HAVE BEEN ESTABLISHED BY THAT AGENCY. DEFECTIVE EQUIPMENT OR EQUIPMENT DAMAGED IN THE COURSE OF INSTALLATION OR TEST SHALL BE REPLACED OR REPAIRED IN A MANNER MEETING THE APPROVAL OF THE OWNER. ALL ITEMS OF THE SAME TYPE AND RATING SHALL BE IDENTICAL.
2. TRADE NAMES - UNLESS SPECIFICALLY IDENTIFIED OTHERWISE, MANUFACTURERS' NAMES AND CATALOG NUMBERS INDICATED HEREIN AND ON THE DRAWINGS ARE NOT INTENDED TO BE PROPRIETARY DESIGNATIONS. THEY ARE TO INDICATE GENERAL TYPE AND QUALITY OF MATERIALS AND EQUIPMENT REQUIRED. EQUIPMENT AND MATERIAL BY OTHER MANUFACTURERS WHICH IN THE OPINION OF THE ENGINEER ARE OF EQUAL QUALITY AND WHICH WILL PRODUCE THE SAME RESULTS WILL BE CONSIDERED ACCEPTABLE.
3. MOTORS - MOTORS SHALL BE PROVIDED WITH DISCONNECTING MEANS.
4. POWER WIRING - UP TO AND INCLUDING MOTOR CONNECTIONS FOR ALL EQUIPMENT PROVIDED UNDER OTHER DIVISIONS OF THIS SPECIFICATION SHALL BE INCLUDED IN THIS DIVISION. WHERE MANUAL MOTOR CONTROL SWITCHES FOR SINGLE PHASE MOTORS ARE INDICATED, THEY SHALL BE PROVIDED AND WIRED COMPLETE UNDER THIS DIVISION. MOTOR CONTROLLERS AND MOTOR STARTERS FURNISHED UNDER OTHER DIVISIONS SHALL BE SET IN PLACE AND CONNECTED TO SOURCE AND LOAD UNDER THIS DIVISION. IN GENERAL, MOTORS WILL BE PROVIDED WITH THE EQUIPMENT THEY DRIVE AND ARE NOT PART OF THIS WORK UNDER THIS DIVISION, EXCEPT THAT THEY SHALL BE CONNECTED HEREUNDER.
5. OBTAIN APPROVED SHOP DRAWINGS - SHOWING WIRING DIAGRAMS, CONNECTION DIAGRAMS, ROUGH-IN AND HOOKUP DETAILS, FROM ALL CONTRACTORS FOR ALL EQUIPMENT AND COMPLY THEREWITH.
6. CONTROL, INTERLOCK AND INTERNAL EQUIPMENT - WIRING REGARDLESS OF VOLTAGE SHALL BE PROVIDED BY OTHERS UNLESS SPECIFICALLY SHOWN HERE.
7. TEMPORARY ELECTRICAL SERVICE - TEMPORARY ELECTRICAL SERVICE AT 120/240V, I PHASE WITH GROUND FAULT INTERRUPTER WITH SOLIDLY GROUNDED NEUTRAL SHALL BE PROVIDED. PROVIDE ALL NECESSARY TEMPORARY LIGHTING AND RECEPTACLES. GENERAL CONTRACTOR WILL PAY ALL CHARGES, WHICH MAY BE MADE BY THE POWER COMPANY FOR TEMPORARY SERVICE.
8. GROUNDING - THE ENTIRE ELECTRICAL SYSTEM, INCLUDING EQUIPMENT FRAMES, CONDUIT, SWITCHES, CONTROLLERS, WIREWAYS, NEUTRAL CONDUCTORS, AND ALL OTHER SUCH EQUIPMENT SHALL BE PERMANENTLY AND EFFECTIVELY GROUNDED IN ACCORDANCE WITH THE NEC. GROUNDING OF EACH TRANSFORMER SECONDARY SHALL BE PROVIDED AND EACH SHALL BE CONSIDERED AS A SEPARATE SERVICE GROUND. PROVIDE A SEPARATE GROUND CONDUCTOR IN ALL BRANCH CIRCUIT CONDUITS SIZED IN ACCORDANCE WITH THE NEC.
9. SCHEDULE OF WORK - THE SCHEDULE OF THE ELECTRICAL WORK SHALL BE ARRANGED TO SUIT THE PROGRESS OF WORK BY THE OTHER TRADES AND SHALL IN NO WAY RETARD PROGRESS OF CONSTRUCTION OF THE PROJECT.
10. WORK UNDER THIS DIVISION - SHALL PROCEED IN ADVANCE OF THE WORK OF OTHERS WHENEVER POSSIBLE, ELIMINATING ALL CUTTING AND PATCHING. WHEN SUCH PROCEDURE IS IMPOSSIBLE, CUTTING AND PATCHING SHALL BE DONE IN AN APPROVED MANNER. CUTTING SHALL NOT ENDANGER STRUCTURAL INTEGRITY IN ANY WAY. PATCHING SHALL EXACTLY MATCH CONTIGUOUS WORK. ACTUAL WORK OF CUTTING AND PATCHING OF EXISTING SURFACES SHALL BE PERFORMED BY THE SUBCONTRACTOR WHO ORIGINALLY PREPARED THESE SURFACES, E.G., CUTTING AND PATCHING OF MASONRY WALL WILL BE PERFORMED BY THE MASONRY SUBCONTRACTOR. COSTS OF SUCH CUTTING AND PATCHING SHALL BE BORNE BY THE ELECTRICAL SUBCONTRACTOR. CUTTING SHALL BE CAREFULLY DONE AND DAMAGE TO BUILDING, PIPING, WIRING OR EQUIPMENT AS A RESULT OF CUTTING SHALL BE REPAIRED BY SKILLED MECHANICS OF TRADE INVOLVED.
11. STORAGE AND MATERIALS - SPACE WILL BE ASSIGNED TO THE CONTRACTOR BY THE OWNER FOR THE STORAGE OF MATERIAL. THIS CONTRACTOR WILL BE RESPONSIBLE FOR THE PROTECTION AND SAFEKEEPING OF MATERIALS, TOOLS, AND EQUIPMENT. ALL MATERIALS AND EQUIPMENT SHALL BE KEPT IN ITS ASSIGNED PLACE UNTIL THE TIME OF ITS INSTALLATION. EXCESS MATERIALS, DIRT AND REFUSE SHALL BE PROMPTLY REMOVED FROM THE WORK SITE.
12. LABELING OF EQUIPMENT - ALL PANELBOARDS, CABINETS, SAFETY SWITCHES, MOTOR DISCONNECT SWITCHES, AND MOTOR CONTROLLERS SHALL BE IDENTIFIED BY MACHINE ENGRAVED LAMINATED PLASTIC DESIGNATION PLATES PERMANENTLY ATTACHED THERETO WITH SELF-TAPPING SCREWS OR RIVETS. ALL COMPONENT PARTS OF EACH ITEM OF EQUIPMENT OR DEVICE SHALL BEAR THE MANUFACTURER'S NAMEPLATE, GIVING NAME OF MANUFACTURER, DESCRIPTION, SIZE TYPE, SERIAL AND MODEL NUMBER AND ELECTRICAL CHARACTERISTICS IN ORDER TO FACILITATE MAINTENANCE OR REPLACEMENT.
13. COORDINATION - COOPERATE AND COORDINATE EFFORTS WITH ALL CONTRACTORS ON THE PROJECT. THIS IS ESPECIALLY IMPORTANT IN DETERMINING EXACT LOCATIONS OF ALL SWITCHES, RECEPTACLES AND LIGHTING FIXTURES. ARRANGE LIGHTING FIXTURES IN ACCORDANCE WITH THE ARCHITECTURAL REFLECTED CEILING PLANS UNLESS OTHERWISE INDICATED. COORDINATE LIGHTING FIXTURE LOCATIONS WITH GRILLES, DIFFUSERS, ACCESS PANELS, ETC. VERIFY CEILING AND WALL CONSTRUCTION AND MATERIAL PRIOR TO ORDERING LIGHTING FIXTURES OR OTHER DEVICES TO ENSURE PROPER FIXTURE OR DEVICE IS FURNISHED TO MATCH CONSTRUCTION. THIS VERIFICATION MUST BE EXECUTED REGARDLESS OF INFORMATION PLACED ON THE DRAWINGS. ANY COST INCURRED WHICH IN THE OPINION OF THE OWNER, COULD HAVE BEEN AVOIDED BY THIS STEP SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR.
14. GUARANTEE OF WORK - CONTRACTOR GUARANTEES BY HIS ACCEPTANCE OF THE CONTRACT THAT ALL WORK INSTALLED IS FREE FROM ANY AND ALL DEFECTS IN WORKMANSHIP AND/OR MATERIALS, AND THAT THE APPARATUS WILL DEVELOP CAPACITIES AND CHARACTERISTICS SPECIFIED, AND THAT IF, DURING THE PERIOD OF ONE YEAR OR AS OTHERWISE SPECIFIED, FROM DATE OF CERTIFICATE OF COMPLETION AND ACCEPTANCE OF THE WORK ANY SUCH DEFECTS IN WORKMANSHIP, MATERIAL OR PERFORMANCE APPEAR, HE WILL, WITHOUT COST TO THE OWNER, REMEDY SUCH DEFECTS WITHIN A REASONABLE TIME TO BE SPECIFIED IN NOTICE. IN DEFAULT THEREOF, THE OWNER MAY HAVE SUCH WORK DONE AND CHARGE COST TO CONTRACTOR. EQUIPMENT GUARANTEES FROM DATE OF "START-UP" WILL NOT BE RECOGNIZED.

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL
1.1 SUBMITTALS
A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT.
PART 2 - PRODUCTS
2.1 COPPER BUILDING WIRE
A. DESCRIPTION: FLEXIBLE, INSULATED AND UNINSULATED, DRAWN COPPER CURRENT-CARRYING CONDUCTOR WITH AN OVERALL INSULATION LAYER OR JACKET, OR BOTH, RATED 600 V OR LESS.
B. CONDUCTOR INSULATION:
1. TYPE THHN AND TYPE THWN-2: COMPLY WITH UL 83.
2. TYPE XHHW-2: COMPLY WITH UL 44.
2.2 METAL-CLAD CABLE, TYPE MC
A. DESCRIPTION: A FACTORY ASSEMBLY OF ONE OR MORE CURRENT-CARRYING INSULATED CONDUCTORS IN AN OVERALL METALLIC SHEATH.
B. STANDARDS:
1. LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND USE.
2. COMPLY WITH UL 1569.
C. GROUND CONDUCTOR SHALL BE INSULATED. CONDUCTOR INSULATION TYPE THHN/THWN-2 SHALL COMPLY WITH UL 83. CONDUCTOR INSULATION TYPE XHHW-2 SHALL COMPLY WITH UL 44.
D. ARMOR SHALL BE STEEL OR ALUMINUM, INTERLOCKED. JACKET SHALL BE PVC APPLIED OVER ARMOR.
2.3 CONNECTORS AND SPLICES
A. DESCRIPTION: FACTORY-FABRICATED CONNECTORS, SPLICES, AND LUGS OF SIZE, AMPACITY RATING, MATERIAL, TYPE, AND CLASS FOR APPLICATION AND SERVICE INDICATED; LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND USE.
B. JACKETED CABLE CONNECTORS: FOR STEEL AND ALUMINUM JACKETED CABLES, ZINC DIE-CAST WITH SET SCREWS, DESIGNED TO CONNECT CONDUCTORS SPECIFIED IN THIS SECTION.
C. LUGS: ONE PIECE, SEAMLESS, DESIGNED TO TERMINATE CONDUCTORS SPECIFIED IN THIS SECTION. MATERIAL SHALL BE COPPER. TYPE SHALL BE ONE OR TWO HOLE WITH STANDARD OR LONG BARRELS. TERMINATIONS SHALL BE COMPRESSION.
PART 3 - EXECUTION
3.1 CONDUCTOR MATERIAL APPLICATIONS
A. FEEDERS: COPPER. CONDUCTORS SHALL BE SOLID OR STRANDED FOR NO. 10 AWG AND SMALLER; STRANDED FOR NO. 8 AWG AND LARGER.
B. BRANCH CIRCUITS: COPPER. SOLID OR STRANDED FOR NO. 10 AWG AND SMALLER; STRANDED FOR NO. 8 AWG AND LARGER. WIRE SMALLER THAN NO. 12 AWG SHALL NOT BE USED FOR LIGHTING AND POWER CIRCUITS.
C. POWER-LIMITED FIRE ALARM AND CONTROL: SOLID FOR NO. 12 AWG AND SMALLER.
3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS
A. SERVICE ENTRANCE: TYPE THHN-THWN OR XHHW-2, SINGLE CONDUCTORS IN RACEWAY.
B. FEEDERS AND BRANCH CIRCUITING: TYPE THHN-THWN, SINGLE CONDUCTORS IN RACEWAY.
C. METAL-CLAD CABLE, TYPE MC, SHALL BE PERMISSIBLE WHERE INSTALLED AS BRANCH CIRCUITING CONCEALED IN ACCESSIBLE CEILINGS, WALLS, AND PARTITIONS, OR WHERE INSTALLED BELOW RAISED FLOORING.
3.3 INSTALLATION OF CONDUCTORS AND CABLES
A. CONCEAL CABLES IN FINISHED WALLS, CEILINGS, AND FLOORS UNLESS OTHERWISE INDICATED.
B. USE MANUFACTURER-APPROVED PULLING COMPOUND OR LUBRICANT WHERE NECESSARY; COMPOUND USED MUST NOT DETERIORATE CONDUCTOR OR INSULATION. DO NOT EXCEED MANUFACTURER'S RECOMMENDED MAXIMUM PULLING TENSIONS AND SIDEWALL PRESSURE VALUES.
C. INSTALL EXPOSED CABLES PARALLEL AND PERPENDICULAR TO SURFACES OF EXPOSED STRUCTURAL MEMBERS, AND FOLLOW SURFACE CONTOURS WHERE POSSIBLE.
D. METAL CLAD CABLING SHALL BE SECURED EVERY SIX FEET AND WITHIN 12 INCHES OF EVERY BOX OR TERMINATION AS REQUIRED BY CODE. INSTALLATION OF METAL CLAD CABLING SHALL BE DONE IN A NEAT AND WORKMANLIKE MANNER AND FOLLOW OR BE PERPENDICULAR TO BUILDING LINES.
E. EACH DESIGNED CIRCUIT HOMERUN SHALL HAVE ITS OWN INDIVIDUAL GROUND CONDUCTOR. CONDUIT SHALL NOT BE USED A GROUND CONDUCTOR.
3.4 CONNECTIONS
A. TIGHTEN ELECTRICAL CONNECTORS AND TERMINALS ACCORDING TO MANUFACTURER'S PUBLISHED TORQUE-TIGHTENING VALUES. IF MANUFACTURER'S TORQUE VALUES ARE NOT INDICATED, USE THOSE SPECIFIED IN UL 486A-486B.
B. MAKE SPLICES, TERMINATIONS, AND TAPS THAT ARE COMPATIBLE WITH CONDUCTOR MATERIAL AND THAT POSSESS EQUIVALENT OR BETTER MECHANICAL STRENGTH AND INSULATION RATINGS THAN UNSPLICED CONDUCTORS.
C. WIRING AT OUTLETS: INSTALL CONDUCTOR AT EACH OUTLET, WITH AT LEAST 6 INCHES OF SLACK.
D. PUSH-ON WIRE CONNECTORS, OTHER THAN FOR LUMINAIRE DISCONNECTS, ARE NOT PERMITTED.
E. ALL EXTERIOR WIRING CONNECTIONS, AND THOSE MADE AT OR BELOW GRADE SHALL BE WATERPROOF WITH UL LISTED WATERPROOF CONNECTORS.
F. COPPER CONDUCTORS #10 AWG AND SMALLER SHALL BE TERMINATED AND SPLICED WITH WIRE NUT CONNECTORS. THE NYLON SELF_INSULATED TYPE SHALL BE USED TO ISOLATE THE TERMINATION FROM OTHER METAL PARTS AND EQUIPMENT.
G. COPPER CONDUCTORS #8 AWG AND LARGER SHALL BE TERMINATED, SPLICED, AND TAPPED WITH COLOR_KEYED COMPRESSION CONNECTORS. THE MANUFACTURERS RECOMMENDED TOOLS AND DIES SHALL BE USED.
H. COPPER CABLE LUG CONNECTIONS #8 AND LARGER TO COPPER BUS BAR MAINS AND BRANCHES SHALL USE COPPER SOLDERLESS CONNECTORS HAVING EITHER 2_BOLT CAST COPPER CLAMPS OR COMPRESSION CONNECTORS, WITH MANUFACTURER'S RECOMMENDED HEXAGONAL DIES AND HYDRAULIC COMPRESSION TOOLS.

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL
1.1 SUBMITTALS
A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.
PART 2 - PRODUCTS
2.1 SYSTEM DESCRIPTION
A. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
B. COMPLY WITH UL 467 FOR GROUNDING AND BONDING MATERIALS AND EQUIPMENT.
2.2 CONDUCTORS
A. INSULATED CONDUCTORS: COPPER OR TINNED-COPPER WIRE OR CABLE INSULATED FOR 600 V UNLESS OTHERWISE REQUIRED BY APPLICABLE CODE OR AUTHORITIES HAVING JURISDICTION.
B. GROUNDING BUS: PREDRILLED RECTANGULAR BARS OF ANNEALED COPPER, 1/4 BY 4 INCHES IN CROSS SECTION, WITH 9/32-INCH HOLES SPACED 1-1/8 INCHES APART. STAND-OFF INSULATORS FOR MOUNTING SHALL COMPLY WITH UL 891 FOR USE IN SWITCHBOARDS, 600 V AND SHALL BE LEXAN OR PVC, IMPULSE TESTED AT 5000 V.
2.3 CONNECTORS
A. LISTED AND LABELED BY AN NRTL ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION FOR APPLICATIONS IN WHICH USED AND FOR SPECIFIC TYPES, SIZES, AND COMBINATIONS OF CONDUCTORS AND OTHER ITEMS CONNECTED.
2.4 GROUNDING ELECTRODES
A. GROUND RODS: COPPER-CLAD STEEL; 3/4 INCH BY 10 FEET.
B. GROUND PLATES: 1/4 INCH THICK, HOT-DIP GALVANIZED.
PART 3 - EXECUTION
3.1 APPLICATIONS
A. CONDUCTORS: INSTALL SOLID CONDUCTOR FOR NO. 8 AWG AND SMALLER, AND STRANDED CONDUCTORS FOR NO. 6 AWG AND LARGER UNLESS OTHERWISE INDICATED.
B. UNDERGROUND GROUNDING CONDUCTORS: INSTALL BARE COPPER CONDUCTOR, NO. 3/0 AWG MINIMUM. BURY AT LEAST 24 INCHES BELOW GRADE.
C. ISOLATED GROUNDING CONDUCTORS: GREEN-COLORED INSULATION WITH CONTINUOUS YELLOW STRIPE. ON FEEDERS WITH ISOLATED GROUND, IDENTIFY GROUNDING CONDUCTOR WHERE VISIBLE TO NORMAL INSPECTION, WITH ALTERNATING BANDS OF GREEN AND YELLOW TAPE, WITH AT LEAST THREE BANDS OF GREEN AND TWO BANDS OF YELLOW.
D. GROUNDING BUS: INSTALL IN ELECTRICAL EQUIPMENT ROOMS, IN ROOMS HOUSING SERVICE EQUIPMENT, AND ELSEWHERE AS INDICATED.
1. INSTALL BUS HORIZONTALLY, ON INSULATED SPACERS 2 INCHES MINIMUM FROM WALL, 6 INCHES ABOVE FINISHED FLOOR UNLESS OTHERWISE INDICATED.
2. WHERE INDICATED ON BOTH SIDES OF DOORWAYS, ROUTE BUS UP TO TOP OF DOOR FRAME, ACROSS TOP OF DOORWAY, AND DOWN; CONNECT TO HORIZONTAL BUS.
E. CONDUCTOR TERMINATIONS AND CONNECTIONS:
1. PIPE AND EQUIPMENT GROUNDING CONDUCTOR TERMINATIONS: BOLTED CONNECTORS.
2. UNDERGROUND CONNECTIONS: WELDED CONNECTORS EXCEPT AT TEST WELLS AND AS OTHERWISE INDICATED.
3. CONNECTIONS TO GROUND RODS AT TEST WELLS: BOLTED CONNECTORS.
4. CONNECTIONS TO STRUCTURAL STEEL: WELDED CONNECTORS.
3.2 GROUNDING AT THE SERVICE
A. EQUIPMENT GROUNDING CONDUCTORS AND GROUNDING ELECTRODE CONDUCTORS SHALL BE CONNECTED TO THE GROUND BUS. INSTALL A MAIN BONDING JUMPER BETWEEN THE NEUTRAL AND GROUND BUSES.
3.3 EQUIPMENT GROUNDING
A. INSTALL INSULATED EQUIPMENT GROUNDING CONDUCTORS WITH ALL FEEDERS AND BRANCH CIRCUITS.
B. INSTALL INSULATED EQUIPMENT GROUNDING CONDUCTORS WITH THE FOLLOWING ITEMS, IN ADDITION TO THOSE REQUIRED BY NFPA 70:
1. FEEDERS AND BRANCH CIRCUITS.
2. LIGHTING CIRCUITS.
3. RECEPTACLE CIRCUITS.
4. SINGLE-PHASE MOTOR AND APPLIANCE BRANCH CIRCUITS.
5. THREE-PHASE MOTOR AND APPLIANCE BRANCH CIRCUITS.
6. FLEXIBLE RACEWAY RUNS.
7. METAL-CLAD CABLE RUNS.
8. COMPUTER AND RACK-MOUNTED ELECTRONIC EQUIPMENT CIRCUITS: INSTALL INSULATED EQUIPMENT GROUNDING CONDUCTOR IN BRANCH-CIRCUIT RUNS FROM EQUIPMENT-AREA POWER PANELS AND POWER-DISTRIBUTION UNITS.
3.4 INSTALLATION
A. GROUNDING CONDUCTORS: ROUTE ALONG SHORTEST AND STRAIGHTEST PATHS POSSIBLE UNLESS OTHERWISE INDICATED OR REQUIRED BY CODE. AVOID OBSTRUCTING ACCESS OR PLACING CONDUCTORS WHERE THEY MAY BE SUBJECTED TO STRAIN, IMPACT, OR DAMAGE.
B. GROUND RODS: DRIVE RODS UNTIL TOPS ARE 6 INCHES BELOW FINISHED FLOOR OR FINAL GRADE UNLESS OTHERWISE INDICATED.
1. INTERCONNECT GROUND RODS WITH GROUNDING ELECTRODE CONDUCTOR BELOW GRADE AND AS OTHERWISE INDICATED. MAKE CONNECTIONS WITHOUT EXPOSING STEEL OR DAMAGING COATING IF ANY.
2. USE EXOTHERMIC WELDS FOR ALL BELOW-GRADE CONNECTIONS.
3. FOR GROUNDING ELECTRODE SYSTEM, INSTALL AT LEAST THREE RODS SPACED AT LEAST ONE-ROD LENGTH FROM EACH OTHER AND LOCATED AT LEAST THE SAME DISTANCE FROM OTHER GROUNDING ELECTRODES, AND CONNECT TO THE SERVICE GROUNDING ELECTRODE CONDUCTOR.
C. TEST WELLS: GROUND ROD DRIVEN THROUGH DRILLED HOLE IN BOTTOM OF HANDHOLE. HANDHOLES SHALL BE AT LEAST 12 INCHES DEEP, WITH COVER.
1. INSTALL AT LEAST ONE TEST WELL FOR EACH SERVICE UNLESS OTHERWISE INDICATED. INSTALL AT THE GROUND ROD ELECTRICALLY CLOSEST TO SERVICE ENTRANCE. SET TOP OF TEST WELL FLUSH WITH FINISHED GRADE OR FLOOR.
D. BONDING STRAPS AND JUMPERS: INSTALL IN LOCATIONS ACCESSIBLE FOR INSPECTION AND MAINTENANCE EXCEPT WHERE ROUTED THROUGH SHORT LENGTHS OF CONDUIT.
1. BONDING TO STRUCTURE: BOND STRAPS DIRECTLY TO BASIC STRUCTURE, TAKING CARE NOT TO PENETRATE ANY ADJACENT PARTS.
2. BONDING TO EQUIPMENT MOUNTED ON VIBRATION ISOLATION HANGERS AND SUPPORTS: INSTALL BONDING SO VIBRATION IS NOT TRANSMITTED TO RIGIDLY MOUNTED EQUIPMENT.
3. USE EXOTHERMIC-WELDED CONNECTORS FOR OUTDOOR LOCATIONS; IF A DISCONNECT-TYPE CONNECTION IS REQUIRED, USE A BOLTED CLAMP.
E. GROUNDING AND BONDING FOR PIPING:
1. METAL WATER SERVICE PIPE: INSTALL INSULATED COPPER GROUNDING CONDUCTORS, IN CONDUIT, FROM BUILDING'S MAIN SERVICE EQUIPMENT, OR GROUNDING BUS, TO MAIN METAL WATER SERVICE ENTRANCES TO BUILDING. CONNECT GROUNDING CONDUCTORS TO MAIN METAL WATER SERVICE PIPES; USE A BOLTED CLAMP CONNECTOR OR BOLT A LUG-TYPE CONNECTOR TO A PIPE FLANGE BY USING ONE OF THE LUG BOLTS OF THE FLANGE. WHERE A DIELECTRIC MAIN WATER FITTING IS INSTALLED, CONNECT GROUNDING CONDUCTOR ON STREET SIDE OF FITTING. BOND METAL GROUNDING CONDUCTOR CONDUIT OR SLEEVE TO CONDUCTOR AT EACH END.
2. WATER METER PIPING: USE BRAIDED-TYPE BONDING JUMPERS TO ELECTRICALLY BYPASS WATER METERS. CONNECT TO PIPE WITH A BOLTED CONNECTOR.
3. BOND EACH ABOVEGROUND PORTION OF GAS PIPING SYSTEM DOWNSTREAM FROM EQUIPMENT SHUTOFF VALVE.
F. BONDING INTERIOR METAL DUCTS: BOND METAL AIR DUCTS TO EQUIPMENT GROUNDING CONDUCTORS OF ASSOCIATED FANS, BLOWERS, ELECTRIC HEATERS, AND AIR CLEANERS. INSTALL TINNED BONDING JUMPER TO BOND ACROSS FLEXIBLE DUCT CONNECTIONS TO ACHIEVE CONTINUITY.
G. GROUNDING FOR STEEL BUILDING STRUCTURE: INSTALL A DRIVEN GROUND ROD AT BASE OF EACH CORNER COLUMN AND AT INTERMEDIATE EXTERIOR COLUMNS AT DISTANCES NOT MORE THAN 60 FEET APART.
H. CONNECTIONS: MAKE CONNECTIONS SO POSSIBILITY OF GALVANIC ACTION OR ELECTROLYSIS IS MINIMIZED. SELECT CONNECTORS, CONNECTION HARDWARE, CONDUCTORS, AND CONNECTION METHODS SO METALS IN DIRECT CONTACT ARE GALVANICALLY COMPATIBLE.
1. USE ELECTROPLATED OR HOT-TIN-COATED MATERIALS TO ENSURE HIGH CONDUCTIVITY AND TO MAKE CONTACT POINTS CLOSER IN ORDER OF GALVANIC SERIES.
2. MAKE CONNECTIONS WITH CLEAN, BARE METAL AT POINTS OF CONTACT.
3. MAKE ALUMINUM-TO-STEEL CONNECTIONS WITH STAINLESS-STEEL SEPARATORS AND MECHANICAL CLAMPS.
4. MAKE ALUMINUM-TO-GALVANIZED-STEEL CONNECTIONS WITH TIN-PLATED COPPER JUMPERS AND MECHANICAL CLAMPS.
5. COAT AND SEAL CONNECTIONS HAVING DISSIMILAR METALS WITH INERT MATERIAL TO PREVENT FUTURE PENETRATION OF MOISTURE TO CONTACT SURFACES.

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL
1.1 ACTION SUBMITTALS
A. PRODUCT DATA: FOR SURFACE RACEWAYS, WIREWAYS AND FITTINGS, FLOOR BOXES, HINGED-COVER ENCLOSURES, AND CABINETS.
PART 2 - PRODUCTS
2.1 METAL CONDUITS AND FITTINGS
A. METAL CONDUIT:
1. LISTING AND LABELING: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
2. GRC: COMPLY WITH ANSI C80.1.
3. IMC: COMPLY WITH ANSI C80.6.
4. PVC-COATED STEEL CONDUIT: PVC-COATED RIGID STEEL CONDUIT IMC. COMPLY WITH NEMA RN1.
5. EMT: COMPLY WITH ANSI C80.3.
6. FMC: COMPLY WITH UL 1; ZINC-COATED STEEL OR ALUMINUM.
7. LFMC: FLEXIBLE STEEL CONDUIT WITH PVC JACKET AND COMPLYING WITH UL 360.
B. METAL FITTINGS:
1. COMPLY WITH NEMA FB1 AND UL 514B.
2. LISTING AND LABELING: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
3. FITTINGS, GENERAL: LISTED AND LABELED FOR TYPE OF CONDUIT, LOCATION, AND USE.
4. CONDUIT FITTINGS FOR HAZARDOUS (CLASSIFIED) LOCATIONS: COMPLY WITH UL 1203 AND NFPA 70.
5. FITTINGS FOR EMT: MATERIAL: STEEL OR DIE CAST. TYPE: COMPRESSION.
6. EXPANSION FITTINGS: PVC OR STEEL TO MATCH CONDUIT TYPE, COMPLYING WITH UL 651, RATED FOR ENVIRONMENTAL CONDITIONS WHERE INSTALLED, AND INCLUDING FLEXIBLE EXTERNAL BONDING JUMPER.
7. COATING FOR FITTINGS FOR PVC-COATED CONDUIT: MINIMUM THICKNESS OF 0.040 INCH, WITH OVERLAPPING SLEEVES PROTECTING THREADED JOINTS.
C. JOINT COMPOUND FOR IMC, GRC, OR ARC: APPROVED, AS DEFINED IN NFPA 70, BY AUTHORITIES HAVING JURISDICTION FOR USE IN CONDUIT ASSEMBLIES, AND COMPOUNDED FOR USE TO LUBRICATE AND PROTECT THREADED CONDUIT JOINTS FROM CORROSION AND TO ENHANCE THEIR CONDUCTIVITY.
2.2 NONMETALLIC CONDUITS AND FITTINGS
A. NONMETALLIC CONDUIT:
1. LISTING AND LABELING: NONMETALLIC CONDUIT SHALL BE LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
2. FIBERGLASS: COMPLY WITH NEMA TC 14. COMPLY WITH UL 2515 FOR ABOVEGROUND RACEWAYS. COMPLY WITH UL 2420 FOR BELOWGROUND RACEWAYS.
3. ENT: COMPLY WITH NEMA TC 13.
4. RNC: TYPE EPC-80-PVC, COMPLYING WITH NEMA TC 2 AND UL 651 UNLESS OTHERWISE INDICATED.
5. LFNC: COMPLY WITH UL 1660.
B. NONMETALLIC FITTINGS:
1. FITTINGS, GENERAL: LISTED AND LABELED FOR TYPE OF CONDUIT, LOCATION, AND USE.
2. FITTINGS FOR ENT AND RNC: COMPLY WITH NEMA TC 3; MATCH TO CONDUIT OR TUBING TYPE AND MATERIAL. FITTINGS FOR LFNC: COMPLY WITH UL 514B.
2.3 METAL WIREWAYS AND AUXILIARY GUTTERS
A. DESCRIPTION: SHEET METAL, COMPLYING WITH UL 870 AND NEMA 250, TYPE 1, TYPE 3R, OR TYPE 4 UNLESS OTHERWISE INDICATED, AND SIZED ACCORDING TO NFPA 70.
1. METAL WIREWAYS INSTALLED OUTDOORS SHALL BE LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
B. FITTINGS AND ACCESSORIES: INCLUDE COVERS, COUPLINGS, OFFSETS, ELBOWS, EXPANSION JOINTS, ADAPTERS, HOLD-DOWN STRAPS, END CAPS, AND OTHER FITTINGS TO MATCH AND MATE WITH WIREWAYS AS REQUIRED FOR COMPLETE SYSTEM.
C. WIREWAY COVERS: HINGED TYPE SCREW-COVER TYPE FLANGED-AND-GASKETED TYPE UNLESS OTHERWISE INDICATED.
D. FINISH: MANUFACTURER'S STANDARD ENAMEL FINISH.
2.4 SURFACE RACEWAYS
A. LISTING AND LABELING: SURFACE RACEWAYS AND TELE-POWER POLES SHALL BE LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
B. SURFACE METAL RACEWAYS: GALVANIZED STEEL WITH SNAP-ON COVERS COMPLYING WITH UL 5. MANUFACTURER'S STANDARD ENAMEL FINISH IN COLOR SELECTED BY ARCHITECT.
2.5 BOXES, ENCLOSURES, AND CABINETS
A. GENERAL REQUIREMENTS FOR BOXES, ENCLOSURES, AND CABINETS: BOXES, ENCLOSURES, AND CABINETS INSTALLED IN WET LOCATIONS SHALL BE LISTED FOR USE IN WET LOCATIONS.
B. SHEET METAL OUTLET AND DEVICE BOXES: COMPLY WITH NEMA OS1 AND UL 514A.
C. CAST-METAL OUTLET AND DEVICE BOXES: COMPLY WITH NEMA FB1, FERROUS ALLOY ALUMINUM, TYPE FD, WITH GASKETED COVER.
D. NONMETALLIC OUTLET AND DEVICE BOXES: COMPLY WITH NEMA OS2 AND UL 514C.
E. METAL FLOOR BOXES: MATERIAL: CAST METAL OR SHEET METAL. TYPE: FULLY ADJUSTABLE. SHAPE: RECTANGULAR.
F. LUMINAIRE OUTLET BOXES: NONADJUSTABLE, DESIGNED FOR ATTACHMENT OF LUMINAIRE WEIGHING 50 LB. OUTLET BOXES DESIGNED FOR ATTACHMENT OF LUMINAIRES WEIGHING MORE THAN 50 LB SHALL BE LISTED AND MARKED FOR THE MAXIMUM ALLOWABLE WEIGHT.
G. SMALL SHEET METAL PULL AND JUNCTION BOXES: NEMA OS1.
H. CAST-METAL ACCESS, PULL, AND JUNCTION BOXES: COMPLY WITH NEMA FB1 AND UL 1773, CAST ALUMINUM OR GALVANIZED, CAST IRON WITH GASKETED COVER.
I. BOX EXTENSIONS USED TO ACCOMMODATE NEW BUILDING FINISHES SHALL BE OF SAME MATERIAL AS RECESSED BOX.
J. DEVICE BOX DIMENSIONS: 4 INCHES SQUARE BY 2-1/8 INCHES DEEP OR 4 INCHES BY 2-1/8 INCHES BY 2-1/8 INCHES DEEP.
K. GANGABLE BOXES ARE PROHIBITED.
L. HINGED-COVER ENCLOSURES: COMPLY WITH UL 50 AND NEMA 250, TYPE 1 TYPE 3R TYPE 4 WITH CONTINUOUS-HINGE COVER WITH FLUSH LATCH UNLESS OTHERWISE INDICATED.
1. METAL ENCLOSURES: STEEL, FINISHED INSIDE AND OUT WITH MANUFACTURER'S STANDARD ENAMEL.
2. NONMETALLIC ENCLOSURES: FIBERGLASS.
3. INTERIOR PANELS: STEEL; ALL SIDES FINISHED WITH MANUFACTURER'S STANDARD ENAMEL.
M. CABINETS:
NEMA 250, TYPE 1 TYPE 3R TYPE 12 GALVANIZED-STEEL BOX WITH REMOVABLE INTERIOR PANEL AND REMOVABLE FRONT, FINISHED INSIDE AND OUT WITH MANUFACTURER'S STANDARD ENAMEL. HINGED DOOR IN FRONT COVER WITH FLUSH LATCH AND CONCEALED HINGE. KEY LATCH TO MATCH PANELBOARDS. METAL BARRIERS TO SEPARATE WIRING OF DIFFERENT SYSTEMS AND VOLTAGE. ACCESSORY FEET WHERE REQUIRED FOR FREESTANDING EQUIPMENT. NONMETALLIC CABINETS SHALL BE LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING
A. GENERAL REQUIREMENTS FOR HANDHOLES AND BOXES:
1. BOXES AND HANDHOLES FOR USE IN UNDERGROUND SYSTEMS SHALL BE DESIGNED AND IDENTIFIED AS DEFINED IN NFPA 70, FOR INTENDED LOCATION AND APPLICATION.
2. BOXES INSTALLED IN WET AREAS SHALL BE LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
PART 3 - EXECUTION
3.1 RACEWAY APPLICATION
A. OUTDOORS: APPLY RACEWAY PRODUCTS AS SPECIFIED BELOW UNLESS OTHERWISE INDICATED:
1. EXPOSED CONDUIT: GRC, IMC, RNC, TYPE EPC-80-PVC.
2. CONCEALED CONDUIT, ABOVEGROUND: GRC, IMC AND EMT.
3. UNDERGROUND CONDUIT: RNC, TYPE EPC-80-PVC, DIRECT BURIED AND CONCRETE ENCASED WHERE UNDER DRIVES AND PARKING AREAS.
4. CONNECTION TO VIBRATING EQUIPMENT (INCLUDING TRANSFORMERS AND HYDRAULIC, PNEUMATIC, ELECTRIC SOLENOID, OR MOTOR-DRIVEN EQUIPMENT): LFMC AND LFNC.
5. BOXES AND ENCLOSURES, ABOVEGROUND: NEMA 250, TYPE 3R AND TYPE 4.
B. INDOORS: APPLY RACEWAY PRODUCTS AS SPECIFIED BELOW UNLESS OTHERWISE INDICATED:
1. EXPOSED, NOT SUBJECT TO PHYSICAL DAMAGE: EMT.
2. EXPOSED, NOT SUBJECT TO SEVERE PHYSICAL DAMAGE: EMT.
3. EXPOSED AND SUBJECT TO SEVERE PHYSICAL DAMAGE: GRC. RACEWAY LOCATIONS INCLUDE THE FOLLOWING: LOADING DOCK, CORRIDORS USED FOR TRAFFIC OF MECHANIZED CARTS, FORKLIFTS, AND PALLET-HANDLING UNITS, MECHANICAL ROOMS.
4. CONCEALED IN CEILINGS AND INTERIOR WALLS AND PARTITIONS: EMT.
5. CONNECTION TO VIBRATING EQUIPMENT (INCLUDING TRANSFORMERS AND HYDRAULIC, PNEUMATIC, ELECTRIC SOLENOID, OR MOTOR-DRIVEN EQUIPMENT): FMC, EXCEPT USE LFMC IN DAMP OR WET LOCATIONS.
6. DAMP OR WET LOCATIONS: GRC.
7. BOXES AND ENCLOSURES: NEMA 250, TYPE 1, EXCEPT USE NEMA 250, TYPE 4 STAINLESS STEEL IN INSTITUTIONAL AND COMMERCIAL KITCHENS AND DAMP OR WET LOCATIONS.
C. MINIMUM RACEWAY SIZE: 3/4-INCH TRADE SIZE.
D. RACEWAY FITTINGS: COMPATIBLE WITH RACEWAYS AND SUITABLE FOR USE AND LOCATION.
1. RIGID AND INTERMEDIATE STEEL CONDUIT: USE THREADED RIGID STEEL CONDUIT FITTINGS UNLESS OTHERWISE INDICATED. COMPLY WITH NEMA FB 2.10.
2. PVC EXTERNALLY COATED, RIGID STEEL CONDUITS: USE ONLY FITTINGS LISTED FOR USE WITH THIS TYPE OF CONDUIT. PATCH AND SEAL ALL JOINTS, NICKS, AND SCRAPES IN PVC COATING AFTER INSTALLING CONDUITS AND FITTINGS. USE SEALANT RECOMMENDED BY FITTING MANUFACTURER AND APPLY IN THICKNESS AND NUMBER OF COATS RECOMMENDED BY MANUFACTURER.
3. EMT: USE SETSCREW, STEEL FITTINGS. COMPLY WITH NEMA FB 2.10.
4. FLEXIBLE CONDUIT: USE ONLY FITTINGS LISTED FOR USE WITH FLEXIBLE CONDUIT. COMPLY WITH NEMA FB 2.20.
E. DO NOT INSTALL ALUMINUM CONDUITS, BOXES, OR FITTINGS IN CONTACT WITH CONCRETE OR EARTH.
F. INSTALL SURFACE RACEWAYS ONLY WHERE INDICATED ON DRAWINGS.
3.2 INSTALLATION
A. COMPLY WITH NECA 1 AND NECA 101 FOR INSTALLATION REQUIREMENTS EXCEPT WHERE REQUIREMENTS ON DRAWINGS OR IN THIS ARTICLE ARE STRICTER. COMPLY WITH NECA 102 FOR ALUMINUM CONDUITS. COMPLY WITH NFPA 70 LIMITATIONS FOR TYPES OF RACEWAYS ALLOWED IN SPECIFIC OCCUPANCIES AND NUMBER OF FLOORS.
B. KEEP RACEWAYS AT LEAST 6 INCHES AWAY FROM PARALLEL RUNS OF FLUES AND STEAM OR HOT-WATER PIPES. INSTALL HORIZONTAL RACEWAY RUNS ABOVE WATER AND STEAM PIPING.
C. ARRANGE STUB-UPS SO CURVED PORTIONS OF BENDS ARE NOT VISIBLE ABOVE FINISHED SLAB.
D. INSTALL NO MORE THAN THE EQUIVALENT OF THREE 90-DEGREE BENDS IN ANY CONDUIT RUN EXCEPT FOR CONTROL WIRING CONDUITS, FOR WHICH FEWER BENDS ARE ALLOWED. SUPPORT WITHIN 12 INCHES OF CHANGES IN DIRECTION.
E. CONCEAL CONDUIT AND EMT WITHIN FINISHED WALLS, CEILINGS, AND FLOORS UNLESS OTHERWISE INDICATED. INSTALL CONDUITS PARALLEL OR PERPENDICULAR TO BUILDING LINES.
F. SUPPORT CONDUIT WITHIN 12 INCHES OF ENCLOSURES TO WHICH ATTACHED.
G. RACEWAYS EMBEDDED IN SLABS:
RUN CONDUIT LARGER THAN 1-INCH TRADE SIZE, PARALLEL OR AT RIGHT ANGLES TO MAIN REINFORCEMENT. WHERE AT RIGHT ANGLES TO REINFORCEMENT, PLACE CONDUIT CLOSE TO SLAB SUPPORT. SECURE RACEWAYS TO REINFORCEMENT AT MAXIMUM 10-FOOTINTERVALS. ARRANGE RACEWAYS TO CROSS BUILDING EXPANSION JOINTS AT RIGHT ANGLES WITH EXPANSION FITTINGS. ARRANGE RACEWAYS TO KEEP A MINIMUM OF 3 INCHES OF CONCRETE COVER IN ALL DIRECTIONS.
DO NOT EMBED THREADLESS FITTINGS IN CONCRETE UNLESS SPECIFICALLY APPROVED BY ARCHITECT FOR EACH SPECIFIC LOCATIONS. SOME AUTHORITIES HAVING JURISDICTION MAY NOT PERMIT NONMETALLIC TUBING IN FIRE-RATED SLABS IN SUBPARAGRAPH BELOW. CHANGE FROM ENT TO GRC OR IMC BEFORE RISING ABOVE FLOOR.
H. STUB-UPS TO ABOVE RECESSED CEILINGS: USE EMT, IMC, OR RMC FOR RACEWAYS.
USE A CONDUIT BUSHING OR INSULATED FITTING TO TERMINATE STUB-UPS NOT TERMINATED IN HUBS OR IN AN ENCLOSURE.
I. THREADED CONDUIT JOINTS, EXPOSED TO WET, DAMP, CORROSIVE, OR OUTDOOR CONDITIONS: APPLY LISTED COMPOUND TO THREADS OF RACEWAY AND FITTINGS BEFORE MAKING UP JOINTS. FOLLOW COMPOUND MANUFACTURER'S WRITTEN INSTRUCTIONS.
J. COAT FIELD-CUT THREADS ON PVC-COATED RACEWAY WITH A CORROSION-PREVENTING CONDUCTIVE COMPOUND PRIOR TO ASSEMBLY.
K. RACEWAY TERMINATIONS AT LOCATIONS SUBJECT TO MOISTURE OR VIBRATION: USE INSULATING BUSHINGS TO PROTECT CONDUCTORS INCLUDING CONDUCTORS SMALLER THAN NO. 4 AWG.
L. TERMINATE THREADED CONDUITS INTO THREADED HUBS OR WITH LOCKNUTS ON INSIDE AND OUTSIDE OF BOXES OR CABINETS. INSTALL BUSHINGS ON CONDUITS UP TO 1-1/4-INCH TRADE SIZE AND INSULATED THROAT METAL BUSHINGS ON 1-1/2-INCH TRADE SIZE AND LARGER CONDUITS TERMINATED WITH LOCKNUTS. INSTALL INSULATED THROAT METAL GROUNDING BUSHINGS ON SERVICE CONDUITS.
M. INSTALL RACEWAYS SQUARE TO THE ENCLOSURE AND TERMINATE AT ENCLOSURES WITH LOCKNUTS. INSTALL LOCKNUTS HAND TIGHT PLUS 1/4 TURN MORE.
N. DO NOT RELY ON LOCKNUTS TO PENETRATE NONCONDUCTIVE COATINGS ON ENCLOSURES. REMOVE COATINGS IN THE LOCKNUT AREA PRIOR TO ASSEMBLING CONDUIT TO ENCLOSURE TO ASSURE A CONTINUOUS GROUND PATH.
O. CUT CONDUIT PERPENDICULAR TO THE LENGTH. FOR CONDUITS 2-INCH TRADE SIZE AND LARGER, USE ROLL CUTTER OR A GUIDE TO MAKE CUT STRAIGHT AND PERPENDICULAR TO THE LENGTH.
P. INSTALL PULL WIRES IN EMPTY RACEWAYS.
Q. FLEXIBLE CONDUIT CONNECTIONS: COMPLY WITH NEMA RV 3. USE A MAXIMUM OF 72 INCHES OF FLEXIBLE CONDUIT FOR EQUIPMENT SUBJECT TO VIBRATION, NOISE TRANSMISSION, OR MOVEMENT; AND FOR TRANSFORMERS AND MOTORS.
1. USE LFMC IN DAMP OR WET LOCATIONS SUBJECT TO SEVERE PHYSICAL DAMAGE.
2. USE LFMC OR LFNC IN DAMP OR WET LOCATIONS NOT SUBJECT TO SEVERE PHYSICAL DAMAGE.
R. MOUNT BOXES AT HEIGHTS INDICATED ON DRAWINGS. IF MOUNTING HEIGHTS OF BOXES ARE NOT INDIVIDUALLY INDICATED, GIVE PRIORITY TO ADA REQUIREMENTS. INSTALL BOXES WITH HEIGHT MEASURED TO CENTER OF BOX UNLESS OTHERWISE INDICATED.
S. RECESSED BOXES IN MASONRY WALLS: SAW-CUT OPENING FOR BOX IN CENTER OF CELL OF MASONRY BLOCK, AND INSTALL BOX FLUSH WITH SURFACE OF WALL. PREPARE BLOCK SURFACES TO PROVIDE A FLAT SURFACE FOR A RAINTIGHT CONNECTION BETWEEN BOX AND COVER PLATE OR SUPPORTED EQUIPMENT AND BOX.
T. HORIZONTALLY SEPARATE BOXES MOUNTED ON OPPOSITE SIDES OF WALLS SO THEY ARE NOT IN THE SAME VERTICAL CHANNEL.
U. LOCATE BOXES SO THAT COVER OR PLATE WILL NOT SPAN DIFFERENT BUILDING FINISHES.
V. SUPPORT BOXES OF THREE GANGS OR MORE FROM MORE THAN ONE SIDE BY SPANNING TWO FRAMING MEMBERS OR MOUNTING ON BRACKETS SPECIFICALLY DESIGNED FOR THE PURPOSE.
W. FASTEN JUNCTION AND PULL BOXES TO OR SUPPORT FROM BUILDING STRUCTURE. DO NOT SUPPORT BOXES BY CONDUITS.

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL
1.1 SUBMITTALS
A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.
1.2 COORDINATION
A. COORDINATE LAYOUT AND INSTALLATION OF CEILING-MOUNTED DEVICES WITH OTHER CONSTRUCTION THAT PENETRATES CEILINGS OR IS SUPPORTED BY THEM, INCLUDING LIGHT FIXTURES, HVAC EQUIPMENT, SMOKE DETECTORS, FIRE-SUPPRESSION SYSTEM, AND PARTITION ASSEMBLIES.
PART 2 - PRODUCTS
2.1 TIME SWITCHES
A. LOW VOLTAGE DIGITAL TIME SWITCH: SPECIFIC PRODUCT AS INDICATED ON DRAWINGS.
1. THE DIGITAL TIME SWITCH SHALL BE PROGRAMMABLE TO TURN LOADS OFF AFTER A PRESET TIME.
2. TIME SWITCH SHALL BE A FIVE WIRE, COMPLETELY SELF CONTAINED CONTROL SYSTEM THAT REPLACES A STANDARD TOGGLE SWITCH. SWITCHING MECHANISM SHALL BE A 30V, 1A AIR GAP RELAY.
3. TIME SWITCH SHALL OPERATE AT EITHER 24 VAC OR 24 VDC, 60 HZ.
4. TIME SWITCH SHALL HAVE NO MINIMUM LOAD REQUIREMENT.
5. TIME SWITCH SHALL BE 6-BUTTON WITH 30 MINUTE/1HOUR/2HOUR/4 HOUR/8 HOUR/12 HOUR OPTIONS, WITH EACH OPTION ENGRAVED ON THE BUTTONS TO REFLECT THOSE TIMES.
6. TIME SWITCH SHALL GIVE VISUAL WARNING AT 5 MINUTES UNTIL LIGHTS TURN OFF, AND AUDIBLE/VISUAL WARNING AT 1 MINUTE BEFORE THE LIGHTS TURN OFF.
7. TIME SWITCH SHALL HAVE THE OPTION FOR A BEEP WARNING THAT SHALL SOUND EVERY FIVE SECONDS ONCE THE TIME SWITCH COUNTDOWN REACHES ONE MINUTE.
8. TIME SWITCH SHALL HAVE MANUAL FEATURE FOR TIMER RESET WHERE PRESSING THE ON/OFF SWITCH FOR MORE THAN 2 SECONDS RESETS THE TIMER TO THE PROGRAMMED TIME-OUT PERIOD.
9. TIME SWITCH SHALL BE CAPABLE OF OPERATING AS AN ON/OFF SWITCH.
10. TIME SWITCH CAN OPERATE WITH POWER PACKS IN ORDER TO CONTROL ADDITIONAL LOADS.
2.2 OUTDOOR PHOTOELECTRIC SWITCHES
A. DESCRIPTION: SOLID STATE, WITH DPST DRY CONTACTS RATED FOR 1800-VA TUNGSTEN OR 1000-VA INDUCTIVE, TO OPERATE CONNECTED RELAY, CONTACTOR COILS, OR MICROPROCESSOR INPUT; COMPLYING WITH UL 773A. SPECIFIC PRODUCT AS INDICATED ON DRAWINGS.
2.3 DAYLIGHTING SENSORS
A. DESCRIPTION: SOLID-STATE, LIGHT-LEVEL SENSOR UNIT, WITH SEPARATE RELAY UNIT, TO DETECT CHANGES IN LIGHTING LEVELS THAT ARE PERCEIVED BY THE EYE. COMPATIBLE WITH LIGHTING SYSTEM AS SPECIFIED.

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PROJECT NAME
CCAC WEST HILLS CENTER - UPS AND GENERATOR UPGRADES
1000 McKee Road
Oakdale, PA 15071-1099
CCAC Project #13-CO-003n5a

SEAL

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DAVID C. PRICE
ENGINEER
No. PE081572

NO.	DATE	REVISIONS/ADDENDUMS

DESIGNED: MWM
DRAWN: MWM
CHECKED: DEB
DATE: 10-25-2018
SCALE: AS SHOWN

DRAWING TITLE
ELECTRICAL SPECIFICATIONS

DRAWING NUMBER
E002

PROJECT NUMBER: 1841063

2.4 INDOOR OCCUPANCY SENSORS

A. GENERAL DESCRIPTION: WALL- OR CEILING-MOUNTING, SOLID-STATE UNITS WITH A SEPARATE RELAY UNIT. SPECIFIC PRODUCT AS INDICATED ON DRAWINGS.
1. OPERATION: UNLESS OTHERWISE INDICATED, TURN LIGHTS ON WHEN COVERED AREA IS OCCUPIED AND OFF WHEN UNOCCUPIED; WITH A TIME DELAY FOR TURNING LIGHTS OFF, ADJUSTABLE OVER A MINIMUM RANGE OF 1 TO 30 MINUTES.
2. MOUNTING:
a. SENSOR: SUITABLE FOR MOUNTING IN ANY POSITION ON A STANDARD OUTLET BOX.
3. INDICATOR: LED, TO SHOW WHEN MOTION IS BEING DETECTED DURING TESTING AND NORMAL OPERATION OF THE SENSOR.
4. BYPASS SWITCH: OVERRIDE THE ON FUNCTION IN CASE OF SENSOR FAILURE.

B. PIR TYPE: CEILING MOUNTING; DETECT OCCUPANCY BY SENSING A COMBINATION OF HEAT AND MOVEMENT IN AREA OF COVERAGE. SPECIFIC PRODUCT AS INDICATED ON DRAWINGS.
1. DETECTOR SENSITIVITY: DETECT OCCURRENCES OF 6-INCH- (150-MM-) MINIMUM MOVEMENT OF ANY PORTION OF A HUMAN BODY THAT PRESENTS A TARGET OF NOT LESS THAN 36 SQ. IN. (232 SQ. CM).
2. DETECTION COVERAGE (ROOM): DETECT OCCUPANCY ANYWHERE IN A CIRCULAR AREA OF 1000 SQ. FT. (93 SQ. M) WHEN MOUNTED ON A 96-INCH- (2440-MM-) HIGH CEILING.
3. DETECTION COVERAGE (CORRIDOR): DETECT OCCUPANCY WITHIN 90 FEET (27.4 M) WHEN MOUNTED ON A 10-FOOT- (3-M-) HIGH CEILING.

C. ULTRASONIC TYPE: CEILING MOUNTING; DETECT OCCUPANCY BY SENSING A CHANGE IN PATTERN OF REFLECTED ULTRASONIC ENERGY IN AREA OF COVERAGE. SPECIFIC PRODUCT AS INDICATED ON DRAWINGS.
1. DETECTOR SENSITIVITY: DETECT A PERSON OF AVERAGE SIZE AND WEIGHT MOVING NOT LESS THAN 12 INCHES (305 MM) IN EITHER A HORIZONTAL OR A VERTICAL MANNER AT AN APPROXIMATE SPEED OF 12 INCHES/S (305 MM/S).
2. DETECTION COVERAGE (SMALL ROOM): DETECT OCCUPANCY ANYWHERE WITHIN A CIRCULAR AREA OF 600 SQ. FT. (56 SQ. M) WHEN MOUNTED ON A 96-INCH- (2440-MM-) HIGH CEILING.
3. DETECTION COVERAGE (STANDARD ROOM): DETECT OCCUPANCY ANYWHERE WITHIN A CIRCULAR AREA OF 1000 SQ. FT. (93 SQ. M) WHEN MOUNTED ON A 96-INCH- (2440-MM-) HIGH CEILING.
4. DETECTION COVERAGE (LARGE ROOM): DETECT OCCUPANCY ANYWHERE WITHIN A CIRCULAR AREA OF 2000 SQ. FT. (186 SQ. M) WHEN MOUNTED ON A 96-INCH- (2440-MM-) HIGH CEILING.
5. DETECTION COVERAGE (CORRIDOR): DETECT OCCUPANCY ANYWHERE WITHIN 90 FEET (27.4 M) WHEN MOUNTED ON A 10-FOOT- (3-M-) HIGH CEILING IN A CORRIDOR NOT WIDER THAN 14 FEET (4.3 M).

D. DUAL-TECHNOLOGY TYPE: CEILING MOUNTING; DETECT OCCUPANCY BY USING A COMBINATION OF PIR AND ULTRASONIC DETECTION METHODS IN AREA OF COVERAGE. PARTICULAR TECHNOLOGY OR COMBINATION OF TECHNOLOGIES THAT CONTROLS ON-OFF FUNCTIONS SHALL BE SELECTABLE IN THE FIELD BY OPERATING CONTROLS ON UNIT. SPECIFIC PRODUCT AS INDICATED ON DRAWINGS.
1. SENSITIVITY ADJUSTMENT: SEPARATE FOR EACH SENSING TECHNOLOGY.
2. DETECTOR SENSITIVITY: DETECT OCCURRENCES OF 6-INCH- (150-MM-) MINIMUM MOVEMENT OF ANY PORTION OF A HUMAN BODY THAT PRESENTS A TARGET OF NOT LESS THAN 36 SQ. IN. (232 SQ. CM), AND DETECT A PERSON OF AVERAGE SIZE AND WEIGHT MOVING NOT LESS THAN 12 INCHES (305 MM) IN EITHER A HORIZONTAL OR A VERTICAL MANNER AT AN APPROXIMATE SPEED OF 12 INCHES/S (305 MM/S).
3. DETECTION COVERAGE (STANDARD ROOM): DETECT OCCUPANCY ANYWHERE WITHIN A CIRCULAR AREA OF 1000 SQ. FT. (93 SQ. M) WHEN MOUNTED ON A 96-INCH- (2440-MM-) HIGH CEILING.

2.5 EMERGENCY TRANSFER DEVICE

A. EMERGENCY TRANSFER DEVICE -SPECIFIC PRODUCT AS INDICATED ON DRAWINGS.
1. THE EMERGENCY TRANSFER DEVICE SHALL PROVIDE ALL REQUIRED FUNCTIONALITY TO ALLOW ANY STANDARD LIGHTING CONTROL DEVICE TO CONTROL EMERGENCY LIGHTING IN CONJUNCTION WITH NORMAL LIGHTING IN ANY AREA WITHIN A BUILDING.
2. THE EMERGENCY LIGHTING CONTROL UNIT SHALL ALLOW CONTROL OF EMERGENCY LIGHTING FIXTURES IN TANDEM WITH NORMAL LIGHTING IN AN AREA WHILE ENSURING THAT EMERGENCY LIGHTING WILL TURN ON IMMEDIATELY TO FULL BRIGHTNESS UPON LOSS OF NORMAL POWER SUPPLYING THE CONTROL DEVICE. EMERGENCY LIGHTING OPERATION SHALL BE INDEPENDENT FOR EACH CONTROLLED AREA AND SHALL NOT REQUIRE A GENERALIZED POWER FAILURE FOR PROPER OPERATION.
3. THE UNIT SHALL AUTOMATICALLY SWITCH EMERGENCY LIGHTING ON AND OFF AS NORMAL LIGHTING IS SWITCHED. WHEN NORMAL POWER IS NOT AVAILABLE, THE UNIT SHALL FORCE AND HOLD EMERGENCY LIGHTING ON REGARDLESS OF THE STATE OF ANY EXTERNAL CONTROL DEVICE UNTIL NORMAL POWER IS RESTORED.
4. THE UNIT SHALL BE UL924 AND CUL LISTED AND LABELED FOR CONNECTION TO BOTH NORMAL AND NORMAL/EMERGENCY LIGHTING POWER SOURCES.

2.7 EXECUTION

2.6 SENSOR INSTALLATION

A. INSTALL AND AIM SENSORS IN LOCATIONS TO ACHIEVE NOT LESS THAN 90 PERCENT COVERAGE OF AREAS INDICATED. DO NOT EXCEED COVERAGE LIMITS SPECIFIED IN MANUFACTURER'S WRITTEN INSTRUCTIONS.
B. SENSOR LOCATIONS SHOWN ON THE DRAWINGS ARE TO DENOTE ROOMS THAT SHALL HAVE SENSOR CONTROL. PROVIDE SENSORS IN LOCATIONS AND QUANTITY AS REQUIRED BY THE MANUFACTURER FOR PROPER COVERAGE AND OPERATION OF SPACE.
C. PROVIDE ALL RELATED PARTS AND ACCESSORIES FOR A COMPLETE AND OPERATIONAL SYSTEM.
D. CEILING MOUNTED OCCUPANCY SENSORS AND DAYLIGHT SENSORS SHALL BE INSTALLED CENTERED IN CEILING TILES.
E. UNLESS NOTED OTHERWISE WALL MOUNTED SWITCHES SHALL BE INSTALLED ON THE LATCH SIDE OF THE DOOR.
F. INSTALL DAYLIGHTING SENSORS AS INDICATED TO CONTROL LAMPS AS DETAILED ON CONTRACT DOCUMENTS. LOCATE IN CEILING TO NOT INTERFERE OPERATION BY OTHER OBJECTS AND AS REQUIRED BY MANUFACTURER TO DETECT NATURAL LIGHT LEVELS. SET SENSITIVITY LEVELS FOR CONTROL AS RECOMMENDED BY MANUFACTURER.

2.7 FIELD QUALITY CONTROL

A. ALL OCCUPANCY SENSORS AND DAYLIGHT SENSORS SHALL BE COMMISSIONED. DUAL TECHNOLOGY SENSORS SHALL BE SET TO "TURN ON" WHEN BOTH TECHNOLOGIES SENSE MOTION AND MAINTAIN "ON" WITH EITHER TECHNOLOGY. SET SENSOR TO MID-RANGE SENSITIVITY WITH A 15 MINUTE DELAY TIME TO OFF. SET LIGHT LEVEL FUNCTION FOR DAYLIGHT SENSORS BETWEEN 11AM AND 1PM DURING A DAY OF MODERATE CLOUD COVER WHERE ILLUMINATION AT THE DESK IS AT LEAST 40 FOOTCANDLES WITH THE LUMINAIRES OFF.

2.8 ADJUSTING

A. OCCUPANCY ADJUSTMENTS: WHEN REQUESTED WITHIN 12 MONTHS OF DATE OF SUBSTANTIAL COMPLETION, PROVIDE ON-SITE ASSISTANCE IN ADJUSTING SENSORS TO SUIT OCCUPIED CONDITIONS. PROVIDE UP TO TWO VISITS TO PROJECT DURING OTHER-THAN-NORMAL OCCUPANCY HOURS FOR THIS PURPOSE.

2.9 DEMONSTRATION

A. ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO TRAIN OWNER'S MAINTENANCE PERSONNEL TO ADJUST, OPERATE, AND MAINTAIN LIGHTING CONTROL DEVICES. REFER TO DIVISION 01 SECTION 017900 "DEMONSTRATION AND TRAINING."

SECTION 262213 - LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT.
1. INCLUDE CONSTRUCTION DETAILS, MATERIAL DESCRIPTIONS, DIMENSIONS OF INDIVIDUAL COMPONENTS AND PROFILES, AND FINISHES FOR EACH TYPE AND SIZE OF TRANSFORMER.
2. INCLUDE RATED NAMEPLATE DATA, CAPACITIES, WEIGHTS, DIMENSIONS, MINIMUM CLEARANCES, INSTALLED DEVICES AND FEATURES, AND PERFORMANCE FOR EACH TYPE AND SIZE OF TRANSFORMER.

PART 2 - PRODUCTS

2.1 GENERAL TRANSFORMER REQUIREMENTS

A. DESCRIPTION: FACTORY-ASSEMBLED AND -TESTED, AIR-COOLED UNITS FOR 60-HZ SERVICE.
B. COMPLY WITH NFPA 70.
1. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND USE.
C. TRANSFORMERS RATED 15 KVA AND LARGER:
1. COMPLY WITH 10 CFR 431 (DOE 2016) EFFICIENCY LEVELS.
2. MARKED AS COMPLIANT WITH DOE 2016 EFFICIENCY LEVELS BY AN NRTL.

2.2 DISTRIBUTION TRANSFORMERS

A. COMPLY WITH NFPA 70, AND LIST AND LABEL AS COMPLYING WITH UL 1561.
B. CORES: ELECTRICAL GRADE, NON-AGING SILICON STEEL WITH HIGH PERMEABILITY AND LOW HYSTERESIS LOSSES.
1. ONE LEG PER PHASE.
2. CORE VOLUME SHALL ALLOW EFFICIENT TRANSFORMER OPERATION AT 10 PERCENT ABOVE THE NOMINAL TAP VOLTAGE.
3. GROUNDED TO ENCLOSURE.
C. COILS: CONTINUOUS WINDINGS WITHOUT SPLICES EXCEPT FOR TAPS.
1. COIL MATERIAL: COPPER.
2. INTERNAL COIL CONNECTIONS: BRAZED OR PRESSURE TYPE.
D. ENCAPSULATION: TRANSFORMERS SMALLER THAN 30 KVA SHALL HAVE CORE AND COILS COMPLETELY RESIN ENCAPSULATED.
E. ENCLOSURE: VENTILATED.
1. NEMA 250, TYPE 2 TYPE 3R: CORE AND COIL SHALL BE ENCAPSULATED WITHIN RESIN COMPOUND USING A VACUUM-PRESSURE IMPREGNATION PROCESS TO SEAL OUT MOISTURE AND AIR.
2. KVA RATINGS: BASED ON CONVECTION COOLING ONLY AND NOT RELYING ON AUXILIARY FANS.
3. WIRING COMPARTMENT: SIZED FOR CONDUIT ENTRY AND WIRING INSTALLATION.
4. FINISH: COMPLY WITH NEMA 250.
a. FINISH COLOR: GRAY, ANSI 49 OR GRAY ANSI 61 GRAY WEATHER-RESISTANT ENAMEL.
F. TAPS FOR TRANSFORMERS 3 KVA AND SMALLER: NONE.
G. TAPS FOR TRANSFORMERS 7.5 TO 24 KVA: ONE 5 PERCENT TAP ABOVE AND ONE 5 PERCENT TAP BELOW NORMAL FULL CAPACITY.
H. TAPS FOR TRANSFORMERS 25 KVA AND LARGER: TWO 2.5 PERCENT TAPS ABOVE AND FOUR 2.5 PERCENT TAPS BELOW NORMAL FULL CAPACITY.
I. INSULATION CLASS, SMALLER THAN 30 KVA: 180 DEG C, UL-COMPONENT-RECOGNIZED INSULATION SYSTEM WITH A MAXIMUM OF 115 DEG C RISE ABOVE 40 DEG C AMBIENT TEMPERATURE.
J. INSULATION CLASS, 30 KVA AND LARGER: 220 DEG C, UL-COMPONENT-RECOGNIZED INSULATION SYSTEM WITH A MAXIMUM OF 150 DEG C RISE ABOVE 40 DEG C AMBIENT TEMPERATURE.
K. GROUNDING: PROVIDE GROUND-BAR KIT OR A GROUND BAR INSTALLED ON THE INSIDE OF THE TRANSFORMER ENCLOSURE.
L. ELECTROSTATIC SHIELDING: EACH WINDING SHALL HAVE AN INDEPENDENT, SINGLE, FULL-WIDTH COPPER ELECTROSTATIC SHIELD ARRANGED TO MINIMIZE INTERWINDING CAPACITANCE.
1. ARRANGE COIL LEADS AND TERMINAL STRIPS TO MINIMIZE CAPACITIVE COUPLING BETWEEN INPUT AND OUTPUT TERMINALS.
2. INCLUDE SPECIAL TERMINAL FOR GROUNDING THE SHIELD.
M. WALL BRACKETS: WALL BRACKETS FABRICATED FROM DESIGN DRAWINGS SIGNED AND SEALED BY A LICENSED STRUCTURAL ENGINEER.

PART 3 - EXECUTION

3.1 EXAMINATION

A. EXAMINE CONDITIONS FOR COMPLIANCE WITH ENCLOSURE- AND AMBIENT-TEMPERATURE REQUIREMENTS FOR EACH TRANSFORMER.
B. VERIFY THAT FIELD MEASUREMENTS ARE AS NEEDED TO MAINTAIN WORKING CLEARANCES REQUIRED BY NFPA 70 AND MANUFACTURER'S WRITTEN INSTRUCTIONS.
C. ENVIRONMENT: ENCLOSURES SHALL BE RATED FOR THE ENVIRONMENT IN WHICH THEY ARE LOCATED. COVERS FOR NEMA 250, TYPE 4X ENCLOSURES SHALL NOT CAUSE ACCESSIBILITY PROBLEMS.

3.2 INSTALLATION

A. INSTALL WALL-MOUNTED TRANSFORMERS LEVEL AND PLUMB WITH WALL BRACKETS FABRICATED FROM DESIGN DRAWINGS SIGNED AND SEALED BY A LICENSED STRUCTURAL ENGINEER.
1. COORDINATE INSTALLATION OF WALL-MOUNTED AND STRUCTURE-HANGING SUPPORTS WITH ACTUAL TRANSFORMER PROVIDED.
2. BRACE WALL-MOUNTED TRANSFORMERS AS SPECIFIED IN SECTION 260548.16 "SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS."
B. INSTALL TRANSFORMERS LEVEL AND PLUMB ON A CONCRETE BASE WITH VIBRATION-DAMPENING SUPPORTS. LOCATE TRANSFORMERS AWAY FROM CORNERS AND NOT PARALLEL TO ADJACENT WALL SURFACE.
C. CONSTRUCT CONCRETE BASES AND ANCHOR FLOOR-MOUNTED TRANSFORMERS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS, AND SEISMIC CODES APPLICABLE TO PROJECT.
1. COORDINATE SIZE AND LOCATION OF CONCRETE BASES WITH ACTUAL TRANSFORMER PROVIDED. CAST ANCHOR-BOLT INSERTS INTO BASES. CONCRETE, REINFORCEMENT, AND FORMWORK REQUIREMENTS ARE SPECIFIED WITH CONCRETE.

3.3 CONNECTIONS

A. GROUND EQUIPMENT ACCORDING TO SECTION 260526 "GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS."
B. CONNECT WIRING ACCORDING TO SECTION 260519 "LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES."
C. TIGHTEN ELECTRICAL CONNECTORS AND TERMINALS ACCORDING TO MANUFACTURER'S PUBLISHED TORQUE-TIGHTENING VALUES. IF MANUFACTURER'S TORQUE VALUES ARE NOT INDICATED, USE THOSE SPECIFIED IN UL 486A-486B.
D. PROVIDE FLEXIBLE CONNECTIONS AT ALL CONDUIT AND CONDUCTOR TERMINATIONS AND SUPPORTS TO ELIMINATE SOUND AND VIBRATION TRANSMISSION TO THE BUILDING STRUCTURE.

3.4 CLEANING

A. VACUUM DIRT AND DEBRIS; DO NOT USE COMPRESSED AIR TO ASSIST IN CLEANING.

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PANELBOARD.
1. INCLUDE MATERIALS, SWITCHING AND OVERCURRENT PROTECTIVE DEVICES, SPDS, ACCESSORIES, AND COMPONENTS INDICATED.
2. INCLUDE DIMENSIONS AND MANUFACTURERS' TECHNICAL DATA ON FEATURES, PERFORMANCE, ELECTRICAL CHARACTERISTICS, RATINGS, AND FINISHES.
3. PANELBOARD SCHEDULES: FOR INSTALLATION IN PANELBOARDS. SUBMIT FINAL VERSIONS AFTER LOAD BALANCING.

1.2 MAINTENANCE MATERIAL SUBMITTALS

A. FURNISH EXTRA MATERIALS THAT MATCH PRODUCTS INSTALLED AND THAT ARE PACKAGED WITH PROTECTIVE COVERING FOR STORAGE AND IDENTIFIED WITH LABELS DESCRIBING CONTENTS.
1. KEYS: TWO SPARES FOR EACH TYPE OF PANELBOARD CABINET LOCK.
2. CIRCUIT BREAKERS INCLUDING GFCI AND GFEP TYPES: TWO SPARES FOR EACH PANELBOARD.
3. FUSES FOR FUSED SWITCHES: EQUAL TO 10 PERCENT OF QUANTITY INSTALLED FOR EACH SIZE AND TYPE, BUT NO FEWER THAN THREE OF EACH SIZE AND TYPE.
4. FUSES FOR FUSED POWER-CIRCUIT DEVICES: EQUAL TO 10 PERCENT OF QUANTITY INSTALLED FOR EACH SIZE AND TYPE, BUT NO FEWER THAN THREE OF EACH SIZE AND TYPE.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. ENCLOSURES: FLUSH AND SURFACE-MOUNTED, DEAD-FRONT CABINETS.
1. RATED FOR ENVIRONMENTAL CONDITIONS AT INSTALLED LOCATION.
a. INDOOR DRY AND CLEAN LOCATIONS: NEMA 250, TYPE 1.
b. OUTDOOR LOCATIONS: NEMA 250, TYPE 3R.
c. KITCHEN WASH-DOWN AREAS: NEMA 250, TYPE 4X, STAINLESS STEEL.
d. OTHER WET OR DAMP INDOOR LOCATIONS: NEMA 250, TYPE 4.
e. INDOOR LOCATIONS SUBJECT TO DUST, FALLING DIRT, AND DRIPPING NONCORROSIVE LIQUIDS: NEMA 250, TYPE 5 OR TYPE 12.
2. HEIGHT: 84 INCHES MAXIMUM.
3. FRONT: SECURED TO BOX WITH CONCEALED TRIM CLAMPS. FOR SURFACE-MOUNTED FRONTS, MATCH BOX DIMENSIONS; FOR FLUSH-MOUNTED FRONTS, OVERLAP BOX. TRIMS SHALL COVER ALL LIVE PARTS AND SHALL HAVE NO EXPOSED HARDWARE.
4. HINGED FRONT COVER: ENTIRE FRONT TRIM HINGED TO BOX AND WITH STANDARD DOOR WITHIN HINGED TRIM COVER. TRIMS SHALL COVER ALL LIVE PARTS AND SHALL HAVE NO EXPOSED HARDWARE.
5. SKIRT FOR SURFACE-MOUNTED PANELBOARDS: SAME GAGE AND FINISH AS PANELBOARD FRONT WITH FLANGES FOR ATTACHMENT TO PANELBOARD, WALL, AND CEILING OR FLOOR.
B. INCOMING MAINS SHALL BE CONVERTIBLE BETWEEN TOP AND BOTTOM. MAIN LUG INTERIORS UP TO 400 AMPERES SHALL BE FIELD CONVERTIBLE TO MAIN BREAKER.
C. PHASE, NEUTRAL, AND GROUND BUSES:
1. MATERIAL: HARD-DRAWN COPPER, 98 PERCENT CONDUCTIVITY. PLATING SHALL RUN ENTIRE LENGTH OF BUS. BUS SHALL BE FULLY RATED THE ENTIRE LENGTH.
2. INTERIORS SHALL BE FACTORY ASSEMBLED INTO A UNIT. REPLACING SWITCHING AND PROTECTIVE DEVICES SHALL NOT DISTURB ADJACENT UNITS OR REQUIRE REMOVING THE MAIN BUS CONNECTORS.
3. EQUIPMENT GROUND BUS: ADEQUATE FOR FEEDER AND BRANCH-CIRCUIT EQUIPMENT GROUNDING CONDUCTORS; BONDED TO BOX.
D. CONDUCTOR CONNECTORS: SUITABLE FOR USE WITH CONDUCTOR MATERIAL AND SIZES.
1. MATERIAL: HARD-DRAWN COPPER, 98 PERCENT CONDUCTIVITY.
2. TERMINATIONS SHALL ALLOW USE OF 75 DEG C RATED CONDUCTORS WITHOUT DERATING.
3. SIZE: LUGS SUITABLE FOR INDICATED CONDUCTOR SIZES, WITH ADDITIONAL GUTTER SPACE, IF REQUIRED, FOR LARGER CONDUCTORS.
4. MAIN AND NEUTRAL LUGS: MECHANICAL TYPE, WITH A LUG ON THE NEUTRAL BAR FOR EACH POLE IN THE PANELBOARD.
5. GROUND LUGS AND BUS-CONFIGURED TERMINATORS: MECHANICAL TYPE, WITH A LUG ON THE BAR FOR EACH POLE IN THE PANELBOARD.
6. FEED-THROUGH LUGS: MECHANICAL TYPE, SUITABLE FOR USE WITH CONDUCTOR MATERIAL. LOCATE AT OPPOSITE END OF BUS FROM INCOMING LUGS OR MAIN DEVICE.
7. SUBFEED (DOUBLE) LUGS: MECHANICAL TYPE SUITABLE FOR USE WITH CONDUCTOR MATERIAL. LOCATE AT SAME END OF BUS AS INCOMING LUGS OR MAIN DEVICE.
8. GUTTER-TAP LUGS: MECHANICAL TYPE SUITABLE FOR USE WITH CONDUCTOR MATERIAL AND WITH MATCHING INSULATING COVERS. LOCATE AT SAME END OF BUS AS INCOMING LUGS OR MAIN DEVICE.
E. FUTURE DEVICES: PANELBOARDS SHALL HAVE MOUNTING BRACKETS, BUS CONNECTIONS, FILLER PLATES, AND NECESSARY APPURTENANCES REQUIRED FOR FUTURE INSTALLATION OF DEVICES.
F. PANELBOARD SHORT-CIRCUIT CURRENT RATING: FULLY RATED TO INTERRUPT SYMMETRICAL SHORT-CIRCUIT CURRENT AVAILABLE AT TERMINALS. ASSEMBLY LISTED BY AN NRTL FOR 100 PERCENT INTERRUPTING CAPACITY.
G. SURGE SUPPRESSION: FACTORY INSTALLED AS AN INTEGRAL PART OF INDICATED PANELBOARDS, COMPLYING WITH UL 1449 SPD TYPE 1.

2.2 DISTRIBUTION PANELBOARDS. POWER PANELBOARDS, AS SPECIFIED IN THIS ARTICLE, FALL UNDER REQUIREMENTS OF "DISTRIBUTION PANELBOARDS" IN NEMA PB1.

A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: EATON, SIEMENS, SQUARE D, OR GE.
B. PANELBOARDS: NEMA PB1, DISTRIBUTION TYPE.
C. DOORS: SECURED WITH VAULT-TYPE LATCH WITH TUMBLER LOCK; KEYED ALIKE.
D. MAINS: CIRCUIT BREAKER OR LUGS ONLY. REFER TO SINGLE LINE DRAWING.
E. BRANCH OVERCURRENT PROTECTIVE DEVICES: BOLT-ON CIRCUIT BREAKERS.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS PANELBOARDS, AS SPECIFIED IN THIS ARTICLE, COMPLY WITH REQUIREMENTS OF "LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS" IN NEMA PB1.

A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: EATON, SIEMENS, SQUARE D, OR GE.
B. PANELBOARDS: NEMA PB1, LIGHTING AND APPLIANCE BRANCH-CIRCUIT TYPE.
C. MAINS: CIRCUIT BREAKER OR LUGS ONLY. REFER TO SINGLE LINE DRAWING.
D. BRANCH OVERCURRENT PROTECTIVE DEVICES: BOLT-ON CIRCUIT BREAKERS, REPLACEABLE WITHOUT DISTURBING ADJACENT UNITS.
E. DOORS: DOOR-IN-DOOR CONSTRUCTION WITH CONCEALED HINGES; SECURED WITH MULTIPOINT LATCH WITH TUMBLER LOCK; KEYED ALIKE. OUTER DOOR SHALL PERMIT FULL ACCESS TO THE PANEL INTERIOR. INNER DOOR SHALL PERMIT ACCESS TO BREAKER OPERATING HANDLES AND LABELING, BUT CURRENT CARRYING TERMINALS AND BUS SHALL REMAIN CONCEALED.
F. PANELS KNOWN AS LOADCENTERS ARE NOT ACCEPTABLE.

2.4 IDENTIFICATION

A. PANELBOARD LABEL: MANUFACTURER'S NAME AND TRADEMARK, VOLTAGE, AMPERAGE, NUMBER OF PHASES, AND NUMBER OF POLES SHALL BE LOCATED ON THE INTERIOR OF THE PANELBOARD DOOR.
B. BREAKER LABELS: FACEPLATE SHALL LIST CURRENT RATING, UL AND IEC CERTIFICATION STANDARDS, AND AIC RATING.
C. CIRCUIT DIRECTORY: DIRECTORY CARD INSIDE PANELBOARD DOOR, MOUNTED IN METAL FRAME WITH TRANSPARENT PROTECTIVE COVER.
1. CIRCUIT DIRECTORY SHALL IDENTIFY SPECIFIC PURPOSE WITH DETAIL SUFFICIENT TO DISTINGUISH IT FROM ALL OTHER CIRCUITS.

PART 3 - EXECUTION

3.1 INSTALLATION

A. COORDINATE LAYOUT AND INSTALLATION OF PANELBOARDS AND COMPONENTS WITH OTHER CONSTRUCTION THAT PENETRATES WALLS OR IS SUPPORTED BY THEM, INCLUDING ELECTRICAL AND OTHER TYPES OF EQUIPMENT, RACEWAYS, PIPING, ENCUMBRANCES TO WORKSPACE CLEARANCE REQUIREMENTS, AND ADJACENT SURFACES. MAINTAIN REQUIRED WORKSPACE CLEARANCES AND REQUIRED CLEARANCES FOR EQUIPMENT ACCESS DOORS AND PANELS.
B. COMPLY WITH NECA 1. INSTALL PANELBOARDS AND ACCESSORIES ACCORDING TO NECA 407 AND NEMA PB1.1.
C. MOUNT TOP OF TRIM 90 INCHES ABOVE FINISHED FLOOR UNLESS OTHERWISE INDICATED.

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. WIRING DEVICES, COMPONENTS, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
B. DEVICES THAT ARE MANUFACTURED FOR USE WITH MODULAR PLUG-IN CONNECTORS MAY BE SUBSTITUTED UNDER THE FOLLOWING CONDITIONS:
A. CONNECTORS SHALL COMPLY WITH UL 2459 AND SHALL BE MADE WITH STRANDING BUILDING WIRE.
B. DEVICES SHALL COMPLY WITH THE REQUIREMENTS IN THIS SECTION.
C. DEVICES FOR OWNER-FURNISHED EQUIPMENT: RECEPTACLES: MATCH PLUG CONFIGURATIONS. CORD AND PLUG SETS: MATCH EQUIPMENT REQUIREMENTS.
D. SOURCE LIMITATIONS: OBTAIN EACH TYPE OF WIRING DEVICE AND ASSOCIATED WALL PLATE FROM SINGLE SOURCE FROM SINGLE MANUFACTURER. ACCEPTABLE MANUFACTURERS ARE EATON, HUBBELL, PASS & SEYMOUR, AND LEVITON, UNLESS OTHERWISE NOTED.

2.2 STRAIGHT-BLADE RECEPTACLES

A. DUPLEX CONVENIENCE RECEPTACLES: 125 V, 20 A; COMPLY WITH NEMA WD1, NEMA WD 6 CONFIGURATION 5-20R, UL 498, AND FS W-C-596.
B. ISOLATED-GROUND, DUPLEX CONVENIENCE RECEPTACLES: 125 V, 20 A; COMPLY WITH NEMA WD1, NEMA WD 6 CONFIGURATION 5-20R, UL 498, AND FS W-C-596.
1. DESCRIPTION: STRAIGHT BLADE; EQUIPMENT GROUNDING CONTACTS SHALL BE CONNECTED ONLY TO THE GREEN GROUNDING SCREW TERMINAL OF THE DEVICE AND WITH INHERENT ELECTRICAL ISOLATION FROM MOUNTING STRAP. ISOLATION SHALL BE INTEGRAL TO RECEPTACLE CONSTRUCTION AND NOT DEPENDENT ON REMOVABLE PARTS.

2.3 USB CHARGER DEVICES

A. TAMPER-RESISTANT, USB CHARGER RECEPTACLES: 12 V DC, 2.0 A, USB DUAL TYPE A; COMPLY WITH NEMA WD1, NEMA WD 6 CONFIGURATION 5-20R, UL 498, UL 1310, AND FS W-C-596.
1. DESCRIPTION: SINGLE-PIECE, RIVETLESS, NICKEL-PLATED, ALL-BRASS GROUNDING SYSTEM. NICKEL-PLATED, BRASS MOUNTING STRAP.

2.4 GFCI RECEPTACLES

A. DUPLEX RECEPTACLE, 125 V, 20 A, STRAIGHT BLADE, NON-FEED-THROUGH TYPE.
COMPLY WITH NEMA WD1, NEMA WD 6 CONFIGURATION 5-20R, UL 498, UL 943 CLASS A, AND FS W-C-596.
INCLUDE INDICATOR LIGHT THAT SHOWS WHEN THE GFCI HAS MALFUNCTIONED AND NO LONGER PROVIDES PROPER GFCI PROTECTION.

2.5 TWIST-LOCKING RECEPTACLES

A. TWIST-LOCK, SINGLE CONVENIENCE RECEPTACLES: 125 V, 20 A; COMPLY WITH NEMA WD1, NEMA WD 6 CONFIGURATION L5-20R, AND UL 498.

2.6 PENDANT CORD-CONNECTOR DEVICES

A. DESCRIPTION:
1. MATCHING, LOCKING-TYPE PLUG AND RECEPTACLE BODY CONNECTOR.
2. NEMA WD 6 CONFIGURATIONS L5-20P AND L5-20R, HEAVY-DUTY GRADE, AND FS W-C-596.
3. BODY: NYLON, WITH SCREW-OPEN, CABLE-GRIPPING JAWS AND PROVISION FOR ATTACHING EXTERNAL CABLE GRIP.
4. EXTERNAL CABLE GRIP: WOVEN WIRE-MESH TYPE MADE OF HIGH-STRENGTH, GALVANIZED-STEEL WIRE STRAND, MATCHED TO CABLE DIAMETER, AND WITH ATTACHMENT PROVISION DESIGNED FOR CORRESPONDING CONNECTOR.

2.7 CORD AND PLUG SETS

A. DESCRIPTION:
1. MATCH VOLTAGE AND CURRENT RATINGS AND NUMBER OF CONDUCTORS TO REQUIREMENTS OF EQUIPMENT BEING CONNECTED.
2. CORD: RUBBER-INSULATED, STRANDED-COPPER CONDUCTORS, WITH TYPE SOW-A JACKET; WITH GREEN-INSULATED GROUNDING CONDUCTOR AND AMPACITY OF AT LEAST 130 PERCENT OF THE EQUIPMENT RATING.
3. PLUG: NYLON BODY AND INTEGRAL CABLE-CLAMPING JAWS. MATCH CORD AND RECEPTACLE TYPE FOR CONNECTION.

2.8 TOGGLE SWITCHES

A. COMPLY WITH NEMA WD1, UL 20, AND FS W-S-896.
B. SWITCHES, 120/277V, 20 A:
C. PILOT-LIGHT SWITCHES: 120/277V, 20 A.
1. DESCRIPTION: SINGLE POLE, WITH LED-LIGHTED HANDLE, ILLUMINATED WHEN SWITCH IS OFF.
2. KEY-OPERATED SWITCHES: 120/277V, 20 A.
3. `DESCRIPTION: SINGLE POLE, WITH FACTORY-SUPPLIED KEY IN LIEU OF SWITCH HANDLE.

2.9 WALL SWITCH SENSOR LIGHT SWITCH, DUAL TECHNOLOGY

A. DESCRIPTION: SWITCHBOX-MOUNTED, COMBINATION LIGHTING-CONTROL SENSOR AND CONVENTIONAL SWITCH LIGHTING-CONTROL UNIT USING DUAL TECHNOLOGY. ADJUSTABLE TIME DELAY OF 20 MINUTES. ABLE TO BE LOCKED TO AUTOMATIC-ON OR MANUAL-ON MODE. COMPLY WITH NEMA WD1, UL 20, AND FS W-S-896.

2.10 WALL PLATES

A. SINGLE AND COMBINATION TYPES SHALL MATCH CORRESPONDING WIRING DEVICES.
B. PLATE-SECURING SCREWS: METAL WITH HEAD COLOR TO MATCH PLATE FINISH.
C. MATERIAL FOR FINISHED SPACES: SMOOTH, HIGH-IMPACT THERMOPLASTIC.
D. MATERIAL FOR UNFINISHED SPACES: SMOOTH, HIGH-IMPACT THERMOPLASTIC.
E. MATERIAL FOR DAMP LOCATIONS: THERMOPLASTIC WITH SPRING-LOADED LIFT COVER, AND LISTED AND LABELED FOR USE IN WET AND DAMP LOCATIONS.
F. WET-LOCATION, WEATHERPROOF COVER PLATES: NEMA 250, COMPLYING WITH TYPE 3R, WEATHER-RESISTANT THERMOPLASTIC WITH LOCKABLE COVER.

2.11 FLOOR SERVICE FITTINGS

A. TYPE: MODULAR, DUAL-SERVICE UNITS SUITABLE FOR WIRING METHOD USED. TYPE AS INDICATED ON DRAWINGS.
B. COMPARTMENTS: BARRIER SEPARATES POWER FROM VOICE AND DATA COMMUNICATION CABLING.
C. SERVICE PLATE: AS INDICATED BY ARCHITECT WITH SATIN FINISH.
D. POWER RECEPTACLE: NEMA WD 6 CONFIGURATION 5-20R, GRAY FINISH, UNLESS OTHERWISE INDICATED.
E. DATA COMMUNICATION OUTLET: AS DIRECTED BY THE OWNER.

2.12 POKE-THROUGH ASSEMBLIES

A. DESCRIPTION:
1. FACTORY-FABRICATED AND -WIRED ASSEMBLY OF BELOW-FLOOR JUNCTION BOX WITH MULTICHANNELED, THROUGH-FLOOR RACEWAY/FIRESTOP UNIT AND DETACHABLE MATCHING FLOOR SERVICE-OUTLET ASSEMBLY.
2. COMPLY WITH UL 514 SCRUB WATER EXCLUSION REQUIREMENTS.
3. SERVICE-OUTLET ASSEMBLY: TYPE AS INDICATED ON DRAWINGS.
4. SIZE: SELECTED TO FIT NOMINAL CORED HOLES IN FLOOR AND MATCHED TO FLOOR THICKNESS.
5. FIRE RATING: UNIT IS LISTED AND LABELED FOR FIRE RATING OF FLOOR-CEILING ASSEMBLY.
6. CLOSURE PLUG: ARRANGED TO CLOSE UNUSED CORED OPENINGS AND REESTABLISH FIRE RATING OF FLOOR.

2.13 FINISHES

A. DEVICE COLOR:
1. WIRING DEVICES CONNECTED TO NORMAL POWER SYSTEM: AS SELECTED BY ARCHITECT UNLESS OTHERWISE INDICATED OR REQUIRED BY NFPA 70 OR DEVICE LISTING.
2. WIRING DEVICES CONNECTED TO EMERGENCY POWER SYSTEM: RED
3. ISOLATED-GROUND RECEPTACLES: AS SPECIFIED ABOVE, WITH ORANGE TRIANGLE ON FACE.
A. WALL PLATE COLOR: FOR PLASTIC COVERS, MATCH DEVICE COLOR.

PART 3 - EXECUTION

3.1 INSTALLATION

A. COMPLY WITH NECA 1, INCLUDING MOUNTING HEIGHTS LISTED IN THAT STANDARD, UNLESS OTHERWISE INDICATED.
B. COORDINATION WITH OTHER TRADES:
1. PROTECT INSTALLED DEVICES AND THEIR BOXES. DO NOT PLACE WALL FINISH MATERIALS OVER DEVICE BOXES AND DO NOT CUT HOLES FOR BOXES WITH ROUTERS THAT ARE GUIDED BY RIDING AGAINST OUTSIDE OF BOXES.
2. KEEP OUTLET BOXES FREE OF PLASTER, DRYWALL JOINT COMPOUND, MORTAR, CEMENT, CONCRETE, DUST, PAINT, AND OTHER MATERIAL THAT MAY CONTAMINATE THE RACEWAY SYSTEM, CONDUCTORS, AND CABLES.
3. INSTALL DEVICE BOXES IN BRICK OR BLOCK WALLS SO THAT THE COVER PLATE DOES NOT CROSS A JOINT UNLESS THE JOINT IS TROWELED FLUSH WITH THE FACE OF THE WALL.
4. INSTALL WIRING DEVICES AFTER ALL WALL PREPARATION, INCLUDING PAINTING, IS COMPLETE.
C. CONDUCTORS:
1. DO NOT STRIP INSULATION FROM CONDUCTORS UNTIL RIGHT BEFORE THEY ARE SPLICED OR TERMINATED ON DEVICES.
2. STRIP INSULATION EVENLY AROUND THE CONDUCTOR USING TOOLS DESIGNED FOR THE PURPOSE. AVOID SCORING OR NICKING OF SOLID WIRE OR CUTTING STRANDS FROM STRANDED WIRE.
3. THE LENGTH OF FREE CONDUCTORS AT OUTLETS FOR DEVICES SHALL MEET PROVISIONS OF NFPA 70, ARTICLE 300, WITHOUT PIGTAILS.
D. EXISTING CONDUCTORS:
a. CUT BACK AND PIGTAIL, OR REPLACE ALL DAMAGED CONDUCTORS.
b. STRAIGHTEN CONDUCTORS THAT REMAIN AND REMOVE CORROSION AND FOREIGN MATTER.
c. PIGTAILING EXISTING CONDUCTORS IS PERMITTED, PROVIDED THE OUTLET BOX IS LARGE ENOUGH.
E. DEVICE INSTALLATION:
1. REPLACE DEVICES THAT HAVE BEEN IN TEMPORARY USE DURING CONSTRUCTION AND THAT WERE INSTALLED BEFORE BUILDING FINISHING OPERATIONS WERE COMPLETE.
2. KEEP EACH WIRING DEVICE IN ITS PACKAGE OR OTHERWISE PROTECTED UNTIL IT IS TIME TO CONNECT CONDUCTORS.
3. DO NOT REMOVE SURFACE PROTECTION, SUCH AS PLASTIC FILM AND SMUDGE COVERS, UNTIL THE LAST POSSIBLE MOMENT.
4. CONNECT DEVICES TO BRANCH CIRCUITS USING PIGTAILS THAT ARE NOT LESS THAN 6 INCHES (152 MM) IN LENGTH.
5. WHEN THERE IS A CHOICE, USE SIDE WIRING WITH BINDING-HEAD SCREW TERMINALS. WRAP SOLID CONDUCTOR TIGHTLY CLOCKWISE, TWO-THIRDS TO THREE-FOURTHS OF THE WAY AROUND TERMINAL SCREW.
6. USE A TORQUE SCREWDRIVER WHEN A TORQUE IS RECOMMENDED OR REQUIRED BY MANUFACTURER.
7. WHEN CONDUCTORS LARGER THAN NO. 12 AWG ARE INSTALLED ON 15- OR 20-A CIRCUITS, SPLICE NO. 12 AWG PIGTAILS FOR DEVICE CONNECTIONS.
8. TIGHTEN UNUSED TERMINAL SCREWS ON THE DEVICE.
9. WHEN MOUNTING INTO METAL BOXES, REMOVE THE FIBER OR PLASTIC WASHERS USED TO HOLD DEVICE-MOUNTING SCREWS IN YOKES, ALLOWING METAL-TO-METAL CONTACT.
F. RECEPTACLE ORIENTATION:
INSTALL GROUND PIN OF VERTICALLY MOUNTED RECEPTACLES UP, AND ON HORIZONTALLY MOUNTED RECEPTACLES TO THE RIGHT.
G. DEVICE PLATES: DO NOT USE OVERSIZED OR EXTRA-DEEP PLATES. REPAIR WALL FINISHES AND REMOUNT OUTLET BOXES WHEN STANDARD DEVICE PLATES DO NOT FIT FLUSH OR DO NOT COVER ROUGH WALL OPENING.
H. ARRANGEMENT OF DEVICES: UNLESS OTHERWISE INDICATED, MOUNT FLUSH, WITH LONG DIMENSION VERTICAL AND WITH GROUNDING TERMINAL OF RECEPTACLES ON TOP. GROUP ADJACENT SWITCHES UNDER SINGLE, MULTIGANG WALL PLATES.
I. ADJUST LOCATIONS OF FLOOR SERVICE OUTLETS AND SERVICE POLES TO SUIT ARRANGEMENT OF PARTITIONS AND FURNISHINGS.

3.2 IDENTIFICATION

A. IDENTIFY EACH RECEPTACLE WITH PANELBOARD IDENTIFICATION AND CIRCUIT NUMBER. USE HOT, STAMPED, OR ENGRAVED MACHINE PRINTING WITH BLACK-FILLED LETTERING ON FACE OF PLATE, AND DURABLE WIRE MARKERS OR TAGS INSIDE OUTLET BOXES.

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT. INCLUDE CONSTRUCTION DETAILS, MATERIAL DESCRIPTIONS, DIMENSIONS OF INDIVIDUAL COMPONENTS AND PROFILES, AND FINISHES FOR SPARE-FUSE CABINETS.

1.2 MAINTENANCE MATERIAL SUBMITTALS

A. FURNISH EXTRA MATERIALS THAT MATCH PRODUCTS INSTALLED AND THAT ARE PACKAGED WITH PROTECTIVE COVERING FOR STORAGE AND IDENTIFIED WITH LABELS DESCRIBING CONTENTS.
1. FUSES: EQUAL TO 10 PERCENT OF QUANTITY INSTALLED FOR EACH SIZE AND TYPE, BUT NO FEWER THAN THREE OF EACH SIZE AND TYPE.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. SOURCE LIMITATIONS: OBTAIN FUSES, FOR USE WITHIN A SPECIFIC PRODUCT OR CIRCUIT, FROM SINGLE SOURCE FROM SINGLE MANUFACTURER.

2.2 CARTRIDGE FUSES

A. CHARACTERISTICS: NEMA FU1, CURRENT-LIMITING, NONRENEWABLE CARTRIDGE FUSES WITH VOLTAGE RATINGS CONSISTENT WITH CIRCUIT VOLTAGES.
B. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
C. COMPLY WITH NEMA FU1 FOR CARTRIDGE FUSES.
D. COORDINATE FUSE RATINGS WITH UTILIZATION EQUIPMENT NAMEPLATE LIMITATIONS OF MAXIMUM FUSE SIZE AND WITH SYSTEM SHORT-CIRCUIT CURRENT LEVELS.

2.3 SPARE-FUSE CABINET

A. CHARACTERISTICS: WALL-MOUNTED STEEL UNIT WITH FULL-LENGTH, RECESSED PIANO-HINGED DOOR AND KEY-CODED CAM LOCK AND PULL.
1. SIZE: ADEQUATE FOR STORAGE OF SPARE FUSES SPECIFIED WITH 15 PERCENT SPARE CAPACITY MINIMUM.
2. FINISH: GRAY, BAKED ENAMEL.
3. IDENTIFICATION: "SPARE FUSES" IN 1-1/2-INCH- (38-MM-) HIGH LETTERS ON EXTERIOR OF DOOR.
4. FUSE PULLERS: FOR EACH SIZE OF FUSE, WHERE APPLICABLE AND AVAILABLE, FROM FUSE MANUFACTURER.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

A. CARTRIDGE FUSES:
1. SERVICE ENTRANCE: CLASS L, FAST ACTING
2. FEEDERS: CLASS RK1, FAST ACTING
3. MOTOR BRANCH CIRCUITS: CLASS RK1, TIME DELAY.
4. LARGE MOTOR BRANCH (601-4000 A): CLASS L, TIME DELAY.
5. OTHER BRANCH CIRCUITS: CLASS RK1, TIME DELAY
6. ELEVATOR POWER MODULES: CLASS J

3.2 INSTALLATION

A. INSTALL FUSES IN FUSIBLE DEVICES. ARRANGE FUSES SO RATING INFORMATION IS READABLE WITHOUT REMOVING FUSE.
B. INSTALL SPARE-FUSE CABINET(S) IN LOCATION SHOWN ON THE DRAWINGS OR AS INDICATED IN THE FIELD BY OWNER.

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF ENCLOSED SWITCH, CIRCUIT BREAKER, ACCESSORY, AND COMPONENT INDICATED. INCLUDE NAMEPLATE RATINGS, DIMENSIONED ELEVATIONS, SECTIONS, WEIGHTS, AND MANUFACTURERS' TECHNICAL DATA ON FEATURES, PERFORMANCE, ELECTRICAL CHARACTERISTICS, RATINGS, ACCESSORIES, AND FINISHES.

1.2 MAINTENANCE MATERIAL SUBMITTALS

A. FURNISH EXTRA MATERIALS THAT MATCH PRODUCTS INSTALLED AND THAT ARE PACKAGED WITH PROTECTIVE COVERING FOR STORAGE AND IDENTIFIED WITH LABELS DESCRIBING CONTENTS.
1. FUSES: EQUAL TO 10 PERCENT OF QUANTITY INSTALLED FOR EACH SIZE AND TYPE, BUT NO FEWER THAN THREE OF EACH SIZE AND TYPE.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. SOURCE LIMITATIONS: OBTAIN ENCLOSED SWITCHES AND CIRCUIT BREAKERS, OVERCURRENT PROTECTIVE DEVICES, COMPONENTS, AND ACCESSORIES, WITHIN SAME PRODUCT CATEGORY, FROM SINGLE MANUFACTURER.
B. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY AN NRTL, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
C. ACCEPTABLE MANUFACTURERS ARE EATON, SIEMENS, SQUARE D, AND GE.

2.2 FUSIBLE SWITCHES

A. FUSIBLE SWITCH, 800 A AND SMALLER: NEMA KS1, TYPE HD, WITH CLIPS OR BOLT PADS TO ACCOMMODATE SPECIFIED FUSES, LOCKABLE HANDLE WITH CAPABILITY TO ACCEPT TWO PADLOCKS, AND INTERLOCKED WITH COVER IN CLOSED POSITION.
B. ACCESSORIES:
1. EQUIPMENT GROUND KIT: INTERNALLY MOUNTED AND LABELED FOR COPPER AND ALUMINUM GROUND CONDUCTORS.
2. NEUTRAL KIT: INTERNALLY MOUNTED; INSULATED, CAPABLE OF BEING GROUNDED, AND BONDED; AND LABELED FOR COPPER AND ALUMINUM NEUTRAL CONDUCTORS.
3. AUXILIARY CONTACT KIT: AUXILIARY SET OF CONTACTS ARRANGED TO OPEN BEFORE SWITCH BLADES OPEN. PROVIDE WHEN USED AS REMOTE DISCONNECT FOR VARIABLE FREQUENCY MOTOR CONTROLLER CIRCUITS.
4. SERVICE-RATED SWITCHES: LABELED FOR USE AS SERVICE EQUIPMENT.

2.3 NONFUSIBLE SWITCHES

A. NONFUSIBLE SWITCH, 800 A AND SMALLER: NEMA KS1, TYPE HD, LOCKABLE HANDLE WITH CAPABILITY TO ACCEPT TWO PADLOCKS, AND INTERLOCKED WITH COVER IN CLOSED POSITION.
B. ACCESSORIES:
1. EQUIPMENT GROUND KIT: INTERNALLY MOUNTED AND LABELED FOR COPPER AND ALUMINUM GROUND CONDUCTORS.
2. NEUTRAL KIT: INTERNALLY MOUNTED; INSULATED, CAPABLE OF BEING GROUNDED, AND BONDED; AND LABELED FOR COPPER AND ALUMINUM NEUTRAL CONDUCTORS.
3. AUXILIARY CONTACT KIT: AUXILIARY SET OF CONTACTS ARRANGED TO OPEN BEFORE SWITCH BLADES OPEN. PROVIDE WHEN USED AS REMOTE DISCONNECT FOR VARIABLE FREQUENCY MOTOR CONTROLLER CIRCUITS.
4. SERVICE-RATED SWITCHES: LABELED FOR USE AS SERVICE EQUIPMENT.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. MOLDED-CASE CIRCUIT BREAKER: NEMA AB1, WITH INTERRUPTING CAPACITY TO MEET AVAILABLE FAULT CURRENTS.
1. THERMAL-MAGNETIC CIRCUIT BREAKERS: INVERSE TIME-CURRENT ELEMENT FOR LOW-LEVEL OVERLOADS AND INSTANTANEOUS MAGNETIC TRIP ELEMENT FOR SHORT CIRCUITS. ADJUSTABLE MAGNETIC TRIP SETTING FOR CIRCUIT-BREAKER FRAME SIZES 250 A AND LARGER.
2. ADJUSTABLE INSTANTANEOUS-TRIP CIRCUIT BREAKERS: MAGNETIC TRIP ELEMENT WITH FRONT-MOUNTED, FIELD-ADJUSTABLE TRIP SETTING.
3. ELECTRONIC TRIP-UNIT CIRCUIT BREAKERS: RMS SENSING; FIELD-REPLACEABLE RATING PLUG; WITH THE FOLLOWING FIELD-ADJUSTABLE SETTINGS:
a. INSTANTANEOUS TRIP.
b. LONG- AND SHORT-TIME PICKUP LEVELS.
c. LONG- AND SHORT-TIME TIME ADJUSTMENTS.
d. GROUND-FAULT PICKUP LEVEL, TIME DELAY, AND I2T RESPONSE.
B. MOLDED-CASE CIRCUIT-BREAKER FEATURES AND ACCESSORIES:
1. STANDARD FRAME SIZES, TRIP RATINGS, AND NUMBER OF POLES.
2. LUGS: MECHANICAL STYLE SUITABLE FOR NUMBER, SIZE, TRIP RATINGS, AND CONDUCTOR MATERIAL.
3. APPLICATION LISTING: HACR FOR HEATING, AIR-CONDITIONING, AND REFRIGERATING EQUIPMENT.
4. GROUND-FAULT PROTECTION: INTEGRALLY MOUNTED RELAY AND TRIP UNIT WITH ADJUSTABLE PICKUP AND TIME-DELAY SETTINGS, PUSH-TO-TEST FEATURE, AND GROUND-FAULT INDICATOR.
5. SHUNT TRIP: 120-V TRIP COIL ENERGIZED FROM SEPARATE CIRCUIT, SET TO TRIP AT 55 PERCENT OF RATED VOLTAGE.
6. UNDERVOLTAGE TRIP: SET TO OPERATE AT 35 TO 75 PERCENT OF RATED VOLTAGE WITHOUT INTENTIONAL OR WITH FIELD-ADJUSTABLE 0.1- TO 0.6-SECOND TIME DELAY.
7. AUXILIARY SWITCH: ONE SPDT SWITCH OR TWO SPDT SWITCHES WITH "A" AND "B" CONTACTS; "A" CONTACTS MIMIC CIRCUIT-BREAKER CONTACTS, "B" CONTACTS OPERATE IN REVERSE OF CIRCUIT-BREAKER CONTACTS.

2.5 ENCLOSURES

A. NEMA AB1 AND NEMA KS1 TO MEET ENVIRONMENTAL CONDITIONS OF INSTALLED LOCATION.
1. INDOOR LOCATIONS: NEMA 250, TYPE 1.
2. OUTDOOR LOCATIONS: NEMA 250, TYPE 3R.
3. OTHER WET OR DAMP INDOOR LOCATIONS: NEMA 250, TYPE 4.
B. CONDUIT ENTRY: NEMA 250 TYPES 4, 4X, AND 12 ENCLOSURES SHALL CONTAIN NO KNOCKOUTS. NEMA 250 TYPES 7 AND 9 ENCLOSURES SHALL BE PROVIDED WITH THREADED CONDUIT OPENINGS IN BOTH ENDWALLS.
C. ENCLOSURES DESIGNATED AS NEMA 250 TYPE 4, 4X STAINLESS STEEL, 12, OR 12K SHALL HAVE A DUAL COVER INTERLOCK MECHANISM TO PREVENT UNINTENTIONAL OPENING OF THE ENCLOSURE COVER WHEN THE CIRCUIT BREAKER IS ON AND TO PREVENT TURNING THE CIRCUIT BREAKER ON WHEN THE ENCLOSURE COVER IS OPEN.
D. ALL ENCLOSURES SHALL INCLUDE A BONDED EQUIPMENT BUS.

PART 3 - EXECUTION

3.1 INSTALLATION

A. COORDINATE LAYOUT AND INSTALLATION OF SWITCHES, CIRCUIT BREAKERS, AND COMPONENTS WITH EQUIPMENT SERVED AND ADJACENT SURFACES. MAINTAIN REQUIRED WORKSPACE CLEARANCES AND REQUIRED CLEARANCES FOR EQUIPMENT ACCESS DOORS AND PANELS.
B. INSTALL INDIVIDUAL WALL-MOUNTED SWITCHES AND CIRCUIT BREAKERS WITH TOPS AT UNIFORM HEIGHT UNLESS OTHERWISE INDICATED.
C. INSTALL FUSES IN FUSIBLE DEVICES.
D. COMPLY WITH NFPA 70 AND NECA 1.

SECTION 265119 - LED LIGHTING

PART 1 - PART 1 - GENERAL

1.1 SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT.
B. PRODUCT SCHEDULE: FOR LUMINAIRES AND LAMPS. USE SAME DESIGNATIONS INDICATED ON DRAWINGS.

1.2 QUALITY ASSURANCE

A. LUMINAIRE PHOTOMETRIC DATA TESTING LABORATORY QUALIFICATIONS: PROVIDED BY AN INDEPENDENT AGENCY, WITH THE EXPERIENCE AND CAPABILITY TO CONDUCT THE TESTING INDICATED, THAT IS AN NRTL AS DEFINED BY OSHA IN 29 CFR 1910.7, ACCREDITED UNDER THE NVLAP FOR ENERGY EFFICIENT LIGHTING PRODUCTS, AND COMPLYING WITH THE APPLICABLE IES TESTING STANDARDS.
B. PROVIDE LUMINAIRES FROM A SINGLE MANUFACTURER FOR EACH LUMINAIRE TYPE.

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PROJECT NAME

CCAC WEST HILLS CENTER - UPS AND GENERATOR UPGRADES

1000 McKee Road
Oakdale, PA 15071-1099

CCAC Project #13-CO-003n5a

SEAL

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
DAVID C. PRICE
No. PE081572

NO.	DATE	REVISIONS/ADDENDUMS

DESIGNED:	MWM
DRAWN:	MWM
CHECKED:	DEB
DATE:	10-25-2018
SCALE:	AS SHOWN

DRAWING TITLE
ELECTRICAL SPECIFICATIONS

DRAWING NUMBER
E003

PROJECT NUMBER: 1841063

C. EACH LUMINAIRE TYPE SHALL BE BINNED WITHIN A THREE-STEP MACADAM ELLIPSE TO ENSURE COLOR CONSISTENCY AMONG LUMINAIRES.
D. MOCKUPS: FOR INTERIOR LUMINAIRES IN ROOM OR MODULE MOCKUPS, COMPLETE WITH POWER AND CONTROL CONNECTIONS.
1. OBTAIN ARCHITECT'S APPROVAL OF LUMINAIRES IN MOCKUPS BEFORE STARTING INSTALLATIONS.
2. MAINTAIN MOCKUPS DURING CONSTRUCTION IN AN UNDISTURBED CONDITION AS A STANDARD FOR JUDGING THE COMPLETED WORK.
3. APPROVAL OF MOCKUPS DOES NOT CONSTITUTE APPROVAL OF DEVIATIONS FROM THE CONTRACT DOCUMENTS CONTAINED IN MOCKUPS UNLESS ARCHITECT SPECIFICALLY APPROVES SUCH DEVIATIONS IN WRITING.
4. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, APPROVED MOCKUPS MAY BECOME PART OF THE COMPLETED WORK IF UNDISTURBED AT TIME OF SUBSTANTIAL COMPLETION.

1.3 DELIVERY, STORAGE, AND HANDLING
A. PROTECT FINISHES OF EXPOSED SURFACES BY APPLYING A STRIPPABLE, TEMPORARY PROTECTIVE COVERING BEFORE SHIPPING.

1.4 WARRANTY
A. WARRANTY: MANUFACTURER AND INSTALLER AGREE TO REPAIR OR REPLACE COMPONENTS OF LUMINAIRES THAT FAIL IN MATERIALS OR WORKMANSHIP WITHIN SPECIFIED WARRANTY PERIOD. WARRANTY PERIOD: FIVE YEAR(S) FROM DATE OF SUBSTANTIAL COMPLETION.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS
A. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
B. CRI AS INDICATED IN LIGHTING FIXTURE SCHEDULE. CCT AS INDICATED IN LIGHTING FIXTURE SCHEDULE.
C. RATED LAMP LIFE OF 50,000 HOURS TO L70.
D. LAMPS DIMMABLE FROM 100 PERCENT TO 0 PERCENT OF MAXIMUM LIGHT OUTPUT.
E. INTERNAL DRIVER.
F. NOMINAL OPERATING VOLTAGE: AS INDICATED IN LIGHTING FIXTURE SCHEDULE.

2.2 LUMINAIRE SUPPORT
A. SINGLE-STEM HANGERS: 1/2-INCH (13-MM) STEEL TUBING WITH SWIVEL BALL FITTINGS AND CEILING CANOPY. FINISH SAME AS LUMINAIRE.
B. WIRES: ASTM A 641/A 641 M, CLASS 3, SOFT TEMPER, ZINC-COATED STEEL, 12 GAGE (2.68 MM)
C. ROD HANGERS: 3/16-INCH (5-MM) MINIMUM DIAMETER, CADMIUM-PLATED, THREADED STEEL ROD.
D. HOOK HANGERS: INTEGRATED ASSEMBLY MATCHED TO LUMINAIRE, LINE VOLTAGE, AND EQUIPMENT WITH THREADED ATTACHMENT, CORD, AND LOCKING-TYPE PLUG.

PART 3 - EXECUTION

3.1 INTERIOR LIGHTING INSTALLATION
A. COMPLY WITH NECA 1.
B. INSTALL LUMINAIRES LEVEL, PLUMB, AND SQUARE WITH CEILINGS AND WALLS UNLESS OTHERWISE INDICATED.
C. INSTALL LAMPS IN EACH LUMINAIRE.
D. SUPPORTS:
1. SIZED AND RATED FOR LUMINAIRE WEIGHT.
2. ABLE TO MAINTAIN LUMINAIRE POSITION AFTER CLEANING AND RELAMPING.
3. PROVIDE SUPPORT FOR LUMINAIRE WITHOUT CAUSING DEFLECTION OF CEILING OR WALL.
4. LUMINAIRE MOUNTING DEVICES SHALL BE CAPABLE OF SUPPORTING A HORIZONTAL FORCE OF 100 PERCENT OF LUMINAIRE WEIGHT AND VERTICAL FORCE OF 400 PERCENT OF LUMINAIRE WEIGHT.
E. FLUSH-MOUNTED LUMINAIRE SUPPORT:
1. SECURED TO OUTLET BOX.
2. ATTACHED TO CEILING STRUCTURAL MEMBERS AT FOUR POINTS EQUALLY SPACED AROUND CIRCUMFERENCE OF LUMINAIRE.
3. TRIM RING FLUSH WITH FINISHED SURFACE.
F. WALL-MOUNTED LUMINAIRE SUPPORT:
1. ATTACHED TO STRUCTURAL MEMBERS IN WALLS.
2. DO NOT ATTACH LUMINAIRES DIRECTLY TO GYPSUM BOARD.
G. CEILING-MOUNTED LUMINAIRE SUPPORT:
1. CEILING MOUNT WITH FOUR-POINT PENDANT MOUNT WITH 5/32-INCH- (4-MM-) DIAMETER AIRCRAFT CABLE SUPPORTS ADJUSTABLE TO 120 INCHES (6 M) IN LENGTH.
2. CEILING MOUNT WITH HOOK MOUNT.
H. SUSPENDED LUMINAIRE SUPPORT:
1. PENDANTS AND RODS: WHERE LONGER THAN 48 INCHES (1200 MM), BRACE TO LIMIT SWINGING.
2. STEM-MOUNTED, SINGLE-UNIT LUMINAIRES: SUSPEND WITH TWIN-STEM HANGERS. SUPPORT WITH APPROVED OUTLET BOX AND ACCESSORIES THAT HOLD STEM AND PROVIDE DAMPING OF LUMINAIRE OSCILLATIONS. SUPPORT OUTLET BOX VERTICALLY TO BUILDING STRUCTURE USING APPROVED DEVICES.
3. CONTINUOUS ROWS OF LUMINAIRES: USE TUBING OR STEM FOR WIRING AT ONE POINT AND WIRE SUPPORT FOR SUSPENSION FOR EACH UNIT LENGTH OF LUMINAIRE CHASSIS, INCLUDING ONE AT EACH END.
4. DO NOT USE CEILING GRID AS SUPPORT FOR PENDANT LUMINAIRES. CONNECT SUPPORT WIRES OR RODS TO BUILDING STRUCTURE.
I. CEILING-GRID-MOUNTED LUMINAIRES:
1. SECURE TO ANY REQUIRED OUTLET BOX.
2. SECURE LUMINAIRE TO THE LUMINAIRE OPENING USING APPROVED FASTENERS IN A MINIMUM OF FOUR LOCATIONS, SPACED NEAR CORNERS OF LUMINAIRE.
3. USE APPROVED DEVICES AND SUPPORT COMPONENTS TO CONNECT LUMINAIRE TO CEILING GRID AND BUILDING STRUCTURE IN A MINIMUM OF FOUR LOCATIONS, SPACED NEAR CORNERS OF LUMINAIRE.

3.2 ADJUSTING
A. OCCUPANCY ADJUSTMENTS: WHEN REQUESTED WITHIN 12 MONTHS OF DATE OF SUBSTANTIAL COMPLETION, PROVIDE ON-SITE ASSISTANCE IN ADJUSTING THE DIRECTION OF AIM OF LUMINAIRES TO SUIT OCCUPIED CONDITIONS. MAKE UP TO TWO VISITS TO PROJECT DURING OTHER-THAN-NORMAL HOURS FOR THIS PURPOSE. SOME OF THIS WORK MAY BE REQUIRED DURING HOURS OF DARKNESS. ADJUST THE AIM OF LUMINAIRES IN THE PRESENCE OF THE ARCHITECT.

3.3 GENERAL EXTERIOR LIGHTING INSTALLATION REQUIREMENTS
A. COMPLY WITH NECA 1.
B. USE FASTENING METHODS AND MATERIALS SELECTED TO RESIST SEISMIC FORCES DEFINED FOR THE APPLICATION AND APPROVED BY MANUFACTURER.
C. INSTALL LAMPS IN EACH LUMINAIRE.
D. FASTEN LUMINAIRE TO STRUCTURAL SUPPORT.
E. SUPPORTS:
1. SIZED AND RATED FOR LUMINAIRE WEIGHT.
2. ABLE TO MAINTAIN LUMINAIRE POSITION AFTER CLEANING AND RELAMPING.
3. SUPPORT LUMINAIRES WITHOUT CAUSING DEFLECTION OF FINISHED SURFACE.
4. LUMINAIRE-MOUNTING DEVICES SHALL BE CAPABLE OF SUPPORTING A HORIZONTAL FORCE OF 100 PERCENT OF LUMINAIRE WEIGHT AND A VERTICAL FORCE OF 400 PERCENT OF LUMINAIRE WEIGHT.
F. INSTALL LUMINAIRES LEVEL, PLUMB, AND SQUARE WITH FINISHED GRADE UNLESS OTHERWISE INDICATED. INSTALL LUMINAIRES AT HEIGHT AND AIMING ANGLE AS INDICATED ON DRAWINGS.
G. COORDINATE LAYOUT AND INSTALLATION OF LUMINAIRES WITH OTHER CONSTRUCTION.
H. ADJUST LUMINAIRES THAT REQUIRE FIELD ADJUSTMENT OR AIMING.

3.4 BOLLARD LUMINAIRE INSTALLATION:
A. ALIGN UNITS FOR OPTIMUM DIRECTIONAL ALIGNMENT OF LIGHT DISTRIBUTION.
1. INSTALL ON CONCRETE BASE WITH TOP 4 INCHES (100 MM) ABOVE FINISHED GRADE OR SURFACE AT LUMINAIRE LOCATION. CAST CONDUIT INTO BASE, AND SHAPE BASE TO MATCH SHAPE OF BOLLARD BASE. FINISH BY TROWELING AND RUBBING SMOOTH.

3.5 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES
A. AIM AS INDICATED ON DRAWINGS.
B. INSTALL ON CONCRETE BASE WITH TOP 4 INCHES (100 MM) ABOVE FINISHED GRADE OR SURFACE AT LUMINAIRE LOCATION. CAST CONDUIT INTO BASE, AND FINISH BY TROWELING AND RUBBING SMOOTH.

SECTION 283111 - ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION - PROVIDE ADDRESSABLE DIGITAL FIRE ALARM SYSTEM INSTALLED AS SHOWN ON DRAWINGS AND DESCRIBED HEREIN. THE OPERATION SHALL BE SUCH THAT ACTUATION OF ANY MANUAL FIRE ALARM STATION OR ANY OTHER INITIATION DEVICE SHALL CAUSE AUDIBLE/VISIBLE SIGNAL DEVICES THROUGHOUT THE BUILDING TO OPERATE, SHALL CAUSE THE MAIN ANNUNCIATOR TO DISPLAY THE "ADDRESS"/"ZONE" OF THE INITIATING DEVICE UNTIL THE DEVICE IS RESTORED TO ITS NORMAL POSITION AND THE CONTROL PANEL IS RESET AND SHALL CAUSE AN ALARM SIGNAL TO BE TRANSMITTED TO A CENTRAL STATION. ALL INITIATING DEVICES SHALL BE FULLY COMPATIBLE WITH EXISTING SYSTEMS AND SHALL BE PER MANUFACTURER'S RECOMMENDATIONS. ALL COMPONENTS SHALL BE ADDRESSABLE OR BE PROVIDED WITH ADDRESSABLE ZONE INTERFACE MODULES.

1.2 SUBMITTALS
A. GENERAL SUBMITTAL REQUIREMENTS:
1. SUBMITTALS SHALL BE APPROVED BY AUTHORITIES HAVING JURISDICTION PRIOR TO SUBMITTING THEM TO ARCHITECT.
2. SHOP DRAWINGS SHALL BE PREPARED BY PERSONS WITH THE FOLLOWING QUALIFICATIONS:
a. TRAINED AND CERTIFIED BY MANUFACTURER IN FIRE-ALARM SYSTEM DESIGN.
b. NICET-CERTIFIED FIRE-ALARM TECHNICIAN, LEVEL III MINIMUM.
c. LICENSED OR CERTIFIED BY AUTHORITIES HAVING JURISDICTION.
B. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.
C. SHOP DRAWINGS: FOR FIRE-ALARM SYSTEM. INCLUDE PLANS, ELEVATIONS, SECTIONS, DETAILS, AND ATTACHMENTS TO OTHER WORK.
1. COMPLY WITH RECOMMENDATIONS IN THE "DOCUMENTATION" SECTION OF THE "FUNDAMENTALS OF FIRE ALARM SYSTEMS" CHAPTER IN NFPA 72.
2. INCLUDE VOLTAGE DROP CALCULATIONS FOR NOTIFICATION APPLIANCE CIRCUITS.
3. INCLUDE BATTERY-SIZE CALCULATIONS.
4. INCLUDE PERFORMANCE PARAMETERS AND INSTALLATION DETAILS FOR EACH DETECTOR, VERIFYING THAT EACH DETECTOR IS LISTED FOR COMPLETE RANGE OF AIR VELOCITY, TEMPERATURE, AND HUMIDITY POSSIBLE WHEN AIR-HANDLING SYSTEM IS OPERATING.
5. INCLUDE AUDIO/ALARM SIGNALING-SERVICE EQUIPMENT RACK OR CONSOLE LAYOUT, GROUNDING SCHEMATIC, AMPLIFIER POWER CALCULATION, AND SINGLE-LINE CONNECTION DIAGRAM.
6. INCLUDE FLOOR PLANS TO INDICATE FINAL OUTLET LOCATIONS SHOWING ADDRESS OF EACH ADDRESSABLE DEVICE. SHOW SIZE AND ROUTE OF CABLE AND CONDUITS.

1.3 QUALITY ASSURANCE
A. INSTALLER QUALIFICATIONS: PERSONNEL SHALL BE TRAINED AND CERTIFIED BY MANUFACTURER FOR INSTALLATION OF UNITS REQUIRED FOR THIS PROJECT.
B. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
C. NFPA CERTIFICATION: OBTAIN CERTIFICATION ACCORDING TO NFPA 72 BY A UL-LISTED ALARM COMPANY.

1.4 EXTRA MATERIALS
A. FURNISH EXTRA MATERIALS THAT MATCH PRODUCTS INSTALLED AND THAT ARE PACKAGED WITH PROTECTIVE COVERING FOR STORAGE AND IDENTIFIED WITH LABELS DESCRIBING CONTENTS.
1. LAMPS FOR REMOTE INDICATING LAMP UNITS: QUANTITY EQUAL TO 10 PERCENT OF AMOUNT INSTALLED.
2. LAMPS FOR STROBE UNITS: QUANTITY EQUAL TO 10 PERCENT OF AMOUNT INSTALLED.
3. SMOKE DETECTORS, FIRE DETECTORS: QUANTITY EQUAL TO 10 PERCENT OF AMOUNT OF EACH TYPE INSTALLED, BUT NO FEWER THAN 1 UNIT OF EACH TYPE.
4. DETECTOR BASES: QUANTITY EQUAL TO 2 PERCENT OF AMOUNT OF EACH TYPE INSTALLED, BUT NO FEWER THAN 1 UNIT OF EACH TYPE.
5. KEYS AND TOOLS: ONE EXTRA SET FOR ACCESS TO LOCKED AND TAMPERPROOFED COMPONENTS.
6. AUDIBLE AND VISUAL NOTIFICATION APPLIANCES: ONE OF EACH TYPE INSTALLED.
7. FUSES: TWO OF EACH TYPE INSTALLED IN THE SYSTEM.

1.5 SEQUENCING AND SCHEDULING
A. EXISTING FIRE-ALARM EQUIPMENT: MAINTAIN EXISTING EQUIPMENT FULLY OPERATIONAL UNTIL NEW EQUIPMENT HAS BEEN TESTED AND ACCEPTED. AS NEW EQUIPMENT IS INSTALLED, LABEL IT "NOT IN SERVICE" UNTIL IT IS ACCEPTED. REMOVE LABELS FROM NEW EQUIPMENT WHEN PUT INTO SERVICE, AND LABEL EXISTING FIRE-ALARM EQUIPMENT "NOT IN SERVICE" UNTIL REMOVED FROM THE BUILDING.
B. EQUIPMENT REMOVAL: AFTER ACCEPTANCE OF NEW FIRE-ALARM SYSTEM, REMOVE EXISTING DISCONNECTED FIRE-ALARM EQUIPMENT AND WIRING.

1.6 WARRANTY
A. SPECIAL WARRANTY: MANUFACTURER AGREES TO REPAIR OR REPLACE FIRE-ALARM SYSTEM EQUIPMENT AND COMPONENTS THAT FAIL IN MATERIALS OR WORKMANSHIP WITHIN SPECIFIED WARRANTY PERIOD.
1. WARRANTY EXTENT: ALL EQUIPMENT AND COMPONENTS NOT COVERED IN THE MAINTENANCE SERVICE AGREEMENT.
2. WARRANTY PERIOD: FIVE YEARS FROM DATE OF SUBSTANTIAL COMPLETION.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
1. NOTIFIER; A HONEYWELL COMPANY.
2. SIEMENS BUILDING TECHNOLOGIES, INC.; FIRE SAFETY DIVISION.
3. SIMPLEX GRINNELL LP; A TYCO INTERNATIONAL COMPANY.
4. EDWARDS

2.2 SYSTEM DESCRIPTION
A. NONCODED, UL-CERTIFIED ADDRESSABLE SYSTEM, WITH MULTIPLEXED SIGNAL TRANSMISSION AND HORN/STROBE EVACUATION.
B. AUTOMATIC SENSITIVITY CONTROL OF CERTAIN SMOKE DETECTORS.
C. ALL COMPONENTS PROVIDED SHALL BE LISTED FOR USE WITH THE SELECTED SYSTEM.
D. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.

2.3 FIRE-ALARM CONTROL UNIT
A. GENERAL REQUIREMENTS FOR FIRE-ALARM CONTROL UNIT:
1. FIELD-PROGRAMMABLE, MICROPROCESSOR-BASED, MODULAR, POWER-LIMITED DESIGN WITH ELECTRONIC MODULES, COMPLYING WITH UL 864 AND LISTED AND LABELED BY AN NRTL.
a. SYSTEM SOFTWARE AND PROGRAMS SHALL BE HELD IN NONVOLATILE FLASH, ELECTRICALLY ERASABLE, PROGRAMMABLE, READ-ONLY MEMORY, RETAINING THE INFORMATION THROUGH FAILURE OF PRIMARY AND SECONDARY POWER SUPPLIES.
b. INCLUDE A REAL-TIME CLOCK FOR TIME ANNOTATION OF EVENTS ON THE EVENT RECORDER AND PRINTER.
c. PROVIDE COMMUNICATION BETWEEN THE FACP AND REMOTE CIRCUIT INTERFACE PANELS, ANNUNCIATORS, AND DISPLAYS.
d. THE FACP SHALL BE LISTED FOR CONNECTION TO A CENTRAL-STATION SIGNALING SYSTEM SERVICE.
e. PROVIDE NONVOLATILE MEMORY FOR SYSTEM DATABASE, LOGIC, AND OPERATING SYSTEM AND EVENT HISTORY. THE SYSTEM SHALL REQUIRE NO MANUAL INPUT TO INITIALIZE IN THE EVENT OF A COMPLETE POWER DOWN CONDITION. THE FACP SHALL PROVIDE A MINIMUM 500-EVENT HISTORY LOG.
2. ADDRESSABLE INITIATION DEVICES THAT COMMUNICATE DEVICE IDENTITY AND STATUS.
a. SMOKE SENSORS SHALL ADDITIONALLY COMMUNICATE SENSITIVITY SETTING AND ALLOW FOR ADJUSTMENT OF SENSITIVITY AT FIRE-ALARM CONTROL UNIT.
b. TEMPERATURE SENSORS SHALL ADDITIONALLY TEST FOR AND COMMUNICATE THE SENSITIVITY RANGE OF THE DEVICE.
3. ADDRESSABLE CONTROL CIRCUITS FOR OPERATION OF MECHANICAL EQUIPMENT.
B. ALPHANUMERIC DISPLAY AND SYSTEM CONTROLS: ARRANGED FOR INTERFACE BETWEEN HUMAN OPERATOR AT FIRE-ALARM CONTROL UNIT AND ADDRESSABLE SYSTEM COMPONENTS INCLUDING ANNUNCIATION AND SUPERVISION. DISPLAY ALARM, SUPERVISORY, AND COMPONENT STATUS MESSAGES AND THE PROGRAMMING AND CONTROL MENU.
C. INITIATING-DEVICE, NOTIFICATION-APPLIANCE, AND SIGNALING-LINE CIRCUITS:
1. PATHWAY CLASS DESIGNATIONS: NFPA 72, CLASS B.
D. PRIMARY POWER: 24-VDC OBTAINED FROM 120-VAC SERVICE AND A POWER-SUPPLY MODULE. INITIATING DEVICES, NOTIFICATION APPLIANCES, SIGNALING LINES, TROUBLE SIGNALS, SUPERVISORY AND DIGITAL ALARM COMMUNICATOR TRANSMITTERS SHALL BE POWERED BY 24-VDC SOURCE.
1. ALARM CURRENT DRAW OF ENTIRE FIRE-ALARM SYSTEM SHALL NOT EXCEED 80 PERCENT OF THE POWER-SUPPLY MODULE RATING.
E. SECONDARY POWER: 24-VDC SUPPLY SYSTEM WITH BATTERIES, AUTOMATIC BATTERY CHARGER, AND AUTOMATIC TRANSFER SWITCH.
1. BATTERIES: SEALED LEAD CALCIUM.
2. GENERAL DESCRIPTION - PROVIDE ADDRESSABLE DIGITAL FIRE ALARM SYSTEM INSTALLED AS SHOWN ON DRAWINGS AND DESCRIBED HEREIN. THE OPERATION SHALL BE SUCH THAT ACTUATION OF ANY MANUAL FIRE ALARM STATION OR ANY OTHER INITIATION DEVICE SHALL CAUSE AUDIBLE/VISIBLE SIGNAL DEVICES THROUGHOUT THE BUILDING TO OPERATE, SHALL CAUSE THE MAIN ANNUNCIATOR TO DISPLAY THE "ADDRESS"/"ZONE" OF THE INITIATING DEVICE UNTIL THE DEVICE IS RESTORED TO ITS NORMAL POSITION AND THE CONTROL PANEL IS RESET AND SHALL CAUSE AN ALARM SIGNAL TO BE TRANSMITTED TO A CENTRAL STATION. ALL INITIATING DEVICES SHALL BE FULLY COMPATIBLE WITH EXISTING SYSTEMS AND SHALL BE PER MANUFACTURER'S RECOMMENDATIONS. ALL COMPONENTS SHALL BE ADDRESSABLE OR BE PROVIDED WITH ADDRESSABLE ZONE INTERFACE MODULES.

2.4 MANUAL FIRE-ALARM BOXES
A. PROVIDE NON-CODED DOUBLE ACTION MANUAL STATIONS WHERE SHOWN ON THE DRAWINGS, TO BE FLUSH OR SURFACE MOUNTED AS REQUIRED. PULL STATION ACTIVATION SHALL PROVIDE ALARM INPUT TO THE SYSTEM AND ALARM OUTPUT FROM THE SYSTEM WITHIN FOUR (4) SECONDS. THE MANUAL STATION SHALL BE EQUIPPED WITH TERMINAL STRIP AND PRESSURE STYLE SCREW TERMINALS FOR THE CONNECTION OF FIELD WIRING. HOUSINGS SHALL BE MADE OF THERMOPLASTIC MATERIAL WITH RAISED FIRE ALARM LETTERING AND BE COLORED RED. STATIONS THAT REQUIRE THE BREAKING OF GLASS WILL NOT BE ACCEPTABLE. SURFACE MOUNTED STATIONS WHERE INDICATED ON THE DRAWINGS SHALL BE MOUNTED USING A MANUFACTURER'S PRESCRIBED MATCHING RED ENAMEL OUTLET BOX.

2.5 SYSTEM SMOKE DETECTORS
A. PROVIDE PHOTOELECTRIC TYPE. DETECTORS SHALL BE LISTED FOR USE AS OPEN AREA PROTECTIVE COVERAGE AND SHALL BE INSENSITIVE TO AIR VELOCITY CHANGES. THE SMOKE DETECTOR SHALL CONTAIN A MULTI-COLORED LED INDICATOR THAT WILL FLASH GREEN TO INDICATE THAT THE DETECTOR IS OPERATIONAL AND FLASH RED WHEN THE DETECTOR IS IN ALARM. THE DETECTOR SHALL BE CONTINUALLY SELF-TESTING AND SHALL BE DESIGNED TO ELIMINATE CALIBRATION ERRORS ASSOCIATED WITH FIELD CLEANING OF THE CHAMBER. DETECTOR SHALL TWIST LOCK INTO A BASE ASSEMBLY WITH SCREW CLAMP TERMINALS. DETECTOR ACTIVATION SHALL PROVIDE ALARM INPUT TO THE SYSTEM AND ALARM OUTPUT FROM THE SYSTEM WITHIN FOUR (4) SECONDS. THE DETECTOR SHALL SUPPORT THE USE OF A RELAY OR LED REMOTE INDICATOR. DETECTOR SPACING AND LOCATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, THE REQUIREMENTS OF NFPA 72, AND AS INDICATED. NO DETECTOR SHALL BE LOCATED CLOSER THAN 12 INCHES TO ANY PART OF ANY LIGHTING FIXTURE NOR SHALL ANY DETECTOR BE MOUNTED CLOSER THAT 36 INCHES TO ANY AHU AIR DIFFUSER.

2.6 HEAT DETECTORS
A. HEAT DETECTOR (SYSTEM) - THERMAL DETECTORS SHALL BE RATED AT 135 DEGREES FIXED TEMPERATURE AND 15 DEGREES PER MINUTE RATE OF RISE. DETECTORS SHALL BE CONSTRUCTED TO COMPENSATE FOR THE THERMAL LAG INHERENT IN CONVENTIONAL TYPE DETECTORS DUE TO THE THERMAL MASS, AND ALARM AT THE SET POINT OF 135 DEGREES FAHRENHEIT. THE DETECTORS FURNISHED SHALL HAVE A LISTED SPACING FOR COVERAGE UP TO 2,500 SQUARE FEET AND SHALL BE INSTALLED ACCORDING TO THE REQUIREMENTS OF NFPA 72 FOR OPEN AREA COVERAGE.

2.7 NOTIFICATION APPLIANCES
A. NOTIFICATION APPLIANCES - THE HORN, STROBE OR HORN/STROBE APPLIANCE AS INDICATED ON THE DRAWINGS SHALL BE A SYNCHRONIZED TEMPORAL HORN WITH A SYNCHRONIZED STROBE LIGHT WITH MULTIPLE CANDELA TAPS TO MEET THE INTENDED APPLICATION. THE STROBE LIGHT TAPS SHALL BE ADJUSTABLE FOR 15, 30, 75, AND 110 CANDELA. THE STROBE SHALL FLASH AT A RATE BETWEEN 1/3 AND 3 FLASHES/SECOND. THE APPLIANCE SHALL BE RED FOR WALL MOUNTED AND WHITE FOR CEILING MOUNTED. CEILING MOUNTED APPLIANCES SHALL BE RATED FOR THAT APPLICATION.

2.8 REMOTE ANNUNCIATOR
A. PROVIDE ANNUNCIATOR WITH FUNCTIONS TO MATCH THOSE OF FIRE-ALARM CONTROL UNIT FOR ALARM, SUPERVISORY, AND TROUBLE INDICATIONS. MANUAL SWITCHING FUNCTIONS SHALL MATCH THOSE OF FIRE-ALARM CONTROL UNIT, INCLUDING ACKNOWLEDGING, SILENCING, RESETTING, AND TESTING. MOUNTING SHALL BE FLUSH CABINET, NEMA 250, TYPE 1. ALPHANUMERIC DISPLAY AND LED INDICATING LIGHTS SHALL MATCH THOSE OF FIRE ALARM CONTROL UNIT. PROVIDE CONTROLS TO ACKNOWLEDGE, SILENCE, RESET, AND TEST FUNCTIONS FOR ALARM, SUPERVISORY, AND TROUBLE SIGNALS.

2.9 ADDRESSABLE INTERFACE DEVICE
A. PROVIDE ADDRESSABLE INTERFACE DEVICES WITH THE FOLLOWING FUNCTIONS:
1. INCLUDE ADDRESS-SETTING MEANS ON THE MODULE.
2. STORE AN INTERNAL IDENTIFYING CODE FOR CONTROL PANEL USE TO IDENTIFY THE MODULE TYPE.
3. LISTED FOR CONTROLLING HVAC FAN MOTOR CONTROLLERS.
B. MONITOR MODULE: MICROELECTRONIC MODULE PROVIDING A SYSTEM ADDRESS FOR ALARM-INITIATING DEVICES FOR WIRED APPLICATIONS WITH NORMALLY OPEN CONTACTS.
C. INTEGRAL RELAY: CAPABLE OF PROVIDING A DIRECT SIGNAL TO ELEVATOR CONTROLLER TO INITIATE ELEVATOR RECALL OR TO CIRCUIT-BREAKER SHUNT TRIP FOR POWER SHUTDOWN.
1. ALLOW THE CONTROL PANEL TO SWITCH THE RELAY CONTACTS ON COMMAND.
2. HAVE A MINIMUM OF TWO NORMALLY OPEN AND TWO NORMALLY CLOSED CONTACTS AVAILABLE FOR FIELD WIRING.
D. CONTROL MODULE:
1. OPERATE NOTIFICATION DEVICES.
2. OPERATE SOLENOIDS FOR USE IN SPRINKLER SERVICE.

2.10 DIGITAL ALARM COMMUNICATOR TRANSMITTER
A. PROVIDE DIGITAL ALARM COMMUNICATOR TRANSMITTER ACCEPTABLE TO THE REMOTE CENTRAL STATION AND COMPLYING WITH UL 632.
B. FUNCTIONAL PERFORMANCE: UNIT SHALL RECEIVE AN ALARM, SUPERVISORY, OR TROUBLE SIGNAL FROM FIRE-ALARM CONTROL UNIT AND AUTOMATICALLY CAPTURE TWO TELEPHONE LINE(S) AND DIAL A PRESET NUMBER FOR A REMOTE CENTRAL STATION. WHEN CONTACT IS MADE WITH CENTRAL STATION(S), SIGNALS SHALL BE TRANSMITTED. IF SERVICE ON EITHER LINE IS INTERRUPTED FOR LONGER THAN 45 SECONDS, TRANSMITTER SHALL INITIATE A LOCAL TROUBLE SIGNAL AND TRANSMIT THE SIGNAL INDICATING LOSS OF TELEPHONE LINE TO THE REMOTE ALARM RECEIVING STATION OVER THE REMAINING LINE. TRANSMITTER SHALL AUTOMATICALLY REPORT TELEPHONE SERVICE RESTORATION TO THE CENTRAL STATION. IF SERVICE IS LOST ON BOTH TELEPHONE LINES, TRANSMITTER SHALL INITIATE THE LOCAL TROUBLE SIGNAL.
C. LOCAL FUNCTIONS AND DISPLAY AT THE DIGITAL ALARM COMMUNICATOR TRANSMITTER SHALL INCLUDE THE FOLLOWING:
1. VERIFICATION THAT BOTH TELEPHONE LINES ARE AVAILABLE.
2. PROGRAMMING DEVICE.
3. LED DISPLAY.
4. MANUAL TEST REPORT FUNCTION AND MANUAL TRANSMISSION CLEAR INDICATION.
5. COMMUNICATIONS FAILURE WITH THE CENTRAL STATION OR FIRE-ALARM CONTROL UNIT.
D. SECONDARY POWER: INTEGRAL RECHARGEABLE BATTERY AND AUTOMATIC CHARGER.
E. SELF-TEST: CONDUCTED AUTOMATICALLY EVERY 24 HOURS WITH REPORT TRANSMITTED TO CENTRAL STATION.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION
A. COMPLY WITH NFPA 72, NFPA 101, AND REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION FOR INSTALLATION AND TESTING OF FIRE-ALARM EQUIPMENT. INSTALL ALL ELECTRICAL WIRING TO COMPLY WITH REQUIREMENTS IN NFPA 70 INCLUDING, BUT NOT LIMITED TO, ARTICLE 760, "FIRE ALARM SYSTEMS."
B. CONNECTING TO EXISTING EQUIPMENT: VERIFY THAT EXISTING FIRE-ALARM SYSTEM IS OPERATIONAL BEFORE MAKING CHANGES OR CONNECTIONS.
C. INSTALL WALL-MOUNTED EQUIPMENT, WITH TOPS OF CABINETS NOT MORE THAN 78 INCHES (1980 MM) ABOVE THE FINISHED FLOOR.
D. MANUAL FIRE-ALARM BOXES:
1. INSTALL MANUAL FIRE-ALARM BOX IN THE NORMAL PATH OF EGRESS WITHIN 60 INCHES (1520 MM) OF THE EXIT DOORWAY.
2. MOUNT MANUAL FIRE-ALARM BOX ON A BACKGROUND OF A CONTRASTING COLOR.
3. THE OPERABLE PART OF MANUAL FIRE-ALARM BOX SHALL BE BETWEEN 42 INCHES (1060 MM) AND 48 INCHES (1220 MM) ABOVE FLOOR LEVEL. ALL DEVICES SHALL BE MOUNTED AT THE SAME HEIGHT UNLESS OTHERWISE INDICATED.
E. SMOKE- OR HEAT-DETECTOR SPACING: COMPLY WITH NFPA 72.
F. DUCT SMOKE DETECTORS: COMPLY WITH NFPA 72 AND NFPA 90A. INSTALL SAMPLING TUBES SO THEY EXTEND THE FULL WIDTH OF DUCT. TUBES MORE THAN 36 INCHES (9100 MM) LONG SHALL BE SUPPORTED AT BOTH ENDS.
G. SINGLE-STATION SMOKE DETECTORS: WHERE MORE THAN ONE SMOKE ALARM IS INSTALLED WITHIN A DWELLING OR SUITE, THEY SHALL BE CONNECTED SO THAT THE OPERATION OF ANY SMOKE ALARM CAUSES THE ALARM IN ALL SMOKE ALARMS TO SOUND.
H. REMOTE STATUS AND ALARM INDICATORS: INSTALL IN A VISIBLE LOCATION NEAR EACH SMOKE DETECTOR, SPRINKLER WATER-FLOW SWITCH, AND VALVE-TAMPER SWITCH THAT IS NOT READILY VISIBLE FROM NORMAL VIEWING POSITION.
I. AUDIBLE ALARM-INDICATING DEVICES: INSTALL NOT LESS THAN 6 INCHES (150 MM) BELOW THE CEILING. INSTALL BELLS AND HORNS ON FLUSH-MOUNTED BACK BOXES WITH THE DEVICE-OPERATING MECHANISM CONCEALED BEHIND A GRILLE. INSTALL ALL DEVICES AT THE SAME HEIGHT UNLESS OTHERWISE INDICATED.
J. VISIBLE ALARM-INDICATING DEVICES: INSTALL ADJACENT TO EACH ALARM BELL OR ALARM HORN AND AT LEAST 6 INCHES (150 MM) BELOW THE CEILING. INSTALL ALL DEVICES AT THE SAME HEIGHT UNLESS OTHERWISE INDICATED.
K. DEVICE LOCATION-INDICATING LIGHTS: LOCATE IN PUBLIC SPACE NEAR THE DEVICE THEY MONITOR.

3.2 PATHWAYS
A. PATHWAYS SHALL BE INSTALLED IN EMT. FIRE ALARM MC CABLE IS SUITABLE ONLY WHERE NOT EXPOSED.
B. FIRE ALARM BOXES SHALL BE PAINTED RED ENAMEL.
C. WIRING SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRIC CODE AND NFPA 72, AND ALL OTHER APPLICABLE STATE AND LOCAL CODES. THE CONTRACTOR SHALL PROVIDE, IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, ALL WIRING, CONDUIT, AND OUTLET BOXES REQUIRED FOR THE ERECTION OF THE COMPLETE SYSTEM AS DESCRIBED HEREIN AND AS SHOWN ON THE DRAWINGS. CONDUIT AND WIRE SHALL CONFORM TO THE APPLICABLE REQUIREMENTS FOR LIGHTING AND RECEPTACLE BRANCH CIRCUITS. THE SIZES OF THE DIFFERENT WIRES SHALL BE AS REQUIRED FOR SYSTEM OPERATION. COLOR-CODED WIRES SHALL BE USED.

3.3 CONNECTIONS
A. FOR FIRE-PROTECTION SYSTEMS RELATED TO DOORS IN FIRE-RATED WALLS AND PARTITIONS AND TO DOORS IN SMOKE PARTITIONS, COMPLY WITH REQUIREMENTS IN SECTION 087100 "DOOR HARDWARE." CONNECT HARDWARE AND DEVICES TO FIRE-ALARM SYSTEM.
1. VERIFY THAT HARDWARE AND DEVICES ARE LISTED FOR USE WITH INSTALLED FIRE-ALARM SYSTEM BEFORE MAKING CONNECTIONS.
B. MAKE ADDRESSABLE CONNECTIONS WITH A SUPERVISED INTERFACE DEVICE TO THE FOLLOWING DEVICES AND SYSTEMS. INSTALL THE INTERFACE DEVICE LESS THAN 36 INCHES (910 MM) FROM THE DEVICE CONTROLLED. MAKE AN ADDRESSABLE CONFIRMATION CONNECTION WHEN SUCH FEEDBACK IS AVAILABLE AT THE DEVICE OR SYSTEM BEING CONTROLLED.
1. SMOKE DAMPERS IN AIR DUCTS OF DESIGNATED HVAC DUCT SYSTEMS.
2. MAGNETICALLY HELD-OPEN DOORS.
3. ELECTRONICALLY LOCKED DOORS AND ACCESS GATES.
4. ALARM-INITIATING CONNECTION TO ELEVATOR RECALL SYSTEM AND COMPONENTS.
5. ALARM-INITIATING CONNECTION TO ACTIVATE EMERGENCY LIGHTING CONTROL.
6. ALARM-INITIATING CONNECTION TO ACTIVATE EMERGENCY SHUTOFFS FOR GAS AND FUEL SUPPLIES.
7. SUPERVISORY CONNECTIONS AT VALVE SUPERVISORY SWITCHES.
8. SUPERVISORY CONNECTIONS AT LOW-AIR-PRESSURE SWITCH OF EACH DRY-PIPE SPRINKLER SYSTEM.
9. SUPERVISORY CONNECTIONS AT ELEVATOR SHUNT-TRIP BREAKER.
10. SUPERVISORY CONNECTIONS AT FIRE-EXTINGUISHER LOCATIONS.

3.4 GROUNDING
A. GROUND FIRE-ALARM CONTROL UNIT AND ASSOCIATED CIRCUITS; COMPLY WITH IEEE 1100. INSTALL A GROUND WIRE FROM MAIN SERVICE GROUND TO FIRE-ALARM CONTROL UNIT.

3.5 FIELD QUALITY CONTROL
A. FIELD TESTS SHALL BE WITNESSED BY AUTHORITIES HAVING JURISDICTION.
B. PERFORM THE FOLLOWING TESTS AND INSPECTIONS WITH THE ASSISTANCE OF A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE:
1. VISUAL INSPECTION: CONDUCT VISUAL INSPECTION PRIOR TO TESTING.
a. INSPECTION SHALL BE BASED ON COMPLETED RECORD DRAWINGS AND SYSTEM DOCUMENTATION THAT IS REQUIRED BY NFPA 72 IN ITS "COMPLETION DOCUMENTS, PREPARATION" TABLE IN THE "DOCUMENTATION" SECTION OF THE "FUNDAMENTALS" CHAPTER.
b. COMPLY WITH THE "VISUAL INSPECTION FREQUENCIES" TABLE IN THE "INSPECTION" SECTION OF THE "INSPECTION, TESTING AND MAINTENANCE" CHAPTER IN NFPA 72; RETAIN THE "INITIAL/REACCEPTANCE" COLUMN AND LIST ONLY THE INSTALLED COMPONENTS.
2. SYSTEM TESTING: COMPLY WITH THE "TEST METHODS" TABLE IN THE "TESTING" SECTION OF THE "INSPECTION, TESTING AND MAINTENANCE" CHAPTER IN NFPA 72.
3. TEST AUDIBLE APPLIANCES FOR THE PUBLIC OPERATING MODE ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS. PERFORM THE TEST USING A PORTABLE SOUND-LEVEL METER COMPLYING WITH TYPE 2 REQUIREMENTS IN ANSI S1.4.
4. TEST AUDIBLE APPLIANCES FOR THE PRIVATE OPERATING MODE ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.
5. TEST VISIBLE APPLIANCES FOR THE PUBLIC OPERATING MODE ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.
6. FACTORY-AUTHORIZED SERVICE REPRESENTATIVE SHALL PREPARE THE "FIRE ALARM SYSTEM RECORD OF COMPLETION" IN THE "DOCUMENTATION" SECTION OF THE "FUNDAMENTALS" CHAPTER IN NFPA 72 AND THE "INSPECTION AND TESTING FORM" IN THE "RECORDS" SECTION OF THE "INSPECTION, TESTING AND MAINTENANCE" CHAPTER IN NFPA 72.
C. REACCEPTANCE TESTING: PERFORM REACCEPTANCE TESTING TO VERIFY THE PROPER OPERATION OF ADDED OR REPLACED DEVICES AND APPLIANCES.
D. FIRE-ALARM SYSTEM WILL BE CONSIDERED DEFECTIVE IF IT DOES NOT PASS TESTS AND INSPECTIONS.

3.6 DEMONSTRATION
A. TRAIN OWNER'S MAINTENANCE PERSONNEL TO ADJUST, OPERATE, AND MAINTAIN FIRE-ALARM SYSTEM.

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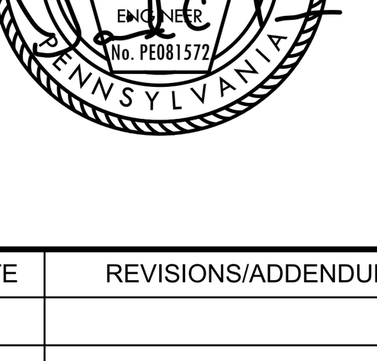
PROJECT NAME
CCAC WEST HILLS CENTER - UPS AND GENERATOR UPGRADES
1000 McKee Road
Oakdale, PA 15071-1099
CCAC Project #13-CO-003n5a

SEAL



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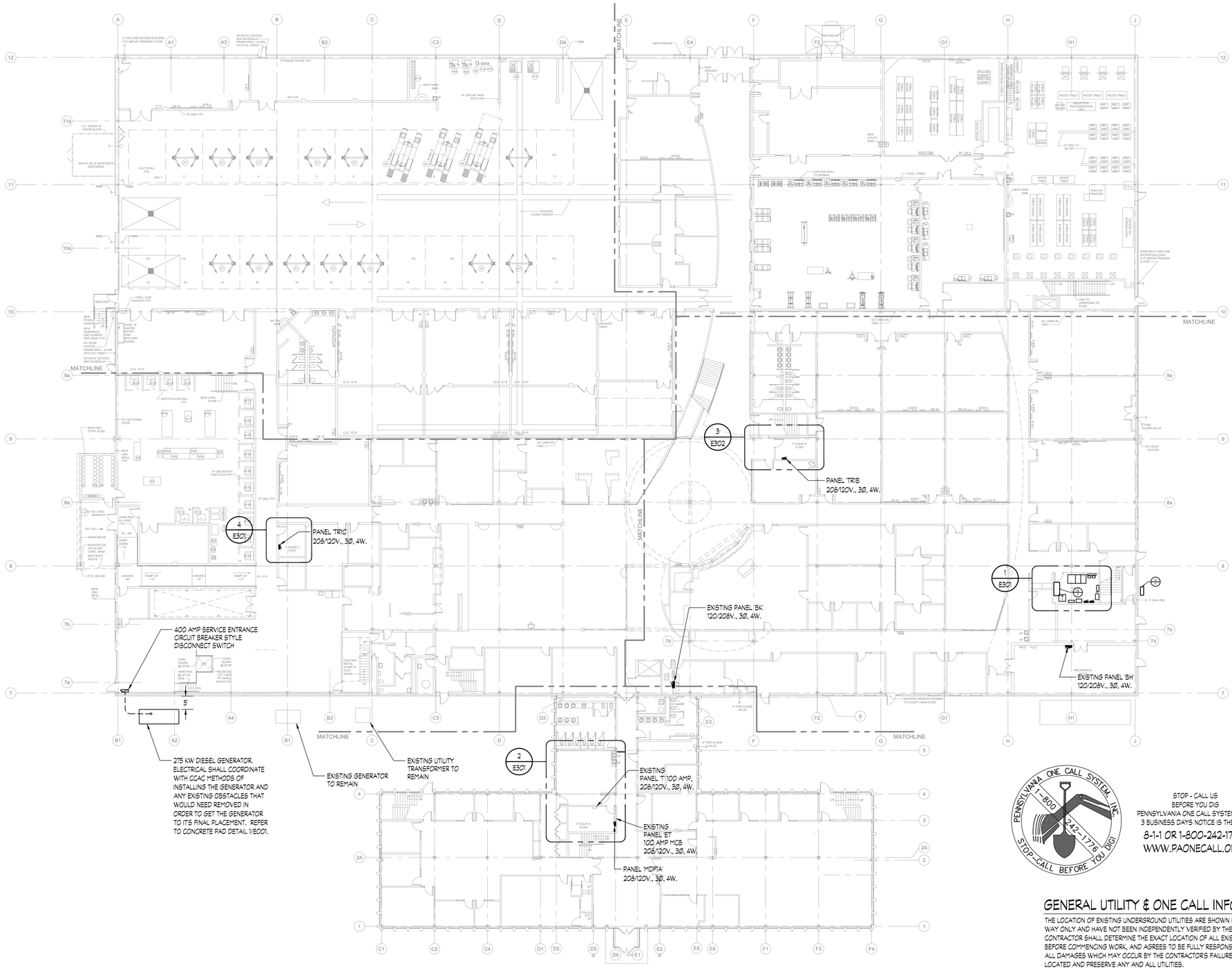
DRAWING TITLE
ELECTRICAL SPECIFICATIONS

DRAWING NUMBER
E004

PROJECT NUMBER: 1841063



1 E201 FIRST FLOOR ELECTRICAL PLAN
1/16" = 1'-0"

PENNSYLVANIA ONE CALL SYSTEM, INC. 1-800-242-1776 STOP-CALL BEFORE YOU DIG!

STOP - CALL US
BEFORE YOU DIG
PENNSYLVANIA ONE CALL SYSTEMS, INC.
3 BUSINESS DAYS NOTICE IS THE LAW!
8-1-1 OR 1-800-242-1776
WWW.PAONECALL.ORG

GENERAL UTILITY & ONE CALL INFORMATION:

THE LOCATION OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE USING AGENCY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MAY OCCUR BY THE CONTRACTORS FAILURE TO EXACTLY LOCATED AND PRESERVE ANY AND ALL UTILITIES.

CONTRACTOR SHALL NOTIFY THE PA ONE CALL SYSTEM NOT LESS THAN THREE (3) DAYS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL PLACE THE CALL AND PROVIDE AN APPROXIMATE DATE AND TIME THAT DIGGING WILL OCCUR. THE ONE CALL SYSTEM WILL THEN NOTIFY THE PUBLIC AND PRIVATE UTILITIES IN THE AREA. PUBLIC AND PRIVATE UTILITIES WILL THEN COORDINATE DIRECTLY WITH THE CONTRACTOR FOR ACTUAL FIELD LOCATIONS.

PA ONE CALL SYSTEM PHONE: 8-1-1 OR 1-800-242-1776.

ALL EARTH/ASPHALT MATERIAL THAT IS LEFTOVER FROM TRENCHING OR FROM GENERATOR PAD AND CONSTRUCTION, SHALL BE REMOVED OFF SITE IN A MANNER THAT MEETS EPA AND LOCAL JURISDICTION REQUIREMENTS BY THE ELECTRICAL CONTRACTOR. METHOD OF REMOVAL SHALL BE DISCUSSED AND APPROVED WITH CCAC WEST HILLS CENTER CAMPUS PRIOR TO REMOVAL.

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PROJECT NAME

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1000 McKee Road
Oakdale, PA 15071-1099

CCAC Project #13-CO-003n5a

SEAL

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL DAVID C. PRICE ENGINEER

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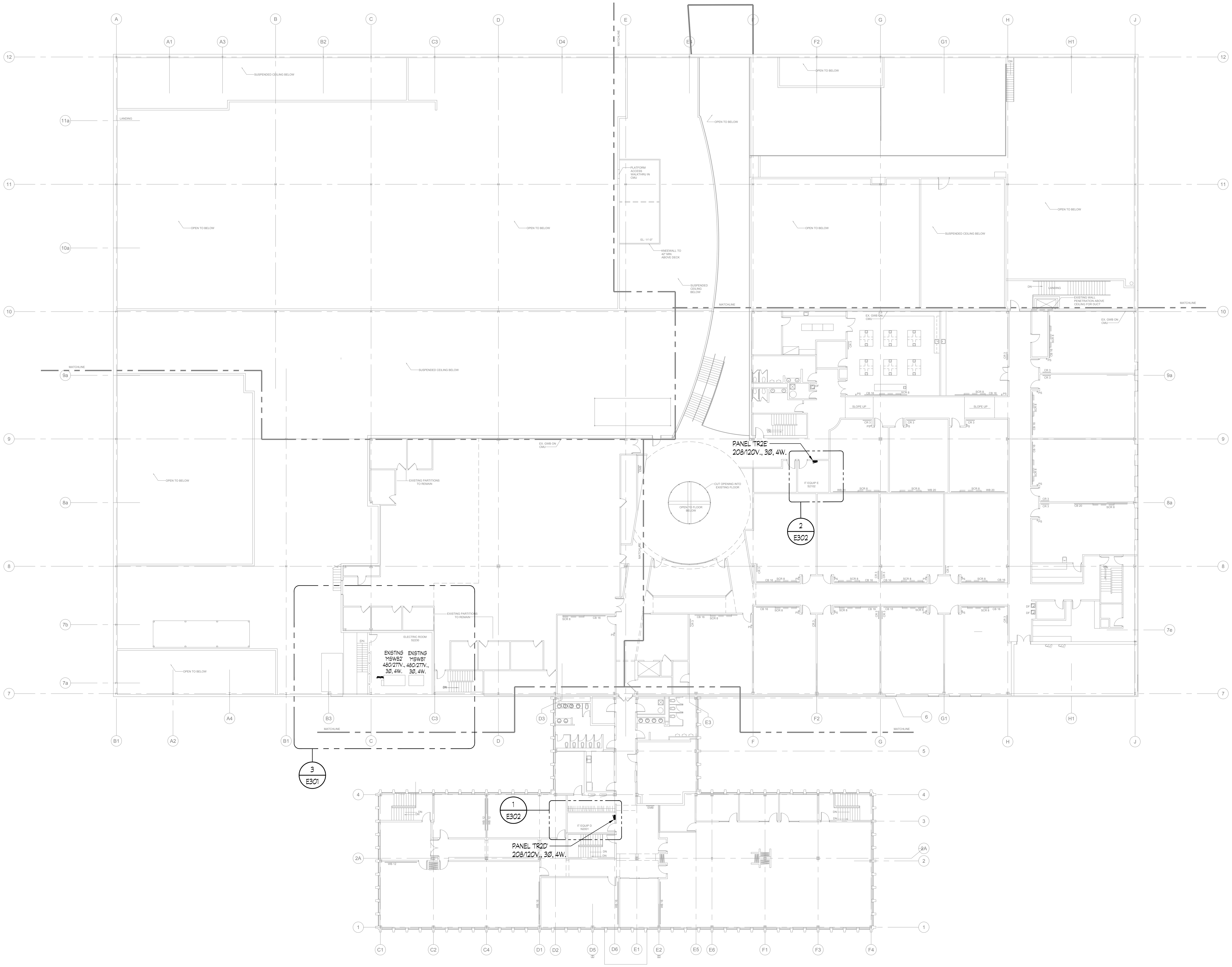
DRAWING TITLE
FIRST FLOOR
ELECTRICAL PLAN

DRAWING NUMBER
E201

PROJECT NUMBER: 1841063



1 SECOND FLOOR ELECTRICAL PLAN

E202 1/16" = 1'-0"

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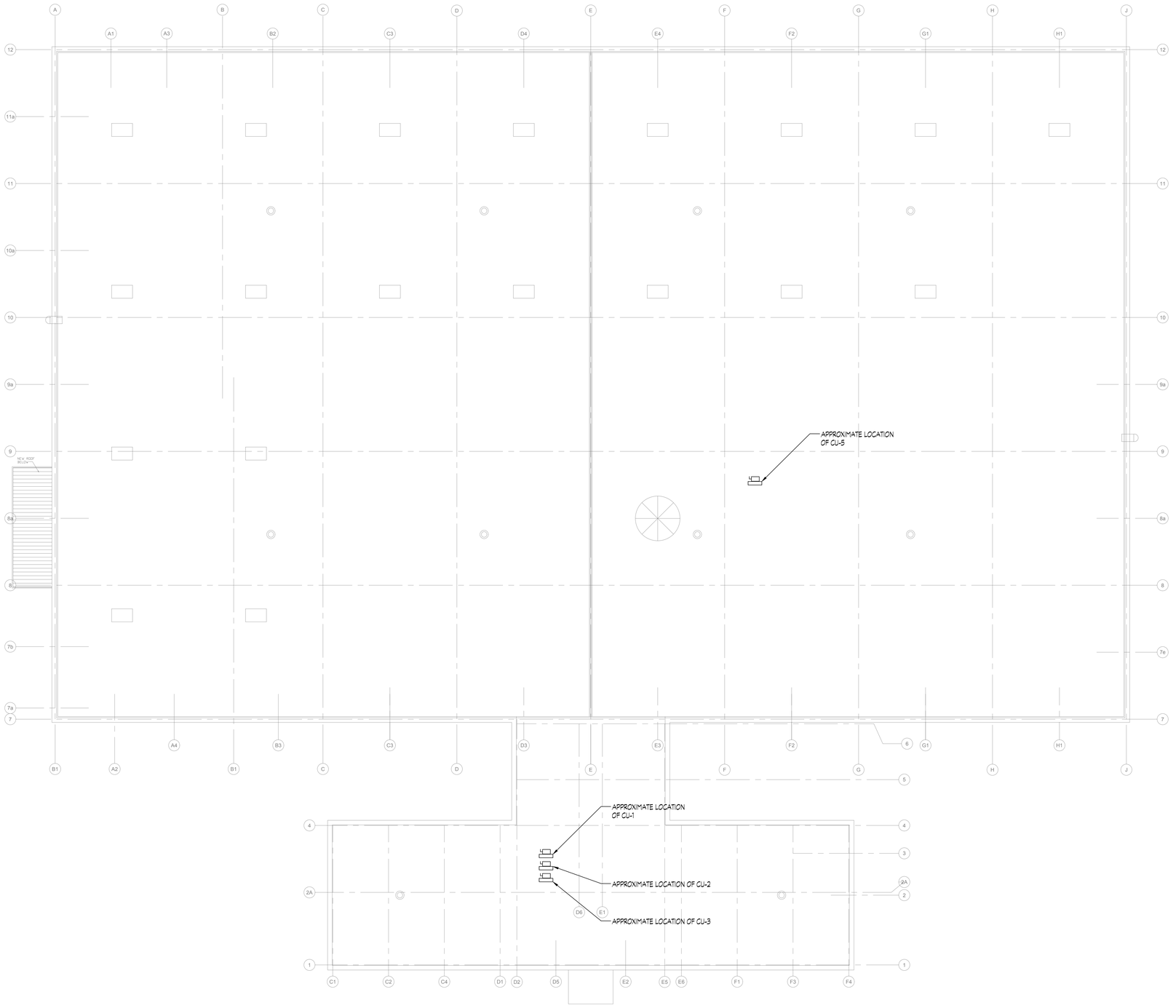
SECOND FLOOR ELECTRICAL PLAN

DRAWING NUMBER

E202

PROJECT NUMBER: 1841063



1 E203 ROOF ELECTRICAL PLAN
1/16" = 1'-0"

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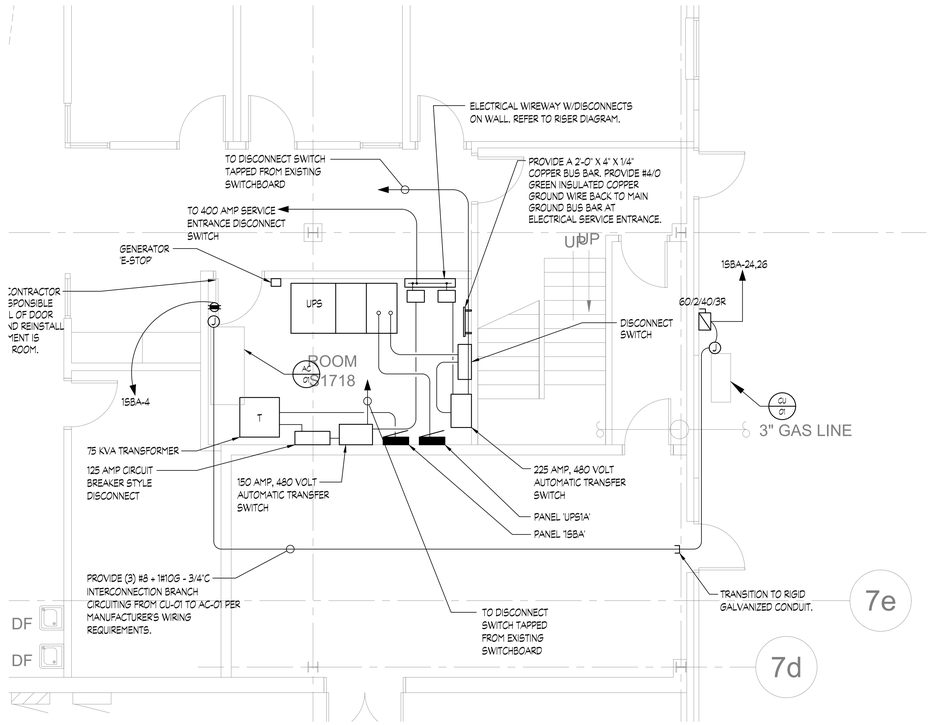
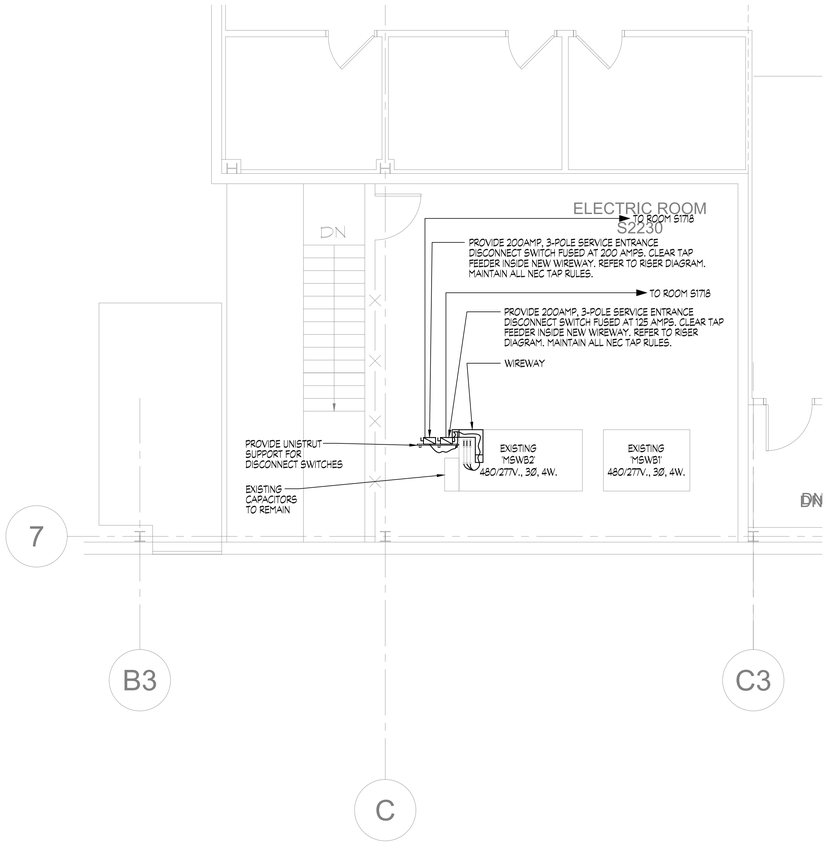
ROOF ELECTRICAL PLAN

DRAWING NUMBER
E203

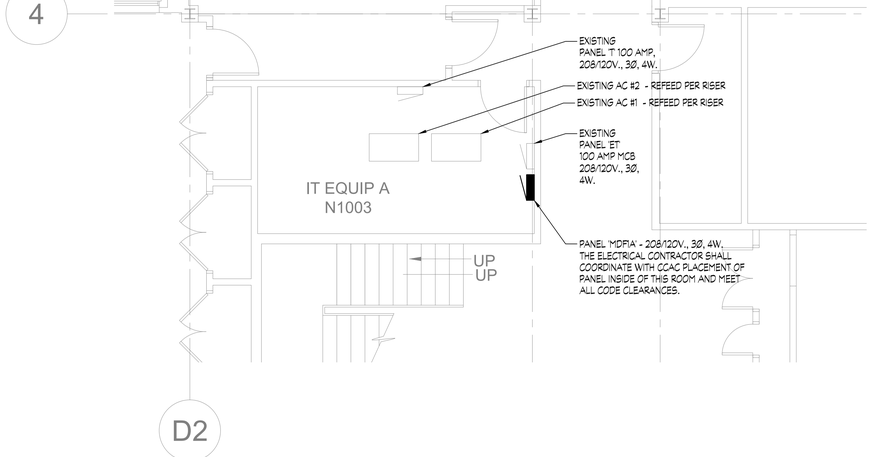
PROJECT NUMBER: 1841063



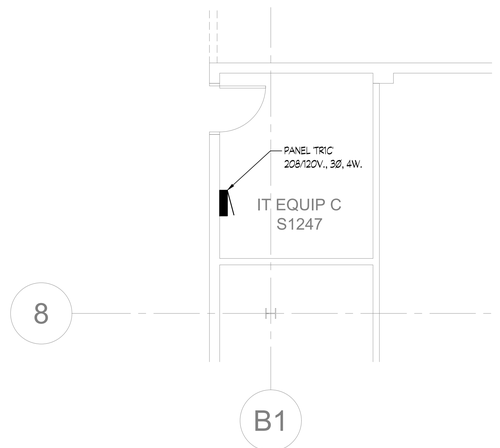
1 E301 PARTIAL FIRST FLOOR ENLARGED ELECTRICAL PLAN - ELECTRICAL ROOM S1718
1/4" = 1'-0"



3 E301 PARTIAL FIRST FLOOR ENLARGED ELECTRICAL PLAN - ELECTRICAL ROOM S2230
1/4" = 1'-0"



2 E301 PARTIAL FIRST FLOOR ENLARGED ELECTRICAL PLAN - IT EQUIP A N1003
1/4" = 1'-0"



4 E301 PARTIAL FIRST FLOOR ENLARGED ELECTRICAL PLAN - IT EQUIP C S1247
1/4" = 1'-0"

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CCAC Project #13-CO-003n5a

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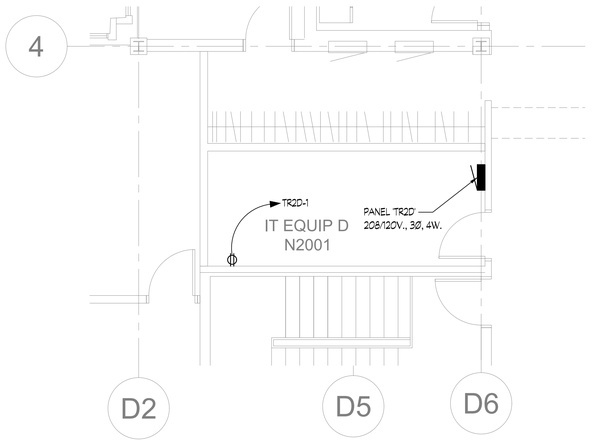
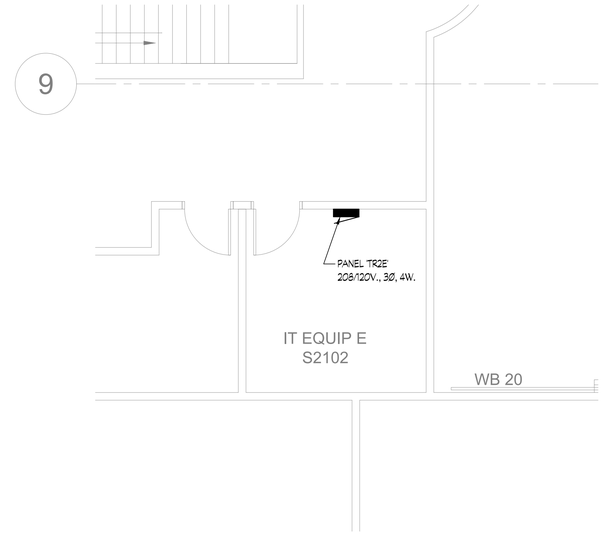
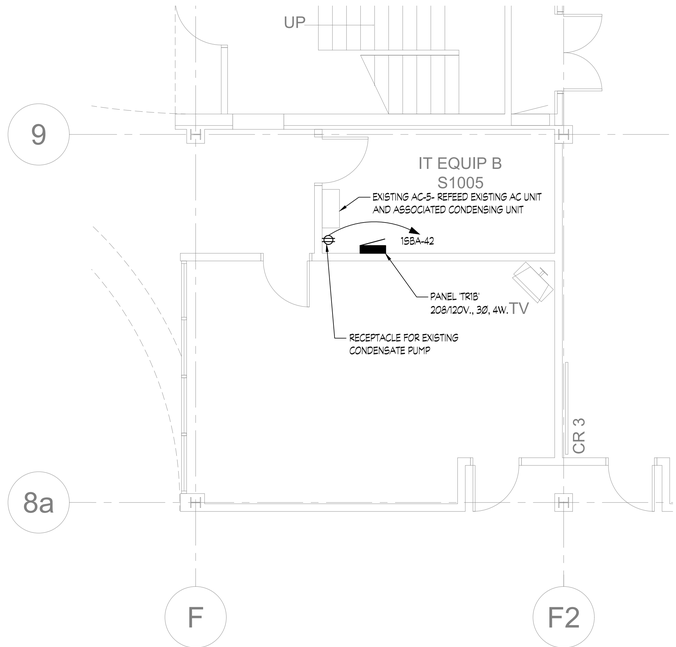


1 E302 PARTIAL SECOND FLOOR ENLARGED ELECTRICAL PLAN - IT EQUIP D N2001
1/4" = 1'-0"



2 E302 PARTIAL SECOND FLOOR ENLARGED ELECTRICAL PLAN - IT EQUIP E S2102
1/4" = 1'-0"



3 E302 PARTIAL FIRST FLOOR ENLARGED ELECTRICAL PLAN - IT EQUIP B S1005
1/4" = 1'-0"

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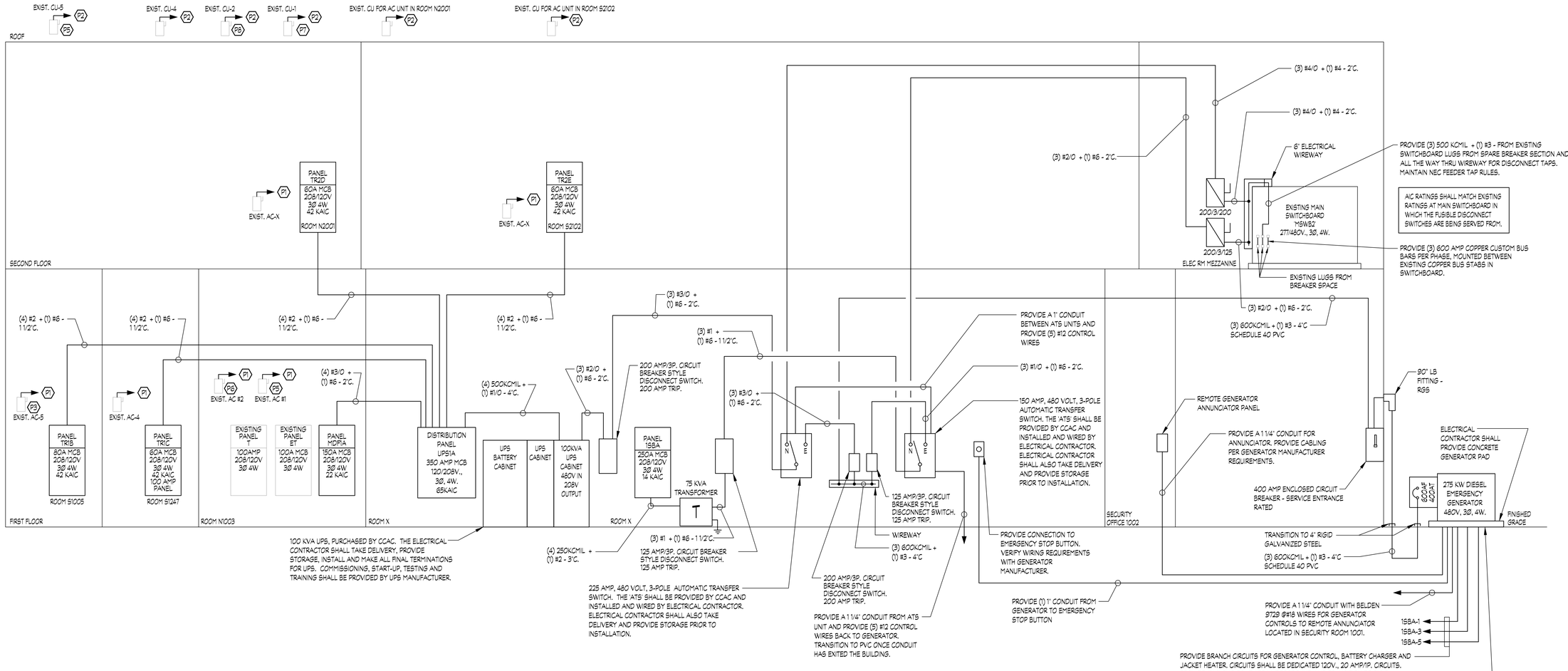
DRAWING NUMBER
E302

PROJECT NUMBER: 1841063



1 E501 ELECTRICAL RISER DIAGRAM
NTS

POWER RISER CODED NOTES: (P#)

P1. ELECTRICAL CONTRACTOR SHALL DISCONNECT EXISTING BRANCH CIRCUITING SERVING EXISTING AC UNIT AND REMOVE BACK TO POINT OF ORIGIN. PROVIDE NEW BRANCH CIRCUIT FROM PANEL '1SBA' AND TERMINATE AT AC UNIT DISCONNECTING MEANS. ELECTRICAL CONTRACTOR SHALL VERIFY EXISTING BRANCH CIRCUIT BREAKER SERVING THIS AC UNIT AND PROVIDE MATCHING BREAKER INSIDE OF PANEL 1SBA. ELECTRICAL CONTRACTOR SHALL VERIFY ROUTINGS FOR BRANCH CIRCUITING AND PROVIDE THE COLLEGE WITH A PLAN FOR REVIEW AND SCHEDULING TO RUN THE BRANCH CIRCUITS. PROVIDE CORE DRILLS WHERE REQUIRED FOR TRAVELING VERTICALLY THROUGH FLOORS. FIRE SEAL ALL PENETRATIONS THROUGH FLOORS AND FIRE RATED WALLS. ELECTRICAL CONTRACTOR SHALL VERIFY LOCATIONS OF ALL CONDENSING AND AC UNITS. REFER TO PANEL SCHEDULE FOR BREAKER AND WIRE SIZE.

P2. ELECTRICAL CONTRACTOR SHALL DISCONNECT EXISTING BRANCH CIRCUITING SERVING EXISTING CONDENSING UNIT AND REMOVE BACK TO POINT OF ORIGIN. PROVIDE NEW BRANCH CIRCUIT FROM PANEL '1SBA' AND TERMINATE AT CONDENSING UNIT DISCONNECTING MEANS. ELECTRICAL CONTRACTOR SHALL VERIFY EXISTING BRANCH CIRCUIT BREAKER SERVING THIS AC UNIT AND PROVIDE MATCHING BREAKER INSIDE OF PANEL 1SBA. ELECTRICAL CONTRACTOR SHALL VERIFY ROUTINGS FOR ALL BRANCH CIRCUITING AND PROVIDE THE COLLEGE WITH A PLAN FOR REVIEW AND SCHEDULING TO RUN THE BRANCH CIRCUITS. PROVIDE CORE DRILLS WHERE REQUIRED FOR TRAVELING VERTICALLY THROUGH FLOORS. FIRE SEAL ALL PENETRATIONS THROUGH FLOORS AND FIRE RATED WALLS. ELECTRICAL CONTRACTOR SHALL VERIFY LOCATIONS OF ALL CONDENSING AND AC UNITS. REFER TO PANEL SCHEDULE FOR BREAKER AND WIRE SIZE.

P3. CURRENTLY FED FROM PANEL 'BK', CIRCUIT NUMBER #22,24.

P4. CURRENTLY FED FROM PANEL 'BH', CIRCUIT NUMBER #10,12.

P5. CURRENTLY FED FROM PANEL 'ET', CIRCUIT NUMBER #1,3.

P6. CURRENTLY FED FROM PANEL 'ET', CIRCUIT NUMBER #5,7.

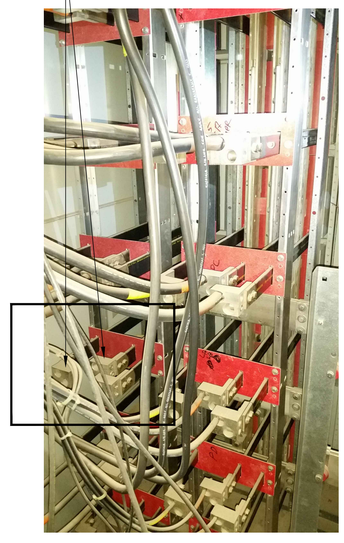
P7. CURRENTLY FED FROM PANEL 'EM', CIRCUIT NUMBER #10,12.

P8. CURRENTLY FED FROM PANEL 'EM', CIRCUIT NUMBER #14,16.

GENERAL NOTE:

THE SHUTDOWN OF THE EXISTING ELECTRICAL SERVICE BY THE UTILITY COMPANY TO WORK ON THE EXISTING SWITCHBOARD AND RE-ENERGIZING THE UTILITY TRANSFORMER FOR FINAL COMPLETION AND INSPECTION, SHALL BE COORDINATED WITH CCAC A MINIMUM OF 30 DAYS PRIOR TO TRANSFORMER SHUTDOWN.

2 E501 EXISTING SWITCHBOARD SPARE BUCKET/BUS STABS
NTS



3 E501 EXISTING INTERIOR SWITCHBOARD LUGS
NTS

4 E501 EXISTING SWITCHBOARD SPARE BUCKET/BUS STABS
NTS

5 E501 EXISTING SWITCHBOARD
NTS

Allen & Shariff
DESIGN | BUILD | MANAGE
Allen & Shariff Engineering, LLC
700 River Avenue, Suite 600
Pittsburgh, PA 15212
Tel: 412.322.9280

PROJECT NAME

CCAC WEST HILLS CENTER - UPS AND GENERATOR UPGRADES

1000 McKee Road
Oakdale, PA 15071-1099

CCAC Project #13-CO-003n5a

SEAL

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DAVID C. PRICE
No. PE051137

NO.	DATE	REVISIONS/ADDENDUMS

DESIGNED:	MWM
DRAWN:	MWM
CHECKED:	DEB
DATE:	10-25-2018
SCALE:	AS SHOWN

DRAWING TITLE
ELECTRICAL RISER DIAGRAMS

DRAWING NUMBER
E501

PROJECT NUMBER: 1841063

Branch Panel: UPS1A

Location: ROOM S1718 | **Volts:** 208/120V | **A.I.C. Rating:** 65 KAIC
Supply From: | **Phases:** 3 | **Mains Type:** MCB
Mounting: Surface | **Wires:** 4 | **Mains Rating:** 400
Enclosure: Type 1 | **MCB Rating:** 350

CKT	Circuit Description	Wire Size	Trip	Pole	LOAD (VA) A	LOAD (VA) B	LOAD (VA) C	Pole	Trip	Wire Size	Circuit Description	CKT
1	SPARE		20	1				1	20		SPARE	2
3	SPARE		20	1				1	20		SPARE	4
5	SPARE		20	1				1	20		SPARE	6
7	SPARE		20	1				3	40		SPARE	8
9	SPARE		20	1								10
11	SPARE		20	1								12
13	SPARE		20	1				3	50		SPARE	14
15	SPARE		20	1								16
17	SPARE		20	1								18
19	SPARE		20	1				3	60		SPARE	20
21	SPARE		20	1								22
23	SPARE		20	1								24
25	PANEL TR1C	SEE RISER DIAGRAM	60	3				3	60	SEE RISER DIAGRAM	TR2E	26
27												28
29												30
31	PANEL TR1B	SEE RISER DIAGRAM	80	3				3	60	SEE RISER DIAGRAM	TR2D	32
33												34
35												36
37	SPARE		50	3				3	150	SEE RISER DIAGRAM		38
39											PANEL MDF1A	40
41												42
		Total Load:			0	0	0					
		Amps:			0.0	0.0	0.0					

NOTES:

Branch Panel: TR1B

Location: ROOM S1005 | **Volts:** 208/120V | **A.I.C. Rating:** 42 KAIC
Supply From: UPS1A | **Phases:** 3 | **Mains Type:** MCB
Mounting: Surface | **Wires:** 4 | **Mains Rating:** 100
Enclosure: Type 1 | **MCB Rating:** 80

CKT	Circuit Description	Wire Size	Trip	Pole	LOAD (VA) A	LOAD (VA) B	LOAD (VA) C	Pole	Trip	Wire Size	Circuit Description	CKT
1	SPARE		20	1				1	20		SPARE	2
3	SPARE		20	1				1	20		SPARE	4
5	SPARE		20	1				1	20		SPARE	6
7	SPARE		20	1				1	20		SPARE	8
9	SPARE		20	1				1	20		SPARE	10
11	SPARE		30	2				1	20		SPARE	12
13								1	20		SPARE	14
15	SPARE		30	2				2	30		SPARE	16
17												18
19	SPARE		30	2				2	30		SPARE	20
21												22
23	SPARE		30	2				2	30		SPARE	24
25												26
27	SPARE		30	2				2	30		SPARE	28
29												30
31	SPARE		30	2				2	30		SPARE	32
33												34
35	SPARE		20	2				2	30		SPARE	36
37												38
39	SPARE		20	2				2	20		SPARE	40
41												42
		Total Load:			0	0	0					
		Amps:			0.0	0.0	0.0					

NOTES:

Branch Panel: TR2E

Location: ROOM S2102 | **Volts:** 208/120V | **A.I.C. Rating:** 42 KAIC
Supply From: UPS1A | **Phases:** 3 | **Mains Type:** MCB
Mounting: Surface | **Wires:** 4 | **Mains Rating:** 100
Enclosure: Type 1 | **MCB Rating:** 60

CKT	Circuit Description	Wire Size	Trip	Pole	LOAD (VA) A	LOAD (VA) B	LOAD (VA) C	Pole	Trip	Wire Size	Circuit Description	CKT
1	SPARE		20	1				1	20		SPARE	2
3	SPARE		20	1				1	20		SPARE	4
5	SPARE		20	1				1	20		SPARE	6
7	SPARE		20	1				1	20		SPARE	8
9	SPARE		20	1				1	20		SPARE	10
11	SPARE		20	1				1	20		SPARE	12
13	SPARE		20	1				1	20		SPARE	14
15	SPARE		30	2				2	30		SPARE	16
17												18
19	SPARE		30	2				2	30		SPARE	20
21												22
23	SPARE		30	2				2	30		SPARE	24
25												26
27	SPARE		20	2				2	20		SPARE	28
29												30
31	SPARE		20	2				2	30		SPARE	32
33												34
35	SPARE		20	2				2	20		SPARE	36
37												38
39	SPARE		20	2				2	20		SPARE	40
41												42
		Total Load:			0	0	0					
		Amps:			0.0	0.0	0.0					

NOTES:

Branch Panel: MDF1A

Location: IT EQUIP A N1003 | **Volts:** 208/120V | **A.I.C. Rating:** 22 KAIC
Supply From: UPS1A | **Phases:** 3 | **Mains Type:** MCB
Mounting: Surface | **Wires:** 4 | **Mains Rating:** 150
Enclosure: Type 1 | **MCB Rating:** 150

CKT	Circuit Description	Wire Size	Trip	Pole	LOAD (VA) A	LOAD (VA) B	LOAD (VA) C	Pole	Trip	Wire Size	Circuit Description	CKT
1	SPARE		15	2				2	15		SPARE	2
3												4
5	SPARE		15	2				2	30		SPARE	6
7												8
9	SPARE		20	2				2	20		SPARE	10
11												12
13	SPARE		30	2				2	30		SPARE	14
15												16
17	SPARE		30	2				2	30		SPARE	18
19												20
21	SPARE		30	2				2	30		SPARE	22
23												24
25	SPARE		30	1				1	30		SPARE	26
27	SPARE		30	1				1	30		SPARE	28
29	SPARE		20	1				1	20		SPARE	30
31	SPARE		20	1				1	20		SPARE	32
33	SPARE		20	1				1	20		SPARE	34
35	SPARE		20	1				1	20		SPARE	36
37	SPARE		20	1				1	20		SPARE	38
39	SPARE		30	2				2	30		SPARE	40
41												42
		Total Load:			0	0	0					
		Amps:			0.0	0.0	0.0					

NOTES:

Branch Panel: TR1C

Location: ROOM S1247 | **Volts:** 208/120V | **A.I.C. Rating:** 42 KAIC
Supply From: UPS1A | **Phases:** 3 | **Mains Type:** MCB
Mounting: Surface | **Wires:** 4 | **Mains Rating:** 100
Enclosure: Type 1 | **MCB Rating:** 60

CKT	Circuit Description	Wire Size	Trip	Pole	LOAD (VA) A	LOAD (VA) B	LOAD (VA) C	Pole	Trip	Wire Size	Circuit Description	CKT
1	SPARE		20	1				1	20		SPARE	2
3	SPARE		20	1				1	20		SPARE	4
5	SPARE		20	1				1	20		SPARE	6
7	SPARE		20	1				1	20		SPARE	8
9	SPARE		20	1				1	20		SPARE	10
11	SPARE		20	1				1	20		SPARE	12
13	SPARE		20	1				1	20		SPARE	14
15	SPARE		20	1				1	20		SPARE	16
17	SPARE		20	1				1	20		SPARE	18
19	SPARE		20	1				1	20		SPARE	20
21	SPARE		20	1				1	20		SPARE	22
23	SPARE		30	2				2	30		SPARE	24
25												26
27	SPARE		30	2				2	30		SPARE	28
29												30
31	SPARE		30	2				2	30		SPARE	32
33												34
35	SPARE		20	2				2	30		SPARE	36
37												38
39	SPARE		20	2				2	20		SPARE	40
41												42
		Total Load:			0	0	0					
		Amps:			0.0	0.0	0.0					

NOTES:

Branch Panel: 1SBA

Location: ROOM S1718 | **Volts:** 208/120V | **A.I.C. Rating:** 14 KAIC
Supply From: | **Phases:** 3 | **Mains Type:** MCB
Mounting: Surface | **Wires:** 4 | **Mains Rating:** 250
Enclosure: Type 1 | **MCB Rating:** 250

CKT	Circuit Description	Wire Size	Trip	Pole	LOAD (VA) A	LOAD (VA) B	LOAD (VA) C	Pole	Trip	Wire Size	Circuit Description	CKT
1	GENERATOR BATT CHARGER	2#8 + 1#10G - 3/4"C	20	1	1000	1000		1	20	2#10 + 1#10G-3/4"C	GENERATOR ANNUNC PANEL	2
3	GENERATOR JACKET HTR	2#8 + 1#10G - 3/4"C	20	1			1000 500	1	20	2#12 + 1#12G - 3/4"C	AC-01 CONDENSATE PUMP	4
5	GENERATOR CONTROLS	2#8 + 1#10G - 3/4"C	20	1			500	1	20		SPARE	6
7	SPARE		20	1	250			2	20	3#6 + 1#10G - 3/4"C	AC-6 EVAP ROOM S2102	8
9	SPARE		100	3		250						10
11							750	2	20	3#6 + 1#10G - 3/4"C	CU-6 ON ROOF	12
13					750						(HACR)	14
15	EXISTING CU #1 ON ROOF	3#6 + 1#10G - 1"C	25	2		2250	750	2	20	3#6 + 1#10G - 3/4"C	CU-7 ON ROOF	16
17	(HACR)						2250 750				(HACR)	18
19	EXISTING AC#1	3#6 + 1#10G - 3/4"C	20	2	2250	2250		2	20	3#6 + 1#10G - 3/4"C	AC-7 EVAP ROOM N2001	20
21	(HACR) ROOM N1003					2250	2250					22
23	EXISTING AC#2	3#6 + 1#10G - 1"C	20	2			2250 2700	2	40	3#8 + 1#10G - 3/4"C	CU-01 EXTERIOR	24
25	(HACR) ROOM N1003				2250	2700					AC UNIT (HACR) ROOM S1718	26
27	EXISTING CU #2 ON ROOF	3#6 + 1#10G - 1"C	25	2		2000	2000	2	30	3#4 + 1#10G - 3/4"C	CU-X ROOF XXX	28
29	(HACR)						2000 2000				CU UNIT (HACR)	30
31	EXISTING AC-4	3#4 + 1#8G - 3/4"C	20	2	2000	5000		2	20	3#6 + 1#6 - 1"C	CU-5 ROOF	32
33	(HACR) ROOM S1247						5000				(HACR)	34
35	EXISTING CU #4 ON ROOF	3#4 + 1#8G - 3/4"C	20	2			2000 5000	1	20		SPARE	36
37	(HACR)SERVES AC IN RM S1247				2000	1000		2	20	2#10 + 1#10G - 3/4"C	AC-5 ROOM S1005	38
39	SPARE		35	2			1000				(HACR)	40
41							500	1	20	2#10 + 1#10G - 3/4"C	COND. PUMP REC RM S1005	42
43	SPARE		20	1				1	20		SPARE	44
45	SPARE		20	1				1	20		SPARE	46
47	SPARE		20	1				1	20		SPARE	48
49	SPARE		20	1				1	20		SPARE	50
51	SPARE		20	1				1	20		SPARE	52
53	SPARE		20	1				1	20		SPARE	54
		Total Load:			22450	19250	20700					
		Amps:			186.9	160.3	172.4					

NOTES:

Branch Panel: TR2D

Location: ROOM N2001 | **Volts:** 208/120V | **A.I.C. Rating:** 42 KAIC
Supply From: UPS1A | **Phases:** 3 | **Mains Type:** MCB
Mounting: Surface | **Wires:** 4 | **Mains Rating:** 100
Enclosure: Type 1 | **MCB Rating:** 60

CKT	Circuit Description	Wire Size	Trip	Pole	LOAD (VA) A	LOAD (VA) B	LOAD (VA) C	Pole	Trip	Wire Size	Circuit Description	CKT
1	CONDENSATE PUMP	2#12 + 1#12G - 3/4"C	20	1	250			1	20		SPARE	2
3	SPARE		20	1				1	20		SPARE	4
5	SPARE		20	1				1	20		SPARE	6
7	SPARE		20	1				1	20		SPARE	8
9	SPARE		20	1				1	20		SPARE	10
11	SPARE		20	1				1	20		SPARE	12
13	SPARE		20	1				1	20		SPARE	14
15	SPARE		30	2				2	30		SPARE	16
17												18
19	SPARE		30	2				2	30		SPARE	20
21												22
23	SPARE		30	2				2	30		SPARE	24
25												26
27	SPARE		30	2				2	20		SPARE	28
29												30
31	SPARE		20	2				2	30		SPARE	32
33												34
35	SPARE		20	2				2	20		SPARE	36
37												38
39	SPARE		20	2				2	20		SPARE	40
41												42
		Total Load:			250	0	0					
		Amps:			2.1	0.0	0.0					

NOTES:

Allen & Shariff
DESIGN | BUILD | MANAGE
Allen & Shariff Engineering, LLC
700 River Avenue, Suite 600
Pittsburgh, PA 15212
Tel: 412.322.9280

PROJECT NAME

CCAC WEST HILLS CENTER - UPS AND GENERATOR UPGRADES

1000 McKee Road
Oakdale, PA 15071-1099

CCAC Project #13-CO-003n5a

SEAL

NO.	DATE	REVISIONS/ADDENDUMS

DESIGNED:	MWM
DRAWN:	MWM
CHECKED:	DEB
DATE:	10-25-2018
SCALE:	AS SHOWN

DRAWING TITLE

ELECTRICAL SCHEDULES

DRAWING NUMBER

E601

PROJECT NUMBER: 1841063

HVAC SPECIFICATIONS

GENERAL INFORMATION

A. GENERAL

1. CONFORM TO ALL GENERAL AND SPECIAL CONDITIONS OF CONTRACT AS SPECIFIED BY ARCHITECT AND/OR OWNER.
2. SPECIFICATIONS ARE APPLICABLE TO ALL CONTRACTORS AND/OR SUBCONTRACTORS FOR MECHANICAL AND ELECTRICAL SYSTEMS. CHECK OTHER PLANS AND SPECIFICATIONS AND FULLY COORDINATE WITH OTHER TRADES, OWNER AND ARCHITECT REQUIREMENTS.
3. VISIT SITE, CHECK FACILITIES AND CONDITIONS MAKE ALL NECESSARY OBSERVATIONS, MEASUREMENTS, NOTE CONDITIONS UNDER WHICH WORK IS TO BE PERFORMED, AND TAKE ALL ITEMS INTO CONSIDERATION IN BID. CONTRACTORS ESTIMATING THIS WORK SHALL VISIT THE SITE AND FULLY INFORM THEMSELVES OF THE NATURE OF THE WORK AND CONDITIONS, AND OBTAIN ALL NECESSARY INFORMATION TO ESTIMATE AND EXECUTE THE WORK. FAILURE TO DO SO WILL IN NO WAY OBLIGATE THE OWNER FOR ANY OMISSIONS OR ERRORS RESULTING FROM SUCH NEGLIGENCE.
4. SYSTEMS ARE TO BE COMPLETE AND WORKABLE IN ALL RESPECTS, PLACED IN OPERATION AND PROPERLY ADJUSTED.
5. EACH CONTRACTOR SHALL PROVIDE FOR HIS OWN CLEAN-UP, REMOVAL AND LEGAL DISPOSAL OF ALL RUBBISH DAILY. CONTRACTOR SHALL PROTECT THEIR WORK AND EXISTING OR ADJACENT PROPERTY AGAINST WEATHER, TO MAINTAIN THEIR WORK, MATERIALS, APPARATUS AND FIXTURES FREE FROM INJURY OR DAMAGE. ANY WORK DAMAGED BY FAILURE TO PROVIDE PROTECTION REQUIRED, SHALL BE REMOVED AND REPLACED WITH NEW WORK AT THE CONTRACTOR'S EXPENSE.
6. ARRANGE FOR AND OBTAIN OWNER'S AND INSURANCE REPRESENTATIVE'S PERMISSION FOR ANY SERVICE SHUTDOWNS.
7. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, SEQUENCES OF CONSTRUCTION AND THE SAFETY OF WORKMEN. NO PIPING, DUCTWORK, CONTROLS, ETC., SHALL BE INSTALLED OR ROUTED ABOVE ELECTRICAL PANELS AND EQUIPMENT OR THROUGH ELEVATOR ROOMS.
8. THE CONTRACTOR SHALL COORDINATE AND OBTAIN A WRITTEN LISTING OF ELECTRICAL CHARACTERISTICS OF ALL MECHANICAL EQUIPMENT FROM ELECTRICAL CONTRACTOR PRIOR TO ORDERING OF EQUIPMENT. NO ADDITIONAL PAYMENT WILL BE MADE FOR LACK OF CONTRACTOR COORDINATION OF ELECTRICAL CHARACTERISTICS.
9. DURING THE BUILDING CONSTRUCTION SOME EXISTING INSTALLATION MAY BE EXPOSED THAT WILL HAVE TO BE CHANGED, ALTERED, REROUTED AND/OR ABANDONED. ANY SUCH WORK WHICH COMES UNDER THE JURISDICTION OF THIS CONTRACTOR SHALL BE DONE BY THIS CONTRACTOR WITHOUT EXTRA COST TO THE OWNER, AS THOUGH FULLY DETAILED ON PLANS AND/OR DESCRIBED IN THE SPECIFICATIONS.
10. WORK RELATED TO THE EXISTING BUILDING SHALL BE COORDINATED TO MINIMIZE INTERFERENCE OR INTERRUPTION OF NORMAL BUILDING USE BY OWNER. REFER TO ARCHITECTURAL PLANS FOR PHASING REQUIREMENTS.

B. CODES, PERMITS, STANDARDS AND REGULATIONS

1. CONFORM TO ALL APPLICABLE CODES (LOCAL, STATE, NATIONAL CODES, NFPA, OSHA, ETC.), GOVERNMENT REGULATIONS, UTILITY COMPANY REQUIREMENTS, AND APPLICABLE STANDARDS.
2. OBTAIN PERMITS AND PAY ALL FEES. ARRANGE FOR ALL REQUIRED INSPECTIONS AND APPROVALS.

C. RELATED WORK SPECIFIED ELSEWHERE

1. ELECTRIC POWER WIRING.
2. FIRESTOPPING

D. DRAWINGS

1. THE SYSTEMS AS SHOWN ON THE DRAWINGS ARE DIAGRAMMATIC. CONFIRM ALL DIMENSIONS BY FIELD MEASUREMENT.
2. THE EXACT LOCATIONS FOR APPARATUS, FIXTURES, EQUIPMENT AND PIPING WHICH IS NOT COVERED BY DRAWINGS, SHALL BE OBTAINED FROM THE ARCHITECT OR HIS REPRESENTATIVE IN THE FIELD, AND THE WORK SHALL BE LAID OUT ACCORDINGLY.
3. DRAWINGS AND SPECIFICATIONS ARE INTENDED TO SUPPLEMENT ONE ANOTHER. ANY MATERIALS OR LABOR CALLED FOR IN ONE BUT NOT THE OTHER SHALL BE FURNISHED AS IF BOTH WERE MENTIONED IN THE SPECIFICATIONS AND SHOWN ON THE DRAWINGS.

E. BASE EQUIPMENT, MATERIALS AND SUBSTITUTIONS

1. ALL EQUIPMENT AND MATERIALS SHALL BE NEW, FREE OF DEFECTS AND U.L. LABELED.
2. BASE BID MANUFACTURERS ARE LISTED IN SCHEDULE ON DRAWING. ANY OTHER MANUFACTURER IS CONSIDERED A SUBSTITUTION.
3. ALL PROPOSALS SHALL BE BASED ON "STANDARDS" SPECIFIED.
4. ALL EQUIPMENT SHALL BE INSTALLED IN FULL ACCORDANCE WITH THE MANUFACTURER'S DATA AND INSTALLATION INSTRUCTIONS. IT IS THIS CONTRACTOR'S RESPONSIBILITY TO CHECK AND CONFORM TO THESE REQUIREMENTS PRIOR TO STARTING WORK.

F. CHECK, TEST, START, ADJUST, BALANCE AND INSTRUCTIONS

1. AFTER INSTALLATION, CHECK ALL EQUIPMENT, AND PERFORM START UP IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
2. ALL PIPING SHALL BE TESTED AND FREE OF LEAKS.

G. CUTTING, PATCHING AND DRILLING

1. ALL CUTTING AND PATCHING OF THE BUILDING CONSTRUCTION REQUIRED FOR THIS WORK SHALL BE BY THIS CONTRACTOR UNLESS SHOWN ON ARCHITECTURAL DRAWINGS AND CONFIRMED AS TO SIZE AND LOCATION PRIOR TO NEW CONSTRUCTION. CUTTING SHALL BE IN A NEAT AND WORKMANLIKE MANNER.
2. NEATLY SAW CUT ALL RECTANGULAR OPENINGS, SET SLEEVE THROUGH OPENING, AND FINISH PATCH OR PROVIDE TRIM FLANGE AROUND OPENING.
3. CORE DRILL AND SLEEVE ALL ROUND OPENINGS. DO NOT CUT ANY STRUCTURAL COMPONENTS WITHOUT ARCHITECT'S APPROVAL.
4. PATCH AND FINISH TO MATCH ADJACENT AREAS THAT HAVE BEEN CUT, DAMAGED OR MODIFIED AS A RESULT OF THE INSTALLATION OF THE MECHANICAL OR ELECTRICAL EQUIPMENT. FIRE STOP ALL PENETRATIONS OF FIRE RATED CONSTRUCTION IN A CODE APPROVED MANNER.

H. WARRANTY

1. FULLY WARRANT ALL MATERIALS, EQUIPMENT AND WORKMANSHIP FOR ONE (1) YEAR FROM DATE OF ACCEPTANCE.
2. EXTEND ALL MANUFACTURER'S WARRANTIES TO OWNER, INCLUDING ALL EXTENDED WARRANTIES ON HVAC EQUIPMENT.

I. SHOP DRAWING SUBMITTALS

1. SUBMIT SHOP DRAWINGS FOR MECHANICAL EQUIPMENT, WITH ADEQUATE DETAILS AND SCALES TO CLEARLY SHOW CONSTRUCTION. INDICATE THE OPERATING CHARACTERISTICS FOR EACH REQUIRED ITEM. CLEARLY IDENTIFY EACH ITEM ON THE SUBMITTAL AS TO MARK, LOCATION AND USE, USING SAME IDENTIFICATION AS PROVIDED ON DESIGN DRAWINGS.

J. RECORD DRAWINGS

1. EACH CONTRACTOR OR SUBCONTRACTOR SHALL KEEP ONE (1) COMPLETE SET OF THE CONTRACT WORKING DRAWINGS ON THE JOB SITE ON WHICH HE SHALL REGULARLY RECORD ANY DEVIATIONS OR CHANGES FROM SUCH CONTRACT DRAWINGS MADE DURING CONSTRUCTION.
2. AFTER THE PROJECT IS COMPLETED, THESE SETS OF DRAWINGS SHALL BE DELIVERED TO THE ARCHITECT IN GOOD CONDITION, AS A PERMANENT RECORD OF THE INSTALLATION AS ACTUALLY CONSTRUCTED.

HEATING, VENTILATING AND AIR CONDITIONING

A. SCOPE

1. FURNISH ALL EQUIPMENT, MATERIALS, LABOR, TOOLS, ETC., FOR THE COMPLETE HVAC SYSTEM. INSTALL COMPLETE AND PLACE IN OPERATION.
2. HVAC SYSTEM ESSENTIALLY CONSISTS OF BUT NOT LIMITED TO THE FOLLOWING:
   a. BALANCING, TESTING AND START UP.
   b. TEMPERATURE CONTROLS.
   c. NEW UPS ROOM SPLIT A/C SYSTEM.
   d. OTHER ITEMS INDICATED ON DRAWINGS OR REQUIRED FOR COMPLETE INSTALLATION.
3. VERIFY EXACT CONDITIONS IN FIELD AND COORDINATE WITH THESE DRAWINGS AND OTHER TRADES BEFORE BEGINNING NEW WORK.
4. DETERMINE EXACT LOCATIONS FOR ALL NEW AND RELOCATED EQUIPMENT, PIPING, CONDUITS AND DUCTWORK IN FIELD.
5. COORDINATE WORK OF THIS CONTRACT WITH OTHER TRADES. CONFLICTS SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ARCHITECT. ARCHITECT'S RESOLUTION TO CONFLICTS SHALL BE FINAL.
6. ANY DISCREPANCIES BETWEEN WHAT IS SHOWN ON DRAWINGS OR SPECIFIED AND THE ACTUAL CONDITIONS IN THE FIELD SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ARCHITECT BEFORE PROCEEDING.
7. BUILDING AND SURFACES DAMAGED DURING INSTALLATION SHALL BE REPAIRED, REPLACED, AND/OR RESTORED TO ORIGINAL CONDITION AFTER COMPLETION OF WORK AND BEFORE ACCEPTANCE BY OWNER.
8. CONTRACTORS BIDDING THIS PROJECT SHALL VISIT THIS SITE AND FAMILIARIZE THEMSELVES WITH ALL CONDITIONS AFFECTING THEIR WORK. SUBMISSION OF A BID ON THIS PROJECT SHALL BE CONSTRUED AS HAVING SUCH KNOWLEDGE.

B. DUCTWORK

1. FABRICATE AND ERECT ALL DUCTWORK TO ASHRAE AND SMACNA STANDARDS FROM NO. 1 GALVANIZED STEEL. COMPLY WITH NFPA BULLETIN 90A REQUIREMENTS.
2. DUCTWORK SHALL BE SMACNA LOW PRESSURE CONSTRUCTION 2" STATIC PRESSURE RATING WITH SEAL CLASS B SEAMS AND JOINTS.
3. FLEXIBLE DUCTS SHALL BE INDEPENDENTLY SUPPORTED FROM THE STRUCTURE AND CONNECTED WITH PLASTIC DRAW BANDS TIGHTENED WITH MANUFACTURER'S TOOL. FLEXIBLE DUCTS SHALL BE LIMITED TO 72" STRAIGHT LENGTHS. FLEXIBLE DUCTS SHALL BE ATCO RUBBER TYPE 070, 1 1/2" INSULATION WITH VINYL VAPOR BARRIER JACKET AND RATED AT 10" W.C. FOR SIZES THROUGH 12", U.L. LISTED, AND MEET 25/50 FLAME AND SMOKE TEST. FLEXIBLE DUCTS ARE NOT PERMITTED IN ROOMS WITHOUT CEILINGS. EQUIVALENT BY VALUFLEX, FLEX-AIRE, FLEXIBLE TECHNOLOGIES, THERMAFLEX OR GENFLEX.

C. REFRIGERANT PIPING

1. INSTALL REFRIGERANT PIPING BETWEEN CONDENSING UNIT AND DX COIL. PIPING SHALL BE REFRIGERANT GRADE TYPE "L" COPPER WITH BRAZED JOINTS. PIPE PER MANUFACTURER'S PIPING DIAGRAMS AND RECOMMENDATIONS.
2. ISOLATE PIPING FROM STRUCTURE WITH ONE (1) INCH INSULATION BETWEEN ALL PIPING AND SUPPORT POINTS. INSULATE SUCTION LINES WITH 3/8" FOAM RUBBER ARMAFLEX INSULATION.
3. AFTER PIPING COMPLETION, PRESSURE TEST PIPING, PURGE AND EVACUATE SYSTEM TWICE AND CHARGE SYSTEM WITH REFRIGERANT AND OIL.
4. INSTALL PIPING IN AS SHORT AND DIRECT ARRANGEMENT AS POSSIBLE TO MINIMIZE PRESSURE DROP. PROVIDE OIL TRAP AS RECOMMENDED BY THE EQUIPMENT MANUFACTURER.

D. SPLIT SYSTEM AIR CONDITIONING AC UNIT

GENERAL
1.1 SYSTEM DESCRIPTION
THE AIR CONDITIONER SYSTEM SHALL BE A MITSUBISHI ELECTRIC SPLIT SYSTEM WITH VARIABLE SPEED INVERTER COMPRESSOR TECHNOLOGY. THE SYSTEM SHALL CONSIST OF A HORIZONTAL DISCHARGE, SINGLE PHASE OUTDOOR UNIT, A MATCHED CAPACITY INDOOR SECTION THAT SHALL BE EQUIPPED WITH A WIRED WALL MOUNTED, WIRELESS WALL MOUNTED AND/OR WIRELESS HAND HELD REMOTE CONTROLLER.
1.2 OUTDOOR UNIT CAPACITY
1.2.1 SEE SCHEDULE ON THE DRAWINGS.

WARRANTY
2.1 THE UNITS SHALL HAVE A MANUFACTURER'S PARTS AND DEFECTS WARRANTY FOR A PERIOD FIVE (5) YEAR FROM DATE OF INSTALLATION. THE COMPRESSOR SHALL HAVE A WARRANTY OF SEVEN (7) YEARS FROM DATE OF INSTALLATION.

OUTDOOR UNIT DESIGN:
3.1 THE OUTDOOR UNIT SHALL BE EQUIPPED WITH AN ELECTRONIC CONTROL BOARD THAT INTERFACES WITH THE INDOOR UNIT TO PERFORM ALL NECESSARY OPERATION FUNCTIONS.
3.2 THE OUTDOOR UNIT SHALL BE CAPABLE OF COOLING OPERATION DOWN TO 0°F (-18°C) AMBIENT TEMPERATURE WITHOUT ADDITIONAL LOW AMBIENT CONTROLS. WIND BAFFLE SHALL BE REQUIRED).
3.3 CABINET
3.2.1 THE CASING SHALL BE CONSTRUCTED FROM GALVANIZED STEEL PLATE, FINISHED WITH AN ELECTROSTATICALLY APPLIED, THERMALLY FUSED ACRYLIC OR POLYESTER POWDER COATING FOR CORROSION PROTECTION. MOUNTING FEET SHALL BE PROVIDED AND SHALL BE WELDED TO THE BASE OF THE CABINET AND BE OF SUFFICIENT SIZE TO AFFORD RELIABLE EQUIPMENT MOUNT AND STABILITY.
3.4 FAN
3.4.1 SINGLE DC FAN MOTOR. THE FAN BLADE(S) SHALL BE OF AERODYNAMIC DESIGN FOR QUIET OPERATION, AND THE FAN MOTOR BEARINGS SHALL BE PERMANENTLY LUBRICATE HORIZONTAL DISCHARGE AIRFLOW. THE FAN SHALL BE PROVIDED WITH A RAISED GUARD TO PREVENT EXTERNAL CONTACT WITH MOVING PARTS
3.5 COIL
3.5.1 THE L SHAPED CONDENSER COIL SHALL BE OF COPPER TUBING WITH FLAT ALUMINUM FINS. THE COIL SHALL BE PROTECTED WITH AN INTEGRAL METAL GUARD.
3.5.2 REFRIGERANT FLOW FROM THE CONDENSER SHALL BE CONTROLLED BY MEANS OF AN ELECTRONIC LINEAR EXPANSION VALVE (LEV) METERING DEVICE. THE LEV SHALL BE CONTROLLED BY A MICROPROCESSOR CONTROLLED STEP MOTOR.
3.5.3 ALL REFRIGERANT LINES BETWEEN OUTDOOR AND INDOOR UNITS SHALL BE OF ANNEALED, REFRIGERATION GRADE COPPER TUBING, ARC TYPE, MEETING ASTM B280 REQUIREMENTS, INDIVIDUALLY INSULATED IN TWIN-TUBE, FLEXIBLE CLOSED-CELL ELASTOMERIC INSULATION. PAINT WITH TWO COATS OF ENAMEL EXPOSED OUTDOOR INSULATION.
3.6 COMPRESSOR
3.6.1 DC TWIN-ROTOR ROTARY COMPRESSOR WITH VARIABLE SPEED INVERTER DRIVE TECHNOLOGY DRIVEN BY INVERTER CIRCUIT TO CONTROL COMPRESSOR SPEED. TO PREVENT LIQUID FROM ACCUMULATING IN THE COMPRESSOR DURING THE OFF CYCLE, A MINIMAL AMOUNT OF CURRENT SHALL BE AUTOMATICALLY, INTERMITTENTLY APPLIED TO THE COMPRESSOR MOTOR WINDINGS TO MAINTAIN SUFFICIENT HEAT TO VAPORIZE ANY REFRIGERANT. NO CRANKCASE HEATER IS TO BE USED.
3.6.2 THE OUTDOOR UNIT SHALL HAVE AN ACCUMULATOR AND HIGH PRESSURE SAFETY SWITCH. THE COMPRESSOR SHALL BE MOUNTED TO AVOID THE TRANSMISSION OF VIBRATION.
3.7 ELECTRICAL
3.7.1 THE ELECTRICAL POWER OF THE UNIT SHALL BE 208VOLTS OR 230 VOLTS, SINGLE PHASE, 60 HERTZ.
3.7.2 POWER FOR THE INDOOR UNIT SHALL BE SUPPLIED FROM THE OUTDOOR UNIT VIA MITSUBISHI ELECTRIC 3.7.3 THE OUTDOOR UNIT SHALL BE CONTROLLED BY THE MICROPROCESSOR LOCATED IN THE INDOOR UNIT.

INDOOR UNIT
4.1 EXPOSED CEILING MOUNTED TYPE
THE INDOOR UNIT SHALL BE FACTORY ASSEMBLED, WIRED AND TESTED. CONTAINED WITHIN THE UNIT SHALL BE ALL FACTORY WIRING AND INTERNAL PIPING, CONTROL CIRCUIT BOARD AND FAN MOTOR. THE UNIT, IN CONJUNCTION WITH THE WIRED WALL-MOUNTED CONTROLLER, WIRELESS WALL-MOUNTED CONTROLLER OR WIRELESS HANDHELD CONTROLLER, SHALL HAVE A SELF-DIAGNOSTIC FUNCTION, 3-MINUTE TIME DELAY MECHANISM, AN AUTO RESTART FUNCTION, AND A TEST RUN SWITCH. INDOOR UNIT AND REFRIGERANT PIPES SHALL BE PURGED WITH DRY NITROGEN BEFORE SHIPMENT FROM THE FACTORY. SEE SCHEDULE ON THE DRAWINGS FOR CAPACITIES.
4.1.1 UNIT CABINET: THE CABINET SHALL BE FORMED FROM HIGH STRENGTH MOLDED PLASTIC WITH SMOOTH FINISH, FLAT BOTTOM PANEL DESIGN WITH ACCESS FOR FILTER.
4.1.2 FAN: THE INDOOR UNIT FAN SHALL BE HIGH PERFORMANCE, DOUBLE INLET, FORWARD CURVE, DIRECT DRIVE SIROCCO FAN WITH A SINGLE MOTOR. THE FANS SHALL BE STATICALLY AND DYNAMICALLY BALANCED AND RUN ON A MOTOR WITH PERMANENTLY LUBRICATED BEARINGS. THE INDOOR FAN SHALL CONSIST OF THREE (3) SPEEDS: LOW, MID, AND HI AND AUTO. THE FAN SHALL HAVE A SELECTABLE AUTO FAN SETTING THAT WILL ADJUST THE FAN SPEED BASED ON THE DIFFERENCE BETWEEN CONTROLLER SET-POINT AND SPACE TEMPERATURE.
4.1.3 VANE: THERE SHALL BE A MOTORIZED HORIZONTAL VANE TO AUTOMATICALLY DIRECT AIR FLOW IN A HORIZONTAL AND DOWNWARD DIRECTION FOR UNIFORM AIR DISTRIBUTION. THE HORIZONTAL VANE SHALL SIGNIFICANTLY DECREASE DOWNWARD AIR RESISTANCE FOR LOWER SOUND LEVELS, AND SHALL CLOSE THE OUTLET PORT WHEN OPERATION IS STOPPED. THERE SHALL ALSO BE A SET OF VERTICAL VANES TO PROVIDE HORIZONTAL SWING AIRFLOW MOVEMENT.
4.1.4 FILTER: RETURN AIR SHALL BE FILTERED BY MEANS OF AN EASILY REMOVABLE WASHABLE FILTER.
4.1.5 COIL: THE EVAPORATOR COIL SHALL BE OF NONFERROUS CONSTRUCTION WITH PRE-COATED ALUMINUM STRAKE FINS ON COPPER TUBING. THE COILS SHALL BE PRESSURE TESTED AT THE FACTORY. A CONDENSATE PAN AND DRAIN SHALL BE PROVIDED UNDER THE COIL. DRAIN PAN LEVEL SWITCH (DPLS1), DESIGNED TO CONNECT TO THE CONTROL BOARD, SHALL BE PROVIDED AND INSTALLED ON THE CONDENSATE PAN TO PREVENT CONDENSATE FROM OVERFLOWING. A CONDENSATE MINI-PUMP SHALL BE PROVIDED TO PROVIDE A MEANS OF CONDENSATE DISPOSAL.
4.1.6SYSTEM CONTROL: THE CONTROL SYSTEM SHALL CONSIST OF A MINIMUM OF TWO (2) MICROPROCESSORS, ONE ON EACH INDOOR AND OUTDOOR UNIT, INTERCONNECTED BY A SINGLE NON-POLAR TWO-WIRE CABLE. THE MICROPROCESSOR LOCATED IN THE INDOOR UNIT SHALL HAVE THE CAPABILITY OF MONITORING RETURN AIR TEMPERATURE AND INDOOR COIL TEMPERATURE, RECEIVING AND PROCESSING COMMANDS FROM A WIRELESS OR WIRED CONTROLLER, PROVIDING EMERGENCY OPERATION AND CONTROLLING THE OUTDOOR UNIT.
4.1.6.2REMOTE CONTROLLERS
THE WIRED REMOTE SHALL HAVE A BUILT-IN WEEKLY TIMER WITH UP TO 8 PATTERN SETTINGS PER DAY. THE CONTROLLER SHALL CONSIST OF AN ON/OFF BUTTON, INCREASE/DECREASE SET TEMPERATURE BUTTONS, A COOL/AUTO/FAN/DRY MODE SELECTOR, A TIMER MENU BUTTON, A TIMER ON/OFF BUTTON, SET TIME BUTTONS, A FAN SPEED SELECTOR, A VENTILATION BUTTON, A TEST RUN BUTTON, AND A CHECK MODE BUTTON. THE CONTROLLER SHALL HAVE A BUILT-IN TEMPERATURE SENSOR. TEMPERATURE SHALL BE DISPLAYED IN EITHER FAHRENHEIT (°F).

ACCESSORIES
4.1 PROVIDE, OVERFLOW SWITCH, CONDENSATE PUMP. WIRED WALL CONTROLLER, INTERCONNECTION WIRING AND WIRED WALL CONTROLLER. WALL BRACKET BY MECHANICAL CONTRACTOR.

E. INSULATION

1. INSULATE REFRIGERANT SUCTION LINE WITH 1/2" FRP FOAM PLASTIC INSULATION WITH JOINTS AND SEAMS SEALED VAPOR TIGHT. PAINT ALL INSULATION INSTALLED OUTDOORS WITH TWO COATS OF UV RESISTANT PAINT AS APPROVED BY THE INSULATION MANUFACTURER.
2. ALL INSULATION TO BE APPLIED IN FULL ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. ALL INSULATION SHALL COMPLY WITH 25/50 FLAME AND SMOKE HAZARD RATINGS PER ASTM E-84, NFPA 255 AND UL 723.
3. REPLACE DAMAGED INSULATION WHICH CANNOT BE REPAIRED SATISFACTORILY, INCLUDING UNITS WITH VAPOR BARRIER DAMAGE AND MOISTURE SATURATED UNITS.

F. CONDENSATE AND OTHER DRAINS

1. PUMP CONDENSATE DRAIN FROM AIR CONDITIONING UNIT TO EXTERIOR AS SHOWN ON THE DRAWINGS. USE 1/4" NYLON TUBING TO EXTERIOR AND HOUSE LINE OUTDOORS WITH 1/2" DIA. PVC PIPE. ROUTE TO GRADE.

G. BALANCING, START UP AND INSTRUCTIONS

1. AFTER INSTALLATION AND EQUIPMENT IS PLACED IN OPERATION, HVAC CONTRACTOR IS RESPONSIBLE FOR BALANCING SYSTEMS TO DESIGN FLOW WITH REPORT SUBMITTED TO OWNER. BALANCING SHALL BE PERFORMED BY AN INDEPENDENT CERTIFIED SUBCONTRACTOR.
2. ADJUST AND BALANCE THE AIR SYSTEMS BEFORE REFRIGERANT SYSTEMS. TEST, ADJUST AND BALANCE AIR CONDITIONING SYSTEMS DURING SUMMER SEASON AND HEATING SYSTEMS DURING WINTER SEASON, INCLUDING AT LEAST A PERIOD OF OPERATION AT OUTSIDE CONDITIONS WITHIN 5 DEG F WET BULB TEMPERATURE OF MAXIMUM SUMMER DESIGN CONDITION, AND WITHIN 10 DEG F DRY BULB TEMPERATURE OF MINIMUM WINTER DESIGN CONDITION. TAKE FINAL TEMPERATURE READINGS DURING SEASONAL OPERATION.
3. START UP AND PLACE ALL SYSTEMS IN OPERATION AND TAG ALL SWITCHES AND CONTROLS WITH PERMANENT LABELS.
4. INSTRUCT OWNER ON PROPER OPERATION AND PREVENTATIVE MAINTENANCE OF SYSTEM.

H. CONTROLS

1. ROOM AC UNIT -- WIRE REMOTE WALL SENSOR FURNISHED WITH THE UNIT TO CYCLE COMPRESSOR IN UNIT TO MAINTAIN IT ROOM TEMPERATURE. WIRE OVERFLOW SWITCH IN DRAIN PAN AND OVERFLOW SWITCH IN CONDENSATE PUMP TO UNIT TO STOP UNIT COOLING IF OVERFLOW CONDITIONS ARE DETECTED.

I. HANGERS AND SUPPORTS

1. CONTRACTOR SHALL PROVIDE INSULATION HANGER WITH PROTECTIVE SHIELDS, SUCH AS MICHIGAN HANGER CO., MODEL NO. 103, OR APPROVED EQUAL FOR ALL INSULATED PIPING. 5 INCH LONG SERICAL CONSTRUCTION OF 1/2 INCH THICK CALCIUM SILICATE SECTIONAL PIPE INSULATION WITH FACTORY LONGITUDINAL LAP SHALL BE PROVIDED AT ALL HANGER POINTS. BUTT JOINTS SHALL BE SEALED WITH INSULATING CEMENT.
2. STRAP HANGERS SHALL NOT BE PERMITTED.
3. HANGER SHALL BE PROVIDED AT EACH CHANGE OF DIRECTION.

J. PIPE IDENTIFICATION

1. CONTRACTOR SHALL PROVIDE IDENTIFICATION LABELS, TAGS, ETC., FOR PLUMBING AND FIRE PROTECTION PIPING AS INDICATED ON THE DRAWINGS AND AS SPECIFIED HEREIN.

MECHANICAL LEGEND

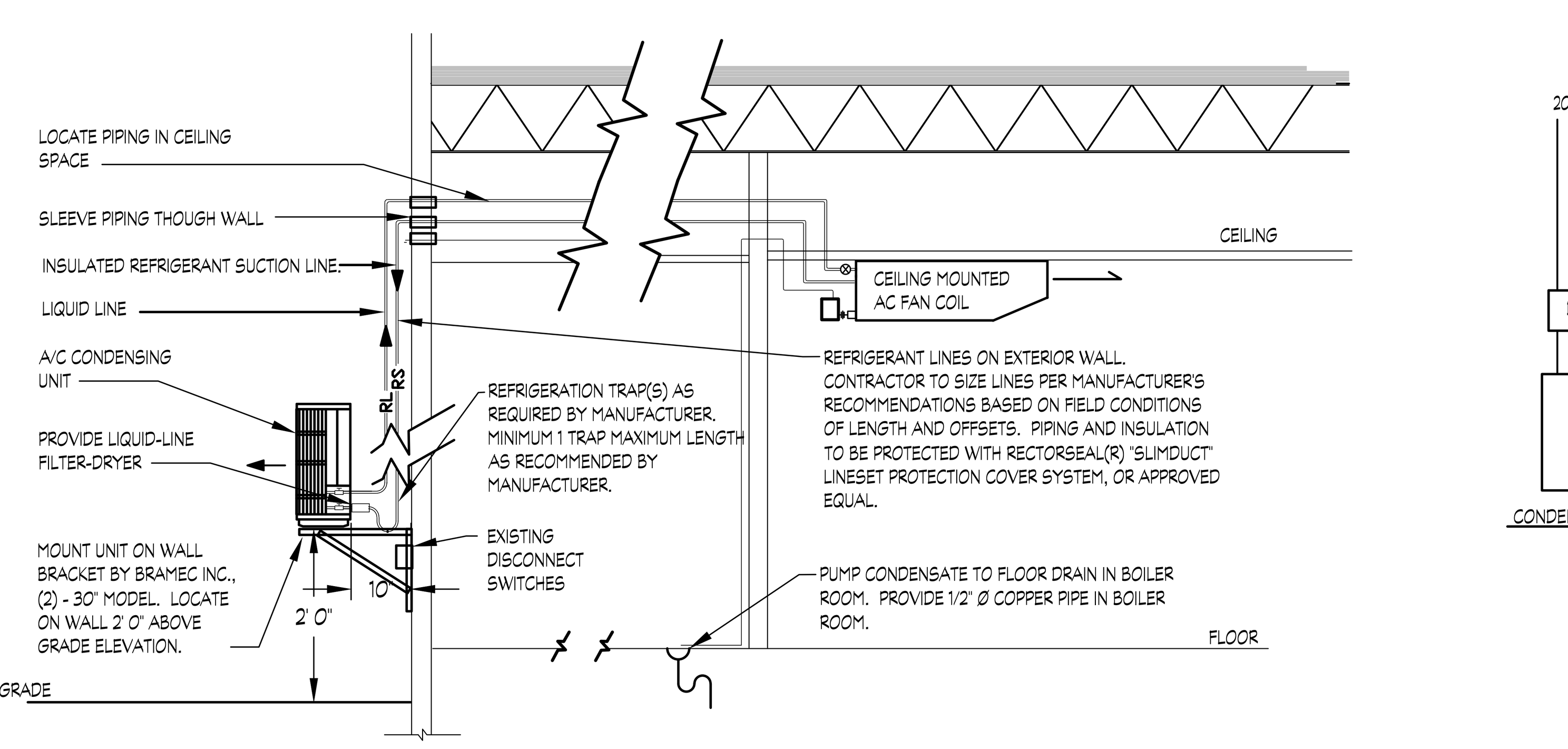
SYMBOL	ABRV.	DESCRIPTION
		EXISTING EQUIPMENT OR DUCTWORK TO REMAIN
		EXISTING EQUIPMENT OR DUCTWORK TO BE REMOVED
		NEW EQUIPMENT OR DUCTWORK
		LINED DUCTWORK
		SUPPLY DUCT UP
		SUPPLY DUCT DOWN
		SQUARE DIFFUSER. SEE SCHEDULE FOR INFORMATION.
		SQUARE/RECTANGULAR SUPPLY REGISTER/GRILLE
		SIDEWALL SUPPLY / RETURN GRILLE
		RETURN / EXHAUST REGISTER OR GRILLE
T		THERMOSTAT
TAG #		EQUIPMENT UNIT DESIGNATION
TAG CFM		DIFFUSER, REGISTER & GRILLE UNIT DESIGNATION W/ CFM
		CONNECTION POINT, NEW TO EXISTING
		DISCONNECTION POINT FROM EXISTING
1		DRAWING KEYNOTE
1		REVISION TAG
D		CONDENSATE DRAIN PIPING
RL		UNION
		REFRIGERANT PIPING (RL - LIQUID LINE OR RS - SUCTION)
		BALL VALVE

	HVAC	HEATING, VENTILATION AND AIR CONDITIONING
	MBH	1000 - BRITISHTHERMAL UNITS
	DB/WB	DRY BULB / WET BULB
	E.S.P.	EXTERNAL STATIC PRESSURE
	IN. W.G.	INCHES WATER GAUGE
	EC-1	EVAPORATOR COIL UNIT DESIGNATION
	CU-1	CONDENSING UNIT DESIGNATION
	E.A.T.	ENTERING AIR TEMPERATURE
	E.S.P.	EXTERNAL STATIC PRESSURE
	FT. W.G.	FEET WATER GAUGE
	(E)	EXISTING
	XTR	EXISTING TO REMAIN
	Ø	DIAMETER
	Ø OR PH	PHASE

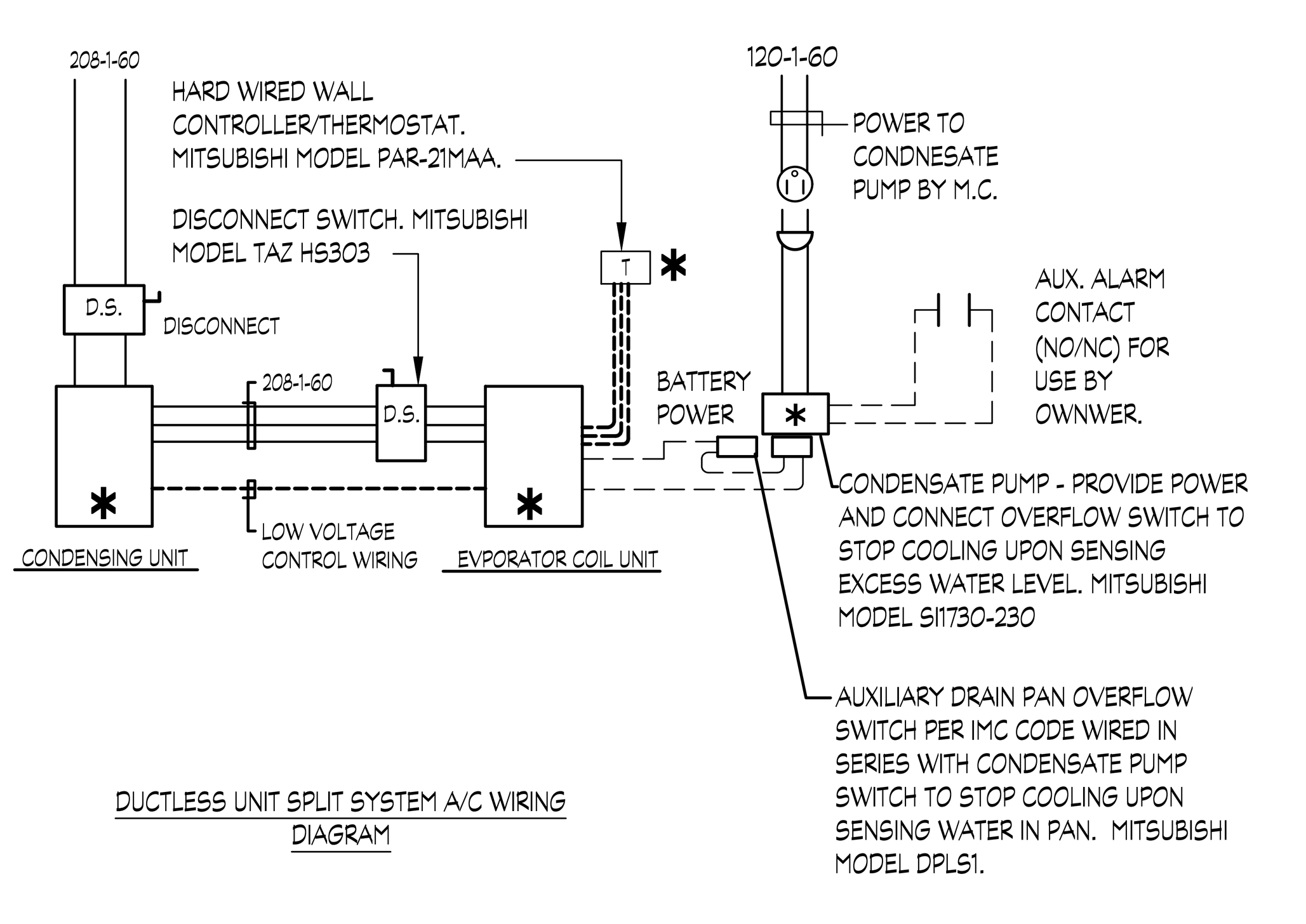
SPLIT SYSTEM AIR-COOLED A/C UNIT SCHEDULE

	EVAPORATOR								CONDENSER						
TAG	TOTAL CAPACITY MBH	SENSIBLE CAPACITY MBH	CFM (DRY COIL)	E.S.P. IN. W.G.	NOMINAL TONS	MCA/MFS	ELECTRICAL VOLTS/PHASE	MITSUBISHI MODEL	TAG	CFM	E.S.P. IN. W.G.	MCA/MOCP	ELECTRICAL VOLTS/PHASE	UNITED COOLAIR MODEL	REMARKS
AC-01	42.0	29.8	995	0.0	3.5	2.0A/SERVED FROM CONDENSER	208 V/1Ø	PCA-A42KA4	CU-3	1940	0.00	26.0/40 A.	208 V/1Ø	PUY-A42NHA4	1,2,3,4.5

NOTES:
1. CAPACITY BASED ON 85 DEG. F. DB/65 DEG. F. WB EAT ON EVAPORATOR AND 95 DEGREES F. AIR ENTERING THE CONDENSER, MID.HIGH FAN SPEED
2. UNIT SHALL BE EQUIPPED FOR OPERATION DOWN TO 0 DEG.S F.
3. PROVIDE THE FOLLOWING ACCESSORIES: INTEGRAL CONDENSATE PUMP MITSUBISHI MODEL SI1730-230. PUMP CONDENSATE TO DRAIN. PROVIDE MOUNTING PAD MITSUBISHI UTILITIES.
4. PROVIDE DISCONNECT FOR EACH OUTDOOR AND INDOOR UNITS.
5. PROVIDE INTEGRAL UNIT CONTROLS AND A HARD WIRED WALL MOUNTED THERMOSTAT/CONTROLLER MODEL PAR-21MAA.



DUCTLESS UNIT SPLIT SYSTEM A/C PIPING DIAGRAM



DUCTLESS UNIT SPLIT SYSTEM A/C WIRING DIAGRAM

ELEMENTARY WIRING DIAGRAM NOTES

1. ALL ITEMS SHOWN ON THESE WIRING DIAGRAMS SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR (M.C.). SEE SPECIFICATIONS FOR DEFINITIONS OF THE WORDS "FURNISHED, INSTALLED AND PROVIDED" FOR THIS WORK.
2. ITEMS MARKED WITH AN ASTERISK (*) SHALL BE PROVIDED BY THE M.C., ALL OTHER ITEMS SHOWN BUT NOT MARKED SHALL BE FURNISHED BY THE M.C. TO THE E.C. OR HVAC-A.T.C SUB-CONTRACTOR FOR INSTALLATION.
3. POWER WIRING IS SHOWN BY SOLID LINES AND SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR (E.C.). CONTROL WIRING IS SHOWN BY DASHED LINES AND ALONG WITH POWER WIRING TO THE CONTROLS, SHALL BE PROVIDED BY THE AUTOMATIC TEMPERATURE CONTROL SUBCONTRACTOR (ATC).
4. ALL MOTOR HORSEPOWERS ARE SHOWN ONLY ONCE IN THE EQUIPMENT SCHEDULES AND ARE NOT SHOWN ON THE WIRING DIAGRAMS. REFER TO THE EQUIPMENT SCHEDULES FOR HORSEPOWER'S AND OTHER ELECTRICAL CAPACITY DATA.
5. ALL WIRING, INCLUDING LOW VOLTAGE CONTROL WIRING, SHALL BE RUN IN EMT CONDUIT EXCEPT FOR FINAL CONNECTIONS TO ROTATING OR VIBRATING EQUIPMENT WHICH SHALL BE MADE WITH FLEXIBLE "GREENFIELD" CONDUIT, NOT TO EXCEED 18" IN LENGTH.
6. ALL WIRING SHALL CONFORM TO THE SPECIFICATIONS FOR THE ELECTRICAL PORTION OF WORK FOR THIS PROJECT AND THE NATIONAL ELECTRIC CODE.
7. D.S. DISCONNECT SWITCH
8. M.M.S. MANUAL MOTOR STARTER

Allen & Shariff
DESIGN | BUILD | MANAGE
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PROJECT NAME
CCAC WEST HILLS CENTER - UPS AND GENERATOR UPGRADES
1000 McKee Road
Oakdale, PA 15071-1099
CCAC Project #13-CO-003n5a

SEAL
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DAVID C. PRICE
ENGINEER
No. PE081572

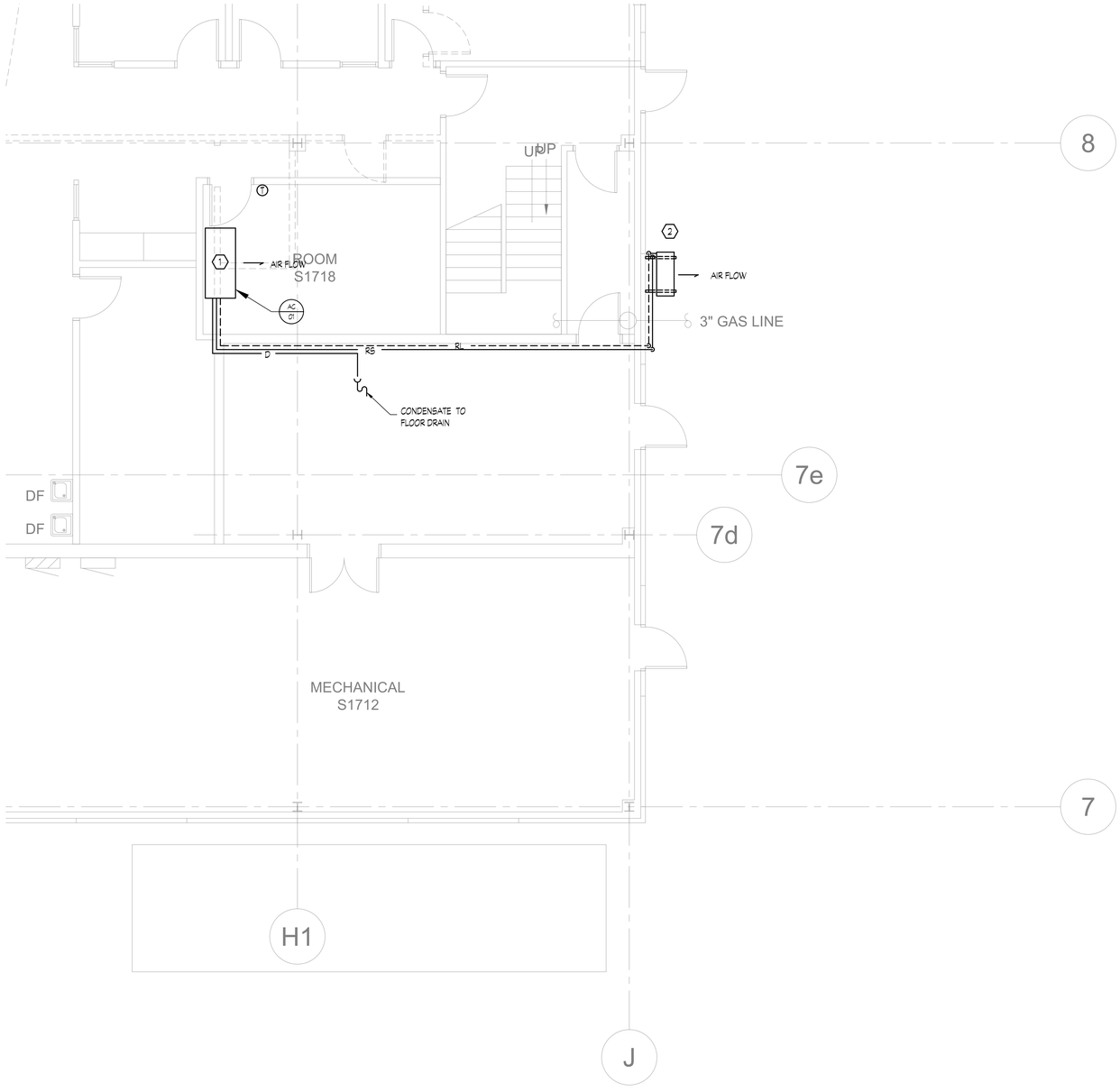
NO.	DATE	REVISIONS/ADDENDUMS

DESIGNED:	MAB
DRAWN:	MAB
CHECKED:	DCP
DATE:	10-25-2018
SCALE:	AS SHOWN

DRAWING TITLE
MECHANICAL DATA SHEET

DRAWING NUMBER
M001

PROJECT NUMBER: 1841063



1 / 201 PARTIAL FIRST FLOOR MECHANICAL PLAN
1/8" = 1'-0"

DRAWING KEY NOTES: (#)

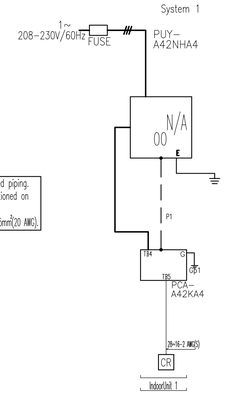
1. INSTALL NEW EVAPORATOR UNIT SURFACE MOUNT ON CEILING TO AVOID LIGHTS. HANG FROM STRUCTURE ABOVE. RUN 3/8" NYLON TUBING FROM PUMPED CONDENSATE DRAIN TO FLOOR DRAIN IN ADJACENT BOILER ROOM. SEE PIPING DETAIL ON DRAWING M-001 FOR PIPING.
2. MOUNT CONDENSING UNIT ON KNEE BRACE SUPPORTS FROM WALL. SEE DETAIL DRAWING M-001.

CCAC

DIAGRAM SYMBOL LEGEND		CONT.No	PAGE
DISPLAY	DESCRIPTION		
	POWER WIRE		
	CONTROL WIRE		
	REF. PIPE		

CITY MULTI

SYSTEM SCHEMATIC DWG.



PIPING LIST

SYMBOL	LIQUID PIPE SIZE	GAS PIPE SIZE
P1	3/8	5/8

Additional refrigerant charge is needed depending on the size and length of extended piping. Please refer the amount of pre-charge and the formula of calculation which is mentioned on the data book.
1.25mm²(16 AWG) : 1.25mm²(16 AWG) or more. 0.75mm²(20 AWG) : between 0.5mm²(24 AWG) and 0.75mm²(20 AWG).

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DAVID C. PRICE
ENGINEER
No. PE081570

NO.	DATE	REVISIONS/ADDENDUMS

DESIGNED:	MAB
DRAWN:	MAB
CHECKED:	DCP
DATE:	10-25-2018
SCALE:	AS SHOWN

DRAWING TITLE
MECHANICAL PLANS

DRAWING NUMBER
M201

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