

USC UPSTATE THRU WALL FANS-University Services Building PROJECT #CP00395036

UNIVERSITY OF SOUTH CAROLINA
UPSTATE
Spartanburg, South Carolina

DESIGN TEAM

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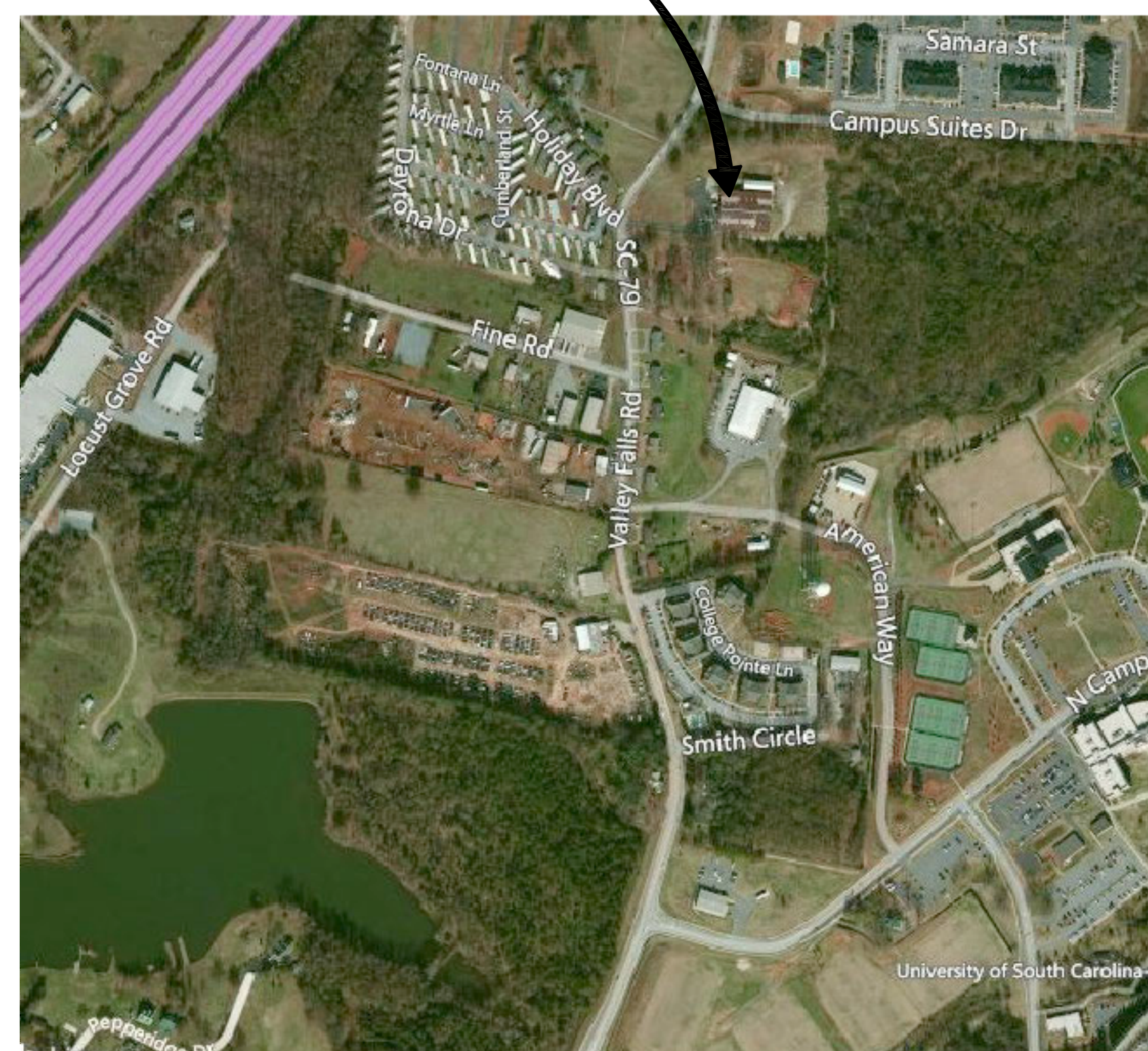
MECHANICAL/PLUMBING ENGINEER

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UNIVERSITY SERVICES BUILDING



VICINITY MAP

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NO.	DATE	BY	DESCRIPTION

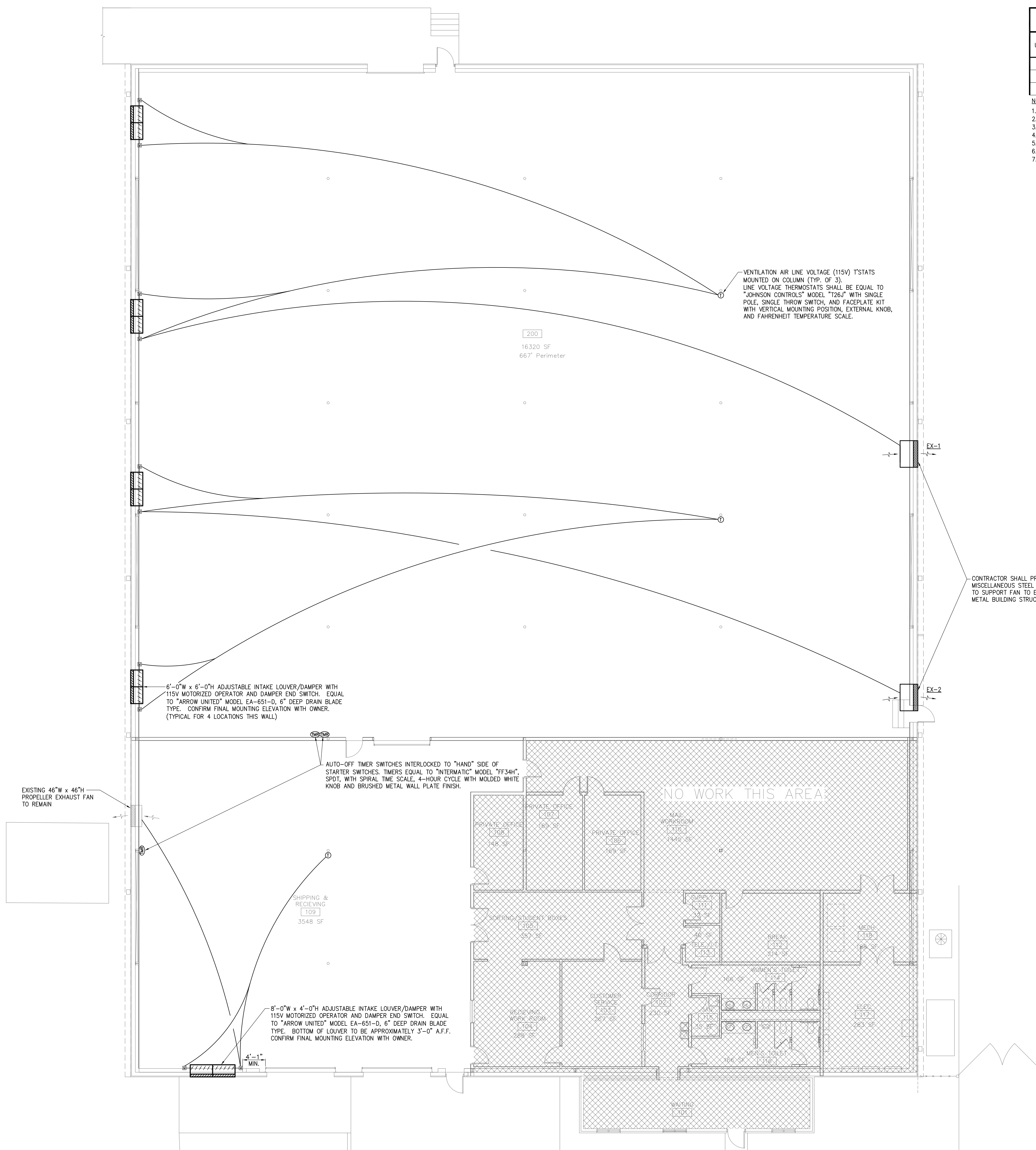


USC UPSTATE
THRU WALL FANS-University Services Building
PROJECT #CP00395036
SPARTANBURG, SOUTH CAROLINA

DESIGN JCP	DRAWN TMI
CHECKED JCP	DATE -/-/14
JOB NO. PERITUS #140208	
SHEET T-1	
1 OF 1 SHEETS	

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METAL BUILDING FAN PACKAGE – EXHAUST FAN SCHEDULE										
UNIT No.	AMERICAN COOLAIR MODEL NO.	TYPE DRIVE	FAN TYPE	C.F.M.	R.P.M.	S.P. INCHES	H.P.	ELECTRICAL	WEIGHT	NOTES
EX-1	MBHX48QE8363	BELT	PROP	24250	597	0.25	5	208/3/60	572	1-7
EX-2	MBHX48QE8363	BELT	PROP	24250	597	0.25	5	208/3/60	572	1-7

- NOTES:**
1. PROVIDE WITH WALL HOUSING, FAN, SHUTTER, AND FAN GUARD.
 2. VARIABLE PITCH SHEAVES.
 3. UL LISTED.
 4. FIELD INTERLOCK FANS WITH MOTORIZED LOUVERS/DAMPERS. SEE ELECTRICAL DRAWINGS.
 5. FIELD INTERLOCK FAN WITH THERMOSTAT WITH FAN SWITCH. SEE ELECTRICAL DRAWINGS.
 6. MOTOR STARTERS AND REMOTE HOA SWITCHES BY ELECTRICAL.
 7. PROVIDE 115V THERMOSTATS AND TIMER SWITCHES FOR EACH FAN.

MECHANICAL GENERAL NOTES

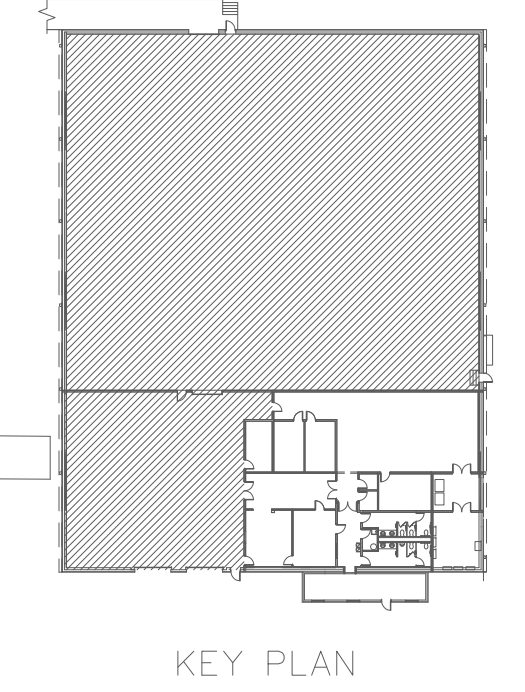
1. ALL SCHEDULES SHOWN ARE THE PURPOSE OF AIDING THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CORRECT QUANTITY OF EQUIPMENT.
2. REFER TO ELECTRICAL DRAWINGS FOR POWER CONNECTION POINTS.
3. ALL ELECTRICALLY POWERED EQUIPMENT SHALL BE LISTED AND LABELED PER NATIONAL ELECTRICAL CODE, AND INTERNATIONAL MECHANICAL CODE, 2012 EDITION CHAPTER 3.
4. ALL EQUIPMENT SHALL BE ACCESSIBLE PER INTERNATIONAL MECHANICAL CODE, CHAPTER 3 2012 EDITION.
5. THE HORSEPOWERS SHOWN ARE MIN. REQUIRED FOR PRESENT AND/OR FUTURE GROWTH/OPERATION. IN NO CASE WILL ANY MOTOR H.P. REDUCTION FROM THAT SPECIFIED BE ACCEPTED.
6. PATCH WALLS TO MATCH EXISTING. CAULK & SEAL ALL PENETRATIONS.

MECHANICAL LEGEND	
SYMBOL	DESCRIPTION
M	DAMPER OPERATOR (MOTOR)
T	THERMOSTAT – T*STAT
TMR	TIMER SWITCH

CONTRACTOR SHALL PROVIDE MISCELLANEOUS STEEL SUPPORTS TO SUPPORT FAN TO EXISTING METAL BUILDING STRUCTURE.

HVAC FLOOR PLAN
SCALE: 1/8" = 1'-0"

NOTE: SEE ELECTRICAL DRAWINGS FOR DAMPER OPERATOR, THERMOSTAT, AUTO-TIMER, AND FAN STARTER WIRING.



REVISIONS

DESCRIPTION

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USC UPSTATE
THRU WALL FANS-University Services Building
PROJECT #CP00395036
SPARTANBURG, SOUTH CAROLINA

DESIGN: JCP / DRAWN: TMI
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DATE: 1/14
JOB NO.: PERITUS #140208
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1 OF 1 SHEETS

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SYMBOL	DESCRIPTION
	HOME RUN TO LIGHTING/SERVICE PANEL. HASH MARKS, WHEN SHOWN, INDICATE NUMBERS OF CONDUCTORS. "/> INDICATES HOT WIRE, "N" INDICATES NEUTRAL CONDUCTOR, "G" INDICATES GROUND CONDUCTOR. HOME RUN NOTE INDICATES PANEL NAME AND CIRCUIT NAME OR FEEDER TAG. CONDUCTORS SHALL BE #12 AND IN 3/4" CONDUIT UNLESS NOTED OTHERWISE. ANY HOME RUN OR CONDUIT WITHOUT HASH MARKS IS TO CONTAIN 3 CONDUCTORS: 1 HOT, 1 NEUTRAL, AND 1 EQUIPMENT GROUND, EACH HOT CIRCUIT SHALL BE PAIRED WITH A SEPARATE NEUTRAL CONDUCTOR. SHARING OF NEUTRAL CONDUCTORS BETWEEN CIRCUITS IS NOT ALLOWED.
	EXPOSED CONDUIT
	CONDUIT RUN IN SLAB OR UNDERGROUND.
	CONDUIT RUN CONCEALED ABOVE CEILING OR IN WALLS, UNLESS NOTED OTHERWISE.
	CONDUIT JUNCTION IN CONDUIT OR JUNCTION BOX.
	FLEXIBLE CONDUIT
	CONDUIT TURNING UP
	CONDUIT TURNING DOWN
	JUNCTION BOX STEM INDICATES WALL MOUNTED
	THERMOSTAT, PROVIDED BY MECHANICAL, MOUNTED AND WIRED BY ELECTRICAL
	LIGHTING OR SERVICE PANEL, SURFACE MOUNTED (208V)
	EXHAUST FAN. SEE MECHANICAL DRAWINGS FOR FAN SPECIFICATIONS.
	COMBINATION STARTER, NEMA SIZE NOTED, WITH CIRCUIT BREAKER, STARTER TO BE FWR, UNLESS NOTED OTHERWISE, WITH HOA SWITCH AND 1-N.O., 1-N.C. AUXILIARY CONTACTS. SO, D OR EQUAL. PROVIDE PHASE LOSS PROTECTION.
	CONNECTION TO A SPECIFIC PIECE OF EQUIPMENT. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH PROVIDER / INSTALLER OF THE EQUIPMENT.
WIRING DEVICES	
	SWITCH SYMBOLS
	MANUAL MOTOR STARTER, SO D OR EQUAL

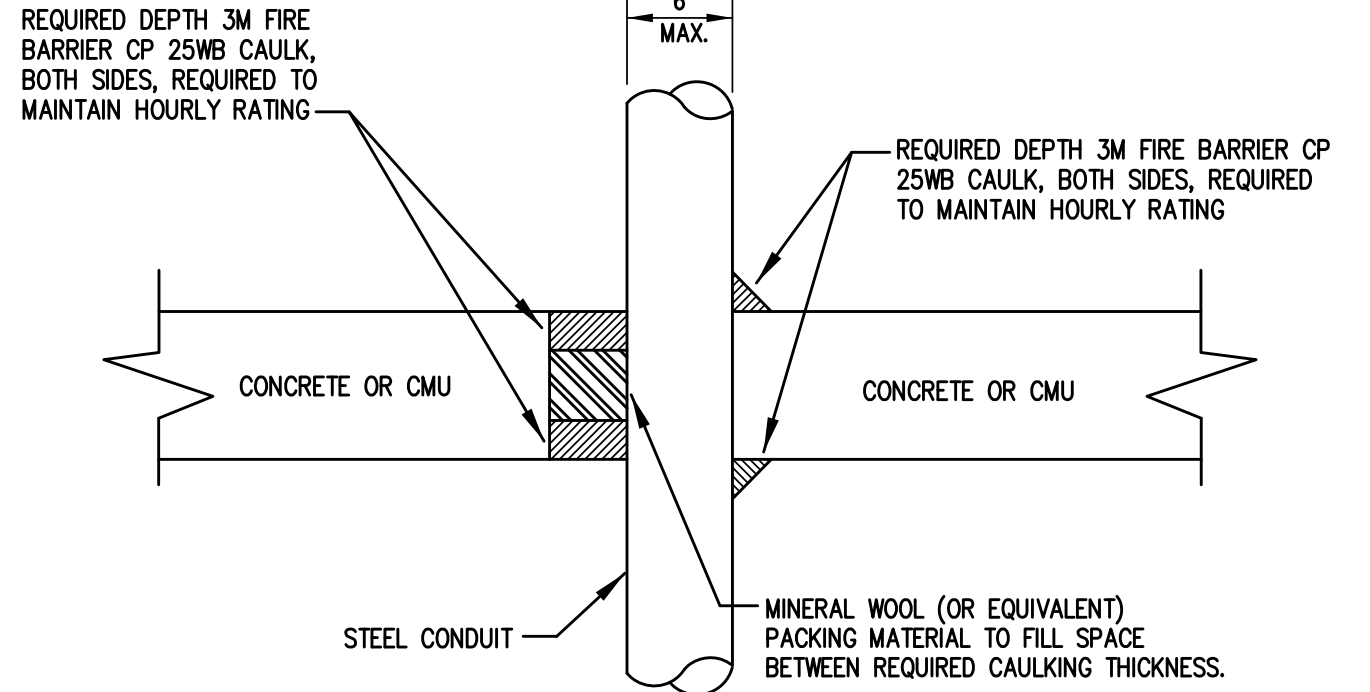
ELECTRICAL GENERAL NOTES:

- INSPECT SITE PRIOR TO SUBMITTING BID. DRAWINGS ARE INTENDED TO COVER THE REQUIRED ELECTRICAL SYSTEMS. DRAWINGS MAY NOT SHOW COMPLETE OR ACCURATE DETAILS OF THE BUILDING OR SYSTEM IN EVERY RESPECT. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN ANY ADDITIONAL INFORMATION AS REQUIRED.
- CONFORM TO THE NATIONAL ELECTRICAL CODE (2011), IBC (2012), APPLICABLE NEMA, ANSI AND IEEE PUBLICATIONS, UL AND ADA STANDARDS AND OSHA REQUIREMENTS. COMPLY WITH LOCAL, COUNTY, STATE AND NATIONAL CODES HAVING JURISDICTION.
- FURNISH AND INSTALL ALL MATERIALS IN A NEAT AND WORKMANLIKE FASHION. ALL MATERIALS SHALL BE NEW, WITH FIRST QUALITY AND UL LABEL.
- VERIFY ALL DIMENSIONS AND CLEARANCES PRIOR TO INSTALLATION OF EQUIPMENT AND RACEWAYS. CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF WORK WITH THAT OF ALL OTHER TRADES AS REQUIRED.
- CONDUIT SHALL BE EMT FOR BRANCH CIRCUIT WIRING AS ALLOWED BY NEC, EXCEPT THAT SET SCREW OR CRIMP FITTINGS ARE NOT ALLOWED. WHERE EXPOSED TO PHYSICAL DAMAGE CONDUITS SHALL BE RIGID GALVANIZED STEEL. MINIMUM CONDUIT SIZE SHALL BE 3/4". ALL CONDUCTORS SHALL BE TYPE THHN/THWN, 600V COPPER BUILDING WIRE. MINIMUM SIZE SHALL BE #12 AWG COPPER UNLESS NOTED.
- PROVIDE GROUNDING FOR ALL EQUIPMENT IN ACCORDANCE WITH ARTICLE 250 OF THE NATIONAL ELECTRICAL CODE. VERIFY EXISTING SERVICE ENTRANCE GROUND.
- ALL ENCLOSURES SHALL BE OF THE NEMA TYPE WHICH IS SUITABLE FOR THE APPLICATION.
- SEAL ALL CONDUIT PENETRATIONS TO MATCH RATING OF WALL BEING PENETRATED.
- ALL WORK SHALL HAVE PROPER LABELING AND NAMEPLATES. ALL CIRCUITS SHALL BE LABELED AT PANELS AND BOXES AS INDICATED. ALL PANELS AND DISCONNECTS ARE TO BE PERMANENTLY MARKED WITH NAME OF EQUIPMENT SERVED AND SOURCE PANEL, CIRCUIT NO. ALL PANELS ARE TO BE PROVIDED WITH TYPEWRITTEN PANEL SCHEDULES.
- THOROUGHLY CLEAN ALL EQUIPMENT AND SYSTEMS BEFORE PLACING IN OPERATION. RESTORE FINISHED SURFACES IF DAMAGED AND DELIVER THE ENTIRE INSTALLATION IN AN APPROVED CONDITION. INSTRUCT THE OWNERS' PERSONNEL IN THE PROPER OPERATION AND MAINTENANCE OF THE SYSTEMS. FURNISH TO THE OWNER THREE SETS OF OPERATION AND MAINTENANCE MANUALS FOR EACH SYSTEM.
- GUARANTEE THE WORK INSTALLED FOR A PERIOD OF ONE YEAR AFTER DATE OF FINAL ACCEPTANCE. DEFECTS WHICH APPEAR AS A RESULT OF NORMAL USAGE SHALL BE REMEDIED BY THE CONTRACTOR TO THE COMPLETE SATISFACTION OF THE OWNER WITHOUT COST TO THE OWNER.
- CONTRACTOR SHALL KEEP CURRENT A SET OF PLANS FOR THE DURATION OF CONSTRUCTION WITH ALL CHANGES TO WORK NEATLY AND ACCURATELY MARKED IN RED AND SHALL TURN OVER TO OWNER AT COMPLETION OF PROJECT.
- ALL ELECTRICAL EQUIPMENT SHALL BE INSTALLED TO MEET SEISMIC REQUIREMENTS OF 2012 IBC AND SHALL BE SUBJECT TO SPECIAL INSPECTION REQUIREMENTS, CHAPTER 17 OF 2012 IBC AS IT RELATES TO ELECTRICAL EQUIPMENT.

ABBREVIATIONS:

AFF	ABOVE FINISH FLOOR
BKR	BREAKER
CU	COPPER
CKT	CIRCUIT
DWG	DRAWING
EC	ELECTRICAL CONTRACTOR
FU	FUSE
FWE	FURNISHED WITH EQUIPMENT
MFR	MANUFACTURER
NTS	NOT TO SCALE
PH	PHASE
PNL	PANEL
REQD	REQUIRED
SW	SWITCH
UNO	UNLESS NOTED OTHERWISE
UH	UNIT HEATER
W/	WITH
WP	WEATHER PROOF

PROVIDE FIRESTOPPING THRU ALL RATED (1 HOUR AND ABOVE) WALLS. FIRESTOPPING SHALL BE 3M CP 25WB CAULK OR FIRE-AM 150 CAULK OR EQUAL. FIRESTOPPING SHALL BE AS REQUIRED TO MAINTAIN A U.L. SYSTEM CLOSURE. PROVIDE U.L. NO. AND MANUFACTURER'S SPECIFICATION AND INSTALLATION DRAWING FOR ALL SUBSTITUTION REQUESTS.

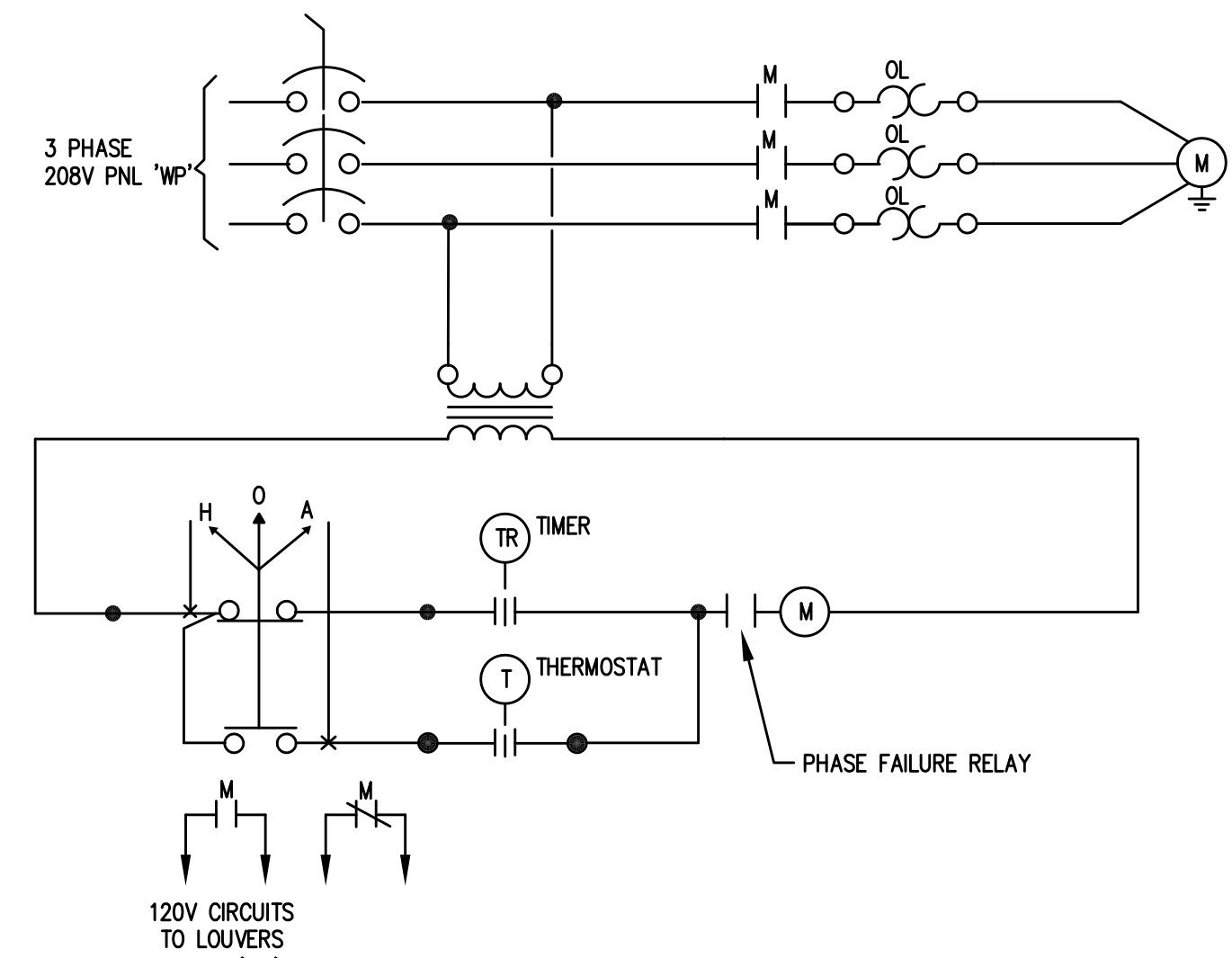


TYPICAL CONDUIT SLEEVE DETAIL B

MOTOR ELEMENTARY GENERAL NOTES:

- CONTRACTOR SHALL CONFIRM NAMEPLATE MOTOR DATA ACTUALLY DELIVERED TO JOB SITE AND SIZE OVER-LOADS AS REQUIRED BY NATIONAL ELECTRICAL CODE.
- MECHANICAL CONTRACTOR SHALL WIRE ALL ADDITIONAL CONTROLS TO POINTS PROVIDED.
- CONFIRM ACTUAL VOLTAGES OF EXISTING FAN IN ROOM 109 TO REMAIN AND PROVIDE OVER-LOADS AS REQUIRED WITH NEW STARTER.

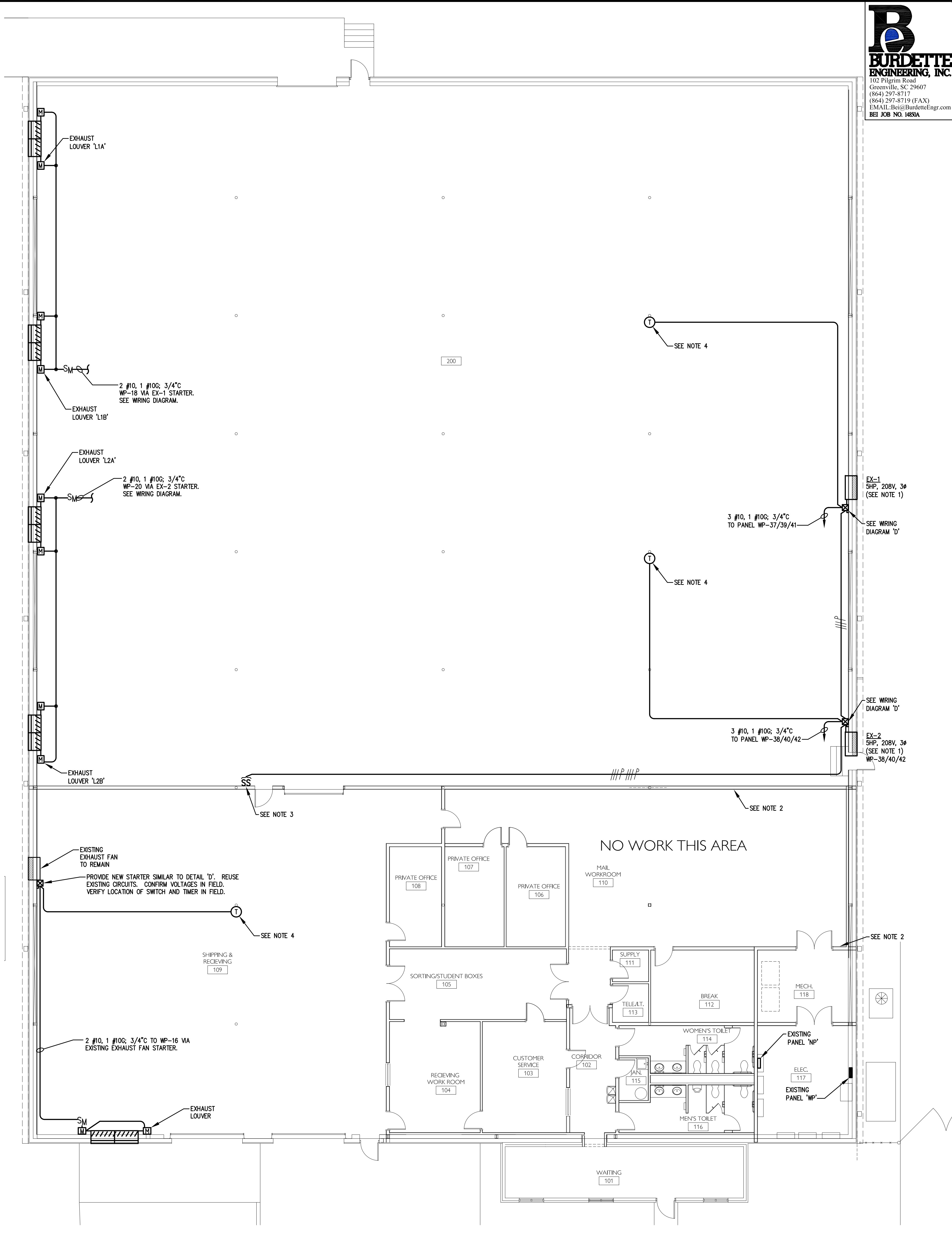
MOTOR ELEMENTARY GENERAL NOTES C



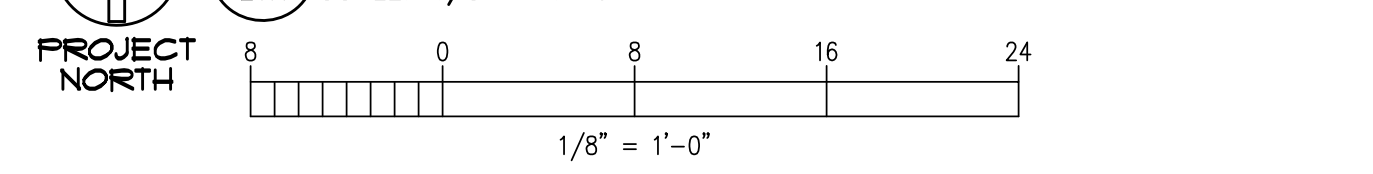
- NOTES:**
- PROVIDE 208V/3Ø ENCLOSED STARTER WITH REMOTE H.O.A. SWITCH AND AUXILIARY CONTACTS AS SHOWN, NEMA SIZE 1.
 - MOUNT H.O.A. SWITCH AND TIMER IN NEMA 1 BOX. SURFACE MOUNT ON APPROPRIATE WALL SPACE AT WAREHOUSE ENTRY PER PLANS. PROVIDE NAMEPLATE: "EXHAUST FAN NO.1, LOUVERS" USE TIMER WITH HAND OPERATION* (SIMILAR FOR EX-2 AND EXISTING FAN) TIMERS AND THERMOSTAT ARE PROVIDED BY MECHANICAL CONTRACTOR, MOUNTED AND WIRED BY ELECTRICAL CONTRACTOR.
 - PROVIDE PHASE FAILURE RELAY TO SHUT MOTOR OFF ON LOSS OF A PHASE.

MOTOR ELEMENTARY FOR EX-1, EX-2, EXISTING FANS D

PANEL	TRIP	DESIGNATION	CABINET SURFACE MOUNTED			TYPE SQ.D. WOOD OR EQUAL			DESIGNATION	POLES	TRIP
			FEEDER	BOTTOM	PHASE LOAD (VOLT-AMPS)	MAINS	150A MCB	BRANCH CIRCUIT			
20	1	EXISTING RECEPTACLE	1		100			2	LIGHTING CONTROLS	1	20
20	1	EXISTING RECEPTACLE	3		1374			4	L-WAREHOUSE	2	20
20	1	EXISTING RECEPTACLE	5		1374			6	L-WAREHOUSE	2	20
20	1	SPARE	7		1542			8	L-WAREHOUSE	2	20
20	1	SPARE	9		1542			10	L-WAREHOUSE	2	20
20	1	SPARE	11					12	SPARE	2	20
20	1	SPARE	13					14	SPARE	2	20
20	1	SPARE	15					16	EXH. LOUVER	1	20
20	1	SPARE	17		600			18	EXH. LOUVERS 'L1A','L1B'	1	20
20	1	SPARE	19		600			20	EXH. LOUVERS 'L2A','L2B'	1	20
20	1	SPARE	21		950			22	EX. FAN EX-3, LOUVER 3	1	20
20	1	SPARE	23		950			24	EX. FAN EX-4, LOUVER 4	1	20
20	1	SPARE	25		1620			26	UNIT HEATER UH-1,2,3	1	20
20	1	SPARE	27		1620			28	UNIT HEATER UH-4,5,6	1	20
20	1	SPARE	29				30	UNIT HEATER UH-7,8	1	20	
20	1	SPARE	31					32	SPACE		
20	1	SPARE	33					34	SPACE		
20	1	SPARE	35					36	SPACE		
20	1	SPARE	37		2100	2100		38	SPACE		
25	3	EXHAUST FAN EX-1	39		2100	2100		40	EXHAUST FAN EX-2	3	25
			41		2100	2100		42	SPACE		
INTEGRATED EQUIPMENT DATA: 10KVA			KVA TOTAL	8.1	9.7	8.1	PANELBOARD KVA LOAD TOTAL:			25.6	



ELECTRICAL EQUIPMENT POWER PLAN



- NOTES:**
- REMOVE EXISTING WIRING, STARTERS AND CONDUIT FOR FANS BEING REMOVED. REUSE EXISTING CONDUIT AS IS PRACTICAL.
 - FIRESTOP PENETRATIONS OF THESE WALLS. SEE DETAIL 'B'.
 - MOUNT H.O.A. SWITCHES AND TIMERS AT LOCATIONS SHOWN. SEE DETAILS 'D', THIS SHEET FOR ADDITIONAL INFORMATION. MOUNT STARTERS ADJACENT TO FANS ON WALL.
 - MOUNT LINE VOLTAGE THERMOSTATS (FURNISHED BY DIVISION 15) AND WIRE TO CONTROL EXHAUST FANS AND DAMPER MOTORS PER DETAIL 'D'. SEE MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.

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USC UPSTATE
 THRU WALL FANS-University Services Building
 PROJECT #CP00395036
 SPARTANBURG, SOUTH CAROLINA

DESIGN: DJB / DRAWN: TMP
 CHECKED: DJB
 DATE: 3/6/14
 JOB NO.: PERITUS #140208
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 1 OF 2 SHEETS

REVISIONS

DESCRIPTION

NO.

DATE

BY

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SECTION 16010 -- GENERAL PROVISIONS

PART 1 -- GENERAL

1.1 SCOPE

A. THE CONTRACTOR SHALL PROVIDE AND INSTALL COMPLETE ELECTRICAL SYSTEMS INCLUDING ALL CONDUCTORS, RACEWAYS, FITTINGS, PROTECTIVE DEVICES, WIRING DEVICES, FIXTURES, SUPPORTS, AND ALL MISCELLANEOUS HARDWARE NECESSARY. ALL OF THE ABOVE EQUIPMENT SHALL BE COMPLETELY INSTALLED AND LEFT IN PROPER OPERATING CONDITION. ALL ELECTRICALLY POWERED EQUIPMENT WHETHER FURNISHED BY OTHERS OR BY THE CONTRACTOR SHALL BE WIRED BY THE CONTRACTOR.

B. COMPLETE POWER DISTRIBUTION AND UTILIZATION SYSTEM SHALL BE INSTALLED, INCLUDING PANELBOARDS, UTILIZATION DEVICES AND EQUIPMENT AS INDICATED ON DRAWINGS.

C. THE CONTRACTOR SHALL FURNISH AND INSTALL POWER, WIRING AND/OR DISCONNECTS AS SHOWN ON DRAWINGS FOR WIRING SYSTEMS SPECIFIED IN DIVISION 15. TEMPERATURE CONTROL WIRING, EQUIPMENT CONTROL, AND INTERLOCK WIRING ARE NOT INCLUDED IN THIS DIVISION UNLESS SPECIFICALLY NOTED IN THESE SPECIFICATIONS OR SHOWN ON THE PLANS. ALL MOTOR DISCONNECTS, STARTERS, COMBINATION MOTOR CONTROLLERS AND MOTOR CENTER COLUMNS SHALL BE FURNISHED UNDER THIS DIVISION OF SPECIFICATIONS UNLESS NOTED OTHERWISE.

1.2 REQUIREMENTS

A. FIELD VERIFICATION OF SCALE ON ELECTRICAL PLANS IS DIRECTED SINCE ACTUAL LOCATIONS, DISTANCES AND LEVELS WILL BE GOVERNED BY ACTUAL FIELD CONDITIONS.

B. IN CASE OF CONFLICTS OR DISCREPANCIES BETWEEN PLANS, PLANS AND SPECIFICATIONS AND/OR ACTUAL FIELD CONDITIONS, CONTRACTOR SHALL NOTIFY THE ENGINEER BEFORE WORK IS CONTINUED. COORDINATE WITH OTHER TRADES TO AVOID CONFLICTS.

C. PERMITS AND TESTS -- THE CONTRACTOR SHALL OBTAIN AND PAY FOR ALL PERMITS, FEES, AND LICENSES REQUIRED. PERFORM ALL TESTS TO ENSURE ALL SYSTEMS ARE IN GOOD OPERATING CONDITION.

D. REVIEW OF MATERIAL; SPECIFIC REFERENCE IN THE SPECIFICATION TO ANY ARTICLE, DEVICE, PRODUCT, MATERIAL, FIXTURE, FORM OR TYPE OF CONSTRUCTION BY NAME, MAKE OR CATALOG NUMBER, WITH OR WITHOUT THE WORDS "OR EQUAL", SHALL BE INTERPRETED AS ESTABLISHING A STANDARD OF QUALITY AND SHALL NOT BE CONSTRUED AS LIMITING COMPETITION.

E. BIDDERS SHALL BASE BIDS ON THE MATERIAL SPECIFIED OR ON EQUALS RECEIVING APPROVAL PRIOR TO BID OPENING. ANY INCREASE IN THE COST OF WORK RESULTING FROM SUBSTITUTION OF ANY PRODUCT SPECIFIED IS PART OF THIS CONTRACT AND SHALL BE ACCOMPLISHED IN AN APPROVED MANNER AT NO EXTRA COST TO THE OWNER.

F. SUBSTITUTIONS. NO SUBSTITUTION WILL BE CONSIDERED UNLESS WRITTEN REQUEST FOR APPROVAL HAS BEEN RECEIVED BY THE ENGINEER AT LEAST 10 DAYS PRIOR TO THE DATE OF RECEIPT OF BIDS. EACH SUCH REQUEST SHALL INCLUDE THE NAME OF THE MATERIAL OR EQUIPMENT FOR WHICH IT IS TO BE SUBSTITUTED AND A COMPLETE DESCRIPTION OF THE PROPOSED SUBSTITUTION INCLUDING DRAWINGS, CUTS, PERFORMANCE AND TEST DATA AND ANY OTHER INFORMATION NECESSARY FOR AN EVALUATION. A STATEMENT SETTING FORTH ANY CHANGES IN OTHER MATERIALS, EQUIPMENT OR OTHER WORK THAT INCORPORATION OF THE SUBSTITUTE WOULD REQUIRE SHALL BE INCLUDED; FAILURE TO DO SO DOES NOT ALLEVIATE THE CONTRACTOR OF HIS RESPONSIBILITY TO MAKE ANY AND ALL NECESSARY CHANGES REQUIRED FOR INSTALLATION OF THE APPROVED SUBSTITUTION. THE BURDEN OF PROOF OF THE MERIT OF THE PROPOSED SUBSTITUTION IS UPON THE PROPOSER. THE ENGINEER'S DECISION OF APPROVAL OR DISAPPROVAL OF A PROPOSED SUBSTITUTE SHALL BE FINAL.

G. ALL MATERIALS SHALL BE NEW AND OF CURRENT MANUFACTURER. WHERE MORE THAN ONE OF A TYPE OF DEVICE IS USED, ALL SHALL BE BY THE SAME MANUFACTURER. ALL MATERIALS SHALL CONFORM TO THE GRADE, QUALITY AND STANDARDS OF THOSE SPECIFIED.

H. SHOP DRAWINGS SHALL BE SUBMITTED IN ACCORDANCE WITH THE GENERAL CONDITIONS. FORWARD ALL SHOP DRAWINGS AT ONE TIME. EACH ITEM SHALL BEAR PROJECT NAME AND IDENTIFYING SYMBOL FROM PLANS. SHOP DRAWINGS REQUIRED ARE AS FOLLOWS:

I. STARTERS 3. JUNCTION BOXES
2. WIRING CONDUCTORS 4. CIRCUIT BREAKERS

J. INTERFERENCES -- THE DRAWINGS ARE GENERALLY DIAGRAMMATIC IN NATURE, AND ACCORDINGLY THE CONTRACTOR SHALL COORDINATE HIS WORK WITH THAT OF ALL OTHER TRADES TO AVOID INTERFERENCES. THE CONTRACTOR SHALL EXAMINE THE COMPLETE SET OF DRAWINGS AND SPECIFICATIONS FOR THE JOB BEFORE INSTALLATION OF ELECTRICAL WORK, COORDINATING LOCATIONS AND ROUTINGS WITH OTHER TRADES TO AVOID INTERFERENCES. WORK INSTALLED BY THE CONTRACTOR WHICH DOES INTERFERE WITH ANOTHER TRADE SHALL BE REMOVED AND REINSTALLED AT THE CONTRACTOR'S EXPENSE WHEN DIRECTED BY THE ARCHITECT.

K. WORKMANSHIP SHALL BE OF THE HIGHEST QUALITY AND ALL WORK SHALL BE DONE BY WORKMEN SKILLED IN THE TRADES INVOLVED.

L. THE CONTRACTOR SHALL GUARANTEE ALL WORK UNDER THIS CONTRACT FOR ONE YEAR AND SHALL BE RESPONSIBLE FOR THE MAINTENANCE OF ALL ELECTRICAL EQUIPMENT FURNISHED AND INSTALLED UNDER THIS CONTRACT, FOR A PERIOD OF ONE YEAR FROM THE DATE OF SUBSTANTIAL COMPLETION.

PART 2 -- PRODUCTS

NOT USED

PART 3 -- EXECUTION

3.1 APPLICABLE CODES AND STANDARDS

NOTE: THE MATERIALS AND INSTALLATION SHALL CONFORM TO THE MINIMUM REQUIREMENTS AND LATEST OUTSTANDING ISSUES AND REVISIONS OF THE FOLLOWING CODES, STANDARDS, AND REGULATIONS WHEREIN THEY APPLY:

NFPA NO. 70, NATIONAL ELECTRICAL CODE, (2008 EDITION),
IBC (2009), ICC (2009), IFC (2009)
AMERICAN NATIONAL STANDARD, NATIONAL ELECTRICAL SAFETY CODE, (2002).
APPLICABLE PUBLICATIONS OF NEMA, ANSI, IEEE AND IECIA.
UNDERWRITER'S LABORATORIES, INC. STANDARDS
CITY, STATE AND LOCAL CODES AND REGULATIONS HAVING JURISDICTION.
OSHA REQUIREMENTS.
ADA REQUIREMENTS.

3.2 PROVIDE 3 COPIES OF CLOSE OUT DOCUMENTS TO INCLUDE SUBMITTALS, O&M MANUALS, WARRANTIES AND RED LINE RECORD DRAWINGS WITHIN 1 MONTH OF SUBSTANTIAL COMPLETION.

END OF SECTION 16010

SECTION 16100 -- BASIC MATERIALS

PART 1 -- GENERAL

1.1 RELATED SECTIONS

A. MATERIALS SPECIFIED IN THIS SECTION SHALL COMPLY WITH ALL APPLICABLE REQUIREMENTS OF SECTION 16010, GENERAL PROVISIONS.

1.2 SCOPE

A. CONTRACTOR FURNISHED. UNLESS OTHERWISE NOTED ON THE DRAWINGS, EQUIPMENT LIST, OR SPECIFICATIONS, THE CONTRACTOR SHALL FURNISH AND INSTALL ALL MATERIALS, DEVICES, AND APPARATUS NECESSARY FOR THE COMPLETE ELECTRICAL SYSTEM. ALL MATERIALS AND EQUIPMENT SHALL BE OF TYPES AND MANUFACTURER SPECIFIED WHEREVER PRACTICAL. SHOULD MATERIALS OR EQUIPMENT SO SPECIFIED BE UNOBTAINABLE, THE CONTRACTOR SHALL SUBMIT THE DESCRIPTION AND MANUFACTURER'S LITERATURE, REASON FOR THE SUBSTITUTION REQUEST AND SHALL SECURE THE APPROVAL OF THE ENGINEER BEFORE SUBSTITUTION OF OTHER MATERIAL OR EQUIPMENT. THIS SPECIFICATION ESTABLISHES PERFORMANCE REQUIREMENTS AND THE QUALITY OF EQUIPMENT ACCEPTABLE FOR USE AND SHALL IN NO WAY BE CONSTRUED TO LIMIT PROCUREMENT FROM OTHER MANUFACTURERS.

B. EQUAL OR EQUIVALENT. THE TERM "OR EQUAL" AND SIMILAR TERMS AS USED ON THE DRAWINGS OR SPECIFICATIONS SHALL BE INTERPRETED TO MEAN "EQUAL OR EQUIVALENT" IN THE OPINION OF THE ENGINEER.

C. MANUFACTURER'S PRINTS. WHERE THE CONTRACTOR FURNISHES EQUIPMENT OTHER THAN STANDARD CONSTRUCTION ITEMS, HE SHALL FURNISH MANUFACTURER'S PRINTS AND REPRODUCIBLES OF ALL SUCH EQUIPMENT TO THE ENGINEER.

D. U.L. LISTING. ALL EQUIPMENT AND MATERIALS SHALL BE NEW AND CONFORM TO THE REQUIREMENTS OF THIS SPECIFICATION. ALL EQUIPMENT AND MATERIALS SHALL BE LISTED BY THE UNDERWRITER'S LABORATORIES, INC., AND SHALL BEAR THEIR LABEL WHENEVER STANDARDS HAVE BEEN ESTABLISHED AND LABEL SERVICE IS REGULARLY FURNISHED. ALL EQUIPMENT AND MATERIALS SHALL BE OF THE BEST GRADE OF THEIR RESPECTIVE KIND FOR THE PURPOSE.

PART 2 -- PRODUCTS AND EXECUTION

2.1 CIRCUIT BREAKERS

A. CONTRACTOR FURNISHED. THE CONTRACTOR WILL PROVIDE BREAKERS UNLESS SPECIFICALLY DESIGNATED TO BE "OWNER FURNISHED" ON THE DRAWINGS, EQUIPMENT LIST, OR WITHIN THE SPECIFICATIONS.

B. AS SPECIFIED. BREAKERS SHALL BE OF THE TYPE, RATING, NUMBER OF POLES, SIZE, AND INTERRUPTING CAPACITY, SPECIFIED OR REQUIRED FOR THE ENVIRONMENT, LOCATION, APPLICATION, AND LOAD SERVED.

C. MOLDED CASE CIRCUIT BREAKERS. MOLDED CASE CIRCUIT BREAKERS SHALL BE CIRCUIT INTERRUPTING DEVICES WHICH WILL OPERATE BOTH MANUALLY FOR NORMAL SWITCHING FUNCTIONS AND AUTOMATICALLY UNDER OVERLOAD AND SHORT CIRCUIT CONDITIONS. CIRCUIT BREAKERS SHALL PROVIDE CIRCUIT PROTECTION WHEN APPLIED WITHIN RATING.

D. OPERATING AND SWITCHING MECHANISM. THE OPERATING MECHANISM SHALL BE ENTIRELY TRIP-FREE SO THAT THE CONTACTS CANNOT BE HELD CLOSED AGAINST AN ABNORMAL OVERCURRENT OR SHORT CIRCUIT CONDITION. THE SWITCHING MECHANISM SHALL BE QUICK-MAKE, QUICK-BREAK TYPE.

E. OVERLOAD AND SHORT CIRCUIT PROTECTION. THE OPERATING HANDLE OF THE CIRCUIT BREAKER SHALL OPEN AND CLOSE ALL POLES OF A MULTI-POLE BREAKER SIMULTANEOUSLY. THE BREAKERS SHALL MEET APPLICABLE NEMA AND U.L. SPECIFICATIONS. EACH CIRCUIT BREAKER SHALL HAVE A TRIP UNIT TO PROVIDE OVERLOAD AND SHORT CIRCUIT PROTECTION. THE TRIP UNIT FOR EACH POLE SHALL HAVE ELEMENTS PROVIDING INVERSE TIME DELAY UNDER OVERLOAD CONDITIONS AND INSTANTANEOUS MAGNETIC TRIPPING FOR SHORT CIRCUIT PROTECTION. THE TRIP ELEMENT SHALL OPERATE A COMMON TRIP BAR WHICH SHALL OPERATE ALL POLES IN CASE OF AN OVERLOAD OR SHORT CIRCUIT THROUGH ANY ONE POLE. AUTOMATIC TRIPPING SHALL BE CLEARLY INDICATED BY HANDLE POSITION.

F. RATING. THE MOLDED CASE CIRCUIT BREAKERS SHALL BE RATED FOR FAULT DUTY AS SPECIFIED ON THE PLANS. SERIES RATINGS ARE NOT ALLOWED. THE CONTRACTOR SHALL VERIFY AVAILABLE FAULT CURRENT WITH THE UTILITY COMPANY FOR THE ACTUAL INSTALLATION AND FORWARD TO THE ENGINEER.

2.2 BOXES

A. CONTRACTOR FURNISHED. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL ELECTRICAL BOXES REQUIRED FOR THE PROPER INSTALLATION OF THE ELECTRICAL SYSTEMS. BOXES SHALL BE OF THE NEMA TYPE SUITABLE FOR THE LOCATION. BOXES SHALL BE INSTALLED AS SPECIFIED ON THE DRAWINGS AND AS DESCRIBED UNDER "WIRING METHODS" AND OTHER APPLICABLE SECTIONS OF THIS SPECIFICATION FOR WIRING DEVICES SUCH AS SWITCHES, RECEPTACLES, AND SIMILAR DEVICES. IN ORDER TO MAINTAIN FIRE RATINGS, BOXES INSTALLED "BACK-TO-BACK" IN FIRE WALLS SHALL NOT BE LOCATED IN THE SAME SPACE BETWEEN STUDS, BUT SHALL HAVE A STUD LOCATED BETWEEN THEM.

B. CONCEALED. FIXTURE, OUTLET, AND SWITCH BOXES INSTALLED CONCEALED IN WALLS OR CEILING AREAS SHALL BE GALVANIZED OR CADMIUM PLATED SHEET STEEL OF NOT LESS THAN THE MINIMUM SIZE AS RECOMMENDED IN THE NATIONAL ELECTRICAL CODE AND SHALL BE ACCESSIBLE FOR MAINTENANCE USE. FOR CONDUIT SIZES 3/4" AND 1" INCH, CONDUIT FITTINGS OF THE "C", "LB", "TB" AND SIMILAR TYPES MAY BE USED FOR "PULLING IN," UNLESS DESIGNATED OTHERWISE. ALL PULL BOXES SHALL BE THE STRAIGHT-THROUGH TYPE AND CHANGES IN DIRECTION SHALL NOT BE MADE IN THE BOX. THE BOXES SHALL BE OF THE MINIMUM SIZE AND TYPE AS REQUIRED BY THE NATIONAL ELECTRIC CODE OR AS SIZED ON THE DRAWINGS.

C. EXACT LOCATIONS OF ALL FLOOR BOXES SHALL BE COORDINATED IN THE FIELD WITH THE ARCHITECT UNLESS SPECIFIC DIMENSIONS ARE SHOWN ON THE DRAWINGS. ALSO, SEE SECTION 16500 OF THESE SPECIFICATIONS.

D. SURFACE MOUNTED. FIXTURE, OUTLET, AND SWITCH BOXES INSTALLED SURFACE MOUNTED IN PLANT, SHOP, OPERATING, AND UNFINISHED AREAS SHALL BE THREADED, CAST ALLOY IRON OR MALLEABLE IRON. IRON TYPE SHALL HAVE A CADMIUM/ZINC ELECTROPLATE OR GALVANIZED FINISH WITH APPROPRIATE LACQUER. BOXES SHALL BE OF THE APPROVED TYPE FOR THE OUTLETS, SWITCHES, AND FIXTURES SERVED AND SHALL BE MADE OF THE MATERIAL AND FINISH COMPATIBLE WITH THE CONDUIT SYSTEM AND LOCATION. SURFACE MOUNTED BOXES SHALL BE ONLY AS NOTED ON THE PLANS.

E. SPLICE AND TAP BOXES. SPLICE AND TAP BOXES FOR POWER CIRCUITS SHALL BE USED ONLY WHERE DESIGNATED ON THE DRAWINGS AND SHALL BE OF THE TYPE AND SIZE INDICATED. OTHERWISE ALL POWER WIRING SHALL BE CONTINUOUS, SPLICE AND TAP FREE BETWEEN EQUIPMENT. ON LIGHTING AND CONVENIENCE RECEPTACLE CIRCUITRY, WIRING MAY BE SPLICED AND BOXES SHALL BE PROVIDED FOR CONCEALED OR SURFACE MOUNTING AS PREVIOUSLY SPECIFIED OR MAY BE JOI OIL-TIGHT OF SIZE AND TYPE INDICATED ON THE DRAWINGS OR MINIMUM SIZE AS SPECIFIED IN THE NATIONAL ELECTRICAL CODE.

F. PULL BOXES. PULL BOXES FOR INTERIOR, OR OUTDOOR EXPOSED POWER WIRING SHALL BE PROVIDED WHERE SHOWN OR REQUIRED TO FACILITATE THE INSTALLATION OF THE WIRING. PULL BOXES SHALL NOT BE LOCATED IN FINISHED ROOMS AND SHALL BE ACCESSIBLE FOR MAINTENANCE USE. FOR CONDUIT SIZES 3/4" AND 1" INCH, CONDUIT FITTINGS OF THE "C", "LB", "TB" AND SIMILAR TYPES MAY BE USED FOR "PULLING IN," UNLESS DESIGNATED OTHERWISE. ALL PULL BOXES SHALL BE THE STRAIGHT-THROUGH TYPE AND CHANGES IN DIRECTION SHALL NOT BE MADE IN THE BOX. THE BOXES SHALL BE OF THE MINIMUM SIZE AND TYPE AS REQUIRED BY THE NATIONAL ELECTRIC CODE OR AS SIZED ON THE DRAWINGS.

G. EXTERIOR AND UNDERGROUND. FOR EXTERIOR EXPOSED WORK, PULL BOXES SHALL BE OF NEMA 3R CONSTRUCTION AND SHALL BE THREADED HUB TYPE WITH GASKETED COVER.

2.7 COVERS AND DEVICE PLATES

A. CONTRACTOR FURNISHED. THE CONTRACTOR SHALL FURNISH AND INSTALL THE APPROPRIATE COVER ON ALL BOXES, CONDUIT FITTINGS, PANELS, CABINETS, SWITCHES, RECEPTACLES, AND SIMILAR WIRING DEVICES AND OTHER EQUIPMENT THAT IS CONTRACTOR FURNISHED. CONDUIT OUTLET FITTING COVERS SHALL BE THE TYPE SPECIFIED UNDER "CONDUIT FITTINGS."

2.8 ENCLOSURES

A. ENCLOSURES AND HOUSINGS FOR ALL CONTRACTOR FURNISHED ELECTRICAL EQUIPMENT AND DEVICES SHALL BE SUITABLE FOR THE LOCATION AND ENVIRONMENTAL CONDITIONS AND SHALL BE OF NEMA TYPE AS SHOWN ON SYMBOL SHEET DRAWING.

END OF SECTION 16100

SECTION 16110 -- ELECTRICAL RACEWAYS

PART 1 -- GENERAL

1.1 RELATED SECTIONS

A. MATERIALS SPECIFIED IN THIS SECTION SHALL COMPLY WITH ALL APPLICABLE REQUIREMENTS OF SECTION 16010, GENERAL PROVISIONS.

1.2 SCOPE

A. CONTRACTOR FURNISHED. THE CONTRACTOR SHALL PROVIDE ALL CONDUIT, FITTINGS, AND SUPPORTS REQUIRED AND NOT OTHERWISE SHOWN ON PLANS AS FURNISHED BY OTHERS.

B. THE TYPES OF ELECTRICAL RACEWAYS REQUIRED FOR THE PROJECT INCLUDE THE FOLLOWING:

- ELECTRICAL METALLIC TUBING
- FLEXIBLE METAL CONDUIT
- LIQUID-TIGHT FLEXIBLE METAL CONDUIT
- RIGID GALVANIZED CONDUIT

C. THE MINIMUM RACEWAY SIZE SHALL BE 3/4".

D. PRODUCT DELIVERY, STORAGE, AND HANDLING. CONTRACTOR IS TO PROVIDE COLOR-CODED END-CAP THREAD PROTECTORS AND HANDLE CONDUIT AND TUBING CAREFULLY TO PREVENT DAMAGE. STORE PIPE AND TUBING INSIDE WHENEVER POSSIBLE. WHEN NECESSARY TO STORE OUTDOORS, ELEVATE WELL ABOVE GRADE AND ENCLOSE WITH DURABLE, WATER-TIGHT WRAPPING.

PART 2 -- PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. ELECTRICAL METALLIC TUBING. GALVANIZED, THIN WALL TUBING, FITTINGS SHALL BE HEX-NUT, EXPANSION GLAND TYPE, ZINC PLATED, AND U.L. LISTED AS "RAIN-TIGHT." NO CRIMP, SPRING, OR SET-SCREW TYPE FITTINGS WILL BE ACCEPTED.

B. FLEXIBLE METAL CONDUIT. GALVANIZED SINGLE STEEL STRIP, FLEXIBLE, INTERLOCKED.

C. LIQUID-TIGHT FLEXIBLE METAL CONDUIT. GALVANIZED SINGLE STEEL STRIP, FLEXIBLE, INTERLOCKED, DOUBLE WRAPPED, WITH LIQUID-TIGHT PVC JACKET.

D. RIGID GALVANIZED CONDUIT. RIGID STEEL, HOT-DIPPED GALVANIZED CONDUIT.

E. CONDUIT, TUBING AND DUCT ACCESSORIES INCLUDING STRAPS, HANGERS, EXPANSION AND DEFLECTION FITTINGS AS RECOMMENDED BY CONDUIT, TUBING, AND DUCT MANUFACTURERS.

PART 3 -- EXECUTION

3.1 APPLICATION

A. ELECTRICAL METALLIC TUBING. BRANCH CIRCUITS RUN IN HOLLOW DRY WALLS AND ABOVE CEILINGS. NOT TO BE EXPOSED.

B. FLEXIBLE METAL CONDUIT. CONNECTION OF MOTORS AND FOR OTHER ELECTRICAL EQUIPMENT WHERE SUBJECT TO MOVEMENT AND VIBRATION AND LOCATED IN A DRY, INTERIOR LOCATION. FLEXIBLE CONDUIT IS NOT TO EXCEED 60" IN LENGTH FOR ANY ONE APPLICATION.

C. LIQUID-TIGHT FLEXIBLE METAL CONDUIT. CONNECTION OF MOTORS AND FOR OTHER ELECTRICAL EQUIPMENT WHERE SUBJECT TO MOVEMENT AND VIBRATION, AND ALSO SUBJECTED TO ONE OR MORE OF THE FOLLOWING CONDITIONS: EXTERIOR LOCATION; MOIST OR HUMID ATMOSPHERE WHERE CONDENSATE CAN BE EXPECTED TO ACCUMULATE; CORROSIVE ATMOSPHERE; SUBJECTED TO WATER SPRAY; SUBJECTED TO DIPPING OIL, GREASE OR WATER. FLEXIBLE CONDUIT IS NOT TO EXCEED 60" IN LENGTH FOR ANY ONE APPLICATION.

D. RIGID GALVANIZED. WHERE SPECIFIED ON PLANS FOR CERTAIN UNDERGROUND OR EXPOSED RUNS, OR WHERE STUBBED UP AT FLOOR LEVEL.

3.2 INSTALLATION

A. INSTALL CONDUIT AND TUBING IN ACCORDANCE WITH NEC AND NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION'S "STANDARD OF INSTALLATION", AND WITH RECOGNIZED INDUSTRY PRACTICES. WHERE NECA AND NEC STANDARDS DIFFER, USE THE MORE STRINGENT REQUIREMENT.

B. COMPLETE THE INSTALLATION OF RACEWAYS BEFORE STARTING INSTALLATION OF WIRES.

C. WHEREVER POSSIBLE, INSTALL HORIZONTAL RACEWAY RUNS ABOVE WATER AND STEAM PIPING.

D. CARE SHALL BE TAKEN TO KEEP THE INTERIOR OF CONDUITS CLEAN, AND EACH CONDUIT RUN SHALL BE THOROUGHLY CLEANED AND DRIED BEFORE ANY CABLE IS PULLED THROUGH.

E. UNLESS INDICATED OTHERWISE ON DRAWINGS, ALL EXPOSED CONDUITS SHALL BE RUN PARALLEL WITH OR PERPENDICULAR TO BUILDING STRUCTURAL MEMBERS.

F. CONDUITS ENTERING SHEET METAL ENCLOSURES SHALL BE MADE UP WITH DOUBLE LOOKNUT AND INSULATING BUSHING. LOOKNUT SHALL BE OF THE TYPE WHICH WILL BITE INTO THE METAL OF THE BOX.

G. CONDUITS ENTERING THREADED OPENINGS IN EQUIPMENT ENCLOSURES, BOXES, ETC., SHALL HAVE AT LEAST FIVE FULL THREADS ENGAGED. IN OUTDOOR AND UNDERGROUND LOCATIONS, THREADED JOINTS SHALL BE MADE UP WITH A THIN APPLICATION OF CONDUCTING JOINT COMPOUND. THE INSIDE OF THE FITTING SHALL BE THOROUGHLY CLEANED OF ANY EXCESS COMPOUND.

H. POWER OPERATED BENDING MACHINES SHALL BE USED ON CONDUITS 1-1/4" AND LARGER. HEATING WITH TORCHES WILL NOT BE PERMITTED.

I. ALL CONDUIT RUNS SHALL BE CONTINUOUS FROM OUTLET TO OUTLET WITH ALL JOINTS AND CONNECTIONS PULLED TIGHT TO INSURE AN ELECTRICALLY CONTINUOUS AND MECHANICALLY SECURE RACEWAY SYSTEM.

J. ALL RACEWAYS IN "FINISHED AREAS" SUCH AS OFFICES, CORRIDORS, ETC., SHALL BE CONCEALED.

3.3 CONDUIT OPENINGS

A. CONTRACTOR'S RESPONSIBILITY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SLEEVES AND OPENINGS THROUGH WALLS AND FLOORS NECESSARY FOR PASSAGE OF ELECTRICAL CONDUITS AND RACEWAYS. WHERE CONTRACTOR MUST PROVIDE OPENINGS AND/OR DRILL CONCRETE FLOORS AND/OR WALLS, HE SHALL BE RESPONSIBLE FOR THE REPAIR OF THESE OPENINGS. STRUCTURAL MEMBERS AND REINFORCING SHALL NOT BE CUT, BURNED OR DAMAGED IN ANY WAY. ALL OPENINGS IN WALLS AND FLOORS, AND UNDER SWITCHGEAR AND PANELS WHERE ELECTRICAL CABLES AND CONDUITS ARE INSTALLED, SHALL BE CLOSED UP BY THE CONTRACTOR TO PREVENT DUST, DIRT AND WATER FROM ENTERING.

B. SEALING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SEALING ALL WALL AND FLOOR OPENINGS AND ALL FLOOR AND WALL SLEEVE OPENINGS UTILIZED BY THE CONTRACTOR WHETHER FURNISHED BY OTHERS OR BY THE CONTRACTOR.

C. SLEEVES AND OPENINGS SHALL BE SEALED WITH MATERIALS THAT WILL WITHSTAND FIRE AND HEAT TO THE SAME RATING AS THE WALL, FLOOR, OR CEILING THROUGH WHICH THE CONDUIT OR TRAY PASSES AND SHALL NOT BE LESS THAN A 30-MINUTE BARRIER.

END OF SECTION 16110

SECTION 16130 -- CONDUCTORS

PART 1 -- GENERAL

1.1 RELATED SECTIONS

A. MATERIALS SPECIFIED IN THIS SECTION SHALL COMPLY WITH ALL APPLICABLE REQUIREMENTS OF SECTION 16010, GENERAL PROVISIONS.

1.2 SCOPE

A. THIS SPECIFICATION COVERS THE REQUIREMENTS FOR ALL WIRE AND CABLE TO BE USED IN THE INSTALLATION OF THE ELECTRICAL SYSTEMS FOR THE PROJECT, INCLUDING ALL POWER, LIGHTING, CONTROL AND INSTRUMENTATION SYSTEMS.

B. WIRE AND CABLE WILL NORMALLY BE FURNISHED BY THE CONTRACTOR FOR INSTALLATION. DRAWINGS WILL INDICATE WHERE CABLE IS NOT TO BE FURNISHED.

C. ALL CABLE IS TO BE "CONTRACTOR-FURNISHED", THE CONTRACTOR SHALL SUBMIT FOR APPROVAL BY THE OWNER ANY DEVIATIONS ANTICIPATED OR PROPOSED WITH RESPECT TO THE CABLE MANUFACTURER, CABLE TYPE, OR SPECIFICATION CONTAINED HEREIN.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. ALL WIRE AND CABLE SHALL BE UNDERWRITER'S LABORATORIES (UL) LISTED. IN ADDITION TO OTHER STANDARD LABELING, ALL WIRE AND CABLE SHALL BE MARKED UL ON THE OUTER SURFACE INDICATING UNDERWRITER'S LABORATORIES, INC. CERTIFICATION.

B. GROUNDING CONDUCTORS, WHERE INSULATED, SHALL BE COLORED SOLID GREEN. CONDUCTORS INTENDED AS A NEUTRAL SHALL BE COLORED SOLID WHITE.

C. FOR ALL CIRCUITS 600 VOLT AND LESS, WIRES AND CABLES SHALL HAVE CODE GRADE, 600 VOLT TYPE THHN--THHN, 75 DEGREES C., WET OR DRY LOCATIONS, MOISTURE AND HEAT RESISTANT THERMOPLASTIC INSULATION. INSULATION THICKNESS SHALL BE PER NATIONAL ELECTRICAL CODE, TABLE 310-13.

D. CONDUCTOR SIZES ARE EXPRESSED IN AMERICAN WIRE GAGE (AWG) OR IN CIRCULAR MILS. CONDUCTORS SHALL BE ANNEALED COPPER WIRE, MINIMUM SIZE #12 AWG, EXCEPT THAT #14 AWG MAY BE USED FOR CONTROL. ALL CONDUCTORS SHALL BE STRANDED.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. SEPARATION OF USAGE. LIGHTING AND POWER WIRING SHALL BE ROUTED IN CONDUITS, OR OTHER RACEWAYS AS SHOWN ON THE DRAWINGS. LIGHTING AND POWER WIRING SHALL NOT BE ROUTED IN A COMMON RACEWAY EXCEPT WHERE SHOWN ON DRAWINGS. PUSH-BUTTON WIRING SHALL BE ROUTED IN SEPARATE RACEWAYS EVEN THOUGH RELATED TO A PARTICULAR MOTOR CIRCUIT.

B. PULLING. WHERE MECHANICAL ASSISTANCE IS USED FOR PULLING CONDUCTORS, PATENTED WIRE PULLING COMPOUNDS HAVING HERT QUALITIES THAT DO NOT HARM THE WIRE INSULATION OR COVERING SHALL BE APPLIED TO THE CONDUCTORS AS THEY ARE PULLED INTO RACEWAYS. INTERIOR OF ALL RACEWAYS SHALL BE FREE FROM GREASE, FLINGS OR FOREIGN MATTER BEFORE CONDUCTORS ARE PULLED IN.

3.2 IDENTIFICATION

A. WIRE, CABLE, RACEWAYS, AND CONDUITS.

B. CIRCUIT IDENTIFICATION NUMBERS SHALL BE PLACED ON EACH END OF THE CONDUCTOR INVOLVED BY USING SELF-LAMINATING MARKER TAGS, TAB COMPANY E-Z CODE TYPE WSL OR EQUAL. CIRCUIT NUMBERS SHALL BE AS SHOWN ON THE PLAN AND PANEL SCHEDULE DRAWINGS.

C. PHASE IDENTIFICATION. PHASE SEQUENCE THROUGHOUT THE INSTALLATION SHALL BE STANDARDIZED WHEREVER PRACTICAL IN ALL ELECTRICAL POWER EQUIPMENT AS FOLLOWS:

	PHASE A	PHASE B	PHASE C
POSITION OCCUPIED	FRONT	CENTER	REAR
	TOP	CENTER	BOTTOM
	LEFT	CENTER	RIGHT
COLOR CODE: 208/120V, 3-PHASE	BLACK	RED	BLUE
480/277V, 3-PHASE	BROWN	ORANGE	YELLOW

3.3 SPLICES AND TERMINATIONS

A. LIGHTING CONDUCTORS. SPLICES IN LIGHTING CONDUCTORS SHALL BE MADE WITH SPLICING CAPS WITH METAL INSERTS ONLY, SUCH AS 3M COMPANY'S "SCOTCHLOCK" SPRING CONNECTORS. THE SPLICES SHALL BE FIRMLY AND NEATLY TAPED TO PREVENT ENTRY OF MOISTURE.

B. POWER CONDUCTORS SHALL BE CONTINUOUS FROM OUTLET TO OUTLET. NO POWER CABLE SHALL BE SPLICED EXCEPT ON EXPLICIT INSTRUCTIONS OF THE OWNER'S REPRESENTATIVE.

3.4 LUGS

A. ALL LUGS SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR WHERE REQUIRED.

B. LUGS FOR COPPER POWER WIRING, SIZES NO. 12 AND NO. 10 AWG, SHALL BE TAB "STA-KON" UN-INSULATED RING TYPE LUGS. LUGS FOR COPPER POWER WIRING FROM NO. 10 AWG TO SIZE 1/0 AWG SHALL BE TAB 1-HOLE TYPE 54100 SERIES. SIZE 2/0 AWG AND LARGER LUGS SHALL BE 2-HOLE TYPE 54200 SERIES (EXCEPT WHERE 1-HOLE IS REQUIRED TO MATCH MOTOR LEAD LUGS). SIZES ABOVE 1/0 ARE TO BE APPLIED USING HYDRAULIC PUMP TOOL.

B. WHERE MOTOR LEADS ARE FURNISHED WITHOUT LUGS, TAB 54500 SERIES 2-WAY CONNECTORS (SPLICING SLEEVES) SHALL BE USED. SPLICE SLEEVES MAY BE DESIRABLE WHERE LIMITED SPACE FOR TERMINATION EXISTS.

C. THE PROPER LUGS WILL NORMALLY BE FURNISHED WITH EQUIPMENT IN ALL OWNER-FURNISHED EQUIPMENT. ALL OTHER LUGS SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR. NO MECHANICAL TYPE LUGS SHALL BE USED EXCEPT IN PANELBOARDS. IF ANY MECHANICAL TYPE LUGS ARE FURNISHED WITH OWNER-FURNISHED EQUIPMENT, THE CONTRACTOR SHALL REPLACE THEM WITH PROPER COMPRESSION TYPE LUGS WHERE PRACTICAL.

3.5 TAPING

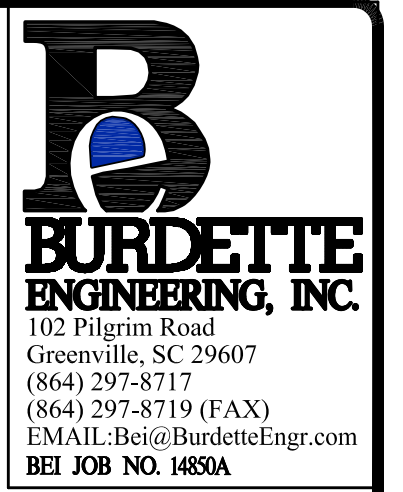
A. ALL VOIDS, SHARP CORNERS AND BOLT PROJECTIONS SHALL BE MADE SMOOTH BY FILLING WITH OKONITE OR SCOTCH FILL BEFORE APPLYING THE LAPS OF TAPE REQUIRED FOR INSULATION. ALL LOOSE STRANDS OF WIRE SHALL BE REMOVED BEFORE TAPING. DUXSEAL WILL NOT BE PERMITTED.

B. JOINTS AND OTHER SECTIONS OF WIRING REQUIRING TAPE SHALL BE HALF LAP AND AT LEAST TWO LAYERS. TAPING SHALL BE NEATLY DONE AND SHALL FORM A PERMANENT INSULATION EQUAL IN MECHANICAL AND ELECTRICAL STRENGTH TO THE INSULATION OF THE CONDUCTOR. TAPING SHALL BE AS FOLLOWS:

- 600 VOLT INSULATION -- A MINIMUM OF 1-1/2 LAP LAYER VARNISHED CAMBRIC AND 2-1/2 LAP LAYERS OF 3M NO. 33 VINYL PLASTIC ELECTRICAL TAPE.

C. ALL TAPING, SPLICING AND TERMINATION MATERIALS SHALL BE FURNISHED BY THE CONTRACTOR.

END OF SECTION 16130



DESCRIPTION		BY	DATE	NO.
USC UPSTATE THRU WALL FANS-University Services Building PROJECT #CP00395036 SPARTANBURG, SOUTH CAROLINA				
DESIGN	DJB	DRAWN	TMP	
CHECKED	DJB	DATE	3/6/14	
JOB NO.	PERITUS #140208			
2 OF 2 SHEETS				