

CITY OF CHARLOTTESVILLE



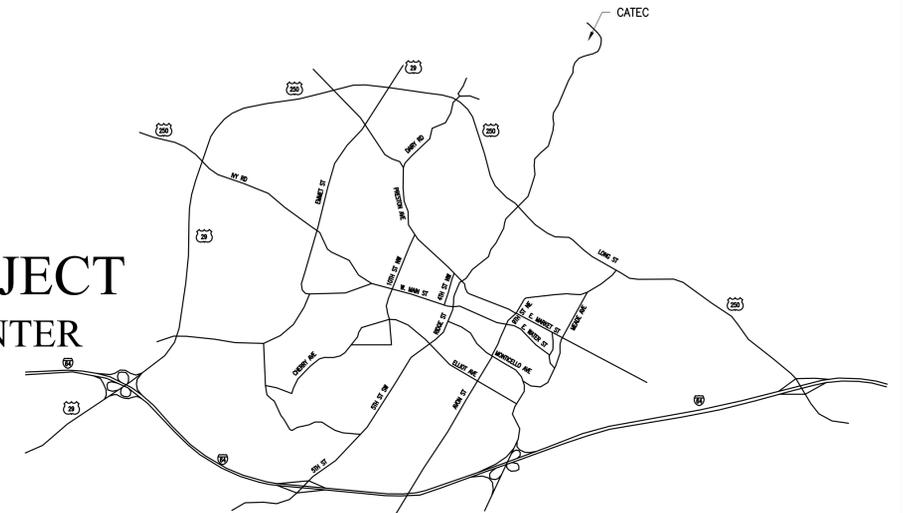
PROJECT CONTACTS

MASTER ENGINEERS AND DESIGNERS, INC.
GRANT BEASLEY, PE
434-846-1350
GBEASLEY@MASTERENGINEERSINC.COM

CITY OF CHARLOTTESVILLE
R.J. NARKIE
NARKIE@CHARLOTTESVILLE.GOV

ELECTRICAL EQUIPMENT REPLACEMENT PROJECT CHARLOTTESVILLE-ALBERMARLE TECHNICAL EDUCATION CENTER

1000 RIO RD E.
CHARLOTTESVILLE, VA 22901



VICINITY MAP

DRAWING LIST

E0.1	SPECIFICATIONS & ABBREVIATIONS
E1.1	ONE LINE DIAGRAM
E2.1	FLOOR PLANS (1 OF 3)
E2.2	FLOOR PLANS (2 OF 3)
E2.3	FLOOR PLANS (3 OF 3)
E2.4	ENLARGED MECHANICAL ROOM PLAN
E3.1	PANEL SCHEDULES - PHASE 1 (SHEET 1 OF 2)
E3.2	PANEL SCHEDULES - PHASE 1 (SHEET 2 OF 2)
E3.3	PANEL SCHEDULES - PHASE 2 (SHEET 1 OF 2)
E3.4	PANEL SCHEDULES - PHASE 2 (SHEET 2 OF 2)
E3.5	PANEL SCHEDULES - PHASE 3 (SHEET 1 OF 4)
E3.6	PANEL SCHEDULES - PHASE 3 (SHEET 2 OF 4)
E3.7	PANEL SCHEDULES - PHASE 3 (SHEET 3 OF 4)
E3.8	PANEL SCHEDULES - PHASE 3 (SHEET 4 OF 4)

SEPTEMBER 9, 2021



904 LAKESIDE DRIVE
LYNCHBURG, VA 24501
434.846.1350

PROJECT NUMBER: 653-014

SPECIFICATIONS

REFERENCE STANDARDS

- NATIONAL ELECTRICAL CODE (NFPA NO.70).....NEC
- NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION.....NEMA
- UNDERWRITERS LABORATORIES, INC.UL
- UNIFORM STATE BUILDING CODEVUSBC

260000- ELECTRICAL GENERAL REQUIREMENTS

A. SUBMITTALS: SUBMIT SHOP DRAWINGS FOR THE FOLLOWING:

- POWER SYSTEM ANALYSIS
- SWITCHBOARDS
- PANELBOARDS
- MOTOR CONTROL CENTERS

B. PROJECT SCOPE DIVIDED INTO THREE PHASES. SEE SCHEDULES AND ONE LINE DIAGRAM FOR PHASING. REFER TO FRONT END DOCUMENTS AND BID SHEET FOR BIDDING INSTRUCTIONS. ALL WORK DEPICTED ON DRAWINGS SHALL BE CONSIDERED PHASE 1, UNLESS SPECIFICALLY NOTED OTHERWISE.

C. NAMEPLATES: SHALL BE CONSTRUCTED OF LAMINATED PHENOLIC WITH A BLACK CENTER CORE SANDWICHED BETWEEN WHITE LAYERS. LETTERS SHALL BE ENGRAVED IN THE PHENOLIC TO FORM LETTERS 3/8 INCHES HIGH, UNLESS INDICATED OTHERWISE ON DRAWINGS. FASTENERS SHALL BE SCREWS OR A NON-ADHESIVE TYPE FASTENER. INSTALL NAMEPLATES ON ALL, NEW SWITCHBOARDS AND PANELBOARDS.

D. PRIOR TO SUBMITTING A BID FOR THIS WORK, BECOME FAMILIAR WITH THE DRAWINGS AND EXAMINE THE CONTRACT. THE CONTRACTOR WILL NOT BE ENTITLED TO ANY EXTRA COMPENSATION FOR FAILURE TO ALLOW FOR EXISTING CONDITIONS.

E. SUBMITTING A BID WILL BE CONSIDERED EVIDENCE OF THE FACT THAT THE CONTRACTOR HAS INVESTIGATED AND IS FULLY AWARE OF EXISTING CONDITIONS AND IS ABLE TO COMPLETE ALL WORK REQUIRED BY THE CONTRACT. IT IS EXPECTED THAT THE CONTRACTOR VISIT THE SITE PRIOR TO BID TO VERIFY EXISTING CONDITIONS.

F. PERFORM ALL WORK IN ACCORDANCE WITH THE LATEST ADOPTED EDITION OF THE NEC.

G. ALL ELECTRICAL EQUIPMENT SHALL BE INSTALLED SUCH THAT PROPER WORKING CLEARANCES ARE MAINTAINED. WHERE THIS IS NOT POSSIBLE, CONSULT ENGINEER.

H. ANY ADDITIONAL WIRING OR CONDUIT NECESSARY TO INSTALL NEW EQUIPMENT SHALL BE PROVIDED BY CONTRACTOR AT NO ADDITIONAL COST TO BID. CONTRACTOR SHALL USE SAME WIRING AND CONDUIT SIZES AND MATERIALS.

I. PANELBOARD, SWITCHBOARD, AND MOTOR CONTROL CENTER DIRECTORY CARDS FOR ALL NEW EQUIPMENT SHALL BE UPDATED BEFORE PROJECT CLOSEOUT. CARDS SHALL BE TYPED NEATLY WITH NO HAND-WRITTEN CORRECTIONS. CIRCUITS LABELLED AS "SPARE?" ON SCHEDULES SHALL BE VERIFIED AS SPARE. IF FOUND NOT TO BE SPARE, CONTRACTOR SHALL TRACE CIRCUIT AND LABEL APPROPRIATELY. FOR ANY PANELBOARD WITH THE WORDS "TRACE ALL CIRCUITS" IN THE SCHEDULE HEADER, CONTRACTOR SHALL TRACE ALL CIRCUITS AND LABEL APPROPRIATELY.

J. CONTRACTOR SHALL PROVIDE RED LINE DRAWINGS TO OWNER SHOWING DEVIATIONS IN SCHEDULES.

K. CONTRACTOR SHALL PROVIDE AT LEAST 2 KEYS TO EACH PANELBOARD TO OWNER AT PROJECT CLOSE-OUT.

260201 - ELECTRIC SERVICE

A. PROJECT CONDITIONS: CONTRACTOR SHALL COORDINATE WITH POWER COMPANY FOR REQUIREMENTS OF CT CABINET SECTION OF SERVICE ENTRANCE EQUIPMENT AND FOR ANY NECESSARY INTERRUPTION OF POWER IN ORDER TO INSTALL THE NEW EQUIPMENT. ANY AID-TO-CONSTRUCTION COSTS DUE TO THE POWER COMPANY SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

260130 - REWORKING EXISTING SYSTEM

A. OUTAGE TO ACCOMMODATE SWITCHBOARD REPLACEMENT SHALL BE NO LONGER THAN THREE CALENDAR DAYS AND SHALL TAKE PLACE OVER A LONG WEEKEND. COORDINATE TIMING WITH OWNER.

B. GROUNDING: ENSURE NEW SERVICE ENTRANCE HAS A LINK BETWEEN NEUTRAL AND GROUND BUSES. ENSURE NEW SERVICE ENTRANCE GROUND BUS HAS CONNECTIONS TO THE FOLLOWING ELECTRODES, WHERE EXTANT:

- GROUND ROD
- METALLIC COLD WATER SERVICE
- BUILDING STRUCTURE
- UFER GROUND
- OTHER METALLIC PIPING SYSTEMS IN THE FACILITY

260173 - POWER SYSTEM ANALYSIS

A. SCOPE:

- PROVIDE A POWER SYSTEM ANALYSIS CONSISTING OF AN INTEGRATED SHORT CIRCUIT STUDY, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY AND ARC FLASH ANALYSIS. PROVIDE AS PART OF PHASE 1 SCOPE OF WORK.
- INCLUDE ALL PORTIONS OF THE ELECTRICAL DISTRIBUTION SYSTEM FROM THE NORMAL AND ALTERNATE SOURCES OF POWER THROUGHOUT DISTRIBUTION SYSTEM. ALL NEW AND EXISTING EQUIPMENT DEPICTED ON ONE LINE DIAGRAMS SHALL BE INCLUDED IN THE STUDY, INCLUDING NEW PANEL "X" TRACED BY CONTRACTOR. INCLUDE EQUIPMENT IN ALL PHASES.
- CONTRACTOR SHALL COLLECT ALL FIELD DATA NECESSARY FOR COMPLETING STUDY.

B. QUALITY CONTROL: CALCULATIONS AND STUDIES SHALL BE PREPARED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE IN WHICH THE PROJECT IS

LOCATED. THE SUBMITTAL SHALL BE SEALED BY THE PROFESSIONAL ENGINEER.

C. ARC FLASH ANALYSIS:

4. SHALL CONFORM TO NFPA 70E AND IEEE STANDARD 1584-2002, THE IEEE GUIDE FOR PERFORMING ARC FLASH CALCULATIONS.

5. SHALL INCLUDE THE FOLLOWING EQUIPMENT:

- SERVICE ENTRANCE EQUIPMENT
- PANELBOARDS
- METER SOCKET ENCLOSURES
- MOTOR CONTROL CENTERS

3. ARC FLASH LABELS SHALL COMPLY WITH RELEVANT NEC AND NFPA STANDARDS AS WELL AS UL 969.

D. EXECUTION:

1. PREPARE THE POWER SYSTEM ANALYSIS AS SPECIFIED ABOVE AND SUBMIT THROUGH SHOP DRAWING PROCESS FOR ENGINEER COMMENT.

2. INSTALL ARC FLASH INCIDENT ENERGY LABELS ON ALL EQUIPMENT, NEW AND EXISTING, INVOLVED IN THE PROJECT IN ACCORDANCE WITH NFPA 70E.

3. CONTRACTOR TO ADJUST BREAKERS PER RECOMMENDATIONS OF STUDY.

4. CONTRACTOR SHALL PROVIDE OWNER WITH ELECTRONIC COPY OF STUDY FILE SO THAT NEW LABELS CAN BE PRINTED WHEN EQUIPMENT IS REPLACED IN FUTURE PHASES.

262413 - SWITCHBOARDS

A. SWITCHBOARD SHALL BE SERVICE-ENTRANCE-RATED AND INCLUDE A CT CABINET SECTION, COMPLIANT WITH POWER COMPANY STANDARDS,

B. DIMENSIONS OF EXISTING SWITCHBOARD ARE SHOWN ON DRAWINGS. NEW SWITCHBOARD SHALL BE SIMILAR IN SIZE TO ACCOMMODATE EXISTING CONDUIT ENTRY.

C. PROVIDE SWITCHBOARD FROM ONE OF THE FOLLOWING MANUFACTURERS: ABB/GE, EATON, SIEMENS, OR SQUARE D.

D. SERVICE ENTRANCE ENCLOSURES SHALL BE MODULAR TYPE CONSTRUCTION AND SHALL CONFORM TO THE REQUIREMENTS ESTABLISHED BY UL, NEMA AND THE NEC, EXCEPT WHERE MODIFIED HEREIN. EACH SHALL BE SUITABLE FOR ITS INTENDED APPLICATION AS SCHEDULED, CONSIDERING VOLTAGE, PHASE, FREQUENCY AND INTENDED SERVICE. ALL SWITCHBOARDS SHALL BE UL LISTED AND SHALL BE SO LABELED.

E. SWITCHBOARD SHALL BE RIGID, SELF-SUPPORTING, COMPLETELY METAL ENCLOSED STATIONARY STRUCTURES, CONSISTING OF BUS ASSEMBLY, CIRCUIT BREAKERS, TRIM, AND ALL ACCESSORIES AS INDICATED AND REQUIRED. ALL CHARACTERISTICS SHALL BE AS SHOWN ON SCHEDULES ON THE DRAWINGS.

F. EQUIPMENT SHALL INCLUDE GROUND AND NEUTRAL BUSES AND SHALL BE BONDED TOGETHER WITH JUMPER SIZED IN ACCORDANCE WITH THE NEC.

G. CT COMPARTMENT SHALL COMPLY WITH REQUIREMENTS OF POWER COMPANY. (DOMINION). CONTRACTOR RESPONSIBLE FOR COORDINATING THESE DETAILS WITH POWER COMPANY.

H. INCOMING SERVICE: INCOMING LINE LUG COMPARTMENT TO ISOLATE INCOMING SERVICE CONDUCTORS. THIS COMPARTMENT SHALL BE OF THE BUSSED TYPE. MECHANICAL LUGS, LUGS TO TERMINATE, ALUMINUM, CABLE, SHALL BE FURNISHED. LUGS SHALL BE SUFFICIENT TO TERMINATED EXISTING SERVICE ENTRANCE CONDUCTORS. CONTRACTOR SHALL FIELD VERIFY SIZE AND QUANTITY OF CONDUCTORS.

I. EQUIPMENT SHALL BE SERVICE ENTRANCE RATED. SERVICE DISCONNECT SHALL BE A 100% RATED, ELECTRONIC TRIP, LSIG CIRCUIT BREAKER. BREAKER SHALL HAVE AN ENERGY-REDUCING MAINTENANCE SWITCH FUNCTION TO MEET NEC 240.87(B)

J. IN ADDITION TO ARC FLASH LABEL, INSTALL LABEL ON SWITCHBOARD STATING THE FOLLOWING:

- NOMINAL SYSTEM VOLTAGE
- AVAILABLE FAULT CURRENT AT THE SERVICE OVERCURRENT PROTECTIVE DEVICE (BASED ON SHORT CIRCUIT STUDY)
- THE CLEARING TIME OF SERVICE OVERCURRENT PROTECTIVE DEVICE BASED ON THE AVAILABLE FAULT CURRENT
- DATE LABEL APPLIED

K. FURNISH SWITCHBOARD WITH A SURGE PROTECTIVE DEVICE (SPD) HAVING THE FOLLOWING QUALITIES.

- UNIT OPERATING VOLTAGE - REFER TO DRAWINGS FOR OPERATING VOLTAGE AND UNIT CONFIGURATION.
- MAXIMUM CONTINUOUS OPERATING VOLTAGE (MCOV) - THE MCOV SHALL NOT BE LESS THAN 115% OF THE NOMINAL SYSTEM OPERATING VOLTAGE.
- SPD SHALL BE A TYPE 1 AND HAVE A MINIMUM SURGE CURRENT CAPACITY OF 250KA PER PHASE, 125KA PER MODE.
- THE SPD'S SHALL BE MAINTENANCE FREE AND SHALL NOT REQUIRE ANY USER INTERVENTION THROUGHOUT ITS LIFE. SPD'S CONTAINING ITEMS SUCH AS REPLACEABLE MODULES, REPLACEABLE FUSES, OR REPLACEABLE BATTERIES SHALL NOT BE ACCEPTED. SPD'S REQUIRING ANY MAINTENANCE OF ANY SORT SUCH AS PERIODIC TIGHTENING OF CONNECTIONS SHALL NOT BE ACCEPTED. SPD'S REQUIRING USER INTERVENTION TO TEST THE UNIT VIA A DIAGNOSTIC TEST KIT OR SIMILAR DEVICE SHALL NOT BE ACCEPTED.
- ELECTRICAL NOISE FILTER: EACH UNIT SHALL INCLUDE A HIGH-PERFORMANCE EMI/RFI NOISE REJECTION FILTER. NOISE

ATTENUATION FOR ELECTRIC LINE NOISE SHALL BE UP TO 50 DB FROM 10 KHZ TO 100 MHZ USING THE MIL-STD-220A INSERTION LOSS TEST METHOD. PRODUCTS UNABLE TO MEET THIS SPECIFICATION SHALL NOT BE ACCEPTED.

6. SURGE COUNTER: THE SPD SHALL BE EQUIPPED WITH AN LCD DISPLAY THAT INDICATES TO THE USER HOW MANY SURGES HAVE OCCURRED AT THE LOCATION.

J. WARRANTY PERIOD SHALL BE THREE YEARS FROM SUBSTANTIAL COMPLETION. MANUFACTURER SHALL AGREE TO REPAIR OR REPLACE SERVICE ENTRANCE EQUIPMENT ENCLOSURE, BUSWORK, OVERCURRENT PROTECTIVE DEVICES, ACCESSORIES, SPD'S, AND FACTORY-INSTALLED INTERCONNECTION WIRING THAT FAIL IN MATERIALS OR WORKMANSHIP DURING THIS PERIOD.

262416 - PANELBOARDS

A. GENERAL

1. PANELBOARDS SHALL BE OF DEAD FRONT CONSTRUCTION AND SHALL CONFORM TO THE REQUIREMENTS ESTABLISHED BY UL, NEMA AND THE NEC, EXCEPT WHERE MODIFIED HEREIN. EACH SHALL BE SUITABLE FOR ITS INTENDED APPLICATION AS SCHEDULED, CONSIDERING VOLTAGE, PHASE, FREQUENCY AND INTENDED SERVICE. ALL PANELBOARDS SHALL BE UL LISTED AND SHALL BE SO LABELED.

2. PANELS KNOWN AS "LOADCENTERS" WILL NOT BE ACCEPTED.

3. PANELBOARDS SHALL CONSIST OF CABINET OR BACK BOX, BUS ASSEMBLY, CIRCUIT BREAKERS, TRIM, AND ALL ACCESSORIES AS INDICATED AND REQUIRED. ALL CHARACTERISTICS SHALL BE AS SHOWN OR SCHEDULED ON THE DRAWINGS.

B. CABINETS:

1. CABINETS SHALL BE NEMA 1 ENCLOSURES IF INSTALLED INDOORS, AND NEMA 3R ENCLOSURES IF INSTALLED OUTDOORS.

2. CABINETS OR BACK BOXES SHALL BE FABRICATED FROM GALVANIZED OR EQUIVALENT RUST RESISTANT SHEET STEEL OF THICKNESS TO MEET CODE REQUIREMENTS.

3. CABINET DEPTHS SHALL BE THE MANUFACTURER'S STANDARD EXCEPT WHERE SPECIFIC REQUIREMENTS INDICATED OTHERWISE.

4. GUTTER SPACE SHALL MEET UL AND NEC REQUIREMENTS.

C. BUS

1. THE BUS ASSEMBLY SHALL CONSIST OF COPPER OR ALUMINUM BUS STRUCTURE, SECURED AND ARRANGED TO RECEIVE BREAKERS AS INDICATED.

2. ALL BUSSING SHALL BE DESIGNED IN ACCORDANCE WITH UL STANDARDS TO SUIT THE LOADING REQUIREMENTS AS SCHEDULED AND SHALL BE MAGNETIC TO WITHSTAND MECHANICAL STRESSES CREATED BY FAULTS OF BRACED TO EQUIVALENT TO THE RATING OF BREAKERS TO BE INSTALLED.

3. BUS ASSEMBLY SHALL INCLUDE MAIN LUGS OR MAIN BREAKERS AS INDICATED.

4. ARRANGEMENT SHALL ALSO INCLUDE DOUBLE ROW CONSTRUCTION OF BREAKERS AND ALLOWANCE FOR BREAKER REPLACEMENT FROM THE FRONT WITHOUT DISTURBING ADJACENT UNITS OR MAIN BUS CONNECTIONS. BUS AND MOUNTING PAN SHALL BE DESIGNED SO THAT CIRCUIT BREAKERS MAY BE CHANGED OR ADDED WITHOUT ADDITIONAL MACHINING, DRILLING OR TAPPING.

5. CONNECTIONS TO ALUMINUM BUS BARS SHALL HAVE SPECIAL COATING, SUCH AS PLATING OR INHIBITING COMPOUND, TO PREVENT ELECTROLYSIS. BELLEVILLE WASHERS SHALL BE USED TO PREVENT COLD FLOW.

6. PHASE AND NEUTRAL BUS SUPPORTS SHALL BE INSULATED.

7. CONSTRUCTION SHALL BE SUCH THAT THE BUS WILL NOT BE EXPOSED UPON REMOVAL OF TRIM.

8. PROVISIONS SHALL BE INCLUDED FOR ADJUSTMENT OF BUS ASSEMBLY AND BREAKERS FOR SOME VERTICAL ALIGNMENT AND FRONT-TO-BACK POSITION WITHOUT REMOVAL OF THE ASSEMBLY.

9. ALL PANELBOARDS SHALL BE PROVIDED WITH INSULATED SOLID NEUTRALS.

10. GROUNDING BARS WITH LUGS SHALL BE PROVIDED ON ALL PANELBOARDS. BUSES SHALL BE BONDED TO PANEL ENCLOSURE.

11. SPACE WHERE SHOWN IN PANEL SCHEDULES DESIGNATES SPACE FOR FUTURE PROTECTIVE DEVICES AND SHALL INCLUDE BUS AND SUPPORT COMPONENTS.

D. CIRCUIT BREAKERS: CIRCUIT BREAKERS SHALL BE BOLT-ON TYPE. BREAKERS SMALLER THAN 400 AMPERE-TRIP SHALL BE THERMAL MAGNETIC. BREAKERS 400 AMPERE-TRIP OR LARGER SHALL HAVE ELECTRONIC TRIP UNITS WITH FULL LSI FUNCTIONALITY.

E. PANELBOARD FRONTS:

1. PANELBOARD FRONTS SHALL BE OF COLD ROLLED STEEL IN ACCORDANCE WITH GAUGES REQUIRED BY CODE.

2. TRIM SHALL BE FASTENED TO BOX BY MEANS OF CLAMPS WHICH INDICATE THEIR POSITION FROM THE FRONT. TRIM CLAMPS SHALL BE CONCEALED TO PRESENT A FLAT SMOOTH APPEARANCE. THE USE OF SCREWS ENGAGING HOLES IN THE BOX FLANGE FOR FASTENING TRIM WILL NOT BE ACCEPTABLE.

3. DOORS SHALL BE FASTENED TO TRIM BY FLUSH CONCEALED HINGES AND

EQUIPPED WITH A FLUSH TYPE COMBINATION CATCH AND KEYED LOCK. TWO MILLED TYPE KEYS SHALL BE PROVIDED WITH EACH PANEL, AND ALL LOCKS SHALL BE KEYED ALIKE. DOORS SHALL BE EQUIPPED WITH A NEAT DIRECTORY FRAME SECURED TO THE INSIDE OF THE DOOR.

4. TRIM AND DOORS SHALL BE PROPERLY CLEANED AND FINISHED WITH ONE RUST-INHIBITING PRIMING COAT AND A FINISH COAT OF LIGHT GRAY ENAMEL, ANSI Z55.1-1967 NO. 61. ALL CIRCUITS SHALL BE IDENTIFIED AS SPECIFIED HEREINAFTER.

F. MINIMUM SHORT CIRCUIT RATING: THE MINIMUM SHORT CIRCUIT RATING FOR THE PANELBOARD SHALL BE THE RATING OF THE DEVICE WITHIN THE ASSEMBLY HAVING THE LOWEST SHORT CIRCUIT RATING. MAXIMIZATION OF SELECTIVE TRIPPING COORDINATION IS THE INTENT OF THIS DESIGN. USE OF SERIES RATED EQUIPMENT WILL NOT BE APPROVED. RATING OF PANELBOARD SHALL BE ADEQUATE TO INTERRUPT CALCULATED FAULT CURRENT AVAILABLE.

G. ACCEPTABLE MANUFACTURERS: EATON, GENERAL ELECTRIC, SIEMENS OR SQUARE D. CONTRACTOR RESPONSIBLE FOR VERIFYING ALL DIMENSIONS IN FIELD.

H. WARRANTY PERIOD SHALL BE THREE YEARS FROM SUBSTANTIAL COMPLETION. MANUFACTURER SHALL AGREE TO REPAIR OR REPLACE SWITCHBOARD ENCLOSURE, BUSWORK, OVERCURRENT PROTECTIVE DEVICES, ACCESSORIES, AND FACTORY-INSTALLED INTERCONNECTION WIRING THAT FAIL IN MATERIALS OR WORKMANSHIP DURING THIS PERIOD.

I. WHERE PANELBOARDS RECESSED IN WALL ARE REPLACED, CONTRACTOR RESPONSIBLE FOR PATCHING AND PAINTING WALL SURFACE TO EXISTING CONDITIONS.

262419 - MOTOR CONTROL CENTERS

A. MOTOR CONTROL CENTERS (MCC) SHALL CONSIST OF A STRUCTURE OR GROUPING OF STRUCTURES WITH POWER BUS, FEED FOR POWER BUS, AND VARIOUS TYPES OF UNITS AND OPTIONS FOR THE UNITS.

B. EACH MCC SHALL BE OF DEAD FRONT CONSTRUCTION AND SHALL INCORPORATE HORIZONTAL AND VERTICAL POWER BUS, GROUND BUS AND NEUTRAL BUS BARS AS REQUIRED.

C. THE MCC SHALL CONSIST OF ONE OR MORE VERTICAL SECTIONS BOLTED TOGETHER TO FORM A RIGID, FREE-STANDING ASSEMBLY AND SHALL BE SO DESIGNED AS TO PERMIT FUTURE ADDITIONS OF VERTICAL SECTIONS AND INTERCHANGING OF UNITS BY THE USER.

D. MCCS SHALL BE CONSTRUCTED TO MEET OR EXCEED THE REQUIREMENTS OF THE LATEST PUBLISHED STANDARDS OF NEMA AND UL FOR MOTOR CONTROL CENTERS. EACH SECTION SHALL BE PROVIDED WITH A UL STICKER.

E. MCC SHALL HAVE A MAXIMUM FOOTPRINT OF THE EXISTING MCC. HEIGHT SHALL BE LIMITED TO WHAT IS FEASIBLE FOR CONTRACTOR TO MOVE INTO ROOM AND INSTALL. LOADS SHALL BE DIVIDED INTO THE FEWEST QUANTITY OF VERTICAL SECTIONS REQUIRED.

F. THE POWER BUS SYSTEM SHALL BE EITHER ALUMINUM OR COPPER, SUPPORTED, BRACED AND ISOLATED BY A BUS SUPPORT MOLDED OF A HIGH STRENGTH, NON-TRACKING GLASS POLYESTER MATERIAL. HORIZONTAL AND VERTICAL BUSES SHALL BE FASTENED TOGETHER WITH A BUS CLAMP ASSEMBLY. MINIMUM BUS BRACING RATING SHALL EQUAL OR EXCEED THE SHORT CIRCUIT RATING SHOWN ON THE MCC SCHEDULES.

G. THE GROUND BUS SHALL BE HORIZONTAL, TIN PLATED COPPER AND SHALL BE LOCATED IN THE TOP OR BOTTOM HORIZONTAL WIREWAY. THE BUS SHALL BE RATED 300 AMPERES, MINIMUM.

H. MAIN LUGS ONLY (MLO): THE MAIN INCOMING LINE LUG COMPARTMENT SHALL BE TOP ENTRY AND SHALL UTILIZE MECHANICAL OR CRIMP COMPRESSION LUGS.

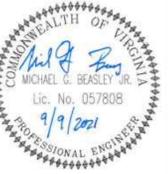
I. STARTER AND CONTROL UNITS SHALL CONSIST OF A NEMA-RATED (AND UL LISTED) MAGNETIC STARTER AND CIRCUIT BREAKER. STARTERS SHALL BE NEMA-RATED OF SIZE AND TYPE NOTED ON DRAWINGS. WHERE NOT TYPE IS LISTED, ONLY A BREAKER IS NECESSARY. ALL BREAKERS SHALL BE MOLDED CASE CIRCUIT BREAKERS WITH ELECTRONIC TRIPS. BREAKERS SHALL HAVE INSTANTANEOUS ADJUSTMENTS. 2 NORMALLY-OPEN AND 2 NORMALLY CLOSED CONTACTS SHALL BE PROVIDED PER STARTER.

J. ACCEPTABLE MANUFACTURERS SHALL BE GENERAL ELECTRIC, ALLEN-BRADLEY, EATON, SIEMENS AND SQUARE D.

ABBREVIATIONS

AF	AMPERE FRAME	MIN	MINIMUM
AFF	ABOVE FINISHED FLOOR	N, NEUT	NEUTRAL
AIC	AMPERES INTERRUPTING CAPACITY	N/A	NOT APPLICABLE
AMPS	AMPERES	NTS	NOT TO SCALE
AT	AMPERE TRIP	P	POLE
C	CONDUIT	REC	RECEPTACLE
CKT	CIRCUIT	RMS	ROOT MEAN SQUARE
EGC	EQUIPMENT GROUNDING CONDUCTOR	SYM	SYMMETRICAL
ETR	EXISTING TO REMAIN	TYP	TYPICAL
GND	GROUND	UON	UNLESS OTHERWISE NOTED
KVA	KILOVOLT-AMPERES	V	VOLTS
KW	KILOWATTS		
L	LINE		
MAX	MAXIMUM		
MCCB	MOLDED CASE CIRCUIT BREAKER		

REVISIONS:



MASTER
ENGINEERS & DESIGNERS
904 Lakeside Drive, Lynchburg, VA 24501
434-846-1350 Fax: 434-846-1351



CATEC
ELECTRICAL EQUIPMENT
REPLACEMENT PROJECT
CHARLOTTESVILLE, VA 22903

SPECIFICATIONS &
ABBREVIATIONS

DATE ISSUED: 09/09/21

SCALE: NONE

JOB. NO. 653-014

DESIGNED: JHR

DRAWN: JHR

CHECKED: MGB

APPROVED: MGB

DRAWING NO.

E.O. 1

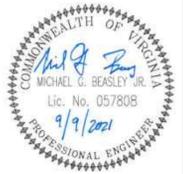
SHEET 1 OF 14

REVISION

REVISIONS:

NOTES (SHEET NO. E0.1)

1. NUMBERS IN PARENTHESIS INDICATE PHASE UNDER WHICH EQUIPMENT IS REPLACED.
2. AN UNLABELED NEW PANEL HAS BEEN INSTALLED IN THE MECHANICAL CLOSET IN THE COSMETOLOGY ARE OF BUILDING. CONTRACTOR SHALL TRACE POWER SOURCE AND REDLINE PANEL ON ONE LINE DIAGRAM. CONTRACTOR SHALL LABEL PANEL AS PANEL "X".



MASTER
ENGINEERS & DESIGNERS
904 Lakeside Drive, Lynchburg, VA 24501
434-846-1350 Fax: 434-846-1351

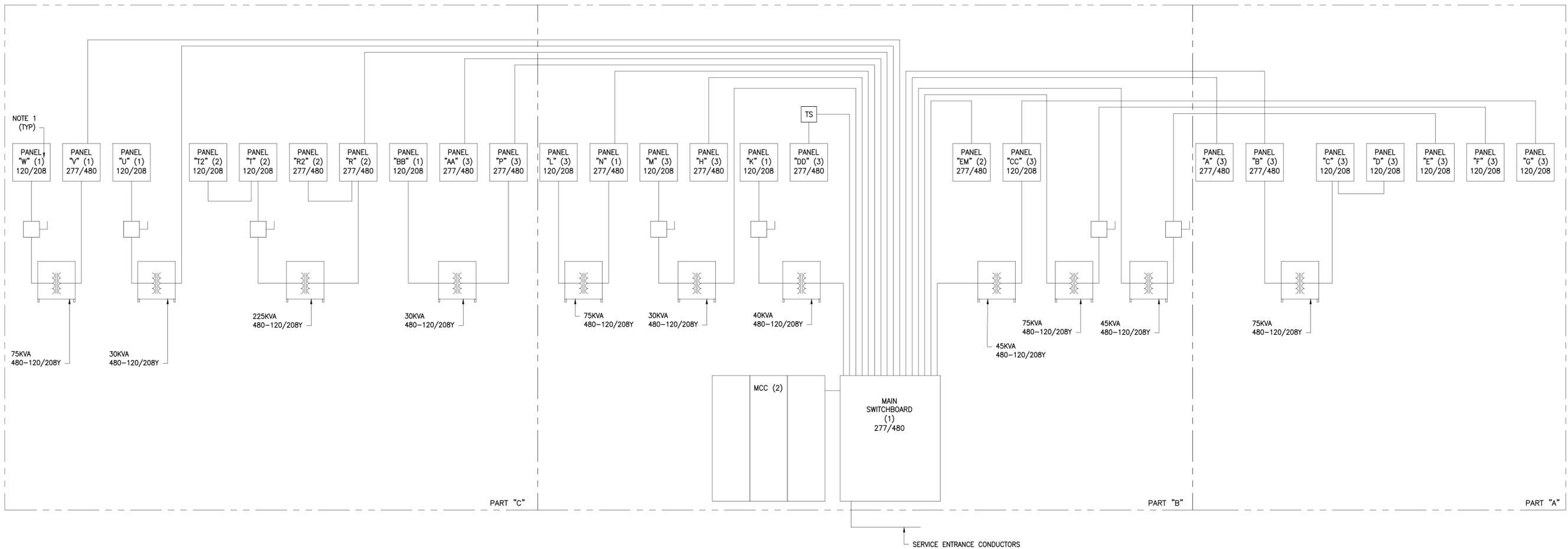


CATEC
ELECTRICAL EQUIPMENT
REPLACEMENT PROJECT
CHARLOTTESVILLE, VA 22903

ONE-LINE DIAGRAM

DATE ISSUED: 09/09/21
SCALE: NONE
JOB. NO. 653-014
DESIGNED: JHR
DRAWN: JHR
CHECKED: MGB
APPROVED: MGB

DRAWING NO. E1.1
SHEET 2 OF 14
REVISION

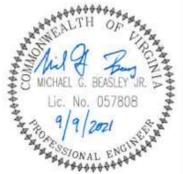


ONE-LINE DIAGRAM
SCALE: NOT TO SCALE

REVISIONS:

NOTES (SHEET NO. E2.1)

1. WIRE EXISTING EPO BUTTON TO SHUNT TRIP MAIN BREAKER IN PANEL "V". PROVIDE CONTROL POWER TO SHUNT TRIP BREAKER IN PANEL "V" FROM PANEL "W" SPARE BREAKER. USE 3/4" EMT TO CONCEAL WIRING.
2. DURING PHASE WHICH PANEL "R" IS REPLACED, IF NEW PANELBOARD IS WIDER THAN EXISTING, IT WILL BE NECESSARY TO MOVE LIGHT SWITCH TO ACCOMMODATE.



MASTER
ENGINEERS & DESIGNERS

904 Lakeside Drive, Lynchburg, VA 24501
434-846-1350 Fax: 434-846-1351

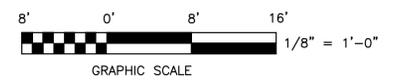
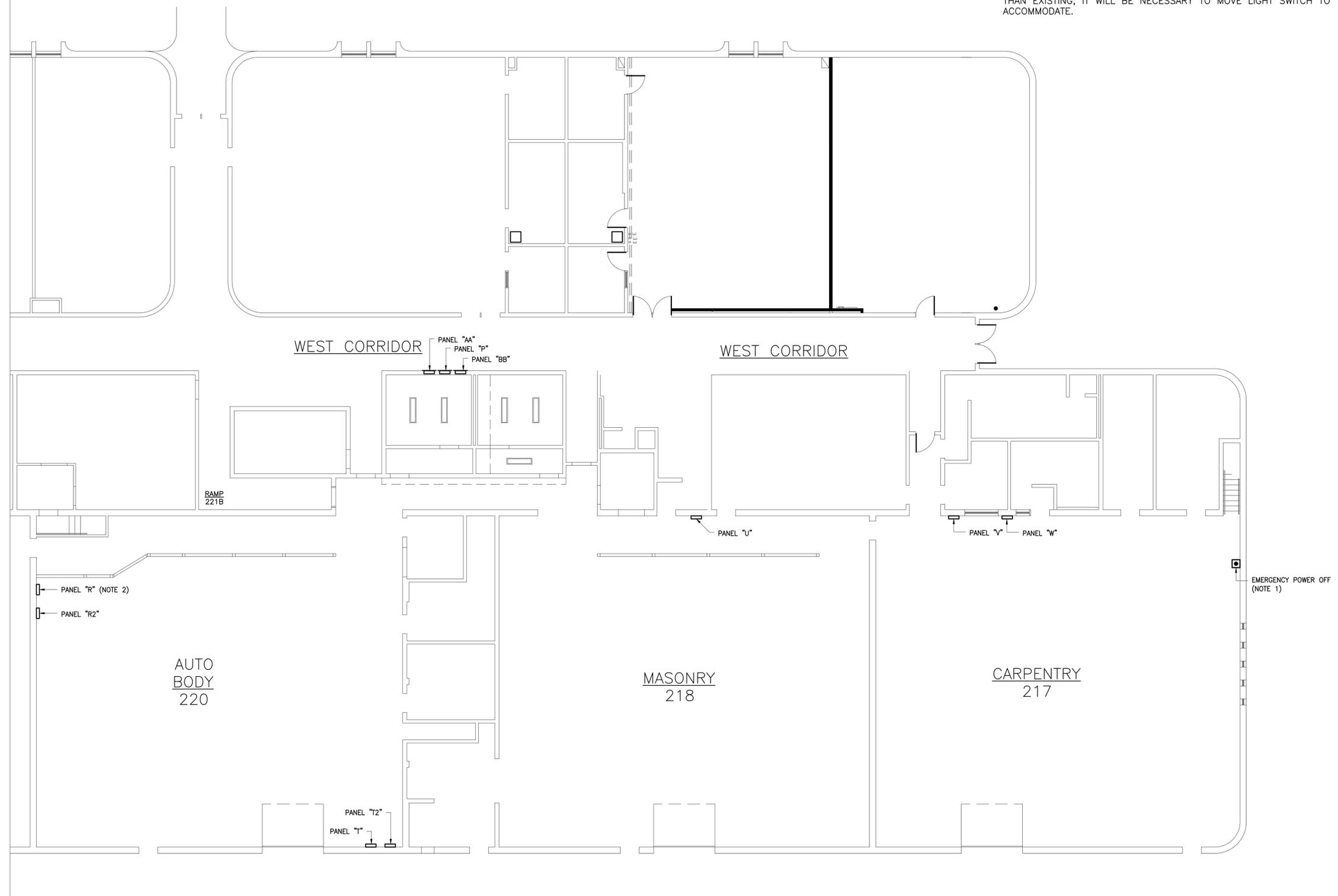
CATEC
ELECTRICAL EQUIPMENT
REPLACEMENT PROJECT
CHARLOTTESVILLE, VA 22903

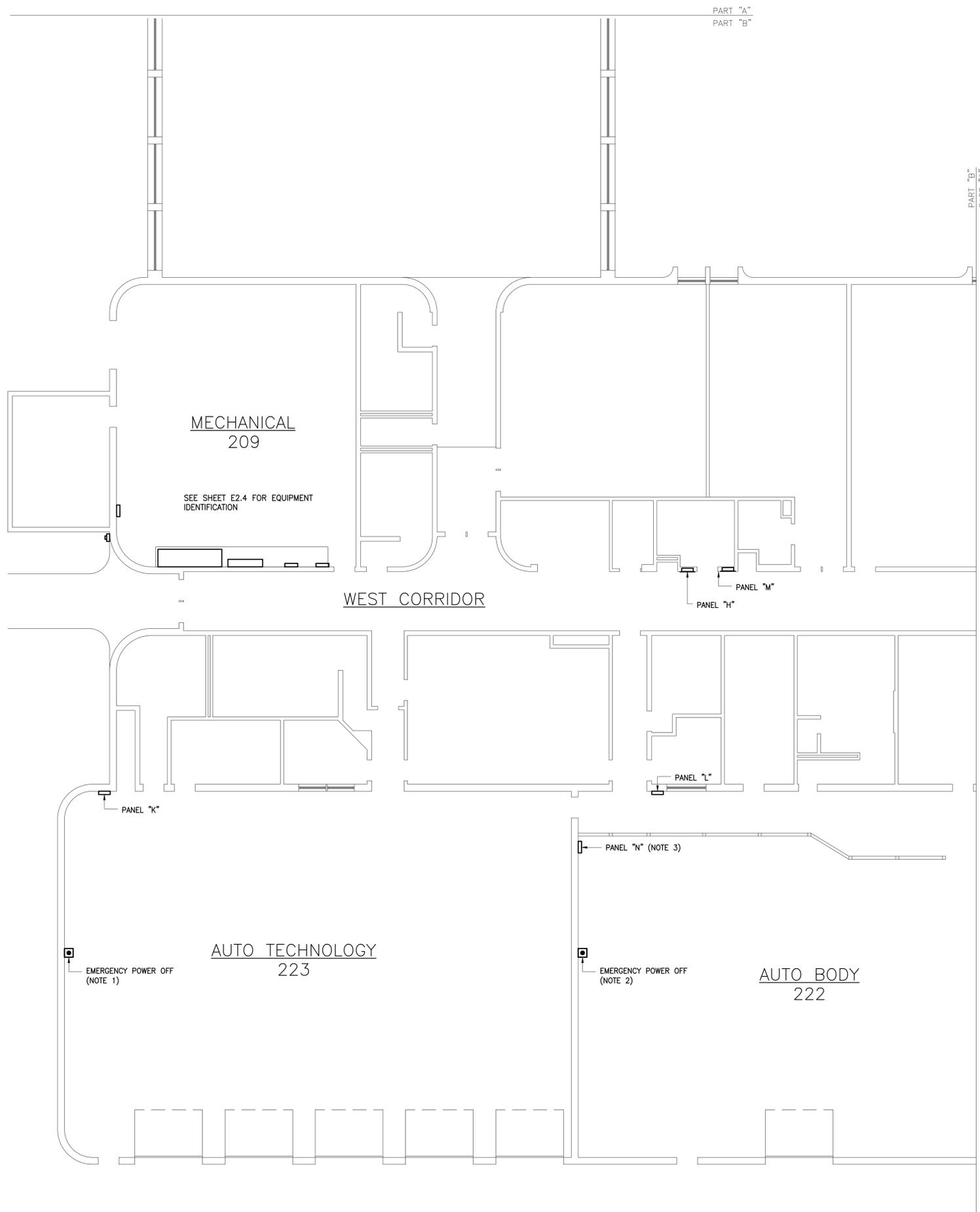
FLOOR PLANS (1 OF 3)

DATE ISSUED: 09/09/21
SCALE: 1/8"=1'-0"
JOB. NO. 653-014
DESIGNED: JHR
DRAWN: JHR
CHECKED: MGB
APPROVED: MGB

DRAWING NO.
E2.1
SHEET 3 OF 14
REVISION

PART "B"
PART "C"





NOTES (SHEET NO. E2.2)

1. WIRE EXISTING EPO BUTTON TO SHUNT TRIP MAIN BREAKER IN PANEL "K". PROVIDE CONTROL POWER TO SHUNT TRIP BREAKER FROM PANEL "K".
2. WIRE EXISTING EPO BUTTON TO SHUNT TRIP MAIN BREAKER IN PANEL "N". PROVIDE CONTROL POWER TO SHUNT TRIP BREAKER IN PANEL "L" FROM PANEL "W" SPARE BREAKER. USE 3/4" EMT TO CONCEAL WIRING.
2. DURING PHASE WHICH PANEL "N" IS REPLACED, IF NEW PANELBOARD IS WIDER THAN EXISTING, IT WILL BE NECESSARY TO MOVE LIGHT SWITCH TO ACCOMMODATE.

REVISIONS:



MASTER
ENGINEERS & DESIGNERS

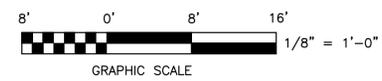
904 Lakeside Drive, Lynchburg, VA 24501
434-846-1350 Fax: 434-846-1351

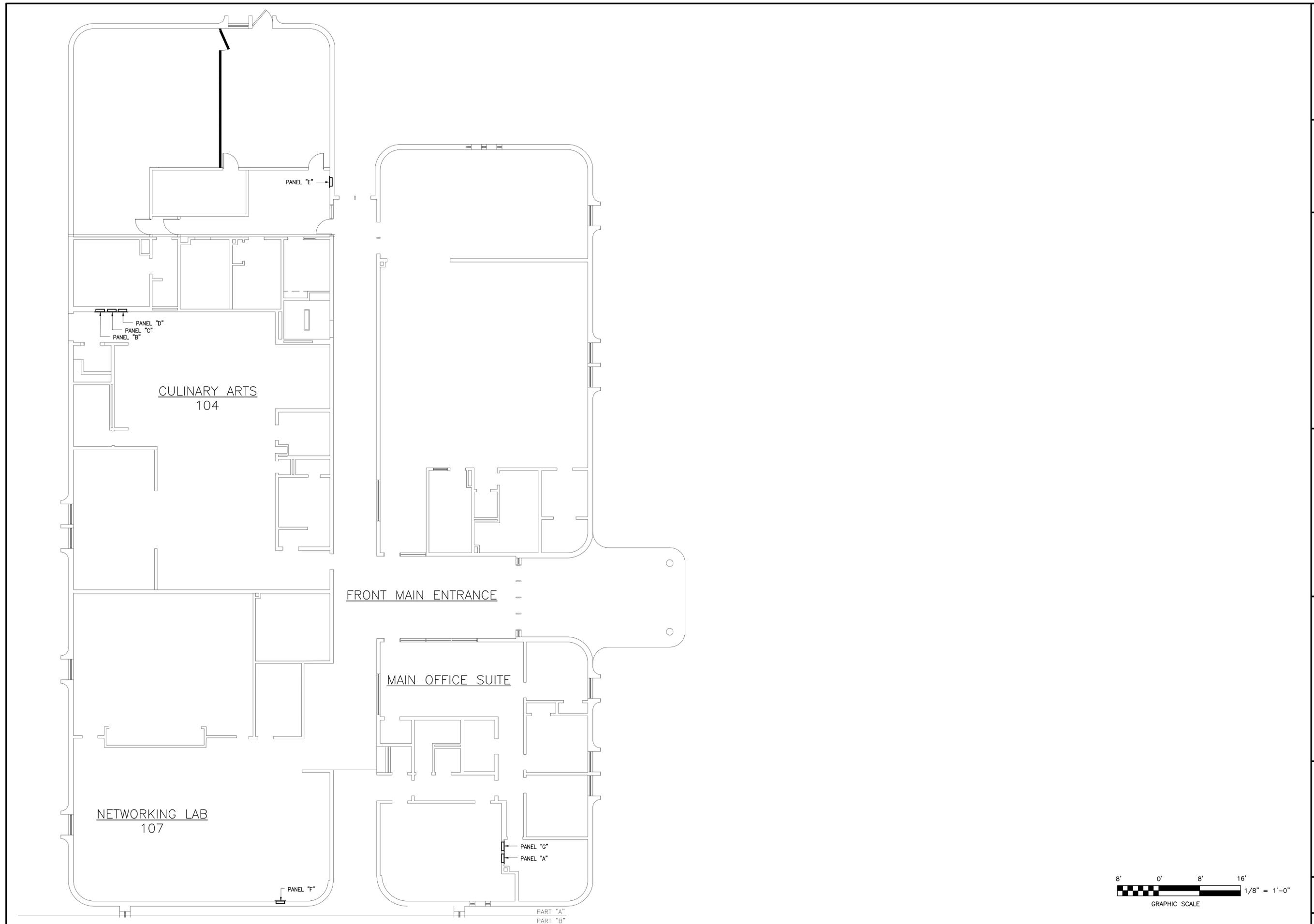
CATEC
ELECTRICAL EQUIPMENT
REPLACEMENT PROJECT
CHARLOTTESVILLE, VA 22903

FLOOR PLANS (2 OF 3)

DATE ISSUED: 09/09/21
SCALE: 1/8"=1'-0"
JOB. NO. 653-014
DESIGNED: JHR
DRAWN: JHR
CHECKED: MGB
APPROVED: MGB

DRAWING NO.
E2.2
SHEET 4 OF 14
REVISION





REVISIONS:



MASTER
ENGINEERS & DESIGNERS
904 Lakeside Drive, Lynchburg, VA 24501
434-846-1350 Fax: 434-846-1351

CATEC
ELECTRICAL EQUIPMENT
REPLACEMENT PROJECT
CHARLOTTESVILLE, VA 22903

FLOOR PLANS (3 OF 3)

DATE ISSUED: 09/09/21
SCALE: 1/8"=1'-0"
JOB. NO. 653-014
DESIGNED: JHR
DRAWN: JHR
CHECKED: MGB
APPROVED: MGB

DRAWING NO.
E2.3
SHEET 5 OF 14
REVISION

REVISIONS:

NOTES (SHEET NO. E2.4)

1. CONTRACTOR SHALL DEMOLISH EXISTING METER AND INSTALL NEW METER BASE OUTSIDE. CONNECT TO SWITCHBOARD CT SECTION WITH 1" RSC. COORDINATE WITH POWER COMPANY.
2. PRIOR TO BID, CONTRACTOR SHALL NOTE DIMENSIONAL CONSTRAINTS THAT WILL MAKE INSTALLATION OF NEW SWITCHBOARD DIFFICULT. DIMENSIONS OF EXISTING SWITCHBOARD ARE APPROXIMATELY 110" X 90" X 30"
3. OWNER TO MODIFY DOOR SUCH THAT IT SWINGS IN THE DIRECTION OF EGRESS AND IS EQUIPPED WITH LISTED PANIC HARDWARE.



MASTER
ENGINEERS & DESIGNERS
904 Lakeside Drive, Lynchburg, VA 24501
434-846-1350 Fax: 434-846-1351

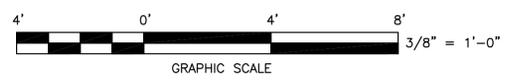
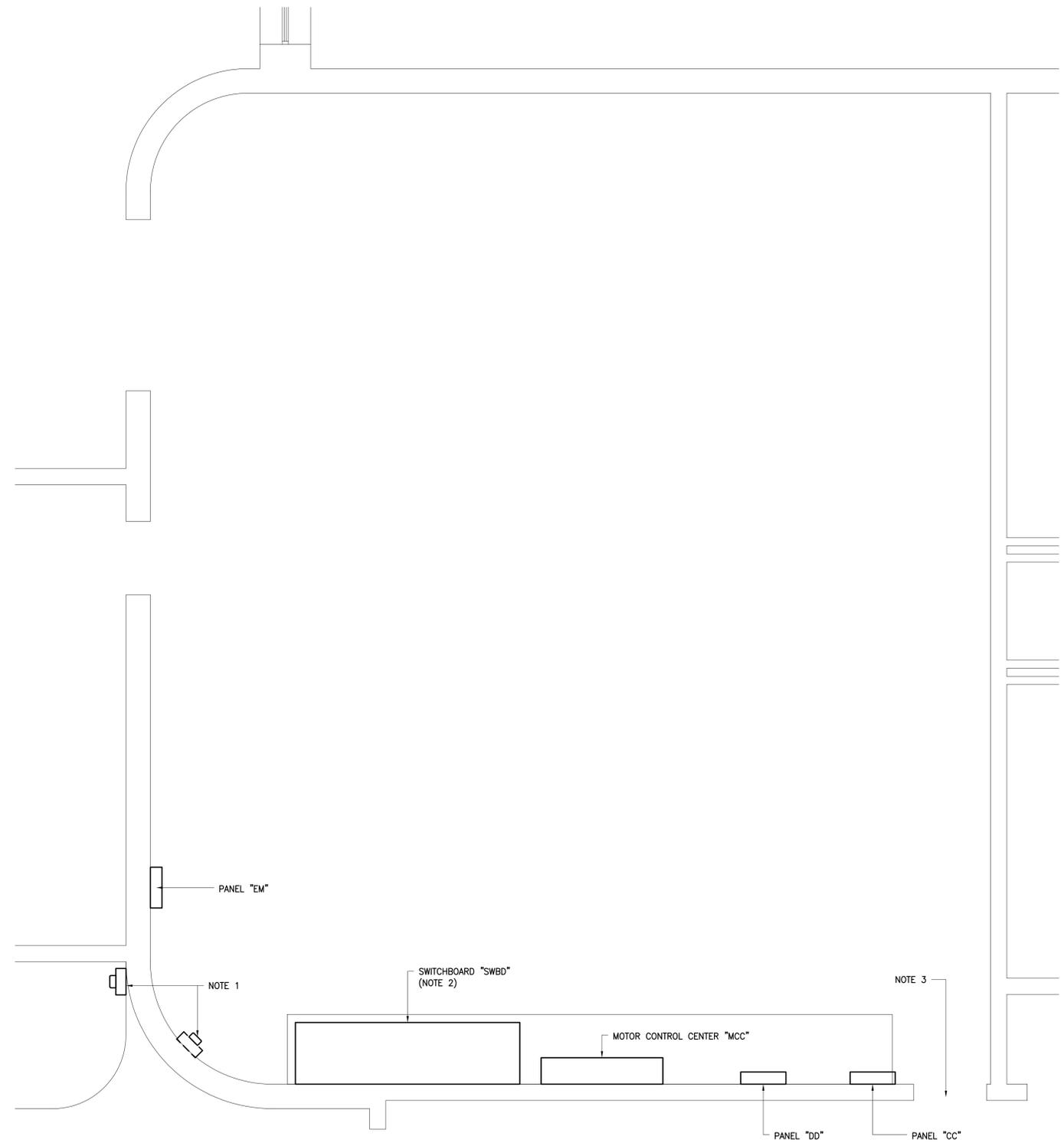


CATEC
ELECTRICAL EQUIPMENT
REPLACEMENT PROJECT
CHARLOTTESVILLE, VA 22903

**ENLARGED MECHANICAL
ROOM PLAN**

DATE ISSUED: 09/09/21
SCALE: 3/8" = 1'-0"
JOB. NO. 653-014
DESIGNED: JHR
DRAWN: JHR
CHECKED: MGB
APPROVED: MGB

DRAWING NO.
E2.4
SHEET 6 OF 14
REVISION



MAIN SWITCHBOARD SCHEDULE

SWITCHBOARD CHARACTERISTICS:
 VOLTS: 277/480
 PHASES: 3
 WIRES: 4
 SOLID NEUTRAL GROUND BAR

LOCATION: MECHANICAL E209/E2.4
 MAIN BREAKER: 2000 AF, 2000AT
 SURGE PROTECTIVE DEVICE
 MINIMUM SHORT CIRCUIT RATING: 42,000 RMS SYMAMPS

TRACE ALL CIRCUITS
 SERVICE ENTRANCE RATED
 PHASE 1

SPACE NO.	DESCRIPTION	CONNECTED			BREAKER CHARACTERISTICS								BRANCH CIRCUIT			CONDUIT SIZE			
		KVA	A	B	C	P	AF	AT	LONG TIME SETTING	DELAY (MIN)	INST	SHORT TIME SETTING	DELAY (MIN)	GROUND FAULT SETTING	DELAY (MIN)		PHASE	NEUT.	EGC
1	PANEL R					3	400	400	**	**	**	**	**	N/A	N/A	ETR	ETR	ETR	ETR
2	PANEL B					3	100	300	**	**	**	**	**	N/A	N/A	ETR	ETR	ETR	ETR
3	TRANSFORMER - PANEL E					3	100	70	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
4	TRANSFORMER - PANEL F					3	100	100	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
5	TRANSFORMER - PANELS G & CC					3	100	70	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
6	PANEL H					3	225	150	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
7	TRANSFORMER - PANEL K					3	100	70	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
8	PANEL N					3	225	200	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
9	TRANSFORMER - PANEL M					3	100	50	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
10	SPARE					3	100	20	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
11	PANEL P					3	225	200	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
12	PANEL AA					3	225	125	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
13	PANEL A					3	400	400	**	**	**	**	**	N/A	N/A	ETR	ETR	ETR	ETR
14	CHILLER STARTER					3	225	175*	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
15	TRANSFORMER - PANEL U					3	100	50	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
16	PANEL V					3	225	200	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
17	TRANSFORMER - ELECTRONICS LAB 30 KVA					3	100	40	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
18	TRANSFORMER - ELECTRONICS LAB 75 KVA					3	100	90	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
19	SPARE?					3	225	175	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
20	MOTOR CONTROL CENTER					3	225	225	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
21	AC UNIT DATA PROCESSING					3	100	60	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
22	AC UNIT DATA PROCESSING					3	100	30	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
23	PANEL DD					3	10	50	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
24	PUMP 1 (NOTE 1)					3	100	30	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
25	PUMP 2 (NOTE 1)					3	100	30	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
26	BOILER PUMPS #1, 2, 3 (NOTE 1)					3	100	20	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
27	SPARE					3	100	30	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
28	SPARE					3	100	20	**	**	N/A	N/A	N/A	N/A	N/A	ETR	ETR	ETR	ETR
TOTALS																			

*-> CONTRACTOR TO VERIFY SIZE IN FIELD PRIOR TO ORDER
 **-> SETTINGS PER COORDINATION STUDY

NOTES (SHEET NO. E3.1)

- AS PART OF PHASE 2 SCOPE, MOVE INDICATED CIRCUITS FROM MCC TO SWITCHBOARD. EXTEND WIRING AS NECESSARY. SWITCH CIRCUITS OVER TO SWITCHBOARD BEFORE DEMOLITION OF MCC.

PANEL "BB" SCHEDULE

PANELBOARD CHARACTERISTICS:
 VOLTS: 120/208
 PHASES: 3
 WIRES: 4

LOCATION: WEST CORRIDOR / E2.1
 SOLID NEUTRAL
 GROUND BAR
 MINIMUM SHORT CIRCUIT RATING: 10,000 RMS SYMAMPS

MANUFACTURER, CAT. NO. ??
 MAIN LUGS: 225 AMPERES
 PHASE 1

OCT. NO.	POLE NO.	DESCRIPTION	CONN. KVA	CONN. AMPS			BREAKER			NO. & WIRE SIZE			CONDUIT SIZE
				A	B	C	P	AF	AT	PHASE	NEUT.	EGC	
1	1	REC. 158					1	100	20	ETR	ETR	ETR	ETR
3	3	REC. 213					1	100	20	ETR	ETR	ETR	ETR
5	5	REC. 204, 206, 207					1	100	20	ETR	ETR	ETR	ETR
7	7	W.U.V. #1					1	100	20	ETR	ETR	ETR	ETR
9	9	REC. 188, 192, 193					1	100	20	ETR	ETR	ETR	ETR
11	11	REC. 181-184					1	100	20	ETR	ETR	ETR	ETR
13	13	REC. 188					1	100	20	ETR	ETR	ETR	ETR
15	15	REC. AT LAB SHELVES					1	100	20	ETR	ETR	ETR	ETR
17	17	REC. 204					1	100	20	ETR	ETR	ETR	ETR
19	19	REC. 158, 187-CLOCK, 187					1	100	20	ETR	ETR	ETR	ETR
21	21	SPARE?					1	100	20	ETR	ETR	ETR	ETR
23	23	P.F. #1 & 2					1	100	20	ETR	ETR	ETR	ETR
25	25	W.F. #4, W.C.H. #3					1	100	20	ETR	ETR	ETR	ETR
27	27	COMPUTERS AT LAB					1	100	20	ETR	ETR	ETR	ETR
29	29	COMPUTERS AT LAB					1	100	20	ETR	ETR	ETR	ETR
31	31	R.F. #13 AND 14					1	100	20	ETR	ETR	ETR	ETR
33	33	SPARE?					1	100	20	ETR	ETR	ETR	ETR
35	35	LIGHTS, 191					1	100	20	ETR	ETR	ETR	ETR
37	37	LIGHTS, M-5					1	100	20	ETR	ETR	ETR	ETR
39	39	SPARE?					1	100	20	ETR	ETR	ETR	ETR
41	41	SPARE?					1	100	20	ETR	ETR	ETR	ETR
2	2	R.F. #17, 18					1	100	20	ETR	ETR	ETR	ETR
4	4	W.U.V. #2					1	100	20	ETR	ETR	ETR	ETR
6	6	W.F. #5 & 6					1	100	20	ETR	ETR	ETR	ETR
8	8	R.F. #15 & 16					1	100	20	ETR	ETR	ETR	ETR
10	10	COMPUTERS AT LAB					1	100	20	ETR	ETR	ETR	ETR
14	14	SPARE?					3	100	20	ETR	ETR	ETR	ETR
18	18	SPARE?					1	100	20	ETR	ETR	ETR	ETR
20	20	REC. 180					1	100	30	ETR	ETR	ETR	ETR
22	22	SPARE?					1	100	20	ETR	ETR	ETR	ETR
24	24	REC. 158					1	100	20	ETR	ETR	ETR	ETR
26	26	REC. 180/9					1	100	20	ETR	ETR	ETR	ETR
28	28	SPARE?					1	100	20	ETR	ETR	ETR	ETR
30	30	LIGHTS, M3M4					1	100	20	ETR	ETR	ETR	ETR
32	32	REC. 187					1	100	20	ETR	ETR	ETR	ETR
34	34	REC. 204 AND CLOCK					1	100	20	ETR	ETR	ETR	ETR
36	36	REC. 187					1	100	20	ETR	ETR	ETR	ETR
38	38	REC. 187					1	100	20	ETR	ETR	ETR	ETR
40	40	SPARE?					1	100	20	ETR	ETR	ETR	ETR
42	42	SPARE?					1	100	20	ETR	ETR	ETR	ETR
TOTALS													

PANEL "K" SCHEDULE

PANELBOARD CHARACTERISTICS:
 VOLTS: 120/208
 PHASES: 3
 WIRES: 4

LOCATION: AUTO TECHNOLOGY 223/E2.2
 SOLID NEUTRAL
 GROUND BAR
 MINIMUM SHORT CIRCUIT RATING: 10,000 RMS SYMAMPS

MANUFACTURER, CAT. NO. GE NLAB
 MAIN BREAKER: 150 AMPS; SHUNT TRIP
 PHASE 1

OCT. NO.	POLE NO.	DESCRIPTION	CONN. KVA	CONN. AMPS			BREAKER			NO. & WIRE SIZE			CONDUIT SIZE
				A	B	C	P	AF	AT	PHASE	NEUT.	EGC	
1	1	ROTARY LIFT @ DOOR 19					2	100	20	ETR	ETR	ETR	ETR
5	5	ROTARY LIFT @ DOOR 19					2	100	20	ETR	ETR	ETR	ETR
9	9	REC. 165					1	100	20	ETR	ETR	ETR	ETR
11	11	GRINDER					1	100	20	ETR	ETR	ETR	ETR
13	13	SPARE?					1	100	20	ETR	ETR	ETR	ETR
17	17	DRILL PRESS					3	100	20	ETR	ETR	ETR	ETR
21	21	JUNCTION BOX ON BAR JOIST					2	100	20	ETR	ETR	ETR	ETR
25	25	ALTERNATING SERVICE CENTER					2	100	20	ETR	ETR	ETR	ETR
31	31	SPARE?					3	100	20	ETR	ETR	ETR	ETR
35	35	SPARE?					2	100	20	ETR	ETR	ETR	ETR
39	39	SPARE?					1	100	20	ETR	ETR	ETR	ETR
41	41	SPARE?					1	100	20	ETR	ETR	ETR	ETR
2	2	DRILL PRESS					1	100	20	ETR	ETR	ETR	ETR
4	4	REC. 165					1	100	20	ETR	ETR	ETR	ETR
6	6	REC. WORK BENCH					1	100	20	ETR	ETR	ETR	ETR
8	8	DROP CORD REELS					1	100	20	ETR	ETR	ETR	ETR
10	10	DYNOMETER					1	100	20	ETR	ETR	ETR	ETR
12	12	REC. WORK BENCH					1	100	20	ETR	ETR	ETR	ETR
14	14	VALVE GRINDER					1	100	20	ETR	ETR	ETR	ETR
16	16	REC. WORK BENCH					1	100	20	ETR	ETR	ETR	ETR
18	18	DOOR OPENER					1	100	20	ETR	ETR	ETR	ETR
20	20	REC. 165					1	100	20	ETR	ETR	ETR	ETR
22	22	WELDER					2	100	70	ETR	ETR	ETR	ETR
26	26	DOOR OPENER					1	100	20	ETR	ETR	ETR	ETR
28	28	DRUM LATHE					1	100	20	ETR	ETR	ETR	ETR
30	30	REC. 165					1	100	20	ETR	ETR	ETR	ETR
32	32	REC. 168-170, CLOCK 172 & 165					1	100	20	ETR	ETR	ETR	ETR
34	34	REC. WORK BENCH					1	100	20	ETR	ETR	ETR	ETR
36	36	WHEEL ALIGNMENT					1	100	20	ETR	ETR	ETR	ETR
38	38	SPARE?					1	100	20	ETR	ETR	ETR	ETR
40	40	SPARE?					1	100	20	ETR	ETR	ETR	ETR
42	42	SPARE?					1	100	20	ETR	ETR	ETR	ETR
TOTALS													

REVISIONS:



CATEC
 ELECTRICAL EQUIPMENT
 REPLACEMENT PROJECT
 CHARLOTTESVILLE, VA 22903

PANEL SCHEDULES -
 PHASE 1 (SHEET 1 OF 2)

DATE ISSUED: 09/09/21
 SCALE: NONE
 JOB. NO. 653-014
 DESIGNED: JHR
 DRAWN: JHR
 CHECKED: MGB
 APPROVED: MGB</

