

**GROUNDING ELECTRODE SYSTEM DIAGRAM**  
SCALE : NO SCALE

### ELECTRICAL LIGHTING SCHEDULE

(OR EQUAL. VERIFY ALL SELECTIONS AND FINISHES WITH OWNER AND ARCHITECT PRIOR TO ORDERING).

FIXTURE TYPE	MANUFACTURER		VOLT AMPS	MOUNTING	LAMP TYPE	REMARKS	VOLT
	NAME	SERIES					
A	LITHONIA	EPANL	31	RECESSED/GRID	INCLUDED 4000K LED	LED 2X4' FLAT PANEL - 4000LM OUTPUT HIGH EFFICIENCY	MVOLT
B	LITHONIA	WF6	14	RECESSED	INCLUDED 2700K LED	WAFFER-STYLE 6" LED DOWNLIGHT	MVOLT
C	LSI	RHB-LED-18L-UNV-DIM-40-BLK	147	SUSPENDED	INCLUDED 4000K LED	COMPACT HIGH-BAY LED WAREHOUSE FIXTURE - 18000 LUMEN OUTPUT	MVOLT
D	JUNO	JSF-7IN-10LM-40K-90CRI-MVOLT ZT-WH	13	SURFACE	INCLUDED 4000K LED	SUMFORM SURFACE MOUNT 7" LED DOWNLIGHT	MVOLT
W	LITHONIA	WDGE3	59	WALL	INCLUDED 4000K LED	EXTERIOR WALL PACK - P2 PACKAGE - PROVIDE WITH 'PE' PHOTOCELL OPTION	MVOLT
	LITHONIA	ELM2L-SDRT	5	SURFACE	INCLUDED LED	EMERGENCY EGRESS LIGHTING UNIT WITH 90 MIN. BATTERY PACK	120
	LITHONIA	LHQM-LED-R-SD	5	SURFACE	INCLUDED LED	EMERGENCY EXIT EGRESS COMBO LIGHTING UNIT WITH RED FACE EXIT SIGN AND 90 MIN. BATTERY PACK	120
	LITHONIA	ELA-B-T-QWP-L0309-SD	5	SURFACE	INCLUDED LED	OUTDOOR EMERGENCY REMOTE EGRESS LIGHTING UNIT	120

**Short-Circuit and Voltage Drop Calculations**

Distances are for calculation purposes only and shall not be used for contractor takeoffs nor bidding - Contractor shall notify Engineer of any field condition that results in a change of 10% or greater circuit distance.

The following calculations are based on the "Point-by-Point" method where:  
 $ISC_{(1)} = ISC_{(1)} \times M_{(1)}$   
 $ISC_{(2)} = \text{short circuit current at fault point 1}$   
 $ISC_{(3)} = \text{short circuit current at fault point 2}$

Feeder:  $f_{(10)} = \frac{1.732 \times L \times I_{sc}}{C \times E}$   
 Feeder:  $f_{(10)} = \frac{2 \times L \times I_{sc}}{C \times E}$

XFMR:  $f_{(10)} = \frac{P(\% \text{sc}) \times V_p \times 1.73 \times \%Z}{100,000 \times KVA}$   
 XFMR:  $f_{(10)} = \frac{P(\% \text{sc}) \times V_p \times \%Z}{100,000 \times KVA}$

$IS_{(10)} = \frac{V_p \times M \times I_{sc}}{V_s}$

VOLTAGE DROP (30):  
 $\%VD = (R \times \cos(\arccos(\text{pf})) + X \times \sin(\arccos(\text{pf}))) \times L \times I \times 1.73 / E$   
 VOLTAGE DROP (10):  
 $\%VD = (R \times \cos(\arccos(\text{pf})) + X \times \sin(\arccos(\text{pf}))) \times 2 \times L \times I / E$

$\%VD \text{ CUM} = \text{Cumulative Voltage Drop from Fault Point 1 to Fault Point \#}$   
 $R = \text{resistance in ohms per LF}$   
 $X = \text{reactance in ohms per LF}$

Date of Calculations: 08/20/23  
 System Voltage: 240/120V-1 phase  
 Source Isc + 6X Motor Contribution = 65160

Fault Point (FP)	Bus/Feeder Description	Source (Fault Point)	Phase	Source Isc (amps)	Type/TX	Conduit	Material	Quantity of Parallel Sets and Bus Phase & Neutral Size	Conductor 'C' Value	Busway 'C' Value	L-L Voltage (E)	Circuit Length (L)	Load Power Factor (pf)	Circuit Load (Amperage)	Conductor			Transformer			f	M	Fault Current (amps)	Voltage Drop (NVD)	Cumulative Voltage Drop (%VD)	Fault Point (FP)		
															Resistance (R)	Reactance (X)	Arccos (pf)	Type	Degree Rise	kVA							New Xmr Z	Existing Xmr Z
1	Utility Service Point			63,000																								
2	TO TENANT METER MAIN 'A'	1	1	85160	NM	AL	2	Sets of 250 kcmil	12862	--	240	285	0.9	82	0.000085	0.000041	0.451027						8,016	0.14	9287	-0.69%	-0.69%	2
3	TO TENANT METER MAIN 'B'	1	1	85160	NM	AL	2	Sets of 250 kcmil	12862	--	240	190	0.9	82	0.000085	0.000041	0.451027						4,011	0.20	13004	-0.46%	-0.46%	3
4	TO TENANT METER MAIN 'C'	1	1	85160	NM	AL	2	Sets of 250 kcmil	12862	--	240	230	0.9	51	0.000085	0.000041	0.451027						4,855	0.17	11129	-0.46%	-0.46%	4
5	TO TENANT METER MAIN 'D'	1	1	85160	NM	AL	2	Sets of 250 kcmil	12862	--	240	250	0.9	51	0.000085	0.000041	0.451027						5,277	0.16	10380	-0.50%	-0.50%	5
6	TO PNL BD 'A'	2	1	9287	M	AL	2	Sets of 250 kcmil	12122	--	240	10	0.9	82	0.000086	0.000052	0.451027						0,032	0.97	9000	-0.03%	-0.72%	6
7	TO PNL BD 'B'	3	1	13004	M	AL	2	Sets of 250 kcmil	12122	--	240	10	0.9	82	0.000086	0.000052	0.451027						0,045	0.98	12448	-0.03%	-0.49%	7
8	TO PNL BD 'C'	4	1	11129	M	AL	2	Sets of 250 kcmil	12122	--	240	10	0.9	51	0.000086	0.000052	0.451027						0,038	0.96	10719	-0.02%	-0.48%	8
9	TO PNL BD 'D'	5	1	10380	M	AL	2	Sets of 250 kcmil	12122	--	240	10	0.9	51	0.000086	0.000052	0.451027						0,036	0.97	10023	-0.02%	-0.52%	9

**SC / VD CALCULATIONS**

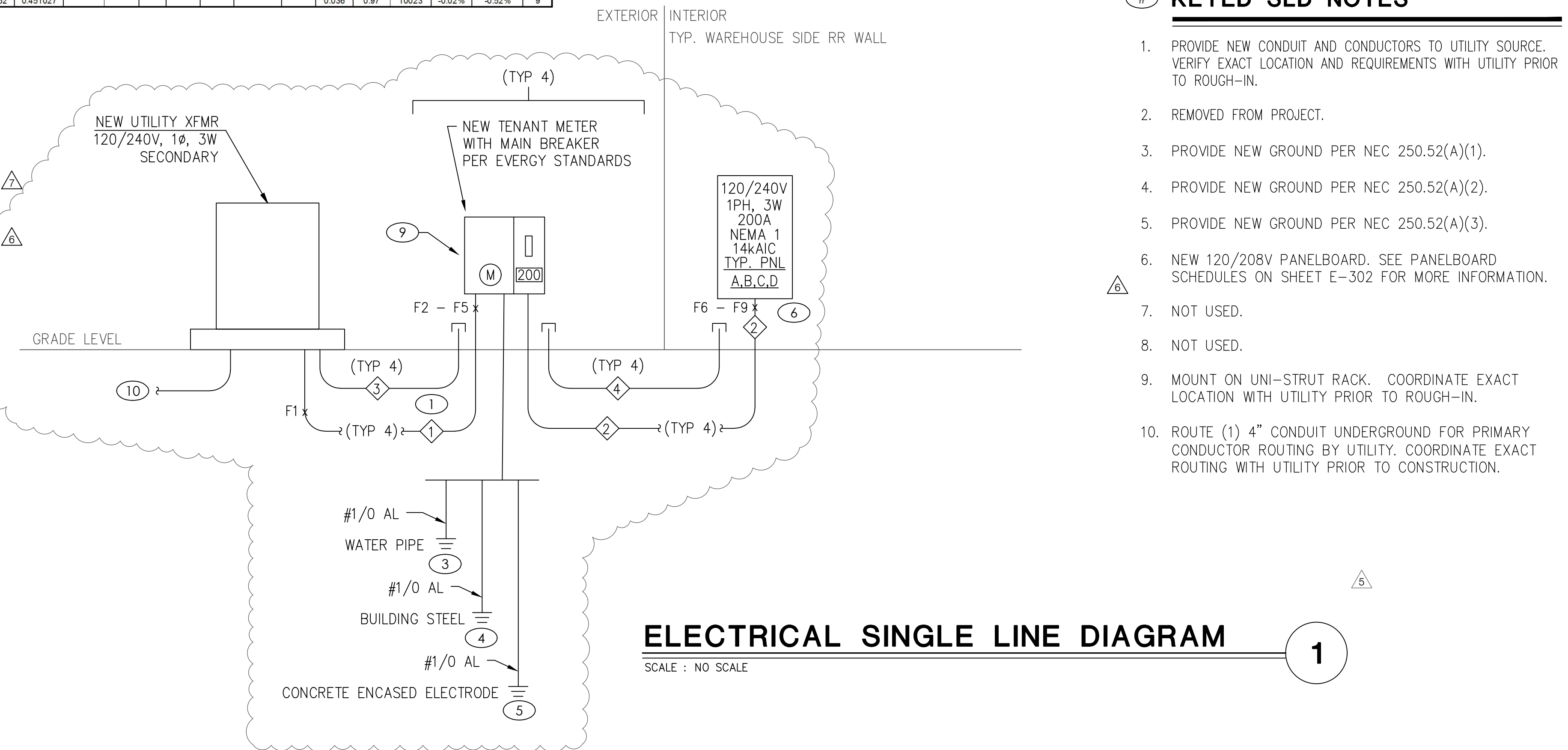
SCALE : NO SCALE

#### FEEDER SCHEDULE

FEEDER NUMBER	CONDUIT AND CONDUCTOR SIZES
1	(1) 2" EACH W/ 3 #250KCM AL
2	(1) 2-1/2" EACH W/ 3 #250KCM AL & 1 #2AWG AL GND
3	(1) 2" SPARE CONDUIT
4	(1) 2-1/2" SPARE CONDUIT
5	REMOVED FROM PROJECT

THE DESIGN PROFESSIONAL HAS PERFORMED ALL THE REQUIRED VOLTAGE DROP CALCULATIONS FOR ALL BRANCH CIRCUITS AND FEEDERS PER THE NATIONAL ELECTRICAL CODE, ARTICLE 210.19(A)(1) FPN NO. 4.

THE DESIGN PROFESSIONAL HAS PERFORMED ALL THE REQUIRED SHORT CIRCUIT CALCULATIONS AND THE AIC RATING INDICATED FOR EACH DEVICE IS ADEQUATE TO PROTECT THE EQUIPMENT AND THE ELECTRICAL SYSTEM.



**ELECTRICAL SINGLE LINE DIAGRAM**  
SCALE : NO SCALE

**KEYED SLD NOTES**

- PROVIDE NEW CONDUIT AND CONDUCTORS TO UTILITY SOURCE. VERIFY EXACT LOCATION AND REQUIREMENTS WITH UTILITY PRIOR TO ROUGH-IN.
- REMOVED FROM PROJECT.
- PROVIDE NEW GROUND PER NEC 250.52(A)(1).
- PROVIDE NEW GROUND PER NEC 250.52(A)(2).
- PROVIDE NEW GROUND PER NEC 250.52(A)(3).
- NEW 120/208V PANELBOARD. SEE PANELBOARD SCHEDULES ON SHEET E-302 FOR MORE INFORMATION.
- NOT USED.
- NOT USED.
- MOUNT ON UNI-STRUT RACK. COORDINATE EXACT LOCATION WITH UTILITY PRIOR TO ROUGH-IN.
- ROUTE (1) 4" CONDUIT UNDERGROUND FOR PRIMARY CONDUCTOR ROUTING BY UTILITY. COORDINATE EXACT ROUTING WITH UTILITY PRIOR TO CONSTRUCTION.

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Seal:  
JUSTIN R. SMOTHERS  
PROFESSIONAL ENGINEER  
12-07-2023

Project Number: 22-215  
Project Type: NEW CONSTRUCTION  
Project Name and Address:  
**I-470 B&T CENTER, LOT 7**  
2701 NE McBaine Drive  
Lee's Summit, Missouri 64064

Issue:	Date:
Plan Review	09.30.22
Plan Review Revisions	11.17.22
Plan Review Revisions	01.02.23
Owner Comments	01.17.23
Owner Comments	02.14.23
Owner Revisions	06.22.23
Owner Revisions	12.07.23

Sheet Title:  
**ELECTRICAL SCHEDULES AND DIAGRAMS**  
**E-301**

**PANELBOARD: A,B (TYP) (NEW)**

FED FROM: UTILITY METER/MAIN  
 BUS AMPS: 200  
 MAIN SIZE/TYPE: MLO  
 VOLTS/PHASE: 120/240V, 1PH, 3W

AC RATING: 14000 FULLY RATED  
 SERVES: END WH & OFFICE  
 MOUNTING: SURFACE  
 LOCATION: WAREHOUSE SIDE REAR WALL  
 SERVICE ENTRANCE RATED

CKT NO	DESCRIPTION	VOLTAMPS/PHASE		WIRE NO	BKR AMP	P	BKR AMP	WIRE NO	VOLTAMPS/PHASE		DESCRIPTION	CKT NO
		A	B						A	B		
1	LTG - WAREHOUSE 1	1,549		10	20	1	20	12	167		LTG - OFFICE / RESTROOM	2
3	RCPT - OFFICE		1,260	12	20	1	20	12	360		RCPT - WAREHOUSE	4
5	RCPT - ROOF SERVICE	180		12	20	1	20	12	360		RCPT - PANELBOARD	6
7	*PWR - UNIT HTRS		1,200	12	20	1	20	12	924		*PWR - FURNACE	8
9	*PWR - CU-1	2,292		10	30	2	1	20	1,500		*PWR - WATER HEATER	10
11			2,292				1	20	12	800	PWR - OVERHEAD DOOR	12
13	LTG - SITE	210		12	20	2	1	20			SPARE	14
15	(PANEL 'A' ONLY)		210				1	20			SPARE	16
17	LTG - WAREHOUSE 2	1,823		10	20	1	20	12			SPARE	18
19	SPARE						20	1	20		SPARE	20
21	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	22
23	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	24
25	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	26
27	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	28
29	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	30
31	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	32
33	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	34
35	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	36
37	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	38
39	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	40
41	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	42
SUBTOTAL		6,054	4,962						2,027	2,084		
TOTAL PHASE A - VA		8,081										
AMPS		67										
TOTAL PHASE B - VA		7,046										
AMPS		59										
TOTAL PNLBD - VA		15,127										
AMPS		63										
LOAD												
COOLING			5,508	1.00								
HEATING			1,200	0								
LIGHTING			3,959	1.25								
RECEPTACLES			2,160	1.0/5								
MOTORS			800	1.00								
SUPP HEAT			1,500	1.00								
MISC EQUIP				1.00								
REFRIG				1.00								
SIGN/DISP				1.25								
KITCHEN				1.00								
EXISTING				1.00								
LRG MOTOR				1.25								
SHOW WNDW				1.25								
LTG TRACK				1.00								
TOTAL DEMAND												14,917 VA
												62 A

PANELBOARD NOTES  
 \* = HACR-TYPE CIRCUIT BREAKER

**PANELBOARD: C,D (TYP) (NEW)**

FED FROM: UTILITY METER/MAIN  
 BUS AMPS: 200  
 MAIN SIZE/TYPE: MLO  
 VOLTS/PHASE: 120/240V, 1PH, 3W

AC RATING: 14000 FULLY RATED  
 SERVES: CENTRAL WH & OFFICE  
 MOUNTING: SURFACE  
 LOCATION: WAREHOUSE SIDE REAR WALL  
 SERVICE ENTRANCE RATED

CKT NO	DESCRIPTION	VOLTAMPS/PHASE		WIRE NO	BKR AMP	P	BKR AMP	WIRE NO	VOLTAMPS/PHASE		DESCRIPTION	CKT NO
		A	B						A	B		
1	LTG - WAREHOUSE	1,490		10	20	1	20	12	167		LTG - OFFICE / RESTROOM	2
3	RCPT - OFFICE		1,260	12	20	1	20	12	360		RCPT - WAREHOUSE	4
5	RCPT - ROOF SERVICE	180		12	20	1	20	12	360		RCPT - PANELBOARD	6
7	*PWR - UNIT HEATER		600	12	20	1	20	12	924		*PWR - FURNACE	8
9	*PWR - CU-1	2,292		10	30	2	1	20	1,500		*PWR - WATER HEATER	10
11			2,292				1	20	12	800	PWR - OVERHEAD DOOR	12
13	SPARE						20	1	20		SPARE	14
15	SPARE						20	1	20		SPARE	16
17	SPARE						20	1	20		SPARE	18
19	SPARE						20	1	20		SPARE	20
21	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	22
23	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	24
25	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	26
27	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	28
29	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	30
31	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	32
33	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	34
35	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	36
37	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	38
39	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	40
41	PROVISIONAL SPACE						1	1			PROVISIONAL SPACE	42
SUBTOTAL		3,982	4,152						2,027	1,904		
TOTAL PHASE A - VA		5,989										
AMPS		50										
TOTAL PHASE B - VA		6,056										
AMPS		50										
TOTAL PNLBD - VA		12,045										
AMPS		50										
LOAD												
COOLING			5,508	1.00								
HEATING			600	0								
LIGHTING			1,657	1.25								
RECEPTACLES			1,980	1.0/5								
MOTORS			800	1.00								
SUPP HEAT				1.00								
MISC EQUIP				1.00								
REFRIG				1.00								
SIGN/DISP				1.25								
KITCHEN				1.00								
EXISTING				1.00								
LRG MOTOR				1.25								
SHOW WNDW				1.25								
LTG TRACK				1.00								
TOTAL DEMAND												12,234 VA
												51 A

PANELBOARD NOTES  
 \* = HACR-TYPE CIRCUIT BREAKER

**ELECTRICAL PANEL SCHEDULES**  
 SCALE : NO SCALE

1

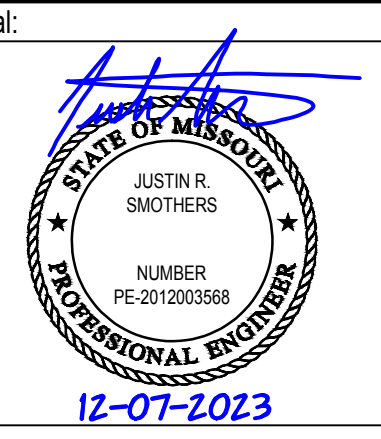
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 Owner Revisions 06.22.23  
 Owner Revisions 12.07.23

Sheet Title:  
**E-302**