



**Western New York Healthcare System**

# **ARC FLASH MITIGATION MEASURES**

3495 BAILEY AVENUE  
BATAVIA, NEW YORK 14020

VA Project No. 528-13-S34

# **PROJECT MANUAL**



1344 University Ave + Suite 210 + Rochester + NY + 14607

10-01-14

**DEPARTMENT OF VETERANS AFFAIRS  
 VHA MASTER SPECIFICATIONS**

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**SECTION 00 01 15**  
**LIST OF DRAWING SHEETS**

The drawings listed below accompanying this specification form a part of  
the contract.

<u>Drawing No.</u>	<u>Title</u>
GI001	COVER SHEET
GI002	ELECTRICAL ABBREVIATIONS, GENERAL NOTES, AND SYMBOLS
E001	MEDIUM VOLTAGE SYSTEM ONE LINE DIAGRAM
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E102	SWBD BPH1 ONE LINE DIAGRAM
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E120	SWBD DP-LR-N-RIE ONE LINE DIAGRAM
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E125	USS-S15 ONE LINE DIAGRAM

E200	SUB BASEMENT AND BASEMENT KEY PLANS
E201	FIRST AND THIRD FLOOR KEY PLAN
E202	PARTIAL SUB BASEMENT, BASEMENT, AND FIRST FLOOR KEY PLANS
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E400	REPLACEMENT SCHEDULES & DETAILS
E401	PANELBOARD SCHEDULES
E402	PANELBOARD SCHEDULES
E500	PANELBOARD ELEVATIONS

- - - END - - -

VA Western New York Healthcare System  
Buffalo - Arc Flash Mitigation Measures  
VA Project No. 528-13-S34

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**SECTION 00 01 16**  
**PROTECTIVE DEVICE SETTINGS**

SEE ATTACHED SECTION 00 01 16 APPENDIX 7 - PROTECTION DEVICE SETTINGS.

---END---

**Buffalo VAMC Arc Flash Remediation**

Turner Engineering PC

**Section 00 01 16 Appendix 7 - Protective Device Settings**

ETK 11/1/2014 Rev2

**Sub MV**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
DISC: 28_CH-1	CB: 28_CH-1	SQUARE D	NX	1200.0A	LTPU (0.5-1.0 x P) 0.8 (960A)
	Static Trip	NX, Micrologic		1200.0A	LTD (2-24 Sec.) 2
		LSI, 100-1200A		1200.0A	STPU (2-10 x P) 2.0 (2400A)
					STD (0.1-0.5 Sec.) .1 (I <sup>2</sup> t In)
					INST (3-12 x P) 3.0 (3600A)
DISC: 1_CH-2	CB: 1_CH-2	MERLIN GERIN	NSJ400H	400.0A	LTPU (Io x Ir x S) 1; 1 (400A)
	Static Trip	Compact NSJ N/H, STR 53UP		400.0A	LTD (1-16 Sec.) 1
		LSI, 150-600A			STPU (1.5-10 x LTPU) 1.5 (600A)
					STD (0-0.3 Sec.) 0.1 (I <sup>2</sup> t In)
					INST (1.5-11 x S) 2 (800A)
DISC: 28_CH-1	CB: 28_CH-1 GF	SQUARE D	NX	1200.0A	GFPU (0.2-0.75 x S) 0.2 (240A)
	Ground Fault	NX, Micrologic		1200.0A	GFD (0.2-0.5 Sec.) 0.1
		GF, 250-1200A		1200.0A	
HV/MV Breakers					
Bus Connected	Name/Type	Description		Frame/Sensor/Plug	
SWGR: CB_PM1	CB: PM1	SIEMENS	38-3AF-1500	1200.0A	
	HV/MV without Trip-Unit	38-3AF			
		1200-3000A			
SWGR: 9_A	CB: A Main	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			
SWGR: 9_A	CB: F1	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			
SWGR: 9_A	CB: F2	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			
SWGR: 9_A	CB: F3	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			
SWGR: 9_A	CB: F4	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			
SWGR: 9_B	CB: F5	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			
SWGR: 9_B	CB: F6	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			
SWGR: 9_B	CB: F7	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			
SWGR: 9_B	CB: F8	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			
SWGR: 9_B	CB: F9	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			



**Buffalo VAMC Arc Flash Remediation**

Turner Engineering PC

**Section 00 01 16 Appendix 7 - Protective Device Settings**

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**Sub MV**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
SWGR: 9_B	CB: F10	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			
SWGR: 9A_C	CB: SP1	SIEMENS	5-GMI-250	1200.0A	
	HV/MV without Trip-Unit	GMI			
		1200-3000A			
SWGR: 9A_C	CB: C1	SIEMENS	5-GMI-250	1200.0A	
	HV/MV without Trip-Unit	GMI			
		1200-3000A			
SWGR: 9A_C	CB: C2	SIEMENS	5-GMI-250	1200.0A	
	HV/MV without Trip-Unit	GMI			
		1200-3000A			
SWGR: 9A_C	CB: C3	SIEMENS	5-GMI-250	1200.0A	
	HV/MV without Trip-Unit	GMI			
		1200-3000A			
SWGR: 9_A	CB: TIE TA	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			
SWGR: 9A_C	CB: TIE TB	SIEMENS	5-GMI-250	1200.0A	
	HV/MV without Trip-Unit	GMI			
		1200-3000A			
SWGR: CB_PM2	CB: PM2	SIEMENS	38-3AF-1500	1200.0A	
	HV/MV without Trip-Unit	38-3AF			
		1200-3000A			
SWGR: 9_B	CB: B Main	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			
SWGR: 9A_C	CB: C Main	ABB	5 VHK 250	1200.0A	
	HV/MV without Trip-Unit	VHK			
		1200-3000A			
SWGR: CB_PM3	CB: PM3	SIEMENS	38-3AF-1500	1200.0A	
	HV/MV without Trip-Unit	38-3AF			
		1200-3000A			
Relays					
Bus Connected	Name/Type	Description		CT Ratio (A)	Settings
SWGR: CB_PM1	R: DR2/1_50/51-1A	SEL	SEL-551	1200 / 5	51PIP(0.5-16.0 x CTR) 0.7 (168A)
	Electronic	551/551C			U2, Inverse 2.8
		50P/51P, 5A nom.			50PIP(0.50-80.0 x CTR) 6.3 (1512A)
SWGR: CB_PM1	R: DR2/1_50/51N-1A	SEL	SEL-551	1200 / 5	51N1P(0.5-16.0 x CTR) 0.5 (120A)
	Electronic	551/551C			U3, Very Inverse 3
		50N/51N, 5A nom.			50N1P(0.50-80.0 x CTR) 1.6 (384A)
SWGR: 9_A	R: DR/F1_50/51-F1	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 4.5 (360A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 4.2
					50PIP(0.25-100 x CTR) 42 (3360A)
					QT
					51PP(0.25-16.0 x CTR) 4.5 (360A)

**Buffalo VAMC Arc Flash Remediation**
**Turner Engineering PC**
**Section 00 01 16 Appendix 7 - Protective Device Settings**
**ETK 11/1/2014 Rev2**
**Sub MV**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
					U4, Extremely Inverse 4.2
					50PIP(0.25-100 x CTR) 10 (800A)
SWGR: 9_A	R: DR/F1_50/51N-F1	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 1 (80A)
	Electronic	351A			U2, Inverse 2
		50N/51P/67, 5A nom.			50N1P(0.25-100 x CTR) 4 (320A)
SWGR: 9_A	R: DR/F2_50/51-F2	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 9 (720A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3
					50PIP(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 9 (720A)
					U4, Extremely Inverse 3
					50PIP(0.25-100 x CTR) 7 (560A)
SWGR: 9_A	R: DR/F2_50/51N-F2	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 2 (160A)
	Electronic	351A			U1, Moderately Inverse 2
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 7 (560A)
SWGR: 9_A	R: DR/F3_50/51-F3	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 6.88 (550.4A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3.1
					50PIP(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 6.88 (550.4A)
					U4, Extremely Inverse 3.1
					50PIP(0.25-100 x CTR) 5 (400A)
SWGR: 9_A	R: DR/F3_50/51N-F3	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 1.5 (120A)
	Electronic	351A			U1, Moderately Inverse 2
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 5 (400A)
SWGR: 9_A	R: DR/F4_50/51-F4	SEL	SEL-351A	400 / 5	51PP(0.25-16.0 x CTR) 9 (720A)
	Electronic	351A			U4, Extremely Inverse 3
		50P/51P/67, 5A nom.			50PIP(0.25-100 x CTR) 100 (8000A)
SWGR: 9_A	R: DR/F4_50/51N-F4	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 1.5 (120A)
	Electronic	351A			U1, Moderately Inverse 2
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 6 (480A)
SWGR: 9_B	R: DR/F5_50/51-F5	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 5 (400A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3.3
					50PIP(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 5 (400A)
					U4, Extremely Inverse 3.3
					50PIP(0.25-100 x CTR) 7 (560A)
SWGR: 9_B	R: DR/F5_50/51N-F5	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 2 (160A)
	Electronic	351A			U1, Moderately Inverse 2
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 5 (400A)
SWGR: 9_B	R: DR/F6_50/51-F6	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 7 (560A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3.5
					50PIP(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 7 (560A)
					U4, Extremely Inverse 3.5
					50PIP(0.25-100 x CTR) 5 (400A)

**Buffalo VAMC Arc Flash Remediation**

Turner Engineering PC

**Section 00 01 16 Appendix 7 - Protective Device Settings**

ETK 11/1/2014 Rev2

**Sub MV**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
SWGR: 9_B	R: DR/F6_50/51N-F6	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 1.5 (120A)
	Electronic	351A			U1, Moderately Inverse 2
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 5 (400A)
SWGR: 9_B	R: DR/F7_50/51-F7	SEL	SEL-351A	400 / 5	51PP(0.25-16.0 x CTR) 7 (560A)
	Electronic	351A			U4, Extremely Inverse 2.5
		50P/51P/67, 5A nom.			50P1P(0.25-100 x CTR) 50 (4000A)
SWGR: 9_B	R: DR/F7_50/51N-F7	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 1.5 (120A)
	Electronic	351A			U1, Moderately Inverse 2
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 6 (480A)
SWGR: 9_B	R: DR/F8_50/51-F8	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 4.5 (360A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 4.2
					50P1P(0.25-100 x CTR) 42 (3360A)
					QT
					51PP(0.25-16.0 x CTR) 4.5 (360A)
					U4, Extremely Inverse 4.2
					50P1P(0.25-100 x CTR) 10 (800A)
SWGR: 9_B	R: DR/F8_50/51N-F8	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 1 (80A)
	Electronic	351A			U2, Inverse 0.5
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 4 (320A)
SWGR: 9_B	R: DR/F9_50/51-F9	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 9 (720A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3
					50P1P(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 9 (720A)
					U4, Extremely Inverse 3
					50P1P(0.25-100 x CTR) 14 (1120A)
SWGR: 9_B	R: DR/F9_50/51N-F9	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 1 (80A)
	Electronic	351A			U1, Moderately Inverse 2
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 7 (560A)
SWGR: 9_B	R: DR/F10_50/51-F10	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 9 (720A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3
					50P1P(0.25-100 x CTR) 75 (6000A)
					QT
					51PP(0.25-16.0 x CTR) 9 (720A)
					U4, Extremely Inverse 3
					50P1P(0.25-100 x CTR) 4 (320A)
SWGR: 9_B	R: DR/F10_50/51N-F10	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 1 (80A)
	Electronic	351A			U1, Moderately Inverse 2
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 3.5 (280A)
SWGR: 9A_C	R: DR/SP1_50/51-SP1	SEL	SEL-351A	400 / 5	51PP(0.25-16.0 x CTR) 0.5 (40A)
	Electronic	351A			U1, Moderately Inverse 15
		50P/51P/67, 5A nom.			50P1P(0.25-100 x CTR) 100 (8000A)
SWGR: 9A_C	R: DR/SP1_50/51N-SP1	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 0.5 (40A)
	Electronic	351A			U1, Moderately Inverse 15
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 100 (8000A)
SWGR: 9A_C	R: DR/C1_50/51-C1	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 9 (720A)

**Buffalo VAMC Arc Flash Remediation**
**Turner Engineering PC**
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**ETK 11/1/2014 Rev2**
**Sub MV**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3
					50PIP(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 9 (720A)
					U4, Extremely Inverse 3
					50PIP(0.25-100 x CTR) 12 (960A)
SWGR: 9A_C	R: DR/C1_50/51N-C1	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 1.5 (120A)
	Electronic	351A			U1, Moderately Inverse 2
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 6 (480A)
SWGR: 9A_C	R: DR/C2_50/51-C2	SEL	SEL-351A	400 / 5	51PP(0.25-16.0 x CTR) 9 (720A)
	Electronic	351A			U4, Extremely Inverse 3
		50P/51P/67, 5A nom.			50PIP(0.25-100 x CTR) 75 (6000A)
SWGR: 9A_C	R: DR/C2_50/51N-C2	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 1 (80A)
	Electronic	351A			U1, Moderately Inverse 2
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 3.5 (280A)
SWGR: 9A_C	R: DR/C3_50/51-C3	SEL	SEL-351A	400 / 5	51PP(0.25-16.0 x CTR) 6 (480A)
	Electronic	351A			U4, Extremely Inverse 6
		50P/51P/67, 5A nom.			50PIP(0.25-100 x CTR) 55 (4400A)
SWGR: 9A_C	R: DR/C3_50/51N-C3	SEL	SEL-351A	400 / 5	51NP(0.5-16.0 x CTR) 1 (80A)
	Electronic	351A			U1, Moderately Inverse 2
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 5 (400A)
SWGR: 9A_C	R: DR3A/3_67-3A	SEL	SEL-351A	1200 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 1.5 (360A)
		50P/51P/67, 5A nom.			U2, Inverse 1
					50PIP(0.25-100 x CTR) 12 (2880A)
					Directional
					51PP(0.25-16.0 x CTR) 1.5 (360A)
					U2, Inverse 1
					50PIP(0.25-100 x CTR) 12 (2880A)
SWGR: 9_A	R: DR/TA_51N-TA	SEL	SEL-551	1200 / 5	51G1P(0.5-16.0 x CTR) 1 (240A)
	Electronic	551/551C			U2, Inverse 4
		50G/51G, 5A nom.			
SWGR: MS1	R: N Grid 50/51N Line #1	WESTINGHOUSE	CO-6	400 / 5	Tap (4-12A) 5 (400A)
	Electro-Mechanical	CO-6			Time Dial (0.5-11) 0.8
		50/51, 10-40/4-12A			INST (10-40A) 10 (800A)
SWGR: MS1	R: N Grid 50/51 Line #1	WESTINGHOUSE	CO-6	400 / 5	Tap (1-12A) 10.0 (800A)
	Electro-Mechanical	CO-6			Time Dial (0.5-11) 4.3
		50/51, 2-48/1-12A			INST (2-48A) 30 (2400A)
SWGR: 9_A	R: DR1/1_87_T1_Sec	SEL	387	3680 / 5	Phase
	Electronic	387E			51PnP 2 (1472A)
		50P/51P, 5A Rated			U2, Inverse 3
					50PnP1P 19 (13984A)
					Differential
					51PnP 2 (1472A)
					U2, Inverse 3
					50PnP1P 16 (11776A)
SWGR: CB_PM1	R: DR1/1_87_T1_Pri	SEL	387	665 / 5	Phase
	Electronic	387E			51PnP 2 (266A)
		50P/51P, 5A Rated			U2, Inverse 3
					50PnP1P 19 (2527A)
					Differential

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
					51PnP 2 (266A)
					U2, Inverse 3
					50PnP 16 (2128A)
SWGR: 9A_C	R: DR4/3_51	SEL	SEL-551	1200 / 5	Phase
	Electronic	551/551C			51PIP(0.5-16.0 x CTR) 3.5 (840A)
		50P/51P, 5A nom.			U3, Very Inverse 4.3
					Summation
					51PIP(0.5-16.0 x CTR) 3.5 (840A)
					U3, Very Inverse 4.3
SWGR: CB_PM3	R: DR1/3_50/51BU	SEL	387	500 / 5	51PnP 2 (200A)
	Electronic	387E			U2, Inverse 3
		50P/51P, 5A Rated			50PnP 19 (1900A)
SWGR: CB_PM2	R: DR1/2_50/51BU	SEL	387	500 / 5	51PnP 2 (200A)
	Electronic	387E			U2, Inverse 3
		50P/51P, 5A Rated			50PnP 19 (1900A)
SWGR: CB_PM1	R: DR1/1_50/51-BU	SEL	387	500 / 5	51PnP 2 (200A)
	Electronic	387E			U2, Inverse 3
		50P/51P, 5A Rated			50PnP 19 (1900A)
SWGR: 9_A	R: DR/TA_51_L	SEL	SEL-551	1200 / 5	Phase
	Electronic	551/551C			51PIP(0.5-16.0 x CTR) 3.3 (792A)
		50P/51P, 5A nom.			U3, Very Inverse 4
					Summation
					51PIP(0.5-16.0 x CTR) 3.3 (792A)
					U3, Very Inverse 4
SWGR: CB_PM2	R: DR2/2_50/51-2A	SEL	SEL-551	1200 / 5	51PIP(0.5-16.0 x CTR) 0.7 (168A)
	Electronic	551/551C			U2, Inverse 2.8
		50P/51P, 5A nom.			50PIP(0.50-80.0 x CTR) 6.3 (1512A)
SWGR: CB_PM2	R: DR2/2_50/51N-2A	SEL	SEL-551	1200 / 5	51N1P(0.5-16.0 x CTR) 0.5 (120A)
	Electronic	551/551C			U3, Very Inverse 3
		50N/51N, 5A nom.			50N1P(0.50-80.0 x CTR) 1.6 (384A)
SWGR: CB_PM3	R: DR2/3_50/51-3A	SEL	SEL-551	1200 / 5	51PIP(0.5-16.0 x CTR) 0.7 (168A)
	Electronic	551/551C			U2, Inverse 2.8
		50P/51P, 5A nom.			50PIP(0.50-80.0 x CTR) 6.3 (1512A)
SWGR: CB_PM3	R: DR2/3_50/51N-3A	SEL	SEL-551	1200 / 5	51N1P(0.5-16.0 x CTR) 0.5 (120A)
	Electronic	551/551C			U3, Very Inverse 3
		50N/51N, 5A nom.			50N1P(0.50-80.0 x CTR) 1.6 (384A)
SWGR: 9_B	R: DR3A/2_67-2A	SEL	SEL-351A	1200 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 1.5 (360A)
		50P/51P/67, 5A nom.			U2, Inverse 1
					50PIP(0.25-100 x CTR) 12 (2880A)
					Directional
					51PP(0.25-16.0 x CTR) 1.5 (360A)
					U2, Inverse 1
					50PIP(0.25-100 x CTR) 12 (2880A)
SWGR: 9_B	R: DR4/2_51	SEL	SEL-551	1200 / 5	Phase
	Electronic	551/551C			51PIP(0.5-16.0 x CTR) 3.5 (840A)
		50P/51P, 5A nom.			U3, Very Inverse 4.3
					Summation
					51PIP(0.5-16.0 x CTR) 3.3 (792A)
					U3, Very Inverse 4

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SWGR: 9_A	R: DR3A/1_67-1A	SEL	SEL-351A	1200 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 1.5 (360A)
		50P/51P/67, 5A nom.			U2, Inverse 1
					50PIP(0.25-100 x CTR) 12 (2880A)
					Directional
					51PP(0.25-16.0 x CTR) 1.5 (360A)
					U2, Inverse 1
					50PIP(0.25-100 x CTR) 12 (2880A)
SWGR: 9_A	R: DR4/1_51	SEL	SEL-551	1200 / 5	Phase
	Electronic	551/551C			51PIP(0.5-16.0 x CTR) 3.5 (840A)
		50P/51P, 5A nom.			U3, Very Inverse 4.3
					Summation
					51PIP(0.5-16.0 x CTR) 3.3 (792A)
					U3, Very Inverse 4
SWGR: 9_B	R: DR/TB_51N-TB	SEL	SEL-551	1200 / 5	51G1P(0.5-16.0 x CTR) 1 (240A)
	Electronic	551/551C			U2, Inverse 4
		50G/51G, 5A nom.			
SWGR: 9_B	R: DR/TB_51-L	SEL	SEL-551	1200 / 5	Phase
	Electronic	551/551C			51PIP(0.5-16.0 x CTR) 3.3 (792A)
		50P/51P, 5A nom.			U3, Very Inverse 4
					Summation
					51PIP(0.5-16.0 x CTR) 3.3 (792A)
					U3, Very Inverse 4
SWGR: MS2	R: N Grid 50/51N Line #2	GE	IAC 53	400 / 5	Tap (1.5-12A) 5 (400A)
	Electro-Mechanical	IAC 53			Time Dial (0.5-10) 0.6
		50/51, 10-80/1.5-12A			INST-Low (10-40A) 10 (800A)
SWGR: MS2	R: N Grid 50/51 Line #2	WESTINGHOUSE	CO-6	400 / 5	Tap (1-12A) 10.0 (800A)
	Electro-Mechanical	CO-6			Time Dial (0.5-11) 4.3
		50/51, 2-48/1-12A			INST (2-48A) 32 (2560A)
SWGR: MS3	R: N Grid 50/51N Line #3	GE	IAC 53	400 / 5	Tap (1.5-12A) 5 (400A)
	Electro-Mechanical	IAC 53			Time Dial (0.5-10) 0.6
		50/51, 10-80/1.5-12A			INST-Low (10-40A) 10 (800A)
SWGR: MS3	R: N Grid 50/51 Line #3	WESTINGHOUSE	CO-6	400 / 5	Tap (1-12A) 10.0 (800A)
	Electro-Mechanical	CO-6			Time Dial (0.5-11) 5.0
		50/51, 2-48/1-12A			INST (2-48A) 32 (2560A)
T1 Secondary	R: 51G/1	ABB	51I	600 / 5	Tap 2.0 (240A)
	Electronic	51I			Time Dial 3.0
		50/51, INVERSE			
T2 Secondary	R: 51G/2	ABB	51I	600 / 5	Tap 2.0 (240A)
	Electronic	51I			Time Dial 3.0
		50/51, INVERSE			
T3 Secondary	R: 51G/3	ABB	51I	600 / 5	Tap 2.0 (240A)
	Electronic	51I			Time Dial 3.0
		50/51, INVERSE			
T1 Secondary	R: 67N/1	SEL	SEL-351A	600 / 5	51PP(0.25-16.0 x CTR) 1.2 (144A)
	Electronic	351A			U1, Moderately Inverse 1
		50P/51P/67, 5A nom.			
T1 Secondary	R: 67N/1BU	SEL	SEL-351A	600 / 5	51PP(0.25-16.0 x CTR) 1.5 (180A)
	Electronic	351A			U1, Moderately Inverse 2
		50P/51P/67, 5A nom.			

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T2 Secondary	R: 67N/2	SEL	SEL-351A	600 / 5	51PP(0.25-16.0 x CTR) 1.2 (144A)
	Electronic	351A			U1, Moderately Inverse 1
		50P/51P/67, 5A nom.			
T2 Secondary	R: 67N/2BU	SEL	SEL-351A	600 / 5	51PP(0.25-16.0 x CTR) 1.5 (180A)
	Electronic	351A			U1, Moderately Inverse 2
		50P/51P/67, 5A nom.			
T3 Secondary	R: 67N/3	SEL	SEL-351A	600 / 5	51PP(0.25-16.0 x CTR) 1.2 (144A)
	Electronic	351A			U1, Moderately Inverse 1
		50P/51P/67, 5A nom.			
T3 Secondary	R: 67N/3BU	SEL	SEL-351A	600 / 5	51PP(0.25-16.0 x CTR) 1.5 (180A)
	Electronic	351A			U1, Moderately Inverse 2
		50P/51P/67, 5A nom.			
SWGR: 9_B	R: DR1/2_87_T2_Sec	SEL	387	3680 / 5	Phase
	Electronic	387E			51PnP 2 (1472A)
		50P/51P, 5A Rated			U2, Inverse 3
					50PnP1P 19 (13984A)
					Differential
					51PnP 2 (1472A)
					U2, Inverse 3
					50PnP1P 16 (11776A)
SWGR: 9_A	R: DR/TA_51_R	SEL	SEL-551	1200 / 5	Phase
	Electronic	551/551C			51PIP(0.5-16.0 x CTR) 3 (720A)
		50P/51P, 5A nom.			U2, Inverse 1.3
					Summation
					51PIP(0.5-16.0 x CTR) 3.3 (792A)
					U3, Very Inverse 4
SWGR: 9A_C	R: DR/TB_51_R	SEL	SEL-551	1200 / 5	Phase
	Electronic	551/551C			51PIP(0.5-16.0 x CTR) 3 (720A)
		50P/51P, 5A nom.			U2, Inverse 1.2
					Summation
					51PIP(0.5-16.0 x CTR) 3.3 (792A)
					U3, Very Inverse 4
SWGR: CB_PM2	R: DR1/2_87_T2_Pri	SEL	387	665 / 5	Phase
	Electronic	387E			51PnP 2 (266A)
		50P/51P, 5A Rated			U2, Inverse 3
					50PnP1P 19 (2527A)
					Differential
					51PnP 2 (266A)
					U2, Inverse 3
					50PnP1P 16 (2128A)
SWGR: CB_PM3	R: DR1/3_87_T3_Pri	SEL	387	665 / 5	Phase
	Electronic	387E			51PnP 2 (266A)
		50P/51P, 5A Rated			U2, Inverse 3
					50PnP1P 19 (2527A)
					Differential
					51PnP 2 (266A)
					U2, Inverse 3
					50PnP1P 16 (2128A)
SWGR: 9A_C	R: DR1/3_87_T3_Sec	SEL	387	3680 / 5	Phase
	Electronic	387E			51PnP 2 (1472A)
		50P/51P, 5A Rated			U2, Inverse 3
					50PnP1P 19 (13984A)

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
					Differential
					51PnP 2 (1472A)
					U2, Inverse 3
					50PnP 16 (11776A)
	R: N Grid 50/51 Line #1 (ALT)	SEL	SEL-351A	800 / 5	51PP(0.25-16.0 x CTR) 4 (640A)
	Electronic	351A			U1, Moderately Inverse 2.3
		50P/51P/67, 5A nom.			50P1P(0.25-100 x CTR) 15 (2400A)
	R: N Grid 50/51N Line #1 (ALT)	SEL	SEL-351A	800 / 5	51NP(0.5-16.0 x CTR) 1.5 (240A)
	Electronic	351A			U3, Very Inverse 1
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 4 (640A)
	R: N Grid 50/51 Line #2 (ALT)	SEL	SEL-351A	800 / 5	51PP(0.25-16.0 x CTR) 4 (640A)
	Electronic	351A			U1, Moderately Inverse 2.3
		50P/51P/67, 5A nom.			50P1P(0.25-100 x CTR) 15 (2400A)
	R: N Grid 50/51N Line #2 (ALT)	SEL	SEL-351A	800 / 5	51NP(0.5-16.0 x CTR) 1.5 (240A)
	Electronic	351A			U3, Very Inverse 1
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 4 (640A)
	R: N Grid 50/51 Line #3 (ALT)	SEL	SEL-351A	800 / 5	51PP(0.25-16.0 x CTR) 4 (640A)
	Electronic	351A			U1, Moderately Inverse 2.3
		50P/51P/67, 5A nom.			50P1P(0.25-100 x CTR) 15 (2400A)
	R: N Grid 50/51N Line #3 (ALT)	SEL	SEL-351A	800 / 5	51NP(0.5-16.0 x CTR) 1.5 (240A)
	Electronic	351A			U3, Very Inverse 1
		50N/51N/67, 5A nom.			50N1P(0.25-100 x CTR) 4 (640A)
Fuses					
Bus Connected	Name/Type	Description		Cartridge/Trip	Settings
BUS-0027	FU: 18_XF H	GOULD SHAWMUT	CS-3, 175E	175.0A	175 Amps
	High Voltage	CS-3, 5.5kV E-Rated		175.0A	
		10E-450E			
BUS-0028	FU: 18_XF G	GOULD SHAWMUT	CS-3, 175E	175.0A	175 Amps
	High Voltage	CS-3, 5.5kV E-Rated		175.0A	
		10E-450E			
BUS: XF Sub E	FU: 6_XF E	GE	EJO-1, 125E	125.0A	125 Amps
	High Voltage	9F60 EJO-1, 2.75 & 5.5kV E-Rated		125.0A	
		1E-200E			
BUS: XF Sub F	FU: 6_XF F	GE	EJO-1, 125E	125.0A	125 Amps
	High Voltage	9F60 EJO-1, 2.75 & 5.5kV E-Rated		125.0A	
		1E-200E			
SWGR: 28-1-MVS01	FU: 28_XF CH-1	BUSSMANN	55GFMSJD	150.0A	150.0 Amps
	High Voltage	55GFMSJD, Type E		150.0A	
		150E-450E			
SWGR: 28-1-MVS01	FU: 28_USS S-15	BUSSMANN	125E	125.0A	125.0 Amps
	High Voltage	55GDMSJD		125.0A	
		10E-125E			
SWGR: 28-1-MVS01	FU: 28_USS 28A	BUSSMANN	55GFMSJD	200.0A	200.0 Amps
	High Voltage	55GFMSJD, Type E		200.0A	
		150E-450E			
SWGR: 20_MVS01	FU: 20_MVS03	GE	EJO-1	200.0A	200 Amps
	High Voltage	9F62 EJO-1, 5.5kV		200.0A	
		25-900A			



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SWGR: 20_MVS02	FU: 20_XF USS-20	GE	EJO-1	200.0A	200 Amps
	High Voltage	9F62 EJO-1, 5.5kV		200.0A	
		25-900A			
SWGR: 20_MVS03	FU: 20_CH-2-1	GE	EJO-1	65.0A	65 Amps
	High Voltage	9F62 EJO-1, 5.5kV		65.0A	
		25-900A			
SWGR: 20_MVS03	FU: 20_CH-1-1	GE	EJO-1	65.0A	65 Amps
	High Voltage	9F62 EJO-1, 5.5kV		65.0A	
		25-900A			
BUS-0054	FU: 20_CH-2-2	CUTLER-HAMMER	CLS, 3R	100.0A	100.0 Amps
	High Voltage	CLS-12, -14, -22, -24, -700, HCLS-12, -22, 5.08kV R		100.0A	
		2R-44R			
BUS-0055	FU: 20_CH-1-2	CUTLER-HAMMER	CLS, 3R	100.0A	100.0 Amps
	High Voltage	CLS-12, -14, -22, -24, -700, HCLS-12, -22, 5.08kV R		100.0A	
		2R-44R			
SWGR: 1_S22-1-MVS01	FU: 1_CH-1_1	BUSSMANN	100E	100.0A	100.0 Amps
	High Voltage	55GDMSJD		100.0A	
		10E-125E			
SWGR: 1_S22-1-MVS01	FU: 1_XF UB-2	BUSSMANN	55GFMSJD	200.0A	200.0 Amps
	High Voltage	55GFMSJD, Type E		200.0A	
		150E-450E			
SWGR: 1_S22-1-MVS01	FU: 1_XF UB-1 CH-2	BUSSMANN	65E	65.0A	65.0 Amps
	High Voltage	55GDMSJD		65.0A	
		10E-125E			
DISC: 1_CH-1	FU: 1_CH-1_2	CUTLER-HAMMER	CLS, 3R	100.0A	100.0 Amps
	High Voltage	CLS-12, -14, -22, -24, -700, HCLS-12, -22, 5.08kV R		100.0A	
		2R-44R			
BUS: Cap Bank	FU: Cap Bank Step 1	ABB	CLC	130.0A	130.0 Amps
	High Voltage	CLC, 1.2-3.0kV		130.0A	
		25-130A			
BUS: Cap Bank	FU: Cap Bank Step 2	ABB	CLC	130.0A	130.0 Amps
	High Voltage	CLC, 1.2-3.0kV		130.0A	
		25-130A			
Switches					
Bus Connected	Name/Type	Description			
SWGR: CB_PM1	SW: MS1	ABB (Malton)	600A		
	Load Break Switch	MES			
		600A			
SWGR: CB_PM2	SW: MS2	ABB (Malton)	600A		
	Load Break Switch	MES			
		600A			
SWGR: CB_PM3	SW: MS3	ABB (Malton)	600A		
	Load Break Switch	MES			
		600A			
SWGR: 28-1-MVS01	SW: 28-1-MVS01_F10	SQUARE D	600A		
	Load Break Switch	PowerZone HVL			
		600A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
SWGR: 28-1-MVS01	SW: 28-1-MVS01_C2	SQUARE D	600A		
	Load Break Switch	PowerZone HVL			
		600A			
SWGR: 20_MVS01	SW: 20_MVS01_C1	ITE	4.8kV, 600A		
	Load Break Switch	HPL-C Air Interrupter Switch			
		WW created			
SWGR: 20_MVS01	SW: 20_MVS01_F4	ITE	4.8kV, 600A		
	Load Break Switch	HPL-C Air Interrupter Switch			
		WW created			
SWGR: 20_MVS02	SW: 20_MVS02_F9	ITE	4.8kV, 600A		
	Load Break Switch	HPL-C Air Interrupter Switch			
		WW created			
SWGR: 20_MVS02	SW: 20_MVS02_F2	ITE	4.8kV, 600A		
	Load Break Switch	HPL-C Air Interrupter Switch			
		WW created			
SWGR: 1_S22-1-MVS01	SW: 1_S22-1-MVS01_C1	SQUARE D	600A		
	Load Break Switch	PowerZone HVL			
		600A			
SWGR: 1_S22-1-MVS01	SW: 1_S22-1-MVS01_F4	SQUARE D	600A		
	Load Break Switch	PowerZone HVL			
		600A			

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**Sub A\_B**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
SWBD: 11_USS B	CB: 11_ATS G (N)	UTILITY RELAY CO.	AC-Pro retrofit	1600.0A	Phase
	Static Trip	AC-Pro Retrofit (480V)		1600.0A	LTPU, (20 - 100% x S) 0.5 (800A)
		LSI, 50-5000A			LTD, (2 - 30s) 8
					STPU, (150 - 1200% x LTPU) 3.2 (2560A)
					STD, (0.07 - 0.4) 0.4 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 1200 % (9600A)
					Ground
					GFP, (20 - 200% x S) 20 % (320A)
					GFD, (0.1 - 0.5s) 0.2 (I <sup>2</sup> t Out)
					QT
					LTPU, (20 - 100% x S) 0.5 (800A)
					LTD, (2 - 30s) 8
					STPU, (150 - 1200% x LTPU) 3.2 (2560A)
					STD, (0.07 - 0.4) 0.4 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 3 (2400A)
SWBD: 11_USS A	CB: 11_ATS-H (N)	UTILITY RELAY CO.	Quick-Trip	1600.0A	Phase
	Static Trip	AC-Pro Retrofit w/ QT (480V)		1600.0A	LTPU, (20 - 100% x S) 0.5 (800A)
		LSI, 50-5000A			LTD, (2 - 30s) 8
					STPU, (150 - 1200% x LTPU) 3.2 (2560A)
					STD, (0.07 - 0.4s) 0.2 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 1200% (9600A)
					Ground
					GFP, (20 - 200% x S) 20 % (320A)
					GFD, (0.1 - 0.5s) 0.2 (I <sup>2</sup> t Out)
					QT
					LTPU, (20 - 100% x S) 0.5 (800A)
					LTD, (2 - 30s) 8
					STPU, (150 - 1200% x LTPU) 3.2 (2560A)
					STD, (0.07 - 0.4s) 0.2 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 3 (2400A)
SWBD: 11_PP-B11	CB: 11_Cell Phone	GE	SGLA	400.0A	MAX
	Thermal Magnetic	SGLA, Spectra RMS		300.0A	
		125-600A			
PNL: 11_PP-B11 Sub	CB: 11_Heater North	SQUARE D	QO	50.0A	Fixed (730-6, 50A)
	Thermal Magnetic	QO, 3-Pole		50.0A	
		15-100A			
PNL: 11_PP-B11 Sub	CB: 11_Heater South	SQUARE D	QO	50.0A	Fixed (730-6, 50A)
	Thermal Magnetic	QO, 3-Pole		50.0A	
		15-100A			
SWBD: 11_USS B	CB: 11_Pnl 2NHA-1 (x-ray)	UTILITY RELAY CO.	AC-Pro retrofit	1600.0A	Phase
	Static Trip	AC-Pro Retrofit (480V)		1600.0A	LTPU, (20 - 100% x S) 0.5 (800A)
		LSI, 50-5000A			LTD, (2 - 30s) 8
					STPU, (150 - 1200% x LTPU) 3.2 (2560A)
					STD, (0.07 - 0.4) 0.1 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 10 (8000A)
					Ground
					GFP, (20 - 200% x S) 20 % (320A)
					GFD, (0.1 - 0.5s) 0.2 (I <sup>2</sup> t Out)
					QT
					LTPU, (20 - 100% x S) 0.5 (800A)
					LTD, (2 - 30s) 8
					STPU, (150 - 1200% x LTPU) 3.2 (2560A)
					STD, (0.07 - 0.4) 0.1 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 3 (2400A)
SWBD: 11_USS A	CB: 11_Pnl BPHI	UTILITY RELAY CO.	AC-Pro retrofit	1600.0A	Phase

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Static Trip	AC-Pro Retrofit (480V)		1600.0A	LTPU, (20 - 100% x S) 0.7 (1120A)
		LSI, 50-5000A			LTD, (2 - 30s) 4
					STPU, (150 - 1200% x LTPU) 2.2 (2464A)
					STD, (0.07 - 0.4) 0.3 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 10 (11200A)
					Ground
					GPUP, (20 - 200% x S) 0.5 (800A)
					GFD, (0.1 - 0.5s) 0.2 (I <sup>2</sup> t Out)
					QT
					LTPU, (20 - 100% x S) 0.7 (1120A)
					LTD, (2 - 30s) 4
					STPU, (150 - 1200% x LTPU) 2.2 (2464A)
					STD, (0.07 - 0.4) 0.3 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 3 (3360A)
SWBD: 11_USS B	CB: 11_Pnl BPH1 (2)	UTILITY RELAY CO.	AC-Pro retrofit	1600.0A	Phase
	Static Trip	AC-Pro Retrofit (480V)		1600.0A	LTPU, (20 - 100% x S) 0.7 (1120A)
		LSI, 50-5000A			LTD, (2 - 30s) 4
					STPU, (150 - 1200% x LTPU) 2.3 (2576A)
					STD, (0.07 - 0.4) 0.4 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 10 (11200A)
					Ground
					GPUP, (20 - 200% x S) 0.4 (640A)
					GFD, (0.1 - 0.5s) 0.3 (I <sup>2</sup> t Out)
					QT
					LTPU, (20 - 100% x S) 0.7 (1120A)
					LTD, (2 - 30s) 4
					STPU, (150 - 1200% x LTPU) 2.3 (2576A)
					STD, (0.07 - 0.4) 0.4 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 3 (3360A)
SWBD: 11_USS A	CB: 11_Pnl PP-B11	UTILITY RELAY CO.	AC-Pro retrofit	1600.0A	Phase
	Static Trip	AC-Pro Retrofit (480V)		1600.0A	LTPU, (20 - 100% x S) 0.8 (1280A)
		LSI, 50-5000A			LTD, (2 - 30s) 2
					STPU, (150 - 1200% x LTPU) 2.75 (3520A)
					STD, (0.07 - 0.4) 0.4 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 8 (10240A)
					Ground
					GPUP, (20 - 200% x S) 0.4 (640A)
					GFD, (0.1 - 0.5s) 0.2 (I <sup>2</sup> t Out)
					QT
					LTPU, (20 - 100% x S) 0.8 (1280A)
					LTD, (2 - 30s) 2
					STPU, (150 - 1200% x LTPU) 1.9 (2432A)
					STD, (0.07 - 0.4) 0.4 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 3 (3840A)
SWBD: 11_USS B	CB: 11_Pnl SNH-15	UTILITY RELAY CO.	AC-Pro retrofit	1600.0A	Phase
	Static Trip	AC-Pro Retrofit (480V)		1600.0A	LTPU, (20 - 100% x S) 0.7 (1120A)
		LSI, 50-5000A			LTD, (2 - 30s) 4
					STPU, (150 - 1200% x LTPU) 2.2 (2464A)
					STD, (0.07 - 0.4) 0.4 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 10 (11200A)
					Ground
					GPUP, (20 - 200% x S) 0.4 (640A)
					GFD, (0.1 - 0.5s) 0.2 (I <sup>2</sup> t Out)
					QT
					LTPU, (20 - 100% x S) 0.7 (1120A)
					LTD, (2 - 30s) 4
					STPU, (150 - 1200% x LTPU) 2.2 (2464A)
					STD, (0.07 - 0.4) 0.4 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 3 (3360A)

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SWBD: 11_PP-B11	CB: 11_Pnls PP-PFD-1_2	GE	SGLA	400.0A	MAX
	Thermal Magnetic	SGLA, Spectra RMS		400.0A	
		125-600A			
PNL: 11_PP-B11 Sub	CB: 11_PP-B11 Sub Main	SQUARE D	QO-VH	125.0A	Fixed (730-10, 125A)
	Thermal Magnetic	QO-VH, 3-Pole		125.0A	
		15-150A			
SWBD: 11_USS A	CB: 11_Sub A_B Tie	UTILITY RELAY CO.	AC-Pro retrofit	3000.0A	Phase
	Static Trip	AC-Pro Retrofit (480V)		3000.0A	LTPU, (20 - 100% x S) 0.65 (1950A)
		LSI, 50-5000A			LTD, (2 - 30s) 2
					STPU, (150 - 1200% x LTPU) 1.6 (3120A)
					STD, (0.07 - 0.4) 0.3 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 8 (15600A)
					Ground
					GFPU, (20 - 200% x S) 0.4 (1200A)
					GFD, (0.1 - 0.5s) 0.3 (I <sup>2</sup> t Out)
SWBD: 11_USS A	CB: 11_USS A Main	UTILITY RELAY CO.	AC-Pro retrofit	3000.0A	Phase
	Static Trip	AC-Pro Retrofit (480V)		3000.0A	LTPU, (20 - 100% x S) 0.8 (2400A)
		LSI, 50-5000A			LTD, (2 - 30s) 2
					STPU, (150 - 1200% x LTPU) 1.6 (3840A)
					STD, (0.07 - 0.4) 0.3 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 10 (24000A)
					Ground
					GFPU, (20 - 200% x S) 0.4 (1200A)
					GFD, (0.1 - 0.5s) 0.4 (I <sup>2</sup> t Out)
SWBD: 11_USS B	CB: 11_USS B Main	UTILITY RELAY CO.	AC-Pro retrofit	3000.0A	Phase
	Static Trip	AC-Pro Retrofit (480V)		3000.0A	LTPU, (20 - 100% x S) 0.8 (2400A)
		LSI, 50-5000A			LTD, (2 - 30s) 2
					STPU, (150 - 1200% x LTPU) 1.6 (3840A)
					STD, (0.07 - 0.4) 0.3 (I <sup>2</sup> t In)
					INST, (150 - 1200% x LTPU) 10 (24000A)
					Ground
					GFPU, (20 - 200% x S) 0.4 (1200A)
					GFD, (0.1 - 0.5s) 0.4 (I <sup>2</sup> t Out)
SWBD: 11_PP-B11	CB: 11_XF PP-B11 Sub	GE	SEDA	50.0A	MAX
	Thermal Magnetic	SEDA, Spectra RMS		50.0A	
		15-150A			
DISC: 1_219A	CB: 1_219A	GE	TED	80.0A	Fixed
	Thermal Magnetic	TED (E-100 Line)		80.0A	
		15-100A, 2-3 Pole			
PNL: 1_EM 13-233	CB: 1_ Elev 1	SQUARE D	LG	400.0A	Ir (125-400A) 300 (300A)
	Static Trip	PowerPact L-Frame, 3.3		400.0A	tr (4 sec)
		LI, 400AS		400.0A	Ii (1.5 - 12 x In) 8 (3200A)
PNL: 1_13-238	CB: 1_ Elev 10	SQUARE D	LG	400.0A	Ir (125-400A) 300 (300A)
	Static Trip	PowerPact L-Frame, 3.3		400.0A	tr (4 sec)
		LI, 400AS		400.0A	Ii (1.5 - 12 x In) 8 (3200A)
PNL: 1_EM 13-233	CB: 1_ Elev 2	SQUARE D	LG	400.0A	Ir (125-400A) 300 (300A)
	Static Trip	PowerPact L-Frame, 3.3		400.0A	tr (4 sec)
		LI, 400AS		400.0A	Ii (1.5 - 12 x In) 8 (3200A)
PNL: 1_EM 13-233	CB: 1_ Elev 3	SQUARE D	LG	400.0A	Ir (125-400A) 300 (300A)
	Static Trip	PowerPact L-Frame, 3.3		400.0A	tr (4 sec)
		LI, 400AS		400.0A	Ii (1.5 - 12 x In) 8 (3200A)

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PNL: 1_EM 13-233	CB: 1_ Elev 4	SQUARE D	LG	400.0A	Ir (125-400A) 300 (300A)
	Static Trip	PowerPact L-Frame, 3.3		400.0A	tr (4 sec)
		LI, 400AS		400.0A	Ii (1.5 - 12 x In) 8 (3200A)
PNL: 1_EM 13-233	CB: 1_ Elev 5	SQUARE D	LG	400.0A	Ir (125-400A) 300 (300A)
	Static Trip	PowerPact L-Frame, 3.3		400.0A	tr (4 sec)
		LI, 400AS		400.0A	Ii (1.5 - 12 x In) 8 (3200A)
PNL: 1_13-238	CB: 1_ Elev 6	SQUARE D	LG	400.0A	Ir (125-400A) 300 (300A)
	Static Trip	PowerPact L-Frame, 3.3		400.0A	tr (4 sec)
		LI, 400AS		400.0A	Ii (1.5 - 12 x In) 8 (3200A)
PNL: 1_13-238	CB: 1_ Elev 7	SQUARE D	LG	400.0A	Ir (125-400A) 300 (300A)
	Static Trip	PowerPact L-Frame, 3.3		400.0A	tr (4 sec)
		LI, 400AS		400.0A	Ii (1.5 - 12 x In) 8 (3200A)
PNL: 1_13-238	CB: 1_ Elev 8	SQUARE D	LG	400.0A	Ir (125-400A) 300 (300A)
	Static Trip	PowerPact L-Frame, 3.3		400.0A	tr (4 sec)
		LI, 400AS		400.0A	Ii (1.5 - 12 x In) 8 (3200A)
PNL: 1_13-238	CB: 1_ Elev 9	SQUARE D	LG	400.0A	Ir (125-400A) 300 (300A)
	Static Trip	PowerPact L-Frame, 3.3		400.0A	tr (4 sec)
		LI, 400AS		400.0A	Ii (1.5 - 12 x In) 8 (3200A)
PNL: 1_EM 13-233	CB: 1_ Elev Controls	SQUARE D	HG	30.0A	Fixed
	Thermal Magnetic	Powerpact HG		30.0A	
		15-150A			
PNL: 1_13-238	CB: 1_ Pnl 13-243	SQUARE D	JG	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		225.0A	INST (5-10 x Trip) High (2250A)
		150-250A, UL			
PNL: 1_10CL-A	CB: 1_10CL-A Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_10CL-B	CB: 1_10CL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_10CL-C	CB: 1_10CL-C Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_10CL-D	CB: 1_10CL-D Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_10LL-B	CB: 1_10LL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_11-LL-B	CB: 1_11-LL-B Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 1_11CL-D	CB: 1_11CL-D Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
DISC: 1_12AC	CB: 1_12AC	SYLVANIA	SJK	600.0A	Thermal Curve (Fixed)

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	SJK & HSJK		400.0A	INST (5x-12x) 12x (4800A)
		250-600A, 2 & 3 Pole			
DISC: 1_Pnl 13-243A	CB: 1_13-243A	SQUARE D	Q2	225.0A	Fixed
	Thermal Magnetic	Q2		225.0A	
		100-225A			
PNL: 1_11-LL-B	CB: 1_14-LL-B	Unknown	60	60.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_14-NLD	CB: 1_14-NLD Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_2EHE-1	CB: 1_15 Ton AC	SQUARE D	ED	20.0A	Fixed
	Thermal Magnetic	ED		20.0A	
		15-125A			
PNL: 1_2EHE-1	CB: 1_15 Ton AC PU Exist	SQUARE D	ED	20.0A	Fixed
	Thermal Magnetic	ED		20.0A	
		15-125A			
PNL: 1_1CLB-1	CB: 1_1CLB-1 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 1_1LL-B	CB: 1_1LL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_1NLB-4-1	CB: 1_1NLB-4-1 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		225.0A	
		100-225A			
DISC: 1_209	CB: 1_209	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A (Pre 1986)			
DISC: 1_210	CB: 1_210	GE	TED	80.0A	Fixed
	Thermal Magnetic	TED (E-100 Line)		80.0A	
		15-100A, 2-3 Pole			
DISC: 1_211	CB: 1_211	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
PNL: 1_2EHE-1	CB: 1_22 Ton AC	SQUARE D	ED	125.0A	Fixed
	Thermal Magnetic	ED		125.0A	
		15-125A			
PNL: 1_2EHE-1	CB: 1_22 Ton AC Pumps	SQUARE D	ED	90.0A	Fixed
	Thermal Magnetic	ED		90.0A	
		15-125A			
PNL: 1_2CL-A	CB: 1_2CL-A Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_2CL-B	CB: 1_2CL-B Main	Unknown		0.0A	
	Thermal Magnetic	Unknown			
		Unknown			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_2CLE-2	CB: 1_2CLE-2 Main	CUTLER-HAMMER	QBHW	100.0A	Fixed
	Thermal Magnetic	QBHW, 3-Pole		100.0A	
		15-100A			
PNL: 1_2EHA	CB: 1_2EHA Main	GE	TED	50.0A	Fixed
	Thermal Magnetic	TED (E-100 Line)		50.0A	
		15-100A, 2-3 Pole			
PNL: 1_2LH2	CB: 1_2LH2 Main	CHALLENGER	Unknown	0.0A	
	Thermal Magnetic	CJS/CJ		225.0A	
		70A-250A			
PNL: 1_2LL-B	CB: 1_2LL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_2LL7	CB: 1_2LL7 Main	CUTLER-HAMMER	QBHW	100.0A	Fixed
	Thermal Magnetic	QBHW, 3-Pole		100.0A	
		15-100A			
PNL: 1_3LL-B	CB: 1_3LL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_4CL-A	CB: 1_4CL-A Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_4CL-B	CB: 1_4CL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_4CL-C	CB: 1_4CL-C Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_4CL-D	CB: 1_4CL-D Main	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_4CLA-2	CB: 1_4CLA-2 Main	SQUARE D	QO-VH	60.0A	Fixed (730-13)
	Thermal Magnetic	QO-VH, 3-Pole		60.0A	
		15-150A			
PNL: 1_4EHA	CB: 1_4EHA Main	SQUARE D	EG	100.0A	Fixed
	Thermal Magnetic	EG		100.0A	
		15-125A			
PNL: 1_4LL-B	CB: 1_4LL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_LP-N-A12A	CB: 1_4th Fl EX Fans	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		40.0A	
		15-150A			
PNL: 1_5CL-A	CB: 1_5CL-A Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_5CL-B	CB: 1_5CL-B Main	Unknown	Unknown	0.0A	



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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_5CL-D	CB: 1_5CL-D Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_5LL-B	CB: 1_5LL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_6CL-A	CB: 1_6CL-A Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_6CL-B	CB: 1_6CL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_6CL-C	CB: 1_6CL-C Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_6CL-D	CB: 1_6CL-D Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_6LL-B	CB: 1_6LL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_7CL-A	CB: 1_7CL-A Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_7CL-B	CB: 1_7CL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_7CL-C-1	CB: 1_7CL-C-1 Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_7CL-C-2	CB: 1_7CL-C-2 Main	CUTLER-HAMMER	QBHW	70.0A	Fixed
	Thermal Magnetic	QBHW, 3-Pole		70.0A	
		15-100A			
PNL: 1_7CLD1	CB: 1_7CLD1 Main	SQUARE D	QB	150.0A	Fixed
	Thermal Magnetic	QB		150.0A	
		70-250A			
PNL: 1_7LL-B	CB: 1_7LL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_8CL-A	CB: 1_8CL-A Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_8CL-B	CB: 1_8CL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_8CL-C-1	CB: 1_8CL-C-1 Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_8CL-C-2	CB: 1_8CL-C-2 Main	Unknown	70	70.0A	
	Thermal Magnetic	Unknown		70.0A	
		Unknown			
PNL: 1_8CL-D	CB: 1_8CL-D Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_8LL-B	CB: 1_8LL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_9CLA-1	CB: 1_9CLA-1 Main	SQUARE D	QD	200.0A	Fixed
	Thermal Magnetic	QD		200.0A	
		70-250A			
PNL: 1_9CL-B	CB: 1_9CL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_9CL-C	CB: 1_9CL-C Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_9CL-D	CB: 1_9CL-D Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_9CLA-2	CB: 1_9CLA-2 Main	SQUARE D	HD	100.0A	Fixed
	Thermal Magnetic	HD		100.0A	
		15-150A			
PNL: 1_9LL-B	CB: 1_9LL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_13-NH	CB: 1_AC Rm 1104	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_2CLA2	CB: 1_AC Unit	SQUARE D	QO-VH	70.0A	Fixed (730-13)
	Thermal Magnetic	QO-VH, 3-Pole		70.0A	
		15-150A			
PNL: 1_13-NH	CB: 1_AC unit 11A	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_2PGH1	CB: 1_AC-1	GE	TED	50.0A	Fixed
	Thermal Magnetic	TED (E-100 Line)		40.0A	
		15-100A, 2-3 Pole			
PNL: 1_2PGH1	CB: 1_ACCU-1	FPE	NEF	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole, WW Mod		15.0A	
		15-20A, Page 13, WW Mod			
PNL: 1_BLLB-TEL	CB: 1_AHH-2	SQUARE D	QO	30.0A	Fixed (730-5, 30A)

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
PNL: 1_13-NH	CB: 1_AHU SA-12	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_4EHA	CB: 1_AHU-1	SQUARE D	EG	80.0A	Fixed
	Thermal Magnetic	EG		80.0A	
		15-125A			
PNL: 1_12AC	CB: 1_AHU-8	WESTINGHOUSE	QBH	100.0A	Opening Clearing Curve
	Thermal Magnetic	QBH		30.0A	
		15-100A, 3 Pole			
PNL: 1_1LH2	CB: 1_AHU1 Pet Scan	SQUARE D	ED	20.0A	Fixed
	Thermal Magnetic	ED		20.0A	
		15-125A			
PNL: 1_1LH2	CB: 1_AHU2 Pet Scan	SQUARE D	ED	20.0A	Fixed
	Thermal Magnetic	ED		20.0A	
		15-125A			
PNL: 1_LP-LS-PH1RA	CB: 1_Air Comp	GE	THHQB	20.0A	Fixed
	Thermal Magnetic	THHQB		20.0A	
		15-100A			
PNL: 1_12AC	CB: 1_Air Comp-4	WESTINGHOUSE	QBH	100.0A	Opening Clearing Curve
	Thermal Magnetic	QBH		50.0A	
		15-100A, 3 Pole			
SWBD: 1_BPH1 (2)	CB: 1_ATS 1 (N)	FPE	NFJ	225.0A	Thermal Curve
	Thermal Magnetic	NFJ		175.0A	INST (6-10 x Trip) 10 (1750A)
		70-225A, WW Mod			
SWBD: 1_BPH1 (2)	CB: 1_ATS 3 (N)	FPE	NFJ	225.0A	Thermal Curve
	Thermal Magnetic	NFJ		150.0A	INST (6-10 x Trip) 10 (1500A)
		70-225A, WW Mod			
SWBD: 1_BPH1 (2)	CB: 1_ATS 31 (N)	FPE	NFJ	225.0A	Thermal Curve
	Thermal Magnetic	NFJ		225.0A	INST (6-10 x Trip) 10 (2250A)
		70-225A, WW Mod			
BUS-0448	CB: 1_ATS-1 (E) W/G	GE	TJS	600.0A	Phase
	Static Trip	TJS & TJSS, VersaTrip		300.0A	LTPU (0.6-1.0 x S) 0.8 (240A)
		LI, 150-600A			LTD (Min-Max) Int
					INST (3-10 x LTPU) 6 (1440A)
					Ground
					GFPD (0.3-0.7 x S) 0.4 (120A)
					GFD (Min-Max) Min
SWBD: 1_BPH1 (2)	CB: 1_ATS-2	FPE	HEG	100.0A	Thermal Curve
	Thermal Magnetic	NEG - HEG, 3 Pole		90.0A	
		15-100A, Pages 17-18			
BUS-0391	CB: 1_ATS-2 (E) W/G	GE	TJS	600.0A	Phase
	Static Trip	TJS & TJSS, VersaTrip		150.0A	LTPU (0.6-1.0 x S) 0.9 (135A)
		LI, 150-600A			LTD (Min-Max) Int
					INST (3-10 x LTPU) 8 (1080A)
					Ground
					GFPD (0.3-0.7 x S) 0.7 (105A)
					GFD (Min-Max) Min

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
BUS-0456	CB: 1_ATS-28-CT (E) W/G	GE	THJS	600.0A	Phase
	Static Trip	THJS, VersaTrip Mod2		500.0A	LTPU (0.5-1.0 x S) 0.6 (300A)
		LI, 150-600A			LTD (Min-Max) Int
					INST (3-10 x LTPU) 6 (1800A)
					Ground
					GFP (0.3-0.75 x S) 0.6 (300A)
					GFD (Min-Max) Max
PNL: 1_2NHA-1	CB: 1_ATS-28-CT(N)	WESTINGHOUSE	LB	400.0A	LTD
	Thermal Magnetic	LBB, LB		250.0A	INST 10.0 (2500A)
		70-400A			
SWBD: 1_BPH1	CB: 1_ATS-29	FPE1	NJL	400.0A	Thermal Curve
	Thermal Magnetic	NJL, HJL		400.0A	Instantaneous 10 (4000A)
		70-400A			
BUS-0450	CB: 1_ATS-29 (E) W/G	GE	THJS	600.0A	Phase
	Static Trip	THJS, VersaTrip Mod2		500.0A	LTPU (0.5-1.0 x S) 1 (500A)
		LI, 150-600A			LTD (Min-Max) Min
					INST (3-10 x LTPU) 5 (2500A)
					Ground
					GFP (0.3-0.75 x S) 0.75 (112.5A)
					GFD (Min-Max) Max
BUS-0445	CB: 1_ATS-3 (E) W/G	GE	TJS	600.0A	Phase
	Static Trip	TJS & TJSS, VersaTrip		150.0A	LTPU (0.6-1.0 x S) 0.9 (135A)
		LI, 150-600A			LTD (Min-Max) Int
					INST (3-10 x LTPU) 8 (1080A)
					Ground
					GFP (0.3-0.7 x S) 0.7 (105A)
					GFD (Min-Max) Min
BUS-0458	CB: 1_ATS-31 (E) W/G	GE	TJS	600.0A	Phase
	Static Trip	TJS & TJSS, VersaTrip		150.0A	LTPU (0.6-1.0 x S) 0.8 (120A)
		LI, 150-600A			LTD (Min-Max) Min
					INST (3-10 x LTPU) 3 (360A)
					Ground
					GFP (0.3-0.7 x S) 0.3 (45A)
					GFD (Min-Max) Min
BUS-0455	CB: 1_ATS-C01 (E) W/G	GE	THJS	600.0A	Phase
	Static Trip	THJS, VersaTrip Mod2		300.0A	LTPU (0.5-1.0 x S) 0.9 (270A)
		LI, 150-600A			LTD (Min-Max) Max
					INST (3-10 x LTPU) 8 (2160A)
					Ground
					GFP (0.3-0.75 x S) 0.75 (225A)
					GFD (Min-Max) Max
PNL: 1_SNH-15	CB: 1_ATS-C01 (N)	SQUARE D	JG	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		225.0A	INST (5-10 x Trip) 7.5 (1687.5A)
		150-250A, UL			
PNL: 1_XPH1	CB: 1_ATS-Comp Rm	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		225.0A	
		Unknown			
BUS-0457	CB: 1_ATS-Comp Rm (E) W/G	GE	TJS	600.0A	Phase
	Static Trip	TJS & TJSS, VersaTrip		200.0A	LTPU (0.6-1.0 x S) 0.9 (180A)
		LI, 150-600A			LTD (Min-Max) Int
					INST (3-10 x LTPU) 5 (900A)
					Ground

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
					GFPV (0.3-0.7 x S) 0.4 (80A)
					GFD (Min-Max) Min
BUS-0435	CB: 1_ATS-D (E) W/G	GE	TJS	600.0A	Phase
	Static Trip	TJS & TJSS, VersaTrip, alternate		300.0A	LTPV (0.6-1.0 x S) 0.8 (240A)
		LSI, 150-600A			LTD (Min-Max) Int
					INST (3-10 x LTPV) 6 (1440A)
					Ground
					GFPV (0.3-0.7 x S) 0.4 (120A)
					GFD (Min-Max) Min
PNL: 1_SNH-15	CB: 1_ATS-D (N)	SQUARE D	JG	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		225.0A	INST (5-10 x Trip) High (2250A)
		150-250A, UL			
BUS-0437	CB: 1_ATS-E (E) W/G	GE	TJS	600.0A	Phase
	Static Trip	TJS & TJSS, VersaTrip, alternate		300.0A	LTPV (0.6-1.0 x S) 0.8 (240A)
		LSI, 150-600A			LTD (Min-Max) Int
					INST (3-10 x LTPV) 6 (1440A)
					Ground
					GFPV (0.3-0.7 x S) 0.4 (120A)
					GFD (Min-Max) Min
PNL: 1_SNH-15	CB: 1_ATS-E (N)	SQUARE D	JG	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		225.0A	INST (5-10 x Trip) High (2250A)
		150-250A, UL			
BUS-0433	CB: 1_ATS-F (E) W/G	GE	TJS	600.0A	Phase
	Static Trip	TJS & TJSS, VersaTrip, alternate		300.0A	LTPV (0.6-1.0 x S) 0.8 (240A)
		LSI, 150-600A			LTD (Min-Max) Int
					INST (3-10 x LTPV) 6 (1440A)
					Ground
					GFPV (0.3-0.7 x S) 0.4 (120A)
					GFD (Min-Max) Min
PNL: 1_SNH-15	CB: 1_ATS-F (N)	SQUARE D	JG	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		225.0A	INST (5-10 x Trip) High (2250A)
		150-250A, UL			
BUS-0440	CB: 1_ATS-G (E) W/G	SQUARE D	LE	250.0A	Phase
	Static Trip	LE, Micrologic		250.0A	LTPV (0.5-1.0 x P) 1.0 (250A)
		LSI, 100-600A		250.0A	LTD (2-14 Sec.) 14
					STPV (2-8 x P) 6 (1500A)
					STD (0.1-0.5 Sec.) 0.2 (I <sup>2</sup> t In)
					INST (2.5-8 x P) 8.0 (2000A)
					Ground
					GFPV (0.2-0.75 x S) 0.45 (112.5A)
					GFD (0.1-0.5 Sec.) 0.1 (I <sup>2</sup> t In)
BUS-0443	CB: 1_ATS-H (E) W/G	SQUARE D	LE	250.0A	Phase
	Static Trip	LE, Micrologic		250.0A	LTPV (0.5-1.0 x P) 1.0 (250A)
		LSI, 100-600A		250.0A	LTD (2-14 Sec.) 14
					STPV (2-8 x P) 6 (1500A)
					STD (0.1-0.5 Sec.) 0.2 (I <sup>2</sup> t In)
					INST (2.5-8 x P) 8.0 (2000A)
					Ground
					GFPV (0.2-0.75 x S) 0.45 (112.5A)
					GFD (0.1-0.5 Sec.) 0.1 (I <sup>2</sup> t In)
PNL: 1_BCL-U	CB: 1_BCL-U Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_BCL1	CB: 1_BCL1 Main	FPE	NJL	400.0A	Thermal Curve
	Thermal Magnetic	NJL, HJL		250.0A	Instantaneous 10 (2500A)
		70-400A			
PNL: 1_EM 13th Fl	CB: 1_Beacon Its	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 1_UPS Bypass-1	CB: 1_BIB Bypass	CUTLER-HAMMER	FD	150.0A	Fixed
	Thermal Magnetic	FD		150.0A	
		15-225A			
PNL: 1_CompRm	CB: 1_BIB Bypass Input	SQUARE D	HD	150.0A	Fixed
	Thermal Magnetic	HD		150.0A	
		15-150A			
PNL: 1_BL-3	CB: 1_BL-3 Main	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 1_BLH-4	CB: 1_BLH-4 Main	SQUARE D	ED	60.0A	Fixed
	Thermal Magnetic	ED		60.0A	
		15-125A			
PNL: 1_BLL-B	CB: 1_BLL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_BLL1-1	CB: 1_BLL1-1		0.0A		
	Static Trip				
PNL: 1_5CLC-1	CB: 1_Blower Coil	SQUARE D	QO-VH	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO-VH, 3-Pole		15.0A	
		15-150A			
PNL: 1_BPL1	CB: 1_BPL1 Main	FPE	NN	1200.0A	Thermal Curve
	Thermal Magnetic	NN - HN, 2-3 Pole		1200.0A	INST (3.5 - 6 x In) Low (4200A)
		800-1200A, Page 23			
PNL: 1_BSL1	CB: 1_BSL1 Main	FPE	NFJ	225.0A	Thermal Curve
	Thermal Magnetic	NFJ		225.0A	INST (6-10 x Trip) 10 (2250A)
		70-225A, WW Mod			
PNL: 1_INLB-4-2	CB: 1_Casting Machine	GE	THHQB	50.0A	Fixed
	Thermal Magnetic	THHQB		40.0A	
		15-100A			
SWBD: 1_BPH1	CB: 1_Cat Scan Rm 210A	FPE	NFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NFJ		100.0A	INST (6-10 x Trip) 6 (600A)
		70-225A, WW Mod			
PNL: 1_SNH2-15	CB: 1_Cath Lab 4A_1	SQUARE D	JD	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		225.0A	INST (5-10 x Trip) 7.13 (1604.25A)
		150-250A, UL			
DISC: Cath Lab 4A	CB: 1_Cath Lab 4A_2	SQUARE D	KA	150.0A	Thermal Curve
	Thermal Magnetic	KA		125.0A	INST 3 (875A)
		70-250A			
MCC: 1_2	CB: 1_Chilled Wtr PU	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		20.0A	

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		15-150A			
MCC: 1_2A	CB: 1_Chilled Wtr PU-2	CUTLER-HAMMER	HFD	30.0A	Fixed
	Thermal Magnetic	HFD		30.0A	
		15-225A			
PNL: 1_2PGH1	CB: 1_Chiller	GE	TED	50.0A	Fixed
	Thermal Magnetic	TED (E-100 Line)		50.0A	
		15-100A, 2-3 Pole			
PNL: 1_C11	CB: 1_CL1	SQUARE D	QO	80.0A	Fixed (730-7, 80A)
	Thermal Magnetic	QO, 2-Pole		80.0A	
		15-125A			
PNL: 1_C110	CB: 1_CL10	SQUARE D	QO	80.0A	Fixed (730-7, 80A)
	Thermal Magnetic	QO, 2-Pole		80.0A	
		15-125A			
PNL: 1_C111	CB: 1_CL11	SQUARE D	QO	80.0A	Fixed (730-7, 80A)
	Thermal Magnetic	QO, 2-Pole		80.0A	
		15-125A			
PNL: 1_C12	CB: 1_CL2	SQUARE D	QO	80.0A	Fixed (730-7, 80A)
	Thermal Magnetic	QO, 2-Pole		80.0A	
		15-125A			
PNL: 1_C13	CB: 1_CL3	SQUARE D	QO	80.0A	Fixed (730-7, 80A)
	Thermal Magnetic	QO, 2-Pole		80.0A	
		15-125A			
PNL: 1_C14	CB: 1_CL4	SQUARE D	QO	80.0A	Fixed (730-7, 80A)
	Thermal Magnetic	QO, 2-Pole		80.0A	
		15-125A			
PNL: 1_C15	CB: 1_CL5	SQUARE D	QO	80.0A	Fixed (730-7, 80A)
	Thermal Magnetic	QO, 2-Pole		80.0A	
		15-125A			
PNL: 1_C16	CB: 1_CL6	SQUARE D	QO	80.0A	Fixed (730-7, 80A)
	Thermal Magnetic	QO, 2-Pole		80.0A	
		15-125A			
PNL: 1_C17	CB: 1_CL7	SQUARE D	QO	80.0A	Fixed (730-7, 80A)
	Thermal Magnetic	QO, 2-Pole		80.0A	
		15-125A			
PNL: 1_C18	CB: 1_CL8	SQUARE D	QO	80.0A	Fixed (730-7, 80A)
	Thermal Magnetic	QO, 2-Pole		80.0A	
		15-125A			
PNL: 1_C19	CB: 1_CL9	SQUARE D	QO	80.0A	Fixed (730-7, 80A)
	Thermal Magnetic	QO, 2-Pole		80.0A	
		15-125A			
PNL: 1_CLB	CB: 1_CLB	SQUARE D	QO	80.0A	Fixed (730-7, 80A)
	Thermal Magnetic	QO, 2-Pole		80.0A	
		15-125A			
PNL: 1_2CLA2	CB: 1_Comp on Roof	SQUARE D	QO-VH	40.0A	Fixed (730-12)
	Thermal Magnetic	QO-VH, 3-Pole		40.0A	
		15-150A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_PGH1	CB: 1_Comp Unit	SQUARE D	ED	30.0A	Fixed
	Thermal Magnetic	ED		30.0A	
		15-125A			
PNL: 1_CompRm	CB: 1_CompRm Main	SQUARE D	JD	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		250.0A	INST (5-10 x Trip) Low (1250A)
		150-250A, UL			
PNL: 1_1LL-B	CB: 1_Computers Rm 103	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_13-243A	CB: 1_Condensor Comm Clst	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 1_BLLB-TEL	CB: 1_Condensor-5	SQUARE D	KA	100.0A	Thermal Curve
	Thermal Magnetic	KA		70.0A	INST LO (350A)
		70-250A			
PNL: 1_12AC	CB: 1_Cooler Comp-5	WESTINGHOUSE	QBH	100.0A	Opening Clearing Curve
	Thermal Magnetic	QBH		30.0A	
		15-100A, 3 Pole			
DISC: 1_CT Rm 210A	CB: 1_CT Rm 210A	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
PNL: 1_2LH2	CB: 1_DC Lighting	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		15.0A	
		Unknown			
PNL: 1_1LH2	CB: 1_Digital X-Ray	SQUARE D	ED	20.0A	Fixed
	Thermal Magnetic	ED		20.0A	
		15-125A			
BUS-0401	CB: 1_DISC ER Digital X-Ray	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
PNL: 1_12-233	CB: 1_Disc SF SA-1	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_12-238	CB: 1_Disc SF SA-3	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_12-238	CB: 1_Disc SF SA-4	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_13-243	CB: 1_Dumb waiter	Unknown	90	90.0A	
	Thermal Magnetic	Unknown		90.0A	
		Unknown			
PNL: 1_BLL3	CB: 1_Dumbwaiter	FPE1	NEF	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole		20.0A	
		15-20A, Page 13			
PNL: 1_BLL2	CB: 1_Dumbwaiter-2	FPE1	NEF	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole		20.0A	



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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		15-20A, Page 13			
PNL: 1_12-233	CB: 1_EF Fan-46	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_4EHA	CB: 1_EF-1-1	SQUARE D	EG	20.0A	Fixed
	Thermal Magnetic	EG		20.0A	
		15-125A			
PNL: 1_PGH1	CB: 1_Elev 11	SQUARE D	ED	100.0A	Fixed
	Thermal Magnetic	ED		100.0A	
		15-125A			
PNL: 1_PGH1	CB: 1_Elev 12	SQUARE D	ED	100.0A	Fixed
	Thermal Magnetic	ED		100.0A	
		15-125A			
DISC: 1_Elev 11	CB: 1_Elev-11	SIEMENS	QP	100.0A	Thermal Curve (Fixed)
	Thermal Magnetic	QP, 2 & 3-Pole		100.0A	INST Fixed (750A)
		15-125A			
DISC: 1_Elev 12	CB: 1_Elev-12	SIEMENS	QP	100.0A	Thermal Curve (Fixed)
	Thermal Magnetic	QP, 2 & 3-Pole		100.0A	INST Fixed (750A)
		15-125A			
DISC: 1_EM 13th Fl	CB: 1_EM 13th Fl	SQUARE D	Q2	200.0A	Fixed
	Thermal Magnetic	Q2		200.0A	
		100-225A			
DISC: 1_CB EM Pnl 13-233	CB: 1_EM Pnl 13-233	SQUARE D	RG	3000.0A	Phase
	Static Trip	Powerpact R-Frame, 5.0 & 6.0 A/P/H		1000.0A	LTPU (A);LTD 1 (1000A); 8
		LSI, 250-3000A			STPU 5 (5000A)
					STD 0.1 (I <sup>2</sup> t Out)
					INST (RG "OFF") OFF
					QT
					LTPU (A);LTD 1 (1000A); 8
					STPU 2 (2000A)
					STD INST (I <sup>2</sup> t Out)
					INST (RG) 2 (2000A)
DISC: 1_CB EM Pnl 13-238	CB: 1_EM Pnl 13-238	SQUARE D	RG	3000.0A	Phase
	Static Trip	Powerpact R-Frame, 5.0 & 6.0 A/P/H		1000.0A	LTPU (A);LTD 1 (1000A); 8
		LSI, 250-3000A			STPU 5 (5000A)
					STD 0.1 (I <sup>2</sup> t Out)
					INST (RG "OFF") OFF
					QT
					LTPU (A);LTD 1 (1000A); 8
					STPU 2 (2000A)
					STD INST (I <sup>2</sup> t Out)
					INST (RG) 2 (2000A)
PNL: 1_SNH2-15	CB: 1_ENDO 2nd Fl	SQUARE D	HD	125.0A	Fixed
	Thermal Magnetic	HD		125.0A	
		15-150A			
SWBD: 1_BPH1 (2)	CB: 1_ER Digital X-Ray	FPE	HEG	100.0A	Thermal Curve
	Thermal Magnetic	NEG - HEG, 3 Pole		100.0A	
		15-100A, Pages 17-18			
PNL: 1_LP-LS-PH1RA	CB: 1_EX Fan	GE	THHQB	20.0A	Fixed
	Thermal Magnetic	THHQB		15.0A	

**Buffalo VAMC Arc Flash Remediation**

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**Sub A\_B**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		15-100A			
PNL: 1_SCLC-1	CB: 1_EX Fan 1 (500C-2)	SQUARE D	QO-VH	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO-VH, 3-Pole		15.0A	
		15-150A			
MCC: 1_2	CB: 1_EX Fan VEF	GE	THFK	110.0A	Thermal Curve (Fixed)
	Thermal Magnetic	THFK		110.0A	INST (6-12.5 x Trip) 8.6 (946A)
		70-225A			
PNL: 1_12-233	CB: 1_EX Fan-15	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_12-233	CB: 1_EX Fan-16	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_12-233	CB: 1_EX Fan-17	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_12-233	CB: 1_EX Fan-18_19	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		35.0A	
		Unknown			
MCC: 1_3	CB: 1_Ex Fan-2	CUTLER-HAMMER	HFD	60.0A	Fixed
	Thermal Magnetic	HFD		60.0A	
		15-225A			
PNL: 1_12-233	CB: 1_EX Fan-20	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		35.0A	
		Unknown			
PNL: 1_12-233	CB: 1_Ex Fan-21	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		35.0A	
		Unknown			
PNL: 1_12-238	CB: 1_EX Fan-22	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_12-238	CB: 1_EX Fan-23	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		35.0A	
		Unknown			
PNL: 1_12-238	CB: 1_EX Fan-24	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		35.0A	
		Unknown			
PNL: 1_12-238	CB: 1_EX Fan-25	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_12-238	CB: 1_EX Fan-26	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_12-238	CB: 1_EX Fan-27	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			

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**Sub A\_B**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_12-238	CB: 1_EX Fan-28	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_12-238	CB: 1_EX Fan-45	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_14-NHD	CB: 1_Fan B-1	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		40.0A	
		Unknown			
PNL: 1_14-NHD	CB: 1_Fan B-2	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_14-NHD	CB: 1_Fan B-3	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		40.0A	
		Unknown			
PNL: 1_14-NHD	CB: 1_Fan B-4	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		30.0A	
		Unknown			
PNL: 1_14-NHD	CB: 1_Fan B-5	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		30.0A	
		Unknown			
MCC: 1_I	CB: 1_Glycol PU	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		20.0A	
		15-150A			
MCC: 1_I	CB: 1_Glycol PU Standby	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		20.0A	
		15-150A			
PNL: 1_13-NH	CB: 1_Heat Recovery Booster Pu	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_13-NH	CB: 1_Heat Recovery Glyco Pu	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_PLL1	CB: 1_Heat Recovery Wheel	FPE1	NE	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole		20.0A	
		15-20A, Page 13			
PNL: 1_EM 13th FI	CB: 1_Hot Wtr circ pu-2	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
MCC: 1_I	CB: 1_Hot Wtr PU	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		20.0A	
		15-150A			
MCC: 1_I	CB: 1_Hot Wtr PU Standby	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		20.0A	
		15-150A			
PNL: 1_EM 13th FI	CB: 1_HotWtr circ pu-1	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	

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**Sub A\_B**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		15-100A			
PNL: 1_LP-LS-PH1RA	CB: 1_ICU Air Comp	GE	TXQB	30.0A	Fixed
	Thermal Magnetic	TXQB		30.0A	
		15-30A			
PNL: 1_UPS Bypass-2	CB: 1_LDB1	CUTLER-HAMMER	FD	125.0A	Fixed
	Thermal Magnetic	FD		125.0A	
		15-225A			
PNL: 1_UPS Bypass-2	CB: 1_LDB2	CUTLER-HAMMER	FD	50.0A	Fixed
	Thermal Magnetic	FD		50.0A	
		15-225A			
PNL: 1_12-233	CB: 1_Lift 13th fl	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		35.0A	
		Unknown			
PNL: 1_LL-EC-CLC	CB: 1_LL-EC-CLC Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 1_LL-N-C11A	CB: 1_LL-N-C11A Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 1_LP-LS-PH1RA	CB: 1_LP-LS-PH1RA Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
DISC: 1_LP-N-A12A	CB: 1_LP-N-A12A	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		400.0A	INST (3-10 x Trip) HI (4000A)
		125-400A			
PNL: 1_LP-N-A12A	CB: 1_LP-N-A12A Main	GE	TJD	400.0A	Fixed
	Thermal Magnetic	TJD		400.0A	
		250-400A			
PNL: 1_UPS Bypass-1	CB: 1_MBB	CUTLER-HAMMER	FD	150.0A	Fixed
	Thermal Magnetic	FD		150.0A	
		15-225A			
PNL: 1_BLLB-TEL	CB: 1_MBM	SQUARE D	QO	50.0A	Fixed (730-6, 50A)
	Thermal Magnetic	QO, 3-Pole		50.0A	
		15-100A			
PNL: 1_PGH1	CB: 1_MCC-1	SQUARE D	ED	100.0A	Fixed
	Thermal Magnetic	ED		100.0A	
		15-125A			
SWBD: 1_BPH1	CB: 1_MCC-2	FPE1	NJL	400.0A	Thermal Curve
	Thermal Magnetic	NJL, HJL		400.0A	Instantaneous 10 (4000A)
		70-400A (Updated AIC ratings)			
PNL: 1_PGH1	CB: 1_MCC-3	SQUARE D	ED	125.0A	Fixed
	Thermal Magnetic	ED		125.0A	
		15-125A			
PNL: 1_BLH2	CB: 1_Med air comp #1	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		30.0A	
		Unknown			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_BLH2	CB: 1_Med air comp #2	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		40.0A	
		Unknown			
PNL: 1_BLH2	CB: 1_Med air comp #3	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		40.0A	
		Unknown			
PNL: 1_LP-LS-PH1RA	CB: 1_P-2	GE	THHQB	20.0A	Fixed
	Thermal Magnetic	THHQB		15.0A	
		15-100A			
PNL: 1_LP-LS-PH1RA	CB: 1_P-3	GE	THHQB	20.0A	Fixed
	Thermal Magnetic	THHQB		15.0A	
		15-100A			
PNL: 1_2LH2	CB: 1_PDV	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_PGH1	CB: 1_PGH1 Main	SQUARE D	JD	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		175.0A	INST (5-10 x Trip) High (1750A)
		150-250A, UL			
PNL: 1_PGH2	CB: 1_PGH2 Main	SQUARE D	JG	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		225.0A	INST (5-10 x Trip) Low (1125A)
		150-250A, UL			
PNL: 1_PGH2	CB: 1_Pharm RTU	SQUARE D	EG	30.0A	Fixed
	Thermal Magnetic	EG		30.0A	
		15-125A			
PNL: 1_1LL3	CB: 1_Pill Machine	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
PNL: 1_2LL4	CB: 1_Plug E-222	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		30.0A	
		30-100A			
PNL: 1_2CL1	CB: 1_Pneumatic tube	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		30.0A	
		30-100A			
MCC: 1_2	CB: 1_Pneumatic Tube-2	GE	TED	50.0A	Fixed
	Thermal Magnetic	TED (E-100 Line)		40.0A	
		15-100A, 2-3 Pole			
PNL: 1_12AC	CB: 1_Pnl 12-233	CUTLER-HAMMER	CA	225.0A	Fixed
	Thermal Magnetic	CA		200.0A	
		125-225A			
PNL: 1_12AC	CB: 1_Pnl 12-238	CUTLER-HAMMER	CA	225.0A	Fixed
	Thermal Magnetic	CA		200.0A	
		125-225A			
PNL: 1_SNH-15	CB: 1_Pnl 13-NH	SQUARE D	LG	400.0A	Ir (125-400A); tr(0.5-16s) 400 (400A); 2
	Static Trip	Powerpact L-Frame, 5.3A/E & 6.3A/E		400.0A	Isd (1.5 - 10 x Ir) 7 (2800A)
		LSI, 400AS		400.0A	tsd (0 - 0.4) 0.1 (I^2t Out)
					Ii (1.5 - 12 x In) 8 (3200A)
PNL: 1_13-NH	CB: 1_Pnl 14-NHD	Unknown	Unknown	0.0A	

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**Sub A\_B**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_BCL1	CB: 1_Pnl 1CL1	FEDERAL PACIFIC	NEF	50.0A	Opening and Clearing Curve
	Thermal Magnetic	NEF		50.0A	
		15-100A, 2-3 Pole			
PNL: 1_BCL1	CB: 1_Pnl 1CL2	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		90.0A	
		30-100A			
PNL: 1_1CL2	CB: 1_Pnl 1CL2-A	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		70.0A	
		30-100A			
PNL: 1_BCL1	CB: 1_Pnl 1CL3	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		50.0A	
		30-100A			
PNL: 1_BCL1	CB: 1_Pnl 1CL4	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		100.0A	
		30-100A			
PNL: 1_SCL-15	CB: 1_Pnl 1CLB-1	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
SWBD: 1_BPH1	CB: 1_Pnl 1LH1	FPE	HEG	100.0A	Thermal Curve
	Thermal Magnetic	NEG - HEG, 3 Pole		70.0A	
		15-100A, Pages 17-18			
SWBD: 1_BPH1	CB: 1_Pnl 1LH2	FEDERAL PIONEER	NFJ 2-3P	225.0A	Thermal Curve
	Thermal Magnetic	NFJ, HFJ, 2-3 Pole		225.0A	INST 10 (2250A)
		70-225A			
PNL: 1_BPL1	CB: 1_Pnl 1LL1	FPE	NFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NFJ		70.0A	INST (6-10 x Trip) 10 (700A)
		70-225A, WW Mod			
PNL: 1_BPL1	CB: 1_Pnl 1LL2	FPE	NFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NFJ		90.0A	INST (6-10 x Trip) 10 (900A)
		70-225A, WW Mod			
PNL: 1_BPL1	CB: 1_Pnl 1LL3	FPE	NFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NFJ		100.0A	INST (6-10 x Trip) 10 (1000A)
		70-225A, WW Mod			
PNL: 1_1LL3	CB: 1_Pnl 1LL3-A	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 1_2-CLC	CB: 1_Pnl 2-CLC-2	CUTLER-HAMMER	QBHW	100.0A	Fixed
	Thermal Magnetic	QBHW, 3-Pole		100.0A	
		15-100A			
PNL: 1_BCL1	CB: 1_Pnl 2CL1	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		90.0A	
		30-100A			
PNL: 1_SCL-15	CB: 1_Pnl 2CLC	SYLVANIA	SJK	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	SJK & HSIK		250.0A	INST (5x-12x) 12x (3000A)
		250-600A, 2 & 3 Pole			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_BCL1	CB: 1_Pnl 2CLE-2	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 1_PGH1	CB: 1_Pnl 2EHA_4EHA	SQUARE D	ED	100.0A	Fixed
	Thermal Magnetic	ED		100.0A	
		15-125A			
PNL: 1_SLL-15	CB: 1_Pnl 2EL-L	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		225.0A	INST (3-10 x Trip) 6 (1350A)
		125-600A			
SWBD: 1_BPH1 (2)	CB: 1_Pnl 2LH1	FPE	HEG	100.0A	Thermal Curve
	Thermal Magnetic	NEG - HEG, 3 Pole		70.0A	
		15-100A, Pages 17-18			
SWBD: 1_BPH1	CB: 1_Pnl 2LH2	GE	THFK	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	THFK		175.0A	INST (4.5-10 x Trip) HI (1750A)
		70-225A			
PNL: 1_BPL1	CB: 1_Pnl 2LL1	GE	TFJ	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		225.0A	INST (4.5-10 x Trip) 7 (1575A)
		70-225A			
PNL: 1_BPL1	CB: 1_Pnl 2LL2	FPE	NFJ	225.0A	Thermal Curve
	Thermal Magnetic	NFJ		150.0A	INST (6-10 x Trip) 10 (1500A)
		70-225A, WW Mod			
PNL: 1_2LL1	CB: 1_Pnl 2LL3	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_BPL1	CB: 1_Pnl 2LL4	GE	TFJ	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		225.0A	INST (4.5-10 x Trip) HI (2250A)
		70-225A			
PNL: 1_2LL2	CB: 1_Pnl 2LL6	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		50.0A	
		30-100A			
PNL: 1_2NHA-1	CB: 1_Pnl 2NHA-2	WESTINGHOUSE	LB	400.0A	LTD
	Thermal Magnetic	LBB, LB		400.0A	INST 10.0 (4000A)
		70-400A			
PNL: 1_XPH1	CB: 1_Pnl 2PGH1	FPE	NFJ	225.0A	Thermal Curve
	Thermal Magnetic	NFJ		225.0A	INST (6-10 x Trip) 10 (2250A)
		70-225A, WW Mod			
PNL: 1_4CL-A	CB: 1_Pnl 4CL-A2	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_5CLC-1	CB: 1_Pnl 5CLC-2	SQUARE D	QO-VH	100.0A	Fixed (730-8)
	Thermal Magnetic	QO-VH, 3-Pole		100.0A	
		15-150A			
PNL: 1_7CL-C-1	CB: 1_Pnl 7CL-C-2	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		70.0A	
		Unknown			
PNL: 1_8CL-C-1	CB: 1_Pnl 8CL-C-2	Unknown	Unknown	0.0A	

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**Sub A\_B**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_9-CLA-1	CB: 1_Pnl 9CLA-2	SQUARE D	QO-VH	100.0A	Fixed (730-8)
	Thermal Magnetic	QO-VH, 3-Pole		100.0A	
		15-150A			
SWBD: 1_BPH1	CB: 1_Pnl BLH1	FPE	HEG	100.0A	Thermal Curve
	Thermal Magnetic	NEG - HEG, 3 Pole		100.0A	
		15-100A, Pages 17-18			
PNL: 1_BLH2	CB: 1_Pnl BLH4	GE	TED	80.0A	Fixed
	Thermal Magnetic	TED (E-150 Line)		60.0A	
		15-150A, 2-3 Pole, 08/2010			
PNL: 1_BPL1	CB: 1_Pnl BLL1	FPE	NFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NFJ		70.0A	INST (6-10 x Trip) 10 (700A)
		70-225A, WW Mod			
PNL: 1_BPL1	CB: 1_Pnl BLL2	FPE	NFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NFJ		100.0A	INST (6-10 x Trip) 10 (1000A)
		70-225A, WW Mod			
PNL: 1_BPL1	CB: 1_Pnl BLL3	FPE	NFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NFJ		70.0A	INST (6-10 x Trip) 10 (700A)
		70-225A, WW Mod			
PNL: 1_SLL-15	CB: 1_Pnl BLLB-TEL	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		225.0A	INST (3-10 x Trip) 6 (1350A)
		125-600A			
PNL: 1_SCL-10	CB: 1_Pnl CT 2nd fl	GE	THED	150.0A	Fixed
	Thermal Magnetic	THED		150.0A	
		15-150A			
PNL: 1_SCL-15	CB: 1_Pnl LL-EC-C1C	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 1_12-233	CB: 1_Pnl LL-N-C11A	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_BSL1	CB: 1_Pnl LP-LS-PH1RA	FEDERAL PACIFIC	Unknown	0.0A	
	Thermal Magnetic	NE & NEF, 3-Pole		100.0A	
		30-100A			
PNL: 1_PPA-1	CB: 1_Pnl LPA-1	CUTLER-HAMMER	QBHW	100.0A	Fixed
	Thermal Magnetic	QBHW, 3-Pole		100.0A	
		15-100A			
PNL: 1_PPA-1	CB: 1_Pnl LPA-2	CUTLER-HAMMER	QBHW	100.0A	Fixed
	Thermal Magnetic	QBHW, 3-Pole		100.0A	
		15-100A			
PNL: 1_PPA-1	CB: 1_Pnl LPA-3	CUTLER-HAMMER	QBHW	100.0A	Fixed
	Thermal Magnetic	QBHW, 3-Pole		100.0A	
		15-100A			
PNL: 1_PPA-1	CB: 1_Pnl LPA-4	CUTLER-HAMMER	QBHW	100.0A	Fixed
	Thermal Magnetic	QBHW, 3-Pole		100.0A	
		15-100A			



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**Sub A\_B**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_BSL1	CB: 1_Pnl LPCC-1	GE	TED	150.0A	Fixed
	Thermal Magnetic	TED (E-150 Line)		125.0A	
		15-150A, 2-3 Pole			
PNL: 1_LPCC-1	CB: 1_Pnl LPCC-2	CUTLER-HAMMER	QBHW	100.0A	Fixed
	Thermal Magnetic	QBHW, 3-Pole		100.0A	
		15-100A			
PNL: 1_BPL1	CB: 1_Pnl PLL1	FPE	NFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NFJ		70.0A	INST (6-10 x Trip) 10 (700A)
		70-225A, WW Mod			
PNL: 1_SLL-15	CB: 1_Pnl SLL-17	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_SLL-17 (sect 1)	CB: 1_Pnl SLL-17 (sect 2)	WESTINGHOUSE	QBH	100.0A	Opening Clearing Curve
	Thermal Magnetic	QBH		100.0A	
		15-100A, 3 Pole			
PNL: 1_2NHA-1	CB: 1_Pnl XPH1	WESTINGHOUSE	LB	400.0A	LTD
	Thermal Magnetic	LBB, LB		400.0A	INST 10.0 (4000A)
		70-400A			
PNL: 1_SCL-15	CB: 1_Pnls BCL_1CL (util bldg)	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_PPA-1	CB: 1_PPA-1 Main	CUTLER-HAMMER	DK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	DK		400.0A	INST (5-10 x Trip) 10 (4000A)
		250-400A			
PNL: 1_LP-N-A12A	CB: 1_Pump-1	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		15.0A	
		15-150A			
PNL: 1_LP-N-A12A	CB: 1_Pump-2	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		15.0A	
		15-150A			
PNL: 1_13-243A	CB: 1_RF Comm Clst	SQUARE D	QO-VH	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO-VH, 3-Pole		15.0A	
		15-150A			
PNL: 1_2LL4	CB: 1_Right steril rm	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		30.0A	
		30-100A			
PNL: 1_SCL-10	CB: 1_Riser CLA (2-5)	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_SCL-10	CB: 1_Riser CLA (6-8)	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_SCL-15	CB: 1_Riser CLB (2, 4-5)	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_SCL-15	CB: 1_Riser CLB (6-8)	GE	TJJ	400.0A	Thermal Curve (Fixed)

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_SCL-15	CB: 1_Riser CLB (9-10)	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_SCL-15	CB: 1_Riser CLC (4-5)	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_SCL-15	CB: 1_Riser CLC (6-8)	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_SCL-15	CB: 1_Riser CLC (9-10)	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 5 (1000A)
		125-400A			
PNL: 1_SCL-10	CB: 1_Riser CLD (4-6)	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_SCL-10	CB: 1_Riser CLD (7-8)	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_SCL-10	CB: 1_Riser CLD (9-11)	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_SCL-10	CB: 1_Riser Core Comm	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		225.0A	INST (3-10 x Trip) HI (2250A)
		125-400A			
PNL: 1_SLL-15	CB: 1_Riser LLB (6-11)	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_SLL-15	CB: 1_Riser LLB (Bsmt-5)	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		200.0A	INST (3-10 x Trip) 6 (1200A)
		125-400A			
PNL: 1_XPH1	CB: 1_Rm 209	FPE	NFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NFJ		125.0A	INST (6-10 x Trip) 10 (1250A)
		70-225A, WW Mod			
PNL: 1_XPH1	CB: 1_Rm 210	FPE	NFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NFJ		100.0A	INST (6-10 x Trip) 10 (1000A)
		70-225A, WW Mod			
PNL: 1_XPH1	CB: 1_Rm 211	FPE	NFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NFJ		125.0A	INST (6-10 x Trip) 10 (1250A)
		70-225A, WW Mod			
PNL: 1_2NHA-1	CB: 1_Rm 214C-3	WESTINGHOUSE	KD	400.0A	LTD
	Thermal Magnetic	KDB, KD		300.0A	INST 10.0 (3000A)
		100-400A			
PNL: 1_2NHA-1	CB: 1_Rm 219A	CUTLER-HAMMER	EHD	70.0A	Fixed
	Thermal Magnetic	EHD		70.0A	
		15-100A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_2NHA-1	CB: 1_Rm 220A	CUTLER-HAMMER	EB	100.0A	Fixed
	Thermal Magnetic	EB, 2 & 3-Pole		100.0A	
		15-100A			
PNL: 1_LP-N-A12A	CB: 1_Roof Top AC A-wing	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 1_LP-N-A12A	CB: 1_Roof Top AC B-wing	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 1_LP-N-A12A	CB: 1_Roof Top AC C-wing	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 1_LP-N-A12A	CB: 1_Roof Top AC D-wing	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 1_ILH2	CB: 1_RTU1 Pet Scan	SQUARE D	ED	60.0A	Fixed
	Thermal Magnetic	ED		60.0A	
		15-125A			
PNL: 1_12AC	CB: 1_S3_S4 Pre Filters	WESTINGHOUSE	QBH	100.0A	Opening Clearing Curve
	Thermal Magnetic	QBH		20.0A	
		15-100A, 3 Pole			
PNL: 1_SCL-10	CB: 1_SCL-10 Main	SYLVANIA	HSJK	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	SJK & HSJK		400.0A	INST (5x-12x) 12x (4800A)
		250-600A, 2 & 3 Pole			
PNL: 1_SCL-15	CB: 1_SCL-15 Main	SYLVANIA	HSJK	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	SJK & HSJK		400.0A	INST (5x-12x) 12x (4800A)
		250-600A, 2 & 3 Pole			
PNL: 1_13-243A	CB: 1_SF Comm Clst	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
PNL: 1_12-233	CB: 1_SF SA-2	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
DISC: 1_SF SA-3	CB: 1_SF SA-3	CUTLER-HAMMER	EB	70.0A	Fixed
	Thermal Magnetic	EB, 2 & 3-Pole		70.0A	
		15-100A			
DISC: 1_SF SA-4	CB: 1_SF SA-4	CUTLER-HAMMER	EB	70.0A	Fixed
	Thermal Magnetic	EB, 2 & 3-Pole		70.0A	
		15-100A			
DISC: 1_SF SA-1	CB: 1_SF SA1	CUTLER-HAMMER	EB	70.0A	Fixed
	Thermal Magnetic	EB, 2 & 3-Pole		70.0A	
		15-100A			
DISC: 1_SF SA-2	CB: 1_SF SA2	CUTLER-HAMMER	EB	70.0A	Fixed
	Thermal Magnetic	EB, 2 & 3-Pole		70.0A	
		15-100A			
MCC: 1_2A	CB: 1_SF-1	CUTLER-HAMMER	HKD	350.0A	Thermal Curve (Fixed)

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	HKD		350.0A	INST (5-10 x Trip) 6 (2100A)
		100-400A			
MCC: 1_3	CB: 1_SF-2	CUTLER-HAMMER	HFD	100.0A	Fixed
	Thermal Magnetic	HFD		100.0A	
		15-225A			
PNL: 1_2EHC	CB: 1_Siemens Equip-1	SQUARE D	ED	100.0A	Fixed
	Thermal Magnetic	ED		100.0A	
		15-125A			
PNL: 1_2EHC	CB: 1_Siemens Equip-2	SQUARE D	ED	50.0A	Fixed
	Thermal Magnetic	ED		50.0A	
		15-125A			
PNL: 1_SLL-15	CB: 1_SLL-15 Main	SYLVANIA	SJK	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	SJK & HSJK		400.0A	INST (5x-12x) 12x (4800A)
		250-600A, 2 & 3 Pole			
PNL: 1_SNH-15	CB: 1_SNH-15 Main	SQUARE D	PG	1200.0A	LTPU (A);LTD 0.9 (1080A); 2
	Static Trip	Powerpact P-Frame, 5.0 & 6.0 A/P/H		1200.0A	STPU 2 (2160A)
		LSI, 250-1200A			STD 0.2 (I <sup>2</sup> t In)
					INST (PG 250-1200) 10 (12000A)
PNL: 1_SNH2-15	CB: 1_SNH2-15 Main	SQUARE D	LC	400.0A	Thermal Curve
	Thermal Magnetic	LC		400.0A	INST LO (2000A)
		300-600A			
PNL: 1_13-243A	CB: 1_Spare Disc	SQUARE D	KA	100.0A	Thermal Curve
	Thermal Magnetic	KA		90.0A	INST LO (450A)
		70-250A			
PNL: 1_2NHA-2	CB: 1_Special procedure x-ray	WESTINGHOUSE	LB	400.0A	LTD
	Thermal Magnetic	LBB, LB		200.0A	INST 10.0 (2000A)
		70-400A			
SWBD: 1_BPH1	CB: 1_Tap PET Scan	FPE	NFJ	225.0A	Thermal Curve
	Thermal Magnetic	NFJ		150.0A	INST (6-10 x Trip) 10 (1500A)
		70-225A			
PNL: 1_2CL1	CB: 1_unit 3P PH	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		30.0A	
		30-100A			
PNL: 1_12-238	CB: 1_Unit vent-10	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		70.0A	
		Unknown			
PNL: 1_12-238	CB: 1_Unit vent-11	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		35.0A	
		Unknown			
PNL: 1_12-233	CB: 1_Unit vent-9	CUTLER-HAMMER	EB	60.0A	Fixed
	Thermal Magnetic	EB, 2 & 3-Pole		60.0A	
		15-100A			
PNL: 1_13-NH	CB: 1_Unk	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_Solar Pnl	CB: 1_UNK (off)	SQUARE D	QB	110.0A	Fixed
	Thermal Magnetic	QB		110.0A	

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		70-250A			
PNL: 1_12AC	CB: 1_Unk-7	WESTINGHOUSE	QBH	100.0A	Opening Clearing Curve
	Thermal Magnetic	QBH		30.0A	
		15-100A, 3 Pole			
PNL: 1_CompRm	CB: 1_UPS Input	SQUARE D	HD	150.0A	Fixed
	Thermal Magnetic	HD		150.0A	
		15-150A			
PNL: 1_XPH2	CB: 1_UPS-215A	SQUARE D	FH	100.0A	Fixed
	Thermal Magnetic	FH		100.0A	
		15-100A			
PNL: 1_12AC	CB: 1_VAC Pu-3	WESTINGHOUSE	QBH	100.0A	Opening Clearing Curve
	Thermal Magnetic	QBH		30.0A	
		15-100A, 3 Pole			
PNL: 1_12-233	CB: 1_Walk in Cooler	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		15.0A	
		Unknown			
PNL: 1_XPH2	CB: 1_X-Ray Rm 212E	SQUARE D	FH	100.0A	Fixed
	Thermal Magnetic	FH		100.0A	
		15-100A			
DISC: 1_212E	CB: 1_X-Ray Rm 212E EB	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
PNL: 1_13-NH	CB: 1_XF 12AC_LP-N-A12A	SYLVANIA	SJK	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	SJK & HSJK		300.0A	INST (5x-12x) 12x (3600A)
		250-600A, 2 & 3 Pole			
PNL: 1_14-NHD	CB: 1_XF 14-NLD	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_SNH-15	CB: 1_XF 1NLB-4	SQUARE D	HG	125.0A	Fixed
	Thermal Magnetic	Powerpact HG		125.0A	
		15-150A			
PNL: 1_2LH2	CB: 1_XF 2LL7	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		40.0A	
		Unknown			
PNL: 1_BLH2	CB: 1_XF BL-3	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		50.0A	
		30-100A			
SWBD: 1_BPH1	CB: 1_XF BPL1	FPE	NM	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NM/HM, 2-3 Pole		600.0A	INST(FIXED) 2400 (2400A)
		125-1000A, WW Mod			
DISC: 1_XF PGH1	CB: 1_XF PGH1	SQUARE D	JD	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		175.0A	INST (5-10 x Trip) High (1750A)
		150-250A, UL			
SWBD: 1_BPH1 (2)	CB: 1_XF PPA-1	FPE	NFJ	225.0A	Thermal Curve
	Thermal Magnetic	NFJ		175.0A	INST (6-10 x Trip) 10 (1750A)
		70-225A, WW Mod			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
DISC: 1_XF-12LB-1	CB: 1_XF-12LB-1	SQUARE D	LE	600.0A	Phase
	Static Trip	LE, Micrologic		600.0A	LTPU (0.5-1.0 x P) 1.0 (600A)
		LSI, 100-600A		600.0A	LTD (2-14 Sec.) 2
					STPU (2-8 x P) 5 (3000A)
					STD (0.1-0.5 Sec.) 0.2 (I <sup>2</sup> t In)
					INST (2.5-8 x P) 4.0 (2400A)
					Ground
					GFP (0.2-0.75 x S) 0.2 (120A)
					GFD (0.1-0.5 Sec.) 0.1 (I <sup>2</sup> t In)
DISC: 1_XF-12LB-2	CB: 1_XF-12LB-2	SQUARE D	LE	600.0A	Phase
	Static Trip	LE, Micrologic		600.0A	LTPU (0.5-1.0 x P) 1.0 (600A)
		LSI, 100-600A		600.0A	LTD (2-14 Sec.) 6
					STPU (2-8 x P) 4 (2400A)
					STD (0.1-0.5 Sec.) 0.1 (I <sup>2</sup> t In)
					INST (2.5-8 x P) 8.0 (4800A)
					Ground
					GFP (0.2-0.75 x S) 0.2 (120A)
					GFD (0.1-0.5 Sec.) 0.1 (I <sup>2</sup> t In)
PNL: 1_XPH1	CB: 1_XPH1 Main	FPE1	NJL	400.0A	Thermal Curve
	Thermal Magnetic	NJL, HJL		400.0A	Instantaneous 10 (4000A)
		70-400A			
PNL: 6_1CL-U	CB: 6_1CL-U Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
Relays					
Bus Connected	Name/Type	Description		CT Ratio (A)	Settings
SWBD: 1_BPH1	GF: 1_ILH1		0		
	Electronic				
SWBD: 1_BPH1	GF: 1_210A		0		
	Electronic				
SWBD: 1_BPH1	GF: 1_BPL1		0		
	Electronic				
SWBD: 1_BPH1	GF: 1_MCC-2		0		
	Electronic				
SWBD: 1_BPH1	GF: 1_Pet Scan		0		
	Electronic				
SWBD: 1_BPH1 (2)	PD: 1_2LH1_GF		0		
	Electronic				
SWBD: 1_BPH1 (2)	PD: 1_ATS-1_GF		0		
	Electronic				
SWBD: 1_BPH1 (2)	PD: 1_ATS-2_GF		0		
	Electronic				
SWBD: 1_BPH1 (2)	PD: 1_ATS-3_GF		0		
	Electronic				
SWBD: 1_BPH1	PD: 1_BLH1_GF		0		
	Electronic				
BUS-0373	R: DR/F1_50/51-F1	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 4.5 (360A)

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		50P/51P/67, 5A nom.			U4, Extremely Inverse 4.2
					50P1P(0.25-100 x CTR) 42 (3360A)
BUS-0375	R: DR/F8_50/51-F8	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 4.5 (360A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 4.2
					50P1P(0.25-100 x CTR) 42 (3360A)
MCP					
Bus Connected			Name/Type	Description	
MCC: 1_3	MCP: 1_EF-1	CUTLER-HAMMER	HMCP	INST (9-30A) D (18A)	
	Circuit Protector	HMCP			
		3A (9-30A Inst)			
MCC: 1_3	MCP: 1_EF-2	CUTLER-HAMMER	HMCP	INST (9-30A) D (18A)	
	Circuit Protector	HMCP			
		3A (9-30A Inst)			
Fuses					
Bus Connected			Name/Type	Description	
DISC: 1_ER Dig X-Ray	FU: 1_ER Dig X-Ray	BUSSMANN	FRS-R	100.0A	
	Low Voltage	FRS-R, 600V Class RK5		100.0A	
		1-600A			
DISC: 1_Condensor	FU: 1_Condensor	BUSSMANN	FRN-R	100.0A	
	Low Voltage	FRN-R, 250V Class RK5		100.0A	
		0.1-600A			
BUS-0323	FU: 1_Disc-Elev 1	BUSSMANN	FWP-400A	400.0A	
	Low Voltage	FWP		400.0A	
		150-600A			
BUS-0302	FU: 1_Disc-Elev 10	BUSSMANN	FWP-400A	400.0A	
	Low Voltage	FWP		400.0A	
		150-600A			
BUS-0311	FU: 1_Disc-Elev 2	BUSSMANN	FWP-400A	400.0A	
	Low Voltage	FWP		400.0A	
		150-600A			
BUS-0316	FU: 1_Disc-Elev 3	BUSSMANN	FWP-400A	400.0A	
	Low Voltage	FWP		400.0A	
		150-600A			
BUS-0360	FU: 1_Disc-Elev 4	BUSSMANN	FWP-400A	400.0A	
	Low Voltage	FWP		400.0A	
		150-600A			
BUS-0363	FU: 1_Disc-Elev 5	BUSSMANN	FWP-400A	400.0A	
	Low Voltage	FWP		400.0A	
		150-600A			
BUS-0304	FU: 1_Disc-Elev 6	BUSSMANN	FWP-400A	400.0A	
	Low Voltage	FWP		400.0A	
		150-600A			
BUS-0292	FU: 1_Disc-Elev 7	BUSSMANN	FWP-400A	400.0A	
	Low Voltage	FWP		400.0A	
		150-600A			
BUS-0297	FU: 1_Disc-Elev 8	BUSSMANN	FWP-400A	400.0A	
	Low Voltage	FWP		400.0A	

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		150-600A			
BUS-0303	FU: 1_Disc-Elev 9	BUSSMANN	FWP-400A	400.0A	
	Low Voltage	FWP		400.0A	
		150-600A			
BUS-0282	FU: 1_Disc-PNL BLH-2	GOULD SHAWMUT	TRS	100.0A	
	Low Voltage	TRS, 600V Class RK5		100.0A	
		15-600A			
DISC: 1_Dumb Waiter	FU: 1_Dumb Waiter	LITTELFUSE	NLN	60.0A	
	Low Voltage	NLN, 250V Class K5		60.0A	
		8-600A			
DISC: 1_Pet Scan	FU: 1_Pet Scan	BUSSMANN	LPJ-150SP	150.0A	
	Low Voltage	LPJ, 600V Class J		150.0A	
		1-600A			
BUS-0279	FU: 1_XF-9CLA_10CLA	BUSSMANN	FRS-R	90.0A	
	Low Voltage	FRS-R, 600V Class RK5		90.0A	
		1-600A			
DISC: 11_PP-PFD-1	FU: 11_PP-PFD-1	GOULD SHAWMUT	TR	400.0A	
	Low Voltage	TR, 250V Class RK5		400.0A	
		15-600A			
DISC: 11_PP-PFD-2	FU: 11_PP-PFD-2	GOULD SHAWMUT	TR	400.0A	
	Low Voltage	TR, 250V Class RK5		400.0A	
		15-600A			



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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 11_GSL1	CB: 11_Fuel Pumps	FPE	NE	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole, WW Mod		20.0A	
		15-20A, Page 13, WW Mod			
PNL: 11_GSL1	CB: 11_Pnl GSL1-1	Unknown	70	70.0A	
	Thermal Magnetic	Unknown		70.0A	
		Unknown			
SWBD: 11_Sub C	CB: 11_Sub C Main	UTILITY RELAY CO.	AC-Pro retrofit	3000.0A	LTPU, (20 - 100% x S) 100 % (3000A)
	Static Trip	AC-Pro Retrofit (240V)		3000.0A	LTD, (2 - 30s) 8
		LSI, 50-5000A			STPU, (150 - 1200% x LTPU) 5 (15000A)
					STD, (0.07 - 0.4) 0.3 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 10 (30000A)
SWBD: 11_Sub C	CB: 11_Sub C_D Tie	UTILITY RELAY CO.	AC-Pro retrofit	3000.0A	LTPU, (20 - 100% x S) 100 % (3000A)
	Static Trip	AC-Pro Retrofit (240V)		3000.0A	LTD, (2 - 30s) 4
		LSI, 50-5000A			INST, (150 - 1200% x LTPU) 4 (12000A)
SWBD: 11_Sub D	CB: 11_Sub D Main	UTILITY RELAY CO.	Quick-Trip	3000.0A	LTPU, (20 - 100% x S) 100 % (3000A)
	Static Trip	AC-Pro Retrofit w/ QT (240V)		3000.0A	LTD, (2 - 30s) 8
		LSI, 50-5000A.			STPU, (150 - 1200% x LTPU) 5 (15000A)
					STD, (0.07 - 0.4s) 0.3 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 10 (30000A)
SWBD: 11_Sub D	CB: 11_SWBD 208A	UTILITY RELAY CO.	Quick-Trip	1600.0A	Phase
	Static Trip	AC-Pro Retrofit w/ QT (240V)		1600.0A	LTPU, (20 - 100% x S) 0.75 (1200A)
		LSI, 50-5000A.			LTD, (2 - 30s) 15
					STPU, (150 - 1200% x LTPU) 6 (7200A)
					STD, (0.07 - 0.4s) 0.15 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 6 (7200A)
					QT
					LTPU, (20 - 100% x S) 0.75 (1200A)
					LTD, (2 - 30s) 15
					STPU, (150 - 1200% x LTPU) 6 (7200A)
					STD, (0.07 - 0.4s) 0.15 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 2 (2400A)
SWBD: 11_Sub C	CB: 11_SWBD 208B	UTILITY RELAY CO.	Quick-Trip	1600.0A	Phase
	Static Trip	AC-Pro Retrofit w/ QT (240V)		1600.0A	LTPU, (20 - 100% x S) 0.5 (800A)
		LSI, 50-5000A.			LTD, (2 - 30s) 15
					STPU, (150 - 1200% x LTPU) 1200% (9600A)
					STD, (0.07 - 0.4s) 0.2 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 1200% (9600A)
					QT
					LTPU, (20 - 100% x S) 0.5 (800A)
					LTD, (2 - 30s) 15
					STPU, (150 - 1200% x LTPU) 1200% (9600A)
					STD, (0.07 - 0.4s) 0.2 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 2 (1600A)
SWBD: 11_Sub C	CB: 11_SWBD 208B-1	UTILITY RELAY CO.	Quick-Trip	1000.0A	Phase
	Static Trip	AC-Pro Retrofit w/ QT (240V)		1000.0A	LTPU, (20 - 100% x S) 100 % (1000A)
		LSI, 50-5000A.			LTD, (2 - 30s) 30
					STPU, (150 - 1200% x LTPU) 3 (3000A)
					STD, (0.07 - 0.4s) 0.1 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 1200% (12000A)
					QT
					LTPU, (20 - 100% x S) 100 % (1000A)
					LTD, (2 - 30s) 30
					STPU, (150 - 1200% x LTPU) 3 (3000A)
					STD, (0.07 - 0.4s) 0.1 (I <sup>2</sup> t Out)

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
					INST, (150 - 1200% x LTPU) 2 (2000A)
DISC: 1_B-81-2	CB: 1_ Bkr B-81-2	Unknown	125	125.0A	
	Thermal Magnetic	Unknown		125.0A	
		Unknown			
PNL: 1_1-61-1	CB: 1_1-61-1 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		150.0A	
		100-225A			
PNL: 1_1-61-2	CB: 1_1-61-2 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 1_1-81	CB: 1_1-81 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		150.0A	
		100-225A			
PNL: 1_10-81-2	CB: 1_10-81-1	Unknown	60	60.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_10-81-3	CB: 1_10-81-3 Main	SQUARE D	Q2M	150.0A	Fixed
	Thermal Magnetic	Q2M		150.0A	
		100-225A			
SWBD: 1_208-A	CB: 1_11 A-Labs	SQUARE D	JD	250.0A	Thermal Curve (Fixed)
	Thermal Magnetic	Powerpact, J-Frame		250.0A	INST (5-10 x Trip) 6 (1500A)
		150-250A, UL			
PNL: 1_11-1	CB: 1_11-1 Main	GE	TJD	400.0A	Fixed
	Thermal Magnetic	TJD		250.0A	
		250-400A			
PNL: 1_10-61-2	CB: 1_1_10-61-3	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 1_2-31-2	CB: 1_2-31-2 Main	CUTLER-HAMMER	CAH	225.0A	Fixed
	Thermal Magnetic	CAH		150.0A	
		125-225A			
PNL: 1_2-61-2	CB: 1_2-61-2 Main	SQUARE D	Q2M	150.0A	Fixed
	Thermal Magnetic	Q2M		150.0A	
		100-225A			
PNL: 1_GEL-1	CB: 1_2P Load	FPE	NEF	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole, WW Mod		20.0A	
		15-20A, Page 13, WW Mod			
DISC: 1_Tap Bkr-3-47	CB: 1_3-47_Tap Bkr	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_3-61-3	CB: 1_3-61-3 Main	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 1_3-81	CB: 1_3-81 Main	SQUARE D	Q2	200.0A	Fixed
	Thermal Magnetic	Q2		200.0A	
		100-225A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_4-47-2	CB: 1_4-47-2 Main	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 1_4-81	CB: 1_4-81 Main	SQUARE D	QD	100.0A	Fixed
	Thermal Magnetic	QD		100.0A	
		70-250A			
PNL: 1_5-11-1	CB: 1_5-11-2	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_6-11-2	CB: 1_6-11-2 Main	CUTLER-HAMMER	CHB	100.0A	Thermal Curve
	Thermal Magnetic	CH/CHB, 3 pole		70.0A	INST 8 (560A)
		70-100A			
PNL: 1_8-61-1	CB: 1_8-61-1 Main	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 1_8-61-1	CB: 1_8-61-2	SQUARE D	QO	60.0A	Fixed (730-6, 60A)
	Thermal Magnetic	QO, 3-Pole		60.0A	
		15-100A			
PNL: 1_8-61-2	CB: 1_8-61-2 Main	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_8CL-A	CB: 1_8CL-A Main	ITE	100	100.0A	LTD
	Thermal Magnetic	BQ/QP		100.0A	INST Fixed (600A)
		45-125A			
PNL: 1_9-11	CB: 1_9-11 Main	SQUARE D	HD	100.0A	Fixed
	Thermal Magnetic	HD		100.0A	
		15-150A			
DISC: 1_9-11 Tap Bkr	CB: 1_9-11 TAP BKR	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A (10kAIC)			
PNL: 1_9-31	CB: 1_9-31 Main	SQUARE D	HD	100.0A	Fixed
	Thermal Magnetic	HD		100.0A	
		15-150A			
DISC: 1_9-31 TAP BKR	CB: 1_9-31 TAP BKR	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A (10kAIC)			
PNL: 1_9-47	CB: 1_9-47 Main	SQUARE D	HD	100.0A	Fixed
	Thermal Magnetic	HD		100.0A	
		15-150A			
DISC: 1_9-47_Tap Bkr	CB: 1_9-47_TAP BKR	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A (10kAIC)			
PNL: 1_9-61-1	CB: 1_9-61-2	CUTLER-HAMMER	QC	50.0A	Fixed
	Thermal Magnetic	QC, 3-Pole		50.0A	
		15-100A			
PNL: 1_9-61-2	CB: 1_9-61-2 Main	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		Unknown			
PNL: 1_3-47-2	CB: 1_AC 301	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
PNL: 1_3-31	CB: 1_AC 320-1	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_3-31	CB: 1_AC 320-2	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_5-11-1	CB: 1_AC 525-A1	Unknown	60	60.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_BLLB-3	CB: 1_AC Airco	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		30.0A	
		30-100A (WW Mod)			
PNL: 1_B-47-1	CB: 1_AC Rm 18	WESTINGHOUSE	QBH	100.0A	Opening Clearing Curve
	Thermal Magnetic	QBH		30.0A	
		15-100A, 3 Pole			
PNL: 1_B-47-1	CB: 1_AC Rm 32	CUTLER-HAMMER	EHD	70.0A	Fixed
	Thermal Magnetic	EHD		70.0A	
		15-100A			
PNL: 1_SB-97-2	CB: 1_AC unit	SQUARE D	QO	60.0A	Fixed (730-6, 60A)
	Thermal Magnetic	QO, 3-Pole		60.0A	
		15-100A			
PNL: 1_2-97-1	CB: 1_AC Unit 210B	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_2-11	CB: 1_AC Unit 226A	CUTLER-HAMMER	FD	60.0A	Fixed
	Thermal Magnetic	FD		60.0A	
		15-225A			
PNL: 1_5-47-2	CB: 1_AC unit 5-3-A	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
PNL: 1_B97	CB: 1_AC Unit rm 45	Unknown	15	15.0A	
	Thermal Magnetic	Unknown		15.0A	
		Unknown			
SWBD: 1_208-A	CB: 1_AC unit-1	SQUARE D	HD	50.0A	Fixed
	Thermal Magnetic	Powerpact HD		50.0A	
		15-150A			
PNL: 1_9-97	CB: 1_AC-RM901-B	Unknown	40	40.0A	
	Thermal Magnetic	Unknown		40.0A	
		Unknown			
PNL: 1_SB-3	CB: 1_Accelerator	SQUARE D	FA	60.0A	Fixed
	Thermal Magnetic	FA		60.0A	
		15-100A (10kAIC)			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_3-61-3	CB: 1_AC_	SQUARE D	QO	40.0A	Fixed (730-5, 40A)
	Thermal Magnetic	QO, 3-Pole		40.0A	
		I5-100A			
PNL: 1_B-61-1	CB: 1_AHU	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
SWBD: 1_208B	CB: 1_ATS-4	SQUARE D	JD	250.0A	Ir (70-250A) 225 (225A)
	Static Trip	PowerPact J-Frame, 3.2S		250.0A	tr (Fixed)
		LSI, 70-250A		250.0A	Isd (1.5 - 10 x Ir) 10 (2250A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (3000A)
BUS-0280	CB: 1_ATS-4 (E) W/G	GE	TJS	600.0A	Phase
	Static Trip	TJS & TJSS, VersaTrip, alternate		200.0A	LTPU (0.6-1.0 x S) 1 (200A)
		LSI, 150-600A			LTD (Min-Max) Max
					INST (3-10 x LTPU) 10 (2000A)
					Ground
					GFPU (0.3-0.7 x S) 0.5 (100A)
					GFD (Min-Max) Min
DISC: 1_ATS-8LA (E)	CB: 1_ATS-8LA-1 (E)	SQUARE D	QB	150.0A	Fixed
	Thermal Magnetic	QB		150.0A	
		70-250A			
BUS-0270	CB: 1_ATS-8LA-1 (E) 480V	GE	TJS	600.0A	Phase
	Static Trip	TJS & TJSS, VersaTrip, alternate		150.0A	LTPU (0.6-1.0 x S) 0.6 (90A)
		LSI, 150-600A			LTD (Min-Max) Min
					INST (3-10 x LTPU) 3 (270A)
					Ground
					GFPU (0.3-0.7 x S) 0.7 (105A)
					GFD (Min-Max) Int
SWBD: 1_208B-1	CB: 1_B Wing riser #61	SQUARE D	LD	400.0A	Ir (125-400A) 400 (400A)
	Static Trip	PowerPact L-Frame, 3.3S		400.0A	tr (Fixed)
		LSI, 400AS		400.0A	Isd (1.5 - 10 x Ir) 4 (1600A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (4800A)
SWBD: 1_208B-1	CB: 1_B Wing riser #81	SQUARE D	LD	400.0A	Ir (125-400A) 400 (400A)
	Static Trip	PowerPact L-Frame, 3.3S		400.0A	tr (Fixed)
		LSI, 400AS		400.0A	Isd (1.5 - 10 x Ir) 4 (1600A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (4800A)
PNL: 1_B-47-3	CB: 1_B-47-3 Main	SQUARE D	Q2M	125.0A	Fixed
	Thermal Magnetic	Q2M		125.0A	
		I00-225A			
PNL: 1_B-47-5	CB: 1_B-47-5 Main	GE	TQD	225.0A	Fixed
	Thermal Magnetic	TQD		125.0A	
		I00-225A			
PNL: 1_B-61-1	CB: 1_B-61-1 Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		200.0A	
		Unknown			
PNL: 1_B-81-3	CB: 1_B-81-3 Main	SQUARE D	Q2M	200.0A	Fixed
	Thermal Magnetic	Q2M		200.0A	
		I00-225A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_B97-3	CB: 1_B97-3 Main	CUTLER-HAMMER	CA	225.0A	Fixed
	Thermal Magnetic	CA		125.0A	
		125-225A			
SWBD: 1_208B-1	CB: 1_Bldg 2 & 3	SQUARE D	JD	250.0A	Ir (70-250A) 250 (250A)
	Static Trip	PowerPact J-Frame, 3.2S		250.0A	tr (Fixed)
		LSI, 70-250A		250.0A	Isd (1.5 - 10 x Ir) 5 (1250A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 8 (2000A)
PNL: 1_BLLB-3	CB: 1_BLLB-3 Main	GE	TFJ	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		150.0A	INST (4.5-10 x Trip) HI (1500A)
		70-225A			
PNL: 1_SB-3	CB: 1_Cobalt AC Unit	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A (10kAIC)			
PNL: 1_Main Kitchen	CB: 1_Coffee Maker	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_B-81-3	CB: 1_Compression cooler 1	SQUARE D	QO	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO, 3-Pole		15.0A	
		15-100A			
PNL: 1_B-81-3	CB: 1_Compression cooler 2	SQUARE D	QO	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO, 3-Pole		15.0A	
		15-100A			
PNL: 1_B-81-3	CB: 1_Compression cooler 3	SQUARE D	QO	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO, 3-Pole		15.0A	
		15-100A			
PNL: 1_B-61-1	CB: 1_Cond Unit	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
SWBD: 1_208-A	CB: 1_Const Trl DISC	SQUARE D	LD	400.0A	Ir (125-400A) 400 (400A)
	Static Trip	PowerPact L-Frame, 3.3S		400.0A	tr (Fixed)
		LSI, 400AS		400.0A	Isd (1.5 - 10 x Ir) 1.5 (600A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 1.5 (600A)
PNL: 1_B-81-3	CB: 1_Cont comp freezer	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
PNL: 1_2-31-2	CB: 1_Cont rm condensor	CUTLER-HAMMER	BAB	50.0A	Fixed
	Thermal Magnetic	BAB, 3-Pole		50.0A	
		15-100A			
PNL: 1_2-47-2	CB: 1_Control Pnl U&S	SQUARE D	QO	60.0A	Fixed (730-6, 60A)
	Thermal Magnetic	QO, 3-Pole		60.0A	
		15-100A			
PNL: 1_2-31-2	CB: 1_CR-AC-2	CUTLER-HAMMER	BAB	30.0A	Fixed
	Thermal Magnetic	BAB, 3-Pole		30.0A	
		15-100A			
PNL: 1_B97-4	CB: 1_Deli Oven	CUTLER-HAMMER	BAB	40.0A	Fixed
	Thermal Magnetic	BAB, 3-Pole		40.0A	

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		15-100A			
PNL: 1_B97	CB: 1_Dishwasher	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_SB-3	CB: 1_Door Comp	SQUARE D	FA	20.0A	Fixed
	Thermal Magnetic	FA		20.0A	
		15-100A (Pre 1986)			
PNL: 1_LP8CLA-2	CB: 1_E.F.-4	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_3-81	CB: 1_EF 3108	SQUARE D	QO	50.0A	Fixed (730-6, 50A)
	Thermal Magnetic	QO, 3-Pole		50.0A	
		15-100A			
PNL: 1_3-81	CB: 1_EF 3109	SQUARE D	QO	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO, 3-Pole		15.0A	
		15-100A			
PNL: 1_Main Kitchen	CB: 1_EF Kitchen	Unknown	15	15.0A	
	Thermal Magnetic	Unknown		15.0A	
		Unknown			
PNL: 1_B97	CB: 1_EF-8	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_B97	CB: 1_EF-9	CUTLER-HAMMER	EHD	70.0A	Fixed
	Thermal Magnetic	EHD		70.0A	
		15-100A			
PNL: 1_2-31-2	CB: 1_Exam rm AC	Unknown	40	40.0A	
	Thermal Magnetic	Unknown		40.0A	
		Unknown			
PNL: 1_B97-3	CB: 1_Exhaust Fan CL	CUTLER-HAMMER	BAB	20.0A	Fixed
	Thermal Magnetic	BAB, 3-Pole		20.0A	
		15-100A			
PNL: 1_B97-3	CB: 1_Exhaust Fan Kitchen	CUTLER-HAMMER	BAB	30.0A	Fixed
	Thermal Magnetic	BAB, 3-Pole		30.0A	
		15-100A			
PNL: 1_SB-3	CB: 1_Fan Motor	SQUARE D	FA	20.0A	Fixed
	Thermal Magnetic	FA		20.0A	
		15-100A (10kAIC)			
PNL: 1_B-47-2	CB: 1_Fan-1	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_B-47-2	CB: 1_Fan-2	Unknown	30	30.0A	
	Thermal Magnetic	Unknown		30.0A	
		Unknown			
PNL: 1_2-31-2	CB: 1_Filtrine mach	CUTLER-HAMMER	BAB	35.0A	Fixed
	Thermal Magnetic	BAB, 3-Pole		35.0A	
		15-100A			

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**Sub C\_D**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_Main Kitchen	CB: 1_Food Conveyor	WESTINGHOUSE	JA	100.0A	LTD
	Thermal Magnetic	JA, KA		100.0A	INST 10.0 (1000A)
		70-225A			
PNL: 1_Main Kitchen	CB: 1_Fryer	CUTLER-HAMMER	EB	40.0A	Fixed
	Thermal Magnetic	EB, 2 & 3-Pole		40.0A	
		15-100A			
PNL: 1_B97	CB: 1_Garbage Disp	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_GEL-1	CB: 1_GEL-1 Main	FPE	NFJ	225.0A	Thermal Curve
	Thermal Magnetic	NFJ		225.0A	INST (6-10 x Trip) 10 (2250A)
		70-225A, WW Mod			
PNL: 1_B97-4	CB: 1_Grill	CUTLER-HAMMER	BAB	40.0A	Fixed
	Thermal Magnetic	BAB, 3-Pole		40.0A	
		15-100A			
PNL: 1_7-47	CB: 1_Ice Maker	CUTLER-HAMMER	QC	30.0A	Fixed
	Thermal Magnetic	QC, 3-Pole		30.0A	
		15-100A			
PNL: 1_PP8A	CB: 1_LP8CLA-2	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		70.0A	
		30-100A (WW Mod)			
PNL: 1_10-97-2	CB: 1_Main_10-97-3	CUTLER-HAMMER	EHB	100.0A	Fixed
	Thermal Magnetic	EHB, 2 & 3-Pole		100.0A	
		15-100A			
PNL: 1_GEL-1	CB: 1_Morgue EF	FPE	NEF	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole, WW Mod		20.0A	
		15-20A, Page 13, WW Mod			
PNL: 1_2-31-2	CB: 1_MRI AC	CUTLER-HAMMER	BAB	40.0A	Fixed
	Thermal Magnetic	BAB, 3-Pole		40.0A	
		15-100A			
PNL: 1_1-47-1	CB: 1_Pnl 1-47-2	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_1-61-1	CB: 1_Pnl 1-61-2	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
DISC: 1_Pnl 10-81-3	CB: 1_Pnl 10-81-3	SQUARE D	KH	150.0A	Thermal Curve
	Thermal Magnetic	KH		125.0A	INST LO (625A)
		70-250A			
SWBD: 1_208-A	CB: 1_Pnl 2-31	SQUARE D	LD	400.0A	Ir (125-400A) 400 (400A)
	Static Trip	PowerPact L-Frame, 3.3S		400.0A	tr (Fixed)
		LSI, 400AS		400.0A	Isd (1.5 - 10 x Ir) 3 (1200A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 3 (1200A)
PNL: 1_2-47-1	CB: 1_Pnl 2-47-2	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			



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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_2-61-2	CB: 1_Pnl 2-61-3	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
SWBD: 1_208B	CB: 1_Pnl 208-C	SQUARE D	LD	400.0A	Ir (125-400A) 350 (350A)
	Static Trip	PowerPact L-Frame, 3.3S		400.0A	tr (Fixed)
		LSI, 400AS		400.0A	Isd (1.5 - 10 x Ir) 8 (2800A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (4800A)
PNL: 1_3-61-1	CB: 1_Pnl 3-61-2	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_4-31-1	CB: 1_Pnl 4-31-2	CUTLER-HAMMER	EB	100.0A	Fixed
	Thermal Magnetic	EB, 2 & 3-Pole		100.0A	
		15-100A			
PNL: 1_4-31-1	CB: 1_Pnl 4-31-3	CUTLER-HAMMER	EB	100.0A	Fixed
	Thermal Magnetic	EB, 2 & 3-Pole		100.0A	
		15-100A			
PNL: 1_5-47-1	CB: 1_Pnl 5-47-2	CUTLER-HAMMER	QC	100.0A	Fixed
	Thermal Magnetic	QC, 3-Pole		100.0A	
		15-100A			
PNL: 1_5-61-1	CB: 1_Pnl 5-61-2	CUTLER-HAMMER	QC	100.0A	Fixed
	Thermal Magnetic	QC, 3-Pole		100.0A	
		15-100A			
PNL: 1_6-11-1	CB: 1_Pnl 6-11-2	CUTLER-HAMMER	QC	60.0A	Fixed
	Thermal Magnetic	QC, 3-Pole		60.0A	
		15-100A			
PNL: 1_6-61-1	CB: 1_Pnl 6-61-2	CUTLER-HAMMER	QC	60.0A	Fixed
	Thermal Magnetic	QC, 3-Pole		60.0A	
		15-100A			
PNL: 1_3-61-1	CB: 1_Pnl 61-1-3	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_7-11-1	CB: 1_Pnl 7-11-2	CUTLER-HAMMER	QC	60.0A	Fixed
	Thermal Magnetic	QC, 3-Pole		60.0A	
		15-100A			
PNL: 1_7-61-1	CB: 1_Pnl 7-61-2	CUTLER-HAMMER	QC	60.0A	Fixed
	Thermal Magnetic	QC, 3-Pole		60.0A	
		15-100A			
PNL: 1_PP8A	CB: 1_Pnl 8CL-A	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		100.0A	
		30-100A (WW Mod)			
PNL: 1_B-47-2	CB: 1_Pnl B-47-4 (Starbucks)	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_B-47-2	CB: 1_Pnl B-47-5	WESTINGHOUSE	FDB	125.0A	Opening Clearing Curve
	Thermal Magnetic	FDB SER C		125.0A	
		110-150A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug	Settings
PNL: 1_B-61-1	CB: 1_Pnl B-61-2	Unknown	Unknown	0.0A
	Thermal Magnetic	Unknown		70.0A
		Unknown		
SWBD: 1_208B-1	CB: 1_Pnl B-97-2	SQUARE D	JD	250.0A
	Thermal Magnetic	Powerpact, J-Frame		225.0A
		150-250A, UL		
SWBD: 1_208B-1	CB: 1_Pnl B-97-3	SQUARE D	HD	100.0A
	Thermal Magnetic	Powerpact HD		100.0A
		15-150A		
PNL: 1_208-C	CB: 1_Pnl B-97-4	WESTINGHOUSE	HJD	250.0A
	Thermal Magnetic	HJD		200.0A
		70-250A		
PNL: 1_GEL-1	CB: 1_Pnl BLLB-3	FEDERAL PACIFIC	NE	100.0A
	Thermal Magnetic	NE & NEF, 3-Pole		100.0A
		30-100A (WW Mod)		
PNL: 1_BLLB-3	CB: 1_Pnl BLLB-4	FEDERAL PACIFIC	NE	100.0A
	Thermal Magnetic	NE & NEF, 3-Pole		100.0A
		30-100A (WW Mod)		
PNL: 1_GEL-1	CB: 1_Pnl GSL-1	FPE	NFJ	125.0A
	Thermal Magnetic	NFJ		125.0A
		70-225A, WW Mod		
SWBD: 1_208B	CB: 1_Pnl Kitchen	SQUARE D	LD	400.0A
	Static Trip	PowerPact L-Frame, 3.3S		400.0A
		LSI, 400AS		400.0A
SWBD: 1_208B-1	CB: 1_Pnl SB-3	SQUARE D	JD	250.0A
	Thermal Magnetic	Powerpact, J-Frame		225.0A
		150-250A, UL		
SWBD: 1_208-A	CB: 1_Pnl SB-47	SQUARE D	HD	50.0A
	Thermal Magnetic	Powerpact HD		50.0A
		15-150A		
SWBD: 1_208B	CB: 1_Pnl SB-97-1	SQUARE D	HD	125.0A
	Thermal Magnetic	Powerpact HD		125.0A
		15-150A		
PNL: 1_4-47-1	CB: 1_PNL-4-47-2	WESTINGHOUSE	HQNB	100.0A
	Thermal Magnetic	HQNB		100.0A
		15-100A, 3-pole		
SWBD: 1_208-A	CB: 1_Pnls B-47-1_3	SQUARE D	LD	250.0A
	Static Trip	PowerPact L-Frame, 3.3S		250.0A
		LSI, 250AS		250.0A
SWBD: 1_208-A	CB: 1_Pnls B-47-2	SQUARE D	LD	250.0A
	Static Trip	PowerPact L-Frame, 3.3S		250.0A
		LSI, 250AS		250.0A

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**Sub C\_D**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_3-81	CB: 1_PU 3108	SQUARE D	QO	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO, 3-Pole		15.0A	
		15-100A			
PNL: 1_6-97-2	CB: 1_Recpt	Unknown	35	35.0A	
	Thermal Magnetic	Unknown		35.0A	
		Unknown			
SWBD: 1_208-A	CB: 1_Riser #47-2 (A-wing)	SQUARE D	LD	400.0A	Ir (125-400A) 400 (400A)
	Static Trip	PowerPact L-Frame, 3.3S		400.0A	tr (Fixed)
		LSI, 400AS		400.0A	Isd (1.5 - 10 x Ir) 6 (2400A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (4800A)
SWBD: 1_208-A	CB: 1_Riser 11 (A-wing)	SQUARE D	LD	400.0A	Ir (125-400A) 400 (400A)
	Static Trip	PowerPact L-Frame, 3.3S		400.0A	tr (Fixed)
		LSI, 400AS		400.0A	Isd (1.5 - 10 x Ir) 4 (1600A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (4800A)
SWBD: 1_208-A	CB: 1_Riser 31 (A-wing)	SQUARE D	LD	400.0A	Ir (125-400A) 400 (400A)
	Static Trip	PowerPact L-Frame, 3.3S		400.0A	tr (Fixed)
		LSI, 400AS		400.0A	Isd (1.5 - 10 x Ir) 4 (1600A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (4800A)
SWBD: 1_208-A	CB: 1_Riser 47-1 (A-wing)	SQUARE D	LD	400.0A	Ir (125-400A) 400 (400A)
	Static Trip	PowerPact L-Frame, 3.3S		400.0A	tr (Fixed)
		LSI, 400AS		400.0A	Isd (1.5 - 10 x Ir) 10 (4000A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (4800A)
SWBD: 1_208B	CB: 1_Riser 97-1	SQUARE D	LD	400.0A	Ir (125-400A) 350 (350A)
	Static Trip	PowerPact L-Frame, 3.3S		400.0A	tr (Fixed)
		LSI, 400AS		400.0A	Isd (1.5 - 10 x Ir) 10 (3500A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (4800A)
SWBD: 1_208B	CB: 1_Riser 97-2	SQUARE D	LD	400.0A	Ir (125-400A) 350 (350A)
	Static Trip	PowerPact L-Frame, 3.3S		400.0A	tr (Fixed)
		LSI, 400AS		400.0A	Isd (1.5 - 10 x Ir) 6 (2100A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 8 (3200A)
PNL: 1_10-11	CB: 1_Roof Exhaust	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
DISC: 1_ Bkr_2-97-2	CB: 1_Tap Bkr 2-97-2	WESTINGHOUSE	JA	225.0A	LTD
	Thermal Magnetic	JA, KA		225.0A	INST 10.0 (2250A)
		70-225A			
DISC: 1_ Bkr_3-81	CB: 1_Tap Bkr 3-81	SQUARE D	Q2	200.0A	Fixed
	Thermal Magnetic	Q2		200.0A	
		100-225A			
DISC: 1_Tap Bkr_6-97-2	CB: 1_Tap Bkr 6-97-2	CUTLER-HAMMER	EC	100.0A	Opening and Clearing Curve
	Thermal Magnetic	EC		100.0A	
		15-100A			
DISC: 1_Tap Bkr_7-92-2	CB: 1_Tap Bkr 7-92-2	CUTLER-HAMMER	EC	100.0A	Opening and Clearing Curve
	Thermal Magnetic	EC		100.0A	

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**Sub C\_D**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		15-100A			
DISC: 1_Tap Bkr_B-47-3	CB: 1_Tap Bkr_B-47-3	SQUARE D	KA	150.0A	Thermal Curve
	Thermal Magnetic	KA		125.0A	INST LO (625A)
		70-250A (Older)			
PNL: 1_B-11	CB: 1_Unit Vent #2	Unknown	30	30.0A	
	Thermal Magnetic	Unknown		30.0A	
		Unknown			
PNL: 1_B-47-2	CB: 1_Univent	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_SB-47	CB: 1_Unk-1	CUTLER-HAMMER	QC	15.0A	Fixed
	Thermal Magnetic	QC, 3-Pole		15.0A	
		15-100A			
PNL: 1_B-47-1	CB: 1_Unk-3	Unknown	30	30.0A	
	Thermal Magnetic	Unknown		30.0A	
		Unknown			
PNL: 1_B97	CB: 1_Unk-4	Unknown	25	25.0A	
	Thermal Magnetic	Unknown		25.0A	
		Unknown			
PNL: 1_3-81	CB: 1_Unk-5	SQUARE D	QO	50.0A	Fixed (730-6, 50A)
	Thermal Magnetic	QO, 3-Pole		50.0A	
		15-100A			
PNL: 2_2-1	CB: 2_2-1 Main	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
DISC: 2_Pnl-2-1	CB: 2_DISC_2-1	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 2_2-1	CB: 2_Pnl-2-2	SQUARE D	QO	60.0A	Fixed (730-6, 60A)
	Thermal Magnetic	QO, 3-Pole		60.0A	
		15-100A			
PNL: 3_3-1	CB: 3_3-1 Main	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 3_3-2	CB: 3_3-2 Main	CUTLER-HAMMER	CHB	100.0A	Thermal Curve
	Thermal Magnetic	CH/CHB, 3 pole		70.0A	INST 8 (560A)
		70-100A			
PNL: 3_3-1	CB: 3_3-3	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 3_3-1	CB: 3_3-4	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 3_3-1	CB: 3_3-5	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			

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**Sub C\_D**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 3_3-1	CB: 3_3-6	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 3_3-1	CB: 3_3-7	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
DISC: 1_ATS-8LA (N)	CB: ATS 8LA-1 (N)	FPE1	NEJ	225.0A	Thermal-Magnetic Curve
	Thermal Magnetic	NEJ/HEJ		150.0A	
		125-225A			
Relays					
Bus Connected	Name/Type	Description		CT Ratio (A)	Settings
XF: 11_D-PRI	R: DR/F3_50/51-F3	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 7 (560A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3.1
					50P1P(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 7 (560A)
					U4, Extremely Inverse 3.1
					50P1P(0.25-100 x CTR) 5 (400A)
XF: 11_C-PRI	R: DR/F3_50/51-F6	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 7 (560A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3.5
					50P1P(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 7 (560A)
					U4, Extremely Inverse 3.5
					50P1P(0.25-100 x CTR) 5 (400A)
Fuses					
Bus Connected	Name/Type	Description		Cartridge/Trip	
Disc: 1_MRI-AC	CB: 1_MRI-AC	GOULD SHAWMUT	TRS	60.0A	
	Low Voltage	TRS, 600V Class RK5		60.0A	
		15-600A			
DISC: 1_FU_Const Trl	FU: 1_Const Trl DISC	GOULD SHAWMUT	TR	200.0A	
	Low Voltage	TR, 250V Class RK5		200.0A	
		15-600A			
DISC: 1_Food Conveyor	FU: 1_Food Conveyor	LITTELFUSE	FLNR	100.0A	
	Low Voltage	FLNR, 250V Class RK5		100.0A	
		25-600A			

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**Sub E\_F**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 6_LP1	BKR: 6_INC-Elev	FPE	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE/NEF		40.0A	
		30-100A			
PNL: 1_DP-L	CB: 6_3-Roll Iron	FPE	NEJ	225.0A	Thermal-Magnetic Curve
	Thermal Magnetic	NEJ/HEJ		125.0A	
		125-225A			
PNL: 1_DP-L	CB: 6_AHU-2	FPE	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE/NEF		100.0A	
		30-100A			
PNL: 1_LE-1	CB: 6_200# Washer	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
PNL: 1_LE-1	CB: 6_400 # Tumbler	SQUARE D	Q2	125.0A	Fixed
	Thermal Magnetic	Q2		125.0A	
		100-225A			
PNL: 1_LE-1	CB: 6_50# Washer -1	SQUARE D	FA	50.0A	Fixed
	Thermal Magnetic	FA		50.0A	
		15-100A			
PNL: 1_LE-1	CB: 6_50# Washer -2	SQUARE D	FA	50.0A	Fixed
	Thermal Magnetic	FA		50.0A	
		15-100A			
PNL: 1_LE-1	CB: 6_600# Washer-1	SQUARE D	Q2	125.0A	Fixed
	Thermal Magnetic	Q2		125.0A	
		100-225A			
PNL: 1_LE-1	CB: 6_600# Washer-2	SQUARE D	Q2	125.0A	Fixed
	Thermal Magnetic	Q2		125.0A	
		100-225A			
PNL: 6_Bio-1	CB: 6_AC	SQUARE D	QO	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO, 3-Pole		15.0A	
		15-100A			
PNL: 6_PP-3	CB: 6_AC Man Shop	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		30.0A	
		30-100A			
PNL: 6_BU-55	CB: 6_AC Room 55	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 6_BU-55	CB: 6_AC Shop	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 6_AC-1	CB: 6_AC-1 Main	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 1_DP-L	CB: 6_AHU-1	FPE	NE	100.0A	Fixed
	Thermal Magnetic	NE, 2-Pole		60.0A	
		30-100A			

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**Sub E\_F**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_DP-L	CB: 6_AHU-3	FPE	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE/NEF		100.0A	
		30-100A			
MCC: 6_MCC-1_2	CB: 6_Air Comp-1	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		100.0A	
		30-100A			
MCC: 6_MCC-1_2	CB: 6_Air Comp-2	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		100.0A	
		30-100A			
BUS-0047	CB: 6_ATS_BP-EM	WESTINGHOUSE	SPB-50	800.0A	LTPU 1.0 (800A)
	Static Trip	SPB 50/65		800.0A	LTD 24.0
		LI 200-2K			INST 8.0 (6400A)
PNL: 6_ES-1	CB: 6_Bench Recpt	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
SWBD: 6_BHDP	CB: 6_BHDP Main	FPE	NN	1200.0A	Thermal Curve
	Thermal Magnetic	NN - HN, 2-3 Pole		1200.0A	INST (3.5 - 6 x In) High (7200A)
		800-1200A, Page 23, WW Mod			
SWBD: 6_BHDP	CB: 6_Bio-1, Bio-2, B-472	GE	TFJ	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		225.0A	INST (4.5-10 x Trip) HI (2250A)
		70-225A			
MCC: 6_MCC-1_1	CB: 6_Bldg 7 (Snow Removal)	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		40.0A	
		30-100A			
PNL: 1_DP-L	CB: 6_Blower Mtr Disc	FPE	NM	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NM/HM, 2-3 Pole		400.0A	INST(FIXED) 1600 (1600A)
		125-1000A			
MCC: 6_MCC-1_1	CB: 6_Boiler Fdr Pump-1	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		100.0A	
		30-100A			
MCC: 6_MCC-1_1	CB: 6_Boiler Fdr Pump-2, 2a	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		100.0A	
		30-100A			
PNL: 6_LP1E	CB: 6_Boiler Rm Cond-1	FPE	NE	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole, WW Mod		20.0A	
		15-20A, Page 13, WW Mod			
PNL: 6_LP1E	CB: 6_Boiler Rm Cond-2	FPE	NE	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole, WW Mod		20.0A	
		15-20A, Page 13, WW Mod			
MCC: 6_MCC-1_1	CB: 6_Boiler-1	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		70.0A	
		30-100A			
MCC: 6_MCC-1_1	CB: 6_Boiler-2	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		70.0A	
		30-100A			
MCC: 6_MCC-1_1	CB: 6_Boiler-3	WESTINGHOUSE	FB	70.0A	Opening Clearing Curve

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**Sub E\_F**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	FB		70.0A	
		15-150A			
PNL: 6_Pnl-B	CB: 6_Break room AC	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
SWBD: 6_BHDP	CB: 6_BU-55	FPE	NJL	400.0A	Thermal Curve
	Thermal Magnetic	NJL, HJL		400.0A	Instantaneous 2.9 (1160A)
		70-400A			
MCC: 6_MCC-1_2	CB: 6_Bull Air ES-6	WESTINGHOUSE	FDB	40.0A	Opening Clearing Curve
	Thermal Magnetic	FDB SER C		40.0A	
		15-45A			
MCC: 6_MCC-3	CB: 6_Cart Wash XFMR	SQUARE D	HD	70.0A	Fixed
	Thermal Magnetic	HD		70.0A	
		15-150A			
PNL: 1_DP-L	CB: 6_Ceiling Exhaust Dirty Sid	FPE	NE	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole, WW Mod		15.0A	
		15-20A, Page 13, WW Mod			
PNL: 1_LE-1	CB: 6_Colmac	SQUARE D	FA	30.0A	Fixed
	Thermal Magnetic	FA		30.0A	
		15-100A			
SWBD: 6_BHDP	CB: 6_DP-L	FPE	NM	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NM/HM, 2-3 Pole		600.0A	INST(FIXED) 2400 (2400A)
		125-1000A			
PNL: 6_ES-1	CB: 6_Drill Press	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 6_BU-55	CB: 6_Elec Rm	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
MCC: 6_MCC-2	CB: 6_Elev-14	CHALLENGER	CF	100.0A	Opening Clearing Curve
	Thermal Magnetic	CF		100.0A	
		87B 100A			
MCC: 6_MCC-2	CB: 6_Elev-16	CHALLENGER	CF	100.0A	Opening Clearing Curve
	Thermal Magnetic	CF		100.0A	
		87B 100A			
PNL: 6_ES-1	CB: 6_ES-1 Main	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 6_Pnl-LL-L	CB: 6_Exhaust Fan	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 6_PP-1	CB: 6_Fan Inc Rm	FPE	NE	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole		20.0A	
		15-20A, Page 13			
PNL: 1_LE-1	CB: 6_Feed Conveyor	SQUARE D	FA	30.0A	Fixed
	Thermal Magnetic	FA		30.0A	



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**Sub E\_F**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		15-100A			
BUS-0105	CB: 6_Fire Pump OCP-E	SQUARE D	JD	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		200.0A	INST (5-10 x Trip) Low (1000A)
		150-250A, UL			
BUS-0099	CB: 6_Fire Pump OCP-N	SQUARE D	JD	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		250.0A	INST (5-10 x Trip) Low (1250A)
		150-250A, UL			
PNL: 6_LE-2	CB: 6_Folding Table-1	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 6_LE-2	CB: 6_Folding Table-2	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 6_LE-2	CB: 6_Folding Table-3	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
MCC: 6_MCC-1_2	CB: 6_Fuel Oil Pump-6	FPE	NEF	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole		15.0A	
		15-20A, Page 13			
MCC: 6_MCC-1_2	CB: 6_Fuel Oil Pump-7	FPE	NEF	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole		15.0A	
		15-20A, Page 13			
MCC: 6_MCC-1_2	CB: 6_Heat Extractor	WESTINGHOUSE	HKB	250.0A	LTD
	Thermal Magnetic	HKB		225.0A	INST 5.0 (1125A)
		70-250A			
PNL: 1_DP-L	CB: 6_Heat Reclaim	FPE	NEJ	225.0A	Thermal-Magnetic Curve
	Thermal Magnetic	NEJ/HEJ		225.0A	
		125-225A, Page 19			
MCC: 6_MCC-2	CB: 6_High Pressure Skid	WESTINGHOUSE	FB	150.0A	Opening Clearing Curve
	Thermal Magnetic	FB		90.0A	
		15-150A			
MCC: 6_MCC-1_2	CB: 6_HP-1	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		100.0A	
		30-100A			
PNL: 6_PP-1	CB: 6_Htr in SWGR Rm	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		40.0A	
		30-100A			
PNL: 6_PP-1	CB: 6_Htr Mtn Shop	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		40.0A	
		30-100A			
PNL: 6_PP-1	CB: 6_Htr over table LL-16	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		30.0A	
		30-100A			
SWBD: 6_BHDP	CB: 6_LC1 & LC2	GE	TFJ	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		150.0A	INST (4.5-10 x Trip) HI (1500A)
		70-225A			

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**Sub E\_F**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
SWBD: 6_BHDP	CB: 6_LE-1 & LE-2	FPE	NM	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NM/HM, 2-3 Pole		400.0A	INST(FIXED) 1600 (1600A)
		125-1000A			
MCC: 6_MCC-2	CB: 6_Low Pressure Skid	FPE	NEJ	225.0A	Thermal-Magnetic Curve
	Thermal Magnetic	NEJ/HEJ		175.0A	
		125-225A			
PNL: 6_LP1E	CB: 6_LP1E Main	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		100.0A	
		30-100A			
PNL: 6_LP1E	CB: 6_LP1E-1 Main	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		70.0A	
		30-100A			
SWBD: 6_BP-EM	CB: 6_MCC-1	SQUARE D	LD	600.0A	Ir (200-600A); tr(0.5-16s) 600 (600A); 8
	Static Trip	Powerpact L-Frame, 5.3A/E & 6.3A/E		600.0A	Isd (1.5 - 10 x Ir) 5 (3000A)
		LSI, 600AS		600.0A	tsd (0 - 0.4) 0.1 (I^2t Out)
BUS-0089	CB: 6_MCC-2	FPE	NM	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NM/HM, 2-3 Pole		600.0A	INST(FIXED) 4200 (4200A)
		125-1000A			
SWBD: 6_BP-EM	CB: 6_MCC-3	SQUARE D	JD	250.0A	Ir (70-250A) 150 (150A)
	Static Trip	PowerPact J-Frame, 3.2S		250.0A	tr (Fixed)
		LSI, 70-250A		250.0A	Isd (1.5 - 10 x Ir) 10 (1500A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (3000A)
SWBD: 6_BHDP	CB: 6_Med Waste Trl	FPE	NFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NFJ		100.0A	INST (6-10 x Trip) 10 (1000A)
		70-225A, WW Mod			
PNL: 6_Pnl-B	CB: 6_Paint Shop exhaust fan	SQUARE D	QO	25.0A	Fixed (730-4, 25A)
	Thermal Magnetic	QO, 3-Pole		25.0A	
		15-100A			
PNL: 6_Pnl-B	CB: 6_Paint Shop OH door	SQUARE D	QO	25.0A	Fixed (730-4, 25A)
	Thermal Magnetic	QO, 3-Pole		25.0A	
		15-100A			
SWBD: 6_BHDP	CB: 6_PLUMB SHOP	GE	TFJ	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		225.0A	INST (4.5-10 x Trip) 9 (2025A)
		70-225A			
PNL: 6_B-472	CB: 6_Pnl-Bio-1	CUTLER-HAMMER	BAB	100.0A	Fixed
	Thermal Magnetic	BAB, 3-Pole		100.0A	
		15-100A			
PNL: 6_B-472	CB: 6_Pnl-Bio-2	CUTLER-HAMMER	BAB	50.0A	Fixed
	Thermal Magnetic	BAB, 3-Pole		50.0A	
		15-100A			
PNL: 6_LC-1	CB: 6_Pnl-LC-2	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_LE-1	CB: 6_PNL-LE-2	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	

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**Sub E\_F**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		15-100A			
PNL: 1_DP-L	CB: 6_Pnl-LL-L	FPE	NEJ	225.0A	Thermal-Magnetic Curve
	Thermal Magnetic	NEJ/HEJ		150.0A	
		125-225A, Page 19			
PNL: 6_BU-55	CB: 6_Pnl-N-C1A	CUTLER-HAMMER	KA	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	KA		150.0A	INST (5-10 x Trip) 5 (750A)
		70-225A			
MCC: 6_MCC-2	CB: 6_PNL_LP1	FPE	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE/NEF		100.0A	
		30-100A			
SWBD: 6_BHDP	CB: 6_PP-1,PP-2,PP-3	FPE	NFJ	225.0A	Thermal Curve
	Thermal Magnetic	NFJ		150.0A	INST (6-10 x Trip) 10 (1500A)
		70-225A			
PNL: 6_AC-1	CB: 6_Retherm	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
MCC: 6_MCC-1_2	CB: 6_Sellaic	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		40.0A	
		30-100A			
PNL: 1_LE-1	CB: 6_Small Folder-1	SQUARE D	FA	20.0A	Fixed
	Thermal Magnetic	FA		20.0A	
		15-100A			
PNL: 1_LE-1	CB: 6_Small Folder-2	SQUARE D	FA	20.0A	Fixed
	Thermal Magnetic	FA		20.0A	
		15-100A			
PNL: 1_LE-1	CB: 6_Soiled	SQUARE D	FA	20.0A	Fixed
	Thermal Magnetic	FA		20.0A	
		15-100A			
BUS: 6_Sub-E	CB: 6_Sub-E-BP-EM	FPE	NM	800.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NM/HM, 2-3 Pole		800.0A	INST(FIXED) 8000 (8000A)
		125-1000A			
BUS: 6_Sub-F	CB: 6_Sub-F	FPE	NM	800.0A	Thermal Curve (Fixed)
	Thermal Magnetic	NM/HM, 2-3 Pole		800.0A	INST(FIXED) 8000 (8000A)
		125-1000A			
MCC: 6_MCC-2	CB: 6_Sump-1	FPE	NE	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole		20.0A	
		15-20A, Page 13			
MCC: 6_MCC-2	CB: 6_Sump-2	FPE	NE	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole		20.0A	
		15-20A, Page 13			
PNL: 6_Pnl-B	CB: 6_Thread Machine	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
BUS: 6_Sub-F	CB: 6_Tie-Sub E&F	FPE	NM	800.0A	Phase
	Thermal Magnetic	NM/HM, 2-3 Pole		800.0A	Thermal Curve (Fixed)
		125-1000A			INST(FIXED) 8000 (8000A)

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**Sub E\_F**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
					Ground
					GFPD (0.2-1.0 x F) 0.5 (400A)
					GFD (0.1-0.5 Sec.) 0.35 (I <sup>2</sup> t In)
PNL: 6_LE-2	CB: 6_Trans Conveyor	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
MCC: 6_MCC-1_1	CB: 6_Trash Comp	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		70.0A	
		30-100A			
PNL: 6_Trl_Pnl-Med Waste	CB: 6_Trl_Pnl-Med Waste Main	Unknown	70	70.0A	
	Thermal Magnetic	Unknown		70.0A	
		Unknown			
MCC: 6_MCC-1_2	CB: 6_Turf Pump-1	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		30.0A	
		30-100A			
MCC: 6_MCC-1_2	CB: 6_Turf Pump-2	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		30.0A	
		30-100A			
PNL: 6_LC-2	CB: 6_Unk2	Unknown	30	30.0A	
	Thermal Magnetic	Unknown		30.0A	
		Unknown			
PNL: 1_DP-L	CB: 6_Unkown	FPE	NE	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole, WW Mod		15.0A	
		15-20A, Page 13, WW Mod			
PNL: 1_LE-1	CB: 6_Vacumn	SQUARE D	FA	40.0A	Fixed
	Thermal Magnetic	FA		40.0A	
		15-100A			
MCC: 6_MCC-3	CB: 6_Vacuum Pump #1	SQUARE D	HD	20.0A	Fixed
	Thermal Magnetic	HD		20.0A	
		15-150A			
MCC: 6_MCC-3	CB: 6_Vacuum Pump #2	SQUARE D	HD	20.0A	Fixed
	Thermal Magnetic	HD		20.0A	
		15-150A			
MCC: 6_MCC-1_2	CB: 6_Water Softner	FPE	NEF	20.0A	Thermal Curve
	Thermal Magnetic	NE-NEF, 2-3 Pole		15.0A	
		15-20A, Page 13			
PNL: 6_Pnl-B	CB: 6_Weld Shop Exhaust	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 6_TC-1 BNL	CB: 6_Winch	CUTLER-HAMMER	BAB	20.0A	Fixed
	Thermal Magnetic	BAB, 3-Pole		20.0A	
		15-100A			
PNL: 6_AC-1	CB: 6_Work Bench 3 phase	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
SWBD: 6_BP-EM	CB: 6_XF-MCC-2	SQUARE D	JD	250.0A	Ir (70-250A); tr(0.5-16s) 200 (200A); 16

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**Sub E\_F**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Static Trip	Powerpact J Frame, 5.2A/E & 6.2A/E		250.0A	Isd (1.5 - 10 x Ir) 5.5 (1100A)
		LSI, 250AS		200.0A	tsd (0 - 0.4) 0.2 (I²t Out)
					Ii (1.5 - 12 x In) 12 (3000A)
MCC: 6_MCC-1_1	CB: 6_Xfmr-LP1E	FEDERAL PACIFIC	NEF	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		50.0A	
		30-100A			
PNL: 7_Bldg 7	CB: 7_208V Welder	SQUARE D	QO	40.0A	Fixed (730-5, 40A)
	Thermal Magnetic	QO, 3-Pole		40.0A	
		15-100A			
PNL: 7_Bldg 7	CB: 7_Pnl Bldg-7	SQUARE D	Q1 (Obs.)	100.0A	Fixed
	Thermal Magnetic	Q1 (Obs.)		100.0A	
		15-150A (10kAIC)			
TAP: 6_Fire Pump	GEN: 6_OL	Generic	500kW	762.0A	10-60 sec
	Specialty Device	Synchronous Generator			Abv 60 sec
		PMG Long Time			
Relays					
Bus Connected	Name/Type	Description		CT Ratio (A)	Settings
BUS: 6_Sub-E	R: 6_GND Relay Sub-E	FPE		800 / 5	Trip Amperes 400 (400A)
	Electronic	GLR-T Ground Fault Relay			Time Delay (Sec.) 0.8
		100-1200A			
BUS: 6_Sub-F	R: 6_GND Relay Sub-F	FPE		800 / 5	Trip Amperes 700 (700A)
	Electronic	GLR-T Ground Fault Relay			Time Delay (Sec.) 0.8
		100-1200A			
BUS-0120	R: DR/F2_50/51-F2	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 9 (720A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3
					50P1P(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 9 (720A)
					U4, Extremely Inverse 3
					50P1P(0.25-100 x CTR) 7 (560A)
BUS-0123	R: DR/F5_50/51-F5	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 5 (400A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3.3
					50P1P(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 5 (400A)
					U4, Extremely Inverse 3.3
					50P1P(0.25-100 x CTR) 7 (560A)
MCP					
Bus Connected			Name/Type	Description	Settings
MCC: 6_MCC-3	CB: 6_Cond Pump	SQUARE D	FAL	15M (100-350A)	100 (100A)
	Circuit Protector	FAL Mag-Gard			
		30A (Hi-Inst)			
SWBD: 6_BP-EM	CB: 6_Jockey Pump	SQUARE D	M75	Pickup, (8 - 13x) 13x (2500A)	
	Circuit Protector	Powerpact H/J, Manual			
		M71 - M75			
MCC: 6_MCC-3	CB: 6_Kitchen Cond-1	SQUARE D	FAL	15M (100-350A)	100 (100A)
	Circuit Protector	FAL Mag-Gard			
		30A (Hi-Inst)			

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**Sub E\_F**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
MCC: 6_MCC-3	CB: 6_Kitchen Cond-2	SQUARE D	FAL	15M (100-350A)	100 (100A)
	Circuit Protector	FAL Mag-Gard			
		30A (Hi-Inst)			
MCC: 6_MCC-3	CB: 6_Sump Pump-1	SQUARE D	FAL	15M (100-350A)	100 (100A)
	Circuit Protector	FAL Mag-Gard			
		30A (Hi-Inst)			
MCC: 6_MCC-3	CB: 6_Sump Pump-2	SQUARE D	FAL	15M (100-350A)	100 (100A)
	Circuit Protector	FAL Mag-Gard			
		30A (Hi-Inst)			
MCC: 6_MCC-3	CB: 6_Vacumn Pump	SQUARE D	FAL	16M (150-580A)	580 (580A)
	Circuit Protector	FAL Mag-Gard			
		50A (Hi-Inst)			
Fuses					
Bus Connected	Name/Type	Description		Cartridge/Trip	
	FU: 6_Disc-LE-1,2	BUSSMANN	NON	600.0A	
	Low Voltage	NON, 250V Class H		600.0A	
		65-600A			
DISC: 6_Elev-14	FU: 6_Fused Disc_Elev-14	BUSSMANN	FRN-R	100.0A	
	Low Voltage	FRN-R, 250V Class RK5		100.0A	
		0.1-600A			
DISC: 6_Elev-16	FU: 6_Fused Disc_Elev-16	BUSSMANN	FRN-R	100.0A	
	Low Voltage	FRN-R, 250V Class RK5		100.0A	
		0.1-600A			
DISC: 6_Trash Comp	FU: 6_Trash Comp Disc	CEFCON	CRS	30.0A	
	Low Voltage	CRS		30.0A	
		15-600A			
XF-6-E-PRI	FU: 6_XF E	GE	EJ-1, 125E	125.0A	125 Amps
	High Voltage	9F60 EJ-1, 2.75kV E-Rated		125.0A	
		1E-200E			
BUS-0122	FU: 6_XF F	GE	EJ-1, 125E	125.0A	125 Amps
	High Voltage	9F60 EJ-1, 2.75kV E-Rated		125.0A	
		1E-200E			
BUS-0124	FU: 7_Disc-XF-Bldg 7	BUSSMANN	NOS	40.0A	
	Low Voltage	NOS, 600V Class K5		40.0A	
		1-60A			
	PD-0143		0.0A		
	Low Voltage				
Switches					
Bus Connected			Name/Type	Description	
DISC: 6_Disc Blower Mtr	DISC: 6_Blower Mtr	GE	400A		
	Load Break Switch	Spec-Setter General Duty			
		30-600A			
DISC: 6_Boiler 1	DISC: 6_NF-Boiler-1	CUTLER-HAMMER	DH		
	Load Break Switch	DH Heavy Duty			
		30-1200A			
DISC: 6_Boiler 2	DISC: 6_NF-Boiler-2	CUTLER-HAMMER	DH		

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Load Break Switch	DH Heavy Duty			
		30-1200A			
DISC: 6_ Boiler 3	DISC: 6_NF-Boiler-3	CUTLER-HAMMER	DH		
	Load Break Switch	DH Heavy Duty			
		30-1200A			
DISC: 6_Trash Comp	DISC: 6_NF-Boiler-5	CUTLER-HAMMER	DH		
	Load Break Switch	DH Heavy Duty			
		30-1200A			
DISC: 6_Disc-LE-1,2	SW: 6_Disc-LE-1,2				
	Load Break Switch				

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### Sub G\_H

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_SEL1-22	CB: 15_Gen	SQUARE D	HD	100.0A	Fixed
	Thermal Magnetic	Powerpact HD		100.0A	
		I5-150A			
PNL: 15_Gen	CB: 15_Gen Main	WESTINGHOUSE	QBH	100.0A	Opening Clearing Curve
	Thermal Magnetic	QBH		100.0A	
		I5-100A, 3 Pole			
PNL: 15_Gen	CB: 15_Htr	WESTINGHOUSE	QBH	100.0A	Opening Clearing Curve
	Thermal Magnetic	QBH		50.0A	
		I5-100A, 3 Pole			
SWBD: 18_Sub G	CB: 18_Sub G Main	UTILITY RELAY CO.	Quick-Trip	3200.0A	Phase
	Static Trip	AC-Pro Retrofit w/ QT (480V)		3200.0A	LTPU, (20 - 100% x S) 0.9375 (3000A)
		LSI, 50-5000A			LTD, (2 - 30s) 10
					STPU, (150 - 1200% x LTPU) 4 (12000A)
					STD, (0.07 - 0.4s) 0.4 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 6 (18000A)
					QT
					LTPU, (20 - 100% x S) 0.9375 (3000A)
					LTD, (2 - 30s) 10
					STPU, (150 - 1200% x LTPU) 4 (12000A)
					STD, (0.07 - 0.4s) 0.4 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 150% (4500A)
SWBD: 18_Sub G	CB: 18_Sub G_H Tie	UTILITY RELAY CO.	AC-Pro retrofit	1600.0A	LTPU, (20 - 100% x S) 100 % (1600A)
	Static Trip	AC-Pro Retrofit (600V)		1600.0A	LTD, (2 - 30s) 24
		LSI, 50-5000A			STPU, (150 - 1200% x LTPU) 6 (9600A)
					STD, (0.07 - 0.4) 0.3 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 8 (12800A)
SWBD: 18_Sub H	CB: 18_Sub H Main	UTILITY RELAY CO.	Quick-Trip	3200.0A	Phase
	Static Trip	AC-Pro Retrofit w/ QT (480V)		3200.0A	LTPU, (20 - 100% x S) 0.9375 (3000A)
		LSI, 50-5000A			LTD, (2 - 30s) 10
					STPU, (150 - 1200% x LTPU) 4 (12000A)
					STD, (0.07 - 0.4s) 0.4 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 6 (18000A)
					QT
					LTPU, (20 - 100% x S) 0.9375 (3000A)
					LTD, (2 - 30s) 10
					STPU, (150 - 1200% x LTPU) 4 (12000A)
					STD, (0.07 - 0.4s) 0.4 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 150% (4500A)
SWBD: 18_Sub G	CB: 18_SWBD 208C-A	UTILITY RELAY CO.	Quick-Trip	1600.0A	Phase
	Static Trip	AC-Pro Retrofit w/ QT (480V)		1600.0A	LTPU, (20 - 100% x S) 0.5 (800A)
		LSI, 50-5000A			LTD, (2 - 30s) 12
					STPU, (150 - 1200% x LTPU) 7.5 (6000A)
					STD, (0.07 - 0.4s) 0.2 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 10 (8000A)
					QT
					LTPU, (20 - 100% x S) 0.9375 (1500A)
					LTD, (2 - 30s) 16
					STPU, (150 - 1200% x LTPU) 5 (7500A)
					STD, (0.07 - 0.4s) 0.1 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 150% (2250A)
SWBD: 18_Sub G	CB: 18_SWBD 208C-B	UTILITY RELAY CO.	Quick-Trip	1600.0A	Phase
	Static Trip	AC-Pro Retrofit w/ QT (480V)		1600.0A	LTPU, (20 - 100% x S) 0.5 (800A)
		LSI, 50-5000A			LTD, (2 - 30s) 16
					STPU, (150 - 1200% x LTPU) 6 (4800A)



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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
					STD, (0.07 - 0.4s) 0.07 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 1200% (9600A)
					QT
					LTPU, (20 - 100% x S) 0.9375 (1500A)
					LTD, (2 - 30s) 16
					STPU, (150 - 1200% x LTPU) 5 (7500A)
					STD, (0.07 - 0.4s) 0.1 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 150% (2250A)
SWBD: 18_Sub H	CB: 18_SWBD 208C-C	UTILITY RELAY CO.	Quick-Trip	1600.0A	Phase
	Static Trip	AC-Pro Retrofit w/ QT (480V)		1600.0A	LTPU, (20 - 100% x S) 0.9375 (1500A)
		LSI, 50-5000A			LTD, (2 - 30s) 16
					STPU, (150 - 1200% x LTPU) 5 (7500A)
					STD, (0.07 - 0.4s) 0.1 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 6 (9000A)
					QT
					LTPU, (20 - 100% x S) 0.9375 (1500A)
					LTD, (2 - 30s) 16
					STPU, (150 - 1200% x LTPU) 5 (7500A)
					STD, (0.07 - 0.4s) 0.1 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 150% (2250A)
SWBD: 18_Sub H	CB: 18_SWBD 208D	UTILITY RELAY CO.	Quick-Trip	1600.0A	Phase
	Static Trip	AC-Pro Retrofit w/ QT (480V)		1600.0A	LTPU, (20 - 100% x S) 0.75 (1200A)
		LSI, 50-5000A			LTD, (2 - 30s) 6.5
					STPU, (150 - 1200% x LTPU) 5 (6000A)
					STD, (0.07 - 0.4s) 0.1 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 6 (7200A)
					QT
					LTPU, (20 - 100% x S) 0.9375 (1500A)
					LTD, (2 - 30s) 16
					STPU, (150 - 1200% x LTPU) 5 (7500A)
					STD, (0.07 - 0.4s) 0.1 (I <sup>2</sup> t Out)
					INST, (150 - 1200% x LTPU) 150% (2250A)
PNL: 1_B-147-2	CB: 1_#33 Dishwasher	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_10-111-2	CB: 1_10-111-2 Main	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_10-130	CB: 1_10-130-2	Unknown	60	60.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_10-130-2	CB: 1_10-130-2 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 1_10-161-2	CB: 1_10-161-2 Main	Unknown	60	60.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_10-197-2	CB: 1_10-197-2 UNK	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_SB-114	CB: 1_100A-3P-UNKOWN ORG	WESTINGHOUSE	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		50-100A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_11-197	CB: 1_11-197 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
SWBD: 1_208D	CB: 1_197 (7-11)	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		300.0A	INST (3-10 x Trip) HI (3000A)
		125-600A			
PNL: 1_1EL-111C	CB: 1_1EL-111C Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		225.0A	
		Unknown			
PNL: 1_1NLC-105-1	CB: 1_1NLC-105-1 Main	GE	TJD	400.0A	Fixed
	Thermal Magnetic	TJD		300.0A	
		250-400A			
PNL: 1_1NLC-111C-6 Sec-2	CB: 1_1NLC-111C-2	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		150.0A	
		100-225A			
PNL: 1_1NLC-111C-6 sec-1	CB: 1_1NLC-111C-6 sec-1 Main	GE	TJD	400.0A	Fixed
	Thermal Magnetic	TJD		250.0A	
		250-400A			
PNL: 1_2-111-2	CB: 1_2-111-2 Main	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 1_2-130	CB: 1_2-130 Main	CUTLER-HAMMER	ED	100.0A	Fixed
	Thermal Magnetic	ED		100.0A	
		100-225A			
SWBD: 1_208D	CB: 1_20-ICU	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		400.0A	INST (3-10 x Trip) 7 (2800A)
		125-600A			
PNL: 1_SB-142	CB: 1_208 recpt	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_4-130-1	CB: 1_208 Recpt 429 column	GE	TEB	50.0A	Fixed
	Thermal Magnetic	TEB		20.0A	
		15-100A			
PNL: 1_7EL-D	CB: 1_20A Unit	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 1_2EL-139B	CB: 1_2EL-139B Main	GE	TJD	400.0A	Fixed
	Thermal Magnetic	TJD		250.0A	
		250-400A			
PNL: 1_2EL-B	CB: 1_2EL-B Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_2EL-D	CB: 1_2EL-D Main	SYLVANIA	HSJK	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	SJK & HSJK		300.0A	INST (5x-12x) 12x (3600A)
		250-600A, 2 & 3 Pole			
PNL: 1_3-111	CB: 1_3-111 Main	SQUARE D	QO	100.0A	Fixed (730-7, 100A)

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 1_3-130	CB: 1_3-130 Main	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 1_3-147-1	CB: 1_3-147-1 Main	SQUARE D	LA	400.0A	Thermal Curve
	Thermal Magnetic	LA		300.0A	INST LO (1500A)
		125-400A			
PNL: 1_3-147-2	CB: 1_3-147-2 Main	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 1_3-147-3	CB: 1_3-147-3 Main	SQUARE D	KA	250.0A	Thermal Curve
	Thermal Magnetic	KA		200.0A	INST LO (1000A)
		70-250A			
PNL: 1_7EL-D	CB: 1_30A Unit	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
PNL: 1_3EL-306C	CB: 1_3EL-306C Main	SQUARE D	LA	400.0A	Thermal Curve
	Thermal Magnetic	LA		400.0A	INST LO (2000A)
		125-400A			
PNL: 1_3EL-311C	CB: 1_3EL-311C Main	SQUARE D	Q2H	150.0A	Fixed
	Thermal Magnetic	Q2H		150.0A	
		100-225A			
DISC:1_4-130	CB: 1_4-130 Disc	GE	TQD	225.0A	Fixed
	Thermal Magnetic	TQD		225.0A	
		100-225A			
PNL: 1_4-161	CB: 1_4-161 Main	GE	SFLA	250.0A	MAX
	Thermal Magnetic	SFLA, Spectra RMS		225.0A	
		70-250A			
PNL: 1_4-181	CB: 1_4-181 Main	GE	SFLA	250.0A	MAX
	Thermal Magnetic	SFLA, Spectra RMS		225.0A	
		70-250A			
PNL: 1_4-197	CB: 1_4-197 Main	GE	SFLA	250.0A	MAX
	Thermal Magnetic	SFLA, Spectra RMS		225.0A	
		70-250A			
PNL: 1_5-111-1	CB: 1_5-111-1 Main	SQUARE D	QO-VH	100.0A	Fixed (730-8)
	Thermal Magnetic	QO-VH, 3-Pole		100.0A	
		15-150A			
PNL: 1_5-111-2	CB: 1_5-111-2 Main	SQUARE D	QO-VH	100.0A	Fixed (730-8)
	Thermal Magnetic	QO-VH, 3-Pole		100.0A	
		15-150A			
PNL: 1_5-130	CB: 1_5-130 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 1_5-147	CB: 1_5-147 Main	SQUARE D	QO-VH	100.0A	Fixed (730-8)
	Thermal Magnetic	QO-VH, 3-Pole		100.0A	
		15-150A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_5-161-1	CB: 1_5-161-2	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_7EL-D	CB: 1_50A Unit	SQUARE D	QO	50.0A	Fixed (730-6, 50A)
	Thermal Magnetic	QO, 3-Pole		50.0A	
		15-100A			
PNL: 1_6-111-1	CB: 1_6-111-2	CUTLER-HAMMER	QC	60.0A	Fixed
	Thermal Magnetic	QC, 3-Pole		60.0A	
		15-100A			
PNL: 1_4-111-1	CB: 1_7 Ton AC	GE	TED	50.0A	Fixed
	Thermal Magnetic	TED (E-100 Line)		50.0A	
		15-100A, 2-3 Pole			
PNL: 1_7-161A	CB: 1_7-161A Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 1_7-181	CB: 1_7-181 Main	SQUARE D	QO	100.0A	Fixed (730-7, 100A)
	Thermal Magnetic	QO, 3-Pole		100.0A	
		15-100A			
PNL: 1_7EL-D	CB: 1_7EL-D Main	SQUARE D	QB	200.0A	Fixed
	Thermal Magnetic	QB		200.0A	
		70-250A			
PNL: 1_8-161-2	CB: 1_8-161-2 Main	Unknown	60	60.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_9-111-2	CB: 1_9-111-2 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 1_9-130-2	CB: 1_9-130-2 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 1_9-147-2	CB: 1_9-147-2 Main	GE	THQB	100.0A	Fixed
	Thermal Magnetic	THQB		100.0A	
		15-100A			
PNL: 1_9-161-2	CB: 1_9-161-2 Main	Unknown	60	60.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_9-181-2	CB: 1_9-181-2 Main	Unknown	60	60.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_3EL-311C	CB: 1_Abator	SQUARE D	QO	40.0A	Fixed (730-5, 40A)
	Thermal Magnetic	QO, 3-Pole		40.0A	
		15-100A			
PNL: 1_B-111-2	CB: 1_AC	CUTLER-HAMMER	EHD	60.0A	Fixed
	Thermal Magnetic	EHD		60.0A	
		15-100A			
PNL: 1_4EL-A	CB: 1_AC 412A-4	Unknown	Unknown	0.0A	

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	Unknown		70.0A	
		Unknown			
PNL: 1_B-197-1	CB: 1_AC Dietetic Ser.	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_B-147-1	CB: 1_AC Forms Rm	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_B-161-1	CB: 1_AC Prost	Unknown	30	30.0A	
	Thermal Magnetic	Unknown		30.0A	
		Unknown			
PNL: 1_2EL-D	CB: 1_AC Unit 5	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_5-197	CB: 1_AC-1	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_5-181	CB: 1_AC-2	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_8-147	CB: 1_AC-3	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_3-161-1	CB: 1_AC-314-D	Unknown	60	60.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_2EL-D	CB: 1_AC-8	GE	THED	150.0A	Fixed
	Thermal Magnetic	THED		150.0A	
		15-150A			
PNL: 1_9-197	CB: 1_AC-9-197	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_INLC-111C-3	CB: 1_AC-POLICE	SQUARE D	QO	40.0A	Fixed (730-5, 40A)
	Thermal Magnetic	QO, 3-Pole		40.0A	
		15-100A			
PNL: 1_2-147-1	CB: 1_AC-Unit-4	Unknown	60	60.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_3-147-3	CB: 1_AH unit 3C	SQUARE D	Q1(B)-VH (Obs.)	90.0A	Fixed
	Thermal Magnetic	Q1(B)-VH (Obs.)		90.0A	
		15-150A			
PNL: 1_3-147-3	CB: 1_AH unit 3D	SQUARE D	Q1(B)-VH (Obs.)	50.0A	Fixed
	Thermal Magnetic	Q1(B)-VH (Obs.)		50.0A	
		15-150A			
PNL: 1_4-147	CB: 1_AHU	GE	TEB	50.0A	Fixed
	Thermal Magnetic	TEB		50.0A	
		15-100A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_2EL-139B	CB: 1_AHU 139B	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 1_1ELA-111C	CB: 1_AHU Rm 111C	SQUARE D	Q2H	175.0A	Fixed
	Thermal Magnetic	Q2H		175.0A	
		100-225A			
PNL: 1_B-161-1	CB: 1_air handler kit	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
SWBD: 1_208C-A	CB: 1_ATS -A SURGERY	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		150.0A	INST (3-10 x Trip) HI (1500A)
		125-600A			
SWBD: 1_208C-A	CB: 1_ATS -B SURGERY	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		150.0A	INST (3-10 x Trip) HI (1500A)
		125-400A			
SWBD: 1_208C-A	CB: 1_ATS -C SURGERY	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		150.0A	INST (3-10 x Trip) HI (1500A)
		125-600A			
PNL: 1_208C-C	CB: 1_ATS-I	SQUARE D	PG	1200.0A	LTPU/LTD (A 0.4-1.0 x S) 1 (1200A); 8
	Static Trip	Powerpact P-Frame, 6.0A/P/H		1200.0A	STPU (1.5-10 x LTPU) 5 (6000A)
		LSI, 100-1200A, UL			STD (0-0.4) 0.1 (I <sup>2</sup> t In)
					INST (2-15 x S) 15 (18000A)
BUS-0343	CB: 1_ATS-I (E)	CUTLER-HAMMER	HNC	1200.0A	LTPU (1.0 x P) Fixed (1200A)
	Static Trip	HNC		1200.0A	LTD (Fixed) Fixed
		800-1200A Fixed Plug		1200.0A	STPU (2-8 x P) 8 (9600A)
					STD (Fixed) Fixed (I <sup>2</sup> t In)
					INST (13250A) Fixed (13250A)
BUS-0343	CB: 1_ATS-I (E) GF	CUTLER-HAMMER	HNCG	1200.0A	GFPD (120-1200A) 1200A (1200A)
	Ground Fault	HNCG		1200.0A	GFD (3.5-30 Cycles) Max
		800-1200A		1200.0A	
SWBD: 1_208C-A	CB: 1_ATS-J	GE	THFK	110.0A	Thermal Curve (Fixed)
	Thermal Magnetic	THFK		100.0A	INST (6-12.5 x Trip) HI (1250A)
		70-225A			
BUS-0344	CB: 1_ATS-J (E)	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
SWBD: 1_208C-A	CB: 1_ATS-K	GE	THFK	110.0A	Thermal Curve (Fixed)
	Thermal Magnetic	THFK		100.0A	INST (6-12.5 x Trip) HI (1250A)
		70-225A			
BUS-0347	CB: 1_ATS-K (E)	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		90.0A	
		15-150A			
DISC: 1_B-197-2	CB: 1_B-197-2 Main	WESTINGHOUSE	JA	225.0A	LTD
	Thermal Magnetic	JA, KA		125.0A	INST 10.0 (1250A)
		70-225A			
PNL: 1_B-EL	CB: 1_B-EL Main	FEDERAL PACIFIC	NE	100.0A	Opening Clearing Curve
	Thermal Magnetic	NE & NEF, 3-Pole		100.0A	

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		30-100A			
PNL: 1_SEL-3B	CB: 1_Barrel Compactor	WESTINGHOUSE	QBH	100.0A	Opening Clearing Curve
	Thermal Magnetic	QBH		40.0A	
		15-100A, 3 Pole			
PNL: 1_D1	CB: 1_BH-1	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		50.0A	
		15-150A			
PNL: 1_D1	CB: 1_BH-2	GE	TED	150.0A	Fixed
	Thermal Magnetic	TED (E-150 Line)		100.0A	
		15-150A, 2-3 Pole, 08/2010			
SWBD: 1_208D	CB: 1_BLDG 5	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		400.0A	INST (3-10 x Trip) HI (4000A)
		125-600A			
PNL: 1_SEL-306C	CB: 1_Caviwave	SQUARE D	QO	40.0A	Fixed (730-5, 40A)
	Thermal Magnetic	QO, 3-Pole		40.0A	
		15-100A			
PNL: 1_cc11 towers	CB: 1_cc11 towers Main	CUTLER-HAMMER	KD	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	KD		400.0A	INST (5-10 x Trip) 10 (4000A)
		100-400A			
SWBD: 1_208C-B	CB: 1_Cell Towers-pnl-11th fl	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		400.0A	INST (3-10 x Trip) 9 (3600A)
		125-600A			
PNL: 1_1EL-111C	CB: 1_Chilled Wtr Pu	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		40.0A	
		Unknown			
PNL: 1_PP1CU	CB: 1_Chiller Comp	CUTLER-HAMMER	KA	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	KA		100.0A	INST (5-10 x Trip) 5 (500A)
		70-225A			
PNL: 1_4-147	CB: 1_Cir Pump	GE	TEB	50.0A	Fixed
	Thermal Magnetic	TEB		40.0A	
		15-100A			
PNL: 1_4-147	CB: 1_Cir Pump-2	GE	TEB	50.0A	Fixed
	Thermal Magnetic	TEB		40.0A	
		15-100A			
PNL: 1_7EL-D	CB: 1_City Booster	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 1_SEL-5A	CB: 1_Comp 1 cooler 77	WESTINGHOUSE	FB	40.0A	Opening Clearing Curve
	Thermal Magnetic	FB		20.0A	
		15-150A			
PNL: 1_SEL-5A	CB: 1_Comp 2 cooler 77	WESTINGHOUSE	FB	40.0A	Opening Clearing Curve
	Thermal Magnetic	FB		20.0A	
		15-150A			
SWBD: 1_208D	CB: 1_D1	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		400.0A	INST (3-10 x Trip) HI (4000A)
		125-600A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_3-147-3	CB: 1_Deionized Water Pump	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 1_2EL-139B	CB: 1_Dental Air	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
1_DISC-4-147	CB: 1_DISC-Pnl-4-147	GE	TQD	225.0A	Fixed
	Thermal Magnetic	TQD		225.0A	
		100-225A			
PNL: 1_1NLC-111C-6 sec-1	CB: 1_Drill Press	GE	THHQB	20.0A	Fixed
	Thermal Magnetic	THHQB		20.0A	
		15-100A			
PNL: 1_3-147-3	CB: 1_Dumb Waiter 1	SQUARE D	Q1(B)-VH (Obs.)	40.0A	Fixed
	Thermal Magnetic	Q1(B)-VH (Obs.)		40.0A	
		15-150A			
PNL: 1_3-147-3	CB: 1_Dumb Waiter 2	SQUARE D	Q1(B)-VH (Obs.)	40.0A	Fixed
	Thermal Magnetic	Q1(B)-VH (Obs.)		40.0A	
		15-150A			
PNL: 1_2EL-139B	CB: 1_E Vac	GE	THHQB	20.0A	Fixed
	Thermal Magnetic	THHQB		20.0A	
		15-100A			
PNL: 1_3-147-3	CB: 1_EF-1	SQUARE D	QO	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO, 3-Pole		15.0A	
		15-100A			
PNL: 1_1EL-111C	CB: 1_EX Fan 30	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		40.0A	
		Unknown			
PNL: 1_3EL-311C	CB: 1_Ex Fan 311C	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 1_4EL-A	CB: 1_EX Fan 412A-4	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_7-181	CB: 1_Exhaust Fan	SQUARE D	QO	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO, 3-Pole		15.0A	
		15-100A			
PNL: 1_11-146	CB: 1_Fan-1	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_11-146	CB: 1_Fan-2	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_308-1	CB: 1_Food Proc	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 1_B-147-3	CB: 1_Freezer	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	



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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		15-100A			
PNL: 1_2EL-B	CB: 1_Fume Hood	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		30.0A	
		Unknown			
PNL: 1_308-1	CB: 1_Garbage	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 1_2EL-139B	CB: 1_Glycol Pu 1&2	GE	THHQB	50.0A	Fixed
	Thermal Magnetic	THHQB		30.0A	
		15-100A			
PNL: 1_2EL-139B	CB: 1_Glycol Pu 3&4	GE	THHQB	50.0A	Fixed
	Thermal Magnetic	THHQB		30.0A	
		15-100A			
PNL: 1_2EL-139B	CB: 1_Glycol Pu 5&6	GE	THHQB	50.0A	Fixed
	Thermal Magnetic	THHQB		30.0A	
		15-100A			
PNL: 1_308-1	CB: 1_Hobart Freezer	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 1_308-1	CB: 1_Hobart Mixer	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
SWBD: 1_208C-B	CB: 1_ILNC-105	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		300.0A	INST (3-10 x Trip) HI (3000A)
		125-600A			
SWBD: 1_208C-B	CB: 1_ILNC-111C-6	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		250.0A	INST (3-10 x Trip) 7 (1750A)
		125-600A			
PNL: 1_SEL-5B	CB: 1_Kitchen EX fan 12	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		35.0A	
		Unknown			
PNL: 1_PP1CU	CB: 1_LP-LORR	CUTLER-HAMMER	KA	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	KA		150.0A	INST (5-10 x Trip) 7 (1050A)
		70-225A			
PNL: 1_LP-N-PH1RA	CB: 1_LP-N-PH1RA Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 1_PP1CU	CB: 1_LP-N-PH1RA	CUTLER-HAMMER	KA	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	KA		100.0A	INST (5-10 x Trip) 5 (500A)
		70-225A			
PNL: 1_PP1CU	CB: 1_LPL-OR-LPR	CUTLER-HAMMER	KA	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	KA		150.0A	INST (5-10 x Trip) 7 (1050A)
		70-225A			
PNL: 1_SEL-5B	CB: 1_Med Comp 1	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		35.0A	
		Unknown			

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Equipment	Name/Type	Description	Frame/Sensor/Plug	Settings
PNL: 1_SEL-5B	CB: 1_Med Vac 2	Unknown	Unknown	0.0A
	Thermal Magnetic	Unknown		100.0A
		Unknown		
PNL: 1_SEL-3A	CB: 1_Med Vacuum Pumps	SQUARE D	HD	125.0A
	Thermal Magnetic	Powerpact HD		125.0A
		15-150A		
PNL: 1_2EL-139B	CB: 1_Outside EX Fan	GE	THHQB	50.0A
	Thermal Magnetic	THHQB		40.0A
		15-100A		
PNL: 1_B-111-1	CB: 1_Panel B-111-2	Unknown	100	100.0A
	Thermal Magnetic	Unknown		100.0A
		Unknown		
PNL: 1_1-130-1	CB: 1_PNL 1-130-2	Unknown	70	70.0A
	Thermal Magnetic	Unknown		70.0A
		Unknown		
PNL: 1_10-147	CB: 1_Pnl 11-146	Unknown	50	50.0A
	Thermal Magnetic	Unknown		50.0A
		Unknown		
PNL: 1_SEL1-22	CB: 1_Pnl 1EL-111C	SQUARE D	JD	250.0A
	Thermal Magnetic	Powerpact, J-Frame		200.0A
		150-250A, UL		
BUS-0351	CB: 1_Pnl 1ELA-111C	SQUARE D	LA	400.0A
	Thermal Magnetic	LA		400.0A
		125-400A, Inst 5-10		
PNL: 1_INLC-111C-6 sec-1	CB: 1_Pnl 1NLC-111C-3	GE	THQB	50.0A
	Thermal Magnetic	THQB		40.0A
		15-100A		
PNL: 1_SEL-3A	CB: 1_Pnl 2EL	SQUARE D	JD	250.0A
	Static Trip	PowerPact J-Frame, 3.2S		250.0A
		LSI, 70-250A		250.0A
PNL: 1_SEL-3A	CB: 1_Pnl 2ELB	SQUARE D	JD	250.0A
	Static Trip	PowerPact J-Frame, 3.2S		250.0A
		LSI, 70-250A		250.0A
PNL: 1_SEL-3A	CB: 1_Pnl 3EL-306C	SQUARE D	LD	400.0A
	Static Trip	PowerPact L-Frame, 3.3S		400.0A
		LSI, 400AS		400.0A
PNL: 1_3EL-306C	CB: 1_Pnl 3EL-311C	SQUARE D	Q2H	225.0A
	Thermal Magnetic	Q2H		225.0A
		100-225A		
PNL: 1_SEL-3A	CB: 1_Pnl 4ELA	SQUARE D	JD	250.0A
	Static Trip	PowerPact J-Frame, 3.2S		250.0A
		LSI, 70-250A		250.0A

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
					Ii (1.5 - 12 x In) 12 (3000A)
PNL: 1_SEL-3A	CB: 1_Pnl 7EL-D	SQUARE D	JD	250.0A	Ir (70-250A) 175 (175A)
	Static Trip	PowerPact J-Frame, 3.2S		250.0A	tr (Fixed)
		LSI, 70-250A		250.0A	Isd (1.5 - 10 x Ir) 10 (1750A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (3000A)
PNL: 1_SEL-3A	CB: 1_Pnl B-EL	SQUARE D	HD	100.0A	Fixed
	Thermal Magnetic	Powerpact HD		100.0A	
		15-150A			
PNL: 1_SEL1-22	CB: 1_Pnl BELU	SQUARE D	JD	250.0A	Thermal Curve (Fixed)
	Thermal Magnetic	Powerpact, J-Frame		200.0A	INST (5-10 x Trip) 5 (1000A)
		150-250A, UL			
PNL: 1_1EL-111C	CB: 1_Pnl Bldg 28	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		40.0A	
		Unknown			
PNL: 1_SEL1-22	CB: 1_Pnl SEL-3A	SQUARE D	PG	1200.0A	LTPU (A);LTD 1 (800A); 8
	Static Trip	Powerpact P-Frame, 5.0 & 6.0 A/P/H		800.0A	STPU 5 (4000A)
		LSI, 250-1200A			STD 0.1 (I <sup>2</sup> t In)
					INST (PG 250-1200) 10 (8000A)
PNL: 1_SEL-3A	CB: 1_Pnl SEL-3B	SQUARE D	JD	250.0A	Ir (70-250A) 200 (200A)
	Static Trip	PowerPact J-Frame, 3.2S		250.0A	tr (Fixed)
		LSI, 70-250A		250.0A	Isd (1.5 - 10 x Ir) 10 (2000A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (3000A)
PNL: 1_SEL-5A	CB: 1_Pnl SEL-5B	WESTINGHOUSE	FD	150.0A	Opening Clearing Curve
	Thermal Magnetic	FD SER C		150.0A	
		110-150A			
PNL: 1_SEL-3A	CB: 1_Pnl SEL5A	SQUARE D	JD	250.0A	Ir (70-250A) 200 (200A)
	Static Trip	PowerPact J-Frame, 3.2S		250.0A	tr (Fixed)
		LSI, 70-250A		250.0A	Isd (1.5 - 10 x Ir) 10 (2000A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (3000A)
PNL: 1_10-111-1	CB: 1_Pnl-10-111-2	Unknown	60	60.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_cc11 towers	CB: 1_pnl-1103-1	CUTLER-HAMMER	CH	100.0A	Thermal Curve
	Thermal Magnetic	CH/CHB, 3 pole		100.0A	INST 8 (800A)
		70-100A			
SWBD: 1_208C-A	CB: 1_PNL-147	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		225.0A	INST (3-10 x Trip) 7 (1575A)
		125-600A			
SWBD: 1_208C-A	CB: 1_PNL-147-2	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		225.0A	INST (3-10 x Trip) HI (2250A)
		125-600A			
PNL: 1_2-111-1	CB: 1_Pnl-2-111-2	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
PNL: 1_3-147-1	CB: 1_Pnl-3-147-2	SQUARE D	QB	100.0A	Fixed

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	QB		100.0A	
		70-250A			
PNL: 1_3-147-1	CB: 1_Pnl-3-147-3	SQUARE D	Q2M	200.0A	Fixed
	Thermal Magnetic	Q2M		200.0A	
		100-225A			
PNL: 1_3-161-1	CB: 1_PNL-3-161-2	Unknown	100	100.0A	
	Thermal Magnetic	Unknown		100.0A	
		Unknown			
SWBD: 1_208D	CB: 1_PNL-308 KIT	GE	THFK	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	THFK		225.0A	INST (4.5-10 x Trip) HI (2250A)
		70-225A			
PNL: 1_B-147-1	CB: 1_PNL-B 147-3 (B-51)	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_SB-359	CB: 1_PNL-SB-359-2	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_Pnls 4-111-1, 2	CB: 1_Pnls 4-111-1,2	GE	TQD	225.0A	Fixed
	Thermal Magnetic	TQD		225.0A	
		100-225A			
PNL: 1_PP1CU	CB: 1_PP1CU-1	WESTINGHOUSE	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		50-100A			
PNL: 1_3-147-3	CB: 1_Pump-3	SQUARE D	Q1(B)-VH (Obs.)	40.0A	Fixed
	Thermal Magnetic	Q1(B)-VH (Obs.)		40.0A	
		15-150A			
PNL: 1_3-147-3	CB: 1_Pump-4	SQUARE D	QO	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO, 3-Pole		15.0A	
		15-100A			
SWBD: 1_208C-B	CB: 1_Riser 111 (6-10)	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		400.0A	INST (3-10 x Trip) 4 (1600A)
		125-600A			
SWBD: 1_208C-B	CB: 1_Riser 111 (B-5)	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		400.0A	INST (3-10 x Trip) 6 (2400A)
		125-600A			
SWBD: 1_208C-B	CB: 1_Riser 130 (6-10)	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		350.0A	INST (3-10 x Trip) 5 (1750A)
		125-600A			
SWBD: 1_208C-A	CB: 1_Riser 147 (6-10)	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		400.0A	INST (3-10 x Trip) 5 (2000A)
		125-600A			
SWBD: 1_208C-A	CB: 1_Riser 147 (B-5)	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		400.0A	INST (3-10 x Trip) 6 (2400A)
		125-600A			
SWBD: 1_208D	CB: 1_RISER 161 (B-10)	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		400.0A	INST (3-10 x Trip) HI (4000A)
		125-600A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
SWBD: 1_208D	CB: 1_RISER 181 (6-10)	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		400.0A	INST (3-10 x Trip) HI (4000A)
		125-600A			
SWBD: 1_208D	CB: 1_Riser 197	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		300.0A	INST (3-10 x Trip) 7 (2100A)
		125-600A			
PNL: 1_RM-206C	CB: 1_RM-211		0.0A		
	Static Trip				
SWBD: 1_208C-B	CB: 1_S-22 Walkin cooler	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		225.0A	INST (3-10 x Trip) HI (2250A)
		125-600A			
SWBD: 1_208C-B	CB: 1_SB-114	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		300.0A	INST (3-10 x Trip) HI (3000A)
		125-600A			
SWBD: 1_208C-A	CB: 1_SB-142	GE	THFK	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	THFK		225.0A	INST (4.5-10 x Trip) HI (2250A)
		70-225A			
PNL: 1_D1	CB: 1_SB-197	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		50.0A	
		15-150A			
SWBD: 1_208C-A	CB: 1_SB-359	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		225.0A	INST (3-10 x Trip) HI (2250A)
		125-600A			
PNL: 1_4EL-A	CB: 1_SF 412A-4	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		30.0A	
		Unknown			
PNL: 1_SB-142	CB: 1_SF-7	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_SEL-5B	CB: 1_Standby Comp	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		35.0A	
		Unknown			
PNL: 1_3EL-306C	CB: 1_Sterilizer #2	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 1_3EL-306C	CB: 1_Sterilizer #3	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 1_3EL-311C	CB: 1_Sterilizer 100k	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
PNL: 1_3EL-311C	CB: 1_Sterilizer 100nx	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
PNL: 1_SEL-5B	CB: 1_Suction Pump	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		30.0A	

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		Unknown			
PNL: 1_SEL-3B	CB: 1_Sump Pump S-9	WESTINGHOUSE	QBH	100.0A	Opening Clearing Curve
	Thermal Magnetic	QBH		20.0A	
		15-100A, 3 Pole			
PNL: 1_1EL-111C	CB: 1_Surgery P7	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		40.0A	
		Unknown			
PNL: 1_1EL-111C	CB: 1_Surgery PF4	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		40.0A	
		Unknown			
PNL: 1_UDS-209J	CB: 1_UDS-209J Main	CUTLER-HAMMER	QBHW	100.0A	Fixed
	Thermal Magnetic	QBHW, 3-Pole		100.0A	
		15-100A			
PNL: 1_UDS-209K	CB: 1_UDS-209K Main	CUTLER-HAMMER	QBHW	100.0A	Fixed
	Thermal Magnetic	QBHW, 3-Pole		100.0A	
		15-100A			
PNL: 1_B-111-2	CB: 1_Uni-Vent Fan	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_B-147-2	CB: 1_Unk	Unknown	50	50.0A	
	Thermal Magnetic	Unknown		50.0A	
		Unknown			
PNL: 1_308-1	CB: 1_Unkown	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
PNL: 1_308-1	CB: 1_Unkown-2	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
PNL: 1_INLC-111C-2	CB: 1_Unkown.	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
PNL: 1_cc11 towers	CB: 1_Unkown_	CUTLER-HAMMER	CH	30.0A	
	Thermal Magnetic	CH/CHB, 3 pole		30.0A	
		70-100A			
PNL: 1_6-111-2	CB: 1_Unkown__	Unknown	20	20.0A	
	Thermal Magnetic	Unknown		20.0A	
		Unknown			
PNL: 1_INLC-111C-6 Sec-2	CB: 1_UNK_1	GE	THQB	50.0A	Fixed
	Thermal Magnetic	THQB		40.0A	
		15-100A			
PNL: 1_2EL-139B	CB: 1_Vac PU	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 1_4-130-1	CB: 1_Walkin Cooler	GE	TEB	50.0A	Fixed
	Thermal Magnetic	TEB		20.0A	
		15-100A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_B-130	CB: 1_Warehouse AC-1	Unknown	70	70.0A	
	Thermal Magnetic	Unknown		70.0A	
		Unknown			
PNL: 1_B-130	CB: 1_Warehouse AC-2	Unknown	60	60.0A	
	Thermal Magnetic	Unknown		60.0A	
		Unknown			
PNL: 1_3EL-306C	CB: 1_Washer 333	SQUARE D	QO	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO, 3-Pole		30.0A	
		15-100A			
PNL: 1_SB-359	CB: 1_WELDER	SQUARE D	FA	50.0A	Fixed
	Thermal Magnetic	FA		50.0A	
		15-100A			
PNL: 1_SEL-3A	CB: 1_Wire Trough	SQUARE D	JD	250.0A	Ir (70-250A) 200 (200A)
	Static Trip	PowerPact J-Frame, 3.2S		250.0A	tr (Fixed)
		LSI, 70-250A		250.0A	Isd (1.5 - 10 x Ir) 1.5 (300A)
					tsd (Fixed) Fixed
					Ii (1.5 - 12 x In) 12 (3000A)
PNL: 1_UDS-209J	CB: 1_XF-210J		0.0A		
	Static Trip				
PNL: 1_UDS-209K	CB: 1_XF-210K		0.0A		
	Static Trip				
PNL: 1_UDS-209J	CB: 1_XF-213J		0.0A		
	Static Trip				
PNL: 1_UDS-209K	CB: 1_XF-213K		0.0A		
	Static Trip				
PNL: 1_UDS-209J	CB: 1_XF-216J		0.0A		
	Static Trip				
PNL: 1_UDS-209K	CB: 1_XF-216K		0.0A		
	Static Trip				
PNL: 1_RM-206C	CB: 1_XF-GU-214		0.0A		
	Static Trip				
PNL: 1_RM-206C	CB: 1_XF-GU-215		0.0A		
	Static Trip				
PNL: 1_STW-7	CB: 1_XF_RM-223		0.0A		
	Static Trip				
PNL: 1_STW-7	CB: 1_XF_RM-225		0.0A		
	Static Trip				
PNL: 1_STW-7	CB: 1_XF_RM-228		0.0A		
	Static Trip				
PNL: 28_1LEL-1	CB: 28_unk	SQUARE D	QO	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO, 3-Pole		20.0A	
		15-100A			
PNL: 5_Pnl-MDP-1	CB: 5_Elev Control Pnl	GE	TFK	110.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFK		100.0A	INST (6-12.5 x Trip) LO (600A)
		70-225A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 5_Pnl-MDP-1	CB: 5_PNL-1 (BNL5-5)	GE	TFK	110.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFK		100.0A	INST (6-12.5 x Trip) 0
		70-225A			
PNL: 5_Pnl-1	CB: 5_Pnl-1 Main	CUTLER-HAMMER	QC	100.0A	Fixed
	Thermal Magnetic	QC, 3-Pole		100.0A	
		15-100A			
PNL: 5_Pnl-MDP-1	CB: 5_PNL-2 (BNL5-4)	GE	TFK	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFK		200.0A	INST (4.5-10 x Trip) LO (900A)
		70-225A			
PNL: 5_Pnl-2	CB: 5_Pnl-2 Main	WESTINGHOUSE	JA	225.0A	LTD
	Thermal Magnetic	JA, KA		225.0A	INST 5.0 (1125A)
		70-225A			
PNL: 5_MDP-2	CB: 5_Pnl-3	GE	THQB	50.0A	Fixed
	Thermal Magnetic	THQB		50.0A	
		15-100A			
PNL: 5_Pnl-4	CB: 5_Pnl-4 Main	CUTLER-HAMMER	EB	100.0A	Fixed
	Thermal Magnetic	EB, 2 & 3-Pole		100.0A	
		15-100A			
PNL: 5_Pnl-MDP-1	CB: 5_Pnl-4 Opposite Rm	GE	TFK	80.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFK		70.0A	INST (8.6-12.5 x Trip) LO (602A)
		70-225A			
PNL: 5_Pnl-MDP-1	CB: 5_Pnl-5	GE	TFK	80.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFK		70.0A	INST (8.6-12.5 x Trip) LO (602A)
		70-225A			
PNL: 5_Pnl-MDP-1	CB: 5_PNL-6-1 & 6-2	GE	TFK	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFK		175.0A	INST (4.5-10 x Trip) LO (787.5A)
		70-225A			
PNL: 5_Pnl-MDP-1	CB: 5_PNL-7	GE	TFK	80.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFK		70.0A	INST (8.6-12.5 x Trip) LO (602A)
		70-225A			
PNL: 5_Pnl-MDP-1	CB: 5_Pnl-AC Unit	GE	TFJ	110.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		100.0A	INST (6-12.5 x Trip) LO (600A)
		70-225A			
PNL: 5_Pnl-MDP-1	CB: 5_Pnl-MDP-1 Main	GE	TKMA	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TKMA		600.0A	INST (3-10 x Trip) LO-HI (2400A)
		300-1200A			
PNL: 5_MDP-2	CB: 5_Pnl-Sreet Ltg	GE	THQB	100.0A	Fixed
	Thermal Magnetic	THQB		100.0A	
		15-100A			
PNL: 6_BEL-U	CB: 6_BEL-U Main	Unknown	Unknown	0.0A	
	Thermal Magnetic	Unknown		200.0A	
		Unknown			
PNL: 6_BEL-U	CB: 6_SF 55	SYLVANIA	BQ	100.0A	Thermal Curve(Fixed)
	Thermal Magnetic	BQ		40.0A	INST(Fixed) Fixed (750A)
		40-60A, 100AF, 2-3 Poles			
SWBD: 1_208C-A	CB:1_Riser 130 (B-5)	GE	TJK	400.0A	Thermal Curve (Fixed)



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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	TJK		350.0A	INST (3-10 x Trip) 6 (2100A)
		125-600A			
Relays					
Bus Connected	Name/Type	Description		CT Ratio (A)	Settings
BUS-0338	R: DR/F3_50/51-F3	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 7 (560A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3.1
					50P1P(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 7 (560A)
					U4, Extremely Inverse 3.1
					50P1P(0.25-100 x CTR) 5 (400A)
BUS-0336	R: DR/F6_50/51-F6	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 7 (560A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3.5
					50P1P(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 7 (560A)
					U4, Extremely Inverse 3.5
					50P1P(0.25-100 x CTR) 5 (400A)
Fuses					
Bus Connected	Name/Type	Description		Cartridge/Trip	Settings
BUS-0340	FU: 18_Sub G	GOULD SHAWMUT	CS-3, 200E	200.0A	200 Amps
	High Voltage	CS-3, 5.5kV E-Rated		200.0A	
		10E-450E			
BUS-0341	FU: 18_Sub H	GOULD SHAWMUT	CS-3, 200E	200.0A	200 Amps
	High Voltage	CS-3, 5.5kV E-Rated		200.0A	
		10E-450E			
DISC: 1_B 147-3	FU: 1_Disc-Pnl B-147-3	BUSSMANN	REN	60.0A	
	Low Voltage	REN, 250V Class H		40.0A	
		12-600A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 20_R2W-2113	CB: 20_2113 SPECIAL PURP-1	GE	THHQB	20.0A	Fixed
	Thermal Magnetic	THHQB		20.0A	
		15-100A			
PNL: 20_R2W-2113	CB: 20_2113 SPECIAL PURP-2	GE	THHQB	20.0A	Fixed
	Thermal Magnetic	THHQB		20.0A	
		15-100A			
PNL: 20_9A1LCL1	CB: 20_9A1LCL1	SIEMENS	QJH2	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	QJH2		225.0A	INST Fixed (2650A)
		60-225A			
PNL: 20_9A1LCL2	CB: 20_9A1LCL2	SIEMENS	QJH2	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	QJH2		225.0A	INST Fixed (2650A)
		60-225A			
PNL: 20_LL-EC-RBE-B	CB: 20_AHU	GE	THQB	100.0A	Fixed
	Thermal Magnetic	THQB		60.0A	
		15-100A			
MCC: 20_HP-EE-R3W_2	CB: 20_AIR COMP 1	GE	THED	80.0A	Fixed
	Thermal Magnetic	THED		60.0A	
		15-150A			
MCC: 20_HP-EE-R3W_1	CB: 20_AIR COMP 2	GE	THED	80.0A	Fixed
	Thermal Magnetic	THED		60.0A	
		15-150A			
MCC: 20_HP-EE=R3E_1	CB: 20_AIR COMP-1	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		20.0A	
		15-150A			
MCC: 20_HP-EE=R3E_2	CB: 20_AIR COMP-2	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		20.0A	
		15-150A			
PNL: 20_HP-EE-R1E (SEC-1)	CB: 20_AIRVAC PUMP	GE	TEY	30.0A	Fixed
	Thermal Magnetic	TEY		30.0A	
		15-100A, 2 & 3-Pole			
SWBD: 20_Sub: J	CB: 20_ATS-FP-RBE	GE	TJH	600.0A	Phase
	Static Trip	TJH, MVT RMS-9		600.0A	LTPU (0.5-1.0 x P) 0.8 (480A)
		LSI, 60-600A		600.0A	LTD (1-4) 1
					STPU (1.5-9 x LTPU) 1.5 (720A)
					STD (Min-Max) Min (I^2t Out)
					INST (1.5-15 x P) 15 (9000A)
					Ground
					GFPU (0.2-0.6 x S) 0.6 (360A)
					GFD (Min-Max) Min (I^2t Out)
SWBD: 20_Sub: J	CB: 20_ATS-HL-ES-R1E	GE	TJH	400.0A	Phase
	Static Trip	TJH, MVT RMS-9		150.0A	LTPU (0.5-1.0 x P) 1 (125A)
		LSI, 60-600A		125.0A	LTD (1-4) 4
					STPU (1.5-9 x LTPU) 9 (1125A)
					STD (Min-Max) Min (I^2t Out)
					INST (1.5-15 x P) 10 (1250A)
					Ground
					GFPU (0.2-0.6 x S) 0.6 (90A)
					GFD (Min-Max) Min (I^2t In)
SWBD: 20_Sub: J	CB: 20_ATS-HP-EE-R1E	GE	TKH	800.0A	Phase

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Static Trip	TKH & TKL, MVT RMS-9		800.0A	LTPU (0.5-1.0 x P) 1 (800A)
		LSI, 300-1200A		800.0A	LTD (1-4) 3
					STPU (1.5-9 x LTPU) 7 (5600A)
					STD (Min-Max) Min (I <sup>2</sup> t Out)
					INST (1.5-15 x P) 9 (7200A)
					Ground
					GFPD (0.2-0.6 x S) 0.6 (480A)
					GFD (Min-Max) Min (I <sup>2</sup> t In)
SWBD: 20_Sub: J	CB: 20_ATS-LL-EC-R1E	GE	TJH	400.0A	Phase
	Static Trip	TJH, MVT RMS-9		400.0A	LTPU (0.5-1.0 x P) 0.9 (360A)
		LSI, 60-600A		400.0A	LTD (1-4) 4
					STPU (1.5-9 x LTPU) 7 (2520A)
					STD (Min-Max) Min (I <sup>2</sup> t Out)
					INST (1.5-15 x P) 10 (4000A)
					Ground
					GFPD (0.2-0.6 x S) 0.6 (240A)
					GFD (Min-Max) Min (I <sup>2</sup> t In)
MCC: 20_HP-N-R3E-SEC-1	CB: 20_BOOSTER PUMP	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		30.0A	
		15-150A			
PNL: 20_HP-N-R1E	CB: 20_BOTTLE WASH(B115)	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		15.0A	
		15-150A			
PNL: 20_HP-N-R1E	CB: 20_CAGE WASH (B115)	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		30.0A	
		15-150A			
SWBD: 20_Sub: J	CB: 20_CB-HL-N-RBE / RBW	GE	TJH	400.0A	Phase
	Static Trip	TJH, MVT RMS-9		400.0A	LTPU (0.5-1.0 x P) 1 (400A)
		LSI, 60-600A		400.0A	LTD (1-4) 3
					STPU (1.5-9 x LTPU) 9 (3600A)
					STD (Min-Max) Min (I <sup>2</sup> t Out)
					INST (1.5-15 x P) 15 (6000A)
					Ground
					GFPD (0.2-0.6 x S) 0.6 (240A)
					GFD (Min-Max) Min (I <sup>2</sup> t In)
PNL: 20_HP-EE-R1E (SEC-2)	CB: 20_COMP	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HP-EE-R1E (SEC-1)	CB: 20_CP-1	GE	TEY	30.0A	Fixed
	Thermal Magnetic	TEY		30.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HP-EE-R1E (SEC-1)	CB: 20_CU-5	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HP-N-R1E	CB: 20_DISPOSAL (B115)	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		15.0A	
		15-150A			
PNL: 20_HP-N-R1E	CB: 20_DOCK LEVER	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		20.0A	
		15-150A			
PNL: 20_DP-LL-ES-R1E	CB: 20_DOMESTIC WP RM-B14	GE	THED	50.0A	Fixed

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	THED		30.0A	
		15-150A			
PNL: 20_DP-HL-ES-R1E	CB: 20_DP-HL-ES-R1E Main	GE	TFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		125.0A	INST (5-10 x Trip) HI (1250A)
		70-225A			
PNL: 20_DP-HP-EE-R1E	CB: 20_DP-HP-EE-R1E Main	GE	TKMA	800.0A	Phase
	Thermal Magnetic	TKMA		800.0A	Thermal Curve (Fixed)
		300-1200A			INST (3-8 x Trip) HI (6400A)
					QT
					Thermal Curve (Fixed)
					INST (3-8 x Trip) LO (2400A)
PNL: 20_DP-HR-N-R2W-A	CB: 20_DP-HR-N-R2W-A Main	GE	TJD	400.0A	Fixed
	Thermal Magnetic	TJD		400.0A	
		250-400A			
PNL: 20_DP-LL-EC-R1E	CB: 20_DP-LL-EC-R1E Main	GE	TKMA	800.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TKMA		800.0A	INST (3-8 x Trip) HI (6400A)
		300-1200A			
PNL: 20_DP-LL-ES-R1E	CB: 20_DP-LL-ES-R1E	GE	TFJ	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		150.0A	INST (4.5-10 x Trip) HI (1500A)
		70-225A			
SWBD: 20_DP-LR-N-R1E	CB: 20_DP-LR-N-R1E (Main)	GE	TP	1600.0A	Phase
	Static Trip	TP & THP, MVT RMS-9		1600.0A	LTPU (0.5-1.0 x P) 1 (1200A)
		LI, 200-3000A Sensors		1200.0A	LTD (1-4) 4
					INST (1.5-10 x P) 10 (12000A)
					Ground
					GFPU (0.2-0.6 x S) 0.3 (480A)
					GFD (Min-Max) Min (I^2t Out)
					QT
					LTPU (0.5-1.0 x P) 1 (1200A)
					LTD (1-4) 4
					INST (1.5-10 x P) 1.5 (1800A)
SWBD: 20_DP-LR-N-RBW	CB: 20_DP-LR-N-R1W	GE	TJK	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		600.0A	INST (3-10 x Trip) HI (6000A)
		125-600A			
PNL: 20_DP-LR-N-R1W	CB: 20_DP-LR-N-R1W Main	GE	TJK	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		600.0A	INST (3-10 x Trip) HI (6000A)
		125-600A			
SWBD: 20_DP-LR-N-R1E	CB: 20_DP-LR-N-R2E	GE	TJK	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		600.0A	INST (3-10 x Trip) HI (6000A)
		125-600A			
PNL: 20_DP-LR-N-R2E	CB: 20_DP-LR-N-R2E Main	GE	TJK	600.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		600.0A	INST (3-10 x Trip) HI (6000A)
		125-600A			
SWBD: 20_DP-LR-N-RBW	CB: 20_DP-LR-N-R2W-A	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		400.0A	INST (3-10 x Trip) HI (4000A)
		125-600A			
SWBD: 20_DP-LR-N-RBW	CB: 20_DP-LR-N-R2W-B	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		400.0A	INST (3-10 x Trip) HI (4000A)
		125-600A			

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PNL: 20_DP-LR-N-R2W-B	CB: 20_DP-LR-N-R2W-B Main	GE	TJD	400.0A	Fixed
	Thermal Magnetic	TJD		400.0A	
		250-400A			
SWBD: 20_DP-LR-N-RIE	CB: 20_DP-LR-N-RBE	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		400.0A	INST (3-10 x Trip) HI (4000A)
		125-600A			
PNL: 20_DP-LR-N-RBE	CB: 20_DP-LR-N-RBE Main	GE	TJD	400.0A	Fixed
	Thermal Magnetic	TJD		400.0A	
		250-400A			
SWBD: 20_DP-LR-N-RBW	CB: 20_DP-LR-N-RBW Main	GE	TP	800.0A	Phase
	Static Trip	TP & THP, MVT RMS-9		800.0A	LTPU (0.5-1.0 x P) 1 (800A)
		LI, 200-3000A Sensors		800.0A	LTD (1-4) 4
					INST (1.5-10 x P) 10 (8000A)
					Ground
					GFPU (0.2-0.6 x S) 0.35 (280A)
					GFD (Min-Max) Int (I^2t Out)
					QT
					LTPU (0.5-1.0 x P) 1 (800A)
					LTD (1-4) 4
					INST (1.5-10 x P) 1.5 (1200A)
PNL: 20_HP-N-R1E	CB: 20_DRYER (2142)	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		30.0A	
		15-150A			
PNL: 20_HP-EE-R1E (SEC-1)	CB: 20_EF-33	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HP-EE-R1E (SEC-1)	CB: 20_EF-35	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_9A1LCL2	CB: 20_Ex Fan	SIEMENS	BLH	40.0A	Thermal Curve (Fixed)
	Thermal Magnetic	BLH, 2 & 3-Pole		15.0A	INST Fixed (425A)
		15-100A			
PNL: 20_DP-HP-EE-R1E	CB: 20_F-11 MCC-HP-EE-R3E	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		400.0A	INST (3-10 x Trip) HI (4000A)
		125-400A			
PNL: 20_DP-HP-EE-R1E	CB: 20_F-13 MCC-HP-EE-R3W	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		400.0A	INST (3-10 x Trip) HI (4000A)
		125-400A			
PNL: 20_DP-HP-EE-R1E	CB: 20_F-16 ELEV-EAST	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		175.0A	INST (3-10 x Trip) HI (1750A)
		125-400A			
PNL: 20_DP-HP-EE-R1E	CB: 20_F-21 ELEV-WEST	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		225.0A	INST (3-10 x Trip) HI (2250A)
		125-400A			
PNL: 20_HP-N-R1E	CB: 20_GLASS WASH (2142)	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		30.0A	
		15-150A			
PNL: 20_HP-N-R1E	CB: 20_GLASS WASH-2 (2142)	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		30.0A	

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		15-150A			
PNL: 20_HP-N-R1E	CB: 20_GLASS WASH-2 (B115)	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		30.0A	
		15-150A			
PNL: 20_DP-HL-ES-R1E	CB: 20_HL-ES-R1E	GE	THED	80.0A	Fixed
	Thermal Magnetic	THED		80.0A	
		15-150A			
PNL: 20_HL-ES-R1E	CB: 20_HL-ES-R1E Main	GE	TEY	80.0A	Fixed
	Thermal Magnetic	TEY		80.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_DP-HL-ES-R1E	CB: 20_HL-ES-R1W	GE	THED	80.0A	Fixed
	Thermal Magnetic	THED		80.0A	
		15-150A			
PNL: 20_HL-ES-R1W	CB: 20_HL-ES-R1W Main	GE	TEY	80.0A	Fixed
	Thermal Magnetic	TEY		80.0A	
		15-100A, 2 & 3-Pole			
DISC: 20_HL-N-E	CB: 20_HL-N-E	GE	TFL	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFL		225.0A	INST (4.5-10 x Trip) HI (2250A)
		70-225A (WW Mod)			
PNL: 20_HL-N-R1E	CB: 20_HL-N-R1E Main	GE	TEY	100.0A	Fixed
	Thermal Magnetic	TEY		100.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HL-N-R1W	CB: 20_HL-N-R1W Main	GE	TEY	100.0A	Fixed
	Thermal Magnetic	TEY		100.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HL-N-R2E	CB: 20_HL-N-R2E Main	GE	TEY	100.0A	Fixed
	Thermal Magnetic	TEY		100.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HL-N-R2W	CB: 20_HL-N-R2W Main	GE	TEY	100.0A	Fixed
	Thermal Magnetic	TEY		100.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HL-N-R3E	CB: 20_HL-N-R3E Main	GE	TEY	100.0A	Fixed
	Thermal Magnetic	TEY		100.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HL-N-RBE	CB: 20_HL-N-RBE Main	GE	TEY	100.0A	Fixed
	Thermal Magnetic	TEY		100.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HL-N-RBW	CB: 20_HL-N-RBW Main	GE	TEY	100.0A	Fixed
	Thermal Magnetic	TEY		100.0A	
		15-100A, 2 & 3-Pole			
DISC: 20_HL-N-W	CB: 20_HL-N-W	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		175.0A	INST (3-10 x Trip) HI (1750A)
		125-400A			
PNL: 20_DP-HP-EE-R1E	CB: 20_HP-EE-R1E	GE	TJJ	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJJ		175.0A	INST (3-10 x Trip) HI (1750A)
		125-400A			

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PNL: 20_HP-EE-R1E (SEC-1)	CB: 20_HP-EE-R1E (SEC-1) Main	GE	TFL	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFL		175.0A	INST (4.5-10 x Trip) HI (1750A)
		70-225A (WW Mod)			
SWBD: 20_Sub: J	CB: 20_HP-N-R1E	GE	TJH	400.0A	Phase
	Static Trip	TJH, MVT RMS-9		400.0A	LTPU (0.5-1.0 x P) 1 (400A)
		LSI, 60-600A		400.0A	LTD (1-4) 1
					STPU (1.5-9 x LTPU) 1.5 (600A)
					STD (Min-Max) Min (I^2t In)
					INST (1.5-15 x P) 10 (4000A)
					Ground
					GFPU (0.2-0.6 x S) 0.6 (240A)
					GFD (Min-Max) Min (I^2t In)
PNL: 20_HP-N-R1E	CB: 20_HTR (BLDG 21)	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		30.0A	
		15-150A			
PNL: 20_LP-EC-R1E-OR	CB: 20_IP-OR-1A	GE	THHQB-C	40.0A	Fixed
	Thermal Magnetic	THHQB - Model C		40.0A	
		25-60A, 2-Pole			
PNL: 20_LP-EC-R1E-OR	CB: 20_IP-OR-1B	GE	THHQB-C	40.0A	Fixed
	Thermal Magnetic	THHQB - Model C		40.0A	
		25-60A, 2-Pole			
PNL: 20_LP-EC-R1E-OR	CB: 20_IP-OR-1C	GE	THHQB-C	40.0A	Fixed
	Thermal Magnetic	THHQB - Model C		40.0A	
		25-60A, 2-Pole			
PNL: 20_LP-EC-R1E-OR	CB: 20_IP-OR-2A	GE	THHQB-C	40.0A	Fixed
	Thermal Magnetic	THHQB - Model C		40.0A	
		25-60A, 2-Pole			
PNL: 20_LP-EC-R1E-OR	CB: 20_IP-OR-2B	GE	THHQB-C	40.0A	Fixed
	Thermal Magnetic	THHQB - Model C		40.0A	
		25-60A, 2-Pole			
PNL: 20_L-EC-RBE-A	CB: 20_L-EC-RBE-A Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		225.0A	
		100-225A			
PNL: 20_LL-EC-R1E	CB: 20_LL-EC-R1E Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LL-EC-R1E	CB: 20_LL-EC-R1E, R2E, R3E	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		225.0A	
		100-225A			
PNL: 20_DP-LL-EC-R1E	CB: 20_LL-EC-R1E-OR	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_LL-EC-R1N	CB: 20_LL-EC-R1N Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LL-EC-R1E	CB: 20_LL-EC-R1N, R2N	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 20_LL-EC-R1S	CB: 20_LL-EC-R1S Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LL-EC-R1E	CB: 20_LL-EC-R1S, R2S	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		225.0A	
		100-225A			
PNL: 20_LL-EC-R1W	CB: 20_LL-EC-R1W Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		225.0A	
		100-225A			
PNL: 20_LL-EC-R2E	CB: 20_LL-EC-R2E Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_LL-EC-R2N	CB: 20_LL-EC-R2N Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_LL-EC-R2S	CB: 20_LL-EC-R2S Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		225.0A	
		100-225A			
PNL: 20_LL-EC-R2W	CB: 20_LL-EC-R2W Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_DP-LL-EC-R1E	CB: 20_LL-EC-R2W, R3W	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_LL-EC-R3E	CB: 20_LL-EC-R3E Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_LL-EC-R3W	CB: 20_LL-EC-R3W Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LL-EC-R1E	CB: 20_LL-EC-RB-EA, EB	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		225.0A	
		100-225A			
PNL: 20_LL-EC-RBW	CB: 20_LL-EC-RBW Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		225.0A	
		100-225A			
PNL: 20_DP-LL-EC-R1E	CB: 20_LL-EC-RBW, R1W	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		225.0A	
		100-225A			
PNL: 20_DP-LL-ES-R1E	CB: 20_LL-ES-GEN 5 (BLDG 21)	GE	THED	80.0A	Fixed
	Thermal Magnetic	THED		80.0A	
		15-150A			
PNL: 20_LL-ES-R1E	CB: 20_LL-ES-R1E Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		80.0A	
		15-100A			
PNL: 20_DP-LL-ES-R1E	CB: 20_LL-ES-R1E, R4E	GE	THED	80.0A	Fixed
	Thermal Magnetic	THED		80.0A	



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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		15-150A			
PNL: 20_LL-ES-R4E	CB: 20_LL-ES-R4E Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		80.0A	
		15-100A			
PNL: 20_LL-ES-R4W	CB: 20_LL-ES-R4W Main	GE	THHQB	50.0A	Fixed
	Thermal Magnetic	THHQB		50.0A	
		15-100A			
PNL: 20_DP-LR-N-RBE	CB: 20_LL-N-R1E	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_LL-N-R1E	CB: 20_LL-N-R1E Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-HR-N-R2W-A	CB: 20_LL-N-R2W, R3W	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_LL-N-R3E	CB: 20_LL-N-R3E Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_LL-N-R3W	CB: 20_LL-N-R3W Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-RBE	CB: 20_LL-N-RBE	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
SWBD: 20_DP-LR-N-RBW	CB: 20_LL-N-RBW	GE	TFJ	110.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		100.0A	INST (6-12.5 x Trip) HI (1250A)
		70-225A			
PNL: 20_DP-LR-N-R1W	CB: 20_LL-N-R1W	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_LP-EC-R1E-OR	CB: 20_LP-EC-R1E-OR Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_9A1LCL2	CB: 20_Ltg Poles North	SIEMENS	BLH	40.0A	Thermal Curve (Fixed)
	Thermal Magnetic	BLH, 2 & 3-Pole		40.0A	INST Fixed (425A)
		15-100A			
SWBD: 20_Sub: J	CB: 20_MCC-HP-N-R3E	GE	TJH	600.0A	Phase
	Static Trip	TJH, MVT RMS-9		600.0A	LTPU (0.5-1.0 x P) 1 (600A)
		LSI, 60-600A		600.0A	LTD (1-4) 1
					STPU (1.5-9 x LTPU) 1.5 (900A)
					STD (Min-Max) Min (I <sup>2</sup> t Out)
					INST (1.5-15 x P) 15 (9000A)
					Ground
					GFPD (0.2-0.6 x S) 0.6 (360A)
					GFD (Min-Max) Min (I <sup>2</sup> t In)
PNL: 20_LL-N-RBE	CB: 20_MICRO SUPPLY	GE	THHQB	50.0A	Fixed
	Thermal Magnetic	THHQB		40.0A	

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
		15-100A			
PNL: 20_LL-N-RBE	CB: 20_MICRO SUPPLY-2	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		60.0A	
		15-100A			
MCC: 20_HP-N-R3E-SEC-1	CB: 20_PUMP-11	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		30.0A	
		15-150A			
SWBD: 20_DP-LR-N-RIE	CB: 20_R1E-1114	GE	TFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		125.0A	INST (5-10 x Trip) HI (1250A)
		70-225A			
PNL: 20_R1E-1114	CB: 20_R1E-1114 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
SWBD: 20_DP-LR-N-RIE	CB: 20_R1E-1116	GE	TFJ	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		225.0A	INST (4.5-10 x Trip) HI (2250A)
		70-225A			
PNL: 20_R1E-1116	CB: 20_R1E-1116 MAIN	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		225.0A	
		100-225A			
SWBD: 20_DP-LR-N-RIE	CB: 20_R1E-1117	GE	TFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		125.0A	INST (5-10 x Trip) HI (1250A)
		70-225A			
PNL: 20_R1E-1117	CB: 20_R1E-1117 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
SWBD: 20_DP-LR-N-RIE	CB: 20_R1E-1119	GE	TFJ	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		175.0A	INST (4.5-10 x Trip) HI (1750A)
		70-225A			
PNL: 20_R1E-1119	CB: 20_R1E-1119 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
SWBD: 20_DP-LR-N-RIE	CB: 20_R1E-1126	GE	TFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		125.0A	INST (5-10 x Trip) HI (1250A)
		70-225A			
PNL: 20_R1E-1126	CB: 20_R1E-1126 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		225.0A	
		100-225A			
SWBD: 20_DP-LR-N-RIE	CB: 20_R1E-1134	GE	TFJ	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		175.0A	INST (4.5-10 x Trip) HI (1750A)
		70-225A			
PNL: 20_R1E-1134	CB: 20_R1E-1134 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
SWBD: 20_DP-LR-N-RIE	CB: 20_R1E-1136	GE	TFJ	125.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		125.0A	INST (5-10 x Trip) HI (1250A)
		70-225A			

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PNL: 20_R1E-1136	CB: 20_R1E-1136 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
SWBD: 20_DP-LR-N-RIE	CB: 20_R1E-1138	GE	TFJ	110.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		100.0A	INST (6-12.5 x Trip) HI (1250A)
		70-225A			
PNL: 20_R1E-1138	CB: 20_R1E-1138 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R1W	CB: 20_R1W-1102	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_R1W-1102	CB: 20_R1W-1102 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_DP-LR-N-R1W	CB: 20_R1W-1105	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_R1W-1105	CB: 20_R1W-1105 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_DP-LR-N-R1W	CB: 20_R1W-1107	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R1W-1107	CB: 20_R1W-1107 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R1W	CB: 20_R1W-1109	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_R1W-1109	CB: 20_R1W-1109 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_DP-LR-N-R1W	CB: 20_R1W-1110	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R1W-1110	CB: 20_R1W-1110 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_R1W-1111B (SEC-1)	CB: 20_R1W-1111-B (SEC-1) Main	GE	TJD	400.0A	Fixed
	Thermal Magnetic	TJD		250.0A	
		250-400A			
PNL: 20_DP-LR-N-R1W	CB: 20_R1W-1111B	GE	TJD	400.0A	Fixed
	Thermal Magnetic	TJD		250.0A	
		250-400A			
PNL: 20_DP-LR-N-R1W	CB: 20_R1W-1112	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	

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		100-225A			
PNL: 20_R1W-1112	CB: 20_R1W-1112 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_DP-LR-N-R1W	CB: 20_R1W-1140	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R1W-1140	CB: 20_R1W-1140 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R1W	CB: 20_R1W-1142	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R1W-1142	CB: 20_R1W-1142 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R1W	CB: 20_R1W-1144	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_R1W-1144	CB: 20_R1W-1144 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_DP-LR-N-R2E	CB: 20_R2E-2115	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2E-2115	CB: 20_R2E-2115 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R2E	CB: 20_R2E-2116	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2E-2116	CB: 20_R2E-2116 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R2E	CB: 20_R2E-2117	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_R2E-2117	CB: 20_R2E-2117 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_DP-LR-N-R2E	CB: 20_R2E-2118	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2E-2118	CB: 20_R2E-2118 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			

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PNL: 20_DP-LR-N-R2E	CB: 20_R2E-2119	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_R2E-2119	CB: 20_R2E-2119 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_DP-LR-N-R2E	CB: 20_R2E-2123	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2E-2123	CB: 20_R2E-2123 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R2E	CB: 20_R2E-2128	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_R2E-2128	CB: 20_R2E-2128 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_DP-LR-N-R2E	CB: 20_R2E-2133	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2E-2133	CB: 20_R2E-2133 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R2E	CB: 20_R2E-2135	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2E-2135	CB: 20_R2E-2135 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R2E	CB: 20_R2E-2136	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_R2E-2136	CB: 20_R2E-2136 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_DP-LR-N-R2E	CB: 20_R2E-2137	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2E-2137	CB: 20_R2E-2137 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R2E	CB: 20_R2E/R3E	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_DP-HR-N-R2W-A	CB: 20_R2W-2102	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	

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		15-150A			
PNL: 20_R2W-2102	CB: 20_R2W-2102 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R2W-B	CB: 20_R2W-2105	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2W-2105	CB: 20_R2W-2105 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R2W-B	CB: 20_R2W-2107	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_R2W-2107	CB: 20_R2W-2107 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_DP-LR-N-R2W-B	CB: 20_R2W-2109	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2W-2109	CB: 20_R2W-2109 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-HR-N-R2W-A	CB: 20_R2W-2110	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2W-2110	CB: 20_R2W-2110 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R2W-B	CB: 20_R2W-2111	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2W-2111	CB: 20_R2W-2111 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-HR-N-R2W-A	CB: 20_R2W-2112	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2W-2112	CB: 20_R2W-2112 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R2W-B	CB: 20_R2W-2113	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_R2W-2113	CB: 20_R2W-2113 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			

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PNL: 20_DP-HR-N-R2W-A	CB: 20_R2W-2114	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2W-2114	CB: 20_R2W-2114 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-HR-N-R2W-A	CB: 20_R2W-2138	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_R2W-2138	CB: 20_R2W-2138 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-R2W-B	CB: 20_R2W-2139	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_R2W-2139	CB: 20_R2W-2139 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_DP-HR-N-R2W-A	CB: 20_R2W-2140	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_R2W-2140	CB: 20_R2W-2140 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_DP-LR-N-R2W-B	CB: 20_R2W-2143	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_R2W-2143	CB: 20_R2W-2143 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		125.0A	
		100-225A			
PNL: 20_DP-HR-N-R2W-A	CB: 20_R2W-2144	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_R2W-2144	CB: 20_R2W-2144 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_RBE-121	CB: 20_RBE-121 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-RBE	CB: 20_RBE-B121	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_DP-LR-N-RBE	CB: 20_RBE-B124	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_RBE-B124	CB: 20_RBE-B124 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	

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		100-225A			
PNL: 20_DP-LR-N-RBE	CB: 20_RBE-B124G	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_RBE-B124G	CB: 20_RBE-B124G Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-RBE	CB: 20_RBE-B126	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_RBE-B126	CB: 20_RBE-B126 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 20_DP-LR-N-RBE	CB: 20_RBE-B146	GE	THED	100.0A	Fixed
	Thermal Magnetic	THED		100.0A	
		15-150A			
PNL: 20_RBE-B146	CB: 20_RBE-B146 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
SWBD: 20_DP-LR-N-RBW	CB: 20_RBW-B101	GE	TFJ	110.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		100.0A	INST (6-12.5 x Trip) HI (1250A)
		70-225A			
PNL: 20_RBW-B101	CB: 20_RBW-B101 Main	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
SWBD: 20_DP-LR-N-RBW	CB: 20_RBW-B116	GE	TFJ	225.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TFJ		175.0A	INST (4.5-10 x Trip) HI (1750A)
		70-225A			
PNL: 20_RBW-B116	CB: 20_RBW-B116 Main	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		175.0A	
		100-225A			
PNL: 20_R1E-1126	CB: 20_SPECIAL PURP	GE	THHQB	50.0A	Fixed
	Thermal Magnetic	THHQB		30.0A	
		15-100A			
PNL: 20_R2E-2128	CB: 20_SPECIAL PURPOSE	GE	THHQB	50.0A	Fixed
	Thermal Magnetic	THHQB		30.0A	
		15-100A			
PNL: 20_R2E-2117	CB: 20_SPECIAL PURPOSE-	GE	THHQB	50.0A	Fixed
	Thermal Magnetic	THHQB		30.0A	
		15-100A			
PNL: 20_LL-N-RBW	CB: 20_STERILIZER	GE	THHQB	20.0A	Fixed
	Thermal Magnetic	THHQB		20.0A	
		15-100A			
SWBD: 20_Sub: J	CB: 20_Sub: J Main	GE	TP	3000.0A	Phase
	Static Trip	TP & THP, MVT RMS-9		3000.0A	LTPU (0.5-1.0 x P) 0.8 (2400A)
		LSI, 2500-3000A Sensors		3000.0A	LTD (1-4) 1
					STPU (1.5-9 x LTPU) 3 (7200A)



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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
					STD (Min-Max) Int (I <sup>2</sup> t Out)
					INST (1.5-13 x P) 13 (39000A)
					Ground
					GFP (0.2-0.37 x S) 0.26 (780A)
					GFD (Min-Max) Max (I <sup>2</sup> t In)
SWBD: 20_Sub: J	CB: 20_SW-LR-N-RBW	GE	TJH	400.0A	Phase
	Static Trip	TJH, MVT RMS-9		400.0A	LTPU (0.5-1.0 x P) 1 (400A)
		LSI, 60-600A		400.0A	LTD (1-4) 4
					STPU (1.5-9 x LTPU) 7 (2800A)
					STD (Min-Max) Min (I <sup>2</sup> t Out)
					INST (1.5-15 x P) 10 (4000A)
					Ground
					GFP (0.2-0.6 x S) 0.2 (80A)
					GFD (Min-Max) Min (I <sup>2</sup> t In)
PNL: 20_HL-ES-R1W	CB: 20_TR-LL-ES-R3W	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
SWBD: 20_Sub: J	CB: 20_TR-LR-N-R1E	GE	TJH	400.0A	Phase
	Static Trip	TJH, MVT RMS-9		400.0A	LTPU (0.5-1.0 x P) 1 (400A)
		LSI, 60-600A		400.0A	LTD (1-4) 4
					STPU (1.5-9 x LTPU) 5 (2000A)
					STD (Min-Max) Min (I <sup>2</sup> t Out)
					INST (1.5-15 x P) 10 (4000A)
					Ground
					GFP (0.2-0.6 x S) 0.2 (80A)
					GFD (Min-Max) Min (I <sup>2</sup> t In)
PNL: 20_HP-N-R1E	CB: 20_TRANE UNIT HTR	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		20.0A	
		15-150A			
PNL: 20_9A1LCL1	CB: 20_UH-East	SIEMENS	BLH	40.0A	Thermal Curve (Fixed)
	Thermal Magnetic	BLH, 2 & 3-Pole		40.0A	INST Fixed (425A)
		15-100A			
PNL: 20_9A1LCL1	CB: 20_UH-North	SIEMENS	BLH	40.0A	Thermal Curve (Fixed)
	Thermal Magnetic	BLH, 2 & 3-Pole		40.0A	INST Fixed (425A)
		15-100A			
PNL: 20_9A1LCL1	CB: 20_UH-South	SIEMENS	BLH	40.0A	Thermal Curve (Fixed)
	Thermal Magnetic	BLH, 2 & 3-Pole		40.0A	INST Fixed (425A)
		15-100A			
PNL: 20_HP-EE-R1E (SEC-2)	CB: 20_UNKOWN	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HL-N-RBW	CB: 20_UNKOWN2	GE	TEY	20.0A	Fixed
	Thermal Magnetic	TEY		20.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HP-EE-R1E (SEC-2)	CB: 20_WALKIN COOLER	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HP-EE-R1E (SEC-2)	CB: 20_WALKIN COOLER-2	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			

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PNL: 20_HP-EE-R1E (SEC-2)	CB: 20_WALKIN COOLER-3	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HP-EE-R1E (SEC-2)	CB: 20_WALKIN COOLER-4	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HP-EE-R1E (SEC-2)	CB: 20_WALKIN COOLER-5	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HP-EE-R1E (SEC-2)	CB: 20_WALKIN COOLER-6	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HP-EE-R1E (SEC-2)	CB: 20_WALKIN COOLER-7	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HP-EE-R1E (SEC-2)	CB: 20_WALKIN COOLER-8	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
PNL: 20_HP-EE-R1E (SEC-2)	CB: 20_WALKIN FREEZER	GE	TEY	15.0A	Fixed
	Thermal Magnetic	TEY		15.0A	
		15-100A, 2 & 3-Pole			
DISC: 20_XF DP-LR-N-RBW	CB: 20_XF DP-LR-N-RBW	GE	TJK	400.0A	Thermal Curve (Fixed)
	Thermal Magnetic	TJK		350.0A	INST (3-10 x Trip) HI (3500A)
		125-600A			
PNL: 20_DP-HL-ES-R1E	CB: 20_XF-DP-LL-ES-R1E	GE	THED	80.0A	Fixed
	Thermal Magnetic	THED		70.0A	
		15-150A			
PNL: 21_LL-ES-GEN 5	CB: 21_Compressor	GE	THHQB	20.0A	Fixed
	Thermal Magnetic	THHQB		20.0A	
		15-100A			
DISC: 20_LL-ES-R4W	CB: 21_Disc LL-ES-R4W	GE	THED	50.0A	Fixed
	Thermal Magnetic	THED		30.0A	
		15-150A			
BUS-0197	CB: 21_Gen 21 Output Brkr	GE	TKL	1200.0A	LTPU (0.5-1.0 x P) 1 (1200A)
	Static Trip	TKH & TKL, MVT RMS-9		1200.0A	LTD (1-4) 4
		LSI, 300-1200A		1200.0A	STPU (1.5-9 x LTPU) 7 (8400A)
					STD (Min-Max) Int (I^2t Out)
					INST (1.5-15 x P) 7 (8400A)
PNL: 21_LL-ES-GEN 5	CB: 21_LL-ES-GEN 5 MAIN	GE	THHQB	100.0A	Fixed
	Thermal Magnetic	THHQB		100.0A	
		15-100A			
PNL: 21_LL-ES-GEN 5	CB: 21_Unit Htr	GE	THQB	50.0A	Fixed
	Thermal Magnetic	THQB		50.0A	
		15-100A			
PNL: 20_DP-LL-EC-R1E	CB: 9A1LCL1 (SS 23KV)	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		225.0A	
		100-225A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 20_DP-LL-EC-R1E	CB: 9A1LCL2 (SUB STATION 2)	GE	THQD	225.0A	Fixed
	Thermal Magnetic	THQD		225.0A	
		100-225A			
BUS-0197	GEN: 21_1 OL	Generic	700kW	1052.0A	10-60 sec
	Specialty Device	Synchronous Generator			Abv 60 sec
		PMG Long Time			
Relays					
Bus Connected	Name/Type	Description		CT Ratio (A)	Settings
SWGR: 9B	R: DR/F9_50/51-F9	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 9 (720A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3
					50PIP(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 9 (720A)
					U4, Extremely Inverse 3
					50PIP(0.25-100 x CTR) 14 (1120A)
MCP					
Bus Connected			Name/Type	Description	
MCC: 20_HP-N-R3E SEC-2	MCP: 20_CHW-4	GE	TEC	INST (LO-HI) 215 (215A)	
	Circuit Protector	TEC Mag-Break			
		30A			
MCC: 20_HP-EE=R3E_1	MCP: 20_EF-1	GE	TEC	INST (LO-HI) 10 (340A)	
	Circuit Protector	TEC Mag-Break			
		30A			
MCC: 20_HP-EE=R3E_2	MCP: 20_EF-11	GE	TEC	INST (LO-HI) HI (90A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-EE=R3E_1	MCP: 20_EF-12	GE	TEC	INST (LO-HI) 4 (94A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE=R3E_1	MCP: 20_EF-13	GE	TEC	INST (LO-HI) 4 (94A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE=R3E_1	MCP: 20_EF-14	GE	TEC	INST (LO-HI) 4 (94A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE=R3E_1	MCP: 20_EF-15	GE	TEC	INST (LO-HI) 10 (78A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-EE=R3E_2	MCP: 20_EF-16	GE	TEC	INST (LO-HI) 4 (94A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE-R3W_1	MCP: 20_EF-18	GE	TEC	INST (LO-HI) 8 (66A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-EE-R3W_1	MCP: 20_EF-19	GE	TEC	INST (LO-HI) 4 (42A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-EE=R3E_1	MCP: 20_EF-2	GE	TEC	INST (LO-HI) 4 (42A)	

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-EE-R3W_2	MCP: 20_EF-20	GE	TEC	INST (LO-HI) 4 (42A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-EE-R3W_1	MCP: 20_EF-21	GE	TEC	INST (LO-HI) 4 (94A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE-R3W_2	MCP: 20_EF-22	GE	TEC	INST (LO-HI) 48 (48A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-EE-R3W_1	MCP: 20_EF-23	GE	TEC	INST (LO-HI) 48 (48A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-EE-R3W_1	MCP: 20_EF-24	GE	TEC	INST (LO-HI) 107 (107A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE-R3W_1	MCP: 20_EF-25	GE	TEC	INST (LO-HI) 133 (133A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE-R3W_1	MCP: 20_EF-26	GE	TEC	INST (LO-HI) 48 (48A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-EE-R3W_1	MCP: 20_EF-27	GE	TEC	INST (LO-HI) 4 (94A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE-R3W_2	MCP: 20_EF-28	GE	TEC	INST (LO-HI) 8 (66A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-EE-R3W_1	MCP: 20_EF-29	GE	TEC	INST (LO-HI) 8 (66A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-EE-R3E_2	MCP: 20_EF-3	GE	TEC	INST (LO-HI) 8 (290A)	
	Circuit Protector	TEC Mag-Break			
		30A			
MCC: 20_HP-EE-R3E_2	MCP: 20_EF-30	GE	TEC	INST (LO-HI) 20.5 (20.5A)	
	Circuit Protector	TEC Mag-Break			
		3A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_EF-31	GE	TEC	INST (LO-HI) 4 (18A)	
	Circuit Protector	TEC Mag-Break			
		3A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_EF-32	GE	TEC	INST (LO-HI) 4 (18A)	
	Circuit Protector	TEC Mag-Break			
		3A			
MCC: 20_HP-EE-R3W_1	MCP: 20_EF-39	GE	TEC	INST (LO-HI) 25.5 (25.5A)	
	Circuit Protector	TEC Mag-Break			
		3A			

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MCC: 20_HP-EE=R3E_1	MCP: 20_EF-4	GE	TEC	INST (LO-HI) 4 (190A)	
	Circuit Protector	TEC Mag-Break			
		30A			
MCC: 20_HP-EE-R3W_1	MCP: 20_EF-5	GE	TEC	INST (LO-HI) 6 (420A)	
	Circuit Protector	TEC Mag-Break			
		50A			
MCC: 20_HP-EE-R3W_1	MCP: 20_EF-6	GE	TEC	INST (LO-HI) 10 (340A)	
	Circuit Protector	TEC Mag-Break			
		30A			
MCC: 20_HP-EE-R3W_2	MCP: 20_EF-7	GE	TEC	INST (LO-HI) 365 (365A)	
	Circuit Protector	TEC Mag-Break			
		30A			
MCC: 20_HP-EE=R3E_1	MCP: 20_EF-8	GE	TEC	INST (LO-HI) 81 (81A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE=R3E_2	MCP: 20_EF-9	GE	TEC	INST (LO-HI) 4 (94A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE=R3E_1	MCP: 20_EX-10	GE	TEC	INST (LO-HI) 48 (48A)	
	Circuit Protector	TEC Mag-Break			
		7A			
BUS-0119	MCP: 20_FP ATS N	SIEMENS	ED6	INST (315-1000A) HI (1000A)	
	Circuit Protector	ED6 Sentron ETI			
		100A (315-1000A Inst)			
MCC: 20_HP-EE=R3E_1	MCP: 20_GLY COND PUMP	GE	TEC	INST (LO-HI) 8 (28A)	
	Circuit Protector	TEC Mag-Break			
		3A			
MCC: 20_HP-EE=R3E_2	MCP: 20_GLY COND PUMP-2	GE	TEC	INST (LO-HI) 107 (107A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_HEAT RECOV PUMP-3	GE	TEC	INST (LO-HI) 6 (54A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_HEAT RECOV PUMP-3	GE	TEC	INST (LO-HI) 48 (48A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_HEAT RECOV PUMP-3	GE	TEC	INST (LO-HI) 4 (42A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_HEAT RECOV PUMP-3	GE	TEC	INST (LO-HI) 4 (42A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_HEAT RECOV PUMP-3	GE	TEC	INST (LO-HI) 4 (42A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_HEAT RECOV PUMP-3	GE	TEC	INST (LO-HI) 4 (42A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_HEAT RECOV PUMP-3	GE	TEC	INST (LO-HI) 4 (42A)	

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-EE=R3E_1	MCP: 20_HW-REHEAT	GE	TEC	INST (LO-HI) 6 (120A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE=R3E_2	MCP: 20_HW-REHEAT-2	GE	TEC	INST (LO-HI) 6 (120A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE=R3E_2	MCP: 20_P34	GE	TEC	INST (LO-HI) 30.5 (30.5A)	
	Circuit Protector	TEC Mag-Break			
		3A			
MCC: 20_HP-EE=R3E_2	MCP: 20_P35	GE	TEC	INST (LO-HI) 60 (60A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-EE=R3E_1	MCP: 20_PREHEAT GLY PUMP	GE	TEC	INST (LO-HI) 8 (146A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE=R3E_2	MCP: 20_PREHEAT GLY PUMP	GE	TEC	INST (LO-HI) 6 (120A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-N-R3E-SEC-2	MCP: 20_PRI-COND-CCU-1 (P-3	GE	TEC	INST (LO-HI) 10 (580A)	
	Circuit Protector	TEC Mag-Break			
		50A			
MCC: 20_HP-N-R3E-SEC-1	MCP: 20_PUMP-12	GE	TEC	INST (LO-HI) 4 (18A)	
	Circuit Protector	TEC Mag-Break			
		3A			
MCC: 20_HP-N-R3E-SEC-1	MCP: 20_PUMP-13	GE	TEC	INST (LO-HI) 4 (18A)	
	Circuit Protector	TEC Mag-Break			
		3A			
MCC: 20_HP-N-R3E-SEC-1	MCP: 20_PUMP-15	GE	TEC	INST (LO-HI) 4 (42A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E-SEC-1	MCP: 20_PUMP-16	GE	TEC	INST (LO-HI) 60 (60A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E-SEC-1	MCP: 20_PUMP-17	GE	TEC	INST (LO-HI) 4 (42A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E-SEC-1	MCP: 20_PUMP-18	GE	TEC	INST (LO-HI) 4 (42A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E-SEC-1	MCP: 20_PUMP-19	GE	TEC	INST (LO-HI) 48 (48A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E-SEC-1	MCP: 20_PUMP-20	GE	TEC	INST (LO-HI) 4 (42A)	
	Circuit Protector	TEC Mag-Break			
		7A			

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
MCC: 20_HP-N-R3E-SEC-1	MCP: 20_PUMP-21	GE	TEC	INST (LO-HI) 6 (54A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E-SEC-1	MCP: 20_PUMP-22	GE	TEC	INST (LO-HI) 4 (42A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E-SEC-1	MCP: 20_PUMP-23	GE	TEC	INST (LO-HI) 2 (30A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E-SEC-1	MCP: 20_PUMP-24	GE	TEC	INST (LO-HI) 2 (30A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E-SEC-1	MCP: 20_PUMP-6 CHILL WTR	GE	TEC	INST (LO-HI) 4 (190A)	
	Circuit Protector	TEC Mag-Break			
		30A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_PUMP-7 COND WTR	GE	TEC	INST (LO-HI) 380 (380A)	
	Circuit Protector	TEC Mag-Break			
		50A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_PUMP-8 CHILL WTR	GE	TEC	INST (LO-HI) 165 (165A)	
	Circuit Protector	TEC Mag-Break			
		30A			
MCC: 20_HP-EE=R3E_2	MCP: 20_SF-3	GE	TEC	INST (LO-HI) HI (660A)	
	Circuit Protector	TEC Mag-Break			
		50A			
MCC: 20_HP-EE=R3E_2	MCP: 20_SF-4	GE	TEC	INST (LO-HI) 4 (636A)	
	Circuit Protector	TEC Mag-Break			
		100A			
MCC: 20_HP-EE-R3W_2	MCP: 20_SF-5	GE	TEC	INST (LO-HI) 10 (580A)	
	Circuit Protector	TEC Mag-Break			
		50A			
MCC: 20_HP-EE-R3W_2	MCP: 20_SF-6	GE	TEC	INST (LO-HI) 8 (972A)	
	Circuit Protector	TEC Mag-Break			
		100A			
MCC: 20_HP-EE-R3W_1	MCP: 20_SF-7	GE	TEC	INST (LO-HI) HI (660A)	
	Circuit Protector	TEC Mag-Break			
		50A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_STBY-COND-W (P-5)	GE	TEC	INST (LO-HI) 4 (340A)	
	Circuit Protector	TEC Mag-Break			
		50A			
MCC: 20_HP-EE=R3E_1	MCP: 20_SUPPLY FAN 1	GE	TEC	INST (LO-HI) 10 (340A)	
	Circuit Protector	TEC Mag-Break			
		30A			
MCC: 20_HP-EE=R3E_1	MCP: 20_SUPPLY FAN 2	GE	TEC	INST (LO-HI) HI (90A)	
	Circuit Protector	TEC Mag-Break			
		7A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_TOWER-NS-CT2	GE	TEC	INST (LO-HI) 620 (620A)	

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Circuit Protector	TEC Mag-Break			
		50A			
MCC: 20_HP-N-R3E SEC-2	MCP: 20_TOWER-SS-CT1	GE	TEC	INST (LO-HI) HI (660A)	
	Circuit Protector	TEC Mag-Break			
		50A			
MCC: 20_HP-EE=R3E_1	MCP: 20_WALK IN COOLER	GE	TEC	INST (LO-HI) 6 (120A)	
	Circuit Protector	TEC Mag-Break			
		15A			
MCC: 20_HP-EE=R3E_2	MCP: 20_WATER TWR PUMP	GE	TEC	INST (LO-HI) 10 (78A)	
	Circuit Protector	TEC Mag-Break			
		7A			
Fuses					
Bus Connected	Name/Type	Description		Cartridge/Trip	
DISC:20_F-21 Elev East	FU: 20_Disc Elev East	BUSSMANN	FRS-R	80.0A	
	Low Voltage	FRS-R, 600V Class RK5		80.0A	
		1-600A			
DISC:20_F-21 Elev West	FU: 20_Disc Elev West	LITTELFUSE	FLSR	200.0A	
	Low Voltage	FLSR, 600V RK5		125.0A	
		15-600A			
DISC: 20_Jockey Pump	FU: 20_Jockey Pump	CEFCON	CRS	30.0A	
	Low Voltage	CRS		30.0A	
		15-600A, WW Mod			
SWGR: 20_MVS02	FU: 20_USS-20	GE	EJO-1	200.0A	200 Amps
	High Voltage	9F62 EJO-1, 5.5kV		200.0A	
		25-900A			
Switches					
Bus Connected	Name/Type	Description			
SWGR: 20_MVS02	SW: 20_MVS02_F9				
	Load Break Switch				



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**Sub 15**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_5NLC-5	CB: 1-AHU-1	SQUARE D	QO-VH	100.0A	Fixed (730-8)
	Thermal Magnetic	QO-VH, 3-Pole		100.0A	
		15-150A			
PNL: 1_5NLC-5	CB: 1-EX-Fan	SQUARE D	QO-VH	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO-VH, 3-Pole		15.0A	
		15-150A			
DISC: 1_10LNL1-B	CB: 1_10LNL1-B	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_10LNL1-C	CB: 1_10LNL1-C	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_10LNL1-D	CB: 1_10LNL1-D	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_5LNL1-A	CB: 1_5LNL1-A	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_5LNL1-B	CB: 1_5LNL1-B	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_5LNL1-C	CB: 1_5LNL1-C	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_5LNL1-D	CB: 1_5LNL1-D	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_6LNL1-A	CB: 1_6LNL1-A	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_6LNL1-B	CB: 1_6LNL1-B	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_6LNL1-C	CB: 1_6LNL1-C	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_6LNL1-D	CB: 1_6LNL1-D	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_7LNL1-A	CB: 1_7LNL1-A	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_7LNL1-B	CB: 1_7LNL1-B	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_8LNL1-A	CB: 1_8LNL1-A	SQUARE D	FA	100.0A	Fixed

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Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_8LNL1-B	CB: 1_8LNL1-B	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_8LNL1-C	CB: 1_8LNL1-C	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_8LNL1-D	CB: 1_8LNL1-D	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_9LNL1-B	CB: 1_9LNL1-B	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_9LNL1-C	CB: 1_9LNL1-C	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_9LNL1-D	CB: 1_9LNL1-D	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
SWBD: 1_USS-S15	CB: 1_1_Pnl: 4LNL1-B	SQUARE D	LA	400.0A	Thermal Curve
	Thermal Magnetic	LA		300.0A	INST LO (1500A)
		125-400A			
PNL: 1_4LNL1-B	CB: 1_4LNL1-B Main	SQUARE D	QD	100.0A	Fixed
	Thermal Magnetic	QD		100.0A	
		70-250A			
DISC: 1_7LNL1-C	CB: 1_7LNL1-C	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_7LNL1-D	CB: 1_7LNL1-D	SQUARE D	FA	100.0A	Fixed
	Thermal Magnetic	FA		100.0A	
		15-100A			
DISC: 1_9LNL1-A	CB: 1_9LNL1-A	SQUARE D	QD	200.0A	Fixed
	Thermal Magnetic	QD		200.0A	
		70-250A			
PNL: 1_9LNL1-A	CB: 1_9LNL1-A Main	SQUARE D	QD	200.0A	Fixed
	Thermal Magnetic	QD		200.0A	
		70-250A			
SWBD: 1_USS-S15	CB: 1_A-wing 5-7	SQUARE D	KA	250.0A	Thermal Curve
	Thermal Magnetic	KA		225.0A	INST LO (1125A)
		70-250A			
SWBD: 1_USS-S15	CB: 1_A-wing 8-9	SQUARE D	KA	250.0A	Thermal Curve
	Thermal Magnetic	KA		225.0A	INST LO (1125A)
		70-250A			
PNL: 1_4LNL1-B	CB: 1_AHU-1	SQUARE D	QO-VH	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO-VH, 3-Pole		20.0A	
		15-150A			

**Buffalo VAMC Arc Flash Remediation**

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**Section 00 01 16 Appendix 7 - Protective Device Settings**

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**Sub 15**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_9LNL1-A	CB: 1_AHU-RF	SQUARE D	QO-VH	30.0A	Fixed (730-5, 30A)
	Thermal Magnetic	QO-VH, 3-Pole		30.0A	
		15-150A			
PNL: 1_4LNL1-B	CB: 1_AHU-RF2	SQUARE D	QO-VH	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO-VH, 3-Pole		20.0A	
		15-150A			
PNL: 1_9LNL1-A	CB: 1_AHU-SF	SQUARE D	QO-VH	90.0A	Fixed (730-8)
	Thermal Magnetic	QO-VH, 3-Pole		90.0A	
		15-150A			
SWBD: 1_USS-S15	CB: 1_B-wing 5-7	SQUARE D	KA	250.0A	Thermal Curve
	Thermal Magnetic	KA		225.0A	INST 0
		70-250A			
SWBD: 1_USS-S15	CB: 1_B-wing 8-10	SQUARE D	KA	250.0A	Thermal Curve
	Thermal Magnetic	KA		225.0A	INST LO (1125A)
		70-250A			
SWBD: 1_USS-S15	CB: 1_C-wing 5-7	SQUARE D	KA	250.0A	Thermal Curve
	Thermal Magnetic	KA		225.0A	INST LO (1125A)
		70-250A			
SWBD: 1_USS-S15	CB: 1_C-wing 8-10	SQUARE D	KA	250.0A	Thermal Curve
	Thermal Magnetic	KA		225.0A	INST LO (1125A)
		70-250A			
SWBD: 1_USS-S15	CB: 1_Canteen AHU	SQUARE D	FH	25.0A	Fixed
	Thermal Magnetic	FH		25.0A	
		15-100A			
SWBD: 1_USS-S15	CB: 1_Canteen Cond	SQUARE D	KA	150.0A	Thermal Curve
	Thermal Magnetic	KA		125.0A	INST LO (625A)
		70-250A			
SWBD: 1_USS-S15	CB: 1_D-wing 5-7	SQUARE D	KA	250.0A	Thermal Curve
	Thermal Magnetic	KA		225.0A	INST LO (1125A)
		70-250A			
SWBD: 1_USS-S15	CB: 1_D-wing 8-10	SQUARE D	KA	250.0A	Thermal Curve
	Thermal Magnetic	KA		225.0A	INST LO (1125A)
		70-250A			
DISC: 1_4LNL1-B	CB: 1_Disc- 4LNL1-B	SQUARE D	QD	100.0A	Fixed
	Thermal Magnetic	QD		100.0A	
		70-250A			
PNL: 1_9LNL1-A	CB: 1_EX Fan Rm 908	SQUARE D	QO-VH	15.0A	Fixed (730-4, 15A)
	Thermal Magnetic	QO-VH, 3-Pole		15.0A	
		15-150A			
SWBD: 1_USS-S15	CB: 1_Pnl-5NLC	SQUARE D	KA	150.0A	Thermal Curve
	Thermal Magnetic	KA		150.0A	INST LO (750A)
		70-250A (Older)			
PNL: 1_5NLC-5	CB: 1_RF-1	SQUARE D	QO-VH	20.0A	Fixed (730-4, 20A)
	Thermal Magnetic	QO-VH, 3-Pole		20.0A	
		15-150A			
PNL: 1_9LNL1-A	CB: 1_Stove	SQUARE D	QO-VH	50.0A	Fixed (730-12)

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**Sub 15**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
	Thermal Magnetic	QO-VH, 3-Pole		50.0A	
		15-150A			
SWBD: 1_USS-S15	CB: 1_USS-S15 Main	SQUARE D	PA	1600.0A	Thermal Curve
	Thermal Magnetic	PA		1600.0A	INST HI (10080A)
		600-2000A			
Relays					
Bus Connected	Name/Type	Description		CT Ratio (A)	Settings
SWGR: 9B	R: DR/F10_50/51-F10	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 9 (720A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3
					50P1P(0.25-100 x CTR) 75 (6000A)
					QT
					51PP(0.25-16.0 x CTR) 9 (720A)
					U4, Extremely Inverse 3
					50P1P(0.25-100 x CTR) 4 (320A)
Fuses					
Bus Connected	Name/Type	Description		Cartridge/Trip	Settings
SWGR:S28_1-MVS01	FU: 28_USS S-15	BUSSMANN	100E	100.0A	100.0 Amps
	High Voltage	55GDMSJD		100.0A	
		10E-125E			
Switches					
Bus Connected	Name/Type	Description			
BUS-0090	SW: 28_USS S-15				
	Load Break Switch				
SWGR:S28_1-MVS01	SW:S28-1-MVS01_F10	Load Break Switch			

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**Sub 22\_28**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
PNL: 1_BPNH1	CB: 1_BPNH1 Main	SQUARE D	LA	400.0A	Thermal Curve
	Thermal Magnetic	LA		350.0A	INST LO (1750A)
		125-400A			
SWBD: 1_USS-S22	CB: 1_Chill wtr pu	SQUARE D	HG	90.0A	Fixed
	Thermal Magnetic	Powerpact HG		90.0A	
		15-150A			
SWBD: 1_USS-S22	CB: 1_Chiller #1 htr	SQUARE D	HG	15.0A	Fixed
	Thermal Magnetic	Powerpact HG		15.0A	
		15-150A			
SWBD: 1_USS-S22	CB: 1_Condenser pu	SQUARE D	HG	150.0A	Fixed
	Thermal Magnetic	Powerpact HG		150.0A	
		15-150A			
PNL: 1_BPNH1	CB: 1_Cooling Twr 3 East Fan	SQUARE D	ED	100.0A	Fixed
	Thermal Magnetic	ED		100.0A	
		15-125A			
PNL: 1_BPNH1	CB: 1_Cooling Twr 3 West Fan	SQUARE D	ED	100.0A	Fixed
	Thermal Magnetic	ED		100.0A	
		15-125A			
PNL: 1_BPNH1	CB: 1_Htr Cooling Twr 3	SQUARE D	ED	40.0A	Fixed
	Thermal Magnetic	ED		40.0A	
		15-125A			
SWBD: 1_USS-S22	CB: 1_North CT	SQUARE D	HG	100.0A	Fixed
	Thermal Magnetic	Powerpact HG		100.0A	
		15-150A			
SWBD: 1_USS-S22	CB: 1_South CT	SQUARE D	HG	100.0A	Fixed
	Thermal Magnetic	Powerpact HG		100.0A	
		15-150A			
SWBD: 1_USS-S22	CB: 1_Standby pu	SQUARE D	HG	150.0A	Fixed
	Thermal Magnetic	Powerpact HG		150.0A	
		15-150A			
SWBD: 1_USS-S22	CB: 1_USS-S22 Main	SQUARE D	RG	2500.0A	Phase
	Static Trip	Powerpact R-Frame, 6.0A/P/H		1600.0A	LTPU/LTD (A 0.4-1.0 x S) 1 (1600A); 0.5
		LSI, 600-2500A, UL			STPU (1.5-10 x LTPU) 1.5 (2400A)
					STD (0-0.4) 0.1 (1^2t In)
					INST (2-15 x S) 2 (3200A)
					Ground
					GFPD (500-1200A) A (500A)
					GFD (0-0.4) 0.1 (1^2t In)
PNL: 28_1LNL1	CB: 28_1LNL1 Main	SQUARE D	Q2H	150.0A	Fixed
	Thermal Magnetic	Q2H		150.0A	
		100-225A			
SWBD: 28_USS 28B	CB: 28_BPNH-1	SQUARE D	LH	400.0A	Thermal Curve
	Thermal Magnetic	LH		350.0A	INST HI (3500A)
		125-400A			
SWBD: 28_USS 28B	CB: 28_CLWP-1	SQUARE D	JG	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		200.0A	INST (5-10 x Trip) High (2000A)
		150-250A, UL			

**Buffalo VAMC Arc Flash Remediation**

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**Sub 22\_28**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
SWBD: 28_USS 28B	CB: 28_CLWP-2	SQUARE D	JD	250.0A	Thermal Curve
	Thermal Magnetic	J-Frame, Powerpact		200.0A	INST (5-10 x Trip) High (2000A)
		150-250A, UL			
SWBD: 28_USS 28B	CB: 28_Ex Fan	SQUARE D	FC	15.0A	Phase
	Thermal Magnetic	FC		15.0A	Fixed
		15-100A			Ground
					GFPD (20-100A) 20 (20A)
					Delay=1
					Fixed Inst 1200A (1200A)
SWBD: 28_USS 28B	CB: 28_Pu-PCW-1	SQUARE D	HG	100.0A	Fixed
	Thermal Magnetic	Powerpact HG		100.0A	
		15-150A			
SWBD: 28_USS 28B	CB: 28_Pu-PCW-2	SQUARE D	HG	100.0A	Fixed
	Thermal Magnetic	Powerpact HG		100.0A	
		15-150A			
SWBD: 28_USS 28B	CB: 28_SCW-1-Bypass	SQUARE D	LH	400.0A	Thermal Curve
	Thermal Magnetic	LH		350.0A	INST LO (1750A)
		125-400A			
SWBD: 28_USS 28B	CB: 28_SCW-2-Bypass	SQUARE D	LH	400.0A	Thermal Curve
	Thermal Magnetic	LH		350.0A	INST LO (1750A)
		125-400A			
SWBD: 28_USS 28B	CB: 28_SCW-3-Bypass	SQUARE D	LH	400.0A	Thermal Curve
	Thermal Magnetic	LH		350.0A	INST 3 (2702A)
		125-400A			
SWBD: 28_USS 28B	CB: 28_Syscom Pnl Con	SQUARE D	HG	60.0A	Fixed
	Thermal Magnetic	HG		60.0A	
		15-150A			
SWBD: 28_USS 28A	CB: 28_USS 28A Main W/G	SQUARE D	PX	1600.0A	Phase
	Static Trip	PX, Micrologic		1600.0A	LTPD (0.5-1.0 x P) 1.0 (1600A)
		LSI, 600-1600A		1600.0A	LTD (2-24 Sec.) 2.0
					STPD (2-8 x P) 2.0 (3200A)
					STD (0.1-0.5 Sec.) .1 (I <sup>2</sup> t In)
					INST (2.5-8 x P) 2.5 (4000A)
					Ground
					GFPD (0.2-0.75 x S) 0.2 (320A)
					GFD (0.1-0.5 Sec.) 0.1
SWBD: 28_USS 28B	CB: 28_XF 1LNL1 W/G	SQUARE D	FC	90.0A	Phase
	Thermal Magnetic	FC		90.0A	Fixed
		15-100A			Ground
					GFPD (20-100A) 20 (20A)
					Delay=1
					Fixed Inst 1200A (1200A)
Relays					
Bus Connected	Name/Type	Description		CT Ratio (A)	Settings
SWGR: 9A_C	R: DR/C1_50/51-C1	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 9 (720A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3
					50P1P(0.25-100 x CTR) 100 (8000A)
					QT
					51PP(0.25-16.0 x CTR) 9 (720A)
					U4, Extremely Inverse 3
					50P1P(0.25-100 x CTR) 11 (880A)

**Buffalo VAMC Arc Flash Remediation**

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**Section 00 01 16 Appendix 7 - Protective Device Settings**

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**Sub 22\_28**

Equipment	Name/Type	Description	Frame/Sensor/Plug		Settings
SWGR: 9B	R: DR/F10_50/51-F10	SEL	SEL-351A	400 / 5	Phase
	Electronic	351A			51PP(0.25-16.0 x CTR) 9 (720A)
		50P/51P/67, 5A nom.			U4, Extremely Inverse 3
					50P1P(0.25-100 x CTR) 75 (6000A)
					QT
					51PP(0.25-16.0 x CTR) 9 (720A)
					U4, Extremely Inverse 3
					50P1P(0.25-100 x CTR) 11 (880A)
Fuses					
Bus Connected			Name/Type	Description	
DISC: 1_North CT	FU: 1_North CT	GOULD SHAWMUT	AJT	100.0A	
	Low Voltage	AJT, 600V Class J		80.0A	
		15-600A			
DISC: 1_South CT	FU: 1_South CT	GOULD SHAWMUT	AJT	100.0A	
	Low Voltage	AJT, 600V Class J		80.0A	
		15-600A			
SWGR:1_S22-1-MVS01	FU: 1_XF USS-S22	BUSSMANN	55GFMSJD	200.0A	200.0 Amps
	High Voltage	55GFMSJD, Type E		200.0A	
		150E-450E			
SWGR:S28_1-MVS01	FU: 28_USS 28A	BUSSMANN	55GFMSJD	150.0A	150.0 Amps
	High Voltage	55GFMSJD, Type E		150.0A	
		150E-450E			
Switches					
Bus Connected	Name/Type	Description			
SWGR:1_S22-1-MVS01	SW:1_S22-1-MVS01_C1				
	Load Break Switch				
SWGR:S28_1-MVS01	SW:S28_1-MVS01_F10				
	Load Break Switch				

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Buffalo - Arc Flash Mitigation Measures  
VA Project No. 528-13-S34

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**SECTION 00 01 17**  
**PHOTOGRAPHS**

SEE ATTACHED SECTION 00 01 17 APPENDIX 8 - PHOTOGRAPHS.

---END---





*Photograph 2: Medium voltage switchgear*



*Photograph 1: Medium voltage switchgear*

**Buffalo VAMC Arc Flash Remediation**  
**Section 00 01 17 Appendix 8 – Photographs**

**Turner Engineering PC**  
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*Photograph 4: USS A\_B*



*Photograph 3: ECB XF\_PGH1*

**Buffalo VAMC Arc Flash Remediation**  
**Section 00 01 17 Appendix 8 – Photographs**

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*Photograph 6: PGH1*



*Photograph 5: ECB 13-233 & 13-238*





*Photograph 7: 13-233*



*Photograph 8: 13-238*

**Buffalo VAMC Arc Flash Remediation**  
**Section 00 01 17 Appendix 8 – Photographs**

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*Photograph 10: USS C\_D*



*Photograph 9: 208A*



*Figure 12: 208B*



*Figure 11: 208B-1*



*Photograph 14: USS G\_H*



*Photograph 13: SEL1-22*





*Photograph 16: SEL-3A*



*Photograph 15: USS E\_F*





*Photograph 17: BP-EM*

**SECTION 01 00 00**  
**GENERAL REQUIREMENTS**

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**SECTION 01 00 00**  
**GENERAL REQUIREMENTS**

**1.1 SAFETY REQUIREMENTS**

Refer to section 01 35 26, SAFETY REQUIREMENTS for safety and infection control requirements.

**1.2 GENERAL INTENTION**

- A. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, and furnish labor and materials and perform work for the arc flash mitigation measures as required by drawings and specifications. The Contractor shall include in their bid for each Contract Line Item Number (CLIN) all premium time work necessary to complete the scope of work. All utility shutdowns will be required to occur on weekends utilizing premium time work hours.

The Contractor shall implement the corrective work identified in the construction documents to implement Arc Flash mitigation measures throughout the VA's Buffalo, NY Medical Center campus. All work shall comply with the following Codes:

- NFPA-70, 2014 National Electrical Code
  - Article **110.16: Arc Flash Hazard Warning**. Electrical equipment, such as switchboards, switchgear, panelboards, industrial control panels, meter socket enclosures, and motor control centers, that are in other than dwelling units, and are likely to require examination, adjustment, servicing, or maintenance while energized, shall be field or factory marked to warn qualified persons of potential electric arc flash hazards. The marking shall meet the requirements in 110.21(B) and shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

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- o Article **700.28: Selective Coordination.** Emergency system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices.

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. The selection shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

- o Article **701.27: Selective Coordination.** Legally required standby system(s) overcurrent devices shall be selectively coordinated with all supply-side overcurrent protective devices.

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. The selection shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

- NFPA-70E, 2015 Standard for Electrical Safety in the Workplace

- o Article **130.5: Arc Flash Risk Assessment.** An arc flash risk assessment shall be performed and shall:

- (1) Determine if an arc flash hazard exists. If an arc flash hazard exists, the risk assessment shall determine:

- a. Appropriate safety-related work practices
    - b. The arc flash boundary
    - c. The PPE to be used within the arc flash boundary

- (2) Be updated when a major modification or renovation takes place. It shall be reviewed periodically, at intervals not to exceed 5 years, to account for changes in the electrical distribution system that could affect the results of the arc flash risk assessment.

- (3) Take into consideration the design of the overcurrent protective device and its opening time, including its condition of maintenance.

- (A) **Documentation.** The results of the arc flash risk assessment shall be documented.

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**(B) Arc Flash Boundary.**

- (1) The arc flash boundary shall be the distance at which the incident energy equals  $5 \text{ J/cm}^2$  ( $1.2 \text{ cal/cm}^2$ ).
- (2) The arc flash boundary shall be permitted to be determined by Table 130.7(C)(15)(A)(b) or Table 130.7(C)(15)(B), when the requirements of these tables apply.

**(C) Arc Flash PPE.** One of the following methods shall be used for the selection of PPE. Either, but not both, methods shall be permitted to be used on the same piece of equipment. The results of an incident energy analysis to specify an arc flash PPE Category in Table 130.7(C)(16) shall not be permitted.

- (1) Incident Energy Analysis Method.** The incident energy exposure level shall be based on the working distance of the employee's face and chest areas from a prospective arc source for the specified task to be performed. Arc-rated clothing and other PPE shall be used by the employee based on the incident energy exposure associated with the specific task. Recognizing that incident energy increases as the distance from the arc flash decreases, additional PPE shall be used for any parts of the body that are closer than the distance at which the incident energy was determined.
- (2) Arc Flash PPE Categories Method.** The requirements of 130.7(C)(15) and 130.7(C)(16) shall apply when the arc flash PPE category method is used for the selection of arc flash PPE.

**(D) Equipment Labeling.** Electrical equipment such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are in other than dwelling units and that are likely to require examination, adjustment, servicing, or maintenance while energized shall be field-marked with a label containing all the following information:

- (1) Nominal system voltage
- (2) Arc flash boundary
- (3) At least one of the following:
  - a. Available incident energy and the corresponding working distance, or the arc flash PPE category in Table 130.7(C)(15)(A)(b) or 130.7(C)(15)(B) for the equipment, but not both
  - b. Minimum arc rating of clothing

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c. Site-specific level of PPE

The method of calculating and the data to support the information for the label shall be documented. Where the review of the arc flash hazard risk assessment identifies a change that renders the label inaccurate, the label shall be updated.

The owner of the electrical equipment shall be responsible for the documentation, installation, and maintenance of the field-marked label.

- **Article 205.2: Single-Line Diagram.** A single-line diagram, where provided for the electrical system, shall be maintained in a legible condition and shall be kept current.
- IEEE-1584-2002
- IEEE-242 "Buff Book" Protection and Coordination of Industrial Power Systems
- IEEE-399 "Brown Book" Power System Analysis
- IEEE-141 "Red Book" Electric Power Distribution for Industrial Plants
- o OSHA Protection from Flames and Electric Arc Hazards
  - The employer must assess the workplace to identify workers exposed to flame or electric-arc hazards.
  - No later than January 1, 2015, employers must estimate the incident heat energy of any electric-arc hazard to which a worker would be exposed.
  - No later than April 1, 2015, employers generally must provide workers exposed to hazards from electric arcs with protective clothing and other protective equipment with an arc rating greater than or equal to the estimated heat energy.

**Basis-of-design:** The work associated with this project has been designed with basis-of-design equipment in order to accurately model the arc flash hazards. The contractor shall provide the basis-of-design equipment or may substitute equipment with an approved equal. If the contractor elects to provide substitute equivalent equipment, the contractor will be responsible for updates to the arc flash model at their own cost based on

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the approved substitute equivalent equipment. The substitute equivalent equipment modeled must provide an equal or lesser hazard than the basis-of-design equipment specified. Upon request, the VA can provide a copy of the existing SKM Power Tools arc flash model at no cost for use by the contractor to model any substitute equipment to be provided.

The work description includes, but is not limited to the following:

Medium Voltage Switchgear

1. Adjust medium voltage protective device settings to properly coordinate the Medium Voltage system which is the base of the Hospitals electrical system.
2. Program secondary settings "maintenance mode setting" into the (14) SEL-351A medium voltage distribution relays. These maintenance settings will allow the instantaneous trip current settings to be reduced which will greatly reduce the arc flash hazard on the downstream switchgear, thus allowing safe operation and maintenance of downstream equipment.
3. Add a keyed switch and pilot light onto the door of the medium voltage switchgear. This will activate and indicate the maintenance mode settings, which will allow simple and confident operation by the electrical staff.

Substation USS-A and USS-B

1. This switchgear is dual feed, motor operated main-tie-main, with draw-out circuit breakers. Each circuit breaker has been previously retrofitted with URC AC-Pro trip units. Remove and perform preventative maintenance on each draw-out circuit breaker, one at a time. Ensure the motor operated main-tie-main is fully functional.
2. While circuit breakers are removed, upgrade the URC AC-Pro trip units to include Quick-Trip capability on each feeder breaker. Program maintenance mode settings in each trip unit. The maintenance settings will allow the instantaneous trip current setting to be reduced to allow safe operation and maintenance of downstream equipment.



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3. Replace enclosed circuit breaker XF PGH1.
4. Replace panelboard PGH1.
5. Replace enclosed circuit breaker 13-233. The current device does not allow proper coordination. The upgraded device will also include a "maintenance mode" setting, greatly lowering the arc flash hazard downstream for maintenance purposes.
6. Replace panelboard 13-233.
7. Replace enclosed circuit breaker 13-238. The current device does not allow proper coordination. The upgraded device will also include a "maintenance mode" setting, greatly lowering the arc flash hazard downstream for maintenance purposes.
8. Replace panelboard 13-238.

Substation USS-C and USS-D

1. This switchgear is dual feed, motor operated main-tie-main, with draw-out circuit breakers. 3 of 6 circuit breakers have been previously retrofitted with URC AC-Pro trip units. Remove and perform preventative maintenance on each draw-out circuit breaker, one at a time. Retrofit the 3 remaining circuit breakers with URC AC-Pro Quick-Trip trip units. Ensure the motor operated main-tie-main is fully functional.
2. While circuit breakers are removed, upgrade the URC AC-Pro trip units to include Quick-Trip capability on each feeder breaker. Program maintenance mode settings in each trip unit. The maintenance settings will allow the instantaneous trip current setting to be reduced to allow safe operation and maintenance of downstream equipment.
3. Replace distribution panelboard 208A.
4. Replace distribution panelboard 208B.
5. Replace distribution panelboard 208B-1.

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Substation USS-G and USS-H (Building 18)

1. This switchgear is dual feed, motor operated main-tie-main, with draw-out circuit breakers. 3 of 7 circuit breakers have been previously retrofitted with URC AC-Pro trip units. Remove and perform preventative maintenance on each draw-out circuit breaker, one at a time. Retrofit the 4 remaining circuit breakers with URC AC-Pro Quick-Trip trip units. Ensure the motor operated main-tie-main is fully functional.
2. While circuit breakers are removed, upgrade the URC AC-Pro trip units to include Quick-Trip capability on each feeder breaker. Program maintenance mode settings in each trip unit. The maintenance settings will allow the instantaneous trip current setting to be reduced to allow safe operation and maintenance of downstream equipment.
3. Replace the trip unit in circuit breaker ATS-I in panelboard 208C-C, with an upgraded device.
4. Replace distribution panelboard SEL1-22.
5. Replace distribution panelboard SEL-3A.

Substation USS-E and USS-F (Building 6)

1. Replace distribution panelboard BP-EM (located within the distribution section of USS-E). This is a Federal Pacific panelboard that has reached its end of life, and replacement parts are not readily available. The make/model of the circuit breakers is unknown and therefore, cannot be modeled. This panelboard is located within the unit substation, but is fed from an external automatic transfer switch. Replacing and relocating this panelboard, will result in reducing the arc flash hazard.

General

- A. Several circuit breaker setting adjustments have been made in order to provide proper coordination and/or reduce arc flash hazard. See Section 00 01 16 "Protective Device Settings"(Appendix 7) for protective device settings, and also refer to the one-line diagrams

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included in the proposed electrical drawings included additional to this report.

- B. Visits to the site by Bidders may be made only by appointment with the COR.
- C. Offices of Simbari Design Architecture, PLLC, as Architect-Engineers, will render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.
- D. Before placement and installation of work subject to tests by testing laboratory retained by Department of Veterans Affairs, the Contractor shall notify the COR in sufficient time to enable testing laboratory personnel to be present at the site in time for proper taking and testing of specimens and field inspection. Such prior notice shall be not less than three work days unless otherwise designated by the COR.
- E. All employees of general contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and restricted from unauthorized access.

### **1.3 STATEMENT OF BID ITEM(S)**

- A. CLIN I (BASE BID), MEDIUM VOLTAGE & SUBSTATION WORK: Work includes all labor, material, equipment, supervision and premium time to perform the required general construction, alterations, electrical work and necessary removals and construction and certain other items for all Medium Voltage Distribution Systems, Substation USS-A and USS-B, Substation USS-C and USS-D, and Substation USS-G and USS-H as indicated in the construction documents.
- B. OPTIONAL CLIN II, PANELBOARD, SWITCHBOARD & CIRCUIT BREAKER REPLACEMENTS: Work includes all labor, material, equipment, supervision and premium time to perform the required general construction,

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alterations, electrical work and necessary removals and construction and certain other items as for all Switchboard, Panelboard, and Circuit Breaker Replacements indicated in the construction documents.

#### **1.4 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR**

- A. Drawings and contract documents may be obtained from the website where the solicitation is posted. Additional copies will be at Contractor's expense.

#### **1.5 CONSTRUCTION SECURITY REQUIREMENTS**

A. Security Plan:

1. The security plan defines both physical and administrative security procedures that will remain effective for the entire duration of the project.
2. The General Contractor is responsible for assuring that all sub-contractors working on the project and their employees also comply with these regulations.

B. Security Procedures:

1. General Contractor's employees shall not enter the project site without appropriate badge. They may also be subject to inspection of their personal effects when entering or leaving the project site.
2. Before starting work the General Contractor shall give one week's notice to the Contracting Officer so that security arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.
3. No photography of VA premises is allowed without written permission of the Contracting Officer.
4. VA reserves the right to close down or shut down the project site and order General Contractor's employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.

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C. Guards:

1. Not required.

D. Key Control:

1. The General Contractor shall provide duplicate keys and lock combinations to the Contracting officers representative (COR) for the purpose of security inspections of every area of project including tool boxes and parked machines and take any emergency action.
2. The General Contractor shall turn over all permanent lock cylinders to the VA locksmith for permanent installation. See Section 08 71 00, DOOR HARDWARE and coordinate.

E. Document Control:

1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the approach to following goals and maintaining confidentiality of "sensitive information".
2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
3. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive Unclassified". Secure such information in separate containers and limit the access to only those who will need it for the project. Return the information to the Contracting Officer upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".

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7. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
  - a. Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.
  - b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

**F. Motor Vehicle Restrictions**

1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.
2. A limited number of (2 to 5) permits shall be issued for General Contractor and its employees for parking in designated areas only.

**1.6 OPERATIONS AND STORAGE AREAS**

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
- B. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

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- C. The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.
- D. Working space and space available for storing materials shall be as determined by the COR.
- E. Workmen are subject to rules of Medical Center applicable to their conduct.
- F. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by COR where required by limited working space.
  - 1. Do not store materials and equipment in other than assigned areas.
  - 2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of Veterans Affairs in quantities sufficient for not more than two work days. Provide unobstructed access to Medical Center areas required to remain in operation.
  - 3. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.
  - 4. Utilities Services: Where necessary to cut existing pipes, electrical wires, conduits, cables, etc., of utility services, or of

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fire protection systems or communications systems (except telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by COR. All such actions shall be coordinated with the COR involved.

G. Phasing:

The Medical Center must maintain its operation 24 hours a day 7 days a week. Therefore, any interruption in service must be scheduled and coordinated with the COR to ensure that no lapses in operation occur. It is the CONTRACTOR'S responsibility to develop a work plan and schedule detailing, at a minimum, the procedures to be employed, the equipment and materials to be used, the interim life safety measure to be used during the work, and a schedule defining the duration of the work with milestone subtasks. The Contractor shall include in their bid for each Contract Line Item Number (CLIN) all premium time work necessary to complete the scope of work. Any utility shutdowns will be required to occur on weekends utilizing premium time work hours.

This project will be very difficult on the Medical Center and facilities operations.

During construction, a substantial amount of preparatory work can be done in advance. Panel replacements will have to be scheduled during premium time off hours on weekends, and possibly on continuous shifts. In the unit substations equipped with draw-out circuit breakers (USS-A, B, C, D, G, H), these circuit breakers can be modified one at a time, using a spare circuit breaker to minimize down time.

Additionally, several crews can be working at one time on different areas of a distribution system, to minimize the number of shutdowns.

Most work will be accomplished in electrical rooms, so this will reduce the impact on the general public. However, much of the work will require substantial shutdowns. These shutdowns will have to be coordinated, and many will be performed on off shifts during weekends.

To insure such executions, Contractor shall furnish the COR with a schedule of approximate phasing dates on which the Contractor intends



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to accomplish work in each specific area of the Medical Center, building or portion thereof. In addition, Contractor shall notify the COR two weeks in advance of the proposed date of starting work in each specific area of the Medical Center, building or portion thereof. Arrange such phasing dates to insure accomplishment of this work in successive phases mutually agreeable to COR and Contractor.

- H. All buildings will be occupied during performance of work. Medical Center safety precautions must be observed during work in all occupied areas.

Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Medical Centers operations will not be hindered. Contractor shall permit access to Department of Veterans Affairs personnel and patients through other construction areas which serve as routes of access to such affected areas and equipment. These routes whether access or egress shall be isolated from the construction area by temporary partitions and have walking surfaces, lighting etc to facilitate patient and staff access. Coordinate alteration work in areas occupied by Department of Veterans Affairs so that Medical Center operations will continue during the construction period.

- I. Section Omitted.

- J. Section Omitted.

- K. Utilities Services: Maintain existing utility services for Medical Center at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing conduits, wires, cables, etc. of utility services or of fire protection systems and communications systems (including telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by COR.

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1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of COR. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without a detailed work plan, the Medical Center Director's prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and 28 05 11, REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATIONS for additional requirements.
2. Contractor shall submit a request to interrupt any such services to COR, in writing, 14 days in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center. Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
4. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the COR.
5. In case of a contract construction emergency, service will be interrupted on approval of COR. Such approval will be confirmed in writing as soon as practical.
6. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.

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- L. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged at the main, branch or panel they originate from. The lines shall not be capped in finished areas, but shall be removed and sealed, capped or plugged in ceilings, within furred spaces, in unfinished areas, or within walls or partitions; so that they are completely behind the finished surfaces.
- M. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:
  - 1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles.
  - 2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the COR.
- N. Coordinate the work for this contract with other construction operations as directed by COR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

#### **1.7 ALTERATIONS**

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the COR of areas of buildings in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed by both, to the Contracting Officer. This report shall list by rooms and spaces:
  - 1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of buildings.
  - 2. Existence and conditions of items such as electrical fixtures and equipment required by drawings to be either reused or relocated, or both.
  - 3. Shall note any discrepancies between drawings and existing conditions at site.

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4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and COR.
- B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of COR, to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and COR together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:
1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workmen in executing work of this contract.
- D. Protection: Provide the following protective measures:
1. Temporary protection against damage for portions of existing structures and grounds where work is to be done, materials handled and equipment moved and/or relocated.
  2. Protection of interior of existing structures at all times, from damage, dust and weather inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.

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#### **1.8 DISPOSAL AND RETENTION**

A. Materials and equipment accruing from work removed and from demolition activities, shall be disposed of as follows:

1. Reserved items which are to remain property of the Government are identified by attached tags or noted on drawings or in specifications as items to be stored. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by COR.
2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.
3. Items of portable equipment and furnishings located in rooms and spaces in which work is to be done under this contract shall remain the property of the Government. When rooms and spaces are vacated by the Department of Veterans Affairs during the alteration period, such items which are NOT required by drawings and specifications to be either relocated or reused will be removed by the Government in advance of work to avoid interfering with Contractor's operation.

#### **1.9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS**

- A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those

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facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

**(FAR 52.236-9)**

- C. Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS, for additional requirements on protecting vegetation, soils and the environment. Refer to Articles, "Alterations", "Restoration", and "Operations and Storage Areas" for additional instructions concerning repair of damage to structures and site improvements.

**S1.10 RESTORATION**

- A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without approval of the COR. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the COR before it is disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
- B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.
- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are not scheduled for discontinuance or abandonment.

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- D. Expense of repairs to such utilities and systems not shown on drawings or locations of which are unknown will be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

#### **1.11 PHYSICAL DATA**

- A. Not Required. Contractor shall request and review all available physical data associated with any individual work area with the COR prior to completing work.

#### **1.12 PROFESSIONAL SURVEYING SERVICES**

- A Section omitted.

#### **1.13 LAYOUT OF WORK**

- A. Section Omitted.

#### **1.14 AS-BUILT DRAWINGS**

- A. The contractor shall maintain two full size sets of as-built drawings which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.
- B. All variations shall be shown in the same general detail as used in the contract drawings. To insure compliance, as-built drawings shall be made available for the COR's review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings to the COR within 15 calendar days after each completed phase and after the acceptance of the project by the COR.
- D. Paragraphs A, B, & C shall also apply to all shop drawings.

#### **1.15 USE OF ROADWAYS**

- A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the COR when necessary to cross curbing, sidewalks, or similar construction, they must be protected by well-constructed bridges.

#### **1.16 RESIDENT ENGINEER'S FIELD OFFICE**

- A. Section Omitted.

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#### **1.17 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT**

- A. Use of new installed mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power will be permitted subject to written approval and compliance with the following provisions:
  - 1. Permission to use each unit or system must be given by COR in writing. If the equipment is not installed and maintained in accordance with the written agreement and following provisions, the COR will withdraw permission for use of the equipment.
  - 2. Electrical installations used by the equipment shall be completed in accordance with the drawings and specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, motor controllers and their overload elements shall be properly sized, coordinated and adjusted. Installation of temporary electrical equipment or devices shall be in accordance with NFPA 70, National Electrical Code, (2014 Edition), Article 590, *Temporary Installations*. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.
- B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal, shall be replaced with identical replacements, at no additional cost to the Government.
- C. This paragraph shall not reduce the requirements of the mechanical and electrical specifications sections.
- D. Any damage to the equipment or excessive wear due to prolonged use will be repaired replaced by the contractor at the contractor's expense.

#### **1.18 TEMPORARY USE OF EXISTING ELEVATORS**

- A. Use of existing elevators for handling building materials and Contractor's personnel will be permitted subject to following provisions:



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1. Contractor makes all arrangements with the COR for use of elevators. The COR will ascertain that elevators are in proper condition. Contractor may use only those elevators permitted by COR. Contractor shall review use and restrictions with COR prior to work being completed. Certain restrictions may exist on type of use and hours of use. Personnel for operating elevators will not be provided by the Department of Veterans Affairs.
2. Contractor covers and provides maximum protection of following elevator components:
  - a. Entrance jambs, heads soffits and threshold plates.
  - b. Entrance columns, canopy, return panels and inside surfaces of car enclosure walls.
  - c. Finish flooring.
3. Government will accept hoisting ropes of elevator and rope of each speed governor if they are worn under normal operation. However, if these ropes are damaged by action of foreign matter such as sand, lime, grit, stones, etc., during temporary use, they shall be removed and replaced by new hoisting ropes at the contractors expense.

#### **1.19 TEMPORARY USE OF NEW ELEVATORS**

- A. Section omitted.

#### **1.20 TEMPORARY TOILETS**

- A. Contractor may have for use of Contractor's workmen, such toilet accommodations as may be assigned to Contractor by Medical Center. Contractor shall keep such places clean and be responsible for any damage done thereto by Contractor's workmen. Failure to maintain satisfactory condition in toilets will deprive Contractor of the privilege to use such toilets.

#### **1.21 AVAILABILITY AND USE OF UTILITY SERVICES**

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. The amount to be paid by the Contractor for

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chargeable electrical services shall be the prevailing rates charged to the Government. The Contractor shall carefully conserve any utilities furnished without charge.

**B. Electricity (for Construction and Testing):**

1. Obtain electricity by connecting to the Medical Center electrical distribution system. The Contractor shall meter and pay for electricity required for electric cranes and hoisting devices, electrical welding devices and any electrical heating devices providing temporary heat. Electricity for all other uses is available at no cost to the Contractor.

**1.22 NEW TELEPHONE EQUIPMENT**

Section omitted.

**1.23 TESTS**

- A. As per specification section 23 05 93 the contractor shall provide a written testing and commissioning plan complete with component level, equipment level, sub-system level and system level breakdowns. The plan will provide a schedule and a written sequence of what will be tested, how and what the expected outcome will be. This document will be submitted for approval prior to commencing work. The contractor shall document the results of the approved plan and submit for approval with the as built documentation.
- B. Pre-test electrical equipment and systems and make corrections required for proper operation of such systems before requesting final tests. Final test will not be conducted unless pre-tested.
- C. Conduct final tests required in various sections of specifications in presence of an authorized representative of the Contracting Officer. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.
- D. Electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire system which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply air is only one part of entire system which provides comfort conditions for a

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building. Other related components are return air, exhaust air, steam, chilled water, refrigerant, hot water, controls and electricity, etc. Another example of a system which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of fuel, combustion air, controls, steam, feedwater, condensate and other related components.

- E. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonable period of time during which operating and environmental conditions remain reasonably constant and are typical of the design conditions.
- F. Individual test result of any component, where required, will only be accepted when submitted with the test results of related components and of the entire system.

#### **1.24 INSTRUCTIONS**

- A. Contractor shall furnish Maintenance and Operating manuals (hard copies and electronic) and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals and one compact disc (four hard copies and one electronic copy each) for each separate piece of equipment shall be delivered to the COR coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason

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for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.

- C. Instructions: Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed training to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system, shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the COR and shall be considered concluded only when the COR is satisfied in regard to complete and thorough coverage. The contractor shall submit a course outline with associated material to the COR for review and approval prior to scheduling training to ensure the subject matter covers the expectations of the VA and the contractual requirements. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the COR, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

#### **1.25 GOVERNMENT-FURNISHED PROPERTY**

- A. The Government shall deliver to the Contractor, the Government-furnished property shown on the drawings.
- B. Equipment furnished by Government to be installed by Contractor will be furnished to Contractor at the Medical Center.
- C. Storage space for equipment will be provided by the Government and the Contractor shall be prepared to unload and store such equipment therein upon its receipt at the Medical Center.

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D. Notify Contracting Officer in writing, 60 days in advance, of date on which Contractor will be prepared to receive equipment furnished by Government. Arrangements will then be made by the Government for delivery of equipment.

1. Immediately upon delivery of equipment, Contractor shall arrange for a joint inspection thereof with a representative of the Government. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Government representative with a written statement as to its condition or shortages.

2. Contractor thereafter is responsible for such equipment until such time as acceptance of contract work is made by the Government.

E. Equipment furnished by the Government will be delivered in a partially assembled (knock down) condition in accordance with existing standard commercial practices, complete with all fittings, fastenings, and appliances necessary for connections to respective services installed under contract. All fittings and appliances (i.e., couplings, ells, tees, nipples, piping, conduits, cables, and the like) necessary to make the connection between the Government furnished equipment item and the utility stub-up shall be furnished and installed by the contractor at no additional cost to the Government.

F. Completely assemble and install the Government furnished equipment in place ready for proper operation in accordance with specifications and drawings.

G. Furnish supervision of installation of equipment at construction site by qualified factory trained technicians regularly employed by the equipment manufacturer.

#### **1.26 RELOCATED EQUIPMENT & ITEMS**

A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing equipment and items indicated by symbol "R" or otherwise shown to be relocated by the Contractor.

B. Perform relocation of such equipment or items at such times and in such a manner as directed by the COR.

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- C. Suitably cap existing service lines, such as steam, condensate return, water, drain, gas, air, vacuum and/or electrical, at the main whenever such lines are disconnected from equipment to be relocated. Remove abandoned lines in finished areas and cap as specified herein before under paragraph "Abandoned Lines".
- D. Provide all mechanical and electrical service connections, fittings, fastenings and any other materials necessary for assembly and installation of relocated equipment; and leave such equipment in proper operating condition.
- E. All service lines such as noted above for relocated equipment shall be in place at point of relocation ready for use before any existing equipment is disconnected. Make relocated existing equipment ready for operation or use immediately after reinstallation.

**1.27 STORAGE SPACE FOR DEPARTMENT OF VETERANS AFFAIRS EQUIPMENT**

- A. Section omitted.

**1.28 CONSTRUCTION SIGN**

- A. Section omitted.

**1.29 SAFETY SIGN**

- A. section omitted.

**1.30 PHOTOGRAPHIC DOCUMENTATION**

- A. Section omitted.

**1.31 FINAL ELEVATION DIGITAL IMAGES 1.30 PHOTOGRAPHIC DOCUMENTATION**

- A. Section omitted.

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**SECTION 01 32 16.15**  
**PROJECT SCHEDULES**  
*(SMALL PROJECTS - DESIGN/BID/BUILD)*

**PART 1- GENERAL**

**1.1 DESCRIPTION:**

- A. The Contractor shall develop a Critical Path Method (CPM) plan and schedule demonstrating fulfillment of the contract requirements (Project Schedule), and shall keep the Project Schedule up-to-date in accordance with the requirements of this section and shall utilize the plan for scheduling, coordinating and monitoring work under this contract (including all activities of subcontractors, equipment vendors and suppliers). Conventional Critical Path Method (CPM) technique shall be utilized to satisfy both time and cost applications.

**1.2 CONTRACTOR'S REPRESENTATIVE:**

- A. The Contractor shall designate an authorized representative responsible for the Project Schedule including preparation, review and progress reporting with and to the Contracting Officer's Representative (COR).
- B. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the requirements of this specification section.
- C. The Contractor's representative shall have the option of developing the project schedule within their organization or to engage the services of an outside consultant. If an outside scheduling consultant is utilized, Section 1.3 of this specification will apply.

**1.3 CONTRACTOR'S CONSULTANT:**

- A. The Contractor shall submit a qualification proposal to the COR, within 10 days of bid acceptance. The qualification proposal shall include:
1. The name and address of the proposed consultant.
  2. Information to show that the proposed consultant has the qualifications to meet the requirements specified in the preceding paragraph.
  3. A representative sample of prior construction projects, which the proposed consultant has performed complete project scheduling services. These representative samples shall be of similar size and scope.
- B. The Contracting Officer has the right to approve or disapprove the proposed consultant, and will notify the Contractor of the VA decision within seven calendar days from receipt of the qualification proposal.

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In case of disapproval, the Contractor shall resubmit another consultant within 10 calendar days for renewed consideration. The Contractor shall have their scheduling consultant approved prior to submitting any schedule for approval.

#### **1.4 COMPUTER PRODUCED SCHEDULES**

- A. The contractor shall provide monthly, to the Department of Veterans Affairs (VA), all computer-produced time/cost schedules and reports generated from monthly project updates. This monthly computer service will include: three copies of up to five different reports (inclusive of all pages) available within the user defined reports of the scheduling software approved by the Contracting Officer; a hard copy listing of all project schedule changes, and associated data, made at the update and an electronic file of this data; and the resulting monthly updated schedule in PDM format. These must be submitted with and substantively support the contractor's monthly payment request and the signed look ahead report. The COR shall identify the five different report formats that the contractor shall provide.
- B. The contractor shall be responsible for the correctness and timeliness of the computer-produced reports. The Contractor shall also responsible for the accurate and timely submittal of the updated project schedule and all CPM data necessary to produce the computer reports and payment request that is specified.
- C. The VA will report errors in computer-produced reports to the Contractor's representative within ten calendar days from receipt of reports. The Contractor shall reprocess the computer-produced reports and associated diskette(s), when requested by the Contracting Officer's representative, to correct errors which affect the payment and schedule for the project.

#### **1.5 THE COMPLETE PROJECT SCHEDULE SUBMITTAL**

- A. Within 45 calendar days after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; three blue line copies of the interim schedule on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file in the previously approved CPM schedule program. The submittal shall also include three copies of a computer-produced activity/event ID schedule showing project duration; phase completion dates; and other data, including event cost. Each activity/event on the computer-produced schedule shall contain as a minimum, but not limited to, activity/event ID, activity/event description, duration, budget amount, early start date, early finish



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date, late start date, late finish date and total float. Work activity/event relationships shall be restricted to finish-to-start or start-to-start without lead or lag constraints. Activity/event date constraints, not required by the contract, will not be accepted unless submitted to and approved by the Contracting Officer. The contractor shall make a separate written detailed request to the Contracting Officer identifying these date constraints and secure the Contracting Officer's written approval before incorporating them into the network diagram. The Contracting Officer's separate approval of the Project Schedule shall not excuse the contractor of this requirement. Logic events (non-work) will be permitted where necessary to reflect proper logic among work events, but must have zero duration. The complete working schedule shall reflect the Contractor's approach to scheduling the complete project. **The final Project Schedule in its original form shall contain no contract changes or delays which may have been incurred during the final network diagram development period and shall reflect the entire contract duration as defined in the bid documents.** These changes/delays shall be entered at the first update after the final Project Schedule has been approved. The Contractor should provide their requests for time and supporting time extension analysis for contract time as a result of contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

- D. Within 30 calendar days after receipt of the complete project interim Project Schedule and the complete final Project Schedule, the Contracting Officer or his representative, will do one or both of the following:
1. Notify the Contractor concerning his actions, opinions, and objections.
  2. A meeting with the Contractor at or near the job site for joint review, correction or adjustment of the proposed plan will be scheduled if required. Within 14 calendar days after the joint review, the Contractor shall revise and shall submit three blue line copies of the revised Project Schedule, three copies of the revised computer-produced activity/event ID schedule and a revised electronic file as specified by the Contracting Officer. The revised submission will be reviewed by the Contracting Officer and, if found to be as previously agreed upon, will be approved.
- E. The approved baseline schedule and the computer-produced schedule(s) generated there from shall constitute the approved baseline schedule

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until subsequently revised in accordance with the requirements of this section.

- F. The Complete Project Schedule shall contain approximately 75\_work activities/events.

#### **1.6 WORK ACTIVITY/EVENT COST DATA**

- A. The Contractor shall cost load all work activities/events except procurement activities. The cumulative amount of all cost loaded work activities/events (including alternates) shall equal the total contract price. Prorate overhead, profit and general conditions on all work activities/events for the entire project length. The contractor shall generate from this information cash flow curves indicating graphically the total percentage of work activity/event dollar value scheduled to be in place on early finish, late finish. These cash flow curves will be used by the Contracting Officer to assist him in determining approval or disapproval of the cost loading. Negative work activity/event cost data will not be acceptable, except on VA issued contract changes.
- B. The Contractor shall cost load work activities/events for guarantee period services, test, balance and adjust various systems in accordance with the provisions in Article, FAR 52.232 - 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 - 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS).
- C. In accordance with FAR 52.236 - 1 (PERFORMANCE OF WORK BY THE CONTRACTOR) and VAAR 852.236 - 72 (PERFORMANCE OF WORK BY THE CONTRACTOR), the Contractor shall submit, simultaneously with the cost per work activity/event of the construction schedule required by this Section, a responsibility code for all activities/events of the project for which the Contractor's forces will perform the work.
- D. The Contractor shall cost load work activities/events for all BID ITEMS including ASBESTOS ABATEMENT. The sum of each BID ITEM work shall equal the value of the bid item in the Contractors' bid.

#### **1.7 PROJECT SCHEDULE REQUIREMENTS**

- A. Show on the project schedule the sequence of work activities/events required for complete performance of all items of work. The Contractor Shall:
1. Show activities/events as:
    - a. Contractor's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction work.

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- b. Contracting Officer's and Architect-Engineer's review and approval of shop drawings, equipment schedules, samples, template, or similar items.
  - c. Interruption of VA Facilities utilities, delivery of Government furnished equipment, and rough-in drawings, project phasing and any other specification requirements.
  - d. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.
  - e. VA inspection and acceptance activity/event with a minimum duration of five work days at the end of each phase and immediately preceding any VA move activity/event required by the contract phasing for that phase.
2. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to indicate the movement of trades from one area, floor, or building, to another area, floor, or building, for at least five trades who are performing major work under this contract.
  3. Break up the work into activities/events of a duration no longer than 20 work days each or one reporting period, except as to non-construction activities/events (i.e., procurement of materials, delivery of equipment, concrete and asphalt curing) and any other activities/events for which the COR may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals will not be less than 20 work days.
  4. Describe work activities/events clearly, so the work is readily identifiable for assessment of completion. Activities/events labeled "start," "continue," or "completion," are not specific and will not be allowed. Lead and lag time activities will not be acceptable.
  5. The schedule shall be generally numbered in such a way to reflect either discipline, phase or location of the work.
- B. The Contractor shall submit the following supporting data in addition to the project schedule:
1. The appropriate project calendar including working days and holidays.
  2. The planned number of shifts per day.
  3. The number of hours per shift.
- Failure of the Contractor to include this data shall delay the review of the submittal until the Contracting Officer is in receipt of the missing data.

- C. To the extent that the Project Schedule or any revised Project Schedule shows anything not jointly agreed upon, it shall not be deemed to have been approved by the COR. Failure to include any element of work required for the performance of this contract shall not excuse the Contractor from completing all work required within any applicable completion date of each phase regardless of the COR's approval of the Project Schedule.
- D. Compact Disk Requirements and CPM Activity/Event Record Specifications: Submit to the VA an electronic file(s) containing one file of the data required to produce a schedule, reflecting all the activities/events of the complete project schedule being submitted.

#### **1.8 PAYMENT TO THE CONTRACTOR:**

- A. Monthly, the contractor shall submit the AIA application and certificate for payment documents G702 & G703 reflecting updated schedule activities and cost data in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made pursuant to Article, FAR 52.232 - 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 - 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS). The Contractor shall be entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated project schedule. Monthly payment requests shall include: a listing of all agreed upon project schedule changes and associated data; and an electronic file (s) of the resulting monthly updated schedule.
- B. Approval of the Contractor's monthly Application for Payment shall be contingent, among other factors, on the submittal of a satisfactory monthly update of the project schedule.

#### **1.9 PAYMENT AND PROGRESS REPORTING**

- A. Monthly schedule update meetings will be held on dates mutually agreed to by the COR and the Contractor. Contractor and their CPM consultant (if applicable) shall attend all monthly schedule update meetings. The Contractor shall accurately update the Project Schedule and all other data required and provide this information to the COR three work days in advance of the schedule update meeting. Job progress will be reviewed to verify:
  - 1. Actual start and/or finish dates for updated/completed activities/events.
  - 2. Remaining duration for each activity/event started, or scheduled to start, but not completed.

3. Logic, time and cost data for change orders, and supplemental agreements that are to be incorporated into the Project Schedule.
  4. Changes in activity/event sequence and/or duration which have been made, pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.
  5. Completion percentage for all completed and partially completed activities/events.
  6. Logic and duration revisions required by this section of the specifications.
  7. Activity/event duration and percent complete shall be updated independently.
- B. After completion of the joint review, the contractor shall generate an updated computer-produced calendar-dated schedule and supply the Contracting Officer's representative with reports in accordance with the Article, COMPUTER PRODUCED SCHEDULES, specified.
- C. After completing the monthly schedule update, the contractor's representative or scheduling consultant shall rerun all current period contract change(s) against the prior approved monthly project schedule. The analysis shall only include original workday durations and schedule logic agreed upon by the contractor and resident engineer for the contract change(s). When there is a disagreement on logic and/or durations, the Contractor shall use the schedule logic and/or durations provided and approved by the resident engineer. After each rerun update, the resulting electronic project schedule data file shall be appropriately identified and submitted to the VA in accordance to the requirements listed in articles 1.4 and 1.7. This electronic submission is separate from the regular monthly project schedule update requirements and shall be submitted to the resident engineer within fourteen (14) calendar days of completing the regular schedule update. **Before inserting the contract changes durations, care must be taken to ensure that only the original durations will be used for the analysis, not the reported durations after progress. In addition, once the final network diagram is approved, the contractor must recreate all manual progress payment updates on this approved network diagram and associated reruns for contract changes in each of these update periods as outlined above for regular update periods. This will require detailed record keeping for each of the manual progress payment updates.**
- D. Following approval of the CPM schedule, the VA, the General Contractor, its approved CPM Consultant, RE office representatives, and all

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subcontractors needed, as determined by the SRE, shall meet to discuss the monthly updated schedule. The main emphasis shall be to address work activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period. The Government representatives and the Contractor should conclude the meeting with a clear understanding of those work and administrative actions necessary to maintain project schedule status during the reporting period. This schedule coordination meeting will occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule, discussions should include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

#### **1.10 RESPONSIBILITY FOR COMPLETION**

- A. If it becomes apparent from the current revised monthly progress schedule that phasing or contract completion dates will not be met, the Contractor shall execute some or all of the following remedial actions:
  - 1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.
  - 2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.
  - 3. Reschedule the work in conformance with the specification requirements.
- B. Prior to proceeding with any of the above actions, the Contractor shall notify and obtain approval from the COR for the proposed schedule changes. If such actions are approved, the representative schedule revisions shall be incorporated by the Contractor into the Project Schedule before the next update, at no additional cost to the Government.

#### **1.11 CHANGES TO THE SCHEDULE**

- A. Within 30 calendar days after VA acceptance and approval of any updated project schedule, the Contractor shall submit a revised electronic file (s) and a list of any activity/event changes including predecessors and successors for any of the following reasons:
  - 1. Delay in completion of any activity/event or group of activities/events, which may be involved with contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are

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- shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.
2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
  3. The schedule does not represent the actual prosecution and progress of the project.
  4. When there is, or has been, a substantial revision to the activity/event costs regardless of the cause for these revisions.
- B. CPM revisions made under this paragraph which affect the previously approved computer-produced schedules for Government furnished equipment, vacating of areas by the VA Facility, contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, shall be furnished in writing to the Contracting Officer for approval.
- C. Contracting Officer's approval for the revised project schedule and all relevant data is contingent upon compliance with all other paragraphs of this section and any other previous agreements by the Contracting Officer or the VA representative.
- D. The cost of revisions to the project schedule resulting from contract changes will be included in the proposal for changes in work as specified in FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental), and will be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.
- E. The cost of revisions to the Project Schedule not resulting from contract changes is the responsibility of the Contractor.

#### **1.12 ADJUSTMENT OF CONTRACT COMPLETION**

- A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the COR may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals. The schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved in this request. The Contracting Officer's determination as to the total number of days of contract extension will be based upon the

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current computer-produced calendar-dated schedule for the time period in question and all other relevant information.

- B. Actual delays in activities/events which, according to the computer-produced calendar-dated schedule, do not affect the extended and predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Contracting Officer's decision.
- C. The Contractor shall submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental). The Contractor shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.
- D. All delays due to non-work activities/events such as RFI's, WEATHER, STRIKES, and similar non-work activities/events shall be analyzed on a month by month basis.

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**SECTION 01 33 23**  
**SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES**

- 1-1. Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- 1-2. For the purposes of this contract, samples, test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.
- 1-3. Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:
  - A. Satisfactory written evidence is presented to, and approved by Contracting Officer, that manufacturer cannot make scheduled delivery of approved item or;
  - B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity or;
  - C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.
- 1-4. Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of contract - required items. Delays attributable to untimely and rejected submittals will not serve as a basis for extending contract time for completion.
- 1-5. Submittals will be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by COR on behalf of the Contracting Officer.
- 1-6. Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.
- 1-7. The Government reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional submittals beyond those required by the contract are furnished pursuant to request therefor by Contracting Officer, adjustment in contract price

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and time will be made in accordance with Articles titled CHANGES (FAR 52.243-4) and CHANGES - SUPPLEMENT (VAAR 852.236-88) of the GENERAL CONDITIONS.

- 1-8. Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect-Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer and Architect-Engineer assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.
- 1-9. Submittals must be submitted by Contractor only and shipped prepaid. Contracting Officer assumes no responsibility for checking quantities or exact numbers included in such submittals.
  - A. Submit samples in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.
  - B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail or electronic mail and shall contain the list of items, name of Medical Center, name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.
    1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
    2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center, name of Contractor, manufacturer, brand, contract number and ASTM or Federal Specification Number as applicable and location(s) on project.
    3. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.
  - C. Section Omitted.

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- D. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be marked "Resubmitted Sample" in addition to containing other previously specified information required on label and in transmittal letter.
  - E. Approved samples will be kept on file by the COR at the site until completion of contract, at which time such samples will be delivered to Contractor as Contractor's property. Where noted in technical sections of specifications, approved samples in good condition may be used in their proper locations in contract work. At completion of contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request should be made prior to completion of the contract. Disapproved samples that are not requested for return by Contractor will be discarded after completion of contract.
  - F. Submittal drawings (shop, erection or setting drawings) and schedules, required for work of various trades, shall be checked before submission by technically qualified employees of Contractor for accuracy, completeness and compliance with contract requirements. These drawings and schedules shall be stamped and signed by Contractor certifying to such check.
    - 1. For each drawing required, submit one legible photographic paper or vellum reproducible.
    - 2. Reproducible shall be full size.
    - 3. Each drawing shall have marked thereon, proper descriptive title, including Medical Center location, project number, manufacturer's number, reference to contract drawing number, detail Section Number, and Specification Section Number.
    - 4. A space 120 mm by 125 mm (4-3/4 by 5 inches) shall be reserved on each drawing to accommodate approval or disapproval stamp.
    - 5. Submit drawings, ROLLED WITHIN A MAILING TUBE, fully protected for shipment.
    - 6. One reproducible print of approved or disapproved shop drawings will be forwarded to Contractor.
    - 7. When work is directly related and involves more than one trade, shop drawings shall be submitted to Architect-Engineer under one cover.
- 1-10. Samples , shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to

Simbari Design Architecture, PLLC  
1344 University Avenue, Suite 210

VA Western New York Healthcare System  
Buffalo - Arc Flash Mitigation Measures  
VA Project No. 528-13-S34

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Rochester, New York 14607

1-11. At the time of transmittal to the Architect-Engineer, the Contractor shall also send a copy of the complete submittal directly to the COR.

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**SECTION 01 35 26**  
**SAFETY REQUIREMENTS**

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**SECTION 01 35 26**  
**SAFETY REQUIREMENTS**

**1.1 APPLICABLE PUBLICATIONS:**

A. Latest publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.

B. American Society of Safety Engineers (ASSE):

A10.1-2011.....Pre-Project & Pre-Task Safety and Health  
Planning

A10.34-2012.....Protection of the Public on or Adjacent to  
Construction Sites

A10.38-2013.....Basic Elements of an Employer's Program to  
Provide a Safe and Healthful Work Environment  
American National Standard Construction and  
Demolition Operations

C. American Society for Testing and Materials (ASTM):

E84-2013.....Surface Burning Characteristics of Building  
Materials

D. The Facilities Guidelines Institute (FGI):

FGI Guidelines-2010Guidelines for Design and Construction of  
Healthcare Facilities

E. National Fire Protection Association (NFPA):

10-2013.....Standard for Portable Fire Extinguishers

30-2012.....Flammable and Combustible Liquids Code

51B-2014.....Standard for Fire Prevention During Welding,  
Cutting and Other Hot Work

70-2014.....National Electrical Code

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70B-2013.....Recommended Practice for Electrical Equipment  
Maintenance

70E-2012 .....Standard for Electrical Safety in the Workplace

99-2012.....Health Care Facilities Code

241-2013.....Standard for Safeguarding Construction,  
Alteration, and Demolition Operations

F. The Joint Commission (TJC)

TJC Manual .....Comprehensive Accreditation and Certification  
Manual

G. U.S. Nuclear Regulatory Commission

10 CFR 20 .....Standards for Protection Against Radiation

H. U.S. Occupational Safety and Health Administration (OSHA):

29 CFR 1904 .....Reporting and Recording Injuries & Illnesses

29 CFR 1910 .....Safety and Health Regulations for General  
Industry

29 CFR 1926 .....Safety and Health Regulations for Construction  
Industry

CPL 2-0.124.....Multi-Employer Citation Policy

I. VHA Directive 2005-007

**1.2 DEFINITIONS:**

A. OSHA "Competent Person" (CP). One who is capable of identifying existing and predictable hazards in the surroundings and working conditions which are unsanitary, hazardous or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them (see 29 CFR 1926.32(f)).

B. "Qualified Person" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to

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solve or resolve problems relating to the subject matter, the work, or the project.

- C. High Visibility Accident. Any mishap which may generate publicity or high visibility.
- D. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even though provided by a physician or registered personnel.
- E. Recordable Injuries or Illnesses. Any work-related injury or illness that results in:
  - 1. Death, regardless of the time between the injury and death, or the length of the illness;
  - 2. Days away from work (any time lost after day of injury/illness onset);
  - 3. Restricted work;
  - 4. Transfer to another job;
  - 5. Medical treatment beyond first aid;
  - 6. Loss of consciousness; or
  - 7. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

### **1.3 REGULATORY REQUIREMENTS:**

- A. In addition to the detailed requirements included in the provisions of this contract, comply with 29 CFR 1926, comply with 29 CFR 1910 as incorporated by reference within 29 CFR 1926, comply with ASSE A10.34, and all applicable federal, state, and local laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern except with specific approval and acceptance by the



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Facility Safety Manager or Contracting Officer Representative or  
Government Designated Authority.

#### **1.4 ACCIDENT PREVENTION PLAN (APP):**

A. The APP (aka Construction Safety & Health Plan) shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and ensure it is site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all worksite safety and health of each subcontractor(s). Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out.

B. The APP shall be prepared as follows:

1. Written in English by a qualified person who is employed by the Prime Contractor articulating the specific work and hazards pertaining to the contract (model language can be found in ASSE A10.33). Specifically articulating the safety requirements found within these VA contract safety specifications.
2. Address both the Prime Contractors and the subcontractors work operations.
3. State measures to be taken to control hazards associated with materials, services, or equipment provided by suppliers.
4. Address all the elements/sub-elements and in order as follows:
  - a. **SIGNATURE SHEET.** Title, signature, and phone number of the following:
    - 1) Plan preparer (Qualified Person such as corporate safety staff person or contracted Certified Safety Professional with construction safety experience);

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- 2) Plan approver (company/corporate officers authorized to obligate the company);
- 3) Plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional). Provide concurrence of other applicable corporate and project personnel (Contractor).

**b. BACKGROUND INFORMATION.** List the following:

- 1) Contractor;
- 2) Contract number;
- 3) Project name;
- 4) Brief project description, description of work to be performed, and location; phases of work anticipated (these will require an AHA).

**c. STATEMENT OF SAFETY AND HEALTH POLICY.** Provide a copy of current corporate/company Safety and Health Policy Statement, detailing commitment to providing a safe and healthful workplace for all employees. The Contractor's written safety program goals, objectives, and accident experience goals for this contract should be provided.

**d. RESPONSIBILITIES AND LINES OF AUTHORITIES.** Provide the following:

- 1) A statement of the employer's ultimate responsibility for the implementation of his SOH program;
- 2) Identification and accountability of personnel responsible for safety at both corporate and project level. Contracts specifically requiring safety or industrial hygiene personnel shall include a copy of their resumes.
- 3) The names of Competent and/or Qualified Person(s) and proof of competency/qualification to meet specific OSHA Competent/Qualified Person(s) requirements must be attached.;

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- 4) Requirements that no work shall be performed unless a designated competent person is present on the job site;
- 5) Requirements for pre-task Activity Hazard Analysis (AHAs);
- 6) Lines of authority;
- 7) Policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified;

**e. SUBCONTRACTORS AND SUPPLIERS.** If applicable, provide procedures for coordinating SOH activities with other employers on the job site:

- 1) Identification of subcontractors and suppliers (if known);
- 2) Safety responsibilities of subcontractors and suppliers.

**f. TRAINING.**

- 1) Site-specific SOH orientation training at the time of initial hire or assignment to the project for every employee before working on the project site is required.
- 2) Mandatory training and certifications that are applicable to this project (e.g., explosive actuated tools, crane operator, rigger, crane signal person, fall protection, electrical lockout/NFPA 70E, machine/equipment lockout, confined space, etc...) and any requirements for periodic retraining/recertification are required.
- 3) Procedures for ongoing safety and health training for supervisors and employees shall be established to address changes in site hazards/conditions.
- 4) OSHA 10-hour training is required for all workers on site and the OSHA 30-hour training is required for Trade Competent Persons (CPs)

**g. SAFETY AND HEALTH INSPECTIONS.**

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- 1) Specific assignment of responsibilities for a minimum daily job site safety and health inspection during periods of work activity: Who will conduct (e.g., "Site Safety and Health CP"), proof of inspector's training/qualifications, when inspections will be conducted, procedures for documentation, deficiency tracking system, and follow-up procedures.
- 2) Any external inspections/certifications that may be required (e.g., contracted CSP or CSHT)

**h. ACCIDENT INVESTIGATION & REPORTING.** The Contractor shall conduct mishap investigations of all OSHA Recordable Incidents. The APP shall include accident/incident investigation procedure & identify person(s) responsible to provide the following to the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority:

- 1) Exposure data (man-hours worked);
- 2) Accident investigations, reports, and logs.

**i. PLANS (PROGRAMS, PROCEDURES) REQUIRED.** Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational risks in site-specific compliance and accident prevention plans. These Plans shall include but are not be limited to procedures for addressing the risks associates with the following:

- 1) Emergency response ;
- 2) Contingency for severe weather;
- 3) Fire Prevention ;
- 4) Medical Support;
- 5) Posting of emergency telephone numbers;
- 6) Prevention of alcohol and drug abuse;
- 7) Site sanitation (housekeeping, drinking water, toilets);

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- 8) Night operations and lighting ;
- 9) Hazard communication program;
- 10) Welding/Cutting "Hot" work ;
- 11) Electrical Safe Work Practices (Electrical LOTO/NFPA 70E);
- 12) General Electrical Safety
- 13) Hazardous energy control (Machine LOTO);
- 14) Site-Specific Fall Protection & Prevention;
- 15) Excavation/trenching;
- 16) Asbestos abatement;
- 17) Lead abatement;
- 18) Crane Critical lift;
- 19) Respiratory protection;
- 20) Health hazard control program;
- 21) Radiation Safety Program;
- 22) Abrasive blasting;
- 23) Heat/Cold Stress Monitoring;
- 24) Crystalline Silica Monitoring (Assessment);
- 25) Demolition plan (to include engineering survey);
- 26) Formwork and shoring erection and removal;
- 27) PreCast Concrete.

C. Submit the APP to the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP.

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- D. Once accepted by the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.
- E. Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the project superintendent, project overall designated OSHA Competent Person, and facility Safety Manager and Contracting Officer Representative. Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSE/SAFE A10.34) and the environment.

#### **1.5 ACTIVITY HAZARD ANALYSES (AHAS):**

- A. AHAs are also known as Job Hazard Analyses, Job Safety Analyses, and Activity Safety Analyses. Before beginning each work activity involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or sub-contractor is to perform the work, the Contractor(s) performing that work activity shall prepare an AHA (Example electronic AHA forms can be found on the US Army Corps of Engineers web site)
- B. AHAs shall define the activities being performed and identify the work sequences, the specific anticipated hazards, site conditions, equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk.
- C. Work shall not begin until the AHA for the work activity has been accepted by the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.

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1. The names of the Competent/Qualified Person(s) required for a particular activity (for example, excavations, scaffolding, fall protection, other activities as specified by OSHA and/or other State and Local agencies) shall be identified and included in the AHA. Certification of their competency/qualification shall be submitted to the Government Designated Authority (GDA) for acceptance prior to the start of that work activity.
2. The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified person(s).
  - a. If more than one Competent/Qualified Person is used on the AHA activity, a list of names shall be submitted as an attachment to the AHA. Those listed must be Competent/Qualified for the type of work involved in the AHA and familiar with current site safety issues.
  - b. If a new Competent/Qualified Person (not on the original list) is added, the list shall be updated (an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he or she has reviewed the AHA and is familiar with current site safety issues.
3. Submit AHAs to the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES for review at least 15 calendar days prior to the start of each phase. Subsequent AHAs as shall be formatted as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.
4. The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.
5. Develop the activity hazard analyses using the project schedule as the basis for the activities performed. All activities listed on the project schedule will require an AHA. The AHAs will be developed by

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the contractor, supplier, or subcontractor and provided to the prime contractor for review and approval and then submitted to the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority.

#### **1.6 PRECONSTRUCTION CONFERENCE:**

- A. Contractor representatives who have a responsibility or significant role in implementation of the accident prevention program, as required by 29 CFR 1926.20(b)(1), on the project shall attend the preconstruction conference to gain a mutual understanding of its implementation. This includes the project superintendent, subcontractor superintendents, and any other assigned safety and health professionals.
- B. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.
- C. Deficiencies in the submitted APP will be brought to the attention of the Contractor within 14 days of submittal, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.

#### **1.7 "SITE SAFETY AND HEALTH OFFICER" (SSHO) AND "COMPETENT PERSON" (CP):**

- A. The Prime Contractor shall designate a minimum of one SSHO at each project site that will be identified as the SSHO to administer the Contractor's safety program and government-accepted Accident Prevention Plan. Each subcontractor shall designate a minimum of one CP in compliance with 29 CFR 1926.20 (b)(2) that will be identified as a CP to administer their individual safety programs.



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- B. Further, all specialized Competent Persons for the work crews will be supplied by the respective contractor as required by 29 CFR 1926 (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations).
- C. These Competent Persons can have collateral duties as the subcontractor's superintendent and/or work crew lead persons as well as fill more than one specialized CP role (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations).
- D. The SSHO or an equally-qualified Designated Representative/alternate will maintain a presence on the site during construction operations in accordance with FAR Clause 52.236-6: *Superintendence by the Contractor*. CPs will maintain presence during their construction activities in accordance with above mentioned clause. A listing of the designated SSHO and all known CPs shall be submitted prior to the start of work as part of the APP with the training documentation and/or AHA as listed in Section 1.8 below.
- E. The repeated presence of uncontrolled hazards during a contractor's work operations will result in the designated CP as being deemed incompetent and result in the required removal of the employee in accordance with FAR Clause 52.236-5: Material and Workmanship, Paragraph (c).

#### **1.8 TRAINING:**

- A. The designated Prime Contractor SSHO must meet the requirements of all applicable OSHA standards and be capable (through training, experience, and qualifications) of ensuring that the requirements of 29 CFR 1926.16 and other appropriate Federal, State and local requirements are met for the project. As a minimum the SSHO must have completed the OSHA 30-hour Construction Safety class and have five (5) years of construction industry safety experience or three (3) years if he/she possesses a Certified Safety Professional (CSP) or certified Construction Safety and Health Technician (CSHT) certification or have a safety and health degree from an accredited university or college.

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- B. All designated CPs shall have completed the OSHA 30-hour Construction Safety course within the past 5 years.
- C. In addition to the OSHA 30 Hour Construction Safety Course, all CPs with high hazard work operations such as operations involving asbestos, electrical, cranes, demolition, work at heights/fall protection, fire safety/life safety, ladder, rigging, scaffolds, and trenches/excavations shall have a specialized formal course in the hazard recognition & control associated with those high hazard work operations. Documented "repeat" deficiencies in the execution of safety requirements will require retaking the requisite formal course.
- D. All other construction workers shall have the OSHA 10-hour Construction Safety Outreach course and any necessary safety training to be able to identify hazards within their work environment.
- E. Submit training records associated with the above training requirements to the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES 15 calendar days prior to the date of the preconstruction conference for acceptance.
- F. Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the SSHO or his/her designated representative. As a minimum, this briefing shall include information on the site-specific hazards, construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, emergency procedures, accident reporting etc... Documentation shall be provided to the COR that individuals have undergone contractor's safety briefing.
- G. Ongoing safety training will be accomplished in the form of weekly documented safety meeting.

#### **1.9 INSPECTIONS:**

- A. The SSHO shall conduct frequent and regular safety inspections (daily) of the site and each of the subcontractors CPs shall conduct frequent and regular safety inspections (daily) of the their work operations as required by 29 CFR 1926.20(b)(2). Each week, the SSHO shall conduct a

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formal documented inspection of the entire construction areas with the subcontractors' "Trade Safety and Health CPs" present in their work areas. Coordinate with, and report findings and corrective actions weekly to Facility Safety Manager or Contracting Officer Representative or Government Designated Authority.

**1.10 ACCIDENTS, OSHA 300 LOGS, AND MAN-HOURS:**

- A. Notify the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority as soon as practical, but no more than four hours after any accident meeting the definition of OSHA Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than \$5,000, or any weight handling equipment accident. Within notification include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority determine whether a government investigation will be conducted.
- B. Conduct an accident investigation for recordable injuries and illnesses, for Medical Treatment defined in paragraph DEFINITIONS, and property damage accidents resulting in at least \$20,000 in damages, to establish the root cause(s) of the accident. Complete the VA Form 2162, and provide the report to the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority within 5 calendar days of the accident. The Facility Safety or Contracting Officer Representative or Government Designated Authority will provide copies of any required or special forms.
- C. A summation of all man-hours worked by the contractor and associated sub-contractors for each month will be reported to the Facility Safety

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Manager or Contracting Officer Representative or Government Designated Authority monthly.

- D. A summation of all OSHA recordable accidents experienced on site by the contractor and associated sub-contractors for each month will be provided to the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority monthly. The contractor and associated sub-contractors' OSHA 300 logs will be made available to the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority as requested.

**1.11 PERSONAL PROTECTIVE EQUIPMENT (PPE):**

- A. PPE is governed in all areas by the nature of the work the employee is performing. For example, specific PPE required for performing work on electrical equipment is identified in NFPA 70E, Standard for Electrical Safety in the Workplace.

B. Mandatory PPE includes:

1. Hard Hats - unless written authorization is given by the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority in circumstances of work operations that have limited potential for falling object hazards such as during finishing work or minor remodeling. With authorization to relax the requirement of hard hats, if a worker becomes exposed to an overhead falling object hazard, then hard hats would be required in accordance with the OSHA regulations.
2. Safety glasses - unless written authorization is given by the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority appropriate safety glasses meeting the ANSI Z.87.1 standard must be worn by each person on site.
3. Appropriate Safety Shoes - based on the hazards present, safety shoes meeting the requirements of ASTM F2413-11 shall be worn by each person on site unless written authorization is given by the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority.

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4. Hearing protection - Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks.

#### **1.12 INFECTION CONTROL**

- A. Infection Control is critical in all medical center facilities. Interior construction activities causing disturbance of existing dust, or creating new dust, must be conducted within ventilation-controlled areas that minimize the flow of airborne particles into patient areas. Exterior construction activities causing disturbance of soil or creates dust in some other manner must be controlled.
- B. An AHA associated with infection control will be performed by VA personnel in accordance with FGI Guidelines (i.e. Infection Control Risk Assessment (ICRA)). The ICRA procedure found on the American Society for Healthcare Engineering (ASHE) website will be utilized. Risk classifications of Class II or lower will require approval by the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority before beginning any construction work. Risk classifications of Class III or higher will require a permit before beginning any construction work. Infection Control permits will be issued by the COR. The Infection Control Permits will be posted outside the appropriate construction area. More than one permit may be issued for a construction project if the work is located in separate areas requiring separate classes. The primary project scope area for this project varies. The required infection control precautions with each class are as follows:

1. Class I requirements:

- a. During Construction Work:

- 1) Notify the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority

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- 2) Execute work by methods to minimize raising dust from construction operations.
- 3) Ceiling tiles: Immediately replace a ceiling tiles displaced for visual inspection.

b. Upon Completion:

- 1) Clean work area upon completion of task
- 2) Notify the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority

2. Class II requirements:

a. During Construction Work:

- 1) Notify the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority
- 2) Provide active means to prevent airborne dust from dispersing into atmosphere such as wet methods or tool mounted dust collectors where possible.
- 3) Water mist work surfaces to control dust while cutting.
- 4) Seal unused doors with duct tape.
- 5) Block off and seal air vents.
- 6) Remove or isolate HVAC system in areas where work is being performed.

b. Upon Completion:

- 1) Wipe work surfaces with cleaner/disinfectant.
- 2) Contain construction waste before transport in tightly covered containers.
- 3) Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area.
- 4) Upon completion, restore HVAC system where work was performed

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- 5) Notify the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority

3. Class III requirements:

a. During Construction Work:

- 1) Obtain permit from the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority
- 2) Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system.
- 3) Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.
- 4) Maintain negative air pressure, 0.01 inches of water gauge, within work site utilizing HEPA equipped air filtration units and continuously monitored with a digital display, recording and alarm instrument, which must be calibrated on installation, maintained with periodic calibration and monitored by the contractor.
- 5) Contain construction waste before transport in tightly covered containers.
- 6) Cover transport receptacles or carts. Tape covering unless solid lid.

b. Upon Completion:

- 1) Do not remove barriers from work area until completed project is inspected by the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority and thoroughly cleaned by the VA Environmental Services Department.

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- 2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
- 3) Vacuum work area with HEPA filtered vacuums.
- 4) Wet mop area with cleaner/disinfectant.
- 5) Upon completion, restore HVAC system where work was performed.
- 6) Return permit to the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority

4. Class IV requirements:

a. During Construction Work:

- 1) Obtain permit from the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority
- 2) Isolate HVAC system in area where work is being done to prevent contamination of duct system.
- 3) Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.
- 4) Maintain negative air pressure within work site utilizing HEPA equipped air filtration units.
- 5) Seal holes, pipes, conduits, and punctures.
- 6) Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave work site.
- 7) All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.



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b. Upon Completion:

- 1) Do not remove barriers from work area until completed project is inspected by the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority with thorough cleaning by the VA Environmental Services Dept.
- 2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
- 3) Contain construction waste before transport in tightly covered containers.
- 4) Cover transport receptacles or carts. Tape covering unless solid lid.
- 5) Vacuum work area with HEPA filtered vacuums.
- 6) Wet mop area with cleaner/disinfectant.
- 7) Upon completion, restore HVAC system where work was performed.
- 8) Return permit to the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority

C. Barriers shall be erected as required based upon classification (Class III & IV requires barriers) and shall be constructed as follows:

1. Class III and IV - closed door with masking tape applied over the frame and door is acceptable for projects that can be contained in a single room.
2. Construction, demolition or reconstruction not capable of containment within a single room must have the following barriers erected and made presentable on hospital occupied side:
  - a. Class III & IV (where dust control is the only hazard, and an agreement is reached with the COR and Medical Center) - Airtight plastic barrier that extends from the floor to ceiling. Seams must be sealed with duct tape to prevent dust and debris from escaping

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- b. Class III & IV - Drywall barrier erected with joints covered or sealed to prevent dust and debris from escaping.
  - c. Class III & IV - Seal all penetrations in existing barrier airtight
  - d. Class III & IV - Barriers at penetration of ceiling envelopes, chases and ceiling spaces to stop movement air and debris
  - e. Class IV only - Anteroom or double entrance openings that allow workers to remove protective clothing or vacuum off existing clothing
  - f. Class III & IV - At elevators shafts or stairways within the field of construction, overlapping flap minimum of two feet wide of polyethylene enclosures for personnel access.
- D. Products and Materials:
- 1. Sheet Plastic: Fire retardant polystyrene, 6-mil thickness meeting local fire codes
  - 2. Barrier Doors: Self Closing Two-hour fire-rated solid core wood in steel frame, painted
  - 3. Dust proof two-hour fire-rated drywall
  - 4. High Efficiency Particulate Air-Equipped filtration machine rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Maintenance of equipment and replacement of the HEPA filters and other filters will be in accordance with manufacturer's instructions.
  - 5. Exhaust Hoses: Heavy duty, flexible steel reinforced; Ventilation Blower Hose
  - 6. Adhesive Walk-off Mats: Provide minimum size mats of 24 inches x 36 inches
  - 7. Disinfectant: Hospital-approved disinfectant or equivalent product

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#### 8. Portable Ceiling Access Module

- E. Before any construction on site begins, all contractor personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.
- F. A dust control program will be establish and maintained as part of the contractor's infection preventive measures in accordance with the FGI Guidelines for Design and Construction of Healthcare Facilities. Prior to start of work, prepare a plan detailing project-specific dust protection measures with associated product data, including periodic status reports, and submit to COR and Facility CSC for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- G. Medical center Infection Control personnel will monitor for airborne disease (e.g. aspergillosis) during construction. A baseline of conditions will be established by the medical center prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality with safe thresholds established.
- H. In general, the following preventive measures shall be adopted during construction to keep down dust and prevent mold.
  - 1. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. HEPA filtration is required where the exhaust dust may reenter the medical center.
  - 2. Exhaust hoses shall be exhausted so that dust is not reintroduced to the medical center.
  - 3. Adhesive Walk-off/Carpet Walk-off Mats shall be used at all interior transitions from the construction area to occupied medical center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.
  - 4. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall

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- utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as it is created. Transport these outside the construction area in containers with tightly fitting lids.
5. The contractor shall not haul debris through patient-care areas without prior approval of the Resident Engineer and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.
  6. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.
  7. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.

I. Final Cleanup:

1. Upon completion of project, or as work progresses, remove all construction debris from above ceiling, vertical shafts and utility chases that have been part of the construction.
2. Perform HEPA vacuum cleaning of all surfaces in the construction area. This includes walls, ceilings, cabinets, furniture (built-in or free standing), partitions, flooring, etc.
3. All new air ducts shall be cleaned prior to final inspection.

J. Exterior Construction

1. Contractor shall verify that dust will not be introduced into the medical center through intake vents, or building openings. HEPA filtration on intake vents is required where dust may be introduced.

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2. Dust created from disturbance of soil such as from vehicle movement will be wetted with use of a water truck as necessary
3. All cutting, drilling, grinding, sanding, or disturbance of materials shall be accomplished with tools equipped with either local exhaust ventilation (i.e. vacuum systems) or wet suppression controls.

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**1.13 TUBERCULOSIS SCREENING**

- A. Contractor shall provide written certification that all contract employees assigned to the work site have had a pre-placement tuberculin screening within 90 days prior to assignment to the worksite and been found have negative TB screening reactions. Contractors shall be required to show documentation of negative TB screening reactions for any additional workers who are added after the 90-day requirement before they will be allowed to work on the work site. NOTE: This can be the Center for Disease Control (CDC) and Prevention and two-step skin testing or a Food and Drug Administration (FDA)-approved blood test.
  1. Contract employees manifesting positive screening reactions to the tuberculin shall be examined according to current CDC guidelines prior to working on VHA property.
  2. Subsequently, if the employee is found without evidence of active (infectious) pulmonary TB, a statement documenting examination by a physician shall be on file with the employer (construction contractor), noting that the employee with a positive tuberculin screening test is without evidence of active (infectious) pulmonary TB.
  3. If the employee is found with evidence of active (infectious) pulmonary TB, the employee shall require treatment with a subsequent statement to the fact on file with the employer before being allowed to return to work on VHA property.

#### **1.14 FIRE SAFETY**

- A. Fire Safety Plan: Establish and maintain a site-specific fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to Facility Safety Manager or Contracting Officer Representative or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. This plan may be an element of the Accident Prevention Plan.
- B. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- C. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).
- D. Temporary Construction Partitions:
  - 1. Install and maintain temporary construction partitions to provide smoke-tight separations between construction areas the areas that are described in phasing requirements and adjoining areas. Construct partitions of gypsum board or treated plywood (flame spread rating of 25 or less in accordance with ASTM E84) on both sides of fire retardant treated wood or metal steel studs. Extend the partitions through suspended ceilings to floor slab deck or roof. Seal joints and penetrations. At door openings, install Class C, ¾ hour fire/smoke rated doors with self-closing devices.
  - 2. Install two-hour fire-rated temporary construction partitions as shown on drawings to maintain integrity of existing exit stair enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures.
  - 3. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-

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penetration firestop materials in accordance with Section 07 84 00,  
FIRESTOPPING.

- E. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- F. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with Facility Safety Manager or Contracting Officer Representative or Government Designated Authority.
- G. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to Facility Safety Manager or Contracting Officer Representative or Government Designated Authority.
- H. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- I. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- J. Section omitted.
- K. Section omitted.
- L. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with Facility Safety Manager or Contracting Officer Representative or Government Designated Authority. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the Resident Engineer.

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- M. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with / Facility Safety Manager or Contracting Officer Representative or Government Designated Authority.
- N. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Facility Safety Office. Obtain permits from facility Safety Manager at least 24 hours in advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work.
- O. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to Facility Safety Manager or Contracting Officer Representative or Government Designated Authority.
- P. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.
- Q. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.
- R. If required, submit documentation to the Facility Safety Office COR or other Government Designated Authority that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.

#### **1.15 ELECTRICAL**

- A. All electrical work shall comply with NFPA 70 (NEC), NFPA 70B, NFPA 70E, 29 CFR Part 1910 Subpart J – General Environmental Controls, 29 CFR Part 1910 Subpart S – Electrical, and 29 CFR 1926 Subpart K in addition to other references required by contract.
- B. All qualified persons performing electrical work under this contract shall be licensed journeyman or master electricians. All apprentice electricians performing under this contract shall be deemed unqualified persons unless they are working under the immediate supervision of a licensed electrician or master electrician.



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C. All electrical work will be accomplished de-energized and in the Electrically Safe Work Condition ( refer to NFPA 70E for Work Involving Electrical Hazards, including Exemptions to Work Permit). Any Contractor, subcontractor or temporary worker who fails to fully comply with this requirement is subject to immediate termination in accordance with FAR clause 52.236-5(c). Only in rare circumstance where achieving an electrically safe work condition prior to beginning work would increase or cause additional hazards, or is infeasible due to equipment design or operational limitations is energized work permitted. The Facility Safety Manager or Contracting Officer Representative or Government Designated Authority with approval of the Medical Center Director will make the determination if the circumstances would meet the exception outlined above. An AHA specific to energized work activities will be developed, reviewed, and accepted prior to the start of that work.

1. Development of a Hazardous Electrical Energy Control Procedure is required prior to de-energization. A single Simple Lockout/Tagout Procedure for multiple work operations can only be used for work involving qualified person(s) de-energizing one set of conductors or circuit part source. Task specific Complex Lockout/Tagout Procedures are required at all other times.
2. Verification of the absence of voltage after de-energization and lockout/tagout is considered "energized electrical work" (live work) under NFPA 70E, and shall only be performed by qualified persons wearing appropriate shock protective (voltage rated) gloves and arc rate personal protective clothing and equipment, using Underwriters Laboratories (UL) tested and appropriately rated contact electrical testing instruments or equipment appropriate for the environment in which they will be used.
3. Personal Protective Equipment (PPE) and electrical testing instruments will be readily available for inspection by the The Facility Safety Manager or Contracting Officer Representative or Government Designated Authority.

D. Before beginning any electrical work, an Activity Hazard Analysis (AHA) will be conducted to include Shock Hazard and Arc Flash Hazard analyses

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(NFPA Tables can be used only as a last alternative and it is strongly suggested a full Arc Flash Hazard Analyses be conducted). Work shall not begin until the AHA for the work activity has been accepted by the Facility Safety Manager or Contracting Officer Representative or Government Designated Authority and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.

- E.** Ground-fault circuit interrupters. All 120-volt, single-phase 15- and 20-ampere receptacle outlets on construction sites shall have approved ground-fault circuit interrupters for personnel protection. "Assured Equipment Grounding Conductor Program" only is not allowed.

#### **1.16 FALL PROTECTION**

- A.** The fall protection (FP) threshold height requirement is 6 ft (1.8 m) for ALL WORK, unless specified differently or the OSHA 29 CFR 1926 requirements are more stringent, to include steel erection activities, systems-engineered activities (prefabricated) metal buildings, residential (wood) construction and scaffolding work.
  - 1. The use of a Safety Monitoring System (SMS) as a fall protection method is prohibited.
  - 2. The use of Controlled Access Zone (CAZ) as a fall protection method is prohibited.
  - 3. A Warning Line System (WLS) may ONLY be used on floors or flat or low-sloped roofs (between 0 - 18.4 degrees or 4:12 slope) and shall be erected around all sides of the work area (See 29 CFR 1926.502(f) for construction of WLS requirements). Working within the WLS does not require FP. No worker shall be allowed in the area between the roof or floor edge and the WLS without FP. FP is required when working outside the WLS.
  - 4. Fall protection while using a ladder will be governed by the OSHA requirements.

#### **1.17 SCAFFOLDS AND OTHER WORK PLATFORMS**

- A. All scaffolds and other work platforms construction activities shall comply with 29 CFR 1926 Subpart L.
- B. The fall protection (FP) threshold height requirement is 6 ft (1.8 m) as stated in Section 1.16.
- C. The following hierarchy and prohibitions shall be followed in selecting appropriate work platforms.
  - 1. Scaffolds, platforms, or temporary floors shall be provided for all work except that can be performed safely from the ground or similar footing.
  - 2. Ladders less than 20 feet may be used as work platforms only when use of small hand tools or handling of light material is involved.
  - 3. Ladder jacks, lean-to, and prop-scaffolds are prohibited.
  - 4. Emergency descent devices shall not be used as working platforms.
- D. Contractors shall use a scaffold tagging system in which all scaffolds are tagged by the Competent Person. Tags shall be color-coded: green indicates the scaffold has been inspected and is safe to use; red indicates the scaffold is unsafe to use. Tags shall be readily visible, made of materials that will withstand the environment in which they are used, be legible and shall include:
  - 1. The Competent Person's name and signature;
  - 2. Dates of initial and last inspections.
- E. Mast Climbing work platforms: When access ladders, including masts designed as ladders, exceed 20 ft (6 m) in height, positive fall protection shall be used.

#### **1.18 EXCAVATION AND TRENCHES**

- A. All excavation and trenching work shall comply with 29 CFR 1926 Subpart P.
- B. All excavations and trenches 5 feet in depth or greater shall require a written trenching and excavation permit (NOTE – some States and other local jurisdictions require separate state/jurisdiction-issued

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excavation permits). The permit shall be completed and provided to the Facility Safety Manager and/or other Government Designated Authority prior to commencing work for the day. At the end of the day, the permit shall be closed out and provided to the Facility Safety Manager and/or other Government Designated Authority. The permit shall be maintained onsite and include the following:

1. Determination of soil classification
  2. Indication that utilities have been located and identified. If utilities could not be located after all reasonable attempt, then excavating operations will proceed cautiously.
  3. Indication of selected excavation protective system.
  4. Indication that the spoil pile will be stored at least 2 feet from the edge of the excavation and safe access provided within 25 feet of the workers.
  5. Indication of assessment for a potential toxic, explosive, or oxygen deficient atmosphere.
- C. If not using an engineered protective system such as a trench box, shielding, shoring, or other Professional Engineer designed system and using a sloping or benching system, soil classification cannot be Solid Rock or Type A. All soil will be classified as Type B or Type C and sloped or benched in accordance with Appendix B of 29 CFR 1926.

#### **1.19 CRANES**

- A. All crane work shall comply with 29 CFR 1926 Subpart CC.
- B. Prior to operating a crane, the operator must be licensed, qualified or certified to operate the crane. Thus, all the provisions contained with Subpart CC are effective and there is no "Phase In" date of November 10, 2014.
- C. A detailed lift permit shall be submitted 14 days prior to the scheduled lift complete with route for truck carrying load, crane load analysis, siting of crane and path of swing. The lift will not be allowed without approval of this document.
- D. Crane operators shall not carry loads

1. over the general public or VAMC personnel
2. over any occupied building unless
  - a. the top two floors are vacated
  - b. or overhead protection with a design live load of 300 psf is provided

#### **1.20 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)**

- A. All installation, maintenance, and servicing of equipment or machinery shall comply with 29 CFR 1910.147 except for specifically referenced operations in 29 CFR 1926 such as concrete & masonry equipment [1926.702(j)], heavy machinery & equipment [1926.600(a)(3)(i)], and process safety management of highly hazardous chemicals (1926.64). Control of hazardous electrical energy during the installation, maintenance, or servicing of electrical equipment shall comply with Section 1.15 to include NFPA 70E and other VA specific requirements discussed in the section.

#### **1.21 CONFINED SPACE ENTRY**

- A. All confined space entry shall comply with 29 CFR 1910.146 except for specifically referenced operations in 29 CFR 1926 such as excavations/trenches [1926.651(g)].
- B. A site-specific Confined Space Entry Plan (including permitting process) shall be developed and submitted to the Facility Safety Manager and/or other Government Designated Authority.

#### **1.22 WELDING AND CUTTING**

As specified in section 1.14, Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Facility Safety Manager and/or other Government Designated Authority. Obtain permits from Facility Safety Manager and/or other Government Designated Authority at least 24 hours in advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work.

#### **1.23 LADDERS**

- A. All Ladder use shall comply with 29 CFR 1926 Subpart X.

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- B. All portable ladders shall be of sufficient length and shall be placed so that workers will not stretch or assume a hazardous position.
- C. Manufacturer safety labels shall be in place on ladders
- D. Step Ladders shall not be used in the closed position
- E. Top steps or cap of step ladders shall not be used as a step
- F. Portable ladders, used as temporary access, shall extend at least 3 ft (0.9 m) above the upper landing surface.
  - 1. When a 3 ft (0.9-m) extension is not possible, a grasping device (such as a grab rail) shall be provided to assist workers in mounting and dismounting the ladder.
  - 2. In no case shall the length of the ladder be such that ladder deflection under a load would, by itself, cause the ladder to slip from its support.
- G. Ladders shall be inspected for visible defects on a daily basis and after any occurrence that could affect their safe use. Broken or damaged ladders shall be immediately tagged "DO NOT USE," or with similar wording, and withdrawn from service until restored to a condition meeting their original design.

#### **1.24 FLOOR & WALL OPENINGS**

- A. All floor and wall openings shall comply with 29 CFR 1926 Subpart M.
- B. Floor and roof holes/openings are any that measure over 2 in (51 mm) in any direction of a walking/working surface which persons may trip or fall into or where objects may fall to the level below. See 21.F for covering and labeling requirements. Skylights located in floors or roofs are considered floor or roof hole/openings.
- C. All floor, roof openings or hole into which a person can accidentally walk or fall through shall be guarded either by a railing system with toeboards along all exposed sides or a load-bearing cover. When the cover is not in place, the opening or hole shall be protected by a removable guardrail system or shall be attended when the guarding system has been removed, or other fall protection system.

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1. Covers shall be capable of supporting, without failure, at least twice the weight of the worker, equipment and material combined.
2. Covers shall be secured when installed, clearly marked with the word "HOLE", "COVER" or "Danger, Roof Opening-Do Not Remove" or color-coded or equivalent methods (e.g., red or orange "X"). Workers must be made aware of the meaning for color coding and equivalent methods.
3. Roofing material, such as roofing membrane, insulation or felts, covering or partly covering openings or holes, shall be immediately cut out. No hole or opening shall be left unattended unless covered.
4. Non-load-bearing skylights shall be guarded by a load-bearing skylight screen, cover, or railing system along all exposed sides.
5. Workers are prohibited from standing/walking on skylights.

- - - E N D - - -

**SECTION 01 42 19**  
**REFERENCE STANDARDS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies the availability and source of references and standards specified in the project manual under paragraphs APPLICABLE PUBLICATIONS and/or shown on the drawings.

**1.2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS FPMR PART 101-29 (FAR 52.211-1) (AUG 1998)**

- A. The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 and copies of specifications, standards, and commercial item descriptions cited in the solicitation may be obtained for a fee by submitting a request to - GSA Federal Supply Service, Specifications Section, Suite 8100, 470 East L'Enfant Plaza, SW, Washington, DC 20407, Telephone (202) 619-8925, Facsimile (202) 619-8978.
- B. If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (a) of this provision. Additional copies will be issued for a fee.

**1.3 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-4) (JUN 1988)**

The specifications and standards cited in this solicitation can be examined at the following location:

DEPARTMENT OF VETERANS AFFAIRS  
Office of Construction & Facilities Management  
Facilities Quality Service (00CFM1A)  
425 Eye Street N.W, (sixth floor)  
Washington, DC 20001  
Telephone Numbers: (202) 632-5249 or (202) 632-5178  
Between 9:00 AM - 3:00 PM

**1.4 AVAILABILITY OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-3) (JUN 1988)**

The specifications cited in this solicitation may be obtained from the associations or organizations listed below.



AA	Aluminum Association Inc. <a href="http://www.aluminum.org">http://www.aluminum.org</a>
AABC	Associated Air Balance Council <a href="http://www.aabchg.com">http://www.aabchg.com</a>
AAMA	American Architectural Manufacturer's Association <a href="http://www.aamanet.org">http://www.aamanet.org</a>
AAN	American Nursery and Landscape Association <a href="http://www.anla.org">http://www.anla.org</a>
AASHTO	American Association of State Highway and Transportation Officials <a href="http://www.aashto.org">http://www.aashto.org</a>
AATCC	American Association of Textile Chemists and Colorists <a href="http://www.aatcc.org">http://www.aatcc.org</a>
ACGIH	American Conference of Governmental Industrial Hygienists <a href="http://www.acgi.org">http://www.acgi.org</a>
ACI	American Concrete Institute <a href="http://www.aci-int.net">http://www.aci-int.net</a>
ACPA	American Concrete Pipe Association <a href="http://www.concrete-pipe.org">http://www.concrete-pipe.org</a>
ACPPA	American Concrete Pressure Pipe Association <a href="http://www.acppa.org">http://www.acppa.org</a>
ADC	Air Diffusion Council <a href="http://flexibleduct.org">http://flexibleduct.org</a>
AGA	American Gas Association <a href="http://www.aga.org">http://www.aga.org</a>
AGC	Associated General Contractors of America <a href="http://www.agc.org">http://www.agc.org</a>
AGMA	American Gear Manufacturers Association, Inc. <a href="http://www.agma.org">http://www.agma.org</a>
AHAM	Association of Home Appliance Manufacturers <a href="http://www.aham.org">http://www.aham.org</a>
AISC	American Institute of Steel Construction <a href="http://www.aisc.org">http://www.aisc.org</a>
AISI	American Iron and Steel Institute <a href="http://www.steel.org">http://www.steel.org</a>
AITC	American Institute of Timber Construction <a href="http://www.aitc-glulam.org">http://www.aitc-glulam.org</a>
AMCA	Air Movement and Control Association, Inc. <a href="http://www.amca.org">http://www.amca.org</a>
ANLA	American Nursery & Landscape Association <a href="http://www.anla.org">http://www.anla.org</a>

ANSI	American National Standards Institute, Inc. <a href="http://www.ansi.org">http://www.ansi.org</a>
APA	The Engineered Wood Association <a href="http://www.apawood.org">http://www.apawood.org</a>
ARI	Air-Conditioning and Refrigeration Institute <a href="http://www.ari.org">http://www.ari.org</a>
ASAE	American Society of Agricultural Engineers <a href="http://www.asae.org">http://www.asae.org</a>
ASCE	American Society of Civil Engineers <a href="http://www.asce.org">http://www.asce.org</a>
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers <a href="http://www.ashrae.org">http://www.ashrae.org</a>
ASME	American Society of Mechanical Engineers <a href="http://www.asme.org">http://www.asme.org</a>
ASSE	American Society of Sanitary Engineering <a href="http://www.asse-plumbing.org">http://www.asse-plumbing.org</a>
ASTM	American Society for Testing and Materials <a href="http://www.astm.org">http://www.astm.org</a>
AWI	Architectural Woodwork Institute <a href="http://www.awinet.org">http://www.awinet.org</a>
AWS	American Welding Society <a href="http://www.aws.org">http://www.aws.org</a>
AWWA	American Water Works Association <a href="http://www.awwa.org">http://www.awwa.org</a>
BHMA	Builders Hardware Manufacturers Association <a href="http://www.buildershardware.com">http://www.buildershardware.com</a>
BIA	Brick Institute of America <a href="http://www.bia.org">http://www.bia.org</a>
CAGI	Compressed Air and Gas Institute <a href="http://www.cagi.org">http://www.cagi.org</a>
CGA	Compressed Gas Association, Inc. <a href="http://www.cganet.com">http://www.cganet.com</a>
CI	The Chlorine Institute, Inc. <a href="http://www.chlorineinstitute.org">http://www.chlorineinstitute.org</a>
CISCA	Ceilings and Interior Systems Construction Association <a href="http://www.cisca.org">http://www.cisca.org</a>
CISPI	Cast Iron Soil Pipe Institute <a href="http://www.cispi.org">http://www.cispi.org</a>

CLFMI	Chain Link Fence Manufacturers Institute <a href="http://www.chainlinkinfo.org">http://www.chainlinkinfo.org</a>
CPMB	Concrete Plant Manufacturers Bureau <a href="http://www.cpmc.org">http://www.cpmc.org</a>
CRA	California Redwood Association <a href="http://www.calredwood.org">http://www.calredwood.org</a>
CRSI	Concrete Reinforcing Steel Institute <a href="http://www.crsi.org">http://www.crsi.org</a>
CTI	Cooling Technology Institute <a href="http://www.cti.org">http://www.cti.org</a>
DHI	Door and Hardware Institute <a href="http://www.dhi.org">http://www.dhi.org</a>
EGSA	Electrical Generating Systems Association <a href="http://www.egsa.org">http://www.egsa.org</a>
EEI	Edison Electric Institute <a href="http://www.eei.org">http://www.eei.org</a>
EPA	Environmental Protection Agency <a href="http://www.epa.gov">http://www.epa.gov</a>
ETL	ETL Testing Laboratories, Inc. <a href="http://www.etl.com">http://www.etl.com</a>
FAA	Federal Aviation Administration <a href="http://www.faa.gov">http://www.faa.gov</a>
FCC	Federal Communications Commission <a href="http://www.fcc.gov">http://www.fcc.gov</a>
FPS	The Forest Products Society <a href="http://www.forestprod.org">http://www.forestprod.org</a>
GANA	Glass Association of North America <a href="http://www.cssinfo.com/info/gana.html/">http://www.cssinfo.com/info/gana.html/</a>
FM	Factory Mutual Insurance <a href="http://www.fmglobal.com">http://www.fmglobal.com</a>
GA	Gypsum Association <a href="http://www.gypsum.org">http://www.gypsum.org</a>
GSA	General Services Administration <a href="http://www.gsa.gov">http://www.gsa.gov</a>
HI	Hydraulic Institute <a href="http://www.pumps.org">http://www.pumps.org</a>
HPVA	Hardwood Plywood & Veneer Association <a href="http://www.hpva.org">http://www.hpva.org</a>
ICBO	International Conference of Building Officials <a href="http://www.icbo.org">http://www.icbo.org</a>

ICEA	Insulated Cable Engineers Association Inc. <a href="http://www.icea.net">http://www.icea.net</a>
\ICAC	Institute of Clean Air Companies <a href="http://www.icac.com">http://www.icac.com</a>
IEEE	Institute of Electrical and Electronics Engineers <a href="http://www.ieee.org/">http://www.ieee.org/</a>
IMSA	International Municipal Signal Association <a href="http://www.imsasafety.org">http://www.imsasafety.org</a>
IPCEA	Insulated Power Cable Engineers Association
NBMA	Metal Buildings Manufacturers Association <a href="http://www.mbma.com">http://www.mbma.com</a>
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc. <a href="http://www.mss-hq.com">http://www.mss-hq.com</a>
NAAMM	National Association of Architectural Metal Manufacturers <a href="http://www.naamm.org">http://www.naamm.org</a>
NAPHCC	Plumbing-Heating-Cooling Contractors Association <a href="http://www.phccweb.org.org">http://www.phccweb.org.org</a>
NBS	National Bureau of Standards See - NIST
NBBPVI	National Board of Boiler and Pressure Vessel Inspectors <a href="http://www.nationboard.org">http://www.nationboard.org</a>
NEC	National Electric Code See - NFPA National Fire Protection Association
NEMA	National Electrical Manufacturers Association <a href="http://www.nema.org">http://www.nema.org</a>
NFPA	National Fire Protection Association <a href="http://www.nfpa.org">http://www.nfpa.org</a>
NHLA	National Hardwood Lumber Association <a href="http://www.natlhardwood.org">http://www.natlhardwood.org</a>
NIH	National Institute of Health <a href="http://www.nih.gov">http://www.nih.gov</a>
NIST	National Institute of Standards and Technology <a href="http://www.nist.gov">http://www.nist.gov</a>
NLMA	Northeastern Lumber Manufacturers Association, Inc. <a href="http://www.nelma.org">http://www.nelma.org</a>
NPA	National Particleboard Association 18928 Premiere Court Gaithersburg, MD 20879 (301) 670-0604

NSF        National Sanitation Foundation  
<http://www.nsf.org>

NWWDA     Window and Door Manufacturers Association  
<http://www.nwwda.org>

OSHA      Occupational Safety and Health Administration  
Department of Labor  
<http://www.osha.gov>

PCA        Portland Cement Association  
<http://www.portcement.org>

PCI        Precast Prestressed Concrete Institute  
<http://www.pci.org>

PPI        The Plastic Pipe Institute  
<http://www.plasticpipe.org>

PEI        Porcelain Enamel Institute, Inc.  
<http://www.porcelainenamel.com>

PTI        Post-Tensioning Institute  
<http://www.post-tensioning.org>

RFCI      The Resilient Floor Covering Institute  
<http://www.rfci.com>

RIS        Redwood Inspection Service  
See - CRA

RMA        Rubber Manufacturers Association, Inc.  
<http://www.rma.org>

SCMA      Southern Cypress Manufacturers Association  
<http://www.cypressinfo.org>

SDI        Steel Door Institute  
<http://www.steeldoor.org>

IGMA      Insulating Glass Manufacturers Alliance  
<http://www.igmaonline.org>

SJI        Steel Joist Institute  
<http://www.steeljoist.org>

SMACNA   Sheet Metal and Air-Conditioning Contractors  
National Association, Inc.  
<http://www.smacna.org>

SSPC      The Society for Protective Coatings  
<http://www.sspc.org>

STI        Steel Tank Institute  
<http://www.steeltank.com>

SWI        Steel Window Institute  
<http://www.steelwindows.com>

TCA        Tile Council of America, Inc.  
            <http://www.tileusa.com>

TEMA       Tubular Exchange Manufacturers Association  
            <http://www.tema.org>

TPI        Truss Plate Institute, Inc.  
            583 D'Onofrio Drive; Suite 200  
            Madison, WI 53719  
            (608) 833-5900

UBC        The Uniform Building Code  
            See ICBO

UL         Underwriters' Laboratories Incorporated  
            <http://www.ul.com>

ULC        Underwriters' Laboratories of Canada  
            <http://www.ulc.ca>

WCLIB      West Coast Lumber Inspection Bureau  
            6980 SW Varns Road, P.O. Box 23145  
            Portland, OR 97223  
            (503) 639-0651

WRCLA     Western Red Cedar Lumber Association  
            P.O. Box 120786  
            New Brighton, MN 55112  
            (612) 633-4334

WWPA      Western Wood Products Association  
            <http://www.wwpa.org>

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**SECTION 01 58 16**  
**TEMPORARY INTERIOR SIGNAGE**

**PART 1 GENERAL**

**DESCRIPTION**

This section specifies temporary interior signs.

**PART 2 PRODUCTS**

**2.1 TEMPORARY SIGNS**

- A. Fabricate from 50 Kg (110 pound) mat finish white paper.
- B. Cut to 100 mm (4-inch) wide by 300 mm (12 inch) long size tag.
- C. Punch 3 mm (1/8-inch) diameter hole centered on 100 mm (4-inch) dimension of tag. Edge of Hole spaced approximately 13 mm (1/2-inch) from one end on tag.
- D. Reinforce hole on both sides with gummed cloth washer or other suitable material capable of preventing tie pulling through paper edge.
- E. Ties: Steel wire 0.3 mm (0.0120-inch) thick, attach to tag with twist tie, leaving 150 mm (6-inch) long free ends.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- A. Install temporary signs attached to room door frame or room door knob, lever, or pull for doors on corridor openings.
- B. Mark on signs with felt tip marker having approximately 3 mm (1/8-inch) wide stroke for clearly legible numbers or letters.
- C. Identify room with numbers as designated on floor plans.

**3.2 LOCATION**

- A. Install on doors that have room, corridor, and space numbers shown.
- B. Doors that do not require signs are as follows:
  - 1. Corridor barrier doors (cross-corridor) in corridor with same number.
  - 2. Folding doors or partitions.
  - 3. Toilet or bathroom doors within and between rooms.
  - 4. Communicating doors in partitions between rooms with corridor entrance doors.
  - 5. Closet doors within rooms.
- C. Replace missing, damaged, or illegible signs.

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**SECTION 01 74 19**  
**CONSTRUCTION WASTE MANAGEMENT**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.
- B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled or reused.
- C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle not limited to the following:
  - 1. Waste Management Plan development and implementation.
  - 2. Techniques to minimize waste generation.
  - 3. Sorting and separating of waste materials.
  - 4. Salvage of existing materials and items for reuse or resale.
  - 5. Recycling of materials that cannot be reused or sold.
- D. At a minimum the following waste categories shall be diverted from landfills:
  - 1. Soil.
  - 2. Inerts (eg, concrete, masonry and asphalt).
  - 3. Clean dimensional wood and palette wood.
  - 4. Green waste (biodegradable landscaping materials).
  - 5. Engineered wood products (plywood, particle board and I-joists, etc).
  - 6. Metal products (eg, steel, wire, beverage containers, copper, etc).
  - 7. Cardboard, paper and packaging.
  - 8. Bitumen roofing materials.
  - 9. Plastics (eg, ABS, PVC).
  - 10. Carpet and/or pad.
  - 11. Gypsum board.
  - 12. Insulation.
  - 13. Paint.
  - 14. Fluorescent lamps.

**1.2 RELATED WORK**

- A. Section 02 41 00, DEMOLITION.



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B. Section 01 00 00, GENERAL REQUIREMENTS.

C. Lead Paint: Section 02 83 33.13, LEAD BASED PAINT REMOVAL AND DISPOSAL.

### **1.3 QUALITY ASSURANCE**

- A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction /Demolition waste includes products of the following:
1. Excess or unusable construction materials.
  2. Packaging used for construction products.
  3. Poor planning and/or layout.
  4. Construction error.
  5. Over ordering.
  6. Weather damage.
  7. Contamination.
  8. Mishandling.
  9. Breakage.
- B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.
- C. Contractor shall develop and implement procedures to recycle construction and demolition waste to a minimum of 50 percent.
- D. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the contractor.
- E. Contractor shall provide all demolition, removal and legal disposal of materials. Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations. The Whole Building Design Guide website <http://www.wbdg.org/tools/cwm.php> provides a Construction Waste Management Database that contains information on companies that haul, collect, and process recyclable debris from construction projects.
- F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to

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be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.

- G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.
- H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

#### **1.4 TERMINOLOGY**

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.
- B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.
- C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.
- D. Dismantle: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.
- E. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).
- F. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.
- G. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.
- H. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.
- I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- J. Mixed Debris Recycling Facility: A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.

- K. Permitted Waste Hauler: A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.
- L. Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
  - 1. On-site Recycling - Materials that are sorted and processed on site for use in an altered state in the work, i.e. concrete crushed for use as a sub-base in paving.
  - 2. Off-site Recycling - Materials hauled to a location and used in an altered form in the manufacture of new products.
- M. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.
- N. Reuse: Materials that are recovered for use in the same form, on-site or off-site.
- O. Return: To give back reusable items or unused products to vendors for credit.
- P. Salvage: To remove waste materials from the site for resale or re-use by a third party.
- Q. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.
- R. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.
- S. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

#### **1.5 SUBMITTALS**

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES, furnish the following:

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- B. Prepare and submit to the COR a written demolition debris management plan. The plan shall include, but not be limited to, the following information:
1. Procedures to be used for debris management.
  2. Techniques to be used to minimize waste generation.
  3. Analysis of the estimated job site waste to be generated:
    - a. List of each material and quantity to be salvaged, reused, recycled.
    - b. List of each material and quantity proposed to be taken to a landfill.
  4. Detailed description of the Means/Methods to be used for material handling.
    - a. On site: Material separation, storage, protection where applicable.
    - b. Off site: Transportation means and destination. Include list of materials.
      - 1) Description of materials to be site-separated and self-hauled to designated facilities.
      - 2) Description of mixed materials to be collected by designated waste haulers and removed from the site.
    - c. The names and locations of mixed debris reuse and recycling facilities or sites.
    - d. The names and locations of trash disposal landfill facilities or sites.
    - e. Documentation that the facilities or sites are approved to receive the materials.
- C. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.
- D. Monthly summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the work site and disposed of or diverted from disposal through recycling.

#### **1.6 APPLICABLE PUBLICATIONS**

- A Publications listed below form a part of this specification to the extent referenced. Publications are referenced by the basic designation only. In the event that criteria requirements conflict, the most stringent requirements shall be met.

B. U.S. Green Building Council (USGBC):

LEED Green Building Rating System for New Construction

**1.7 RECORDS**

Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Records shall be kept in accordance with the LEED Reference Guide and LEED Template.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. List of each material and quantity to be salvaged, recycled, reused.
- B. List of each material and quantity proposed to be taken to a landfill.
- C. Material tracking data: Receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices, net total costs or savings.

**PART 3 - EXECUTION**

**3.1 COLLECTION**

- A. Provide all necessary containers, bins and storage areas to facilitate effective waste management.
- B. Clearly identify containers, bins and storage areas so that recyclable materials are separated from trash and can be transported to respective recycling facility for processing.
- C. Hazardous wastes shall be separated, stored, disposed of according to local, state, federal regulations.

**3.2 DISPOSAL**

- A. Contractor shall be responsible for transporting and disposing of materials that cannot be delivered to a source-separated or mixed materials recycling facility to a transfer station or disposal facility that can accept the materials in accordance with state and federal regulations.
- B. Construction or demolition materials with no practical reuse or that cannot be salvaged or recycled shall be disposed of at a landfill or incinerator.

**3.3 REPORT**

- A. With each application for progress payment, submit a summary of construction and demolition debris diversion and disposal including beginning and ending dates of period covered.

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- B. Quantify all materials diverted from landfill disposal through salvage or recycling during the period with the receiving parties, dates removed, transportation costs, weight tickets, manifests, invoices. Include the net total costs or savings for each salvaged or recycled material.
- C. Quantify all materials disposed of during the period with the receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices. Include the net total costs for each disposal.

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**SECTION 01 81 11**

**SUSTAINABLE DESIGN REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

This Section describes general requirements and procedures to comply with the Guiding Principles for Leadership in High Performance and Sustainable Buildings Memorandum of Understanding incorporated in the Executive Orders 13423 and 13514; Energy Policy Act of 2005 (EPA 2005) and the Energy Independence and Security Act of 2007 (EISA 2007).

**1.2 OBJECTIVES**

- A. To maximize resource efficiency and reduce the environmental impacts of construction and operation, the Contractor during the construction phase of this project shall implement the following procedures:
  - 1. Select products that minimize consumption of energy, water and non-renewable resources, while minimizing the amounts of pollution resulting from the production and employment of building technologies. It is the intent of this project to conform with EPA's Five Guiding Principles on environmentally preferable purchasing. The five principles are:
    - a. Include environmental considerations as part of the normal purchasing process.
    - b. Emphasize pollution prevention early in the purchasing process.
    - c. Examine multiple environmental attributes throughout a product's or service's life cycle.
    - d. Compare relevant environmental impacts when selecting products and services.
    - e. Collect and base purchasing decisions on accurate and meaningful information about environmental performance.
  - 2. Control sources for potential Indoor Air Quality (IAQ) pollutants by controlled selection of materials and processes used in project construction in order to attain superior IAQ.
  - 3. Products and processes that achieve the above objectives to the extent currently possible and practical have been selected and included in these Construction Documents. The Contractor is responsible to maintain and support these objectives in developing means and methods for performing the work of this Contract and in

proposing product substitutions and/or changes to specified processes.

4. Use building practices that insure construction debris and particulates do not contaminate or enter duct work prior to system startup and turn over.

### **1.3 RELATED DOCUMENTS**

- A. Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT
- B. Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS

### **1.4 DEFINITIONS**

- A. Agrifiber Products: Composite panel products derived from agricultural fiber
- B. Biobased Product: As defined in the 2002 Farm Bill, a product determined by the Secretary to be a commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials
- C. Biobased Content: The weight of the biobased material divided by the total weight of the product and expressed as a percentage by weight
- D. Certificates of Chain-of-Custody: Certificates signed by manufacturers certifying that wood used to make products has been tracked through its extraction and fabrication to ensure that it was obtained from forests certified by a specified certification program
- E. Composite Wood: A product consisting of wood fiber or other plant particles bonded together by a resin or binder
- F. Construction and Demolition Waste: Includes solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting from construction, remodeling, repair and demolition operations. A construction waste management plan is to be provided by the Contractor as defined in Section 01 74 19.
- G. Third Party Certification: Certification of levels of environmental achievement by nationally recognized sustainability rating system.
- H. Light Pollution: Light that extends beyond its source such that the additional light is wasted in an unwanted area or in an area where it inhibits view of the night sky
- I. Recycled Content Materials: Products that contain pre-consumer or post-consumer materials as all or part of their feedstock



- J. Post-Consumer Recycled Content: The percentage by weight of constituent materials that have been recovered or otherwise diverted from the solid-waste stream after consumer use
- K. Pre-Consumer Recycled Content: Materials that have been recovered or otherwise diverted from the solid-waste stream during the manufacturing process. Pre-consumer content must be material that would not have otherwise entered the waste stream as per Section 5 of the FTC Act, Part 260 "Guidelines for the Use of Environmental Marketing Claims": [www.ftc.gov/bcp/grnrule/guides980427](http://www.ftc.gov/bcp/grnrule/guides980427)
- L. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 250 miles (400 km) from the Project site
- M. Salvaged or Reused Materials: Materials extracted from existing buildings in order to be reused in other buildings without being manufactured
- N. Sealant: Any material that fills and seals gaps between other materials
- O. Type 1 Finishes: Materials and finishes which have a potential for short-term levels of off gassing from chemicals inherent in their manufacturing process, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing.
- P. Type 2 Finishes: "Fuzzy" materials and finishes which are woven, fibrous, or porous in nature and tend to adsorb chemicals offgas
- Q. Volatile Organic Compounds (VOCs): Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. Compounds that have negligible photochemical reactivity, listed in EPA 40 CFR 51.100(s), are also excluded from this regulatory definition.

#### **1.5 SUBMITTALS**

- A. Sustainable Design Submittals:
  - 1. Measurement and Verification Systems: Provide cut sheets and manufacturer's product data for all controls systems, highlighting electrical metering and trending capability components.
  - 2. Recycled Content: Submittals for all materials with recycled content (excluding MEP systems equipment and components) must include the following documentation: Manufacturer's product data, product

- literature, or a letter from the manufacturer verifying the percentage of post-consumer and pre-consumer recycled content (by weight) of each material or product
- a. An electronic spreadsheet that tabulates the Project's total materials cost and combined recycled content value (defined as the sum of the post-consumer recycled content value plus one-half of the pre-consumer recycled content value) expressed as a percentage of total materials cost. This spreadsheet shall be submitted every third month with the Contractor's Certificate and Application for Payment. It should indicate, on an ongoing basis, line items for each material, including cost, pre-consumer recycled content, post-consumer recycled content, and combined recycled content value.
3. Regional Materials: Submittals for all products or materials expected to contribute to the regional calculation (excluding MEP systems equipment and components) must include the following documentation:
- a. Cost of each material or product, excluding cost of labor and equipment for installation
  - b. Location of product manufacture and distance from point of manufacture to the Project Site
  - c. Location of point of extraction, harvest, or recovery for each raw material in each product and distance from the point of extraction, harvest, or recovery to the Project Site
  - d. Manufacturer's product data, product literature, or a letter from the manufacturer verifying the location and distance from the Project Site to the point of manufacture for each regional material
  - e. Manufacturer's product data, product literature, or a letter from the manufacturer verifying the location and distance from the Project Site to the point of extraction, harvest, or recovery for each regional material or product, including, at a minimum, gravel and fill, planting materials, concrete, masonry, and GWB
  - f. An electronic spreadsheet that tabulates the Project's total materials cost and regional materials value, expressed as a percentage of total materials cost. This spreadsheet shall be submitted every third month with the Contractor's Certificate and

Application for Payment. It should indicate on an ongoing basis, line items for each material, including cost, location of manufacture, distance from manufacturing plant to the Project Site, location of raw material extraction, and distance from extraction point to the Project Site.

4. Interior Adhesives and Sealants: Submittals for all field-applied adhesives and sealants, which have a potential impact on indoor air, must include manufacturer's MSDSs or other Product Data highlighting VOC content.
  - a. Provide manufacturers' documentation verifying all adhesives used to apply laminates, whether shop-applied or field-applied, contain no urea-formaldehyde.
5. Interior Paints and Coatings: Submittals for all field-applied paints and coatings, which have a potential impact on indoor air, must include manufacturer's MSDSs or other Product Data highlighting VOC content
6. Green Housekeeping: Provide documentation that all cleaning products and janitorial paper products meet the VOC limits and content requirements of this specification section.
- C. Construction Waste Management: See Section 01 74 19 "Construction Waste Management" for submittal requirements.
- D. Construction Indoor Air Quality (IAQ) Management: Submittals must include the following:
  1. Not more than 30 days after the Preconstruction Meeting, prepare and submit for the Architect and Owner's approval, an electronic copy of the draft Construction IAQ Management Plan in an electronic file including, but not limited to, descriptions of the following:
  2. F. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports for the following:
    1. Construction Waste Management: Waste reduction progress reports and logs complying with the requirements of Section 01 74 19 "Construction Waste Management."
    2. Construction IAQ Management: See details below under Section 3.2 Construction Indoor Air Quality Management for Construction IAQ management progress report requirements.

## **1.6 QUALITY ASSURANCE**

- A. Preconstruction Meeting: After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with Owner, Architect, and all Subcontractors to discuss the Construction Waste Management Plan, the required Construction Indoor Air Quality (IAQ) Management Plan, and all other Sustainable Design Requirements. The purpose of this meeting is to develop a mutual understanding of the Project's Sustainable Design Requirements and coordination of the Contractor's management of these requirements with the Contracting Officer and the Construction Quality Manager.
- B. Construction Job Conferences: The status of compliance with the Sustainable Design Requirements of these specifications will be an agenda item at all regular job meetings conducted during the course of work at the site.

## **PART 2 - PRODUCTS**

### **2.1 PRODUCT ENVIRONMENTAL REQUIREMENTS**

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**SECTION 01 91 00**

**GENERAL COMMISSIONING REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 COMMISSIONING DESCRIPTION**

- A. This Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS shall form the basis of the construction phase commissioning process and procedures. The Commissioning Agent shall add, modify, and refine the commissioning procedures, as approved by the Department of Veterans Affairs (VA), to suit field conditions and actual manufacturer's equipment, incorporate test data and procedure results, and provide detailed scheduling for all commissioning tasks.
- B. Various sections of the project specifications require equipment startup, testing, and adjusting services. Requirements for startup, testing, and adjusting services specified in the Division 7, Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 series sections of these specifications are intended to be provided in coordination with the commissioning services and are not intended to duplicate services. The Contractor shall coordinate the work required by individual specification sections with the commissioning services requirements specified herein.
- C. Where individual testing, adjusting, or related services are required in the project specifications and not specifically required by this commissioning requirements specification, the specified services shall be provided and copies of documentation, as required by those specifications shall be submitted to the VA and the Commissioning Agent to be indexed for future reference.
- D. Where training or educational services for VA are required and specified in other sections of the specifications, including but not limited to Division 7, Division 8, Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 series sections of the specification, these services are intended to be provided in addition to the training and educational services specified herein.
- E. Commissioning is a systematic process of verifying that the building systems perform interactively according to the construction documents and the VA's operational needs. The commissioning process shall encompass and coordinate the system documentation, equipment startup,

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control system calibration, testing and balancing, performance testing and training. Commissioning during the construction and post-occupancy phases is intended to achieve the following specific objectives according to the contract documents:

1. Verify that the applicable equipment and systems are installed in accordance with the contract documents and according to the manufacturer's recommendations.
2. Verify and document proper integrated performance of equipment and systems.
3. Verify that Operations & Maintenance documentation is complete.
4. Verify that all components requiring servicing can be accessed, serviced and removed without disturbing nearby components including ducts, piping, cabling or wiring.
5. Verify that the VA's operating personnel are adequately trained to enable them to operate, monitor, adjust, maintain, and repair building systems in an effective and energy-efficient manner.
6. Document the successful achievement of the commissioning objectives listed above.

F. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.

## **1.2 CONTRACTUAL RELATIONSHIPS**

- A. For this construction project, the Department of Veterans Affairs contracts with a Contractor to provide construction services. The contracts are administered by the VA Contracting Officer and the COR as the designated representative of the Contracting Officer. On this project, the authority to modify the contract in any way is strictly limited to the authority of the Contracting Officer.
- B. In this project, only two contract parties are recognized and communications on contractual issues are strictly limited to VA COR and the Contractor. It is the practice of the VA to require that communications between other parties to the contracts (Subcontractors and Vendors) be conducted through the COR and Contractor. It is also the practice of the VA that communications between other parties of the project (Commissioning Agent and Architect/Engineer) be conducted through the COR.

- C. Whole Building Commissioning is a process that relies upon frequent and direct communications, as well as collaboration between all parties to the construction process. By its nature, a high level of communication and cooperation between the Commissioning Agent and all other parties (Architects, Engineers, Subcontractors, Vendors, third party testing agencies, etc.) is essential to the success of the Commissioning effort.
- D. With these fundamental practices in mind, the commissioning process described herein has been developed to recognize that, in the execution of the Commissioning Process, the Commissioning Agent must develop effective methods to communicate with every member of the construction team involved in delivering commissioned systems while simultaneously respecting the exclusive contract authority of the Contracting Officer and COR. Thus, the procedures outlined in this specification must be executed within the following limitations:
1. No communications (verbal or written) from the Commissioning Agent shall be deemed to constitute direction that modifies the terms of any contract between the Department of Veterans Affairs and the Contractor.
  2. Commissioning Issues identified by the Commissioning Agent will be delivered to the COR and copied to the designated Commissioning Representatives for the Contractor and subcontractors on the Commissioning Team for information only in order to expedite the communication process. These issues must be understood as the professional opinion of the Commissioning Agent and as suggestions for resolution.
  3. In the event that any Commissioning Issues and suggested resolutions are deemed by the COR to require either an official interpretation of the construction documents or require a modification of the contract documents, the Contracting Officer or Resident Engineer will issue an official directive to this effect.
  4. All parties to the Commissioning Process shall be individually responsible for alerting the COR of any issues that they deem to constitute a potential contract change prior to acting on these issues.
  5. Authority for resolution or modification of design and construction issues rests solely with the Contracting Officer or COR, with

appropriate technical guidance from the Architect/Engineer and/or  
 Commissioning Agent.

### 1.3 RELATED WORK

- A. Section 01 00 00 GENERAL REQUIREMENTS.
- B. Section 01 32.16.15 PROJECT SCHEDULES (SMALL PROJECTS -  
 DESIGN/BID/BUILD)
- C. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
- D. Section 01 81 11 SUSTAINABLE DESIGN REQUIREMENTS
- E. Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.
- F.

### 1.4 SUMMARY

- A. This Section includes general requirements that apply to implementation  
 of commissioning without regard to systems, subsystems, and equipment  
 being commissioned.
- B. The commissioning activities have been developed to support the VA  
 requirements to meet guidelines for Federal Leadership in  
 Environmental, Energy, and Economic Performance.

### 1.5 ACRONYMS

List of Acronyms	
Acronym	Meaning
A/E	Architect / Engineer Design Team
AHJ	Authority Having Jurisdiction
ASHRAE	Association Society for Heating Air Condition and Refrigeration Engineers
BOD	Basis of Design
BSC	Building Systems Commissioning
CCTV	Closed Circuit Television
CD	Construction Documents
CMMS	Computerized Maintenance Management System
CO	Contracting Officer (VA)
COR	Contracting Officer's Representative (see also VA-RE)
COBie	Construction Operations Building Information Exchange
CPC	Construction Phase Commissioning
Cx	Commissioning
CxA	Commissioning Agent
CxM	Commissioning Manager



List of Acronyms	
Acronym	Meaning
CxR	Commissioning Representative
DPC	Design Phase Commissioning
FPT	Functional Performance Test
GBI-GG	Green Building Initiative - Green Globes
HVAC	Heating, Ventilation, and Air Conditioning
LEED	Leadership in Energy and Environmental Design
NC	Department of Veterans Affairs National Cemetery
NCA	Department of Veterans Affairs National Cemetery Administration
NEBB	National Environmental Balancing Bureau
O&M	Operations & Maintenance
OPR	Owner's Project Requirements
PFC	Pre-Functional Checklist
PFT	Pre-Functional Test
SD	Schematic Design
SO	Site Observation
TAB	Test Adjust and Balance
VA	Department of Veterans Affairs
VAMC	VA Medical Center
VA CFM	VA Office of Construction and Facilities Management
VACO	VA Central Office
VA PM	VA Project Manager
VA-RE	VA Resident Engineer
USGBC	United States Green Building Council

## 1.6 DEFINITIONS

**Acceptance Phase Commissioning:** Commissioning tasks executed after most construction has been completed, most Site Observations and Static Tests have been completed and Pre-Functional Testing has been completed and accepted. The main commissioning activities performed during this phase are verification that the installed systems are functional by conducting Systems Functional Performance tests and Owner Training.

**Accuracy:** The capability of an instrument to indicate the true value of a measured quantity.

**Back Check:** A back check is a verification that an agreed upon solution to a design comment has been adequately addressed in a subsequent design review

**Basis of Design (BOD):** The Engineer's Basis of Design is comprised of two components: the Design Criteria and the Design Narrative, these documents record the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements (OPR) and to satisfy applicable regulatory requirements, standards, and guidelines.

**Benchmarks:** Benchmarks are the comparison of a building's energy usage to other similar buildings and to the building itself.. For example, ENERGY STAR Portfolio Manager is a frequently used and nationally recognized building energy benchmarking tool.

**Building Information Modeling (BIM):** Building Information Modeling is a parametric database which allows a building to be designed and constructed virtually in 3D, and provides reports both in 2D views and as schedules. This electronic information can be extracted and reused for pre-populating facility management CMMS systems. Building Systems Commissioning (BSC): NEBB acronym used to designate its commissioning program.

**Calibrate:** The act of comparing an instrument of unknown accuracy with a standard of known accuracy to detect, correlate, report, or eliminate by adjustment any variation in the accuracy of the tested instrument.

**CCTV:** Closed circuit Television. Normally used for security surveillance and alarm detections as part of a special electrical security system.

**COBie:** Construction Operations Building Information Exchange (COBie) is an electronic industry data format used to transfer information developed during design, construction, and commissioning into the Computer Maintenance Management Systems (CMMS) used to operate facilities. See the Whole Building Design Guide website for further information (<http://www.wbdg.org/resources/cobie.php>)

**Commissionability:** Defines a design component or construction process that has the necessary elements that will allow a system or component to be effectively measured, tested, operated and commissioned

**Commissioning Agent (CxA):** The qualified Commissioning Professional who administers the Cx process by managing the Cx team and overseeing the Commissioning Process. Where CxA is used in this specification it means

the Commissioning Agent, members of his staff or appointed members of the commissioning team. Note that LEED uses the term Commissioning Authority in lieu of Commissioning Agent.

**Commissioning Checklists:** Lists of data or inspections to be verified to ensure proper system or component installation, operation, and function. Verification checklists are developed and used during all phases of the commissioning process to verify that the Owner's Project Requirements (OPR) is being achieved.

**Commissioning Design Review:** The commissioning design review is a collaborative review of the design professionals design documents for items pertaining to the following: owner's project requirements; basis of design; operability and maintainability (O&M) including documentation; functionality; training; energy efficiency, control systems' sequence of operations including building automation system features; commissioning specifications and the ability to functionally test the systems.

**Commissioning Issue:** A condition identified by the Commissioning Agent or other member of the Commissioning Team that adversely affects the commissionability, operability, maintainability, or functionality of a system, equipment, or component. A condition that is in conflict with the Contract Documents and/or performance requirements of the installed systems and components. (See also - Commissioning Observation).

**Commissioning Manager (CxM):** A qualified individual appointed by the Contractor to manage the commissioning process on behalf of the Contractor.

**Commissioning Observation:** An issue identified by the Commissioning Agent or other member of the Commissioning Team that does not conform to the project OPR, contract documents or standard industry best practices. (See also Commissioning Issue)

**Commissioning Plan:** A document that outlines the commissioning process, commissioning scope and defines responsibilities, processes, schedules, and the documentation requirements of the Commissioning Process.

**Commissioning Process:** A quality focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all of its systems, components, and assemblies are planned, designed, installed, tested, can be operated, and maintained to meet the Owner's Project Requirements.

**Commissioning Report:** The final commissioning document which presents the commissioning process results for the project. Cx reports include an executive summary, the commissioning plan, issue log, correspondence, and all appropriate check sheets and test forms.

**Commissioning Representative (CxR):** An individual appointed by a sub-contractor to manage the commissioning process on behalf of the sub-contractor.

**Commissioning Specifications:** The contract documents that detail the objective, scope and implementation of the commissioning process as developed in the Commissioning Plan.

**Commissioning Team:** Individual team members whose coordinated actions are responsible for implementing the Commissioning Process.

**Construction Phase Commissioning:** All commissioning efforts executed during the construction process after the design phase and prior to the Acceptance Phase Commissioning.

**Contract Documents (CD):** Contract documents include design and construction contracts, price agreements and procedure agreements. Contract Documents also include all final and complete drawings, specifications and all applicable contract modifications or supplements.

**Construction Phase Commissioning (CPC):** All commissioning efforts executed during the construction process after the design phase and prior to the Acceptance Phase Commissioning.

**Coordination Drawings:** Drawings showing the work of all trades that are used to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances. On mechanical projects, coordination drawings include structural steel, ductwork, major piping and electrical conduit and show the elevations and locations of the above components.

**Data Logging:** The monitoring and recording of temperature, flow, current, status, pressure, etc. of equipment using stand-alone data recorders.

**Deferred System Test:** Tests that cannot be completed at the end of the acceptance phase due to ambient conditions, schedule issues or other

conditions preventing testing during the normal acceptance testing period.

**Deficiency:** See "Commissioning Issue".

**Design Criteria:** A listing of the VA Design Criteria outlining the project design requirements, including its source. These are used during the design process to show the design elements meet the OPR.

**Design Intent:** The overall term that includes the OPR and the BOD. It is a detailed explanation of the ideas, concepts, and criteria that are defined by the owner to be important. The design intent documents are utilized to provide a written record of these ideas, concepts and criteria.

**Design Narrative:** A written description of the proposed design solutions that satisfy the requirements of the OPR.

**Design Phase Commissioning (DPC):** All commissioning tasks executed during the design phase of the project.

**Environmental Systems:** Systems that use a combination of mechanical equipment, airflow, water flow and electrical energy to provide heating, ventilating, air conditioning, humidification, and dehumidification for the purpose of human comfort or process control of temperature and humidity.

**Executive Summary:** A section of the Commissioning report that reviews the general outcome of the project. It also includes any unresolved issues, recommendations for the resolution of unresolved issues and all deferred testing requirements.

**Functionality:** This defines a design component or construction process which will allow a system or component to operate or be constructed in a manner that will produce the required outcome of the OPR.

**Functional Test Procedure (FTP):** A written protocol that defines methods, steps, personnel, and acceptance criteria for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.

**Industry Accepted Best Practice:** A design component or construction process that has achieved industry consensus for quality performance and functionality. Refer to the current edition of the NEBB Design Phase Commissioning Handbook for examples.

**Installation Verification:** Observations or inspections that confirm the system or component has been installed in accordance with the contract documents and to industry accepted best practices.

**Integrated System Testing:** Integrated Systems Testing procedures entail testing of multiple integrated systems performance to verify proper functional interface between systems. Typical Integrated Systems Testing includes verifying that building systems respond properly to loss of utility, transfer to emergency power sources, re-transfer from emergency power source to normal utility source; interface between HVAC controls and Fire Alarm systems for equipment shutdown, interface between Fire Alarm system and elevator control systems for elevator recall and shutdown; interface between Fire Alarm System and Security Access Control Systems to control access to spaces during fire alarm conditions; and other similar tests as determined for each specific project.

Issues Log: A formal and ongoing record of problems or concerns - and their resolution - that have been raised by members of the Commissioning Team during the course of the Commissioning Process.

**Lessons Learned Workshop:** A workshop conducted to discuss and document project successes and identify opportunities for improvements for future projects.

**Maintainability:** A design component or construction process that will allow a system or component to be effectively maintained. This includes adequate room for access to adjust and repair the equipment. Maintainability also includes components that have readily obtainable repair parts or service.

**Manual Test:** Testing using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the 'observation').

**Owner's Project Requirements (OPR):** A written document that details the project requirements and the expectations of how the building and its systems will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

**Peer Review:** A formal in-depth review separate from the commissioning review processes. The level of effort and intensity is much greater than a typical commissioning facilitation or extended commissioning

review. The VA usually hires an independent third-party (called the IDIQ A/E) to conduct peer reviews.

**Precision:** The ability of an instrument to produce repeatable readings of the same quantity under the same conditions. The precision of an instrument refers to its ability to produce a tightly grouped set of values around the mean value of the measured quantity.

**Pre-Design Phase Commissioning:** Commissioning tasks performed prior to the commencement of design activities that includes project programming and the development of the commissioning process for the project

**Pre-Functional Checklist (PFC):** A form used by the contractor to verify that appropriate components are onsite, correctly installed, set up, calibrated, functional and ready for functional testing.

**Pre-Functional Test (PFT):** An inspection or test that is done before functional testing. PFT's include installation verification and system and component start up tests.

**Procedure or Protocol:** A defined approach that outlines the execution of a sequence of work or operations. Procedures are used to produce repeatable and defined results.

**Range:** The upper and lower limits of an instrument's ability to measure the value of a quantity for which the instrument is calibrated.

**Resolution:** This word has two meanings in the Cx Process. The first refers to the smallest change in a measured variable that an instrument can detect. The second refers to the implementation of actions that correct a tested or observed deficiency.

**Site Observation Visit:** On-site inspections and observations made by the Commissioning Agent for the purpose of verifying component, equipment, and system installation, to observe contractor testing, equipment start-up procedures, or other purposes.

**Site Observation Reports (SO):** Reports of site inspections and observations made by the Commissioning Agent. Observation reports are intended to provide early indication of an installation issue which will need correction or analysis.

**Special System Inspections:** Inspections required by a local code authority prior to occupancy and are not normally a part of the commissioning process.

**Static Tests:** Tests or inspections that validate a specified static condition such as pressure testing. Static tests may be specification or code initiated.

**Start Up Tests:** Tests that validate the component or system is ready for automatic operation in accordance with the manufactures requirements.

**Systems Manual:** A system-focused composite document that includes all information required for the owners operators to operate the systems.

**Test Procedure:** A written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.

**Testing:** The use of specialized and calibrated instruments to measure parameters such as: temperature, pressure, vapor flow, air flow, fluid flow, rotational speed, electrical characteristics, velocity, and other data in order to determine performance, operation, or function.

**Testing, Adjusting, and Balancing (TAB):** A systematic process or service applied to heating, ventilating and air-conditioning (HVAC) systems and other environmental systems to achieve and document air and hydronic flow rates. The standards and procedures for providing these services are referred to as "Testing, Adjusting, and Balancing" and are described in the Procedural Standards for the Testing, Adjusting and Balancing of Environmental Systems, published by NEBB or AABC.

**Thermal Scans:** Thermographic pictures taken with an Infrared Thermographic Camera. Thermographic pictures show the relative temperatures of objects and surfaces and are used to identify leaks, thermal bridging, thermal intrusion, electrical overload conditions, moisture containment, and insulation failure.

**Training Plan:** A written document that details, in outline form the expectations of the operator training. Training agendas should include instruction on how to obtain service, operate, startup, shutdown and maintain all systems and components of the project.

**Trending:** Monitoring over a period of time with the building automation system.

**Unresolved Commissioning Issue:** Any Commissioning Issue that, at the time that the Final Report or the Amended Final Report is issued that has not been either resolved by the construction team or accepted by



the VA. **Validation:** The process by which work is verified as complete and operating correctly:

1. First party validation occurs when a firm or individual verifying the task is the same firm or individual performing the task.
2. Second party validation occurs when the firm or individual verifying the task is under the control of the firm performing the task or has other possibilities of financial conflicts of interest in the resolution (Architects, Designers, General Contractors and Third Tier Subcontractors or Vendors).
3. Third party validation occurs when the firm verifying the task is not associated with or under control of the firm performing or designing the task.

**Verification:** The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner's Project Requirements.

**Warranty Phase Commissioning:** Commissioning efforts executed after a project has been completed and accepted by the Owner. Warranty Phase Commissioning includes follow-up on verification of system performance, measurement and verification tasks and assistance in identifying warranty issues and enforcing warranty provisions of the construction contract.

**Warranty Visit:** A commissioning meeting and site review where all outstanding warranty issues and deferred testing is reviewed and discussed.

**Whole Building Commissioning:** Commissioning of building systems such as Building Envelope, HVAC, Electrical, Special Electrical (Fire Alarm, Security & Communications), Plumbing and Fire Protection as described in this specification.

#### **1.7 SYSTEMS TO BE COMMISSIONED**

- A. Commissioning of a system or systems specified for this project is part of the construction process. Documentation and testing of these systems, as well as training of the VA's Operation and Maintenance personnel, is required in cooperation with the VA and the Commissioning Agent.
- B. The following systems will be commissioned as part of this project:

<b>Systems To Be Commissioned</b>	
<b>System</b>	<b>Description</b>
<b>Electrical</b>	
Medium-Voltage Electrical Distribution Systems	Medium-Voltage Switchgear, Medium-Voltage Switches, Underground ductbank and distribution, Pad-Mount Transformers, Medium-Voltage Load Interrupter Switches,
Grounding & Bonding Systems	Witness 3rd party testing, review reports
Electric Power Monitoring Systems	Metering, sub-metering, power monitoring systems, PLC control systems
Electrical System Protective Device Study	Review reports, verify field settings consistent with Study
Secondary Unit Substations	Medium-voltage components, transformers, low-voltage distribution, verify breaker testing results (injection current, etc)
Low-Voltage Distribution System	Normal power distribution system, Life-safety power distribution system, critical power distribution system, equipment power distribution system, switchboards, distribution panels, panelboards, verify breaker testing results (injection current, etc)
Emergency Power Generation Systems	Generators, Generator paralleling switchgear, automatic transfer switches, PLC and other control systems
Lighting & Lighting Control** Systems	Emergency lighting, occupancy sensors, lighting control systems, architectural dimming systems, theatrical dimming systems, exterior lighting and controls
Cathodic Protection Systems	Review 3rd party testing results.
Lightning Protection System	Witness 3rd party testing, review reports

#### **1.8 COMMISSIONING TEAM**

- A. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project Superintendent and subcontractors, installers, schedulers, suppliers, and specialists deemed appropriate by the Department of Veterans Affairs (VA) and Commissioning Agent.
- B. Members Appointed by Contractor:
  - 1. Contractor' Commissioning Manager: The designated person, company, or entity that plans, schedules and coordinates the commissioning activities for the construction team.
  - 2. Contractor's Commissioning Representative(s): Individual(s), each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions.
- C. Members Appointed by VA:
  - 1. Commissioning Agent: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. The VA will engage the CxA under a separate contract.
  - 2. User: Representatives of the facility user and operation and maintenance personnel.
  - 3. A/E: Representative of the Architect and engineering design professionals.

#### **AY VA'S COMMISSIONING RESPONSIBILITIES**

- A. Appoint an individual, company or firm to act as the Commissioning Agent.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
  - 1. Coordination meetings.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
  - 3. Testing meetings.
  - 4. Witness and assist in Systems Functional Performance Testing.
  - 5. Demonstration of operation of systems, subsystems, and equipment.
- C. Provide the Construction Documents, prepared by Architect and approved by VA, to the Commissioning Agent and for use in managing the

commissioning process, developing the commissioning plan, systems manuals, and reviewing the operation and maintenance training plan.

#### **1.10 CONTRACTOR'S COMMISSIONING RESPONSIBILITIES**

- A. The Contractor shall assign a Commissioning Manager to manage commissioning activities of the Contractor, and subcontractors.
- B. The Contractor shall ensure that the commissioning responsibilities outlined in these specifications are included in all subcontracts and that subcontractors comply with the requirements of these specifications.
- C. The Contractor shall ensure that each installing subcontractor shall assign representatives with expertise and authority to act on behalf of the subcontractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
  - 1. Participate in commissioning coordination meetings.
  - 2. Conduct operation and maintenance training sessions in accordance with approved training plans.
  - 3. Verify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
  - 4. Evaluate commissioning issues and commissioning observations identified in the Commissioning Issues Log, field reports, test reports or other commissioning documents. In collaboration with entity responsible for system and equipment installation, recommend corrective action.
  - 5. Review and comment on commissioning documentation.
  - 6. Participate in meetings to coordinate Systems Functional Performance Testing.
  - 7. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to Commissioning Agent for incorporation into the commissioning plan.
  - 8. Provide information to the Commissioning Agent for developing commissioning plan.
  - 9. Participate in training sessions for VA's operation and maintenance personnel.
  - 10. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test

procedures to conduct Systems Functional Performance Testing of  
installed systems.

#### **1.11 COMMISSIONING AGENT'S RESPONSIBILITIES**

- A. Organize and lead the commissioning team.
- B. Prepare the commissioning plan. See Paragraph 1.11-A of this specification Section for further information.
- C. Review and comment on selected submittals from the Contractor for general conformance with the Construction Documents. Review and comment on the ability to test and operate the system and/or equipment, including providing gages, controls and other components required to operate, maintain, and test the system. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the Construction Documents.
- D. At the beginning of the construction phase, conduct an initial construction phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; TAB Work; Pre-Functional Checklists, Systems Functional Performance Testing; and project completion.
- E. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss status of the commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The Commissioning Agent shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting.
- F. Observe construction and report progress, observations and issues. Observe systems and equipment installation for adequate accessibility for maintenance and component replacement or repair, and for general conformance with the Construction Documents.
- G. Prepare Project specific Pre-Functional Checklists and Systems Functional Performance Test procedures.
- H. Coordinate Systems Functional Performance Testing schedule with the Contractor.
- I. Witness selected systems startups.
- J. Verify selected Pre-Functional Checklists completed and submitted by the Contractor.

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- K. Witness and document Systems Functional Performance Testing.
- L. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.
- M. Review and comment on operation and maintenance (O&M) documentation and systems manual outline for compliance with the Contract Documents. Operation and maintenance documentation requirements are specified in Paragraph 1.25, Section 01 00 00 GENERAL REQUIREMENTS.
- N. Review operation and maintenance training program developed by the Contractor. Verify training plans provide qualified instructors to conduct operation and maintenance training.
- O. Prepare commissioning Field Observation Reports.
- P. Prepare the Final Commissioning Report.
- Q. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal Systems Functional Performance Testing. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.
- R. Assemble the final commissioning documentation, including the Final Commissioning Report and Addendum to the Final Commissioning Report.

#### **1.12 COMMISSIONING DOCUMENTATION**

- A. Commissioning Plan: A document, prepared by Commissioning Agent, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited, to the following:
  - 1. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
  - 2. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a

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- detailed description of documents to be provided along with identification of responsible parties.
3. Identification of systems and equipment to be commissioned.
  4. Schedule of Commissioning Coordination meetings.
  5. Identification of items that must be completed before the next operation can proceed.
  6. Description of responsibilities of commissioning team members.
  7. Description of observations to be made.
  8. Description of requirements for operation and maintenance training.
  9. Schedule for commissioning activities with dates coordinated with overall construction schedule.
  10. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
  11. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
  12. Preliminary Systems Functional Performance Test procedures.
- B. Systems Functional Performance Test Procedures: The Commissioning Agent will develop Systems Functional Performance Test Procedures for each system to be commissioned, including subsystems, or equipment and interfaces or interlocks with other systems. Systems Functional Performance Test Procedures will include a separate entry, with space for comments, for each item to be tested. Preliminary Systems Functional Performance Test Procedures will be provided to the VA, Architect/Engineer, and Contractor for review and comment. The Systems Performance Test Procedure will include test procedures for each mode of operation and provide space to indicate whether the mode under test responded as required. Each System Functional Performance Test procedure, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:
1. Name and identification code of tested system.
  2. Test number.
  3. Time and date of test.
  4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
  5. Dated signatures of the person performing test and of the witness, if applicable.
  6. Individuals present for test.

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7. Observations and Issues.

8. Issue number, if any, generated as the result of test.

- C. Pre-Functional Checklists: The Commissioning Agent will prepare Pre-Functional Checklists. Pre-Functional Checklists shall be completed and signed by the Contractor, verifying that systems, subsystems, equipment, and associated controls are ready for testing. The Commissioning Agent will spot check Pre-Functional Checklists to verify accuracy and readiness for testing. Inaccurate or incomplete Pre-Functional Checklists shall be returned to the Contractor for correction and resubmission.
- D. Test and Inspection Reports: The Commissioning Agent will record test data, observations, and measurements on Systems Functional Performance Test Procedure. The report will also include recommendation for system acceptance or non-acceptance. Photographs, forms, and other means appropriate for the application shall be included with data. Commissioning Agent Will compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.
- E. Corrective Action Documents: The Commissioning Agent will document corrective action taken for systems and equipment that fail tests. The documentation will include any required modifications to systems and equipment and/or revisions to test procedures, if any. The Commissioning Agent will witness and document any retesting of systems and/or equipment requiring corrective action and document retest results.
- F. Commissioning Issues Log: The Commissioning Agent will prepare and maintain Commissioning Issues Log that describes Commissioning Issues and Commissioning Observations that are identified during the Commissioning process. These observations and issues include, but are not limited to, those that are at variance with the Contract Documents. The Commissioning Issues Log will identify and track issues as they are encountered, the party responsible for resolution, progress toward resolution, and document how the issue was resolved. The Master Commissioning Issues Log will also track the status of unresolved issues.
1. Creating an Commissioning Issues Log Entry:



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- a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
  - b. Assign a descriptive title for the issue.
  - c. Identify date and time of the issue.
  - d. Identify test number of test being performed at the time of the observation, if applicable, for cross reference.
  - e. Identify system, subsystem, and equipment to which the issue applies.
  - f. Identify location of system, subsystem, and equipment.
  - g. Include information that may be helpful in diagnosing or evaluating the issue.
  - h. Note recommended corrective action.
  - i. Identify commissioning team member responsible for corrective action.
  - j. Identify expected date of correction.
  - k. Identify person that identified the issue.
2. Documenting Issue Resolution:
- a. Log date correction is completed or the issue is resolved.
  - b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
  - c. Identify changes to the Contract Documents that may require action.
  - d. State that correction was completed and system, subsystem, and equipment are ready for retest, if applicable.
  - e. Identify person(s) who corrected or resolved the issue.
  - f. Identify person(s) verifying the issue resolution.
- G. Final Commissioning Report: The Commissioning Agent will document results of the commissioning process, including unresolved issues, and performance of systems, subsystems, and equipment. The Commissioning Report will indicate whether systems, subsystems, and equipment have been properly installed and are performing according to the Contract Documents. This report will be used by the Department of Veterans Affairs when determining that systems will be accepted. This report will be used to evaluate systems, subsystems, and equipment and will serve as a future reference document during VA occupancy and operation. It shall describe components and performance that exceed requirements

of the Contract Documents and those that do not meet requirements of the Contract Documents. The commissioning report will include, but is not limited to, the following:

1. Lists and explanations of substitutions; compromises; variances with the Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. Design Narrative documentation maintained by the Commissioning Agent.
2. Commissioning plan.
3. Pre-Functional Checklists completed by the Contractor, with annotation of the Commissioning Agent review and spot check.
4. Systems Functional Performance Test Procedures, with annotation of test results and test completion.
5. Commissioning Issues Log.
6. Listing of deferred and off season test(s) not performed, including the schedule for their completion.

H. Addendum to Final Commissioning Report: The Commissioning Agent will prepare an Addendum to the Final Commissioning Report near the end of the Warranty Period. The Addendum will indicate whether systems, subsystems, and equipment are complete and continue to perform according to the Contract Documents. The Addendum to the Final Commissioning Report shall include, but is not limited to, the following:

1. Documentation of deferred and off season test(s) results.
2. Completed Systems Functional Performance Test Procedures for off season test(s).
3. Documentation that unresolved system performance issues have been resolved.
4. Updated Commissioning Issues Log, including status of unresolved issues.
5. Identification of potential Warranty Claims to be corrected by the Contractor.

I. Systems Manual: The Commissioning Agent will gather required information and compile the Systems Manual. The Systems Manual will include, but is not limited to, the following:

1. Design Narrative, including system narratives, schematics, single-line diagrams, flow diagrams, equipment schedules, and changes made throughout the Project.

2. Reference to Final Commissioning Plan.
3. Reference to Final Commissioning Report.
4. Approved Operation and Maintenance Data as submitted by the Contractor.

#### **1.13 SUBMITTALS**

A. Preliminary Commissioning Plan Submittal: The Commissioning Agent has prepared a Preliminary Commissioning Plan based on the final Construction Documents. The Preliminary Commissioning Plan is included as an Appendix to this specification section. The Preliminary Commissioning Plan is provided for information only. It contains preliminary information about the following commissioning activities:

1. The Commissioning Team: A list of commissioning team members by organization.
2. Systems to be commissioned. A detailed list of systems to be commissioned for the project. This list also provides preliminary information on systems/equipment submittals to be reviewed by the Commissioning Agent; preliminary information on Pre-Functional Checklists that are to be completed; preliminary information on Systems Performance Testing, including information on testing sample size (where authorized by the VA).
3. Commissioning Team Roles and Responsibilities: Preliminary roles and responsibilities for each Commissioning Team member.
4. Commissioning Documents: A preliminary list of commissioning-related documents, include identification of the parties responsible for preparation, review, approval, and action on each document.
5. Commissioning Activities Schedule: Identification of Commissioning Activities, including Systems Functional Testing, the expected duration and predecessors for the activity.
6. Pre-Functional Checklists: Preliminary Pre-Functional Checklists for equipment, components, subsystems, and systems to be commissioned. These Preliminary Pre-Functional Checklists provide guidance on the level of detailed information the Contractor shall include on the final submission.
7. Systems Functional Performance Test Procedures: Preliminary step-by-step System Functional Performance Test Procedures to be used during Systems Functional Performance Testing. These Preliminary Systems Functional Performance procedures provide information on the

level of testing rigor, and the level of Contractor support required during performance of system's testing.

- B. Final Commissioning Plan Submittal: Based on the Final Construction Documents and the Contractor's project team, the Commissioning Agent will prepare the Final Commissioning Plan as described in this section. The Commissioning Agent will submit three hard copies and three sets of electronic files of Final Commissioning Plan. The Contractor shall review the Commissioning Plan and provide any comments to the VA. The Commissioning Agent will incorporate review comments into the Final Commissioning Plan as directed by the VA.
- C. Systems Functional Performance Test Procedure: The Commissioning Agent will submit preliminary Systems Functional Performance Test Procedures to the Contractor, and the VA for review and comment. The Contractor shall return review comments to the VA and the Commissioning Agent. The VA will also return review comments to the Commissioning Agent. The Commissioning Agent will incorporate review comments into the Final Systems Functional Test Procedures to be used in Systems Functional Performance Testing.
- D. Pre-Functional Checklists: The Commissioning Agent will submit Pre-Functional Checklists to be completed by the Contractor.
- E. Test and Inspection Reports: The Commissioning Agent will submit test and inspection reports to the VA with copies to the Contractor and the Architect/Engineer.
- F. Corrective Action Documents: The Commissioning Agent will submit corrective action documents to the VA Resident Engineer with copies to the Contractor and Architect.
- G. Preliminary Commissioning Report Submittal: The Commissioning Agent will submit three electronic copies of the preliminary commissioning report. One electronic copy, with review comments, will be returned to the Commissioning Agent for preparation of the final submittal.
- H. Final Commissioning Report Submittal: The Commissioning Agent will submit four sets of electronically formatted information of the final commissioning report to the VA. The final submittal will incorporate comments as directed by the VA.
- I. Data for Commissioning:
  - 1. The Commissioning Agent will request in writing from the Contractor specific information needed about each piece of commissioned

equipment or system to fulfill requirements of the Commissioning Plan.

2. The Commissioning Agent may request further documentation as is necessary for the commissioning process or to support other VA data collection requirements, including Construction Operations Building Information Exchange (COBIE), Building Information Modeling (BIM), etc.

#### **1.14 COMMISSIONING PROCESS**

- A. The Commissioning Agent will be responsible for the overall management of the commissioning process as well as coordinating scheduling of commissioning tasks with the VA and the Contractor. As directed by the VA, the Contractor shall incorporate Commissioning tasks, including, but not limited to, Systems Functional Performance Testing (including predecessors) with the Master Construction Schedule.
- B. Within 45 days of contract award, the Contractor shall designate a specific individual as the Commissioning Manager (CxM) to manage and lead the commissioning effort on behalf of the Contractor. The Commissioning Manager shall be the single point of contact and communications for all commissioning related services by the Contractor.
- C. Within 45 days of contract award, the Contractor shall ensure that each subcontractor designates specific individuals as Commissioning Representatives (CXR) to be responsible for commissioning related tasks. The Contractor shall ensure the designated Commissioning Representatives participate in the commissioning process as team members providing commissioning testing services, equipment operation, adjustments, and corrections if necessary. The Contractor shall ensure that all Commissioning Representatives shall have sufficient authority to direct their respective staff to provide the services required, and to speak on behalf of their organizations in all commissioning related contractual matters.

#### **1.15 QUALITY ASSURANCE**

- A. Instructor Qualifications: Factory authorized service representatives shall be experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.
- B. Test Equipment Calibration: The Contractor shall comply with test equipment manufacturer's calibration procedures and intervals.

Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

#### **1.16 COORDINATION**

- A. Management: The Commissioning Agent will coordinate the commissioning activities with the VA and Contractor. The Commissioning Agent will submit commissioning documents and information to the VA. All commissioning team members shall work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.
- B. Scheduling: The Contractor shall work with the Commissioning Agent and the VA to incorporate the commissioning activities into the construction schedule. The Commissioning Agent will provide sufficient information (including, but not limited to, tasks, durations and predecessors) on commissioning activities to allow the Contractor and the VA to schedule commissioning activities. All parties shall address scheduling issues and make necessary notifications in a timely manner in order to expedite the project and the commissioning process. The Contractor shall update the Master Construction as directed by the VA.
- C. Initial Schedule of Commissioning Events: The Commissioning Agent will provide the initial schedule of primary commissioning events in the Commissioning Plan and at the commissioning coordination meetings. The Commissioning Plan will provide a format for this schedule. As construction progresses, more detailed schedules will be developed by the Contractor with information from the Commissioning Agent.
- D. Commissioning Coordinating Meetings: The Commissioning Agent will conduct periodic Commissioning Coordination Meetings of the commissioning team to review status of commissioning activities, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.
- E. Pretesting Meetings: The Commissioning Agent will conduct pretest meetings of the commissioning team to review startup reports, Pre-Functional Checklist results, Systems Functional Performance Testing procedures, testing personnel and instrumentation requirements.
- F. Systems Functional Performance Testing Coordination: The Contractor shall coordinate testing activities to accommodate required quality

assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting. The Contractor shall coordinate the schedule times for tests, inspections, obtaining samples, and similar activities.

## **PART 2 - PRODUCTS**

### **2.1 TEST EQUIPMENT**

- A. The Contractor shall provide all standard and specialized testing equipment required to perform Systems Functional Performance Testing. Test equipment required for Systems Functional Performance Testing will be identified in the detailed System Functional Performance Test Procedure prepared by the Commissioning Agent.
- B. Data logging equipment and software required to test equipment shall be provided by the Contractor.
- C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5 °C (1.0 °F) and a resolution of + or - 0.1 °C (0.2 °F). Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and following any repairs to the equipment. Calibration tags shall be affixed or certificates readily available.

### PART 3 - EXECUTION

#### 3.1 COMMISSIONING PROCESS ROLES AND RESPONSIBILITIES

A. The following table outlines the roles and responsibilities for the Commissioning Team members during the Construction Phase:

Construction Phase		CxA = Commissioning Agent RE = COR A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Construction Commissioning Kick Off meeting	L	A	P	P	O	
	Commissioning Meetings	L	A	P	P	O	
	Project Progress Meetings	P	A	P	L	O	
	Controls Meeting	L	A	P	P	O	
Coordination	Coordinate with [OGC's, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support the OPR and BOD.	L	A	P	P	N/A	
Cx Plan & Spec	Final Commissioning Plan	L	A	R	R	O	
Schedules	Duration Schedule for Commissioning Activities	L	A	R	R	N/A	



Construction Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = COR					P = Participate
		A/E = Design Arch/Engineer					A = Approve
		PC = Prime Contractor					R = Review
		O&M = Gov't Facility O&M					O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
OPR and BOD	Maintain OPR on behalf of Owner	L	A	R	R	O	
	Maintain BOD/DID on behalf of Owner	L	A	R	R	O	
Document Reviews	TAB Plan Review	L	A	R	R	O	
	Submittal and Shop Drawing Review	R	A	R	L	O	
	Review Contractor Equipment Startup Checklists	L	A	R	R	N/A	
	Review Change Orders, ASI, and RFI	L	A	R	R	N/A	
Site Observations	Witness Factory Testing	P	A	P	L	O	
	Construction Observation Site Visits	L	A	R	R	O	
Functional Test Protocols	Final Pre-Functional Checklists	L	A	R	R	O	
	Final Functional Performance Test Protocols	L	A	R	R	O	
Technical Activities	Issues Resolution Meetings	P	A	P	L	O	
Reports and	Status Reports	L	A	R	R	O	

Construction Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = COR					P = Participate
		A/E = Design Arch/Engineer					A = Approve
		PC = Prime Contractor					R = Review
		O&M = Gov't Facility O&M					O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Logs	Maintain Commissioning Issues Log	L	A	R	R	O	

B. The following table outlines the roles and responsibilities for the Commissioning Team members during the Acceptance Phase:

Acceptance Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = COR					P = Participate
		A/E = Design Arch/Engineer					A = Approve
		PC = Prime Contractor					R = Review
		O&M = Gov't Facility O&M					O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Commissioning Meetings	L	A	P	P	O	
	Project Progress Meetings	P	A	P	L	O	
	Pre-Test Coordination Meeting	L	A	P	P	O	
	Lessons Learned and Commissioning Report Review Meeting	L	A	P	P	O	
Coordination	Coordinate with [OGC's, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support OPR and BOD	L	P	P	P	O	

Acceptance Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = COR					P = Participate
		A/E = Design Arch/Engineer					A = Approve
		PC = Prime Contractor					R = Review
		O&M = Gov't Facility O&M					O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Cx Plan & Spec	Maintain/Update Commissioning Plan	L	A	R	R	O	
Schedules	Prepare Functional Test Schedule	L	A	R	R	O	
OPR and BOD	Maintain OPR on behalf of Owner	L	A	R	R	O	
	Maintain BOD/DID on behalf of Owner	L	A	R	R	O	
Document Reviews	Review Completed Pre-Functional Checklists	L	A	R	R	O	
	Pre-Functional Checklist Verification	L	A	R	R	O	
	Review Operations & Maintenance Manuals	L	A	R	R	R	
	Training Plan Review	L	A	R	R	R	
	Warranty Review	L	A	R	R	O	
	Review TAB Report	L	A	R	R	O	
Site Observations	Construction Observation Site Visits	L	A	R	R	O	
	Witness Selected Equipment Startup	L	A	R	R	O	
Functional Test Protocols	TAB Verification	L	A	R	R	O	
	Systems Functional Performance Testing	L	A	P	P	P	
	Retesting	L	A	P	P	P	

Acceptance Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = COR					P = Participate
		A/E = Design Arch/Engineer					A = Approve
		PC = Prime Contractor					R = Review
		O&M = Gov't Facility O&M					O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Technical Activities	Issues Resolution Meetings	P	A	P	L	O	
	Systems Training	L	S	R	P	P	
Reports and Logs	Status Reports	L	A	R	R	O	
	Maintain Commissioning Issues Log	L	A	R	R	O	
	Final Commissioning Report	L	A	R	R	R	
	Prepare Systems Manuals	L	A	R	R	R	

C. The following table outlines the roles and responsibilities for the Commissioning Team members during the Warranty Phase:

Warranty Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = COR					P = Participate
		A/E = Design Arch/Engineer					A = Approve
		PC = Prime Contractor					R = Review
		O&M = Gov't Facility O&M					O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Post-Occupancy User Review Meeting	L	A	O	P	P	
Site Observations	Periodic Site Visits	L	A	O	O	P	
Functional Test Protocols	Deferred and/or seasonal Testing	L	A	O	P	P	
Technical Activities	Issues Resolution Meetings	L	S	O	O	P	
	Post-Occupancy Warranty Checkup and review of Significant Outstanding Issues	L	A		R	P	
Reports and Logs	Final Commissioning Report Amendment	L	A		R	R	
	Status Reports	L	A		R	R	

### **3.2 STARTUP, INITIAL CHECKOUT, AND PRE-FUNCTIONAL CHECKLISTS**

A. The following procedures shall apply to all equipment and systems to be commissioned, according to Part 1, Systems to Be Commissioned.

1. Pre-Functional Checklists are important to ensure that the equipment and systems are hooked up and operational. These ensure that Systems Functional Performance Testing may proceed without unnecessary delays. Each system to be commissioned shall have a full Pre-Functional Checklist completed by the Contractor prior to Systems Functional Performance Testing. No sampling strategies are used.
  - a. The Pre-Functional Checklist will identify the trades responsible for completing the checklist. The Contractor shall ensure the appropriate trades complete the checklists.
  - b. The Commissioning Agent will review completed Pre-Functional Checklists and field-verify the accuracy of the completed checklist using sampling techniques.
2. Startup and Initial Checkout Plan: The Contractor shall develop detailed startup plans for all equipment. The primary role of the Contractor in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed. Parties responsible for startup shall be identified in the Startup Plan and in the checklist forms.
  - a. The Contractor shall develop the full startup plan by combining (or adding to) the checklists with the manufacturer's detailed startup and checkout procedures from the O&M manual data and the field checkout sheets normally used by the Contractor. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
  - b. The full startup plan shall at a minimum consist of the following items:
    - 1) The Pre-Functional Checklists.
    - 2) The manufacturer's standard written startup procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
    - 3) The manufacturer's normally used field checkout sheets.

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- c. The Commissioning Agent will submit the full startup plan to the VA and Contractor for review. Final approval will be by the VA.
  - d. The Contractor shall review and evaluate the procedures and the format for documenting them, noting any procedures that need to be revised or added.
3. Sensor and Actuator Calibration
- a. All field installed temperature, relative humidity, CO2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described in Division 21, Division 22, Division 23, Division 26, Division 27, and Division 28 specifications.
  - b. All procedures used shall be fully documented on the Pre-Functional Checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.
4. Execution of Equipment Startup
- a. Three (3) weeks prior to equipment startup, the Contractor shall schedule startup and checkout with the VA and Commissioning Agent. The performance of the startup and checkout shall be directed and executed by the Contractor.
  - b. The Commissioning Agent will observe the startup procedures for selected pieces of primary equipment.
  - c. The Contractor shall execute startup and provide the VA and Commissioning Agent with a signed and dated copy of the completed startup checklists, and contractor tests.
  - d. Only individuals that have direct knowledge and witnessed that a line item task on the Startup Checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

### **3.3 DEFICIENCIES, NONCONFORMANCE, AND APPROVAL IN CHECKLISTS AND STARTUP**

- A. The Contractor shall clearly list any outstanding items of the initial startup and Pre-Functional Checklist procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies shall be provided to the VA and the Commissioning Agent within two days of completion.

- B. The Commissioning Agent will review the report and submit comments to the VA. The Commissioning Agent will work with the Contractor to correct and verify deficiencies or uncompleted items. The Commissioning Agent will involve the VA and others as necessary. The Contractor shall correct all areas that are noncompliant or incomplete in the checklists in a timely manner, and shall notify the VA and Commissioning Agent as soon as outstanding items have been corrected. The Contractor shall submit an updated startup report and a Statement of Correction on the original noncompliance report. When satisfactorily completed, the Commissioning Agent will recommend approval of the checklists and startup of each system to the VA.
- C. The Contractor shall be responsible for resolution of deficiencies as directed the VA.

### **3.4 PHASED COMMISSIONING**

- A. The project may require startup and initial checkout to be executed in phases. This phasing shall be planned and scheduled in a coordination meeting of the VA, Commissioning Agent, and the Contractor. Results will be added to the master construction schedule and the commissioning schedule.

### **3.5 DDC SYSTEM TRENDING FOR COMMISSIONING**

#### **A. SECTION OMITTED.**

### **3.6 SYSTEMS FUNCTIONAL PERFORMANCE TESTING**

- A. This paragraph applies to Systems Functional Performance Testing of systems for all referenced specification Divisions.
- B. Objectives and Scope: The objective of Systems Functional Performance Testing is to demonstrate that each system is operating according to the Contract Documents. Systems Functional Performance Testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of noncompliant performance are identified and corrected, thereby improving the operation and functioning of the systems. In general, each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load, fire alarm and emergency power) where there is a specified system response. The Contractor shall verify each sequence in the sequences of operation. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.



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C. Development of Systems Functional Performance Test Procedures: Before Systems Functional Performance Test procedures are written, the Contractor shall submit all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements found in the Contract Documents and approved submittals and shop drawings, the Commissioning Agent will develop specific Systems Functional Test Procedures to verify and document proper operation of each piece of equipment and system to be commissioned. The Contractor shall assist the Commissioning Agent in developing the Systems Functional Performance Test procedures as requested by the Commissioning Agent i.e. by answering questions about equipment, operation, sequences, etc. Prior to execution, the Commissioning Agent will provide a copy of the Systems Functional Performance Test procedures to the VA, the Architect/Engineer, and the Contractor, who shall review the tests for feasibility, safety, equipment and warranty protection.

D. Purpose of Test Procedures: The purpose of each specific Systems Functional Performance Test is to verify and document compliance with the stated criteria of acceptance given on the test form. Representative test formats and examples are found in the Commissioning Plan for this project. (The Commissioning Plan is issued as a separate document and is available for review.) The test procedure forms developed by the Commissioning Agent will include, but not be limited to, the following information:

1. System and equipment or component name(s)
2. Equipment location and ID number
3. Unique test ID number, and reference to unique Pre-Functional Checklists and startup documentation, and ID numbers for the piece of equipment
4. Date
5. Project name
6. Participating parties
7. A copy of the specification section describing the test requirements
8. A copy of the specific sequence of operations or other specified parameters being verified
9. Formulas used in any calculations

10. Required pretest field measurements
  11. Instructions for setting up the test.
  12. Special cautions, alarm limits, etc.
  13. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
  14. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
  15. A section for comments.
  16. Signatures and date block for the Commissioning Agent. A place for the Contractor to initial to signify attendance at the test.
- E. Test Methods: Systems Functional Performance Testing shall be achieved by manual testing (i.e. persons manipulate the equipment and observe performance) and/or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by standalone data loggers. The Contractor and Commissioning Agent shall determine which method is most appropriate for tests that do not have a method specified.
1. Simulated Conditions: Simulating conditions (not by an overwritten value) shall be allowed, although timing the testing to experience actual conditions is encouraged wherever practical.
  2. Overwritten Values: Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
  3. Simulated Signals: Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.

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4. Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the Air Conditioning compressor lockout initiate at an outside air temperature below 12 C (54 F), when the outside air temperature is above 12 C (54 F), temporarily change the lockout setpoint to be 2 C (4 F) above the current outside air temperature.
  5. Indirect Indicators: Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification shall be completed during systems startup and initial checkout.
- F. Setup: Each function and test shall be performed under conditions that simulate actual conditions as closely as is practically possible. The Contractor shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Contractor shall return all affected building equipment and systems, due to these temporary modifications, to their pretest condition.
- G. Sampling: No sampling is allowed in completing Pre-Functional Checklists. Sampling is allowed for Systems Functional Performance Test Procedures execution. The Commissioning Agent will determine the sampling rate. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the Commissioning Agent may stop the testing and require the Contractor to perform and document a checkout of the remaining units, prior to continuing with Systems Functional Performance Testing of the remaining units.

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- H. Cost of Retesting: The cost associated with expanded sample System Functional Performance Tests shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.

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- I. Coordination and Scheduling: The Contractor shall provide a minimum of 7 days' notice to the Commissioning Agent and the VA regarding the completion schedule for the Pre-Functional Checklists and startup of all equipment and systems. The Commissioning Agent will schedule Systems Functional Performance Tests with the Contractor and VA. The Commissioning Agent will witness and document the Systems Functional Performance Testing of systems. The Contractor shall execute the tests in accordance with the Systems Functional Performance Test Procedure.
- J. Testing Prerequisites: In general, Systems Functional Performance Testing will be conducted only after Pre-Functional Checklists have been satisfactorily completed. The control system shall be sufficiently tested and approved by the Commissioning Agent and the VA before it is used to verify performance of other components or systems. The air balancing and water balancing shall be completed before Systems Functional Performance Testing of air-related or water-related equipment or systems are scheduled. Systems Functional Performance Testing will proceed from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems will be checked.
- K. Problem Solving: The Commissioning Agent will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the Contractor.

### **3.7 DOCUMENTATION, NONCONFORMANCE AND APPROVAL OF TESTS**

- A. Documentation: The Commissioning Agent will witness, and document the results of all Systems Functional Performance Tests using the specific procedural forms developed by the Commissioning Agent for that purpose. Prior to testing, the Commissioning Agent will provide these forms to the VA and the Contractor for review and approval. The Contractor shall include the filled out forms with the O&M manual data.
- B. Nonconformance: The Commissioning Agent will record the results of the Systems Functional Performance Tests on the procedure or test form. All items of nonconformance issues will be noted and reported to the VA on Commissioning Field Reports and/or the Commissioning Master Issues Log.
  - 1. Corrections of minor items of noncompliance identified may be made during the tests. In such cases, the item of noncompliance and

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- resolution shall be documented on the Systems Functional Test Procedure.
2. Every effort shall be made to expedite the systems functional Performance Testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the Commissioning Agent shall not be pressured into overlooking noncompliant work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so by direction from the VA.
  3. As the Systems Functional Performance Tests progresses and an item of noncompliance is identified, the Commissioning Agent shall discuss the issue with the Contractor and the VA.
  4. When there is no dispute on an item of noncompliance, and the Contractor accepts responsibility to correct it:
    - a. The Commissioning Agent will document the item of noncompliance and the Contractor's response and/or intentions. The Systems Functional Performance Test then continues or proceeds to another test or sequence. After the day's work is complete, the Commissioning Agent will submit a Commissioning Field Report to the VA. The Commissioning Agent will also note items of noncompliance and the Contractor's response in the Master Commissioning Issues Log. The Contractor shall correct the item of noncompliance and report completion to the VA and the Commissioning Agent.
    - b. The need for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test and the test shall be repeated.
  5. If there is a dispute about item of noncompliance, regarding whether it is an item of noncompliance, or who is responsible:
    - a. The item of noncompliance shall be documented on the test form with the Contractor's response. The item of noncompliance with the Contractor's response shall also be reported on a Commissioning Field Report and on the Master Commissioning Issues Log.
    - b. Resolutions shall be made at the lowest management level possible. Other parties are brought into the discussions as

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needed. Final interpretive and acceptance authority is with the Department of Veterans Affairs.

- c. The Commissioning Agent will document the resolution process.
- d. Once the interpretation and resolution have been decided, the Contractor shall correct the item of noncompliance, report it to the Commissioning Agent. The requirement for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test. Retesting shall be repeated until satisfactory performance is achieved.

C. Cost of Retesting: The cost to retest a System Functional Performance Test shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.

D. Failure Due to Manufacturer Defect: If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform in compliance with the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance specifications, all identical units may be considered unacceptable by the VA. In such case, the Contractor shall provide the VA with the following:

- 1. Within one week of notification from the VA, the Contractor shall examine all other identical units making a record of the findings. The findings shall be provided to the VA within two weeks of the original notice.
- 2. Within two weeks of the original notification, the Contractor shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
- 3. The VA shall determine whether a replacement of all identical units or a repair is acceptable.

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4. Two examples of the proposed solution shall be installed by the Contractor and the VA shall be allowed to test the installations for up to one week, upon which the VA will decide whether to accept the solution.
  5. Upon acceptance, the Contractor shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.
- E. Approval: The Commissioning Agent will note each satisfactorily demonstrated function on the test form. Formal approval of the Systems Functional Performance Test shall be made later after review by the Commissioning Agent and by the VA. The Commissioning Agent will evaluate each test and report to the VA using a standard form. The VA will give final approval on each test using the same form, and provide signed copies to the Commissioning Agent and the Contractor.

### **3.8 DEFERRED TESTING**

- A. Unforeseen Deferred Systems Functional Performance Tests: If any Systems Functional Performance Test cannot be completed due to the building structure, required occupancy condition or other conditions, execution of the Systems Functional Performance Testing may be delayed upon approval of the VA. These Systems Functional Performance Tests shall be conducted in the same manner as the seasonal tests as soon as possible. Services of the Contractor to conduct these unforeseen Deferred Systems Functional Performance Tests shall be negotiated between the VA and the Contractor.
- B. Deferred Seasonal Testing: Deferred Seasonal Systems Functional Performance Tests are those that must be deferred until weather conditions are closer to the systems design parameters. The Commissioning Agent will review systems parameters and recommend which Systems Functional Performance Tests should be deferred until weather conditions more closely match systems parameters. The Contractor shall review and comment on the proposed schedule for Deferred Seasonal Testing. The VA will review and approve the schedule for Deferred Seasonal Testing. Deferred Seasonal Systems Functional Performances Tests shall be witnessed and documented by the Commissioning Agent.

Deferred Seasonal Systems Functional Performance Tests shall be executed by the Contractor in accordance with these specifications.

### **3.9 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS**

- A. Training Preparation Conference: Before operation and maintenance training, the Commissioning Agent will convene a training preparation conference to include VA's Resident Engineer, VA's Operations and Maintenance personnel, and the Contractor. The purpose of this conference will be to discuss and plan for Training and Demonstration of VA Operations and Maintenance personnel.
- B. The Contractor shall provide training and demonstration as required by other Division 26 sections. The Training and Demonstration shall include, but is not limited to, the following:
  - 1. Review the Contract Documents.
  - 2. Review installed systems, subsystems, and equipment.
  - 3. Review instructor qualifications.
  - 4. Review instructional methods and procedures.
  - 5. Review training module outlines and contents.
  - 6. Review course materials (including operation and maintenance manuals).
  - 7. Review and discuss locations and other facilities required for instruction.
  - 8. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
  - 9. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.
- C. Training Module Submittals: The Contractor shall submit the following information to the VA and the Commissioning Agent:
  - 1. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module. At completion of training, submit two complete training manuals for VA's use.
  - 2. Qualification Data: Submit qualifications for facilitator and/or instructor.



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3. Attendance Record: For each training module, submit list of participants and length of instruction time.
4. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
5. Demonstration and Training Recording:
  - a. General: Engage a qualified commercial photographer to record demonstration and training. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. At beginning of each training module, record each chart containing learning objective and lesson outline.
  - b. Video Format: Provide high quality color DVD color on standard size DVD disks.
  - c. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
  - d. Narration: Describe scenes on video recording by audio narration by microphone while demonstration and training is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
  - e. Submit two copies within seven days of end of each training module.
6. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

D. Quality Assurance:

1. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
2. Instructor Qualifications: A factory authorized service representative, complying with requirements in Division 01

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Section "Quality Requirements," experienced in operation and maintenance procedures and training.

3. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.

E. Training Coordination:

1. Coordinate instruction schedule with VA's operations. Adjust schedule as required to minimize disrupting VA's operations.
2. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
3. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by the VA.

F. Instruction Program:

1. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
  - a. Electrical service and distribution, including switchgear, transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
  - b. Packaged engine generators, including synchronizing switchgear/switchboards, and transfer switches.

G. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participants are expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria:

Include the following:

  - a. System, subsystem, and equipment descriptions.
  - b. Performance and design criteria if Contractor is delegated design responsibility.
  - c. Operating standards.
  - d. Regulatory requirements.
  - e. Equipment function.
  - f. Operating characteristics.

- g. Limiting conditions.
- H, Performance curves.
- 2. Documentation: Review the following items in detail:
  - a. Emergency manuals.
  - b. Operations manuals.
  - c. Maintenance manuals.
  - d. Project Record Documents.
  - e. Identification systems.
  - f. Warranties and bonds.
  - g. Maintenance service agreements and similar continuing commitments.
- 3. Emergencies: Include the following, as applicable:
  - a. Instructions on meaning of warnings, trouble indications, and error messages.
  - b. Instructions on stopping.
  - c. Shutdown instructions for each type of emergency.
  - d. Operating instructions for conditions outside of normal operating limits.
  - e. Sequences for electric or electronic systems.
  - f. Special operating instructions and procedures.
- 4. Operations: Include the following, as applicable:
  - a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
  - a. Alignments.
  - b. Checking adjustments.

- c. Noise and vibration adjustments.
- d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.
- H. Training Execution:
  - 1. Preparation: Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual. Set up instructional equipment at instruction location.
  - 2. Instruction:
    - a. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Department of Veterans Affairs for number of participants, instruction times, and location.
    - b. Instructor: Engage qualified instructors to instruct VA's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

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- 1) The Commissioning Agent will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
  - 2) The VA will furnish an instructor to describe VA's operational philosophy.
  - 3) The VA will furnish the Contractor with names and positions of participants.
3. Scheduling: Provide instruction at mutually agreed times. For equipment that requires seasonal operation, provide similar instruction at start of each season. Schedule training with the VA and the Commissioning Agent with at least seven days' advance notice.
  4. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, or a written, performance-based test.
  5. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.
- I. Demonstration and Training Recording:
1. General: Engage a qualified commercial photographer to record demonstration and training. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. At beginning of each training module, record each chart containing learning objective and lesson outline.
  2. Video Format: Provide high quality color DVD color on standard size DVD disks.
  3. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
  4. Narration: Describe scenes on videotape by audio narration by microphone while demonstration and training is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

----- END -----

VA Western New York Healthcare System  
Buffalo - Arc Flash Mitigation Measures  
VA Project No. 528-13-S34

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## SELECTIVE STRUCTURE DEMOLITION

### SECTION 02 41 19

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Demolition and removal of selected portions of building or structure.

##### 1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner[ **ready for reuse**].
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

##### 1.3 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.

##### 1.4 INFORMATIONAL SUBMITTALS

- A. Predemolition Photographs or Video: Submit before Work begins.

##### 1.5 CLOSEOUT SUBMITTALS

- A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 FIELD CONDITIONS

- A. Owner will occupy portions of all buildings where selective demolition is to occur. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. Hazardous materials will be removed by Owner before start of the Work.
  - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.



### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- D. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs.
  - 1. Comply with requirements specified in Section 01 00 00 "General Requirements."

#### 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
  - 1. Comply with requirements for existing services/systems interruptions specified in Section 01 00 00 "General Requirements."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. COR will arrange to shut off indicated services/systems when requested by Contractor.
  - 2. Arrange to shut off indicated utilities with utility companies and COR.
  - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  - 4. Disconnect, demolish, and remove electrical systems, equipment, and components indicated to be removed.
    - a. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    - b. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

- c. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

### 3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with walks, walkways, and other adjacent occupied and used facilities.
  - 1. Comply with requirements for access and protection specified in Section 01 00 00 "General Requirements."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

### 3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  - 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
  - 4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  - 5. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."
- B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When

permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

### 3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
  - 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

### 3.6 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

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**SECTION 02 83 33.13**  
**LEAD-BASED PAINT REMOVAL AND DISPOSAL**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies abatement and disposal of lead-based paint (LBP) and controls needed to limit occupational and environmental exposure to lead hazards.

**1.2 RELATED WORK**

A. Section 02 41 19, SELECTIVE DEMOLITION.

**1.3 APPLICABLE PUBLICATIONS**

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

B. Code of Federal Regulations (CFR):

CFR 29 Part 1910.....Occupational Safety and Health Standards

CFR 29 Part 1926.....Safety and Health Regulations for Construction

CFR 40 Part 148.....Hazardous Waste Injection Restrictions

CFR 40 Part 260.....Hazardous Waste Management System: General

CFR 40 Part 261.....Identification and Listing of Hazardous Waste

CFR 40 Part 262.....Standards Applicable to Generators of Hazardous  
Waste

CFR 40 Part 263.....Standards Applicable to Transporters of  
Hazardous Waste

CFR 40 Part 264.....Standards for Owners and Operations of Hazardous  
Waste Treatment, Storage, and Disposal  
Facilities

CFR 40 Part 265.....Interim Status Standards for Owners and  
Operators of Hazardous Waste Treatment, Storage,  
and Disposal Facilities

CFR 40 Part 268.....Land Disposal Restrictions

CFR 49 Part 172.....Hazardous Material Table, Special Provisions,  
Hazardous Material Communications, Emergency  
Response Information, and Training Requirements

CFR 49 Part 178.....Specifications for Packaging

C. National Fire Protection Association (NFPA):

NFPA 701-2004.....Methods of Fire Test for Flame-Resistant  
Textiles and Films

D. National Institute for Occupational Safety And Health (NIOSH)

NIOSH OSHA Booklet 3142.       Lead in Construction

E. Underwriters Laboratories (UL)

UL 586-1996 (Rev 2009).. High-Efficiency, Particulate, Air Filter  
Units

F. American National Standards Institute

Z9.2-2006.....Fundamentals Governing the Design and Operation  
of Local Exhaust Systems

Z88.6-2006.....Respiratory Protection

**1.4 DEFINITIONS**

- A. Action Level: Employee exposure, without regard to use of respirations, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period. As used in this section, "30 micrograms per cubic meter of air" refers to the action level.
- B. Area Monitoring: Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead concentrations which may reach the breathing zone of personnel potentially exposed to lead.
- C. Physical Boundary: Area physically roped or partitioned off around an enclosed lead control area to limit unauthorized entry of personnel. As used in this section, "inside boundary" shall mean the same as "outside lead control area."
- D. Certified Industrial Hygienist (CIH): As used in this section, refers to an Industrial Hygienist employed by the Contractor and is certified by the American Board of Industrial Hygiene in comprehensive practice.
- E. Change Rooms and Shower Facilities: Rooms within the designated physical boundary around the lead control area equipped with separate storage facilities for clean protective work clothing and equipment and for street clothes which prevent cross- contamination.
- F. Competent Person: A person capable of identifying lead hazards in the work area and is authorized by the contractor to take corrective action.
- G. Decontamination Room: Room for removal of contaminated personal protective equipment (PPE).
- H. Eight-Hour Time Weighted Average (TWA): Airborne concentration of lead averaged over an 8-hour workday to which an employee is exposed.
- I. High Efficiency Particulate Air (HEPA) Filter Equipment: HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead-contaminated paint dust. A high efficiency particulate filter means 99.97 percent efficient against 0.3 micron size particles.

- J. Lead: Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are other organic lead compounds.
- K. Lead Control Area: An enclosed area or structure with full containment to prevent the spread of lead dust, paint chips, or debris of lead-containing paint removal operations. The lead control area is isolated by physical boundaries to prevent unauthorized entry of personnel.
- L. Lead Permissible Exposure Limit (PEL): Fifty micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1910.1025. If an employee is exposed for more than 8 hours in a work day, the PEL shall be determined by the following formula. 
$$\text{PEL (micrograms/cubic meter of air)} = 400 / \text{No. of hrs worked per day}$$
- M. Personnel Monitoring: Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1910.1025. Samples shall be representative of the employee's work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 150 mm to 225 mm (6 to 9 inches) and the center at the nose or mouth of an employee.

#### 1.5 QUALITY ASSURANCE

- A. Before exposure to lead-contaminated dust, provide workers with a comprehensive medical examination as required by 29 CFR 1926.62 (I) (1) (i) & (ii). The examination shall not be required if adequate records show that employees have been examined as required by 29 CFR 1926.62(I) without the last year.
- B. Medical Records: Maintain complete and accurate medical records of employees in accordance with 29 CFR 1910.20.
- C. CIH Responsibilities: The Contractor shall employ a certified Industrial Hygienist who will be responsible for the following:
  - 1. Certify Training.
  - 2. Review and approve lead-containing paint removal plan for conformance to the applicable referenced standards.
  - 3. Inspect lead-containing paint removal work for conformance with the approved plan.
  - 4. Direct monitoring.
  - 5. Ensure work is performed in strict accordance with specifications at all times.
  - 6. Ensure hazardous exposure to personnel and to the environment are adequately controlled at all times.

- D. Training: Train each employee performing paint removal, disposal, and air sampling operations prior to the time of initial job assignment, in accordance with 29 CFR 1926.62.
- E. Training Certification: Submit certificates signed and dated by the CIH and by each employee stating that the employee has received training.
- F. Respiratory Protection Program:
  - 1. Furnish each employee required to wear a negative pressure respirator or other appropriate type with a respirator fit test at the time of initial fitting and at least every 6 months thereafter as required by 29 CFR 1926.62.
  - 2. Establish and implement a respiratory protection program as required by 29 CFR 1910.134, 29 CFR 1910.1025, and 29 CFR 1926.62.
- G. Hazard Communication Program: Establish and implement a Hazard Communication Program as required by 29 CFR 1910.1200.
- H. Hazardous Waste Management: The Hazardous Waste Management plan shall comply with applicable requirements of Federal, State, and local hazardous waste regulations and address:
  - 1. Identification of hazardous wastes associated with the work.
  - 2. Estimated quantities of wastes to be generated and disposed of.
  - 3. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location and a 24-hour point of contact. Furnish two copies of EPA, state and local hazardous waste permit applications permits and EPA Identification numbers.
  - 4. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.
  - 5. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
  - 6. Spill prevention, containment, and cleanup contingency measures to be implemented.
  - 7. Work plan and schedule for waste containment, removal and disposal. Wastes shall be cleaned up and containerized daily.
  - 8. Cost for hazardous waste disposal according to this plan.
- I. Safety and Health Compliance:
  - 1. In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding removing, handling, storing, transporting, and disposing of lead waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1910.1025.

- Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work.
2. Where specification requirements and the referenced documents vary, the most stringent requirements shall apply.
  3. The following local laws, ordinances, criteria, rules and regulations regarding removing, handling, storing, transporting, and disposing of lead-contaminated materials apply:
    - a. New York State Department of Health, Title 10
- J. Pre-Construction Conference: Along with the CIH, meet with the Contracting Officer to discuss in detail the lead-containing paint removal work plan, including work procedures and precautions for the work plan.

#### **1.6 SUBMITTALS**

- A. Submit the following in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Catalog Data:
  - Vacuum filters
  - Respirators
- C. Instructions: Paint removal materials. Include applicable material safety data sheets.
- D. Statements Certifications and Statements:
  1. Qualifications of CIH: Submit name, address, and telephone number of the CIH selected to perform responsibilities in paragraph entitled "CIH Responsibilities." Provide previous experience of the CIH. Submit proper documentation that the Industrial Hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification.
  2. Testing Laboratory: Submit the name, address, and telephone number of the testing laboratory selected to perform the monitoring, testing, and reporting of airborne concentrations of lead. Provide proper documentation that persons performing the analysis have been judged proficient by successful participation within the last year in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program. The laboratory shall be accredited by the American Industrial Hygiene Association (AIHA). Provide AIHA documentation along with date of accreditation/reaccreditation.
  3. Lead-Containing Paint Removal Plan:



- a. Submit a detailed job-specific plan of the work procedures to be used in the removal of lead-containing paint. The plan shall include a sketch showing the location, size, and details of lead control areas, location and details of decontamination rooms, change rooms, shower facilities, and mechanical ventilation system.
  - b. Include in the plan, eating, drinking, smoking and restroom procedures, interface of trades, sequencing of lead related work, collected wastewater and paint debris disposal plan, air sampling plan, respirators, protective equipment, and a detailed description of the method of containment of the operation to ensure that airborne lead concentrations of 30 micrograms per cubic meter of air are not exceeded outside of the lead control area.
  - c. Include air sampling, training and strategy, sampling methodology, frequency, duration of sampling, and qualifications of air monitoring personnel in the air sampling portion on the plan.
4. Field Test Reports: Monitoring Results: Submit monitoring results to the Contracting Officer within 3 working days, signed by the testing laboratory employee performing the air monitoring, the employee that analyzed the sample, and the CIH.
5. Records:
- a. Completed and signed hazardous waste manifest from treatment or disposal facility.
  - b. Certification of Medical Examinations.
  - c. Employee training certification.

## **PART 2 PRODUCTS**

**PAINT REMOVAL PRODUCTS:** Submit applicable Material Safety Data Sheets for paint removal products used in paint removal work. Use the least toxic product, suitable for the job and acceptable to the Industrial Hygienist.

## **PART 3 EXECUTION**

### **3.1 PROTECTIONA. NOTIFICATION: NOTIFY THE CONTRACTING OFFICER 20 DAYS PRIOR TO THE START OF ANY PAINT REMOVAL WORK.**

#### **B. Lead Control Area Requirements.**

1. Establish a lead control area by completely enclosing with containment screens the area or structure where lead-containing paint removal operations will be performed.

2. Contain removal operations by the use of a negative pressure full containment system with at least one change room and with HEPA filtered exhaust.
- C. Protection of Existing Work to Remain: Perform paint removal work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition.
- D. Boundary Requirements: Provide physical boundaries around the lead control area by roping off the area [designated on the drawings] or providing curtains, portable partitions or other enclosures to ensure that airborne concentrations of lead will not reach 30 micrograms per cubic meter of air outside of the lead control area.
- E. Heating, Ventilating and Air Conditioning (HVAC) Systems: Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead control areas. Seal intake and exhaust vents in the lead control area with 6-mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area.
- F. Change Room and Shower Facilities: Provide clean change rooms and shower facilities within the physical boundary around the designated lead control area in accordance with requirements of 29 CFR 1926.62.
- G. Mechanical Ventilation System:
  1. Use adequate ventilation to control personnel exposure to lead in accordance with 29 CFR 1926.57.
  2. To the extent feasible, use fixed local exhaust ventilation connected to HEPA filters or other collection systems, approved by the industrial hygienist. Local exhaust ventilation systems shall be designed, constructed, installed, and maintained in accordance with ANSI Z9.2.
  3. If air from exhaust ventilation is recirculated into the work place, the system shall have a high efficiency filter with reliable back-up filter and controls to monitor the concentration of lead in the return air and to bypass the recirculation system automatically if it fails. Air may be recirculated only where exhaust to the outside is not feasible.
- H. Personnel Protection: Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been given appropriate training and protective equipment.
- I. Warning Signs: Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign

and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.

### **3.2 WORK PROCEDURES**

- A. Perform removal of lead-containing paint in accordance with approved lead-containing paint removal plan. Use procedures and equipment required to limit occupational and environmental exposure to lead when lead-containing paint is removed in accordance with 29 CFR 1926.62, except as specified herein. Dispose of removed paint chips and associated waste in compliance with Environmental Protection Agency (EPA), federal, state, and local requirements.
- B. Personnel Exiting Procedures:
  - 1. Whenever personnel exist the lead-controlled area, they shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn during the work day:
    - a. Vacuum themselves off.
    - b. Remove protective clothing in the decontamination room, and place them in an approved impermeable disposal bag.
    - c. Shower.
    - d. Change to clean clothes prior to leaving the physical boundary designated around the lead-contaminated job site.
- C. Monitoring: Monitoring of airborne concentrations of lead shall be in accordance with 29 CFR 1910.1025 and as specified herein. Air monitoring, testing, and reporting shall be performed by a CIH or an Industrial Hygiene (IH) Technician who is under the direction of the CIH:
  - 1. The CIH or the IH Technician under the direction of the CIH shall be on the job site directing the monitoring, and inspecting the lead-containing paint removal work to ensure that the requirements of the Contract have been satisfied during the entire lead-containing paint removal operation.
  - 2. Take personal air monitoring samples on employees who are anticipated to have the greatest risk of exposure as determined by the CIH. In addition, take air monitoring samples on at least 25 percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.
  - 3. Submit results of air monitoring samples, signed by the CIH, within 16 hours after the air samples are taken. Notify the Contracting Officer immediately of exposure to lead at or in excess of the action

level of 30 micrograms per cubic meter of air outside of the lead control area.

D. Monitoring During Paint Removal Work:

1. Perform personal and area monitoring during the entire paint removal operation. Sufficient area monitoring shall be conducted at the physical boundary to ensure unprotected personnel are not exposed above 30 micrograms per cubic meter of air at all times. If the outside boundary lead levels are at or exceed 30 micrograms per cubic meter of air, work shall be stopped and the CIH shall immediately correct the condition(s) causing the increased levels and notify the Contracting Officer immediately.
2. The CIH shall review the sampling data collected on that day to determine if condition(s) requires any further change in work methods. Removal work shall resume when approval is given by the CIH. The Contractor shall control the lead level outside of the work boundary to less than 30 micrograms per cubic meter of air at all times. As a minimum, conduct area monitoring daily on each shift in which lead paint removal operations are performed in areas immediately adjacent to the lead control area.
3. For outdoor operations, at least one sample on each shift shall be taken on the downwind side of the lead control area. If adjacent areas are contaminated, clean and visually inspect contaminated areas. The CIH shall certify that the area has been cleaned of lead contamination.

**3.3 LEAD-CONTAINING PAINT REMOVAL**

- A. Remove paint within the areas designated on the drawings in order to completely expose the substrate. Take whatever precautions are necessary to minimize damage to the underlying substrate.
- B. Indoor Lead Paint Removal: Select paint removal processes to minimize contamination of work areas with lead-contaminated dust or other lead-contaminated debris/waste. This paint removal process should be described in the lead-containing paint removal plan. Perform manual sanding and scraping to the maximum extent feasible.
- C. Mechanical Paint Removal and Blast Cleaning: Perform mechanical paint removal and blast cleaning in lead control areas using negative pressure full containments with HEPA filtered exhaust. Collect paint residue and spent grit (used abrasive) from blasting operations for disposal in accordance with EPA, state and local requirements.

- D. Outside Lead Paint Removal: Select removal processes to minimize contamination of work areas with lead-contaminated dust or other lead-contaminated debris/waste. This paint removal process should be described in the lead-containing paint removal plan. Perform manual sanding and scraping to the maximum extent feasible.

### **3.4 SURFACE PREPARATIONS**

Avoid flash rusting or other deterioration of the substrate. Provide surface preparations for painting in accordance with Section 09 91 00, PAINTING.

### **3.5 CLEANUP AND DISPOSAL**

- A. Cleanup: Maintain surfaces of the lead control area free of accumulations of paint chips and dust. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use compressed air to clean up the area. At the end of each shift and when the paint removal operation has been completed, clean the area of visible lead paint contamination by vacuuming with a HEPA filtered vacuum cleaner and wet mopping the area.
- B. Certification: The CIH shall certify in writing that the inside and outside the lead control area air monitoring samples are less than 30 micrograms per cubic meter of air, the respiratory protection for the employees was adequate, the work procedures were performed in accordance with 29 CFR 1926.62, and that there were no visible accumulations of lead-contaminated paint and dust on the worksite. Do not remove the lead control area or roped-off boundary and warning signs prior to the Contracting Officer's receipt of the CIH's certification. Reclean areas showing dust or residual paint chips.
- C. Testing of Lead-Containing Paint Residue and Used Abrasive Where indicated or when directed by the Contracting Officer, test lead containing paint residue and used abrasive in accordance with 40 CFR 261 for hazardous waste.
- D. Disposal:
1. Collect lead-contaminated waste, scrap, debris, bags, containers, equipment, and lead-contaminated clothing, which may produce airborne concentrations of lead particles.
  2. Store removed paint, lead-contaminated clothing and equipment, and lead-contaminated dust and cleaning debris into U.S. Department of Transportation (49 CFR 178) approved 55-gallon drums. Properly labels each drum to identify the type of waste (49 CFR 172) and the date

- lead-contaminated wastes were first put into the drum. Obtain and complete the Uniform Hazardous Waste Manifest forms from [Activity Staff Civil Engineer. Comply with land disposal restriction notification requirements as required by 40 CFR 268:
- a. At least 14 days prior to delivery, notify the Contracting Officer who will arrange for job site inspection of the drums and manifests by [PWC Hazardous Waste Storage Facility personnel].
  - b. As necessary, make lot deliveries of hazardous wastes to the PWC Hazardous Waste Storage Facility to ensure that drums do not remain on the jobsite longer than 90 calendar days from the date affixed to each drum.
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- a. Collect lead-contaminated waste, scrap, debris, bags, containers, equipment, and lead-contaminated clothing which may produce airborne concentrations of lead particles. Label the containers in accordance with 29 CFR 1926.62. Dispose of lead-contaminated waste material at a EPA approved hazardous waste treatment, storage, or disposal facility off Government property.
  - b. Store waste materials in U.S. Department of Transportation (49 CFR 178) approved 55-gallon drums. Properly label each drum to identify the type of waste (49 CFR 172) and the date the drum was filled. The Contracting Officer or an authorized representative will assign an area for interim storage of waste-containing drums. Do not store hazardous waste drums in interim storage longer than 90 calendar days from the date affixed to each drum.
  - c. Handle, store, transport, and dispose lead or lead-contaminated waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification
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- E. Disposal Documentation Submit written evidence that the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead disposal by the EPA and state or local regulatory agencies. Submit one copy of the completed manifest, signed and dated by the initial transporter in accordance with 40 CFR 262.

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**SECTION 07 84 00**  
**FIRESTOPPING**

**PART 1 GENERAL**

**1.1 DESCRIPTION**

- A. Closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.
- B. Closure of openings in walls against penetration of gases or smoke in smoke partitions.

**1.2 RELATED WORK**

**SECTION OMITTED. 1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.
- C. List of FM, UL, or WH classification number of systems installed.
- D. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.

**1.4 DELIVERY AND STORAGE**

- A. Deliver materials in their original unopened containers with manufacturer's name and product identification.
- B. Store in a location providing protection from damage and exposure to the elements.

**1.5 WARRANTY**

Firestopping work subject to the terms of the Article "Warranty of Construction", FAR clause 52.246-21, except extend the warranty period to five years.

**1.6 QUALITY ASSURANCE**

FM, UL, or WH or other approved laboratory tested products will be acceptable.

**1.7 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):

E84-10.....Surface Burning Characteristics of Building  
Materials

E814-11.....Fire Tests of Through-Penetration Fire Stops

C. Factory Mutual Engineering and Research Corporation (FM):

Annual Issue Approval Guide Building Materials

D. Underwriters Laboratories, Inc. (UL):

Annual Issue Building Materials Directory

Annual Issue Fire Resistance Directory

1479-10.....Fire Tests of Through-Penetration Firestops

E. Warnock Hersey (WH):

Annual Issue Certification Listings

## **PART 2 - PRODUCTS**

### **2.1 FIRESTOP SYSTEMS**

- A. Use either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke.
- B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 100 mm (4 in) nominal pipe or 0.01 m<sup>2</sup> (16 sq. in.) in overall cross sectional area.
- C. Products requiring heat activation to seal an opening by its intumescence shall exhibit a demonstrated ability to function as designed to maintain the fire barrier.
- D. Firestop sealants used for firestopping or smoke sealing shall have following properties:
  - 1. Contain no flammable or toxic solvents.
  - 2. Have no dangerous or flammable out gassing during the drying or curing of products.
  - 3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
  - 4. When used in exposed areas, shall be capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.



- E. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials shall have following properties:
1. Classified for use with the particular type of penetrating material used.
  2. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping systems that allow unrestricted cable changes without damage to the seal.
  3. Intumescent products which would expand to seal the opening and act as fire, smoke, toxic fumes, and, water sealant.
- F. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84.
- G. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.
- H. Materials to be asbestos free.

## **2.2 SMOKE STOPPING IN SMOKE PARTITIONS**

- A. Use silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.
- B. Use mineral fiber filler and bond breaker behind sealant.
- C. Sealants shall have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with E84.
- D. When used in exposed areas capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

Submit product data and installation instructions, as required by article, submittals, after an on site examination of areas to receive firestopping.

### **3.2 PREPARATION**

- A. Remove dirt, grease, oil, loose materials, or other substances that prevent adherence and bonding or application of the firestopping or smoke stopping materials.
- B. Remove insulation on insulated pipe for a distance of 150 mm (six inches) on either side of the fire rated assembly prior to applying the

firestopping materials unless the firestopping materials are tested and approved for use on insulated pipes.

### **3.3 INSTALLATION**

- A. Do not begin work until the specified material data and installation instructions of the proposed firestopping systems have been submitted and approved.
- B. Install firestopping systems with smoke stopping in accordance with FM, UL, WH, or other approved system details and installation instructions.
- C. Install smoke stopping seals in smoke partitions.

### **3.4 CLEAN-UP AND ACCEPTANCE OF WORK**

- A. As work on each floor is completed, remove materials, litter, and debris.
- B. Do not move materials and equipment to the next-scheduled work area until completed work is inspected and accepted by the Resident Engineer.
- C. Clean up spills of liquid type materials.

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**SECTION 13 05 41**  
**SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

- A. Provide seismic restraint in accordance with the requirements of this section in order to maintain the integrity of nonstructural components of the building so that they remain safe and functional in case of seismic event.
- B. The design to resist seismic load shall be based on Seismic Design Categories per section 4.0 of the VA Seismic Design Requirements (H-18-8) dated August 2013, <http://www.cfm.va.gov/til/etc/seismic.pdf>.
- C. Definitions: Non-structural building components are components or systems that are not part of the building's structural system whether inside or outside, above or below grade. Non-structural components of buildings include:
  - 1. Architectural Elements: Suspended ceilings; stairs isolated from the basic structure; cabinets; bookshelves; medical equipment; and storage racks.
  - 2. Electrical Elements: Power and lighting systems; substations; switchgear and switchboards; auxiliary engine-generator sets; transfer switches; motor control centers; motor generators; selector and controller panels; fire protection and alarm systems; special life support systems; and telephone and communication systems.

**1.2 RELATED WORK:**

SECTION OMITTED.

**1.3 QUALITY CONTROL:**

- A. Shop-Drawing Preparation:
  - 1. Have seismic-force-restraint shop drawings and calculations prepared by a professional structural engineer experienced in the area of seismic force restraints. The professional structural engineer shall be registered in the state where the project is located (New York State).
  - 2. Submit design tables and information used for the design-force levels, stamped and signed by a professional structural engineer registered in the State where project is located.
- B. Coordination:

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1. Do not install seismic restraints until seismic restraint submittals are approved by the COR.
2. Coordinate and install trapezes or other multi-pipe hanger systems prior to pipe installation.

C. Seismic Certification:

In structures assigned to IBC Seismic Design Category C, D, E, or F, permanent equipments and components are to have Special Seismic Certification in accordance with requirements of section 13.2.2 of ASCE 7 except for equipment that are considered rugged as listed in section 2.2 OSHPD code application notice CAN No. 2-1708A.5, and shall comply with section 13.2.6 of ASCE 7.

**1.4 SUBMITTALS:**

- A. Submit a coordinated set of equipment anchorage drawings prior to installation including:
  1. Description, layout, and location of items to be anchored or braced with anchorage or brace points noted and dimensioned.
  2. Details of anchorage or bracing at large scale with all members, parts brackets shown, together with all connections, bolts, welds etc. clearly identified and specified.
  3. Numerical value of design seismic brace loads.
  4. For expansion bolts, include design load and capacity if different from those specified.
- B. Submit prior to installation, a coordinated set of bracing drawings for seismic protection of piping, with data identifying the various support-to-structure connections and seismic bracing structural connections, include:
  1. Single-line piping diagrams on a floor-by-floor basis. Show all suspended piping for a given floor on the same plain.
  2. Type of pipe (Copper, steel, cast iron, insulated, non-insulated, etc.).
  3. Pipe contents.
  4. Structural framing.
  5. Location of all gravity load pipe supports and spacing requirements.
  6. Numerical value of gravity load reactions.
  7. Location of all seismic bracing.
  8. Numerical value of applied seismic brace loads.
  9. Type of connection (Vertical support, vertical support with seismic brace etc.).

- ### 1.5 APPLICABLE PUBLICATIONS:

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- A325M-09.....Standard Specification for High-Strength Bolts  
for Structural Steel Joints [Metric]
- A490-10.....Standard Specification for Heat-Treated Steel  
Structural Bolts, 150 ksi Minimum Tensile  
Strength
- A490M-10.....Standard Specification for High-Strength Steel  
Bolts, Classes 10.9 and 10.9.3, for Structural  
Steel Joints [Metric]
- A500/A500M-10.....Standard Specification for Cold-Formed Welded  
and Seamless Carbon Steel Structural Tubing in  
Rounds and Shapes
- A501-07.....Specification for Hot-Formed Welded and Seamless  
Carbon Steel Structural Tubing
- A615/A615M-09.....Standard Specification for Deformed and Plain  
Billet-Steel Bars for Concrete Reinforcement
- A992/A992M-06.....Standard Specification for Steel for Structural  
Shapes for Use in Building Framing
- A996/A996M-09.....Standard Specification for Rail-Steel and Axel-  
Steel Deformed Bars for Concrete  
Reinforcement
- E488-96(R2003).....Standard Test Method for Strength of Anchors in  
Concrete and Masonry Element
- E. American Society of Civil Engineers (ASCE 7) Latest Edition.
- F. International Building Code (IBC) Latest Edition
- G. VA Seismic Design Requirements, H-18-8, August 2013
- H. National Uniform Seismic Installation Guidelines (NUSIG)
- I. Sheet Metal and Air Conditioning Contractors National Association  
(SMACNA): Seismic Restraint Manual - Guidelines for Mechanical Systems,  
1998 Edition and Addendum

#### **1.6 REGULATORY REQUIREMENT:**

- A. IBC Latest Edition.
- B. Exceptions: The seismic restraint of the following items may be omitted:
  - 1. Equipment weighing less than 400 pounds, which is supported directly on the floor or roof.
  - 2. Equipment weighing less than 20 pounds, which is suspended from the roof or floor or hung from a wall.
  - 3. Gas and medical piping less than 2 ½ inches inside diameter.

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4. Piping in boiler plants and equipment rooms less than 1 ½ inches inside diameter.
5. All other piping less than 2 ½ inches inside diameter, except for automatic fire suppression systems.
6. All piping suspended by individual hangers, 12 inches or less in length from the top of pipe to the bottom of the support for the hanger.
7. All electrical conduits, less than 2 ½ inches inside diameter.
8. All rectangular air handling ducts less than six square feet in cross sectional area.
9. All round air handling ducts less than 28 inches in diameter.
10. All ducts suspended by hangers 12 inches or less in length from the top of the duct to the bottom of support for the hanger.

## **PART 2 - PRODUCTS**

### **2.1 STEEL:**

- A. Structural Steel: ASTM A36.
- B. Structural Tubing: ASTM A500, Grade B.
- C. Structural Tubing: ASTM A501.
- D. Steel Pipe: ASTM A53/A53M, Grade B.
- E. Bolts & Nuts: ASTM A325.

### **2.2 CAST-IN-PLACE CONCRETE:**

- A. Concrete: 28 day strength,  $f'c = 25$  MPa (3,000 psi)
- B. Reinforcing Steel: ASTM A615/615M or ASTM A996/A996M deformed.

## **PART 3 - EXECUTION**

### **3.1 CONSTRUCTION, GENERAL:**

- A. Provide equipment supports and anchoring devices to withstand the seismic design forces, so that when seismic design forces are applied, the equipment cannot displace, overturn, or become inoperable.
- B. Provide anchorages in conformance with recommendations of the equipment manufacturer and as shown on approved shop drawings and calculations.
- C. Construct seismic restraints and anchorage to allow for thermal expansion.
- D. Testing Before Final Inspection:
  1. Test 10-percent of anchors in masonry and concrete per ASTM E488, and ACI 355.2 to determine that they meet the required load capacity. If any anchor fails to meet the required load, test the next 20 consecutive anchors, which are required to have zero failure, before resuming the 10-percent testing frequency.

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2. Before scheduling Final Inspection, submit a report on this testing indicating the number and location of testing, and what anchor-loads were obtained.

### **3.2 EQUIPMENT RESTRAINT AND BRACING:**

- A. See drawings for equipment to be restrained or braced.

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### **3.3 ELECTRICAL BUSWAYS, CONDUITS, AND CABLE TRAYS; AND TELECOMMUNICATION WIRES AND CABLE TRAYS**

- A. Support and brace electrical busways, conduits and cable trays; and telecommunication wires and cable trays including boiler plant stacks and breeching to resist directional forces (lateral, longitudinal and vertical).
- C. Provide supports and anchoring so that, upon application of seismic forces, piping remains fully connected as operable systems which will not displace sufficiently to damage adjacent or connecting equipment, or building members.
- E. Seismic Restraint of Piping:
  1. Design criteria:
    - a. Piping resiliently supported: Restrain to support 120 -percent of the weight of the systems and components and contents.
    - b. Piping not resiliently supported: Restrain to support 60 -percent of the weight of the system components and contents.
- F. Piping Connections: Provide flexible connections where pipes connect to equipment. Make the connections capable of accommodating relative differential movements between the pipe and equipment under conditions of earthquake shaking.

### **3.4 PARTITIONS**

Section omitted.

### **3.5 CEILINGS AND LIGHTING FIXTURES**

- A. At regular intervals, laterally brace suspended ceilings against lateral and vertical movements, and provide with a physical separation at the walls.
- B. Independently support and laterally brace all lighting fixtures. Refer to applicable portion of lighting specification, Section 26 51 00, INTERIOR LIGHTING.



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### **3.6 FACADES AND GLAZING**

#### **SECTION OMITTED. 3.7 STORAGE RACKS, CABINETS, AND BOOKCASES**

- A. Install storage racks to withstand earthquake forces and anchored to the floor or laterally braced from the top to the structural elements.
- B. Anchor medical supply cabinets to the floor or walls and equip them with properly engaged, lockable latches.
- C. Anchor filing cabinets that are more than 2 drawers high to the floor or walls, and equip all drawers with properly engaged, lockable latches.
- D. Anchor bookcases that are more than 30 inches high to the floor or walls, and equip any doors with properly engaged, lockable latches.

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**SECTION 26 05 11**  
**REQUIREMENTS FOR ELECTRICAL INSTALLATIONS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section applies to all sections of Division 26.
- B. Furnish and install electrical systems, materials, equipment, and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, transformers, conductors and cable, switchboards, switchgear, panelboards, motor control centers, generators, automatic transfer switches, and other items and arrangements for the specified items are shown on the drawings.
- C. Conductor ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways sized per NEC. Aluminum conductors are prohibited.

**1.2 MINIMUM REQUIREMENTS**

- A. The International Building Code (IBC), National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL), and National Fire Protection Association (NFPA) codes and standards are the minimum requirements for materials and installation.
- B. The drawings and specifications shall govern in those instances where requirements are greater than those stated in the above codes and standards.

**1.3 TEST STANDARDS**

- A. All materials and equipment shall be listed, labeled, or certified by a Nationally Recognized Testing Laboratory (NRTL) to meet Underwriters Laboratories, Inc. (UL), standards where test standards have been established. Materials and equipment which are not covered by UL standards will be accepted, providing that materials and equipment are listed, labeled, certified or otherwise determined to meet the safety requirements of a NRTL. Materials and equipment which no NRTL accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as ANSI, NEMA, and NETA. Evidence of compliance shall include certified test reports and definitive shop drawings.

B. Definitions:

1. Listed: Materials and equipment included in a list published by an organization that is acceptable to the Authority Having Jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production or listed materials and equipment or periodic evaluation of services, and whose listing states that the materials and equipment either meets appropriate designated standards or has been tested and found suitable for a specified purpose.
2. Labeled: Materials and equipment to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the Authority Having Jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled materials and equipment, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
3. Certified: Materials and equipment which:
  - a. Have been tested and found by a NRTL to meet nationally recognized standards or to be safe for use in a specified manner.
  - b. Are periodically inspected by a NRTL.
  - c. Bear a label, tag, or other record of certification.
4. Nationally Recognized Testing Laboratory: Testing laboratory which is recognized and approved by the Secretary of Labor in accordance with OSHA regulations.

**1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)**

- A. Manufacturer's Qualifications: The manufacturer shall regularly and currently produce, as one of the manufacturer's principal products, the materials and equipment specified for this project, and shall have manufactured the materials and equipment for at least three years.
- B. Product Qualification:
  1. Manufacturer's materials and equipment shall have been in satisfactory operation, on three installations of similar size and type as this project, for at least three years.
  2. The Government reserves the right to require the Contractor to submit a list of installations where the materials and equipment have been in operation before approval.

- C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

#### **1.5 APPLICABLE PUBLICATIONS**

- A. Applicable publications listed in all Sections of Division 26 are the latest issue, unless otherwise noted.
- B. Products specified in all sections of Division 26 shall comply with the applicable publications listed in each section.

#### **1.6 MANUFACTURED PRODUCTS**

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, and for which replacement parts shall be available.
- B. When more than one unit of the same class or type of materials and equipment is required, such units shall be the product of a single manufacturer.
- C. Equipment Assemblies and Components:
1. Components of an assembled unit need not be products of the same manufacturer.
  2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
  3. Components shall be compatible with each other and with the total assembly for the intended service.
  4. Constituent parts which are similar shall be the product of a single manufacturer.
- D. Factory wiring and terminals shall be identified on the equipment being furnished and on all wiring diagrams.
- E. When Factory Testing Is Specified:
1. The Government shall have the option of witnessing factory tests. The Contractor shall notify the Government through the COR a minimum of 15 working days prior to the manufacturer's performing the factory tests.
  2. Four copies of certified test reports shall be furnished to the COR two weeks prior to final inspection and not more than 90 days after completion of the tests.

3. When materials and equipment fail factory tests, and re-testing and re-inspection is required, the Contractor shall be liable for all additional expenses for the Government to witness re-testing.

#### **1.7 VARIATIONS FROM CONTRACT REQUIREMENTS**

- A. Where the Government or the Contractor requests variations from the contract requirements, the connecting work and related components shall include, but not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.

#### **1.8 MATERIALS AND EQUIPMENT PROTECTION**

- A. Materials and equipment shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.
  1. Store materials and equipment indoors in clean dry space with uniform temperature to prevent condensation.
  2. During installation, equipment shall be protected against entry of foreign matter, and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.
  3. Damaged equipment shall be repaired or replaced, as determined by the COR.
  4. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
  5. Damaged paint on equipment shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

#### **1.9 WORK PERFORMANCE**

- A. All electrical work shall comply with the requirements of NFPA 70 (NEC), NFPA 70B, NFPA 70E, OSHA Part 1910 subpart J - General Environmental Controls, OSHA Part 1910 subpart K - Medical and First Aid, and OSHA Part 1910 subpart S - Electrical, in addition to other references required by contract.
- B. Job site safety and worker safety is the responsibility of the Contractor.

- C. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished in this manner for the required work, the following requirements are mandatory:
  - 1. Electricians must use full protective equipment (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools, etc.) while working on energized systems in accordance with NFPA 70E.
  - 2. Before initiating any work, a job specific work plan must be developed by the Contractor with a peer review conducted and documented by the COR and Medical Center staff. The work plan must include procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used, and exit pathways.
  - 3. Work on energized circuits or equipment cannot begin until prior written approval is obtained from the COR.
- D. For work that affects existing electrical systems, arrange, phase and perform work to assure minimal interference with normal functioning of the facility. Refer to Article OPERATIONS AND STORAGE AREAS under Section 01 00 00, GENERAL REQUIREMENTS.
- E. New work shall be installed and connected to existing work neatly, safely and professionally. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Section 01 00 00, GENERAL REQUIREMENTS.
- F. Coordinate location of equipment and conduit with other trades to minimize interference.

#### **1.10 EQUIPMENT INSTALLATION AND REQUIREMENTS**

- A. Equipment location shall be as close as practical to locations shown on the drawings.
- B. Working clearances shall not be less than specified in the NEC.
- C. Inaccessible Equipment:
  - 1. Where the Government determines that the Contractor has installed equipment not readily accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.

2. "Readily accessible" is defined as being capable of being reached quickly for operation, maintenance, or inspections without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.

- D. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.

#### **1.11 EQUIPMENT IDENTIFICATION**

- A. In addition to the requirements of the NEC, install an identification sign which clearly indicates information required for use and maintenance of items such as switchboards and switchgear, panelboards, cabinets, motor controllers, fused and non-fused safety switches, generators, automatic transfer switches, separately enclosed circuit breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices and other significant equipment.
- B. Identification signs for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Identification signs for Essential Electrical System (EES) equipment, as defined in the NEC, shall be laminated red phenolic resin with a white core with engraved lettering. Lettering shall be a minimum of 12 mm (1/2 inch) high. Identification signs shall indicate equipment designation, rated bus amperage, voltage, number of phases, number of wires, and type of EES power branch as applicable. Secure nameplates with screws.
- C. Install adhesive arc flash warning labels on all equipment as required by NFPA 70E. Label shall indicate the arc hazard boundary (inches), working distance (inches), arc flash incident energy at the working distance (calories/cm<sup>2</sup>), required PPE category and description including the glove rating, voltage rating of the equipment, limited approach distance (inches), restricted approach distance (inches), prohibited approach distance (inches), equipment/bus name, date prepared, and manufacturer name and address.

#### 1.12 SUBMITTALS

- A. Submit to the COR in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. The Government's approval shall be obtained for all materials and equipment before delivery to the job site. Delivery, storage or installation of materials and equipment which has not had prior approval will not be permitted.
- C. All submittals shall include six copies of adequate descriptive literature, catalog cuts, shop drawings, test reports, certifications, samples, and other data necessary for the Government to ascertain that the proposed materials and equipment comply with drawing and specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify specific materials and equipment being submitted.
- D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.
  - 1. Mark the submittals, "SUBMITTED UNDER SECTION\_\_\_\_\_".
  - 2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
  - 3. Submit each section separately.
- E. The submittals shall include the following:
  - 1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, manuals, pictures, nameplate data, and test reports as required.
  - 2. Elementary and interconnection wiring diagrams for communication and signal systems, control systems, and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
  - 3. Parts list which shall include information for replacement parts and ordering instructions, as recommended by the equipment manufacturer.
- F. Maintenance and Operation Manuals:
  - 1. Submit as required for systems and equipment specified in the technical sections. Furnish in hardcover binders or an approved equivalent.



2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, material, equipment, building, name of Contractor, and contract name and number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the material or equipment.
3. Provide a table of contents and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
4. The manuals shall include:
  - a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
  - b. A control sequence describing start-up, operation, and shutdown.
  - c. Description of the function of each principal item of equipment.
  - d. Installation instructions.
  - e. Safety precautions for operation and maintenance.
  - f. Diagrams and illustrations.
  - g. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers.
  - h. Performance data.
  - i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare and replacement parts, and name of servicing organization.
  - j. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.
- G. Approvals will be based on complete submission of shop drawings, manuals, test reports, certifications, and samples as applicable.

#### **1.13 SINGULAR NUMBER**

- A. Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

Coordinate with the applicable sections  
of Division 01 and 02.

#### **1.14 ACCEPTANCE CHECKS AND TESTS**

- A. The Contractor shall furnish the instruments, materials, and labor for tests.
- B. Where systems are comprised of components specified in more than one section of Division 26, the Contractor shall coordinate the installation, testing, and adjustment of all components between various manufacturer's representatives and technicians so that a complete, functional, and operational system is delivered to the Government.
- C. When test results indicate any defects, the Contractor shall repair or replace the defective materials or equipment, and repeat the tests. Repair, replacement, and retesting shall be accomplished at no additional cost to the Government.

#### **1.15 WARRANTY**

- A. All work performed and all equipment and material furnished under this Division shall be free from defects and shall remain so for a period of one year from the date of acceptance of the entire installation by the Contracting Officer for the Government.

#### **1.16 INSTRUCTION**

- A. Instruction to designated Government personnel shall be provided for the particular equipment or system as required in each associated technical specification section.
- B. Furnish the services of competent instructors to give full instruction in the adjustment, operation, and maintenance of the specified equipment and system, including pertinent safety requirements. Instructors shall be thoroughly familiar with all aspects of the installation, and shall be trained in operating theory as well as practical operation and maintenance procedures.
- C. A training schedule shall be developed and submitted by the Contractor and approved by the COR at least 30 days prior to the planned training.

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**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

---END---

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**SECTION 26 05 19**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the furnishing, installation, connection, and testing of the electrical conductors and cables for use in electrical systems rated 600 V and below, indicated as cable(s), conductor(s), wire, or wiring in this section.

**1.2 RELATED WORK**

- A. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-resistant rated construction.
- B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.
- C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- D. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for conductors and cables.
- E. Section 26 05 41, UNDERGROUND ELECTRICAL CONSTRUCTION: Installation of conductors and cables in manholes and ducts.

**1.3 QUALITY ASSURANCE**

- A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

**1.4 FACTORY TESTS**

- A. Conductors and cables shall be thoroughly tested at the factory per NEMA to ensure that there are no electrical defects. Factory tests shall be certified.

**1.5 SUBMITTALS**

- A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
  - 1. Shop Drawings:
    - a. Submit sufficient information to demonstrate compliance with drawings and specifications.
    - b. Submit the following data for approval:
      - 1) Electrical ratings and insulation type for each conductor and cable.

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2) Splicing materials and pulling lubricant.

#### **1.6 APPLICABLE PUBLICATIONS**

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are reference in the text by designation only.
- B. American Society of Testing Material (ASTM):
  - D2301-10.....Standard Specification for Vinyl Chloride  
Plastic Pressure-Sensitive Electrical  
Insulating Tape
  - D2304-10.....Test Method for Thermal Endurance of Rigid  
Electrical Insulating Materials
  - D3005-10.....Low-Temperature Resistant Vinyl Chloride  
Plastic Pressure-Sensitive Electrical  
Insulating Tape
- C. National Electrical Manufacturers Association (NEMA):
  - WC 70-09.....Power Cables Rated 2000 Volts or Less for the  
Distribution of Electrical Energy
- D. National Fire Protection Association (NFPA):
  - 70-11.....National Electrical Code (NEC)
- E. Underwriters Laboratories, Inc. (UL):
  - 44-10.....Thermoset-Insulated Wires and Cables
  - 83-08.....Thermoplastic-Insulated Wires and Cables
  - 467-07.....Grounding and Bonding Equipment
  - 486A-486B-03.....Wire Connectors
  - 486C-04.....Splicing Wire Connectors
  - 486D-05.....Sealed Wire Connector Systems
  - 486E-09.....Equipment Wiring Terminals for Use with  
Aluminum and/or Copper Conductors
  - 493-07.....Thermoplastic-Insulated Underground Feeder and  
Branch Circuit Cables
  - 514B-04.....Conduit, Tubing, and Cable Fittings

#### **PART 2 - PRODUCTS**

##### **2.1 CONDUCTORS AND CABLES**

- A. Conductors and cables shall be in accordance with NEMA, UL, as specified herein, and as shown on the drawings.
- B. All conductors shall be copper.

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C. Single Conductor and Cable:

1. No. 12 AWG: Minimum size, except where smaller sizes are specified herein or shown on the drawings.
2. No. 12 AWG and larger: Stranded.

D. Color Code:

1. No. 10 AWG and smaller: Solid color insulation or solid color coating.
2. No. 8 AWG and larger: Color-coded using one of the following methods:
  - a. Solid color insulation or solid color coating.
  - b. Stripes, bands, or hash marks of color specified.
  - c. Color using 19 mm (0.75 inches) wide tape.
4. For modifications and additions to existing wiring systems, color coding shall conform to the existing wiring system.
5. Conductors shall be color-coded as follows:

208/120 V	Phase	480/277 V
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray *
* or white with colored (other than green) tracer.		

6. Lighting circuit "switch legs", and 3-way and 4-way switch "traveling wires," shall have color coding that is unique and distinct (e.g., pink and purple) from the color coding indicated above. The unique color codes shall be solid and in accordance with the NEC. Coordinate color coding in the field with the COR.
7. Color code for isolated power system wiring shall be in accordance with the NEC.

## 2.2 SPLICES

- A. Splices shall be in accordance with NEC and UL.
- B. Above Ground Splices for No. 10 AWG and Smaller:
  1. Solderless, screw-on, reusable pressure cable type, with integral insulation, approved for copper and aluminum conductors.
  2. The integral insulator shall have a skirt to completely cover the stripped conductors.

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3. The number, size, and combination of conductors used with the connector, as listed on the manufacturer's packaging, shall be strictly followed.

C. Above Ground Splices for No. 8 AWG to No. 4/0 AWG:

1. Compression, hex screw, or bolt clamp-type of high conductivity and corrosion-resistant material, listed for use with copper and aluminum conductors.
2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
3. Splice and insulation shall be product of the same manufacturer.
4. All bolts, nuts, and washers used with splices shall be zinc-plated steel.

D. Above Ground Splices for 250 kcmil and Larger:

1. Long barrel "butt-splice" or "sleeve" type compression connectors, with minimum of two compression indents per wire, listed for use with copper and aluminum conductors.
2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
3. Splice and insulation shall be product of the same manufacturer.

- E. Plastic electrical insulating tape: Per ASTM D2304, flame-retardant, cold and weather resistant.

### **2.3 CONNECTORS AND TERMINATIONS**

- A. Mechanical type of high conductivity and corrosion-resistant material, listed for use with copper and aluminum conductors.
- B. Long barrel compression type of high conductivity and corrosion-resistant material, with minimum of two compression indents per wire, listed for use with copper and aluminum conductors.
- C. All bolts, nuts, and washers used to connect connections and terminations to bus bars or other termination points shall be zinc-plated steel.

### **2.4 CONTROL WIRING**

- A. Unless otherwise specified elsewhere in these specifications, control wiring shall be as specified herein, except that the minimum size shall be not less than No. 14 AWG.

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- B. Control wiring shall be sized such that the voltage drop under in-rush conditions does not adversely affect operation of the controls.

## **2.5 WIRE LUBRICATING COMPOUND**

- A. Lubricating compound shall be suitable for the wire insulation and conduit, and shall not harden or become adhesive.
- B. Shall not be used on conductors for isolated power systems.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Install conductors in accordance with the NEC, as specified, and as shown on the drawings.
- B. Install all conductors in raceway systems.
- C. Splice conductors only in outlet boxes, junction boxes, pullboxes, manholes, or handholes.
- D. Conductors of different systems (e.g., 120 V and 277 V) shall not be installed in the same raceway.
- E. Install cable supports for all vertical feeders in accordance with the NEC. Provide split wedge type which firmly clamps each individual cable and tightens due to cable weight.
- F. In panelboards, cabinets, wireways, switches, enclosures, and equipment assemblies, neatly form, train, and tie the conductors with non-metallic ties.
- G. For connections to motors, transformers, and vibrating equipment, stranded conductors shall be used only from the last fixed point of connection to the motors, transformers, or vibrating equipment.
- H. Use expanding foam or non-hardening duct-seal to seal conduits entering a building, after installation of conductors.
- I. Conductor and Cable Pulling:
  - 1. Provide installation equipment that will prevent the cutting or abrasion of insulation during pulling. Use lubricants approved for the cable.
  - 2. Use nonmetallic pull ropes.
  - 3. Attach pull ropes by means of either woven basket grips or pulling eyes attached directly to the conductors.
  - 4. All conductors in a single conduit shall be pulled simultaneously.
  - 5. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.



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J. No more than three branch circuits shall be installed in any one conduit.

K. When stripping stranded conductors, use a tool that does not damage the conductor or remove conductor strands.

### **3.2 INSTALLATION IN MANHOLES**

A. Train the cables around the manhole walls, but do not bend to a radius less than six times the overall cable diameter.

### **3.3 SPLICE AND TERMINATION INSTALLATION**

A. Splices and terminations shall be mechanically and electrically secure, and tightened to manufacturer's published torque values using a torque screwdriver or wrench.

B. Where the Government determines that unsatisfactory splices or terminations have been installed, replace the splices or terminations at no additional cost to the Government.

### **3.4 CONDUCTOR IDENTIFICATION**

A. When using colored tape to identify phase, neutral, and ground conductors larger than No. 8 AWG, apply tape in half-overlapping turns for a minimum of 75 mm (3 inches) from terminal points, and in junction boxes, pullboxes, and manholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable, stating size and insulation type.

### **3.5 FEEDER CONDUCTOR IDENTIFICATION**

A. In each interior pullbox and each underground manhole and handhole, install brass tags on all feeder conductors to clearly designate their circuit identification and voltage. The tags shall be the embossed type, 40 mm (1-1/2 inches) in diameter and 40 mils thick. Attach tags with plastic ties.

### **3.6 EXISTING CONDUCTORS**

A. Unless specifically indicated on the plans, existing conductors shall not be reused.

### **3.7 CONTROL WIRING INSTALLATION**

A. Unless otherwise specified in other sections, install control wiring and connect to equipment to perform the required functions as specified or as shown on the drawings.

B. Install a separate power supply circuit for each system, except where otherwise shown on the drawings.

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### **3.8 CONTROL WIRING IDENTIFICATION**

- A. Install a permanent wire marker on each wire at each termination.
- B. Identifying numbers and letters on the wire markers shall correspond to those on the wiring diagrams used for installing the systems.
- C. Wire markers shall retain their markings after cleaning.
- D. In each manhole and handhole, install embossed brass tags to identify the system served and function.

### **3.9 ACCEPTANCE CHECKS AND TESTS**

- A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
  - 1. Visual Inspection and Tests: Inspect physical condition.
  - 2. Electrical tests:
    - a. After installation but before connection to utilization devices, such as fixtures, motors, or appliances, test conductors phase-to-phase and phase-to-ground resistance with an insulation resistance tester. Existing conductors to be reused shall also be tested.
    - b. Applied voltage shall be 500 V DC for 300 V rated cable, and 1000 V DC for 600 V rated cable. Apply test for one minute or until reading is constant for 15 seconds, whichever is longer. Minimum insulation resistance values shall not be less than 25 megohms for 300 V rated cable and 100 megohms for 600 V rated cable.
    - c. Perform phase rotation test on all three-phase circuits.

---END---

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**SECTION 26 05 26**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the furnishing, installation, connection, and testing of grounding and bonding equipment, indicated as grounding equipment in this section.
- B. "Grounding electrode system" refers to grounding electrode conductors and all electrodes required or allowed by NEC, as well as made, supplementary, and lightning protection system grounding electrodes.
- C. The terms "connect" and "bond" are used interchangeably in this section and have the same meaning.

**1.2 RELATED WORK**

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS:  
Requirements that apply to all sections of Division 26.
- B. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES:  
Low-voltage conductors.
- C. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduit and boxes.
- D. Section 26 23 00, LOW-VOLTAGE SWITCHGEAR: Low-voltage switchgear.
- E. Section 26 24 16, PANELBOARDS: Low-voltage panelboards.

**1.3 QUALITY ASSURANCE**

- A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

**1.4 SUBMITTALS**

- A. None Required

**1.5 APPLICABLE PUBLICATIONS**

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. American Society for Testing and Materials (ASTM):
  - B1-07.....Standard Specification for Hard-Drawn Copper Wire
  - B3-07.....Standard Specification for Soft or Annealed Copper Wire

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- B8-11.....Standard Specification for Concentric-Lay-  
Stranded Copper Conductors, Hard, Medium-Hard,  
or Soft
- C. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
- 81-83.....IEEE Guide for Measuring Earth Resistivity,  
Ground Impedance, and Earth Surface Potentials  
of a Ground System Part 1: Normal Measurements
- D. National Fire Protection Association (NFPA):
- 70-11.....National Electrical Code (NEC)
- 70E-12.....National Electrical Safety Code
- 99-12.....Health Care Facilities
- E. Underwriters Laboratories, Inc. (UL):
- 44-10 .....Thermoset-Insulated Wires and Cables
- 83-08 .....Thermoplastic-Insulated Wires and Cables
- 467-07 .....Grounding and Bonding Equipment

SPEC WRITER NOTE: Delete between // ----  
// if not applicable to project. Also  
delete any other item or paragraph not  
applicable to the section and renumber  
the paragraphs.

## **PART 2 - PRODUCTS**

### **2.1 GROUNDING AND BONDING CONDUCTORS**

- A. Equipment grounding conductors shall be insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be identified per NEC.
- B. Bonding conductors shall be bare stranded copper, except that sizes No. 10 AWG and smaller shall be bare solid copper. Bonding conductors shall be stranded for final connection to motors, transformers, and vibrating equipment.
- C. Conductor sizes shall not be less than shown on the drawings, or not less than required by the NEC, whichever is greater.
- D. Insulation: THHN-THWN and XHHW-2. XHHW-2 shall be used for isolated power systems.

### **2.2 GROUND CONNECTIONS**

- A. Below Grade and Inaccessible Locations: Exothermic-welded type connectors.

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B. Above Grade:

1. Bonding Jumpers: Listed for use with aluminum and copper conductors. For wire sizes No. 8 AWG and larger, use compression-type connectors. For wire sizes smaller than No. 8 AWG, use mechanical type lugs. Connectors or lugs shall use zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.
2. Connection to Building Steel: Exothermic-welded type connectors.
3. Connection to Grounding Bus Bars: Listed for use with aluminum and copper conductors. Use mechanical type lugs, with zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.

**2.3 GROUND TERMINAL BLOCKS**

- A. At any equipment mounting location (e.g., backboards and hinged cover enclosures) where rack-type ground bars cannot be mounted, provide mechanical type lugs, with zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Install grounding equipment in accordance with the NEC, as shown on the drawings, and as specified herein.
- B. System Grounding:
1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformer.
  2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.
- C. Equipment Grounding: Metallic piping, building structural steel, electrical enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits, shall be bonded and grounded.
- D. For patient care area electrical power system grounding, conform to NFPA 99 and NEC.

**3.2 SECONDARY VOLTAGE EQUIPMENT AND CIRCUITS**

- A. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.

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B. Metallic Piping, Building Structural Steel, and Supplemental  
Electrode(s):

1. Provide a grounding electrode conductor sized per NEC between the service equipment ground bus and all metallic water pipe systems, building structural steel, and supplemental or made electrodes. Provide jumpers across insulating joints in the metallic piping.
2. Provide a supplemental ground electrode as shown on the drawings and bond to the grounding electrode system.

C. Switchgear, Switchboards, Unit Substations, Panelboards, Motor Control Centers, Engine-Generators, Automatic Transfer Switches, and other electrical equipment:

1. Connect the equipment grounding conductors to the ground bus.
2. Connect metallic conduits by grounding bushings and equipment grounding conductor to the equipment ground bus.

### **3.3 RACEWAY**

A. Conduit Systems:

1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor.
2. Non-metallic conduit systems, except non-metallic feeder conduits that carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment, shall contain an equipment grounding conductor.
3. Metallic conduit that only contains a grounding conductor, and is provided for its mechanical protection, shall be bonded to that conductor at the entrance and exit from the conduit.
4. Metallic conduits which terminate without mechanical connection to an electrical equipment housing by means of locknut and bushings or adapters, shall be provided with grounding bushings. Connect bushings with an equipment grounding conductor to the equipment ground bus.

B. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders, and power and lighting branch circuits.

C. Boxes, Cabinets, Enclosures, and Panelboards:

1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes (except for special grounding systems for intensive care units and other critical units shown).

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2. Provide lugs in each box and enclosure for equipment grounding conductor termination.

D. Wireway Systems:

1. Bond the metallic structures of wireway to provide electrical continuity throughout the wireway system, by connecting a No. 6 AWG bonding jumper at all intermediate metallic enclosures and across all section junctions.
2. Install insulated No. 6 AWG bonding jumpers between the wireway system, bonded as required above, and the closest building ground at each end and approximately every 16 M (50 feet).
3. Use insulated No. 6 AWG bonding jumpers to ground or bond metallic wireway at each end for all intermediate metallic enclosures and across all section junctions.
4. Use insulated No. 6 AWG bonding jumpers to ground cable tray to column-mounted building ground plates (pads) at each end and approximately every 15 M (49 feet).

E. Receptacles shall not be grounded through their mounting screws. Ground receptacles with a jumper from the receptacle green ground terminal to the device box ground screw and a jumper to the branch circuit equipment grounding conductor.

F. Panelboard Bonding in Patient Care Areas: The equipment grounding terminal buses of the normal and essential branch circuit panel boards serving the same individual patient vicinity shall be bonded together with an insulated continuous copper conductor not less than No. 10 AWG, installed in rigid metal conduit.

### 3.4 CORROSION INHIBITORS

A. When making grounding and bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

### 3.5 CONDUCTIVE PIPING

- A. Bond all conductive piping systems, interior and exterior, to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.
- B. In operating rooms and at intensive care and coronary care type beds, bond the medical gas piping and medical vacuum piping at the outlets directly to the patient ground bus.

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### **3.6 MAIN ELECTRICAL ROOM GROUNDING**

- A. Provide ground bus bar and mounting hardware at each main electrical room where incoming feeders are terminated, as shown on the drawings. Connect to pigtail extensions of the building grounding ring, as shown on the drawings.

---END---



**SECTION 26 05 33  
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the furnishing, installation, and connection of conduit, fittings, and boxes, to form complete, coordinated, grounded raceway systems. Raceways are required for all wiring unless shown or specified otherwise.
- B. Definitions: The term conduit, as used in this specification, shall mean any or all of the raceway types specified.

**1.2 RELATED WORK**

- A. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire rated construction.
- B. Section 07 92 00, JOINT SEALANTS: Sealing around conduit penetrations through the building envelope to prevent moisture migration into the building.
- C. Section 09 91 00, PAINTING: Identification and painting of conduit and other devices.
- D. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.
- E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- F. Section 26 05 41, UNDERGROUND ELECTRICAL CONSTRUCTION: Underground conduits.

**1.3 QUALITY ASSURANCE**

Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

**1.4 SUBMITTALS**

- A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
  - 1. Shop Drawings:
    - a. Submit the following data for approval:
      - 1) Raceway types and sizes.
      - 2) Conduit bodies, connectors and fittings.
      - 3) Junction and pull boxes, types and sizes.

## 1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. American National Standards Institute (ANSI):
- C80.1-05.....Electrical Rigid Steel Conduit
  - C80.3-05.....Steel Electrical Metal Tubing
  - C80.6-05.....Electrical Intermediate Metal Conduit
- C. National Fire Protection Association (NFPA):
- 70-11.....National Electrical Code (NEC)
- D. Underwriters Laboratories, Inc. (UL):
- 1-05.....Flexible Metal Conduit
  - 5-11.....Surface Metal Raceway and Fittings
  - 6-07.....Electrical Rigid Metal Conduit - Steel
  - 50-95.....Enclosures for Electrical Equipment
  - 360-13.....Liquid-Tight Flexible Steel Conduit
  - 467-13.....Grounding and Bonding Equipment
  - 514A-13.....Metallic Outlet Boxes
  - 514B-12.....Conduit, Tubing, and Cable Fittings
  - 514C-07.....Nonmetallic Outlet Boxes, Flush-Device Boxes  
and Covers
  - 651-11.....Schedule 40 and 80 Rigid PVC Conduit and  
Fittings
  - 651A-11.....Type EB and A Rigid PVC Conduit and HDPE  
Conduit
  - 797-07.....Electrical Metallic Tubing
  - 1242-06.....Electrical Intermediate Metal Conduit - Steel
- E. National Electrical Manufacturers Association (NEMA):
- TC-2-13.....Electrical Polyvinyl Chloride (PVC) Tubing and  
Conduit
  - TC-3-13.....PVC Fittings for Use with Rigid PVC Conduit and  
Tubing
  - FB1-12.....Fittings, Cast Metal Boxes and Conduit Bodies  
for Conduit, Electrical Metallic Tubing and  
Cable

FB2.10-13.....Selection and Installation Guidelines for  
Fittings for use with Non-Flexible Conduit or  
Tubing (Rigid Metal Conduit, Intermediate  
Metallic Conduit, and Electrical Metallic  
Tubing)

FB2.20-12.....Selection and Installation Guidelines for  
Fittings for use with Flexible Electrical  
Conduit and Cable

F. American Iron and Steel Institute (AISI):

S100-2007.....North American Specification for the Design of  
Cold-Formed Steel Structural Members

## **PART 2 - PRODUCTS**

### **2.1 MATERIAL**

A. Conduit Size: In accordance with the NEC, but not less than 13 mm  
(0.5-inch) unless otherwise shown. Where permitted by the NEC, 13 mm  
(0.5-inch) flexible conduit may be used for tap connections to recessed  
lighting fixtures.

B. Conduit:

1. Size: In accordance with the NEC, but not less than 13 mm (0.5-  
inch).
2. Rigid Steel Conduit (RMC): Shall conform to UL 6 and ANSI C80.1.
3. Electrical Metallic Tubing (EMT): Shall conform to UL 797 and ANSI  
C80.3. Maximum size not to exceed 105 mm (4 inches) and shall be  
permitted only with cable rated 600 V or less.
4. Flexible Metal Conduit: Shall conform to UL 1.
5. Liquid-tight Flexible Metal Conduit: Shall conform to UL 360.
6. Direct Burial Plastic Conduit: Shall conform to UL 651 and UL 651A,  
heavy wall PVC or high density polyethylene (PE).
7. Surface Metal Raceway: Shall conform to UL 5.

C. Conduit Fittings:

1. Rigid Steel and Intermediate Metallic Conduit Fittings:
  - a. Fittings shall meet the requirements of UL 514B and NEMA FB1.
  - b. Standard threaded couplings, locknuts, bushings, conduit bodies,  
and elbows: Only steel or malleable iron materials are  
acceptable. Integral retractable type IMC couplings are also  
acceptable.

- c. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
  - d. Bushings: Metallic insulating type, consisting of an insulating insert, molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
  - e. Set Screw Type Couplings: Use set screws of case-hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
2. Electrical Metallic Tubing Fittings:
- a. Fittings and conduit bodies shall meet the requirements of UL 514B, ANSI C80.3, and NEMA FB1.
  - b. Only steel or malleable iron materials are acceptable.
  - c. Setscrew Couplings and Connectors: Use setscrews of case-hardened steel with hex head and cup point, to firmly seat in wall of conduit for positive grounding.
  - d. Indent-type connectors or couplings are prohibited.
  - e. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are prohibited.
3. Flexible Metal Conduit Fittings:
- a. Conform to UL 514B. Only steel or malleable iron materials are acceptable.
  - b. Clamp-type, with insulated throat.
4. Liquid-tight Flexible Metal Conduit Fittings:
- a. Fittings shall meet the requirements of UL 514B and NEMA FB1.
  - b. Only steel or malleable iron materials are acceptable.
  - c. Fittings must incorporate a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening. Connectors shall have insulated throats.
5. Direct Burial Plastic Conduit Fittings: Fittings shall meet the requirements of UL 514C and NEMA TC3.
6. Surface Metal Raceway Fittings: As recommended by the raceway manufacturer. Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, conduit entry fittings, accessories, and other fittings as required for complete system.

7. Expansion and Deflection Couplings:

- a. Conform to UL 467 and UL 514B.
- b. Accommodate a 19 mm (0.75-inch) deflection, expansion, or contraction in any direction, and allow 30 degree angular deflections.
- c. Include internal flexible metal braid, sized to guarantee conduit ground continuity and a low-impedance path for fault currents, in accordance with UL 467 and the NEC tables for equipment grounding conductors.
- d. Jacket: Flexible, corrosion-resistant, watertight, moisture and heat-resistant molded rubber material with stainless steel jacket clamps.

D. Conduit Supports:

1. Parts and Hardware: Zinc-coat or provide equivalent corrosion protection.
2. Individual Conduit Hangers: Designed for the purpose, having a pre-assembled closure bolt and nut, and provisions for receiving a hanger rod.
3. Multiple Conduit (Trapeze) Hangers: Not less than 38 mm x 38 mm (1.5 x 1.5 inches), 12-gauge steel, cold-formed, lipped channels; with not less than 9 mm (0.375-inch) diameter steel hanger rods.
4. Solid Masonry and Concrete Anchors: Self-drilling expansion shields, or machine bolt expansion.

E. Outlet, Junction, and Pull Boxes:

1. UL-50 and UL-514A.
2. Rustproof cast metal where required by the NEC or shown on drawings.
3. Sheet Metal Boxes: Galvanized steel, except where shown on drawings.

F. Metal Wireways: Equip with hinged covers, except as shown on drawings.

Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for a complete system.

## **PART 3 - EXECUTION**

### **3.1 PENETRATIONS**

#### **A. Cutting or Holes:**

1. Cut holes in advance where they should be placed in the structural elements, such as ribs or beams. Obtain the approval of the COR prior to drilling through structural elements.
2. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammers, impact electric, hand, or manual hammer-type drills are not allowed, except when permitted by the COR where working space is limited.

#### **B. Firestop:** Where conduits, wireways, and other electrical raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING.

#### **C. Waterproofing:** At floor, exterior wall, and roof conduit penetrations, completely seal the gap around conduit to render it watertight, as specified in Section 07 92 00, JOINT SEALANTS.

### **3.2 INSTALLATION, GENERAL**

#### **A. In accordance with UL, NEC, NEMA, as shown on drawings, and as specified herein.**

#### **B. Raceway systems used for Essential Electrical Systems (EES) shall be entirely independent of other raceway systems.**

#### **C. Install conduit as follows:**

1. In complete mechanically and electrically continuous runs before pulling in cables or wires.
2. Unless otherwise indicated on the drawings or specified herein, installation of all conduits shall be concealed within finished walls, floors, and ceilings.
3. Flattened, dented, or deformed conduit is not permitted. Remove and replace the damaged conduits with new conduits.
4. Assure conduit installation does not encroach into the ceiling height head room, walkways, or doorways.
5. Cut conduits square, ream, remove burrs, and draw up tight.
6. Independently support conduit at 2.4 M (8 feet) on centers with specified materials and as shown on drawings.

7. Do not use suspended ceilings, suspended ceiling supporting members, lighting fixtures, other conduits, cable tray, boxes, piping, or ducts to support conduits and conduit runs.
8. Support within 300 mm (12 inches) of changes of direction, and within 300 mm (12 inches) of each enclosure to which connected.
9. Close ends of empty conduits with plugs or caps at the rough-in stage until wires are pulled in, to prevent entry of debris.
10. Conduit installations under fume and vent hoods are prohibited.
11. Secure conduits to cabinets, junction boxes, pull-boxes, and outlet boxes with bonding type locknuts. For rigid steel and IMC conduit installations, provide a locknut on the inside of the enclosure, made up wrench tight. Do not make conduit connections to junction box covers.
12. Flashing of penetrations of the roof membrane is specified in Section 07 60 00, FLASHING AND SHEET METAL.
13. Conduit bodies shall only be used for changes in direction, and shall not contain splices.

D. Conduit Bends:

1. Make bends with standard conduit bending machines.
2. Conduit hickey may be used for slight offsets and for straightening stubbed out conduits.
3. Bending of conduits with a pipe tee or vise is prohibited.

E. Layout and Homeruns:

1. Install conduit with wiring, including homeruns, as shown on drawings.
2. Deviations: Make only where necessary to avoid interferences and only after drawings showing the proposed deviations have been submitted and approved by the COR.

### **3.3 CONCEALED WORK INSTALLATION**

A. In Concrete:

1. Conduit: Rigid steel, IMC, or EMT. Do not install EMT in concrete slabs that are in contact with soil, gravel, or vapor barriers.
2. Align and run conduit in direct lines.
3. Install conduit through concrete beams only:
  - a. Where shown on the structural drawings.

- b. As approved by the COR prior to construction, and after submittal of drawing showing location, size, and position of each penetration.
- 4. Installation of conduit in concrete that is less than 75 mm (3 inches) thick is prohibited.
  - a. Conduit outside diameter larger than one-third of the slab thickness is prohibited.
  - b. Space between conduits in slabs: Approximately six conduit diameters apart, and one conduit diameter at conduit crossings.
  - c. Install conduits approximately in the center of the slab so that there will be a minimum of 19 mm (0.75-inch) of concrete around the conduits.
- 5. Make couplings and connections watertight. Use thread compounds that are UL approved conductive type to ensure low resistance ground continuity through the conduits. Tightening setscrews with pliers is prohibited.
- B. Above Furred or Suspended Ceilings and in Walls:
  - 1. Conduit for Conductors 600 V and Below: EMT. Mixing different types of conduits in the same system is prohibited.
  - 2. Align and run conduit parallel or perpendicular to the building lines.
  - 3. Connect recessed lighting fixtures to conduit runs with maximum 1.8 M (6 feet) of flexible metal conduit extending from a junction box to the fixture.
  - 4. Tightening set screws with pliers is prohibited.
  - 5. For conduits running through metal studs, limit field cut holes to no more than 70% of web depth. Spacing between holes shall be at least 457 mm (18 inches). Cuts or notches in flanges or return lips shall not be permitted.

### **3.4 EXPOSED WORK INSTALLATION**

- A. Unless otherwise indicated on drawings, exposed conduit is only permitted in mechanical and electrical rooms.
- B. Conduit for Conductors Above 600 V: Rigid steel. Mixing different types of conduits in the system is prohibited.
- C. Conduit for Conductors 600 V and Below: EMT. Mixing different types of conduits in the system is prohibited.



- D. Align and run conduit parallel or perpendicular to the building lines.
- E. Install horizontal runs close to the ceiling or beams and secure with conduit straps.
- F. Support horizontal or vertical runs at not over 2.4 M (8 feet) intervals.
- G. Surface Metal Raceways: Use only where shown on drawings.
- H. Painting:
  - 1. Paint exposed conduit as specified in Section 09 91 00, PAINTING.
  - 2. Paint all conduits containing cables rated over 600 V safety orange. Refer to Section 09 91 00, PAINTING for preparation, paint type, and exact color. In addition, paint legends, using 50 mm (2 inch) high black numerals and letters, showing the cable voltage rating. Provide legends where conduits pass through walls and floors and at maximum 6 M (20 feet) intervals in between.

### **3.5 DIRECT BURIAL INSTALLATION**

Refer to Section 26 05 41, UNDERGROUND ELECTRICAL CONSTRUCTION.

### **3.6 WET OR DAMP LOCATIONS**

- A. Use rigid steel or IMC conduits unless as shown on drawings.
- B. Provide sealing fittings to prevent passage of water vapor where conduits pass from warm to cold locations, i.e., refrigerated spaces, constant-temperature rooms, air-conditioned spaces, building exterior walls, roofs, or similar spaces.
- C. Use rigid steel or IMC conduit within 1.5 M (5 feet) of the exterior and below concrete building slabs in contact with soil, gravel, or vapor barriers, unless as shown on drawings. Conduit shall be half-lapped with 10 mil PVC tape before installation. After installation, completely recoat or retape any damaged areas of coating.
- D. Conduits run on roof shall be supported with integral galvanized lipped steel channel, attached to UV-inhibited polycarbonate or polypropylene blocks every 2.4 M (8 feet) with 9 mm (3/8-inch) galvanized threaded rods, square washer and locknut. Conduits shall be attached to steel channel with conduit clamps.

### **3.7 MOTORS AND VIBRATING EQUIPMENT**

- A. Use flexible metal conduit for connections to motors and other electrical equipment subject to movement, vibration, misalignment, cramped quarters, or noise transmission.

- B. Use liquid-tight flexible metal conduit for installation in exterior locations, moisture or humidity laden atmosphere, corrosive atmosphere, water or spray wash-down operations, inside airstream of HVAC units, and locations subject to seepage or dripping of oil, grease, or water.
- C. Provide a green equipment grounding conductor with flexible and liquid-tight flexible metal conduit.

### **3.8 EXPANSION JOINTS**

- A. Conduits 75 mm (3 inch) and larger that are secured to the building structure on opposite sides of a building expansion joint require expansion and deflection couplings. Install the couplings in accordance with the manufacturer's recommendations.
- B. Provide conduits smaller than 75 mm (3 inch) with junction boxes on both sides of the expansion joint. Connect flexible metal conduits to junction boxes with sufficient slack to produce a 125 mm (5 inch) vertical drop midway between the ends of the flexible metal conduit. Flexible metal conduit shall have a green insulated copper bonding jumper installed. In lieu of this flexible metal conduit, expansion and deflection couplings as specified above are acceptable.
- C. Install expansion and deflection couplings where shown.
- D. Seismic Areas: In seismic areas, provide conduits rigidly secured to the building structure on opposite sides of a building expansion joint with junction boxes on both sides of the joint. Connect conduits to junction boxes with 375 mm (15 inches) of slack flexible conduit. Flexible conduit shall have a copper bonding jumper installed.

### **3.9 CONDUIT SUPPORTS**

- A. Safe working load shall not exceed one-quarter of proof test load of fastening devices.
- B. Use pipe straps or individual conduit hangers for supporting individual conduits.

- C. Support multiple conduit runs with trapeze hangers. Use trapeze hangers that are designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger itself, and an additional 90 kg (200 lbs). Attach each conduit with U-bolts or other approved fasteners.
- D. Support conduit independently of junction boxes, pull-boxes, fixtures, suspended ceiling T-bars, angle supports, and similar items.
- E. Fasteners and Supports in Solid Masonry and Concrete:
  - 1. New Construction: Use steel or malleable iron concrete inserts set in place prior to placing the concrete.
  - 2. Existing Construction:
    - a. Steel expansion anchors not less than 6 mm (0.25-inch) bolt size and not less than 28 mm (1.125 inch) in embedment.
    - b. Power set fasteners not less than 6 mm (0.25-inch) diameter with depth of penetration not less than 75 mm (3 inch).
    - c. Use vibration and shock-resistant anchors and fasteners for attaching to concrete ceilings.
- F. Hollow Masonry: Toggle bolts.
- G. Bolts supported only by plaster or gypsum wallboard are not acceptable.
- H. Metal Structures: Use machine screw fasteners or other devices specifically designed and approved for the application.
- I. Attachment by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.
- J. Chain, wire, or perforated strap shall not be used to support or fasten conduit.
- K. Spring steel type supports or fasteners are prohibited for all uses except horizontal and vertical supports/fasteners within walls.
- L. Vertical Supports: Vertical conduit runs shall have riser clamps and supports in accordance with the NEC and as shown. Provide supports for cable and wire with fittings that include internal wedges and retaining collars.

### **3.10 BOX INSTALLATION**

- A. Boxes for Concealed Conduits:
  - 1. Flush-mounted.
  - 2. Provide raised covers for boxes to suit the wall or ceiling, construction, and finish.

- B. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling-in operations or where more than the equivalent of 4-90 degree bends are necessary.
- C. Locate pullboxes so that covers are accessible and easily removed. Coordinate locations with piping and ductwork where installed above ceilings.
- D. Remove only knockouts as required. Plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.
- E. Outlet boxes mounted back-to-back in the same wall are prohibited. A minimum 600 mm (24 inch) center-to-center lateral spacing shall be maintained between boxes.
- F. Flush-mounted wall or ceiling boxes shall be installed with raised covers so that the front face of raised cover is flush with the wall. Surface-mounted wall or ceiling boxes shall be installed with surface-style flat or raised covers.
- G. Minimum size of outlet boxes for ground fault circuit interrupter (GFCI) receptacles is 100 mm (4 inches) square x 55 mm (2.125 inches) deep, with device covers for the wall material and thickness involved.
- H. Stencil or install phenolic nameplates on covers of the boxes identified on riser diagrams; for example "SIG-FA JB No. 1."
- I. On all branch circuit junction box covers, identify the circuits with black marker.

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**SECTION 26 05 73**  
**OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the overcurrent protective device coordination study, indicated as the study in this section.
- B. A short-circuit and selective coordination study shall be prepared for the electrical overcurrent devices to be installed under this project.
- C. The study shall present a well-coordinated time-current analysis of each overcurrent protective device in the electrical system.

**1.2 RELATED WORK**

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section of Division 26.
- B. Section 26 23 00, LOW-VOLTAGE SWITCHGEAR: Low-voltage switchgear.
- C. Section 26 24 13, DISTRIBUTION SWITCHBOARDS: Low-voltage distribution switchboards.
- D. Section 26 24 16, PANELBOARDS: Low-voltage panelboards.

**1.3 QUALITY ASSURANCE**

- A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. The study shall be prepared by the equipment manufacturer.

**1.4 SUBMITTALS**

- A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
  - 1. Product data on the software program to be used for the study.  
Software shall be in mainstream use in the industry, shall provide device settings and ratings, and shall show selective coordination by time-current drawings.
  - 2. Complete study as described in paragraph 1.6. Submittal of the study shall be well-coordinated with submittals of the shop drawings for equipment in related specification sections.
  - 3. Certifications: Two weeks prior to final inspection, submit the following.

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- a. Certification by the Contractor that the overcurrent protective devices have been set in accordance with the approved study.

#### **1.5 APPLICABLE PUBLICATIONS**

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. Institute of Electrical and Electronics Engineers (IEEE):
  - 242-01.....Protection and Coordination of Industrial and Commercial Power Systems
  - 399-97.....Industrial and Commercial Power Systems Analysis
  - 1584a-04.....Guide for Performing Arc-Flash Hazard Calculations

#### **1.6 STUDY REQUIREMENTS**

- A. The study shall include one line diagram, short-circuit and ground fault analysis, and protective coordination plots for all overcurrent protective devices.
- B. One Line Diagram:
  1. Show all electrical equipment and wiring to be protected by the overcurrent devices.
  2. Show the following specific information:
    - a. Calculated fault impedance, X/R ratios, and short-circuit values at each feeder and branch circuit bus.
    - b. Relay, circuit breaker, and fuse ratings.
    - c. Generator kW/kVA and transformer kVA and voltage ratings, percent impedance, X/R ratios, and wiring connections.
    - d. Voltage at each bus.
    - e. Identification of each bus, matching the identification on the drawings.
    - f. Conduit, conductor, and busway material, size, length, and X/R ratios.
- C. Short-Circuit Study:
  1. The study shall be performed using computer software designed for this purpose. Pertinent data and the rationale employed in developing the calculations shall be described in the introductory remarks of the study.

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2. Calculate the fault impedance to determine the available short-circuit and ground fault currents at each bus. Incorporate applicable motor and/or generator contribution in determining the momentary and interrupting ratings of the overcurrent protective devices.
3. Present the results of the short-circuit study in a table. Include the following:
  - a. Device identification.
  - b. Operating voltage.
  - c. Overcurrent protective device type and rating.
  - d. Calculated short-circuit current.

D. Coordination Curves:

1. Prepare the coordination curves to determine the required settings of overcurrent protective devices to demonstrate selective coordination. Graphically illustrate on log-log paper that adequate time separation exists between devices, including the utility company upstream device if applicable. Plot the specific time-current characteristics of each overcurrent protective device in such a manner that all devices are clearly depicted.
2. The following specific information shall also be shown on the coordination curves:
  - a. Device identification.
  - b. Potential transformer and current transformer ratios.
  - c. Three-phase and single-phase ANSI damage points or curves for each cable, transformer, or generator.
  - d. Applicable circuit breaker or protective relay characteristic curves.
  - e. No-damage, melting, and clearing curves for fuses.
  - f. Transformer in-rush points.
3. Develop a table to summarize the settings selected for the overcurrent protective devices. Include the following in the table:
  - a. Device identification.
  - b. Protective relay or circuit breaker potential and current transformer ratios, sensor rating, and available and suggested pickup and delay settings for each available trip characteristic.
  - c. Fuse rating and type.

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#### **1.7 ANALYSIS**

- A. Analyze the short-circuit calculations, and highlight any equipment determined to be underrated as specified. Propose solutions to effectively protect the underrated equipment.

#### **1.8 ADJUSTMENTS, SETTINGS, AND MODIFICATIONS**

- A. Final field settings and minor modifications of the overcurrent protective devices shall be made to conform with the study, without additional cost to the Government.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

---END---



## **SECTION 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

- A. The requirements of this Section apply to all sections of Division 26.
- B. This project will have selected building systems commissioned. The complete list of equipment and systems to be commissioned is specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS. The commissioning process, which the Contractor is responsible to execute, is defined in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS. A Commissioning Agent (CxA) appointed by the VA will manage the commissioning process.

#### **1.2 RELATED WORK**

- A. Section 01 00 00 GENERAL REQUIREMENTS.
- B. Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.
- C. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

#### **1.3 SUMMARY**

- A. This Section includes requirements for commissioning the Facility electrical systems, related subsystems and related equipment. This Section supplements the general requirements specified in Section 01 91 00 General Commissioning Requirements.
- B. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for more details regarding processes and procedures as well as roles and responsibilities for all Commissioning Team members.

#### **1.4 DEFINITIONS**

- A. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for definitions.

#### **1.5 COMMISSIONED SYSTEMS**

- A. Commissioning of a system or systems specified in Division 26 is part of the construction process. Documentation and testing of these systems, as well as training of the VA's Operation and Maintenance personnel in accordance with the requirements of Section 01 91 00 and of Division 26, is required in cooperation with the VA and the Commissioning Agent.
- B. The Facility electrical systems commissioning will include the systems listed in Section 01 19 00 General Commissioning Requirements:

## **1.6 SUBMITTALS**

- A. The commissioning process requires review of selected Submittals that pertain to the systems to be commissioned. The Commissioning Agent will provide a list of submittals that will be reviewed by the Commissioning Agent. This list will be reviewed and approved by the VA prior to forwarding to the Contractor. Refer to Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, and SAMPLES for further details.
- B. The commissioning process requires Submittal review simultaneously with engineering review. Specific submittal requirements related to the commissioning process are specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.1 CONSTRUCTION INSPECTIONS**

- A. Commissioning of Electrical systems will require inspection of individual elements of the electrical systems construction throughout the construction period. The Contractor shall coordinate with the Commissioning Agent in accordance with Section 01 19 00 and the Commissioning plan to schedule electrical systems inspections as required to support the Commissioning Process.

### **3.2 PRE-FUNCTIONAL CHECKLISTS**

- A. The Contractor shall complete Pre-Functional Checklists to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems Functional Performance Testing. The Commissioning Agent will prepare Pre-Functional Checklists to be used to document equipment installation. The Contractor shall complete the checklists. Completed checklists shall be submitted to the VA and to the Commissioning Agent for review. The Commissioning Agent may spot check a sample of completed checklists. If the Commissioning Agent determines that the information provided on the checklist is not accurate, the Commissioning Agent will return the marked-up checklist to the Contractor for correction and resubmission. If the Commissioning Agent determines that a significant number of completed checklists for similar equipment are not accurate, the Commissioning Agent will select a broader sample of checklists for review. If the Commissioning Agent determines that a significant number of the broader sample of checklists is also inaccurate, all the checklists for the type of equipment will be returned to the Contractor for correction and resubmission. Refer to SECTION 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for submittal requirements for Pre-Functional Checklists, Equipment Startup Reports, and other commissioning documents.

### **3.3 CONTRACTORS TESTS**

- A. Contractor tests as required by other sections of Division 26 shall be scheduled and documented in accordance with Section 01 00 00 GENERAL REQUIREMENTS. All testing shall be incorporated into the project schedule. Contractor shall provide no less than 7 calendar days' notice of testing. The Commissioning Agent will witness selected Contractor tests at the sole discretion of the Commissioning Agent. Contractor tests shall be completed prior to scheduling Systems Functional Performance Testing.

### **3.4 SYSTEMS FUNCTIONAL PERFORMANCE TESTING**

- A. The Commissioning Process includes Systems Functional Performance Testing that is intended to test systems functional performance under steady state conditions, to test system reaction to changes in operating conditions, and system performance under emergency conditions. The Commissioning Agent will prepare detailed Systems Functional Performance Test procedures for review and approval by the COR. The Contractor shall review and comment on the tests prior to approval. The Contractor shall provide the required labor, materials, and test equipment identified in the test procedure to perform the tests. The Commissioning Agent will witness and document the testing. The Contractor shall sign the test reports to verify tests were performed. See Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS, for additional details.

### **3.5 TRAINING OF VA PERSONNEL**

- A. Training of the VA operation and maintenance personnel is required in cooperation with the COR and Commissioning Agent. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. Contractor shall submit training agendas and trainer resumes in accordance with the requirements of Section 01 19 00. The instruction shall be scheduled in coordination with the VA COR after submission and approval of formal training plans. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS and Division 26 Sections for additional Contractor training requirements.

----- END -----

**SECTION 26 23 00**  
**LOW-VOLTAGE SWITCHGEAR**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the furnishing, installation, connection, and preventative maintenance of low-voltage switchgear, indicated as switchgear in this section.

**1.2 RELATED WORK**

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS:  
Requirements that apply to all sections of Division 26.
- B. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES:  
Low-voltage conductors.
- C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS:  
Requirements for personnel safety and to provide a low impedance path for possible fault currents.
- D. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits.
- E. Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY:  
Short circuit and coordination study, and requirements for a coordinated electrical system.

**1.3 QUALITY ASSURANCE**

- A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

**1.4 PREVENTATIVE MAINTENANCE**

- A. Switchgear shall be thoroughly maintained.
- B. The following tests shall be performed:
1. Verify that circuit breaker sizes and types correspond to drawings, and the Overcurrent Protective Device Coordination Study.
  2. Verify tightness of bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.
  3. Confirm correct operation and sequencing of key-type mechanical interlock systems for multiple circuit breakers by attempting closure on locked-open devices, and attempting to open locked-closed

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- devices, and making key exchange with devices operated in off-normal positions.
4. Verify correct barrier and shutter installation and operation.
  5. Exercise all active components.
  6. Inspect indicating devices for correct operation.
  7. Perform an insulation-resistance test, phase to ground, on each bus section, with phases not under test grounded, in accordance with manufacturer's published data.
  8. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential shall be 500 V DC for 300-volt rated cable and 1000 V DC for 600-volt rated cable, or as required if solid-state components or control devices cannot tolerate the applied voltage.
  9. If applicable, verify correct function of control transfer relays located in the switchgear with multiple control power sources.
  10. Perform phasing checks on double-ended or dual-source switchgear to insure correct bus phasing from each source.
- C. Furnish four (4) copies of an approved switchgear inspection test report.

#### **1.5 SUBMITTALS**

##### **A. No Substitution of Sole Source Equipment:**

1. The work associated with this project has been designed with Sole Source Equipment to match the existing equipment currently installed throughout the Medical Center in order to maintain consistency, minimum maintenance staff training, limit potential maintenance staff hazards, and in order to accurately model the arc flash hazards. The Contractor shall provide the specified equipment. NO SUBSTITUTIONS ARE PERMITTED. Sole Source Equipment Manufacturer: Utility Relay Company.

##### **B. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.**

1. Shop Drawings:
  - a. Submit sufficient information to demonstrate compliance with drawings and specifications.
  - b. Submit the following data for approval:
    - 1) Complete electrical ratings.
    - 2) Circuit breaker sizes.
    - 3) Interrupting ratings.
    - 4) Safety features.

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- 5) Accessories and nameplate data.
- 7) Elementary and interconnection wiring diagrams.
- 8) Technical data for each component.

2. Manuals:

- a. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals, including technical data sheets, wiring diagrams, and information for ordering replacement parts.
  - 1) Schematic signal and control diagrams, with all terminals identified, matching terminal identification in the switchgear.
  - 2) Include information for testing, repair, trouble shooting, assembly, disassembly, and factory recommended/required periodic maintenance procedures and frequency.
  - 3) Provide a replacement and spare parts list. Include a list of tools and instruments for testing and maintenance purposes.
- b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.

**1.6 APPLICABLE PUBLICATIONS**

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata), form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.
- B. Institute of Engineering and Electronic Engineers (IEEE):
  - C37.13-08.....Low-voltage AC Power Circuit Breakers Used in Enclosures
  - C37.20.1-07.....Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
  - C57.13-08.....Instrument Transformers
  - C62.41.1-03.....Surge Environment in Low-voltage (1000V and less) AC Power Circuits
  - C62.45-92.....Surge Testing for Equipment connected to Low-Voltage AC Power Circuits
- C. International Code Council (ICC):
  - IBC-12.....International Building Code
- D. National Electrical Manufacturers Association (NEMA):

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C37.51-10.....Metal-Enclosed Low Voltage AC Power Circuit  
Breaker Switchgear Assemblies - Conformance  
Test Procedures

E. National Fire Protection Association (NFPA):

70-11.....National Electrical Code (NEC).

F. Underwriters Laboratories, Inc. (UL):

891-05 .....Switchboards

977-07.....Safety Fused Power-Circuit Devices

1053-99.....Ground Fault Sensing and Relaying Equipment

1558-99.....Metal-Enclosed Low-Voltage Power Circuit

Breaker Switchgear

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

A. Shall be in accordance with ANSI, IEEE, NEMA, NFPA, UL, as shown on the drawings, and have the following features:

1. Incorporate devices shown on the drawings and all related components required to fulfill operational and functional requirements.
2. Switchgear components shall conform to the arrangements and details shown on the drawings.
3. All non-current-carrying parts shall be grounded per Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS for additional requirements.

### **2.2 HOUSING**

A. Shall have the following features:

1. Auxiliary compartments:
  - a. Compartments shall be provided for auxiliaries, metering, and transition or termination sections as required by the manufacturer, and as shown on drawings. Compartments shall be provided with isolated wireways for control wiring between devices.

### **2.3 LOW-VOLTAGE POWER CIRCUIT BREAKERS**

A. Trip Devices: Breakers shall be electrically and mechanically trip free and shall have trip devices in each pole. Unless otherwise indicated on drawings, each breaker shall have overcurrent and short-circuit, and integral ground fault trip devices. Trip devices shall be of the solid state type with adjustable pick-up settings, with both long time and short time elements, and integral trip unit testing provisions. Devices



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shall have time-delay band adjustment. Long-time delay element shall have inverse time characteristics. Main circuit breakers shall not have instantaneous trip function.

- B. Position Indicator: Provide a mechanical indicator visible from the front of the unit to indicate whether the breaker is open or closed.
- C. Trip Button: Equip each breaker with a mechanical trip button accessible from the front of the door.
- D. Padlocking: Provisions shall be included for padlocking the breaker in the open position.
- E. Operation: Unless otherwise indicated herein or on the drawings, breakers 1600 ampere frame size and less shall be manually operated. Breakers larger than 1600 ampere frame size shall be electrically operated.
- F. Trip device shall include an arc flash reduction system. When enabled the system shall automatically enact a pre-programed "maintenance mode" setting.
- G. Trip devices shall be Utility Relay Company AC-PRO trip unit complete retrofit kit with Quick-Trip system with remote display and selector switch and/or a variation of these components as called for on the drawings. No substitutions will be accepted.

#### **2.4 OTHER EQUIPMENT**

- A. Furnish tools and accessories required for circuit breaker and switchgear test, inspection, maintenance, and proper operation.

#### **2.5 CONTROL WIRING**

- A. Switchgear control wires shall not be less than No. 14 AWG copper 600 V rated. Install wiring complete at the factory, adequately bundled and protected. Provide separate control circuit fuses in each breaker compartment and locate for ease of access and maintenance.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install trip devices and components in accordance with the NEC, as shown on the drawings, and as recommended by the manufacturer.

#### **3.2 PREVENTATIVE MAINTENANCE**

- A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
  - 1. Visual Inspection and Tests:

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- a. Compare equipment nameplate data with specifications and approved shop drawings.
  - b. Inspect physical, electrical, and mechanical condition.
  - c. Confirm correct application of manufacturer's recommended lubricants.
  - d. Verify appropriate anchorage, required area clearances, and correct alignment.
  - e. Verify that circuit breaker sizes and types correspond to approved shop drawings.
  - f. Verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method, or performing thermographic survey after energization.
  - g. Confirm correct operation and sequencing of key-type mechanical interlock systems.
  - h. Vacuum-clean switchgear enclosure interior. Clean switchgear enclosure exterior.
  - i. Inspect insulators for evidence of physical damage or contaminated surfaces.
  - j. Verify correct shutter installation and operation.
  - k. Exercise all active components.
  - l. Verify the correct operation of all sensing devices, alarms, and indicating devices.
  - m. Verify that vents are clear.
2. Electrical tests:
- a. Perform insulation-resistance tests on each bus section.
  - b. Perform insulation-resistance test on control wiring; do not perform this test on wiring connected to solid-state components.
  - c. Perform phasing check on double-ended switchgear to ensure correct bus phasing from each source.
- B. Prior to the final inspection for acceptance, a technical representative from the VA shall witness the testing of the equipment to assure the proper operation of the individual components, and to confirm proper operation/coordination with electric utility company's equipment.

### **3.3 FOLLOW-UP VERIFICATION**

- A. Upon completion of preventative maintenance, settings, and tests, the Contractor shall show by demonstration in service that the switchgear

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is in good operating condition and properly performing the intended function.

### **3.4 ONE LINE DIAGRAM AND SEQUENCE OF OPERATION**

- A. At final inspection, an as-built one line diagram shall be laminated or mounted under acrylic glass, and installed in a frame mounted in the switchgear room or in the outdoor switchgear enclosure.
- B. Furnish a written sequence of operation for the switchgear and connected line side/load side electrical distribution equipment. The sequence of operation shall be laminated or mounted under acrylic glass, and installed in a frame mounted in the switchgear room or in the outdoor switchgear enclosure.
- C. Deliver an additional four copies of the as-built one line diagram and sequence of operation to the //Resident Engineer// //COTR//.

### **3.5 AS-LEFT TRIP UNIT SETTINGS**

- A. The trip unit settings shall be set in the field by an authorized representative of the switchgear manufacturer per the approved Overcurrent Protective Device Coordination Study in accordance with Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY.
- C. Post a durable copy of the "as-left" trip unit settings in a convenient location in the switchgear room.

### **3.6 INSTRUCTION**

- A. Furnish the services of a factory-trained technician for two, 4-hour training periods for instructing personnel in the maintenance and operation of the switchgear, on the dates requested by the.

---END---

**SECTION 26 24 13**  
**DISTRIBUTION SWITCHBOARDS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the furnishing, installation, connection, and testing of the low-voltage circuit-breaker distribution switchboards, indicated as switchboard(s) in this section.

**1.2 RELATED WORK**

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS:  
Requirements that apply to all sections of Division 26.
- B. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES:  
Low-voltage conductors.
- C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS:  
Requirements for personnel safety and to provide a low impedance path for possible fault currents.
- D. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduit.

**1.3 QUALITY ASSURANCE**

- A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

**1.4 FACTORY TESTS**

- A. Switchboards shall be thoroughly tested at the factory to assure that there are no electrical or mechanical defects. Tests shall be conducted as per NEMA PB 2. Factory tests shall be certified.
- B. The following additional tests shall be performed:
1. Verify that circuit breaker sizes and types correspond to drawings, and the Overcurrent Protective Device Coordination Study.
  2. Verify tightness of bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.
  3. Exercise all active components.
  4. Perform an insulation-resistance test, phase to ground, on each bus section, with phases not under test grounded, in accordance with manufacturer's published data.
  5. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential shall be 500 V DC for 300-volt rated cable and 1000 V DC for 600-volt rated cable, or as required if

solid-state components or control devices cannot tolerate the applied voltage.

6. If applicable, verify correct function of control transfer relays located in the switchboard with multiple control power sources.
  7. Perform phasing checks on double-ended or dual-source switchboards to insure correct bus phasing from each source.
- C. Furnish four (4) copies of certified manufacturer's factory test reports prior to shipment of the switchboards to ensure that the switchboards have been successfully tested as specified.

#### **1.5 SUBMITTALS**

##### **A. Substitution of Basis-of-Design Equipment:**

1. The work associated with this project has been designed with basis-of-design equipment in order to accurately model the arc flash hazards. The contractor shall provide the basis-of-design equipment or may substitute equipment with an approved equal. If the contractor elects to provide substitute equivalent equipment, the contractor will be responsible for updates to the arc flash model at their own cost based on the approved substitute equivalent equipment. The substitute equivalent equipment modeled must provide an equal or lesser hazard than the basis-of-design equipment specified. Upon request, the VA can provide a copy of the existing SKM Power Tools arc flash model for use by the contractor to model any substitute equipment to be provided. Basis-of-design manufacturer: Square D.

##### **B. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.**

###### **1. Shop Drawings:**

- a. Switchboard shop drawings shall be submitted simultaneously with or after the Overcurrent Protective Device Coordination Study.
- b. Submit sufficient information to demonstrate compliance with drawings and specifications.
- c. Prior to fabrication of switchboards, submit the following data for approval:
  - 1) Complete electrical ratings.
  - 2) Circuit breaker sizes.
  - 3) Interrupting ratings.
  - 4) Safety features.
  - 5) Accessories and nameplate data.
  - 6) Switchboard one line diagram, showing ampere rating, number of bars per phase and neutral in each bus run (horizontal and

vertical), bus spacing, equipment ground bus, and bus material.

- 7) Elementary and interconnection wiring diagrams.
- 8) Technical data for each component.
- 9) Dimensioned exterior views of the switchboard.
- 10) Dimensioned section views of the switchboard.
- 11) Floor plan of the switchboard.
- 12) Foundation plan for the switchboard.
- 13) Provisions and required locations for external conduit and wiring entrances.
- 14) Approximate design weights.

2. Manuals:

- a. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals, including technical data sheets, wiring diagrams, and information for ordering replacement parts.
    - 1) Schematic signal and control diagrams, with all terminals identified, matching terminal identification in the switchboard.
    - 2) Include information for testing, repair, trouble shooting, assembly, disassembly, and factory recommended/required periodic maintenance procedures and frequency.
    - 3) Provide a replacement and spare parts list. Include a list of tools and instruments for testing and maintenance purposes.
  - b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
3. Certifications: Two weeks prior to final inspection, submit the following.
- a. Certification by the manufacturer that the switchboards conform to the requirements of the drawings and specifications.
  - b. Certification by the Contractor that the switchboards have been properly installed, adjusted, and tested.

**1.6 APPLICABLE PUBLICATIONS**

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent

referenced. Publications are referenced in the text by basic designation only.

- B. Institute of Engineering and Electronic Engineers (IEEE):
- C37.13-08.....Low Voltage AC Power Circuit Breakers Used in Enclosures
  - C57.13-08.....Instrument Transformers
  - C62.41.1-03.....Surge Environment in Low-voltage (1000V and less) AC Power Circuits
  - C62.45-92.....Surge Testing for Equipment connected to Low-Voltage AC Power Circuits
- C. International Code Council (ICC):
- IBC-12.....International Building Code
- D. National Electrical Manufacturer's Association (NEMA):
- PB-2-06.....Deadfront Distribution Switchboards
  - PB-2.1-07.....Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less
- E. National Fire Protection Association (NFPA):
- 70-11.....National Electrical Code (NEC)
- F. Underwriters Laboratories, Inc. (UL):
- 67-09.....Panelboards
  - 489-09.....Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
  - 891-05.....Switchboards

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Shall be in accordance with ANSI, IEEE, NEMA, NFPA, UL, as shown on the drawings, and have the following features:
1. Switchboard shall be a complete, grounded, continuous-duty, integral assembly, dead-front, dead-rear, self-supporting, indoor type switchboard assembly. Incorporate devices shown on the drawings and all related components required to fulfill operational and functional requirements.
  2. Ratings shall not be less than shown on the drawings. Short circuit ratings shall not be less than the available fault current shown in the Overcurrent Protective Device Coordination Study.
  3. Switchboard shall conform to the arrangements and details shown on the drawings.
  4. Switchboards shall be assembled, connected, and wired at the factory so that only external circuit connections are required at the construction site. Split the structure only as required for shipping and installation. Packaging shall provide adequate protection against rough handling during shipment.
  5. All non-current-carrying parts shall be grounded per Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS for additional requirements.
  6. Series rated switchboards are not allowed.



## **2.2 BASIC ARRANGEMENT**

- /A. Type 1: Switchboard shall be front accessible with the following features:
  - 1. Device mounting:
    - a. Main breaker: Individually mounted and compartmented or group mounted with feeder breakers.
    - b. Feeder breakers: Group mounted.
  - 2. Section alignment: As shown on the drawings.
  - 3. Accessibility:
    - a. Main section line and load terminals: Front and side.
    - b. Distribution section line and load terminals: Front.
    - c. Through bus connections: Front and end.
  - 4. Bolted line and load connections.
  - 5. Full height wiring gutter covers for access to wiring terminals.

## **2.3 HOUSING**

- A. Shall have the following features:
  - 1. Frames and enclosures:
    - a. The assembly shall be braced with reinforcing gussets using bolted connections to assure rectangular rigidity.
    - b. The enclosure shall be steel, leveled, and not less than the gauge required by applicable publications.
    - c. Die-pierce the holes for connecting adjacent structures to insure proper alignment, and to allow for future additions.
    - d. All bolts, nuts, and washers shall be zinc-plated steel.
- B. Finish:
  - 1. All metal surfaces shall be thoroughly cleaned, phosphatized and factory primed prior to applying baked enamel or lacquer finish.
  - 2. Provide a light gray finish for indoor switchboard.

## **2.4 BUSES**

- A. Bus Bars and Interconnections:
  - 1. Provide copper phase and neutral buses, fully rated for the amperage as shown on the drawings for the entire length of the switchboard. Bus laminations shall have a minimum of 6 mm (1/4 inch) spacing.
  - 2. Mount the buses on appropriately spaced insulators and brace to withstand the available short circuit currents.
  - 3. The bus and bus compartment shall be designed so that the acceptable NEMA standard temperature rises are not exceeded.

4. Install a copper ground bus the full length of the switchboard assembly.
5. Main Bonding Jumper: An un-insulated copper bus, size as shown on drawings, shall interconnect the neutral and ground buses, when the switchboard is used to establish the system common ground point.
6. All bolts, nuts, and washers shall be zinc-plated steel. Bolts shall be torqued to the values recommended by the manufacturer.
7. Make provisions for future bus extensions by means of bolt holes or other approved method.

## **2.5 MAIN CIRCUIT BREAKERS**

- A. Type I or Type II Switchboards: Provide molded case main circuit breakers as shown on the drawings. Circuit breakers shall be the solid state adjustable trip type.
  1. Trip units shall have field adjustable tripping characteristics as follows:
    - a. Long time pickup.
    - b. Long time delay.
    - c. Short time pickup.
    - d. Short time delay.
    - e. Instantaneous.
    - f. Ground fault pickup.
    - g. Ground fault delay.
  2. Breakers with same frame size shall be interchangeable with each other.

## **2.6 FEEDER CIRCUIT BREAKERS**

- A. Provide molded case circuit breakers as shown on the drawings.
- B. Non-adjustable Trip Molded Case Circuit Breakers:
  - 1. Molded case circuit breakers shall have automatic, trip free, non-adjustable, inverse time characteristics, and instantaneous magnetic trip.
  - 2. Breaker features shall be as follows:
    - a. A rugged, integral housing of molded insulating material.
    - b. Silver alloy contacts.
    - c. Arc quenchers and phase barriers for each pole.
    - d. Quick-make, quick-break, operating mechanisms.
    - e. A trip element for each pole, thermal magnetic type with long time delay and instantaneous characteristics, a common trip bar for all poles and a single operator.
    - f. Electrically and mechanically trip free.
    - g. An operating handle which indicates ON, TRIPPED, and OFF positions.
    - h. Line and load connections shall be bolted.
    - i. An overload on one pole of a multipole breaker shall automatically cause all the poles of the breaker to open.
- C. Adjustable Trip Molded Case Circuit Breakers:
  - 1. Provide molded case, solid state adjustable trip type circuit breakers.
  - 2. Trip units shall have field adjustable tripping characteristics as follows:
    - a. Long time pickup.
    - b. Long time delay.
    - c. Short time pickup.
    - d. Short time delay.
    - e. Instantaneous.
    - f. Ground fault pickup.
    - g. Ground fault delay.
  - 3. Breakers with same frame size shall be interchangeable with each other.

## **2.7 OTHER EQUIPMENT**

- A. Furnish tools and accessories required for circuit breaker and switchboard test, inspection, maintenance, and proper operation.

- B. Panelboards: Requirements for panelboards shown to be installed in the switchboard shall be as shown on the drawings and in Section 26 24 16, PANELBOARDS.

## **2.8 CONTROL WIRING**

- A. Switchboard control wires shall not be less than No. 14 AWG copper 600 volt rated. Install wiring complete at the factory, adequately bundled and protected. Provide separate control circuit fuses in each breaker compartment and locate for ease of access and maintenance.

## **2.9 NAMEPLATES**

- A. Nameplates: For Normal Power system, provide laminated black phenolic resin with white core with 12 mm (1/2 inch) engraved lettered nameplates next to each circuit breaker. For Essential Electrical System, provide laminated red phenolic resin with white core with 12 mm (1/2 inch) engraved lettered nameplates next to each circuit breaker. Nameplates shall indicate equipment served, spaces, or spares in accordance with one line diagram shown on drawings. Nameplates shall be mounted with plated screws on front of breakers or on equipment enclosure next to breakers. Mounting nameplates only with adhesive is not acceptable.
- B.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install switchboards in accordance with the NEC, as shown on the drawings, and as recommended by the manufacturer.
- B. Anchor switchboards with rustproof bolts, nuts, and washers not less than 13 mm (1/2 inch) diameter, in accordance with manufacturer's instructions, and as shown on drawings.
- C. In seismic areas, switchboards shall be adequately anchored and braced per details on structural contract drawings to withstand the seismic forces at the location where installed.
- D. Exterior Location. Mount switchboard on concrete slab. Unless otherwise indicated, the slab shall be at least 200 mm (8 inches) thick, reinforced with a 150 by 150 mm (6 by 6 inches) No. 6 mesh placed uniformly 100 mm (4 inches) from the top of the slab. Slab shall be placed on a 150 mm (6 inches) thick, well-compacted gravel base. The top of the concrete slab shall be approximately 100 mm (4 inches) above the finished grade. Edges above grade shall have 12.5 mm (1/2 inch)

chamfer. The slab shall be of adequate size to project at least 200 mm (8 inches) beyond the equipment. Provide conduit turnups and cable entrance space required by the equipment to be mounted. Seal voids around conduit openings in slab with water- and oil-resistant caulking or sealant. Cut off and bush conduits 75 mm (3 inches) above slab surface. Concrete work shall be as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

E. Interior Location. Mount switchboard on concrete slab. Unless otherwise indicated, the slab shall be at least 100 mm (4 inches) thick. The top of the concrete slab shall be approximately 100 mm (4 inches) above finished floor. Edges above floor shall have 12.5 mm (1/2 inch) chamfer. The slab shall be of adequate size to project at least 200 mm (8 inches) beyond the equipment. Provide conduit turnups and cable entrance space required by the equipment to be mounted. Seal voids around conduit openings in slab with water- and oil-resistant caulking or sealant. Cut off and bush conduits 75 mm (3 inches) above slab surface. Concrete work shall be as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

### 3.2 ACCEPTANCE CHECKS AND TESTS

- A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
1. Visual Inspection and Tests:
    - a. Compare equipment nameplate data with specifications and approved shop drawings.
    - b. Inspect physical, electrical, and mechanical condition.
    - c. Verify appropriate anchorage, required area clearances, and correct alignment.
    - d. Verify that circuit breaker sizes and types correspond to approved shop drawings.
    - e. Verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method, or performing thermographic survey after energization.
    - g. Vacuum-clean switchboard enclosure interior. Clean switchboard enclosure exterior.
    - h. Inspect insulators for evidence of physical damage or contaminated surfaces.
    - i. Verify correct shutter installation and operation.
    - j. Exercise all active components.
    - k. Verify the correct operation of all sensing devices, alarms, and indicating devices.
    - l. Verify that vents are clear.

2. Electrical tests:

- a. Perform insulation-resistance tests on each bus section.
- b. Perform insulation-resistance test on control wiring; do not perform this test on wiring connected to solid-state components.
- c. Perform phasing check on double-ended switchboards to ensure correct bus phasing from each source.

**3.3 FOLLOW-UP VERIFICATION**

- A. Upon completion of acceptance checks, settings, and tests, the Contractor shall show by demonstration in service that the switchboard is in good operating condition and properly performing the intended function.

**3.4 WARNING SIGN**

- A. Mount on each entrance door of the switchboard room, approximately 1500 mm (5 feet) above grade or floor, a clearly lettered warning sign for warning personnel. The sign shall be attached with rustproof metal screws.

**3.5 ONE LINE DIAGRAM AND SEQUENCE OF OPERATION**

- A. At final inspection, an as-built one line diagram shall be laminated or mounted under acrylic glass, and installed in a frame mounted in the switchboard room or in the outdoor switchboard enclosure.
- B. Deliver an additional four copies of the as-built one line diagram to the COR.

### **3.6 AS-LEFT TRIP UNIT SETTINGS**

- A. Post a durable copy of the "as-left" trip unit settings in a convenient location in the //switchboard room //outdoor switchboard enclosure//. Deliver four additional copies of the settings to the COR. Furnish this information prior to the activation of the switchboard.

### **3.7 INSTRUCTION**

- A. Furnish the services of a factory-trained technician for one, 4-hour training period for instructing personnel in the maintenance and operation of the switchboards, on the dates requested by the COR.

---END---



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**SECTION 26 24 16**  
**PANELBOARDS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the furnishing, installation, and connection of panelboards.

**1.2 RELATED WORK**

- A. Section 09 91 00, PAINTING: Painting of panelboards.
- B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS:  
Requirements that apply to all sections of Division 26.
- C. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES:  
Low-voltage conductors.
- D. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS:  
Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- E. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits.

**1.3 QUALITY ASSURANCE**

- A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

**1.4 SUBMITTALS**

**A. Substitution of Basis-of-Design Equipment:**

1. The work associated with this project has been designed with basis-of-design equipment in order to accurately model the arc flash hazards. The contractor shall provide the basis-of-design equipment or may substitute equipment with an approved equal. If the contractor elects to provide substitute equivalent equipment, the contractor will be responsible for updates to the arc flash model at their own cost based on the approved substitute equivalent equipment. The substitute equivalent equipment modeled must provide an equal or lesser hazard than the basis-of-design equipment specified. Upon request, the VA can provide a copy of the existing SKM Power Tools arc flash model for use by the contractor to model any substitute equipment to be provided. Basis-of-design manufacturer: Square D.

- B. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1. Shop Drawings:

- a. Submit sufficient information to demonstrate compliance with drawings and specifications.

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- b. Include electrical ratings, dimensions, mounting details, materials, required clearances, terminations, weight, circuit breakers, wiring and connection diagrams, accessories, and nameplate data.
- 2. Manuals:
  - a. Submit, simultaneously with the shop drawings, complete maintenance and operating manuals including technical data sheets, wiring diagrams, and information for ordering circuit breakers and replacement parts.
    - 1) Include schematic diagrams, with all terminals identified, matching terminal identification in the panelboards.
    - 2) Include information for testing, repair, troubleshooting, assembly, and disassembly.
  - b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
- 3. Certifications: Two weeks prior to final inspection, submit the following.
  - a. Certification by the manufacturer that the panelboards conform to the requirements of the drawings and specifications.
  - b. Certification by the Contractor that the panelboards have been properly installed, adjusted, and tested.

#### **1.5 APPLICABLE PUBLICATIONS**

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. International Code Council (ICC):
  - IBC-12.....International Building Code
- C. National Electrical Manufacturers Association (NEMA):
  - PB 1-11.....Panelboards
  - 250-08.....Enclosures for Electrical Equipment (1,000V Maximum)
- D. National Fire Protection Association (NFPA):
  - 70-11.....National Electrical Code (NEC)
  - 70E-12.....Standard for Electrical Safety in the Workplace
- E. Underwriters Laboratories, Inc. (UL):

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50-95.....	Enclosures for Electrical Equipment
67-09.....	Panelboards
489-09.....	Molded Case Circuit Breakers and Circuit Breaker Enclosures

## **PART 2 - PRODUCTS**

### **2.1 GENERAL REQUIREMENTS**

- A. Panelboards shall be in accordance with NEC, NEMA, UL, as specified, and as shown on the drawings.
- B. Panelboards shall have main breaker or main lugs, bus size, voltage, phases, number of circuit breaker mounting spaces, top or bottom feed, flush or surface mounting, branch circuit breakers, and accessories as shown on the drawings.
- C. Panelboards shall be completely factory-assembled with molded case circuit breakers and integral accessories as shown on the drawings or specified herein.
- D. Non-reduced size copper bus bars, rigidly supported on molded insulators, and fabricated for bolt-on type circuit breakers.
- E. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type.
- F. Mechanical lugs furnished with panelboards shall be cast, stamped, or machined metal alloys listed for use with the conductors to which they will be connected.
- G. Neutral bus shall be 100% rated, mounted on insulated supports.
- H. Grounding bus bar shall be equipped with screws or lugs for the connection of equipment grounding conductors.
- I. Bus bars shall be braced for the available short-circuit current as shown on the drawings, but not be less than 10,000 A symmetrical for 120/208 V and 120/240 V panelboards, and 14,000 A symmetrical for 277/480 V panelboards.
- J. In two-section panelboards, the main bus in each section shall be full size. The first section shall be furnished with subfeed lugs on the line side of main lugs only, or through-feed lugs for main breaker type panelboards, and have field-installed cable connections to the second section as shown on the drawings. Panelboard sections with tapped bus or crossover bus are not acceptable.
- K. Series-rated panelboards are not permitted.

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## **2.2 ENCLOSURES AND TRIMS**

### **A. Enclosures:**

1. Provide galvanized steel enclosures, with NEMA rating as shown on the drawings or as required for the environmental conditions in which installed.
2. Enclosures shall not have ventilating openings.
3. Enclosures may be of one-piece formed steel or of formed sheet steel with end and side panels welded, riveted, or bolted as required.
4. Provide manufacturer's standard option for prepunched knockouts on top and bottom endwalls.
5. Include removable inner dead front cover, independent of the panelboard cover.

### **B. Trims:**

1. Hinged "door-in-door" type.
2. Interior hinged door with hand-operated latch or latches, as required to provide access only to circuit breaker operating handles, not to energized parts.
3. Outer hinged door shall be securely mounted to the panelboard enclosure with factory bolts, screws, clips, or other fasteners, requiring a key or tool for entry. Hand-operated latches are not acceptable.
4. Inner and outer doors shall open left to right.
5. Trims shall be flush or surface type as shown on the drawings.

## **2.3 MOLDED CASE CIRCUIT BREAKERS**

- A. Circuit breakers shall be per UL, NEC, as shown on the drawings, and as specified.
- B. Circuit breakers shall be bolt-on type.
- C. Circuit breakers shall have minimum interrupting rating as required to withstand the available fault current, but not less than:
  1. 120/208 V Panelboard: 10,000 A symmetrical.
  2. 120/240 V Panelboard: 10,000 A symmetrical.
  3. 277/480 V Panelboard: 14,000 A symmetrical.
- D. Circuit breakers shall have automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips for less than 400 A frame. Circuit breakers with 400 A frames and above shall have magnetic trip, adjustable from 5x to 10x. Breaker trip setting shall be set in

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the field Breaker magnetic trip setting shall be set to maximum, unless otherwise noted.

E. Circuit breaker features shall be as follows:

1. A rugged, integral housing of molded insulating material.
2. Silver alloy contacts.
3. Arc quenchers and phase barriers for each pole.
4. Quick-make, quick-break, operating mechanisms.
5. A trip element for each pole, thermal magnetic type with long time delay and instantaneous characteristics, a common trip bar for all poles and a single operator.
6. Electrically and mechanically trip free.
7. An operating handle which indicates closed, tripped, and open positions.
8. An overload on one pole of a multi-pole breaker shall automatically cause all the poles of the breaker to open.
9. Ground fault current interrupting breakers, shunt trip breakers, lighting control breakers (including accessories to switch line currents), or other accessory devices or functions shall be provided where shown on the drawings.
10. For circuit breakers being added to existing panelboards, coordinate the breaker type with existing panelboards. Modify the panel directory accordingly.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Installation shall be in accordance with the manufacturer's instructions, the NEC, as shown on the drawings, and as specified.
- B. Locate panelboards so that the present and future conduits can be conveniently connected.
- C. Install a printed schedule of circuits in each panelboard after approval by the COR. Schedules shall reflect final load descriptions, room numbers, and room names connected to each circuit breaker. Schedules shall be printed on the panelboard directory cards and be installed in the appropriate panelboards
- D. Mount panelboards such that the maximum height of the top circuit breaker above the finished floor shall not exceed 1980 mm (78 inches).
- E. Provide blank cover for each unused circuit breaker mounting space.

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- F. For panelboards located in areas accessible to the public, paint the exposed surfaces of the trims with finishes to match surrounding surfaces after the panelboards have been installed. Do not paint nameplates.
- G. Rust and scale shall be removed from the inside of existing enclosures where new interior components are to be installed. Paint inside of enclosures with rust-preventive paint before the new interior components are installed. Provide new trim. Trim shall fit tight to the enclosure.
- I. Panelboard enclosures shall not be used for conductors feeding through, spliced, or tapping off to other enclosures or devices.

### **3.2 ACCEPTANCE CHECKS AND TESTS**

- A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
  - 1. Visual Inspection and Tests:
    - a. Compare equipment nameplate data with specifications and approved shop drawings.
    - b. Inspect physical, electrical, and mechanical condition.
    - c. Verify appropriate anchorage and required area clearances.
    - d. Verify that circuit breaker sizes and types correspond to approved shop drawings.
    - e. To verify tightness of accessible bolted electrical connections, use the calibrated torque-wrench method or perform thermographic survey after energization.
    - f. Vacuum-clean enclosure interior. Clean enclosure exterior.

### **3.3 FOLLOW-UP VERIFICATION**

- A. Upon completion of acceptance checks, settings, and tests, the Contractor shall demonstrate that the panelboards are in good operating condition and properly performing the intended function.

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**SECTION 26 29 21**  
**ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the furnishing, installation, and connection of fused and unfused disconnect switches (indicated as switches in this section), and separately-enclosed circuit breakers for use in electrical systems rated 600 V and below.

**1.2 RELATED WORK**

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.
- B. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low-voltage conductors.
- C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground faults.
- D. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits.
- E. Section 26 24 16, PANELBOARDS: Molded-case circuit breakers.

**1.3 QUALITY ASSURANCE**

- A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

**1.4 SUBMITTALS**

**A. Substitution of Basis-of-Design Equipment:**

1. The work associated with this project has been designed with basis-of-design equipment in order to accurately model the arc flash hazards. The contractor shall provide the basis-of-design equipment or may substitute equipment with an approved equal. If the contractor elects to provide substitute equivalent equipment, the contractor will be responsible for updates to the arc flash model at their own cost based on the approved substitute equivalent equipment. The substitute equivalent equipment modeled must provide an equal or lesser hazard than the basis-of-design equipment specified. Upon request, the VA can provide a copy of the existing SKM Power Tools arc flash model for use by the contractor to model any substitute equipment to be provided. Basis-of-design manufacturer: Square D.

- B. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1. Shop Drawings:

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- a. Submit sufficient information to demonstrate compliance with drawings and specifications.
- b. Submit the following data for approval:
  - 1) Electrical ratings, dimensions, mounting details, materials, required clearances, terminations, weight, fuses, circuit breakers, wiring and connection diagrams, accessories, and device nameplate data.
2. Manuals:
  - a. Submit complete maintenance and operating manuals including technical data sheets, wiring diagrams, and information for ordering fuses, circuit breakers, and replacement parts.
    - 1) Include schematic diagrams, with all terminals identified, matching terminal identification in the enclosed switches and circuit breakers.
    - 2) Include information for testing, repair, troubleshooting, assembly, and disassembly.
  - b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
3. Certifications: Two weeks prior to final inspection, submit the following.
  - a. Certification by the manufacturer that the enclosed switches and circuit breakers conform to the requirements of the drawings and specifications.
  - b. Certification by the Contractor that the enclosed switches and circuit breakers have been properly installed, adjusted, and tested.

#### **1.5 APPLICABLE PUBLICATIONS**

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. International Code Council (ICC):  
IBC-12.....International Building Code
- C. National Electrical Manufacturers Association (NEMA):  
FU 1-07.....Low Voltage Cartridge Fuses



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KS 1-06.....Enclosed and Miscellaneous Distribution  
Equipment Switches (600 Volts Maximum)

D. National Fire Protection Association (NFPA):

70-11.....National Electrical Code (NEC)

E. Underwriters Laboratories, Inc. (UL):

98-07.....Enclosed and Dead-Front Switches

248-00.....Low Voltage Fuses

489-09.....Molded Case Circuit Breakers and Circuit  
Breaker Enclosures

**PART 2 - PRODUCTS**

**2.1 FUSED SWITCHES RATED 600 AMPERES AND LESS**

- A. Switches shall be in accordance with NEMA, NEC, UL, as specified, and as shown on the drawings.
- B. Shall be NEMA classified General Duty (GD) for 240 V switches, and NEMA classified Heavy Duty (HD) for 480 V switches.
- C. Shall be horsepower (HP) rated.
- D. Shall have the following features:
  1. Switch mechanism shall be the quick-make, quick-break type.
  2. Copper blades, visible in the open position.
  3. An arc chute for each pole.
  4. External operating handle shall indicate open and closed positions, and have lock-open padlocking provisions.
  5. Mechanical interlock shall permit opening of the door only when the switch is in the open position, defeatable to permit inspection.
  6. Fuse holders for the sizes and types of fuses specified.
  7. Solid neutral for each switch being installed in a circuit which includes a neutral conductor.
  8. Ground lugs for each ground conductor.
  9. Enclosures:
    - a. Shall be the NEMA types shown on the drawings.
    - b. Where the types of switch enclosures are not shown, they shall be the NEMA types most suitable for the ambient environmental conditions.
    - c. Shall be finished with manufacturer's standard gray baked enamel paint over pretreated steel.

**2.2 UNFUSED SWITCHES RATED 600 AMPERES AND LESS**

- A. Shall be the same as fused switches, but without provisions for fuses.

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### **2.3 MOTOR RATED TOGGLE SWITCHES**

- A. Type 1, general purpose for single-phase motors rated up to 1 horsepower.
- B. Quick-make, quick-break toggle switch with external reset button and thermal overload protection matched to nameplate full-load current of actual protected motor.

### **2.4 SEPARATELY-ENCLOSED CIRCUIT BREAKERS**

- A. Provide circuit breakers in accordance with the applicable requirements in Section 26 24 16, PANELBOARDS.
- B. Enclosures shall be the NEMA types shown on the drawings. Where the types are not shown, they shall be the NEMA type most suitable for the ambient environmental conditions.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Installation shall be in accordance with the manufacturer's instructions, the NEC, as shown on the drawings, and as specified.
- B. Fused switches shall be furnished complete with fuses. Arrange fuses such that rating information is readable without removing the fuses.

### **3.2 ACCEPTANCE CHECKS AND TESTS**

- A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
  - 1. Visual Inspection and Tests:
    - a. Compare equipment nameplate data with specifications and approved shop drawings.
    - b. Inspect physical, electrical, and mechanical condition.
    - c. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method.
    - d. Vacuum-clean enclosure interior. Clean enclosure exterior.

### **3.3 SPARE PARTS**

- A. Two weeks prior to the final inspection, furnish one complete set of spare fuses for each fused disconnect switch installed on the project. Deliver the spare fuses to the COR.

---END---