

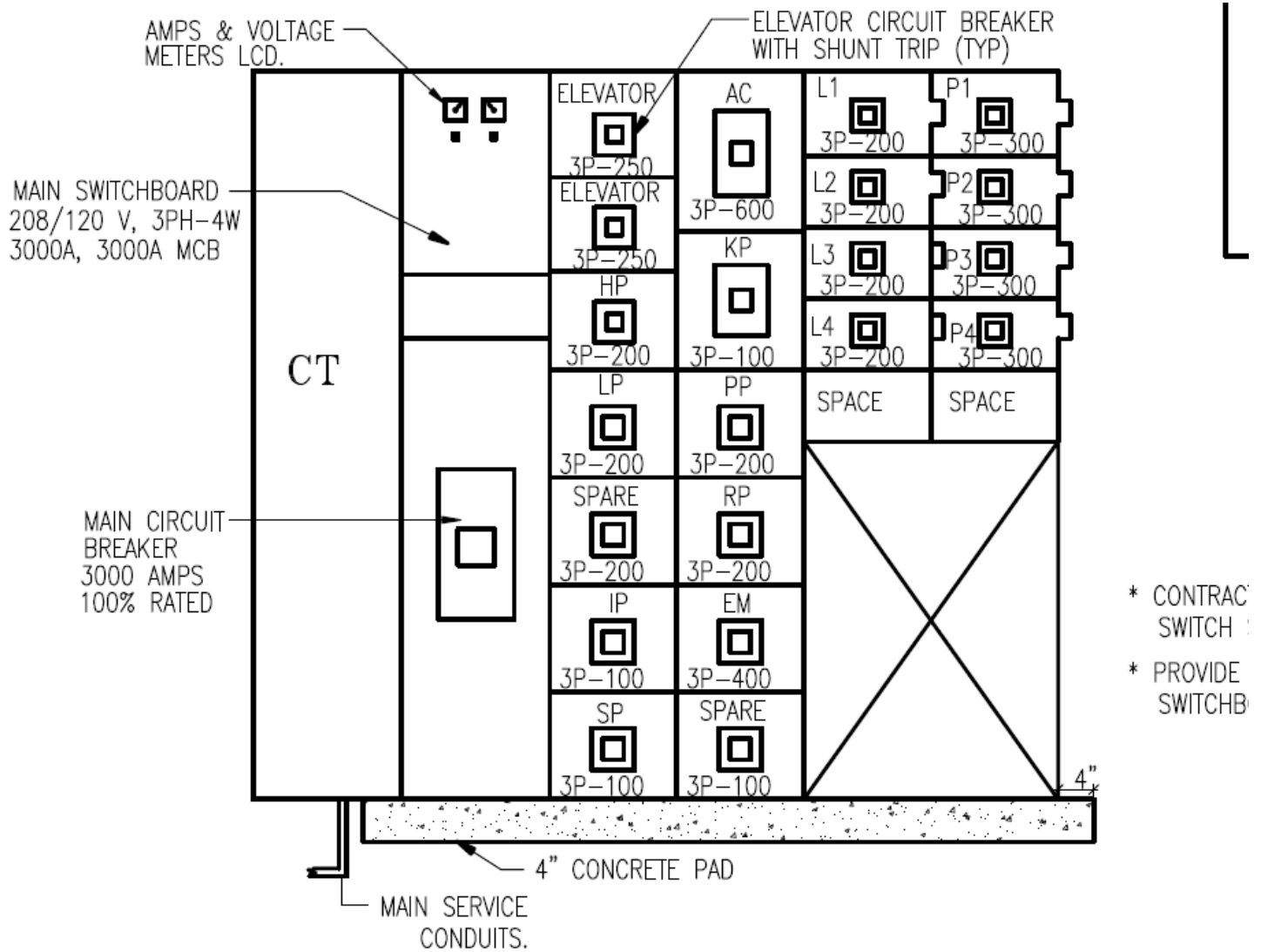
**SWITCHGEAR BOM – FAIRFIELD INN**

3000A Main SWBD MDP w/ Digital A-V Meters		1.00	
Panel KP	1.00		
Panel L1 (Section 1)	1.00		
Panel L1 (Section 2)	1.00		
Panel L2 (Section 1)	1.00		
Panel L2 (Section 2)	1.00		
Panel L3 (Section 1)	1.00		
Panel L3 (Section 2)	1.00		
Panel L4 (Section 1)	1.00		
Panel L4 (Section 2)	1.00		
Panel P1 (Section 1)	1.00		
Panel P1 (Section 2)	1.00		
Panel P2 (Section 1)	1.00		
Panel P2 (Section 2)	1.00		
Panel P3 (Section 1)	1.00		
Panel P3 (Section 2)	1.00		
Panel P4 (Section 1)	1.00		
Panel P4 (Section 2)	1.00		
Panel HP	1.00		
Panel PP	1.00		
Panel SP	1.00		
Panel RP	1.00		
Panel IP (Isolated Ground Power)		1.00	
Panel EL	1.00		
Panel LP (Section 1)	1.00		(Continued on next page)

Panel LP (Section 2)	1.00
Panel AC (Section 1)	1.00
Panel AC (Section 2)	1.00
Panel EM	1.00

\*\*Note that the schedule for Panels L1 (Section 1) & L1 (Section 2) are also applicable for 2-section Panels L2, L3, & L4

\*\*Note that the schedule for Panels P1 (Section 1) & P1 (Section 2) are also applicable for 2-section Panels P2, P3, & P4



1 SWITCH BOARD SCHEMATIC.  
 E19 SCALE: N.T.S.

## PANELBOARD SCHEDULE

**PANEL IP** \_\_\_\_\_ 208/120 **VOLTS**      3 **PHASE**      4 **WIRE**      \_\_\_\_\_ **AMPS MAIN CB**  
**SOLID NEUTRAL:** \_\_\_\_\_ **NEGA TYPE:** 1      \_\_\_\_\_ 125 **MCB/MLO**  
**GROUND BUS** \_\_\_\_\_ **A.I.C. SIZE** 10000      **STD. FRAME** \_\_\_\_\_  
**LOCATION:** ADMIN      **MOUNTING:** RECESSED  SURFACE

**REMARKS** ISOLATED GROUND PANEL ON E-POWER

CO	WIRE	ØA	ØB	ØC	LOAD SERVED	C.B. - AMPS			A	B	C	C.B. - AMPS			LOAD SERVED	ØA	ØB	ØC	WIRE	CO		
						FUSE	FRAME NO.	NO.				FRAME	TYPE	NO.							FRAME	TYPE
1/2	#12	.8			BUSINESS	1	20	100	1			2	100	20	1	MAINT. 4TH FL.	.6			#12	1/2	
1/2	#12		.8		BUSINESS	1	20	100	3			4	100	20	1	HOST		.8		#12	3/4	
1/2	#12			.8	BUSINESS	1	20	100	5			6	100	20	1	HOST			.8			↓
1/2	#12	.8			BUSINESS	1	20	100	7			8	100	20	1	HOST	.8			#12	1/2	
1/2	#12		.8		WORK AREA	1	20	100	9			10	100	20	1	HOST		.8		#12	1/2	
1/2	#12			.8	WORK AREA	1	20	100	11			12	100	20	1	SECURITY			.6	#12	1/2	
1/2	#12	.6			WORK AREA	1	20	100	13			14	100	20	1	SPARE						
1/2	#12		.6		OFFICE	1	20	100	15			16	100	20	1	SPARE						
1/2	#12			.6	LINEN	1	20	100	17			18	100	20	1	SPARE						
1/2	#12	.6			WIRELESS	1	20	100	19			20	100	20	1	SPARE						
1/2	#12		.6		WIRELESS	1	20	100	21			22	100	20	1	SPARE						
					SPARE	1	20	100	23			24	100	20	1	SPARE						
					SPARE	1	20	100	25			26	100	20	1	SPARE						
1/2	#12		.8		COMP. ROOM	1	20	100	27			28	100	20	1	WIRELESS ROUTER		1		#12	3/4	
1/2	#12			.8	COMP. ROOM	1	20	100	29			30	100	20	1	SECURITY EQ.			1	#12	3/4	
1/2	#12	.8			COMP. ROOM	1	20	100	31			32	100	20	1	TIME CLOCK	1			#12	3/4	
1/2	#12		.8		COMP. ROOM	1	20	100	33			34				SPACE						
1/2	#12			.8	COMP. ROOM	1	20	100	35			36										
1/2	#12	.8			COMP. ROOM	1	20	100	37			38										
					SPACE				39			40										
					SPACE				41			42										

ØA= \_\_\_\_\_ KVA      ØB= \_\_\_\_\_ KVA      ØC= \_\_\_\_\_ KVA

LOAD DESCRIPTION	CONNECT KVA	PF	CONNECT KW	DEMAND FACTOR	DEMAND KVA
LIGHTING & APPLIANCES		1.0		1.25	
RECEPT (UNDER 10 KVA) COMPUTER	10	1.0		100	10
RECEPT (EXCESS OF 10 KVA) COMPUTER	8	1.0		50	4
ELECTRICAL HEAT		1.0		100	
OTHER EQUIPMENT,		0.9		100	
MISC.	56	0.9		100	
<b>TOTAL KVA</b>		0.94			14
<b>TOTAL AMPS</b>					39

\* PANEL IP SHALL BE PROTECTED WITH 3P-100A CB IN PANEL EM

## PANELBOARD SCHEDULE

PANEL EL 480/277 VOLTS 3 PHASE 4 WIRE          AMPS MAIN CB  
 SOLID NEUTRAL:  NEMA TYPE: 12 125 MCB/NEO  
 GROUND BUS  A.I.C. SIM 10000 STD. FRAME   
 LOCATION: MAIN ELECTRICAL ROOM MOUNTING: RECESSED  SURFACE

REMARKS EMERGENCY LIGHTING & APPLIANCE PANEL

CO	WIRE	øA	øB	øC	LOAD SERVED	C.B. - AMPS			A	B	C	C.B. - AMPS			LOAD SERVED	øA	øB	øC	WIRE	CO	
						P	TRIP	FRAME NO.				NO.	FRAME	TRIP							P
3/4	#10	1			2ND	1	20	100	1			2	100	20	1	STAIR	1			#12	1/2
	#10		1		2ND	1	20	100	3			4	100	20	1	STAIR		1		#12	1/2
3/4	#10			1	3RD	1	20	100	5			6	100	20	1	1ST FL			.6	#10	1/2
	#10	1			3RD	1	20	100	7			8	100	20	1	LOBBY	.6			#12	1/2
3/4	#10		1		4TH	1	20	100	9			10	100	20	1	POOL		1		#12	1/2
	#10			1	4TH	1	20	100	11			12	100	20	1	OFFICE			1.6	#12	1/2
1	#8	.6			EXTERIOR	1	20	100	13			14				SPACE					
1/2	#12		.6		PIT	1	20	100	15			16									
1/2	#12			.6	EMR	1	20	100	17			18									
					SPACE				19			20									
									21			22									
									23			24									
									25			26									
									27			28									
									29			30									
									31			32									
									33			34									
									35			36									
									37			38									
									39			40									
									41			42									

øA=            KVA            øB=            KVA            øC=            KVA

LOAD DESCRIPTION	CORRECT KVA	PF	CORRECT KW	DEMAND FACTOR	DEMAND KVA
LIGHTING & APPLIANCES	13.60	1.0		1.25	17
RECEPT (UNDER 10 KVA)		1.0		100	
RECEPT (EXCESS OF 10 KVA)		1.0		50	
ELECTRICAL HEAT		1.0		100	
OTHER EQUIPMENT,		0.9		100	
MISC.		0.9		100	
TOTAL KVA		0.94			17
TOTAL AMPS					48

- \* PANEL SHALL BE PROTECTED WITH 3P-100A CB IN EM.
- \* ALL CB'S IN PANEL EL SHALL BE OF LOCKABLE IN ON POSITION

# PANELBOARD SCHEDULE

**PANEL LP** 208/120 **VOLTS**      3 **PHASE**      4 **WIRE**             **AMPS MAIN CB**  
**SOLID NEUTRAL:**       **WEMA TYPE:** 1      225 **MCB/MLO**  
**GROUND BUS**       **A.I.C. SIM** 10000      **STD. FRAME**   
**LOCATION:** MAIN ELECTRICAL ROOM      **MOUNTING:** RECESSED  SURFACE

**REMARKS** LOBBY LIGHTING PANEL      2ND SECTION

CO	WIRE	ØA	ØB	ØC	LOAD SERVED	C.B. - AMPS			A	B	C	C.B. - AMPS			LOAD SERVED	ØA	ØB	ØC	WIRE	CO
						PI	TE	PIE				PI	TE	PIE						
1/2	#12	.6			MARKET	1	20	100	43						SPACE					
	#12		.6		MARKET	1	20	100	45											
					SPACE				47											
									49											
									51											
									53											
									55											
									57											
									59											
									61											
									63											

ØA=                      KVA                      ØB=                      KVA                      ØC=                      KVA

LOAD DESCRIPTION	CONNECT KVA	PF	CONNECT KW	DEMAND FACTOR	DEMAND KVA
LIGHTING & APPLIANCES	27.30	1.0		1.25	35
RECEPT (UNDER 10 KVA)		1.0		100	
RECEPT (EXCESS OF 10 KVA)		1.0		50	
ELECTRICAL HEAT		1.0		100	
OTHER EQUIPMENT,		0.9		100	
MISC.		0.9		100	
TOTAL KVA		0.94			35
TOTAL AMPS					97

\* PANEL LP SHALL BE PROTECTED WITH 3P-200A CB IN PANEL MDP.



# PANELBOARD SCHEDULE

**PANEL AC** 208/120 **VOLTS**      3 **PHASE**      4 **WIRE**               **AMPS MAIN CB**  
**SOLID NEUTRAL:**       **NEMA TYPE:** 1      600 **MCB/MLO**  
**GROUND BUS**       **A.I.C. SIM** 42000      **STD. FRAME**   
**LOCATION:** ELECTRICAL ROOM      **MOUNTING:** RECESSED  SURFACE

**REMARKS**      HVAC PANEL      (1ST SECTION)

CO	WIRE	#A	#B	#C	LOAD SERVED	C.B. - AMPS				A	B	C	C.B. - AMPS				LOAD SERVED	#A	#B	#C	WIRE	CO
						P	TRIP	FRAME	NO.				NO.	FRAME	TRIP	P						
1/2	#10	1			AC-2	2	25	100	1			2	100	20	1	FAN	.6			#12	1/2	
↓	↓		1		↓	↓	↓	↓	3			4	100	20	1	FAN		.6		#12	1/2	
3/4	#12			1	WH-1	2	15	100	5			6	100	20	1	FAN			.6	#12	1/2	
↓	↓	1			↓	↓	↓	↓	7			8	100	20	1	FAN	.6			#12	1/2	
3/4	#12			1	WH-1	2	15	100	9			10	100	30	2	HP-4		2		#8	1	
↓	↓			1	↓	↓	↓	↓	11			12	↓	↓	↓	↓	↓		2	↓	↓	
3/4	#10	2.5			WH-2	2	30	100	13			14	100	80	3	HP-5	7			#3	2	
↓	↓		2.5		↓	↓	↓	↓	15			16	↓	↓	↓	↓	↓		7	↓	↓	
1/2	#12			.6	AC-1	2	15	100	17			18	↓	↓	↓	↓	↓		7	↓	↓	
↓	↓	.6			↓	↓	↓	↓	19			20	100	25	2	CU-1	.8			#12	1/2	
1	#8		2		HP-1	2	30	100	21			22	↓	↓	↓	↓	↓		.8	↓	↓	
↓	↓		2		↓	↓	↓	↓	23			24	100	45	2	CU-2A			3	#8	1	
1	#8	4			HP-2A	3	45	100	25			26	↓	↓	↓	↓	↓		3	↓	↓	
↓	↓		4		↓	↓	↓	↓	27			28	100	45	2	CU-2B			3	↓	↓	
↓	↓		4		↓	↓	↓	↓	29			30	↓	↓	↓	↓	↓		3	↓	↓	
1	#8	4			HP-2B	3	45	100	31			32	100	35	2	SPARE						
↓	↓		4		↓	↓	↓	↓	33			34	↓	↓	↓	↓	↓					
↓	↓		4		↓	↓	↓	↓	35			36	100	20	1	SPARE						
					SPARE	2	15	100	37			38	100	25	2	CU-4	1			#10	1/2	
↓	↓				↓	↓	↓	↓	39			40	↓	↓	↓	↓	↓		1	↓	↓	
1/2	#10			.6	FAN	1	20	100	41			42	100	20	1	FAN			.6	#12	1/2	

# PANELBOARD SCHEDULE

PANEL AC 208/120 VOLTS 3 PHASE 4 WIRE          AMPS MAIN CB  
 SOLID NEUTRAL:  NEMA TYPE: 1 600 MCB/MLO  
 GROUND BUS  A.I.C. SEM 42000 STD. FRAME   
 LOCATION: ELECTRICAL ROOM MOUNTING: RECESSED  SURFACE

REMARKS HVAC PANEL 2ND SECTION

CO	WIRE	ØA	ØB	ØC	LOAD SERVED	C.B. - AMPS			A	B	C	C.B. - AMPS			LOAD SERVED	ØA	ØB	ØC	WIRE	CO	
						P	T	F				NO. FRAME	T	P							NO. FRAME
1/4	#6	4			CU-5	2	60	100	43			44	200	150	3	CU-CV1	12			#1/0	3
			4						45			46					12				
3/4	#10			1	CU-AC	2	35	100	47			48						12			
		1							49			50	200	150	3	CU-CV2	11			#1/0	3
3/4	#10			1	CU-AC	2	35	100	51			52						11			
				1					53			54							11		
3/4	#10	1			CU-AC	2	35	100	55			56	100	20	2	WH-1	1			#12	1/2
			1						57			58						1			
1/2	#10			2.5	CUH	2	30	100	59			60	100	30	2	WH-2			2.5	#10	1/2
		2.5							61			62						2.5			
1/2	#12		.6		HWH	1	20	100	63			64	100	45	3	HP-3A		4		#8	1
1/2	#12		.6		HWH	1	20	100	65			66							4		
1/2	#12	.6			HWH	1	20	100	67			68						4			
1/2	#12		.6		HWH	1	20	100	69			70	100	45	3	HP-3B		4		#8	1
1/2	#12		.6		PUMP	1	20	100	71			72							4		
1/2	#10	.6			PUMP	1	30	100	73			74						4			
1/2	#12		1		UH-1	2	20	100	75			76	100	45	2	CU-3A		3		#8	1
			1						77			78							3		
1/2	#10	.6			FAN	1	20	100	79			80	100	45	2	CU-3B	3			#8	1
1/2	#12		.6		SUMP	1	20	100	81			82							3		
1/2	#10		.6		FAN	1	20	100	83			84	100	20	1	FAN			.6	#12	1/2

ØA=                      KVA                      ØB=                      KVA                      ØC=                      KVA

LOAD DESCRIPTION	CONNECT KVA	PF	CONNECT KW	DEMAND FACTOR	DEMAND KVA
LIGHTING & APPLIANCES		1.0		1.25	
RECEPT (UNDER 10 KVA)		1.0		100	
RECEPT (EXCESS OF 10 KVA)		1.0		50	
ELECTRICAL HEAT WINTER	88	1.0		100	88
HVAC, SUMMER	116	0.9		100	116
MISC.	8	0.9		100	8
TOTAL KVA	212	0.94			124
TOTAL AMPS	589				344

\* PANEL AC SHALL BE PROTECTED WITH 3P-600A CB IN PANEL MDP.



# PANELBOARD SCHEDULE

**PANEL KP** 208/120 **VOLTS**      3 **PHASE**      4 **WIRE**             **AMPS MAIN CB**  
**SOLID NEUTRAL:**       **NEMA TYPE:** 1      125 **MCB/MLO**  
**GROUND BUS**       **A.I.C. SIM** 10000      **STD. FRAME**   
**LOCATION:** KITCHEN      **MOUNTING:** RECESSED  SURFACE

**REMARKS**      KITCHEN PANEL

CO	WIRE	ØA	ØB	ØC	LOAD SERVED	C.B. - AMPS			A	B	C	C.B. - AMPS			LOAD SERVED	ØA	ØB	ØC	WIRE	CO	
						F	T	P				NO.	FRAME	F							T
1/2	#12	.9			E052	1	15	100	1			2	100	20	1	GFI	1.5			#12	1/2
1/2	#12		1.3		E053	1	15	100	3			4	100	20	1	GFI		1.5		#12	1/2
					SPACE				5			6	100	20	1	GFI			1.5	#12	1/2
1/2	#12	1			E144	1	20	100	7			8				SPACE					
1/2	#12		1		E111	2	20	100	9			10									
↓	↓			1	↓	↓	↓	↓	11			12									
1/2	#12	.9			E143	1	15	100	13			14									
1/2	#12		1		E148	1	20	100	15			16									
1/2	#12		.6		E118	1	15	100	17			18									
1/2	#10	3			E115	2	30	100	19			20									
↓	↓		3		↓	↓	↓	↓	21			22									
1/2	#12		.8		LIGHT	1	20	100	23			24									
					SPACE				25			26									
									27			28									
									29			30									

ØA=                      KVA                      ØB=                      KVA                      ØC=                      KVA

LOAD DESCRIPTION	CONNECT KVA	PF	CONNECT KW	DEMAND FACTOR	DEMAND KVA
LIGHTING & APPLIANCES	2.0	1.0		1.25	2.50
RECEPT (UNDER 10 KVA)		1.0		100	
RECEPT (EXCESS OF 10 KVA)		1.0		50	
ELECTRICAL HEAT		1.0		100	
OTHER EQUIPMENT, KITCHEN	18	0.9		65	12
MISC.		0.9		100	
TOTAL KVA		0.94			15
TOTAL AMPS					41

\* STAINLESS STEEL FRAME & DOOR

\* PANEL KP SHALL BE PROTECTED WITH 3P-100A CB IN PANEL MDP.

## PANELBOARD SCHEDULE

**PANEL EM** 208/120 **VOLTS**    3 **PHASE**    4 **WIRE**         **AMPS MAIN CB**  
**SOLID NEUTRAL:**     **NEMA TYPE:** 12    400 **MCB/MLO**  
**GROUND BUS:**     **A.I.C. SIZE:** 42000    **STD. FRAME:**       
**LOCATION:** MAIN ELECTRICAL ROOM    **MOUNTING:** RECESSED  SURFACE

**REMARKS:** EQUIPMENT PANEL, OR EMERGENCY POWER

CO	WIRE	ØA	ØB	ØC	LOAD SERVED	C.B. - AMPS			A	B	C	C.B. - AMPS			LOAD SERVED	ØA	ØB	ØC	WIRE	CO	
						P	T	N				NO.	FRAME	TRIP							P
1/2	#12	.8			STAIR	1	30	100	1			2	200	200	3	ELEVATOR	14			#3/0	3
1/2	#12		.8		STAIR	1	30	100	3			4					14				
1/2	#12			.6	AC-1	2	15	100	5			6						14			
		.6							7			8	200	200	3	ELEVATOR	14			#3/0	3
1/2	#12		.8		CU-AC	2	25	100	9			10						14			
			.8						11			12						14			
1/2	#12	.6			GFI	1	20	100	13			14	100	20	1	ELEVATOR	.6			#12	1/2
1/2	#12		.6		AC-1	2	15	100	15			16	100	20	1	ELEVATOR		.6		#12	1/2
			.6						17			18	100	20	1	FAN F7A		.8		#12	1/2
1/2	#12	1			DOOR	1	20	100	19			20	100	20	1	FAN F7B	.8			#12	1/2
1/2	#12		1		DOOR	1	20	100	21			22	100	20	1	FAN F7C		.8		#12	1/2
1/2	#10			.6	CU-AC	2	25	100	23			24	100	100	3	PANEL EL			6	#3	2
		.6							25			26					6				
1/2	#10		.6		CU-AC	2	25	100	27			28					6				
1/2	#12			1	COMPRESSOR	1	20	100	29			30	100	20	1	2ND		.6		#12	3/4
1/2	#12	.6			TEL	2	20	100	31			32	100	20	1		.6				
		.6							33			34	100	20	1	3RD		6		#12	3/4
1/2	#12			.6	TEL	1	20	100	35			36	100	20	1			.6			
					SPACE				37			38	100	20	1	4TH	.6			#12	3/4
									39			40	100	20	1			.6			
									41			42				SPACE					

ØA=            KVA            ØB=            KVA            ØC=            KVA

LOAD DESCRIPTION	CONNECT KVA	PF	CONNECT KW	DEMAND FACTOR	DEMAND KVA
LIGHTING & APPLIANCES	1.20	1.0		1.25	1.50
RECEPT (UNDER 10 KVA)	1.60	1.0		100	
PANEL IP & EL	24	1.0		100	24
HVAC	8	1.0		100	8
OTHER EQUIPMENT, (ELEVATORS)	84	0.9		100	95
MISC. (ELEVATOR PIT)	1	0.9		100	1
<b>TOTAL KVA</b>		0.94			139
<b>TOTAL AMPS</b>					386

\* CIRCUIT 2 & 8 SHALL BE SHUNT TRIP BREAKER.

\* CIRCUIT 30, SHALL BE KEY OPERATED.

## PANELBOARD SCHEDULE

PANEL KP 208/120 VOLTS 3 PHASE 4 WIRE        AMPS MAIN CB  
 SOLID NEUTRAL:  NEMA TYPE: 1 125 MCB/MLO  
 GROUND BUS  A.I.C. SIM 10000 STD. FRAME   
 LOCATION: KITCHEN MOUNTING: RECESSED  SURFACE

REMARKS: KITCHEN PANEL

CO	WIRE	ØA	ØB	ØC	LOAD SERVED	C.B. - AMPS			A	B	C	C.B. - AMPS			LOAD SERVED	ØA	ØB	ØC	WIRE	CO	
						TYPE	FRAME	NO.				NO.	FRAME	TYPE							
1/2	#12	.9			E052	1	15	100	1			2	100	20	1	GFI	1.5			#12	1/2
1/2	#12		1.3		E053	1	15	100	3			4	100	20	1	GFI		1.5		#12	1/2
					SPACE				5			6	100	20	1	GFI			1.5	#12	1/2
1/2	#12	1			E144	1	20	100	7			8				SPACE					
1/2	#12		1		E111	2	20	100	9			10									
↓	↓			1	↓	↓	↓	↓	11			12									
1/2	#12	.9			E143	1	15	100	13			14									
1/2	#12		1		E148	1	20	100	15			16									
1/2	#12			.6	E118	1	15	100	17			18									
1/2	#10	3			E115	2	30	100	19			20									
↓	↓		3		↓	↓	↓	↓	21			22									
1/2	#12			.8	LIGHT	1	20	100	23			24									
					SPACE				25			26									
									27			28									
									29			30									

ØA=                      KVA                      ØB=                      KVA                      ØC=                      KVA

LOAD DESCRIPTION	CONNECT KVA	PF	CONNECT KW	DEMAND FACTOR	DEMAND KVA
LIGHTING & APPLIANCES	2.0	1.0		1.25	2.50
RECEPT (UNDER 10 KVA)		1.0		100	
RECEPT (EXCESS OF 10 KVA)		1.0		50	
ELECTRICAL HEAT		1.0		100	
OTHER EQUIPMENT, KITCHEN	18	0.9		65	12
MISC.		0.9		100	
TOTAL KVA		0.94			15
TOTAL AMPS					41

- \* STAINLESS STEEL FRAME & DOOR
- \* PANEL KP SHALL BE PROTECTED WITH 3P-100A CB IN PANEL MDP.

JOB NO- 08-27

# PANELBOARD SCHEDULE

PANEL: L1      208/120 VOLTS      3 PHASE      4 WIRE             AMPERE MAIN CB  
 SOLID NEUTRAL: \_\_\_\_\_      NEMA TYPE: 1      225 MOB/MSD  
 GROUND BUS: \_\_\_\_\_      A.I.C. SET: 10000      SPD. FRAME \_\_\_\_\_  
 LOCATION: ELECTRICAL ROOM      MOUNTING: RECESSED  SURFACE

REMARKS: LIGHTING & APPLIANCE PANEL, 2ND. FLOOR      1ST. SECTION.

CO	WIRE	EA	EB	EC	LOAD SERVED	C.B. - AMPERE			A	B	C	C.B. - AMPERE			EA	EB	EC	WIRE	CO	
						FT	FT	FRAM. NO.				NO. FRAM.	TYPE	TYPE						
1/2	#12	1			CORRIDOR L	1	20	100	1			2	100	20	1	ROOMS L & R	1.2		#12	1/2
1/2	#12		1		CORRIDOR L	1	20	100	3			4	100	20	1	ROOMS - GFI		1.5	#12	1/2
1/2	#12			1	CORRIDOR R	1	20	100	5			6	100	20	1	ROOMS - S.C.		1.5	#12	1/2
1/2	#12	1			CORRIDOR R	1	20	100	7			8	100	20	1	ROOMS L & R	1.2		#12	1/2
1/2	#12		1		CORRIDOR R	1	20	100	9			10	100	20	1	ROOMS - GFI		1.5	#12	1/2
1/2	#12			1	CORRIDOR R	1	20	100	11			12	100	20	1	ROOMS - S.C.		1.5	#12	1/2
1/2	#12	1.2			ROOMS L & R	1	20	100	13			14	100	20	1	ROOMS L & R	1.2		#12	1/2
1/2	#12		1.5		ROOMS - GFI	1	20	100	15			16	100	20	1	ROOMS - GFI		1.5	#12	1/2
1/2	#12			1.5	ROOMS - S.C.	1	20	100	17			18	100	20	1	ROOMS - S.C.		1.5	#12	1/2
1/2	#12	1.2			ROOMS L & R	1	20	100	19			20	100	20	1	ROOMS L & R	1.2		#12	1/2
1/2	#12		1.5		ROOMS - GFI	1	20	100	21			22	100	20	1	ROOMS - GFI		1.5	#12	1/2
1/2	#12			1.5	ROOMS - S.C.	1	20	100	23			24	100	20	1	ROOMS - S.C.		1.5	#12	1/2
1/2	#12	1.2			ROOMS L & R	1	20	100	25			26	100	20	1	ROOMS L & R	1.2		#12	1/2
1/2	#12		1.5		ROOMS - GFI	1	20	100	27			28	100	20	1	ROOMS - GFI		1.5	#12	1/2
1/2	#12			1.5	ROOMS - S.C.	1	20	100	29			30	100	20	1	ROOMS L & R		1.2	#12	1/2
1/2	#12	1.2			ROOMS L & R	1	20	100	31			32	100	20	1	ROOMS - GFI	1.5		#12	1/2
1/2	#12		1.5		ROOMS - GFI	1	20	100	33			34	100	20	1	ROOMS L & R		1.2	#12	1/2
1/2	#12			1.5	ROOMS - S.C.	1	20	100	35			36	100	20	1	ROOMS - GFI		1.5	#12	1/2
1/2	#12	1.2			ROOMS L & R	1	20	100	37			38	100	20	1	ROOMS L & R	1.2		#12	1/2
1/2	#12		1.5		ROOMS - GFI	1	20	100	39			40	100	20	1	ROOMS - GFI		1.5	#12	1/2
1/2	#12			1.5	ROOMS - S.C.	1	20	100	41			42	100	20	1	SPARE				

## PANELBOARD SCHEDULE

**PANEL:** L1      208/120 **VOLTS**      3 **PHASE**      4 **WIRE**               **AMPS MAIN CB**  
**SOLID NEUTRAL:**       **NEMA TYPE:** 1      225 **MCB/MD**  
**GROUND BUS:**       **A.I.C. RAT:** 10000      **SEP. FRAME:**   
**LOCATION:** ELECTRICAL ROOM      **MOUNTING:** RECESSED  SURFACE

**REMARKS:** LIGHTING & APPLIANCE PANEL, 2ND. FLOOR      2ND. SECTION.

C/O	WIRE	ØA	ØB	ØC	LOAD	SERVVD	CB - AMPS			A	B	CB - AMPS			ØA	ØB	ØC	WIRE	C/O		
							P	R	I			P	R	I							
1/2	#12	1.2			ROOMS L & R	1	20	100	43			44	100	20	1	ROOMS L & R	1.2			#12	1/2
1/2	#12		1.5		ROOMS - GFI	1	20	100	45			46	100	20	1	ROOMS - GFI		1.5		#12	1/2
1/2	#12			1.2	ROOMS L & R	1	20	100	47			48	100	20	1	ROOMS L & R			1.2	#12	1/2
1/2	#12	1.5			ROOMS - GFI	1	20	100	49			50	100	20	1	ROOMS - GFI	1.5			#12	1/2
1/2	#12		1.2		ROOMS L & R	1	20	100	51			52	100	20	1	ROOMS L & R			1.2	#12	1/2
1/2	#12			1.5	ROOMS - GFI	1	20	100	53			54	100	20	1	ROOMS - GFI			1.5	#12	1/2
1/2	#12	1.2			ROOMS L & R	1	20	100	55			56	100	20	1	ROOMS L & R	1.2			#12	1/2
1/2	#12		1.5		ROOMS - GFI	1	20	100	57			58	100	20	1	ROOMS - GFI			1.5	#12	1/2
1/2	#12			1.2	ROOMS L & R	1	20	100	59			60	100	20	1	ROOMS L & R			1.2	#12	1/2
1/2	#12	1.5			ROOMS - GFI	1	20	100	61			62	100	20	1	ROOMS - GFI	1.5			#12	1/2
1/2	#12		1.2		ROOMS L & R	1	20	100	63			64	100	20	1	ROOMS L & R			1.2	#12	1/2
1/2	#12			1.5	ROOMS - GFI	1	20	100	65			66	100	20	1	ROOMS - GFI			1.5	#12	1/2
1/2	#12	1.2			ROOMS L & R	1	20	100	67			68	100	20	1	ROOMS L & R	1.2			#12	1/2
1/2	#12		1.5		ROOMS - GFI	1	20	100	69			70	100	20	1	ROOMS - GFI			1.5	#12	1/2
1/2	#12			1.2	ROOMS L & R	1	20	100	71			72	100	20	1	ROOMS L & R			1.2	#12	1/2
1/2	#12	1.5			ROOMS - GFI	1	20	100	73			74	100	20	1	ROOMS - GFI	1.5			#12	1/2
1/2	#12		.6		VEND	1	20	100	75			76				SPACE					
1/2	#12			.6	VEND	1	20	100	77			78									
					SPACE				79			80									
									81			82									
									83			84									

ØA=      KVA      ØB=      KVA      ØC=      KVA

LOAD DESCRIPTION	CORRECT KVA	PF	CORRECT KW	DEMAND FACTOR	DEMAND KVA
LIGHTING & APPLIANCES	81	1.0		1.25	34
RECEPT (UNDER 10 KVA)		1.0		100	
RECEPT (EXCESS OF 10 KVA)		1.0		50	
ELECTRICAL HEAT		1.0		100	
OTHER EQUIPMENT		0.9		100	
MISC.	20	0.9		100	20
<b>TOTAL KVA</b>	<b>100</b>	<b>0.94</b>			<b>54</b>
<b>TOTAL AMPS</b>	<b>277</b>				<b>150</b>

- \* PANELS L2, L3, & L4 ARE SIMILAR TO L1.
- \* UN-USED CIRCUITS @ EACH PANEL SHALL BE CONSIDERED AS SPARE.
- \* ALL CIRCUIT BREAKERS SERVING BEDROOMS & SLEEPING AREAS SHALL BE ARC FAULT INTERRUPTER TYPE.
- \* L & R = LIGHTINGS AND RECEPTACLES      \* PROVIDE ALTERNATE ADD ON FOR PROVISION OF ARC FAULT CB'S FOR SLEEPING AREAS IF REQUIRED BY LOCAL CODES.
- \* S.C. = SERVICE COUNTER
- \* GFI = BATHROOM GFI
- \* EACH PANEL SHALL BE PROTECTED WITH 3P-200A CB IN PANEL MDP.

<b>PANELBOARD SCHEDULE</b>															
PANEL <u>P1</u>		<u>208/120</u> VOLTS				<u>3</u> PHASE		<u>4</u> WIRE		AMPS MAIN CB <u>400</u>				MCB/MLO	
SOLID NEUTRAL: <input checked="" type="checkbox"/>		GROUND BUS: _____				NEMA TYPE: <u>1</u>		A.I.C. SIZE: <u>10000</u>		STD. FRAME: <input checked="" type="checkbox"/>				MOUNTING: RECESSED <input type="checkbox"/> SURFACE <input checked="" type="checkbox"/>	
LOCATION: <u>ELECTRICAL ROOM</u>		REMARKS: EQUIPMENT PANEL 2ND. FLOOR 2ND. SECTION													
CO	WIRE	∅A	∅B	∅C	LOAD SERVED	PHASE	BEAM NO.	NO.	∅A	∅B	∅C	WIRE	CO		
1/2	#12	1.5			PTAC	2	20	100	43				1/2		
			1.5						45						
1/2	#12			1.5	PTAC	2	20	100	47				1/2		
			1.5						49						
1/2	#12			1.5	PTAC	2	20	100	51				1/2		
			1.5						53						
1/2	#12	1.5			PTAC	2	20	100	55				1/2		
			1.5						57						
1/2	#12			1.5	PTAC	2	20	100	59				1/2		
			1.5						61						
1/2	#12			1.5	PTAC	2	20	100	63				1/2		
			1.5						65						
1/2	#12	1.5			PTAC	2	20	100	67				1/2		
			1.5						69						
1/2	#12	1.5			PTAC	2	20	100	71				1/2		
			1.5						73						
1/2	#12	1.5			PTAC	2	20	100	75				1/2		
			1.5						77						
					SPACE				79						
									81						
									83						

∅A=	KVA	∅B=	KVA	∅C=	KVA
LOAD DESCRIPTION	CORRECT KVA	PF	CORRECT KW	DEMAND FACTOR	DEMAND KVA
LIGHTING & APPLIANCES		1.0		1.25	
RECEPT (UNDER 10 KVA)		1.0		100	
RECEPT (EXCESS OF 10 KVA)		1.0		50	
ELECTRICAL HEAT PTACS	90	1.0		100	90
OTHER EQUIPMENT,		0.9		100	
MISC. FNAS, HEAT	10	0.9		100	10
TOTAL KVA		0.94			100
TOTAL AMPS					277

- \* PANEL P2, P3, & P4 ARE SIMILAR TO P1.
- UN-USED CIRCUITS @ EACH PANEL SHALL BE CONSIDERED AS SPARE.
- \* EACH PANEL SHALL BE PROTECTED WITH 3P-300A CB IN PANEL MDP.
- \* CONTRACTOR RESPONSIBLE TO POWER EVERYTHING IN THE BUILDING INCLUDING CIRCUITS & PANELS AS REQUIRED.
- \* CONTRACTOR RESPONSIBLE TO PROVIDE & INSTALL PANELS AS NEEDED EVEN IF MISSED ON THESE PANEL SCHEDULES. NO EXTRA COST TO OWNER.

# PANELBOARD SCHEDULE

**PANEL:** P1      208/120 **VOLTS**      3 **PHASE**      4 **WIRE**             **AMPS MAIN CB**  
**SOLID NEUTRAL:**       **NEUMA TYPE:** 1      400 **MCB/MSB**  
**GROUND BUS:**       **A.I.C. SIZE:** 10000      **STD. FRAME:**         
**LOCATION:** ELECTRICAL ROOM      **MOUNTING:**  RECESSED       SURFACE

**REMARKS:** EQUIPMENT PANEL 2ND FLOOR      1ST. SECTION.

CO	WIRE	EA	EB	EC	LOAD SERVED	C.B. - AMPS			A	B	C	C.B. - AMPS			LOAD SERVED	EA	EB	EC	WIRE	CO	
						PHASE	FRAME	NO.				NO.	FRAME	TYPE							IP
1/2	#12	1.5			PTAC	1	20	100	1			2	100	20	2	PTAC	1.5			#12	1/2
↓	↓		1.5		↓	↓	↓	↓	3			4	↓	↓	↓	↓		1.5		↓	↓
1/2	#12			1.5	PTAC	2	20	100	5			6	100	20	2	PTAC			1.5	#12	1/2
↓	↓	1.5			↓	↓	↓	↓	7			8	↓	↓	↓	↓		1.5		↓	↓
1/2	#12			1.5	PTAC	2	20	100	9			10	100	20	2	PTAC			1.5	#12	1/2
↓	↓			1.5	↓	↓	↓	↓	11			12	↓	↓	↓	↓		1.5		↓	↓
1/2	#12	1.5			PTAC	2	20	100	13			14	100	20	2	PTAC	1.5			#12	1/2
↓	↓		1.5		↓	↓	↓	↓	15			16	↓	↓	↓	↓		1.5		↓	↓
1/2	#12			1.5	PTAC	2	20	100	17			18	100	20	2	PTAC			1.5	#12	1/2
↓	↓	1.5			↓	↓	↓	↓	19			20	↓	↓	↓	↓		1.5		↓	↓
1/2	#12			1.5	PTAC	2	20	100	21			22	100	20	2	PTAC			1.5	#12	1/2
↓	↓			1.5	↓	↓	↓	↓	23			24	↓	↓	↓	↓		1.5		↓	↓
1/2	#12	1.5			PTAC	2	20	100	25			26	100	20	2	PTAC	1.5			#12	1/2
↓	↓		1.5		↓	↓	↓	↓	27			28	↓	↓	↓	↓		1.5		↓	↓
1/2	#12			1.5	PTAC	2	20	100	29			30	100	20	2	PTAC			1.5	#12	1/2
↓	↓	1.5			↓	↓	↓	↓	31			32	↓	↓	↓	↓		1.5		↓	↓
1/2	#12			1.5	PTAC	2	20	100	33			34	100	20	2	PTAC			1.5	#12	1/2
↓	↓			1.5	↓	↓	↓	↓	35			36	↓	↓	↓	↓		1.5		↓	↓
1/2	#12	1.5			PTAC	2	20	100	37			38	100	20	2	PTAC	1.5			#12	1/2
↓	↓			1.5	↓	↓	↓	↓	39			40	↓	↓	↓	↓		1.5		↓	↓
1/2	#12			.6	FAN	1	20	100	41			42	100	20	1	FAN			.6	#12	1/2

# PANELBOARD SCHEDULE

**PANEL RP** 208/120 **VOLTS**      3 **PHASE**      4 **WIRE**               **AMPS MAIN CB**  
**SOLID NEUTRAL:**       **NEMA TYPE:** 1      225 **MCB/BLD**  
**GROUND BUS**       **A.I.C. SET** 10000      **STD. FRAME**   
**LOCATION:** 4TH FLOOR ELECTRICAL ROOM      **MOUNTING:** RECESSED  SURFACE

**REMARKS**      ROOF EQUIPMENT PANEL

CO	WIRE	øA	øB	øC	LOAD SERVED	C.B. - AMPS			A	B	C	C.B. - AMPS			LOAD SERVED	øA	øB	øC	WIRE	CO	
						PI	TRIP	FRAME NO.				NO.	FRAME	TRIP							PI
1	#8	2			CV-1	3	40	40	1			2	100	20	1	FAN F2	.6			#12	1/2
↓	↓		2		↓	↓	↓	↓	3			4	100	20	1	FAN F2		.6		#12	1/2
↓	↓			2	↓	↓	↓	↓	5			6	100	20	1	FAN F2			.6	#12	1/2
1	#8	2			CV-2	3	40	40	7			8	100	20	1	SIGN	1.2			#12	3/4
↓	↓		2		↓	↓	↓	↓	9			10	100	20	1	SIGN		1.2		#12	↓
↓	↓			2	↓	↓	↓	↓	11			12	100	20	1	SIGN			1.2	#12	3/4
1/2	#12	1			LIGHT	1	20	100	13			14	100	20	1	SIGN	1.2			#12	↓
1/2	#12		1		GFI/WP	1	20	100	15			16	100	20	1	SIGN		1.2		#12	3/4
1/2	#12			1	GFI/WP	1	20	100	17			18	100	20	1	SIGN			1.2	#12	↓
					SPACE				19			20	100	20	1	SIGN	1.2			#12	3/4
									21			22	100	20	1	SIGN		1.2		#12	↓
									23			24				SPACE					

øA=                      KVA                      øB=                      KVA                      øC=                      KVA

LOAD DESCRIPTION	CORRECT KVA	PF	CORRECT KW	DEMAND FACTOR	DEMAND KVA
LIGHTING & APPLIANCES	4	1.0		1.25	5
RECEPT (UNDER 10 KVA)		1.0		100	
RECEPT (EXCESS OF 10 KVA)		1.0		50	
ELECTRICAL HEAT		1.0		100	
OTHER EQUIPMENT,	18	0.9		100	18
MISC. SIGNS	56	0.9		100	9.60
TOTAL KVA		0.94			33
TOTAL AMPS					91

\* ALL SIGN CIRCUITS SHALL OPERATE BY A PHOTOCELL & HOA SWITCH. SEE DETAILS.

\* PANEL SHALL BE PROTECTED WITH 3P-200A CB IN PANEL MDP.



## PANELBOARD SCHEDULE

**PANEL HP** 208/120 **VOLTS**    3 **PHASE**    4 **WIRE**    225 **AMPS MAIN CB**  
**SOLID NEUTRAL**     **NEMA TYPE** 1    **MCB/ULC**   
**GROUND BUS**     **A.I.C. SET** 10000    **STD. FRAME**   
**LOCATION** LAUNDRY    **MOUNTING** RECESSED  SURFACE

**REMARKS** HOUSE KEEPING PANEL

CO	WIRE	ØA	ØB	ØC	LOAD SERVED	C.B. - AMPS			A	B	C	C.B. - AMPS			LOAD SERVED	ØA	ØB	ØC	WIRE	CO	
						PT	NO.	FRAME NO.				NO.	FRAME NO.	PT							NO.
3/4	#10	3			WASHER	3	30	100	1			2	100	60	3	IRONER	6			#6	1/4
			3						3			4					6				
				3					5			6					6				
3/4	#10	3			WASHER	3	30	100	7			8	100	30	2	DW	1.5			#10	3/4
			3						9			10					1.5				
				3					11			12	100	20	1	RECEP LOUNGE		.6		#12	1/2
1/2	#12	1			DRYER	3	20	100	13			14	100	20	1	LIGHT LAUNDRY	1.6			#12	1/2
			1						15			16	100	20	1	LIGHT LOUNGE		1		#12	1/2
				1					17			18				SPACE					
1/2	#12	1			DRYER	3	20	100	19			20									
			1						21			22									
				1					23			24									
1/2	#12	1.5			GFI	1	20	100	25			26									
1/2	#12		.6		D.P	1	15	100	27			28									
1/2	#12			1.5	GFI	1	20	100	29			30									
1/2	#12	1.5			GFI	1	20	100	31			32									
					SPACE				33			34									
									35			36									
									37			38									
									39			40									
									41			42									

ØA=                      KVA                      ØB=                      KVA                      ØC=                      KVA

LOAD DESCRIPTION	CONNECT KVA	PF	CONNECT KW	DEMAND FACTOR	DEMAND KVA
LIGHTING & APPLIANCES	8	1.0		1.25	10
RECEPT (UNDER 10 KVA)		1.0		100	
RECEPT (EXCESS OF 10 KVA)		1.0		50	
ELECTRICAL HEAT		1.0		100	
OTHER EQUIPMENT, LAUNDRY	42	0.9		100	42
MISC.	56	0.9		100	
TOTAL KVA		0.94			52
TOTAL AMPS					144

\* PANEL SHALL BE PROTECTED WITH 3P-200A CB IN PANEL MDP.

# PANELBOARD SCHEDULE

**PANEL/SP** 208/120 **VOIDS** 3 **PHASE** 4 **WIRING** AMPS MAIN CB  
**SOLID MATERIAL:** \_\_\_\_\_ **TRMA TYPE:** 1 125 **MOB/ALO**  
**GROUND BUS:** \_\_\_\_\_ **A.I.C. SIZE:** 42000 **STD. FRAME**   
**LOCATION:** ELECTRICAL ROOM **MOUNTING:** RECESSED  SURFACE

**REMARKS:** SITE LIGHTING PANEL

CO	WIRING	ØA	ØB	ØC	LOAD SERVED	C.B. - AMPS			A	B	C	C.B. - AMPS			LOAD SERVED	ØA	ØB	ØC	WIRING	CO	
						PIPS	FRAME	NO.				NO.	FRAME	NO.							
1/4	#6	.8			UPLIGHT	2	20	100	1			2	100	20	1	CANOPY	1.8			#8	1
			.8						3			4	100	20	1	CANOPY		1.8		#8	
	#6			.8	UP LIGHT	2	20	100	5			6	100	20	1	BOLLARD			1	#6	1/4
		.8							7			8	100	20	2	UPLIGHT	.8			#6	1/4
					SPARE	1	20	100	9			10						.8			
2	#6			1.5	POLE	2	20	100	11			12				SPACE					
		1.5							13			14									
2	#6			1.5	POLE	2	20	100	15			16									
				1.5					17			18									
1/4	#6	1.2			SIGN	1	20	100	19			20									
			1.2		SIGN	1	20	100	21			22									
2	#6			1.5	POLE	2	20	100	23			24									
		1.5							25			26									
2	#6			1.5	POLE	2	20	100	27			28									
				1.5					29			30									

ØA=                      KVA                      ØB=                      KVA                      ØC=                      KVA

LOAD DESCRIPTION	CONNECT KVA	PF	CONNECT KW	DEMAND FACTOR	DEMAND KVA
LIGHTING & APPLIANCES	24	1.0		1.25	30
RECEPT (UNDER 10 KVA)		1.0		100	
RECEPT (EXCESS OF 10 KVA)		1.0		50	
ELECTRICAL HEAT		1.0		100	
OTHER EQUIPMENT,		0.9		100	
MISC.		0.9		100	30
TOTAL KVA		0.94			30
TOTAL AMPS					83

- \* UNUSED CIRCUITS SHALL BE USED AS SPARE.                      \* PANEL SHALL BE PROTECTED WITH 3P-100A CB IN PANEL MDP.
- \* FOR EXTERIOR LIGHTING CONTROLS SEE SITE PLAN. ALL LIGHT FIXTURES WILL BE CONTROLLED BY PHOTOCELL VIA SWITCHES.

## PANELBOARD SCHEDULE

**PANEL PP** 208/120 **VOLTS**    3 **PHASE**    4 **WIRE**           **AMPS MAIN CB**  
**SOLID NEUTRAL**     **NEKA TYPE** 12    225 **MOB/MLO**  
**GROUND BUS**     **A.I.C. SIZE** 10000    **STD. FRAME**   
**LOCATION** POOL EQUIPMENT ROOM    **MOUNTING** RECESSED  SURFACE

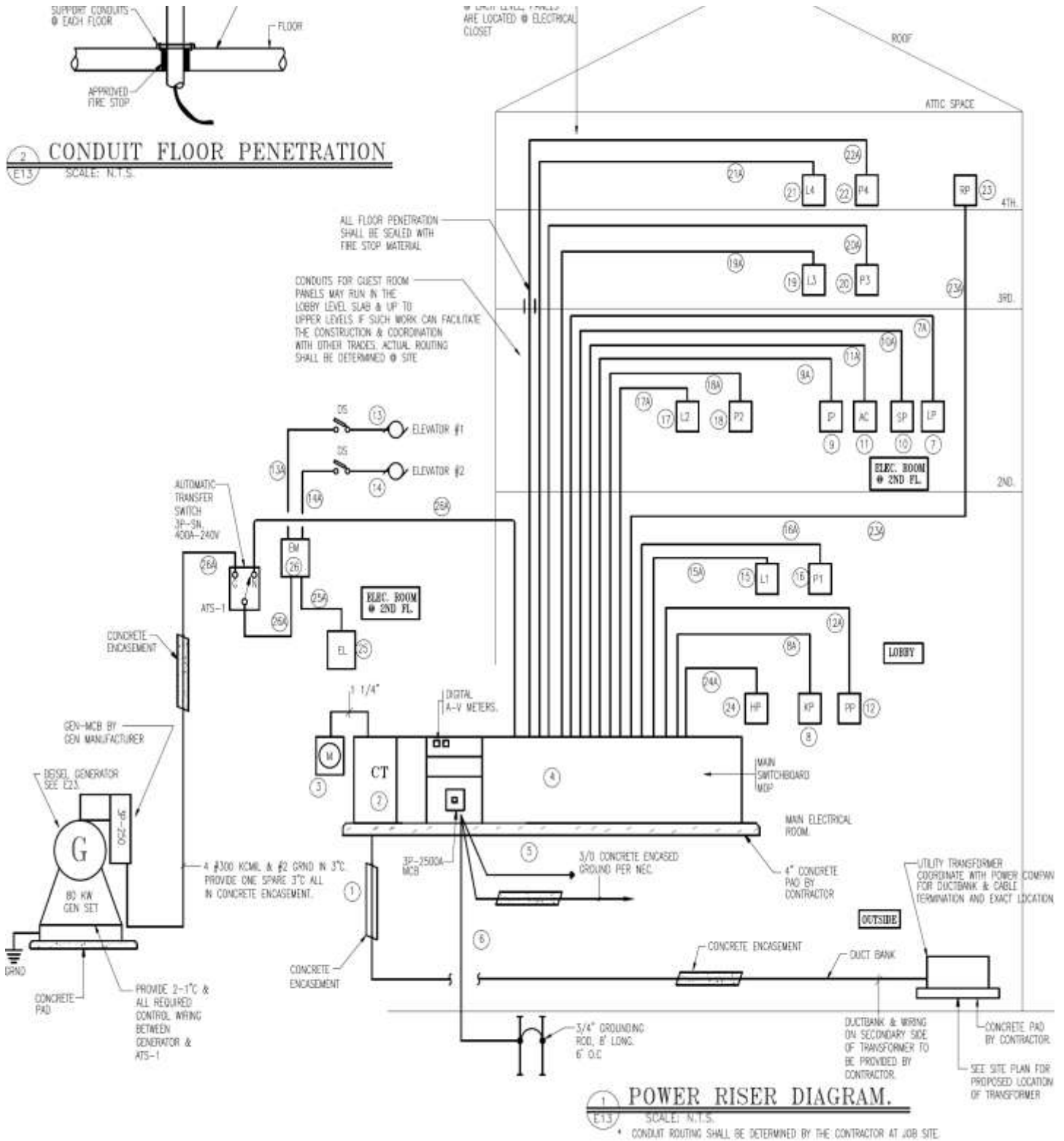
**REMARKS**

CO	WIRE	ØA	ØB	ØC	LOAD SERVED	C.B. - AMPS			A	B	C	C.B. - AMPS			LOAD SERVED	ØA	ØB	ØC	WIRE	CO	
						1	2	3				1	2	3							
1/2	#12	.6			FAN	1	20	100	1			2	100	20	1	EWC	.6			#12	1/2
1/2	#12		.6		HEATER	1	20	100	3			4	100	20	1	GFI		.8		#12	1/2
1/2	#12			.6	HEATER	1	20	100	6			6	100	20	2	UH-1			1	#12	1/2
1/2	#12	.6			PUMP	2	20	100	7			8									
			.6						9			10	100	20	1	GFI		.6		#12	1/2
1/2	#10			.6	PUMP	2	30	100	11			12	100	100	3	DH-1			6	#3	2
			.6						13			14						6			
1/2	#12		.6		FAN	1	20	100	15			16							6		
1/2	#12			1	LIGHT	1	20	100	17			18	100	20	3	CU-DH			1	1/2	#12
1/2	#12	1			LIGHT	1	20	100	19			20							1		
1/2	#12		1		U.W	1	20	100	21			22							1		
1/2	#12			1	U.W	1	20	100	23			24				SPACE					
					SPACE				25			26									
									27			28									
									29			30									
									31			32									
									33			34									
									35			36									
									37			38									
									39			40									
									41			42									

ØA=                    KVA
ØB=                    KVA
ØC=                    KVA

LOAD DESCRIPTION	CONNECT KVA	PF	CONNECT KW	DEMAND FACTOR	DEMAND KVA
LIGHTING & APPLIANCES	6	1.0		1.25	7.50
RECEPT (UNDER 10 KVA)		1.0		100	
RECEPT (EXCESS OF 10 KVA)		1.0		50	
ELECTRICAL HEAT		1.0		100	
OTHER EQUIPMENT, HVAC	21	0.9		100	21
MISC. POOL	5	0.9		100	5
TOTAL KVA		0.94			34
TOTAL AMPS					94

- \* POOL PANEL SHALL BE PROTECTED WITH 3P-200A CB IN PANEL MDP.
- \* ALL CB'S FEEDING LIGHTING (CEILING, UNDER WATER) SHALL BE GFI TYPE.
- \* ALL CB'S FEEDING POOL FILTRATION & PUMPING EQUIPMENT SHALL BE GFI TYPE.



## **SECTION 26 28 16 (16410) - ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

### **PART 1 GENERAL**

#### 1.01 SUMMARY

##### A. Section Includes:

1. Individually Mounted Switches and Circuit Breakers Used for the following:
  - a. Service Disconnect Switches.
  - b. Feeder And Equipment Disconnect Switches.
  - c. Feeder Branch-Circuit Protection.
  - d. Motor Disconnect Switches.

##### B. Related Sections:

1. Section 26 05 19 (16490) - Low-Voltage Electrical Power Conductors and Cables: For fuses in fusible disconnect switches.
2. Section 26 05 53 (16075) - Identification for Electrical Systems.
3. Section 26 24 00 (16440) - Switchboards and Panelboards: For individually enclosed, fused power-circuit devices used as feeder disconnect switches.
4. Section 26 27 26 (16140) - Wiring Devices: For attachment plugs and receptacles, and snap switches used for disconnect switches.

#### 1.02 SUBMITTALS

##### A. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) indicating specified items selected for use in Project with the following supporting data:

1. Product Data:
  - a. Descriptive data and time-current curves.
  - b. Let-through current curves for circuit breakers with current-limiting characteristics.
  - c. Coordination charts and tables and related data.
2. Wiring diagrams detailing wiring for power and control systems and differentiating between manufacturer-installed and field-installed wiring.
3. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of owners representative and owners, and other information specified.
4. Field test reports indicating and interpreting test results.
5. Maintenance data for tripping devices to include in the operation and maintenance manual specified in Division 01.

#### 1.03 QUALITY ASSURANCE

##### A. Testing Agency Qualifications: In addition to the requirements specified in Section 01 45 00 - "Quality Control," an independent testing agency shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or shall be a full member company of the InterNational Electrical Testing Association (NETA).

▪ **SECTION 26 28 16 (16410) - ENCLOSED SWITCHES AND CIRCUIT BREAKERS**▪

▪ **PAGE 1** ▪

1. Testing Agency's Field Supervisor: Person currently certified by NETA or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.
- B. Source Limitations: Obtain disconnect switches and circuit breakers from one source and by a single manufacturer.
- C. Comply with NFPA 70 for components and installation.
- D. Listing and Labeling: Provide disconnect switches and circuit breakers specified in this Section that are listed and labeled.
  1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
  2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Avendra, LLC Preferred Manufacturers:
  1. Disconnect Switches:
    - a. None
  2. Fusible Switches:
    - a. None
  3. Molded-Case Circuit Breakers:
    - a. None
  4. Combination Circuit Breaker and Ground Fault Trip:
    - a. None
  5. Molded-Case, Current-Limiting Circuit Breakers:
    - a. None
- B. Approved Manufacturers:
  1. Disconnect Switches:
    - a. [General Electric Co.; Electrical Distribution and Control Division](#) (888-437-3765)
    - b. [Siemens Energy & Automation, Inc.](#) (800-964-4114)
    - c. [Square D Co.; a Division of Groupe Schneider](#) (888-778-2733)
    - d. [Eaton Corp. Cutler-Hammer Products](#) (800-498-2678)
  2. Fusible Switches:
    - a. [General Electric Co.; Electrical Distribution and Control Division](#) (888-437-3765)
    - b. [Siemens Energy & Automation, Inc.](#) (800-964-4114)
    - c. [Square D Co.; a Division of Groupe Schneider](#) (888-778-2733)
    - d. [Eaton Corp. Cutler-Hammer Products](#) (800-498-2678)
  3. Molded-Case Circuit Breakers:
    - a. [General Electric Co.; Electrical Distribution and Control Division](#) (888-437-3765)

### **▪ SECTION 26 28 16 (16410) - ENCLOSED SWITCHES AND CIRCUIT BREAKERS▪**

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- b. [Siemens Energy & Automation, Inc.](#) (800-964-4114)
  - c. [Square D Co.; a Division of Groupe Schneider](#) (888-778-2733)
  - d. [Eaton Corp. Cutler-Hammer Products](#) (800-498-2678)
4. Combination Circuit Breaker and Ground Fault Trip:
- a. [General Electric Co.; Electrical Distribution and Control Division](#) (888-437-3765)
  - b. [Siemens Energy & Automation, Inc.](#) (800-964-4114)
  - c. [Square D Co.; a Division of Groupe Schneider](#) (888-778-2733)
  - d. [Eaton Corp. Cutler-Hammer Products](#) (800-498-2678)
5. Molded-Case, Current-Limiting Circuit Breakers:
- a. [General Electric Co.; Electrical Distribution and Control Division](#) (888-437-3765)
  - b. [Siemens Energy & Automation, Inc.](#) (800-964-4114)
  - c. [Square D Co.; a Division of Groupe Schneider](#) (888-778-2733)
  - d. [Eaton Corp. Cutler-Hammer Products](#) (800-498-2678)

## 2.02 DISCONNECT SWITCHES

- A. Enclosed, Non-fusible Switch: NEMA KS 1, Type HD, with lockable handle.
- B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position.
- C. Enclosure: NEMA KS 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.
  - 1. Outdoor Locations: Type 3R.
  - 2. Kitchen Areas: Type 4X, stainless steel.
  - 3. Other Wet or Damp Indoor Locations: Type 4.

## 2.03 ENCLOSED CIRCUIT BREAKERS

- A. Enclosed, Molded-Case Circuit Breaker: NEMA AB 1, with lockable handle.
- B. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting rating to meet available fault current.
- C. Application Listing: Appropriate for application, including switching fluorescent lighting loads or heating, air-conditioning, and refrigerating equipment.
- D. Circuit Breakers, 200 A and Larger: Trip units interchangeable within frame size.
- E. Circuit Breakers, 400 A and Larger: Field-adjustable, short-time and continuous-current settings.
- F. Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.
- G. Current Limiters: Where indicated, integral fuse listed for circuit breaker.
- H. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.
- I. Shunt Trip: Where indicated.
- J. Accessories: On drawings.

### ■ SECTION 26 28 16 (16410) - ENCLOSED SWITCHES AND CIRCUIT BREAKERS■



- K. Enclosure: NEMA AB 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.
  - 1. Outdoor Locations: Type 3R.
  - 2. Kitchen Areas: Type 4X, stainless steel.
  - 3. Other Wet or Damp Indoor Locations: Type 4.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install disconnect switches and circuit breakers in locations as indicated, according to manufacturer's written instructions.
- B. Install disconnect switches and circuit breakers level and plumb.
- C. Install wiring between disconnect switches, circuit breakers, control, and indication devices.
- D. Connect disconnect switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer.
  - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- E. Identify each disconnect switch and circuit breaker according to requirements specified in Section 26 05 53 (16075) - "Electrical Identification."

### **3.02 FIELD QUALITY CONTROL**

- A. Testing: After installing disconnect switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
  - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for disconnect switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
- B. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

### **3.03 ADJUSTING**

- A. Set field-adjustable disconnect switches and circuit-breaker trip ranges as indicated or as directed in coordination study report.

### **3.04 CLEANING**

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

## **END OF SECTION**

■ SECTION 26 28 16 (16410) - ENCLOSED SWITCHES AND CIRCUIT BREAKERS■

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## **SECTION 26 24 00 (16440) - SWITCHBOARDS AND PANELBOARDS**

### **PART 1 GENERAL**

#### **1.01 SUMMARY**

**A. Section Includes:**

1. Service And Distribution Sw itchboards Rated 600 V and Less.
2. Load Centers And Panelboards, Overcurrent Protective Devices, And Associated Auxiliary Equipment Rated 600 V and Less For The Following Types:
  - a. Lighting and Appliance Branch-Circuit Panelboards.
  - b. Distribution Panelboards.

**B. Related Sections include the following:**

1. Section 03 30 00 (03300) - Cast-In-Place Concrete.
2. Section 26 05 19 (16490) - Low-Voltage Electrical Power Conductors and Cables.
3. Section 26 05 48 (16071) – Vibration and Seismic Controls for Electrical Work.
4. Section 26 05 53 (16075) – Identification for Electrical Systems.

#### **1.02 DEFINITIONS**

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.
- F. TVSS: Transient voltage surge suppressor.

#### **1.03 SUBMITTALS**

**A. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) indicating specified items selected for Project with the following supporting data:**

**1. Product Data:**

- a. For each type of switchboard, panelboard, overcurrent protective device, TVSS device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

**2. Shop Drawings: For each switchboard, panelboard and related equipment.**

- a. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
  - 1) Enclosure types and details for types other than NEMA 250, Type 1.
  - 2) Bus configuration, current, and voltage ratings.
  - 3) Short-circuit current rating of switchboards and overcurrent protective devices.
  - 4) Descriptive documentation of optional barriers specified for electrical insulation and isolation.

**▪ SECTION 26 24 00 (16440) - SWITCHBOARDS AND PANELBOARDS ▪**

**▪ PAGE 1 ▪**

- 5) Utility company's metering provisions with indication of approval by utility company.
  - 6) UL listing for series rating of installed devices.
  - 7) Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - b. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
  - c. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - d. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
3. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.
  4. Field Test Reports: Submit written test reports and include the following:
    - a. Test procedures used.
    - b. Test results that comply with requirements.
    - c. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
  5. Manufacturer's field service report.
  6. Updated mimic-bus diagram for switchboard reflecting field changes after final switchboard load connections have been made, for record.
  7. Maintenance Data: For Switchboards, Panelboards and components to include in maintenance manuals specified in Division 01. In addition to requirements specified in Division 01 Section "Contract Closeout," include the following:
    - a. Routine maintenance requirements for switchboards and all installed components.
    - b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
    - c. Time-current curves, including selectable ranges for each type of overcurrent protective device.
  8. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

#### 1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency that is a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.
  1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NEMA PB 2 for switchboards.
- D. Comply with NEMA PB1 for panelboards.
- E. Comply with NFPA 70.

▪ SECTION 26 24 00 (16440) - SWITCHBOARDS AND PANELBOARDS ▪

- F. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards, including clearances between switchboards, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in sections of lengths that can be moved past obstructions in delivery path.
- B. Store indoors in clean dry space with uniform temperature to prevent condensation. Protect from exposure to dirt, fumes, water, corrosive substances, and physical damage.
- C. Handle switchboards according to NEMA PB 2.1.

1.06 PROJECT CONDITIONS

- A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.
- B. Environmental Limitations: Rate equipment for continuous operation under the following unless otherwise indicated:
  - 1. Ambient Temperature: Not exceeding 104 deg F.
  - 2. Altitude: Not exceeding 6600 feet.

1.07 COORDINATION

- A. Coordinate layout and installation of switchboards, panelboards, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 03 30 00 (03300) "Cast-in-Place Concrete."

**PART 2 PRODUCT**

2.01 MANUFACTURERS

- A. Avendra, LLC Preferred Manufacturers:
  - 1. Switchboards:
    - a. None.
  - 2. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
    - a. None.
- B. Approved Manufacturers:
  - 1. Switchboards:
    - a. [Eaton Corp.; Cutler-Hammer Products](#) (800-498-2678)
    - b. [General Electric Co.; Electrical Distribution & Control Div.](#) (888-437-3765)
    - c. [Siemens Energy & Automation, Inc.](#) (800-964-4114)
    - d. [Square D Co.; a Division of Groupe Schneider](#) (888-778-2733)
  - 2. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
    - a. [Eaton Corp.; Cutler-Hammer Products](#) (800-498-2678)
    - b. [General Electric Co.; Electrical Distribution & Control Div.](#) (888-437-3765)
    - c. [Siemens Energy & Automation, Inc.](#) (800-864-4114)

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- d. [Square D Co.; a Division of Groupe Schneider](#) (888-778-2733)

## 2.02 SWITCHBOARDS - MANUFACTURED UNITS

- A. Front-Connected, Front-Accessible Switchboard Fixed, individually mounted main device, panel-mounted branches, and sections rear aligned.
- B. Nominal System Voltage: 208 Y/120 V.

## 2.03 SWITCHBOARDS - FABRICATION AND FEATURES

- A. Enclosure: Steel: NEMA 250, Type 3R.
- B. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.
- C. Barriers: Between adjacent switchboard sections.
- D. Utility Metering Compartment: Fabricated compartment and section complying with utility company's requirements. If separate vertical section is required for utility metering, match and align with basic switchboard.
- E. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.
- F. Hinged Front Panels: Allow access to circuit-breaker, metering, accessory, and blank compartments.
- G. Buses and Connections: Three phase, four wire, unless otherwise indicated. Include the following features:
  - 1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity or tin-plated, high-strength, electrical-grade aluminum alloy.
    - a. If bus is aluminum, use copper or tin-plated aluminum for circuit-breaker line connections.
    - b. If bus is copper, use copper for feeder circuit-breaker line connections.
  - 2. Ground Bus: 1/4-by-2-inch minimum size, drawn-temper copper of 98 percent conductivity, equipped with pressure connectors for feeder and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.
  - 3. Contact Surfaces of Buses: Silver plated.
  - 4. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
  - 5. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.
  - 6. Neutral Buses: 100 percent of the ampacity of the phase buses, unless otherwise indicated, equipped with pressure connectors for outgoing circuit neutral cables. Bus extensions for busway feeder neutral bus is braced.
- H. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

## 2.04 SWITCHBOARDS - INSTRUMENTATION

- A. Instrument Transformers: NEMA EI 21.1, IEEE C57.13, and the following:
  - 1. Potential Transformers: Secondary voltage rating of 120 V and NEMA accuracy class of 0.3 with burdens of W, X, and Y.
  - 2. Current Transformers: Ratios with accuracy class and burden suitable for connected relays, meters, and instruments.

### ▪ SECTION 26 24 00 (16440) - SWITCHBOARDS AND PANELBOARDS ▪



3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kV.

B. Ammeters, Voltmeters, and Power-Factor Meters: ANSI C39.1.

1. Meters: 4-inch diameter or 6 inches square, flush or semi-flush, with anti-parallax 250-degree scales and external zero adjustment.
2. Voltmeters: Cover an expanded-scale range of nominal voltage plus 10 percent.

C. Instrument Switches: Rotary type with off position.

1. Voltmeter Switches: Permit reading of all phase-to-phase voltages and, where a neutral is indicated, phase-to-neutral voltages.
2. Ammeter Switches: Permit reading of current in each phase and maintain current-transformer secondaries in a closed-circuit condition at all times.

D. Feeder Ammeters: 2-1/2-inch minimum size with 90- or 120-degree scale. Meter and transfer device with an off position, located on overcurrent device door for indicated feeder circuits only.

#### 2.05 SWITCHBOARDS - CONTROL POWER

- A. Control Circuits: 120 V, supplied through secondary disconnecting devices from control-power transformer.
- B. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.
- C. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

#### 2.06 PANELBOARDS - FABRICATION AND FEATURES

- A. Enclosures: Flush- and/or surface-mounted cabinets as indicated on drawings. NEMA PB 1, Type 1, to meet environmental conditions at installed location.
  1. Outdoor Locations: NEMA 250, Type 3R.
  2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
  3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
- B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
- C. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
- E. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.
- F. Bus: Hard-drawn copper, 98 percent conductivity or tin-plated aluminum.
- G. Main and Neutral Lugs: Mechanical type suitable for use with conductor material.
- H. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
- I. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

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- J. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box.
- K. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
- L. Gutter Barrier: Arrange to isolate individual panel sections.
- M. Feed-through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

#### 2.07 PANELBOARDS - SHORT-CIRCUIT RATING

- A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

#### 2.08 PANELBOARDS - LIGHTING AND APPLIANCE BRANCH-CIRCUITS

- A. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

#### 2.09 PANELBOARDS - DISTRIBUTION

- A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.
- B. Main Overcurrent Protective Devices: Circuit breaker.
- C. Branch overcurrent protective devices shall be one of the following:
  - 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers.
  - 2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

#### 2.10 LOAD CENTERS

- A. Overcurrent Protective Devices: Plug-in, full-module circuit breaker.
- B. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

#### 2.11 SWITCHBOARD AND PANELBOARDS - OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  - 3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
    - a. Instantaneous trip.
    - b. Long- and short-time pickup levels.
    - c. Long- and short-time time adjustments.
    - d. Ground-fault pickup level, time delay, and  $I_t^2$  response.

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4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
  5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
  6. GFCI Circuit Breakers: Single- and two-pole configurations with [5] [30]-mA trip sensitivity.
- B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.
  2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
  3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
  4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
  5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.

## 2.12 ACCESSORY COMPONENTS AND FEATURES

- A. Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented steel box or cabinet. Arrange for wall mounting.

## 2.13 IDENTIFICATION

- A. Mimic Bus for Switchboard: Continuously integrated mimic bus factory applied to front of switchboard. Arrange in single-line diagram format, using symbols and letter designations consistent with final mimic-bus diagram. Coordinate mimic-bus segments with devices in switchboard sections to which applied. Produce a concise visual presentation of principal switchboard components and connections.
- B. Presentation Media: Painted graphics in color contrasting with equipment factory-finished background to represent bus and components, complete with lettered designations.

## PART 3 EXECUTION

### 3.01 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

### 3.02 EXAMINATION

- A. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.03 INSTALLATION

- A. Install switchboards and accessories according to NEMA PB 2.1.
- B. Install panelboards and accessories according to NEMA PB 1.1
- C. Support switchboards on concrete bases, 4-inch nominal thickness.

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- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.
- E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.
- F. Mounting of Panelboards: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- G. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- H. Install filler plates in unused spaces.
- I. Provision for Future Circuits at Flush Panelboards: Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.
- J. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

### 3.04 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 26 05 53 (16075) "Identification for Electrical Systems".
- B. Switchboard Nameplates: Label each switchboard compartment with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.
- C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

### 3.05 CONNECTIONS

- A. Install equipment grounding connections for switchboards with ground continuity to main electrical ground bus.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.06 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
  - 1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- B. Testing: After installing switchboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
  - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Sections 7.1, 7.5, 7.6, 7.9, 7.10, 7.11, and 7.14 as appropriate. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

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- C. Infrared Scanning: Switchboard only. After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panel so joints and connections are accessible to portable scanner.
  - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
  - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  - 3. Record of Infrared Scanning: Prepare a certified report that identifies switchboard checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- D. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:
  - 1. Measure as directed during period of normal system loading.
  - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.
  - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
  - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.07 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges.

3.08 CLEANING

- A. On completion of installation, inspect interior and exterior of switchboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

**END OF SECTION**

## **SECTION 26 22 00 (16460) - LOW-VOLTAGE TRANSFORMERS**

### **PART 1 GENERAL**

#### **1.01 SUMMARY**

**A. Section Includes:**

1. Dry-Type Distribution And Specialty Transformers Rated 1000 V And Less.
  - a. General-Purpose Distribution and Power Transformers
  - b. Buck-Boost Transformers
  - c. Control and Signal Transformers

**B. Related Sections:**

1. Section 26 05 26 (16060) - Grounding and Bonding for Electrical Systems.
2. Section 26 05 53 (16075) – Identification for Electrical Systems.

#### **1.02 SUBMITTALS**

**A. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) indicating specified items selected for use in Project with the following supporting data;**

**1. Product Data:**

- a. Include data on features, components, ratings, and performance for each type of transformer specified. Include dimensioned plans, sections, and elevation views. Show minimum clearances and installed devices and features.

**2. Wiring Diagrams:** Detail wiring and identify terminals for tap changing and connecting field-installed wiring.

**3. Product Certificates:** Signed by manufacturers of transformers certifying that the products furnished comply with requirements.

**4. Qualification Data:** For firms and persons specified in "Quality Assurance" Article.

**5. Field Test Reports:** Indicate and interpret test results for tests specified in Part 3.

**6. Maintenance Data:** For transformers to include in the maintenance manuals specified in Division 01.

#### **1.03 QUALITY ASSURANCE**

**A. Testing Agency Qualifications:** In addition to requirements specified in Section 01450 (01 45 00) "Quality Control," an independent testing agency shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907; or shall be a full-member company of the InterNational Electrical Testing Association.

1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.

**B. Listing and Labeling:** Provide transformers specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

**C. Comply with IEEE C2.**

**D. Comply with NFPA 70.**

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1.04 DELIVERY, STORAGE, AND HANDLING

- A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit throughout periods during which equipment is not energized and is not in a space that is continuously under normal control of temperature and humidity.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. Avendra, LLC Preferred Manufacturers:
  - 1. None.
- B. Approved Manufacturers:
  - 1. [Acme Electric Corp.; Transformer Division](#) (800-334-5214)
  - 2. [Cutler-Hammer/Eaton Corp.](#) (800-498-2678)
  - 3. [GE Electrical Distribution & Control](#) (203-747-7111)
  - 4. [Siemens Energy & Automation, Inc.](#) (800-964-4114)
  - 5. [Square D; a Division of Groupe Schneider](#) (888-778-2733)

2.02 TRANSFORMERS, GENERAL

- A. Description: Factory-assembled and -tested, air-cooled units of types specified, designed for 60-Hz service.
- B. Cores: Grain-oriented, non-aging silicon steel.
- C. Coils: Continuous windings without splices, except for taps.
- D. Internal Coil Connections: Brazed or pressure type.
- E. Enclosure: Class complies with NEMA 250 for the environment in which installed.

2.03 GENERAL-PURPOSE DISTRIBUTION AND POWER TRANSFORMERS

- A. Comply with NEMA ST 20 and list and label as complying with UL 1561.
- B. Cores: One leg per phase.
- C. Windings: One coil per phase in primary and secondary.
- D. Enclosure: Indoor, ventilated.
- E. Insulation Class: 185 or 220 deg C class for transformers 15 kVA or smaller; 220 deg C class for transformers larger than 15 kVA.
  - 1. Rated Temperature Rise: 115 deg C maximum rise above 40 deg C.
- F. Taps: For transformers 3 kVA and larger, full-capacity taps in high-voltage windings are as follows:
  - 1. Taps, 3 through 10 kVA: Two 5-percent taps below rated high voltage.
  - 2. Taps, 15 through 500 kVA: Six 2.5-percent taps, 2 above and 4 below rated high voltage.
  - 3. Taps, 750 kVA and Above: Four 2.5-percent taps, 2 above and 2 below rated high voltage.

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G. K-Factor Rating: Transformers indicated to be K-factor rated are listed to comply with UL 1561 requirements for non-sinusoidal load current handling capability to the degree defined by the designated K-factor.

1. Transformer design prevents overheating when carrying full load with harmonic content corresponding to the designated K-factor.
2. Nameplate states the designated K-factor of the transformer.

H. Wall-Mounting Brackets: Manufacturer's standard brackets for transformers up to 45 kVA.

#### 2.04 BUCK-BOOST TRANSFORMERS

A. Units comply with NEMA ST 1 and are listed and labeled as complying with UL 506 or UL 1561.

B. Description: Self-cooled dry type, rated for continuous duty, and connected as autotransformers to provide the percentage of buck or boost indicated.

#### 2.05 CONTROL AND SIGNAL TRANSFORMERS

A. Units comply with NEMA ST 1 and are listed and labeled as complying with UL 506.

B. Ratings: Continuous duty. If rating is not indicated, provide capacity exceeding peak load by 50 percent minimum.

C. Description: Self-cooled, 2 windings.

#### 2.06 FINISHES

A. Indoor Units: Manufacturer's standard paint over corrosion-resistant pretreatment and primer.

B. Outdoor Units: Comply with ANSI C57.12.28.

#### 2.07 SOURCE QUALITY CONTROL

A. Factory Tests: Design and routine tests comply with referenced standards.

### **PART 3 EXECUTION**

#### 3.01 INSTALLATION

A. Comply with safety requirements of IEEE C2.

B. Arrange equipment to provide adequate spacing for access and for circulation of cooling air.

C. Identify transformers and install warning signs according to Section 26 05 53 - "Identification for Electrical Systems."

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

#### 3.02 GROUNDING

A. Separately Derived Systems: Comply with NFPA 70 requirements for connecting to grounding electrodes and for bonding to metallic piping near the transformer.

B. Comply with Section 26 05 26 - "Grounding and Bonding for Electrical Systems" for materials and installation requirements.

#### 3.03 FIELD QUALITY CONTROL

A. Test Objectives: To ensure transformer is operational within industry and manufacturer's tolerances, is installed according to the Contract Documents, and is suitable for energizing.

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- B. Test Labeling: On satisfactory completion of tests for each transformer, attach a dated and signed "Satisfactory Test" label to tested component.
- C. Schedule tests and provide notification atleast 7 days in advance of test commencement.
- D. Report: Submit a written report of observations and tests. Report defective materials and installation.
- E. Tests: Include the following minimum inspections and tests according to manufacturer's written instructions. Comply with IEEE C 57.12.91 for test methods and data correction factors.
  - 1. Inspect accessible components for cleanliness, mechanical and electrical integrity, and damage or deterioration. Verify that temporary shipping bracing has been removed. Include internal inspection through access panels and covers.
  - 2. Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, if not available, those specified in UL 486A and UL 486B.
  - 3. Insulation Resistance: Perform megohmmeter tests of primary and secondary winding to winding and winding to ground.
    - a. Minimum Test Voltage: 1000 V, dc.
    - b. Minimum Insulation Resistance: 500 megohms.
    - c. Duration of Each Test: 10 minutes.
    - d. Temperature Correction: Correct results for test temperature deviation from 20 deg C standard.
- F. Test Failures: Compare test results with specified performance or manufacturer's data. Correct deficiencies identified by tests and retest. Verify that transformers meet specified requirements.

### 3.04 CLEANING

- A. On completion of installation, inspect components. Remove paint splatters and other spots, dirt, and debris. Repair scratches and mars on finish to match original finish. Clean components internally using methods and materials recommended by manufacturer.

### 3.05 ADJUSTING

- A. After installing and cleaning, touch up scratches and mars on finish to match original finish.
- B. Adjust transformer taps to provide optimum voltage conditions at utilization equipment throughout normal operating cycle of facility. Record primary and secondary voltages and tap settings and submit with test results.
- C. Adjust buck-boost transformer connections to provide optimum voltage conditions at utilization equipment throughout normal operating cycle of facility.
- D. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in readjusting transformer tap settings to suit actual occupied conditions. Provide up to 2 visits to Project site for this purpose without additional cost.
  - 1. Voltage Recordings: Contractor performed. Provide up to 48 hours of recording on the low-voltage system of each medium-voltage transformer.
  - 2. Point of Measurement: Make voltage recordings at load outlets selected by Owner's Representative.

## END OF SECTION

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