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Lighting / Electrical Option
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Gateway Community College
New Haven, CT
September 29, 2008

Technical Report II

A special thanks goes to HLB Lighting Design and Perkins + Will for letting me participate in this exceptional project

Executive Summary

Gateway Community College is a consolidation of two existing campuses into one facility in downtown New Haven, Connecticut. GCC is a 369,000 ft^2 building and is mainly made up of classroom and office space. This report will review and summarize the distribution system within the education facility and define its various attributes.

With the information provided from the normal and emergency riser diagrams (prepared by BVH Integrated Services, Inc.) I prepared a single line diagram to represent how power would be distributed throughout the building. Equipment location tables, panelboard tables, transformer schedules, and loading calculations support the information presented on the single line and are also included in the body of this report.

Additional information (such as the specifications and plan drawings) was used to summarize the special equipment, environmental stewardship design, design issues, and communication system used in GCC.

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Section One:	Single Line Diagram

Single Line Diagram Drawing List	
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Normal Power Distribution Riser Diagram	E-301
Emergency Power Distribution Riser Diagram	E-302

Please see Figures 1.1, 1.2, 1.3, 1.4 and 1.5 for Single Line Diagram, Feeder Schedule, and Riser Diagrams.

THE UNITED UTILITY COMPANY

200A 200A

15KV SWITCH
(BY UTILITY CO.)

100A 100A

TO SWITCHBOARD MSB-BS

7A

???? KV
2500 KVA
480Y / 277, 3Ø, 4W

29A

480Y / 277, 3Ø, 4W

SWITCHBOARD MSB-BN

3000A-3P MAIN

480V, 3Ø, 4W

600A 3P | 110A 3P | 100A 3P | 110A 3P | 100A 3P | 150A 3P | 60A 3P | 80A 3P | 125A 3P | 125A 3P | 1200A 3P | 100A 3P | 800A 3P | 125A 3P | 400A 3P | 400A 3P | 400A 3P | 400A 3P | 350A 3P | 800A 3P | 200A(F) 200A(T) 3P

23D | 9B | 7F | 9CO | 7GO | 10AO | 5A | SPARE | SPARE | SPARE | 25B | 7H | 23E | SPARE | 19A | 19B | 19C | 12F | 17J | 23B | 12D

SPARE CIRCUIT BREAKERS
(PROVIDE 1 SPARE OF EACH
DIFFERENT SIZE OF ACTIVE C/B)

S/S
400A/350A

480V, 3Ø, 3W
208V, 3Ø, 4W
TX-GDPBN1
225 KVA

1000 KW GENERATOR

3P 1200A(F) 1200A(T)

3P 1200A(F) 1200A(T)

25A

TO FP1

17DO

HDP-PG
480V, 3Ø, 4W

12E | 9AO

480V, 3Ø, 3W
208V, 3Ø, 4W
TX GPPG
75 KVA

GP-PG
200A 3P

HLP-BPG
200A 3P

HLP-4PG
200A 3P

TO AHU-3

TO AHU-4

HPPBP
1200A 3P

HLP-BN1
100A 3P
M

WP
200/125
COOLING TOWER

WP
60/50
COOLING TOWER

HMPRN
800A 3P

ELEV
PE-1

ELEV
PE-2

ELEV
SE-3

GDPBN1
800A 3P
208V, 3Ø, 4W

12G

GP-BN1
200A 3P

7K

2K

7L

10B

GP-MWS
100A 3P

LP-CNC
150A 3P

GPBP
50A 3P

LP-ME
100A 3P

STANDBY
ATS1
800A
3P

E-ATS1
200A
3P

17E

12C

ESSDP
3P
1200A(F)
1200A(T)

TO E-ATS2

TO STANDBY ATS2

12B

23A

HDP-4N
400A 3P
480V, 3Ø, 4W

480V, 3Ø, 3W
208V, 3Ø, 4W
TX-GP4N
150 KVA

9D

S/S - GP4N1
200A/200A

S/S - GP4N2
400A/300A

12F

15A

GP-4N1
200A 3P

GP-4N2
300A 3P

HLP-4N
150A 3P

HDP-3N
400A 3P
480V, 3Ø, 4W

480V, 3Ø, 3W
208V, 3Ø, 4W
TX-GP3N
112.5 KVA

9E

GP-3N
300A 3P

HLP-3N
150A 3P

HDP-2N
400A 3P
480V, 3Ø, 4W

480V, 3Ø, 3W
208V, 3Ø, 4W
TX-GP2N
112.5 KVA

9F

GP-2N
350A 3P

7I

GPGCL-2N
100A 3P

HLP-2N
150A 3P

HDP-1N
400A 3P
480V, 3Ø, 4W

480V, 3Ø, 3W
208V, 3Ø, 4W
TX-GP1N
112.5 KVA

9G

GP-3N
350A 3P

HLP-1N
150A 3P

480V, 3Ø, 3W
208V, 3Ø, 4W
TX-CKPN1
75 KVA

7J

KP-1N
250A 3P

SHDP-BN
800A 3P
480V, 3Ø, 4W

480V, 3Ø, 3W
208V, 3Ø, 4W
TX-SLP-BN1
15 KVA

17H

14A

17I

SLP-BN1
50A 3P

SHPP-BP
50A 3P

TO AHU-3

TO AHU-4

FROM SWITCHBOARD MSB-BN

WP
100/80

WP
100/100

WP
100/80

WP
100/100

AHU-3

AHU-4

WP
100/100

WP
100/100

FROM PANEL SHDP-BN

S/N
200A-3P

EMHDPBN
480V, 3Ø, 4W

2E

ELHP-1N1

3D

3E

3F

7F

ELHP-2N

ELHP-3N

2F

ELHP-4N

ELHP-BPG
100A 3P

2G

ELHP-4PG

ELHP-BN
480V, 3Ø, 3W
208V, 3Ø, 4W
TX-ELP-BN
30 KVA

60A/40A

60A/40A

60A/40A

2H

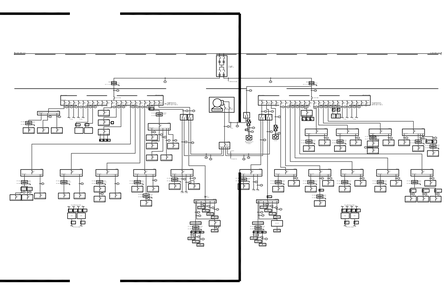
ELP-BN

2I

2J

ELP-2N

ELP-4N



KEY PLAN 1

SINGLE LINE DIAGRAM NORTH TOWER

GATEWAY COMMUNITY COLLEGE
FRONTAGE RD.
AND CHURCH ST.
NEW HAVEN, CT.

DRAWING BY:
BRADLEY SISENWAIN

SUBMITTED FOR:
PROF. DANNERTH
AE 481
11/3/2008

SINGLE LINE DIAGRAM NORTH TOWER FIGURE 1.1 PG. 2

THE UNITED UTILITY COMPANY

200A 200A
15KV SWITCH (BY UTILITY CO.)
100A 100A
TO SWITCHBOARD MSB-BN
12A
???? KV
2500 KVA
480Y / 277, 3Ø, 4W
17A
29B
480Y / 277, 3Ø, 4W
SWITCHBOARD MSB-BS
3000A-3P MAIN
480V, 3Ø, 4W
800A 3P
200A(F) 200A(T) 3P
15A 3P
SPARE
200A 3P
12H
400A 3P
17K
13B
13C
13D
23F
SPARE
13F
13G
13H
17L
75A 3P
8AO
75A 3P
8BO
110A 3P
9HO
100A 3P
7WO
110A 3P
9JO
100A 3P
7XO
SPARE
150A 3P
SPARE
200A 3P
SPARE CIRCUIT BREAKERS (PROVIDE 1 SPARE OF EACH DIFFERENT SIZE OF ACTIVE C/B)
PV SW 100A
PV INVERTER ASSEMBLY 50 KVA
TO AHU-2
TO AHU-1
1000 KW GENERATOR
3P 1200A(F) 1200A(T)
3P 1200A(F) 1200A(T)
HMPRS
800A 3P
FREIGHT ELEV SE-6
FREIGHT ELEV SE-5
FREIGHT ELEV SE-4
23C
7B
STANDBY ATS2 800A 3P
E-ATS2 200A 3P
1A
25A
17DO
ANN
17B
17C
FIRE PUMP WITH CONTROLLER AND INTERGRAL ATS 3Ø, 460V
7C
1B
JOCKEY PUMP 3Ø, 460V
21A
ESSDP
3P 1200A(F) 1200A(T)
TO E-ATS1
TO STANDBY ATS1
23A
23BC
13AC
HDP-4S2
200A 3P
480V, 3Ø, 4W
480V, 3Ø, 3W
TX-GP4S2 75 KVA
208V, 3Ø, 4W
GP-4S2
250A 3P
7S
HLP-4S2
100A 3P
HDP-3S2
200A 3P
480V, 3Ø, 4W
480V, 3Ø, 3W
TX-GP3S2 75 KVA
208V, 3Ø, 4W
GP-4S2
250A 3P
7T
HLP-3S2
100A 3P
HDP-2S2
200A 3P
480V, 3Ø, 4W
480V, 3Ø, 3W
75 KVA
208V, 3Ø, 4W
TX-GP2S2
GP-2S2
250A 3P
7V
GPGCI-2S
250A 3P
7U
HLP-2S2
100A 3P
HDP-1S2
400A 3P
480V, 3Ø, 4W
7Y
HLP-1S2
100A 3P
480V, 3Ø, 3W
TX-GP1S2 75 KVA
208V, 3Ø, 4W
GP-1S2
250A 3P
5B
7Z
PASSENGER ELEV-PET 100/100
100/100
480V, 3Ø, 3W
TX-DKPS1 75 KVA
208V, 3Ø, 4W
DKPS1
250A 3P
SHDP-BS
800A 3P
480V, 3Ø, 4W
480V, 3Ø, 3W
TX-SLP-BN 15 KVA
208V, 3Ø, 4W
SLP-BN
50A 3P
17FO
17G
TO AHU-1
TO AHU-2
HDP-BN2
200A 3P
480V, 3Ø, 4W
480V, 3Ø, 3W
TX-GPBN2 30 KVA
208V, 3Ø, 4W
GP-BN2
100A 3P
2L
HLP-BN2
50A 3P
HDP-1S1
400A 3P
480V, 3Ø, 4W
480V, 3Ø, 3W
TX-GP1S1 75 KVA
208V, 3Ø, 4W
GP-1S1
250A 3P
7M
7N
HLP-1S1
100A 3P
100/100
480V, 3Ø, 3W
TX-MKP2 75 KVA
208V, 3Ø, 4W
KP1S
250A 3P
HDP-2S1
200A 3P
480V, 3Ø, 4W
480V, 3Ø, 3W
TX-GP2S1 75 KVA
208V, 3Ø, 4W
GP-2S1
250A 3P
7O
HLP-2S1
100A 3P
HDP-3S1
200A 3P
480V, 3Ø, 4W
480V, 3Ø, 3W
TX-GP3S1 75 KVA
208V, 3Ø, 4W
GP-3S1
250A 3P
7P
HLP-3S1
100A 3P
HDP-4S1
200A 3P
480V, 3Ø, 4W
480V, 3Ø, 3W
TX-GP4S1 150 KVA
208V, 3Ø, 4W
7Q
HLP-4S1
100A 3P
200A/125A
400A/225A
100A/100A
11A
13E
7R
GP-4S1
GP-4SNL
GP-4SSL
125A 3P
225A 3P
100A 3P
A-3P
EMHDPBN
3D
3E
3F
P-2N
ELHP-3N
ELHP-4N
EHLP-BPG
100A 3P
2G
ELHP-4PG
S/N 200A-3P
EMHDPBN2
480V, 3Ø, 4W
2D
ELHP-1S1
3A
3B
3C
ELHP-2S
7D
ELHP-3S
7E
ELHP-4S
EHLP-BN2
480V, 3Ø, 3W
TX-ELP-BS 30 KVA
208V, 3Ø, 4W
30KVA UPS
PP-UPS
60A/40A
60A/40A
60A/40A
2A
ELP-BN2
2B
2C
ELP-2S
ELP-4S
FROM SWITCHBOARD MSB-BS
WP 100/100
WP 100/80
WP 100/100
WP 100/80
AHU-2
AHU-1
WP 100/100
WP 100/100
FROM PANEL SHDP-BS
KEY PLAN 2

SINGLE LINE DIAGRAM SOUTH TOWER

KEY PLAN 2

GATEWAY COMMUNITY COLLEGE
FRONTAGE RD.
AND CHURCH ST.
NEW HAVEN, CT.

DRAWING BY:
BRADLEY SISENWAIN

SUBMITTED FOR:
PROF. DANNERTH
AE 481
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SINGLE LINE DIAGRAM SOUTH TOWER
FIGURE 1.2
PG. 3

FEEDER SCHEDULE

TYPE	TAG	FROM	TO	NO. OF SETS	CONDUIT (PER SET)		CONDUCTORS (PER SET)									SIZE OF OVERCURRENT PROTECTION	FRAME OR SWITCH SIZE
							PHASE CONDUCTORS			NEUTRAL CONDUCTORS			GROUND CONDUCTORS				
					SIZE	TYPE	No.	SIZE	TYPE	No.	SIZE	TYPE	No.	SIZE	TYPE		
1	A	MSBBS	JPC	1	1"	EMT	3	#10 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
1	B	JPC	JP	1	1"	EMT	3	#10 AWG	CU THHN/THWN	0	N/A	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
2	A	EMHDPBN2	ELPBN2	1	1"	EMT	3	#8 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
2	B	EMHDPBN2	ELP2S	1	1"	EMT	3	#8 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
2	C	EMHDPBN2	ELP4S	1	1"	EMT	3	#8 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
2	D	EMHDPBN2	ELHP1S1	1	1"	EMT	3	#8 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
2	E	EMHDPBN	ELHP1N1	1	1"	EMT	3	#8 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
2	F	EMHDPBN	ELHPBPG	1	1"	EMT	3	#8 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
2	G	ELHPBPG	ELHP4PG	1	1"	EMT	3	#8 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
2	H	TXELPBN	ELPBN	1	1"	EMT	3	#8 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
2	I	TXELPBN	ELP2N	1	1"	EMT	3	#8 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
2	J	TXELPBN	ELP4N	1	1"	EMT	3	#8 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
2	K	GDPN1	GPBP	1	1"	EMT	3	#8 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
2	L	HDPBN2	HLPBN2	1	1"	EMT	3	#8 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	50A	50A/3P
3	A	EMHDPBN2	ELHP2S	1	1 1/4"	EMT	3	#6 AWG	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	100A	100A/3P
3	B	EMHDPBN2	ELHP3S	1	1 1/4"	EMT	3	#6 AWG	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	100A	100A/3P
3	C	EMHDPBN2	ELHP4S	1	1 1/4"	EMT	3	#6 AWG	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	100A	100A/3P
3	D	EMHDPBN	ELHP2N	1	1 1/4"	EMT	3	#6 AWG	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	100A	100A/3P
3	E	EMHDPBN	ELHP3N	1	1 1/4"	EMT	3	#6 AWG	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	100A	100A/3P
3	F	EMHDPBN	ELHP4N	1	1 1/4"	EMT	3	#6 AWG	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	1	#10 AWG	CU THHN/THWN	100A	100A/3P
5	A	MSBBN	CT2	1	1 1/4"	EMT	3	#4 AWG	CU THHN/THWN	1	#4 AWG	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	100A	100A/3P
5	B	HDP1S2	PE7	1	1 1/4"	EMT	3	#4 AWG	CU THHN/THWN	1	#4 AWG	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	100A	100A/3P
7	A	USW1	UX1	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	B	SATS2	MSBBS	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	C	SATS2	EMHDPBN2	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	D	EMHDPBN2	EHLBN2	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	E	EMHDPBN2	UPS	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	F	MSBBN	AHU3	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	GO	MSBBN	AHU4	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	1/0	CU THHN/THWN	1	#4 AWG	CU THHN/THWN	100A	150A/3P
7	H	MSBBN	HLPBN1	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	I	GP2N	GPGCL2N	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	J	HDP1N	KP1N	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	K	GDPN1	GPMWS	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	L	GDPN1	LPME	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	M	HDP1S1	HLP1S1	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	N	HDP1S1	TXMKP2	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	O	HDP2S1	HLP1S1	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	P	HDP3S1	HLP3S1	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	Q	HDP4S1	HLP4S1	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	R	TXGP4S1	GP4SSL	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	S	HDP4S2	HLP4S2	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	T	HDP3S2	HLP3S2	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	U	HDP2S2	HLP2S2	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	V	GP2S2	GPGCL2S	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	150A/3P
7	WO	MSBBS	AHU2	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	1/0	CU THHN/THWN	1	#4 AWG	CU THHN/THWN	100A	100A/3P
7	XO	MSBBS	AHU2	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	1/0	CU THHN/THWN	1	#4 AWG	CU THHN/THWN	100A	100A/3P
7	Y	HDP1S2	HLP1S2	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	100A/3P
7	Z	HDP1S2	TXDKPS1	1	1 1/2"	EMT	3	#2 AWG	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	1	#8 AWG	CU THHN/THWN	100A	100A/3P
8	AO	MSBBS	PV1	1	2"	EMT	3	#2 AWG	CU THHN/THWN	1	2/0	CU THHN/THWN	1	#3 Aawg	CU THHN/THWN	100A	100A/3P
8	BO	MSBBS	PV2	1	2"	EMT	3	#2 AWG	CU THHN/THWN	1	2/0	CU THHN/THWN	1	#3 Aawg	CU THHN/THWN	100A	100A/3P
9	AO	HDPPG	HLP4PG	1	2"	EMT	3	#1 AWG	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	110A	150A/3P
9	B	MSBBN	AHU3	1	2"	EMT	3	#1 AWG	CU THHN/THWN	1	#1 AWG	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	110A	150A/3P
9	CO	MSBBN	AHU4	1	2"	EMT	3	#1 AWG	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	110A	150A/3P
9	D	HDP4N	HLP4N	1	2"	EMT	3	#1 AWG	CU THHN/THWN	1	#1 AWG	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	110A	150A/3P
9	E	HDP3N	HLP3N	1	2"	EMT	3	#1 AWG	CU THHN/THWN	1	#1 AWG	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	110A	150A/3P
9	F	HDP2N	HLP2N	1	2"	EMT	3	#1 AWG	CU THHN/THWN	1	#1 AWG	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	110A	150A/3P
9	G	HDP1N	HLP1N	1	2"	EMT	3	#1 AWG	CU THHN/THWN	1	#1 AWG	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	110A	150A/3P
9	HO	MSBBS	AHU2	1	2"	EMT	3	#1 AWG	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	110A	100A/3P
9	IO	MSBBS	AHU3	1	2"	EMT	3	#1 AWG	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	110A	100A/3P

FEEDER SCHEDULE

TYPE	TAG	FROM	TO	NO. OF SETS	CONDUIT (PER SET)		CONDUCTORS (PER SET)									SIZE OF OVERCURRENT PROTECTION	FRAME OR SWITCH SIZE
							PHASE CONDUCTORS			NEUTRAL CONDUCTORS			GROUND CONDUCTORS				
					SIZE	TYPE	No.	SIZE	TYPE	No.	SIZE	TYPE	No.	SIZE	TYPE		
10	AO	MSBBN	CT1	1	2"	EMT	3	1/0	CU THHN/THWN	1	4/0	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	150A	150A/3P
10	B	MSBBN	CT1	1	2"	EMT	3	1/0	CU THHN/THWN	1	1/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	150A	150A/3P
11	A	TXGP4S1	GP4S1	1	2 1/2"	EMT	3	2/0	CU THHN/THWN	1	2/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	200A	200A/3P
12	A	USW1	UX2	1	2 1/2"	EMT	3	3/0	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	200A	200A/3P
12	B	USW1	UX2	1	2 1/2"	EMT	3	3/0	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	200A	200A/3P
12	C	USW1	UX2	1	2 1/2"	EMT	3	3/0	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	200A	200A/3P
12	D	USW1	UX2	1	2 1/2"	EMT	3	3/0	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	200A	200A/3P
12	E	HDPPG	HLP8PG	1	2 1/2"	EMT	3	3/0	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	200A	200A/3P
12	E	TXGP4N	GP4N1	1	2 1/2"	EMT	3	3/0	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	200A	200A/3P
12	F	MSBBN	HDP1N	1	2 1/2"	EMT	3	3/0	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	200A	200A/3P
12	G	GDPN1	GPBN1	1	2 1/2"	EMT	3	3/0	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	200A	200A/3P
12	H	MSBBS	HDPBN2	1	2 1/2"	EMT	3	3/0	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	200A	200A/3P
13	AO	ESSDP	EATS2	1	3"	EMT	3	4/0	CU THHN/THWN	2	2/0	CU THHN/THWN	1	1/0	CU THHN/THWN	250A	250A/3P
13	B	MSBBS	HDP2S1	1	3"	EMT	3	4/0	CU THHN/THWN	1	4/0	CU THHN/THWN	1	#4 AWG	CU THHN/THWN	250A	250A/3P
13	C	MSBBS	HDP3S1	1	3"	EMT	3	4/0	CU THHN/THWN	1	4/0	CU THHN/THWN	1	#4 AWG	CU THHN/THWN	250A	250A/3P
13	D	MSBBS	HDP4S1	1	3"	EMT	3	4/0	CU THHN/THWN	1	4/0	CU THHN/THWN	1	#4 AWG	CU THHN/THWN	250A	250A/3P
13	E	TXGP4S1	GP4SNL	1	3"	EMT	3	4/0	CU THHN/THWN	1	4/0	CU THHN/THWN	1	#4 AWG	CU THHN/THWN	250A	250A/3P
13	F	MSBBS	HDP4S2	1	2 1/2"	EMT	3	3/0	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	200A	200A/3P
13	G	MSBBS	HDP3S2	1	2 1/2"	EMT	3	3/0	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	200A	200A/3P
13	H	MSBBS	HDP2S2	1	2 1/2"	EMT	3	3/0	CU THHN/THWN	1	3/0	CU THHN/THWN	1	#6 AWG	CU THHN/THWN	200A	200A/3P
14	A	SHDPBN1	SHPP	1	3"	EMT	3	250 MCM	CU THHN/THWN	1	250 MCM	CU THHN/THWN	1	#4 AWG	CU THHN/THWN	300A	300A/3P
15	A	TXGP4N	GP4N2	1	4"	EMT	3	350 MCM	CU THHN/THWN	1	350 MCM	CU THHN/THWN	1	#4 AWG	CU THHN/THWN	300A	300A/3P
17	A	FPATS	UX2	1	4"	EMT	3	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	1	#3 AWG	CU THHN/THWN	400A	400A/3P
17	B	FP1	FPATS	1	4"	EMT	3	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	1	#3 AWG	CU THHN/THWN	400A	400A/3P
17	C	FPATS	FP1	1	4"	EMT	3	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	1	#3 AWG	CU THHN/THWN	400A	400A/3P
17	DO	GEN	FPATS	1	4"	EMT	3	500 MCM	CU THHN/THWN	2	350 MCM	CU THHN/THWN	1	3/0	CU THHN/THWN	400A	400A/3P
17	E	SATS1	SHDPBN	1	4"	EMT	3	500 MCM	CU THHN/THWN	2	500 MCM	CU THHN/THWN	1	#3 AWG	CU THHN/THWN	400A	400A/3P
17	FO	GEN	FPATS	1	4"	EMT	3	500 MCM	CU THHN/THWN	2	350 MCM	CU THHN/THWN	1	3/0	CU THHN/THWN	400A	400A/3P
17	G	SATS1	SHDPBN	1	4"	EMT	3	500 MCM	CU THHN/THWN	2	500 MCM	CU THHN/THWN	1	#3 AWG	CU THHN/THWN	400A	400A/3P
17	H	GEN	FPATS	1	4"	EMT	3	500 MCM	CU THHN/THWN	2	500 MCM	CU THHN/THWN	1	#3 AWG	CU THHN/THWN	400A	400A/3P
17	I	SATS1	SHDPBN	1	4"	EMT	3	500 MCM	CU THHN/THWN	2	500 MCM	CU THHN/THWN	1	#3 AWG	CU THHN/THWN	400A	400A/3P
17	J	MSBBN	TXGDPBN1	1	4"	EMT	3	500 MCM	CU THHN/THWN	2	500 MCM	CU THHN/THWN	1	#3 AWG	CU THHN/THWN	400A	400A/3P
17	K	MSBBS	HDP1S1	1	4"	EMT	3	500 MCM	CU THHN/THWN	2	500 MCM	CU THHN/THWN	1	#3 AWG	CU THHN/THWN	400A	400A/3P
17	L	MSBBS	HDP1S2	1	4"	EMT	3	500 MCM	CU THHN/THWN	2	500 MCM	CU THHN/THWN	1	#3 AWG	CU THHN/THWN	400A	400A/3P
19	A	MSBBN	HDP4N	2	3"	EMT	3	4/0	CU THHN/THWN	1	4/0	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	400A	450A/3P
19	B	MSBBN	HDP3N	2	3"	EMT	3	4/0	CU THHN/THWN	1	4/0	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	400A	450A/3P
19	C	MSBBN	HDP2N	2	3"	EMT	3	4/0	CU THHN/THWN	1	4/0	CU THHN/THWN	1	#2 AWG	CU THHN/THWN	400A	450A/3P
21	A	SATS2	SHDPBN	2	4"	EMT	3	350 MCM	CU THHN/THWN	1	350 MCM	CU THHN/THWN	1	#1 AWG	CU THHN/THWN	600A	600A/3P'
23	A	ESSDP	SATS1	2	4"	EMT	3	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	1	1/0	CU THHN/THWN	800A	800A/3P
23	BO	ESSDP	SATS2	2	4"	EMT	3	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	1	1/0	CU THHN/THWN	800A	800A/3P
23	C	SATS2	MSBBS	2	4"	EMT	3	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	1	1/0	CU THHN/THWN	800A	800A/3P
23	D	SATS2	MSBBS	2	4"	EMT	3	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	1	1/0	CU THHN/THWN	800A	800A/3P
23	E	MSBBN	HMPRN	2	4"	EMT	3	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	1	1/0	CU THHN/THWN	800A	800A/3P
23	F	MSBBS	HMPRS	2	4"	EMT	3	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	1	1/0	CU THHN/THWN	800A	800A/3P
25	A	GEN	ESSDP	4	4"	EMT	3	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	1	3/0	CU THHN/THWN	1200A	1200A/3P
25	B	MSBBN	HPPBP	4	4"	EMT	3	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	1	3/0	CU THHN/THWN	1200A	1200A/3P
29	A	UX1	MSBBN	8	4"	EMT	3	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	3000A	3000A/3P
29	A	UX2	MSBBS	8	4"	EMT	3	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	1	500 MCM	CU THHN/THWN	3000A	3000A/3P

NOTES:
1. REFER TO ONE LINE DIAGRAM FOR FEEDER TAGS

CU=COPPER

SOUTH TOWER — NORTH TOWER

PHOTOVOLTAIC INVERTER ASSEMBLY 30 KW

PHOTOVOLTAIC SYSTEM FUSED DISCONNECT SW 480/277VOLT 60 AMP 100,000 AISC

SEE ELEVATOR SCHEDULE

FREIGHT ELEV-SE-6

PASSENGER ELEV-PE-5

SEE DETAIL FOR MORE INFORMATION

PROVIDE CIRCUIT BREAKERS WITH SHUNT TRIP. SEE ELEVATOR EMERGENCY SHUTOFF DETAIL

LIGHTING POWER MONITORING METER REAL TIME TOTALIZING TYPE

AHU-1 — AIR HANDLING UNIT #1 (3) 20HP (RETURN FANS) – NORMAL POWER

AHU-2 — AIR HANDLING UNIT #2 (3) 20HP (RETURN FANS) – NORMAL POWER

AHU-4 — AIR HANDLING UNIT #4 (3) 20HP (RETURN FANS) – NORMAL POWER

AHU-3 — AIR HANDLING UNIT #3 (3) 20HP (RETURN FANS) – NORMAL POWER

COOLING TOWER

TO SWITCHBOARD "MSB-BS"

TO SWITCHBOARD "MSB-BN"

ELEV PE-2

ELEV SE-3

HMPRN 400A

ROOF

4TH FLOOR

3RD FLOOR

2ND FLOOR

1ST FLOOR

BASEMENT

SOUTH TOWER — NORTH TOWER

TO ELECTRIC FIRE PUMP

2500 KVA PADMOUNT TRANSFORMER

3000A-3P MAIN C/B WITH GFI PROTECTION

PROVIDE CIRCUIT MONITOR TYPE METER (CM3350)

PROVIDE GFI TYPE CIRCUIT BREAKER

TO JOCKEY PUMP

TO 800A STANDBY ATS

TO 200A EMERGENCY ATS

SPARE CIRCUIT BREAKERS (PROVIDE 1 SPARE OF EACH DIFFERENT ACTIVE C/B)

GROUNDING ELECTRODE CONDUCTOR. CONFORM TO NEC. CONNECT TO:
1) STREET SIDE OF WATER METER,
2) CONCRETE ENCASED ELECTRODE,
3) BUILDING STEEL, 4) 3 GROUND RODS
5) NORTH TOWER MAIN SWITCHBOARD

#4/0 TO BUILDING STEEL

#4/0 TO STREET SIDE OF WATER METER

#4/0 TO CONCRETE ENCASED ELECTRODE

GROUND RODS (TYP)

MAIN SWITCHBOARD – 4000A, 480Y/277V, 3ø – 4W
SOUTH TOWER "MSB-BS"
SHORT CIRCUIT RATING: 100,000 A (FULLY RATED, SERIES RATING NOT PERMITTED)

NOTE:
ALL CIRCUIT BREAKER IN DISTRIBUTION SECTION SHALL BE MICRO LOGIC A/P TRIP TYPE (FACTORY WIRED)

MAIN SWITCHBOARD – 4000A, 480Y/277V, 3ø – 4W
NORTH TOWER "MSB-BN"
SHORT CIRCUIT RATING: 100,000 A (FULLY RATED, SERIES RATING NOT PERMITTED)

15KV SWITCH (BY UTILITY CO.)

C.T.S. P.T.S. & FUSING AS REQUIRED FOR UTILITY COMPANY METERING

TO UTILITY CO. MANHOLE

ISSUED FOR FINAL CONSTRUCTION DOCUMENT REVIEW 24 OCTOBER 2008

NOTE: REFER TO MEP DRAWINGS FOR ADDITIONAL INFORMATION.

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Scale	N.T.S.
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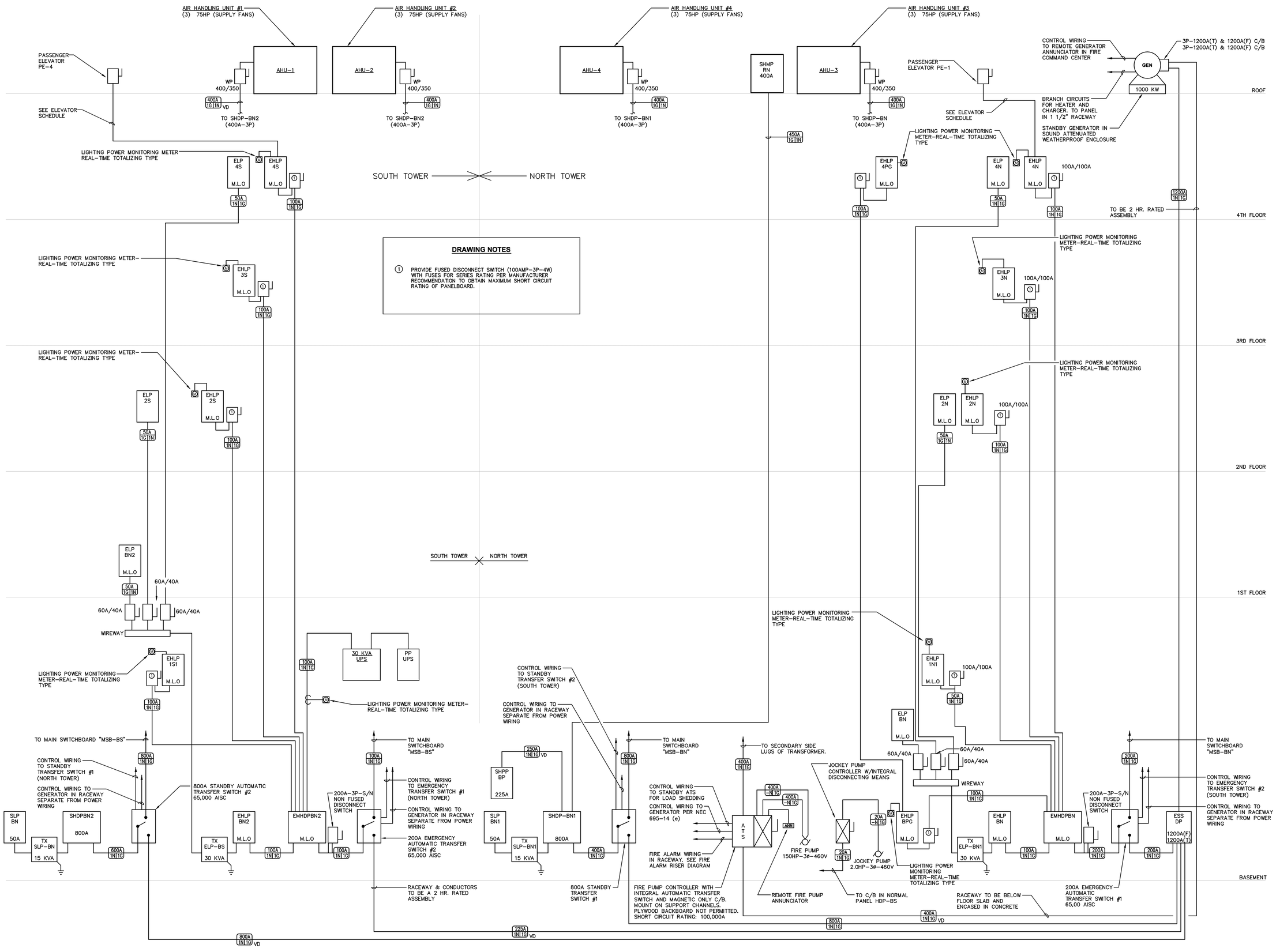
Title

NORMAL POWER DISTRIBUTION RISER DIAGRAM

Sheet

E-301



DRAWING NOTES

1. PROVIDE FUSED DISCONNECT SWITCH (100AMP-3P-4W) WITH FUSES FOR SERIES RATING PER MANUFACTURER RECOMMENDATION TO OBTAIN MAXIMUM SHORT CIRCUIT RATING OF PANELBOARD.

ISSUED FOR FINAL CONSTRUCTION DOCUMENT REVIEW 24 OCTOBER 2008

NOTE:
REFER TO MEP DRAWINGS FOR ADDITIONAL INFORMATION.

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Title

EMERGENCY POWER DISTRIBIUTION RISER DIAGRAM

Sheet

E-302

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Section Two:	Distribution System

Summary Description of Distribution System

In Gateway Community College (GCC), the power is distributed through a radial system. The utility service entrance is fed to a 15KV switch and located in the basement of the North Tower. Incoming power is the split to two 2500 KVA step-down transformers which feed two 4000A, 480Y/277V, 3Φ 4W main switchboards which are located in the North tower. Each switchgear serves one tower, one for the North tower and one for the South. A 30KVA U.P.S. system provides power before emergency power is transferred through the generator. The 1000KW emergency power generator is controlled by four automatic transfer switches. This system distributes power to distribution panels on each floor (including lighting and receptacle panels), cooling towers on the roof, AHUs, elevators, and photovoltaic inverter assemblies.

Utility Company Information

The utility that provides power to GCC is named The United Illuminating Company. The United Illuminating Company, headquartered in New Haven, Connecticut is an investor-owned regional electric utility that provides service to more than 320,000 customers in the greater New Haven and Bridgeport area.[i]

Address:	The United Illuminating Company P.O. Box 1564 New Haven, CT 06506-0901
Website:	www.uinet.com

Please refer to TABLE 2.1 for more information (this schedule is provided by BVH Engineering).

Gatway Community College - Electrical Rate				
Based on GST Rate from The United Illuminating Company				
		6pm-10am		
July-December	On Peak	Off peak		
	c/KWhr	c/KWhr	$	
1. Standard Service Generation	14.2994	12.2994		
2. Delivery Charges				
System benefits	0.1973	0.1973		
Conservation Charge	0.3	0.3		
Renewable Energy Charge	0.1	0.1		
Non Bypassable FMCC	0.4678	0.4678		
3.Competetive Transition Assesment(CTA)				
Demand Rate Charge	1.5222	1.5222		
4. Transmission Charge	2.0474	2.0474		
Sub-total 1-4	18.9341	16.9341		
5. Where Demand Is Billed				
Basic Service Charge			60.42	
Summer:June-September				
Demand Charge				
On Peak Hours			**3.35**	per KW
Off Peak Hours Of Excess KW			**1.67**	per KW
Charge per KWhr				
On Peak Hours	4.7437			
Off Peak Hours		0.759		
Winter: October -May				
Demand Charge				
On Peak Hours			**1.84**	per KW
Off Peak Hours Of Excess KW			**1.66**	per KW
Charge per KWhr				
On Peak Hours	2.9031			
Off Peak Hours		0.4744		
Summer	**23.6778**	**17.4085**		
Winter	**21.8372**	**17.4085**		

TABLE 2.1

Service Entrance
(6) 4" conduits extend from the curb-line and enter the building in the north-east basement of the North Tower. Power is fed to a 15KV switch then to two 2500 KVA step-down transformers (all supplied by the utility). The utility meters the two service entrances from an exterior meter at the 15KV switch. The owner uses meters located at the main C/Bs that protect the two main switchboards and lighting power monitoring meters (real time totalizing type) at lighting panels to measure the power consumed. Beyond the transformer in the service entrance, the owner provides all equipment.

Voltage Systems
GCC will use 480Y/277V, 3Φ 4W and 208Y/120, 3P, 4W voltage systems. The 480V system will provide power to large equipment (like AHUs and other mechanical equipment), elevators, motors and non-incandescent lighting loads. Smaller equipment, receptacles, and incandescent lighting loads are provided power from the 208V system.

Emergency Power Systems
Two emergency automatic transfer switches (ATS) rated at 200A connect to the 1000KW generator on the roof and two main switchboards. The generator is fueled by oil and rated at an engine speed of 2250fpm. The starting system associated is a 24V electric with a negative ground. The ATS's will transfer load (during power failure) from the emergency generator—which will be automatically started—back to switchboards after power is refurbished. These switches will transfer power from the generator to emergency lighting panels which then power exit signs and additional emergency egress lighting, as well as the fire alarm system. Connected to one of the emergency panels is a 30KVA U.P.S system that will supply power while the generator starts. Two standby ATS's rated at 800A also connect to the main distribution switchboards and generator. These switches will provide power from the generator to distribution panels which will power the AHUs. An additional ATS and magnetic only C/B are integrated with the fire pump controller in the North tower. This is connected to the secondary side lugs of the transformer in the South tower. A jockey pump with integral disconnecting means is located in the North tower.

Locations of Switchgear
The main gears are located in the basement of the North tower. MSB-BS serves the South tower and is located on the south-most side of the North tower in Substation E007, whereas MSB-BN serves the North tower and is located on the west side of the North tower in Substation G018. Electrical closest are many and are located throughout the building on every floor in every tower.

Overcurrent Devices[ii]

Main Switchboards:
Main Circuit Breakers are 3000A, 3P with GFI protection. These are enclosed, insulated-case circuit breakers, fully rated, encased-power circuit breaker with interrupting capacity rating to meet available fault current. *Branch Circuits* are rated smaller than 1200A, molded-case circuit breaker with electronic trip unit. Types include SWD for switching fluorescent lighting loads and type HACR for heating, air-conditioning, and refrigerating equipment.

Branches 225 A and Larger: Molded-case circuit breaker with electronic trip unit. Branches smaller than 225 A: Molded-case circuit breaker with thermal magnetic trip.

TABLE 2.2 summarizes the Major Equipment Locations; provided from the Construction Documents and specifications from Perkins + Will for GCC:

Major Equipment Locations						
Equipment Tag	Type	Floor Level	Room Name	Room Number	1/8th Scale Dwg	Enlarged Plan
SWS	Service Switch	Basement	Xformer/Switchgear Room	E008	EP-100B	E-206
TXS1	Service Transformer	Basement	Xformer/Switchgear Room	E008	EP-100B	E-206
TXS2	Service Transformer	Basement	Xformer/Switchgear Room	E008	EP-100B	E-206
TX GPBN1	Stepdown Xfmr	Basement	Substation	G018	EP-100C	E-206
TX GPBN2	Stepdown Xfmr	Basement	Substation	E007	EP-100B	N/A
TX GPPG	Stepdown Xfmr	Basement	Substation	G018	EP-100C	E-206
TX GP1N	Stepdown Xfmr	First	Elec Clo	G106	EP-101C	N/A
TX KPN1	Stepdown Xfmr	First	Elec Clo	G106	EP-101C	N/A
TX MKP2	Stepdown Xfmr	--	--	--	--	--
TX GP1S1	Stepdown Xfmr	First	Elec Clo	D1045	EP-101B	N/A
TX GP1S2	Stepdown Xfmr	First	Elec Clo	A110	EP-101A	N/A
TX DKP1	Stepdown Xfmr	First	Elec Clo	A110	EP-101A	N/A
TX KP1S	Stepdown Xfmr	First	Elec Clo	D1045	EP-101B	N/A
TX GP2N	Stepdown Xfmr	Second	Elec Clo	G206	EP-102C	N/A
TX GP2S1	Stepdown Xfmr	Second	Elec Clo	K206	EP-102A	N/A
TX GP2S2	Stepdown Xfmr	Second	Elec Clo	A210	EP-102A	N/A
TX GP3N	Stepdown Xfmr	Third	Elec Clo	G308	EP-103C	N/A
TX GP3S1	Stepdown Xfmr	Third	Elec Clo	K306	EP-103A	N/A
TX GP3S2	Stepdown Xfmr	Third	Elec Clo	A310	EP-103A	N/A
TX GP4N	Stepdown Xfmr	Fourth	Elec Clo	K406	EP-104C	N/A
TX GP4S1	Stepdown Xfmr	Fourth	Elec Clo	K406	EP-104C	N/A
TX GP4S2	Stepdown Xfmr	Fourth	Elec Clo	A410	EP-104A	N/A
MSB BN	Main Switchboard	Basement	Substation	G018	EP-100C	E-206
MSB BS	Main Switchboard	Basement	Substation	E007	EP-100B	N/A
HDP PG	Distribution Panel	--	--	--	--	--
HDP BN2	Distribution Panel	Basement	Substation	E007	EP-100B	N/A
HDP 1N	Distribution Panel	First	Elec Clo	G106	EP-101C	N/A
HDP 1S1	Distribution Panel	First	Elec Clo	D1045	EP-101B	N/A
HDP 1S2	Distribution Panel	First	Elec Clo	A110	EP-101A	N/A
HDP 2N	Distribution Panel	Second	Elec Clo	G206	EP-102C	N/A
HDP 2S1	Distribution Panel	Second	Elec Clo	K206	EP-102B	N/A
HDP 2S2	Distribution Panel	Second	Elec Clo	A210	EP-102A	N/A
HDP 3N	Distribution Panel	Third	Elec Clo	G308	EP-103C	N/A
HDP 3S1	Distribution Panel	Third	Elec Clo	K306	EP-103B	N/A
HDP 3S2	Distribution Panel	Third	Elec Clo	A310	EP-103A	N/A
HDP 4N	Distribution Panel	Fourth	Elec Clo	K406	EP-104C	N/A
HDP 4S1	Distribution Panel	Fourth	Elec Clo	K406	EP-104B	N/A
HDP 4S2	Distribution Panel	Fourth	Elec Clo	A410	EP-104A	N/A

TABLE 2.2

Major Equipment Locations						
Equipment Tag	Type	Floor Level	Room Name	Room Number	1/8th Scale Dwg	Enlarged Plan
GDP BN1	Distribution Panel	Basement	Substation	G018	EP-100C	E-206
ATS1	Automatic Transfer Switch	Basement	Substation	E007	EP-100B	E-206
ATS2	Automatic Transfer Switch	Basement	Substation	G018	EP-100C	E-206
S ATS1	Standby Auto. Trans. Switch	Basement	Substation	G018	EP-100C	E-206
S ATS2	Standby Auto. Trans. Switch	Basement	Substation	E007	EP-100B	E-206
ATS FP	Integral ATS to Fire Pump	--	--	--	--	--
TX ELP-BN1	Transformer	Basement	Substation	G018	EP-100C	E-206
TX SLP-BN1	Transformer	Basement	Substation	G018	EP-100C	E-206
TX SLP-BN2	Transformer	Basement	Substation	E007	EP-100B	E-206
TX ELP-BS	Transformer	Basement	--	--	--	--
TX SLP-BN	Transformer	Basement	--	--	--	--
EMHDPBN	Emergency Dist. Panel	Basement	Substation	G018	EP-100C	E-206
EMHDPBN2	Emergency Dist. Panel	Basement	Substation	E007	EP-100B	E-206
ESS DP	Emergency Dist. Panel	Basement	Substation	G018	EP-100C	E-206
SHDP BN1	Standby Dist. Panel	Basement	Substation	E007	EP-100B	E-206
SHDP BN	Standby Dist. Panel	Basement	Substation	G018	EP-100C	E-206
SLP BN1	Standby Ltg. Panel	Basement	Substation	G018	EP-100C	E-206
SLP BN	Standby Ltg. Panel	Basement	--	--	--	--
SHPP BP	Standby Ltg. Panel	Basement	Chiller Room	G025.2	EP-100C	N/A
30 KVA UPS	Uninterrupted Power Supply	Basement	MCER Room	G001	EP-100B	N/A
PP UPS	Uninterrupted Power Supply	Basement	MCER Room	G001	EP-100B	N/A
GEN	Generator	Roof	Roof	--	ES-105B	N/A

TABLE 2.2 (CONT.)

Distribution Panelboards:

The *Main Overcurrent Protective Devices* are circuit breakers. *Branch Overcurrent Protective Devices* are bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

Lighting and Appliance Panelboards:

Main Overcurrent Protective Devices are circuit breakers and *Branch Overcurrent Protective Devices* bolt-on circuit breakers, replaceable without disturbing adjacent units.

TABLE 2.3 summarizes the Panelboard Locations; provided from the Construction Documents and specifications from Perkins + Will for GCC:

Panelboard Table								
Equipment Tag	Type	Main Size	Voltage System	Floor Level	Room Name	Room Number	1/8th Scale Dwg	Enlarged Plan
HLP BN1	Lighting Panel	100A-3P	480Y/277V, 3Φ, 4W	Basement	Substation	G018	EP-100C	E-206
HLP PG	Lighting Panel	200A-3P	480Y/277V, 3Φ, 4W	--	--	--	--	--
HLP BN2	Lighting Panel	50A-3P	480Y/277V, 3Φ, 4W	Basement	Substation	E007	EP-100B	N/A
HLP 1N	Lighting Panel	125A-3P	480Y/277V, 3Φ, 4W	First	Elec Clo	G106	EP-101C	N/A
HLP 1S1	Lighting Panel	100A-3P	480Y/277V, 3Φ, 4W	First	Elec Clo	D1045	EP-101B	N/A
HLP 1S2	Lighting Panel	100A-3P	480Y/277V, 3Φ, 4W	First	Elec Clo	A110	EP-101A	N/A
HLP 2N	Lighting Panel	150A-3P	480Y/277V, 3Φ, 4W	Second	Elec Clo	G206	EP-102C	N/A
HLP 2S1	Lighting Panel	100A-3P	480Y/277V, 3Φ, 4W	Second	Elec Clo	K206	EP-102B	N/A
HLP 2S2	Lighting Panel	100A-3P	480Y/277V, 3Φ, 4W	Second	Elec Clo	A210	EP-102A	N/A
HLP 3N	Lighting Panel	150A-3P	480Y/277V, 3Φ, 4W	Third	Elec Clo	G308	EP-103C	N/A
HLP 3S1	Lighting Panel	100A-3P	480Y/277V, 3Φ, 4W	Third	Elec Clo	K306	EP-103B	N/A
HLP 3S2	Lighting Panel	100A-3P	480Y/277V, 3Φ, 4W	Third	Elec Clo	A310	EP-103A	N/A
HLP 4N	Lighting Panel	150A-3P	208Y/120V, 3Φ, 4W	Fourth	Elec Clo	K406	EP-104C	N/A
HLP 4S1	Lighting Panel	100-3P	480Y/277V, 3Φ, 4W	Fourth	Elec Clo	K406	EP-104B	N/A
HLP 4S2	Lighting Panel	200A-3P	480Y/277V, 3Φ, 4W	Fourth	Elec Clo	A410	EP-104A	N/A
HPPBP	Lighting Panel	1200A-3P	N/A	Basement	Chiller Room	G025.2	EP-100C	N/A
HMPRN	Lighting Panel	800A-3P	480Y/277V, 3Φ, 4W	--	--	--	--	--
HMPRS	Lighting Panel	800A-3P	480Y/277V, 3Φ, 4W	Fourth	Elec Clo	A410	EP-104A	N/A
GP BN1	Receptacle Panel	200A-3P	208Y/120V, 3Φ, 4W	Basement	Substation	G018	EP-100C	E-206
GP MWS	Receptacle Panel	100A-3P	208Y/120V, 3Φ, 4W	Basement	Maintenance Workshop	G031	EP-100C	E-206
GPBP	Receptacle Panel	100A-3P	208Y/120V, 3Φ, 4W	Basement	HVAC Maint. Gen. Storage	G025.1	EP-100C	N/A
GP BN2	Receptacle Panel	100A-3P	208Y/120V, 3Φ, 4W	Basement	Substation	E007	EP-100B	E-206
GP PG	Receptacle Panel	250A-3P	208Y/120V, 3Φ, 4W	Basement	Substation	G018	EP-100C	E-206
GP BN2	Receptacle Panel	--	--	Basement	Substation	E007	EP-100B	N/A
GP 1N	Receptacle Panel	350A-3P	208Y/120V, 3Φ, 4W	First	Elec Clo	G106	EP-101C	N/A
GP 1S1	Receptacle Panel	250A-3P	208Y/120V, 3Φ, 4W	First	Elec Clo	D1045	EP-101B	N/A
GP 1S2	Receptacle Panel	250A-3P	208Y/120V, 3Φ, 4W	First	Elec Clo	A110	EP-101A	N/A
GP 2N	Receptacle Panel	350A-3P	208Y/120V, 3Φ, 4W	Second	Elec Clo	G206	EP-102C	N/A
GPGCL 2N	Receptacle Panel	100A-3P	208Y/120V, 3Φ, 4W	Second	Computer Lab	G201	EP-102B	N/A
GP 2S1	Receptacle Panel	250A-3P	208Y/120V, 3Φ, 4W	Second	Elec Clo	K206	EP-102A	N/A
GP 2S2	Receptacle Panel	250A-3P	208Y/120V, 3Φ, 4W	Second	Elec Clo	A210	EP-102A	N/A
GPGCL 2S	Receptacle Panel	100A-3P	208Y/120V, 3Φ, 4W	Second	EE	B205	EP-102A	N/A
GP 3N	Receptacle Panel	350A-3P	208Y/120V, 3Φ, 4W	Third	Elec Clo	G308	EP-103C	N/A
GP 3S1	Receptacle Panel	250A-3P	208Y/120V, 3Φ, 4W	Third	Elec Clo	K306	EP-103A	N/A
GP 3S2	Receptacle Panel	250A-3P	208Y/120V, 3Φ, 4W	Third	Elec Clo	A310	EP-103A	N/A
GP 4N1	Receptacle Panel	350A-3P	208Y/120V, 3Φ, 4W	Fourth	Elec Clo	K406	EP-104C	N/A

TABLE 2.3

Panelboard Table								
Equipment Tag	Type	Main Size	Voltage System	Floor Level	Room Name	Room Number	1/8th Scale Dwg	Enlarged Plan
GP 4N2	Receptacle Panel	N/A	208Y/120V, 3Φ, 4W	Fourth				
GP 4S1	Receptacle Panel	175A-3P	208Y/120V, 3Φ, 4W	Fourth	Elec Clo	K406	EP-104C	N/A
GP 4S2	Receptacle Panel	250A-3P	208Y/120V, 3Φ, 4W	Fourth	Elec Clo	A410	EP-104A	N/A
GP 4SNL	Receptacle Panel	--	--	Fourth	--	--	--	--
GP 4SSL	Receptacle Panel	N/A	208Y/120V, 3Φ, 4W	Fourth	--	--	--	--
LP CNC	Lighting Panel	150A-3P Shunt Trip	208Y/120V, 3Φ, 4W	Basement	Manufacturing Engineering	G040	EP-100C	N/A
LP ME	Lighting Panel	100A-3P Shunt Trip	208Y/120V, 3Φ, 4W	Basement	Mechanical Engineering	G018	EP-100C	E-206
KP1N	Lighting Panel	N/A	208Y/120V, 3Φ, 4W	First	Food Stoage	G101.8	EP-101C	N/A
KP1S	Lighting Panel	--	--	First	Corridor	K104	EP-101A	N/A
DKP1	Lighting Panel	250A-3P	208Y/120V, 3Φ, 4W	First	Corridor	K104	EP-101A	N/A
EHLP BN1	Emergency Ltg. Panel	Lugs Only	480Y/277V, 3Φ, 4W	Basement	Substation	G018	EP-100C	E-206
EHLP BPG	Emergency Ltg. Panel	100A-3P	480Y/277V, 3Φ, 4W	Basement	--	--	--	--
EHLP BN2	Emergency Ltg. Panel	--	--	Basement	Substation	E007	EP-100B	E-206
EHLP 1N1	Emergency Ltg. Panel	Main Lugs Only	480Y/277V, 3Φ, 4W	First	Freight Lobby	G108	EP-101C	N/A
EHLP 1S1	Emergency Ltg. Panel	Main Lugs Only	480Y/277V, 3Φ, 4W	First	--	--	--	--
EHLP 2N	Emergency Ltg. Panel	Main Lugs Only	480Y/277V, 3Φ, 4W	Second	Freight Lobby	G208	EP-102C	N/A
EHLP 2S	Emergency Ltg. Panel	Main Lugs Only	480Y/277V, 3Φ, 4W	Second	EE	B205	EP-102A	N/A
EHLP 3N	Emergency Ltg. Panel	Main Lugs Only	480Y/277V, 3Φ, 4W	Third	Freight Lobby	G308	EP-103C	N/A
EHLP 3S	Emergency Ltg. Panel	Main Lugs Only	480Y/277V, 3Φ, 4W	Third	EEC	B305	EP-103A	N/A
EHLP 4N	Emergency Ltg. Panel	Main Lugs Only	480Y/277V, 3Φ, 4W	Fourth	Freight Lobby	G408	EP-104C	N/A
EHLP 4PG	Emergency Ltg. Panel	--	--	Fourth	Freight Lobby	G408	EP-104C	N/A
EHLP 4S	Emergency Ltg. Panel	50A-3P	480Y/277V, 3Φ, 4W	Fourth	EEC	B405	EP-104A	N/A
ELP BN	Emergency Ltg. Panel	Main Lugs Only	208Y/120V, 3Φ, 4W	Basement	Substation	G018	EP-100C	E-206
ELP BN2	Emergency Ltg. Panel	Main Lugs Only	208Y/120V, 3Φ, 4W	Basement	Substation	E007	EP-100B	E-206
ELP 2N	Emergency Ltg. Panel	Main Lugs Only	208Y/120V, 3Φ, 4W	Second	Freight Lobby	G208	EP-102C	N/A
ELP 2S	Emergency Ltg. Panel	Main Lugs Only	208Y/120V, 3Φ, 4W	Second	EE	B205	EP-102A	N/A
ELP 4N	Emergency Ltg. Panel	Main Lugs Only	208Y/120V, 3Φ, 4W	Fourth				
ELP 4S	Emergency Ltg. Panel	Main Lugs Only	208Y/120V, 3Φ, 4W	Fourth	EEC	B405	EP-104A	N/A
SHDP BN1	Standby Dist. Panel	400A-3P	480Y/277V, 3Φ, 4W	Basement	Substation	E007	EP-100B	E-206
SHDP BN	Standby Dist. Panel	400A-3P	480Y/277V, 3Φ, 4W	Basement	Substation	G018	EP-100C	E-206
SLP BN1	Standby Ltg. Panel	50A-3P	208Y/120V, 3Φ, 4W	Basement	Substation	G018	EP-100C	E-206
SLP BN	Standby Ltg. Panel	50A-3P	208Y/120V, 3Φ, 4W	Basement	--	--	--	--
SHPP BP	Standby Ltg. Panel	--	--	Basement	Chiller Room	G025.2	EP-100C	N/A
30 KVA UPS	Uninterrupted Power Supply	--	--	Basement	MCER Room	G001	EP-100B	N/A
PP UPS	Uninterrupted Power Supply	Main Lugs Only	208Y/120V, 3Φ, 4W	Basement	MCER Room	G001	EP-100B	N/A

TABLE 2.3 (CONT.)

Transformers:

In the following table, transformers are separated by their location within GCC; either in the parking garage, North Tower, or South Tower. Primary and secondary voltage, size, type, and additional properties are listed.

TABLE 2.4 contains information on the transformers provided by the Construction Documents and specifications from Perkins + Will for GCC:

Individual Transformer Schedule								
Tag	Primary Voltage	Secondary Voltage	Size (KVA)	Type	Temp. Rise	Taps	Mounting	Remarks
Parking Garage								
TX GPPG	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
North Tower								
TX GPBN1	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX GPBN2	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX GP1N	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX CKPN1	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX GP2N	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX GP3N	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX GP4N	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
South Tower								
TXSS	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TXSN	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX GP1S1	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX GP1S2	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX GP2S1	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	

TABLE 2.4

Individual Transformer Schedule								
Tag	Primary Voltage	Secondary Voltage	Size (KVA)	Type	Temp. Rise	Taps	Mounting	Remarks
TX GP2S2	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX GP3S1	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX GP3S2	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX GP4S1	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX GP4S2	480V-3Φ Delta	208/120V 3Φ, 4W	112.5	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX MKP2	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX DKP1	480V-3Φ Delta	208/120V 3Φ, 4W	75	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
Standby Power								
TX SLP-BN1	480V-3Φ Delta	208/120V 3Φ, 4W	30	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX SLP-BN	480V-3Φ Delta	208/120V 3Φ, 4W	30	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
Emergency Power								
TX ELP1N	480V-3Φ Delta	208/120V 3Φ, 4W	15	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX ELP1S1	480V-3Φ Delta	208/120V 3Φ, 4W	15	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX ELP-BN1	480V-3Φ Delta	208/120V 3Φ, 4W	15	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	
TX ELP-BS	480V-3Φ Delta	208/120V 3Φ, 4W	15	Dry Type	115°C	(6) 2.5% Taps 2 Up 4 Below	Pad Mounted Vibration Isolated	

TABLE 2.4 (CONT.)

Special Equipment:

Power generation:

Solar Panels[iii]

The SPS are sized for 5.1 kVA and a minimum 5.1 kW output and load voltage will be 277 VAC, single-phase, 3-wire. Input voltage will be 600 VDC max, 3-wire. The PV modules shall support the SPS at 100 percent rated kW load for continuous operation during day time. Under normal conditions, the load is provided with ac power flowing from the inverter output

terminals, through the Photovoltaic modules and inverter, with the utility grid power connected in parallel with the inverter output. Normal conditions for automatic operation include: supplying load during the day, supplying load at night from the utility grid power connected in parallel. It the times where power is in excess in the system, excess power produced from solar panels is fed back into the utility grid. Under Standard Test Conditions
(STC); an irradiance of 1000W/ m^2, spectrum AM 1.5g and cell temperature of 25ºC, the peak power output is 215 Watts.

Power Quality Equipment:

UPS System[iv]
The UPS is sized for 30 kVA and a minimum 24 kW output, load voltage and bypass line voltage will be 208/120 VAC, three-phase, 4-wire. Input voltage will be 480 VAC, three-phase, 3-wire. The battery shall support the UPS at 100 percent rated kW load for at least 20 minutes at 25 deg C. If normal ac power supply fluctuates, the UPS battery maintains constant ac load without breaking any connections.

Lighting Loads
Electric lighting is a balance between function, performance, and appearance. The majorities of lamp types are linear/compact fluorescent and metal halide, and are designed to the lowest wattage consumption to meet LEED® criteria. Time clock control as well as daylight and occupancy sensors are used to limit the operation time and electric load consumed by different fixtures.

TABLE 2.5 summarizes the luminaires specified for GCC. Also included are lamp type and number, ballast type, input wattage, and operating and starting current and power factor. Please see Appendix A for HID ballast cut sheets.

LIGHTING LOAD SCHEDULE											
FIXTURE TYPE	LAMP TYPE	LAMP WATTAGE	# LAMPS	BALLAST TYPE	OPERATING VOLTAGE	INPUT WATTS	BALLAST FACTOR	CURRENT @ START/OPERATING		PF @ START/OPERATING	
F1	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F1A	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F2	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F2A	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F3	CFTR26	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F3A	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.24	-	0.42
F4	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F5	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F6	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F7	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F8	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F9	T5 CIRCLINE	26	1	DALI/DIMMING	277	26	1	-	-	-	-
F10	F14T5	14	1	DALI/DIMMING	277	18	1	-	0.07	-	0.93
F11	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F12	LED	0.5	1	LED DRIVER	277	0.5	-	-	-	-	-
F13	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F14	MP250	250	1	ELEC	277	272	1	1.3	1.08	0.76	0.91
F14A	MP400	400	1	ELEC	277	425	1	2.1	1.7	0.73	0.90
F15	MC150T7	150	1	ELEC	277	167	1	0.7	0.63	0.86	0.96
F16	LED	3W/FT MAX	-	LED DRIVER	277	3W/FT	-	-	-	-	-
F17	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F18	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F19	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F20	F28T5	28	4	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F20	MCP39PAR20	39	1	ELEC	277	44	1	0.5	0.56	0.32	0.28
F21	NOT USED	-	-	-	-	-	-	-	-	-	-
F22	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F23	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F24	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96

TABLE 2.5

LIGHTING LOAD SCHEDULE											
FIXTURE TYPE	LAMP TYPE	LAMP WATTAGE	# LAMPS	BALLAST TYPE	OPERATING VOLTAGE	INPUT WATTS	BALLAST FACTOR	CURRENT @ START/OPERATING		PF @ START/OPERATING	
F25	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F26	F14T5	14	2	DALI/DIMMING	277	32	1	-	0.13	-	0.89
F27	MH39T6	39	1	ELEC	277	44	1	0.3	0.19	0.53	0.84
F28	F14T5	14	2	DALI/DIMMING	277	34	1	-	0.13	-	0.94
F28	F14T5	14	1	DALI/DIMMING	277	19	1	-	0.07	-	0.98
F29	LED	5	1	LED DRIVER	277	6	-	-	-	-	-
F30	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F31	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F32	F14T5	14	2	DALI/DIMMING	277		1	-	0.13	-	0.00
F32	F14T5	14	1	DALI/DIMMING	277		1	-	0.07	-	0.00
F32	T5 CIRCLINE	22	1	DALI/DIMMING	277		1	-	-	-	-
F33	F28T5	28	4	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F34	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F34A	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F35	TRACK	-	-	-	-	-	-	-	-	-	-
F35A	PAR38	100	1	-	120	100	-	-	-	-	1.00
F50B	CMH39PAR30	39	1	ELEC	277	48	1	0.3	0.19	0.58	0.91
F36	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F37	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F38	NOT USED	-	-	-	-	-	-	-	-	-	-
F39	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F40	CFTR26	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F41	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F41A	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F41B	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F41B	CMH MR16	20	1	ELEC	277	22.5	1	-	0.36	-	0.23
F41C	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F42	LED	-	-	-	277	4	-	-	-	-	-
F43	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F44	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F45	CMH MR16	20	2	ELEC	277	22.5	1	-	0.36	-	0.23
F46	CMH MR16	20	1	ELEC	277	22.5	1	-	0.36	-	0.23
F47	CF26DT	26	2	DALI/DIMMING	277	55	1	-	0.11	-	1.81
F48	CFTR26	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F49	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F50	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F50A	PAR 38 HAL	100	1	-	120	100	-	-	-	-	1.00
F50B	CMH39PAR30	39	1	ELEC	277	48	1	0.3	0.19	0.58	0.91
F51	LED			LED DRIVER	277	9	-	-	-	-	
F52	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F53	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F53A	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F54	F14T5	14	2	DALI/DIMMING	277	32	1	-	0.13	-	0.89
F54A	F28T5	28	2	DALI/DIMMING	277	64	1	-	0.23	-	1.00
F55	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F56	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F57	CFTR26	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F58	LED		1	LED DRIVER	277	20W/FT	-	-	-	-	-
F59	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.24	-	0.42
F60	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.12	-	1.90
F61	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F62	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F63	CF26DT	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F64	F14T5	14	1	DALI/DIMMING	277	16	1	-	0.07	-	0.83
F65	TBD	-	-	-	-	-	-	-	-	-	-
F66	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F67	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F68	COLD CATHOD	-	-	-	-	-	-	-	-	-	-
F69	CFTR26	26	1	DALI/DIMMING	277	28	1	-	0.11	-	0.92
F70	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F71	F28T5	28	1	DALI/DIMMING	277	32	1	-	0.12	-	0.96
F72	NOT USED	-	-	-	-	-	-	-	-	-	-
F73	F14T5	14	1	DALI/DIMMING	277	16	1	-	0.15	-	0.39
F74	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F75	F28T5	28	2	DALI/DIMMING	277	63	1	-	0.23	-	0.99
F76	NOT USED	-	-	-	-	-	-	-	-	-	-

NOTES: For Metal Halide ballast information, please refer to Appendix A

TABLE 2.5 (CONT.)

TABLE 2.6 summarizes automatic shutoff requirements set by ASHRAE 90.1:

Space Type	LPD (W./ft^2)	Area (ft^2)	Exceptions	Allowance	Abide by Compliance Path	Total Allowable
Library Stacks	1.7	7456	Decorative (Chandeliers)	+1.0 (W./ft^2)	a., b.,	20131.2W
Exterior Garden (Exterior Walkway >10 ft.)	1.0	4319	Advertisement Signage (b.)	Exempt with individual control device	a., c. e., f.	4319W+
Atrium (1-3)	.6	12694			a., b., d.	7616W
Atrium (4)	.2	3173			a., b.,	635W
Classroom	1.4	2304			a.,	3226W

Compliance Path	Name	Conditions
a. 9.4.1.1	Automatic LTG Shutoff	>5000 ft^2, int ltg controlled with automatic control device
b. 9.4.1.2	Space Control	Space enclose with ceiling height partitions will have auto shut-off within 30 min of leaving
c. 9.4.1.3	Exterior Ltg Control	All exterior will be shut off when sufficient daylight is present, photosensor or astronomical time switch
d. 9.4.1.4	Additional Control	Display/accent will have separate control device
e. 9.4.4	Ext. Building Grounds Ltg	All exterior > 100W shall have efficacy of 60lm/W
f. 9.4.5	Ext. Building Ltg Pwr	Total exterior power allowance is sum of everything in table 9.4.5 "tradable surfaces" + 5% unrestricted of sum.

TABLE 2.6

Mechanical (and other) Loads

TABLE 2.7 summarizes the load in KVA and KW created by different types of equipment in GCC. A total for each section load can be seen at the end of the section and a total of the systems at the end of the schedule itself.

MECHANICAL AND OTHER LOADS									
LOAD TAG	LOAD DESCRIPTION	LOAD MAGNITUDE	LOAD UNITS	MOTOR AMPS	VOLTAGE	PHASES	POWER FACTOR	kVA	kW
LABORATORY									
LEF-1	LAB EXHAUST FAN	50	HP	65.0	460.0	3.0	0.93	51.8	48.2
LEF-2	LAB EXHAUST FAN	50	HP	65.0	460.0	3.0	0.93	51.8	48.2
LEF-3	LAB EXHAUST FAN	50	HP	65.0	460.0	3.0	0.93	51.8	48.2
PLUMBING							SUM:	155.4	144.5
LVP	LAB VACUUM PUMP	(2) 5	HP	15.2	460.0	3.0	0.94	12.1	11.4
LCA	LAB COMPRESSED AIR PACKAGED SYSTEM	(2) 10	HP	28.0	460.0	3.0	0.94	22.3	21.0
HWRP	SOLAR WATER RETURN PUMP	1/2	HP	9.8	115.0	1.0	0.80	1.1	0.9
EP1	EJECTOR PUMP	3/4	HP	1.6	460.0	3.0	0.82	1.3	1.0
SP1	SUMP PUMP	3/4	HP	1.6	460.0	3.0	0.85	1.3	1.1
DWBP	-	15	HP	21.0	460.0	3.0	0.93	16.7	15.6
PUMPS								54.8	50.9
SCHWP-1	CHILLED WATER PUMP	75	HP	96.0	460.0	3.0	0.95	76.5	72.7
SCHWP-2	CHILLED WATER PUMP	75	HP	96.0	460.0	3.0	0.95	76.5	72.7
CHWP-1	ICE STORAGE WATER PUMP	25	HP	34.0	460.0	3.0	0.93	27.1	25.2
CHWP-2	ICE STORAGE WATER PUMP	25	HP	34.0	460.0	3.0	0.93	27.1	25.2
CWP-1	CONDENSOR WATER PUMP	30	HP	40.0	460.0	3.0	0.93	31.9	29.6
CWP-2	CONDENSOR WATER PUMP	30	HP	40.0	460.0	3.0	0.93	31.9	29.6
SHWP-1	HOT WATER PUMP	25	HP	34.0	460.0	3.0	0.93	27.1	25.2
SHWP-2	HOT WATER PUMP	25	HP	34.0	460.0	3.0	0.93	27.1	25.2
HWP-1	HOT WATER PUMP	-	HP	-			0.93	25	23.3
HWP-2	HOT WATER PUMP	-	HP	-			0.93	25	23.3
HWP-3	HOT WATER PUMP	3/4	HP	1.6	460.0	3.0	0.85	1.3	1.1
FANS								376.3	353.0
EF-1	FAN	1/2	HP	1.1	460.0	3.0	0.80	0.9	0.7
EF-2	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
EF-3	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
EF-4	FAN	1/4	HP	5.8	115.0	1.0	0.75	0.7	0.5
EF-5	FAN	1/6	HP	4.4	115.0	1.0	0.73	0.5	0.4
EF-6	FAN	1/6	HP	4.4	115.0	1.0	0.73	0.5	0.4
EF-7	FAN	1/6	HP	4.4	115.0	1.0	0.73	0.5	0.4
EF-8	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
EF-9	FAN	3/4	HP	1.6	460.0	3.0	0.82	1.3	1.0
EF-10	FAN	1/4	HP	5.8	115.0	3.0	0.75	1.2	0.9
EF-11	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
EF-12	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
EF-13	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
EF-14	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
EF-15	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
EF-16	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
EF-17	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
EF-18	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
EF-19	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
EF-20	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4

TABLE 2.7

MECHANICAL AND OTHER LOADS									
LOAD TAG	LOAD DESCRIPTION	LOAD MAGNITUDE	LOAD UNITS	MOTOR AMPS	VOLTAGE	PHASES	POWER FACTOR	kVA	kW
EF-21	FAN	1/4	HP	5.8	115.0	1.0	0.75	0.7	0.5
EF-22	FAN	1/4	HP	5.8	115.0	1.0	0.75	0.7	0.5
EF-23	FAN	1/4	HP	5.8	115.0	1.0	0.75	0.7	0.5
EF-24	FAN	1/4	HP	5.8	115.0	1.0	0.75	0.7	0.5
EF-25	FAN	1/4	HP	5.8	115.0	1.0	0.75	0.7	0.5
GEF-1	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
GEF-2	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
GEF-3	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
GEF-4	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
GEF-5	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
GEF-6	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
GEF-7	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
GEF-8	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
GEF-9	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
GEF-10	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
GEF-11	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
GEF-12	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
GEF-13	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
KEF-1	FAN	2	HP	3.4	460.0	3.0	0.86	2.7	2.3
KEF-2	FAN	2	HP	3.4	460.0	3.0	0.86	2.7	2.3
KEF-3	FAN	2	HP	3.4	460.0	3.0	0.86	2.7	2.3
KEF-4	FAN	2	HP	3.4	460.0	3.0	0.86	2.7	2.3
KEF-5	FAN	2	HP	3.4	460.0	3.0	0.86	2.7	2.3
KEF-6	FAN	2	HP	3.4	460.0	3.0	0.86	2.7	2.3
KEF-7	FAN	2	HP	3.4	460.0	3.0	0.86	2.7	2.3
KEF-8	FAN	2	HP	3.4	460.0	3.0	0.86	2.7	2.3
KEF-9	FAN	2	HP	3.4	460.0	3.0	0.86	2.7	2.3
KEF-10	FAN	5	HP	7.6	460.0	3.0	0.90	6.1	5.4
KEF-11	FAN	7 1/2	HP	11.0	460.0	3.0	0.91	8.8	8.0
KEF-12	FAN	3	HP	4.8	460.0	3.0	0.88	3.8	3.4
KEF-13	FAN	5	HP	7.6	460.0	3.0	0.90	6.1	5.4
KEF-14	FAN	2	HP	3.4	460.0	3.0	0.86	2.7	2.3
KEF-15	FAN	5	HP	7.6	460.0	3.0	0.90	6.1	5.4
AHUS								166.1	145.2
AHU-1	AIR HANDLING UNIT	60	HP	77.0	460.0	3.0	0.95	61.3	58.3
AHU-1	AIR HANDLING UNIT	(3) 75	HP	288.0	460.0	3.0	0.95	229.5	218.0
AHU-2	AIR HANDLING UNIT	60	HP	77.0	460.0	3.0	0.95	61.3	58.3
AHU-2	AIR HANDLING UNIT	(3) 75	HP	288.0	460.0	3.0	0.95	229.5	218.0
AHU-3	AIR HANDLING UNIT	60	HP	77.0	460.0	3.0	0.95	61.3	58.3
AHU-3	AIR HANDLING UNIT	(3) 75	HP	288.0	460.0	3.0	0.95	229.5	218.0
AHU-4	AIR HANDLING UNIT	60	HP	77.0	460.0	3.0	0.95	61.3	58.3
AHU-4	AIR HANDLING UNIT	(3) 75	HP	288.0	460.0	3.0	0.95	229.5	218.0

TABLE 2.7 (CONT.)

MECHANICAL AND OTHER LOADS									
LOAD TAG	LOAD DESCRIPTION	LOAD MAGNITUDE	LOAD UNITS	MOTOR AMPS	VOLTAGE	PHASES	POWER FACTOR	kVA	kW
ELEVATORS AND ESCALATORS						(FLA)		1163.2	1105.1
PE-1	ELEVATOR	30	HP	42.0	460.0	3.0	0.93	33.5	31.1
PE-2	ELEVATOR	30	HP	42.0	460.0	3.0	0.93	33.5	31.1
PE-4	ELEVATOR	30	HP	42.0	460.0	3.0	0.93	33.5	31.1
PE-5	ELEVATOR	30	HP	42.0	460.0	3.0	0.93	33.5	31.1
PE-7	ELEVATOR	40	HP	57.0	460.0	3.0	0.93	45.4	42.2
PE?	ELEVATOR	30	HP	42.0	460.0	3.0	0.93	33.5	31.1
PE?	ELEVATOR	30	HP	42.0	460.0	3.0	0.93	33.5	31.1
SE-3	ELEVATOR	40	HP	52.0	460.0	3.0	0.93	41.4	38.5
SE-6	ELEVATOR	40	HP	57.0	460.0	3.0	0.93	45.4	42.2
ESC1	ESCALATOR	15	HP	29.0	460.0	3.0	0.93	23.1	21.5
								356.1	331.2
							TOTAL kVA:	2272.0	2129.9

TABLE 2.7 (CONT.)

Service Entrance Size

Service Entrance Size: Summary Table				
Method	kVA	Amperage at 480V	Main Breaker (1) Size	Main Breaker (2) Size
Schematic	4428.00	6658	4000A	3000A
Design Development	8078.13	9716	5000A	5000A
CD Loads	3120.60	3120.6	2000A	2000A
Current Design	-	-	3000A	3000A

TABLE 2.8

To size the service entrance for GCC, three different methods were used; 1) sizing with Schematic information, 2) sizing with Design Development information, and 3) sizing with Construction Document information. The results from the three methods were varied in the final size of circuit breakers for two main switchboards (as seen in TABLE 2.8).

The largest breaker size is required from the Design Development process; which is due to the overcompensation used during earlier phases to prevent from under-sizing equipment. In reference to my method, the large size could have also resulted from high demand factors; I assumed 1 for each load except receptacles.

The smallest main breaker size is required from the Construction Document process. This is standard for electrical design, where actual loads (and respective breaker sizes) decrease as the design becomes more detailed. Specific loading schedules also help detail exact equipment, which validates using smaller sized breakers. This also is a result of using conservative demand factors to on each type of load. (In this case, it should also be noted that lighting and receptacle loads are the same as in the Design Development method, as instructed by the Electrical Adviser at The Pennsylvania State University.)

In the current design, the main breakers are used for the two switchboards in GCC; this could be due to compensation for growth, as seen in spare circuit breakers on riser diagrams and single line diagrams.

Service Entrance Size: Schematic			
Space Type	Area	VA/ft^2	kVA
Classroom/Office[i]	369,000	12	4428
		Total Amperage @ 480V	6658
		Size of Service Entrance One	4000A
		Size of Service Entrance Two	3000A

i: Since Building is either college classrooms or offices; which have the same VA/ft^2, the total SF of the building was used to calculate Service Entrance Size

ii. Assumed 25% growth on final sizes

TABLE 2.9

Service Entrance Size: Design Development				
Load Type	Square Footage	VA/ft^2	Demand Factor	kVA
Lighting	369,000	3	1	1107
Receptacle	369,000	1	10000kVA @ 1.0, rest @ 0.5	189.5
Mechanical	369,000	12	1	4428
Fans	369,000	2	1	738
			Total kVA[i]	8078.125
			Total Amperage @ 480V	9716
			Size of Service Entrance One	5000A
			Size of Service Entrance Two	5000A

i. Assumed 25% growth on final sizes

TABLE 2.10

Service Entrance Size: CD Loads				
Load Description	Demand Factor		Load (kW)	Demand Load (kVA)
Lighting	0.64	i	1107	708.48
Receptacle	0.64	i	189.5	121.28
Laboratory	0.80		144.5	115.60
Plumbing	0.80		50.9	40.72
Pumps	0.80		306.5	245.20
Fans	0.80		145.2	116.16
AHUs	0.80		1105.1	884.08
Elevators and Escalators	0.80		331.2	264.96
			Total kVA[ii]	3120.60
			Total Amperage @ 480V	3753
			Size of Service Entrance One	2000A
			Size of Service Entrance Two	2000A

i. 0.64 = .8 * .8 (assumed for continuous load and)

ii. Assumed 25% growth on final sizes

TABLE 2.11

Environmental Stewardship Design

LEED® Gold Rating

To develop high esteem for the new campus in downtown New Haven, CT; publicizing and reinforcing "green" attribute is already successful (even in pre-construction). Integration of Photovoltaic panels on the roof will collect solar power that will supplant power from the grid, and in over-production scenarios, transfer power back to the grid.

Lighting Equipment

Integral daylight sensors—in conjunction with all luminaires within 15' of windows—have the potential to eliminate a percentage of electric light used and therefore power supplied to those fixtures. Also, occupancy (infrared sensors) sensors and time clocks regulate and manage the power provided to various luminaires to eliminate unnecessary use of electric lighting load.

Design Issues

Being rated at the LEED® Gold standard, intense energy modeling was required to record and verify building consumption and the proper integration of systems to maintain a balance within the building. For example, lighting loads were reduced to reduce power supplied to mechanical equipment.

Communication Systems

Fire Alarm

The fire alarm system is a non-coded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only. The alarm signal is initiated by one or more of the following systems located throughout the building; manual stations, heat detectors, smoke detectors, heat detectors (elevator shaft and pit), and duct smoke detectors.

Telecommunication

The main communication rooms in GCC are located in the basement of the North tower. Six server racks and two video distribution system racks are located in the main room. Ladder racks distribute data vertically to three telecommunication rooms on each floor and cable trays allocate data horizontally across the floors. These distribution systems feed data outlets, speakers, and other audio-visual devices.

Appendix A: Cut Sheets

WORLDWIDE PARTNER

GE Lighting

Commercial Products & Solutions

SITE SEARCH | HOME | PRODUCTS | EDUCATION / RESOURCES | LIGHTING APPLICATIONS

Where to Buy | FAQs | Contact Us | EliteNet

Products » Ballasts » High Intensity Discharge » Ceramic Metal Halide » 87490

PRINT

87490 – GEMH20-MLF-120

GE HID UltraMax™ Electronic Low Frequency Ballast

- Light-weight, Low Profile Housing
- Superior low frequency square wave frequency design maximizes performance and life of ceramic metal halide lamps.
- Ultra slim can size for fixture design flexibility

View Larger

GENERAL CHARACTERISTICS

Application	1- 20W M156 120V High Effeciency Low Frequency Electronic HID
Category	High Intensity Discharge
Ballast Type	Electronic - Low Frequency
Starting Method	n/a
Line Voltage Regulation (+/-)	10 %
Ambient Temperature (MIN)	0 °F (-18 °C)
Ambient Temperature (MAX)	55 °C (131 °F)
Case Temperature (MAX)	85 °C (185 °F)
Ballast Factor	Normal
Power Factor Correction	Active
Circuit Type	Electronic
Sound Rating	A (20-24 decibels)
Enclosure Type	Plastic
Distance to Lamp (MAX)	8 ft
Additional Info	End of Life Protection (EOL), Inherent thermal protection
Primary Application	Indoor Floodlight; Indoor Spotlight; Hospitality; Restaurant; Retail Display

ELECTRICAL CHARACTERISTICS

Lamp Operating Frequency	133 Hz
Supply Current Frequency	60 Hz/50 Hz
Supply Current Frequency (MIN)	50 Hz

PRODUCT INFORMATION

Product Code	87490
Description	GEMH20-MLF-120

DIMENSIONS

Case dimensions			
Length (L)	3.7 in (94.99 mm)		
Width (W)	1.6 in (39.87 mm)		
Height (H)	1.0 in (25.40 mm)		
Mounting dimensions			
Mount Length (M)	3.4 in (85.34 mm)		
Mount Width (X or F)	1.2 in (30.22 mm)		
Mount Slots (MS)	0.2 in (4.31 mm)		
Weight	0.38 lbs		
Exit Type	Side		
Remote mounting distance to lamp	8 ft		
Remote Mounting Wire Gauge	18 AWG		
Lead lengths	Qty	Exit	Length (± 1 in.)
Black	1	Left	10.0 in (254 mm)
Brown	1	Right	10.0 in (254 mm)
White	1	Left	10.0 in (254 mm)
Red	1	Right	10.0 in (254 mm)

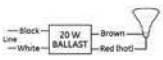


FIGURE B.1

Standard Package	Case
Standard Package GTIN	10043168874905
Standard Package Quantity	12
Sales Unit	Case
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	12
UPC	043168874908

View Larger

SPECIFICATIONS BY LAMP & LINE VOLTAGE

Lamp	# of Lamps	Specifications by Line Voltage	
M156	1		120
(20 W Ceramic Metal Halide)		System Wattage (W)	22.5
		Nominal Current	0.36 A
		Ballast Factor	1
		Ballast Efficiency	0.889
		Open Circuit Voltage	4000 V
		Drop Out Voltage	96 V
		Power factor (>=) %	56
		Crest factor (<)	1.4
		THD % (<)	79
		Min. starting temperature	0 °F (-18 °C)
		Fuse rating	3
			System specs

Safety & Performance

RoHs Compliant
ANSI - C62.41
UL 1029 Listed
FCC - CLASS A Non-Consumer
cUL Listed
UL Listed

WARRANTY INFORMATION

GE Lighting warrants to the purchaser that each ballast will be free from defects in material or workmanship for period as defined in the attached documents from the date of manufacture when properly installed and under normal conditions of use.

Download full warranty

NOTES

- 200C rated lead wires
- Housing meets UL94V0 flame retardant
- Meets IEC and ANSI requirements for power factor for Task and Downlighting
- Short Circuit Protection
- Do not connect brown or red wires to ground

ADDITIONAL RESOURCES

Catalogs
Testimonials
Disposal Policies & Recycling Information

Return To Top

Photos are representational only. Sizes, shapes and labels of ballast may vary.

FIGURE B.1 (CONT.)

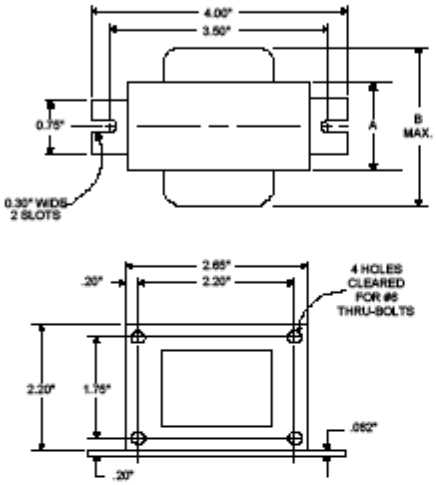
ADVANCE

Metal Halide Lamp Ballast

Catalog Number 71A5037BP
For 35/39W M130
60 Hz R-HPF
Status: Active

DIMENSIONS AND DATA

2 5/8 X 2 3/16 CORE



Capacitor: 7C050L33

Capacitance: 5
Dia/Oval Dim: 1.25
Height: 2.9
Temp Rating: 105°C

Ignitor: INTEGRAL

An ignitor integral to the core and coil assembly is used to start the lamp.

Ballast to Lamp Distance (BTL) = 2 feet
Temp Rating: 125°C

INPUT VOLTS		277				
CIRCUIT TYPE	R-HPF					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±5%					
Lamp Watts	±10%					
LINE CURRENT (Amps)						
Operating		0.19				
Open Circuit		0.52				
Starting		0.30				
UL TEMPERATURE RATINGS						
Insulation Class	H(180°C)					
Coil Temperature Code	1029	A				
MIN. AMBIENT STARTING TEMP.	-20°F or -30°C					
NOM. OPEN CIRCUIT VOLTAGE	277					
INPUT VOLTAGE AT LAMP DROPOUT		190				
INPUT WATTS	48					
RECOMMENDED FUSE (Amps)		2				
CORE and COIL						
Dimension (A)	0.95					
Dimension (B)	2.70					
Weight (lbs.)	1.9					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	5.0					
Volts (min.)	280					
Fault Current Withstand (amps)						
60 Hz TEST PROCEDURES (Refer to Advance Test Procedure for HID Ballasts - Form 1270)						
High Potential Test (Volts)						
1 minute	2000					
2 seconds	2500					
Open Circuit Voltage Test (Volts)	260-290					
Short-Circuit Current Test (Amps)						
Secondary Current	0.50-0.80					
Input Current		0.10 0.16	-	-	-	-

Wiring Diagram:

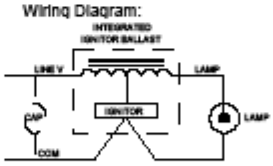


Fig. H

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500DB	Ballast With Integral Igniter and Dry Film Capacitor
510DB	Ballast w/Welded Bracket, Integral Igniter & Dry Film Cap.
600B	Ballast and Integral Igniter, No Capacitor
610B	Ballast w/Welded Bracket and Integral Igniter, No Capacitor

Data is based upon tests performed by Advance Transformer in a controlled environment and representitive of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice.

ADVANCE
O'HARE INTERNATIONAL CENTER - 10275 WEST HIGGINS ROAD - ROSEMONT, IL 60018
Customer Support/Technical Service: Phone: 800-372-3331 - Fax: 630-307-3071
Corporate Offices: Phone: 800-322-2086

12/14/05

FIGURE B.2

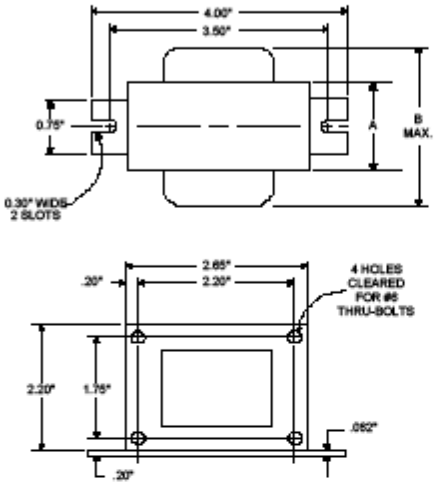
ADVANCE

Metal Halide Lamp Ballast

Catalog Number 71A5437BP
For 150W M102
60 Hz R-HPF
Status: Active

DIMENSIONS AND DATA

2 5/8 X 2 3/16 CORE



INPUT VOLTS		277				
CIRCUIT TYPE	R-HPF					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±5%					
Lamp Watts	±10%					
LINE CURRENT (Amps)						
Operating		0.63				
Open Circuit		1.50				
Starting		0.70				
UL TEMPERATURE RATINGS						
Insulation Class	H(180°C)					
Coil Temperature Code	1029	B				
MIN. AMBIENT STARTING TEMP.	-20°F or -30°C					
NOM. OPEN CIRCUIT VOLTAGE	277					
INPUT VOLTAGE AT LAMP DROPOUT		170				
INPUT WATTS	173					
RECOMMENDED FUSE (Amps)		5				
CORE and COIL						
Dimension (A)	2.50					
Dimension (B)	4.00					
Weight (lbs.)	4.2					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	14.0					
Volts (min.)	280					
Fault Current Withstand (amps)						
60 Hz TEST PROCEDURES (Refer to Advance Test Procedure for HID Ballasts - Form 1270)						
High Potential Test (Volts)						
1 minute	2000					
2 seconds	2500					
Open Circuit Voltage Test (Volts)	250-305					
Short-Circuit Current Test (Amps)						
Secondary Current	2.00-2.50					
Input Current		0.50 0.75	-	-	-	-

Capacitor: 7C140M33-R

Capacitance: 14
Dia/Oval Dim: 1.5
Height: 2.9
Temp Rating: 105°C

Ignitor: INTEGRAL

An ignitor integral to the core and coil assembly is used to start the lamp.

Ballast to Lamp Distance (BTL) = 2 feet
Temp Rating: 125°C

Wiring Diagram:

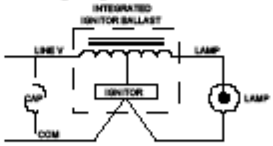


Fig. H

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500DB	Ballast With Integral Igniter and Dry Film Capacitor
510DB	Ballast w/Welded Bracket, Integral Igniter & Dry Film Cap.
500B	Ballast and Integral Igniter, No Capacitor
610B	Ballast w/Welded Bracket and Integral Igniter, No Capacitor

Data is based upon tests performed by Advance Transformer in a controlled environment and may be subject to variation. Actual performance can vary depending on operating conditions. Specifications subject to change without notice.

ADVANCE

O'HARE INTERNATIONAL CENTER - 10275 WEST HIGGINS ROAD - ROSEMONT, IL 60018
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Corporate Offices: Phone: 800-322-2086

05/15/03

FIGURE B.3

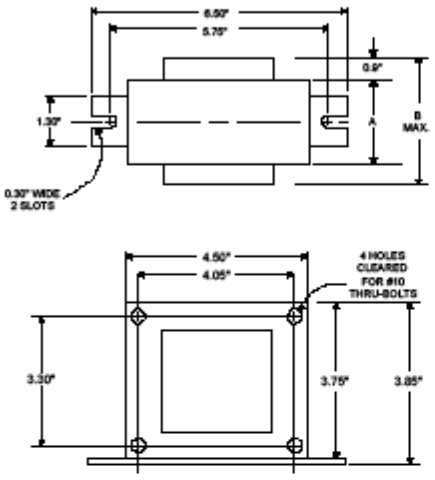
ADVANCE

Metal Halide Lamp Ballast

Catalog Number 71A5737BP
For 250W M138/M153 (P.S.)
60 Hz R-HPF
Status: Active

DIMENSIONS AND DATA

3 3/4 X 4 1/2 CORE



INPUT VOLTS		277				
CIRCUIT TYPE	R-HPF					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±5%					
Lamp Watts	±10%					
LINE CURRENT (Amps)						
Operating		1.08				
Open Circuit		1.50				
Starting		1.30				
UL TEMPERATURE RATINGS						
Insulation Class	H(180°C)					
Coil Temperature Code	1029	A				
MIN. AMBIENT STARTING TEMP.	-20°F or -30°C					
NOM. OPEN CIRCUIT VOLTAGE	277					
INPUT VOLTAGE AT LAMP DROPOUT		200				
INPUT WATTS	272					
RECOMMENDED FUSE (Amps)		4				
CORE and COIL						
Dimension (A)	1.22					
Dimension (B)	3.20					
Weight (lbs.)	6.5					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	14.0					
Volts (min.)	300					
Fault Current Withstand (amps)						
60 Hz TEST PROCEDURES (Refer to Advance Test Procedure for HID Ballasts - Form 1270)						
High Potential Test (Volts)						
1 minute	2000					
2 seconds	2500					
Open Circuit Voltage Test (Volts)	250-305					
Short-Circuit Current Test (Amps)						
Secondary Current	2.40-3.05					
Input Current		1.00 1.55	-	-	-	-

Capacitor: 7C140M33-R

Capacitance: 14
Dia/Oval Dim: 1.5
Height: 2.9
Temp Rating: 105°C

Ignitor: INTEGRAL

An ignitor integral to the core and coil assembly is used to start the lamp.

Ballast to Lamp Distance (BTL) = 5 feet
Temp Rating: 125°C

Wiring Diagram:

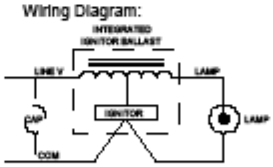


Fig. H

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500DB	Ballast With Integral Igniter and Dry Film Capacitor

Data is based upon tests performed by Advance Transformer in a controlled environment and representitive of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice.

ADVANCE
O'HARE INTERNATIONAL CENTER - 10275 WEST HIGGINS ROAD - ROSEMONT, IL 60018
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Corporate Offices: Phone: 800-322-2086

05/15/03

FIGURE B.4

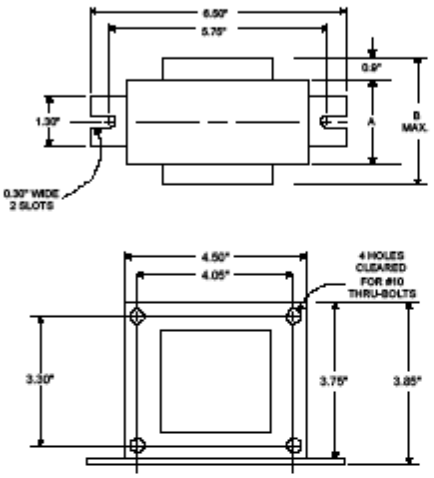
ADVANCE

Metal Halide Lamp Ballast

Catalog Number 71A6137BP
For 400W M135/M155 (P.S.)
60 Hz R-HPF
Status: Active

DIMENSIONS AND DATA

3 3/4 X 4 1/2 CORE



INPUT VOLTS		277				
CIRCUIT TYPE	R-HPF					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±5%					
Lamp Watts	±5%					
LINE CURRENT (Amps)						
Operating		1.70				
Open Circuit		2.10				
Starting		2.10				
UL TEMPERATURE RATINGS						
Insulation Class	H(180°C)					
Coil Temperature Code	1029	A				
MIN. AMBIENT STARTING TEMP.	-5°F or -20°C					
NOM. OPEN CIRCUIT VOLTAGE	277					
INPUT VOLTAGE AT LAMP DROPOUT		200				
INPUT WATTS	425					
RECOMMENDED FUSE (Amps)		5				
CORE and COIL						
Dimension (A)	1.60					
Dimension (B)	3.80					
Weight (lbs.)	9					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	20.0					
Volts (min.)	300					
Fault Current Withstand (amps)						
60 Hz TEST PROCEDURES (Refer to Advance Test Procedure for HID Ballasts - Form 1270)						
High Potential Test (Volts)						
1 minute	2000					
2 seconds	2500					
Open Circuit Voltage Test (Volts)	250-305					
Short-Circuit Current Test (Amps)						
Secondary Current	3.80-4.60					
Input Current		1.70 2.60	-	-	-	-

Capacitor: 7C200P33-R

Capacitance: 20
Dia/Oval Dim: 1.75
Height: 3.75
Temp Rating: 105°C

Ignitor: INTEGRAL

An ignitor integral to the core and coil assembly is used to start the lamp.

Ballast to Lamp Distance (BTL) = 10 feet
Temp Rating: 125°C

Wiring Diagram:

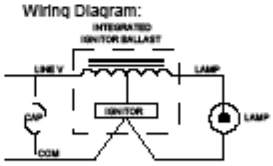


Fig. H

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500DB	Ballast With Integral Igniter and Dry Film Capacitor
510DB	Ballast w/Welded Bracket, Integral Igniter & Dry Film Cap.
540DB	Ballast w/Welded angle bracket to allow mounting in place of a standard CWA ballast
600B	Ballast and Integral Igniter, No Capacitor
610B	Ballast w/Welded Bracket, Integral Igniter, No Capacitor

Data is based upon tests performed by Advance Transformer in a controlled environment and measurements of lamps and ballasts.
Actual performance can vary depending on operating conditions. Specifications are subject to change without notice.

ADVANCE

O'HARE INTERNATIONAL CENTER - 10275 WEST HIGGINS ROAD - ROSEMONT, IL 60018
Customer Support/Technical Service: Phone: 800-372-3331 - Fax: 630-307-3071
Corporate Offices: Phone: 800-322-2086

05/15/03

FIGURE B.5

Appendix C: Citations

[i] Information provided in "Utility Company Information" is taken from a UI description

[ii] Information provided in "Overcurrent Devices" is taken from specification section 16441 switchboards and 16442 Panelboards

[iii] Information provided in "Solar Panels" is taken from specification section 16910 Solar Photovoltaic Systems

[iv] Information provided in "UPS System" is taken from specification section 16264 Static Uninterruptible Power Supply Systems