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Submission Date: October 29, 2003

Electrical Existing Conditions and Building Load Summary Report

Executive Summary:

This Electrical Existing Conditions and Building Load Summary Report will describe the general and specific characteristics of the existing electrical systems, summarize the total building electrical loads, and check of the size of the existing main distribution equipment of the Greater Hartford Academies for the Math and Sciences Building. This report also contains a single line diagram of the electrical distribution system, as well as narratives describing the system type, building utilization voltage, transformer configuration, emergency power systems, over-current protective devices used in the building, general location of electrical components, typical lighting systems used, and power factor correction. Important design requirements that pertain specifically to the building are also addressed within the report. A calculation of the NEC design loads were also performed using the available data and then compared to the actual electrical systems equipment used within the building. Also as an analysis of the energy requirements of the building, a summary of the utility rate structure is also included.

After analysis of the building using the NEC electrical design demand factors, there are several performance conclusions regarding the existing electrical system. First, the total KVA load calculated for each sub panel was well under the KVA rating of the panels, and the total current delivered to the panels was well under the rating of feeder over-current protective devices. But, when the total electrical load of the building was calculated, it was significantly more than the rating of the main distribution panel (about 150 KVA). There may be several reasons for this inconsistency. First, the recorded 1200 A main circuit breaker seems small for a building of this size and type, so further investigation (through verification by the electrical designer) is required to make sure that the correct switchboard size is on the drawings. Also, the building loads as defined by the panel boards on the drawings might be larger than the actual loads used within the building and these will be verified as soon as the utility information is received from the power company.

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The Learning Corridor's Greater Hartford Academies for the Math and Sciences building is a unique public teaching facility that has both traditional classroom areas and many special purpose spaces such as interdisciplinary science 'suites,' as well as studios for dance, recording, and creative writing. The lighting design challenges of the space will be to enhance the performance of the current lighting systems to support the function, architecture, and efficiency of the spaces. This report will describe different aspects of the existing electrical system, as well as document other aspects related to building power, distribution, and regulation of the electrical demand within the building.

System Type

The system type is a radial power distribution system because all power is supplied by the main distribution panel which has one primary feeder and transformer.

Building Utilization Voltage

Electrical power is supplied to the building by a 208/120V, 3ϕ, 4W system.

Transformer Configuration

The transformer is rated to convert utility supply voltage to 208/120V and is provided by the utility company. The utility transformer is located in Transformer Room 175.

Emergency Power Systems

The building does not an emergency generator. Emergency lighting is provided using battery ballasts. Exit signs are LED type with battery back up.

Over-current Protective Devices

The over-current protective devices used within the building are located in several locations. The main location is on the main distribution panel located in the first floor switchgear room. The main distribution panel has a 1200A, 3 pole circuit breaker. This main panel feeds almost all of the other panels located throughout the building and contains 3 pole circuit breakers of type 60A, 100A, 125A, 175A, 225A, and 400A. All panels are main lug only panelboards.

There is also a protective device on a panel located in a first floor electrical room that feeds a panel located within the same electrical room and is protected by a 3 pole, 60A circuit breaker.

The circuit which feeds the elevator 25hp motor from the main panel is protected by a 175A, 3 pole circuit breaker on the main panel, and also a fused disconnect switch rated 125A .

Locations of Electrical Control Gear

The location of the main distribution panel is in the first floor switchgear room. Lighting panels are located in storage rooms and closets on the first and second floor. Power panels and control panels are located in the main electrical room on the first floor, closets, storage rooms and hallways on the first and second floors. Mechanical panels are located in the switchgear room, the mezzanine and a second floor closet.

Typical Lighting Systems

The lighting for the building (outdoor and indoor) is of 4 main types: fluorescent, high intensity discharge, incandescent, and halogen.

- All fixtures operate at 120V.
- Most high intensity discharge lamps are metal halides.
- Exit signs have LED lamps

Power Factor Correction

According to the specifications, the power factor used for compact fluorescent lamps shall be 0.90 at minimum. The other fixture types did not have a specified constraint for power factor, therefore we will assume that the minimum power factor for all sources was 0.90 for this study.

There was no power factor correction applied within the building.

Important Design Requirements

The specialty high school has many power-sensitive loads such as certain electronic equipment (computers), communication equipment, and controls that need to be isolated from other equipment and special consideration must be given to reducing transients on their circuits. As a part of this protection, all control panels have a double neutral isolated ground. Transient voltage surge suppressors are also used to reduce transients produced by motors, fluorescent lighting and other types of sources in order to protect the power-sensitive loads.

Primary Lamps and Ballast

General Ballast Properties								
Type	Ballast Factor	Maximum Current Crest Factor	THD	Minimum Power Factor	Frequency	Starting Temperature	Sound Rating	Other
Electronic Ballast for Linear Fluorescent T8 Lamps	Between 0.90 and 1.00	1.7	< 20%	0.90	20 kHz or higher	0 °F	A	--
Electronic Ballast for Compact Fluorescent Lamps	Between 0.90 and 1.00	1.7	< 20%	0.90	20 kHz or higher	0 °F	A	--
Pulse Start Metal Halide Lamp Ballast	Between 0.90 and 1.00	--	--	0.90	60 Hz	-22 °F min (Normal Ambient Operating Temp of 104°F)	--	Auxillary, instant-on, quartz system
High Pressure Sodium Ballast	Between 0.90 and 1.00	--	--	0.90	60 Hz	22 °F min (Normal Ambient Operating Temp of 104°F)	--	Solid-state Instant restrike device

All electronic ballasts are on the CL&P (Power Company, Connecticut Light and Power) list of approved ballasts.

General Lamp Properties				
Type	CCT	CRI minimum	Average Life	Wattage
Linear Fluorescent Lamps	3500 K	85	20,000 hrs	32W
Compact Fluorescent Lamps	3500 K	85	10,000 hrs	Varies depending on fixture
Metal Halide Lamps -Above 150W -150W and below	 3600K 3200K	 70 80	 10,000 hrs 10,000 hrs	Varies depending on fixture
Halogen Lamps	--	100	2,000 hrs	Varies depending on fixture

Halogen Lamps are to be “IR” lamps by Sylvania or G.E.

Major Mechanical Equipment

The electrical load of the major mechanical equipment is summarized in the table below:

Mechanical Equipment Properties								
Equipment Designation	Description	Location	Voltage	Ph	Hz	HP	RPM	Load (KVA)
AHU-1	Air Handling Unit 1	Mezzanine Mechanical Room	208	3	60	15.0	1750	16.5
AHU-2	Air Handling Unit 2	Mezzanine Mechanical Room	208	3	60	7.5	1750	8.7
AHU-3	Air Handling Unit 3	Mezzanine Mechanical Room	208	3	60	30.0	1750	33.0
RTAH-4	Roof Top Air Handling Unit 4	Roof East	208	3	60	25.0	1750	50.4
RTAH-5	Roof Top Air Handling Unit 5	Roof East	208	3	60	20.0	1750	31.5
RTAH-6	Roof Top Air Handling Unit 6	Roof East	208	3	60	7.5	1750	15.4
EF-18	Exhaust Fan 18	Mezzanine Mechanical Room	208	3	60	0.25	1750	0.7
EF-19	Exhaust Fan 19	Mezzanine Mechanical Room	208	3	60	0.25	1750	0.7
RF-1	Return Fan 1	Mezzanine Mechanical Room	208	3	60	6.3	1750	5
RF-2	Return Fan 2	Mezzanine Mechanical Room	208	3	60	3.9	1750	3
RF-3	Return Fan 3	Mezzanine Mechanical Room	208	3	60	8.7	1750	7.5
REF-10	Roof Top Exhaust Fan 10	Roof West	208	3	60	7.5	1750	6.3
REF-11	Roof Top Exhaust Fan 11	Roof West	208	3	60	10	1750	11.6
REF-12	Roof Top Exhaust Fan 12	Roof West	208	3	60	7.5	1750	9.1
HWP-3	Hot Water Pump 3	Mechanical Room	208	3	60	7.5	1750	9.1
HWP-4	Hot Water Pump 4	Mechanical Room	208	3	60	7.5	1750	9.1
CHWP-3	Chilled Water Pump 3	Mechanical Room	208	3	60	10	1750	11.6
CHWP-4	Chilled Water Pump 4	Mechanical Room	208	3	60	10	1750	11.6
FFP-1	Freeze Protection Pump 1	Mezzanine Mechanical Room	208	3	60	0.25	1750	0.7
FFP-2	Freeze Protection Pump 2	Mezzanine Mechanical Room	208	3	60	0.25	1750	0.7
FFP-3	Freeze Protection Pump 3	Mezzanine Mechanical Room	208	3	60	0.75	1750	1.2
FFP-4	Freeze Protection Pump 4	2nd Floor East	208	3	60	0.25	1750	1.4
FFP-5	Freeze Protection Pump 5	2nd Floor East	208	3	60	0.25	1750	1.4
FFP-6	Freeze Protection Pump 6	2nd Floor East	208	3	60	0.25	1750	1.4

The mechanical load table does not include the following smaller mechanical loads since their contribution to the overall electrical loads are minimal: rooftop exhaust fans = 1/3hp, 1/4hp, wall exhaust fans = 1/10 hp, ceiling fans = 75W, exhaust fans = 1/6hp, 1/2hp, cabinet unit heaters = 1/10 hp, unit heaters = 1/20hp, 1/30 hp.

Analysis of the Building Load

The following is an analysis of NEC building design loads (according to NEC 2002). The calculations are then compared against the actual sizes for the main building transformer, the main distribution panel, sub panels, and all feeders that leave the main distribution panel. The analysis is first calculated according to the loads on each individual panel, and then for the main distribution panel.

The following demand factors were applied:

Connected Load	Demand Factor
Lighting	1.25 (continuous)
Receptacles	1 (for 1st 10 KVA); 0.5 (for > 10 KVA)
Resistance Heat	0 since a/c load is greater than the heat load
Air Conditioning	1
Motors	1
Largest Motor	0.5
Other Loads	1
Water Heating	1
Spare Capacity	

Panel LP1E: Lighting Panel 1 East

Lighting Load = 8.4 KVA
Lighting Demand Factor = 1.25 (continuous loading)

Total Lighting Load = 1.25 * 8.4 = 10.5 KVA
Total Current (I) = 10.5 KVA/(3^.5 * .208 KV) = 29.15 A

I = 29.15 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

Panel LP2E: Lighting Panel 2 East

Lighting Load = 17.67 KVA
Lighting Demand Factor = 1.25 (continuous loading)

Total Lighting Load = 1.25 * 17.67 = 22.09 KVA

Total Current (I) = 22.09 KVA/(3^.5 * .208 KV) = 61.32 A

I = 61.32 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

Panel LP3E: Lighting Panel 3 East

Lighting Load = 12.27 KVA
Lighting Demand Factor = 1.25 (continuous loading)

Total Lighting Load = 1.25 * 12.27 = 15.34 KVA
Total Current (I) = 15.34 KVA/(3^.5 * .208 KV) = 42.58 A

I = 42.58 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

Panel LP4E: Lighting Panel 4 East

Lighting Load = 27.85 KVA
Lighting Demand Factor = 1.25 (continuous loading)

Total Lighting Load = 1.25 * 27.85 = 34.81 KVA
Total Current (I) = 34.81 KVA/(3^.5 * .208 KV) = 96.62 A

I = 96.62 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

Panel LP1W: Lighting Panel 1 West

Lighting Load = 12.7 KVA
Lighting Demand Factor = 1.25 (continuous loading)

Total Lighting Load = 1.25 * 12.7 = 15.88 KVA
Total Current (I) = 15.88 KVA/(3^.5 * .208 KV) = 44.08 A

I = 44.08 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

Panel LP2W: Lighting Panel 2 West

Lighting Load = 21.1 KVA
Lighting Demand Factor = 1.25 (continuous loading)

Total Lighting Load = 1.25 * 21.1 = 26.38 KVA
Total Current (I) = 26.38 KVA/(3^.5 * .208 KV) = 73.22 A

I = 73.22 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

Panel PP1E: Power Panel 1 East

Number of receptacles = 122
Receptacle load = 180 VA * 122 = 21960 VA
Receptacle Demand Factor for first 10 KVA = 1.0
Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = (10 * 1) + (11.96 * 0.5) = 15.98 KVA

Total Other Loads = 17 KVA Panel 'PP3E'
+ 14 KVA Kiln
31 KVA (Demand Factor = 1)

Total Panel Load = 15.98 + 31 = 46.98 KVA

Total Current (I) = 46.98 KVA/(3^.5 * .208 KV) = 130.4 A

I = 130.4 A < 225 A circuit breaker from MDP and 225 A rated panel, OK

Panel PP2E: Power Panel 2 East

Number of receptacles = 51
Receptacle load = 180 VA * 51 = 9180 VA
Receptacle Demand Factor for first 10 KVA = 1.0
Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = 9.18 * 1 = 9.18 KVA

Total Motors and Other Loads = 9.5 KVA
Demand Factor = 1

Largest Motor = 2.5 KVA
Demand Factor = 0.25

Total Largest Motor = 0.25 * 2.5 = 0.63 KVA

Total Panel Load = 9.18 + 9.5 + 0.63 = 19.31 KVA

Total Current (I) = 19.31 KVA/(3^.5 * .208 KV) = 53.60 A

I = 53.60 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

<u>Panel PP3E:</u> Power Panel 3 East

Total Motors and Other Loads = 16.0 KVA
Demand Factor = 1

Largest Motor = 2.5 KVA
Demand Factor = 0.25
Total Largest Motor = 0.25 * 2.5 = 0.63 KVA

Total Panel Load = 16.0 + 0.63 = 16.63 KVA

Total Current (I) = 16.63 KVA/(3^.5 * .208 KV) = 46.16 A

I = 46.16 A < 60 A circuit breaker from Panel ‘PP1E’ and 60 A rated panel, OK

<u>Panel PP1W:</u> Power Panel 1 West

Number of receptacles = 47
Receptacle load = 180 VA * 47 = 8460 VA
Receptacle Demand Factor for first 10 KVA = 1.0
Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = 8.46 * 1 = 8.46 KVA

Total Motors and Other Loads = 20.0 KVA
Demand Factor = 1

Largest Motor = 2.5 KVA
Demand Factor = 0.25
Total Largest Motor = 0.25 * 2.5 = 0.63 KVA

Total Panel Load = 8.46 + 20.0 + 0.63 = 29.09 KVA

Total Current (I) = 29.09 KVA/(3^.5 * .208 KV) = 80.7 A
I = 80.7 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

<u>Panel PP2W:</u> Power Panel 2 West

Number of receptacles = 96
Receptacle load = 180 VA * 96 = 17280 VA
  Receptacle Demand Factor for first 10 KVA = 1.0
  Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = (10 * 1) + (7.28 * 0.5) = 13.64 KVA

Total Other Loads = 1.0 KVA
  Demand Factor = 1

Total Panel Load = 13.64 + 1.0 = 14.64 KVA

Total Current (I) = 14.64 KVA/(3^.5 * .208 KV) = 40.64 A

I = 40.64 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

<u>Panel PP3W:</u> Power Panel 3 West

Number of receptacles = 100
Receptacle load = 180 VA * 100 = 18000 VA
  Receptacle Demand Factor for first 10 KVA = 1.0
  Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = (10 * 1) + (8 * 0.5) = 14.0 KVA

Total Motors and Other Loads = 7.9 KVA
  Demand Factor = 1

Largest Motor = 2.0 KVA
  Demand Factor = 0.25
Total Largest Motor = 0.25 * 2.0 = 0.5 KVA

Total Panel Load = 14.0 + 7.9 + 0.5 = 22.4 KVA

Total Current (I) = 22.4 KVA/(3^.5 * .208 KV) = 62.18 A

I = 62.18 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

Panel PP4W: Power Panel 4 West

Number of receptacles = 168
Receptacle load = 180 VA * 168 = 30240 VA
Receptacle Demand Factor for first 10 KVA = 1.0
Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = (10 * 1) + (20.24 * 0.5) = 20.12 KVA

Total Other Loads = 21.5 KVA
Demand Factor = 1

Total Panel Load = 20.12 + 21.5 = 41.62 KVA

Total Current (I) = 41.62 KVA/(3^.5 * .208 KV) = 115.53 A

I = 115.53 A < 225 A circuit breaker from MDP and 225 A rated panel, OK

Panel PP5W: Power Panel 5 West

Number of receptacles = 19
Receptacle load = 180 VA * 19 = 3420 VA
Receptacle Demand Factor for first 10 KVA = 1.0
Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = 3.42 * 1 = 3.42 KVA

Total Other Loads = 13.8 KVA
Demand Factor = 1

Total Panel Load = 3.42 + 13.8 = 17.22 KVA

Total Current (I) = 17.22 KVA/(3^.5 * .208 KV) = 35.51 A

I = 35.51 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

Panel PP6W: Power Panel 6 West

Total Motors and Other Loads = 28.4 KVA
Demand Factor = 1

Largest Motor = 11.6 KVA
Demand Factor = 0.25
Total Largest Motor = 0.25 * 11.6 = 2.9 KVA

Total Panel Load = 11.6 + 2.9 = 14.5 KVA

Total Current (I) = 14.5 KVA/(3^.5 * .208 KV) = 40.25 A

I = 40.25 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

Panel CP1E: Control Panel 1 East

Number of receptacles = 142
Receptacle load = 180 VA * 142 = 25560 VA
Receptacle Demand Factor for first 10 KVA = 1.0
Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = (10 * 1) + (15.56 * 0.5) = 17.78 KVA

Total Current (I) = 17.78 KVA/(3^.5 * .208 KV) = 49.35 A

I = 49.35 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

Panel CP2E: Control Panel 2 East

Number of receptacles = 95
Receptacle load = 180 VA * 95 = 17100 VA
Receptacle Demand Factor for first 10 KVA = 1.0
Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = (10 * 1) + (7.1 * 0.5) = 13.55 KVA

Total Current (I) = 13.55 KVA/(3^.5 * .208 KV) = 37.61 A

I = 37.61 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

Panel CP1W: Control Panel 1 West

Number of receptacles = 83
Receptacle load = 180 VA * 83 = 14940 VA
Receptacle Demand Factor for first 10 KVA = 1.0
Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = (10 * 1) + (4.94 * 0.5) = 12.47 KVA

Total Current (I) = 12.47 KVA/(3^.5 * .208 KV) = 34.61 A

I = 34.61 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

Panel CP2W: Control Panel 2 West

Number of receptacles = 59
Receptacle load = 180 VA * 59 = 10620 VA
Receptacle Demand Factor for first 10 KVA = 1.0
Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = (10 * 1) + (0.62 * 0.5) = 10.31 KVA

Total Current (I) = 10.31 KVA/(3^.5 * .208 KV) = 28.62 A

I = 28.62 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

Panel CP3W: Control Panel 3 West

Number of receptacles = 124
Receptacle load = 180 VA * 124 = 22320 VA
Receptacle Demand Factor for first 10 KVA = 1.0
Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = (10 * 1) + (12.32 * 0.5) = 16.16 KVA

Total Current (I) = 16.16 KVA/(3^.5 * .208 KV) = 44.86 A

I = 44.86 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

<u>Panel CP4W:</u> Control Panel 4 West

Number of receptacles = 155
Receptacle load = 180 VA * 155 = 27900 VA
Receptacle Demand Factor for first 10 KVA = 1.0
Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = (10 * 1) + (17.9 * 0.5) = 18.95 KVA

Total Current (I) = 18.95 KVA/(3^.5 * .208 KV) = 52.6 A

I = 52.6 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

<u>Panel CP5W:</u> Control Panel 5 West

Number of receptacles = 129
Receptacle load = 180 VA * 129 = 23220 VA
Receptacle Demand Factor for first 10 KVA = 1.0
Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = (10 * 1) + (13.22 * 0.5) = 16.61 KVA

Total Current (I) = 16.61 KVA/(3^.5 * .208 KV) = 46.1 A

I = 46.1 A < 100 A circuit breaker from MDP and 100 A rated panel, OK

<u>Panel MP:</u> Mechanical Panel 1

Lighting Load = 0.75 KVA
Lighting Demand Factor = 1.25 (continuous loading)

Total Lighting Load = 1.25 * 0.75 = 0.9375 KVA

Number of receptacles = 20
Receptacle load = 180 VA * 20 = 3600 VA
Receptacle Demand Factor for first 10 KVA = 1.0
Receptacle Demand Factor for > 10KVA = 0.5

Total Receptacle Load = 3.6 * 1 = 3.6 KVA

Total Motors and Other Loads = 23.2 KVA
Resistance Heat Load = 26.5 KVA (Demand Factor = 0)
Air Conditioning Load = 23.2 KVA (Demand Factor = 1)

Largest Motor = 11.6 KVA
Demand Factor = 0.25
Total Largest Motor = 0.25 * 11.6 = 2.9 KVA

Total Panel Load = 0.9375 + 3.6 + 23.2 + 2.9 = 30.64 KVA

Total Current (I) = 30.64 KVA/(3^.5 * .208 KV) = 85.04 A

I = 85.04 A < 225 A circuit breaker from MDP and 225 A rated panel, OK

Panel MP2: Mechanical Panel 2

Total Motors and Other Loads = 49.3 KVA
Resistance Heat Load = 23.17 KVA (Demand Factor = 0)
Air Conditioning Load = 26.13 KVA (Demand Factor = 1)

Largest Motor = 16.5 KVA
Demand Factor = 0.25
Total Largest Motor = 0.25 * 16.5 = 4.13 KVA

Total Panel Load = 26.13 + 4.13 = 30.26 KVA

Total Current (I) = 30.26 KVA/(3^.5 * .208 KV) = 84.0 A

I = 84.0 A < 225 A circuit breaker from MDP and 225 A rated panel, OK

Panel MP3: Mechanical Panel 3

Total Motors and Other Loads = 97.3 KVA
Resistance Heat Load = 46.71 KVA (Demand Factor = 0)
Air Conditioning Load = 50.59 KVA (Demand Factor = 1)

Largest Motor = 22.4 KVA
Demand Factor = 0.25
Total Largest Motor = 0.25 * 22.4 = 5.6 KVA

Total Panel Load = 50.59 + 5.6 = 56.19 KVA

Total Current (I) = 56.19 KVA/(3^.5 * .208 KV) = 156.0 A

I = 156.0 A < 400 A circuit breaker from MDP and 400 A rated panel, OK

NEC Total Load Calculations		
Panel	Total Load (KVA)	Total Current (A)
LP1E	10.50	29.15
LP2E	22.09	61.32
LP3E	15.34	42.58
LP4E	34.81	96.62
LP1W	15.88	44.08
LP2W	26.38	73.22
PP1E	46.98	130.40
PP2E	19.31	53.60
PP3E	[16.63] Fed from PP1E	[46.16] Fed from PP1E
PP1W	29.09	80.70
PP2W	14.64	40.64
PP3W	22.40	62.18
PP4W	41.62	115.53
PP5W	17.22	35.51
PP6W	14.50	40.25
CP1E	17.78	49.35
CP2E	13.55	37.61
CP1W	12.47	34.61
CP2W	10.31	28.62
CP3W	16.16	44.86
CP4W	18.95	52.6
CP5W	16.61	46.1
MP	30.64	85.04
MP2	30.26	84.0
MP3	56.19	156.0
TOTALS	553.68	1524.57

$$\text{Total Capacity} = \frac{\text{553.68 KVA calculated}}{(3\text{^}.5) * (0.208)} = \text{1536.86 A distributed by MDP}$$

The Main Switchboard (MDP) is rated for 1200A < 1536 calculated.

Therefore the MDP is insufficient for the given system. A 1200A MDP for a building of this size and with these types of loads seems to be too small. There might be an error on the drawings in terms of the size of the MDP. The electrical designer will be contacted to verify sizes of the major loads and the MDP and the updated information will be available in resubmission. A panel of 2000 A seems more appropriate for a school building of this size. If a 2000A main switchboard is used, the available KVA on the 208V/120 system is:

2000A * (3^0.5) * 0.208 KV *0.80 (80% maximum capacity design factor) = 576.43 KVA which is greater than the 553.68 KV needed for the building loads.

Also, another issue might be that the actual loads for the building are well under those initially established by the panel boards on the drawings. If this is the case, the 1200A main circuit breaker may be sufficient for the building. These loads will be verified by the data received by the utility power company (please see below).

Utility Rate Structure

The electrical designer was contacted and all utility information from the MEP company is not available, but it was noted that the building is on a grid system and that the proper electrical power at the building is supplied by CL&P (Connecticut Light and Power). The power company was contacted and permission is needed from the owner to release any utility rate structure data for the building. The owner is currently working with the power company to obtain a summary of the electric utility load data for the previous 12 months and resubmission of this report will include this data when it becomes available. All necessary updates to load sizes will be made and incorporated into the report as soon as possible.

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