

Walter Nichols
Hawthorn Building
Altoona, PA



Executive Summary

The following report analyzes the existing electrical distribution system in the Hawthorn Building, as well as evaluating the electrical consumption calculations according to the NEC 2002 edition building loads. Existing documents including: riser diagrams, panel board schedules, transformer schedules, mechanical schedules, and floor plans were examined to perform this analysis. The report also examines overcurrent protection, emergency lighting systems, motors, and utility rate analysis.

Analysis shows that the electrical system that was designed for the Hawthorn Building is adequate, but greatly oversized. An expansion for the building is already in plans, so this may have something to do with the oversized distribution system. Since the building was built within the last 2 years, no power factor correction is used for the system.

There are a few additional concerns that may be worth checking into, however. First, the pad-mounted transformer is located somewhat far away from the building due to a previous contract. This means that there could be some voltage drop issues that need to be looked into. Also, the path that the conduit takes to get to the Hawthorn Building is somewhat strange. It goes under the building in the rear wing. It may be cheaper to have a transformer closer to the Hawthorn Building, and save on materials running across campus to power the building. A final issue is that there could be a problem involving harmonics due to the large computer lab areas.

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System Overview

The Hawthorn Building's distribution system can be classified as a radial distribution system with both 480/277V and 208/120V capabilities. Main power is brought into the pad-mounted transformer from the utility at 12,470V, where it is stepped down to 480/277V and fed to the main distribution switchboard. There is also a transformer (TD) that feeds the sub-distribution panel, which in turn supplies the 208/120V loads. The main distribution switchboard and sub-distribution panels are both 3 pull and rated at 1200A and 600A respectively. The main distribution panel and sub-distribution panels both feed other step down transformers and the loaded panels at their appropriate voltages.

Equipment Locations

The pad-mounted transformer is located across campus from a previous contract. This transformer supplies power to the main distribution switchboard as well as the sub-distribution panel (after it gets stepped down again). These are both located outside the Hawthorn Building. Once power is brought into the building, it feeds 7 of the panels and the emergency generator inside the mechanical/electrical room on the first floor. The rest of the of the panels are located in electrical closets throughout the rest of the building (1st and 2nd floor).

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Emergency Power

Emergency power is provided to the Hawthorn Building by a 35KW 480/277V 3P, 4W natural gas emergency generator. In the occurrence of a power outage, the Automatic Transfer Switch (ATS) transfers emergency load to the emergency panels which is served by the generator. Emergency lighting, exit lighting, fire alarm control panel power, etc, is all on the two emergency panels “NEH” and “NEL”.

Overcurrent Protection

The Hawthorn Building was recently built, so it primarily uses circuit breakers as overcurrent protection, but panels “CP8” and “CP9” use a 200A fuse and switch for protection instead. The loads on these 2 panels are only computer receptacles and data racks, which may have something to do with it. A 3P 1200A breaker protects the main distribution switchboard and a 3P 600A breaker protects the sub-distribution panel. The remaining transformers and panel boards are all protected by the appropriate sized circuit breaker with the exception of the 2 previously stated panel boards.

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Typical Lighting/Emergency Lighting

The typical lighting in the Hawthorn Building is mostly compact fluorescent downlights and wallwashers, but each room incorporates different lighting for its specific purposes. The auditorium classroom also uses track mounted incandescent spot lighting, the music room uses suspended cylinders, and the computer labs use architectural indirect/direct lights. The lighting is all run on 480/277V, including the emergency lighting. The 208/120V system is primarily used for receptacle and mechanical pump loads, but also includes soundboards and other misc. things.

Emergency lighting is used throughout the Hawthorn Building. Standard exit signs and emergency lights are scattered throughout the hallways of the building. Hallways also have 2x4-recessed troffers for emergency lighting in certain areas, mainly on the 2nd floor. The stairways and exits are also lit with additional lighting besides standard exit signs. Code also requires that rooms over a certain square footage incorporate emergency lighting into the room. Rooms that qualify for this rule in the Hawthorn Building are the G.P. Tech classrooms on the 1st floor, the computer classrooms on the 2nd floor, and the main computer lab on the 2nd floor.

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Power Factor Correction

Due to the Hawthorn Building being a fairly recently built building, it was designed without additional capacitors for power factor correction.

Uninterrupted Power Supply (UPS)

Due to the nature of the Hawthorn Building and its tasks, it does not have an uninterrupted power supply.

Shutoff Requirements

The Hawthorn Building uses occupancy sensors as well as timing systems for their lighting system. If the sensors don't detect any movement after a certain time at night, the system will turn itself off until manually overridden by a switch, or it detects movement inside the building.

Utility Rate Plan

A utility rate plan was requested for the Hawthorn Building, but the information did not get here in time to incorporate into the report. A sample utility rate structure from PPL is included on the next 6 pages.

**RATE SCHEDULE LP-4
 LARGE GENERAL SERVICE AT 12,470 VOLTS**

(C)

APPLICATION RATE SCHEDULE LP-4

(C)

This Rate Schedule is for large general service supplied from available lines of 12,470 volts when the customer furnishes and maintains all equipment necessary to transform the energy from line voltage. New applications with voltage levels higher or lower than 12,470 volts will not be accepted after January 1, 2005.

NET MONTHLY RATE

Distribution Charge

- \$2.486 per kilowatt for all kilowatts of the Billing KW. **(I)**
- 0.000 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW. **(D)**
- 0.000 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW. **(D)**
- 0.000 cts. per KWH for all additional KWH. **(D)**

Competitive Transition Charge (Effective 1-1-05 through 12-31-05)

- \$0.231 per kilowatt for all kilowatts of the Billing KW. **(I)**
- 0.298 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW. **(I)**
- 0.231 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW. **(I)**
- 0.201 cts. per KWH for all additional KWH. **(I)**

Competitive Transition Charge (Effective 1-1-06 through 12-31-06)

- \$0.163 per kilowatt for all kilowatts of the Billing KW. **(I)**
- 0.203 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW. **(I)**
- 0.157 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW. **(I)**
- 0.137 cts. per KWH for all additional KWH. **(I)**

Competitive Transition Charge (Effective 1-1-07 through 12-31-07)

- \$0.156 per kilowatt for all kilowatts of the Billing KW. **(I)**
- 0.193 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW. **(I)**
- 0.150 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW. **(I)**
- 0.130 cts. per KWH for all additional KWH. **(I)**

Competitive Transition Charge (Effective 1-1-08 through 12-31-08)

- \$0.139 per kilowatt for all kilowatts of the Billing KW. **(I)**
- 0.172 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW. **(I)**
- 0.133 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW. **(I)**
- 0.116 cts. per KWH for all additional KWH. **(I)**

Competitive Transition Charge (Effective 1-1-09 through 12-31-09)

- \$0.809 per kilowatt for all kilowatts of the Billing KW. **(I)**
- 1.012 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW. **(I)**
- 0.781 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW. **(I)**
- 0.682 cts. per KWH for all additional KWH. **(I)**

(Continued)

RATE SCHEDULE LP-4 (CONTINUED)

(C)

Intangible Transition Charge (Effective 1-1-05 through 12-31-05)	
\$0.729 per kilowatt for all kilowatts of the Billing KW.	(I)
0.927 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW.	(I)
0.715 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW.	(I)
0.624 cts. per KWH for all additional KWH.	(I)
Intangible Transition Charge (Effective 1-1-06 through 12-31-06)	
\$0.788 per kilowatt for all kilowatts of the Billing KW.	(I)
0.990 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW.	(I)
0.764 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW.	(I)
0.668 cts. per KWH for all additional KWH.	(I)
Intangible Transition Charge (Effective 1-1-07 through 12-31-07)	
\$0.760 per kilowatt for all kilowatts of the Billing KW.	(I)
0.948 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW.	(I)
0.732 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW.	(I)
0.639 cts. per KWH for all additional KWH.	(I)
Intangible Transition Charge (Effective 1-1-08 through 12-31-08)	
\$0.744 per kilowatt for all kilowatts of the Billing KW.	(I)
0.925 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW.	(I)
0.714 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW.	(I)
0.623 cts. per KWH for all additional KWH.	(I)
Intangible Transition Charge (Effective 1-1-09 through 12-31-09)	
\$0.000 per kilowatt for all kilowatts of the Billing KW.	
0.000 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW.	
0.000 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW.	
0.000 cts. per KWH for all additional KWH.	

The Company will provide capacity (KW) and energy (KWH) under this Rate Schedule for customers who receive Basic Utility Supply Service from the Company.

Capacity and Energy Charge (Effective 1-1-05 through 12-31-05)	
\$3.753 per kilowatt for all kilowatts of the Billing KW.	(I)
4.513 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW.	(I)
3.397 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW.	(I)
2.917 cts. per KWH for all additional KWH.	(I)
Capacity and Energy Charge (Effective 1-1-06 through 12-31-06)	
\$4.006 per kilowatt for all kilowatts of the Billing KW.	(I)
4.850 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW.	(I)
3.650 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW.	(I)
3.138 cts. per KWH for all additional KWH.	(I)

(Continued)

RATE SCHEDULE LP-4 (CONTINUED)

(C)

Capacity and Energy Charge (Effective 1-1-07 through 12-31-07)

- \$4.046 per kilowatt for all kilowatts of the Billing KW. **(I)**
- 4.908 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW. **(I)**
- 3.696 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW. **(I)**
- 3.175 cts. per KWH for all additional KWH. **(I)**

Capacity and Energy Charge (Effective 1-1-08 through 12-31-08)

- \$4.107 per kilowatt for all kilowatts of the Billing KW. **(I)**
- 4.987 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW. **(I)**
- 3.758 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW. **(I)**
- 3.229 cts. per KWH for all additional KWH **(I)**

Capacity and Energy Charge (Effective 1-1-09 through 12-31-09)

- \$4.198 per kilowatt for all kilowatts of the Billing KW. **(I)**
- 5.095 cts. per KWH for the first 200 KWH per kilowatt of the Billing KW. **(I)**
- 3.841 cts. per KWH for the next 200 KWH per kilowatt of the Billing KW. **(I)**
- 3.302 cts. per KWH for all additional KWH. **(I)**

Transmission Charge

(C)

The Company will provide and charge for transmission service consistent with the PJM Open Access Transmission Tariff approved or accepted by the Federal Energy Regulatory Commission for customers who receive Basic Utility Supply Service from the Company unless such customers obtain transmission service from another provider. The Transmission Service Charge included in this Tariff applies to all kWh billed under this Rate Schedule.

MONTHLY MINIMUMS

(C)

The Minimum Billing Demand is 25 KW.

The Monthly Minimum Distribution Charge is 25 KW times the demand step of the effective Distribution Charge. The Monthly Minimum Competitive Transition Charge is 25 KW times the demand step of the effective Competitive Transition Charge. The Monthly Minimum Intangible Transition Charge is 25 KW times the demand step of the effective Intangible Transition Charge. The Monthly Minimum Capacity and Energy Charge is 25 KW times the demand step of the effective Capacity and Energy Charge.

Monthly Minimums apply to services provided by the Company.

BILLING KW

The Billing KW is the average number of kilowatts supplied during the 15 minute period of maximum use during the current billing period.

(Continued)

RATE SCHEDULE LP-4 (CONTINUED)

(C)

BILLING KW (Continued)

Time-of-Day metering and billing is available on request for an additional charge of \$15.00 per month for a minimum period of one year. The Billing KW applicable to the charges under this Rate Schedule is the average number of kilowatts supplied during the 15 minute period of maximum use during the on-peak hours of the current billing period. For new applications, this provision is limited to customers of the Company who have not had the opportunity to purchase capacity and energy from their choice of electric generation supplier pursuant to the enrollment procedures contained in the commission's order at Docket Nos. M-00960890F.0014 and M-00960890F.0015. No new applications will be accepted after January 1, 2000.

(I)

ON-PEAK HOURS

On-peak hours for billing purposes are 7 a.m. to 3 p.m., 8 a.m. to 4 p.m., or 9 a.m. to 5 p.m. local time, at the option of the customer, Mondays to Fridays inclusive except, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. The Company's system on-peak period is 7 a.m. to 9 p.m. local time.

INDUSTRIAL DEVELOPMENT INITIATIVES RIDER

The Industrial Development Initiatives Rider included in this Tariff applies to eligible customers served under this Rate Schedule, except for customers served under the Economic Development Initiatives Rider.

ECONOMIC DEVELOPMENT INITIATIVES RIDER

The Economic Development Initiatives Rider included in this Tariff applies to eligible customers served under this Rate Schedule, except for customers served under the Industrial Development Initiatives Rider.

OFF-PEAK SPACE CONDITIONING AND WATER HEATING (Effective 1-1-05)

For customers served under this Rate Schedule, off-peak energy for storage space conditioning and/or water heating may be supplied exclusively through a separate submeter and billed separately at a charge of \$15.00 per month, plus a Distribution Charge of 0.396 cts. per KWH, plus the following Competitive Transition Charge, Intangible Transition Charge and, for customers who receive Basic Utility Supply Service from the Company, the following Capacity and Energy Charge, with a monthly minimum charge of \$15.00. Any billing KW resulting from usage during on-peak hours is billed at Rate Schedule charges. For new applications, this provision is limited to customers of the Company who have not had the opportunity to purchase capacity and energy from their choice of electric generation supplier pursuant to the enrollment procedures contained in the commission's order at Docket Nos. M-00960890F.0014 and M-00960890F.0015. No new applications will be accepted after January 1, 2000.

(I)

(I)

(C)

(Continued)

RATE SCHEDULE LP-4 (CONTINUED)

(C)

<u>Effective</u>	<u>Competitive Transition Charge</u>	<u>Intangible Transition Charge</u>	<u>Capacity and Energy Charge</u>
1-1-05 through 12-31-05	0.172 cts. per KWH (I)	0.850 cts. per KWH (I)	2.004 cts. per KWH (I)
1-1-06 through 12-31-06	0.173 cts. per KWH (I)	0.843 cts. per KWH (I)	2.022 cts. per KWH (I)
1-1-07 through 12-31-07	0.165 cts. per KWH (I)	0.806 cts. per KWH (I)	2.073 cts. per KWH (I)
1-1-08 through 12-31-08	0.147 cts. per KWH (I)	0.786 cts. per KWH (I)	2.141 cts. per KWH (I)
1-1-09 through 12-31-09	0.860 cts. per KWH (I)	0.000 cts. per KWH	2.233 cts. per KWH (I)

Transmission Charge

(C)

The Company will provide and charge for transmission service consistent with the PJM Open Access Transmission Tariff approved or accepted by the Federal Energy Regulatory Commission for customers who receive Basic Utility Supply Service from the Company unless such customers obtain transmission service from another provider. The Transmission Service Charge included in this Tariff applies to all kWh billed under this Rate Schedule.

Service through the separate meter may be used between the off-peak hours of 7 p.m. to 7 a.m. local time, Mondays to Fridays inclusive, and all day Saturday, Sunday and the following holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.

COMPETITIVE TRANSITION CHARGE RECONCILIATION RIDER

The Competitive Transition Charge Reconciliation Rider included in this Tariff applies to the Competitive Transition Charges under this Rate Schedule.

INTANGIBLE TRANSITION CHARGE RECONCILIATION RIDER

The Intangible Transition Charge Reconciliation Rider included in this Tariff applies to the Intangible Transition Charges under this Rate Schedule.

SUSTAINABLE ENERGY FUND RIDER

The Sustainable Energy Fund Rider included in this Tariff applies to the Distribution Charges under this Rate Schedule.

METERING AND BILLING CREDIT RIDER

The Metering and Billing Credit Rider included in this Tariff applies to the Distribution Charges under this Rate Schedule.

(C)

DEMAND SIDE INITIATIVE RIDER (EXPERIMENTAL)

The Demand Side Initiative Rider included in this Tariff is available to eligible customers served under this Rate Schedule.

(Continued)

RATE SCHEDULE LP-4 (CONTINUED)

(C)

GENERATION RATE ADJUSTMENT RIDER

The Generation Rate Adjustment Rider included in this Tariff is available to eligible customers served under this Rate Schedule.

STATE TAX ADJUSTMENT SURCHARGE

The State Tax Adjustment Surcharge included in this Tariff is applied to charges under this Rate Schedule, except for charges under the Generation Rate Adjustment Rider.

PAYMENT

The above net rate applies when bills are paid on or before the due date specified on the bill, which is not less than 15 days from the date bill is mailed. When not so paid, the gross rate applies which is the above net rate plus 5% on the first \$200.00 of the then unpaid balance of the monthly bill and 2% on the remainder thereof.

CONTRACT PERIOD

Service under this Rate Schedule is for an initial term of one (1) year from the date service is first rendered, unless the Company and the customer mutually agree to a different term in the contract for service.

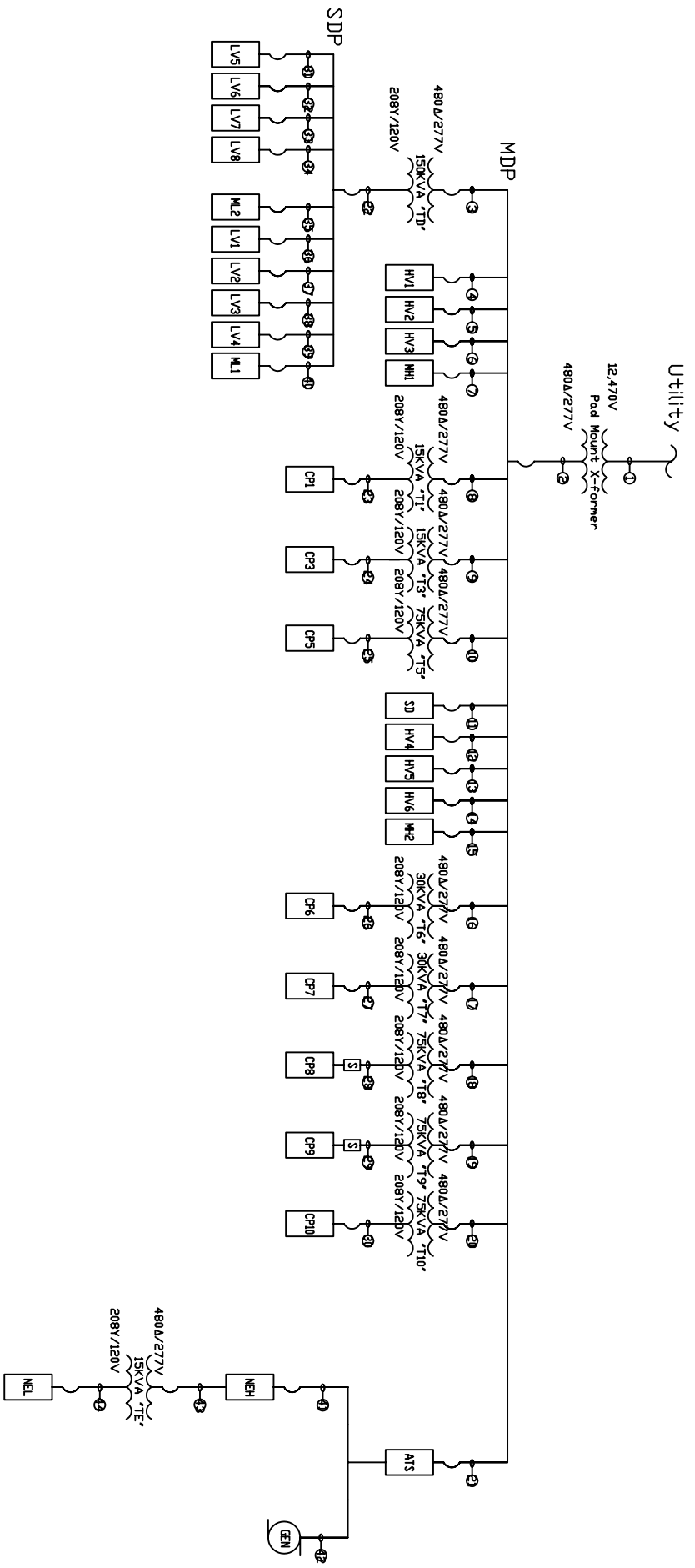
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NEC Calculations

The remaining pages of this report are dedicated to NEC load calculations. These calculations were performed to see if the existing distribution system is adequate enough to safely handle all of the loading for the building. Before doing the calculations, a single line diagram was composed in AutoCAD to make understanding the system easier and more convenient for later. The feeders are labeled with numbers on the single line diagram, and are referenced in the key later. This key has all of the feeders labeled by the number given to them on the single line diagram, gives the wire and conduit sizes, gives primary and secondary voltages, labels what the feeder is serving, and what it was served from.

After completing the calculations, I discovered that the distribution system for the Hawthorn Building is fairly oversized. The building has plans of expanding in the near future, so this probably has something to do with it. Also, when doing my calculations, I didn't have an exact list of all of the loads that would be included in the building, so the actual loading will be slightly higher than what was calculated (IE, # of computers in the lab spaces, # of copy and fax machines, etc).



Transformer Information

Transformer Number	KVA	Primary Voltage	Secondary Voltage	Phase	Primary Feeder #	Secondary Feeder #	Type
TD	150	480 delta	208Y/120	3	3	22	Dry
T1	15	480 delta	208Y/120	3	8	23	Dry
T2	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
T3	15	480 delta	208Y/120	3	9	24	Dry
T4	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
T5	75	480 delta	208Y/120	3	10	25	Dry
T6	30	480 delta	208Y/120	3	16	26	Dry
T7	30	480 delta	208Y/120	3	17	27	Dry
T8	75	480 delta	208Y/120	3	18	28	Dry
T9	75	480 delta	208Y/120	3	19	29	Dry
T10	75	480 delta	208Y/120	3	20	30	Dry
TE	15	480 delta	208Y/120	3	43	44	Dry

Feeder Information

Feeder #	Serving	Served From	Conduit	Wire	Ground
1					
2					
3	Transformer "TD"	Main Dist. Switch. (MDS)	2 1/2"	3 - #4/0	1 - #4
4	Panel "HV1"	Main Dist. Switch. (MDS)	1"	4 - #6	1 - #10
5	Panel "HV2"	Main Dist. Switch. (MDS)	1"	4 - #6	1 - #10
6	Panel "HV3"	Main Dist. Switch. (MDS)	1"	4 - #6	1 - #10
7	Panel "MH1"	Main Dist. Switch. (MDS)	1 1/2"	4 - #1	1 - #8
8	Transformer "T1"	Main Dist. Switch. (MDS)	3/4"	3 - #10	1 - #10
9	Transformer "T2"	Main Dist. Switch. (MDS)	3/4"	3 - #10	1 - #10
10	Transformer "T3"	Main Dist. Switch. (MDS)	1 1/2"	3 - #1	1 - #6
11	Panel "SD1"	Sub Dist. Panel "SDP"	1 1/4"	4 - #4	1 - #8
12	Panel "HV4"	Main Dist. Switch. (MDS)	1"	4 - #6	1 - #10
13	Panel "HV5"	Main Dist. Switch. (MDS)	1"	4 - #6	1 - #10
14	Panel "HV6"	Main Dist. Switch. (MDS)	1"	4 - #6	1 - #10
15	Panel "MH2"	Main Dist. Switch. (MDS)	2 - 2"	4 - #3/0	1 - #3
16	Transformer "T6"	Main Dist. Switch. (MDS)	3/4"	3 - #8	1 - #10
17	Transformer "T7"	Main Dist. Switch. (MDS)	3/4"	3 - #8	1 - #10
18	Transformer "T8"	Main Dist. Switch. (MDS)	1 1/2"	3 - #1	1 - #6
19	Transformer "T9"	Main Dist. Switch. (MDS)	1 1/2"	3 - #1	1 - #6
20	Transformer "T10"	Main Dist. Switch. (MDS)	1 1/2"	3 - #1	1 - #6
21	Auto.Trans.Switch (ATS)	Main Dist. Switch. (MDS)	1 1/2"	4 - #4	1 - #10
22	Sub Dist. Panel "SDP"	Transformer "TD"	4"	4 - 500 KCMIL	1 - #3
23	Panel "CP1"	Transformer "T1"	1 1/4"	3 - #4, 1 - #2/0 (neutral)	1 - #10
24	Panel "CP3"	Transformer "T2"	1 1/4"	3 - #4, 1 - #2/0 (neutral)	1 - #10
25	Panel "CP5"	Transformer "T3"	3"	3 - #4/0, 1 - #350 KCMIL (neutral)	1 - #4
26	Panel "CP6"	Transformer "T6"	2"	3 - #1/0, 1 - #350 KCMIL (neutral)	1 - #6
27	Panel "CP7"	Transformer "T7"	2"	3 - #1/0, 1 - #350 KCMIL (neutral)	1 - #6
28	Panel "CP8"	Transformer "T8"	3"	3 - #4/0, 1 - #350 KCMIL (neutral)	1 - #4
29	Panel "CP9"	Transformer "T9"	3"	3 - #4/0, 1 - #350 KCMIL (neutral)	1 - #4
30	Panel "CP10"	Transformer "T10"	3"	3 - #4/0, 1 - #350 KCMIL (neutral)	1 - #4
31	Panel "LV5"	Sub Dist. Panel "SDP"	2"	4 - #1/0	1 - #6
32	Panel "LV6"	Sub Dist. Panel "SDP"	1 1/2"	4 - #1	1 - #8
33	Panel "LV7"	Sub Dist. Panel "SDP"	1 1/2"	4 - #1	1 - #8
34	Panel "LV8"	Sub Dist. Panel "SDP"	1 1/2"	4 - #1	1 - #8
35	Panel "ML2"	Sub Dist. Panel "SDP"	1"	4 - #6	1 - #10
36	Panel "LV1"	Sub Dist. Panel "SDP"	1 1/2"	4 - #1	1 - #8
37	Panel "LV2"	Sub Dist. Panel "SDP"	1 1/2"	4 - #1	1 - #8
38	Panel "LV3"	Sub Dist. Panel "SDP"	2"	4 - #1/0	1 - #6
39	Panel "LV4"	Sub Dist. Panel "SDP"	1 1/2"	4 - #1	1 - #8
40	Panel "ML1"	Sub Dist. Panel "SDP"	1"	4 - #6	1 - #10
41	Panel "NEH"	Auto.Trans.Switch (ATS)	1"	4 - #4	1 - #10
42	Generator	Auto.Trans.Switch (ATS)	1"	4 - #4	1 - #10
43	Transformer "TE"	Panel "NEH"	3/4"	3 - #10	1 - #10
44	Panel "NEL"	Transformer "TE"	1 1/4"	4 - #4	1 - #10

Lamps and Ballasts

Location	Lamp Type	# of Lamps	CCT	Voltage	BF	Input Watts	PF	Amps	Lamps/Balla
Computer Lab and Classrooms	F32T8/ADV835/ALTO	498	3500	277	0.9	160	0.97	0.4	2
Main Coridor	PL-T32W835/4P/ALTO	32	3500	277	0.98	41	0.97	0.16	1
Main Coridor	PL-C18W/835/ALTO	3	3500	277	0.99	22.2	0.97	0.1	1
Music Room	FB40/35U/6/ALTO	48	3500	277	0.9	112	0.97	0.41	3
Music Room	PL-T32W835/4P/ALTO	5	3500	277	0.98	41	0.97	0.16	1
Music Room	PL-C26W/835/ALTO	21	3500	277	0.91	32	0.97	0.12	1
Music Room	F32T8/TL835/ALTO	4	3500	277	0.9	80	0.97	0.3	2
Music Room	F32T8/TL835/ALTO	3	3500	277	0.96	93	0.97	0.35	3
Auditorioum Classroom	PL-T32W835/4P/ALTO	9	3500	277	0.98	41	0.97	0.16	1
Auditorioum Classroom	PL-T42W835/4P/ALTO	54	3500	277	0.94	81	0.97	0.33	2
Auditorioum Classroom	300PAR56Q/NSP	8	2900	120	1	300	1	2.5	1

Lighting Load By Occupancy

Space	Area (sq ft)	Unit Load (VA/sq. ft.)	Total Load (VA)
Office Spaces	13912	3.5	48692
School	31803	3	95409
Corridors	6777	0.5	3388.5
Closet	417	0.5	208.5
Stairway	656	0.5	328
Storage	1134	0.25	283.5
Restroom	1344	1	1344

Total KVA = 149.6535

Receptacle Loading

Fed From MDP or SDP	Panel	# of Receptacles	KVA
MDP	CP1	38	6.84
MDP	CP3	38	6.84
MDP	CP5	240	43.2
MDP	CP6	88	15.84
MDP	CP7	82	14.76
MDP	CP8	230	41.4
MDP	CP9	170	30.6
MDP	CP10	240	43.2
SDP	ML1	6	1.08
SDP	ML2	8	1.44
SDP	LV1	56	10.08
SDP	LV2	66	11.88
SDP	LV3	29	5.22
SDP	LV4	31	5.58
SDP	LV5	76	13.68
SDP	LV6	62	11.16
SDP	LV7	38	6.84
SDP	LV8	66	11.88

Total KVA On MDP =	202.68
Total KVA On SDP =	78.84

Receptacle Demand Factor: 1.0 1st 10 KVA
 0.5 after 1st 10 KVA

Total KVA After Demand on MDP =	106.34
Total KVA After Demand on SDP =	44.42

Mechanical Equipment

Symbol	Equipment Type	Phase	Voltage	HP (unless noted in KW)	Amps	KV
RTU-3 Supply	Air Handling Unit (including fans)	3	480	48	65	31.
RTU-3 Return	Air Handling Unit (including fans)	3	480	7.5	11	5.2
RTAHU-1	Rooftop AHU	3	480	25	34	16.3
RTAHU-2	Rooftop AHU	3	480	15	21	10.0
RTAHU-3	Rooftop AHU	3	480	20	27	12.9
PRV-1	Power Roof Ventilator	1	120	1/4	1.6	0.19
PRV-2	Power Roof Ventilator	1	120	1/6	1	0.1
PRV-3	Power Roof Ventilator	1	120	1/4	1.6	0.19
PRV-4	Power Roof Ventilator	1	120	1/4	1.6	0.19
PRV-5	Power Roof Ventilator	1	120	1/4	1.6	0.19
PRV-6	Power Roof Ventilator	1	120	1/4	1.6	0.19
PRV-7	Power Roof Ventilator	1	120	1/4	1.6	0.19
PRV-8	Power Roof Ventilator	1	120	1/4	1.6	0.19
PRV-9	Power Roof Ventilator	1	120	1/2	4.4	0.52
PRV-10	Power Roof Ventilator	1	120	1/4	1.6	0.19
PRV-11	Power Roof Ventilator	1	120	1/6	1	0.1
B-1	Boiler	1	208	2.16 KW	-	2.1
B-2	Boiler	1	208	2.16 KW	-	2.1
B-3	Boiler	1	208	2.16 KW	-	2.1
B-4	Boiler	1	208	2.16 KW	-	2.1
ACC-1	Air Cooled Chiller	3	480	3	4.8	2.30
ACCU-1	Air Cooled Condensor Unit	1	208	1/4	0.9	0.18
ACCU-2	Air Cooled Condensor Unit	3	208	1/2	2.4	0.49
ACCU-3	Air Cooled Condensor Unit	3	208	1/4	0.9	0.18
SSAHU-1	Split System AHU	1	208	1.4 KW	-	1.4
SSAHU-2	Split System AHU	1	208	2.8 KW	-	2.8
HUH-1	Horizontal Unit Heater	1	208	.009 KW	-	0.00
HUH-2	Horizontal Unit Heater	1	208	.009 KW	-	0.00
P-1	Pump	3	480	7 1/2	11	5.2
P-2	Pump	3	480	7 1/2	11	5.2
P-3	Pump	3	480	20	27	12.9
P-4	Pump	3	480	20	27	12.9
CRAHU-1	Computer Room Air Conditioner	3	208	1.5	6.6	1.37
RF-1	Relieve Fan	3	480	15	21	10.0
RF-2	Relieve Fan	3	480	5	7.6	3.64
RF-3	Relieve Fan	3	480	10	14	6.7
CUH-1	Cabinet Unit Heater	1	120	1/15	0.41	0.04
CUH-2	Cabinet Unit Heater	1	120	1/15	0.41	0.04
BCU-1	Blower Cooler Unit	1	120	1/4	1.6	0.19

Total KVA = 152.7
 With Demand = 136.4

Demand for Mechanical: 1.0 for heating and cooling
 2.5 for largest motor

Total On MDP = 135.0
 With Demand = 159.5

Total On SDP = 17.69
 With Demand = 21.89

Elevator Loading

Elevator #	Phase	Voltage	Current	KVA
1	3	480	65	54

Demand Factor for elevators = 1.0

Total KVA =	54
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Total Loading

Panel	Loading Type	KVA
MDP	Mechanical	159.55
MDP	Lighting	149.65
MDP	Receptacles	106.34
MDP	Elevator	54
Total KVA =		469.54
Total A =		564.77

Panel	Loading Type	KVA
SDP	Mechanical	21.9
SDP	Lighting	2.4
SDP	Receptacles	44.42
Total KVA =		68.72
Total A =		190.75