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Marie Ostrowski

Lighting/Electrical

Professor Dannerth

Science Building-Phase 1

Buffalo State College-Buffalo, NY

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Technical Report 2

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EXECUTIVE SUMMARY

The following is an overview of the electrical system design for the Buffalo State College Science Building - Phase 1 project. The construction work associated with this phase involves a 96,000 sq. ft. addition to existing laboratories and classrooms. It is the first phase in a two-phase addition and renovation project that will eventually produce a 224,000 sq. ft. science and mathematics complex.

The existing science building has two substations and two service entrances. The electrical distribution system installed with Phase 1 construction is designed to centralize the electrical system at one 4.16 kV service entrance location and will eventually power the entire complex. The design of the system and the detailed loads are presented to provide a comprehensive understanding of the demands that determined the sizing and layout of the electrical distribution. A single-line diagram was generated based off the given design information in order to portray the entire system. Other design considerations such as sustainability, communication systems, and design issues are also discussed.

Power Distribution Systems

Distribution System

As built, the existing Buffalo State College Science Building has two unit substations that provide 208/120V service throughout the building by two separate radial distribution systems. This separation is due to an addition project (Science 2) that followed the original construction of Science 1 in the early 1960s. Both substations are fed 4.16 kV from a campus electrical system substation, which is then routed through a 500 kVA transformer in each respective unit substation. Construction of the new Science Building will rearrange the main distribution system in a phased demolition and construction sequence, as represented in Figure 1.

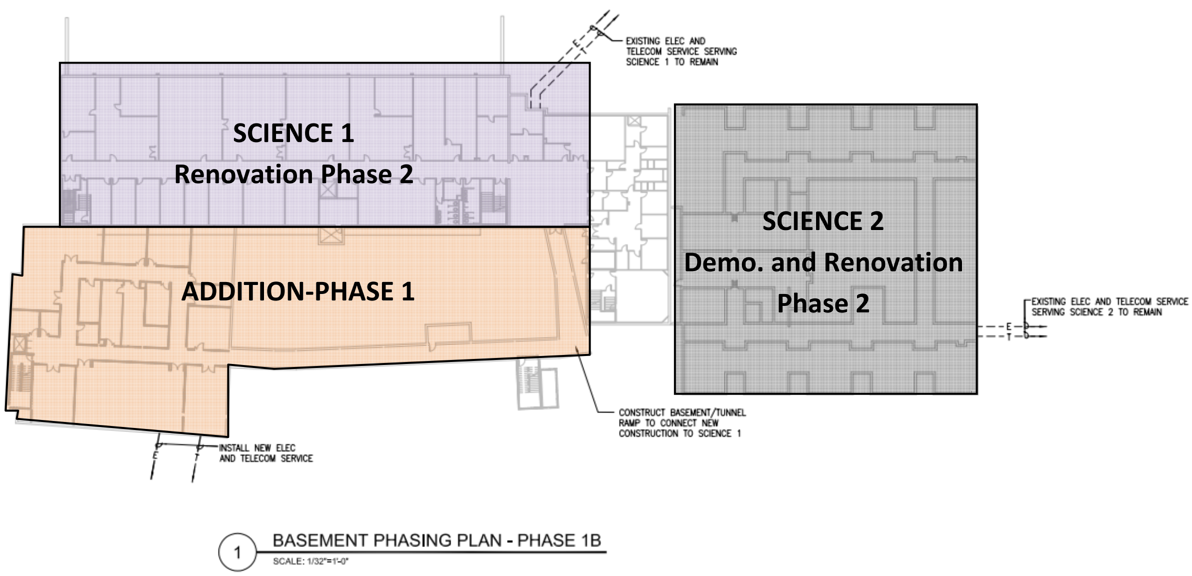


Figure 1 - Phasing of Science Building Project

The Phase 1 addition provides a new 4.16 kV service entrance and substation that will eventually distribute all power to the complete science building complex. However, existing service entrances in Science 1 and 2 will not be disconnected and removed until renovation work begins in Phase 2. Upon completion of both phases, the entire new science building will be powered by the primary-selective system installed in the basement of the phase 1 addition. The double-ended substation is fed by a pair of 5 kV rated load-interrupting switches which allow the selection of the primary feeder and create flexibility in terms of system maintenance. Additionally, the system is designed for emergency generator backup.

Drawings

A single-line diagram of the Science Building electrical distribution system was generated based off the Power Riser Diagram (E701). Scans of the existing building drawings were also used for reference: "Distribution Diagram and Crawl Space Plan" (E-2) and "Plan, Riser Diagram, Schedules, Etc." (61/4001). The resulting drawing is included at the end of the report.

Utility Company Information

Buffalo State College (BSC) purchases electricity for its campus system from National Grid (address and contact information follow):

National Grid
P.O. Box 1303
Buffalo, NY 14240

Customer Service Center
300 Erie Boulevard West
Syracuse, NY 13202-4250

https://www.nationalgridus.com/index.asp

BSC is charged in accordance with the "Large General (SC-3)" service rate for customers consuming more than 100kW each month in Load Zone A. It also participates in the market rate service which enables the purchasing of electricity as a commodity at fluctuating market rates from the New York Independent System Operator (NYISO). The SC-3 rate structure is presented below in Table 1.

Table 1 - SC-3 Service Rate Schedule

	Load Zones A & B *	Load Zones C, D & E *	Load Zone F *
Customer Charge	$ 436.70	$ 436.70	$ 436.70
Delivery Charge			
Minimum kW (first 40 kW)	$ 568.00	$ 568.00	$ 568.00
Per kW Charge (over 40 kW)	$ 14.20	$ 14.20	$ 14.20
Price (per kWh)			
First 450 hrs. of Max kW Usage	$ 0.01351	$ 0.01351	$ 0.01351
Over 450 hrs. of Max kW Usage	$ 0.00521	$ 0.00521	$ 0.00521
RKVA Charge	$ 0.85	$ 0.85	$ 0.85
Delivery Charge Adjustment	**DOES NOT APPLY** Charge varies by month and Load Zone. Applicable prices are located in Electric Supply Charge. This does not apply to customers served on the Market Rate Service.		
Customer Service Credit (per kWh)**	0.05¢ per kWh		
System Benefits Charge (per kWh)	.3536¢	.3536¢	.3536¢
Renewable Portfolio Surcharge (per kWh)	.1083¢	.1083¢	.1083¢
Transmission Revenue Adjustment	**$0.00264 As of September 29, 2009** Charge varies by month. Applicable prices located on Electric Monthly Rate Statements.		

Service Entrance

Components of the campus electrical system transition in ownership from National Grid to BSC immediately following a bank of National Grid meters. From the meters, 4.16 kV is routed through four 3,750 kVA transformers (owned by BSC) into the main BSC Electrical Substation Switchgear. Power is distributed throughout the owner-maintained campus electrical system in a series of concrete encased duct banks.

The electrical service entrance for the Science Building is located at the northwest end of the building (unless indicated otherwise, Science Building shall henceforth refer to the Phase 1 addition). Power flows from bus #3 in the BSC electrical substation switchgear to the science building by 750MCM feeders. The underground primary electric feeder is routed through electrical manhole #33 and enters the building at the areaway. Phase 2 construction provides for a second, redundant feeder connection to the double-ended building substation from manhole #14/substation #4.

The primary feeder enters and exits a pull box in the areaway and then continues underground to the adjacent main electrical room where it feeds directly into a 480V 3Ph 4W unit substation (USSHV-B) and a 208V 3Ph 4W switchboard (SWBDN-B). Both utilize dry-type transformers rated at 2500 kVA OA/3325 kVA FA and 500 kVA OA/665 kVA FA respectively. The 480V unit is a freestanding, modular metal enclosed assembly rated for 4,000 A. The 208V switchboard is also a freestanding, modular metal enclosed assembly rated for 2,000 A. While metering by the utility is centralized outside the BSC substation, the owner provides digital metering in the unit substation within the building, connected to a building automation system.

Voltage Systems

Secondary distribution in the building provides a 480Y/277V 3Ph 4W system that serves mechanical equipment, elevators and lighting loads. The 208Y/120V 3Ph 4W system supplies receptacles, laboratories, and miscellaneous equipment.

Emergency Power Systems

Life safety loads are fed by the emergency branch, which provides continuous power (normal or alternate) via an 800 kW 480/277V engine-driven generator. The emergency transfer switch, ATSE, is fed alternately from the 480V substation or generator. Emergency/life safety loads include egress lighting, fire detection/alarm systems, safety communication systems, and task lighting and selected receptacles and/or communication systems for the elevator machine room, generator location, and fire command center. Additionally there are switched Standby and Optional branches, both alternately fed from the 480V substation and generator. Loads for the standby branch include elevators, lab fume hoods, atrium smoke removal systems, and panels controlling smoke dampers.

The generator starting cycle is to be initiated by a signal from the remote automatic transfer switch, with rated voltage and frequency to be achieved within 10 seconds of initiation.

Locations of Switchgear

Main distribution equipment and switchgear is located in the basement electrical room, room 16. From here, conduits rise vertically through the building and feed into electrical closets at the north end of the building. A 1,000 A 208V 3Ph 4W bus duct also runs up the southern end of the building and feeds into electrical rooms 125, 227, and 328. The existing substation in the Science 1 building is to remain in its current location with feeders rerouted from USSHV-B in Phase 2. The following tables summarize the main switchgear and their locations. A more thorough list of distribution panelboards can be found in Appendix A.

Table 2 - Major Electrical Equipment in Phase 1

MAJOR EQUIPMENT						
TAG	TYPE	LEVEL	ROOM NUMBER	ROOM NAME	FLOOR PLAN	ENLARGED PLAN
SWBDN-B	Switchboard	Basement	16	Electrical Room	E201	E401
SWBDN-P	Switchboard	Penthouse	400A	Penthouse	E209	N/A
USSHV-B	Substation	Basement	16	Electrical Room	E201	E401
BPOH1	Distribution Panel	Basement	16	Electrical Room	E201	E401
BPOL1	Distribution Panel	Basement	16	Electrical Room	E201	E401
BPEH1	Distribution Panel	Basement	16	Electrical Room	E201	E401
BPSH1	Distribution Panel	Basement	16	Electrical Room	E201	E401
1POL1	Distribution Panel	Level One	125	Electrical Room	E204	E401
1PNL1	Distribution Panel	Level One	125	Electrical Room	E204	E401
2POL2	Distribution Panel	Level Two	211	Electrical Room	E205	E401
2PNL2	Distribution Panel	Level Two	211	Electrical Room	E205	E401
2PNL3	Distribution Panel	Level Two	211	Electrical Room	E205	E401
2PNL4	Distribution Panel	Level Two	211	Electrical Room	E205	E401
2POL1	Distribution Panel	Level Two	227	Electrical Room	E206	E401
2PNL1	Distribution Panel	Level Two	227	Electrical Room	E206	E401
3POL1	Distribution Panel	Level Three	328	Electrical Room	E208	E401
3PNL1	Distribution Panel	Level Three	328	Electrical Room	E208	E401
3PNL2	Distribution Panel	Level Three	307	Electrical Room	E207	E401
PPSH1	Distribution Panel	Penthouse	400A	Penthouse	E209	N/A
PPOH1	Distribution Panel	Penthouse	400A	Penthouse	E209	N/A
PPNH1	Distribution Panel	Penthouse	400A	Penthouse	E209	N/A
PPNH2	Distribution Panel	Penthouse	400A	Penthouse	E209	N/A
B-TN-1	Transformer	Basement	16	Electrical Room	E201	E401
B-TN-2	Transformer	Basement	16	Electrical Room	E201	E401
B-TN-3	Transformer	Basement	16	Electrical Room	E201	E401
B-TO1	Transformer	Basement	16	Electrical Room	E201	E401
B-TS1	Transformer	Basement	16	Electrical Room	E201	E401
B-TS2	Transformer	Basement	16	Electrical Room	E201	E401
B-TE1	Transformer	Basement	16	Electrical Room	E201	E401
2-TE1	Transformer	Level Two	227	Electrical Room	E206	E401
P-TE1	Transformer	Penthouse	400A	Penthouse	E209	N/A
P-TE2	Transformer	Penthouse	400A	Penthouse	E210	N/A
P-TS1	Transformer	Penthouse	400A	Penthouse	E209	N/A
P-TS2	Transformer	Penthouse	400A	Penthouse	E210	N/A
P-TN1	Transformer	Penthouse	400A	Penthouse	E209	N/A
P-TN2	Transformer	Penthouse	400A	Penthouse	E210	N/A
P-TO2	Transformer	Penthouse	400A	Penthouse	E210	N/A
P-TO1	Transformer	Penthouse	400A	Penthouse	E209	N/A
Generator	Generator	Basement	15	Generator Room	E201	E401
ATSE	Transfer Switches	Basement	15	Generator Room	E201	E401
ATSS	Transfer Switches	Basement	15	Generator Room	E201	E401
ATSO	Transfer Switches	Basement	15	Generator Room	E201	E401
ATSO-ELEV	Transfer Switches	Basement	18B	Elev. Mach. Room	E201	E401

Table 3 - Panelboards, Existing and New

PANELBOARD SCHEDULE								
PANELBOARD TAG	VOLTAGE SYSTEM	MAIN SIZE	MLO	LEVEL	ROOM NUMBER	ROOM NAME	FLOOR PLAN	ENLARGED PLAN
BLOL1	208V 3PH 4W	225A	X	Basement	16	Electrical Room	E201	E401
BLOL2	208V 3PH 4W	100A	X	Basement	17	Main Telecom Room	E201	E401
BLEL1	208V 3PH 4W	100A		Basement	16	Electrical Room	E201	E401
BLEH1	480V 3PH 4W	100A	X	Basement	16	Electrical Room	E201	E401
BLSL1	208V 3PH 4W	100A		Basement	16	Electrical Room	E201	E401
BLNH1	480V 3PH 4W	100A	X	Basement	16	Electrical Room	E201	E401
BLNH2	480V 3PH 4W	225A	X	Basement	5	Mechanical Room	E201	N/A
BLNL1	208V 3PH 4W	225A	X	Basement	16	Electrical Room	E201	E401
BLNL2	208V 3PH 4W	100A	X	Basement	C02	Corridor	E201	N/A
BLNL3	208V 3PH 4W	225A	X	Basement	C02	Corridor	E201	N/A
BLNL4	208V 3PH 4W	100A	X	Basement	12	NMR	E201	N/A
BLNL5	208V 3PH 4W	100A	X	Basement	13	Laser	E201	N/A
BLNL6	208V 3PH 4W	100A	X	Basement	17	Main Telecom Room	E201	E401
1LOL1	208V 3PH 4W	100A	X	Level One	106B	Alcove	E203	N/A
1LOL4	208V 3PH 4W	100A	X	Level One	115A	Alcove	E203	N/A
1LNL1	208V 3PH 4W	225A	X	Level One	C107	Corridor	E203	N/A
1LNL2	208V 3PH 4W	225A	X	Level One	106A	Alcove	E203	N/A
1LNL8	208V 3PH 4W	225A	X	Level One	115B	Alcove	E203	N/A
1LNL9	208V 3PH 4W	225A	X	Level One	114A	Alcove	E203	N/A
1LNL10	208V 3PH 4W	225A	X	Level One	C108	Corridor	E203	N/A
1LSL1	208V 3PH 4W	225A		Level One	125	Electrical Room	E204	E401
1LOL2	208V 3PH 4W	100A	X	Level One	103A	Alcove	E204	N/A
1LOL3	208V 3PH 4W	100A	X	Level One	120A	Alcove	E204	N/A
1LOL*	208V 3PH 4W	100A	X	Level One	TBD	-	-	N/A
1LOL*	208V 3PH 4W	100A	X	Level One	TBD	-	-	N/A
1LNH1	480V 3PH 4W	225A	X	Level One	125	Electrical Room	E204	E401
1LNL3†	208V 3PH 4W	225A	X	Level One	103B	Alcove	E204	N/A
1LNL4†	208V 3PH 4W	225A	X	Level One	101A	Alcove	E204	N/A
1LNL5†	208V 3PH 4W	225A	X	Level One	125	Electrical Room	E204	E401
1LNL6†	208V 3PH 4W	225A	X	Level One	124A	Alcove	E204	N/A
1LNL7†	208V 3PH 4W	225A	X	Level One	116A	Alcove	E204	N/A
2LOL1	208V 3PH 4W	100A	X	Level Two	208B	Alcove	E205	N/A
2LOL4	208V 3PH 4W	100A	X	Level Two	218A	Alcove	E205	N/A
2LNL1	208V 3PH 4W	225A	X	Level Two	210B	Alcove	E205	N/A
2LNL2	208V 3PH 4W	225A	X	Level Two	208A	Alcove	E205	N/A
2LNL8	208V 3PH 4W	225A	X	Level Two	222A	Alcove	E205	N/A
2LNL9	208V 3PH 4W	225A	X	Level Two	214A	Alcove	E205	N/A
2LNL10	208V 3PH 4W	225A	X	Level Two	211	Electrical Room	E205	E401
2LSL1	208V 3PH 4W	100A		Level Two	227	Electrical Room	E206	E401
2LOL2	208V 3PH 4W	100A	X	Level Two	202A	Alcove	E206	N/A
2LOL3	208V 3PH 4W	100A	X	Level Two	225A	Alcove	E206	N/A
2LOL*	208V 3PH 4W	100A	X	Level Two	TBD	-	-	N/A
2LOL*	208V 3PH 4W	100A	X	Level Two	TBD	-	-	N/A
2LEL1	208V 3PH 4W	100A		Level Two	227	Electrical Room	E206	E401
2LEH1	480V 3PH 4W	225A	X	Level Two	227	Electrical Room	E206	E401
2LNH1	480V 3PH 4W	225A	X	Level Two	227	Electrical Room	E206	E401
2LNL3	208V 3PH 4W	225A	X	Level Two	203A	Alcove	E206	N/A
2LNL4	208V 3PH 4W	225A	X	Level Two	201A	Alcove	E206	N/A

PANELBOARD SCHEDULE								
PANELBOARD TAG	VOLTAGE SYSTEM	MAIN SIZE	MLO	LEVEL	ROOM NUMBER	ROOM NAME	FLOOR PLAN	ENLARGED PLAN
2LNL5	208V 3PH 4W	225A	X	Level Two	227	Electrical Room	E206	E401
2LNL6	208V 3PH 4W	225A	X	Level Two	226B	Alcove	E206	N/A
2LNL7	208V 3PH 4W	225A	X	Level Two	223A	Alcove	E206	N/A
LP1C	*208V 3PH 4W*	*100A*	*X*	*Level One*	*Corr.*	*1st. Floor Old Science 1*	*E204*	*N/A*
LP1D	208V 3PH 4W	225A	X	Level One	Corr.	1st. Floor Old Science 1	E204	N/A
LPBC	*208V 3PH 4W*	*225A*	*X*	*Basement*	*E142*	*Old Science 1*	*E202*	*N/A*
PP1D	*208V 3PH 4W*	*100A*	*x*	*Basement*	*E142*	*Old Science 1*	*E202*	*N/A*
PPBC	*208V 3PH 4W*	*225A*	*X*	*Basement*	*E142*	*Old Science 1*	*E202*	*N/A*
PPTVS	*208V 3PH 4W*	*225A*	*X*	*Basement*	*E119*	*Old Science 1*	*E202*	*N/A*
PPHV1	*208V 3PH 4W*	*400A*	*X*	*Basement*	*Corr.*	*Old Corridor Science 1*	*E202*	*N/A*
PPHV2	*208V 3PH 4W*	*400A*	*X*	*Basement*	*Corr.*	*Old Science 1*	-	-
LPXEM	*208V 3PH 4W*	*100A*	*X*	-	-	*Old Science 1*	-	-
LPBA	*208V 3PH 4W*	*225A*		-	-	*Old Science 1*	-	-
LP1A	*208V 3PH 4W*	*225A*		-	-	*Old Science 1*	-	-
LP2A	*208V 3PH 4W*	*225A*		-	-	*Old Science 1*	-	-
LP3A	*208V 3PH 4W*	*225A*		-	-	*Old Science 1*	-	-
LPBB	*208V 3PH 4W*	*225A*		-	-	*Old Science 1*	-	-
LP1B	*208V 3PH 4W*	*225A*		-	-	*Old Science 1*	-	-
LP2B	*208V 3PH 4W*	*225A*		-	-	*Old Science 1*	-	-
PPMS	*208V 3PH 4W*	*100A*		-	-	*Old Science 1*	-	-
PPBB	*208V 3PH 4W*	*225A*	*X*	-	-	*Old Science 1*	-	-
PPBA	*208V 3PH 4W*	*225A*		-	-	*Old Science 1*	-	-
PP1A	*208V 3PH 4W*	*100A*		-	-	*Old Science 1*	-	-
PP2A	*208V 3PH 4W*	*100A*		-	-	*Old Science 1*	-	-
PP1C	*208V 3PH 4W*	*100A*	*X*	-	-	*Old Science 1*	-	-
LP3B	*208V 3PH 4W*	*225A*		-	-	*Old Science 1*	-	-
3LOL1	208V 3PH 4W	100A	X	Level Three	305A	Alcove	*E207*	N/A
3LOL4	208V 3PH 4W	100A	X	Level Three	313A	Alcove	*E207*	N/A
3LNL1	208V 3PH 4W	225A	X	Level Three	306B	Alcove	*E207*	N/A
3LNL2	208V 3PH 4W	225A	X	Level Three	304A	Alcove	*E207*	N/A
3LNL8	208V 3PH 4W	225A	X	Level Three	318A	Alcove	*E207*	N/A
3LNL9	208V 3PH 4W	225A	X	Level Three	309A	Alcove	*E207*	N/A
3LNL10	208V 3PH 4W	225A	X	Level Three	307	Electrical Room	*E207*	E401
3LSL1	208V 3PH 4W	100A		Level Three	328	Electrical Room	*E208*	E401
3LOL2	208V 3PH 4W	100A	X	Level Three	302A	Alcove	*E208*	N/A
3LOL3	208V 3PH 4W	100A	X	Level Three	323A	Alcove	*E208*	N/A
3LOL*	208V 3PH 4W	100A	X	Level Three	TBD	-	-	N/A
3LOL*	208V 3PH 4W	100A	X	Level Three	TBD	-	-	N/A
3LNH1	480V 3PH 4W	225A	X	Level Three	328	Electrical Room	*E207*	E401
3LNL3	208V 3PH 4W	225A	X	Level Three	303A	Alcove	*E208*	N/A
3LNL4	208V 3PH 4W	225A	X	Level Three	301A	Alcove	*E208*	N/A
3LNL5	208V 3PH 4W	225A	X	Level Three	328	Electrical Room	*E207*	E401
3LNL6	208V 3PH 4W	225A	X	Level Three	327A	Alcove	*E208*	N/A
3LNL7	208V 3PH 4W	225A	X	Level Three	320A	Alcove	*E208*	N/A
PLEH1	480V 3PH 4W	100A	X	Penthouse	400A	Penthouse	*E209*	N/A
PLEL1	208V 3PH 4W	100A		Penthouse	400A	Penthouse	*E209*	N/A
PLEL2	208V 3PH 4W	100A		Penthouse	400A	Penthouse	*E210*	N/A
PLSL1	208V 3PH 4W	100A		Penthouse	400A	Penthouse	*E209*	N/A
PLSL2	208V 3PH 4W	100A		Penthouse	400A	Penthouse	*E210*	N/A
PLNL1	208V 3PH 4W	100A		Penthouse	400A	Penthouse	*E209*	N/A
PLNL2	208V 3PH 4W	100A		Penthouse	400A	Penthouse	*E210*	N/A
PLNH1	480V 3PH 4W	100A	X	Penthouse	400A	Penthouse	*E209*	N/A
PLOL1	208V 3PH 4W	225A		Penthouse	400A	Penthouse	*E209*	N/A
PLOL2	240V 1PH 3W	100A		Penthouse	400A	Penthouse	*E210*	N/A

PANELBOARD SCHEDULE								
PANELBOARD TAG	VOLTAGE SYSTEM	MAIN SIZE	MLO	LEVEL	ROOM NUMBER	ROOM NAME	FLOOR PLAN	ENLARGED PLAN
LP477	208V 3PH 4W	100A		-	-	*Old Science 2*	-	-
LP464	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP468	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP465	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP469	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP466	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP450	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP467	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP471	208V 3PH 4W	100A		-	-	*Old Science 2*	-	-
LP457	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP454	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP458	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP455	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP469	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP456	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP460	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP377	208V 3PH 4W	100A		-	-	*Old Science 2*	-	-
LP357	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP354	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP358	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP355	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP359	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP356	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP360	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP372	208V 3PH 4W	100A		-	-	*Old Science 2*	-	-
LP367	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP364	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP368	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP365	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP369	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP366	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP350	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP274B	208V 3PH 4W	200A		-	-	*Old Science 2*	-	-
LP258	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP274A	208V 3PH 4W	100A		-	-	*Old Science 2*	-	-
LP256	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP251	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP259	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP266	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP270	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP263	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-
LP279	208V 3PH 4W	100A		-	-	*Old Science 2*	-	-
LP275	208V 3PH 4W	70A		-	-	*Old Science 2*	-	-

NOTES: *Text in gray indicates future panels

† Future panels in second phase renovation are assumed to be the same as the indicated panels for normal power in the

Italicized text indicates existing panels or replacement for existing panels

Over-Current Devices

Main Switchgear/Service Entrance Gear

The basement substation (USSHV-B) main over-current device is a kirk-key interlock circuit breaker, LSIG type rated at 4,000 A with an AIC rating of 100K. The branch over-current devices in the substation are all three-pole and range from 100A to 3,000A. The two switchboards, SWBDN-B and SWBDN-P, are both fed from the substation and protected by a 1,500A and 3,000A 100K AIC breaker respectively. However, transformer B-TN1 steps down the voltage for SWBDN-B and therefore there is an interior main 2,000A, 42K AIC circuit breaker in the switchboard frame. Branches from SWBDN-P and SWBDN-B are all protected by three-pole breakers that fall in the range between 100A and 1,200A.

Distribution Panelboards

Distribution panelboard main over-current devices are either main lugs only or circuit breakers.

Branch Circuit Panelboard

Branches are protected by thermal magnetic, bolt-in typed circuit breakers.

Transformers

Transformers for the Science Building are all dry-type and, except for one, are located in either the basement or penthouse. There is one oil-filled transformer, which remains as the existing transformer within the Science 1 substation.

Table 4-Transformers, Existing and New

INDIVIDUAL TRANSFORMER SCHEDULE								
TAG	PRIMARY VOLTAGE	SECONDARY VOLTAGE	SIZE	TYPE	TEMP. RISE	TAPS	MOUNTING	REMARKS
B-TN-1	480V,3PH,3W	208Y/120V,3PH,4W	500	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	FLOOR MOUNTED	John Deere
B-TN-2	4.16 kV	480Y/277V,3PH,4W	2500	DRY TYPE	115 DEGREE C	(4) 2.5%	FLOOR MOUNTED	Case Tractor
B-TN-3	4.16 kV	480Y/277V,3PH,4W	2500	DRY TYPE	115 DEGREE C	(4) 2.5%	FLOOR MOUNTED	Case Tractor
B-TO1	480V,3PH,3W	208Y/120V,3PH,4W	225	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	FLOOR MOUNTED	John Deere
B-TS1	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	TRAPEZE	John Deere
B-TS2	480V,3PH,3W	208Y/120V,3PH,4W	45	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	FLOOR MOUNTED	John Deere
B-TE1	480V,3PH,3W	208Y/120V,3PH,4W	30	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	TRAPEZE	John Deere
2-TE1	480V,3PH,3W	208Y/120V,3PH,4W	30	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	TRAPEZE	John Deere
P-TE1	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	TRAPEZE	John Deere
P-TE2	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	WALL	John Deere
P-TS1	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	TRAPEZE	John Deere
P-TS2	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	WALL	John Deere
P-TN1	480V,3PH,3W	208Y/120V,3PH,4W	30	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	TRAPEZE	John Deere
P-TN2	480V,3PH,3W	208Y/120V,3PH,4W	30	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	WALL	John Deere
P-TO2	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	WALL	John Deere
P-T01	480V,3PH,3W	208Y/120V,3PH,4W	45	DRY TYPE	150 DEGREE C (MAX)	(6) 2.5%	FLOOR MOUNTED	John Deere
T-1	4.16 kV	208Y/120V,3PH,4W	500	OIL FILLED	N/A	N/A	FLOOR MOUNTED	
NOTES:								
1. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS								
KEY:								
N/A=NOT AVAILABLE								

Grounding

The lightning protection system layout is indicated on the roof level power and systems plan, sheets E211 and E212. Downlead conductors are bonded together in a single conductor routed down through the building interstitial spaces. The downlead conductors terminate in the main electrical room at a grounding bar and are connected to a main ground ring composed of 10' copperweld ground rods. Associated details and drawing titles are provided in Table 5.

Table 5 - Grounding Drawings and Details

SHEET	DESCRIPTION
E211,E212	Lightning Protection Plan
1/E401	Ground Rods
2/E501	Ground Rod Detail
3/E501	Lightning Protection System Roof Mounted Air Terminal Detail
4/E501	Supplemental Equipment. Room Ground Terminal Bar Detail
5/E501	Transformer Ground Detail
6/E501	Lightning Protection System Roof Drain/Vent. Pipe Bond Detail
12/E501	Typ. Elec. System Grounding Scheme Detail (Double-ended substation)
13/E501	Secondary Distribution System Grounding Diagram
8/E502	Main Grounding Electrode-Ground Grid

Special Equipment

Though several supplemental, renewable options were considered for power generation in the conceptual phase, none have been implemented into the current design. Therefore, the only alternate power generation equipment is the generator discussed in the "Emergency Power Systems" section.

Lighting Loads

Interior lighting systems for the Science Building consist mainly of linear fluorescent fixtures with sources at 3500K, CRI ≥82, and an input voltage of 277V. Pendant, compact fluorescent luminaires provide accent lighting for the corridors adjacent to the central atrium, and a series of wall-washer, metal halide fixtures are employed to illuminate the ceiling panels in between the skylights of the atrium. LED sources are used in luminaires to provide step and signage lighting. A list of each type of luminaire and source is provided in Table 6, and metal halide ballasts are detailed in Appendix B.

Table 6 - Luminaires for Phase 1 Addition

LUMINAIRE SCHEDULE										
LUMINAIRE TAG	LIGHT SOURCE	LAMP TYPE	INDIVIDUAL LAMP WATTAGE	NUMBER OF LAMPS	BALLAST TYPE	OPERATING OR INPUT VOLTAGE	FIXTURE INPUT WATTS	BALLAST FACTOR	CURRENT @ START/OPERATING	POWER FACTOR @ START/OPERATING
FB2	FLUOR	F32T8	32	2	ELECTRONIC, PS	120/277	65	1.01	0.28	0.98
F32E	FLUOR	F32T8	32	2	ELEC, PS/RELAY	120/277	65	1.01	0.28	0.98
FC2	FLUOR	F32T8	32	3	ELECTRONIC, PS	120/277	94	0.96	0.34	0.99
FK6	FLUOR	F32T8	32	2	ELECTRONIC, PS	277	63	0.88	0.23	0.99
FL4	FLUOR	F32T8	32	2	ELECTRONIC, PS	277	63	0.88	0.23	0.99
FL4A	FLUOR	F32T8	32	2	ELECTRONIC, PS	277	68	0.9	0.26	0.98
FL4E	FLUOR	F32T8	32	2	ELECTRONIC, PS	277	65	1.01	0.28	0.98
FL5	FLUOR	F32T8	32	1	ELECTRONIC, PS	277	34	0.9	0.13	0.98
FL6	FLUOR	F32T8	32	1	ELECTRONIC, PS	277	34	0.9	0.13	0.98
FL7	FLUOR	F32T8	32	2	ELECTRONIC, PS	277	68	0.9	0.26	0.98
FP1	FLUOR	F32T8	32	2	ELECTRONIC, PS	277	63	0.88	0.23	0.99
FP1E	FLUOR	F32T8	32	2	ELECTRONIC, PS	277	63	0.88	0.23	0.99
FP2	FLUOR	F32T8	32	2	ELECTRONIC, PS	277	63	0.88	0.23	0.99
FP2E	FLUOR	F32T8	32	2	ELECTRONIC, PS	277	63	0.88	0.23	0.99
FP8	CFL	F50HL	32	2	INTEGRAL	277	100	0.95	0.21	0.98
FQ7	FLUOR	F32T8	32	2	ELECTRONIC, PS	277	63	0.88	0.23	0.99
FQ8	FLUOR	F28T5	32	1	ELECTRONIC, PS	277	33	1.04	0.12	0.98
FQ9	FLUOR	F28T5	32	2	ELECTRONIC, PS	277	63	1.03	0.23	0.99
FQ10	FLUOR	F28T5	32	1	ELECTRONIC, PS	277	33	1.04	0.12	0.98
FR1	FLUOR	F32T8	32	1	ELECTRONIC, PS	277	34	0.9	0.13	0.98
FR2	FLUOR	F32T8	32	1	ELECTRONIC, PS	277	34	0.9	0.13	0.98
FR2E	FLUOR	F32T8	32	1	ELEC, PS/RELAY	277	34	0.9	0.13	0.98
FR4	FLUOR	F32T8	32	2	ELECTRONIC, PS	277	63	0.88	0.23	0.99
FR5	FLUOR	F32T8	32	2	ELECTRONIC, PS	277	63	0.88	0.23	0.99
PC1	CFL	F42DT	42	1	ELECTRONIC, PS	120/277	46	0.98	0.2	0.98
PD1	CFL	F18DT	18	1	ELECTRONIC, PS	120/277	20	1.05	0.17	0.97
PH9	MH	100 ED17PMH	100	1	ELECTRONIC	277	110	1.00	0.40	1.00
PH9E	MH	100 ED17PMH	100	1	ELECTRONIC	277	110	1.00	0.40	1.00
	INCAN	Q100 T4DCB	100	1	N/A	277	-	-	-	-
PJ1	MH	210/T9/CMH	215	1	MAG/PS/ REMOTE	277	272	1.00	1.30/1.08	0.90
PM2	INCAN	150W A-21	150	1	N/A	120	-	-	-	-
		15W A-15	15	1	N/A	120	-	-	-	-
PN3	INCAN	12/18/PAR-36	18	2	N/A	12(BATTERY)	-	-	-	-
PU2	CFL	F18DT	18	1	ELECTRONIC	120	20	1.05	0.17	0.97
PU3	CFL	F18DT	18	1	ELECTRONIC	120	20	1.05	0.17	0.97
PW1	LED	LED	1	-	N/A	120	1.2	-	0.06	0.8
PW2	LED	LED	1	-	N/A	120	1.2	-	0.06	0.8
PW7	LED	LED	1	-	N/A	120	1.2	-	0.06	0.8
PX3	MH	100 E17PMH	100	1	ELECTRONIC	277	110	1.00	0.40	1.00
PX14	MH	50 ED17PMH	50	1	ELECTRONIC	277	191	1.00	0.70	1.00
XA4	LED	T6	1	2	N/A	120/277	7.5	-	0.03	0.79
XC1	LED	LED	1	56	N/A	120/277	2.1	-	0.04	0.19
XB1	LED	LED	3	-	N/A	120/277	3.62	-	0.03	0.75

Lighting Controls

The Science Building accommodates ASHRAE 90.1 requirements for Automatic Lighting Shutoff by the use of occupancy sensors throughout the labs and offices. The occupancy sensing controls are a mixture of ultrasonic and passive infrared sensors.

Corridor and common area lighting is controlled by an electronic network lighting control system. Luminaires are connected to a lighting control panel in electrical room 227. Presets can be overridden by manual switches in the local electrical rooms on each floor.

Mechanical and Other Loads

Since the Science Building consists largely of laboratory spaces, ventilation requirements were a primary focus in the design of the mechanical system. The addition is served by seven air handling units, three of which are dedicated to the lab spaces and provide 100% outside air. Two 700-Ton chillers are specified to meet air conditioning demands for the future complex. A list of the architectural equipment, plumbing equipment, and mechanical equipment and their power ratings is provided in Tables 7, 8, and 9.

Table 7

ARCHITECTURAL EQUIPMENT									
EQUIPMENT TAG	LOAD DESCRIPTION	LOAD MAGNITUDE	LOAD UNITS	MOTOR AMPS	VOLTAGE	PHASE	ASSUMED POWER FACTOR	LOAD IN KVA	LOAD IN KW
ELEV #1	SERVICE ELEVATOR #1	50	HP	47.2	480.0	3.0	1.0	39.3	37.3
ELEV #2	PASSENGER ELEVATOR #2	50	HP	47.2	480.0	3.0	1.0	39.3	37.3
ELEV #3	PASSENGER ELEVATOR #3	50	HP	47.2	480.0	3.0	1.0	39.3	37.3
								TOTAL LOAD	111.9

Table 8

PLUMBING EQUIPMENT									
EQUIPMENT TAG	LOAD DESCRIPTION	LOAD MAGNITUDE	LOAD UNITS	MOTOR AMPS	VOLTAGE	PHASE	ASSUMED POWER FACTOR	LOAD IN KVA	LOAD IN KW
DI SYS A	DEIONIZED WATER SYSTEM	1 1/2	HP	2.6	480	3	0.85	2.2	1.8
HWCP-1	HOT WATER CIRC. PUMP	1/4	HP	2.1	120	1	0.75	0.25	0.19
DBP-1	DOMESTIC BOOSTER PUMP	5	HP	7.6	480	3	0.85	6.32	5.37
		5	HP	7.6	480	3	0.85	6.32	5.37
DSP-1	DUPLEX SUMP PUMP	1/2	HP	2.3	208	3	0.85	0.83	0.70
		1/2	HP	2.3	208	3	0.85	0.83	0.70
DSE-1	DUPLEX SEWAGE EJECTOR	2	HP	3.4	480	3	0.85	2.83	2.40
		2	HP	3.4	480	3	0.85	2.83	2.40
RAD-1	REFRIGERATED AIR DRYER	1 1/2	HP	2.6	480	3	0.85	2.16	1.84
ACOM-1	AIR COMPRESSOR	15	HP	21	480	3	0.95	17.46	16.59
ACOM-2	AIR COMPRESSOR	15	HP	21	208	3	0.95	7.57	7.19
VP-1	VACUUM PUMP	7 1/2	HP	11	480	3	0.95	9.15	8.69
		7 1/2	HP	11	480	3	0.95	9.15	8.69
		7 1/2	HP	11	480	3	0.95	9.15	8.69
AWS-1	AREA WAY SUMP PUMP	1/2	HP	1	480	3	0.85	0.83	0.71
		1/2	HP	1	480	3	0.85	0.83	0.71
FDS-1	FOUNDATION DRAIN SUMP	1/2	HP	1	480	3	0.85	0.83	0.71
		1/2	HP	1	480	3	0.85	0.83	0.71
E11	CIRC PUMP 1	5	HP	12.2	208	3	0.85	4.39	3.73
E12	CIRC PUMP 2	5	HP	12.2	208	3	0.85	4.39	3.73
								TOTAL LOAD	80.9
NOTES:	Exisiting equipment denoted by gray font. (e.g. AHU S-1)								

Table 9

MECHANICAL EQUIPMENT									
EQUIPMENT TAG	LOAD DESCRIPTION	LOAD MAGNITUDE	LOAD UNITS	MOTOR AMPS	VOLTAGE	PHASE	ASSUMED POWER FACTOR	LOAD IN KVA	LOAD IN KW
E1	AHU S-1	15	HP	32.7	208	3	0.95	11.8	11.19
E2	EXHAUST FAN EF-1	10	HP	21.8	208	3	0.95	7.85	7.46
E3	EXHAUST FAN EF-2	10	HP	21.8	208	3	0.95	7.85	7.46
E4	EXHAUST FAN EF-3	1	HP	2.4	208	3	0.85	0.88	0.75
E5	EXHAUST FAN EF-4	1/2	HP	1.2	208	3	0.85	0.44	0.37
E7	SUPPLY FAN S-9	3/4	HP	1.8	208	3	0.85	0.66	0.56
E10	EXHAUST FAN EF-5	1 1/2	HP	3.7	208	3	0.85	1.32	1.12
E13	CONDENSATE PUMP 14A	1 1/2	HP	3.7	208	3	0.85	1.32	1.12
E14	CONDENSATE PUMP 14B	1 1/2	HP	3.7	208	3	0.85	1.32	1.12
E15	CONDENSATE PUMP 16A	3/4	HP	1.8	208	3	0.85	0.66	0.56
E16	CONDENSATE PUMP 16B	3/4	HP	1.8	208	3	0.85	0.66	0.56
E17	AHU-1	10	HP	21.8	208	3	0.95	7.85	7.46
E20	RETURN FAN-1	10	HP	21.8	208	3	0.95	7.85	7.46
CRU-1	CONDENSATE RETURN UNIT	3/4	HP	0.79	480	3	0.85	0.66	0.56
		3/4	HP	0.79	480	3	0.85	0.66	0.56
CRU-3	CONDENSATE RETURN UNIT	3/4	HP	0.79	480	3	0.85	0.66	0.56
		3/4	HP	0.79	480	3	0.85	0.66	0.56
HWP-1	HOT WATER PUMP	75	HP	70.8	480	3	0.95	58.9	56.0
HWP-2	HOT WATER PUMP	75	HP	70.8	480	3	0.95	58.9	56.0
HRP-1	HEAT RECOVERY PUMP	40	HP	37.8	480	3	0.95	31.4	29.8
HRP-2	HEAT RECOVERY PUMP	40	HP	37.8	480	3	0.95	31.4	29.8
CT-1	COOLING TOWER FAN	40	HP	37.8	480	3	0.95	31.4	29.8
CT-2	COOLING TOWER FAN	40	HP	37.8	480	3	0.95	31.4	29.8
SH-1	CT-1 SUMP HEATER	9	KW	11.4	480	3	0.95	9.5	9.0
SH-2	CT-1 SUMP HEATER	9	KW	11.4	480	3	0.95	9.5	9.0
SH-3	CT-2 SUMP HEATER	9	KW	11.4	480	3	0.95	9.5	9.0
SH-4	CT-2 SUMP HEATER	9	KW	11.4	480	3	0.95	9.5	9.0
AHU-1	AIR HANDLING UNIT	75	HP	70.8	480	3	0.95	58.9	56.0
AHU-2	AIR HANDLING UNIT	125	HP	118	480	3	0.95	98.2	93.3
AHU-3	AIR HANDLING UNIT	125	HP	118	480	3	0.95	98.2	93.3
AHU-4	AIR HANDLING UNIT	125	HP	118	480	3	0.95	98.2	93.3
AHU-5	AIR HANDLING UNIT	36	HP	27	208	3	0.95	28.4	27.0
AHU-6	AIR HANDLING UNIT	1	HP	2.4	208	3	0.85	0.9	0.7
AHU-7	AIR HANDLING UNIT	1	HP	2.4	208	3	0.85	0.9	0.7
RF-1	INLINE RETURN FAN	25	HP	23.6	480	3	0.95	19.6	18.7
LEF-1	STROBIC TYPE EXHAUST FAN	100	HP	94.5	480	3	0.95	78.5	74.60
LEF-2	STROBIC TYPE EXHAUST FAN	100	HP	94.5	480	3	0.95	78.5	74.60
LEF-3	STROBIC TYPE EXHAUST FAN	100	HP	94.5	480	3	0.95	78.5	74.60
LEF-4	STROBIC TYPE EXHAUST FAN	100	HP	94.5	480	3	0.95	78.5	74.60
EF-1	EXHAUST FAN	1	HP	1.1	480	3	0.85	0.9	0.75
EF-2	EXHAUST FAN	3	HP	3.2	480	3	0.85	2.63	2.24
EF-3	EXHAUST FAN	2	HP	2.1	480	3	0.85	1.76	1.49
EF-4	EXHAUST FAN	2	HP	2.1	480	3	0.85	1.76	1.49
EF-5	EXHAUST FAN	3/4	HP	0.8	480	3	0.85	0.66	0.56
EF-6	EXHAUST FAN	15	HP	14.2	480	3	0.95	11.8	11.2
SEF-1	SMOKE EVAC FAN	30	HP	28.3	480	3	0.95	23.6	22.4
SEF-2	SMOKE EVAC FAN	30	HP	28.3	480	3	0.95	23.6	22.38
CH-1	700-TON CHILLER (.577KW/TON)	404	KW	511.5	480	3	0.95	425.3	404
CH-2	700-TON CHILLER (.577KW/TON)	404	KW	511.5	480	3	0.95	425.3	404
CWP-1	CHILLED WATER PUMP	40	HP	37.8	480	3	0.95	31.4	30
CWP-2	CHILLED WATER PUMP	40	HP	37.8	480	3	0.95	31.4	30
CLWP-1	CONDENSER WATER PUMP	75	HP	70.8	480	3	0.95	58.9	56
CLWP-2	CONDENSER WATER PUMP	75	HP	70.8	480	3	0.95	58.9	56

MECHANICAL EQUIPMENT									
EQUIPMENT TAG	LOAD DESCRIPTION	LOAD MAGNITUDE	LOAD UNITS	MOTOR AMPS	VOLTAGE	PHASE	ASSUMED POWER FACTOR	LOAD IN KVA	LOAD IN KW
CWS-1	CHILLED WATER SUPPLY	150	HP	141.7	480	3	0.95	117.8	111.9
CWS-2	CHILLED WATER SUPPLY	150	HP	141.7	480	3	0.95	117.8	111.9
CR-1	COLD ROOM	10	KW	29.2	208	3	0.95	10.5	10.0
CR-2	COLD ROOM	10	KW	29.2	208	3	0.95	10.5	10.0
CR-3	COLD ROOM	10	KW	29.2	208	3	0.95	10.5	10.0
CR-1A	COLD ROOM	0.6	KW	5.6	120	1	0.9	0.67	0.60
CR-2A	COLD ROOM	0.6	KW	5.6	120	1	0.9	0.67	0.60
CR-3A	COLD ROOM	0.6	KW	5.6	120	1	0.9	0.67	0.60
A/C-1A	MAIN TELECOM ROOM A/C	69.8	FLA	69.8	208	3	0.95	25.1	23.9
A/C-1B	MAIN TELECOM ROOM A/C	69.8	FLA	69.8	208	3	0.95	25.1	23.9
A/C-2	NMR	7.2	FLA	7.2	208	3	0.85	2.6	2.2
A/C-3	XRD	7.2	FLA	7.2	208	3	0.85	2.6	2.2
ACCU-1A	MAIN TELECOM ROOM A/C	4.8	FLA	4.8	208	3	0.85	1.7	1.5
ACCU-1B	MAIN TELECOM ROOM A/C	4.8	FLA	4.8	208	3	0.85	1.7	1.5
ACCU-2	NMR	11.4	FLA	11.4	208	3	0.85	4.1	3.5
ACCU-3	XRD	11.4	FLA	11.4	208	3	0.85	4.1	3.5
ACCU-4	*SEE E7	-	-	-	208	3	-	-	-
FIRE PUMP	FIRE PUMP	40	HP	37.8	480	3	0.95	31.41	29.84
JOCKY	JOCKY PUMP	3	HP	3.2	480	3	0.85	2.63	2.24
FOP-1	FUEL OIL PUMPS	1/2	HP	0.5	480	3	0.85	0.44	0.37
		1/2	HP	0.5	480	3	0.85	0.44	0.37
VAV 140	VAV ELEC. COIL	13.3	KW	38.9	208	3	0.95	14.0	13.30
VAV 141	VAV ELEC. COIL	2.3	KW	7.5	208	3	0.85	2.7	2.30
VAV 142	VAV ELEC. COIL	2.3	KW	7.5	208	3	0.85	2.7	2.30
VAV 143	VAV ELEC. COIL	2.3	KW	7.5	208	3	0.85	2.7	2.30
								TOTAL LOAD	2410.7
NOTES:	Exisiting equipment denoted by gray font. (e.g. AHU S-1)								

Service Entrance Size

Service entrance sizing calculations were performed for the three phases of design: Conceptual/Schematic, Design Development, and Construction Documentation. The first method uses building areas and a VA/Sq. Ft. figure associated with the building/occupancy type. The second method used is based on NEC building load values and demand factors applied across the appropriate areas of the building. The last method associated with construction documents is based off the actual loading indicated on the panelboards. The calculations for each method are provided in Tables 10, 11 and 12 and the summarized data follows in Tables 13 and 14.

The summarized data indicates load amp values determined by the first and third methods are too high. This is likely due to a difference in VA/Sq. Ft. values for the conceptual calculations. The discrepancy between the results of the third method and the actual 4,000 A service entrance are due to a variance between capacity considerations. The calculations provided by the designer use a capacity of 10% to obtain a total demand load for the entire complex of 3,946 A. Here, the capacity used is 20% and the resulting load is 4,310 A.

Table 10

CONCEPTUAL/SCHEMATIC DESIGN					
PROJECT PHASE	BUILDING TYPE	AREA (ft^2)	VA/ft^2	LOAD-kVA	AMPS
1(B) Addition	College Lab	39,600	30	1,188	1,431
	Classroom Building	56,400	12	677	815
2(B) Renovation-Existing Science 1	College Lab	10,200	30	306	368
	Classroom Building	57,300	12	688	828
2(C) Demo/Renovation-Science 2	College Lab	10,200	30	306	368
	Classroom Building	42,800	12	514	618
			TOTAL LOAD	3,678	4,429

Table 11

DESIGN DEVELOPMENT						
PROJECT PHASE	LOAD TYPE	AREA (ft^2)	VA/ft^2	DEMAND FACTOR	LOAD-kVA	AMPS
1(B) Addition	Lighting	96,000	3	1	288	347
	Receptacles†	96,000	1	1	10	12
				0.5	43	52
	HVAC-Cooling	96,000	8	0.8	614	740
	ELEVATOR (3) - 50kW/elev*	-	-	0.8	133	161
	Labs††	39,600	18	0.8	570	687
				TOTAL	1,659	1,998
2(B) Renovation-Existing Science 1	Lighting	67,500	3	1	203	244
	Receptacles†	67,500	1	1	10	12
				0.5	29	35
	HVAC-Cooling	67,500	8	0.8	432	520
	ELEVATOR (1) - 50kW/elev*	-	-	0.8	44	54
	Labs††	10,200	18	0.8	147	177
				TOTAL	865	1,041
2(C) Demo/Renovation - Science 2	Lighting	53,000	3	1	159	191
	Receptacles†	53,000	1	1	10	12
				0.5	22	26
	HVAC-Cooling	53,000	8	0.8		
	ELEVATOR (1) - 50kW/elev*	-	-	0.8	44	54
	Labs††	10,200	18	0.8	147	177
				TOTAL	382	460
TOTAL (FOR COMPLETE COMPLEX, ALL CONSTRUCTION PHASES)					2,905	3,499

NOTES:
* Assume a power factor of 0.90;
† Receptacle Demand Factors: 10kVA at 100% Demand, remainder (86kVA) at 50% Demand
† †Assume Phase 1 Addition contains 66% of total Lab space (60,000 sq. ft.) in the complex. Unit load based off average of Hospital Lab value provided (25 VA/Sq. Ft.) and Cannon standard of 10 VA/Sq. Ft.)

Table 12

WORKING DRAWINGS -ACTUAL LOADING						
PROJECT PHASE	LOAD TYPE	CONNECTED LOAD (kVA)	DEMAND FACTOR	DEMAND LOAD (kVA)	DEMAND LOAD W/CAPACITY (kVA)	TOTAL AMPS
1(B) Addition + Future Loads	Lighting	411	0.9	370	444	535
	Receptacles	1,401	0.3	420	504	607
	Equipment	3,654	0.6	2,192	2,631	3,168
TOTALS		5,466		2,983	3,579	4,310
TOTAL (FOR COMPLETE COMPLEX, ALL CONSTRUCTION PHASES)					3,579	4,310

NOTES:

* The panel schedules provided for the addition (Phase 1) include values for the future and existing loads that will be fed from the new substation (USSHV-B). In other words, Phase 2B & C are accounted for in these values.

Table 13- Service Entrance Sizing Results

LOAD CALCULATION SUMMARY			
PHASE	LOAD-kVA	Voltage System	Load-Amps
Conceptual/Schematic Design			
1B	1,188	480/277	1,431
2B	306	480/277	368
2C	306	480/277	368
COMBINED	3,678	480/277	4,429
Design Development			
1B	1,659	480/277	1,998
2B	865	480/277	1,041
2C	382	480/277	460
COMBINED	2,905	480/277	3,499
Working Drawings			
1B	3,579	480/277	4,310
2B	-	480/277	-
2C	-	480/277	-
COMBINED	3,579	480/277	4,310

Table 14-Service Entrance Sizes

SERVICE ENTRANCE			
PHASE	LOAD-kVA	Voltage System	Load-Amps
Actual Conditions - Service Entrance 1	2500	480/277	4000
Actual Conditions - Service Entrance 2 Existing Science 1	500	480/277	1600
Actual Conditions - Service Entrance 3 Existing Science 2	500	480/277	1600
Total Actual Conditions	2500		
Summary-VA/Sq. Ft.	12		
NOTES:			
Service entrance 2 and 3 to be removed in subsequent construction phases			

Environmental Stewardship Design

The Science Building is designed to satisfy LEED Gold requirements, which are largely achieved through improved operating efficiencies and controls of the mechanical and electrical systems. Variable speed drives are used to control the majority of the air handling pumps and fans. The lighting system efficiencies are improved by incorporating automatic and networked lighting controls as well as efficient, fluorescent light sources. Daylighting techniques are also incorporated on the western façade of the building and through the clerestories and skylights in the atrium.

Design Issues

One of the largest design issues with the project was space. Originally, the distribution system was to be supplied by two separate, single-ended substations. However, the 5 kV substation intended for the penthouse was relocated and combined into the more expensive double-ended substation in the basement. As a result, a bus duct was chosen for vertical distribution on the south end of the building in order to provide for future expansion and minimize voltage drop.

COMMUNICATION SYSTEMS

Fire Alarm

The fire command center is located in room 127 and houses the Fire Alarm Control Unit (FACU), Emergency Voice/Alarm Communication (EVAC), Graphic Smoke Control Panel (GSCP), and annunciator panels for the generator and elevators. Alarms are ADA compliant combined speaker/strobe.

Telephone/Data

The telecom service entrance room is connected to campus utilities by inter-building, exterior fiber optic cabling. Head-end equipment and the telephone main distribution frame are located in the basement telecom room. Individual telecom rooms are connected by intra-building backbone systems with 24 strand 50 micron cabling in 4" electrical metallic tubing (EMT) conduit. Horizontal cabling throughout the building telecom distribution system is copper. Telephone service for the existing building and addition is being updated from a Centrex phone system to VoIP.

Security

Video surveillance is provided throughout the corridors of the Science Building and outside storage areas in the basement. Wall and ceiling-mounted cameras are connected to media storage in the main telecom room. Access control is also provided for the labs by means of entry card readers.

Appendix A

DISTRIBUTION PANEL SCHEDULE								
PANELBOARD TAG	VOLTAGE SYSTEM	MAIN SIZE	MLO	LEVEL	ROOM NUMBER	ROOM NAME	FLOOR PLAN	ENLARGED PLAN
BPOH1	480V 3PH 4W	800A	X	Basement	16	Electrical Room	E201	E401
BPOL1	208V 3PH 4W	800A		Basement	16	Electrical Room	E201	E401
BPEH1	480V 3PH 4W	400A	X	Basement	16	Electrical Room	E201	E401
BPSH1	480V 3PH 4W	800A	X	Basement	16	Electrical Room	E201	E401
1POL1	208V 3PH 4W	225A	X	Level One	125	Electrical Room	E204	E401
1PNL1	208V 3PH 4W	400A		Level One	125	Electrical Room	E204	E401
1PNL*	208V 3PH 4W	400A		Level One	125	Electrical Room	E204	E401
2PNL1	208V 3PH 4W	400A	X	Level Two	227	Electrical Room	E206	E401
2PNL*	208V 3PH 4W	400A	X	Level Two	227	Electrical Room	E206	E401
2POL2	208V 3PH 4W	400A	X	Level Two	211	Electrical Room	E205	E401
2PNL2	208V 3PH 4W	400A	X	Level Two	211	Electrical Room	E205	E401
2PNL3	208V 3PH 4W	400A	X	Level Two	211	Electrical Room	E205	E401
2PNL4	208V 3PH 4W	600A	X	Level Two	211	Electrical Room	E205	E401
2POL1	208V 3PH 4W	400A	X	Level Two	227	Electrical Room	E206	E401
2PNL1	208V 3PH 4W	400A		Level Two	227	Electrical Room	E206	E401
3POL1	208V 3PH 4W	400A	X	Level Three	328	Electrical Room	E208	E401
3PNL1	208V 3PH 4W	400A		Level Three	328	Electrical Room	E208	E401
3PNL*	208V 3PH 4W	400A		Level Three	328	Electrical Room	E208	E401
3PNL2	208V 3PH 4W	400A		Level Three	307	Electrical Room	E207	E401
PPSH1	480V 3PH 4W	600A	X	Penthouse	400A	Penthouse	E209	N/A
PPOH1	480V 3PH 4W	225A	X	Penthouse	400A	Penthouse	E209	N/A
PPNH1	480V 3PH 4W	600A	X	Penthouse	400A	Penthouse	E209	N/A
PPNH2	480V 3PH 4W	600A	X	Penthouse	400A	Penthouse	E209	N/A
PP274	*208V 3PH 4W*	*225A*		-	-	*Old Science 2*	-	-
PP372	*208V 3PH 4W*	*225A*		-	-	*Old Science 2*	-	-
PP377	*208V 3PH 4W*	*225A*		-	-	*Old Science 2*	-	-
PP471	*208V 3PH 4W*	*225A*		-	-	*Old Science 2*	-	-
PP477	*208V 3PH 4W*	*225A*		-	-	*Old Science 2*	-	-
NOTES:	*Text in gray indicates future panels **Panels in italicized font to be removed in second phase with demolition of Science 2							

Appendix B – HID Ballasts

1

Associated Luminaires: PH9, PH9E, PX3

Lamp Quantity: 1

Lamp Type: 100 ED17PMH

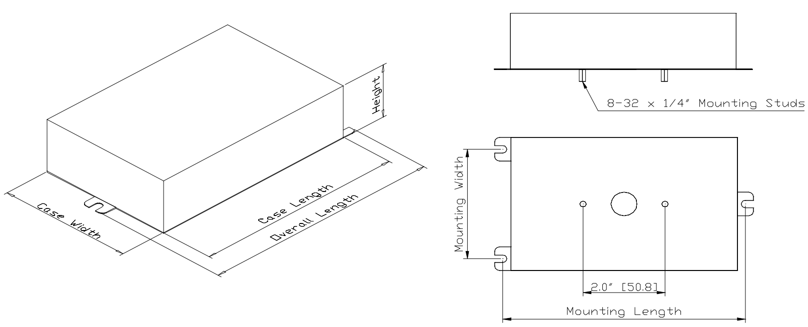
Ballast Type: Electronic

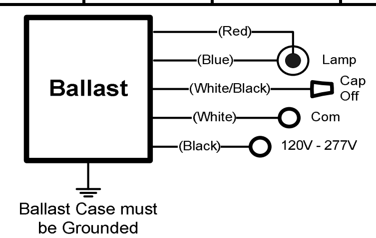
Revised: 4/9/2009

PHILIPS ADVANCE	**e-Vision® Electronic Ballast for Metal Halide Lamps**	Catalog Number: IMH-100-A For 70W or 100W Metal Halide Lamps ANSI M98, M139, M143, M90 or M140 120-277V 50/60Hz Electronic Status: RELEASED

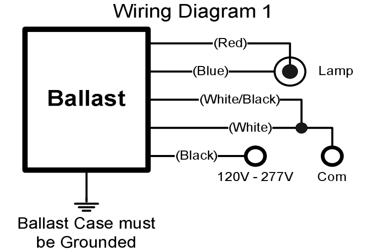
DIMENSIONS AND DATA

Lamp Number	Lamp Watts	Input Volts	Catalong Number*	Line Current (Amps)	Input Power (Watts)	Min Power Factor	Wiring Diag	Fig.	Weight (lb)	Max. Distance to Lamp (ft)
70 Watt Lamp, ANSI Code M98, M139 or M143 Minimum Starting Temp -30°C/-20°F										
1	70	120	IMH-100-A-XXX	0.68	82	1	1	A/B	1.4	5
		277		0.30	81					
100 Watt Lamp, ANSI Code M90 or M140 Minimum Starting Temp -30°C/-20°F										
1	100	120	IMH-100-A-XXX	0.9	112	1	2	A/B	1.4	5
		277		0.4	110					



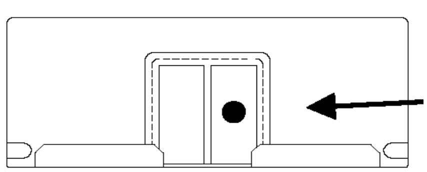


Wiring Diagram 1



Wiring Diagram 2

Case Figure	Overall Length	Case Length	Case Width	Height	Mountin Length	Mounting Width
A/B	140mm [5.5"]	120mm [4.7"]	92mm [3.6"]	38mm [1.5"]	132mm [5.2"]	73mm [2.9"]



MEASURE CASE TEMPERATURE ON RIGHT HEAT SINK CLIP AT BALAST END

INSTALLATION & APPLICATION NOTES:

1. Maximum allowable case temperature is 85°C. See figure above for measurement location
2. Ignition pulse is 4 kV max
3. All leads are 12 inches long
4. Ballast output will shutdown after 20 minutes if lamp fails to ignite
5. Power must be cycled off – then on, after replacing lamp

***Ordering Information**

Order Suffix	Description
-LF	Phased out use IMH70ALF or IMH100BLF
-BLS	Ballast with bottom exit leads and mounting studs

Data is based on tests performed by Philips Advance in a controlled environment and is representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.

Philips Lighting Electronics N.A.
10275 West Higgins Road • Rosemont, IL 60018 • www.philips.com/advance
Tel: 800-322-2086 • Fax: 800-423-1882 • Customer Support: 800-372-3331 • OEM Support: 866-915-5886

2

Associated Luminaires: PJ1

Lamp Quantity: 1

Lamp Type: 210/T9/CMH

Ballast Type: Magnetic, Pulse Start, Remote

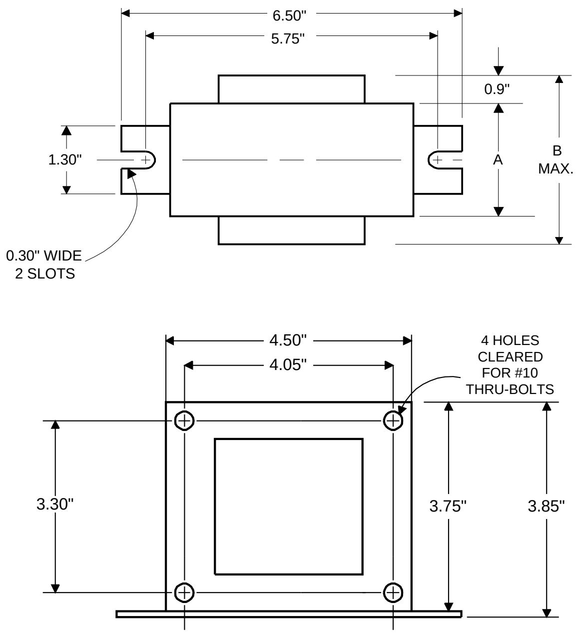
PHILIPS ADVANCE

Metal Halide Lamp Ballast

Catalog Number 71A5737BPEE
For 250W M138/M153 (P.S.)
60 Hz R-HPF
Status: Active

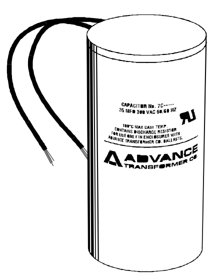
DIMENSIONS AND DATA

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)	1.25					
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 Philips Lighting Electronics N.A. TEST Procedure for HID Ballasts - Form 127						
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: 7C140M30RA



Capacitance: 14
Dia/Oval Dim: 1.58
Height: 2.68
Temp Rating: 105°C

Wiring Diagram:

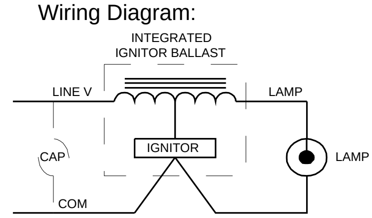


Fig. H

U.L. RECOGNIZED

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

Typical Ordering Information

(please call Philips Lighting Electronics N.A. for suffix availability)

Order Suffix	Description
001DEE	88% EFFICIENT BALLAST KIT - EISA COMPLIANT
EE	EISA COMPLIANT - 88% EFFICIENT BALLAST

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

PHILIPS LIGHTING ELECTRONICS N.A.
10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
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Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

Revised: 10/26/09

3

Associated Luminaires: PX14

Lamp Quantity: 1

Lamp Type: 50 ED17PMH

Ballast Type: Electronic

Revised: 3/5/2009

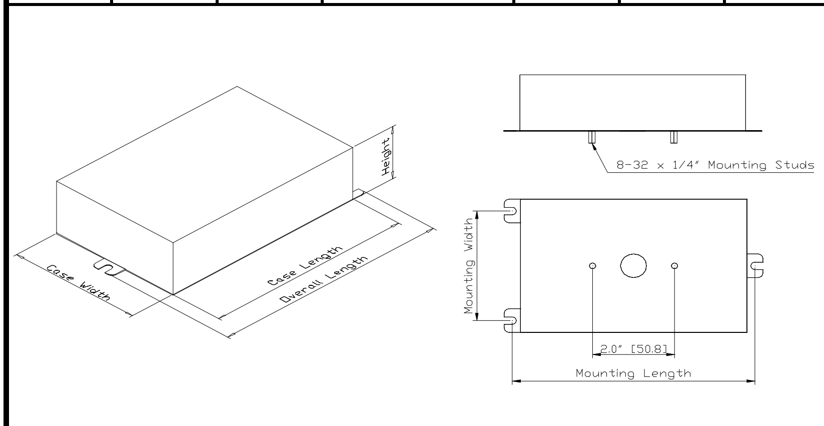
PHILIPS ADVANCE

e-Vision® Electronic Ballast for Metal Halide Lamps

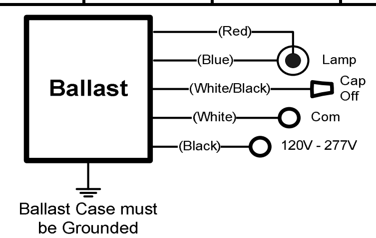
Catalog Number: IMH-50-A
For 39W or 50W Metal Halide Lamps
ANSI M110 or M130
120-277V 50/60Hz Electronic
Status: RELEASED

DIMENSIONS AND DATA

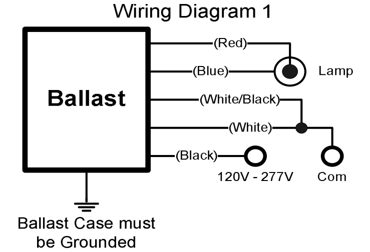
Lamp Number	Lamp Watts	Input Volts	Catalong Number*	Line Current (Amps)	Input Power (Watts)	Min Power Factor	Wiring Diag	Fig.	Weight (lb)	Max. Distance to Lamp (ft)
39 Watt Lamp, ANSI Code M130 Minimum Starting Temp -30°C/-20°F										
1	39	120	IMH-50-A-XXX	0.38	45	1	1	A/B	1.4	5
		277		0.16	44					
50 Watt Lamp, ANSI Code M110 Minimum Starting Temp -30°C/-20°F										
1	50	120	IMH-50-A-XXX	1.7	194	1	2	A/B	1.4	5
		277		0.7	191					



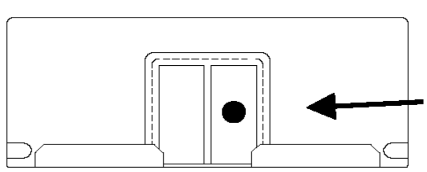
Case Figure	Overall Length	Case Length	Case Width	Height	Mountin Length	Mounting Width
A/B	140mm [5.5"]	120mm [4.7"]	92mm [3.6"]	38mm [1.5"]	132mm [5.2"]	73mm [2.9"]



Wiring Diagram 1



Wiring Diagram 2



MEASURE CASE TEMPERATURE ON RIGHT HEAT SINK CLIP AT BALAST END

INSTALLATION & APPLICATION NOTES:

1. Maximum allowable case temperature is 85°C. See figure above for measurement location
2. Ignition pulse is 4 kV max
3. All leads are 12 inches long
4. Ballast output will shutdown after 20 minutes if lamp fails to ignite
5. Power must be cycled off – then on, after replacing lamp

***Ordering Information**

Order Suffix	Description
-LF	Ballast with side exit leads and mounting feet
-BLS	Ballast with bottom exit leads and mounting studs

Data is based on tests performed by Philips Advance in a controlled environment and is representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.

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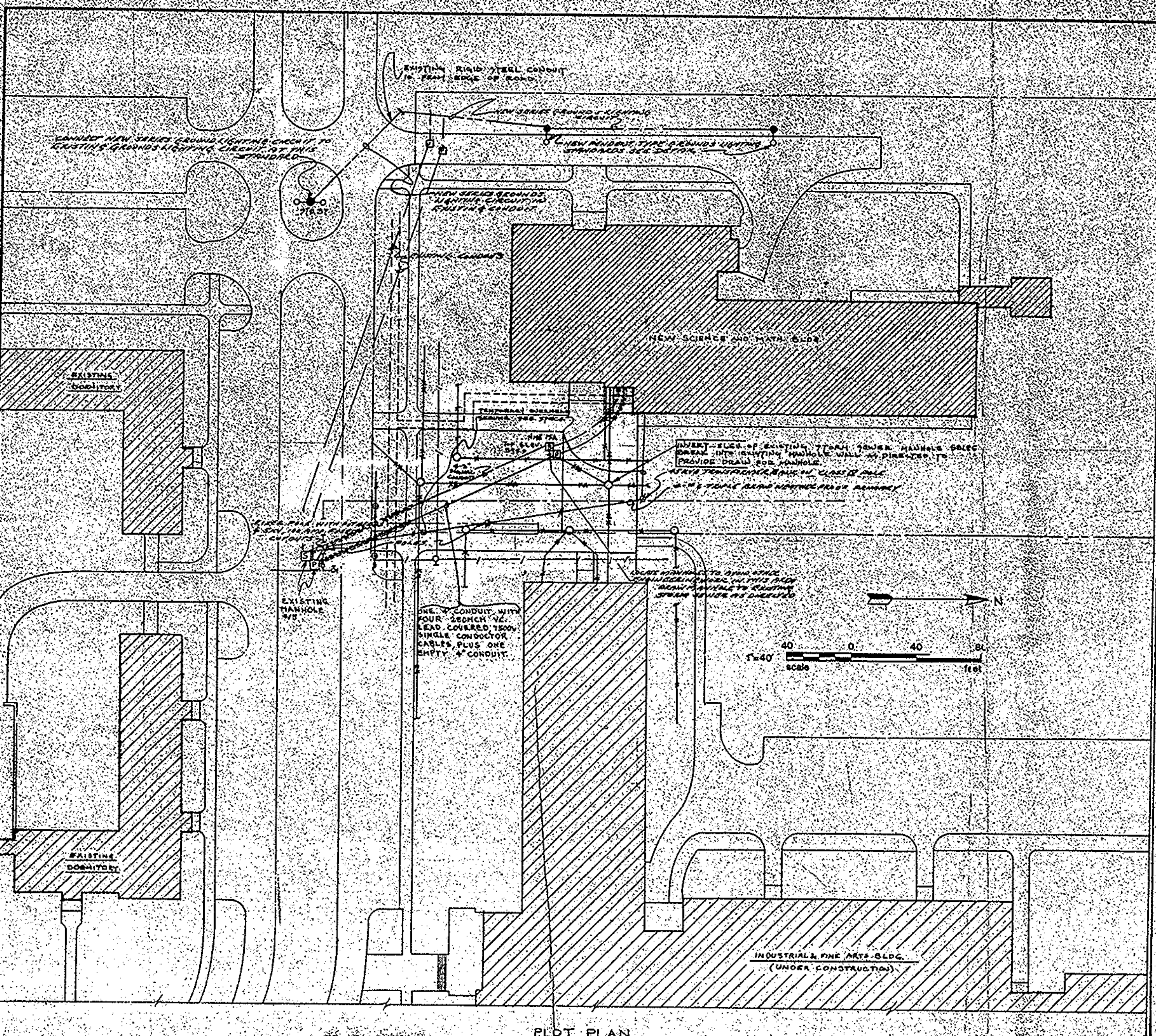
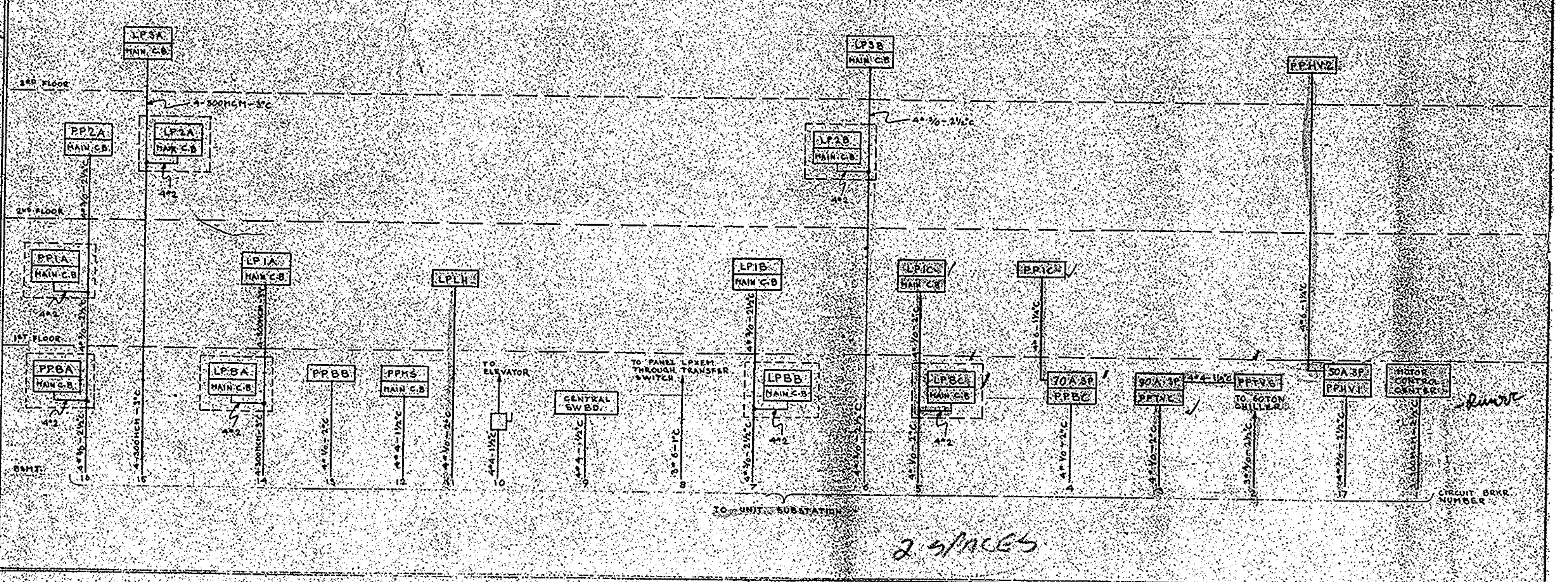
Appendix C - Drawings

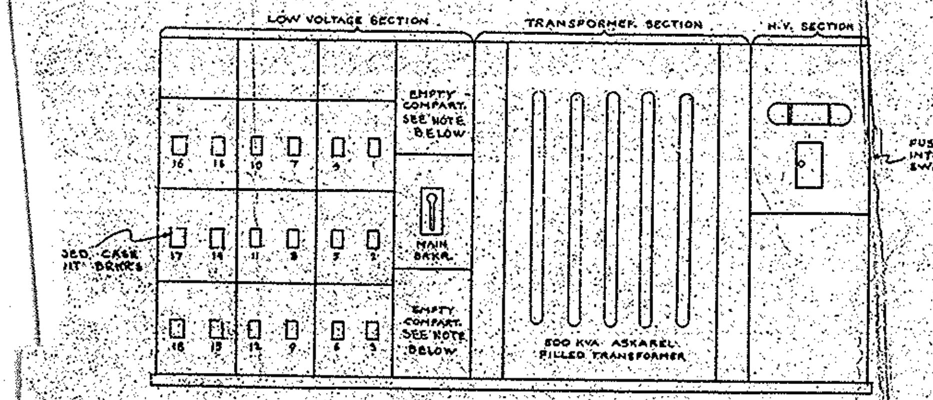


PLOT PLAN

SCALE: 1" = 40'-0"



RISER DIAGRAM   NO SCALE



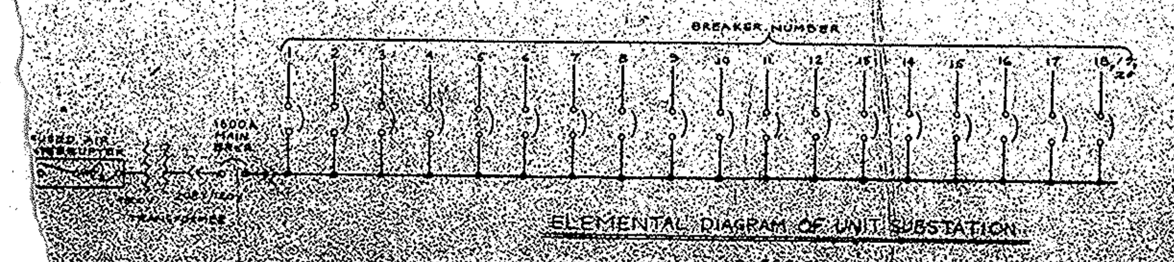
FRONT ELEVATION OF 500 KVA UNIT SUBSTATION

NO SCALE

NOTE: MAKE PROVISION FOR FUTURE BRKRS.

UNIT SUBSTATION SCHEDULE							
BREAKER				LOAD (PANEL #)	FEEDER		NOTES
NUMBER	FRAME	TRIP	POLES		CABLES	CONDUIT	
1	400	250 (300)	3	MCC	3-300MCM	2½"	
2	400	300	3	60 TON CHILLER	3#4/0	2½"	
3	225	150	3	PPTVC	4#1/0	2"	
4	225	150	3	PPBC	4#1/0	2"	
5	225	150	3	LPBC, LP1C	4#1/0	2"	
6	225	225	3	LP2B, LP3B	4#3/0	2½"	
7	225	225	3	LPBB, LP1B	4#3/0	2½"	
8	100	70	2	LPXEM	3#6	1"	
9	100	90	3	CENTRAL SWBD.	4#4	1½"	
10	100	100	3	ELEVATOR	4#4	1½"	
11	225	150	3	LPLH	4#1/0	2"	
12	100	90	3	PPMS	4#4	1½"	
13	225	150	3	PPBB	4#1/0	2"	
14	225	225	3	LPBA, LP1A	4-300MCM	3"	
15	225	225	3	LP2A, LP3A	4-300MCM	3"	
16	225	200	3	PPBA, PP1A, PP2A	4#3/0	2½"	
17	225	200	3	PPHV1	4#3/0	2"	
18 19/20	225	200	3	SPARE	—	—	

~~70~~ ~~ATS~~
200 SPARE
200 ?



ELEMENTAL DIAGRAM OF UNIT SUBSTATION

NO SCALE

SCHEDULE OF BRANCH CIRCUIT & SIGNAL CIRCUIT SYMBOLS

S	1-POLE SWITCH - SEE NOTE 1
S3	3-WAY SWITCH - SEE NOTE 1
S4	4-WAY SWITCH - SEE NOTE 1
SP	1-POLE SWITCH WITH PILOT
SL	1-POLE TUMBLER LOCK SWITCH
SWP	1-POLE SWITCH WITH WEATHERPROOF COVER
S3WP	3-WAY SWITCH WITH WEATHERPROOF COVER
PS	1-POLE CEILING PULL SWITCH
	DOUBLE CONVENIENCE OUTLET - WALL MOUNTED - 12" ABOVE FLOOR
W	DOUBLE CONVENIENCE OUTLET - WALL MOUNTED - HGT. AS DETAILED OR DIRECTED
	DOUBLE CONVENIENCE OUTLET - CEILING MOUNTED
WP	WEATHERPROOF DOUBLE CONVENIENCE OUTLET
	DOUBLE CONVENIENCE OUTLET - MOUNTED IN ELECTRICAL DISTRIBUTION DUCT
PS	DOUBLE CONVENIENCE OUTLET - MOUNTED IN SINGLE FACED CHROME PLATED PEDESTAL
PD	DOUBLE CONVENIENCE OUTLET - MOUNTED IN DOUBLE FACED CHROME PLATED PEDESTAL
F	DOUBLE CONVENIENCE OUTLET - FLUSH MOUNTED IN EQUIPMENT - BY EQUIPMENT CONTRACTOR
	120 VOLT FLOOR OUTLET
	PENDENT LOCK TYPE CEILING RECEPTACLE
W	20A 4-POLE HEAVY DUTY RECEPTACLE - WALL MOUNTED
F	20A 4-POLE HEAVY DUTY RECEPTACLE - FLUSH IN EQUIPMENT
WP	20A 4-POLE HEAVY DUTY RECEPTACLE - WITH WEATHERPROOF COVER
	20A 4-POLE HEAVY DUTY RECEPTACLE - MOUNTED IN ELECTRICAL DISTRIBUTION DUCT
	30A 3-POLE SPECIAL PURPOSE OUTLET - WALL MOUNTED
	30A 4-POLE HEAVY DUTY RECEPTACLE - WALL MOUNTED
	SIGNIFIES ELECTRICAL CONTRACTOR SHALL MAKE COMPLETE ELECTRICAL CONNECTION TO 120 VOLT EQUIPMENT AS NOTED ON PLANS OR SPECIFIED
	SIGNIFIES ELECTRICAL CONTRACTOR SHALL MAKE COMPLETE ELECTRICAL CONNECTION TO 208 VOLT EQUIPMENT AS NOTED ON PLANS OR SPECIFIED
F1	SIGNIFIES ELECTRICAL CONTRACTOR SHALL MAKE COMPLETE ELECTRICAL CONNECTION TO 120 VOLT, 1Ø FUME HOOD ASSEMBLY INCLUDING SWITCH, LIGHT & RECEPTACLE
F2	SIGNIFIES ELECTRICAL CONTRACTOR SHALL MAKE COMPLETE ELECTRICAL CONNECTION TO 120 VOLT, 1Ø FUME HOOD ASSEMBLY INCLUDING SWITCH, LIGHT, RECEPTACLE & TYPE "X3" VARIABLE VOLTAGE OUTLET MOUNTED ON SINGLE FACED PEDESTAL
F3	SIGNIFIES ELECTRICAL CONTRACTOR SHALL MAKE COMPLETE ELECTRICAL CONNECTION TO 120 VOLT 1Ø FUME HOOD ASSEMBLY, INCLUDING SWITCH, LIGHT, RECEPTACLE, 20A 4-POLE HEAVY DUTY RECEPTACLE & TYPE "X3" VARIABLE VOLTAGE OUTLET MOUNTED ON SINGLE FACED PEDESTAL.
F4	SIGNIFIES ELECTRICAL CONTRACTOR SHALL MAKE COMPLETE ELECTRICAL CONNECTION TO 120 VOLT 1Ø FUME HOOD ASSEMBLY, INCLUDING SWITCH, LIGHT & TWO RECEPTACLES
	SINGLE ELECTRICAL DISTRIBUTION DUCT WITH SPECIAL END FEED-IN BOX ON ONE END (SEE DETAIL ON SHEET NO. 61-4015) LENGTHS AS NOTED
	DOUBLE ELECTRICAL DISTRIBUTION DUCT WITH SPECIAL END FEED-IN BOX ON BOTH ENDS (SEE DETAIL ON SHEET NO. 61-4015) LENGTHS AS NOTED
	PLUG-IN STRIP - LENGTHS AS NOTED.

X1W, X1F, X1, X2W, X2F, X3W, X3F, X3PS, X4W, X4F, X5W, X5F, X6W, X6F, X7F, X7	VARIABLE VOLTAGE OUTLETS. SEE SPECS AND SHEET NO. 61/4017 FOR DETAILS
MS	MOTOR CONTROL PUSH BUTTON STATION
R	RELAY FOR EXTERIOR LIGHTING
C	JUNCTION CONDULET
EM	SHOP EMERGENCY POWER CUT-OFF
	INCANDESCENT CEILING FIXTURE - SEE NOTE 2
	INCANDESCENT WALL BRACKET FIXTURE - SEE NOTE 2
	FLUORESCENT FIXTURE - SEE NOTE 3
EXIT	ILLUMINATED EXIT SIGN - SEE NOTE 4
HC	ILLUMINATED HOSE CABINET SIGN
R	CEILING LAMP RECEPTACLE (FOR EMERGENCY LIGHT)
F	FIRE ALARM STATION
F	FIRE ALARM GONG
D	FIRE ALARM DETECTOR
	OUTLET FOR TELEPHONE - 12" ABOVE FLOOR
WT	OUTLET FOR TELEPHONE - 54" ABOVE FLOOR
LS	LECTURE HALL LOUDSPEAKER
	CLOCK
M	MICROPHONE OUTLET
V	VIDEO OUTLET
AC	AUDIO (SPEAKER) OUTLET IN CEILING
AW	AUDIO (SPEAKER) OUTLET IN WALL
V	VIDEO CABLE TRAY
A	AUDIO CABLE TRAY
	FIRE ALARM SYSTEM JUNCTION BOX
	EXIT LIGHT SYSTEM JUNCTION BOX
J	JUNCTION BOX
A	AQUASTAT - BY OTHERS
T	THERMOSTAT - BY OTHERS
EP	ELECTRO-PNEUMATIC VALVE - BY OTHERS
PE	PNEUMATIC-ELECTRIC SWITCH - BY OTHERS
ST	1-POLE THERMAL SWITCH - BY OTHERS
ST2	2-POLE THERMAL SWITCH - BY OTHERS
	MOTOR - BY OTHERS
	INDIVIDUALLY MOUNTED MAGNETIC MOTOR STARTER - BY OTHERS
UH	FLOOR MTD. UNIT HEATER - BY OTHERS
UH	CEILING MTD. UNIT HEATER - BY OTHERS

NOTES:

NOTE 1: ROMAN NUMERALS ADJACENT TO SWITCH SYMBOL INDICATES QUANTITY OF SWITCHES (GANGED UNDER ONE PLATE)

NOTE 2: LETTER IN CIRCLE DESIGNATES FIXTURE TYPE. SEE SPECS. QUANTITY & WATTAGE OF LAMPS ... BY ADJACENT NUMBERS.

NOTE 3: QUANTITY & TYPE OF FLUORESCENT FIXTURES ARE INDICATED IN EACH ...

NOTE 4: TYPE OF EXIT LIGHT IS INDICATED THUS "TYPE A". SEE SPECS. DIRECTION OF ARROWS SHALL BE AS SHOWN.

NOTE:

SIGNIFIES 2#12-1/2"C ALL HOME RUNS SHALL BE 3/4"C MINIMUM.
SIGNIFIES 3#12-1/2"C
SIGNIFIES 4#12-3/4"C
SIGNIFIES 5#12-3/4"C
SIGNIFIES 6#12-1"C
SIGNIFIES 2#14-1/2"C
SIGNIFIES 3#14-1/2"C
SIGNIFIES 4#14-1/2"C
SIGNIFIES 5#14-3/4"C
SIGNIFIES 6#14-3/4"C
SIGNIFIES 2#10-3/4"C
SIGNIFIES 3#10-3/4"C
SIGNIFIES 4#10-3/4"C
SIGNIFIES 6#10-3/4"C
SIGNIFIES 2#10 PLUS 1#10 GROUND-3/4"C
SIGNIFIES 4#10 PLUS 1#10 GROUND-1"C
SIGNIFIES 6#10 PLUS 1#10 GROUND-1"C
SIGNIFIES 2#10 PLUS 1#10 GROUND PLUS 1 CO-AXIAL CABLE-3/4"C
SIGNIFIES 4#10 PLUS 1#10 GROUND PLUS 1 CO-AXIAL CABLE-1"C
SIGNIFIES 6#10 PLUS 1#10 GROUND PLUS 1 CO-AXIAL CABLE-1¼"C
'S' CABLE SIGNIFIES SOUND SYSTEM CABLE-SEE SPECS

SCHEDULE OF DISCONNECT SWITCHES	
33	30A 3P N.D. UNFUSED DISCONNECT SWITCH
33	30A 3P N.D. FUSED SAFETY SWITCH
33WP	30A 3P N.D. WEATHERPROOF, UNFUSED DISCONNECT SWITCH
66	60A 6P. N.D. UNFUSED DISCONNECT SWITCH

SYMBOLS & ABBREVIATIONS FOR PLOT PLAN ONLY

DOUBLE COMPARTMENT ELECTRIC MANHOLE P-POWER S-SIGNAL
NMH NEW ELECTRIC MANHOLE
EXISTING SANITARY OR STORM SEWER MANHOLE
EXISTING SANITARY LINES
EXISTING STORM SEWER LINES
EXISTING WATER LINES
EXISTING GAS LINES
NEW UNDERGROUND POWER CONDUIT
NEW UNDERGROUND SIGNAL CONDUIT
EXISTING STEAM TUNNEL
NEW UNDERGROUND POWER CONDUIT - RIGID STEEL
NEW UNDERGROUND SIGNAL CONDUIT - RIGID STEEL
EXISTING WATER VALVE
EXISTING 4" PERF. UNDERTILE
NEW MANHOLE DRAIN

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STATE UNIVERSITY OF NEW YORK
COLLEGE OF EDUCATION AT BUFFALO
BUFFALO, N.Y.

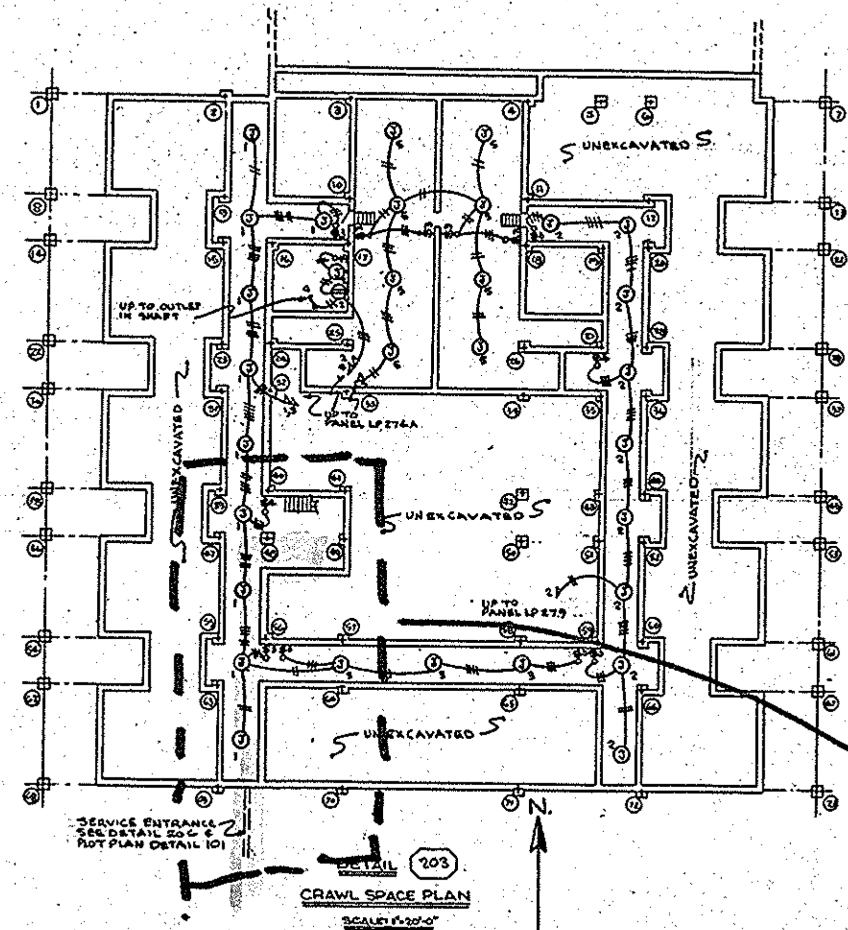
ELECTRICAL

SCIENCE AND MATHEMATICS BUILDING
BLDG. NO. 16
PLAN, RISER DIAGRAM, SCHEDULES, ETC.

KIDENEY, SMITH & FITZGERALD ARCHITECTS

61/4001

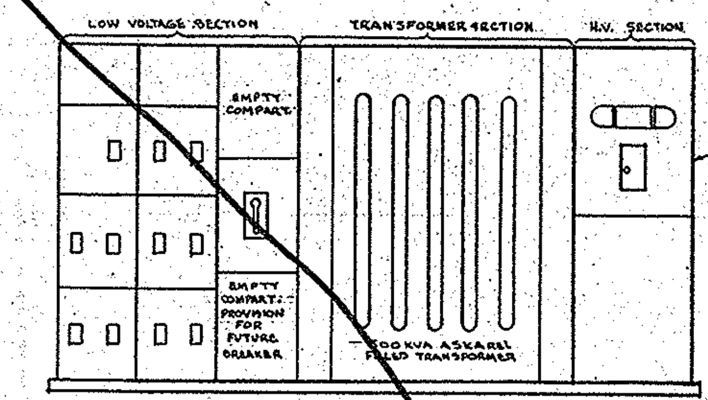
S1



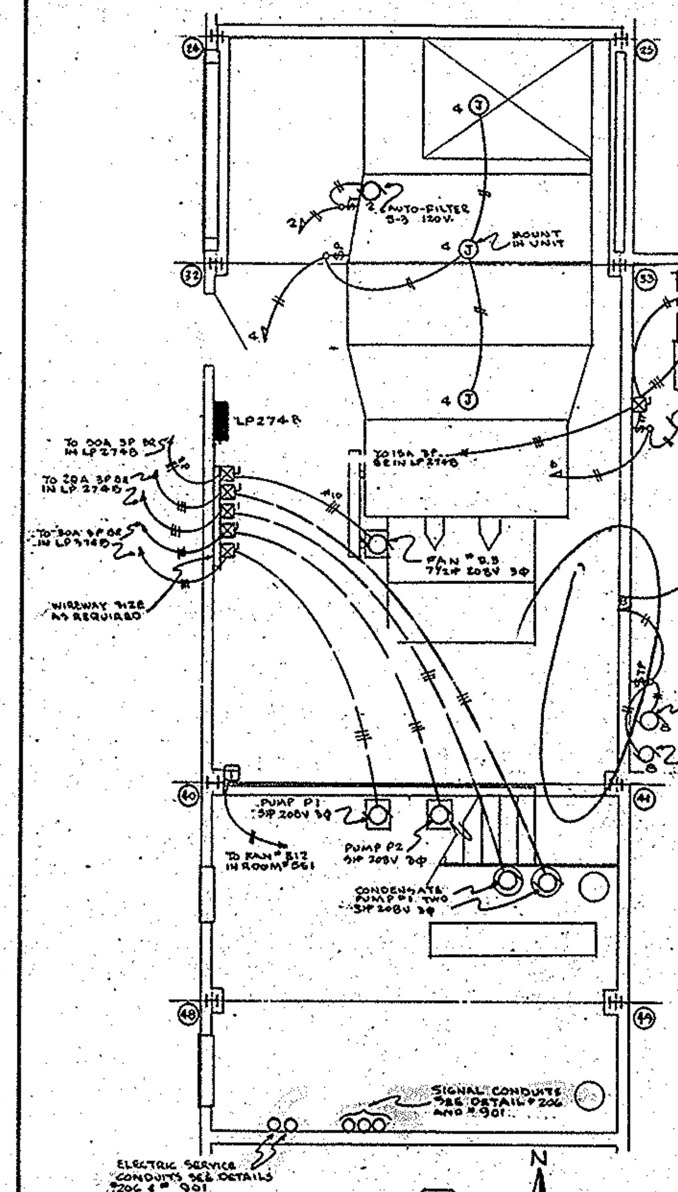
DETAIL 203
CRAWL SPACE PLAN
SCALE 1"=30'0"

UNIT SUBSTATION SCHEDULE				
BREAKER				LOAD (PANEL#)
NUMBER	FRAME	TRIP	POLES	
1	225	200	3	PP 477
2	225	200	3	PP 471
3	225	200	3	PP 377
4	225	200	3	PP 372
5	225	200	3	LP 274B
6	226	200	3	PP 274
7	225	200	3	PP 279
8	100	100	2	LP XEM
9	100	70	2	LP551
10	400	300	3	CHILLER
11	400	250	3	MCC I
12	100	100	3	ELEVATOR

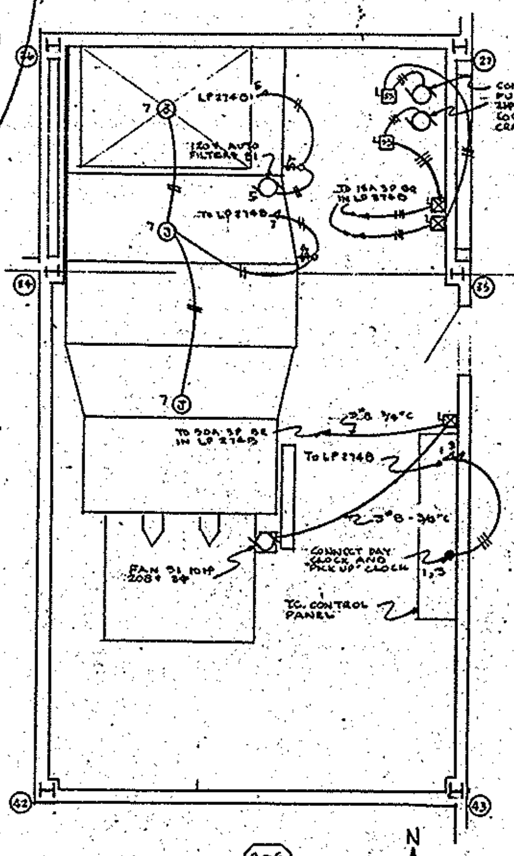
NOTE
1. FOR COMPLETE SCHEDULE OF UNIT SUBSTATION SEE SPECS



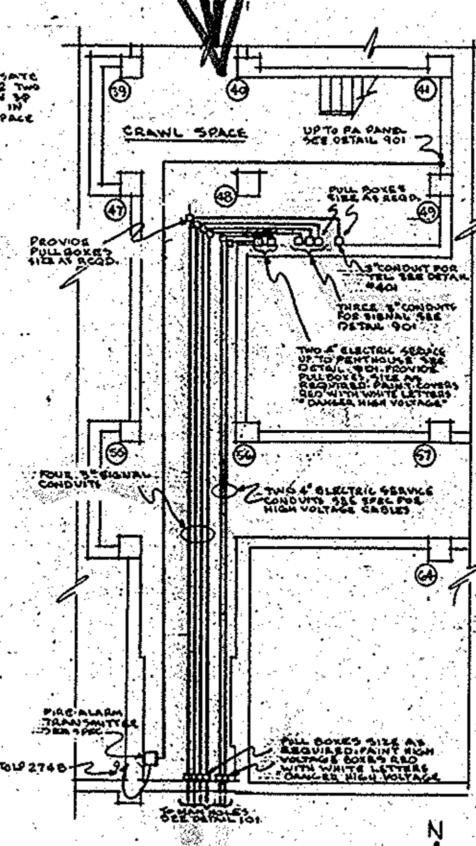
DETAIL 202
FRONT ELEVATION OF 500 KVA UNIT SUBSTATION
SCALE - NONE



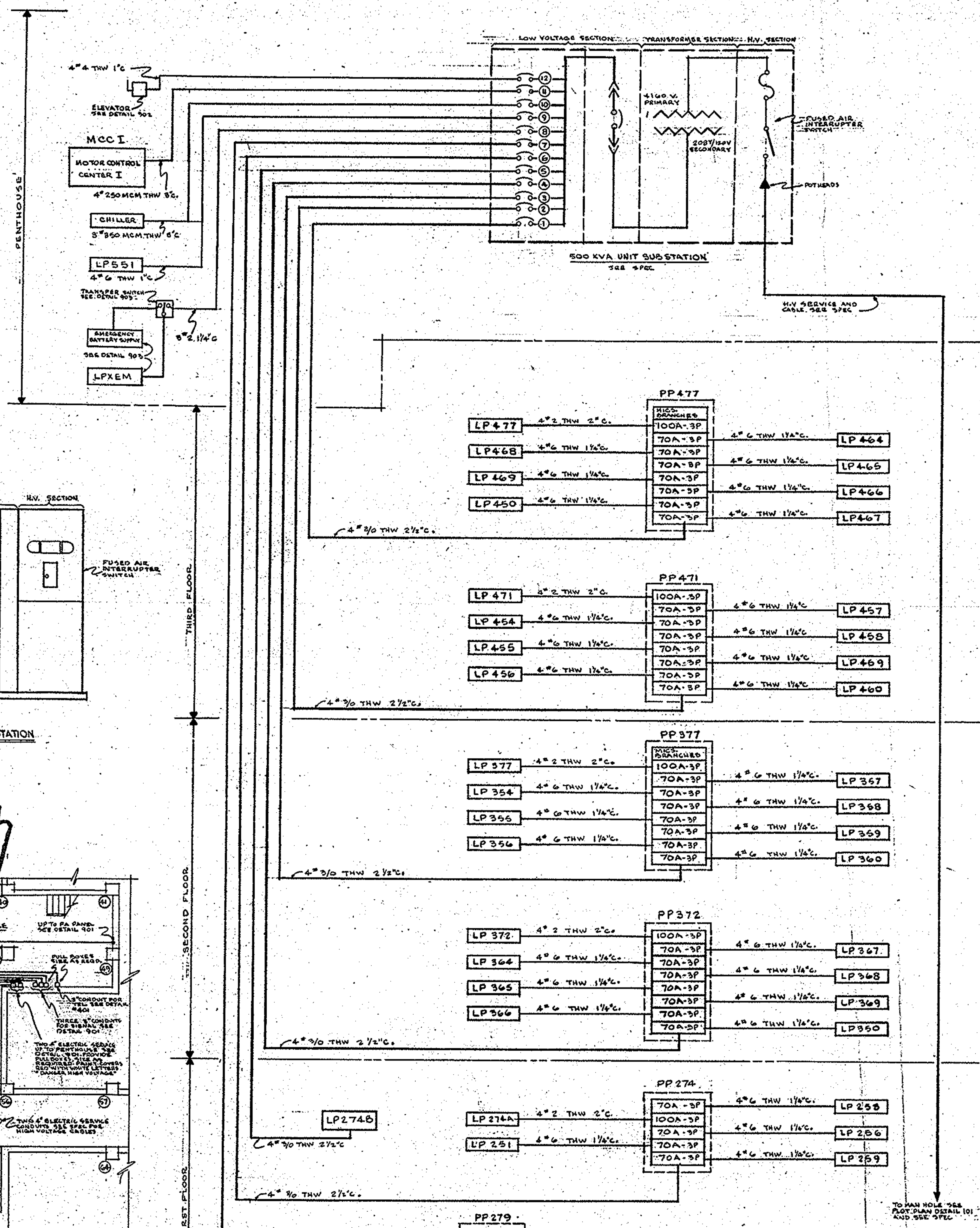
DETAIL 204
ADDITIONAL PLAN
MECHANICAL RM #274
SCALE 1/8"=1'0"



DETAIL 205
ADDITIONAL PLAN
MECHANICAL ROOM #279
SCALE 1/8"=1'-0"



DETAIL 206
ADDITIONAL PLAN OF CRAWL SPACE
SCALE 1/8"=1'-0"



NOTES
1. FOR COMPLETE PANEL SCHEDULES SEE SPECS
2. FOR EACH FLUSH MOUNTED LP. PANEL PROVIDE FIVE 3/4"C FROM PANEL TO CEILING SPACE ABOVE PANEL AND FIVE 3/4"C FROM PANEL TO CEILING SPACE OF FLOOR BELOW AND BUSH.
3. FOR EACH FLUSH MOUNTED PP PANEL PROVIDE TWO 1 1/4"C PLUS ONE 2"C FROM PANEL TO CEILING SPACE ABOVE PANEL AND TWO 1 1/4"C PLUS ONE 2"C FROM PANEL TO CEILING SPACE OF FLOOR BELOW AND CAP
4. PROVIDE A MINIMUM OF ONE CABLE SUPPORT PER VERTICAL FEEDER RUN
5. FOR FEEDERS PROVIDE PULL BOXES AS REQUIRED

DETAIL 201
DISTRIBUTION DIAGRAM
SCALE - NONE

DATE	REV.	ISSUED TO OR REMARKS

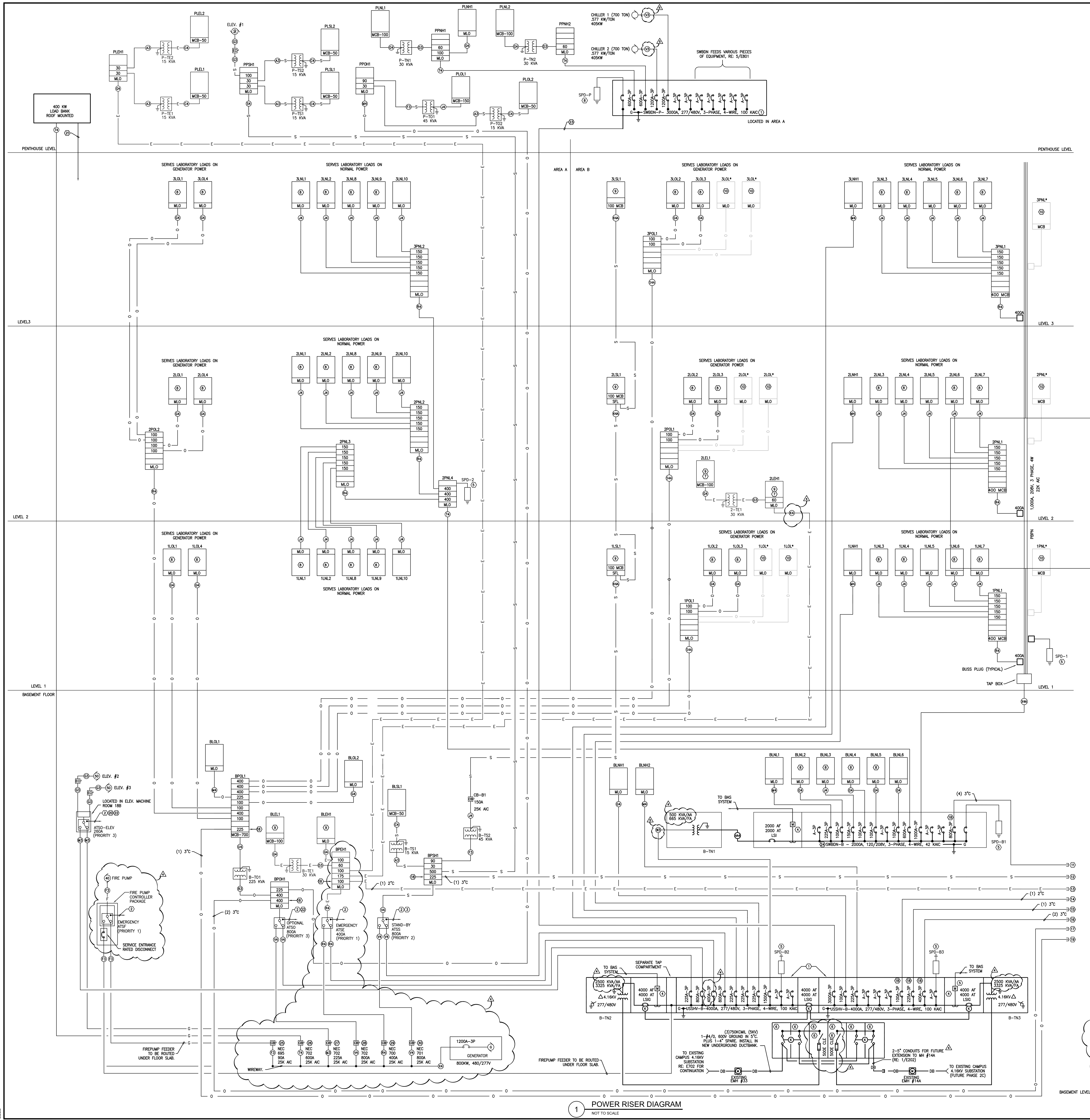
STATE UNIVERSITY CONSTRUCTION FUND NEW YORK
OFFICE OF EDUCATION PROJECT NO.
WALTER H. SHERRY
ROBERT J. LYSIAK

STATE UNIVERSITY CONSTRUCTION FUND
SCIENCE BUILDING NO. 2
STATE UNIVERSITY OF NEW YORK
COLLEGE AT BUFFALO BUFFALO, N.Y.

ARCHITECTS ENGINEERS	KIDENEY, SMITH, & FITZGERALD 374 DELAWARE AVE. BUFFALO, N.Y.
STRUCTURAL ENGINEERS	THOMAS H. MCKAIG BUFFALO, N.Y.
ELECTRICAL ENGINEERS	SHERRY & LYSIAK BUFFALO, N.Y.

DISTRIBUTION DIAGRAM AND CRAWL SPACE PLAN

PROJECT NO	SUCF 0308
BID ISSUE DATE	FEB. 8, 1966
DRAWING NO.	E-2
SCALE	AS NOTED
DRAWN	G.A.H.
CHECKED	G.A.H.



1 POWER RISER DIAGRAM
NOT TO SCALE

4 FEEDER SCHEDULE

FEEDER ID	OCPD	PHASE WIRES (AWG)	NEUTRAL WIRES (AWG)	EQUIP. GND (AWG)	MIN. CONDUIT SIZE
A3	30	(3)10	--	10	3/4
A4	30	(3)10	(1)10	10	3/4
A5	30	(3)10	(1)6	10	3/4
B3	40	(3)8	--	10	3/4
B4	40	(3)8	(1)8	10	3/4
B5	40	(3)8	(1)2	10	1
C3	50	(3)6	--	10	1
C4	50	(3)6	(1)6	10	1-1/4
C5	50	(3)6	(1)2	10	1-1/4
D3	60	(3)4	--	10	1
D4	60	(3)4	(1)4	10	1-1/4
D5	60	(3)4	(1)1/0	10	1-1/4
E3	70	(3)4	--	8	1
E4	70	(3)4	(1)4	8	1-1/4
E5	70	(3)4	(1)1/0	8	1-1/4
F3	90	(3)2	--	8	1-1/4
F4	90	(3)2	(1)2	8	1-1/4
F5	90	(3)2	(1)3/0	8	1-1/2
G3	100	(3)1/0	--	8	1-1/4
G4	100	(3)1/0	(1)1/0	8	1-1/2
G5	100	(3)1/0	(1)3/0	8	2
H3	125	(3)1/0	--	6	1-1/2
H4	125	(3)1/0	(1)1/0	6	1-1/2
H5	125	(3)1/0	(1)250KCMIL	6	2
J3	150	(3)1/0	--	6	1-1/2
J4	150	(3)1/0	(1)1/0	6	1-1/2
J5	150	(3)1/0	(2)1/0	6	2
K3	175	(3)2/0	--	6	1-1/2
K4	175	(3)2/0	(1)2/0	6	2
K5	175	(3)2/0	(2)2/0	6	2
L3	200	(3)3/0	--	6	2
L4	200	(3)3/0	(1)3/0	6	2
L5	200	(3)3/0	(2)3/0	6	2-1/2
M3	225	(3)4/0	--	4	2
M4	225	(3)4/0	(1)4/0	4	2-1/2
M5	225	(3)4/0	(2)4/0	4	2-1/2
N3	250	(3)250KCMIL	--	4	2
N4	250	(3)250KCMIL	(1)250KCMIL	4	2-1/2
N5	250	(3)250KCMIL	(2)250KCMIL	4	3

FEEDER ID	OCPD	PHASE WIRES (AWG)	NEUTRAL WIRES (AWG)	EQUIP. GND (AWG)	MIN. CONDUIT SIZE
P3	300	(3)350KCMIL	--	4	2-1/2
P4	300	(3)350KCMIL	(1)350KCMIL	4	3
P5	300	(3)350KCMIL	(2)350KCMIL	4	4
Q3	350	(3)500KCMIL	--	2	3
Q4	350	(3)500KCMIL	(1)500KCMIL	2	4
Q5	350	(3)500KCMIL	(2)500KCMIL	2	4
R3	400	(6)3/0	--	(2)2	(2)2
R4	400	(6)3/0	(2)3/0	(2)2	(2)2
R5	400	(6)3/0	(4)3/0	(2)2	(2)2-1/2
S3	500	(6)250KCMIL	--	(2)2	(2)2
S4	500	(6)250KCMIL	(2)250KCMIL	(2)2	(2)2-1/2
S5	500	(6)250KCMIL	(4)250KCMIL	(2)2	(2)3
T3	600	(6)350KCMIL	--	(2)1/0	(2)2-1/2
T4	600	(6)350KCMIL	(2)350KCMIL	(2)1/0	(2)3
T5	600	(6)350KCMIL	(4)350KCMIL	(2)1/0	(2)4
U3	700	(6)500KCMIL	--	(2)1/0	(2)3
U4	700	(6)500KCMIL	(2)500KCMIL	(2)1/0	(2)4
U5	700	(6)500KCMIL	(4)500KCMIL	(2)1/0	(2)4
V3	800	(9)300KCMIL	--	(3)1/0	(3)2-1/2
V4	800	(9)300KCMIL	(3)300KCMIL	(3)1/0	(3)3
V5	800	(9)300KCMIL	(6)300KCMIL	(3)1/0	(3)3
W3	1000	(9)400KCMIL	--	(3)2/0	(3)3
W4	1000	(9)400KCMIL	(3)400KCMIL	(3)2/0	(3)4
W5	1000	(9)400KCMIL	(6)400KCMIL	(3)2/0	(3)4
X3	1200	(12)350KCMIL	--	(4)3/0	(4)2-1/2
X4	1200	(12)350KCMIL	(4)350KCMIL	(4)3/0	(4)3
X5	1200	(12)350KCMIL	(8)350KCMIL	(4)3/0	(4)4
Y3	1500	(12)500KCMIL	--	(4)4/0	(4)3
Y4	1500	(12)500KCMIL	(4)500KCMIL	(4)4/0	(4)4
Y5	1500	(12)500KCMIL	(8)500KCMIL	(4)4/0	(4)4
Z3	1600	(15)400KCMIL	--	(5)4/0	(5)3
Z4	1600	(15)400KCMIL	(5)400KCMIL	(5)4/0	(5)3
Z5	1600	(15)400KCMIL	(10)400KCMIL	(5)4/0	(5)4
AA3	2000	(18)400KCMIL	--	(6)250KCMIL	(6)3
AA4	2000	(18)400KCMIL	(6)400KCMIL	(6)250KCMIL	(6)3
AA5	2000	(18)400KCMIL	(12)400KCMIL	(6)250KCMIL	(6)4
BB4	3000	(27)400KCMIL	(9)400KCMIL	(9)400KCMIL	(9)4
CC4	4000	(36)400KCMIL	(12)400KCMIL	(12)400KCMIL	(12)4

AN "A" SUBSCRIPT TO FEEDER ID (i.e. Z3A) TAKES INTO ACCOUNT VOLTAGE DROP.

CONDUIT METRIC CONVERION:

INCHES	MM
1/2	16
3/4	21
1	27
1-1/4	35
1-1/2	41
2	53
2-1/2	63
3	78
4	103
5	129
6	155

CONDUCTOR METRIC CONVERSION:

AWG	SQMM
10	5.26
8	8.38
6	13.3
4	21
2	34
1	42
1/0	54
2/0	67
3/0	85
4/0	107
250	127
300	152
350	178
400	203
500	254

2 GENERAL NOTES

A. THE SECONDARY ELECTRICAL DISTRIBUTION SYSTEM WILL BE SEPARATED INTO THE FOLLOWING BRANCHES AS REQUIRED BY CODES:

B. NORMAL ('N' DESIGNATION): THIS BRANCH PROVIDES NORMAL SOURCE POWER TO THE BULK OF THE FACILITY LOAD SUCH AS GENERAL LIGHTING AND RECEPTACLE LOADS, MISCELLANEOUS EQUIPMENT LOADS, MECHANICAL EQUIPMENT LOADS, ETC., WHICH ARE NOT ESSENTIAL TO BUILDING OR USER FUNCTIONS; THEREFORE, THEY ARE NOT CONNECTED TO AN ALTERNATE SOURCE OF POWER (GENERATOR).

C. GENERATOR ('G' DESIGNATION): THIS BRANCH PROVIDES ALTERNATE SOURCE POWER FROM THE GENERATOR SET MAIN CIRCUIT BREAKER AND ASSOCIATED DISTRIBUTION TO THE LINE SIDE OF EACH AUTOMATIC TRANSFER SWITCH.

D. EMERGENCY ('E' DESIGNATION) (NEC ARTICLE 700): THIS BRANCH PROVIDES CONTINUOUS (NORMAL OR ALTERNATE) SOURCE POWER FOR THE FOLLOWING EQUIPMENT ESSENTIAL FOR SAFETY TO HUMAN LIFE.

1. IILLUMINATED EXIT SIGNS. (SEPARATE CIRCUITS FROM EGRESS LIGHTING PER NFPA 101.)
2. INTERIOR BUILDING MEANS OF EGRESS LIGHTING.
3. EXTERIOR BUILDING MEANS OF EGRESS LIGHTING IMMEDIATELY ADJACENT TO EXIT DISCHARGE DOORWAYS.
4. FIRE DETECTION AND ALARM SYSTEMS.
5. PUBLIC SAFETY COMMUNICATION SYSTEMS (FOR ISSUING EMERGENCY INSTRUCTIONS).
6. ELEVATOR MACHINE ROOM LIGHTING AND RECEPTACLES. ELEVATOR CAB LIGHTING, CONTROL, SIGNAL, AND COMMUNICATION SYSTEMS.
7. GENERATOR SET LOCATION. TASK ILLUMINATION, BATTERY CHARGER FOR EMERGENCY BATTERY-POWERED LIGHTING UNIT(S) AND SELECTED RECEPTACLES.
8. FIRE COMMAND CENTER LOCATION RECEPTACLES AND TASK ILLUMINATION.

E. FIRE PUMP ('F' DESIGNATION) (NEC ARTICLE 695): THIS BRANCH PROVIDES CONTINUOUS (NORMAL OR ALTERNATE) SOURCE POWER DIRECTLY CONNECTED TO A FIRE PUMP THROUGH THE INTEGRAL LISTED COMBINATION FIRE PUMP CONTROLLER AND POWER TRANSFER SWITCH.

F. LEGALLY REQUIRED STANDBY BRANCH ('S' DESIGNATION) (ARTICLE 701): THIS BRANCH PROVIDES CONTINUOUS (NORMAL OR ALTERNATE) SOURCE POWER FOR THE FOLLOWING EQUIPMENT THAT COULD, WHEN STOPPED DURING ANY INTERRUPTION OF THE NORMAL ELECTRICAL SUPPLY, CREATE HAZARDS OR HAMPER RESCUE OR FIRE-FIGHTING OPERATIONS.

1. LABORATORY FUME HOOD VENTILATION (SUPPLY & EXHAUST).
2. SMOKE REMOVAL SYSTEMS (ATRIUM).
3. SERVICE ELEVATOR #1.
4. FIRE PUMP LOCATION INCLUDING JOCKEY PUMP.
5. CONTROL AND ALARM SYSTEMS OF MAJOR APPARATUS (I.E. BAS PANELS).
6. ELECTRIC, DATA AND MECHANICAL ROOM LIGHTING.

G. OPTIONAL STANDBY BRANCH ('O' DESIGNATION) (NEC ARTICLE 702): THIS BRANCH PROVIDES CONTINUOUS (NORMAL OR ALTERNATE) SOURCE POWER FOR SYSTEMS INTENDED TO PROTECT PUBLIC OR PRIVATE FACILITIES OR PROPERTY WHERE LIFE SAFETY DOES NOT DEPEND ON THE PERFORMANCE OF THE SYSTEM.

1. SELECTED LABORATORY EQUIPMENT TO MAINTAIN EXPERIMENTS, COOLERS, ETC.
2. VIVARIUM (ANIMAL HOLDING).
3. SECURITY SYSTEM..
4. DATA ROOM EQUIPMENT AND DATA PROCESSING SYSTEMS.
5. ELECTRIC AND MECHANICAL ROOM RECEPTACLES (SELECTED).
6. MECHANICAL EQUIPMENT INCLUDING: BOILERS; CONDENSATE RETURN PUMPS; HOT WATER HEATING AND GLYCOL CIRCULATION PUMPS; HEAT TRACE CABLE FOR EXTERIOR PIPING AND ROOF DRAIN LINES.
7. PLUMBING EQUIPMENT INCLUDING: DOMESTIC WATER BOOSTER PUMPS; SEWAGE EJECTORS AND SUMP PUMPS.
8. AUTOMATICALLY OPERATED DOORS AT HANDICAPPED BUILDING ENTRANCE.
9. PASSENGER ELEVATOR #2, #3.

H. THE PHASE ARRANGEMENT FOR THE 5 KV SWITCHES MUST BE MAINTAINED FOR EACH FEEDER. FOR EXAMPLE, THE PHASES MUST BE ABC FROM LEFT TO RIGHT (NOT JUST FOR ROTATION); IN CASE THE SWITCHES ARE EVER PARALLELED. 5

3 DRAWING NOTES

1. ALL BREAKERS INSTALLED IN 480V SWITCHGEAR SHALL BE LSIG TYPE.
2. EXTEND ATS STATUS/CONTROL CONDUCTORS IN CONDUIT TO EMERGENCY GENERATOR.
3. EXTEND (2) #12 AWG CONDUCTORS IN 3/4" C FROM ATS TO ELEVATOR #1.
4. INSTALL OWNER METERING & ASSOCIATED CT/PT INSTRUMENT TRANSFORMERS, REFER TO SPECIFICATIONS.
5. PROVIDE OVERCURRENT DEVICE & CIRCUIT CONDUCTORS AS RECOMMENDED BY SPD MANUFACTURER.
6. 600A INTERRUPTER SWITCH (5KV).
7. PANEL SERVES LEVEL 1, 2 AND 3.
8. STUB EMPTY CONDUITS FROM LAB PANELS INTO ACCESSIBLE CEILING SPACE OF NEAREST LAB SPACE. REFER TO SECTION 260470 – PANELBOARDS FOR ADDITIONAL REQUIREMENTS.
9. PANEL SERVES FUTURE PHASE 2C BUILDING LOADS.
10. FUTURE ELECTRICAL DISTRIBUTION FOR SERVING PHASE 2C.
11. EMPTY CONDUIT FOR FUTURE PHASE 2B NORMAL BRANCH (208V) EXTENSION.
12. EMPTY CONDUIT FOR FUTURE PHASE 2B STANDBY BRANCH EXTENSION.
13. EMPTY CONDUIT FOR FUTURE PHASE 2B EMERGENCY BRANCH EXTENSION.
14. EMPTY CONDUIT FOR FUTURE PHASE 2B ELEVATOR #4.
15. EMPTY CONDUIT FOR FUTURE PHASE 2B NORMAL BRANCH (480V) EXTENSION.
16. EMPTY CONDUIT FOR FUTURE PHASE 2B NORMAL BRANCH (480V) HVAC EXTENSION.
17. EMPTY CONDUIT FOR FUTURE PHASE 2B OPTIONAL BRANCH (480V) EXTENSION.
18. 3-POLE CIRCUIT BREAKER SPACE FOR FUTURE USE. AMPERAGE SIZE AS INDICATED.
19. EMPTY CONDUIT FOR FUTURE PHASE 2B OPTIONAL BRANCH (208V) EXTENSION.
20. EXTEND ATS STATUS/CONTROL CONDUCTORS IN CONDUIT TO EACH ELEVATOR #2, #3 CONTROLLER.
21. EXTEND 1"C FROM LOAD BANK TO EMERGENCY GENERATOR. QUANTITY OF CONTROL WIRES AS REQUIRED BY MANUFACTURER.
22. EXTEND ATS LOAD SHED CONTROL CONDUCTORS IN CONDUIT TO EMERGENCY GENERATOR. 5
23. USE ALUMINUM CONDUCTOR 90 DEGREE C. PHASE WIRES: (30) 500 KCMIL, NEUTRAL WIRES (10) 500 KCMIL, EQUIPMENT GROUND (10) 600KCMIL IN (10) 4" CONDUITS. PROVIDE ALUMINUM WIRE OXIDE INHIBITOR AND TORQUE/TIGHTENING MATERIALS AND METHODS.
24. ALL BREAKERS INSTALLED IN 208V SWITCHBOARD SHALL BE LSI TYPE.
25. CB SERVES NEC 695 "ATSF" AND SHALL BE LSIA TYPE.
26. CB SERVES NEC 702 "LOAD BANK" AND SHALL BE LSIA TYPE.
27. CB SERVES NEC 702 "ATSO-ELEV" AND SHALL BE LSIA TYPE. 4
28. CB SERVES NEC 702 "ATSO" AND SHALL BE LSIA TYPE.
29. CB SERVES NEC 700 "ATSE" AND SHALL BE LSIA TYPE.
30. CB SERVES NEC 701 "ATSS" AND SHALL BE LSIA TYPE.

RENOVATE SCIENCE BUILDING BLDG. NO. 15

SUCF#03375

Buffalo State
State University of New York

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2170 Whitehaven Road, Grand Island, New York 14072
T: 716.773.6800 F: 716.773.5909

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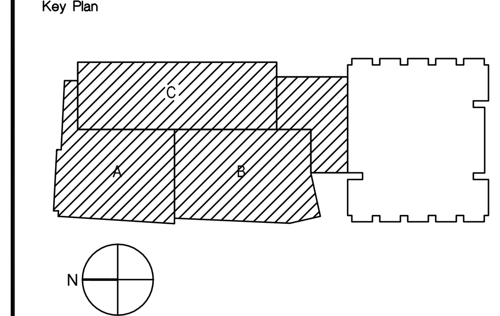
Key Plan



No.	Revisions	Date
5	ADDENDA	8/4/09
4	ADDENDA	7/28/09

Drawing Title:
POWER RISER DIAGRAM

Issue Date: JUNE 22, 2009
Drawn by: JNB Checked by: PMc
Project No.: 02671.00 Scale: NONE
Drawing No.:

E701

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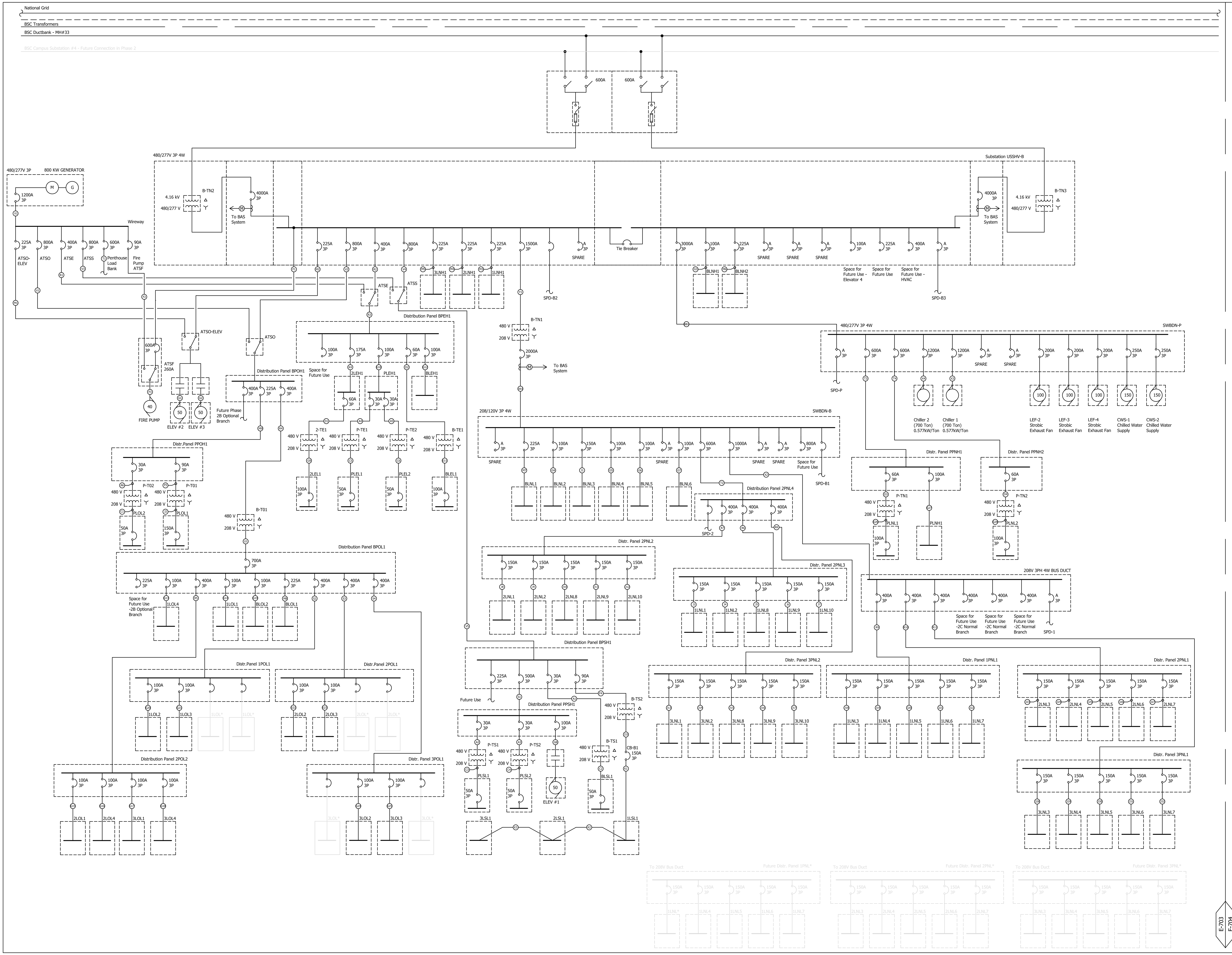


Buffalo State College
Science Building
Phase 1 Addition

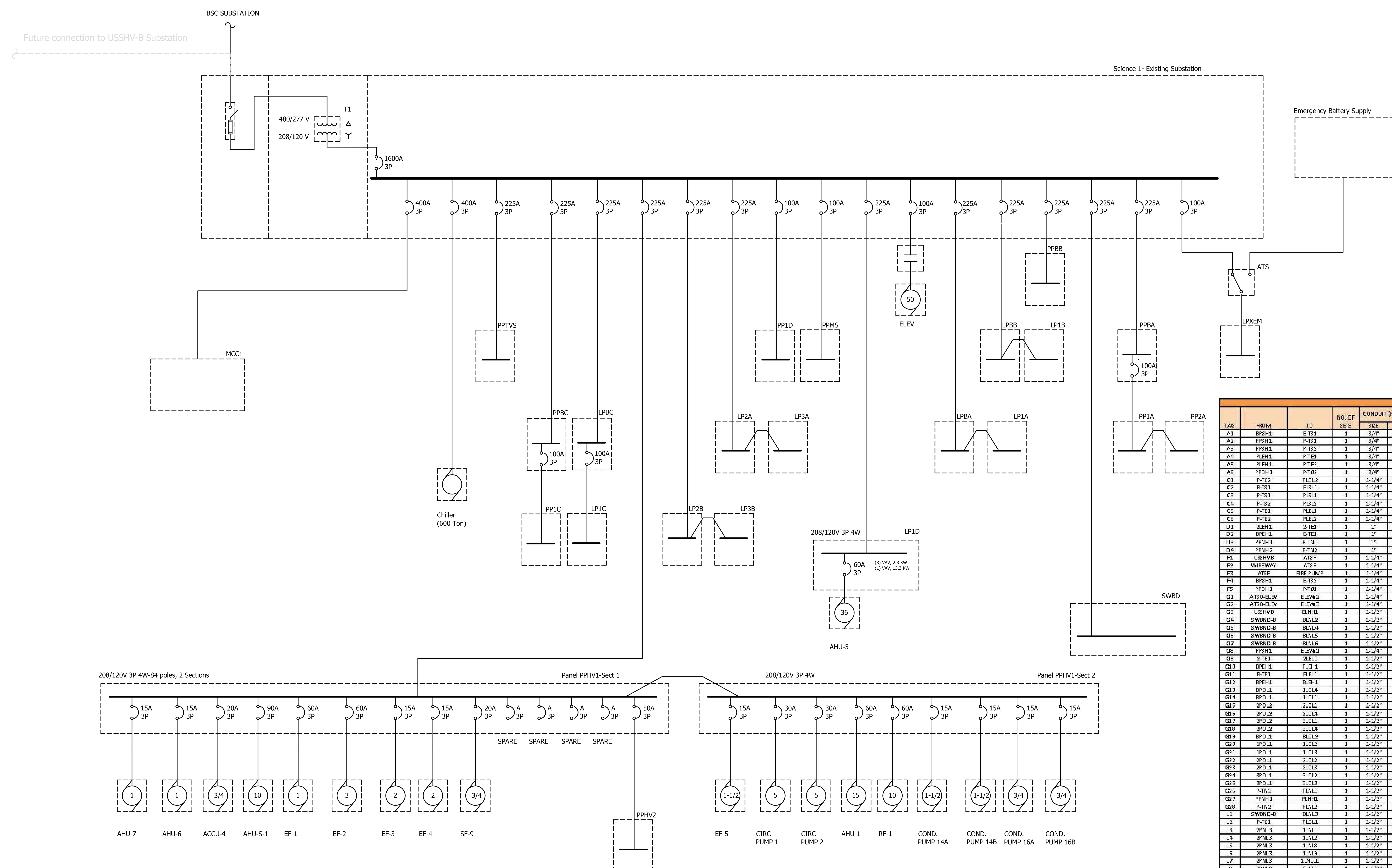
1300 Elmwood Ave
Buffalo, NY 14222

ISSUED:	November 6, 2009
CAD DWG FILE:	Single Line
DRAWN BY:	Marie Ostrowski
AE 481 - Senior Thesis	

SHEET TITLE

SINGLE LINE DIAGRAM

E-703



NOTES:

- Service entrance to be removed in Phase 2B.
- Substation is to be re-routed in Phase 2B. New panels are incorporated into this drawing.

E-703
E-704

FEEDER SCHEDULE

TAG	FROM	TO	NO. OF SETS	CONDUIT (PER SET) SIZE	CONDUIT (PER SET) TYPE	PHASE CONDUCTORS NO.	PHASE CONDUCTORS SIZE	PHASE CONDUCTORS TYPE	NEUTRAL CONDUCTORS NO.	NEUTRAL CONDUCTORS SIZE	NEUTRAL CONDUCTORS TYPE	GROUND CONDUCTORS NO.	GROUND CONDUCTORS SIZE	GROUND CONDUCTORS TYPE	SIZE OF OVERCURRENT PROTECTION	FRAME OR SWITCH SIZE	REMARKS
A1	BPSH1	B-TS1	1	3/4"	EMT	3	10 AWG	CUTHWN	-	-	-	1	10 AWG	CUTHWN	30	30/3P	
A2	PPSH1	P-TS1	1	3/4"	EMT	3	10 AWG	CUTHWN	-	-	-	1	10 AWG	CUTHWN	30	30/3P	
A3	PPSH1	P-TS2	1	3/4"	EMT	3	10 AWG	CUTHWN	-	-	-	1	10 AWG	CUTHWN	30	30/3P	
A4	PLEH1	P-TE1	1	3/4"	EMT	3	10 AWG	CUTHWN	-	-	-	1	10 AWG	CUTHWN	30	30/3P	
A5	PLEH1	P-TE2	1	3/4"	EMT	3	10 AWG	CUTHWN	-	-	-	1	10 AWG	CUTHWN	30	30/3P	
A6	PPOH1	P-T02	1	3/4"	EMT	3	10 AWG	CUTHWN	-	-	-	1	10 AWG	CUTHWN	30	30/3P	
C1	P-T02	PLOL2	1	1-1/4"	EMT	3	6 AWG	CUTHWN	1	6 AWG	CUTHWN	1	10 AWG	CUTHWN	50	50/3P	
C2	B-TS1	BLSL1	1	1-1/4"	EMT	3	6 AWG	CUTHWN	1	6 AWG	CUTHWN	1	10 AWG	CUTHWN	50	50/3P	
C3	P-TS1	PLSL1	1	1-1/4"	EMT	3	6 AWG	CUTHWN	1	6 AWG	CUTHWN	1	10 AWG	CUTHWN	50	50/3P	
C4	P-TS2	PLSL2	1	1-1/4"	EMT	3	6 AWG	CUTHWN	1	6 AWG	CUTHWN	1	10 AWG	CUTHWN	50	50/3P	
C5	P-TE1	PLEL1	1	1-1/4"	EMT	3	6 AWG	CUTHWN	1	6 AWG	CUTHWN	1	10 AWG	CUTHWN	50	50/3P	
C6	P-TE2	PLEL2	1	1-1/4"	EMT	3	6 AWG	CUTHWN	1	6 AWG	CUTHWN	1	10 AWG	CUTHWN	50	50/3P	
D1	2LEH1	2-TE1	1	1"	EMT	3	4 AWG	CUTHWN	-	-	-	1	10 AWG	CUTHWN	60	60/3P	
D2	BPEH1	B-TE1	1	1"	EMT	3	4 AWG	CUTHWN	-	-	-	1	10 AWG	CUTHWN	60	60/3P	
D3	PPNH1	P-TN1	1	1"	EMT	3	4 AWG	CUTHWN	-	-	-	1	10 AWG	CUTHWN	60	60/3P	
D4	PPNH2	P-TN2	1	1"	EMT	3	4 AWG	CUTHWN	-	-	-	1	10 AWG	CUTHWN	60	60/3P	
F1	USSHVB	ATSF	1	1-1/4"	EMT	3	2 AWG	CUTHWN	-	-	-	1	8 AWG	CUTHWN	90	90/3P	
F2	WIREWAY	ATSF	1	1-1/4"	EMT	3	2 AWG	CUTHWN	-	-	-	1	8 AWG	CUTHWN	90	90/3P	
F3	ATSF	FIRE PUMP	1	1-1/4"	EMT	3	2 AWG	CUTHWN	-	-	-	1	8 AWG	CUTHWN	90	90/3P	
F4	BPSH1	B-TS2	1	1-1/4"	EMT	3	2 AWG	CUTHWN	-	-	-	1	8 AWG	CUTHWN	90	90/3P	
F5	PPOH1	P-T01	1	1-1/4"	EMT	3	2 AWG	CUTHWN	-	-	-	1	8 AWG	CUTHWN	90	90/3P	
G1	ATSO-ELEV	ELEV#2	1	1-1/4"	EMT	3	1/0 AWG	CUTHWN	-	-	-	1	8 AWG	CUTHWN	100	100/3P	
G2	ATSO-ELEV	ELEV#3	1	1-1/4"	EMT	3	1/0 AWG	CUTHWN	-	-	-	1	8 AWG	CUTHWN	100	100/3P	
G3	USSHVB	BLNH1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G4	SWBND-B	BLNL2	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G5	SWBND-B	BLNL4	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G6	SWBND-B	BLNL5	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G7	SWBND-B	BLNL6	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G8	PPSH1	ELEV#1	1	1-1/4"	EMT	3	1/0 AWG	CUTHWN	-	-	-	1	8 AWG	CUTHWN	100	100/3P	
G9	2-TE1	2LEL1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G10	BPEH1	PLEH1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G11	B-TE1	BLEL1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G12	BPEH1	BLEH1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G13	BPOL1	1LOL4	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G14	BPOL1	1LOL1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G15	2POL2	2LOL1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G16	2POL2	2LOL4	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G17	2POL2	3LOL1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G18	2POL2	3LOL4	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G19	BPOL1	BLOL2	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G20	1POL1	1LOL2	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G21	1POL1	1LOL3	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G22	2POL1	2LOL2	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G23	2POL1	2LOL3	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G24	3POL1	3LOL2	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G25	3POL1	3LOL3	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G26	P-TN1	PLNL1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G27	PPNH1	PLNH1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
G28	P-TN2	PLNL2	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	8 AWG	CUTHWN	100	100/3P	
J1	SWBND-B	BLNL3	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J2	P-T01	PLOL1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J3	2PNL3	1LNL1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J4	2PNL3	1LNL2	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J5	2PNL3	1LNL8	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J6	2PNL3	1LNL9	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J7	2PNL3	1LNL10	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J8	2PNL2	2LNL1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J9	2PNL2	2LNL2	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J10	2PNL2	2LNL8	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J11	2PNL2	2LNL9	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J12	2PNL2	2LNL10	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J13	3PNL2	3LNL1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J14	3PNL2	3LNL2	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J15	3PNL2	3LNL8	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J16	3PNL2	3LNL9	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J17	3PNL2	3LNL10	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J18	1PNL1	1LNL3	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J19	1PNL1	1LNL4	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J20	1PNL1	1LNL5	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J21	1PNL1	1LNL6	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J22	1PNL1	1LNL7	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J23	2PNL1	2LNL3	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J24	2PNL1	2LNL4	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J25	2PNL1	2LNL5	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J26	2PNL1	2LNL6	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J27	2PNL1	2LNL7	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J28	3PNL1	3LNL3	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J29	3PNL1	3LNL4	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J30	3PNL1	3LNL5	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J31	3PNL1	3LNL6	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J32	3PNL1	3LNL7	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
J33	B-TS2	CB-B1	1	1-1/2"	EMT	3	1/0 AWG	CUTHWN	1	1/0 AWG	CUTHWN	1	6 AWG	CUTHWN	150	150/3P	
K1	CB-B1	1LSL1	1	2"	EMT	3	2/0 AWG	CUTHWN	1	2/0 AWG	CUTHWN	1	6 AWG	CUTHWN	175	175/3P	
K2	1LSL1	2LSL1	1	2"	EMT	3	2/0 AWG	CUTHWN	1	2/0 AWG	CUTHWN	1	6 AWG	CUTHWN	175	175/3P	
K3	2LSL1	3LSL1	1	2"	EMT	3	2/0 AWG	CUTHWN	1	2/0 AWG	CUTHWN	1	6 AWG	CUTHWN	175	175/3P	
K4	BPEH1	2LEH1	1	2"	EMT	3	2/0 AWG	CUTHWN	1	2/0 AWG	CUTHWN	1	6 AWG	CUTHWN	175	175/3P	
M1	WIREWAY	ATSO-ELEV	1	2"	EMT	3	4/0 AWG	CUTHWN	-	-	-	1	4 AWG	CUTHWN	225	225/3P	
M2	USSHVB	ATSO-ELEV	1	2"	EMT	3	4/0 AWG	CUTHWN	-	-	-	1	4 AWG	CUTHWN	225	225/3P	
M3	USSHVB	1LNH1	1	2-1/2"	EMT	3	4/0 AWG	CUTHWN	1	4/0 AWG	CUTHWN	1	4 AWG	CUTHWN	225	225/3P	
M4	USSHVB	2LNH1	1	2-1/2"	EMT	3	4/0 AWG	CUTHWN	1	4/0 AWG	CUTHWN	1	4 AWG	CUTHWN	225	225/3P	
M5	USSHVB	3LNH1	1	2-1/2"	EMT	3	4/0 AWG	CUTHWN	1	4/0 AWG	CUTHWN	1	4 AWG	CUTHWN	225	225/3P	
M6	USSHVB	BLNH2	1	2-1/2"	EMT	3	4/0 AWG	CUTHWN	1	4/0 AWG	CUTHWN	1	4 AWG	CUTHWN	225	225/3P	
M7	SWBDN-B	BLNL1	1	2-1/2"	EMT	3	4/0 AWG	CUTHWN	1	4/0 AWG	CUTHWN	1	4 AWG	CUTHWN	225	225/3P	
M8	BPOL1	BLOL1	1	2-1/2"	EMT	3	4/0 AWG	CUTHWN	1	4/0 AWG	CUTHWN	1	4 AWG	CUTHWN	225	225/3P	
M9	BPOH1	PPOH1	1	2-1/2"	EMT	3	4/0 AWG	CUTHWN	1	4/0 AWG	CUTHWN	1	4 AWG	CUTHWN	225	225/3P	
R1	WIREWAY	ATSE	2	2"	EMT	3	3/0 AWG	CUTHWN	1	3/0 AWG	CUTHWN	1	2 AWG	CUTHWN	400	400/3P	
R2	USSHV-B	ATSE	2	2"	EMT	3	3/0 AWG	CUTHWN	1	3/0 AWG	CUTHWN	1	2 AWG	CUTHWN	400	400/3P	
R3	ATSE	BPEHI	2	2"	EMT	3	3/0 AWG	CUTHWN	1	3/0 AWG	CUTHWN	1	2 AWG	CUTHWN	400	400/3P	
R4	BPOH1	B-TO1	2	2"	EMT	3	3/0 AWG	CUTHWN	-	-	-	1	2 AWG	CUTHWN	400	400/3P	
R5	BPOL1	2POL2	2	2"	EMT	3	3/0 AWG	CUTHWN	1	3/0 AWG	CUTHWN	1	2 AWG	CUTHWN	400	400/3P	
R6	2PNL4	2PNL3	2	2"	EMT	3	3/0 AWG	CUTHWN	1	3/0 AWG	CUTHWN	1	2 AWG	CUTHWN	400	400/3P	
R7	2PNL4	2PNL2	2	2"	EMT	3	3/0 AWG	CUTHWN	1	3/0 AWG	CUTHWN	1	2 AWG	CUTHWN	400	400/3P	
R8	2PNL4	3PNL2	2	2"	EMT	3	3/0 AWG	CUTHWN	1	3/0 AWG	CUTHWN	1	2 AWG	CUTHWN	400	400/3P	
R9	PBPN-BUS DUCT	1PNL1	2	2"	EMT	3	3/0 AWG	CUTHWN	1	3/0 AWG	CUTHWN	1	2 AWG	CUTHWN	400	400/3P	
R10	PBPN-BUS DUCT	2PNL1	2	2"	EMT	3	3/0 AWG	CUTHWN	1	3/0 AWG	CUTHWN	1	2 AWG	CUTHWN	400	400/3P	
R11	PBPN-BUS DUCT	3PNL1	2	2"	EMT	3	3/0 AWG	CUTHWN	1	3/0 AWG	CUTHWN	1	2 AWG	CUTHWN	400	400/3P	
S1	BPSH1	PPSH1	2	2-1/2"	EMT	3	250KCMIL	CUTHWN	1	250KCMIL	CUTHWN	1	2 AWG	CUTHWN	500	500/3P	
S2	BPOL1	1POL1	2	2-1/2"	EMT	3	250KCMIL	CUTHWN	1	250KCMIL	CUTHWN	1	2 AWG	CUTHWN	500	500/3P	TAKES VOLTAGE DROP INTO ACCOUNT
S3	BPOL1	2POL1	2	2-1/2"	EMT	3	250KCMIL	CUTHWN	1	250KCMIL	CUTHWN	1	2 AWG	CUTHWN	500	500/3P	TAKES VOLTAGE DROP INTO ACCOUNT
S4	BPOL1	3POL1	2	2-1/2"	EMT	3	250KCMIL	CUTHWN	1	250KCMIL	CUTHWN	1	2 AWG	CUTHWN	500	500/3P	TAKES VOLTAGE DROP INTO ACCOUNT
T1	WIREWAY	LOADBANK	2	3"	EMT	3	350KCMIL	CUTHWN	1	350KCMIL	CUTHWN	1	1/0 AWG	CUTHWN	600	600/3P	
T2	SWBND-B	2PNL4	2	3"	EMT	3	350KCMIL	CUTHWN	1	350KCMIL	CUTHWN	1	1/0 AWG	CUTHWN	600	600/3P	
T3	SWBDN-P	PPNH1	2	3"	EMT	3	350KCMIL	CUTHWN	1	350KCMIL	CUTHWN	1	1/0 AWG	CUTHWN	600	600/3P	
T4	SWBDN-P	PPNH2	2	3"	EMT	3	350KCMIL	CUTHWN	1	350KCMIL	CUTHWN	1	1/0 AWG	CUTHWN	600	600/3P	
U1	B-TO1	BPOL1	2	4"	EMT	3	500KCMIL	CUTHWN	1	500KCMIL	CUTHWN	1	1/0 AWG	CUTHWN	700	700/3P	
V1	WIREWAY	ATSO	3	3"	EMT	3	300KCMIL	CUTHWN	1	300KCMIL	CUTHWN	1	1/0 AWG	CUTHWN	800	800/3P	
V2	USSHV-B	ATSO	3	3"	EMT	3	300KCMIL	CUTHWN	1	300KCMIL	CUTHWN	1	1/0 AWG	CUTHWN	800	800/3P	
V3	WIREWAY	ATSS	3	3"	EMT	3	300KCMIL	CUTHWN	1	300KCMIL	CUTHWN	1	1/0 AWG	CUTHWN	800	800/3P	
V4	USSHV-B	ATSS	3	3"	EMT	3	300KCMIL	CUTHWN	1	300KCMIL	CUTHWN	1	1/0 AWG	CUTHWN	800	800/3P	
V5	ATSS	BPSH1	3	3"	EMT	3	300KCMIL	CUTHWN	1	300KCMIL	CUTHWN	1	1/0 AWG	CUTHWN	800	800/3P	
X1	GEN	WIREWAY	4	3"	EMT	3	350KCMIL	CUTHWN	1	350KCMIL	CUTHWN	1	3/0 AWG	CUTHWN	1200	1200/3P	
X2	SWBND-B	PBPN-BUS DUCT	4	3"	EMT	3	350KCMIL	CUTHWN	1	350KCMIL	CUTHWN	1	3/0 AWG	CUTHWN	1200	1200/3P	TAKES VOLTAGE DROP INTO ACCOUNT
X3	SWBND-P	CHILLER1	4	2-1/2"	EMT	3	350KCMIL	CUTHWN	-	-	-	1	3/0 AWG	CUTHWN	1200	1200/3P	
X4	SWBND-P	CHILLER2	4	2-1/2"	EMT	3	350KCMIL	CUTHWN	-	-	-	1	3/0 AWG	CUTHWN	1200	1200/3P	
Y1	USSHVB	B-TN1	4	3"	EMT	3	500KCMIL	CUTHWN	-	-	-	1	4/0 AWG	CUTHWN	1500	1500/3P	
AA1	B-TN1	SWBDN-B	6	3"	EMT	3	400KCMIL	CUTHWN	1	400KCMIL	CUTHWN	1	250KCMIL	CUTHWN	2000	2000/3P	
BB1	USSHVB	SWBDN-P	9	4"	EMT	3	500KCMIL	ALTHHN	1	500KCMIL	ALTHHN	1	600KCMIL	ALTHHN	3000	3000/3P	

Buffalo State College
Science Building
Phase 1 Addition

1300 Elmwood Ave
Buffalo, NY 14222

ISSUED: November 6, 2009
CAD DWG FILE: Single Line
DRAWN BY: Marie Ostrowski
AE 481 - Senior Thesis

SHEET TITLE

SINGLE LINE DIAGRAM
EXISTING-SCIENCE 1

E-704