JOSHUA KREUTZBERGER
LIGHTING/ELECTRICAL
TECH. REPORT #2 REVISION
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PROF. DANNERTH

Dorrance H. Hamilton Building
Philadelphia, PA

EXECUTIVE SUMMARY

This report is a summary of the existing electrical systems, such as the power distribution systems and communications systems. Each section contains a narrative describing the general and special characteristics of every part of the electrical system analyzed. A summary of the total building electrical loads and a check of the existing main distribution equipment is included in the section titles NEC Design Loads. The appendix includes a single line and riser diagram, which represent the power distribution system of the building. The Dorrance H. Hamilton Building is a part of the Thomas Jefferson University (TJU) located in Philadelphia, PA.

Analysis starts at the service entrance and finishes at the end utilization based on the given information in the construction documents. The National Electric Code was used extensively throughout the calculation process to determine the correct demand loads. The evaluation of the total building load came out to be low compared to the size of the main bus duct. To explain this occurrence, the sixth floor of the building is empty. The sixth floor is not used at the moment and will be utilized at a later date.

POWER DISTRIBUTION SYSTEMS

ELECTRICAL DISTRIBUTION SYSTEM TYPE

The source of the electrical system for the Dorrance H. Hamilton Building starts with the existing 13.2 kV switchgear in the Jefferson Alumni Hall. Two 13.2 kV Philadelphia Electric Company (PECO) feeders supply six existing 13.2 kV feeders. Four of the feeders are to substations in Jefferson Alumni Hall, while the other two feeders will supply the Dorrance H. Hamilton Building. The electrical service is distributed to two 15 kV load interrupter switches integral for the unit substation. From the closed load interrupter switch, the 13.2 kV service is fed through a dry-type transformer rated at 480Y/277 volt, 3 phase, and 2500 kVA. After the 2500 kVA transformer, the service is supplied to the main bus system with TVSS located in Substation No. 1. A 4000 draw amp low voltage circuit breaker protects the main bus. The main distribution panels are located on the parking level P2 and fed up through the building into the electrical room of each floor into sub-distribution panels. From the sub-distribution panels, lighting and receptacle loads are distributed to each floor and served by 150 kVA dry-type transformers and 208Y/120V panelboards. Please see the building riser and single line diagrams to better understand the distribution system in Appendix.

The emergency power is produced with a 1000 kW, 408Y/277V diesel generator. The generator provides emergency power to the automatic transfer switches of the Life Safety, Elevator, and the Standby Distribution panels.

BUILDING SERVICE CONNECTED TO EXISTING CAMPUS SERVICE

The building service connects to the existing campus service in the Jefferson Alumni Hall 13.2 kV switchgear. Two 13.2 kV PECO feeders supply six existing 13.2 kV feeders. Four of the feeders are to substations in Jefferson Alumni Hall, while the other two feeders will supply the Dorrance H. Hamilton Building.

VARIOUS VOLTAGE SYSTEMS

Multiple service voltages are provided due to the use of multiple main distribution panelboards. The main service to the building is 13.2 kV from the Jefferson Alumni Hall switchgear. The service provided to the building is transformed into secondary service for the various loads of the Dorrance H. Hamilton Building.

The building's main service – 13.2 kV delta-connected – feeds directly into the TJU switchgear, which is transformed to the secondary voltage of 480/277V wye-connected at Substation No. 1. From Substation No. 1, the 480/277V service is transformed into 208/120V service for the sub-distribution panels on each floor. The 480/277V service supplies the mechanical equipment, elevators, and lighting, while the 208/120V service supplies the receptacles and the remainder of the lighting load.

TRANSFORMERS

As seen below, all of the transformers except the main transformer are step-down transformers from a primary voltage of 480/277V to a secondary voltage of 208/120V. The main transformer is a step-down transformer from a primary voltage of 13200V to a secondary voltage of 480/277V.

TRANSFORMER SCHEDULE								
Tag	**Primary Voltage**	**Secondary Voltage**	**Size (kVA)**	**Type**	**Temp. Rise**	**Taps**	**Mounting**	**Remarks**
MAIN	13,200V,3PH,3W	480Y/277V,3PH,4W	2500	DRY TYPE	115°C	N/A	PAD MOUNTED TO FLOOR	N/A
TBA	480V,3PH,3W	208Y/120V,3PH,4W	45	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
T1	480V,3PH,3W	208Y/120V,3PH,4W	150	DRY TYPE	150°C	(4) 2.5%	PAD MOUNTED TO FLOOR	K-13 RATED
T2	480V,3PH,3W	208Y/120V,3PH,4W	150	DRY TYPE	150°C	(4) 2.5%	PAD MOUNTED TO FLOOR	K-13 RATED
T3	480V,3PH,3W	208Y/120V,3PH,4W	150	DRY TYPE	150°C	(4) 2.5%	PAD MOUNTED TO FLOOR	K-13 RATED
T4	480V,3PH,3W	208Y/120V,3PH,4W	150	DRY TYPE	150°C	(4) 2.5%	PAD MOUNTED TO FLOOR	K-13 RATED
T5	480V,3PH,3W	208Y/120V,3PH,4W	150	DRY TYPE	150°C	(4) 2.5%	PAD MOUNTED TO FLOOR	K-13 RATED
T6	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
TP	480V,3PH,3W	208Y/120V,3PH,4W	30	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
LTBA	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
STBA	480V,3PH,3W	208Y/120V,3PH,4W	45	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	K-13 RATED
STBB	480V,3PH,3W	208Y/120V,3PH,4W	30	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
TL1A	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
ST4	480V,3PH,3W	208Y/120V,3PH,4W	45	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
LPA	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
STPA	480V,3PH,3W	208Y/120V,3PH,4W	30	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
NOTES:								
1. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.								
2. TRANSFORMERS 45 KVA AND SMALLER MAY BE FLOOR, WALL, OR TRAPEZE MOUNT AT THE OPTION OF THE CONTRACTOR.								
KEY: A/N = AS NOTED								

Table 1: Individual Transformer Schedule

EMERGENCY POWER SYSTEM

Emergency power is generated by a 1000 kW, 408Y/277V diesel generator. This unit is located on the northwest corner of the building on level P2 of the parking garage. The generator provides emergency power to the emergency distribution panel. The emergency distribution panel has three automatic transfer switches, which are the Life Safety, Elevator, and the Standby distribution panels. In the event of an emergency, the generator distributes power through the emergency distribution panel to the three automatic transfer switches, which are protected by three 400 amp low voltage molded case circuit breakers. The emergency power is then fed into the three existing distribution panels; Life Safety, Elevator, and Standby. The emergency distribution panel provides power to the essential mechanical equipment, elevators, and lighting of the building in the event of a power outage.

Overcurrent Protective Devices

For overcurrent protection, the Dorrance H. Hamilton Building contains fuses, circuit breakers, and load interrupter switches to protect and isolate the system in case of a problem. The main incoming service contains a load interrupter switch with a fuse rated at 150E. After the 2500 kVA, 13.2 kVA -480Y/277V transformer, the bus duct of Substation No. 1 is protected by a 4000 amp circuit breaker. From there, each line going to a distribution panel or panel boards are circuit breakers sized accordingly. In case of a failure, the substation can be isolated from the system in order to fix the problem. With Substation No. 1 down, the emergency generator will power the automatic transfer switches of the Life Safety, Elevator, and the Emergency distribution panels.

Location of Switchgear, Panelboards, and Motor Control Centers

The northwest corner of level P2 of the parking garage houses an electrical room, a fire pump room, and a generator room. Substation No. 1 is located here which includes the 13.2 kV primary switch and the 4000 amp bus. The bus duct services all of the main distribution panelboards. The main distribution panelboards provide power to the sub-distribution panel on each floor. On each floor, an electrical room is located in the northwest corner of the building footprint. Providing an electrical room in the same location on each floor reduces cost by minimizing conductor sizes and reduces voltage drop. The average electrical room of each floor contains a transformer and panelboards. The motor control centers are located on the penthouse floor (7^{th} floor).

Typical Lighting Systems

The lighting of the Dorrance H. Hamilton Building mostly consists of recessed fluorescent light sources powered by 277 and 120 volt services. Linear and compact fluorescent recessed fixtures are specified in most of the classrooms and corridors. The main lobby includes vast daylighting via a curved glass façade, fluorescent fixtures and HID sources. Compact fluorescent downlights are utilized in the auditorium along with some of the higher end classrooms. Accent lighting with MR16 and wallwash luminaires provides a striking design and ample illuminance. The plaza area consists of LED strip lighting, HID, and fluorescent sources of light.

ASHRAE/IESNA 90.1 Shutoff Requirements

A programmable lighting control system is used in the building as a means to meet the shutoff requirements in ASHRAE/IESNA 90.1. The parking levels P1 and P2 are controlled by a system time clock. A photocell with a system time clock represents the method to control the exterior lighting of the plaza. The area lighting of the second through fifth floors will be controlled via a system time clock. During the off period, fixtures shall turn on by local occupancy sensors if presence is detected. The occupancy sensors used include dual technology occupancy sensors, PIR occupancy sensors, ultrasonic occupancy sensors, automatic wall switch sensors, and a low voltage digital time switch.

Power Factor Correction

At the moment, capacitors are not found in the plans or the specifications for the Dorrance H. Hamilton Building. After the building is completed in August 2007, a study may be done in order to determine if power factor correction should be utilized.

DESIGN REQUIREMENTS

Important design considerations for the building are typical of most buildings in the form of transient voltage surge suppression, voltage drop, power conservation, emergency power supply, uninterruptible power supply, and cost effectiveness.

Transient voltage surge suppression for the building can be found at the main bus duct in Substation No. 1. The manufacturers' data for the TVSS is not known at the moment. Since the building is only six stories high, voltage drop is negligible. Power conservation is of moderate concern in the space. A programmable lighting system is used throughout the building in order to save power. The large glass façade was not designed to prevent heat loss and reduce energy consumption. Fluorescent lighting was used throughout the building to reduce lighting costs and compact fluorescents are used where incandescents are typically found. The emergency power supply is provided with the diesel generator. The building is a medical education building, so the uninterruptible power supply was of a lesser necessity.

PRIMARY LAMPS/BALLASTS TABLE

PRIMARY LAMPS/BALLASTS

Type	Lamp Type	Bulb Size	Wattage	Input Voltage	Line Current	Input Power	Ballast Factor	Max THD (%)	Min. Power Factor
L1	Clear Incandescent	A-21	150	120	1.25	150	N/A	N/A	1.00
L2	Halogen	MR-16	75	120	0.63	75	N/A	N/A	1.00
L3	Halogen	MR-16	50	120	0.42	50	N/A	N/A	1.00
L4	Linear Fluorescent	T8	32	277	0.23	62	0.94	10	0.98
L5	Biaxial Fluorescent	T5	40	277	0.35	41	1.01	10	0.99
L6	Linear CFL	T4	40	120	0.70	84	0.95	10	0.98
L7	Linear CFL	T4	36	277	0.14	38	0.95	10	0.98
L8	CFL	T4	13	277	0.05	15	0.98	10	0.98
L9	CFL	T4	26	277	0.10	28	1.10	10	0.98
L10	CFL	T4	32	120	0.31	36	0.98	10	0.98
L11	Clear Metal Halide	ED-17	175	277	0.70	191	1.00	15	0.90
L12	Clear Metal Halide	ED-17	70	277	0.67	80	1.00	15	0.90
L13	Ceramic Metal Halide	T6	35	120	0.33	40	1.00	15	0.95
L14	Ceramic Metal Halide	T6	70	277	0.67	80	1.00	15	0.90

Table 2: Primary Lamps/Ballasts

Note: All ballasts were assumed and from Advance Transformers.

NEC BUILDING DESIGN LOAD CALCULATION

The building design load calculation is found by utilizing the following tables: Lighting Loads, Mechanical Equipment I, Mechanical Equipment II, Other Mechanical Equipment, Receptacle Load, Office/Classroom Equipment, Kitchen Equipment, and Miscellaneous Equipment. Assumptions were made for some of the mechanical equipment, kitchen equipment, the office/classroom equipment, and the miscellaneous equipment because the exact size of the equipment is to be issued at a later date. The correct demand loads were found using the 2005 National Electric Code. The total loading of the Dorrance H. Hamilton Building is 1410.6 kVA. The given bus duct is rated at 4000 amps. Therefore, (4000 amps) * (0.480 kV) * ($\sqrt{3}$) = 3326 kVA. The given bus duct doubles the NEC calculated loads because the sixth floor of the building is empty at the moment. The sixth floor will add approximately another 500 kVA to the total loading of the building at a later date.

LIGHTING LOADS			
Occupancy	**Area (SF)**	**Unit Load (VA/SF)**	**Total Load kVA**
SCHOOLS	129,000	3.00	387.00
NOTE: NEC 2005 – TABLE 220.12 (GENERAL LIGHTING LOADS BY OCCUPANCY)		**Total Connected kVA**	**387.00**

Table 3: Lighting Loads

RECEPTACLE LOAD			
Occupancy	**Area (SF)**	**Unit Load (VA/SF)**	**Total Load kVA**
SCHOOLS	129,000	0.50	64.50
		Total Connected kVA	**64.50**

Table 4: Receptacle Load

MECHANICAL EQUIPMENT SCHEDULE I						
Equipment	**Type**	**Voltage**	**Phase**	**Power**	**Amps**	**kVA**
RF-1	AHU Mixed Flow Fan	480 V	3	50 HP	65 A	54.04
RF-2	AHU Mixed Flow Fan	480 V	3	50 HP	65 A	54.04
SF-3	Utility Set Stairwell Pressure Fan	480V	3	20 HP	27 A	22.45
SF-4	Utility Set Stairwell Pressure Fan	480 V	3	20 HP	27 A	22.45
EF-5	PRV Fan above Toilets	480 V	3	1 HP	2.1 A	1.75
EF-6	PRF Fan above Toilets	480 V	3	1 HP	2.1 A	1.75
EF-7	Plenum Garage Exhaust Fan	480 V	3	30 HP	40 A	33.26
EF-8	Plenum Garage Exhaust Fan	480 V	3	30 HP	40 A	33.26
EF-9	Penthouse Propeller Fan	480 V	3	2 HP	3.4 A	2.83
SF-10	Electric Room Sq. In-line Fan	480 V	3	5 HP	7.6 A	6.32
SF-11	P2 Mechanical Room In-line Fan	480 V	3	1 HP	2.1 A	1.75
SF-12	Garage Sq. In-line Fan	480 V	3	7.5 HP	11 A	9.15
EF-13	P1 Staff TLT Central Exhaust Fan	480 V	3	1 HP	2.1 A	1.75
EF-14	Fire Pump Room In-line Fan	480 V	3	7.5 HP	11 A	9.15
EF-15	Scott Building Bsmt. Prop. Fan	480 V	3	1 HP	2.1 A	1.75
EF-16	Scott Building Bsmt. Prop. Fan	480 V	3	2 HP	3.4 A	2.83
UH-1	Unit Heater	120 V	1	1/30 HP	3 A	0.36
EUH-1	Cabinet Electric Unit Heater	480 V	3	1/100 HP	1 A	0.83
EUH-2	Cabinet Electric Unit Heater	480 V	3	1/100 HP	1 A	0.83
EUH-2	Cabinet Electric Unit Heater	480 V	3	1/100 HP	1 A	0.83
EUH-2	Cabinet Electric Unit Heater	480 V	3	1/100 HP	1 A	0.83
CT-1	Cross Flow Cooling Tower	480 V	3	10 HP	14 A	1.16
CH-1	Chiller	480 V	3	239.6 kW	320.22 A	153.70
AHU-1	Mechanical Room AHU #1	480 V	3	75 HP	96 A	7.98
AHU-2	Mechanical Room AHU #2	480 V	3	75 HP	96 A	7.98
AHU-3	Mechanical Room AHU #3	480 V	3	75 HP	96 A	7.98

Table 5: Mechanical Equipment Schedule I

MECHANICAL EQUIPMENT SCHEDULE II						
Equipment	**Type**	**Voltage**	**Phase**	**Power**	**Amps**	**kVA**
P-1	Chiller – Horiz. Split Case Pump	480 V	3	40 HP	52 A	43.23
P-2	Spare - Horizontal Split Case Pump	480 V	3	40 HP	52 A	43.23
P-3	Cooling Tower Horizontal Pump	480 V	3	40 HP	52 A	43.23
P-4	AHU-1 In-line Pump	120 V	1	¼ HP	5.8 A	0.70
P-5	AHU-2 Inline Pump	120 V	1	¼ HP	5.8 A	0.70
P-6	AHU-3 In-line Pump	120 V	1	¼ HP	5.8 A	0.70
P-7	HHW End-Suction Pump	480 V	3	7 ½ HP	11 A	9.15
P-8	HHW End-Suction Pump	480 V	3	7 ½ HP	11 A	9.15
P-9	RHHW End-Suction Pump	480 V	3	5 HP	7.6 A	6.32
P-10	RHHW End-Suction Pump	480 V	3	5 HP	7.6 A	6.32
P-11	Radiant Floor End-Suction Pump	480 V	3	1 HP	2.1 A	1.75
P-12	Radiant Floor End-Suction Pump	480 V	3	1 HP	2.1 A	1.75
FC-1 to FC-1	Stair #1 Fan Coil	120 V	1	0.420 kW	N/A	0.42
FC-6 to FC-7	Vestibule Fan Coil	120 V	1	0.235 kW	N/A	0.24
FC-8	Mech. Level Elev. Shft. Fan Coil Unit	120 V	1	0.235 kW	N/A	0.24
AC-1	Mechanical Shop AC System	120 V	1	½ HP	9.8 A	1.18
AC-2	Mechanical Room AC System	208 V	1	½ HP	9.8 A	2.04
AC-3	MDF Room AC System	480 V	3	1 ½ HP	3 A	2.49
AC-7	Machine Room AC System	480 V	3	1 ½ HP	3 A	2.49
AC-8	3rd Floor Data Closet AC System	208 V	1	½ HP	9.8 A	2.04
AC-9	4th Floor Data Closet AC System	208 V	1	½ HP	9.8 A	2.04
ACC-1	P1 Air Cooled Condensing Unit	208 V	1	N/A	14.5 A	3.02
ACC-2	Roof Air Cooled Condensing Unit	208 V	1	N/A	12.8 A	2.66
ACC-3	Roof Air Cooled Condensing Unit	480 V	3	N/A	11.4 A	9.48
ACC-7	Roof Air Cooled Condensing Unit	480 V	3	N/A	11.4 A	9.48
ACC-8	Roof Air Cooled Condensing Unit	208 V	1	N/A	14.5 A	2.39
ACC-9	Roof Air Cooled Condensing Unit	208 V	1	N/A	14.5 A	2.39

Table 6: Mechanical Equipment Schedule II

OTHER MECHANICAL EQUIPMENT

Panel Board	Mechanical Equipment	Voltage	Phase	Power	Amps	kVA
BHB	Irrigation Pump, P1	480 V	3	3990 W	4.80 A	2.30
BLA	AC-10	208 V	1	1880 W	9.00 A	1.87
"	AC-11	208 V	1	1880 W	9.00 A	1.87
"	Heat Trace, P1	120 V	1	500 W	4.17 A	0.50
"	Heat Trace, P2	120 V	1	500 W	4.17 A	0.50
"	RCPT Sub-Meter	120 V	1	1000 W	8.33 A	1.00
"	REM Monitor, Elev. #4	120 V	1	500 W	4.17 A	0.50
"	REM Monitor, Elev. #5	120 V	1	500 W	4.17 A	0.50
"	Relay Panel, LP-P2	120 V	1	500 W	4.17 A	0.50
"	Steam Condensing Pump	120 V	1	500 W	4.17 A	0.50
"	Water Heater	120 V	1	500 W	4.17 A	0.50
LBLA	Elev. Cab #3/4	120 V	1	1000 W	8.34 A	1.00
"	EM Call Boxes, P1/P2	120 V	1	1000 W	8.34 A	1.00
SBHA	Dom. Water Pump	480 V	3	18291 W	22.00 A	10.56
"	Jockey Pump	480 V	3	3990 W	4.80 A	2.30
"	SP-1, P201	480 V	3	7980 W	9.60 A	4.61
"	SP-1, P210	480 V	3	7980 W	9.60 A	4.61
"	UH P204	480 V	1	3000 W	6.25 A	3.00
"	UH P205	480 V	1	3000 W	6.25 A	3.00
SBLA	Fire Pump Controller	120 V	1	500 W	4.17 A	0.50
"	(3) FS Air Compressors	120 V	1	1500 W	12.50 A	1.50
1HA	VAV's	480 V	1	3648 W	7.60 A	3.65
1LA	Relay Panel LP-1	120 V	1	500 W	4.17 A	0.50
1LD	Elevator Pit	120 V	1	540 W	4.50 A	0.54
"	Sensors – Restroom	120 V	1	1000 W	8.33 A	1.00
"	FCU's	120 V	1	100 W	0.83 A	0.12
L1LA	1st – 3rd Floor Smoke Dampers	120 V	1	750 W	6.25 A	0.75
"	(2) FACP	120 V	1	3000 W	25.00 A	3.00
"	Fire Shutter Motor	120 V	1	1176 W	9.80 A	1.18
2HA	VAV's	480 V	1	8400 W	17.50 A	8.40
2LA	Relay Panel LP-2	120 V	1	500 W	4.17 A	0.50
2LE	Fan Coil Unit	120 V	1	480 W	4.00 A	0.48
"	Restroom Sensors	120 V	1	500 W	4.17 A	0.50
3HA	VAV's	480 V	1	7152 W	14.90 A	7.15
3LA	Relay Panel LP-3	120 V	1	500 W	4.17 A	0.50
3LE	Fan Coil Unit	120 V	1	480 W	4.00 A	0.48
"	Restroom Sensors	120 V	1	500 W	4.17 A	0.50
4HA	VAV's	480 V	1	6817 W	14.20 A	6.82

4LA	Relay Panel LP-4	120 V	1	500 W	4.17 A	0.50
4LE	Fan Coil Unit	120 V	1	480 W	4.00 A	0.48
"	Restroom Sensors	120 V	1	500 W	4.17 A	0.50
5HA	VAV's	480 V	1	6624 W	13.80 A	6.62
5LA	Relay Panel LP-5	120 V	1	500 W	4.17 A	0.50
5LE	Fan Coil Unit	120 V	1	480 W	4.00 A	0.48
6LA	UH's Shell Space	120 V	1	250 W	2.08 A	0.25
"	Fan Coil Unit	120 V	1	480 W	4.00 A	0.48
LEDPA	Elevator #1	480 V	3	32415 W	38.99 A	18.71
"	Elevator #2	480 V	3	29925 W	35.99 A	17.28
"	Elevator #3	480 V	3	29925 W	35.99 A	17.28
LPLA	Elevator #1 Cab	120 V	1	2000 W	16.67 A	2.00
"	Elevator #2 Cab	120 V	1	2000 W	16.67 A	2.00
"	Elevator #3 Cab	120 V	1	2000 W	16.67 A	2.00
"	4^{th} – 6^{th} Floor Smoke Damper	120 V	1	750 W	6.25 A	0.75
PHA	Air Compressor	480 V	3	9144 W	11.00 A	5.28
"	Basin Heaters	480 V	3	24000 W	28.87 A	13.86
"	Vacuum Pump	480 V	3	6318 W	7.60 A	3.65
PLA	Heat Trace	120 V	1	250 W	2.08 A	0.25
"	REM Monitor, Elev. 1-3	120 V	1	1500 W	12.50 A	1.50
"	UH's, M6	120 V	1	250 W	2.08 A	0.25
SPLA	(3) ATC Control Panel	120 V	1	1500 W	12.50 A	1.50
					Total kVA of Other Mechanical Equipment	**174.81**
					Connected kVA of Mechanical Equip. I & II	**619.10**
					Demand kVA of Mechanical Equip. I & II	**542.25**
NOTE: A DEMAND FACTOR OF 0.5 WAS APPLIED TO THE LARGEST MOTOR.					**Total kVA**	**717.06**

Table 7: Other Mechanical Equipment

OFFICE/CLASSROOM EQUIPMENT						
Panel Board	**Office/Classroom Equipment**	**Voltage**	**Phase**	**Power**	**Amps**	**kVA**
1LB	Stair Lift, 109	120 V	1	2450 W	20.42 A	2.45
"	(5) AV Racks	120 V	1	7500 W	62.50 A	7.50
"	AV Raceway	120 V	1	1500 W	12.50 A	1.50
"	(4) Projectors	120 V	1	5500 W	45.83 A	5.50
"	(4) Motorized Screens	120 V	1	4000 W	33.33 A	4.00
1LD	AV Equipment	120 V	1	1000 W	8.33 A	1.00
"	Projector: Lobby	120 V	1	1000 W	8.33 A	1.00
"	Motorized Screen	120 V	1	500 W	4.17 A	0.50
2LB	(5) Projectors: Meeting Room	120 V	1	5000 W	41.67 A	5.00
"	(5) Screens: Meeting Room	120 V	1	3000 W	25.00 A	3.00
2LC	(5) Projectors: Meeting Room	120 V	1	5000 W	41.67 A	5.00
"	(5) Screens: Meeting Room	120 V	1	2500 W	20.83 A	2.50
2LD	(6) Projectors	120 V	1	6000 W	50.00 A	6.00
"	(6) Screens	120 V	1	3000 W	25.00 A	3.00
2LE	(3) Projectors	120 V	1	3000 W	25.00 A	3.00
"	(3) Screens	120 V	1	1500 W	12.50 A	1.50
3LB	(2) Projectors	120 V	1	2000 W	16.67 A	2.00
"	(2) Screens	120 V	1	1000 W	8.33 A	1.00
"	(2) X-Ray View Boxes	120 V	1	1000 W	8.33 A	1.00
3LC	(6) Computer: Corridor	120 V	1	6000 W	50.00 A	6.00
"	(3) Headboards	120 V	1	3000 W	25.00 A	3.00
"	(5) Racks	120 V	1	5000 W	41.67 A	5.00
"	(4) X-Ray View Boxes	120 V	1	2000 W	16.67 A	2.00
3LD	Copier	120 V	1	1000 W	8.33 A	1.00
"	Fax Machine	120 V	1	500 W	4.17 A	0.50
"	(2) Printers	120 V	1	1000 W	8.33 A	1.00
"	Projector: Classroom	120 V	1	1000 W	8.33 A	1.00
"	Screen: Classroom	120 V	1	500 W	4.17 A	0.50
3LE	(3) Projectors	120 V	1	3000 W	25.00 A	3.00
"	(3) Screens	120 V	1	1500 W	12.50 A	1.50
4LB	(2) Projectors	120 V	1	2000 W	16.67 A	2.00
"	(2) Screens	120 V	1	1000 W	8.33 A	1.00
4LC	(7) Computers: Corridor	120 V	1	10500 W	87.50 A	10.50
"	(5) Racks	120 V	1	5000 W	41.67 A	5.00
"	(4) X-Ray Viewers	120 V	1	1000 W	8.33 A	1.00
4LD	AV Equipment	120 V	1	1000 W	8.33 A	1.00
"	(2) Projectors	120 V	1	2000 W	16.67 A	2.00
"	(2) Screens	120 V	1	1000 W	8.33 A	1.00
5LB	(2) PAX/X-Ray	120 V	1	4000 W	33.33 A	4.00
"	(2) X-Ray Viewers	120 V	1	2000 W	16.67 A	2.00
"	Wall Mounted Laptop	120 V	1	1000 W	8.33 A	1.00

“	(2) Projectors	120 V	1	2000 W	16.67 A	2.00
“	(2) Screens	120 V	1	1000 W	8.33 A	1.00
5LC	AV Equipment	120 V	1	500 W	4.17 A	0.50
“	X-Ray Lab	120 V	1	500 W	4.17 A	0.50
“	Wall Mounted Laptop	120 V	1	500 W	4.17 A	0.50
“	(3) Projectors	120 V	1	3000 W	25.00 A	3.00
“	(3) Screens	120 V	1	1500 W	12.50 A	1.50
5LD	(2) Projectors	120 V	1	2000 W	16.67 A	2.00
“	(2) Screens	120 V	1	1000 W	8.33 A	1.00
5LE	Projector	120 V	1	1000 W	8.33 A	1.00
“	Screen	120 V	1	500 W	4.17 A	0.50
	Screen	120 V	1	500 W	4.17 A	0.50
NOTE: NO DEMAND FACTORS WERE USED.					**Total kVA**	**125.45**

Table 8: Office/Classroom Equipment

KITCHEN EQUIPMENT						
Panel Board	**Kitchen Equipment**	**Voltage**	**Phase**	**Power**	**Amps**	**kVA**
1LA	Ice Machine	120 V	1	1000 W	8.33 A	1.00
“	Garbage Disposal	120 V	1	1000 W	8.33 A	1.00
“	Refrigerator	120 V	1	1000 W	8.33 A	1.00
“	Dishwasher, 110	120 V	1	12252 W	102.1 A	12.25
“	Coffee Maker	120 V	1	500 W	4.17 A	0.50
“	(2) Food Carts	120 V	1	3000 W	25.00 A	3.00
2LE	Ice Machine	120 V	1	1000 W	8.33 A	1.00
“	Garbage Disposal	120 V	1	1000 W	8.33 A	1.00
“	Refrigerator	120 V	1	1000 W	8.33 A	1.00
“	Microwave	120 V	1	1000 W	8.33 A	1.00
“	Coffee Maker	120 V	1	500 W	4.17 A	0.50
“	(2) Food Carts	120 V	1	3000 W	25.00 A	3.00
5LD	(14) Fry Pans	120 V	1	25200 W	210.00 A	25.20
5LE	Refrigerator	120 V	1	500 W	4.17 A	0.50
“	Range	120 V	1	2000 W	16.67 A	2.00
					Total Connected kVA	**53.95**
NOTE: A DEMAND FACTOR OF 0.65 WAS APPLIED TO ALL KITCHEN LOADS.					**Total Demand kVA**	**35.07**

Table 9: Kitchen Equipment

MISCELLANEOUS EQUIPMENT						
Panel Board	**Miscellaneous Equipment**	**Voltage**	**Phase**	**Power**	**Amps**	**kVA**
SBLA	Paystation, P1/P2	120 V	1	3000 W	25.00 A	3.00
"	(3) Entry/Exit Stations	120 V	1	3000 W	25.00 A	3.00
"	(3) Barrier Gates	120 V	1	2595 W	21.63 A	2.60
"	ATC Control Panel	120 V	1	500 W	4.17 A	0.50
1LA	Exterior Camera	120 V	1	200 W	1.67 A	0.20
"	Plasma Screen	120 V	1	1000 W	8.33 A	1.00
"	UH Loading Dock	120 V	1	100 W	0.83 A	0.10
1LD	(3) Plasma Screens	120 V	1	3000 W	25.00 A	3.00
"	Lutron System, 100	120 V	1	250 W	2.08 A	0.25
L1LA	EM Call Stns, Site	120 V	1	500 W	4.17 A	0.50
3LB	(9) Raceways 332/333	120 V	1	5580 W	46.50 A	5.58
3LE	Plasma Screen	120 V	1	1000 W	8.33 A	1.00
S3LA	(3) Aux. Power Supply	120 V	1	300 W	2.50 A	0.30
"	(4) CCTV's	120 V	1	400 W	3.33 A	0.40
"	Fill Station Alarm	120 V	1	250 W	2.08 A	0.25
"	(3) Security Stations	120 V	1	1500 W	12.50 A	1.50
4LB	(9) Raceways: (Sim./O.R.)	120 V	1	9000 W	75.00 A	9.00
"	(7) J-Box for Headboards	120 V	1	7000 W	58.33 A	7.00
4LC	(3) J-Box for Headboards	120 V	1	3000 W	25.00 A	3.00
S4LA	(3) CCTV's	120 V	1	300 W	2.50 A	0.30
5LB	(6) J-Box: Headboard	120 V	1	6000 W	50.00 A	6.00
"	(6) Raceways: Simulation Lab	120 V	1	6000 W	50.00 A	6.00
5LC	(3) J-Box: Headboard	120 V	1	3000 W	25.00 A	3.00
"	(3) Raceways: Simulation Lab	120 V	1	3000 W	25.00 A	3.00
5LD	(12) Raceways	120 V	1	12000 W	100.00 A	12.00
5LE	AV Rack	120 V	1	1500 W	12.50 A	1.50
"	Plasma Screen	120 V	1	1000 W	8.33 A	1.00
"	(3) Raceways	120 V	1	3000 W	25.00 A	3.00
"	Washer and Dryer	120 V	1	3000 W	25.00 A	3.00
PDPB	EM Call Box	120 V	1	500 W	4.17 A	0.50
					Total Connected kVA	**81.48**
NOTE: NO DEMAND FACTORS WERE USED.						

Table 10: Miscellaneous Equipment

TOTAL LOAD – DORRANCE H. HAMILTON BUILDING	
Load	**Demand Load**
Lighting	387.00
Mechanical Equipment	717.06
Receptacles	64.50
Office/Classroom Equipment	125.45
Kitchen Equipment	35.07
Miscellaneous Equipment	81.48
Total Load	**1410.56 kVA**

Table 11: Total Load

ELECTRIC UTILITY COMPANY

The electric utility company is the Philadelphia Electric Company (PECO). PECO is a unit of Exelon Energy Delivery, responsible for safe, reliable electric and natural gas distribution and customer service for residential business and institutional consumers in southeastern Pennsylvania. The pending tariff changes, current tariffs, selected rates of electric tariffs, rate for primary distribution power, rate for high tension power, transmission charges, wind energy, selected tariff provisions/rates on gas tariff, and a variety of other information is available on the PECO website. The website is http://www.exeloncorp.com. Please see Appendix for a full size view of the Primary Distribution Power Rate view.

COMMUNICATION SYSTEMS

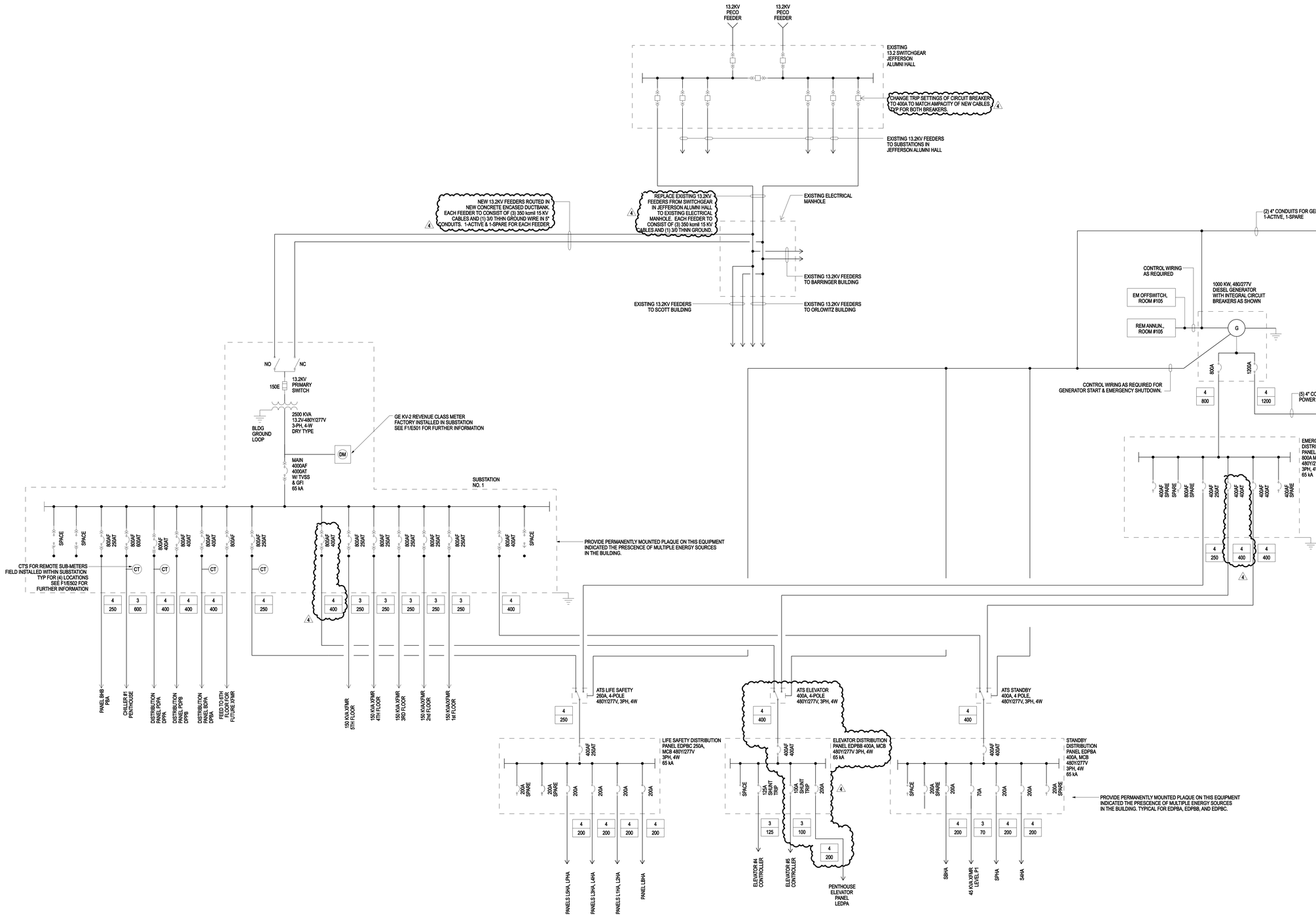
LIST OF COMMUNICATION SYSTEMS

Telecommunications

The building will have manual fire alarm pull stations and an addressable automatic fire detecting device. Alarm signal devices will activate if system detects a fire. The system includes an automatic voice evacuation sequence, a manual voice paging sequence, a device to send a alarm to the University's on-site central monitoring station, sprinkler system tamper switch, smoke detectors in elevator lobbies, machine rooms, and hoist ways, addressable heat detectors, duct mounted smoke detectors, among other items. A supervised, two-way communication system between the fire command center/main fire alarm control panel and the emergency phones throughout the building is also included.

The security system of the building has surveillance television systems, security door access control, and security intrusion detection devices. The security system will provide perimeter security of the areas around the building during off peak hours.

The building has various other communications systems that are to be issued at a later date. These include the nurses call system, sound system, and a clock system.



F3 ELECTRICAL SINGLE LINE DIAGRAM
NTS

BURT, HILL
ARCHITECTURE ENGINEERING INTERIOR DESIGN LANDSCAPE MASTER PLANNING

1735 MARKET STREET 53RD FLOOR
PHILADELPHIA, PA 19103
TEL: 215 751 2900
FAX: 215 751 2901

BOSTON, MA
BUTLER, PA
CLEVELAND, OH
DUBAI, UAE
PHILADELPHIA,PA
PITTSBURGH,PA
WASHINGTON, DC

Seal

CONSTRUCTION COORDINATION SET

Seal

Dorrance H. Hamilton Building

Thomas Jefferson University

1001 Locust St.
Philadelphia PA, 19107

Revisions

No.	Date	By	Description
1	11-08-05	DLM	ADDENDUM 2
2	03-07-06	SCW	CONSTRUCTION COORDINATION
3	04-10-06	SCW	BULLETIN NO. 03
4	04-25-06	SCW	BULLETIN NO. 05

Date OCTOBER 24, 2005

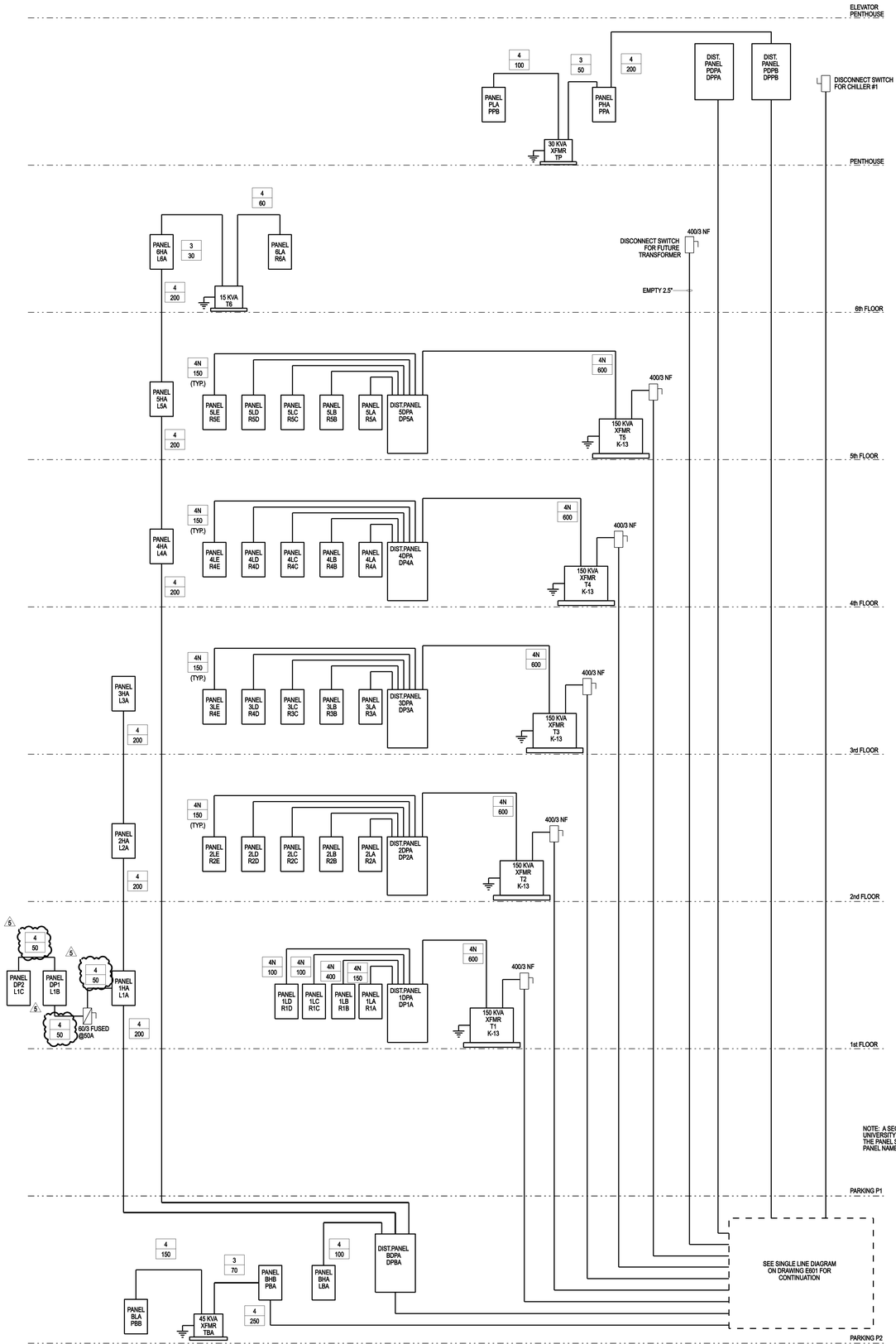
Drawing Name

ELECTRICAL SINGLE LINE DIAGRAM

Project Number 0492400
TJU FDC # 05-144

Drawing Number

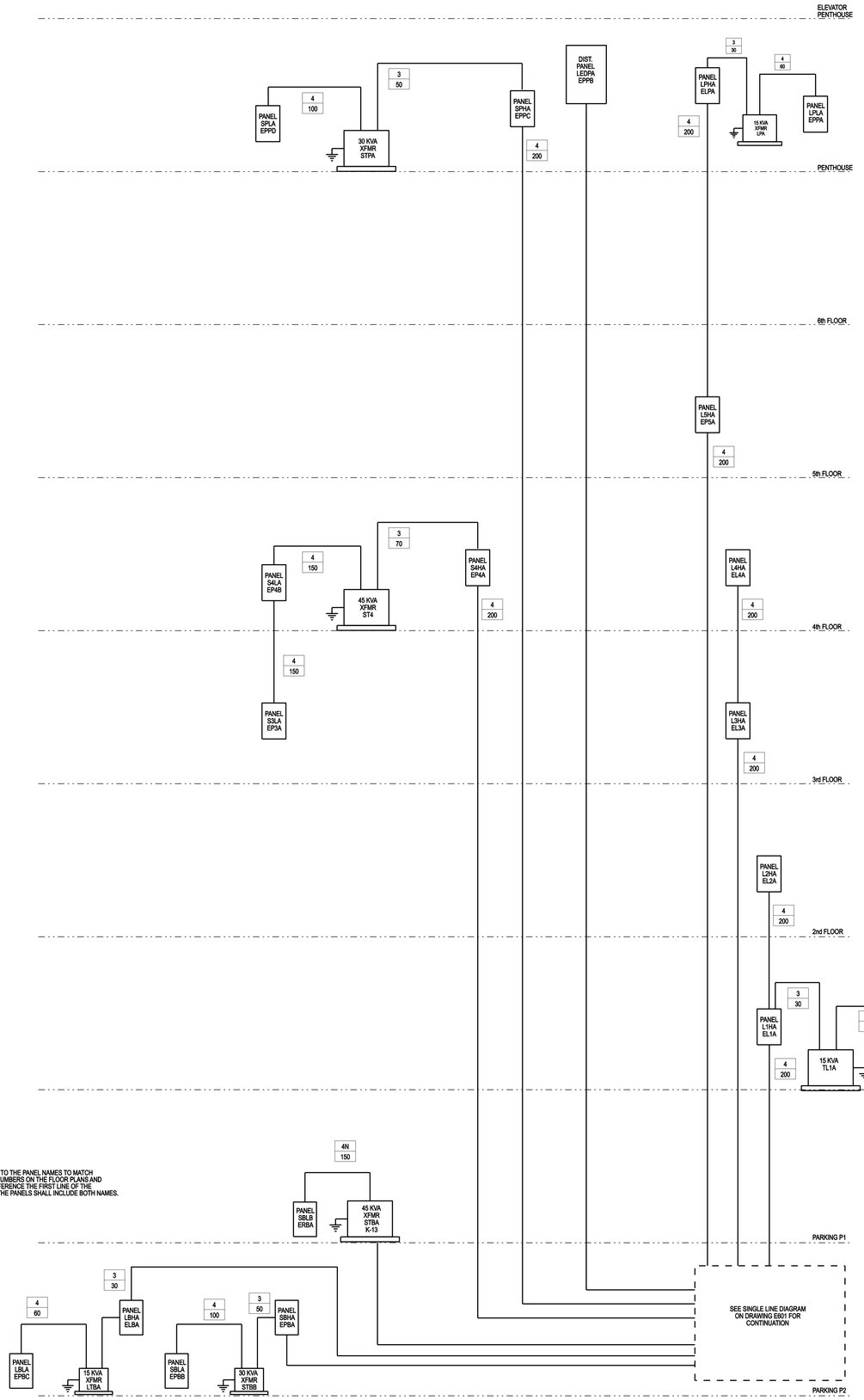
E–601



ELECTRICAL NORMAL POWER RISER DIAGRAM

N.T.S.

NOTE: A SECOND LINE HAS BEEN ADDED TO THE PANEL NAMES TO MATCH UNIVERSITY STANDARDS. THE CIRCUIT NUMBERS ON THE FLOOR PLANS AND THE PANEL SCHEDULE SHEETS ONLY REFERENCE THE FIRST LINE OF THE PANEL NAME. IDENTIFICATION TAGS ON THE PANELS SHALL INCLUDE BOTH NAMES.



ELECTRICAL NORMAL/EMERGENCY POWER RISER DIAGRAM

N.T.S.

BURT, HILL
ARCHITECTURE ENGINEERING INTERIOR DESIGN LANDSCAPE MASTER PLANNING

1735 MARKET STREET 53RD FLOOR
PHILADELPHIA, PA 19103
TEL: 215 751 2900
FAX: 215 751 2901

BOSTON, MA
BUTLER, PA
CLEVELAND, OH
DUBAI, UAE
PHILADELPHIA, PA
PITTSBURGH, PA
WASHINGTON, DC

Seal

CONSTRUCTION COORDINATION SET

Seal

Dorrance H. Hamilton Building

Thomas Jefferson University

1001 Locust St.
Philadelphia PA, 19107

Revisions

No.	Date	By	Description
1	11-08-05	DLM	ADDENDUM NO. 2
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3	04-10-06	SCW	BULLETIN NO. 03
4	04-25-06	SCW	BULLETIN NO. 05
5	06-13-06	SCW	BULLETIN NO. 10

Date OCTOBER 24, 2005

Drawing Name

NORMAL AND NORMAL/ EMERGENCY POWER RISER DIAGRAMS

Project Number 0492400
TJU FDC # 05-144

Drawing Number

E–602

RATE PD PRIMARY - DISTRIBUTION POWER

AVAILABILITY.

Untransformed service from the primary supply lines of the Company's distribution system where the customer installs, owns, and maintains any transforming, switching and other receiving equipment required. However, standard primary service is not available in areas where the distribution voltage has been changed to either 13 kV or 33 kV unless the customer was served with standard primary service before the conversion of the area to either 13 kV or 33 kV. This rate is available only for service locations served on this rate on July 6, 1987 as long as the original primary service has not been removed. PECO Energy may refuse to increase the load supplied to a customer served under this rate when, in PECO Energy's sole judgment, any transmission or distribution capacity limitations exist. If a customer changes the billing rate of a location being served on this rate, PECO Energy may refuse to change that location back to Rate PD when, in PECO Energy's sole judgment, any transmission or distribution capacity limitations exist.

CURRENT CHARACTERISTICS.

Standard primary service.

MONTHLY RATE TABLE.

FIXED DISTRIBUTION SERVICE CHARGE: $279.67

METERING AND BILLING CREDITS A customer receiving Advanced Meter Services from a AMSP other than the Company will receive a credit on the Fixed Distribution Service Charge equal to the Total Metering Credit set forth for this Base Rate in Appendix B to the Joint Petition for Full Settlement. A customer receiving Consolidated EGS Billing will receive a credit on the Fixed Distribution Service Charge equal to the Billing and Collection Credit set forth for this Base Rate in Appendix B to the Joint Petition for Full Settlement.

VARIABLE DISTRIBUTION SERVICE CHARGE:

$1.82 per kW of billing demand	(I)
1.62¢ per kWh of the first 150 hours' use of billing demand	(I)
0.96¢ per kWh of the first next 150 hours' use of billing demand	(I)
0.31¢ per kWh for additional use.	(I)

COMPETITIVE TRANSITION CHARGE:

$3.15 per kW of billing demand	(I)
2.88¢ per kWh of the first 150 hours' use of billing demand	(I)
1.74¢ per kWh for the next 150 hours' use of billing demand	(I)
0.62¢ per kWh for additional use.	(I)

ENERGY AND CAPACITY CHARGE: The following Energy and Capacity Charges will apply to the customer if the customer receives Default PLR Service. These charges are not applicable to the customer if it obtains Competitive Energy Supply.

$4.37 per kW of billing demand	(I)
5.48¢ per kWh of the first 150 hours' use of billing demand	(I)
3.90¢ per kWh for the next 150 hours' use of billing demand	(I)
2.35¢ per kWh for additional use.	(I)

TRANSMISSION SERVICE FOR CUSTOMERS RECEIVING DEFAULT PLR SERVICE: Unless such a customer is able to obtain transmission service on its own, PECO Energy will provide transmission service, and will impose charges on such a customer for such transmission service.

STATE TAX ADJUSTMENT CLAUSE, NUCLEAR DECOMMISSIONING COST ADJUSTMENT APPLY TO THIS RATE.

DETERMINATION OF BILLING DEMAND.

The billing demand will be computed to the nearest kilowatt and will never be less than the measured demand, adjusted for power factor in accordance with the Rules and Regulations, nor less than 25 kilowatts. Additionally, during the eight months of October through May the billing demand will not be less than 40% of the maximum demand specified in the contract nor less than 80% of the highest billing demand in the preceding months of June through September (applied on an unbundled basis). There will be a one-time waiver of the application of the previous sentence as it relates to minimums associated with PLR Energy and Capacity charges the first time a customer at a service location elects to receive Competitive Energy Supply. This one-time waiver is specific to a particular service location unless a new entity has assumed operation of the service location from a customer which has ceased operations at that location as a result of dissolution provided the new entity was not created through merger, partnership, joint venture, acquisition and/or any other type of combined business structure with the former customer.

MINIMUM CHARGE.

The monthly minimum charge shall be the Fixed Distribution Service Charge, plus the charge per kW component of the Variable Distribution Service Charge, the CTC, and the Energy and Capacity Charge.

TERM OF CONTRACT.

The initial contract term shall be for at least three years.

PAYMENT TERMS.

Standard.

(I) Indicates Increase