George Mason University
Art & Visual Technology Building

Electrical Systems Existing Conditions & Building Load Summary Report

Allen Walker

November 02, 2007

Faculty Advisor

Professor Dannerth

Table of Contents

Executive Summary……3

Summary of Distribution System……4

Service Entrance……4

Voltage Systems……4

Transformers……5

Emergency Power Systems……5

Over-Current Devices……6

Locations of Switchgear……7

Power Factor Correction……8

Design Issues……8

Lighting Loads……8

Mechanical and other Loads……9

Service Entrance Sizing……9

Utility Company Information……11

Communication Systems……12

Single Line Diagram……13

Appendices……14

Executive Summary

This report analyzes the electrical distribution system for the Art & Visual Technology building to be built on the Fairfax campus of George Mason University. The report consists of the analysis of the following components; service entrance, voltage systems, transformers, emergency power, over-current systems, location of electrical equipment, power factor correction, design issues, building loads, utility company information and finally communication systems utilized within the building.

The Art & Visual Technology Building was found to use a simple electrical radial distribution system. Studios, labs and other special use areas were found to be large consumers of power and required dedicated panels to serve these areas. Emergency power was found to be created through a diesel powered generator which serves life safety loads and a small portion of stand-by power. Finally, the service entrance size was analyzed under three methods and the current size was appropriate based on the calculations performed within this report.

Summary Description of Distribution Systems:

The Art & Visual Technology Building utilizes simple radial distribution at 480Y/277V, 3ϕ, 4W. It originates at the 2000A switchboard, which is located in the lower level main electrical room. The main switchboard has ten internal circuit breakers; two are dedicated to the automatic transfer switches, six go to distribution panels throughout the building and the final two are dedicated to each elevator. There are also four spaces left open in the switchboard with frame sizes ranging from 250A to 600A. Distribution is divided into panels that feed the north end of the building and those that feed the south. On the lower level, the main electric room feeds the south end of the building, while there is an electrical closet that feeds the north. On the floors above have electrical closets located in north and south end of the core of the building. Each closet contains 480Y/277V 3ϕ, 4W panels, transformers and 208Y/120 3ϕ, 4W panels. Emergency power is supplied from an 80kW diesel generator and is integrated into normal building power thru automatic transfer switches.

Service Entrance:

Dominion Virginia Power (DVP) provides service at 34.5/19.9kV to an exterior pad mounted transformer which is located along the south-east corner of the building. The transformer steps down the voltage to 480Y/277V, 3ϕ, 3W. DVP provides primary conductors, transformer and mounting pad and downstream of the transformer is owned by George Mason University. Service enters the building on the lower level via an underground 4" concrete encased duct bank where it then enters the main electric room and connects to the main switchboard.

Voltage Systems:

The building makes use of both 480Y/277V, 3ϕ, 4W and 208Y/120V, 3ϕ, 4W systems. Track lighting, photography safelights and under-cabinet lighting are the only lighting on 208Y/120V, service. Other loads served off of 208Y/120V, 3ϕ, 4W include small fans, receptacles, projectors, unit heaters, power operated doors and domestic hot water heater pumps. Loads served off of 480Y/277V include the air handling units, dust collection system, most lighting fixtures, dimming panels, trash compactor, and most motors over one half horse power.

Transformers:

INDIVIDUAL TRANSFORMER SCHEDULE								
TAG	PRIMARY VOLTAGE	SECONDARY VOLTAGE	SIZE	TYPE	TEMP. RISE	TAPS	MOUNTING	REMARKS
Utility	34500V,3PH,3W	480Y/277V,3PH,4W	N/A	N/A	N/A	N/A	PAD MOUNTED ON GRADE BY DVP	
T1SA	480V,3PH,3W.	208Y/120V,3PH,4W	75	DRY TYPE	150 °C	(4) 2.5%	FLOOR	K-13 RATED
T1SB	480V,3PH,3W.	208Y/120V,3PH,4W	112.5	DRY TYPE	150 °C	(4) 2.5%	FLOOR	
T1NA	480V,3PH,3W.	208Y/120V,3PH,4W	75	DRY TYPE	150 °C	(4) 2.5%	CEILING	K-13 RATED
T1NB	480V,3PH,3W.	208Y/120V,3PH,4W	75	DRY TYPE	150 °C	(4) 2.5%	CEILING	
T2S	480V,3PH,3W.	208Y/120V,3PH,4W	112.5	DRY TYPE	150 °C	(4) 2.5%	FLOOR	K-13 RATED
T2N	480V,3PH,3W.	208Y/120V,3PH,4W	112.5	DRY TYPE	150 °C	(4) 2.5%	FLOOR	K-13 RATED
T3S	480V,3PH,3W.	208Y/120V,3PH,4W	75	DRY TYPE	150 °C	(4) 2.5%	CEILING	K-13 RATED
T3N	480V,3PH,3W.	208Y/120V,3PH,4W	75	DRY TYPE	150 °C	(4) 2.5%	CEILING	K-13 RATED
T1SE	480V,3PH,3W.	208Y/120V,3PH,4W	15	DRY TYPE	150 °C	(4) 2.5%	CEILING	
T1SS	480V,3PH,3W.	208Y/120V,3PH,4W	30	DRY TYPE	150 °C	(4) 2.5%	CEILING	K-13 RATED
T1NE	480V,3PH,3W.	208Y/120V,3PH,4W	15	DRY TYPE	150 °C	(4) 2.5%	CEILING	
T1NS	480V,3PH,3W.	208Y/120V,3PH,4W	30	DRY TYPE	150 °C	(4) 2.5%	CEILING	K-13 RATED

Emergency Power Systems:

Emergency power is provided via an 80kW diesel generator which is pad mounted on the East corner of the building. It provides power at 480Y/277V, 3ϕ, 3W. The diesel generator has two internal circuit breakers; a 60A which provides power to the life safety loads and also a 100A circuit breaker which feeds stand-by power. The emergency power interfaces the normal power through two automatic transfer switches, one for life safety and one for stand-by power.

The life safety automatic transfer switches is connected to panel H1SE, which has a 60A main circuit breaker and feeds other 480Y/277V, 3ϕ, 4W panels on the lower level as well as the entry level. H1SE feeds H1NE which has a 40A main breaker and supplies emergency power to the North end of the building. H1SE and H1NE both supply power to transformers T1SE and T1NE that in turn supply emergency power at 208Y/120V 3ϕ, 4W on the entry and upper level floors. Currently, the 208Y/120V panels on the entry and upper level (north end only) contain only spare breakers and spaces and are not being utilized. However, the lower level 208Y/120 emergency power is used to power the fire alarm system, battery charger, and jacket water system. The 480Y/277V panels primarily feed the egress lighting and lighting in essential spaces such as electrical and mechanical rooms.

The automatic transfer switch for stand-by power controls panel H1SS, 480Y/277V, 3ϕ, 4W which then distributes standby power to the south end of the building at 480Y/277V, 3ϕ, 4W and 208Y/120V 3ϕ, 4W via transformer T1SS. The north end of the building is also feed from H1SS. The main node for the north end of the building is panel H1NS which is where all standby power for the north end originates from. Similar to the emergency system, there are numerous panels that are currently not being used for the current design. The split system air conditioning systems are the main loads on stand-by power along with some receptacle and lighting loads.

Over-Current Devices

The service entrance switchgear utilizes a 2000A 3pole insulated case circuit breaker. The over current protection for the elevators is comprised of shunt-trip circuit breakers. Also, the panels feeding the metal and wood studios use shunt-trip circuit breakers. Distribution panel boards along with local lighting and appliance panel boards use circuit breakers for means of protection.

Location of Switchgear:

Major Electrical Equipment:

Equipment Tag	Type	Floor Level	Room Name	Room Number	1/8th Scale Dwg	Detail Drawing
Utility XFMR	Utility Transformer	Exterior Grade	N/A	N/A	E0.01	N/A
SWBD	Switchboard	Lower Level	Electrical Room	L121	E1.00	1-E3.00
Engine Generator	Emergency Generator	Exterior Grade	N/A	N/A	E0.01	N/A
ATS, Life Safety	Automatic Transfer Switch	Lower Level	Electrical Room	L121	E1.00	1-E3.00
ATS, Stand By	Automatic Transfer Switch	Lower Level	Electrical Room	L121	E1.00	1-E3.00
T1SA	Transformer	Lower Level	Electrical Room	L121	E1.00	1-E3.00
T1SB	Transformer	Lower Level	Electrical Room	L121	E1.00	1-E3.00
T1NA	Transformer	Lower Level	Electrical Closet	L118	E1.00	2-E3.00
T1NB	Transformer	Lower Level	Electrical Closet	L118	E1.00	*See Note
T2S	Transformer	Entry level	Electrical Closet	1129	E1.01	3-E3.00
T2N	Transformer	Entry level	Electrical Closet	1125	E1.01	4-E3.00
T3S	Transformer	Upper Level	Electrical Closet	2154	E1.02	5-E3.00
T3N	Transformer	Upper Level	Electrical Closet	2151	E1.02	6-3.00
T1SE	Transformer	Lower Level	Electrical Room	L121	E1.00	1-E3.00
T1SS	Transformer	Lower Level	Electrical Room	L121	E1.00	2-E3.00
T1NE	Transformer	Lower Level	Electrical Closet	L118	E1.00	2-E3.00
T1NS	Transformer	Lower Level	Electrical Closet	L118	E1.00	2-E3.00
H1NA	Distribution Panel	Lower Level	Electrical Closet	L118	E1.00	2-E3.00
H4N	Distribution Panel	Roof	AHU-2	N/A	E1.03	N/A
* Transformer T1NB not located on floor plans						

Lighting and Appliance Panel Boards:

See appendix A for the complete table of all lighting and appliance panel boards within the building. This table includes the voltage system, location, size, and relevant associated drawings for each piece of electrical equipment.

Power Factor Correction:

Power factor correction is implemented for all motor loads within the building. The power factor correction is integral with each motor to raise their power factors to more acceptable levels through the use of capacitors. Power factors on smaller motors, fractional horsepower, tend to have the worse factors. The power factor correction is specified through the mechanical division and the information is only found within the specifications.

Design Issues:

Safety in the metal, wood and other studio spaces is a priority. The ability to shut down the equipment easily and quickly was most likely a design consideration. Another consideration to the electrical design would be the future addition which would add 65,000 square feet to the existing 89,000 square foot building.

Lighting Loads:

A complete table can be found at appendix B. This table includes lamp, ballast, operating characteristics, mounting, and other information for each fixture used on the project. Additionally, the operating current and power factor for fluorescent fixtures was assumed to be the same.

All lighting within the building meets ASHRAE/IESNA 90.1 standards which stipulates the means in which lighting will be controlled and shut off. For offices, classrooms, and studios occupancy sensors are integrated into the controls to meet the automatic shut-off requirement. Lighting in corridors is controlled by a central time clock for the building. Finally, exterior lighting is controlled through a combination of time clock and also a photocell.

Cut Sheets for the ballasts of HID sources can be found in appendix C within this document.

Mechanical Loads:

A complete table can be found at appendix D. This table includes the equipment tag, description, load, voltage and phases, power factor and equivalent load in kilowatts for each mechanical, plumbing and architectural load on the project. Based on the specifications for the building, all motors greater than 10hp will have a power factor of 0.9. Furthermore, a power factor of 0.85 was assumed for all motors between 1hp and 10hp and finally, all fractional hp motors were assumed to have a power factor of 0.8.

Service Entrance Size:

Method 1 is primarily used during the conceptual and schematic phases. A total VA/ft^2 for the building is used based on the building type. The 98% growth factor arises from a future addition that would increase the buildings area by 73% along with a general 25% allowance for expansion.

Method 1: Square Foot Method		
Building Type: Classroom Building		8 kVA/ft^2
	Area (ft^2)	**kVA**
Lower Level	29,735	237.88
Entry Level	30,211	241.688
Upper Level	28,956	231.648
	Total kVA	711.22
	98% Growth Factor	696.9956
	Required Service Size	1408.2156
	Service Entrance Size	1,600A

Method 2 is used during the design development of the project. It makes use of the NEC building design loads along with demand factors for those loads. The design loads are still based off of the square footage of the building. Demand factors are applied to obtain the demand load for the building receptacles. The interior lighting Volt-Amp allowance was obtained through a preliminary design calculation performed by the design team. While, the lighting demand factor was obtained through NEC table 220.42. The computer load and lab load demand factor was assumed to be 0.6 to adjust for their intermittent use. The 98% growth factor arises from a future addition that would increase the buildings area by 73% along with a general 25% allowance for expansion.

Method 2: Square Foot & Actual Load Method

		Area (ft^2)	Demand Factor	Demand kVA
Receptacles	1 VA/ft^2	88,902	first 10kVA 1.0 Remainder 0.5	49.450
Fans/Pumps	2 VA/ft^2	88,902	0.8	142.243
Heating& Cooling	7 VA/ft^2	88,902	0.8	497.851
Interior Lighting	1.5VA/ft^2	88,902	1	133.353
Computer Loads	6 VA/ft^2	6,667	0.6	40.002
Lab Loads	10 VA/ft^2	16,823	0.6	100.938

Total kVA	963.837
98% Growth Factor	944.56026
Required Service Size	1908.397
Service Entrance Size	2,000A

Method 3 is utilized during the working drawings phase and until construction is completed. It only uses the actual loads within the building. For the purposes of this report I did not summate each individual piece of equipment, but instead used the connected load for each circuit from the panel board schedules. The lighting demand factor was obtained through NEC table 220.42. Meanwhile, the architectural and elevator demand factors were assumed based on frequency of use. The 98% growth factor arises from a future addition that would increase the buildings area by 73% along with a general 25% allowance for expansion.

Method 3: Actual Load Method

Load Description	Load (kW)	Demand Factor	Demand kVA
Lighting	177.398	1	177.398
Receptacles	400.544	first 10kVA 1.0 Remainder 0.5	205.28
Mechanical Equipment	512.577	0.8	410.08
Architectural + Misc. Loads	30.986	1	30.986
Elevators	97.4	0.25	24.35
		Total kVA	848.094
		98% Growth Factor	831.13212
		Required Service Size	1679.22612
		Service Entrance Size	2,000A

Utility Company Information:

Name: Dominion Virginia Power

Correspondence Address:

Dominion Virginia Power
P.O. Box 26666
Richmond, VA 23261

Corporate Office Address:

Dominion Virginia Power
120 Tredegar Street
Richmond VA 23219

Website: http://www.dom.com/about/companies/vapower/index.jsp

Utility Rate information:

Metering is done at a single point for the campus. I was unable to get in contact with a representative from either the universities' facilities management or from Dominion Virginia Power. I had called both contacts on multiple occasions without success. From the available utility rates provided on DVP's website I have made my best estimation on which rate is most appropriate for the campus and building. Please note that this was done for educational purposes only.

Schedule GS-3 has been selected as the utility rate structure. This rate is for large secondary voltage service from the utility company. For a customer to be eligible for this structure their peak demand must reach above 500kW during at least 3 billing months within the current and previous 11 months or for new service the anticipated demand is above 500kW.

For more detailed information regarding the utility rate structure refer to appendix E. This information contains additional requirements, the electricity supply service charges and determinations of peak hours and demand loads.

Communication Systems:

Fire Alarm:

The building is protected by a combined standpipe and sprinkler system. The standpipe is an automatic wet-type class I. Meanwhile, both wet-pipe and pre-action sprinklers are used in the building. The system is comprised of addressable fire detection equipment, the ability to alarm a central campus monitoring system and finally, an automatic control to shut down air handling equipment associated to the area that signaled the fire protection system.

Telecommunications:

The Art & Visual Technology building ties into the campus telecommunications system via a 4" underground duct which connects into the existing system at the north end of the site. The 4" duct runs into the main telecommunications room which is on the lower level. Cable trays run the along the length of the corridors above the accessible ceiling. Combination voice/data outlets are located in practically all spaces. In most studio spaces these are mounted in floor boxes. The digital studios and graphic design are two areas of extensive telecommunication services where there is a combination outlet for every seat in the room. Four 4" sleeves in the main telecomm room provide vertical transportation of telecommunications.

Security System:

System comprises of a card reader at the entrance to the building and door contracts at all entrances along with at all entrances into stairwells. Finally electric strike system utilized at main and back entrance to the building.

Single Line Diagram:

The single line diagram can be found at appendix F within this document. The single line diagram shows the key elements, layout and sizes of the electrical distribution system and related equipment for the Art & Visual Technology building. The associated feeder schedule for the single line diagram can be found at appendix G of this report.

Appendix A

Equipment Tag	Type	Voltage System	Main Size	Floor Level	Room Name	Room Number	Plan Drawing
L1N	Lighting Contr	480Y/277V, 3	60A	Lower level	*Electrical Clo	L118	2-E3.00
L2N	Lighting Contr	480Y/277V, 3	60A	Entry level	Electrical Clos	1125	4-E3.00
L3N	Lighting Contr	480Y/277V, 3	60A	Upper level	Electrical Clos	2151	6-E3.00
D1S	Dimming Pan	480Y/277V, 3	30A	Lower level	Electrical Roo	L121	1-E3.00
D2N1	Dimming Pan	208Y/120V, 3	60A	Entry level	Gallery Suppo	1002	E1.01
D2N2	Dimming Pan	208Y/120V, 3	60A	Entry level	Gallery Suppo	1002	E1.01
D3S	Dimming Pan	480Y/277V, 3	30A	Upper level	Electrical Clos	2154	5-E3.00
H1NB	Lighting Pane	480Y/277V, 3	100A	Lower level	Electrical Clos	L118	2-E3.00
H1SA	Lighting & Ap	480Y/277V, 3	225A	Lower level	Electrical Roo	L121	1-E3.00
H2SA	Lighting & Ap	480Y/277V, 3	400A	Entry level	Electrical Clos	1129	3-E3.00
H3SA	Appliance	480Y/277V, 3	400A	Upper level	Electrical Clos	2154	5-E3.00
H3SB	Lighting Pane	480Y/277V, 3	100A	Upper level	Electrical Clos	2154	5-E3.00
H1NC	Appliance	480Y/277V, 3	400A	Lower level	Mech Room	L126	E1.00
H2NA	Lighting Pane	480Y/277V, 3	400A	Entry level	Electrical Clos	1125	4-E3.00
H3NA	Lighting Pane	480Y/277V, 3	225A	Upper level	Electrical Clos	2151	6-E3.00
H3NB	Lighting Pane	480Y/277V, 3	100A	Upper level	Electrical Clos	2151	6-E3.00
R1SA	Appliance	208Y/120V, 3	400A	Lower level	Electrical Roo	L121	1-E3.00
R1SB	Appliance	208Y/120V, 3	400A	Lower level	Electrical Roo	L121	1-E3.00
R1SC	Appliance	208Y/120V, 3	225A	Lower level	Stone Plaster	L007A	E1.00
R1SD	Appliance	208Y/120V, 3	100A	Lower level	Wood Studio	L006	E1.00
R1SF	Lighting & Ap	208Y/120V, 3	225A	Lower level	Drying/Work A	L013	E1.00
R2SA	Lighting & Ap	208Y/120V, 3	400A	Entry level	Electrical Clos	1129	3-E3.00
R2SB	Lighting & Ap	208Y/120V, 3	100A	Entry level	Print Making S	1009	E1.01
R2SD	Appliance	208Y/120V, 3	100A	Entry level	Graphics Des	1020	E1.01
R2SF	Appliance	208Y/120V, 3	100A	Entry level	Digital Studio	2021	E1.01
R3SA	Lighting & Ap	208Y/120V, 3	400A	Upper level	Electrical Clos	2154	5-E3.00
R3SB	Appliance	208Y/120V, 3	100A	Upper level	Painting Studi	2044	E1.02
R1NA	Lighting & Ap	208Y/120V, 3	400A	Lower level	Electrical Clos	L118	2-E3.00
R1NB	Appliance	208Y/120V, 3	225A	Lower level	Fundamental/	L003	E1.00
R1NC	Appliance	208Y/120V, 3	400A	Lower level	Mech Room	L126	E1.00
R1ND	Appliance	208Y/120V, 3	100A	Lower level	Digital Photo I	L016	E1.00
R1NF	Appliance	208Y/120V, 3	100A	Lower level	Photo Lighting	L017	E1.00
R1NG	Appliance	208Y/120V, 3	100A	Lower level	Clean/fabricat	L005A	E1.00
R1NH	Appliance	208Y/120V, 3	100A	Lower level	Undergrad St	L005A	E1.00
R2NA	Lighting & Ap	208Y/120V, 3	400A	Entry level	Electrical Clos	1125	4-E3.00
R2ND	Appliance	208Y/120V, 3	100A	Entry level	Web Design S	1123	E1.01
R2NF	Appliance	208Y/120V, 3	225A	Entry level	Gallery Suppo	1002	E1.01
R3NA	Lighting & Ap	208Y/120V, 3	400A	Upper level	Electrical Clos	2151	6-E3.00
R3NB	Appliance	208Y/120V, 3	100A	Upper level	Drawing Studi	2047	E1.02
R3NC	Appliance	208Y/120V, 3	100A	Upper level	Model Classro	2002	E1.02
R3ND	Appliance	208Y/120V, 3	100A	Upper level	Model Classro	2001	E1.02
H1SE	Lighting Pane	480Y/277V, 3	60A	Lower level	Electrical Clos	L121	1-E3.00
H2SE	Spare Panel	480Y/277V, 3	100A	Entry level	Electrical Clos	1129	3-E3.00

R1SE	Appliance	208Y/120V, 3	100A	Lower level	Electrical Clos	L121	1-E3.00
R2SE	Spare Panel	208Y/120V, 3	100A	Entry level	Electrical Clos	1129	3-E3.00
H1SS	Lighting Pane	480Y/277V, 3	100A	Lower level	Electrical Clos	L121	1-E3.00
H2SS	Spare Panel	480Y/277V, 3	100A	Entry level	Electrical Clos	1129	3-E3.00
R1SS	Appliance	208Y/120V, 3	100A	Lower level	Electrical Clos	L121	1-E3.00
R2SS	Appliance	208Y/120V, 3	100A	Entry level	Electrical Clos	1129	3E-1.00
H1NE	Lighting Pane	480Y/277V, 3	100A	Lower level	Electrical Clos	L118	2-E3.00
H2NE	Lighting Pane	480Y/277V, 3	100A	Entry level	Electrical Clos	1125	4E-1.00
H3NE	Lighting Pane	480Y/277V, 3	100A	Upper level	Electrical Clos	2151	6-E3.00
R1NE	Appliance	208Y/120V, 3	100A	Lower level	Electrical Clos	L118	2-E3.00
R2NE	Spare Panel	208Y/120V, 3	100A	Entry level	Electrical Clos	1125	4E-1.00
R3NE	Spare Panel	208Y/120V, 3	100A	Upper level	Electrical Clos	2151	6-E3.00
H1NS	Appliance	480Y/277V, 3	100A	Lower level	Electrical Clos	L118	2-E3.00
H2NS	Spare Panel	480Y/277V, 3	100A	Entry level	Electrical Clos	1125	4E-1.00
H3NS	Spare Panel	480Y/277V, 3	100A	Upper level	Electrical Clos	2151	6-E3.00
R1NS	Appliance	208Y/120V, 3	100A	Lower level	Electrical Clos	L118	2-E3.00
R2NS	Appliance	208Y/120V, 3	100A	Entry level	Electrical Clos	1125	4E-1.00
R3NS	Appliance	208Y/120V, 3	100A	Upper level	Electrical Clos	2151	6-E3.00

* Lighting Control Panel Schedule states this is located in the gallery rather then the lower level electrical closet L118.

Appendix B

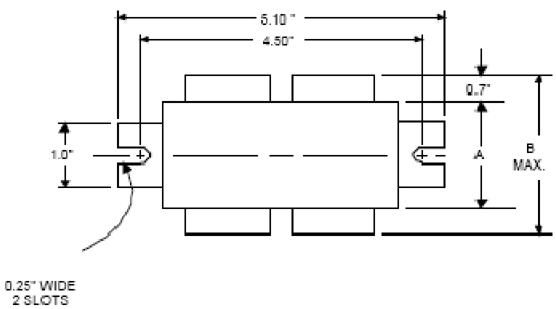
Luminaire Schedule												
Fixture Tag	Mounting	Lamp Type	Lamp Wattage	# of Lamps	Ballast Type	Operating Voltage	Fixture Watts	Ballast Factor	Starting Current	Operating Current	Starting Power Factor	Operating Power Factor
A	CABLE	T8	32	2	Electronic	277	63	0.88		0.23		0.99
AE	CABLE	T8	32	2	Electronic	277	63	0.88		0.23		0.99
B	STEM	PLT CF	32	6	(3)Electronic	277	228	1		0.84		0.98
C	SURFACE	PLT CF	32	1	Electronic	277	38	1.05		0.14		0.98
DW	TRACK	HALOGEN	100	1	none	120	100	n/a		0.83		1
DS	TRACK	HALOGEN	100	1	none	120	100	n/a		0.83		1
F	SEMI-RECESSED	T5 HO	24	1	DIMMING Electric	277	36	1		0.13		0.95
F1	SEMI-RECESSED	T5 HO	24	1	Electronic	277	27	1.02		0.1		0.98
G	SURFACE	T8	32	4	Electronic	277	121	0.88		0.45		0.99
H	CABLE	T8	32	2	DIMMING Electric	277	68	1		0.25		0.99
HE	CABLE	T8	32	2	Electronic	277	63	0.88		0.23		0.99
J	PEDNANT	PLT CF	42	1	Electronic	277	49	1.05		0.18		0.99
K4	WALL	T5 HO	54	1	Electronic	277	62	0.99		0.24		0.98
K8	WALL	T5 HO	54	2	Electronic	277	117	0.99		0.43		0.98
L	RECESSED	PLT CF	32	1	Electronic	277	36	0.98		0.31		0.98
LE	RECESSED	PLT CF	32	1	Electronic	277	36	0.98		0.31		0.98
LD	RECESSED	PLT CF	42	1	Electronic	277	49	1.05		0.18		0.99
LW	RECESSED	PLT CF	32	1	Electronic	277	36	0.98		0.31		0.98
LWE	RECESSED	PLT CF	32	1	Electronic	277	36	0.98		0.31		0.98
M	COLUMN-MOUNT	CMH	50	4	(4) Electronic	277	220	1	0.35	0.3	0.9	0.9
N	RECESSED	T8	32	2	Electronic	277	63	0.88		0.23		0.99
NE	RECESSED	T8	32	2	Electronic	277	63	0.88		0.23		0.99
Q	RECESSED	T8	32	2	Electronic	277	63	0.88		0.23		0.99
R	STEM	T8	32	2	Electronic	277	63	0.88		0.23		0.99
S2	SURFACE	INCAN	15 + 100	1 + 1	none	120	115	n/a		0.96		1
S3	SURFACE WALL	T5	6	2	Magnetic	120	21	0.75		0.44		0.4
T	WALL	PLT CF	42	2	Electronic	277	98	1		0.36		0.98
U	SURFACE	PLT CF	32	1	Electronic	277	38	1.05		0.14		0.98
V	SURFACE	PLT CF	32	1	Electronic	277	38	1.05		0.14		0.98
V1	SURFACE	PLT CF	32	2	Electronic	277	63	0.88		0.23		0.99
W	SURFACE	T8	32	1	Electronic	120	35	0.95		0.32		0.91
X1	CONCRETE BASE	CMH	150	1		277	185	1	0.42	0.7	0.9	0.9
X3	IN-GROUND	CMH	35	1		277	56	1	0.25	0.24	0.9	0.9
X4	IN-GROUND	PLT CF	32	1	Electronic	277	38	1.05		0.14		0.98
X5	RECESSED	PLT CF	32	1	Electronic	277	38	1.05		0.14		0.98
Y	SURFACE CEILING	T8	32	2	Electronic	277	63	0.88		0.23		0.99

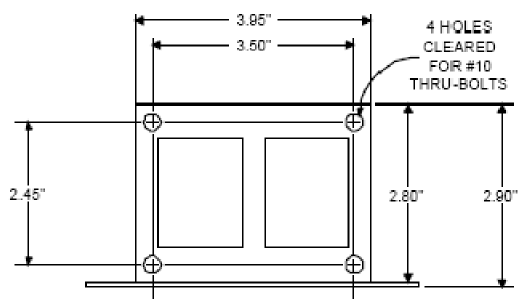
Appendix C

ADVANCE	Metal Halide Lamp Ballast	Catalog Number 71A5482 For 150W M102/M142 60 Hz HX-HPF Status: Active

DIMENSIONS AND DATA

3 X 4 CORE - 2 COIL UNIT



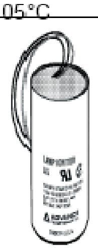


INPUT VOLTS		120	277			
CIRCUIT TYPE	HX-HPF					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±5%					
Lamp Watts	±12%					
LINE CURRENT (Amps)						
Operating		1.60	0.70			
Open Circuit		3.65	1.58			
Starting		0.95	0.42			
UL TEMPERATURE RATINGS						
Insulation Class	H(180°C)					
Coil Temperature Code	1029	C	B			
MIN. AMBIENT STARTING TEMP.	-20°F or -30°C					
NOM. OPEN CIRCUIT VOLTAGE	265					
INPUT VOLTAGE AT LAMP DROPOUT		90	208			
INPUT WATTS	185					
RECOMMENDED FUSE (Amps)		10	4			
CORE and COIL						
Dimension (A)	2.25					
Dimension (B)	3.87					
Weight (lbs.)	7					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	16.0					
Volts (min.)	280					
Fault Current Withstand (amps)						
60 Hz TEST PROCEDURES (Refer to Advance Test Procedure for HID Ballasts - Form 1270)						
High Potential Test (Volts)						
1 minute	2000					
2 seconds	2500					
Open Circuit Voltage Test (Volts)	235-290					
Short-Circuit Current Test (Amps)						
Secondary Current	2.05-2.55					
Input Current		1.20	0.50	-	-	-
		1.90	0.80			

Capacitor: 7C160M30

Capacitance: 16
Dia/Oval Dim: 1.5
Height: 3.75
Temp Rating: 105°C

Ignitor: LI533-H4



Ballast to Lamp Distance (BTL) = 10 feet
Temp Rating: 105°C

Wiring Diagram:

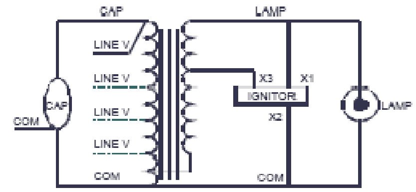


Fig. K3

U.L. RECOGNIZED

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500D.	Ballast With Ignitor and Dry Film Capacitor
510D.	Ballast w/Welded Bracket, Ignitor, & Dry Film Capacitor
600.	Ballast and Ignitor, No Capacitor
610.	Ballast with Welded Bracket and Ignitor, No Capacitor

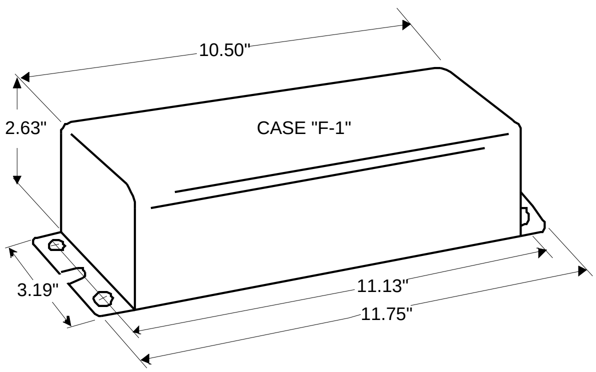
Data is based upon tests performed by Advance Transformer in a controlled environment and representitive of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice.

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

05/19/05

Metal Halide Lamp Ballast	**Catalog Number 72C5181** **For 50W M110** **60 Hz HX-HPF** **Status: Active**

DIMENSIONS AND DATA



INPUT VOLTS		120	277			
CIRCUIT TYPE	HX-HPF					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±5%					
Lamp Watts	±10%					
LINE CURRENT (Amps)						
Operating..		0.65	0.30			
Open Circuit..		1.15	0.50			
Starting...		0.80	0.35			
UL TEMPERATURE RATINGS						
Insulation Class	A (105°C)					
Coil Temperature Code	1029	A	A			
MIN. AMBIENT STARTING TEMP.	-20°F or -30°C					
NOM. OPEN CIRCUIT VOLTAGE	254					
INPUT VOLTAGE AT LAMP DROPOUT..........................		90	208			
INPUT WATTS	72					
RECOMMENDED FUSE (Amps)....................................		3	2			
CORE and COIL						
Dimension (A)						
Dimension (B)						
Weight (lbs.)	9					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads						
Volts (min.)						
Fault Current Withstand (amps)						
60 Hz TEST PROCEDURES (Refer to Advance Test Procedure for HID Ballasts - Form 1270)						
High Potential Test (Volts)						
1 minute	1600					
2 seconds	2000					
Open Circuit Voltage Test (Volts)	230-280					
Short-Circuit Current Test (Amps)						
Secondary Current	0.70-0.85					
Input Current...		0.25	0.10	-	-	-
		0.45	0.20			

Capacitor:

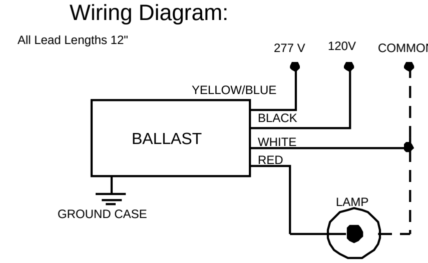
The capacitor is included as part of the potted assembly.

Ignitor: IN CAN

The ignitor is included as part of the potted assembly.

Ballast to Lamp Distance
(BTL) = 25 feet
Temp Rating: 90°C

Wiring Diagram:



F-Can Wiring Diagram

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description

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

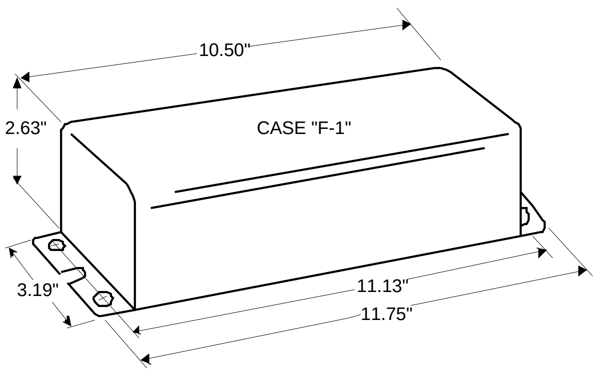
ADVANCE

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

01/25/00

ADVANCE	**Metal Halide Lamp Ballast**	**Catalog Number 72C5081** **For 35/39W M130** **60 Hz HX-HPF** **Status: Active**

DIMENSIONS AND DATA



INPUT VOLTS		120	277			
CIRCUIT TYPE	HX-HPF					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±5%					
Lamp Watts	±10%					
LINE CURRENT (Amps)						
Operating..		0.53	0.24			
Open Circuit..		0.95	0.40			
Starting..		0.55	0.25			
UL TEMPERATURE RATINGS						
Insulation Class	A (105°C)					
Coil Temperature Code	1029	A	A			
MIN. AMBIENT STARTING TEMP.	-20°F or -30°C					
NOM. OPEN CIRCUIT VOLTAGE	255					
INPUT VOLTAGE AT LAMP DROPOUT..........................		90	208			
INPUT WATTS	56					
RECOMMENDED FUSE (Amps)....................................		3	1			
CORE and COIL						
Dimension (A)						
Dimension (B)						
Weight (lbs.)	9					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads						
Volts (min.)						
Fault Current Withstand (amps)						
60 Hz TEST PROCEDURES (Refer to Advance Test Procedure for HID Ballasts - Form 1270)						
High Potential Test (Volts)						
1 minute	1600					
2 seconds	2000					
Open Circuit Voltage Test (Volts)	235-285					
Short-Circuit Current Test (Amps)						
Secondary Current	0.60-0.75					
Input Current...		0.30	0.14	-	-	-
		0.50	0.21			

Capacitor:

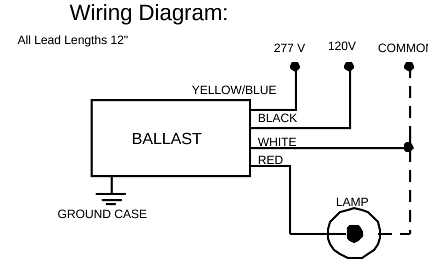
The capacitor is included as part of the potted assembly.

Ignitor: IN CAN

The ignitor is included as part of the potted assembly.

Ballast to Lamp Distance (BTL) = 10 feet
Temp Rating: 90°C

Wiring Diagram:



F-Can Wiring Diagram

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description

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

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

10/11/99

Appendix D

MECHANICAL EQUIPMENT SCHEDULE						
EQUIPMENT TAG	DESCRIPTION	LOAD	FLA	VOLTAGE & PHASE	POWER FACTOR	EQUIVALENT LOAD (KW)
F-1-1A	AHU-1 SUPPLY FAN	75HP	96	480V, 3ϕ	0.9	71.83161109
F-1-1B	AHU-1 SUPPLY FAN	75HP	96	480V, 3ϕ	0.9	71.83161109
F-1-2	AHU-1 RETURN FAN	40HP	52	480V, 3ϕ	0.9	38.90878934
F-2-1A	AHU-2 SUPPLY FAN	30HP	40	480V, 3ϕ	0.9	29.92983795
F-2-1B	AHU-2 SUPPLY FAN	30HP	40	480V, 3ϕ	0.9	29.92983795
F-3-1A	EXHAUST FAN	40HP	52	480V, 3ϕ	0.9	38.90878934
F-3-1B	EXHAUST FAN	40HP	52	480V, 3ϕ	0.9	38.90878934
P-AHU-1	COIL CRICULATION PUMP	3/4HP	1.6	480V, 3ϕ	0.8	1.064172016
P-AHU-2	COIL CRICULATION PUMP	3/4HP	1.6	480V, 3ϕ	0.8	1.064172016
EF-1	EXHAUST FAN	1HP	2.1	480V, 3ϕ	0.85	1.484021132
EF-2	EXHAUST FAN	1/2HP	1.1	480V, 3ϕ	0.8	0.731618261
EF-3	EXHAUST FAN	1/3HP	7.2	120V, 1ϕ	0.8	0.6912
EF-4	EXHAUST FAN	1/6HP	4.4	120V, 1ϕ	0.8	0.4224
ACU-1	ACU-1 (INDOOR)	.33A	0.33	208V, 1ϕ	0.8	0.06864
ACCU-1	ACCU-1 (OUTDOOR)	25A	25	208V, 1ϕ	0.8	5.2
ACU-2	ACU-2 (INDOOR)	.52A	0.52	208V, 1ϕ	0.8	0.10816
ACCU-2	ACCU-2 (OUTDOOR)	12.8A	12.8	208V, 1ϕ	0.8	2.6624
ACU-3	ACU-3 (INDOOR)	.33A	0.33	208V, 1ϕ	0.8	0.06864
ACCU-3	ACCU-3 (OUTDOOR)	13A	13	208V, 1ϕ	0.8	2.704
ACU-4	ACU-4 (INDOOR)	.33A	0.33	208V, 1ϕ	0.8	0.06864
ACCU-4	ACCU-4 (OUTDOOR)	13A	13	208V, 1ϕ	0.8	2.704
ACU-5	ACU-5 (INDOOR)	.33A	0.33	208V, 1ϕ	0.8	0.06864

ACCU-5	ACCU-5(OUTDOOR)	13A	13	208V, 1ϕ	0.8	2.704
FCU-1	FAN COOLING UNIT	3/4HP	1.6	480V, 3ϕ	0.8	1.064172016
CUH-1	CABINET UNIT HEATER	1/3HP	7.2	120V, 1ϕ	0.8	0.6912
CUH-2	CABINET UNIT HEATER	1/3HP	7.2	120V, 1ϕ	0.8	0.6912
CUH-3	CABINET UNIT HEATER	1/6HP	4.4	120V, 1ϕ	0.8	0.4224
CUH-4	CABINET UNIT HEATER	1/6HP	4.4	120V, 1ϕ	0.8	0.4224
CUH-5	CABINET UNIT HEATER	1/6HP	4.4	120V, 1ϕ	0.8	0.4224
CUH-6	CABINET UNIT HEATER	1/6HP	4.4	120V, 1ϕ	0.8	0.4224
CUH-7	CABINET UNIT HEATER	1/3HP	7.2	120V, 1ϕ	0.8	0.6912
CUH-8	CABINET UNIT HEATER	1/6HP	4.4	120V, 1ϕ	0.8	0.4224
UH-1	UNIT HEATER	1/20HP	4.4	120V, 1ϕ	0.8	0.4224
F-FA-1	FUME ARM FANS	2HP	3.4	480V, 3ϕ	0.85	2.40270088
F-FA-2	FUME ARM FANS	2HP	3.4	480V, 3ϕ	0.85	2.40270088

PLUMBING EQUIPMENT SCHEDULE

EQUIPMENT TAG	DESCRIPTION	LOAD	AMPS (FOR MOTOR LOADS)	VOLTAGE & PHASE	POWER FACTOR	EQUIVALENT LOAD (KW)
P-AC-1	AIR COMPRESSOR	30HP	40	480V, 3ϕ	0.9	29.92983795
P-AC-2	AIR COMPRESSOR	30HP	40	480V, 3ϕ	0.9	29.92983795
DC-1	DUST COLLECTOR	5HP	7.6	480V, 3ϕ	0.85	5.370743144
DWH-1	WATER HEATER	20A	20	120V, 1ϕ	0.8	2.4
P-DWHR-1	RECIRCULATION PUMP	1/2HP	9.8	120V, 1ϕ	0.8	0.9408
P-HW-1	HEATING WATER PUMP	15HP	21	480V, 3ϕ	0.9	15.71316493
P-HW-2	HEATING WATER PUMP	15HP	21	480V, 3ϕ	0.9	15.71316493
WATER COOLER (4)		1/5HP	5.1	120V, 1ϕ	0.8	0.4896

ELEVATOR SUMP PUMP		1/2HP	9.8	120V, 1ϕ	0.8	0.9408

ARCHITECTURAL EQUIPMENT SCHEDULE

EQUIPMENT TAG	DESCRIPTION	LOAD	AMPS (FOR MOTOR LOADS)	VOLTAGE & PHASE	POWER FACTOR	EQUIVALENT LOAD (KW)
ELEVATOR #1		50HP	65	480V, 3ϕ	0.9	48.63598668
ELEVATOR #2		40HP	52	480V, 3ϕ	0.9	38.90878934

Schedule GS-3
LARGE GENERAL SERVICE
SECONDARY VOLTAGE

I. APPLICABILITY

A. Except as modified herein, this schedule is applicable only to a non-residential secondary voltage Customer (as defined in Paragraph XI.) who elects to receive Electricity Supply Service and Electric Delivery Service from the Company and whose peak measured demand has reached or exceeded 500 kW during at least three billing months within the current and previous 11 billing months.

B. For a Customer served under this schedule whose peak measured demand has decreased to less than 500 kW, this schedule shall remain applicable to the Customer and the Customer shall not have the option to purchase electricity under Schedule GS-1, GS-2 or GS-2T until such time the maximum measured demand has remained at less than 500 kW during all billing months within the current and previous 11 billing months.

C. Notwithstanding any other provisions of this schedule, if a Customer: (1) received or was eligible to receive service under this schedule during the preceding 24 months; (2) installed and began operating bona fide automated load management equipment or high-efficiency equipment which replaces standard-efficiency equipment; and (3) is currently ineligible for service under Paragraphs I.A. and I.B. because of the installation and operation of such equipment, then the customer shall be eligible for service under this schedule. Once service is provided under this Paragraph I.C., service may continue to be supplied under this schedule only so long as the Customer regularly operates such equipment in a bona fide manner. The type and design of such equipment must be approved by the Company and the equipment shall be subject to inspection by the Company.

D. At such time the Customer no longer meets the above applicability requirements, the Customer will remain on this schedule for the period (not exceeding two additional billing months) required to achieve an orderly transfer to the applicable schedule.

E. For new service, this schedule is applicable when the anticipated kW demand meets the criteria of Paragraph I.A., above.

(Continued)

Schedule GS-3
LARGE GENERAL SERVICE
SECONDARY VOLTAGE

II. 30-DAY RATE

A. Distribution Service Charges

1. Basic Customer Charge
Basic Customer Charge $119.80 per billing month.

2. Plus Distribution Demand Charge
All kW of Distribution Demand @ $2.120 per kW

3. Plus rkVA Demand Charge @ $0.15 per rkVA

B. Electricity Supply Service Charges

1. On-Peak Electricity Supply Demand Charge
All On-Peak kW @ $12.154 per kW

2. Plus Off-Peak Electricity Supply Demand Charge
All Off-Peak kW @ $0.656 per kW

3. Plus Electricity Supply Adjustment Demand Charge
All kW of Demand @ ($0.640) per kW

4. Plus Electricity Supply kWh Charge
All On-peak kWh @ 0.404¢ per kWh
All Off-peak kWh @ 0.272¢ per kWh

5. Each Electricity Supply kilowatthours used are subject to Fuel Charge Rider A.

C. The minimum charge shall be as may be contracted for.

(Continued)

Schedule GS-3
LARGE GENERAL SERVICE
SECONDARY VOLTAGE

(Continued)

III. DETERMINATION OF ON-PEAK AND OFF-PEAK HOURS

The following on-peak and off-peak hours are applicable to the billing of all charges stated in this schedule.

A. On-peak hours are as follows:

1. For the period of June 1 through September 30, 10 a.m. to 10 p.m., Mondays through Fridays.

2. For the period of October 1 through May 31, 7 a.m. to 10 p.m., Mondays through Fridays.

B. All hours not specified in III.A. are off-peak.

IV. DETERMINATION OF DISTRIBUTION DEMAND

A. The Distribution Demand billed under Paragraph II.A.2. shall be such as may be contracted for but not less than the highest of:

1. The highest average kW measured at the location during any 30-minute interval of the current and previous 11 billing months.

2. 500 kW.

B. When the Customer's power factor is less than 85 percent, a minimum Distribution Demand of not less than 85 percent of the Customer's maximum kVA demand may be established.

V. DETERMINATION OF rkVA DEMAND

The rkVA of demand billed shall be the highest average rkVA measured in any 30-minute interval during the current billing month.

(Continued)

Schedule GS-3
LARGE GENERAL SERVICE
SECONDARY VOLTAGE

(Continued)

VI. DETERMINATION OF ON-PEAK ELECTRICITY SUPPLY DEMAND

The kW of demand billed under II.B.1. shall be the highest of:

A. The highest average kW measured in any 30-minute interval of the current billing month during on-peak hours.

B. Seventy-five percent of the highest kW of demand at this location as determined under VI.A., above, during the billing months of June through September of the preceding 11 billing months.

C. 100 kW.

VII. DETERMINATION OF OFF-PEAK ELECTRICITY SUPPLY DEMAND

The kW of demand billed under Paragraph II.B.2. shall be the off-peak demand which is in excess of 90% of the On-Peak Electricity Supply Demand determined under Paragraph VI.

VIII. DETERMINATION OF ELECTRICITY SUPPLY ADJUSTMENT DEMAND

This credit is required in order to achieve customer bill neutrality, arising from changes to the Distribution Demand Charge while maintaining the overall capped rates. The kW of demand billed under Paragraph II.B.3. shall be the Distribution Demand determined under Paragraph IV.

IX. METER READING AND BILLING

When the actual number of days between meter readings is more or less than 30 days, the Basic Customer Charge, the Distribution Demand Charge, the rkVA Demand Charge, the On-Peak Electricity Supply Demand Charge, the Off-Peak Electricity Supply Demand Charge, the Electricity Supply Adjustment Demand Charge, and the minimum charge of the 30-day rate will each be multiplied by the actual number of days in the billing period and divided by 30.

(Continued)

Schedule GS-3
LARGE GENERAL SERVICE
SECONDARY VOLTAGE

(Continued)

X. STANDBY, MAINTENANCE OR PARALLEL OPERATION SERVICE

A Customer requiring standby, maintenance or parallel operation service may elect service under this schedule provided the Customer contracts for the maximum kW which the Company is to supply. Standby, maintenance or parallel operation service is subject to the following provisions:

A. Suitable relays and protective apparatus shall be furnished, installed, and maintained at the Customer's expense in accordance with specifications furnished by the Company. The relays and protective equipment shall be subject, at all reasonable times, to inspection by the Company's authorized representative.

B. In case the Distribution Demand determined under Paragraph IV. exceeds the contract demand, the contract demand shall be increased by such excess demand.

C. The demand billed under II.A.2. and II.B.3. shall be the contract demand.

XI. DEFINITION OF TRANSMISSION, PRIMARY AND SECONDARY VOLTAGE CUSTOMER

A. A transmission voltage Customer is any Customer whose delivery voltage is 69 kV or above.

B. A primary voltage Customer is any Customer (a) served from a circuit of 69 kV or more where the delivery voltage is 4,000 volts or more, (b) served from a circuit of less than 69 kV where Company-owned transformation is not required at the Customer's site, (c) where Company-owned transformation has become necessary at the Customer's site because the Company has changed the voltage of the circuit from that originally supplied, or (d) at a location served prior to October 27, 1992 where the Customer's connection to the Company's facilities is made at 2,000 volts or more.

C. A secondary voltage Customer is any Customer not defined in XI.A. or XI.B. as a transmission or primary voltage Customer.

(Continued)

Schedule GS-3
LARGE GENERAL SERVICE
SECONDARY VOLTAGE

(Continued)

XII. TERM OF CONTRACT

The contract shall be open order unless (a) standby, maintenance or parallel operation service is provided, or (b) the Customer or the Company requests a written contract. In such cases, the term of contract for the purchase of electricity under this schedule shall be as mutually agreed upon, but for not less than one year. During the minimum term of applicability, the Customer may be billed under the corresponding Unbundled Rate Schedule, Schedule GS-3U, if applicable.

Appendix G

FEEDER SCHEDULE															
				CONDUIT (PER SET)		CONDUCTORS (PER SET)									
			NO. OF			PHASE CONDUCTORS			NEUTRAL CONDUCTORS			GROUND CONDUCTORS			
TAG	FROM	TO	SETS	SIZE	TYPE	No.	SIZE	TYPE	No.	SIZE	TYPE	No.	SIZE	TYPE	REMARKS
1	UTILITY XFMR	SWBD	6	4	EMT	3	400KCMIL	CU-THWN	1	400KCMIL	CU-THWN	1	250KCMIL	CU-THWN	
2	GENERATOR	LIFE SAFETY ATS	1	4	EMT	3	#4	CU-THWN	1	#4	CU-THWN	1	#8	CU-THWN	
3	GENERATOR	STANDBY ATS	1	4	EMT	3	#1	CU-THWN	1	#1	CU-THWN	1	#6	CU-THWN	
4	SWBD	LIFE SAFETY ATS	1	1-1/4	EMT	3	#4	CU-THWN	1	#4	CU-THWN	1	#8	CU-THWN	
5	SWBD	STANDBY ATS	1	1-1/2	EMT	3	#1	CU-THWN	1	#1	CU-THWN	1	#6	CU-THWN	
6	SWBD	PANEL H1SA	1	2	EMT	3	#4/0	CU-THWN	1	#4/0	CU-THWN	1	#4	CU-THWN	
7	SWBD	PANEL H2SA	1	3	EMT	3	500KCMIL	CU-THWN	1	500KCMIL	CU-THWN	1	#1/0	CU-THWN	
8	SWBD	PANEL H3SA	1	4	EMT	3	600KCMIL	CU-THWN	1	600KCMIL	CU-THWN	1	#3	CU-THWN	
9	SWBD	XFMR T1SB	1	2	EMT	3	#3/0	CU-THWN	0	#3/0	CU-THWN	1	#6	CU-THWN	
10	SWBD	PANEL H1NA	3	4	EMT	3	400KCMIL	CU-THWN	1	400KCMIL	CU-THWN	1	#2/0	CU-THWN	
11	SWBD	PANEL H1NC	1	3	EMT	3	350KCMIL	CU-THWN	1	350KCMIL	CU-THWN	1	#4	CU-THWN	
12	SWBD	ELEVATOR #1	1	2	EMT	3	#1/0	CU-THWN	0	#1/0	CU-THWN	1	#6	CU-THWN	
13	SWBD	ELEVATOR #2	1	1-1/4	EMT	3	#3	CU-THWN	0	#3	CU-THWN	1	#8	CU-THWN	
14	PANEL H3SA	DIM PANEL D3S	1	1	EMT	3	#10	CU-THWN	1	#10	CU-THWN	1	#10	CU-THWN	
15	PANEL H1SA	DIM PANEL D1S	1	1	EMT	3	#10	CU-THWN	1	#10	CU-THWN	1	#10	CU-THWN	
16	PANEL H1SA	XFMR T1SA	1	1-1/2	EMT	3	#10	CU-THWN	0	#10	CU-THWN	1	#6	CU-THWN	
17	XFMR T1SA	PANEL R1SA	1	2-1/2	EMT	3	250KCMIL	CU-THWN	2	250KCMIL	CU-THWN	1	#2	CU-THWN	200% NEUTRAL
18	PANEL R1SA	PANEL R1SF	1	2-1/2	EMT	3	#4/0	CU-THWN	1	#4/0	CU-THWN	1	#4	CU-THWN	
19	XFMR T1SB	PANEL R1SB	1	3	EMT	3	500KCMIL	CU-THWN	1	500KCMIL	CU-THWN	1	#3	CU-THWN	
20	PANEL R1SB	PANEL R1SC	1	3	EMT	3	500KCMIL	CU-THWN	1	500KCMIL	CU-THWN	1	#3	CU-THWN	
21	PANEL R1SB	PANEL R1SD	1	2	EMT	3	#1/0	CU-THWN	1	#1/0	CU-THWN	1	#6	CU-THWN	
22	PANEL R1SB	PANEL R1NG	1	2	EMT	3	#1/0	CU-THWN	1	#1/0	CU-THWN	1	#6	CU-THWN	
23	PANEL R1SB	PANEL R1NH	1	2	EMT	3	#1/0	CU-THWN	1	#1/0	CU-THWN	1	#6	CU-THWN	
24	PANEL H2SA	XFMR T2S	1	2	EMT	3	#3/0	CU-THWN	0	#3/0	CU-THWN	1	#6	CU-THWN	
25	XFMR T2S	PANEL R2SA	1	3	EMT	3	500KCMIL	CU-THWN	2	500KCMIL	CU-THWN	1	#1/0	CU-THWN	200% NEUTRAL
26	PANEL R2SA	PANEL R2SB	1	1-1/2	EMT	3	#2	CU-THWN	2	#2	CU-THWN	1	#8	CU-THWN	200% NEUTRAL
27	PANEL R2SA	PANEL R2SD	1	1-1/2	EMT	3	#2	CU-THWN	1	#2/0	CU-THWN	1	#6	CU-THWN	200% NEUTRAL
28	PANEL R2SA	XFMR T3S	1	1-1/2	EMT	3	#1/0	CU-THWN	0	#1/0	CU-THWN	1	#6	CU-THWN	
29	XFMR T3S	PANEL R3SA	1	2-1/2	EMT	3	250KCMIL	CU-THWN	2	250KCMIL	CU-THWN	1	#2	CU-THWN	200% NEUTRAL
30	PANEL R3SA	PANEL R3SB	1	1-1/2	EMT	3	#1	CU-THWN	1	#1	CU-THWN	1	#6	CU-THWN	
31	PANEL H1NC	XFMR T1NB	1	1-1/2	EMT	3	#1/0	CU-THWN	0	#1/0	CU-THWN	1	#8	CU-THWN	
32	XFMR T1NB	PANEL R1NC	1	2-1/2	EMT	3	250KCMIL	CU-THWN	1	250KCMIL	CU-THWN	1	#10	CU-THWN	
33	PANEL R1NC	PANEL R1NB	1	2	EMT	3	#1/0	CU-THWN	1	#1/0	CU-THWN	1	#2	CU-THWN	
34	PANEL H1NA	PANEL H1NB	1	1-1/4	EMT	3	#4	CU-THWN	1	#4	CU-THWN	1	#6	CU-THWN	
35	PANEL H1NA	LTG PANEL L1N	1	1-1/4	EMT	3	#6	CU-THWN	1	#6	CU-THWN	1	#8	CU-THWN	
36	PANEL H1NA	PANEL H2NA	1	3	EMT	3	500KCMIL	CU-THWN	1	500KCMIL	CU-THWN	1	#10	CU-THWN	

37	PANEL H1NA	PANEL H3NA	2	3	EMT	3	350KCMIL	CU-THWN	1	350KCMIL	CU-THWN	1	#1/0	CU-THWN	
38	PANEL H1NA	XFMR T1NA	1	1-1/2	EMT	3	#1/0	CU-THWN	0	#1/0	CU-THWN	1	#1	CU-THWN	
39	XFMR T1NA	PANEL R1NA	1	2-1/2	EMT	3	250KCMIL	CU-THWN	2	250KCMIL	CU-THWN	1	#6	CU-THWN	200% NEUTRAL
40	PANEL R1NA	PANEL R1ND	1	2	EMT	3	#1	CU-THWN	1	#3/0	CU-THWN	1	#2	CU-THWN	200% NEUTRAL
41	PANEL R1NA	PANEL R1NF	1	2	EMT	3	#1	CU-THWN	1	#3/0	CU-THWN	1	#6	CU-THWN	200% NEUTRAL
42	PANEL H2NA	LT PANEL L2N	1	1-1/4	EMT	3	#6	CU-THWN	1	#6	CU-THWN	1	#6	CU-THWN	
43	PANEL H2NA	XFMR T2N	1	2	EMT	3	#3/0	CU-THWN	0	#3/0	CU-THWN	1	#10	CU-THWN	
44	XFMR T2N	PANEL R2NA	1	3	EMT	3	500KCMIL	CU-THWN	2	500KCMIL	CU-THWN	1	#6	CU-THWN	200% NEUTRAL
45	PANEL R2SA	PANEL R2NSF	1	1-1/2	EMT	3	#2	CU-THWN	1	#2/0	CU-THWN	1	#1/0	CU-THWN	200% NEUTRAL
46	PANEL R2NA	PANEL R2NF	1	2-1/2	EMT	3	#4/0	CU-THWN	1	#4/0	CU-THWN	1	#6	CU-THWN	
47	PANEL R2NA	PANEL R2ND	1	1-1/2	EMT	3	#2	CU-THWN	1	#2/0	CU-THWN	1	#4	CU-THWN	200% NEUTRAL
48	PANEL R2NF	DIM PANEL D2N1	1	1-1/4	EMT	3	#6	CU-THWN	1	#6	CU-THWN	1	#6	CU-THWN	
49	PANEL H3NA	PANEL H3NB	1	1-1/4	EMT	3	#4	CU-THWN	1	#4	CU-THWN	1	#10	CU-THWN	
50	PANEL H3NA	LTG PANEL L3N	1	1-1/4	EMT	3	#6	CU-THWN	1	#6	CU-THWN	1	#8	CU-THWN	
51	PANEL H3NA	XFMR T3N	1	1-1/2	EMT	3	#1/0	CU-THWN	0	#1/0	CU-THWN	1	#10	CU-THWN	
52	XFMR T3N	PANEL R3NA	1	2-1/2	EMT	3	250KCMIL	CU-THWN	2	250KCMIL	CU-THWN	1	#6	CU-THWN	200% NEUTRAL
53	PANEL R3NA	PANEL R3NB	1	1-1/2	EMT	3	#2	CU-THWN	1	#2	CU-THWN	1	#2	CU-THWN	
54	PANEL R3NA	PANEL R3NC	1	1-1/2	EMT	3	#2	CU-THWN	1	#2	CU-THWN	1	#6	CU-THWN	
55	PANEL R3NA	PANEL R3ND	1	1-1/2	EMT	3	#2	CU-THWN	1	#2	CU-THWN	1	#6	CU-THWN	
56	PANEL R2NF	DIM PANEL D2N2	1	1-1/4	EMT	3	#6	CU-THWN	1	#6	CU-THWN	1	#6	CU-THWN	
57	LIFE SAFETY ATS	PANEL H1SE	1	1-1/4	EMT	3	#4	CU-THWN	1	#4	CU-THWN	1	#10	CU-THWN	
58	STANDBY ATS	PANEL H1SS	1	1-1/2	EMT	3	#1	CU-THWN	1	#1	CU-THWN	1	#8	CU-THWN	
59	PANEL H1SE	PANEL H2SE	1	1	EMT	3	#8	CU-THWN	1	#8	CU-THWN	1	#6	CU-THWN	
60	PANEL H1SE	PANEL H1NE	1	1	EMT	3	#8	CU-THWN	1	#8	CU-THWN	1	#10	CU-THWN	
61	PANEL H1SE	XFMR T1SE	1	1	EMT	3	#10	CU-THWN	0	#10	CU-THWN	1	#10	CU-THWN	
62	XFMR T1SE	PANEL R1SE	1	1-1/4	EMT	3	#4	CU-THWN	1	#4	CU-THWN	1	#8	CU-THWN	
63	PANEL R1SE	PANEL R2SE	1	1	EMT	3	#8	CU-THWN	1	#8	CU-THWN	1	#10	CU-THWN	
64	PANEL H1SS	PANEL H2SS	1	1	EMT	3	#10	CU-THWN	1	#10	CU-THWN	1	#10	CU-THWN	
65	PANEL H1SS	PANEL H1NS	1	1-1/2	EMT	3	#2	CU-THWN	1	#2	CU-THWN	1	#6	CU-THWN	
66	PANEL H1SS	XFMR T1SS	1	1	EMT	3	#6	CU-THWN	0	#6	CU-THWN	1	#6	CU-THWN	
67	XFMR T1SS	PANEL R1SS	1	2	EMT	3	#1	CU-THWN	1	#3/0	CU-THWN	1	#6	CU-THWN	200% NEUTRAL
68	PANEL R1SS	PANEL R2SS	1	1-1/4	EMT	3	#4	CU-THWN	1	#4	CU-THWN	1	#8	CU-THWN	
69	PANEL H1NE	PANEL H2NE, H3NE	1	1	EMT	3	#8	CU-THWN	1	#8	CU-THWN	1	#10	CU-THWN	
70	PANEL H1NE	T1NE	1	1	EMT	3	#10	CU-THWN	0	#10	CU-THWN	1	#10	CU-THWN	
71	XFMR T1NE	PANEL R1NE	1	1-1/4	EMT	3	#4	CU-THWN	1	#4	CU-THWN	1	#8	CU-THWN	
72	PANEL R1NE	PANEL R2NE, R3NE	1	1	EMT	3	#8	CU-THWN	1	#8	CU-THWN	1	#10	CU-THWN	
73	PANEL H1NS	PANEL H2N2, H3NS	1	1	EMT	3	#8	CU-THWN	1	#8	CU-THWN	1	#10	CU-THWN	
74	PANEL H1NS	XFMR T1NS	1	1	EMT	3	#6	CU-THWN	0	#6	CU-THWN	1	#6	CU-THWN	
75	XFMR T1NS	PANEL R1NS	1	2	EMT	3	#1	CU-THWN	1	#3/0	CU-THWN	1	#6	CU-THWN	200% NEUTRAL
76	PANEL R1NS	PANEL R2NS, R3NS	1	1	EMT	3	#8	CU-THWN	1	#8	CU-THWN	1	#10	CU-THWN	
77	PANEL H3NA	H4N	2	2-1/2	EMT	3	250KCMIL	CU-THWN	1	250KCMIL	CU-THWN	1	#2	CU-THWN	