Half Moone

Cruise and Celebration Center
Norfolk, Virginia

Technical Assignment 2
11/04/08
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Single-Line Diagram List

The project's One-Line Diagram is on Drawing EP701.

Single-Line Diagram Drawing

See attached Appendix

Executive Summary

The Half Moone Cruise & Celebration Center in Norfolk, Virginia features an interesting and functional power distribution system, lighting system, and HVAC system. The voltage in the building is either 480Y/277 V or 208Y/120 V, depending on the panel and equipment use. Beyond the mechanical equipment, lighting and receptacle loads, there is special equipment in the building. Of particular interest is the escalator, elevators, x-ray machines and trash compactor.

The service entrance size for this assignment was calculated in three unique ways. This simulates the design approach at different stages in the actual design process. First, a simple calculation yields an entrance size from a VA/SF size. Later in the design, mechanical equipment types are factored into the calculation. The final size is computed from the actual loads on the panelboard. A factor can be applied for future growth.

Design issues in this building include:

- Service entrance. The building is on a pier.
- Voltage drop
- Reducing power consumption (W/SF)

In addition to the aforementioned building systems, there is an overhead paging system and security system and emergency power system.

Summary Description of Distribution System

Service enters through a 15kV switch and then is transformed from 13.2kV to 480Y/277V. From this transformer, power flows to the main switchboard. The 15kV switch, transformer and main switchboard all are considered part of the Unit Substation. Power is then distributed throughout the building by feeders routed to various panelboards. Some panelboards are at 480Y/277V and others are at 208Y/120V because of additional step-down transformers. The entire emergency system goes through an automatic transfer switch, with backup power produced by an emergency generator. The emergency system distributes power both on 480Y/277V and 208Y/120V, and includes various step-down transformers to produce this lower voltage. In addition to these main building electrical systems, some mechanical equipment is fed directly off of the main switchboard.

Utility Company Information

Dominion Virginia Power
P.O. Box 26666
Richmond, VA 23261
http://www.dom.com/about/companies/vapower/index.jsp

Distribution Service Charges (30 Day Rate)

1. Basic Customer Charge: $127.60 per billing month.

2. Plus Distribution Demand Charge:
    a. First 5000 kW of Distribution Demand @ $1.000 per kW
    b. Additional kW of Distribution Demand @ $0.755 per kW
3. Plus rkVA Demand Charge @ $0.15 per rkVA

Electricity Supply Service Charges

1. On-Peak Electricity Supply Demand Charge
    a. All On-Peak Electricity Supply Demand for Primary Service Voltage @ $ 12.003 per kW
    b. All On-Peak Electricity Supply Demand for Transmission Service Voltage @ $ 11.715 per kW
2. Plus Off-Peak Electricity Supply Demand Charge
    a. All Off-Peak kW Demand @ $ 0.632 per kW
3. Plus Electricity Supply Adjustment Demand Charge
    a. First 5000 kW of Demand @ ($ 0.421) per kW
    b. Additional kW of Demand @ ($ 0.318) per kW
4. Plus Electricity Supply kWh Charge
    a. All On-peak kWh @ 0.404¢ per kWh
    b. All Off-Peak kWh @ 0.272¢ per kWh
5. Each Electricity Supply kilowatthour used is subject to Fuel Charge Rider A.

For more detailed information, visit: http://www.dom.com/customer/pdf/va/vabgs4.pdf

Service Entrance

Service is provided through existing infrastructure located around the Nauticus, a maritime-themed science center. After entering various manholes, one set of (3) #1/0 conductors enter to the Main Electrical Room. (6) 4" ductbanks feed from the Unit Substation to manholes. In addition, (3) 4" ductbanks connect to various Pier Shed panels. The 3,000A, 480Y/277V, 3Phase, 4W Unit Substation receives power from a 2,500kVA Dry-Type Transformer (13.2kV to 480Y/277V) after the service enters through a 15kV switch. The Unit Substation is located on the first floor in Rm 134, next to the Generator Rm 135 and the Mechanical Rm 133. The metering occurs at the Main Switchboard in accordance with Dominion Virginia Power, and the distribution system is fed directly from Dominion Virginia Power.

Voltage Systems

There are various Voltages throughout the building, each serving a general category of load types.

Voltage System and Load Category

Voltage System	Category of Loads
13.2kV	Feeds into 2,500kVA Transformer
480Y/277V	Lighting, HVAC systems, and other large equipment
208Y/120V	Receptacles, Incandescent Lighting, and Miscellaneous Power

Emergency Power System

The emergency standby power generation system is a Natural Gas Engine Emergency Generator, complete with automatic controls for starting on loss of normal power and for load transfer. There are local and remote manual controls for starting of the power generation set. The generator is sized for life safety systems, refrigeration, voice/data/sound systems.

Power flows from the Automatic Transfer Switch (800A, 480V, 4P) from either the Main Switchboard or the Natural Gas Engine Emergency Generator (350kW, 438kVA, 480V, 3Phase, 4W). There is one main emergency panel from which all others are fed. In total, there are (8) high power emergency panels (480Y/277V), (5) 480Y/277V Dry Type Transformers, and (7) lower power emergency panels (208Y/120V).

Exit signs are connected to emergency high power (277V) circuits. The Fire Alarm Control Panel is located in Room 137 and is powered from Emergency Panelboard ELP2. All Strobe Units, Horn/Strobe Units, Manual Pull Stations, and Smoke Detectors feed into the Fire Alarm Control Panel either directly or through one of the two Power Booster Panels. Also, a DACT Telephone System connects to the Fire Alarm Control Panel.

Locations of Switchgear

The building systems' main rooms are located on the first floor, but there are electrical closets on the second floor.

Equipment Locations

Equipment Type	Equipment Tag	Floor Level	Room Number	Room Name	Drawing Number (1/8 scale)	Drawing Number (enlarged)
Switch	15kV	First	134	Main Electrical Room	ES101	
Transformer	2500kVA	First	134	Main Electrical Room	ES101	
Switchboard	SWBD1	First	134	Main Electrical Room	EP101	
Automatic Transfer Switch	ATS	First	135	Main Electrical Room	EP101	
Emergency Generator	Generator	First	135	Generator Room	EP101	
Transformer	TX1	First	134	Main Electrical Room	EP101	
Transformer	TX2	First	100	Electrical Room	EP102	
Transformer	TX3	Second	205	Electrical Closet #1	EP105	
Transformer	TXC	First	134	Main Electrical Room	EP101	
Transformer	ETX1	First	135	Generator Room	EP101	
Transformer	ETX2	First	100	Electrical Room	EP102	
Transformer	ETXP	First	141	Electrical Room	EP103	
Transformer	ETX3	Second	220	Electrical Closet #2	EP105	
Transformer	TXL4	Second	220	Electrical Closet #2	EP105	
Transformer	TXL3	Second	205	Electrical Closet #1	EP105	

Equipment Locations

Equipment Tag	Voltage	Main Size	Floor Level	Room Number	Room Name	Drawing Number
HP1	480Y/277V	400A	First	134	Main Electrical Room	EP101
HP2	480Y/277V	400A	First	100	Electrical Room	EP102
HP3	480Y/277V	600A	Second	205	Electrical Closet #1	EP105
HP4	480Y/277V	100A	First	134	Main Electrical Room	EP101
LPC	208Y/120V	400A	First	134	Main Electrical Room	EP101
LP1	208Y/120V	100A	First	134	Main Electrical Room	EP101
LP2	208Y/120V	225A	First	100	Electrical Room	EP102
CCP1	208Y/120V	100A	Second	220	Electrical Closet #2	EP105
LP3	208Y/120V	225A	Second	205	Electrical Closet #1	EP105
LPL3	208Y/120V	100A	Second	205	Electrical Closet #1	EP105
EHP1	480Y/277V	800A	First	135	Generator Room	EP101
EHPL1	480Y/277V	225A	First	134	Main Electrical Room	EP101
ELP1	208Y/120V	100A	First	135	Generator Room	EP101
EHP2	480Y/277V	400A	First	100	Electrical Room	EP102
EHPL2	480Y/277V	100A	First	100	Electrical Room	EP102
ELP2	208Y/120V	225A	First	100	Electrical Room	EP102
ELPL2	208Y/120V	100A	First	100	Electrical Room	EP102
LUPS	208Y/120V	100A	First	109	LAN Room	EP102
EHPP	480Y/277V	225A	First	141	Electrical Room	EP103
EHPLP	480Y/277V	225A	First	141	Electrical Room	EP103
ELPP	208Y/120V	100A	First	141	Electrical Room	EP103
EHP3	480Y/277V	225A	Second	220	Electrical Closet #2	EP105
EHPL4	480Y/277V	100A	Second	220	Electrical Closet #2	EP105
ELP3	208Y/120V	100A	Second	220	Electrical Closet #2	EP105
ELPL4	208Y/120V	225A	Second	220	Electrical Closet #2	EP105
HPL3	480Y/277V	225A	Second	205	Electrical Closet #1	EP105
LCPP	208Y/120V	N/A	First	136	Main Telecom Room	EP101

Over-current Devices

The main over-current device in the Main Switchboard SWBD1 is one 3,000A Main Circuit Breaker rated at 65KAIC. The branch over-current devices range from 100 Ampere Trip to 800 Ampere Trip.

In the distribution panels, there are either Main Circuit Breakers or Main Lug Onlys. The Main Circuit Breakers range from 400A to 800A and the Main Lug Onlys range from 100A to 400A. For example, in a typical distribution panel such as HP3, there is one 600A MCB.

In a typical lighting dimming panelboard, the over-current device is a Main Circuit Breaker. In a typical lighting switching panelboard, there are Main Lugs Only. The dimming panelboards range from 100A to 225A MCB, while the switching panelboards range from 100A to 225A MLO. A typical appliance panelboard contains one Main Circuit Breaker and is rated at 22KAIC.

In Summary, typical panelboards contain the following over-current devices:

Panelboard Information

Typical Panelboard Type	**Type of Circuit Breaker**	**AIC Rating**
Main Switchboard	Main Circuit Breaker	65 KAIC
Main Switchboard Branches	Main Circuit Breaker	N/A
Distribution Panelboard	Main Circuit Breaker	35 KAIC
Lighting Switching Panelboard	Main Lug Only	22 KAIC
Lighting Dimming Panelboard	Main Circuit Breaker	22 KAIC
Appliance Panelboard	Main Circuit Breaker	22KAIC

Transformers

There are 11 transformers in the building which help distribute power. The 2500kVA transformer is located within the Main Switchboard in the Main Electrical Room. It transforms the voltage from 13.2 kVA to 480Y/277V. The other transformers transform the voltage from 480Y/277V to 208Y/120V for use in some lighting systems, receptacles, and other lower voltage applications.

INDIVIDUAL TRANSFORMER SCHEDULE

TAG	PRIMARY VOLTAGE	SECONDARY VOLTAGE	SIZE (kVA)	TYPE	TEMP. RISE	TAPS	MOUNTING	REMARKS
2500kVA	13200V,3PH,3W	480Y/277V,3PH,4W	2500	DRY TYPE	115 DEGREE C	N/A	PAD MOUNTED IN SWBD1	
TX1	480V,3PH,4W.	208Y/120V,3PH,4W	30	DRY TYPE	115 DEGREE C	(6) 2.5%	PAD MOUNTED ON FLOOR	
TX2	480V,3PH,4W.	208Y/120V,3PH,4W	75	DRY TYPE	115 DEGREE C	(6) 2.5%	PAD MOUNTED ON FLOOR	K-13 RATED
TX3	480V,3PH,4W.	208Y/120V,3PH,4W	75	DRY TYPE	115 DEGREE C	(6) 2.5%	PAD MOUNTED ON FLOOR	
TXC	480V,3PH,4W.	208Y/120V,3PH,4W	112.5	DRY TYPE	115 DEGREE C	(6) 2.5%	PAD MOUNTED ON FLOOR	
ETX1	480V,3PH,4W.	208Y/120V,3PH,4W	30	DRY TYPE	115 DEGREE C	(6) 2.5%	PAD MOUNTED ON FLOOR	
ETX2	480V,3PH,4W.	208Y/120V,3PH,4W	75	DRY TYPE	115 DEGREE C	(6) 2.5%	PAD MOUNTED ON FLOOR	
ETXP	480V,3PH,4W.	208Y/120V,3PH,4W	30	DRY TYPE	115 DEGREE C	(6) 2.5%	PAD MOUNTED ON FLOOR	
ETX3	480V,3PH,4W.	208Y/120V,3PH,4W	30	DRY TYPE	115 DEGREE C	(6) 2.5%	PAD MOUNTED ON FLOOR	
TXL4	480V,3PH,4W.	208Y/120V,3PH,4W	75	DRY TYPE	115 DEGREE C	(6) 2.5%	PAD MOUNTED ON FLOOR	
TXL3	480V,3PH,4W.	208Y/120V,3PH,4W	30	DRY TYPE	115 DEGREE C	(6) 2.5%	PAD MOUNTED ON FLOOR	

NOTES:
1. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS

KEY:
A/N=AS NOTED

Special Equipment

The only special equipment is the Natural Gas Engine Emergency Generator. See description under the Emergency Power System section.

Lighting Loads

The lighting systems in this building include fluorescent, halogen, incandescent, LED and metal halide lamps. The luminaires range from direct to indirect and are used to produce downlight, uplight, wall-washing, and cove lighting techniques. There are also various lamp types located outdoors.

Lighting Loads

Lamp Type	Lamp Wattage	Number of Lamps	Ballast Type	Operating Voltage	Luminaire Input Watts	Ballast Factor	Current (starting, operating)	Power Factor (operating)
A	32	3	IS	277	93	1.0	0.78	N/A
B	32	2	IS	277	65	1.03	0.24	N/A
C	32	2	IS	120/277	63	1.0	0.23	N/A
D		N/A	N/A	120		N/A		N/A
E	32	2	IS	277	65	1.03	0.24	N/A
F	150	1	N/A	120	150	N/A		N/A
H	250	1	Pulse Start	277	296	N/A	0.43,1.2	0.9
J	32	2	IS	277	65	1.03	0.24	N/A
K	26	1	PS	120	27	1.0	0.23	N/A
L	31	2	PS	277	70	1.0	0.24	N/A
M	32	4	PS	277	110	0.88	0.4	N/A
N	25	2	IS	277	49	1.0	0.18	N/A
P	200	1	N/A	120	200	N/A	1.67	N/A
Q	175	1	Pulse Start	277	220	N/A	0.43,0.87	0.9
S	13	2	PS	277	29	1.0	0.11	N/A
T	32	4	PS	277	110	0.88	0.4	N/A
U	26	1	PS	277	29	1.1	0.11	N/A
V	32	2	IS	277	65	1.03	0.24	N/A
V1	32	1	IS	277	36	1.03	0.30	N/A
V2	25	1	IS	277	27	1.05	0.1	N/A
V3	17	1	IS	277	16	0.97	0.07	N/A
X	N/A	N/A	N/A	277	2	N/A	N/A	N/A
X1	N/A	N/A	N/A	277	2	N/A	N/A	N/A
X2	N/A	N/A	N/A	277	2	N/A	N/A	N/A
Y	40	16	N/A	277	640	N/A		N/A
Z	N/A	N/A	N/A	120	97	N/A		N/A
AA	175	1	Core & Coil	277	220	N/A	0.43,0.87	0.9
BB	100	1	Pulse Start	277	118	N/A	0.7,0.45	0.9
CC	70	1	Core & Coil	277	94	N/A	0.85,0.85	0.9
DD	57	2	PS	120	128	1	1.07	N/A
EE	50	2	RS	277	106	0.98	0.39	N/A
FF	50	1	RS	277	54	0.98	0.2	N/A
HH	32	1	PS	277	36	0.98	0.31	N/A
KK	100	1	Core	277	118	N/A	0.7,0.45	0.9
LL	57	2	IS	277	36	1.03	0.3	N/A
MM	32	1	IS	277	36	1.03	0.3	N/A
NN	400	1	P.S.	277	455	N/A	0.7,1.72	0.9
PP	70	2	PS	120	156	1	1.3	N/A
QQ	50	1	Core	277	62	N/A	0.35,0.22	0.9
RR	250	1	Pulse Start	277	298	N/A	0.43,1.2	0.9
SS	300	1	N/A	120	300	N/A		N/A
UU	500	1	N/A	120	500	N/A		N/A

Lamp Type	Lamp Wattage	Number of Lamps	Ballast Type	Operating Voltage	Luminaire Input Watts	Ballast Factor	Current (starting, operating)	Power Factor (starting, operating)
A1	32	3	IS	277	93	1.0	0.78	N/A
A2	31	2	IS	277	63	1.0	0.53	N/A
A3	32	2	IS	277	65	1.03	0.24	N/A
A4	26	1	PS	277	31	1.0	0.11	N/A
A5	32	2	IS	277	65	1.03	0.24	N/A
A6	32	2	IS	277	65	1.03	0.24	N/A
A7	32	2	IS	277	65	1.03	0.24	N/A
A8	32	2	IS	277	65	1.03	0.24	N/A

Mechanical and Other Loads

Mechanical loads include air-handling units, pumps, fans and motors which make the building a functional space for occupants. Motor loads are often given in horse power (HP) and other loads are given in Amps. A power factor is assumed for motors fitting into a certain load category.

Mechanical Loads

Load Tag	Load Description	Load Magnitude	Load Units	Motor Amps	Voltage and Phases	Power Factor	Load (KVA)	Equivalent Load (KW)
EF-2		3/4	HP	1.6	480	0.8	768	614
EF-3		1/2	HP	4.4	120	0.8	528	422
EF-4		1/4	HP		120	0.7		
EF-5		¼	HP		120	0.7		
EF-6		¼	HP		120	0.7		
EF-7		¼	HP		120	0.7		
BCAHU-1		1/3	HP		208	0.7		
FCU-1		0.7	FLA	0.7	208			146
UH-1		1/20	HP		120	0.7		
PTAC-1		10.9	A	10.9	208			2267
AD-1		1	HP	2.1	480	0.8	1008	806
UH-1		1/8	HP		120	0.7		
EF-11		¾	HP	1.6	480	0.8	768	614
TRASH COMPACTOR		-	-	-	208	-		
PTAC-1			A	10.9	208			2267
EF-9		¼	HP		120	0.7		
AHU-1		15	HP	21	480	0.9	10080	9072
AHU-2		7.5	HP	11	480	0.9	5280	4752

Load Tag	**Load Description**	**Load Magnitude**	**Load Units**	**Motor Amps**	**Voltage and Phases**	**Power Factor**	**Load (KVA)**	**Equivalent Load (KW)**
AHU-5		3	HP	4.8	480	0.8	2304	1843
AD-2		2	HP	3.4	480	0.8	1632	1306
PTAC-2			A	18.9	208	0.9	3931	3538
ESCALATOR		15	HP	21	480	0.9	10080	9072
CU-1			A	4.8	208	0.8	998	1843
AHU-3		40	HP	52	480	0.9	24960	22464
AHU-4		20	HP	27	480	0.9	12960	11664
EF-10		¼	HP		120	0.7		
EF-8		¼	HP		120	0.7		
EF-12		¼	HP		120	0.7		
RETRACTABLE BRIDGE MOTOR		50	HP	65	480	0.9	31200	28080
UH-1		1/8	HP		120	0.7		
B-1	BOILER	¾	HP	1.6	480	0.8	768	614
B-2	BOILER	¾	HP	1.6	480	0.8	768	614
EF-1		¾	HP	1.6	480	0.8	768	614
RWP-1		20	HP	27	480	0.9	12960	11664
RWP-2		20	HP	27	480	0.9	12960	11664
CWP-1		5	HP	7.6	480	0.8	3648	2918
CWP-2		5	HP	7.6	480	0.8	3648	2918
CDWP-1		15	HP	21	480	0.9	10080	9072
CDWP-2		15	HP	21	480	0.9	10080	9072
DCWP-1		15	HP	21	480	0.9	10080	9072
DCWP-2		15	HP	21	480	0.9	10080	9072
HWP-1		15	HP	21	480	0.9	10080	9072
HWP-2		15	HP	21	480	0.9	10080	9072
C-1	CHILLER				480	0.9		120 KW
C-2	CHILLER				480	0.9		120 KW
RECIRCULATION PUMP		1/6	HP		120	0.7		
RWP-3		1.5	HP	3	480	0.8	1440	1152

Service Entrance Size

A service entrance is that part of the electrical distribution system where the electrical utility company service enters the building. There are usually a number of pieces of equipment associated with the service entrance, both on the utility company side (transformer, metering, primary switches, etc.) and the owner's side (switchboard, unit substations, etc.). Three unique methods of calculating service entrance size were used to show how service size should be calculated at various times in the design process.

Conceptual and Schematic Phases:
Using the example Table 1 from "Sizing Service Entrances," the estimated VA load is as follows:

- Total building area is 89,246 SF
- Assume half of total building area is categorized as "Arena" and half is categorized as "Office Building."
- Total VA with this method = 1,115,575 VA
    - 44,623 SF x 13 VA/SF = 580,099 VA (Arena)
    - 44,623 SF x 12 VA/SF = 535,476 VA (Office Building)
    - 1,115,575 VA total
- Size of 480V service entrance = 1600A
    - Assume 480V service
    - 1,115,575 VA / (480 x 3^1/2) = 1342 A → size up → 1600 A

Service Loads

Area	**Area Type**	**Area SF**	**VA/SF from Table 1**	**Total VA**
First Floor	Office Building	44,623	12	535,476
Second Floor	Arena	44,623	13	580,099
				Total VA = 1,115,575
				Total Amps = **1342**

Design Development Phase:
The NEC was used to find General Lighting Loads by Occupancy (Table 220.12).

Lighting Loads

Area	**Area SF**	**Lighting Load Category**	**Lighting Load (VA/SF)**	**Receptacle Load (VA/SF)**	**Total VA/SF**	**Total VA**
First Floor	44,623	Office Building	3.5	0.5	4	178,492
Second Floor	44,623	Industrial / Commercial Building	2	0.5	2.5	111,558
						Total VA = 290,050

Mechanical Loads

Load Type	Load VA/SF	Load SF	Demand Factor	Total Load
HVAC: Cooling	12	66,935*	0.8	642,571 VA
Escalator	25kW	-	1	25kW
Elevator	50kW	4 units	0	0

*Assume that only half of the first floor needs to be cooled.

Total Load Calculation

Load Category	Load	Converted to VA
Lighting/Receptacles	290,050 VA	290,050 VA
HVAC: Cooling	642,571 VA	642,571 VA
Escalator	25kW	20,000 VA (0.8 p.f.)
		Total VA = 952,621
		Total Amps = **1145**

Construction Document Phase:
All information in the Construction Document Phase is taken from the calculations used to generate the panelboard schedules in the Construction Documents.

Construction Document Load Calculations

Load Category	Total Connected Load	Demand Factor	Total Demand for Building
Lighting	177.7 KVA	1.0	177.7 KVA
Receptacles	683 KVA	NEC*	346.5 KVA
Mechanical Equipment	970.2 KVA	0.8	776.2 KVA
Miscellaneous	56.4 KVA	0.5**	28.2 KVA
			Total KVA = 1328.6
			+ 20% = 1594.32 KVA
			Total Amps = **1917.7 A**

*NEC demand factor. All VA up to 10,000 are at emand factor of 1.0. All VA above 10,000 are at demand factor 0.5.
**0.5 demand factor is assumed because not all miscellaneous equipment is used at the same time. Examples of miscellaneous equipment include ice machines, trash compactors, x-ray machines, and shade motors.

Comparison of Calculated to Actual Values

- Main building transformer
  - Calculated 1594.32 KVA
  - Actual transformer size = 2500KVA
  - The actual transformer in the building would support the calculated load
- Switchboard
  - Calculated 1917.7 A
  - Actual switchboard Size = 3000 A bus
  - The actual switchboard in the building would support the calculated load

Load Summary Table

Phase	Load –KVA	Voltage System	Load - Amps
Conceptual and Schematic	1115.6	480Y/277	1342
Design Development	952.6	480Y/277	1145
Construction Documents	1594.3	480Y/277	1917.7
Actual Design Calculation*	1699.2	480Y/277	2043.8
VA per square foot	(see calculation below)		

*The actual design calculation is different from the construction document take-off because different demand factors were used in the actual building design. Specifically, the demand factors are:

Demand Factor Summary

Load Description	Demand Factor used for Thesis	Demand Factor used by the designers
Lighting	1	1
Receptacles	NEC	NEC
Mechanical Equipment	0.8	0.9
Miscellaneous	0.5	0.33

VA per Square Foot
480V x 3^1/2 x 3000A / 1000 = 2494 KVA, where 3000A is bus size at service entrance
2494 KVA x 1000 / 89,246 SF = **27.95 VA/SF**

Phase	Load - KVA	VA/SF Calculated
Conceptual and Schematic	1115.6	12.5
Design Development	952.6	10.7
Construction Documents	1594.3	17.9
Actual Design Calculation	1699.2	19.0
Actual 3000 A panel capacity	2494	27.9

Environmental Stewardship Design

Several large rooms in the building use inefficient luminaires. For example, the Ticket Queuing and Waiting Lounge/Meeting Rooms contain (64) 500W Halogen lamps, making this room potentially very inefficient depending on how the system is used. There is no on-site power generation, and the building is not LEED rated.

Design Issues

Some important design issues include:

- Delivering power to the building since it is located on a concrete pier above a river
- Voltage drop
- Watts per square foot considerations

Communication Systems

There is an Overhead Paging System which consists of a Wall-mounted Equipment Rack, a Zone Control Station, and various indoor and outdoor speakers. The Wall-mounted Equipment Rack includes Amplification Equipment and a Phone System Interface Panel. All of the various speakers feed from the Zone Control Station, which connects directly to the Amplification Equipment.

Appendix

1. Metal Halide Lamp and Ballast Information

Luminaire Type	**Lamp Number**	**Ballast Number**
H	ARC250T/H960/E39	71A5734
Q	MPR175/C/VBU/O	71A5534T
AA	MPR175/VBU/O	71A5534T
BB	MVR100/C/U/MED	71A5337BP
CC	ARC70/TD/UVC/743	71A5281
KK	MVR100/C/U/MED	71A5337BP
NN	CSR400/SE/HR	71A6034T
QQ	MXR5/C/U/MED	71A5137BP
RR	ARC250T/H960/E39	71A5734

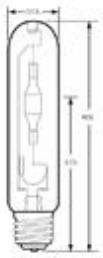
2. Single-Line Diagram
3. Single-Line Diagram EP701

26683 – ARC250T/H960/E39

GE Multi-Vapor® Arcstream® Quartz Metal Halide T15

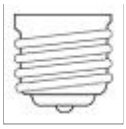
• Compact size, white light, excellent color Precise optical control delivers a concentrated beam of light right where it's needed

PRINT



Bulb

Base



View Larger

GENERAL CHARACTERISTICS

Lamp type	High Intensity Discharge - Quartz Metal Halide
Bulb	T15
Base	Mogul Screw (E39)
Bulb Finish	Clear
Wattage	250
Rated Life	10000 hrs
Bulb Material	Hard glass
Lamp Enclosure Type (LET)	Enclosed fixtures only
Picograms of Mercury	102 picograms

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	19000
Mean Lumens	13300
Nominal Initial Lumens per Watt	76
Color Temperature	6000 K
Color Rendering Index (CRI)	90

ELECTRICAL CHARACTERISTICS

Burn Position	Horizontal ±15º
Warm Up Time to 90%	2 min
Warm Up Time to 90% (MAX)	5 min
Hot Restart Time to 90% (MIN)	10 min
Hot Restart Time to 90% (MAX)	15 min

DIMENSIONS

Maximum Overall Length (MOL)	8.3700 in (212.5 mm)
Nominal Length	8.370 in (212.5 mm)
Bulb Diameter (DIA)	1.875 in (47.6 mm)
Light Center Length (LCL)	5.620 in (142.7 mm)

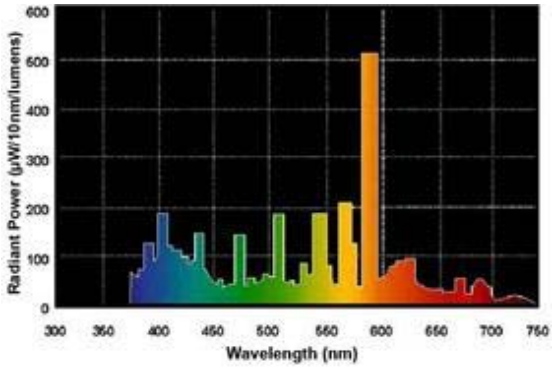
PRODUCT INFORMATION

ADDITIONAL RESOURCES

Catalogs
Testimonials
MSDS (Material Safety Data Sheets)
Disposal Policies & Recycling Information

GRAPHS & CHARTS

Spectral Power Distribution



Product Code	26683
Description	ARC250T/H960/E39
ANSI Code	M80
Standard Package	Case
Standard Package GTIN	10043168266830
Standard Package Quantity	12
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	12
UPC	043168266833

CAUTIONS & WARNINGS

R- WARNING: This lamp can cause serious skin burn and eye inflammation from shortwave ultraviolet radiation if outer envelope of the lamp is broken or punctured, and the arc tube continues to operate. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used. Certain types of lamps that will automatically extinguish when the outer envelope is broken or punctured are commercially available. Visit the FDA website for more information: http://www.fda.gov/cdrh/radhealth/products/urburns.html

See list of cautions & warnings.

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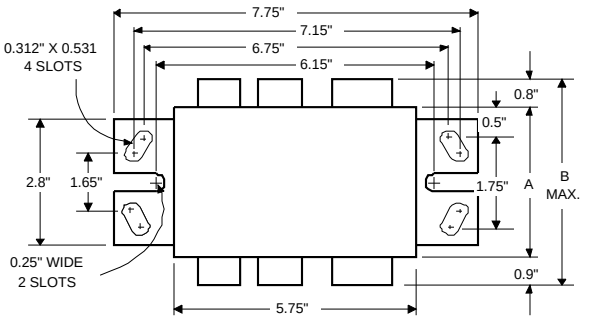
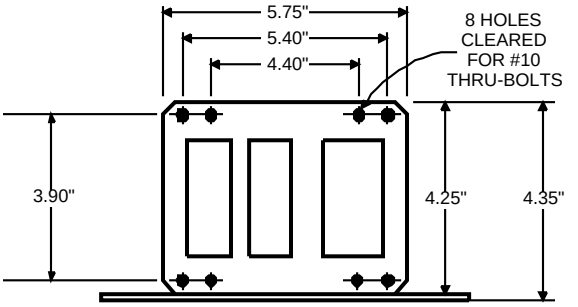
Metal Halide Lamp Ballast

Catalog Number 71A5734
For 250W M138 (Pulse Start)
60 Hz REGULATED LAG
Status: Active

DIMENSIONS AND DATA

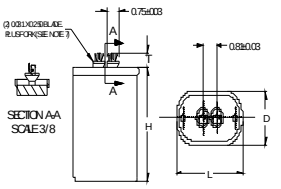
4 1/4 X 5 3/4 CORE - 3 COIL UNIT





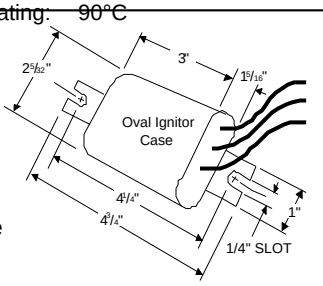
~~INPUT VOLTS~~		277				
CIRCUIT TYPE	REGULATED LAG					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±10%					
Lamp Watts	±+5%, -7%					
LINE CURRENT (Amps)						
Operating		1.20				
Open Circuit		1.00				
Starting		0.43				
UL TEMPERATURE RATINGS						
Insulation Class	H(180°C)					
Coil Temperature Code	1029	A				
MIN. AMBIENT STARTING TEMP.	-40°F or -40°C					
NOM. OPEN CIRCUIT VOLTAGE	305					
INPUT VOLTAGE AT LAMP DROPOUT		195				
INPUT WATTS	298					
RECOMMENDED FUSE (Amps)		3				
CORE and COIL						
Dimension (A)	2.50					
Dimension (B)	4.13					
Weight (lbs.)	16					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	16.0					
Volts (min.)	480					
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)	290-355					
Short-Circuit Current Test (Amps)						
Secondary Current	2.00-2.50					
Input Current		0.20 0.30	-	-	-	-

Capacitor: MD1606-000



Capacitance: 16
Dia/Oval Dim: 1.75
Height: 3.4
Temp Rating: 90°C

Ignitor: LI534-H5



Ballast to Lamp Distance (BTL) = 2 feet
Temp Rating: 105°C

Wiring Diagram:

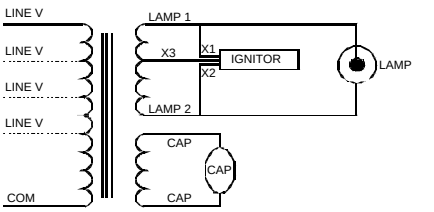


Fig. N

U.L. RECOGNIZED

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500.	Ballast with Ignitor and Oil Filled Capacitor
510.	Ballast w/Welded Bracket, Igniter & Oil-Filled 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.

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09/03/97

11649 – MPR175/C/VBU/O

GE Protected Multi-Vapor® Quartz Metal Halide BT28

PRINT

GENERAL CHARACTERISTICS

Lamp type	High Intensity Discharge - Quartz Metal Halide
Bulb	BT28
Base	Mogul Screw (EX39)
Bulb Finish	Coated
Wattage	175
Rated Life	10000 hrs
Bulb Material	Hard glass
Lamp Enclosure Type (LET)	Open or enclosed fixtures

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	7800
Mean Lumens (Vert)	12800
Nominal Initial Lumens per Watt	44
Color Temperature	3800 K
Color Rendering Index (CRI)	70

ELECTRICAL CHARACTERISTICS

Burn Position	Vertical base up ±15º
Warm Up Time to 90% (MIN)	2 min
Warm Up Time to 90% (MAX)	5 min
Hot Restart Time to 90% (MIN)	10 min
Hot Restart Time to 90% (MAX)	15 min

DIMENSIONS

Maximum Overall Length (MOL)	8 1/4
Nominal Length	8 1/4
Light Center Length (LCL)	5

PRODUCT INFORMATION

Product Code	11649
Description	MPR175/C/VBU/O
ANSI Code	M57
Standard Package	Case

Bulb

Base

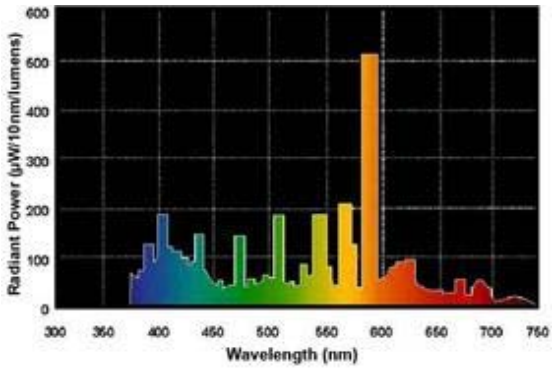
View Larger

ADDITIONAL RESOURCES

Catalogs
Testimonials
MSDS (Material Safety Data Sheets)
Disposal Policies & Recycling Information

GRAPHS & CHARTS

Spectral Power Distribution



Standard Package GTIN	10043168116494
Standard Package Quantity	6
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	6
UPC	043168116497

COMPATIBLE GE BALLASTS

Product Code	Description	# of Bulbs	Power Factor	Ballast Factor
86563	1110245SCTC000I	1	90.0	1.0
86741	GEM175MLTAC3-5	1	90.0	1.0

CAUTIONS & WARNINGS

R- WARNING: This lamp can cause serious skin burn and eye inflammation from shortwave ultraviolet radiation if outer envelope of the lamp is broken or punctured, and the arc tube continues to operate. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used. Certain types of lamps that will automatically extinguish when the outer envelope is broken or punctured are commercially available. Visit the FDA website for more information: http://www.fda.gov/cdrh/radhealth/products/urburns.html

See list of cautions & warnings.

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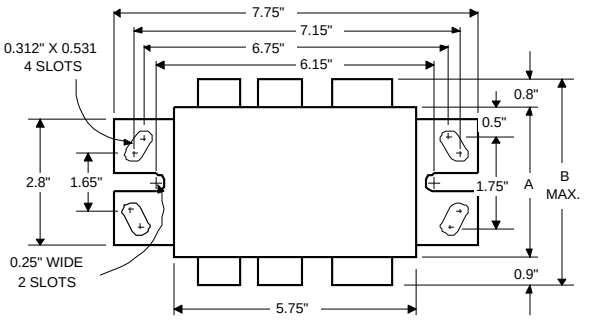
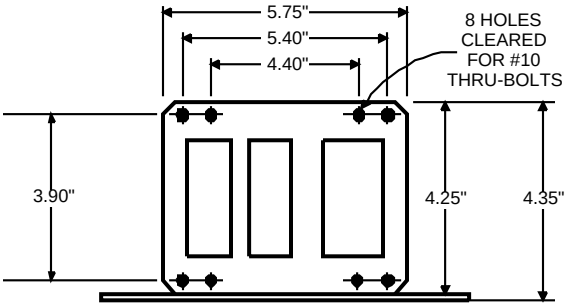
Metal Halide Lamp Ballast

Catalog Number 71A5534T
For 175W M137 (Pulse Start)
60 Hz REGULATED LAG
Status: Active

DIMENSIONS AND DATA

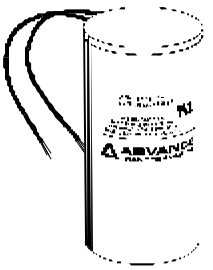
4 1/4 X 5 3/4 CORE - 3 COIL UNIT





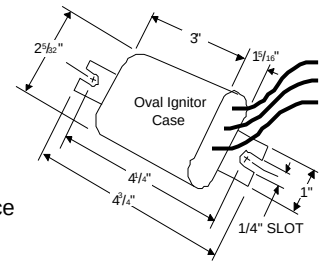
INPUT VOLTS		277					
CIRCUIT TYPE	REGULATED LAG						
POWER FACTOR (min)	90%						
REGULATION							
Line Volts	±10%						
Lamp Watts	±+4%.-6%						
LINE CURRENT (Amps)							
Operating		0.87					
Open Circuit		0.54					
Starting		0.43					
UL TEMPERATURE RATINGS							
Insulation Class	H(180°C)						
Coil Temperature Code	1029	A					
MIN. AMBIENT STARTING TEMP.	-40°F or -40°C						
NOM. OPEN CIRCUIT VOLTAGE	310						
INPUT VOLTAGE AT LAMP DROPOUT		195					
INPUT WATTS	220						
RECOMMENDED FUSE (Amps)		2					
CORE and COIL							
Dimension (A)	1.70						
Dimension (B)	3.50						
Weight (lbs.)	12.5						
Lead Lengths	12"						
CAPACITOR REQUIREMENT							
Microfarads	17.0						
Volts (min.)	400						
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)	305-340						
Short-Circuit Current Test (Amps)							
Secondary Current	1.60-1.95						
Input Current		0.17 0.30	-	-	-	-	

Capacitor: 7C170P40



Capacitance: 17
Dia/Oval Dim: 1.75
Height: 3.75
Temp Rating: 105°C

Ignitor: LI534-H5



Ballast to Lamp Distance (BTL) = 2 feet
Temp Rating: 105°C

Wiring Diagram:

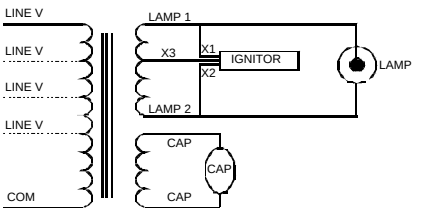


Fig. N

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.

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Corporate Offices: Phone: 800-322-2086

10/24/01

49470 – MPR175/VBU/O

GE Protected Multi-Vapor® Quartz Metal Halide BT28

PRINT

GENERAL CHARACTERISTICS

Lamp type	High Intensity Discharge - Quartz Metal Halide
Bulb	BT28
Base	Mogul Screw (EX39)
Bulb Finish	Clear
Wattage	175
Voltage	135
Rated Life	10000 hrs
Bulb Material	Hard glass
Lamp Enclosure Type (LET)	Open or enclosed fixtures
Base Temperature (MAX)	210
Bulb Temperature (MIN)	400

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	14400
Mean Lumens	10200
Nominal Initial Lumens per Watt	82
Color Temperature	4000 K
Color Rendering Index (CRI)	65
Base to Arc Axis Eccentricity	3 °
Bulb to Base Eccentricity	3 °

ELECTRICAL CHARACTERISTICS

Burn Position	Vertical base up ±15º
Warm Up Time to 90% (MIN)	2 min
Warm Up Time to 90% (MAX)	5 min
Hot Restart Time to 90% (MIN)	10 min
Hot Restart Time to 90% (MAX)	15 min

DIMENSIONS

Maximum Overall Length (MOL)	8 1/4
Nominal Length	8 1/4

Bulb

Base

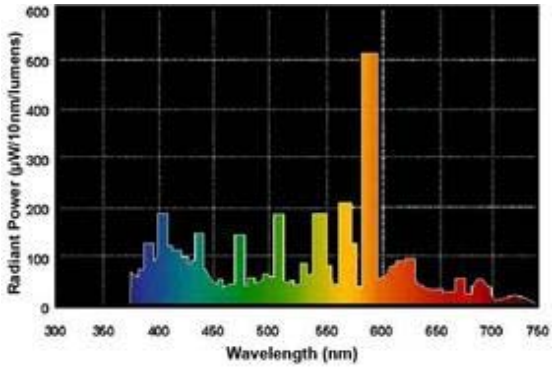
View Larger

ADDITIONAL RESOURCES

Catalogs
Testimonials
MSDS (Material Safety Data Sheets)
Disposal Policies & Recycling Information

GRAPHS & CHARTS

Spectral Power Distribution



Light Center Length (LCL)	5

PRODUCT INFORMATION

Product Code	49470
Description	MPR175/VBU/O
ANSI Code	M57
Standard Package	Case
Standard Package GTIN	10043168494707
Standard Package Quantity	6
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	6
UPC	043168494700

COMPATIBLE GE BALLASTS

Product Code	Description	# of Bulbs	Power Factor	Ballast Factor
86563	1110245SCTC000I	1	90.0	1.0
86741	GEM175MLTAC3-5	1	90.0	1.0

CAUTIONS & WARNINGS

R- WARNING: This lamp can cause serious skin burn and eye inflammation from shortwave ultraviolet radiation if outer envelope of the lamp is broken or punctured, and the arc tube continues to operate. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used. Certain types of lamps that will automatically extinguish when the outer envelope is broken or punctured are commercially available. Visit the FDA website for more information: http://www.fda.gov/cdrh/radhealth/products/urburns.html

See list of cautions & warnings.

NOTES

- When operated on a 120 hrs. cycle (minimum), lamp life rating may be extended by up to 50% based on engineering estimates.

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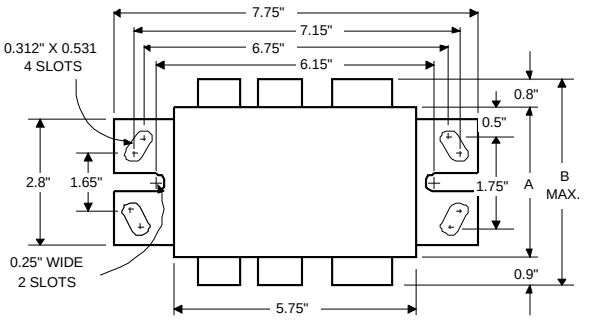
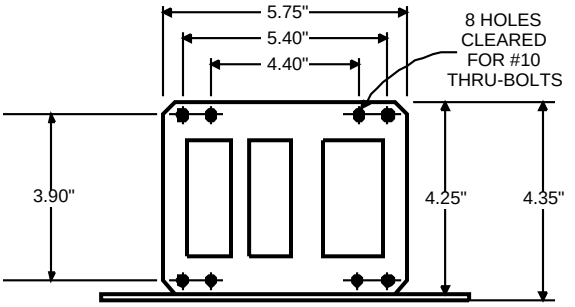
Metal Halide Lamp Ballast

Catalog Number 71A5534T
For 175W M137 (Pulse Start)
60 Hz REGULATED LAG
Status: Active

DIMENSIONS AND DATA

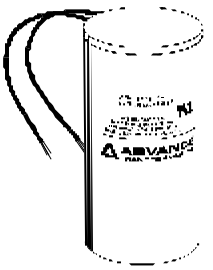
4 1/4 X 5 3/4 CORE - 3 COIL UNIT





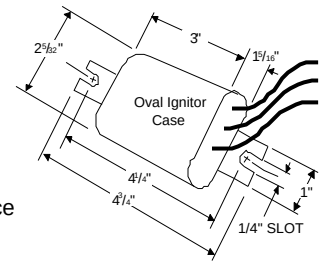
INPUT VOLTS		277					
CIRCUIT TYPE	REGULATED LAG						
POWER FACTOR (min)	90%						
REGULATION							
Line Volts	±10%						
Lamp Watts	±+4%.-6%						
LINE CURRENT (Amps)							
Operating		0.87					
Open Circuit		0.54					
Starting		0.43					
UL TEMPERATURE RATINGS							
Insulation Class	H(180°C)						
Coil Temperature Code	1029	A					
MIN. AMBIENT STARTING TEMP.	-40°F or -40°C						
NOM. OPEN CIRCUIT VOLTAGE	310						
INPUT VOLTAGE AT LAMP DROPOUT		195					
INPUT WATTS	220						
RECOMMENDED FUSE (Amps)		2					
CORE and COIL							
Dimension (A)	1.70						
Dimension (B)	3.50						
Weight (lbs.)	12.5						
Lead Lengths	12"						
CAPACITOR REQUIREMENT							
Microfarads	17.0						
Volts (min.)	400						
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)	305-340						
Short-Circuit Current Test (Amps)							
Secondary Current	1.60-1.95						
Input Current		0.17 0.30	-	-	-	-	

Capacitor: 7C170P40



Capacitance: 17
Dia/Oval Dim: 1.75
Height: 3.75
Temp Rating: 105°C

Ignitor: LI534-H5



Ballast to Lamp Distance (BTL) = 2 feet
Temp Rating: 105°C

Wiring Diagram:

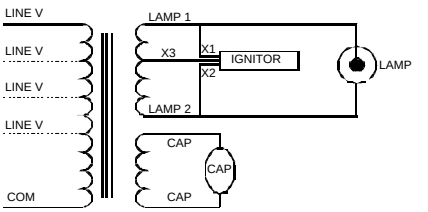


Fig. N

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.

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10/24/01

12653 – MVR100/C/U/MED

GE Multi-Vapor® PulseArc® Quartz Metal Halide BD17

PRINT

GENERAL CHARACTERISTICS

Lamp type	High Intensity Discharge - Quartz Metal Halide
Bulb	BD17
Base	Medium Screw (E26)
Bulb Finish	Coated
Wattage	100
Voltage	100
Rated Life	15000 hrs
Bulb Material	Hard glass
Lamp Enclosure Type (LET)	Enclosed fixtures only

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	7600
Mean Lumens	4900
Nominal Initial Lumens per Watt	76
Color Temperature	4000 K
Color Rendering Index (CRI)	70

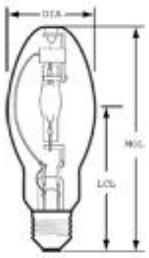
ELECTRICAL CHARACTERISTICS

Burn Position	Universal burning position
Open Circuit Voltage (peak lead ballast) (MIN)	332 V
Open Circuit Voltage (RMS lag ballast) (MIN)	235 V
Warm Up Time to 90% (MIN)	2 min
Warm Up Time to 90% (MAX)	5 min
Hot Restart Time to 90% (MIN)	10 min
Hot Restart Time to 90% (MAX)	15 min

DIMENSIONS

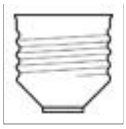
Maximum Overall Length (MOL)	5.4300
Nominal Length	5.430
Bulb Diameter (DIA)	2 1/8
Light Center Length (LCL)	3.430

PRODUCT INFORMATION



Bulb

Base



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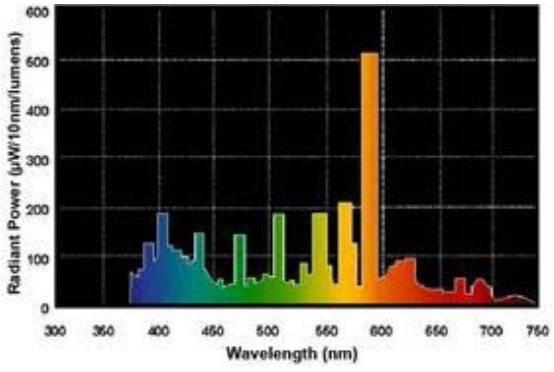
ADDITIONAL RESOURCES

Catalogs
Testimonials
MSDS (Material Safety Data Sheets)
Disposal Policies & Recycling Information

GRAPHS & CHARTS

Spectral Power Distribution



Product Code	12653
Description	MVR100/C/U/MED
ANSI Code	M90
Standard Package	Case
Standard Package GTIN	10043168126530
Standard Package Quantity	6
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	6
UPC	043168126533

COMPATIBLE GE BALLASTS

Product Code	Description	# of Bulbs	Power Factor	Ballast Factor
86574	11210239CTC000I	1	90.0	1.0
86667	GEM10048TLC3D-5	1	90.0	1.0
86675	GEM100MLTLC3D-5	1	90.0	1.0
87561	GEMH100-SLJ-MV	1	98.0	1.0

CAUTIONS & WARNINGS

R- WARNING: This lamp can cause serious skin burn and eye inflammation from shortwave ultraviolet radiation if outer envelope of the lamp is broken or punctured, and the arc tube continues to operate. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used. Certain types of lamps that will automatically extinguish when the outer envelope is broken or punctured are commercially available. Visit the FDA website for more information: http://www.fda.gov/cdrh/radhealth/products/urburns.html

See list of cautions & warnings.

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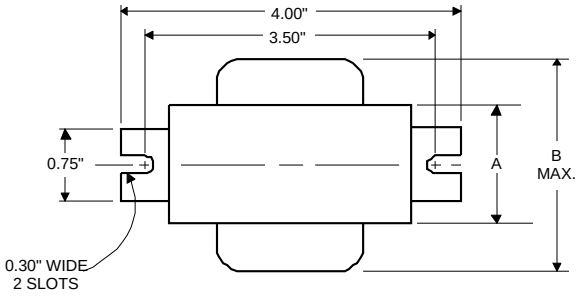
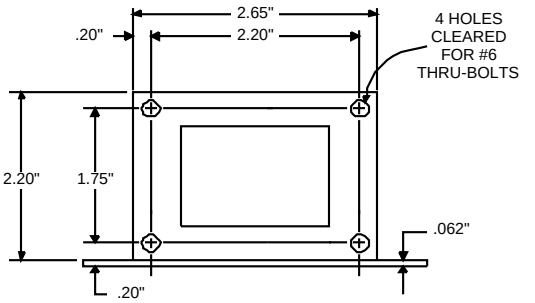
Metal Halide Lamp Ballast

Catalog Number 71A5337BP
For 100W M90/M140
60 Hz R-HPF
Status: Active

DIMENSIONS AND DATA

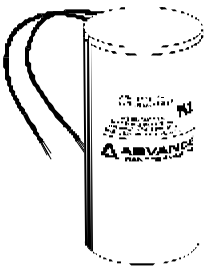
2 5/8 X 2 3/16 CORE





INPUT VOLTS		277				
CIRCUIT TYPE	R-HPF					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±5%					
Lamp Watts	±10%					
LINE CURRENT (Amps)						
Operating		0.45				
Open Circuit		1.05				
Starting		0.70				
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		190				
INPUT WATTS	118					
RECOMMENDED FUSE (Amps)		3				
CORE and COIL						
Dimension (A)	1.80					
Dimension (B)	3.10					
Weight (lbs.)	3.2					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	10.0					
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)	260-290					
Short-Circuit Current Test (Amps)						
Secondary Current	1.05-1.55					
Input Current		0.25 0.35	-	-	-	-

Capacitor: 7C100M33-R



Capacitance: 10
Dia/Oval Dim: 1.5
Height: 2.9
Temp Rating: 105°C

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

Wiring Diagram:

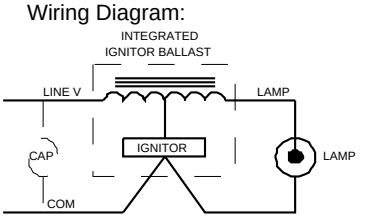


Fig. H

U.L. RECOGNIZED

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500DB	Ballast With Integral Igniter and Dry Film Capacitor
510DB	Ballast w/Welded Bracket, Integral Igniter & Dry Film Cap.
600B	Ballast and Integral Igniter, No Capacitor
610B	Ballast w/Welded Bracket and Integral Igniter, 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.

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08/12/04

PRINT

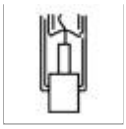
34536 – ARC70/TD/UVC/743

GE Multi-Vapor® PulseArc® Arcstream® Quartz Metal Halide T6

• Compact size, white light, excellent color Precise optical control delivers a concentrated beam of light right where it's needed

Bulb

Base



View Larger

GENERAL CHARACTERISTICS

Lamp type	High Intensity Discharge - Quartz Metal Halide
Bulb	T6
Base	Recessed Single Contact (R7s)
Bulb Finish	Clear
Wattage	70
Rated Life	6000 hrs
Bulb Material	Hard glass
Lamp Enclosure Type (LET)	Enclosed fixtures only
Picograms of Mercury	288 picograms

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	6000
Mean Lumens	4800
Nominal Initial Lumens per Watt	85
Color Temperature	4300 K
Color Rendering Index (CRI)	75

ELECTRICAL CHARACTERISTICS

Burn Position	Horizontal ±15º
Warm Up Time to 90%	2 min
Warm Up Time to 90% (MAX)	5 min
Hot Restart Time to 90% (MIN)	10 min
Hot Restart Time to 90% (MAX)	15 min

DIMENSIONS

Maximum Overall Length (MOL)	4.6800 in (118.8 mm)
Nominal Length	4.680 in (118.8 mm)
Bulb Diameter (DIA)	0.750 in (19.0 mm)
Light Center Length (LCL)	0.000 in (0 mm)

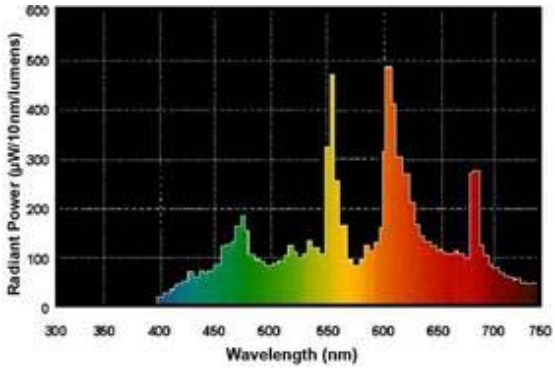
PRODUCT INFORMATION

ADDITIONAL RESOURCES

Catalogs
Testimonials
MSDS (Material Safety Data Sheets)
Disposal Policies & Recycling Information

GRAPHS & CHARTS

Spectral Power Distribution



Product Code	34536
Description	ARC70/TD/UVC/743
ANSI Code	M85
Standard Package	Case
Standard Package GTIN	10043168345368
Standard Package Quantity	12
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	12
UPC	043168345361

COMPATIBLE GE BALLASTS

Product Code	Description	# of Bulbs	Power Factor	Ballast Factor
86576	11210277CTC000C		90.0	1.0

CAUTIONS & WARNINGS

R- WARNING: This lamp can cause serious skin burn and eye inflammation from shortwave ultraviolet radiation if outer envelope of the lamp is broken or punctured, and the arc tube continues to operate. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used. Certain types of lamps that will automatically extinguish when the outer envelope is broken or punctured are commercially available. Visit the FDA website for more information: http://www.fda.gov/cdrh/radhealth/products/urburns.html

See list of cautions & warnings.

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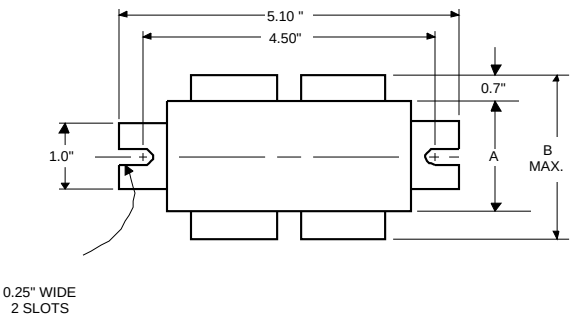
Metal Halide Lamp Ballast

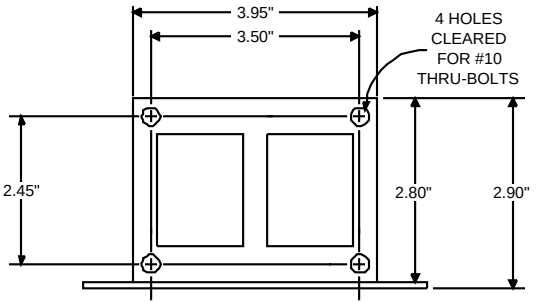
Catalog Number 71A5281
For 70W M139
60 Hz HX-HPF
Status: Active

DIMENSIONS AND DATA

3 X 4 CORE - 2 COIL UNIT

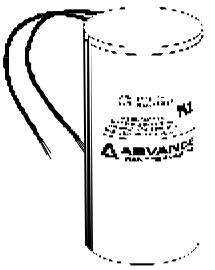


0.25" WIDE
2 SLOTS



INPUT VOLTS		120	277			
CIRCUIT TYPE	HX-HPF					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±5%					
Lamp Watts	±7%					
LINE CURRENT (Amps)						
Operating		0.85	0.37			
Open Circuit		1.60	0.70			
Starting		0.85	0.40			
UL TEMPERATURE RATINGS						
Insulation Class	H(180°C)					
Coil Temperature Code	1029	A	A			
MIN. AMBIENT STARTING TEMP.	-20°F or -30°C					
NOM. OPEN CIRCUIT VOLTAGE	245					
INPUT VOLTAGE AT LAMP DROPOUT		80	190			
INPUT WATTS	94					
RECOMMENDED FUSE (Amps)		4	2			
CORE and COIL						
Dimension (A)	1.50					
Dimension (B)	2.70					
Weight (lbs.)	5.5					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	8.0					
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)	220-270					
Short-Circuit Current Test (Amps)						
Secondary Current	1.10-1.40					
Input Current		0.70 1.10	0.30 0.50	-	-	-

Capacitor: 7C080L33-R



Capacitance: 8
Dia/Oval Dim: 1.25
Height: 2.9
Temp Rating: 105°C

Ignitor: LI533-H4

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

Wiring Diagram:

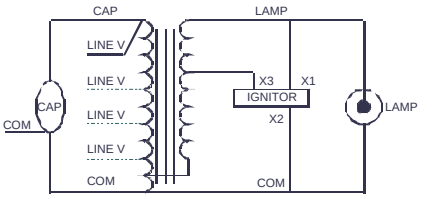


Fig. K3

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.

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05/13/99

12653 – MVR100/C/U/MED

GE Multi-Vapor® PulseArc® Quartz Metal Halide BD17

PRINT

GENERAL CHARACTERISTICS

Lamp type	High Intensity Discharge - Quartz Metal Halide
Bulb	BD17
Base	Medium Screw (E26)
Bulb Finish	Coated
Wattage	100
Voltage	100
Rated Life	15000 hrs
Bulb Material	Hard glass
Lamp Enclosure Type (LET)	Enclosed fixtures only

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	7600
Mean Lumens	4900
Nominal Initial Lumens per Watt	76
Color Temperature	4000 K
Color Rendering Index (CRI)	70

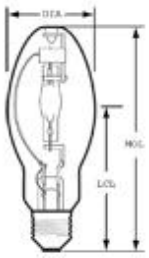
ELECTRICAL CHARACTERISTICS

Burn Position	Universal burning position
Open Circuit Voltage (peak lead ballast) (MIN)	332 V
Open Circuit Voltage (RMS lag ballast) (MIN)	235 V
Warm Up Time to 90% (MIN)	2 min
Warm Up Time to 90% (MAX)	5 min
Hot Restart Time to 90% (MIN)	10 min
Hot Restart Time to 90% (MAX)	15 min

DIMENSIONS

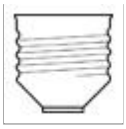
Maximum Overall Length (MOL)	5.4300
Nominal Length	5.430
Bulb Diameter (DIA)	2 1/8
Light Center Length (LCL)	3.430

PRODUCT INFORMATION



Bulb

Base



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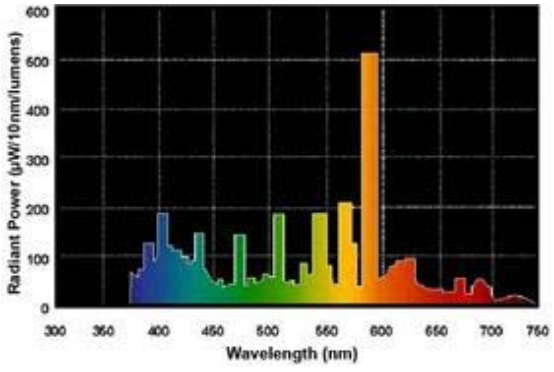
ADDITIONAL RESOURCES

Catalogs
Testimonials
MSDS (Material Safety Data Sheets)
Disposal Policies & Recycling Information

GRAPHS & CHARTS

Spectral Power Distribution



Product Code	12653
Description	MVR100/C/U/MED
ANSI Code	M90
Standard Package	Case
Standard Package GTIN	10043168126530
Standard Package Quantity	6
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	6
UPC	043168126533

COMPATIBLE GE BALLASTS

Product Code	Description	# of Bulbs	Power Factor	Ballast Factor
86574	11210239CTC000I	1	90.0	1.0
86667	GEM10048TLC3D-5	1	90.0	1.0
86675	GEM100MLTLC3D-5	1	90.0	1.0
87561	GEMH100-SLJ-MV	1	98.0	1.0

CAUTIONS & WARNINGS

R- WARNING: This lamp can cause serious skin burn and eye inflammation from shortwave ultraviolet radiation if outer envelope of the lamp is broken or punctured, and the arc tube continues to operate. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used. Certain types of lamps that will automatically extinguish when the outer envelope is broken or punctured are commercially available. Visit the FDA website for more information: http://www.fda.gov/cdrh/radhealth/products/urburns.html

See list of cautions & warnings.

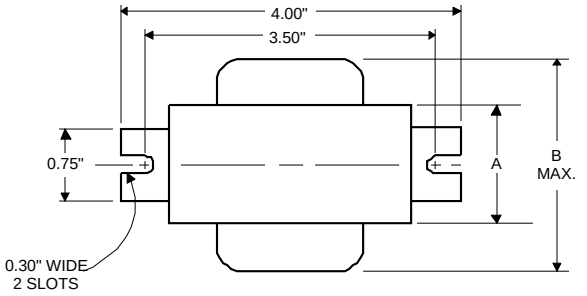
Return To Top

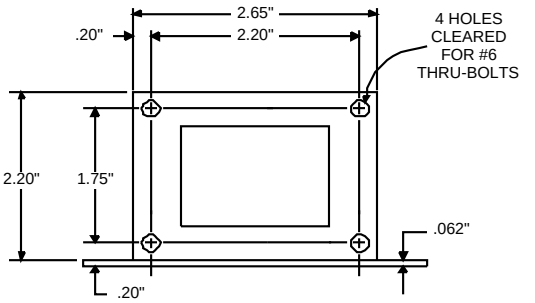
Metal Halide Lamp Ballast

Catalog Number 71A5337BP
For 100W M90/M140
60 Hz R-HPF
Status: Active

DIMENSIONS AND DATA

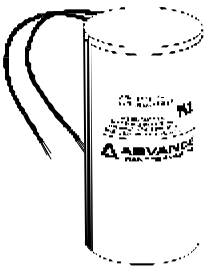
2 5/8 X 2 3/16 CORE





INPUT VOLTS		277				
CIRCUIT TYPE	R-HPF					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±5%					
Lamp Watts	±10%					
LINE CURRENT (Amps)						
Operating		0.45				
Open Circuit		1.05				
Starting		0.70				
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		190				
INPUT WATTS	118					
RECOMMENDED FUSE (Amps)		3				
CORE and COIL						
Dimension (A)	1.80					
Dimension (B)	3.10					
Weight (lbs.)	3.2					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	10.0					
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)	260-290					
Short-Circuit Current Test (Amps)						
Secondary Current	1.05-1.55					
Input Current		0.25 0.35	-	-	-	-

Capacitor: 7C100M33-R



Capacitance: 10
Dia/Oval Dim: 1.5
Height: 2.9
Temp Rating: 105°C

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

Wiring Diagram:

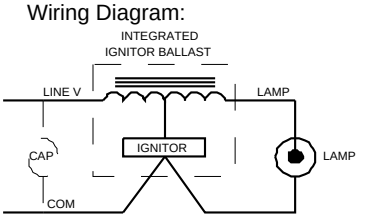


Fig. H

U.L. RECOGNIZED

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500DB	Ballast With Integral Igniter and Dry Film Capacitor
510DB	Ballast w/Welded Bracket, Integral Igniter & Dry Film Cap.
600B	Ballast and Integral Igniter, No Capacitor
610B	Ballast w/Welded Bracket and Integral Igniter, 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.

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08/12/04

21853 – CSR400/SE/HR

GE Quartz Metal Halide T6 - Stage & Studio

PRINT

GENERAL CHARACTERISTICS

Lamp type	High Intensity Discharge - Quartz Metal Halide
Bulb	T6
Base	GZZ9.5
Wattage	400
Voltage	70
Rated Life (Vert)	750 hrs
Primary Application	Stage & Studio

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	32000
Nominal Initial Lumens per Watt	80
Color Temperature	6000 K
CIE Color x	0.323
CIE Color y	0.328

ELECTRICAL CHARACTERISTICS

Burn Position	Universal burning position

DIMENSIONS

Maximum Overall Length (MOL)	4.3300 in (109.9 mm)
Bulb Diameter (DIA)	0.406 in (10.3 mm)
Light Center Length (LCL)	2.360 in (59.9 mm)

PRODUCT INFORMATION

Product Code	21853
Description	CSR400/SE/HR
Standard Package	Case
Standard Package GTIN	10043168218532
Standard Package Quantity	10
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	10
UPC	043168218535

Bulb

View Larger

ADDITIONAL RESOURCES

Catalogs
Testimonials
MSDS (Material Safety Data Sheets)
Disposal Policies & Recycling Information

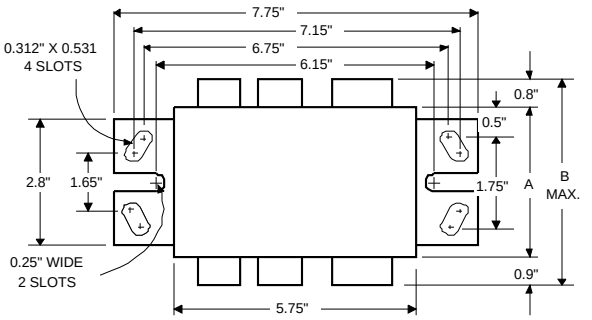
Return To Top

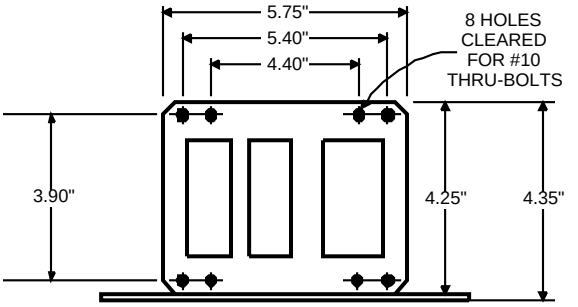
Metal Halide Lamp Ballast

Catalog Number 71A6034T
For 400W M128/M135 (P. S.)
60 Hz REGULATED LAG
Status: Active

DIMENSIONS AND DATA

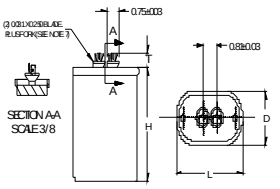
4 1/4 X 5 3/4 CORE - 3 COIL UNIT





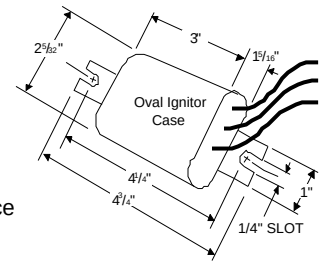
INPUT VOLTS		277				
CIRCUIT TYPE	REGULATED LAG					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±10%					
Lamp Watts	±7%					
LINE CURRENT (Amps)						
Operating		1.72				
Open Circuit		1.25				
Starting		0.70				
UL TEMPERATURE RATINGS						
Insulation Class	H(180°C)					
Coil Temperature Code	1029	A				
MIN. AMBIENT STARTING TEMP.	-40°F or -40°C					
NOM. OPEN CIRCUIT VOLTAGE	315					
INPUT VOLTAGE AT LAMP DROPOUT		150				
INPUT WATTS	465					
RECOMMENDED FUSE (Amps)		5				
CORE and COIL						
Dimension (A)	3.75					
Dimension (B)	5.50					
Weight (lbs.)	26					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	21.0					
Volts (min.)	500					
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)	285-345					
Short-Circuit Current Test (Amps)						
Secondary Current	3.30-4.05					
Input Current		0.20 0.35	-	-	-	-

Capacitor: MD2100-030



Capacitance: 21
Dia/Oval Dim: 1.75
Height: 3.9
Temp Rating: 90°C

Ignitor: LI534-H5



Ballast to Lamp Distance (BTL) = 2 feet
Temp Rating: 105°C

Wiring Diagram:

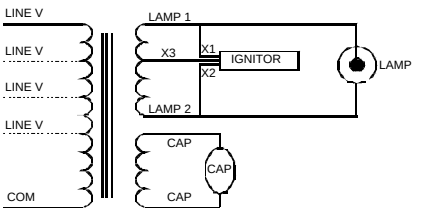


Fig. N

U.L. RECOGNIZED

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500.	Ballast with Ignitor and Oil Filled Capacitor
510.	Ballast w/Welded Bracket, Igniter & Oil-Filled 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
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05/27/99

10364 – MXR50/C/U/MED

GE Multi-Vapor® PulseArc® Quartz Metal Halide BD17

PRINT

GENERAL CHARACTERISTICS

Lamp type	High Intensity Discharge - Quartz Metal Halide
Bulb	BD17
Base	Medium Screw (E26)
Bulb Finish	Coated
Wattage	50
Voltage	75
Rated Life	10000 hrs
Bulb Material	Hard glass
Lamp Enclosure Type (LET)	Enclosed fixtures only

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	3000
Mean Lumens	2000
Nominal Initial Lumens per Watt	60
Color Temperature	3400 K
Color Rendering Index (CRI)	65

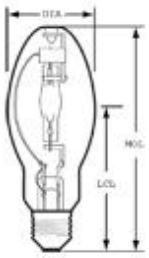
ELECTRICAL CHARACTERISTICS

Burn Position	Universal burning position
Open Circuit Voltage (peak lead ballast) (MIN)	332 V
Open Circuit Voltage (RMS lag ballast) (MIN)	235 V
Warm Up Time to 90% (MIN)	2 min
Warm Up Time to 90% (MAX)	5 min
Hot Restart Time to 90% (MIN)	10 min
Hot Restart Time to 90% (MAX)	15 min

DIMENSIONS

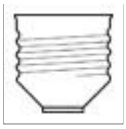
Maximum Overall Length (MOL)	5.4300
Nominal Length	5.430
Bulb Diameter (DIA)	2 1/8
Light Center Length (LCL)	3.430

PRODUCT INFORMATION



Bulb

Base



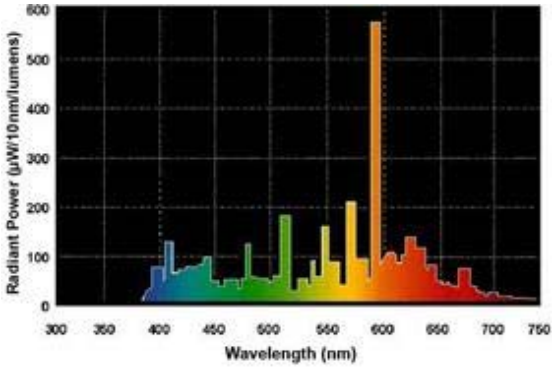
View Larger

ADDITIONAL RESOURCES

Catalogs
Testimonials
MSDS (Material Safety Data Sheets)
Disposal Policies & Recycling Information

GRAPHS & CHARTS

Spectral Power Distribution



Product Code	10364
Description	MXR50/C/U/MED
ANSI Code	M110
Standard Package	Case
Standard Package GTIN	10043168103647
Standard Package Quantity	6
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	6
UPC	043168103640

COMPATIBLE GE BALLASTS

Product Code	Description	# of Bulbs	Power Factor	Ballast Factor
86824	GEM50MLTLC3D-5	1	90.0	1.0
87516	GEMH50-MSF-120	1	99.0	1.0

CAUTIONS & WARNINGS

R- WARNING: This lamp can cause serious skin burn and eye inflammation from shortwave ultraviolet radiation if outer envelope of the lamp is broken or punctured, and the arc tube continues to operate. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used. Certain types of lamps that will automatically extinguish when the outer envelope is broken or punctured are commercially available. Visit the FDA website for more information: http://www.fda.gov/cdrh/radhealth/products/urburns.html

See list of cautions & warnings.

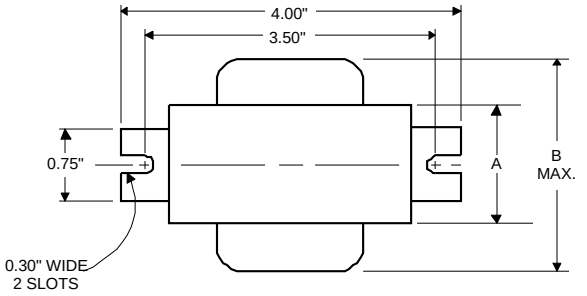
Return To Top

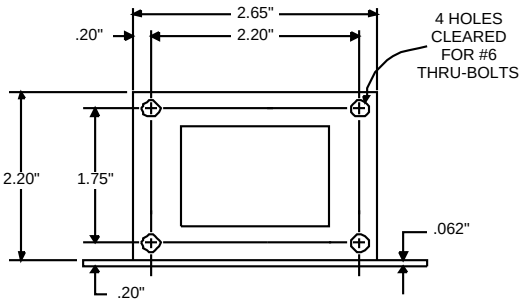
Metal Halide Lamp Ballast

Catalog Number 71A5137BP
For 50W M110
60 Hz R-HPF
Status: Active

DIMENSIONS AND DATA

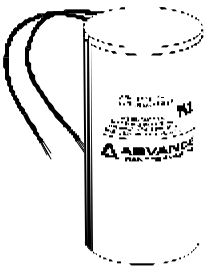
2 5/8 X 2 3/16 CORE





INPUT VOLTS		277				
CIRCUIT TYPE	R-HPF					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±5%					
Lamp Watts	±10%					
LINE CURRENT (Amps)						
Operating		0.22				
Open Circuit		0.55				
Starting		0.35				
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		190				
INPUT WATTS	62					
RECOMMENDED FUSE (Amps)		2				
CORE and COIL						
Dimension (A)	1.10					
Dimension (B)	2.60					
Weight (lbs.)	2.2					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	5.0					
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)	260-290					
Short-Circuit Current Test (Amps)						
Secondary Current	0.65-0.95					
Input Current		0.25 0.35	-	-	-	-

Capacitor: 7C050L33



Capacitance: 5
Dia/Oval Dim: 1.25
Height: 2.9
Temp Rating: 105°C

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

Wiring Diagram:

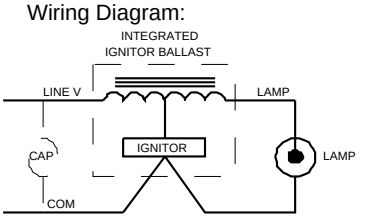


Fig. H

U.L. RECOGNIZED

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500DB	Ballast With Integral Igniter and Dry Film Capacitor
510DB	Ballast w/Welded Bracket, Integral Igniter & Dry Film Cap.
600B	Ballast and Integral Igniter, No Capacitor
610B	Ballast w/Welded Bracket and Integral Igniter, No Capacitor

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Corporate Offices: Phone: 800-322-2086

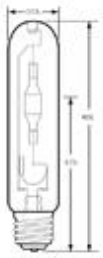
05/15/03

26683 – ARC250T/H960/E39

GE Multi-Vapor® Arcstream® Quartz Metal Halide T15

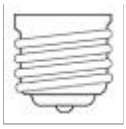
• Compact size, white light, excellent color Precise optical control delivers a concentrated beam of light right where it's needed

PRINT



Bulb

Base



View Larger

GENERAL CHARACTERISTICS

Lamp type	High Intensity Discharge - Quartz Metal Halide
Bulb	T15
Base	Mogul Screw (E39)
Bulb Finish	Clear
Wattage	250
Rated Life	10000 hrs
Bulb Material	Hard glass
Lamp Enclosure Type (LET)	Enclosed fixtures only
Picograms of Mercury	102 picograms

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	19000
Mean Lumens	13300
Nominal Initial Lumens per Watt	76
Color Temperature	6000 K
Color Rendering Index (CRI)	90

ELECTRICAL CHARACTERISTICS

Burn Position	Horizontal ±15º
Warm Up Time to 90%	2 min
Warm Up Time to 90% (MAX)	5 min
Hot Restart Time to 90% (MIN)	10 min
Hot Restart Time to 90% (MAX)	15 min

DIMENSIONS

Maximum Overall Length (MOL)	8.3700 in (212.5 mm)
Nominal Length	8.370 in (212.5 mm)
Bulb Diameter (DIA)	1.875 in (47.6 mm)
Light Center Length (LCL)	5.620 in (142.7 mm)

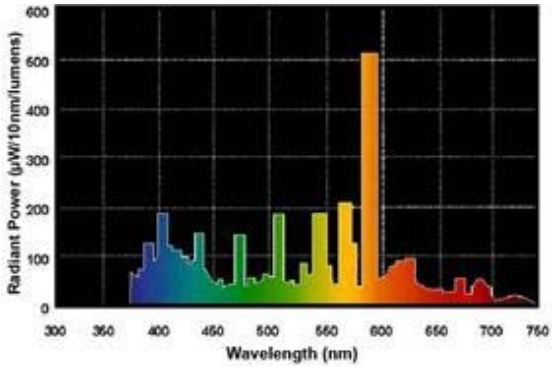
PRODUCT INFORMATION

ADDITIONAL RESOURCES

Catalogs
Testimonials
MSDS (Material Safety Data Sheets)
Disposal Policies & Recycling Information

GRAPHS & CHARTS

Spectral Power Distribution



Product Code	26683
Description	ARC250T/H960/E39
ANSI Code	M80
Standard Package	Case
Standard Package GTIN	10043168266830
Standard Package Quantity	12
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	12
UPC	043168266833

CAUTIONS & WARNINGS

R- WARNING: This lamp can cause serious skin burn and eye inflammation from shortwave ultraviolet radiation if outer envelope of the lamp is broken or punctured, and the arc tube continues to operate. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used. Certain types of lamps that will automatically extinguish when the outer envelope is broken or punctured are commercially available. Visit the FDA website for more information: http://www.fda.gov/cdrh/radhealth/products/urburns.html

See list of cautions & warnings.

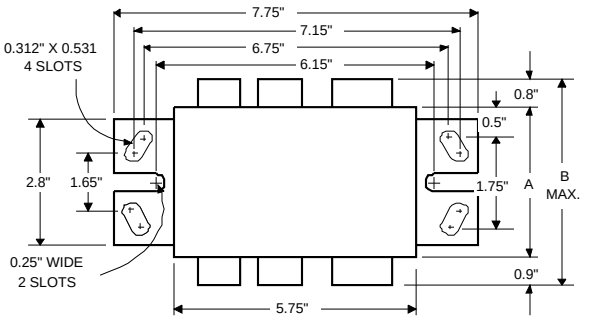
Return To Top

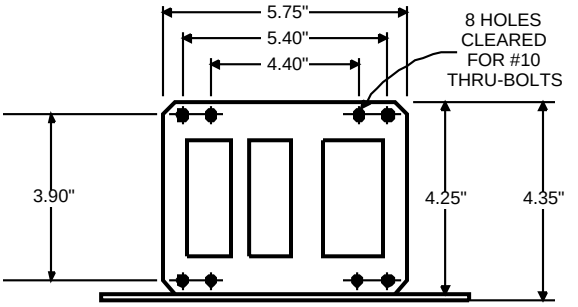
Metal Halide Lamp Ballast

Catalog Number 71A5734
For 250W M138 (Pulse Start)
60 Hz REGULATED LAG
Status: Active

DIMENSIONS AND DATA

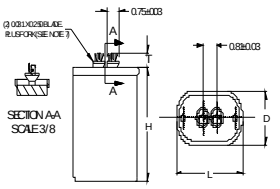
4 1/4 X 5 3/4 CORE - 3 COIL UNIT





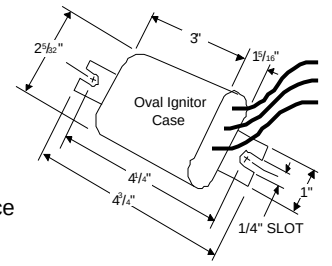
INPUT VOLTS		277				
CIRCUIT TYPE	REGULATED LAG					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±10%					
Lamp Watts	±+5%, -7%					
LINE CURRENT (Amps)						
Operating		1.20				
Open Circuit		1.00				
Starting		0.43				
UL TEMPERATURE RATINGS						
Insulation Class	H(180°C)					
Coil Temperature Code	1029	A				
MIN. AMBIENT STARTING TEMP.	-40°F or -40°C					
NOM. OPEN CIRCUIT VOLTAGE	305					
INPUT VOLTAGE AT LAMP DROPOUT		195				
INPUT WATTS	298					
RECOMMENDED FUSE (Amps)		3				
CORE and COIL						
Dimension (A)	2.50					
Dimension (B)	4.13					
Weight (lbs.)	16					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	16.0					
Volts (min.)	480					
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)	290-355					
Short-Circuit Current Test (Amps)						
Secondary Current	2.00-2.50					
Input Current		0.20 0.30	-	-	-	-

Capacitor: MD1606-000



Capacitance: 16
Dia/Oval Dim: 1.75
Height: 3.4
Temp Rating: 90°C

Ignitor: LI534-H5



Ballast to Lamp Distance (BTL) = 2 feet
Temp Rating: 105°C

Wiring Diagram:

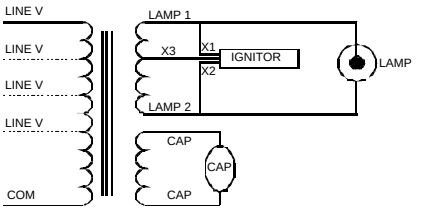


Fig. N

U.L. RECOGNIZED

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500.	Ballast with Ignitor and Oil Filled Capacitor
510.	Ballast w/Welded Bracket, Igniter & Oil-Filled 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.

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Corporate Offices: Phone: 800-322-2086

09/03/97

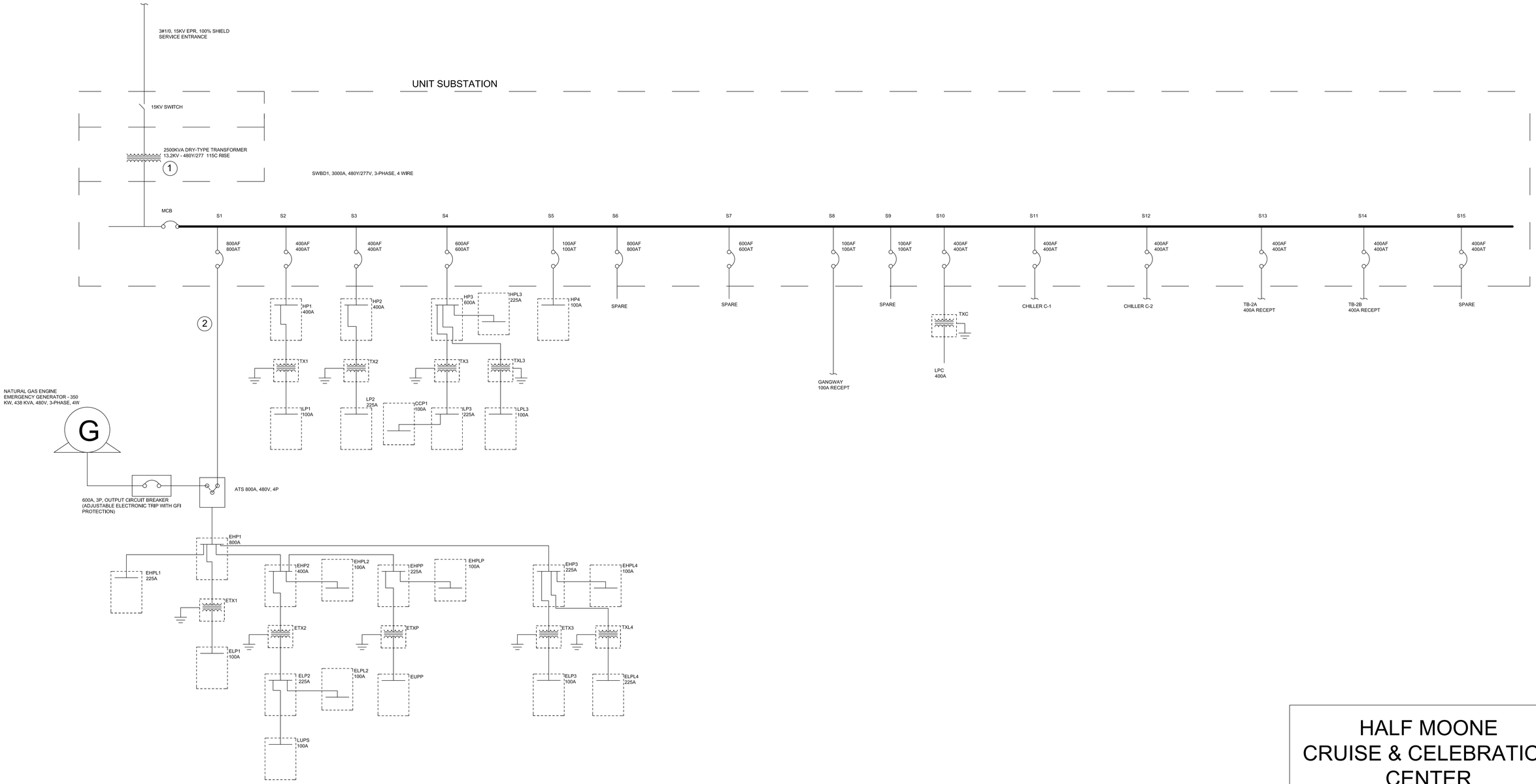
FEEDER SCHEDULE

TAG	FROM	TO	NO. OF SETS	CONDUIT (PER SET)		CONDUCTORS (PER SET)									SIZE OF OVERCURRENT PROTECTION	FRAME OR SWITCH SIZE	REMARKS
						PHASE CONDUCTORS			NEUTRAL CONDUCTORS			GROUND CONDUCTORS					
				SIZE	TYPE	No.	SIZE	TYPE	No.	SIZE	TYPE	No.	SIZE	TYPE			
		SWBD1	1			3	1/0										BY PENN PWR
1	SWBD1	ATS	2	3"	EMT	3	600KCMIL	CU THWN				1	1/0	CU THWN		3000A/3P	
12	SWBD1	HP1	2	2"		3	3/0		1	3/0		1	3			1600A/3P	
12	SWBD1	HP2	2	2"		3	3/0		1	3/0		1	3			1600A/3P	
8	SWBD1	HP3	2	3"		3	300KCMIL		1	300KCMIL		1	1				
6	SWBD1	HP4	1	2"		3	1		1	1		1	6				
9	SWBD1	GANGWAY	1	1/4"		3	3		-			1	8				
2	SWBD1	CHILLER C-1	1	3"		3	500KCMIL		-			1	3				
2	SWBD1	CHILLER C-2	1	3"		3	500KCMIL		-			1	3				
2	SWBD1	TB-2A	1	3"		3	500KCMIL		-			1	3				
2	SWBD1	TB-2B	1	3"		3	500KCMIL		-			1	3				
14	SWBD1	TXC	1	2"		3	2/0		-			1	6				
3	HP1	TX1	1	1"		3	6		-			1	10				
6	TX1	LP1	1	2"		3	1		1	1		1	6				
11	HP2	TX2	1	1-1/2"		3	2		-			1	6				
7	TX2	LP2	1	3"		3	350KCMIL		1	350KCMIL		1	2				
11	HP3	TX3	1	1-1/2"		3	2		-			1	6				
4	TX3	LP3	1	2"		3	1/0		1	1/0		1	6				
4	LP3	CCP1	1	2"		3	1/0		1	1/0		1	6				
3	HP3	TXL3	1	1"		3	6		-			1	10				
6	TXL3	LPL3	1	2"		3	1		1	1		1	6				
13	HP3	HPL3	1	2-1/2"		3	4/0		1	4/0		1	4				
15	TXC	LPC	2	2-1/2"		3	250KCMIL		1	250KCMIL		1	2				
8	ATS	CRKT BKR	2	3"		3	300KCMIL		1	300KCMIL		1	1				
1	ATS	EHP1	2	3"	EMT	3	600KCMIL	CU THWN				1	1/0	CU THWN		3000A/3P	
13	EHP1	EHPL1	1	2-1/2"		3	4/0		1	4/0		1	4				
3	EHP1	ETX1	1	1"		3	6		-			1	10				
6	ETX1	ELP1	1	2"		3	1		1	1		1	6				
2	EHP1	EHP2	1	3"		3	500KCMIL		1	KCMIL		1	3				
6	EHP2	EHPL2	1	2"		3	1		1	1		1	6				
11	EHP2	ETX2	1	1-1/2"		3	2		-			1	6				
7	ETX2	ELP2	1	3"		3	350KCMIL		1	350KCMIL		1	2				
11	ELP2	LUPS	1	1-1/2"		3	2		-			1	6				
11	ELP2	ELPL2	1	1-1/2"		3	2		-			1	6				
13	EHP2	EHPP	1	2-1/2"		3	4/0		1	4/0		1	4				
6	EHPP	EHPLP	1	2"		3	1		1	1		1	6				
3	EHPP	ETXP	1	1"		3	6		-			1	10				
6	ETXP	ELPP	1	2"		3	1		1	1		1	6				
5	EHP1	EHP3	1	3"		3	4/0		1	4/0		1	2				
6	EHP3	EHPL4	1	2"		3	1		1	1		1	6				
3	EHP3	ETX3	1	1"		3	6		-			1	10				
6	ETX3	ELP3	1	2"		3	1		1	1		1	6				
11	EHP3	TXL4	1	1-1/2"		3	2		-			1	6				
7	TXL4	ELPL4	1	3"		3	350KCMIL		1	350KCMIL		1	2				

NOTES:
1. REFER TO RISER DIAGRAM FOR FEEDER TAGS
2. ADD PROJECT NOTES HERE

AL=ALUMINUM

CU=COPPER



NOTES

1. FOR INFORMATION ON TRANSFORMERS, SEE ATTACHED TRANSFORMER SCHEDULE
2. FOR INFORMATION ON FEEDERS, SEE ATTACHED FEEDER SCHEDULE

HALF MOONE CRUISE & CELEBRATION CENTER

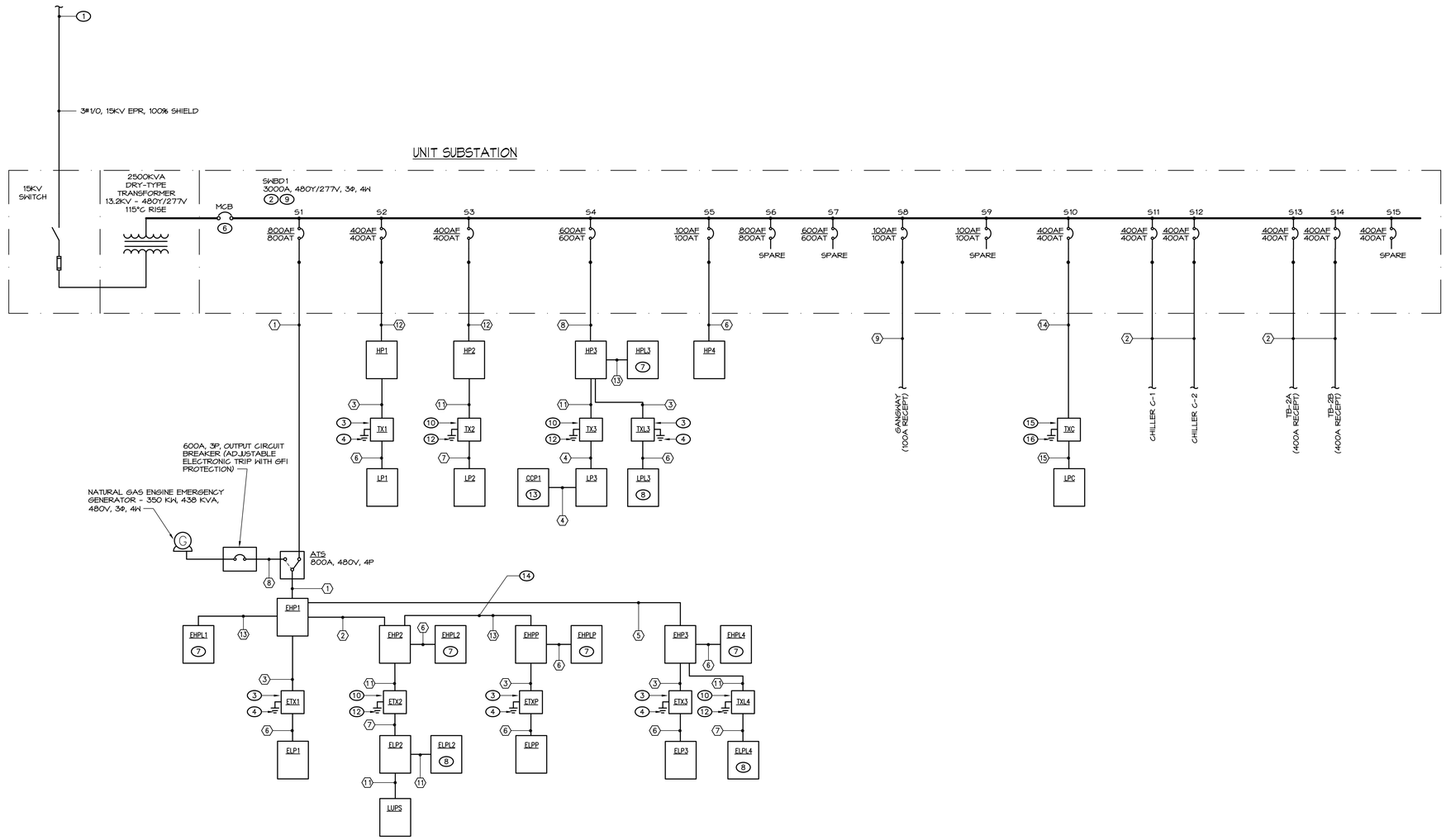
111 WATERSIDE DRIVE
NORFOLK, VIRGINIA

SINGLE-LINE DIAGRAM

JONATHAN C. WALKER

AE 481 SENIOR THESIS

NOVEMBER 2, 2008



NOTES

1. SPLICE TO EXISTING #1/0 FEEDER IN EXISTING MANHOLE.
2. ALL CIRCUIT BREAKERS SHALL BE THREE POLE, UON.
3. DRY TYPE TRANSFORMER - 30 KVA, 480-208Y/120V, 3Φ, 4W - 4.5% Z (MIN).
4. #6G - 1/2"C TO GROUNDING SYSTEM MAIN CONDUCTOR.
5. NOT USED.
6. PROVIDE 100% RATED CIRCUIT BREAKER WITH SINGLE PHASE AND GROUND FAULT PROTECTION.
7. LIGHTING CONTROL SWITCHING PANEL.
8. LIGHTING CONTROL DIMMING PANEL.
9. GROUND AND BOND THE NEUTRAL BUS AND GROUND BUS AT THE SWITCHBOARD ONLY. NEUTRAL BUSES IN ALL DOWNSTREAM PANELBOARDS SHALL BE INSULATED AND ISOLATED FROM GROUND.
10. DRY TYPE TRANSFORMER - 75 KVA, 480-208Y/120V, 3Φ, 4W - 4.5% Z (MIN).
11. NOT USED
12. #2G - 1/2"C TO GROUNDING SYSTEM MAIN CONDUCTOR.
13. CUSTOM COMBINATION PANEL FOR AC MOTOR SHADES
14. RUN CONDUIT ALONG UNDERSIDE OF CROSSING BRIDGE SECOND FLOOR. SEE SHEETS EP102 AND EP103.
15. DRY TYPE TRANSFORMER - 112.5 KVA, 480-208Y/120V, 3Φ, 4W - 4.5% Z (MIN).
16. #1/0G - 3/4"C TO GROUNDING SYSTEM MAIN CONDUCTOR.

CABLE LEGEND

1	2 SETS [3-600KCMIL, 1#1/0G, 3"C]
2	3-500KCMIL, 1#3G, 3"C
3	3#6, 1#10G, 1"C
4	4#1/0, 1#6G, 2"C
5	4#4/0, 1#2G, 3"C
6	4#1, 1#6G, 2"C
7	4-350KCMIL, 1#2G, 3"C
8	2 SETS [4-300KCMIL, 1#1G, 3"C]
9	3#3, 1#8G, 1 1/4"C
10	3#4/0, 1#4G, 2"C
11	3#2, 1#6G, 1 1/2"C
12	2 SETS [4#3/0, 1#3G, 2"C]
13	4#4/0, 1#4G, 2 1/2"C
14	3#2/0, 1#6G, 2"C
15	2 SETS [4-250KCMIL, 1#2G, 2 1/2"C]

ONE-LINE DIAGRAM NORFOLK CRUISE TERMINAL

NO SCALE

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ENGINEERS
INTERIOR DESIGNERS
PLANNERS
CONSTRUCTION MANAGERS

NORFOLK CRUISE TERMINAL
PHASE II
111 WATERSIDE DRIVE
NORFOLK, VIRGINIA

CN NO: 1812.2
DATE: APRIL 7, 2005
DESIGN: SPS
DRAWN: DMB
REVIEW: FJA

REVISIONS

No.	Date	Description	By

ONE-LINE DIAGRAM

EP701

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