Technical Report #2
Electrical System Existing Conditions and Building Load Summary

Maryland Transportation Authority
Police Training Facility
Hawkins Point, Baltimore, MD

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Table of Contents

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EXECUTIVE SUMMARY

Technical Report 2, Electrical System Existing Conditions and Building Load Summary, examines the existing lighting system of the Maryland Transportation Authority Police Training Facility. The report looks at the power distribution system and the communication systems of the building. Descriptions of the characteristics of the building systems and a summary of the total building electrical system are presented in the report that follows and were developed based on an exploration of the design drawings and specifications. Also included in the report are overcorrect devices, transformers, and lighting and mechanical loading. An appendix provides items such single line diagrams, tables, and rate schedules that supplement the report.

The Maryland Transportation Authority Police Training Facility uses a radial type electrical distribution system to supply the grounds with 480Y/277V, 3-phase power. Baltimore Gas & Electric, the electrical utility, supplies power at 13.8 kV to the distribution transformer located on the site. MdTA has three transformers to step-down from 480/277V to 208/120V. These transformers are located in the electrical rooms as defined in Table 1.

Loads on the distribution system are comprised mainly of lighting and mechanical loads. A majority of the lighting loads are powered by 277V single-phase power, however, some are power by 120V single-phase due to unique requirements. Appendix A contains the Luminaire Schedule, which details the lighting loads. Mechanical loads consist mostly of air handling units requiring 3-phase, 460V power. All mechanical loads are detailed in Table 4. Additional loads due to plumbing and architectural requirements are detailed in Table 5. Of these, the elevator is most notable, drawing 302 KVA at 460V, 3-phase power.

Communication systems are provided throughout the building. Telephone service raceways are provided from a main board connected to external telephone lines. A raceway system is also provided for computer networking. Access control systems, fire alarm systems, closed circuit television, and a TV antenna system are also discussed.

POWER DISTRIBUTION SYSTEMS

Distribution System Overview

The Maryland Transportation Authority Police Training Facility utilizes a radial type distribution system. The power distribution system consists of an electrical service provided by Baltimore Gas & Electric (BG&E). Power is available from the existing 13.8 kilovolt primary overhead 3-phase lines located under the 34.5 kilovolt overhead pole mounted line crossing the property line. From the overhead 13.8 kilovolts lines, BG&E supplies a set of primary conductors through conduit to a set of underground conduits encased in concrete, supplied by the owner, running under the building perimeter to the proposed pad mounted BG&E transformer, with the transformer pad being provided by MdTA. From the secondary of the pad mounted transformer, multiple sets of conductors in conduits encased in concrete will run underground to the main switchboard just inside the outer wall of the building. The conductors will be provided BG&E, while the underground ductbank will be provided by MdTA. Refer to Appendix A to view the Single Line Diagram for a better understanding of the interconnectivity of the distribution system and Appendix B for the accompanying Feeder Schedule.

Utility to Owner Transfer Point

The wiring from the utility transformer to the main circuit breaker is to be supplied by BG&E, while the conduit is to be supplied by the owner. The main 1200 amp circuit breaker marks the transfer point from utility to owner. On one side of the circuit breaker is the Baltimore Gas & Electric utility meters and on the other side is the customer meter.

Voltage Systems

A combination of 480Y/277V, 3-phase, 4-wire and 208Y/120V, 3-phase, 4-wire voltages are utilized in the building. Mechanical equipment over 1 HP will be served by 480V, 3-phase panels. Lighting will be served at 277V except special lighting requiring 120V that will be served from 208/120V, 3-phase lighting panels. General purpose receptacles, communication systems and most appliances will be fed from the 208/120V, 3-phase appliance / lighting panels.

Transformers

With the exception of the main utility transformer, voltages are transformed from 480Y/277V to 208Y/120V within the MdTA Police Training Facility. The following schedule lists the pertinent information regarding the transformers in the building.

INDIVIDUAL TRANSFORMER SCHEDULE								
TAG	PRIMARY VOLTAGE	SECONDARY VOLTAGE	SIZE	TYPE	TEMP. RISE	TAPS	MOUNTING	REMARKS
T-0	13800V,3PH,3W	480Y/277V,3PH,4W	N/A	N/A	N/A	N/A	PAD MOUNTED ON GRADE	---
T-1	480V,3PH,3W.	208Y/120V,3PH,4W	75	DRY TYPE	80 DEGREES C		PAD MOUNTED ON FLOOR	K-13 RATED
T-2	480V,3PH,3W.	208Y/120V,3PH,4W	112.5	DRY TYPE	80 DEGREES C		PAD MOUNTED ON FLOOR	---
T-3	480V,3PH,3W.	208Y/120V,3PH,4W	45	DRY TYPE	80 DEGREES C		WALL MOUNTED	---

Table 1

Emergency Power Systems

Emergency power is provided by an outdoor generator. The generator is 450KW at 480/277, 3-phase, 4 wire, with a 1000A circuit breaker. The Generator Distribution Panel (GDP), rated at 1200A, receives power from the generator. Two automatic transfer switches control the switch between normal and emergency power. Life safety lighting fixtures are all equipped with battery packs.

Over-current Protection Devices

A combination of circuit breakers and fused and unfused switches are used throughout the MdTA Police Training Facility. The Main Distribution Panel (MDP) is protected by a 1200A circuit breaker with TVSS protection and customer metering. The Generator has a 1000A circuit breaker leading to the GDP. 600A circuit breakers protect the feeder from GDP to the 600A transfer switch and the feeder from the 600A transfer switch to the Distribution Panel (DPTF). Similarly, 400A circuit breaker protects the feeder from GDP to the 400A transfer switch and the feeder from the 400A transfer switch to the Standby Distribution Panel (SBDP). A 600A circuit breaker provides protection from MDP to Distribution Panel (DPTF) and a 400A circuit breaker provides protection from MDP and GDP to the Standby Distribution Panel (SBDP). All other panels and loads are protected with circuit breakers or fused or unfused switches according to their individual requirements. Branch circuits are protected with individual circuit breakers providing redundant protection for the service entrance. Additionally, some of the mechanical equipment has disconnect switches.

Locations of Electrical Equipment

The generator and utility transformer are located on the exterior site. All main switchgear components located inside the building are on the first floor in either electrical room 124A or 117. This information, as well as the drawing numbers where the switchgear is located, can be found in the table below.

MAIN SWITCHGEAR LOCATIONS						
Equipment Tag	Type	Floor Level	Room Name	Room Number	1/8 Scale Plan	Enlarged Plan
MDP	Main Switchboard	First	Main Electrical	124A	E103	E201
DPTF	Distribution Panel	First	Electrical	117	E103	---
SBDP	Distribution Panel	First	Main Electrical	124A	E103	E201
GDP	Generator Distribution Panel	First	Main Electrical	124A	E103	E201
Generator	Generator	Exterior on Grade	Exterior	---	E103	E201
ATS DPTF	Automatic Transfer Switch	First	Main Electrical	124A	E103	E201
ATS SBDP	Automatic Transfer Switch	First	Main Electrical	124A	E103	E201
T-0	Utility Transformer	Exterior on Grade	Exterior	---	E103	E201
T-1	Transformer	First	Electrical	117	E103	---
T-2	Transformer	First	Electrical	117	E103	---
T-3	Transformer	First	Main Electrical	124A	E103	E201

Table 2

Panelboards are located throughout the building. Placement of panelboards in the building, as well as the main size for the panels, is listed in the table that follows. Plans showing the locations are also referenced in the table.

PANELBOARD LOCATIONS						
Equipment Tag	Main Size	Voltage	Floor Level	Room Name	Room Number	Floor Plan
RPTF1	150	208/120	First	Electrical	117	E103
RPTM2	150	208/120	Second	Electrical 2	222	E104
RPTM1	175	208/120	First	Electrical	117	E103
LPTF1	100	480/277	First	Electrical	117	E103
LPFR1	150	480/277	First	Main Electrical	124A	E103 / E201
RPFR2	175	208/120	First	Main Electrical	124A	E103 / E201
RPTF2	100	208/120	Second	Electrical 2	222	E104
RPG1	100	208/120	First	Telecom / Electric	132	E103
RPTM	300	208/120	First	Electrical	117	E103

Table 3

Power Factor Correction

There are no power factor correction devices in the Maryland Transportation Authority Police Training Facility.

Design Considerations

The electrical distribution system requires no special design considerations.

Lighting Loads

The lighting system throughout the MdTA Police Training Facility consists mostly of fluorescent lighting. Recessed 2' by 4' luminaries of various types are used in classrooms, circulation spaces, the range, office spaces, and others. Most lighting is powered at 277volts with the exception of special lighting at 120 volts. Metal halide, compact fluorescent, and halogen lamps are also found in the facility's lighting design.

Lighting loads are listed with their electrical characteristics in the Luminaire Schedule in Appendix C. Also, included in Appendix C are the various ballast cutsheets referenced to complete the Luminaire Schedule.

Mechanical Loads

Various mechanical system components are utilized throughout the building, which require electrical power. The table below lists load, voltage and phase, power factor, and equivalent load in kilowatts for the various mechanical equipment.

Note: A power factor of 0.95 was assumed for motors larger than 5 hp, and a power factor of 0.85 was assumed for motors smaller than 5 hp.

EQUIPMENT TAG	DESCRIPTION	LOAD (KVA)	VOLTAGE & PHASE	POWER FACTOR	kW
MECHANICAL LOADS					
AHU-1	AIR HANDLING UNIT	54	460V/3Φ	0.95	51.30
AHU-1 ELEC. HEAT	AIR HANDLING UNIT	60	460V/3Φ	0.95	57.00
AHU-2	AIR HANDLING UNIT	54	460V/3Φ	0.95	51.30
AHU-2 ELEC. HEAT	AIR HANDLING UNIT	60	460V/3Φ	0.95	57.00
AHU-3	AIR HANDLING UNIT	52.47	460V/3Φ	0.95	49.85
AHU-4 SUPPLY	AIR HANDLING UNIT	17.45	460V/3Φ	0.95	16.58
AHU-4 RETURN	AIR HANDLING UNIT	9.15	460V/3Φ	0.95	8.69
AHU-5 SUPPLY	AIR HANDLING UNIT	17.45	460V/3Φ	0.95	16.58
AHU-5 RETURN	AIR HANDLING UNIT	9.15	460V/3Φ	0.95	8.69
AHU-6	AIR HANDLING UNIT	9.15	460V/3Φ	0.95	8.69
AHU-7 SUPPLY	AIR HANDLING UNIT	9.15	460V/3Φ	0.95	8.69
AHU-7 RETURN	AIR HANDLING UNIT	6.33	460V/3Φ	0.95	6.01
AHU-8	AIR HANDLING UNIT	18.63	460V/3Φ	0.95	17.70
BOILER-1	BOILER	0.4	277V/1Φ	0.85	0.34
BOILER-2	BOILER	0.4	277V/1Φ	0.85	0.34
UH-1	UNIT HEATER	0.2	277V/1Φ	0.85	0.17
UH-2	UNIT HEATER	0.2	277V/1Φ	0.85	0.17
UH-3	UNIT HEATER	0.03	460V/3Φ	0.95	0.03
UH-4	UNIT HEATER	0.03	460V/3Φ	0.95	0.03
UH-5 & 5A	UNIT HEATERS	15	460V/3Φ	0.95	14.25
UH-6 & 7	UNIT HEATERS	15	460V/3Φ	0.95	14.25
UH-8 & 9	UNIT HEATERS	15	460V/3Φ	0.95	14.25
CUH-1&2		0.36	277V/1Φ	0.85	0.31
DWH-1	WATER HEATER	0.6	277V/1Φ	0.85	0.51
HWP-1	HOT WATER PUMP	2	208V/3Φ	0.95	1.90
HWP-2	HOT WATER PUMP	2	208V/3Φ	0.95	1.90
	MOTOR DAMPER RM#118	0.3	277V/1Φ	0.85	0.26
	MOTOR DAMPER RM#131	0.3	277V/1Φ	0.85	0.26
EF-1	EXHAUST FAN	0.4	277V/1Φ	0.85	0.34
EF-2	EXHAUST FAN	0.4	277V/1Φ	0.85	0.34
EF-3	EXHAUST FAN	0.6	277V/1Φ	0.85	0.51
EF-4	EXHAUST FAN	0.2	277V/1Φ	0.85	0.17
EF-5	EXHAUST FAN	0.6	277V/1Φ	0.85	0.51
EF-6	EXHAUST FAN	2.6	208V/3Φ	0.85	2.21
EF-7	EXHAUST FAN	0.3	277V/1Φ	0.85	0.26
EF-8	EXHAUST FAN	0.12	277V/1Φ	0.85	0.10
EF-9	EXHAUST FAN	0.6	277V/1Φ	0.85	0.51
CP-1	PUMP	1.2	120V/1Φ	0.85	1.02
CP-2	PUMP	1.2	120V/1Φ	0.85	1.02
AC-1	RM#118	2.7	208V/3Φ	0.85	2.30
CU-6	CONDITIONING UNIT	54	460V/3Φ	0.95	51.30
CU-7	CONDITIONING UNIT	65.01	460V/3Φ	0.85	55.26

Table 4

Note: A power factor of 0.95 was assumed for motors larger than 5 hp, and a power factor of 0.85 was assumed for motors smaller than 5 hp.

EQUIPMENT TAG	DESCRIPTION	LOAD (KVA)	VOLTAGE & PHASE	POWER FACTOR	kW
PLUMBING LOADS					
	EYE WASH	0.6	277V/1Φ	0.85	0.51
P-1	AQUASTAT	0.2	277V/1Φ	0.85	0.17
ARCHITECTURAL LOADS					
ELEVATOR		301.6	460V/3Φ	0.95	286.52
	ELEVATOR CAB HEATER/FAN	0.6	277V/1Φ	0.85	0.51
	BULLET TRAP MOTOR 1/2HP	4.155	480V/3Φ	0.95	3.95
	BULLET TRAP MOTOR 1/2HP	0.915	480V/3Φ	0.85	0.78
	BULLET TRAP MOTOR 3 HP	4.155	480V/3Φ	0.95	3.95
	TARGET ACTUATORS 11&12	1.2	277V/1Φ	0.85	1.02
	TARGET ACTUATORS 13&14	1.2	277V/1Φ	0.85	1.02
	TARGET ACTUATORS 15&16	1.2	277V/1Φ	0.85	1.02
	TARGET ACTUATORS 17&18	1.2	277V/1Φ	0.85	1.02
	TARGET ACTUATORS 19&20	1.2	277V/1Φ	0.85	1.02
	GENSET BLOCK HEATER	1.2	277V/1Φ	0.85	1.02
	GENSET BATTERY CHARGER	1.2	277V/1Φ	0.85	1.02
	ELEC. WATER COOLER #1	0.5	120V/1Φ	0.85	0.43
	ELEC. WATER COOLER #2	0.5	120V/1Φ	0.85	0.43

Table 5

Service Entrance Size

A series of calculations were done to indicate the required size of the service entrance during various phases of the design process. Method 1 corresponds to the conceptual and schematic phases, Method 2 to the design development phase, and Method 3 to the working drawings through closeout phases.

Method 1 for sizing the service entrance gives a load per square foot estimate using VA/ft^2 for various building types to determine amps required. The VA/ft^2 value of 8 VA/ft^2 is from the Loading Information for Various Building Types table that was received from the electrical consultant for senior thesis. I assumed the training facility to be a college classroom building, as it seemed to be the closest in terms of function.

SERVICE ENTRANCE SIZE - METHOD 1						
ft^2	VA/ft^2	VA	VOLTAGE	PHASE	MULTIPLIER	AMPS
41200	8	329600	480	3	1.73	397

Table 6

The second method for sizing the service entrance multiplies the gross square foot area times the sum of the average demand loads per category. The VA/ft^2 values used for receptacles, fans/pumps, and heating and cooling loads are assumptions we were advised to make. The lighting value is from NFPA 70: National Electrical Code (NEC 2005) Table 220.10 General Lighting Loads by Occupancy.

SERVICE ENTRANCE SIZE - METHOD 2							
LOAD	ft^2	VA/ft^2	VA	VOLTAGE	PHASE	MULTIPLIER	AMPS
RECEPTACLES	41200	1	41200	120	1	1	343
FANS / PUMPS	41200	2	82400	480	3	1.73	99
HVAC	41200	7	288400	480	3	1.73	347
LIGHTING	41200	3.5	144200	480	3	1.73	174
SUMMARY	---	---	---	---	---	---	964

Table 7

The third method uses a combination of the total loads from lighting and appliance panelboard schedules and mechanical equipment and other loads not found in the lighting and appliance panelboard schedules.

SERVICE ENTRANCE SIZE - METHOD 3						
LOAD / PANELBOARD	KVA	VOLTAGE	PHASE	MULTIPLIER	DEMAND FACTOR	AMPS
LPFR1	25.52	480	3	1.73	0.8	24.59
RPFR2	26.5	120	1	1	0.8	176.67
RPTF2	17.5	120	1	1	0.8	116.67
RPG1	3.6	120	1	1	0.8	24.00
RPTM	64	120	1	1	0.8	426.67
RPFTF1	36	120	1	1	0.8	240.00
RPTM2	17.775	120	1	1	0.8	118.50
RPTM1	23.86	120	1	1	0.8	159.07
LPTF1	27.5	480	3	1.73	0.8	26.49
MECHANICAL	880	480	3	1.73	0.8	847.78
TOTAL	---	---	---	---	---	2160.43

Table 8

The following table contains a summary of the required amps and the service entrance size based on the calculations of the three methods above. The service entrance size was determined from a list of standard sizes of 1600, 2000, 2500, 3000, and 4000 amps (from *Electrical Systems in Buildings* by S. David Hughes). I acknowledge that there are standard sizes at lower amperes, however this is the best source of information presently available, so sizes were chosen based on the above amperages. The actual service entrance size from the design documents is also included.

SERVICE ENTRANCE SIZE - SUMMARY				
SIZE	METHOD 1	METHOD 2	METHOD 3	ACTUAL
REQUIRED SIZE	964 A	943 A	2160 A	---
SERVICE ENTRANCE SIZE	1600 A	1600 A	2500 A	1200 A

Table 9

Utility Company Information

Electric utility service is provided to the Maryland Transportation Authority Police Training facility by Baltimore Gas & Electric (BG&E). The General Service Small Rate Schedule (Schedule GS) applies to the training facility.

A breakdown of the utility rate schedule information, as well as contact information for Baltimore Gas & Electric, can be viewed in Appendix D.

COMMUNICATION SYSTEMS

Communications/Data Systems

A raceway system only will be provided for the telephone system. Cables will be brought by Verizon in two 4" PVC conduits (conduits provided by owner) that will be run underground from the board to a pole East of the building perimeter road and connected to the existing overhead telephone lines.

A raceway system only will be provided for the computer network as well. One data outlet per workstation at offices, classrooms, reception, Weapon Repair room, control room, and Weapon Cleaning room are provided. All outlet conduits shall be run underground to a 4'x8'x0.75' board in electrical room 117.

Access Control (Security) System

A controlled access security system is capable of recording, reporting, and alarming both locally and remotely based on a set of detectors within the facility. Magnetic switches are provided at exit doors and doors into weapons and ammunition storage rooms, the control room, the weapons cleaning and the repair rooms. Door entry controllers are located at the entry doors to the Weapons and Ammunition Storage rooms. Movement Sensors are provided at the weapons and ammunition storage rooms.

Fire Alarm System

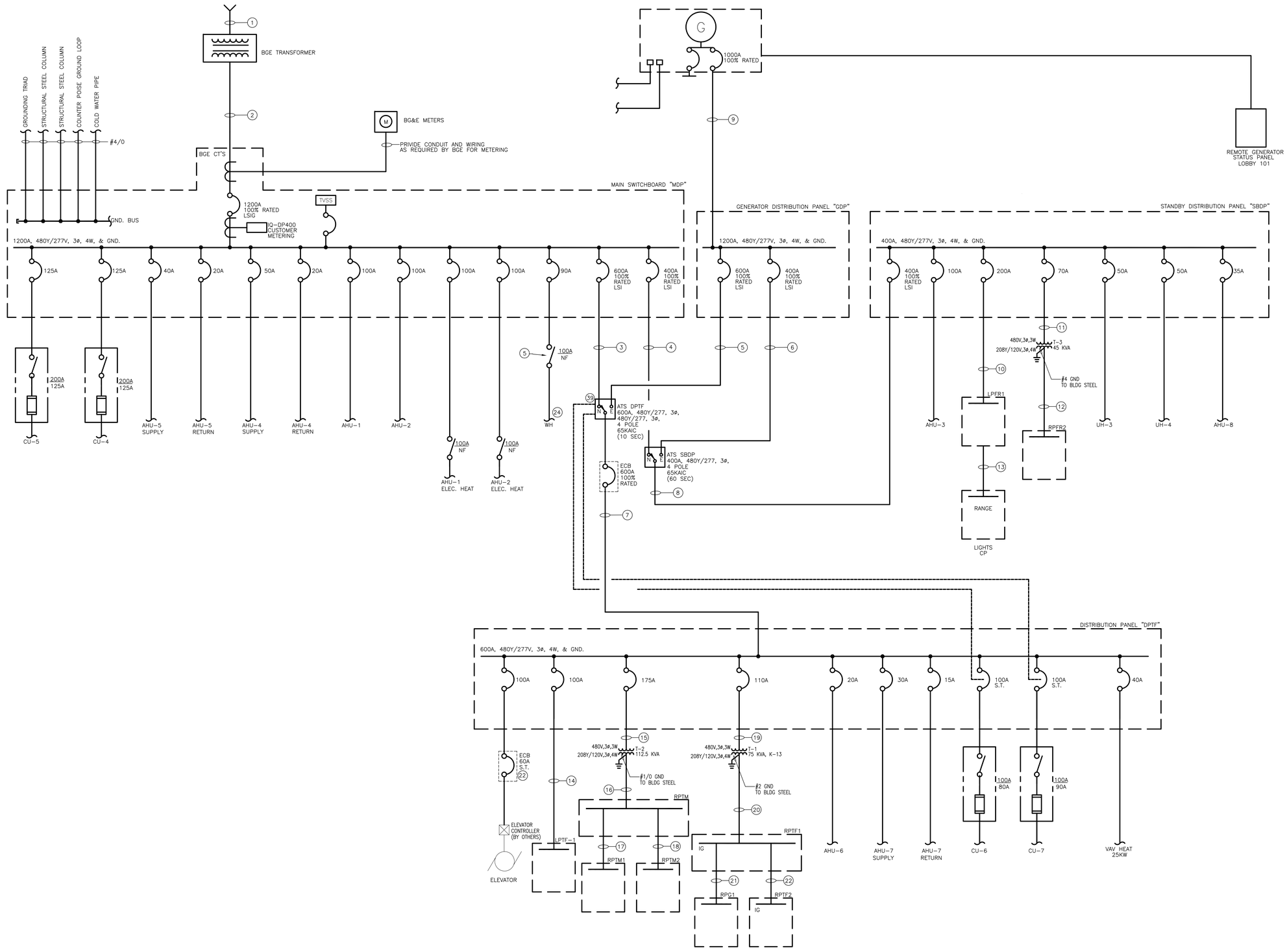
The fire alarm system is a multiplex addressable type with the main panel in the electrical room and the annunciator in the reception room. These are connected via a telephone dialer to the fire department or a remote monitoring service company. Pull stations, audio/visual signals, duct detectors, smoke detectors, and head detectors are located throughout the building.

Closed Circuit TV (CCTV)

A Closed Circuit TV system is utilized with a monitoring console at the reception desk to ensure security in the training facility.

TV Antenna System

TV antenna system is provided via a concealed raceway system with an antenna system connected to a roof mounted dish to pick up regular broadcasting and other signals put out by the state and federal agencies. TV outlets are provided in each classroom for the ceiling mounted TV sets.



SINGLE LINE DIAGRAM
N.T.S.

GENERAL NOTES

1. REFER TO SCHEDULES AND/OR FLOOR PLANS FOR WIRE SIZES.

DRAWING NOTES

(1) AHU-1,480V,3ø,50 HP WITH INTEGRAL STARTER/DISCONNECT.
(2) AHU-1,480V,3ø,60KW ELECTRIC HEAT.
(3) AHU-2,480V,3ø,50 HP WITH INTEGRAL STARTER/DISCONNECT.
(4) AHU-2,480V,3ø,60KW ELECTRIC HEAT.
(5) HEAVY DUTY 100A,600VAC,3POLE NON-FUSED DISCONNECT SWITCH IN A NEMA 12 ENCLOSURE UNIT MTD.
(6) UH-3, 480V,3ø 30 KW ELEC. HEAT WITH INTEGRAL STARTER/DISCONNECT.
(7) UH-4, 480V,3ø 30 KW ELEC. HEAT WITH INTEGRAL STARTER/DISCONNECT.
(8) AHU-4,480V,3ø,15HP SUPPLY FAN WITH INTEGRAL STARTER/DISCONNECT.
(9) AHU-5,480V,3ø,15HP SUPPLY FAN WITH INTEGRAL STARTER/DISCONNECT.
(10) CU-4,480V,3ø,117 FLA.
(11) CU-5,480V,3ø,117 FLA.
(12) HEAVY DUTY 200A,600VAC,3POLE FUSED DISCONNECT SWITCH FUSED AT 125A IN A NEMA 3R ENCLOSURE UNIT MOUNTED. COORDINATE EXACT LOCATION WITH THE MECHANICAL UNIT MANUFACTURER.
(13) CU-6,480V,3ø,65 FLA.
(14) CU-7,480V,3ø,65 FA.
(15) HEAVY DUTY 100A,600VAC,3POLE FUSED DISCONNECT SWITCH FUSED AT 80A IN A NEMA 3R ENCLOSURE UNIT MOUNTED. COORDINATE EXACT LOCATION WITH THE MECHANICAL UNIT MANUFACTURER.
(16) AHU-6,480V,3ø,7.5 HP WITH INTEGRAL STARTER/DISCONNECT.
(17) AHU-7,480V,3ø,7.5 HP SUPPLY FAN WITH INTEGRAL STARTER/DISCONNECT.
(18) AHU-3,480V,3ø,15 HP WITH INTEGRAL STARTER/DISCONNECT.
(19) HEAVY DUTY 100A,600VAC,3POLE FUSED DISCONNECT SWITCH FUSED AT 90A IN A NEMA 3R ENCLOSURE UNIT MOUNTED. COORDINATE EXACT LOCATION WITH THE MECHANICAL UNIT MANUFACTURER.
(20) PROVIDE REMOTE GENSET ANNUNCIATOR PANEL IN CONDUIT.
(21) DISCONNECT BONDING CONNECTION FROM NEUTRAL TO GROUND.
(22) 60A ENCLOSED CIRCUIT BREAKER WITH SHUNT TRIP, NEMA 1 ENCLOSURE. COORDINATE EXACT SIZE WITH ELEVATOR VENDOR.
(23) OUTDOOR GENERATOR 450KW, 480/277 3ø, 4W, WITH WEATHER PROOF ENCLOSURE.
(24) 54KW WATER HEATER
(25) (12)#400KCMIL & (3)#2/0GND IN (3)4" C AND (1) SPARE 4"C
(26) BATTERY CHARGER CIRCUIT TO PANEL RPFR2-32. BLOCK HEATER CIRCUIT TO PANEL RPFR2-30, BOTH IN 1-1/4"C.
(27) ATS CONTROL WIRE
(28) PROVIDE 2 SETS (4)#3/0&(1)#3GND, IN 2"C.
(29) AHU-4,480V,3ø,7.5HP RETURN FAN WITH INTEGRAL STARTER/DISCONNECT.
(30) AHU-5,480V,3ø,7.5HP RETURN FAN WITH INTEGRAL STARTER/DISCONNECT.
(31) AHU-7,480V,3ø,5HP RETURN FAN WITH INTEGRAL STARTER/DISCONNECT.
(32) 10KW VAV BOX 109 ELECTRIC HEAT WITH INTEGRAL DISCONNECT.
(33) AHU-8,480V,3ø, 27MCA WITH INTEGRAL STARTER/DISCONNECT.
(34) PROVIDE (4)#1/0&(1)#4GND, IN 2"C.
(35) PROVIDE (5)#4/0, (1)#2GND. & (1)#2 IG, IN 2-1/2"C. (DOUBLE NEUTRAL CONDUCTOR.)
(36) PROVIDE 2 SETS (4)#3/0&(1)#1/0GND, IN 2"C.
(37) (3)#1&(1)#8GND, IN 1-1/4"C.
(38) (3)#4&(1)#10GND, IN 1"C.
(39) CONNECT SHUNT TRIPS TO AUXILIARY CONTACTS IN ATS.
(40) PROVIDE PROVISIONS INCLUDING CIRCUIT BREAKER AND LUGS FOR CONNECTION OF PORTABLE LOAD BANK FOR 50% RATED CAPACITY OF GENERATOR.
(41) PROVIDE 2 SETS (4)#350KCMIL&(1)#1GND, IN 3"C.

FILE: L:\WASTEWT\3011135 MdTA\Task No. 9 Firearms Training Facility\Drawings\

JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future

RUBELING & ASSOCIATES, INC.
ARCHITECTURE
INTERIOR DESIGN

Leah Clark
AE 482 Senior Thesis
November 2, 2007
Single Line Diagram

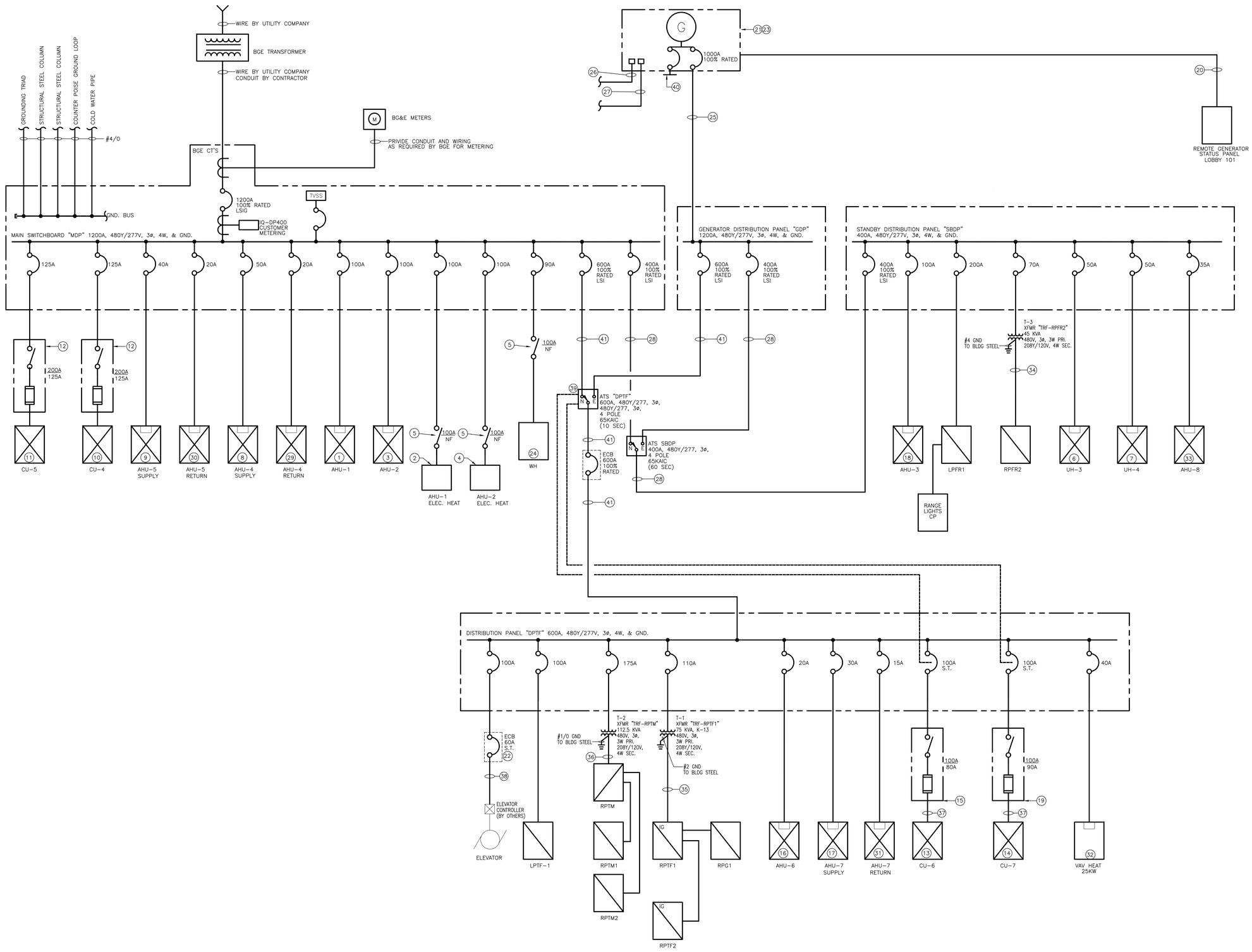
MARYLAND TRANSPORTATION AUTHORITY
Engineering Division

ADDENDUMS & REVISIONS			
NO.	DESCRIPTION	BY	DATE

POLICE TRAINING FACILITY
MARYLAND TRANSPORTATION AUTHORITY
HAWKINS POINT (BALTIMORE CITY)
SINGLE LINE DIAGRAM AND FIXTURE SCHEDULE

DESIGNED BY R.K. | DRAWN BY N.S. | CHECKED BY R.K.
CONST. REVIEW BY R.K. | DATE SEPT. 15, 2004 | SCALE N.T.S.

CONTRACT NO. KB-381-000-006
DRAWING NO. E301
SHEET NO. 98 OF 113



SINGLE LINE DIAGRAM

N.T.S.

GENERAL NOTES

1. REFER TO SCHEDULES AND/OR FLOOR PLANS FOR WIRE SIZES.

DRAWING NOTES

(1) AHU-1,480V,3ø,50 HP WITH INTEGRAL STARTER/DISCONNECT.

(2) AHU-1,480V,3ø,60KW ELECTRIC HEAT.

(3) AHU-2,480V,3ø,50 HP WITH INTEGRAL STARTER/DISCONNECT.

(4) AHU-2,480V,3ø,60KW ELECTRIC HEAT.

(5) HEAVY DUTY 100A,600VAC,3POLE NON-FUSED DISCONNECT SWITCH IN A NEMA 12 ENCLOSURE UNIT MTD.

(6) UH-3, 480V,3ø 30 KW ELEC. HEAT WITH INTEGRAL STARTER/DISCONNECT.

(7) UH-4, 480V,3ø 30 KW ELEC. HEAT WITH INTEGRAL STARTER/DISCONNECT.

(8) AHU-4,480V,3ø,15HP SUPPLY FAN WITH INTEGRAL STARTER/DISCONNECT.

(9) AHU-5,480V,3ø,15HP SUPPLY FAN WITH INTEGRAL STARTER/DISCONNECT.

(10) CU-4,480V,3ø,117 FLA.

(11) CU-5,480V,3ø,117 FLA.

(12) HEAVY DUTY 200A,600VAC,3POLE FUSED DISCONNECT SWITCH FUSED AT 125A IN A NEMA 3R ENCLOSURE UNIT MOUNTED. COORDINATE EXACT LOCATION WITH THE MECHANICAL UNIT MANUFACTURER.

(13) CU-6,480V,3ø,65 FLA.

(14) CU-7,480V,3ø,65 FA.

(15) HEAVY DUTY 100A,600VAC,3POLE FUSED DISCONNECT SWITCH FUSED AT 80A IN A NEMA 3R ENCLOSURE UNIT MOUNTED. COORDINATE EXACT LOCATION WITH THE MECHANICAL UNIT MANUFACTURER.

(16) AHU-6,480V,3ø,7.5 HP WITH INTEGRAL STARTER/DISCONNECT.

(17) AHU-7,480V,3ø,7.5 HP SUPPLY FAN WITH INTEGRAL STARTER/DISCONNECT.

(18) AHU-3,480V,3ø,15 HP WITH INTEGRAL STARTER/DISCONNECT.

(19) HEAVY DUTY 100A,600VAC,3POLE FUSED DISCONNECT SWITCH FUSED AT 90A IN A NEMA 3R ENCLOSURE UNIT MOUNTED. COORDINATE EXACT LOCATION WITH THE MECHANICAL UNIT MANUFACTURER.

(20) PROVIDE REMOTE GENSET ANNUNCIATOR PANEL IN CONDUIT.

(21) DISCONNECT BONDING CONNECTION FROM NEUTRAL TO GROUND.

(22) 60A ENCLOSED CIRCUIT BREAKER WITH SHUNT TRIP, NEMA 1 ENCLOSURE. COORDINATE EXACT SIZE WITH ELEVATOR VENDOR.

(23) OUTDOOR GENERATOR 450KW, 480/277 3ø, 4W, WITH WEATHER PROOF ENCLOSURE.

(24) 54KW WATER HEATER

(25) (12)#400KCMIL & (3)#2/0GND IN (3)4" C AND (1) SPARE 4"C

(26) BATTERY CHARGER CIRCUIT TO PANEL RPFR2-32. BLOCK HEATER CIRCUIT TO PANEL RPFR2-30, BOTH IN 1-1/4"C.

(27) ATS CONTROL WIRE

(28) PROVIDE 2 SETS (4)#3/0&(1)#3GND, IN 2"C.

(29) AHU-4,480V,3ø,7.5HP RETURN FAN WITH INTEGRAL STARTER/DISCONNECT.

(30) AHU-5,480V,3ø,7.5HP RETURN FAN WITH INTEGRAL STARTER/DISCONNECT.

(31) AHU-7,480V,3ø,5HP RETURN FAN WITH INTEGRAL STARTER/DISCONNECT.

(32) 10KW VAV BOX 109 ELECTRIC HEAT WITH INTEGRAL DISCONNECT.

(33) AHU-8,480V,3ø, 27MCA WITH INTEGRAL STARTER/DISCONNECT.

(34) PROVIDE (4)#1/0&(1)#4GND, IN 2"C.

(35) PROVIDE (5)#4/0, (1)#2GND. & (1)#2 IG, IN 2-1/2"C. (DOUBLE NEUTRAL CONDUCTOR.)

(36) PROVIDE 2 SETS (4)#3/0&(1)#1/0GND, IN 2"C.

(37) (3)#1&(1)#8GND, IN 1-1/4"C.

(38) (3)#4&(1)#10GND, IN 1"C.

(39) CONNECT SHUNT TRIPS TO AUXILIARY CONTACTS IN ATS.

(40) PROVIDE PROVISIONS INCLUDING CIRCUIT BREAKER AND LUGS FOR CONNECTION OF PORTABLE LOAD BANK FOR 50% RATED CAPACITY OF GENERATOR.

(41) PROVIDE 2 SETS (4)#350KCMIL&(1)#1GND, IN 3"C.

FILE: L:\WASTEWAT\301135 MdTA\Task No. 9 Firearms Training Facility\Drawings\

JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future

RUBELING & ASSOCIATES, INC.
ARCHITECTURE INTERIOR DESIGN

MARYLAND TRANSPORTATION AUTHORITY
Engineering Division

ADDENDUMS & REVISIONS			
NO.	DESCRIPTION	BY	DATE

POLICE TRAINING FACILITY
MARYLAND TRANSPORTATION AUTHORITY
HAWKINS POINT (BALTIMORE CITY)

SINGLE LINE DIAGRAM AND FIXTURE SCHEDULE

DESIGNED BY R.K. | DRAWN BY N.S. | CHECKED BY R.K.
CONST. REVIEW BY R.K. | DATE SEPT. 15, 2004 | SCALE N.T.S.

CONTRACT NO. KB-381-000-006
DRAWING NO. E301
SHEET NO. 98 OF 113

APPENDIX B
FEEDER SCHEDULE

FEEDER SCHEDULE																	
				CONDUIT (PER SET)		CONDUCTORS (PER SET)									SIZE OF OVERCURRENT	FRAME OR SWITCH	
						PHASE CONDUCTORS			NEUTRAL CONDUCTORS			GROUND CONDUCTORS					
TAG	FROM	TO	NO. OF SETS	SIZE	TYPE	No.	SIZE	TYPE	No.	SIZE	TYPE	No.	SIZE	TYPE	PROTECTION	SIZE	REMARKS
1		T-0															BY BG&E
2	T-0	MDP	8	3"		3	500KCMIL	CU THWN	1	500KCMIL	CU THWN	1	400KCMIL	CU THWN	3000	3000A/3P	
3	MDP	ATS DPTF						CU THWN			CU THWN			CU THWN	1600	1600A/3P	
4	MSB	ATS SBDP	1	1 1/4"	EMT	3	3AWG	CU THWN	1	3AWG	CU THWN	1	8AWG	CU THWN	100	100A/3P	
5	GDP	ATS DPTF	1	2"	EMT	3	3/0AWG	CU THWN	1	3/0AWG	CU THWN	1	4AWG	CU THWN	225	225A/3P	
6	GDP	ATS SBDP	1	2"	EMT	3	3/0AWG	CU THWN	1	3/0AWG	CU THWN	1	4AWG	CU THWN	225	225A/3P	
7	ATS	DPTF						CU THWN			CU THWN			CU THWN			
8	ATS	SBDP						CU THWN			CU THWN			CU THWN			
9	GEN	GDP						CU THWN			CU THWN			CU THWN			
10	SBDP	LPFR-1	1	2 1/2"		3	3/0AWG	CU THWN	1	3/0AWG	CU THWN	1	6AWG	CU THWN	200	250A/3P	
11	SBDP	T-3	1	1 1/4"		3	4AWG	CU THWN			CU THWN	1	8AWG	CU THWN	70	100A/3P	
12	T-3	RPFR2						CU THWN			CU THWN			CU THWN			
13	LPFR1	RANGE CP						CU THWN			CU THWN			CU THWN			
14	DPTF	LPTF-1						CU THWN			CU THWN			CU THWN			
	DPTF	T-2	1	2"		3	2AWG	CU THWN	0		CU THWN	1	6AWG	CU THWN	175	250A/3P	
16	T-2	RPTM						CU THWN			CU THWN			CU THWN			
17	RPTM	RPTM1	1	2"		3	2/0AWG	CU THWN	1	2/0AWG	CU THWN	1	6AWG	CU THWN	175	200A/3P	
18	RPTM	RPTM2	1	2"		3	1/0AWG	CU THWN	1	1/0AWG	CU THWN	1	6AWG	CU THWN	150	200A/3P	
19	DPTF	T-1	1	1 1/2"		3	2/0AWG	CU THWN	0		CU THWN	1	6AWG	CU THWN	110	250A/3P	
20	T-1	RPTF1						CU THWN			CU THWN			CU THWN			
21	RPTF1	RPG1	1	1 1/2"		3	1AWG	CU THWN	1	1AWG	CU THWN	1	6AWG	CU THWN	100	100A/3P	
22	RPTF1	RPTF2	1	2"		3	1AWG	CU THWN	1	3/0AWG	CU THWN	2	6AWG	CU THWN	100	100A/3P	

APPENDIX C
LUMINAIRE SCHEDULE

LUMINAIRE INFORMATION												
TAG	DESCRIPTION	LAMP TYPE	WATTS	# OF LAMPS	BALLAST TYPE	OPERATING VOLTAGE	FIXTURE INPUT WATTS	BALLAST FACTOR	CURRENT		POWER FACTOR	
									START	OPERATING	START	OPERATING
A	2'X4' PRISMATIC LENSED TROFFER	T8	32	2	ELECTRONIC	277	65	1.03	0.24	0.24	0.99	0.99
B	2'X4' PRISMATIC LENSED TROFFER	T8	32	3	ELECTRONIC	277	94	1	0.34	0.34	0.99	0.99
C	4' WRAPAROUND FIXTURE	T8	32	3	ELECTRONIC	277	94	1	0.34	0.34	0.99	0.99
D	6" WIDE WRAPAROUND	T8	32	1	ELECTRONIC	277	35	1.01	0.13	0.13	0.98	0.98
F	2'X2' SHOEBOX TYPE 2 EXTERIOR	MH	250	1	DUAL	277	290	1	1.1	1.2	0.9	0.9
G	2'X2' SHOEBOX TYPE 3 EXTERIOR	MH	250	1	DUAL	277	290	1	1.1	1.2	0.9	0.9
F/G	2'X2' SHOEBOX TYPE 2&3 EXTERIOR	MH	250/250	1/1	DUAL	277	290	1	1.1	1.2	0.9	0.9
H	WALL BRACKET FIXTURE	T8	32	2	ELECTRONIC	277	65	1.03	0.24	0.24	0.99	0.99
I		TWIN TUBE	13	2		277						
K	WALL MOUNTED FIXTURE	T8	25	2	ELECTRONIC	277	65	1.03				
L	INDUSTRIAL FIXTURE	T8	32	3	ELECTRONIC	277	94	1	0.34	0.34	0.99	0.99
M	PARABOLIC	T8	32	3	ELECTRONIC	277	94	1	0.34	0.34	0.99	0.99
N	EXTERIOR WALLPACK LIGHTING	MH	70	1	DUAL	277	94	1	0.45	0.37	0.9	0.9
O	WALLPACK PERIMETER LIGHTING	MH	100	1	DUAL	277	100	1	0.95	0.48	0.9	0.9
P	ELEVATOR PIT LIGHTING		28	1		277						
Q	BUILDING LOGO PENDANT MOUNT	T5HO	54	1	ELECTRONIC	277	62	0.99				
R	PAR38 LAMP W/ KNUCKLE JOINT LAMPHOLDER AND MOUNTING BOX	HALOGEN PAR38	45	1		120						
T	RANGE HPS WIDE FLOOD	HPS	100	1	HYBRID ELECT	277	125	1	1	0.58	0.9	0.9
U	EXTERIOR FLAG LIGHTS	MH	175	1	DUAL	277	210	1	0.55	0.8	0.9	0.9
U1	EXTRANCE SIGN LIGHTS	MH	100	1	DUAL	277	100	1	0.95	0.48	0.9	0.9
V	LOW PROFILE WRAPAROUND	T8	32	4	ELECTRONIC	277	121	0.88	0.45	0.45	0.99	0.99
W	INDUSTRIAL FIXTURE	T8	32	4	ELECTRONIC	277	121	0.88	0.45	0.45	0.99	0.99
X	WALL WASH KICKER	BIAX CF	50	2		277						
EL1	FIRING RANGE EMERGENCY LIGHT		32	1		24						
EL2	FIRING RANGE EMERGENCY LIGHT		35	1		24						
EL3	FIRING RANGE EMERGENCY LIGHT		32	1		24						
Z1	LOWBAY GYM LIGHTING	MH	250	1	DUAL	277	290	1	1.1	1.2	0.9	0.9
Z	LOWBAY GYM LIGHTING	MH	250	1	DUAL	277	290	1	1.1	1.2	0.9	0.9
AB	SPECIAL WORDING "RANGE IN USE"	LED				24						

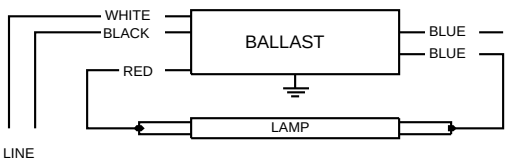
VOP-2P32-SC

Brand Name	OPTANIUM
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	277
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
F17T8	1	17	0/-18	0.08	19	1.02	15	0.95	1.7	5.37
F17T8	2	17	0/-18	0.11	31	0.90	15	0.97	1.7	2.90
F25T8	1	25	0/-18	0.10	27	1.02	15	0.97	1.7	3.78
F25T8	2	25	0/-18	0.16	43	0.88	10	0.99	1.7	2.05
* F32T8	1	32	0/-18	0.13	35	1.01	15	0.98	1.7	2.89
F32T8	2	32	0/-18	0.20	55	0.88	10	0.99	1.7	1.60
F32T8/ES (30W)	1	30	60/16	0.12	33	1.01	15	0.97	1.7	3.06
F32T8/ES (30W)	2	30	60/16	0.19	52	0.88	10	0.99	1.7	1.69
F40T8	1	40	32/00	0.15	41	1.01	15	0.99	1.7	2.46
F40T8	2	40	32/00	0.24	67	0.88	10	0.99	1.7	1.31

Wiring Diagram



Diag. 68

Insulate unused blue lead for 1000V

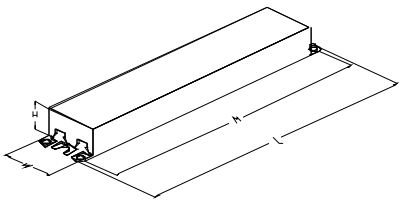
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	25L	63.5
White	25L	63.5
Blue	31R	78.7
Red	37L	94
Yellow	0	0
Gray	0	0
Violet	0	0

	in.	cm.
Yellow/Blue	0	0
Blue/White	0	0
Brown	0	0
Orange	0	0
Orange/Black	0	0
Black/White	0	0
Red/White	0	0

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
9.50 "	1.7 "	1.18 "	8.90 "
9 1/2	1 7/10	1 9/50	8 9/10
24.1 cm	4.3 cm	3 cm	22.6 cm

Revised 06/09/2003

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

ADVANCE
O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
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Corporate Offices: Phone: 800-322-2086

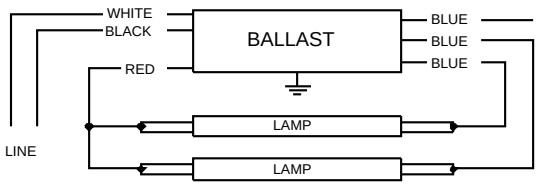
VEL-3P32-SC

Brand Name	STANDARD ELEC
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	277
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
F17T8	3	17	0/-18	0.17	47	0.99	15	0.99	1.7	2.11
F25T8	2	25	0/-18	0.14	54	1.06	20	0.99	1.7	1.96
F25T8	3	25	0/-18	0.24	66	0.93	15	0.99	1.7	1.41
* F32T8	2	32	0/-18	0.24	65	1.03	15	0.99	1.7	1.58
F32T8	3	32	0/-18	0.31	85	0.88	15	0.99	1.7	1.04
F32T8/ES (30W)	2	30	60/16	0.22	61	1.03	20	0.99	1.7	1.69
F32T8/ES (30W)	3	30	60/16	0.29	79	0.88	20	0.99	1.7	1.11
F40T8	2	40	0/-18	0.31	79	1.01	15	0.99	1.7	1.28

Wiring Diagram



Diag. 70

Insulate unused blue lead for 1000V

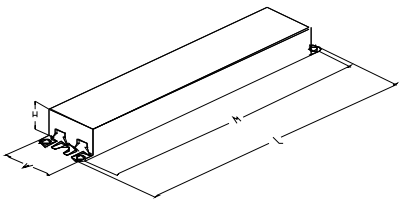
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	25L	63.5
White	25L	63.5
Blue	31R	78.7
Red	37R	94
Yellow		0
Gray		0
Violet		0

	in.	cm.
Yellow/Blue		0
Blue/White		0
Brown		0
Orange		0
Orange/Black		0
Black/White		0
Red/White		0

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
9.50 "	1.7 "	1.18 "	8.90 "
9 1/2	1 7/10	1 9/50	8 9/10
24.1 cm	4.3 cm	3 cm	22.6 cm

Revised 08/21/2002

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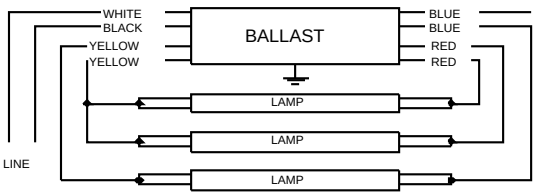
VEL-4P32-SC

Brand Name	STANDARD ELEC
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	277
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
F17T8	4	17	0/-18	0.22	61	0.96	15	0.99	1.7	1.57
F25T8	3	25	0/-18	0.27	74	1.04	20	0.99	1.7	1.41
F25T8	4	25	0/-18	0.32	89	0.94	15	0.99	1.7	1.06
* F32T8	3	32	0/-18	0.34	94	1.00	15	0.99	1.7	1.06
F32T8	4	32	0/-18	0.41	112	0.88	15	0.99	1.7	0.79
F32T8/ES (30W)	3	30	60/16	0.32	87	1.00	20	0.99	1.7	1.15
F32T8/ES (30W)	4	30	60/16	0.38	104	0.88	20	0.99	1.7	0.85
F40T8	3	40	0/-18	0.41	112	0.88	15	0.99	1.7	0.79

Wiring Diagram



Diag. 71

Insulate unused blue lead for 1000V

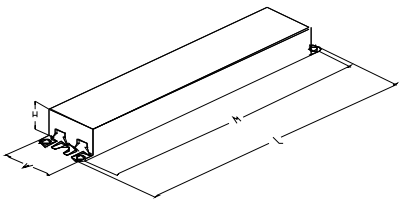
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	25L	63.5
White	25L	63.5
Blue	31R	78.7
Red	31R	78.7
Yellow	39L	99.1
Gray		0
Violet		0

	in.	cm.
Yellow/Blue		0
Blue/White		0
Brown		0
Orange		0
Orange/Black		0
Black/White		0
Red/White		0

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
9.50 "	1.7 "	1.18 "	8.90 "
9 1/2	1 7/10	1 9/50	8 9/10
24.1 cm	4.3 cm	3 cm	22.6 cm

Revised 08/26/2002

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Corporate Offices: Phone: 800-322-2086

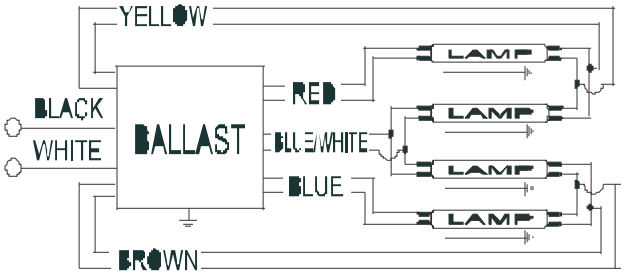
VCN-4S32-SC

Brand Name	CENTIUM
Ballast Type	Electronic
Starting Method	Programmed Start
Lamp Connection	Series/Parallel
Input Voltage	277
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
F17T8	4	17	32/00	0.29	79	1.00	10	0.99	1.7	1.27
F25T8	4	25	32/00	0.36	101	0.95	10	0.99	1.7	0.94
* F32T8	4	32	32/00	0.45	121	0.88	10	0.99	1.7	0.73

Wiring Diagram



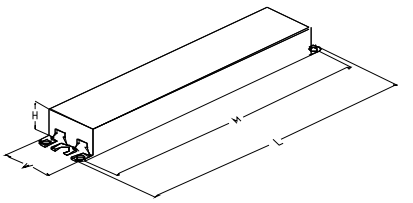
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	22L	55.9
White	22L	55.9
Blue	36R	91.4
Red	36R	91.4
Yellow	46L	116.8
Gray		0
Violet		0

	in.	cm.
Yellow/Blue		0
Blue/White	36R	91.4
Brown	46L	116.8
Orange		0
Orange/Black		0
Black/White		0
Red/White		0

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
9.50 "	1.7 "	1.18 "	8.90 "
9 1/2	1 7/10	1 9/50	8 9/10
24.1 cm	4.3 cm	3 cm	22.6 cm

Revised 03/01/2007

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

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

ADVANCE™

High Pressure Sodium Lamp Ballast

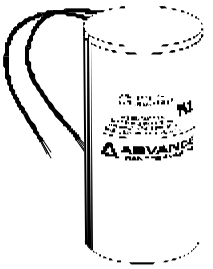
Catalog Number 71A8085
For 100W S105
60 Hz HYBRID ELECT
Status: Active

DIMENSIONS AND DATA

NO ILLUSTRATION AVAILABLE AT THIS TIME.

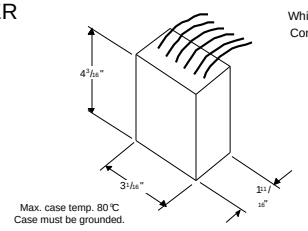
INPUT VOLTS		277					
CIRCUIT TYPE	HYBRID ELECT						
POWER FACTOR (min)	90%						
REGULATION							
Line Volts	±8%						
Lamp Watts	±2%						
LINE CURRENT (Amps)							
Operating		0.58					
Open Circuit		0.90					
Starting		1.00					
UL TEMPERATURE RATINGS							
Insulation Class	H(180°C)						
Coil Temperature Code	1029	A					
MIN. AMBIENT STARTING TEMP.	-20°F or -30°C						
NOM. OPEN CIRCUIT VOLTAGE	120						
INPUT VOLTAGE AT LAMP DROPOUT		185					
INPUT WATTS	125						
RECOMMENDED FUSE (Amps)		3					
CORE and COIL							
Dimension (A)							
Dimension (B)							
Weight (lbs.)	5.5						
Lead Lengths	12"						
CAPACITOR REQUIREMENT							
Microfarads	45.0						
Volts (min.)	120						
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)	105-135						
Short-Circuit Current Test (Amps)							
Secondary Current	4.40-5.40						
Input Current		1.00 1.50	-	-	-	-	

Capacitor: 7C450P12



Capacitance: 45
Dia/Oval Dim: 1.75
Height: 3.75
Temp Rating: 105°C

Ignitor: IN CONTROLLER



Wiring Diagram:

NO ILLUSTRATION AVAILABLE AT THIS TIME.

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

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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

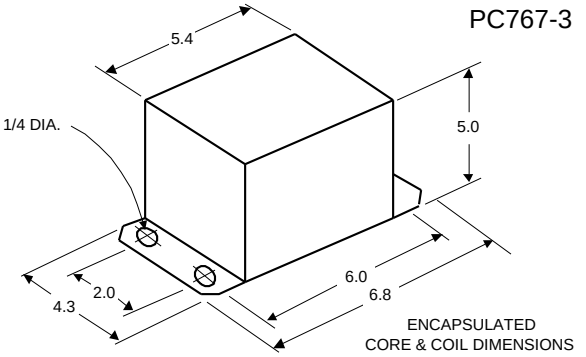
06/16/97

High Pressure Sodium Lamp Ballast

Catalog Number 73B8281
For 250W S50
60 Hz CWA
Status: Active

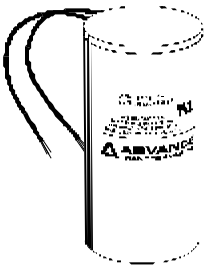
DIMENSIONS AND DATA

PC767-3



~~INPUT VOLTS~~		~~120~~	~~277~~			
CIRCUIT TYPE	CWA					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±10%					
Lamp Watts	WITHIN TRAPEZOID					
LINE CURRENT (Amps)						
Operating		2.50	1.10			
Open Circuit		1.70	0.75			
Starting		1.65	0.70			
UL TEMPERATURE RATINGS						
Insulation Class	H(180°C)					
Coil Temperature Code	1029	B	B			
MIN. AMBIENT STARTING TEMP.	-40°F or -40°C					
NOM. OPEN CIRCUIT VOLTAGE	187					
INPUT VOLTAGE AT LAMP DROPOUT		90	208			
INPUT WATTS	295					
RECOMMENDED FUSE (Amps)		7	3			
CORE and COIL						
Dimension (A)						
Dimension (B)						
Weight (lbs.)	15					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	35.0					
Volts (min.)	240					
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)	170-205					
Short-Circuit Current Test (Amps)						
Secondary Current	3.70-4.50					
Input Current		1.00 1.60	0.40 0.75	-	-	-

Capacitor: 7C350P24



Capacitance: 35
Dia/Oval Dim: 1.75
Height: 3.75
Temp Rating: 105°C

Ignitor: LI501-H4

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

Wiring Diagram:

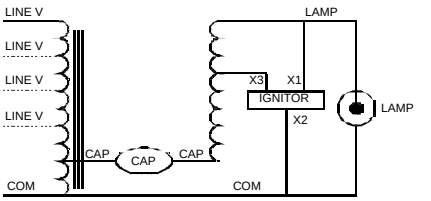


Fig. M

U.L. RECOGNIZED

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500D.	Ballast With Ignitor and Dry Film Capacitor
600.	Ballast and Ignitor, No Capacitor

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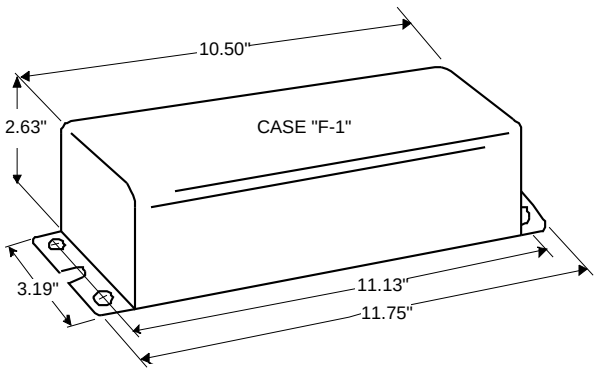
ADVANCE
O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071
Corporate Offices: Phone: 800-322-2086

03/25/98

Metal Halide Lamp Ballast

Catalog Number 72C5381
For 100W M90/M140
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	±12%					
LINE CURRENT (Amps)						
Operating		1.10	0.48			
Open Circuit		2.55	1.10			
Starting		2.20	0.95			
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	277					
INPUT VOLTAGE AT LAMP DROPOUT		72	166			
INPUT WATTS	125					
RECOMMENDED FUSE (Amps)		6	3			
CORE and COIL						
Dimension (A)						
Dimension (B)						
Weight (lbs.)	11					
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)	250-305					
Short-Circuit Current Test (Amps)						
Secondary Current	1.30-1.60					
Input Current		0.70 1.10	0.30 0.50	-	-	-

Capacitor:

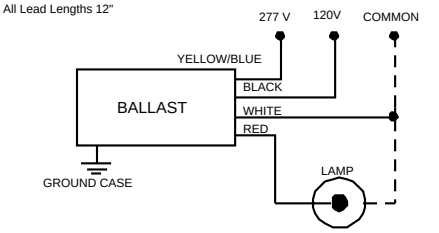
The capacitor is included as part of the potted assembly.

Ignitor: IN CAN

The ignitor is included as part of the potted assembly.

Ballast to Lamp Distance (BTL) = 15 feet
Temp Rating: 90°C

Wiring Diagram:



F-Can Wiring Diagram

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description

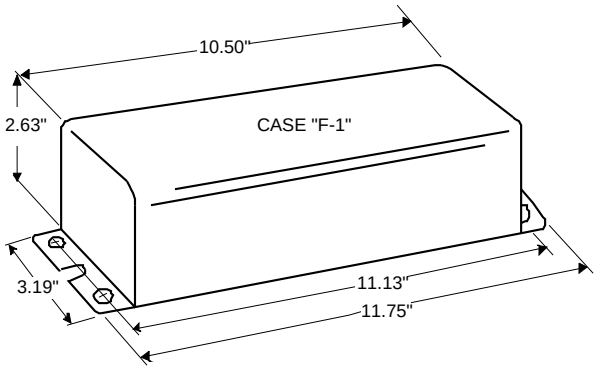
Data is based upon tests performed by Advance Transformer in a controlled environment and representitive of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice.

ADVANCE
09/03/99
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

Metal Halide Lamp Ballast

Catalog Number 72C5281
For 70W M139
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		0.85	0.37			
Open Circuit		1.70	0.75			
Starting		1.00	0.45			
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	240					
INPUT VOLTAGE AT LAMP DROPOUT		100	225			
INPUT WATTS	94					
RECOMMENDED FUSE (Amps)		5	2			
CORE and COIL						
Dimension (A)						
Dimension (B)						
Weight (lbs.)	8.5					
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	1500					
2 seconds	2500					
Open Circuit Voltage Test (Volts)	215-265					
Short-Circuit Current Test (Amps)						
Secondary Current	1.05-1.35					
Input Current		0.60 1.10	0.25 0.50	-	-	-

Capacitor:

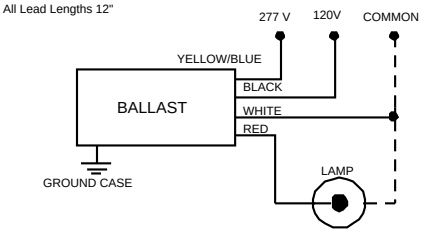
The capacitor is included as part of the potted assembly.

Ignitor: IN CAN

The ignitor is included as part of the potted assembly.

Ballast to Lamp Distance (BTL) = 5 feet
Temp Rating: 90°C

Wiring Diagram:



F-Can Wiring Diagram

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description

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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
UTILITY INFORMATION

The following is the contact information for Baltimore Gas & Electric, the utility for the Maryland Transportation Authority Police Training Facility.

BGE Gas & Electric
7317 Parkway Drive, South
Hanover, MD 21076
www.bge.com

The next pages are the utility rate structure for the MdTA Police Training Facility.

GENERAL SERVICE SMALL - ELECTRIC

SCHEDULE GS

Availability: At the Customer's request, for use for all purposes where the Customer qualifies for Schedule G, and where the Customer's consumption is 2,000 kWh or more in any month.

Delivery Voltage: Service at Secondary Distribution Systems voltages.

Monthly Net Rates:

Delivery Service Customer Charge: **$17.50 per month,**

Less: Competitive Billing (where applicable) **$ 0.47 per month, plus,**

(see Section 7.7 for details)

Energy Charges:

Generation Market-Priced Service (¢ per kWh):

(Excludes Rider 8 – Energy Cost Adjustment)

Type I:	Summer	Non-Summer
Peak	15.173	11.817
Intermediate-Peak	9.177	10.109
Off-Peak	7.254	7.984

Transmission Charge For Market-Priced Service: 0.208 ¢/kWh

Delivery Service Charge: **2.153 ¢/kWh**

(Excludes Rider 10 – Administrative Cost Adjustment)

Minimum Charge: Net Delivery Service Customer Charge.

Billing Seasons: Summer rates are billed for usage from June 1 through September 30. Non-Summer rates are billed for usage from October 1 through May 31.

Rating Periods:

Summer

Peak - Between the hours of 10 am and 8 pm on weekdays, excluding the National holidays listed below.

Intermediate - Between the hours of 7 am and 10 am, and the hours of 8 pm and 11 pmon weekdays, excluding the National holidays listed below.

Off-Peak - All times other than those defined for the On-Peak and Intermediate-Peak rating periods.

(Continued on next page)

Schedule GS continued

Non-Summer

Peak - Between the hours of 7 am and 11 am, and the hours of 5 pm and 9 pm on weekdays, excluding the National holidays listed below.

Intermediate - Between the hours of 11 am and 5 pm on weekdays, excluding the National holidays listed below.

Off-Peak - All times other than those defined for the On-Peak and Intermediate-Peak rating periods.

The Non-Summer time periods shown above will begin and end one hour later for the period between the second Sunday in March and the first Sunday in April, and for the period between the last Sunday in October and the first Sunday in November.

Holidays:

All hours on Saturdays and Sundays and the following National holidays are Off-Peak: New Year's Day, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving, Christmas, and the Monday following such of these as fall on Sunday.

Average Price to Compare (includes Generation and Transmission): 9.78 ¢/kWh.

Late Payment Charge: Standard. (Sec. 7.4)

Payment Terms: Standard. (Sec. 7)

Term of Contract: One year and thereafter until terminated by the Customer.

Subject to Riders applicable as listed below

1. Standard Offer Service
3. Miscellaneous Taxes and Surcharges
4. Budget Billing
5. Controlled Air Conditioning Service
8. Energy Cost Adjustment
9. Customer Billing and Consumption Data Requests
10. Administrative Cost Adjustment
13. Change of Schedule
19. Demonstration and Trial Installations
21. Billing in Event of Service Interruption
22. Minimum Charge for Short-Term Uses
23. Advanced Meter Services
24. Load Response Program