REPORT OF GENERAL MANAGER APPROVED APR 16 2008 BOARD OF RECREATION and PARK COMMISSIONERS NO. 08-93

DATE April 16, 2008 C.D. Ali

BOARD OF RECREATION AND PARK COMMISSIONERS

SUBJECT: MAJOR ELECTRICAL EQUIPMENT AND ENERGY CONSERVATION STANDARDIZATION FOR ALL NEW OR RENOVATED RECREATION AND PARK FACILITIES

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General Manager

Approved _____ Disapproved _____ Withdrawn _____

RECOMMENDATION:

That the Board:

1. Approve the major electrical equipment and energy conservation standards for all new or renovated recreation and park facilities; and,

2. Request the Department of Public Works, Bureau of Engineering to direct its staff as well as outside consulting engineering firms to comply with the approved standards.

SUMMARY:

Adoption and practical application of electrical equipment standards while promoting energy conservation are critical to Recreation and Parks Department working towards a more efficient, healthier and sustainable Department.

Energy conservation can be achieved by implementing energy efficient and cost-effective systems, and facilitating environmentally clean power sources by replacing non-renewable resources (coal, oil, gas) with renewable ones. These efforts will significantly reduce the hazardous emissions of carbon and sulfur dioxide and nitrogen oxide, the main pollutants and causes of global warming, acid rain, and smog.

In the instance of Department of Recreation and Parks indoor facilities, energy conservation can best be achieved by standardizing the major electrical equipment that is designed to perform the same functions, using new and advanced energy-efficient products and implementing power control systems on a widespread basis.

The conceptual similarities between these facilities require maintaining a great level of compatibility to avoid future operational, technical and administrative difficulties, while providing energy efficient systems. To implement the required improvements, field investigations have been conducted regarding these vital issues with each Region's Electrical Supervisor and Planning and Development Division's Electrical Engineer. Field investigations and discussion revealed a number of difficulties.

Among them, the most common were:

1. Stocking a vast variety of inventory intended to serve the same purpose.
2. Inconvertibility of spare parts.
3. Possession of "easy-to-vandalize" devices and equipment.
4. Installation of equipment and servicing which requires the use of specific mechanisms.
5. Lack of uniformity requiring additional training for maintenance staff.

These and other difficulties can be avoided or minimized by standardizing the specified recreation centers' major electrical equipment.

Approval of the required standardizations, as included in this report, will allow the City to:

- Reduce design time and increase owner – design consultant relationship efficiency.
- Simplify changes and improve maintenance agility.
- Reduce operational costs by eliminating the need for over-provisioning and having many non-standard components.
- Facilitate common training, best maintenance practices and the reuse of knowledge. These are specifically important for RAP maintenance staff due to their work mobility and transferability to different regions.

The Summary of all comments and suggestions was shared and discussed during a joint meeting with all Region Electrical Supervisors and the RAP Planning & Development Electrical Engineer.

Electrical equipment has been itemized at each site and every major item has been evaluated according to its designation performance characteristics, ease of maintenance, and spare parts convertibility. Special priority was given to power efficiency and energy saving suitability.

After agreeing on their evaluations, the parties concurred to submit for consideration the attached recommendations to establish technical standards for design and selections of the major electrical equipment for all renovated and new recreation centers.

It is recommended that the following standards be specified for the listed equipment for Recreation Centers and Gymnasiums.

	Equipment	Standards	Acceptable Brands
1.	Switchboards, Panel - boards, Transformers, Disconnects	Outdoor Installations to be specified powder and marine coat protected	General Electric, Siemens or equal
2.	Fire Alarm Systems		Edwards Systems Technologies (EST), Silent Knight, Notifier or equal
3.	Public Address Systems		Bogen, Rauland, Toa or equal
4.	Security Systems		Digital Security Controls (DSC), Edwards Systems Technologies or equal
5.	Lighting Control Systems		Lighting Control and Design, Lutron or equal
6.	UPS, Inverters	Batteries: Maintenance free, self contained, 10 years manufacturing warranty	General Electric, Dual-Lite, Meyers Power Products or equal
7.	Hand Dryers	Layout to expose vent hose only, specify recessed sensor controlled drives to avoid vandalism	Nova, World or equal
8.	Outdoor Lighting fixtures	Specify surface mounted fixtures for up to 10 foot canopies, pendant mounted for over 10 feet. Specify high efficiency T8 fluorescent lamps.	Kenall, Fail Safe or equal

	Equipment	Standards	Acceptable Brands
9.	Electronic Ballasts	Specify 10 years lifetime warranty	
10.	Emergency Exit Lights	Specify Light Emitting Diots (LED) types with wire guards	
11.	Offices, Classrooms and lobbies lighting fixtures	Specify strip length fixtures and recessed type fixtures for T-bar ceilings only. Surface mounted fixtures for up to 10 feet high ceilings, pendant - above 10 foot high. Specify T8 fluorescent lamps.	
12.	Gymnasium lights	Enduratron, Electronic Ballast, Open Superglass optics, pendant mounting, electronic HID dimming, auto sensing 200-300 volts, emergency lighting fixture, wireguard and hole for lamp replacement, twisted locked cord, earthquake safety chain, loop male hooks with Pulse start lamp.	Holophane, Lumark or equal
13.	Parking lot lighting poles, fixtures and security	Specify vandal resistant luminaries and minimum 2'6" high concrete poles bases. Specify Close Circuit Television (CCTV) System per owner request (if needed) Specify Los Angeles Police Department (LAPD) approved cameras. Specify tempered screw cover pole hand holes located at maximum height allowed by Code.	

	Equipment	Standards	Acceptable Brands
14.	Gymnasium side basketball hoops	Specify motor driven controls	
15.	Photo cells, relays, sensors, timers	Locate concealed from public, specify timers with astronomic features and day skip, sensors to possess time selection feature	Paragon, Intermatic, Tork or equal
16.	Restrooms, Corridors, public accessible areas	Specify fluorescent fixtures with wrap -around diffusers. Specify T8 fluorescent lamps	Kenall, Fail Safe or equal
17.	Storage and pipe chase area lighting fixtures	Specify guard protection for pendant strips. Specify T8 fluorescent lamps	Prudential industrial type or equal
18.	Compact fluorescent lamps	Specify 13 or 26 watt lamps with two or four pins	

Exhibit No. 1 compares the same wattage lamps' performance improvements on an electronic ballast versus a magnetic ballast.

Exhibit No. 2 shows percentages of quantity and wattage reduction when utilizing ISD super glass reflector high bay lighting fixtures to achieve the same lighting level as acrylic or aluminum reflector fixtures.

The cost of light analysis chart shown on Exhibit No. 3 compares four types of lighting fixtures: fixtures having magnetic ballast with an aluminum, acrylic, or regular glass reflector versus to a fixture having electronic ballast with Ideal Synergetic Distribution (ISD) super glass reflector.The chart compares the initial investment required as well as the energy savings gained for a typical Los Angeles RAP recreation center of 7,000 square feet requiring 30 foot-candles at 11 cents per kilowatt hour (Kwh). The chart shows that utilization of fixtures with electronic ballast and ISD super glass reflectors can reduce the annual operating cost at a typical recreation center by 56%, and the annual energy cost by almost 58%. These savings are enough to light six (6) households.

Using fixtures with electronic ballast and ISD super glass reflectors at a single recreation center will annually save 22,116 Kwh of energy:

16* x 2,351 Kwh=37,616 Kwh

*The average number of 400w metal halide magnetic ballast fixtures installed at recreation centers.
12 x 1,292 Kwh =15,500 Kwh
37,616 Kwh-15,500 Kwh=22,116 Kwh

Presently, 50% of the energy supplied by Los Angeles Department of Water and Power (DWP) is generated at thermal power plants using coal as a primary source. On average, coal power plants produce approximated 2.0 Kwh of energy per 1 Kilogram (Kg) of coal burned.

Thus, converting annual savings of 22,116 kwh into physical coal consumption will result in not having to burn 11.0 tons of coal for one full year. Taking into account transmission and distribution losses in the power lines, which range from 5% to 10% depending on different factors, the amount of "saved" coal is even more. As it is well known, emissions from coal-fired power plants constitute one of the largest sources of carbon dioxide (CO_2) emissions, believed to be the cause of global warming.

It is stated that using coal to generate electricity produces 0.915 Kg of CO_2 per 1 Kwh. Saving 22,116 Kwh of energy is equivalent to not emitting 20.2 tons of carbon dioxide annually. In turn, saving 22,116 Kwh will lead to reduced annual emissions of 126.2 pounds of sulfur dioxide, and 128 pounds of nitrogen oxide. Both of these gases are considered the main causes of acid rain and smog.

Also, savings of 22,116 Kwh of energy will result in $1,106 rebate ($0.05 per Kwh) from Department of Water and Power incentive program, which is designed to assist its customers in achieving a cleaner environment while lowering their energy consumption.

In conclusion, the monetary reward from utilizing fixtures with electronic ballast will lower the first year cost of energy at a single recreation center by $3,410 + $1,106 = $4,516, and in the following years by $3,410 (at current rates).

Los Angeles Department of Water and Power, Energy Efficiency Group reviewed and approved this Board report. The Energy Efficiency Group concurred that the Pulse Start Electronic Ballast ISD super glass high bay fixtures are the most appropriate to be used at the recreation centers and also recommended the installation of energy efficient mechanical equipment (HVAC, pumps) and control systems at RAP facilities.

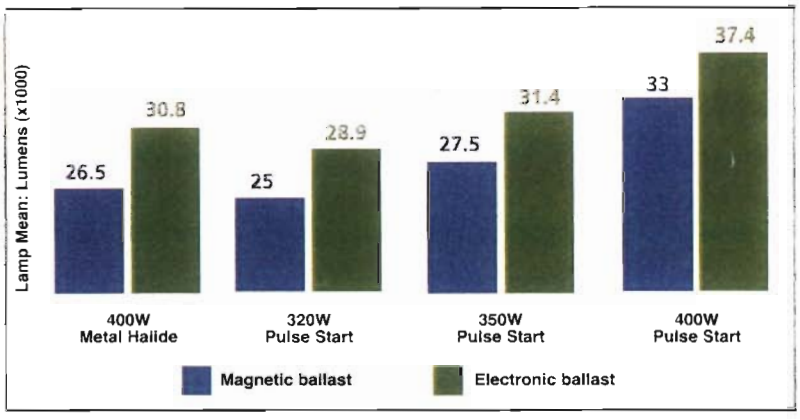
FISCAL IMPACT STATEMENT:

No immediate impact, except when technologically advanced product installation is implemented (see Exhibit No. 3, Cost of Lighting Analysis). The Department should realize cost savings over the long term due to operation and maintenance efficiency, generated from the electrical equipment standardization.

Prepared by Harry Surmenian, Electrical Engineer, Planning and Development Division.

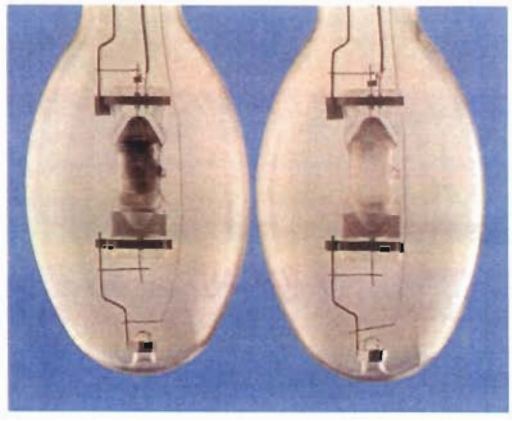
HID Electronic Ballast

Electronic Ballasts Improve Lamp Lumen Output



More Lumens

Electronic ballast technology improves lamp lumen depreciation in pulse start and standard metal halide lamps. Mean lumen output is increased by 15% on standard metal halide lamps and by 13% on pulse start lamps.



Unaltered photo of two 400W typical lamps, taken at mean lamp life (8,000 hours). Note the difference in arc tube condition. The lamp on the left shows the arc tube blackening effect caused by the use of magnetic ballasts. The lamp at the right shows the minimal arc tube discoloration that is characteristic of lamps operated on an electronic ballast The lamp on the right is capable of generating at least 15% more mean lumens than the magnetically ballasted lamp at the left.

Electronic Ballast Improves Lighting System Efficacy

Compared to alternative metal halide systems electronic ballasts can provide equivalent light levels while improving the efficacy of a lighting system by up to 56%. The information in the example compares a lighting system of (100) 400W pulse start lamps operated on an electronic ballast to other metal halide lamp/magnetic ballast systems. An electronic ballast operating a pulse start lamp can reduce total fixture count by 30% and reduce the lighting system wattage consumed by over 50% while maintaining equivalent light levels.

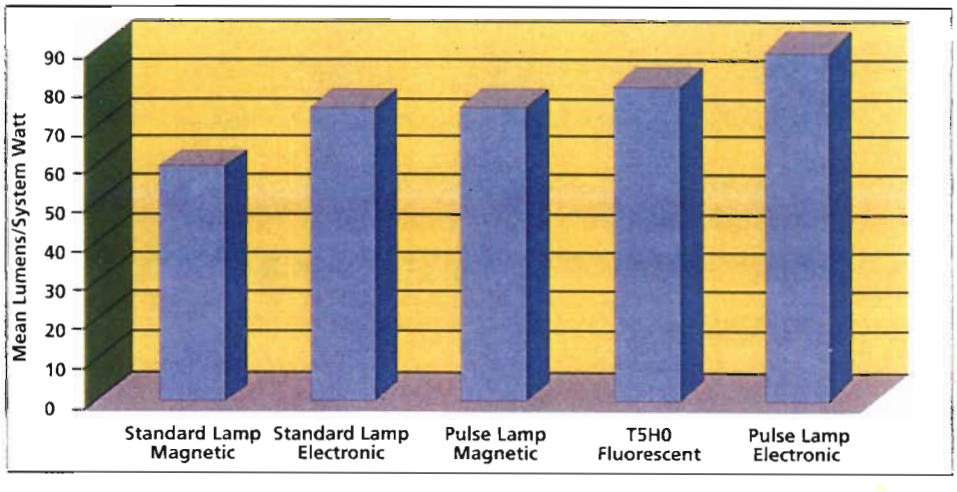


EXHIBIT No. 1

ISD SuperGlass® Optics

A Revolutionary Scientific Advancement in Optical Design

6611 Reflector (wide distribution)

6612 Reflector (narrow distribution)

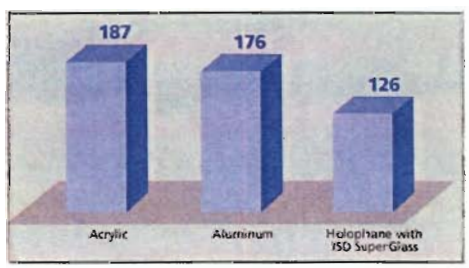
Features

- Invention of new distribution patterns
- "Ideal Synergetic Distribution" shapes eliminate the need to adjust reflectors to achieve different results
- Prismatic design optimized for HID sources
- Advances in glass manufacturing using PrismBoost™ technology

Advantages of Borosilicate Glass over Acrylic and Aluminum

- Precise optical control
- Glare reduction
- Electrically neutral; does not attract dirt (LDD)
- Self cleaning (Venturi effect, open optics)
- Low maintenance
- High impact strength
- Thermal stability and shock resistant
- Unaffected by UV
- Resistant to most chemicals
- Long term investment

Luminaire quantity



System watts

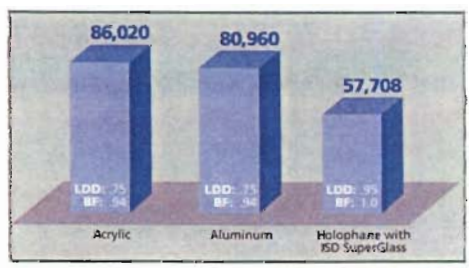


EXHIBIT No. 2

Cost of Lighting Analysis

System Description	400 watt Probe Start Magnetic Aluminum Reflector	400 watt *(1) Pulse Start Magnetic Holophane Glass	320 watt Pulse Start Magnetic Acrylic Reflector	320 watt Pulse Start Electronic ISD SuperGlass
Customer Information				
Building size (sq. ft.)	7,000	7,000	7,000	7,000
Maintained light level (foot candies) (3)	35.6	39	33.8	36.6
Energy rate ($/KWH)	$0.11	$0.11	$0.11	$0.11
Annual hours of luminaire operation (4)	5110	5110	5110	(4a) 3833
Lamp Information				
Lamp type	(5) 400MH	(5) 400MH	320 PSMH	320 PSMH
Lamp life	20,000	20,000	20,000	20,000
Initial Lumens	36,000	36,000	34,000	34,000
Lamp depreciation	0.65	0.65	0.74	0.85
Lamp replacement cost	$14.00	$14.00	$17.00	$17.00
Ballast Information				
Ballast type	Magnetic	Magnetic	Magnetic	Electronic
Ballast factor	0.94	1.00	0.94	1.0
Ballast life	160,000	160,000	160,000	60,000
Ballast replacement cost	$60	$60	$70	$125
Luminaire Information				
Number of Luminaires	20	16	18	12
Reflector material	Aluminum	Glass	Acrylic	ISD SuperGlass
Luminaire dirt depreciation factor	0.75	0.9	0.75	0.90
Luminaire cost (2)	$175	$300	$225	$400
Installation Cost				
Installed cost of wiring and outlets with labor (6)	$4,700	$3,760	$4,230	$2,820
Installed cost of luminaire with lamps	$189	$314	$242	$417
Total installed cost	$8,480	$8,784	$8,586	$7,824
Energy Cost				
System watts per fixture	460	460	360	337
Annual energy cost	$5,171	$4,137	$3,642	$1,705
Annual energy consumption per fixture, Kwh	2,351	2,351	1,840	1,292
Total annual energy consumption, Kwh	47,012	37,610	33,112	15,500
Annual energy cost per fixture	$259	$259	$202	$142
Maintenance Cost				
Annual ballast replacement with labor	$50	$50	$50	$159
Annual lamp replacement with labor	$188	$188	$121	$61
Total annual maintenance cost	$238	$238	$172	$220
Annual Operating Cost				
Annual maintenance cost	$238	$238	$172	$220
Annual energy cost	$5,171	$4,137	$3,642	$1,705
Total annual operation cost	$5,409	$4,375	$3,814	$1,925
Summary	400 watt Probe Start Magnetic Aluminum Reflector	400 watt Pulse Start Magnetic Glass Optic	320 watt Pulse Start Magnetic Acrylic Reflector	320 watt Pulse Start Electronic ISD SuperGlass
Annual Operating Savings vs. Current	- $1,034	*Current System*	$561	$2,450
Annual Energy Savings vs. Current	-$1,034	*Current System*	$495	$2,432
Initial Cost Savings vs. Current	$304	*Current System*	$198	$960
Total annual energy savings, Kwh	- $9,404	*Current System*	$4,496	22,116
Total System Cost Savings vs. Current	- $730	*Current System*	$759	$3,410
Energy Savings payback, year		*Current System*	17.3	3.22

See Remarks:

(1.) Currently installed at many Los Angeles Recreation facilities and Gymnasiums.
(2.) Distributor's Cost with mark-up.
(3.) After 4 years of installation.
(4.) Based on 14 hours per day operation.
(4a.) Adjusted for occupancy dimming savings of 25%.
(5.) Since 01/2007 State of California outlawed Probe Start lamps use.
(6.) Based on RS means Electrical Estimating Methods.

EXHIBIT No 3