

APPENDIX G

LIGHTING ANALYSIS

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**Hall Property Community Park
Encinitas, California
County of San Diego**

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December 29, 2005

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1.0 EXECUTIVE SUMMARY

The proposed project is the Hall Property Community Park, a 43-acre publicly owned parcel on the west side of Interstate 5 (I-5) between Santa Fe Drive and Birmingham Drive¹ in the City of Encinitas, County of San Diego, California. This report considers the impacts of the proposed community park and makes recommendations for any necessary mitigation measures. Francis Krahe & Associates, Inc. furnishes this report in response to the requirements of the City for an environmental light impact analysis and report, as part of the project's site plan design review.

Through mitigation, the proposed exterior lighting impacts for the Hall Property Community Park can be minimized or eliminated. Section 5.3 summarizes potential lighting impacts and mitigation measures. With the implementation of this mitigation, light impact from all sources within the proposed community park can be controlled to acceptable levels.

The proposed Hall Property Community Park can be built to be in compliance with the Illuminating Engineering Society of North America (IESNA) Guidelines and the County of San Diego, with the implementation of the mitigation measures listed in Section 5.0 *Lighting Environmental Impacts and Mitigation*.

1.1 Organization of the Lighting Analysis

Section 2.0 of this analysis describes the project, including the project location. Section 3.0 provides information on regulations and ordinances that provide guidance for the determination of impact significance. Most of the requirements and regulations provided in Section 3.0 do not directly apply to the project, but they provide guidance for the formulation of appropriate thresholds of significance in consideration of the lighting impacts of the proposed project. Section 4.0 provides information regarding the methodology for the measure of lighting and resultant impacts of the proposed project. Lastly, Section 5.0 presents the impact analysis and conclusions regarding the significance of the proposed Hall Property Community Park lighting effects.

1.2 Lighting Impacts Resulting from the Proposed Project

As described in the analysis presented in Section 5.0, glare and light trespass, and dark sky conformance are often the most debatable aspects of outdoor lighting and are most often in need of municipal mediation. The following will offer a summary of lighting impacts resulting from the proposed project.

Section 3.1 defines direct glare and Table A5.0 in the Appendix summarizes the luminaire aiming angles that may potentially be lighting issue impacts of the property. Annoying glare from exterior lighting can affect visibility, thus preventing important particulars from being seen. Within the proposed project glare has been controlled through proper equipment selection, fixture aiming and limits on brightness. The floodlight aiming angles have been kept low so that the entire beam falls within the intended lighted area of the project.

It is recommended that floodlights have glare shields to prevent light trespass and lighting nuisance. Refer to Section 3.1 for light trespass defined. Floodlight luminaire mounting usually includes a mechanical arrangement that permits aiming. Such luminaires are often grouped in banks, since their application usually involves limited mounting and access availability.

However, each luminaire is aimed independently.² Section 5.2 outlines specific means to how glare and light trespass have been minimized and controlled.

Within the project, sports field lighting is located near adjacent roadways, Interstate 5. These luminaires do not contribute glare unto the roadways. The overall brightness at the sports fields located near the residential community has been controlled with the proposed luminaires. Poles have been mounted at least 70 feet high, as required for aerial sports, and floodlights have not been aimed above 62 degrees.³ All outdoor sports field lighting has taken the surrounding community brightness into account and has been designed to minimize nighttime sky glow.

2.0 INTRODUCTION

This lighting analysis describes and summarizes the findings and recommendations from the survey of the design proposal for the Hall Property Community Park that evaluates the possible lighting intrusions from general and specific resources that are proposed to be located within the Hall Park Property Community Park within the City of Encinitas. This analysis focuses on the impact areas identified as potentially significant in the overall project study. These impact areas are:

- Compatibility with environmental plans, zoning, and goals of the city and region
- Obtrusive visual impacts such as light trespass and light pollution
- Substantial light or glare which would adversely affect day or nighttime views in the area

The objective of this report is to clearly identify and discuss areas within the Hall Park Property Community Park that are sources of high glare and disrupt the dark sky and identify project features and mitigation requirements necessary to reduce lighting impacts generated by the project to allowable levels. This report includes a brief discussion of lighting terminology in *Section 6.0 Lighting Glossary*.

2.1 Project Location

The City of Encinitas proposes to develop a community park on a 43-acre parcel immediately west of I-5. This parcel of land is known as the Hall property and was previously used for agricultural flower cultivation operations. The project site is irregular in shape but is generally bounded by I-5 to the west, Santa Fe Drive to the north, Rubenstein Avenue to the east, and Warwick Avenue to the south. The project site is in the Encinitas neighborhood known as Cardiff-by-the-Sea (Cardiff). The project site is relatively flat, with elevations ranging from 180 feet above mean sea level on the northern side of the site to approximately 220 feet mean sea level on the southern side of the site.

A mixture of land uses surrounds the project site. Directly east and adjacent to the site is I-5, including the California Department of Transportation (Caltrans) right-of-way associated with the interstate. The interstate is generally elevated above the level of the project site. North of the project site is Santa Fe Plaza, a commercial and retail shopping center. This commercial center blocks visual access and limits vehicular access from the north side of the project site. Residential development surrounds the site to the west and south. These residential neighborhoods are a combination of both new and longstanding developments. West of the site

is the newly developed Cardiff Glen residential area. South of the project site is an older, more eclectic residential neighborhood.

2.2 Project Objectives

The objective of the project is to develop a community park that:

1. Provides a variety of recreational facilities;
2. Provides athletic fields that help to offset the unmet needs of Encinitas;
3. Provides multiple vehicular and pedestrian access points;
4. Provides adequate recreational facilities for all user groups; and
5. Provides a buffer to separate park activities from the adjacent residential uses.

2.3 Project Background

In May 2001, the City purchased the 43-acre Hall property. The greenhouse operations remained active for approximately 1 year after the City took possession of the property. In December 2001, the City awarded a contract for design and planning services for the park. In May 2002, several conceptual access alternatives to the property were presented to the City Council.

A public workshop was held on June 8, 2002, to gather input from the community on potential design ideas for the park. The purpose of the workshop was to gain information, ideas, and input from the community. The information generated by the public meeting was used to prepare multiple designs, which were presented to the City Council in July 2002. Based on the public workshop discussions, the City Council directed modifications to the preliminary design for the park.

Additional public meetings have been held with the City Council to gather input on the design of the park and to refine the proposed plan for the park. As a result of these meetings, the buffer area between the residential neighborhoods to the west has been expanded, the design of the amphitheatre and teen center have been refined, and alternatives to address the potential of a municipal pool in the northern portion of the park have been developed.

2.4 Project Description

The City has developed a preliminary design for the proposed community park (RJM 2004) (*Figure 1*). As shown in this plan, the park would include a mixture of active and passive uses. Active components in the park would include softball/baseball fields, basketball courts, multi-use fields, a teen center, a dog park, a skate park, and a possible aquatic facility. Passive elements of the park would include gardens, picnic areas, and trails.

Three softball/baseball diamonds would be developed in the middle portion of the property. The softball/baseball facilities would include two full-size fields and one smaller field. The ball fields would typically serve organized resident sports leagues and could participate in co-hosting regional tournaments in association with other parks in the area. Multi-use turf fields would be

developed throughout the property. The rectangular turf fields would be used for sports activities such as soccer or lacrosse. Five independent turf fields are planned in the design of the park. The grassy areas of the three ball fields could also be used for this purpose when no softball/baseball games were in session.

The potential for a municipal pool has been included as a feature in the proposed park. The aquatic facility would be located in the northeast corner of the park. One of the pools would be a 25-yard by 25-meter pool (approximately 6,500 square feet), located in the northern portion of the aquatic facility. The other pool would be a separate recreation pool (also approximately 6,500 square feet) in the southern portion of the aquatic facility.

A teen center would be developed in the northwest corner of the property. The teen center would be approximately 5,000 square feet and would be focused on youth, ages 12 to 18. The teen center would provide hosted events and activities for area youth. An outdoor plaza would be located just behind the teen center. An enclosed outdoor activity area would be located adjacent to the teen center.

An amphitheater would be constructed near the center of the property on the west side. It would be designed to host special events, such as concerts or plays. The amphitheater would be designed to accommodate loudspeakers and other electronic equipment. The amphitheatre would seat approximately 75 to 100 people.

A skate park would be located in the northern portion of the site near I-5. This facility would consist of a concrete foundation with various ramps and platforms for skating. The skate park would encompass approximately 13,000 square feet and would be fenced.

A dog park would be developed on a parcel that is not continuous with the main property, but is adjacent to the west and would be connected by a pathway. The dog park would provide an area where dog owners could unleash their dogs for play and exercise. The dog park area would be fenced to contain the dogs while they are off-leash.

Trails would be located along the western boundary of the site and would loop around the playing fields within the park. These pathways would be in the form of 12-foot-wide, concrete paved sidewalks and an 8-foot-wide pedestrian path of stabilized, decomposed granite with an 8-foot concrete header on each side. Athletic stations would be located along the trail system. A rock-lined, dry stream feature would run parallel to the pathway system on the west side of the park. A pedestrian bridge would cross the stream south of the amphitheater.

A landscaped buffer and garden area is planned along the western boundary of the site to provide separation from the adjacent residential development. This buffer would be planted with landscaping, such as trees and shrubs, to block light and noise and to provide a visual barrier between the park and the adjacent residential areas. The landscaped buffer would be planned in coordination with the trail system and would include features such as individual water, herb, and flower gardens; benches; and picnic pads.

Other park amenities, including two toddler play areas and four covered picnic areas, would be located within the park. Two restroom facilities are also included in the park design; one would be located in the northwest corner (near the dog park) and the second would be located near the concessions facility at the full-size baseball/softball fields.



Figure 1: Preliminary design for proposed Community Park

3.0 LIGHTING CRITERIA

The following sections will provide information on regulations and ordinances that provide guidance for the determination of significant lighting impacts. Appropriate thresholds of significance, which are provided in Section 5.1, are derived from these sources.

3.1 Lighting Issues

Glare

Offensive or unattractive lighting results from excessive contrast, or glare. Glare conditions usually result from highly visible lamps (light bulbs) within landscape, streetlights, parking, security, or entertainment lighting. Proper design and selection of light fixtures, mounting heights and placement will control the visibility of light sources from outside or within the project site, and therefore limit the perception of glare. The guidelines establish criteria to control the light output, mounting height and placement of fixtures to reduce glare.

Direct glare is defined to not be observable (outside the originating property limits) at an angle greater than 85 degrees from the nadir of the vertical axis of the light source.⁴ To further prevent glare potential, the direct view of a luminaire should be limited below 69 degrees from nadir as indicated in *Figure 2*.

Light Trespass

Light trespass is considered an undesirable condition in which spill light (light that falls outside of the area intended to be lighted) is cast where it is not wanted. Light trespass is defined as exterior lighting originating on a property of a maximum 0.5 horizontal foot-candles at a distance of 25 feet beyond the property lines.⁴ Height and placement of light fixtures are strategic in preventing this contentious aspect of outdoor lighting.

Dark Sky

The County of San Diego provides guidance regarding the preservation of dark skies in accordance with the Outdoor Light Control Ordinance (*No. 7155*). These regulations only apply to land uses and properties within the unincorporated portions of San Diego County; thus, they are not requirements for the proposed project. However, in consideration of potential regional influences of lighting effects, these regulations are presented in this analysis and provide guidance for the analysis of potential effects to dark skies. Specifically, Palomar Mountain and Mount Laguna have been identified by the County of San Diego as important dark sky resources. Special provisions are provided in the County of San Diego Outdoor Light Control Ordinance for the preservation of dark skies surrounding these resources within a 15 mile radius.

Additional guidance is provided by the County of San Diego Outdoor Light Control Ordinance pertaining to the specific types of fixtures, light shielding, and control of light emissions. More detail on these applicable guidelines is provided in *Section 3.3 Lighting Regulations and Analysis Guidance*.

3.2 Sight Line Studies

As an illustrative example, sight line studies are documented below to depict the areas of controversy within a project site to demonstrate the effects of light output distribution to control light at the property perimeter and limit any adverse lighting impact on adjacent property. Each siteline section includes an analysis utilizing the glare control angle described in *Figure 2* and the consideration of pole height restrictions.

Glare

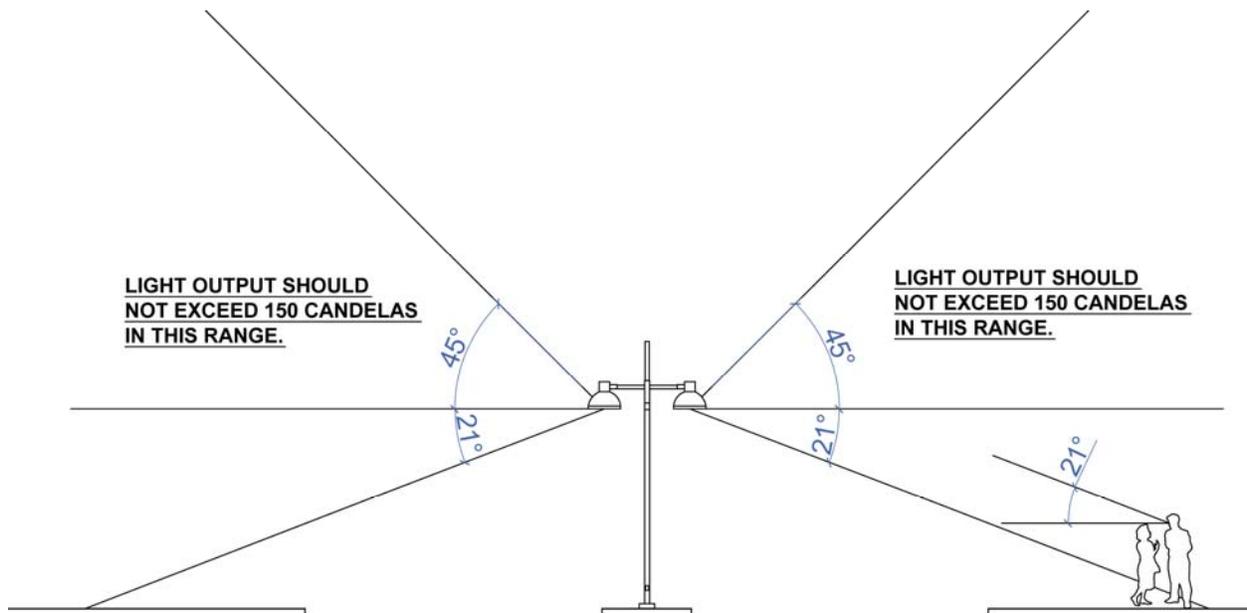


Figure 2: Direct Glare: controlling light distribution angles minimizes glare

Light Trespass

Figure 3 demonstrates the concept of light trespass. An athletic field (not pictured) illuminates this building, even though the lighting was clearly only intended for the sports activity. The light trespass is so intense that the streetlight on the left side of the image is off since its photocell still thinks that it is daytime.⁵



Figure 3: Example of Light Trespass ⁵

In terms of visibility, pole height limits play a crucial role in the avoidance of light trespass. Luminaire pole height limits are considered to prevent light trespass from the site onto adjacent properties. These height restrictions will not eliminate complete visibility of the pole itself, but in combination with the shielding and glare control restrictions will decrease visibility of the high brightness lamps within the luminaires and will prevent stray light from extending over the property line.

The westward property divider between the project and residential community is a 6'-0" concrete wall. This wall divider serves as a light trespass boundary.



Figure 4: Proposed Portion of Site for Hall Property Community Park

Dark Sky

All parking, roadway, and sports lighting poles should be “full cutoff” type photometric optics for controlled light distribution. “Full cutoff” describes a luminaire that has no direct uplight (light emitted upward by a luminaire) or no light emitted above horizontal.

Name	Description of illuminance distribution
Type I	Narrow, symmetric illuminance pattern
Type II	Slightly wider illuminance pattern than Type I
Type III	Wide illuminance pattern
Type IV	Widest illuminance pattern
Type V	Symmetrical circular illuminance pattern
Type VS	Symmetrical, nearly square illuminance pattern

Cutoff classifications are as follows:

Name	Description of intensity distribution
Full cutoff	A luminaire light distribution where zero candela intensity occurs at an angle of 90° above nadir, and at all greater angles from nadir. Additionally, the candela per 1000 lamp lumens does not numerically exceed 100 (10%) at a vertical angle of 80° above nadir. This applies to all lateral angles around the luminaire.
Cutoff	A luminaire light distribution where the candela per 1000 lamp lumens does not numerically exceed 25 (2.5%) at an angle of 90° above nadir, and 100 (10%) at a vertical angle of 80° above nadir. This applies to all lateral angles around the luminaire.
Semicutoff	A luminaire light distribution where the candela per 1000 lamp lumens does not numerically exceed 50 (5%) at an angle of 90° above nadir, and 200 (20%) at a vertical angle of 80° above nadir. This applies to all lateral angles around the luminaire.
Noncutoff	A luminaire light distribution where there is no candela limitation in the zone above maximum candela.

Figure 5: Luminaire Photometric Classification

3.3 Lighting Regulations and Analysis Guidance

The proposed project is not regulated by local lighting requirements or ordinances. In lieu of applicable regulations, this section provides a summary of the most relevant ordinances, which provide direction for the consideration of light nuisances and lighting impacts. While the City of Encinitas has specific outdoor lighting regulations, they do not apply to public recreational facilities. The County of San Diego also provides regulations for unincorporated portions of the County, which are considered in this analysis. In addition, the IESNA provides recommended practice guidelines for lighting. The IESNA guidelines are the most applicable to the proposed project, as they provide specific guidance for sports field lighting and appropriate levels of illumination. These guidance documents and provisions are described in more detail in the following sections. In addition, these guidance documents have been used to formulate the thresholds of significance for the proposed project, which are presented in Section 5.1 of this analysis.

3.3.1 IESNA RP-6-01 Guidance

This section summarizes the IESNA recommendations for specific outdoor sports and their associated facilities including illuminance values, uniformity ratios, and design considerations as it pertains to the Hall Property Community Park. The recommended illuminance are average maintained values.

The Hall Property Community Park will require a more sophisticated luminous environment as a result of the project's overall development objectives. IESNA RP-6-01 draws a correlation between the size of a facility and the level of play. Facilities are grouped into four classes based on the skill levels of the players and the anticipated number of spectators. This project shall be classified as type Class III – competition play with some spectator facilities.

Baseball/Softball

Illuminance Criteria

Readings taken at a 3-foot elevation, recommended horizontal illuminance levels:

- Infield 500 lux (50 fc) and Outfield 300 lux (30 fc)

Design Considerations

- To control glare, floodlights should be kept out of the player's normal line of sight. To do so, triangular areas extending from each infield base form a 20-degree wide zone. Floodlights located outside of these triangular areas prohibit the ball (as seen by the players) from moving through the floodlight bank. This arrangement also minimizes direct glare for the infielders (see *Figure 6*).
- Minimum mounting height to the bottom row of luminaries for all poles is 70 feet. Mounting height should be increased (when necessary) so the top of the defined beam remains 10 degrees or more below the luminaire plane (see *Figure 7*).

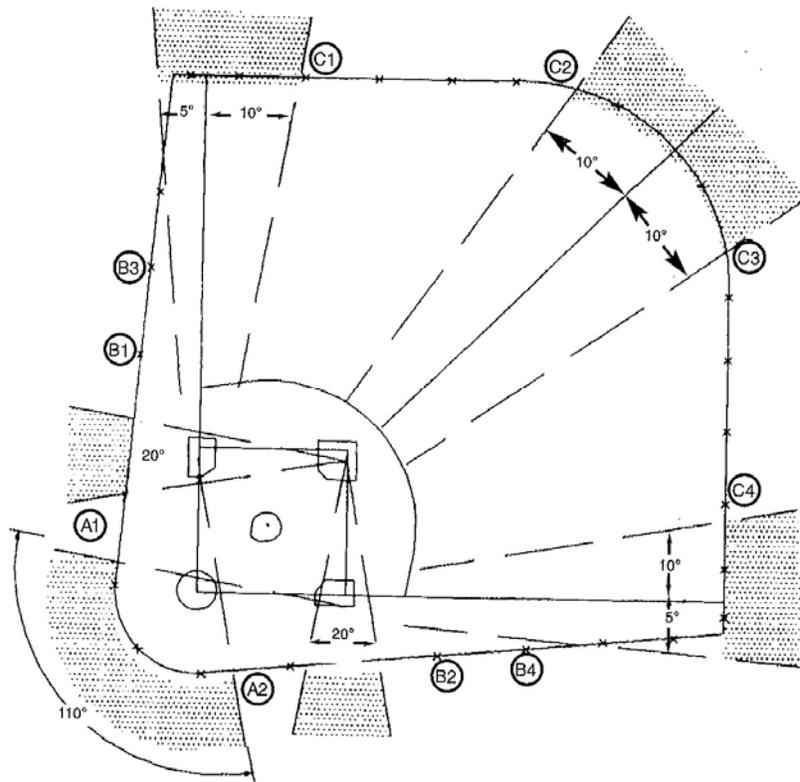


Figure 6: Each shaded area indicates a critical glare zone where luminaires should not be located ⁶

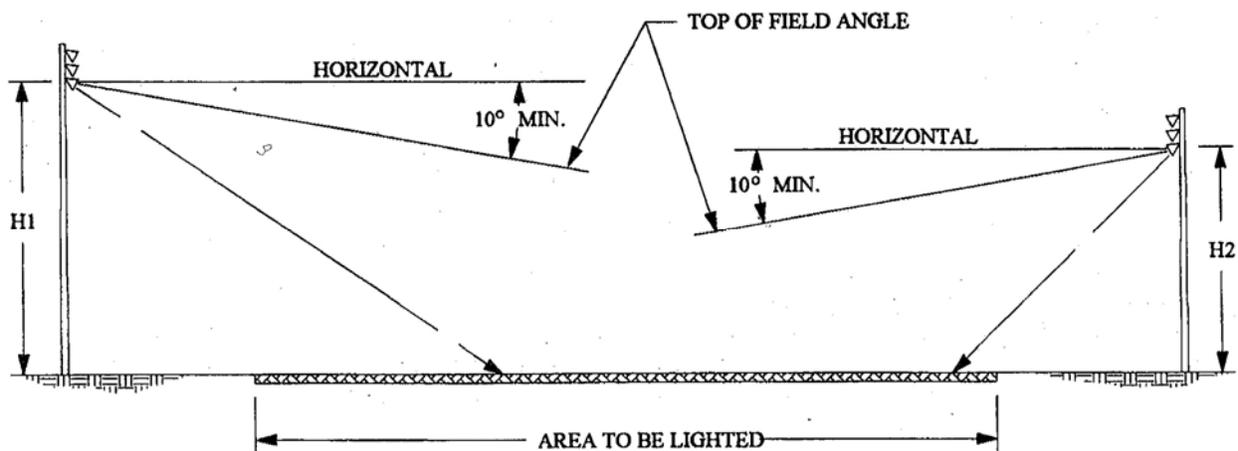


Figure 7: Pole mounting heights (H1 and H2) should be selected to ensure the top of the field angle of the selected Luminaire is 10 degrees (minimum) as shown. ⁷

Basketball

Illuminance Criteria

Readings taken at a 3-foot elevation, recommended horizontal illuminance levels:

- 300 lux (30 fc)

Design Considerations

- A minimum of four poles with floodlights (medium to wide spread) should be installed along the longitudinal sides of the court. Poles should have a minimum Luminaire mounting height of 30 feet.

Soccer

Illuminance Criteria

Readings taken at a 3-foot elevation, recommended horizontal illuminance levels:

- 300 lux (30 fc)

Design Considerations

- See Figure 8: for this particular soccer field, each shaded area indicates a critical glare zone where luminaires should not be located.

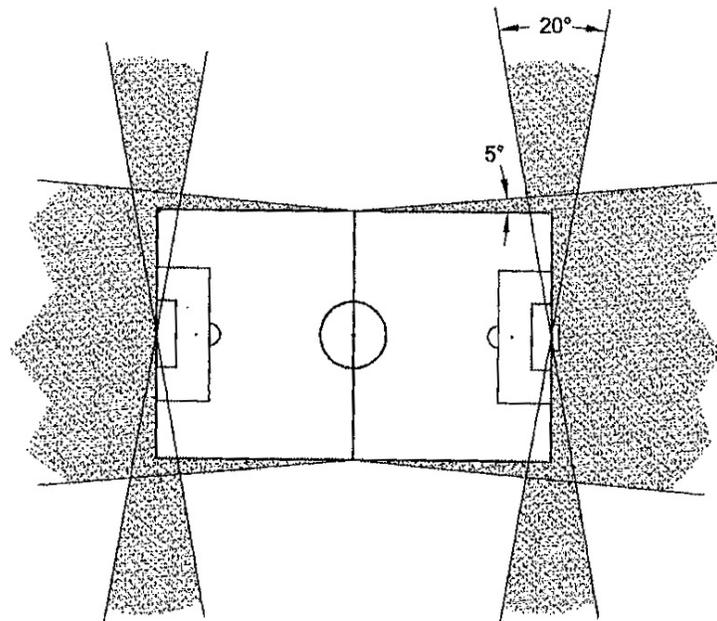


Figure 8: Soccer Design Considerations⁸

Swimming

Illuminance Criteria

Readings taken at water level, recommended horizontal illuminance levels:

- Outdoor - 300 lux (30 fc) Pool
- Outdoor - 100 lux (10 fc) Deck Area

Design Considerations

- Luminaires should be placed at locations that permit an adequate portion of the incident light (reflected light off of the surface of water) to penetrate the water and not be reflected in to the eyes of observers. Luminaires should not be placed inside a 20-degree cone extending above the diving platform.

Parking Lots

Parking lots and parking structures have vehicular speeds that are much lower than roadways. More importantly, the primary purpose of the lighting here is to benefit the pedestrian. It is intended that a driver (or pedestrian) looking at the brightest spot in the field of view will also be able to detect an object in the dark areas within the field of view. This detection can only occur if the maximum-to-minimum illuminance is limited to a range that the human eye can see. Illuminance recommendations for active parking lots open to customers, employees, or the general public are given in Table 9. The illuminance is to be measured or calculated on a clear pavement, without any parked vehicles. The maximum and minimum values are maintained illuminances. This condition occurs just prior to lamp replacement and luminaire cleaning.⁹

Walkway Lighting

Recommended levels of walkway and bikeway illuminance are given in Table 10. The levels shown represent the average maintained illuminance and should be considered the minimum recommended light levels, particularly when security and/or pedestrian identification at a distance are important. Visual identification of other pedestrians and objects along walkways and bikeways is dependent on vertical illuminance. Values for this are also shown in Table 10.¹¹

		Basic¹	Enhanced Security²
Minimum Horizontal Illuminance ³	lux ⁴	2	5
	fc ²	0.2	0.5
Uniformity Ratio, Maximum to Minimum ⁶		20:1	15:1
Minimum Vertical Illuminance ⁷	lux ⁸	1	2.5
	fc ⁵	0.1	0.25

¹ For typical conditions. During periods of non-use, the illuminance of certain parking facilities may be turned off or reduced to conserve energy. If reduced lighting is to be used only for the purpose of property security, it is desirable that the minimum (low point) value not be less than 1.0 horizontal lux (0.1 hfc). Reductions should not be applied to facilities subject to intermittent night use, such as at apartments, hospitals, and transportation terminals.

² If personal security or vandalism is a likely and/or severe problem, a significant increase of the Basic level may be appropriate (see **Section 4.3**). Many retailers prefer even higher levels, with a specification of 10 lux (1 fc) as the minimum value.

³ For **preliminary design**, an *average* value of 10 horizontal lux (1 hfc) for basic, or 25 horizontal lux (2.5 hfc) for enhanced illuminance may be calculated. The minimum points (or areas) and maximum point are then calculated and the uniformity ratio checked for compliance with the **Table 1** values (see **Section 5.3**). *Note:* The 5:1 average-to-minimum ratio is the first step toward directing the design to achieve the maximum to minimum ratios presented in **Table 1**.

⁴ Measured on the parking surface, without any shadowing effect from parked vehicles or trees at points of measurement.

⁵ Rounded conversion of lux to footcandles (see **Annex E**).

⁶ The highest horizontal illuminance point divided by the lowest horizontal illuminance point or area should not be greater than the values shown (see **Section 4.4** and **Annex B**).

⁷ Facial *recognition* can be made at levels as low as 2.5 lux (0.25 fc). The IESNA Security Lighting Committee recommends that for facial *identification*, the minimum vertical illuminance should be 5.0 lux (0.5 fc).

⁸ Measured at 1.5 meters (5.0 ft.) above parking surface at the point of lowest horizontal illuminance, excluding facing outward along boundaries (see **Section 4.4** and **Annex B**).

Note 1: The height of the measurement has been lowered from the previous 1.8 meters (6 ft.) of RP-20-84 to be in line with the average human observers eye height of 1.5 meters (5 ft.)

Note 2: A survey of existing installations by the authoring committee found that a value of 1 lux (0.1 fc) minimum vertical illuminance was achievable using cutoff luminaires, but values greater than this may not be achievable.

Table 9: Parking Lot Lighting – Illuminance Values for Parking Lots ¹⁰

Walkway Class	Average Conditions		Special Conditions ¹	
	Avg. Maintained Illuminance Levels Horizontal Levels (E Avg.) ²	Horizontal Avg. to Min. Average	Min. Maintained Avg. Vertical Levels (E Avg.) ³	Avg. to Min. Ratio
Sidewalks along streets by Area Classifications*				
Commercial	10	4:1	20	5:1
Intermediate	5	4:1	10	5:1
Residential	2	10:1	5	5:1
Park Walkways & Class I Bikeways				
Pedestrian Tunnels	20	4:1	55	5:1
Pedestrian Overpasses	2	10:1	5	5:1
Pedestrian Stairways	5	10:1	10	5:1

***AREA CLASSIFICATIONS**

a) **Commercial**—A business area of a municipality where ordinarily there are many pedestrians during night hours. This definition applies to densely developed business areas outside, as well as within, the central part of a municipality. The area contains land use which attracts a relatively heavy volume of nighttime vehicular and/or pedestrian traffic on a frequent basis.

b) **Intermediate**—Those areas of a municipality often characterized by moderately heavy nighttime pedestrian activity such as in blocks having libraries, community recreation centers, large apartment buildings, industrial buildings, or neighborhood retail stores.

c) **Residential**—A residential development, or a mixture of residential and small commercial establishments, characterized by few pedestrians at night. This definition includes areas with single homes, town houses, and/or small apartment buildings. Certain land uses, such as office and industrial parks, may fit into any of the above classifications. The classification selected should be consistent with the expected nighttime pedestrian activity.

¹There are conditions and situations which may suggest that increased vertical illuminances are appropriate to increase the perception of safety and reduce criminals' opportunities to operate under the cover of darkness. Vertical illuminances can improve facial recognition, recognition of peripheral elements and peripheral movement, and minimize deep shadows when compared to simply designing toward horizontal illuminance criteria. In densely populated areas, areas where nighttime activity is intermittent throughout the entire night, areas where architectural configurations provide opportunities for significant shadows, where narrow/deep entryways are frequent, where dense and high (1.2 meters; 4 feet and higher) landscaping occurs for great stretches, where pedestrians are likely to be alone and on a recurring schedule (e.g., shift workers walking to bus stops, walking home), where crime has been recorded as a community problem and/or where community officials predict future nighttime disturbances (based on anticipated future land use and development), consideration should be given to invoking the "Special Conditions" criteria.

²Values measured or calculated at ground level.

³Values measured or calculated (1.5 meters; 5 feet) above pavement, in both directions, parallel to the direction of travel on the walkway or bikeway.

Table 10: Walkway Lighting – Recommended Illumination¹²

Roadway Lighting

The illuminance method of roadway lighting design determines the amount of light incident on the roadway surface from the roadway lighting system. Because the amount of light seen by the driver is the portion that reflects from the pavement towards the driver, and because different pavements exhibit varied reflectance characteristics, different illuminance levels are needed for each type. The illuminance criteria give recommendations for average maintained lux for various road and area classifications depending on the pavement type used. The recommended illuminance values and the uniformity ratio are in Table 12.¹³

Class	Q _o	Description	Mode of Reflectance
R1	0.10	Portland cement concrete road surface. Asphalt road surface with a minimum of 12 percent of the aggregates composed of artificial brightener (e.g., Synopal) aggregates (e.g., labradorite, quartzite).	Mostly Diffuse
R2	0.07	Asphalt road surface with an aggregate composed of a minimum 60 percent gravel [size greater than 1 cm (0.4 in.)]. Asphalt road surface with 10 to 15 percent artificial brightener in aggregate mix. (Not normally used in North America.)	Mixed (diffuse and specular)
R3	0.07	Asphalt road surface (regular and carpet seal) with dark aggregates (e.g., trap rock, blast furnace slag); rough texture after some months of use (typical highways).	Slightly Specular
R4	0.08	Asphalt road surface with very smooth texture.	Mostly Specular

Table 11: Roadway Lighting – Road Surface Classification. ¹⁴ Actual pavement reflectance and specularity will vary with pavement age and wear.

Road and Pedestrian Conflict Area		Pavement Classification (Minimum Maintained Average values)			Uniformity Ratio E _{avg} /E _{min}	Veiling Luminance Ratio L _{vmax} /L _{avg}
Road	Pedestrian Conflict Area	R1 lux/ftc	R2 & R3 lux/ftc	R4 lux/ftc		
Freeway Class A		6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Freeway Class B		4.0/0.4	6.0/0.6	5.0/0.5	3.0	0.3
Expressway	High	10.0/1.0	14.0/1.4	13.0/1.3	3.0	0.3
	Medium	8.0/0.8	12.0/1.2	10.0/1.0	3.0	0.3
	Low	6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Major	High	12.0/1.2	17.0/1.7	15.0/1.5	3.0	0.3
	Medium	9.0/0.9	13.0/1.3	11.0/1.1	3.0	0.3
	Low	6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Collector	High	8.0/0.8	12.0/1.2	10.0/1.0	4.0	0.4
	Medium	6.0/0.6	9.0/0.9	8.0/0.8	4.0	0.4
	Low	4.0/0.4	6.0/0.6	5.0/0.5	4.0	0.4
Local	High	6.0/0.6	9.0/0.9	8.0/0.8	6.0	0.4
	Medium	5.0/0.5	7.0/0.7	6.0/0.6	6.0	0.4
	Low	3.0/0.3	4.0/0.4	4.0/0.4	6.0	0.4

Table 12: Roadway Lighting – Illuminance Method Recommended Values ¹⁵

3.3.2 Title 24

Title 24, Part 6, of the California Code of Regulations: is the California's Energy Efficiency Standards for Residential and Nonresidential Buildings. The Energy Efficiency Standards for Residential and Nonresidential Buildings were established in 1978 in response to a legislative mandate to reduce California's energy consumption resulting from the energy crisis, and to emphasize energy efficiency measures throughout specific technologies, institutions and programs.

Within Title 24, the requirements for outdoor lighting vary according to which "Lighting Zone" the equipment and project is located in. The Energy Commission defines the boundaries of Lighting Zones based on U.S. Census Bureau boundaries for urban and rural areas. The default for urban areas is Lighting Zone 3.¹⁶ Thus, the Hall Property Community Park shall comply by the regulations and guidelines as stated in the Title 24 Outdoor Lighting Zone standards under Zone 3, per Standards Table 10-114-A, Lighting Zone Characteristics and Rules for Amendments by Local Jurisdictions of the 2005 Building Energy Efficiency Code.

The complete outdoor lighting system, consisting of all walkway, parking, roadway and sports field lighting shall comply with:

- Section 132, Outdoor Lighting Controls and Equipment:
 - (a) Outdoor Lighting (lamp efficacy of 60 lumens/watt minimum is required for lamps rated over 100 watts),
 - (b) Luminaire Cutoff Requirements (luminaries requiring cutoff optics for lamps rated over 175 watts in hardscape areas),
 - (c) Controls for Outdoor Lighting ((1) all outdoor lighting shall be controlled by photocontrol or astronomical time switch that automatically turns off the outdoor lighting when daylight is available, (2) all lighting of building facades or parking lots, where two or more luminaires are used, requires an automatic time switch be installed that: (a) turns off the lighting when not needed and (b) reduces the lighting power (in watts) by at least 50% but not exceeding 80% or provides continuous dimming through a range that includes 50% through 80% reduction).
- Section 147, Requirements for Outdoor Lighting:
 - This section applies to all outdoor lighting, whether attached to buildings, poles, structures, hardscape areas including parking lots and lighting for building facades with the exception of:
 - 4) Lighting for sports and athletic fields and children's playground.
 - 9) Lighting used in or around swimming pools, water features or other locations subject to Article 680 of the California Electrical Code.
 - 11) Landscape lighting

The outdoor lighting installation shall be comply with the actual outdoor lighting power allowance as indicated in Table 147-A of the 2005 Building Energy Efficiency Code:

**Standards Table 10-114-A
Lighting Zone Characteristics and Rules for Amendments by Local
Jurisdictions**

Zone	Ambient Illumination	State wide Default Location	Moving Up to Higher Zones	Moving Down to Lower Zones
LZ1	Dark	Government designated parks, recreation areas, and wildlife preserves. Those that are wholly contained within a higher lighting zone may be considered by the local government as part of that lighting zone.	A government designated park, recreation area, wildlife preserve, or portions thereof, can be designated as LZ2 or LZ3 if they are contained within such a zone.	Not applicable.
LZ2	Low	Rural areas, as defined by the 2000 U.S. Census.	Special districts within a default LZ2 zone may be designated as LZ3 or LZ4 by a local jurisdiction. Examples include special commercial districts or areas with special security considerations located within a rural area.	Special districts and government designated parks within a default LZ2 zone maybe designated as LZ1 by the local jurisdiction for lower illumination standards, without any size limits.
LZ3	Medium	Urban areas, as defined by the 2000 U.S. Census.	Special districts within a default LZ3 may be designated as a LZ4 by local jurisdiction for high intensity nighttime use, such as entertainment or commercial districts or areas with special security considerations requiring very high light levels.	Special districts and government designated parks within a default LZ3 zone may be designated as LZ1 or LZ2 by the local jurisdiction, without any size limits.
LZ4	High	None.	Not applicable.	Not applicable.

Table 13: Lighting Zone Characteristics and Rules ¹⁷

TABLE 147-A LIGHTING POWER ALLOWANCES FOR GENERAL SITE ILLUMINATION (W/FT² UNLESS OTHERWISE NOTED)

Lighting Application	Allowed Area	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
Hardscape for automotive vehicular use, including parking lots driveways and site roads	Method (i.) Actual paved area plus 5' perimeter of adjacent unpaved land. Includes planters and landscaped areas less than 10' wide that are enclosed by hardscape on at least three sides..	0.05	0.08	0.15	0.19
Hardscape for pedestrian use, including, plazas, sidewalks, walkways and bikeways	Method (i.) Actual paved area plus 5 feet of unpaved land on either side of path of travel. Shall include all continuous paved area before including adjacent grounds.	0.06	0.09	0.17	0.21
Hardscape for driveways, site roads, sidewalks, walkways and bikeways	Method (ii.) 25' wide path incorporating as much of the paved area of the site roadway, driveway, sidewalk, walkway or bikeway as possible.	1.0 w/lf	1.5 w/lf	4.0 w/lf	5.0 w/lf
Building Entrances (without canopy)	Width of doors plus 3 ft on either side times a distance of 18 feet outward.	0.35	0.50	.70	1.00
Outdoor Sales Lot	Actual portion of uncovered outdoor sales lot used exclusively for display of vehicles or other merchandise for sale. All adjacent access drives, walkway areas, customer parking areas, vehicle service or storage areas that are not surrounded on at least three sides by sales area shall be considered hardscape.	0.35	0.70	1.25	2.00

Table 14: Lighting Power Allowances for General Site Illumination ¹⁷

3.3.3 City of Encinitas Requirements

In order to minimize the adverse impacts of certain nuisance factors and to provide methods of determining compatibility between uses of land and buildings, the following performance standards are established by the City of Encinitas. The purpose of these Outdoor Lighting Regulations is to preserve the quality of the night sky by minimizing light and glare nuisances to adjacent properties. The standards mentioned within the Performance Standards apply to all residential and commercial zones with the following exceptions:¹⁸

1. Public recreational facilities are not subject to the performance standards but shall be viewed through the use permit process for minimizing lighting impacts to surrounding properties, and may be subject to restrictions on operating hours and/or the number and type of lighting fixtures.
2. Street lighting is not subject to the performance standards, but shall be evaluated through proposed subdivision/projects and street standards in order to preserve dark sky character of the community, while still maintaining the necessary lighting for safety purposes.

As noted, the outdoor lighting regulations contained in Chapter 30.40 of the City of Encinitas Municipal Code do not apply to public recreational facilities. However, it is the intent that public

facilities minimize lighting impacts to surrounding properties. The development of project-specific thresholds of significance for this analysis take the guiding principles and guidelines presented in the Municipal Code into consideration in order to meet this overall goal of the City of Encinitas.

6. Lighting Guidelines

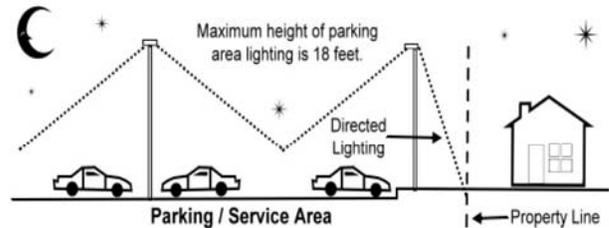
Light pollution is a major concern for the citizens of Encinitas. The Design Review Guidelines have been developed to help integrate the community's development and prevent lighting from interfering with residential properties. Lighting within the project should provide for the safety of pedestrians and aesthetically enhance the project.

6.1 Guiding Principles

- 6.1.1 *New lighting should not impact any adjacent properties.*
- 6.1.2 *Exterior lighting shall be the minimum necessary to provide for safety.*

6.2 Guidelines

- 6.2.1 All exterior lighting shall be directed and shielded to prevent glare to adjacent properties or streets.
- 6.2.2 High intensity lighting shall be limited to service areas or other similar locations.
- 6.2.3 Service area lighting should be contained within service yard boundaries and enclosure walls. Light spillover should not occur outside the service area.



*Figure 6-1
Control for light and glare onto adjacent properties.*

- 6.2.4 Light intensity shall be minimized to reduce indirect lighting of the nighttime sky.
- 6.2.5 Lighting elements should not dominate a landscape during daylight hours.
- 6.2.6 The use of walkway and landscape feature lighting is encouraged for safety and aesthetic purposes
- 6.2.7 Landscape up-lights are effective for accentuating trees and other plant material; however, they should not be used as the sole source of illumination along walkways or other pedestrian areas.
- 6.2.8 All site, landscape or building exterior lighting shall be of a configuration, style, finish and color that complements the architectural theme and materials established by the building architecture. Patterns of light and fixture concealment should be designed to avoid glare and intrusion into adjacent properties. The light source should not be visible from surrounding properties or public areas.
- 6.2.9 Lighting shall not be used as an attention-getting device.

Figure 15: Lighting Guidelines, City of Encinitas ¹⁸

4.0 METHODOLOGY

Measurement of light sources and illuminated surfaces and methods of analysis used for this evaluation are based on standard practices established by the most recent IESNA Recommended Practice Guidelines for Sports Field Lighting (RP-6-01) for measurement of light sources and illuminated surfaces and guidance documents from the City of Encinitas and County of San Diego, although these local ordinances and requirements do not specifically apply to the proposed project.

4.1 Measurement

The light energy incident at a point is measured by a scale of foot-candles or lux, and is described in the technical term **illuminance**. This incident light is not visible to the eye until it is reflected from a surface, such as pavement, a wall, or dust in the atmosphere or the surface of a light bulb. The visible brightness of a surface is measured in foot-lamberts and is described by the term **luminance**.

The human eye processes brightness variations across a very broad spectrum of intensities. The ratio of brightness values generated by direct noon sun versus a moonlight evening is over 5000 to 1. Eyes can accommodate this range of intensities given adequate time. However, one cannot view brightness ratios beyond a range of more than 30 to 1 without discomfort.

The perception of a natural state or dark sky is altered by light sources that are clearly visible and have brightness, such as streetlights, security lights and parking lot lighting.

The site measurements and observations support the following analysis of the lighting data.

4.2 Calculations

Francis Krahe & Associates, Inc. reviewed lighting calculations conducted by others for the site plan of the Hall Property Community Park to evaluate the proposed lighting conditions within the Community Park from the viewpoint of surrounding neighborhoods. The information listed below was documented at each location and serves as the basis for this lighting analysis.

Note: the site locations on the site plan are included in the report for diagrammatic purposes only and do not accurately represent the observer's field of view (*see Figure 16*), sensation of brightness, or values of contrast. The site locations are included only for reference and illustrate a portion of the observer's field of view or impact. Locations were chosen for accessibility and appropriateness to the data acquisition required by the study. Provided within this report are calculations provided by King Luminaire Photometric Layout (*see Figure A1.0 in Appendix*) and Musco Lighting Illumination Summary (*see Figure A2.0 series in Appendix*).

4.3 Equipment

The lighting design proposal for the Hall Property Community Park should take into account the lighting criteria and guidelines, as stated above in Section 3.1, as well as provide the park and its functional components appropriate quantity and quality of lighting, as recommended by IESNA for sports lighting, Recommended Practice for Sports and Recreational Area Lighting (RP-6-01), Recommended Lighting for Walkways and Class 1 Bikeways (DG-5-94), Lighting for

Parking Facilities (RP-20-98), Roadway Lighting (RP-8-00), and Lighting for Exterior Environments (RP-33-99). The goals of lighting are to provide an appropriate luminous environment that allows visibility for sports activities and pedestrians' security and safety. The quality of lighting relies on the measurement of the following criteria: average illuminance, modeling, uniformity, glare, contrast, and color rendition. The design and use of lighting systems should balance the lighting requirements for appropriate lighting and take into consideration potential negative impacts of lighting contributing to neighboring property owners (light trespass, glare, and dark sky).

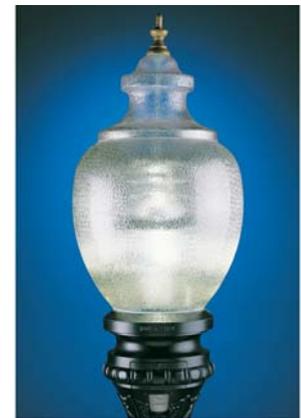
The lighting system is comprised of two major components: walkway and parking lot lighting, and sports field lighting. The two proposed systems are to be provided by two lighting manufacturers: King Luminaire (*Appendix Figure A3.0 and A3.1*) and Musco Green Generation Luminaire (*Appendix Figure A4.0 and A4.1*).

The proposed King Luminaire used throughout walkways and parking lots contains the following design performance characteristic, an internal louver assembly that is classified as an IES cut-off optics for Dark Sky compliance and a house side shield that further reduces visible glare and light trespass onto neighboring properties. Pole fixtures are proposed at heights of 14.5' for pedestrian walkways and 16.5' for parking lots. The luminaire globe is comprised of an acrylic refractor and the light source is a high luminous efficacy and long lamp life, high pressure sodium lamp of the following performance characteristics: 70W for the lower walkway poles (5800 lumens) and 150W for the taller poles (16000 lumens), approximately 20,000 hour lamp life, and color rendering of 65.

The calculation study performed by King Luminaire illustrates that the minimum average values for safe and secure pedestrian walkway and parking lot lighting is provided utilizing the proposed King Luminaire type K118 and the lighting design layout proposed. Minimum average recommended illuminance values are met as indicated in Appendix Figure A1.0, and minimized illuminance values reach the nearby property lines for limited light trespass. Thus, the proposed walkway and parking lot lighting system meets the Dark Sky requirements, minimizes light trespass, and has integral shielding to reduce visibility glare. The light source will be viewed as comfortable and glare free, while meeting the necessary minimum illuminance criteria for safe and sufficient uniform lighting for pedestrians.

KING LUMINAIRE

- Conforms to Dark Sky Requirements
- Conforms to Light Trespass
- Conforms to Glare Requirements
 - The Decorative Acorn Post Top Fixture is designed to be dark sky friendly
 - IES Cutoff Classification
 - Non-Glare Internal Reflector
 - Internal Shield to prevent trespass light in windows



- Automatic on at dusk and off at dawn
- Environmentally Safe

Sports lighting and other special exterior lighting applications can have a wide range of intensity distributions, depending on the size of the object being illuminated, and often use floodlight luminaires. The sports field floodlighting system proposed as Musco Green Generation contributes more of a luminous impact on the project site due to its scale and lamp wattage intensity. Higher horizontal and vertical illuminance level requirements, and uniformity ratios demand higher lamp wattages at greater heights for more uniform distribution. Strategic placement of these poles in relation to the sports activity is key to the success of the objective illuminance performance as well as is key to the luminous impact to the project site in relation to neighboring sites. These pole heights are to be located at certain distances to the property boundary, thereby limiting light trespass reaching property lines and lessen glare potential. The further the light source is from the line of sight, the lower the glare. Pole fixture heights range from 40' tall (skate park), 60'-90' (soccer), 60'-80' (softball), 80'-90' (baseball) and 60' (pool).

The lamp source is a high luminous efficacy, 1500W high-pressure sodium lamp (5000 hour lamp life, 134,000 lumens per lamp, and color rendering of 65). These lamps are in multiple combinations for various illuminance level requirements and various sports field activities. These sports light fixtures contain external partial snoots (shielding reflector) to provide shielding and glare control, decreasing visibility of these high brightness lamps. The luminaires are tilted for a maximum angle of incidence of 44.7°. This angle of tilt lies within the range of the recommended angle of 69° that reduces glare or visibility to excessive contrast from highly visible lamps and the background (refer to Figure 2 for Glare/Light Distribution). The luminaire shielding of the fixture and photometric optics indicate cut off optics that comply with Dark Sky requirements.

MUSCO LIGHTING

- Conforms to Dark Sky Requirements
- Conforms to Light Trespass
- Conforms to Glare Requirements
 - Reflector and Visor System provides minimal spill light at a reduction of 50%
 - Shield provides glare control



Utilizing the proposed design layout and the Musco Green Generation light poles, the calculation studies performed by Musco illustrate that the minimum average illuminance values for various sports activities are provided within the proposed project. The calculation also indicates that minimized illuminance values reach the nearby property lines for limited light trespass.

5.0 Lighting Environmental Impacts and Mitigation

This section describes the environmental setting and analyzes the potential lighting impacts associated with the development of Hall Property Community Park. The proposed lighting plan is analyzed with respect to the lighting terms as defined in section 6.0 *Lighting Glossary*.

5.1 Thresholds of Significance

In consideration of guidance provided by the City of Encinitas and the IESNA, the following are the thresholds of significance that have been used to evaluate the lighting impacts of the proposed project:

The Hall Property Community Park would cause a significant lighting impact if the project would:

- Create lighting that is inconsistent with applicable environmental plans, zoning, and regulations of the City of Encinitas or the region.
- Interfere with or negatively affect the regional dark sky resources of Palomar Mountain and Mount Laguna.
- Create a new source of substantial glare; a significant glare impact is defined quantitatively as a luminance ratio of 30:1 or more (foreground of luminaries to background of dark sky).
- Allow for the uncontrolled placement of lighting poles and luminaires adjacent to the property line. Thus, resulting in light trespass at a distance 25 feet beyond the property line to any adjacent property zoned for residential use.
- Provide lighting that is extraneous and unnecessary for the function of the recreation facility, which would result in illumination of the night sky and nuisance to surrounding properties.

5.2 Site Lighting Analysis

All portions of the Hall Property Community Park project have illuminance objectives and criteria, as outlined in Section 3.3 of this report to provide a quality luminous environment that is uniform, sufficient illumination and incorporates preventive measures for glare and light trespass.

Applicable Environmental Plans, Zoning and Regulations

As noted above, the City of Encinitas provides regulation of outdoor lighting through Chapter 30.40 of the Municipal Code. However, these regulations specifically do not apply to public recreational facilities. Thus, the proposed project does not conflict with the performance standards contained in the Municipal Code. However, it is the intent that public facilities minimize lighting impacts to surrounding properties. The following additional analyses further consider this directive of the Municipal Code.

Dark Sky Resources

Recognized dark sky resources in the County of San Diego are Palomar Mountain and Mount Laguna. The City of Encinitas and the project site is more than 30 miles from Palomar Mountain and 50 miles from Mount Laguna. Because the proposed project is more than 15 miles from either of these locations, lighting from the project would not have the potential to negatively affect dark skies surrounding these regional resources. Thus, the proposed project would not impact regional dark sky resources.

Glare

Glare is defined as visual discomfort experienced from high contrast. Each visible luminaire source (light bulb) or surface relative to the surrounding background (sky, hills, foreground) has the potential to result in "glare". There are two types of glare: 1) Disability Glare, which is glare that reduces the ability to see or identify objects, and 2) Discomfort Glare, which is glare that produces ocular discomfort, but does not reduce the ability to see. Glare is measured by a contrast ratio, which defines a luminance ratio between the foreground of luminaries to the background of dark sky. A significant glare impact is defined quantitatively as a luminance ratio of 30:1 or more.

Although no discomfort glare rating system has been adopted by the IESNA, the principles that should be used to reduce discomfort glare are well known. They are as follows:

- Increase the angular displacement of light sources from the normal lines of sight.
- Increase the size of the diffusing medium surrounding the light source.

To prevent the potential of lamp visibility of the pathway and parking lot lighting, King Luminaire incorporates a cut off qualified louver that directs illumination to the ground, shielding lamp visibility. The Musco Green Generation sports lighting luminaries are positioned in higher elevations to avoid normal sight lines, and accomplish the necessary higher illuminance for sports event lighting. Due to their high light intensity output and larger fixture profiles, these fixtures are reviewed in detail below for an individual's potential for viewing into the aimed luminaries as a source of glare.

The design methods that are incorporated into the proposed sports lighting to prevent discomfort or nuisance glare are as follows:

- Project design layout strategically locates and aims luminaires toward the center of the property to further reduce likely views into the luminaries.
- Luminaire aiming angle is lower than the recommended 21° below horizontal (aiming angle is greater than 21°).
- Pole heights have been increased to avoid normal lines of sight.
- Glare shields are used to prevent spill light and excessive views into luminaries (views into luminaire are limited to aiming angle and luminaire beam spread).

The sports luminaries are strategically located and aimed towards the targeted sports field with a visor shield. Sports lighting adjacent to the eastern property line, are directed towards the main property to minimize viewing sightlines from the adjacent freeway. Sports lighting adjacent

to the western property line are directed easterly to minimize views from the neighboring properties.

In order to attempt to quantify glare, the relationship and potential glare impacts from sports lighting within the proposed project have been mathematically analyzed (refer to Table A5.0). The horizontal field of view shall be referenced at an angle of 180°. If the difference between the luminaire aiming direction ($\omega^{\circ}\text{horiz}$) and the line of sight (in these examples, the closest distance and furthest distance to the property line) is greater than 180°, then view into the luminaire is avoided, thus discomfort glare is avoided (Yes or No values in Appendix Table A5.0)

Table A5.0 also indicates the luminaire aiming angles ($\omega^{\circ}\text{vert}$) required to accomplish the recommended illuminance criteria of various sports events. The angles range from 23.5°-47.0° below the horizontal field of view. As defined in Figure 2, direct glare is defined as sightlines avoided with vertical tilt angles higher than 21° below horizontal field of view. Potential glaring sightlines have been minimized by limiting luminaire aiming angles below the recommended angle of 21° below horizontal field of view (an aiming angle greater than 21°, Column F).

Figure 16 indicates the maximum vertical limits of the field of view as 60° above and 70° below the line of sight. Normal line of sight is horizontal, which contends a normal field of vision. Glare, potentially occurs when a pedestrian has the ability to view into a luminaire directly, beyond the normal line of sight (beyond 60° above horizontal).

Within the project, this incident of sight lines beyond 60° above horizontal and direct view into the luminaire may occur at the closest viewing point from the property line. *Dmin* in Appendix Table A5.0, indicates the closest distance from the luminaire to the property line and the resultant line of sight angle, above horizontal or the line of sight ($\theta^{\circ}\text{vert}$). The limit of luminaire visibility (discomfort glare) is dependent on whether the line of sight ($\theta^{\circ}\text{vert}$) is less than the combined total of the luminaire aiming angle ($\omega^{\circ}\text{vert}$) plus the luminaire aperture (β°), where β° = total luminaire aperture minus visor coverage). Column M indicates that the closest distance from the proposed luminaire to the property line and the aiming angle ($\omega^{\circ}\text{vert}$) are within the 180° horizontal field of view. Furthermore, Column N evaluates whether the direct view into each luminaire from the closest point from the property line, are potential glare conditions. Figure A2.1 of Appendix identifies six potential locations, where a pedestrian may view directly into the sports luminaries, beyond the normal line of sight of 60° above horizontal.

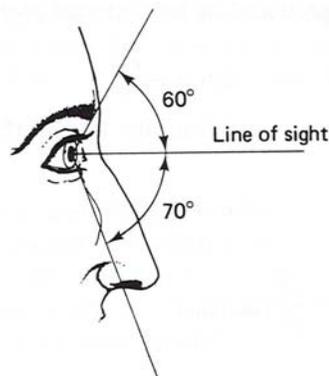


Figure 16: Vertical Limits of the Field of View ¹⁹

As mentioned in the design objectives of this project, the Hall Property Community Park have illuminance objectives as outlined in Section 3.3 of this report to provide a quality luminous environment that is uniform sufficient illumination to properly render sports activities and provide a safe and secure environment. These high illuminance values required for the functionality of the project will indirectly produce higher luminance or perceived brightness from reflected surfaces. In terms of the luminance values, the two contributing factors are the surface reflectance and the illuminance incident on a surface.

$$E = p * L$$

E = Illuminance (incident light energy)

p = Reflectance of surface

L = Luminance (reflected light energy)

Luminance ratios are dependent on surface reflectance values and the resultant illuminance (incident light) that reach surfaces.

Light Trespass

The quality of illumination has a direct bearing on the safety, efficiency, and appearance of the proposed lighting once the functional needs of the project have been established as in Section 2.4. As mentioned above, quality is dependant upon transient adaptation as well as glare control. For example, the internal 5" diameter reflector head shield of the King K118 and the Musco Green Generation floodlight aluminum spill and glare light control visor are both used to produce the required luminous intensity distribution (L), thus eliminating glare. In turn, good glare control will minimize wasted spill light. Spill light or light trespass is brought to the forefront in this analysis because of the potential environmental impact in regards to unwanted light that falls beyond the property line or area intended to be illuminated.

Section 3.1 defines light trespass and Figure A1.0 and Figure A2.1, respectively contained in the Appendix, depict the calculated light levels for proposed King Luminaire and Musco fixtures and the relationship in regards to the resulting horizontal light levels to the potentially impacted property lines. Table 17 summarizes the location and values of potential lighting issue impacts of the project. The adjacent property may receive high illuminance levels or unwanted light at these locations, yet the selection, location and mounting of proposed luminaires have been pivotal factors in the containment of light within the project in regards to light trespass. Light trespass, being somewhat subjective and at times uncontrolled due to safety and security uses, is a minor yet mitigated impact since the exterior lighting originating on the property line has been limited to a maximum of 0.5 horizontal foot-candles at a distance of 25 feet beyond the property line within the majority of the project (see *Table 17*).

Care has been taken in the avoidance of using luminaires that emit light above the horizontal plane. The King K118 has a louver assembly with house side shield that minimizes light trespass onto nearby windows, illumination onto adjacent properties, and improves observer comfort. The use of a louver, highly reflective blades arranged in a rectangular grid producing cells, reduces or eliminates the direct view of the lamp from outside the luminaire.

For sport lighting luminaires the proposed uses of high-pressure sodium (HPS) lamps within both fixtures have relatively small light-emitting elements that allow for good optical control. The narrow luminous intensity distribution of the Musco Green Generation floodlight allows for the mounting of this pole fixture well above the playing area. For pathway lighting luminaires the optical components are usually at the top, producing an illuminated area in the immediate vicinity, thus minimizing light trespass, as evident in the King K118. The smaller pole mounting and Type 3 - IES classification (see *Figure 5*) of this luminaire provides a wide illuminance pattern with sharp cutoff to minimize light trespass. Typically, such luminaires have smaller pole mounting, in this case 14 feet, that produces a smaller light contribution.

Since aiming is a critical part of its application, the Musco Green Generation floodlight is provided with special aiming and locking gear consisting of horizontal and vertical aiming adjustments and geared tilt adjustment. In relation to the property line, the shielded floodlights adjacent to I-5 where direct glare is not a problem, high mounting poles with luminaires having a low aiming angle exist. The higher the pole height the better the light distribution onto the intended field area. The visor system of the floodlight produces energy efficient light on the field and minimal spill light. Neither the Musco Green Generation floodlight or King K118 are aimed toward the property lines of the project.

Property Line Location	King Luminaire Illuminance at Property Line	Musco Floodlight Illuminance at Property Line
Southwest Corner	.4 fc	.46 fc - .47 fc
Northwest Corner	.5 fc	0.0 fc
25 feet beyond	0.0 fc	0.0 fc

Table 17: Potential Light Trespass Impacts

5.3 Summary of Potential Lighting Impacts and Mitigation Measures

As described in the previous sections, the proposed Hall Property Community Park has the potential to create a new source of substantial light and glare. Specifically, there are six locations where a pedestrian may view directly into the sports lighting from the closest viewing points along the property lines. This glare would not result in the reduction in the ability to see or identify objects, however, it could cause discomfort for the viewer (i.e., discomfort glare). In addition, the project has the potential to result in light trespass onto adjacent properties. Although this potential is minimal under the current lighting plan, there are specific areas in the northwest and southwest corner of the site where light would spill beyond the park property line (refer to *Table 17 and Figure A2.1*). To address these impacts, the following mitigation measures shall be implemented:

- Adjustments to the lighting plan shall be made to address the potential glare effects identified on *Figure A2.1*. This potential discomfort glare can be addressed through the

installation of well-placed glare shields, or through the adjustment of the aiming or position of the luminaire.

- Light trespass, a maximum of 0.5 horizontal foot-candles, shall not occur 25 feet beyond the property boundaries of the Hall Property Community Park. Light shall be contained within the proposed project area by the location, mounting, and aiming of luminaires; the use of shielding; and/or the use of cutoff reflectors and refractors. Inspection of the luminaires shall occur immediately after light installation, and every 6 months thereafter, to ensure that no starbursts or light trespass occurs beyond the park property boundary. If starbursts are present that would be obtrusive to nearby residences or roadways, the lights shall be manually adjusted (e.g., through the use of the special aiming and locking gear adjustments that each luminaire will be equipped with) or with the use of shielding or other cutoff mechanisms. Similarly, luminaries shall be adjusted to ensure no light trespass 25 feet beyond the park boundary. A light meter shall be used to measure, at grade, the amount of horizontal foot-candles obtained around a 25 foot perimeter from the project property line to eliminate any subjective references to light trespass.
- To minimize the overall illumination and perceived brightness of the project, the use of reflective surfacing should be minimized. Surfaces surrounding light sources should have matte or dull finishes, with reflectance values at or below 20%²⁰ Refer to Table 18 for examples of material surface reflectance. These values can be obtained from the material manufacturer.

With the implementation of these measures, the potentially significant light and glare impacts identified in this analysis would be reduced to a less-than-significant level.

Material	Reflectance %
White plaster	90
Aluminum sheet, polished	82
Acoustic tile	80
White paint	70-85
Pastel color paint	45-60
Saturated colors	25-35
Galvanized sheet metal	50
Unpainted concrete	30
Unpainted wood	30
Black tar paper	7

Table 18: Material Reflectance Chart

6.0 LIGHTING GLOSSARY

Discussions of lighting issues should include precise descriptions or terminology of the specific lighting technical parameters. The following glossary summarizes explanations of the technical lighting terms utilized within the report and the related practice standards to facilitate discussion of these issues. The following technical terms are presented in this report.

- Brightness:** The magnitude of sensation which results from viewing surfaces from which light comes to the eye. This sensation is determined partly by the measurable luminance of the source and partly by the conditions of observation, such as the state of adaptation of the eye. For example, very bright lamps at night appear dim during the day, because our eyes have adapted to the higher brightness of daylight.
- Candela:** Measure of light energy from a source at a specific standard angle and distance. A convenient measure to evaluate output of light from a lamp or light fixture in terms of both the intensity of light and the direction of travel of the light energy away from the source. The output of a 60-watt household incandescent lamp is approximately 150 candelas.
- Context:** Unobstructed portion of the site location view towards the project site, including ambient illuminance and visual obstructions.
- Contrast:** Calculated evaluation of high, medium and low contrast of visible light sources or surfaces within the site by a ratio of luminance values. Ratio of one surface luminance to a second surface luminance. Contrast values exceeding 30 to 1 are usually deemed uncomfortable; 10 to 1 clearly visible; less than 3 to 1 appear to be of equal value.
- Coverage:** Extent portion of the field of view covered by the project site area.
- Cutoff:** Type of light distribution which includes a shield to restrict light to a direct (down) configuration. Cutoff is a luminaire light distribution classification where the candela per 1000 lamp lumens does not numerically exceed 25 (2.5%) at or above a vertical angle of 90° above nadir, and 100 (10%) at or above a vertical angle of eighty degrees above nadir. This applies to all lateral angles around the luminaire.
- Extent:** Visual description of prominence of the site and lighting elements within the field of view. Describes visible illuminated features, describe the extent of the field of view (180 degrees) covered by the project site and illuminated objects.
- Full Cutoff:** A luminaire light distribution where zero candela intensity occurs at an angle of 90° above nadir, and at all greater angles from nadir. Additionally, the candela per 1000 lamp lumens does not numerically exceed 100 (10%) at a vertical angle of 80° above nadir. This applies to all lateral angles around the luminaire.
- Fully Shielded:**
Outdoor light fixtures shielded or constructed so that light rays emitted by the fixture are projected below the horizontal plane passing through the lowest point on the fixture from which light is emitted.
- Glare:** Visual discomfort experienced from high contrast. Describes visual evaluation of each visible source or surface relative to the surrounding background (sky, hills, foreground). There are two types of glare: 1) *Disability Glare*, that which reduces the ability to see or identify objects, 2) *Discomfort Glare*, that which produces ocular discomfort, but does not reduce the ability to see. Glare is categorized into three levels. These levels are based on the contrast ratio as follows:

High glare sources: View of light fixture emitting surface, such as lens, reflector or lamp where contrast ratio exceeds 30 to 1.

Medium glare sources:

Brightly lighted surfaces where contrast ratio exceeds 10 to 1, but is less than 30 to 1.

Low glare sources: Illuminated surfaces where contrast ratio exceeds 3 to 1, but is less than 10 to 1.

Illuminance: Measure of light energy (luminous flux) incident at a specific point on a surface over a standard area (foot-candles (fc), or lumens per square foot). This term is commonly used to measure and describe light intensity on a surface.

Light Output Direction:

Luminaires for general lighting are classified in accordance with the percentages of total luminaire output emitted above and below horizontal. The light distribution curves may take many forms within the limits of upward and downward distribution, depending upon the type of light and the design of the luminaire. The following diagrams show examples of light output direction.

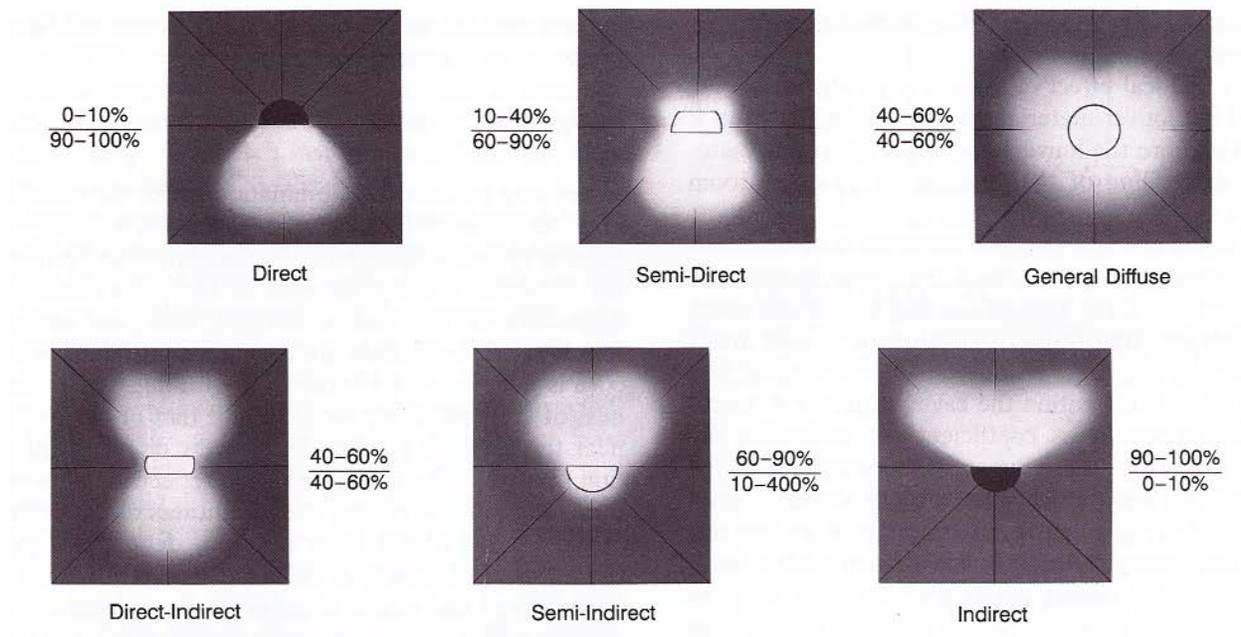


Figure 18: Defined Directional Light Output Configurations

Light Pollution:

Any adverse effect of man-made light including sky glow, glare, light trespass, light clutter, decreased visibility at night, and energy waste.

Light Trespass:

Electric light from subject property incident onto adjacent properties, measured in foot-candles, usually analyzed by measurement at or near the property line.

Line of Sight: An imaginary straight line from the eye to a perceived object.

Lumen: Mean value of total candelas produced by a light source. Lumen does not define direction.

Luminaire: A device to produce, control, and distribute light.

Luminance: Measure of reflected light energy from a specific surface in a specific direction over a standard area (foot-lambert). This term is the measure of the strength or intensity of the source.

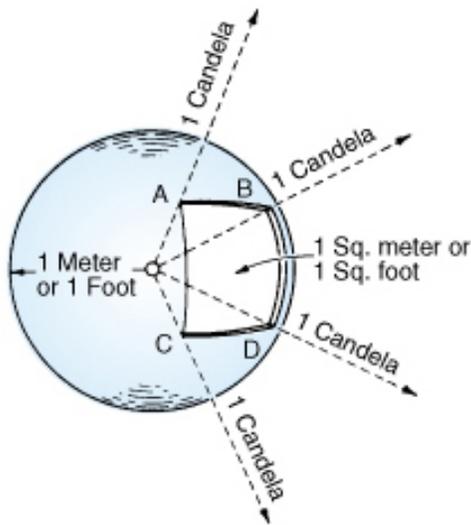


Figure 19: Lighting Units²²

The diagram indicates the relationship between candelas (cd), foot-candles (fc), and lumens (lm). A point source [luminous intensity = 1 candela] is shown at the center of a sphere of unit radius whose surface has a reflectance of zero. The illuminance of any point on the sphere is 1fc if the radius is 1 foot. The solid angle subtended by the area ABCD is 1 steradian (sr). The flux density is therefore 1 lm/sr which corresponds to a luminous intensity of 1cd as originally assumed. The sphere has a total area of 4π ft², and there is a luminous flux of 1 lm falling on each unit area. Thus, the source provides a total of 4π lm (12.56 lm).

Nadir: The direction of straight down, as would be indicated by a plumb line. Ninety degrees above nadir is horizontal. Eighty degrees above nadir is 10 degrees below horizontal.

View: Visual description of each location view towards the project site. Distance from the site; distance to visible sources. Describes extent of view in radian degrees; describe major physical features

7.0 REFERENCES

- ¹ City of Encinitas, City Projects, Project List, www.ci.encinitas.ca.us, October 25, 2005.
- ² Lighting for Exterior Environments an IESNA Recommended Practice, IESNA RP-33-99, *Floodlight Luminaires*, pg. 21, February 27, 1999.
- ³ Lighting for Exterior Environments an IESNA Recommended Practice, IESNA RP-33-99, *Outdoor Sports Lighting*, pg. 42, February 27, 1999.
- ⁴ International Dark-Sky Association – Information Sheet 76, <http://www.darksky.org/infoshts/is076.html>, *Exterior Lighting: Glare and Light Trespass*, July 1996.
- ⁵ International Dark-Sky Association, www.darksky.org/key/trespass.html, *An Example of Light Trespass*, September 16, 2004.
- ⁶ Recommended Practice for Sports and Recreational Area Lighting, IESNA RP-6-01, *Figure 53*, pg. 44, August 5, 2001.
- ⁷ Recommended Practice for Sports and Recreational Area Lighting, IESNA RP-6-01, *Figure 16*, pg. 11, August 5, 2001.
- ⁸ Recommended Practice for Sports and Recreational Area Lighting, IESNA RP-6-01, *Figure 81*, pg.61, August 5, 2001.
- ⁹ Lighting for Parking Facilities, IESNA RP-20-98, *Recommended Maintained Illuminance Values for Parking Lots*, pg. 2-3, December 5, 1998.
- ¹⁰ Lighting for Parking Facilities, IESNA RP-20-98, *Recommended Maintained Illuminance Values for Parking Lots*, pg. 3, December 5, 1998.
- ¹¹ Recommended Lighting for Walkways and Class 1 Bikeways, IESNA DG-5-1994, *General*, pg. 8, August 7, 1994
- ¹² Recommended Lighting for Walkways and Class 1 Bikeways, IESNA DG-5-1994, *Table 2 – Recommended Illumination*, pg. 9, August 7, 1994
- ¹³ American National Standard Practice for Roadway Lighting, ANSI/IESNA RP-8-00, *Illuminance Criteria* pg. 7, June 27, 2000.
- ¹⁴ American National Standard Practice for Roadway Lighting, ANSI/IESNA RP-8-00, *Table 1 - Road Surface Classification*, pg. 5, June 27, 2000.
- ¹⁵ American National Standard Practice for Roadway Lighting, ANSI/IESNA RP-8-00, *Table 2 – Illuminance Method Recommended Values*, pg. 8, June 27, 2000.
- ¹⁶ Title 24, www.energy.ca.gov/title24/, *Outdoor Lighting*, October 1, 2005.
- ¹⁷ California’s Energy Efficiency Standards for Residential and Nonresidential Buildings, Title 24, Section 147 Requirements for Outdoor Lighting, *Table 10-114-A of the Building Energy Efficiency Code - Lighting Zone Characteristics and Rules* and *Table 147-A of the Building Energy Efficiency Code - Lighting Power Allowances for General Site Illumination*, 2005.
- ¹⁸ City of Encinitas, Planning Department, www.ci.encinitas.ca.us, *Chapter 30.40, Ordinance 2003-10*, February 2005.

- ¹⁹ Lighting for Energy Efficient Luminous Environments, by Helms, Ronald L., and Belcher, M. Clay, *Vertical Limits of the Field of View*, pg. 35, 1991.
- ²⁰ Lighting for Exterior Environments an IESNA Recommended Practice, IESNA RP-33-99, *Consider How Luminance Ratios Impact Visibility*, pg. 6, February 27, 1999.
- ²¹ Controlling Luminance, IES ED-50 PowerPoint Presentation, IES Inland Empire Section, by Avery, Doug, *Material Reflectance Chart*, November 19, 2005.
- ²² American National Standard Practice for Roadway Lighting, ANSI/IESNA RP-8-00, *Figure G2 – Relationship Between Candelas, Lumens, Lux, and Foot-candles*, pg. 56, June 27, 2000.

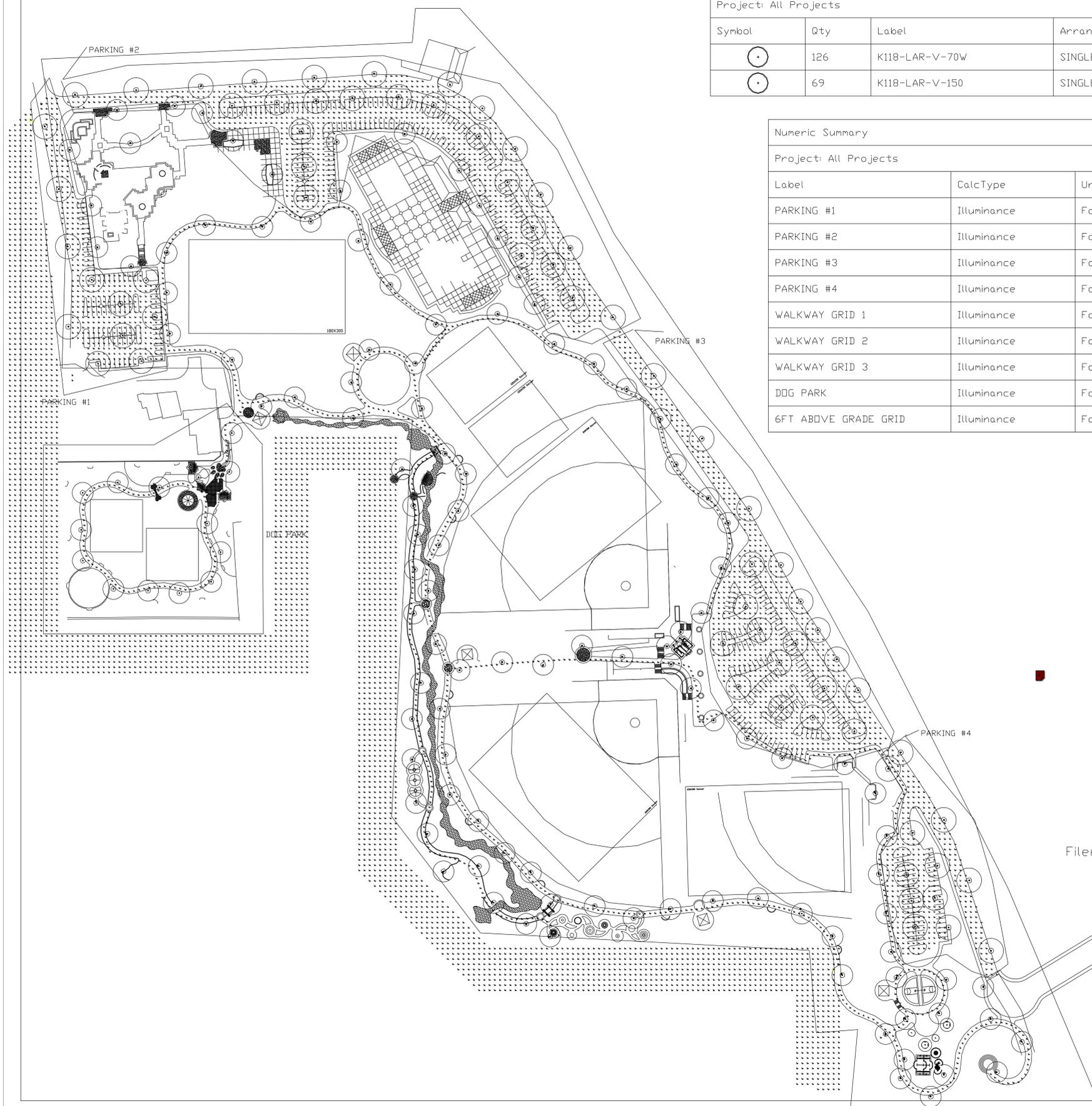
APPENDIX

FIGURE A1.0 King Luminaire – Photometric Layout

REV.	ALTERATION	DATE	BY

Luminaire Schedule						
Project: All Projects						
Symbol	Qty	Label	Arrangement	Lumens	LLF	Description
○	126	K118-LAR-V-70W	SINGLE	5800	0.800	14.5' LIGHT CENTER
○	69	K118-LAR-V-150	SINGLE	16000	0.800	16.5' LIGHT CENTER

Numeric Summary							
Project: All Projects							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
PARKING #1	Illuminance	Fc	1.11	2.2	0.3	3.70	7.33
PARKING #2	Illuminance	Fc	1.10	2.4	0.2	5.50	12.00
PARKING #3	Illuminance	Fc	1.04	2.4	0.1	10.40	24.00
PARKING #4	Illuminance	Fc	1.26	2.7	0.2	6.30	13.50
WALKWAY GRID 1	Illuminance	Fc	0.51	1.1	0.0	0.00	0.00
WALKWAY GRID 2	Illuminance	Fc	0.51	1.6	0.1	5.10	16.00
WALKWAY GRID 3	Illuminance	Fc	0.64	2.5	0.2	3.20	12.50
DOG PARK	Illuminance	Fc	0.55	0.9	0.2	2.75	4.50
6FT ABOVE GRADE GRID	Illuminance	Fc	0.01	1.3	0.0	0.00	0.00



Filename: g:\Cad\PHOTOMETRICS\AGI\TEMPLATE\HALL PARK REV DEC 1A32

	KING LUMINAIRE COMPANY INC.	
	840 WALKER'S LINE, P.O. BOX 7, BURLINGTON, ONTARIO, CANADA L7R 3X9	P.O. BOX 266 JEFFERSON, OHIO 1153 STATE ROUTE 46N U.S.A. 44047
DRAWN BY: MIKE McCLELLAN	DATE: 09/03/04	
PROJECT: HALL PARK REVISED DEC 1/05		
DRAWING NAME: PHOTOMETRIC LAYOUT		

APPENDIX

FIGURE A2.0

Musco Lighting – Blanket Spill Illumination Summary

APPENDIX

FIGURE A2.1

Musco Lighting – Spill Illumination Summary (Horizontal)

APPENDIX

FIGURE A2.2

Musco Lighting – Spill Illumination Summary (Vertical)

ILLUMINATION SUMMARY

Spill:
HALL PROPERTY
ENCINITAS, CA

Spill:
- Grid Spacing = 60'
- Values given at 6.0' above grade

- Luminaire Type: Green Generation
- Rated Lamp Life: 5000 hours
- Avg Lumens/Lamp: 134,000

CONSTANT ILLUMINATION	
MAX VERTICAL FOOTCANDLES	
Statistical	
Area	
No. of Target Points:	144
Average:	0.1502
Maximum:	0.88
Minimum:	0.02

Average Lamp Tilt Factor: 1.000
Number of Luminaires: 158
Avg KWh Consumption over 5000 hours: 246.48

Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the rated life of the lamp.

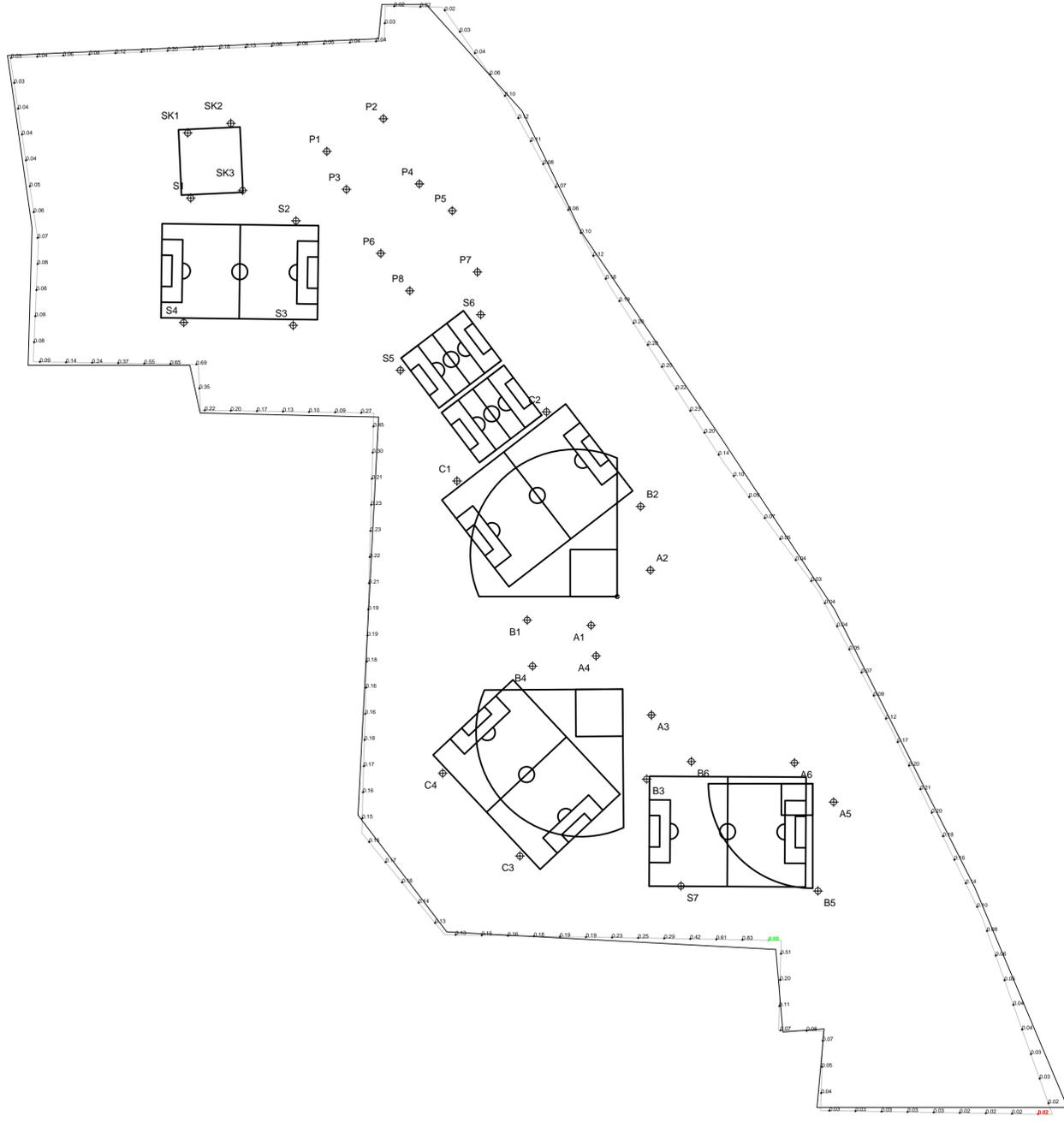
Field Measurements: Averages shall be +/-10% in accordance with IESNA RP-6-01. Individual measurements may vary from computer predictions.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.

EQUIPMENT LIST FOR AREAS SHOWN									
Luminaires									
QTY	LOCATION	SIZE	GRADE	MOUNTING	LAMP	QTY	THE	OTHER	
			ELEVATION	HEIGHT	FOOT-CANDLES				
1	A1	80"	-	80"	1500W MZ	2	2	0	
				80"	1500W MZ	1	1	0	
				80"	1500W MZ	2	2	0	
2	A2, A4	80"	-	80"	1500W MZ	1	1	0	
				80"	1500W MZ	2	2	0	
				80"	1500W MZ	1	1	0	
1	A3	80"	-	80"	1500W MZ	2	2	0	
				80"	1500W MZ	1	1	0	
				80"	1500W MZ	1	1	0	
				80"	1500W MZ	1	1	0	
1	A5	60"	-	60"	1500W MZ	2	2	0	
1	A6	60"	-	60"	1500W MZ	1	1	0	
				60"	1500W MZ	2	2	0	
1	B1	90"	-	90"	1500W MZ	3	3	0	
				90"	1500W MZ	1	1	0	
				90"	1500W MZ	4	4	0	
				90"	1500W MZ	1	1	0	
1	B2	90"	-	90"	1500W MZ	1	1	0	
				90"	1500W MZ	2	2	0	
				90"	1500W MZ	4	4	0	
				90"	1500W MZ	1	1	0	
				90"	1500W MZ	1	1	0	
1	B3	90"	-	90"	1500W MZ	4	4	0	
				90"	1500W MZ	2	2	0	
				90"	1500W MZ	3	3	0	
1	B4	90"	-	90"	1500W MZ	2	2	0	
				90"	1500W MZ	4	4	0	
				90"	1500W MZ	3	3	0	
1	B5	80"	-	80"	1500W MZ	7	7	0	
1	B6	80"	-	80"	1500W MZ	1	1	0	
				80"	1500W MZ	1	1	0	
				80"	1500W MZ	6	6	0	
				80"	1500W MZ	1	1	0	
1	C1	80"	-	80"	1500W MZ	11	11	0	
				80"	1500W MZ	1	1	0	
				80"	1500W MZ	1	1	0	
				80"	1500W MZ	2	2	0	
				80"	1500W MZ	3	3	0	
				80"	1500W MZ	1	1	0	
1	C2	80"	-	80"	1500W MZ	31	31	0	
				80"	1500W MZ	1	1	0	
				80"	1500W MZ	2	2	0	
				80"	1500W MZ	1	1	0	
				80"	1500W MZ	1	1	0	
1	C3	80"	-	80"	1500W MZ	3	3	0	
				80"	1500W MZ	1	1	0	
				80"	1500W MZ	1	1	0	
1	C4	80"	-	80"	1500W MZ	1	1	0	
				80"	1500W MZ	1	1	0	
				80"	1500W MZ	1	1	0	
				80"	1500W MZ	3	3	0	
1	P1	60"	-	60"	1500W MZ	1	1	0	
				60"	1500W MZ	1	1	0	
				60"	1500W MZ	1	1	0	
7	P2-P8	60"	-	60"	1500W MZ	1	1	0	
3	SK1	40"	-	40"	1500W MZ	1	1	0	
	SK2								
	SK3								
1	S1	70"	-	70"	1500W MZ	2	2	0	
				70"	1500W MZ	1	1	0	
				70"	1500W MZ	1	1	0	
				70"	1500W MZ	1	1	0	
2	S2, S4	60"	-	60"	1500W MZ	1	1	0	
				60"	1500W MZ	1	1	0	
				60"	1500W MZ	3	3	0	
1	S3	60"	-	60"	1500W MZ	3	3	0	
				60"	1500W MZ	1	1	0	
				60"	1500W MZ	1	1	0	
1	S5	70"	-	70"	1500W MZ	2	2	0	
				70"	1500W MZ	2	2	0	
1	S6	70"	-	70"	1500W MZ	3	3	0	
				70"	1500W MZ	1	1	0	
				70"	1500W MZ	1	1	0	
1	S7	70"	-	70"	1500W MZ	1	1	0	
				70"	1500W MZ	1	1	0	
				70"	1500W MZ	3	3	0	
				70"	1500W MZ	1	1	0	
34	TOTALS					158	158	0	

* This structure utilizes a back-to-back mounting configuration



SCALE IN FEET 1" = 150'

APPENDIX

FIGURE A2.3 Musco Lighting – Equipment Layout

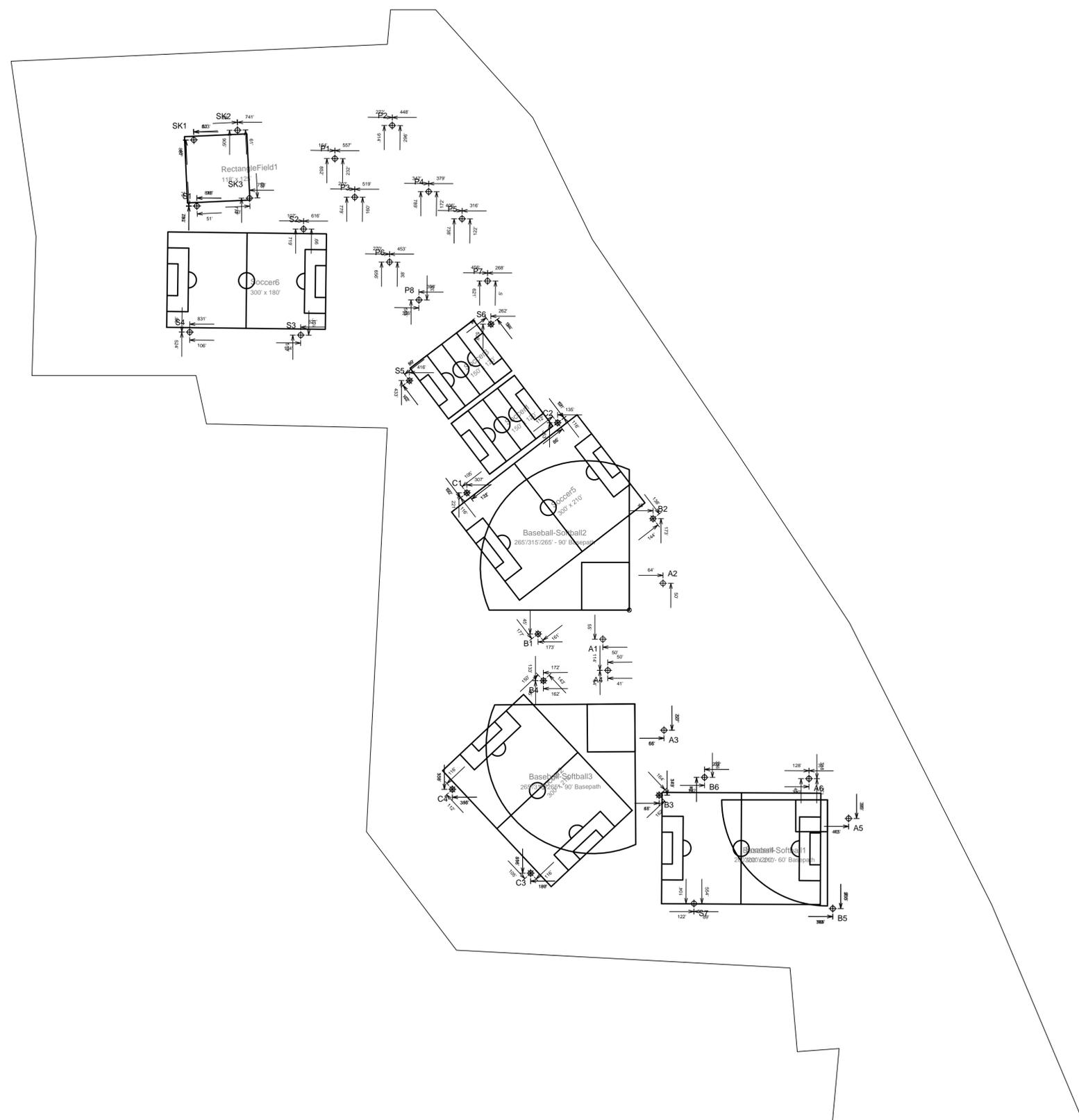
EQUIPMENT LAYOUT

HALL PROPERTY
ENCINITAS, CA

- INCLUDES:**
- Soccer1
 - RectangleField1
 - Soccer2
 - Soccer3
 - Baseball-Softball1
 - Soccer4
 - Baseball-Softball2
 - Soccer5
 - Soccer6
 - Baseball-Softball3

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.



EQUIPMENT LIST FOR AREAS SHOWN

QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	Luminaires		QTY
					POLE	TYPE	
1	A1	80'	-	80'	1500W MZ	2	2
				80'	1500W MZ	1	1
2	A2, A4	80'	-	80'	1500W MZ	1	2
				80'	1500W MZ	1	1
				80'	1500W MZ	2	2
				80'	1500W MZ	1	1
1	A3	80'	-	80'	1500W MZ	2	2
				80'	1500W MZ	1	1
				80'	1500W MZ	1	1
1	A5	60'	-	60'	1500W MZ	2	2
				60'	1500W MZ	2	2
1	A6	60'	-	60'	1500W MZ	1	1
				60'	1500W MZ	1	1
1	B1	90'	-	90'	1500W MZ	3	3
				90'	1500W MZ	1	1
				90'	1500W MZ	4	4
				90'	1500W MZ	1	1
1	B2	90'	-	90'	1500W MZ	1	1
				90'	1500W MZ	2	2
				90'	1500W MZ	4	4
				90'	1500W MZ	1	1
1	B3	90'	-	90'	1500W MZ	4	4
				90'	1500W MZ	2	2
				90'	1500W MZ	3	3
1	B4	90'	-	90'	1500W MZ	2	2
				90'	1500W MZ	4	4
				90'	1500W MZ	3	3
1	B5	80'	-	80'	1500W MZ	7	7
1	B6	90'	-	80'	1500W MZ	1	1
				80'	1500W MZ	6	6
				80'	1500W MZ	1	1
1	C1	80'	-	80'	1500W MZ	1*	1*
				80'	1500W MZ	1*	1*
				80'	1500W MZ	1*	1*
				80'	1500W MZ	2*	2*
				80'	1500W MZ	3*	3*
				80'	1500W MZ	1*	1*
1	C2	80'	-	80'	1500W MZ	3/1*	3/1*
				80'	1500W MZ	1*	1*
				80'	1500W MZ	2*	2*
				80'	1500W MZ	1*	1*
				80'	1500W MZ	1/1*	1/1*
1	C3	80'	-	80'	1500W MZ	3	3
				80'	1500W MZ	1	1
				80'	1500W MZ	1	1
1	C4	80'	-	80'	1500W MZ	1	1
				80'	1500W MZ	1	1
				80'	1500W MZ	3	3
1	P1	60'	-	60'	1500W MZ	1	1
				60'	1500W MZ	1	1
7	P2-P8	60'	-	60'	1500W MZ	1	7
3	SK1 SK2 SK3	40'	-	40'	1500W MZ	1	3
1	S1	70'	-	70'	1500W MZ	2	2
				70'	1500W MZ	1	1
				70'	1500W MZ	1	1
				70'	1500W MZ	1	1
				70'	1500W MZ	1	1
2	S2, S4	60'	-	60'	1500W MZ	1	2
				60'	1500W MZ	3	3
1	S3	60'	-	60'	1500W MZ	3	3
				60'	1500W MZ	1	1
				60'	1500W MZ	1	1
1	S5	70'	-	70'	1500W MZ	2	2
1	S6	70'	-	70'	1500W MZ	3	3
1	S7	70'	-	70'	1500W MZ	1	1
				70'	1500W MZ	3	3
				70'	1500W MZ	1	1
34	TOTALS						158

*This structure utilizes a back-to-back mounting configuration

SINGLE LUMINAIRE AMPERAGE DRAW CHART

Ballast Specifications (@ min power factor)	Line Amperage Per Luminaire (@ min power factor)						
	120	208	220	240	277	347	396/415/480
Single Phase Voltage	120	208	220	240	277	347	396/415/480
	1.8	1.7	1.5	1.5	1.1	0.8	0.7
1500 watt MZ	Max	6.7	6.0	5.9	5.1	4.0	X X 2.9
1000 watt MZ	Min	5.4	4.8	4.8	4.1	3.3	- - 2.4

APPENDIX

FIGURE A2.4

Musco Lighting – Skate Park Illumination Summary

EQUIPMENT LIST FOR AREAS SHOWN									
Pole				Luminaires					
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS	
3	SK1 SK2 SK3	40'	-	40'	1500W MZ	1	1	0	
1	S1	70'	-	70'	1500W MZ	7	2	5	
4	TOTALS						10	5	5



GUARANTEED PERFORMANCE

ILLUMINATION SUMMARY

SKATE PARK
HALL PROPERTY
ENCINITAS, CA

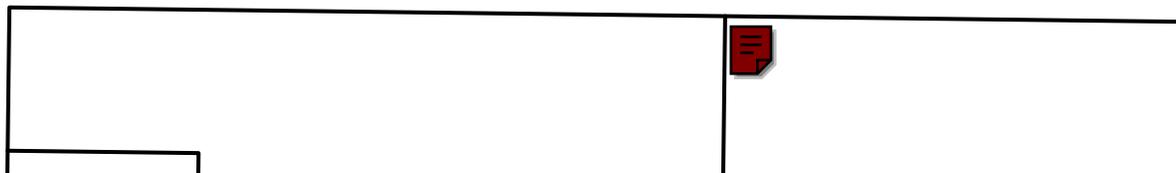
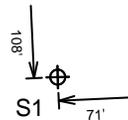
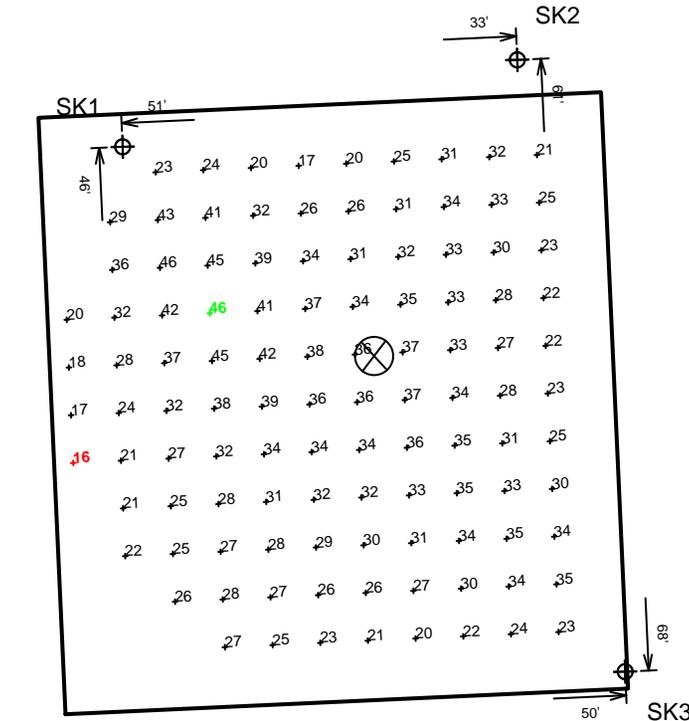
- SKATE PARK
- Size: 118' x 125'
- Grid Spacing = 10.0' x 10.0'
- Values given at 3.0' above grade

- Luminaire Type: Green Generation
- Rated Lamp Life: 5000 hours
- Avg Lumens/Lamp: 134,000

CONSTANT ILLUMINATION HORIZONTAL FOOTCANDLES

	Statistical Area
No. of Target Points:	110
Average:	30.22
Maximum:	46
Minimum:	16
Avg/Min:	1.94
Max/Min:	2.98
UG (Adjacent Pts):	1.86
CV:	0

Average Lamp Tilt Factor:	1.000
Number of Luminaires:	5
Avg kWh Consumption over 5000 hours:	7.8



SCALE IN FEET 1 : 40



Pole location(s) Ⓢ dimensions are relative to 0,0 reference point(s) ⊗

Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the rated life of the lamp.

Field Measurements: Averages shall be +/-10% in accordance with IESNA RP-6-01. Individual measurements may vary from computer predictions.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.

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Date: 10-Aug-05

File #: 110479tb2

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APPENDIX

FIGURE A2.5

Musco Lighting – SM Soccer #1 Illumination Summary

EQUIPMENT LIST FOR AREAS SHOWN									
Pole				Luminaires					
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS	
1	C1	80'	-	80'	1500W MZ	10*	4	6	
1	C2	80'	-	80'	1500W MZ	4/6*	4	6	
2	S5-S6	70'	-	70'	1500W MZ	4	4	0	
4	TOTALS						28	16	12

* This structure utilizes a back-to-back mounting configuration



GUARANTEED PERFORMANCE

ILLUMINATION SUMMARY

SM SOCCER #1
HALL PROPERTY
ENCINITAS, CA

SM SOCCER #1
· Size: 150' x 120'
· Grid Spacing = 30.0' x 30.0'
· Values given at 3.0' above grade

· Luminaire Type: Green Generation
· Rated Lamp Life: 5000 hours
· Avg Lumens/Lamp: 134,000

CONSTANT ILLUMINATION HORIZONTAL FOOTCANDLES

	Statistical Area
No. of Target Points:	20
Average:	30.08
Maximum:	42
Minimum:	23
Avg/Min:	1.31
Max/Min:	1.82
UG (Adjacent Pts):	1.33
CV:	0

Average Lamp Tilt Factor: 1.000
Number of Luminaires: 16
Avg kWh Consumption over 5000 hours: 24.96

Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the rated life of the lamp.

Field Measurements: Averages shall be +/-10% in accordance with IESNA RP-6-01. Individual measurements may vary from computer predictions.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

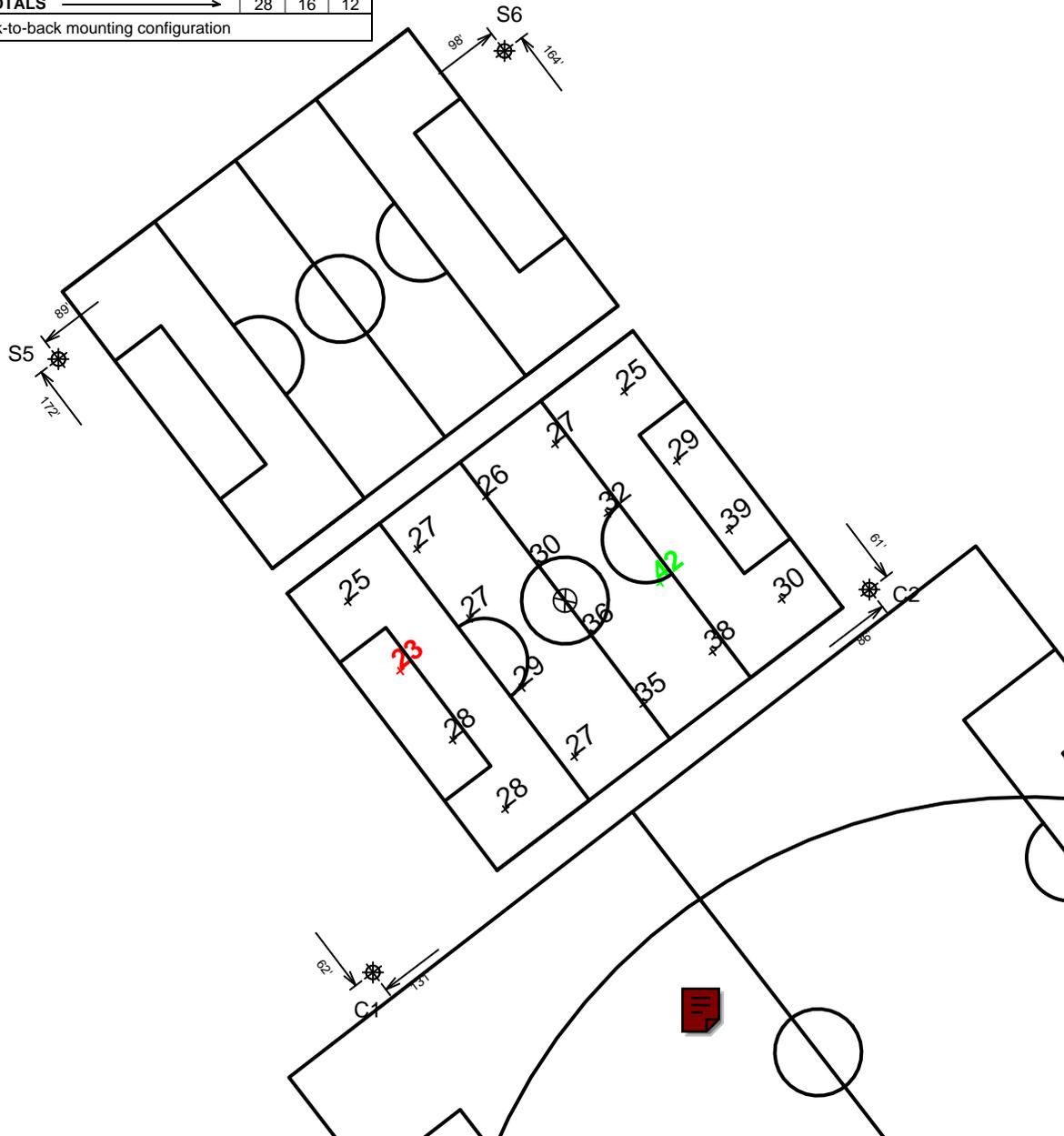
Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.

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SCALE IN FEET 1 : 60



Pole location(s) ⚡ dimensions are relative to 0,0 reference point(s) ⊗

APPENDIX

FIGURE A2.6

Musco Lighting – Soccer #2 Illumination Summary

EQUIPMENT LIST FOR AREAS SHOWN								
Pole			Luminaires					
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
2	B3-B4	90'	-	90'	1500W MZ	9	9	0
2	C3-C4	80'	-	80'	1500W MZ	6	6	0
4	← TOTALS →					30	30	0



GUARANTEED PERFORMANCE

ILLUMINATION SUMMARY

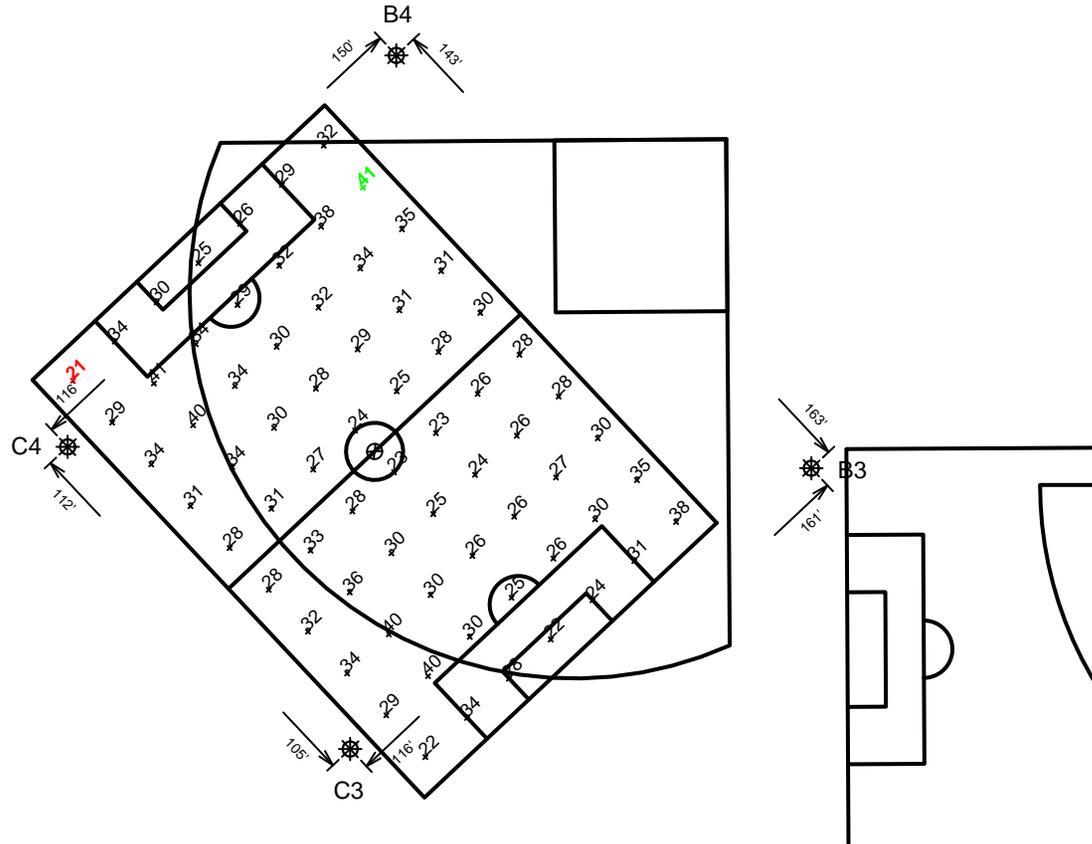
SOCCER #2
HALL PROPERTY
ENCINITAS, CA

SOCCER #2
 · Size: 300' x 210'
 · Grid Spacing = 30.0' x 30.0'
 · Values given at 3.0' above grade

· Luminaire Type: Green Generation
 · Rated Lamp Life: 5000 hours
 · Avg Lumens/Lamp: 134,000

CONSTANT ILLUMINATION HORIZONTAL FOOTCANDLES

	Statistical Area
No. of Target Points:	70
Average:	30.05
Maximum:	41
Minimum:	21
Avg/Min:	1.45
Max/Min:	1.99
UG (Adjacent Pts):	1.64
CV:	0
Average Lamp Tilt Factor:	1.000
Number of Luminaires:	30
Avg KWh Consumption over 5000 hours:	46.8



Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the rated life of the lamp.

Field Measurements: Averages shall be +/-10% in accordance with IESNA RP-6-01. Individual measurements may vary from computer predictions.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.

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Date: 10-Aug-05

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SCALE IN FEET 1 : 100



Pole location(s) ⚡ dimensions are relative to 0,0 reference point(s) ⊗

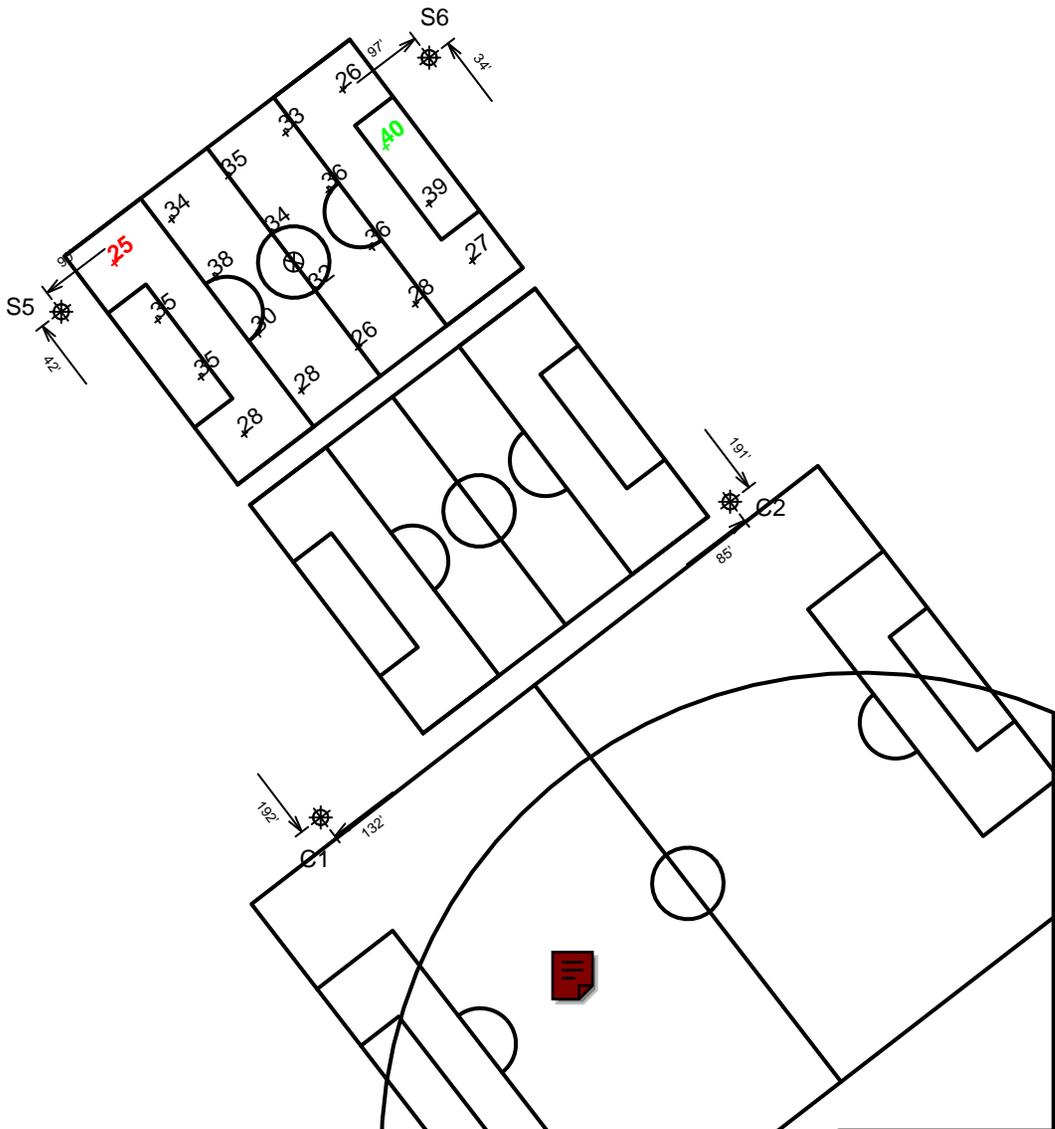
APPENDIX

FIGURE A2.7

Musco Lighting – SM Soccer 2 Illumination Summary

EQUIPMENT LIST FOR AREAS SHOWN									
Pole			Luminaires						
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS	
1	C1	80'	-	80'	1500W MZ	10*	4	6	
1	C2	80'	-	80'	1500W MZ	4/6*	4	6	
2	S5-S6	70'	-	70'	1500W MZ	4	4	0	
4	TOTALS						28	16	12

* This structure utilizes a back-to-back mounting configuration



GUARANTEED PERFORMANCE

ILLUMINATION SUMMARY

SM SOCCER 2
HALL PROPERTY
ENCINITAS, CA

SM SOCCER 2
 · Size: 150' x 120'
 · Grid Spacing = 30.0' x 30.0'
 · Values given at 3.0' above grade

· Luminaire Type: Green Generation
 · Rated Lamp Life: 5000 hours
 · Avg Lumens/Lamp: 134,000

CONSTANT ILLUMINATION HORIZONTAL FOOTCANDLES

	Statistical Area
No. of Target Points:	20
Average:	32.39
Maximum:	40
Minimum:	25
Avg/Min:	1.29
Max/Min:	1.58
UG (Adjacent Pts):	1.51
CV:	0

Average Lamp Tilt Factor: 1.000
 Number of Luminaires: 16
 Avg KWh Consumption over 5000 hours: 24.96

Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the rated life of the lamp.

Field Measurements: Averages shall be +/-10% in accordance with IESNA RP-6-01. Individual measurements may vary from computer predictions.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.

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Date: 10-Aug-05

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SCALE IN FEET 1 : 80



Pole location(s) ⚡ dimensions are relative to 0,0 reference point(s) ⊗

APPENDIX

FIGURE A2.8

Musco Lighting – Softball Illumination Summary

EQUIPMENT LIST FOR AREAS SHOWN									
Pole				Luminaires					
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS	
2	A5-A6	60'	-	60'	1500W MZ	3	3	0	
1	B5	80'	-	80'	1500W MZ	7	7	0	
1	B6	80'	-	80'	1500W MZ	9	9	0	
4	TOTALS						22	22	0



GUARANTEED PERFORMANCE

ILLUMINATION SUMMARY

SOFTBALL HALL PROPERTY
ENCINITAS, CA

- SOFTBALL**
 - Size: 200'/200'/200' - 60' Basepath
 - Grid Spacing = 20.0' x 20.0'
 - Values given at 3.0' above grade

- Luminaire Type: Green Generation
 - Rated Lamp Life: 5000 hours
 - Avg Lumens/Lamp: 134,000

CONSTANT ILLUMINATION HORIZONTAL FOOTCANDLES

No. of Target Points:	Infield	Outfield
Average:	50.17	30.09
Maximum:	62	45
Minimum:	39	20
Avg/Min:	1.29	1.50
Max/Min:	1.60	2.27
UG (Adjacent Pts):	1.53	1.53
CV:	0	0

Average Lamp Tilt Factor: 1.000
 Number of Luminaires: 22
 Avg KWh Consumption over 5000 hours: 34.32

Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the rated life of the lamp.

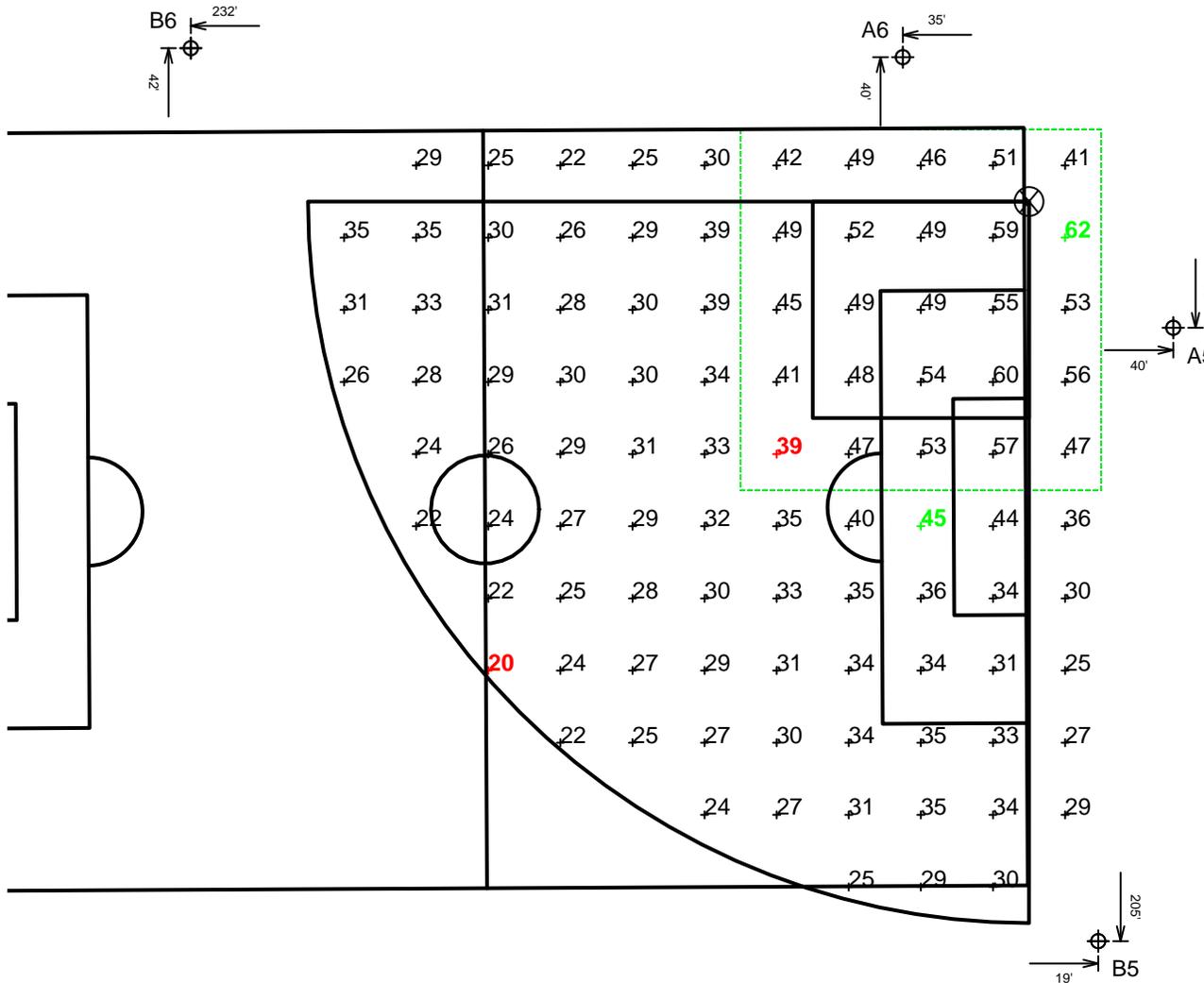
Field Measurements: Averages shall be +/-10% in accordance with IESNA RP-6-01. Individual measurements may vary from computer predictions.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.

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 File #: 110479tb2

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SCALE IN FEET 1 : 50



Pole location(s) ⚡ dimensions are relative to 0,0 reference point(s) ⊗

APPENDIX

FIGURE A2.9

Musco Lighting – Softball/Baseball Illumination Summary

EQUIPMENT LIST FOR AREAS SHOWN									
Pole				Luminaires					
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS	
1	A6	60'	-	60'	1500W MZ	3	3	0	
1	B5	80'	-	80'	1500W MZ	7	7	0	
1	B6	80'	-	80'	1500W MZ	9	9	0	
1	S7	70'	-	70'	1500W MZ	6	6	0	
4	TOTALS						25	25	0



GUARANTEED PERFORMANCE

ILLUMINATION SUMMARY

SO/BS
HALL PROPERTY
ENCINITAS, CA

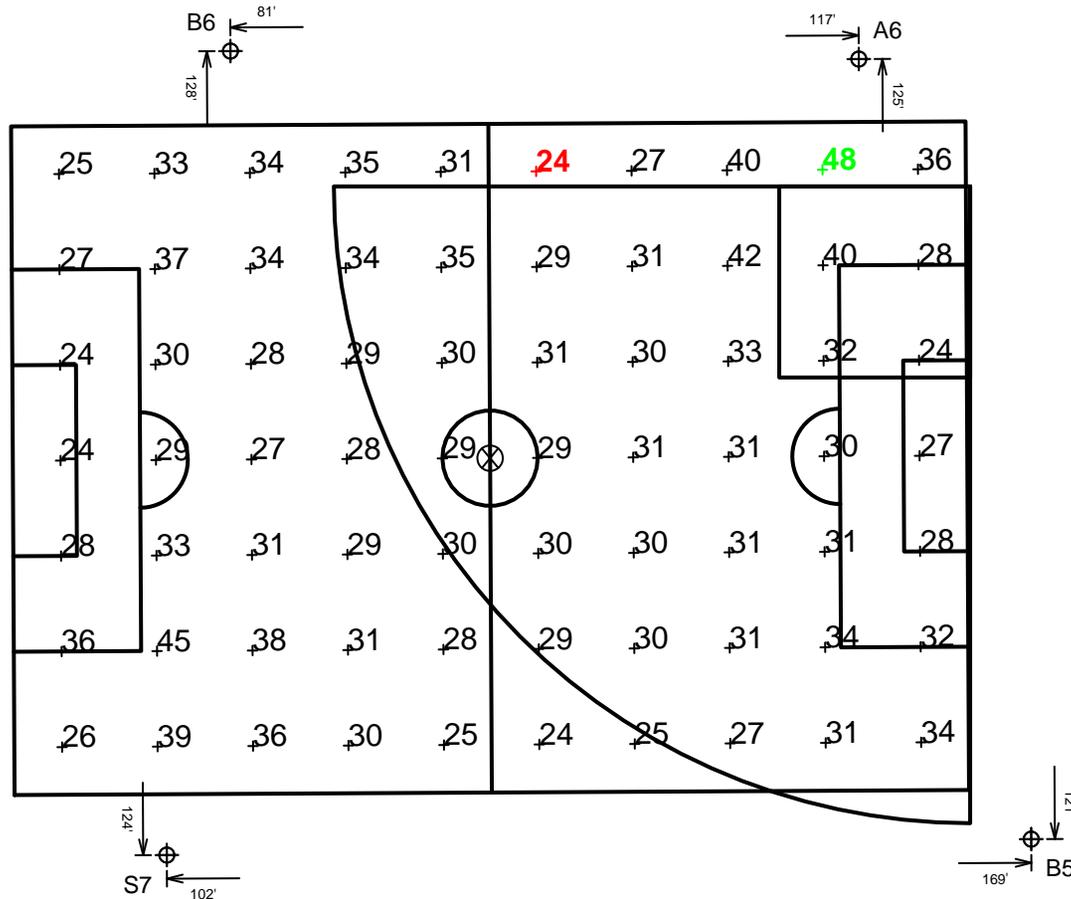
SO/BS
- Size: 300' x 210'
- Grid Spacing = 30.0' x 30.0'
- Values given at 3.0' above grade

- Luminaire Type: Green Generation
- Rated Lamp Life: 5000 hours
- Avg Lumens/Lamp: 134,000

CONSTANT ILLUMINATION HORIZONTAL FOOTCANDLES

No. of Target Points:	Statistical Area
	70
Average:	31.10
Maximum:	48
Minimum:	24
Avg/Min:	1.29
Max/Min:	1.98
UG (Adjacent Pts):	1.47
CV:	0

Average Lamp Tilt Factor: 1.000
Number of Luminaires: 25
Avg kWh Consumption over 5000 hours: 39.0



SCALE IN FEET 1 : 60



Pole location(s) ⚡ dimensions are relative to 0,0 reference point(s) ⊗

Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the rated life of the lamp.

Field Measurements: Averages shall be +/-10% in accordance with IESNA RP-6-01. Individual measurements may vary from computer predictions.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.

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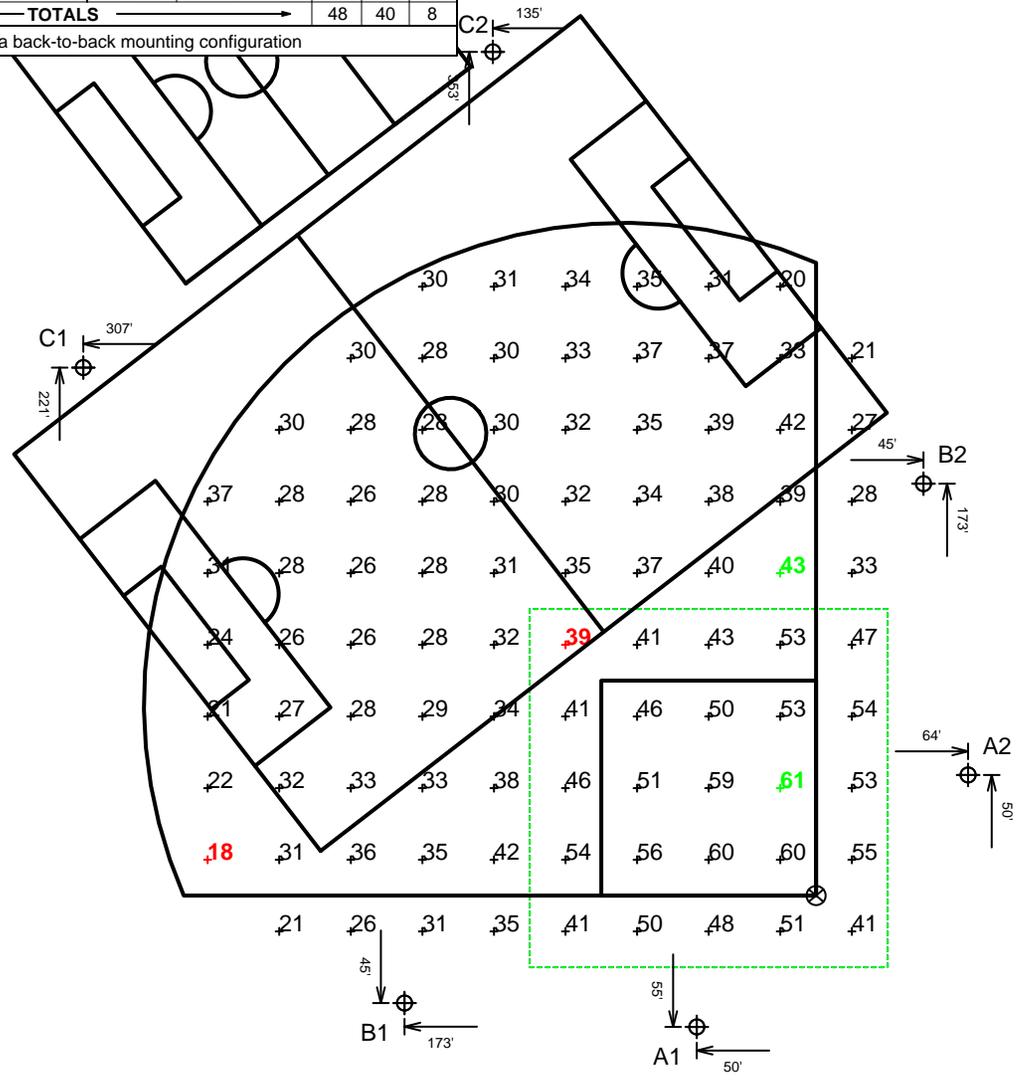
APPENDIX

FIGURE A2.10

Musco Lighting –Baseball #1 Illumination Summary

EQUIPMENT LIST FOR AREAS SHOWN								
Pole			Luminaires					
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
2	A1-A2	80'	-	80'	1500W MZ	5	5	0
2	B1-B2	90'	-	90'	1500W MZ	9	9	0
1	C1	80'	-	80'	1500W MZ	10*	6	4
1	C2	80'	-	80'	1500W MZ	4/6*	6	4
6	TOTALS					48	40	8

* This structure utilizes a back-to-back mounting configuration



GUARANTEED PERFORMANCE

ILLUMINATION SUMMARY

BASEBALL #1
HALL PROPERTY
ENCINITAS, CA

BASEBALL #1
 - Size: 265'/315'/265' - 90' Basepath
 - Grid Spacing = 30.0' x 30.0'
 - Values given at 3.0' above grade

- Luminaire Type: Green Generation
 - Rated Lamp Life: 5000 hours
 - Avg Lumens/Lamp: 134,000

CONSTANT ILLUMINATION HORIZONTAL FOOTCANDLES

No. of Target Points:	Infield	Outfield
Average:	50.03	31.02
Maximum:	61	43
Minimum:	39	18
Avg/Min:	1.30	1.76
Max/Min:	1.58	2.42
UG (Adjacent Pts):	1.78	1.78
CV:	0	0

Average Lamp Tilt Factor: 1.000
 Number of Luminaires: 40
 Avg KWh Consumption over 5000 hours: 62.4

Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the rated life of the lamp.

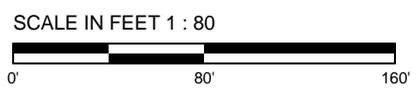
Field Measurements: Averages shall be +/-10% in accordance with IESNA RP-6-01. Individual measurements may vary from computer predictions.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.

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Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

APPENDIX

FIGURE A2.11

Musco Lighting – Soccer #1 Illumination Summary

EQUIPMENT LIST FOR AREAS SHOWN									
Pole			Luminaires						
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS	
2	B1-B2	90'	-	90'	1500W MZ	9	9	0	
1	C1	80'	-	80'	1500W MZ	10*	6	4	
1	C2	80'	-	80'	1500W MZ	4/6*	6	4	
4	TOTALS						38	30	8

* This structure utilizes a back-to-back mounting configuration



GUARANTEED PERFORMANCE

ILLUMINATION SUMMARY

SOCCER #1
HALL PROPERTY
ENCINITAS, CA

- SOCCER #1**
- Size: 300' x 210'
 - Grid Spacing = 30.0' x 30.0'
 - Values given at 3.0' above grade

- Luminaire Type: Green Generation
- Rated Lamp Life: 5000 hours
- Avg Lumens/Lamp: 134,000

CONSTANT ILLUMINATION HORIZONTAL FOOTCANDLES

	Statistical Area
No. of Target Points:	70
Average:	30.09
Maximum:	42
Minimum:	20
Avg/Min:	1.47
Max/Min:	2.05
UG (Adjacent Pts):	1.73
CV:	0
Average Lamp Tilt Factor:	1.000
Number of Luminaires:	30
Avg KWh Consumption over 5000 hours:	46.8

Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the rated life of the lamp.

Field Measurements: Averages shall be +/-10% in accordance with IESNA RP-6-01. Individual measurements may vary from computer predictions.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

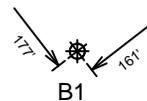
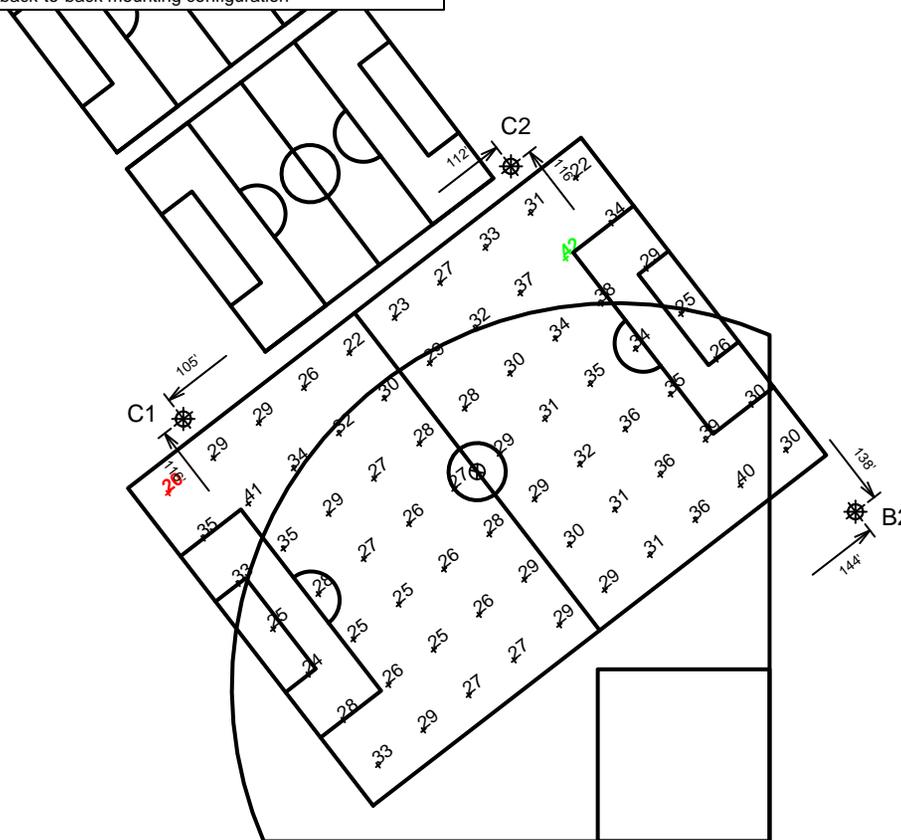
Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.

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SCALE IN FEET 1 : 100

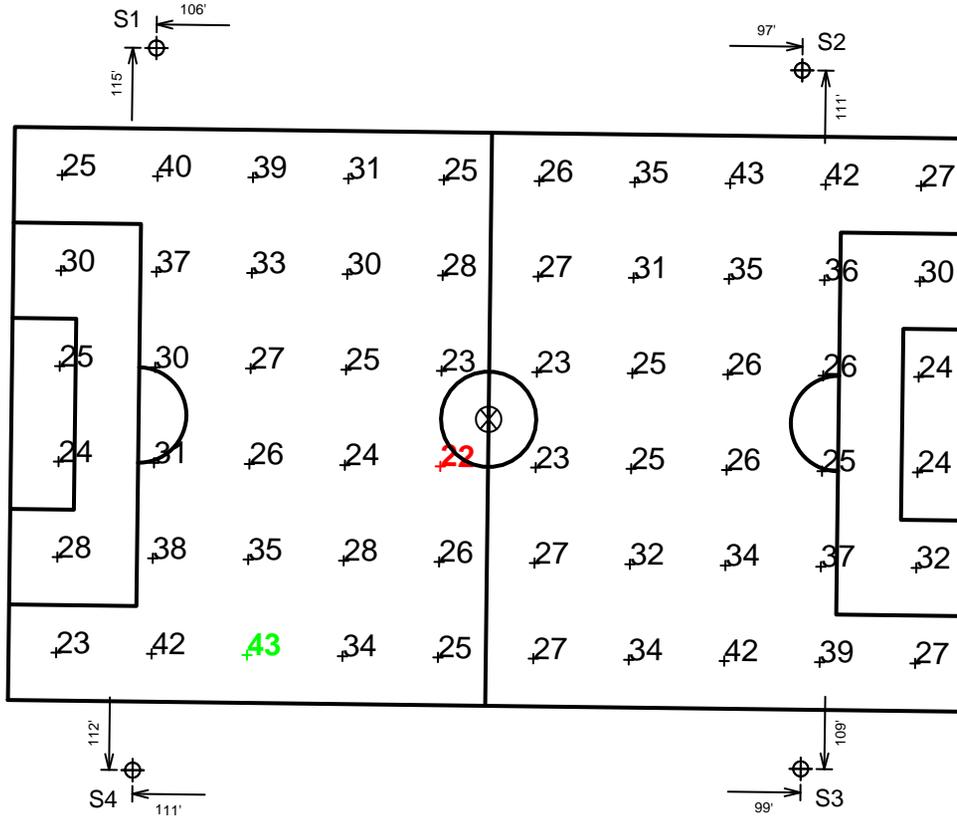


Pole location(s) ⚡ dimensions are relative to 0,0 reference point(s) ⊗

APPENDIX

FIGURE A2.12 Musco Lighting – Soccer Illumination Summary

EQUIPMENT LIST FOR AREAS SHOWN									
Pole				Luminaires					
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS	
1	S1	70'	-	70'	1500W MZ	7	5	2	
3	S2-S4	60'	-	60'	1500W MZ	5	5	0	
4	← TOTALS →						22	20	2



GUARANTEED PERFORMANCE

ILLUMINATION SUMMARY

SOCCER
HALL PROPERTY
ENCINITAS, CA

- SOCCER**
- Size: 300' x 180'
 - Grid Spacing = 30.0' x 30.0'
 - Values given at 3.0' above grade

- Luminaire Type: Green Generation
- Rated Lamp Life: 5000 hours
- Avg Lumens/Lamp: 134,000

CONSTANT ILLUMINATION HORIZONTAL FOOTCANDLES

	Statistical Area
No. of Target Points:	60
Average:	30.10
Maximum:	43
Minimum:	22
Avg/Min:	1.38
Max/Min:	1.98
UG (Adjacent Pts):	1.79
CV:	0

Average Lamp Tilt Factor:	1.000
Number of Luminaires:	20
Avg kWh Consumption over 5000 hours:	31.2

Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the rated life of the lamp.

Field Measurements: Averages shall be +/-10% in accordance with IESNA RP-6-01. Individual measurements may vary from computer predictions.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.

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SCALE IN FEET 1 : 60



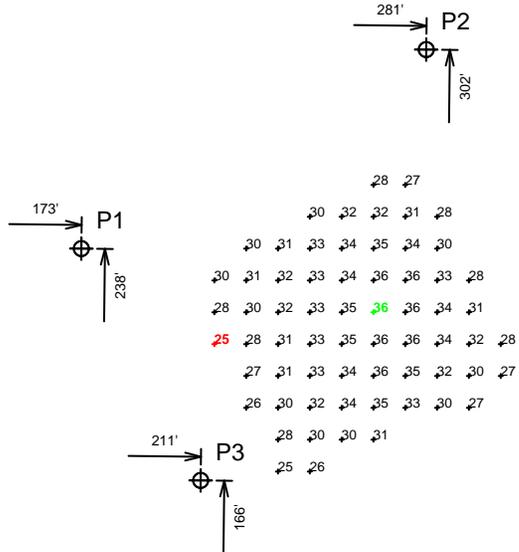
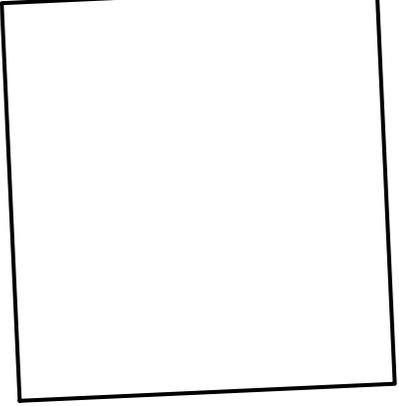
Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

APPENDIX

FIGURE A2.13

Musco Lighting – North Pool Illumination Summary

EQUIPMENT LIST FOR AREAS SHOWN								
Pole			Luminaires					
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
1	P1	60'	-	60'	1500W MZ	2	2	0
3	P2-P4	60'	-	60'	1500W MZ	1	1	0
4	← TOTALS →					5	5	0



GUARANTEED PERFORMANCE

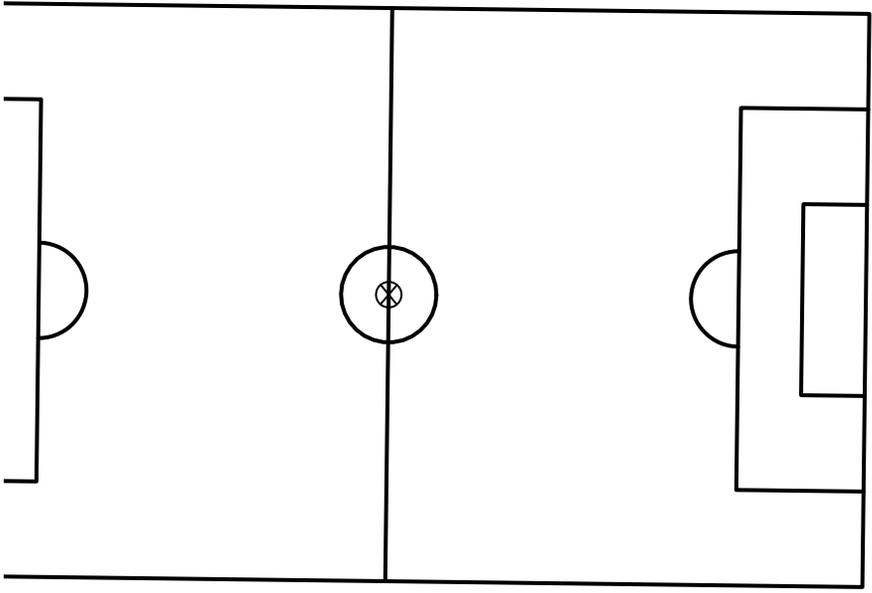
ILLUMINATION SUMMARY

Pool North
HALL PROPERTY
ENCINITAS, CA

Pool North
 · Size: 300' x 180'
 · Grid Spacing = 10.0' x 10.0'
 · Values given at 0.0' above grade

· Luminaire Type: Green Generation
 · Rated Lamp Life: 5000 hours
 · Avg Lumens/Lamp: 134,000

CONSTANT ILLUMINATION HORIZONTAL FOOTCANDLES	
	Statistical Area
No. of Target Points:	65
Average:	31.39
Maximum:	36
Minimum:	25
Avg/Min:	1.26
Max/Min:	1.45
UG (Adjacent Pts):	1.15
CV:	0
Average Lamp Tilt Factor:	1.000
Number of Luminaires:	5
Avg KWh Consumption over 5000 hours:	7.8



Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the rated life of the lamp.

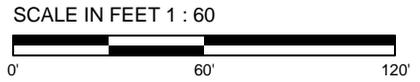
Field Measurements: Averages shall be +/-10% in accordance with IESNA RP-6-01. Individual measurements may vary from computer predictions.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.

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 File #: 110479tb2

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Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

APPENDIX

FIGURE A2.14

Musco Lighting – South Pool Illumination Summary

EQUIPMENT LIST FOR AREAS SHOWN									
Pole				Luminaires					
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS	
4	P5-P8	60'	-	60'	1500W MZ	1	1	0	
4	← TOTALS →						4	4	0



GUARANTEED PERFORMANCE

ILLUMINATION SUMMARY

Pool South
HALL PROPERTY
ENCINITAS, CA

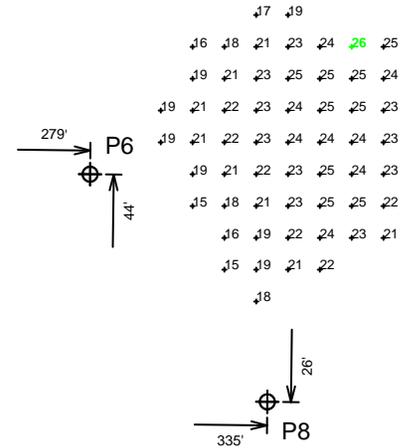
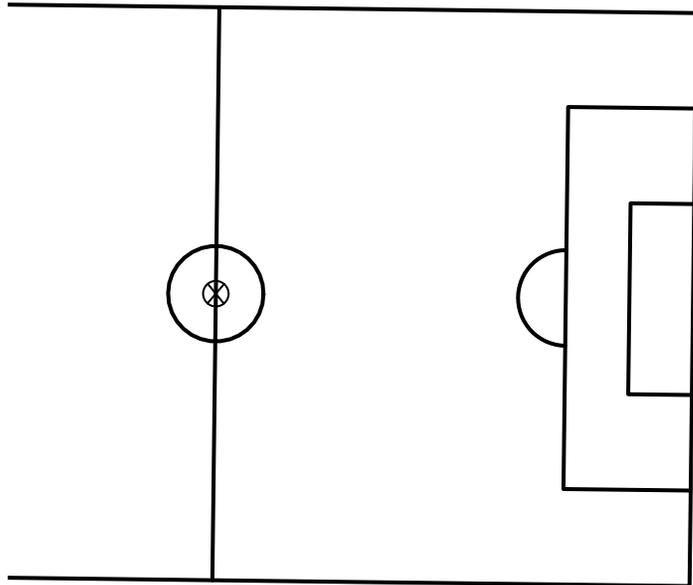
- Pool South
- Size: 300' x 180'
- Grid Spacing = 10.0' x 10.0'
- Values given at 0.0' above grade

- Luminaire Type: Green Generation
- Rated Lamp Life: 5000 hours
- Avg Lumens/Lamp: 134,000

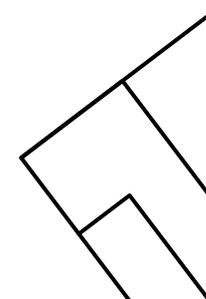
CONSTANT ILLUMINATION HORIZONTAL FOOTCANDLES

	Statistical Area
No. of Target Points:	77
Average:	21.28
Maximum:	26
Minimum:	15
Avg/Min:	1.44
Max/Min:	1.73
UG (Adjacent Pts):	1.28
CV:	0

Average Lamp Tilt Factor:	1.000
Number of Luminaires:	4
Avg KWh Consumption over 5000 hours:	6.24



SCALE IN FEET 1 : 60



Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the rated life of the lamp.

Field Measurements: Averages shall be +/-10% in accordance with IESNA RP-6-01. Individual measurements may vary from computer predictions.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.

By: T.Benson

Date: 10-Aug-05

File #: 110479tb2

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APPENDIX

FIGURE A2.15 Musco Lighting – Baseball #2 Illumination Summary

EQUIPMENT LIST FOR AREAS SHOWN								
Pole			Luminaires					
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
2	A3-A4	80'	-	80'	1500W MZ	5	5	0
2	B3-B4	90'	-	90'	1500W MZ	9	9	0
2	C3-C4	80'	-	80'	1500W MZ	6	6	0
6	← TOTALS →					40	40	0



GUARANTEED PERFORMANCE

ILLUMINATION SUMMARY

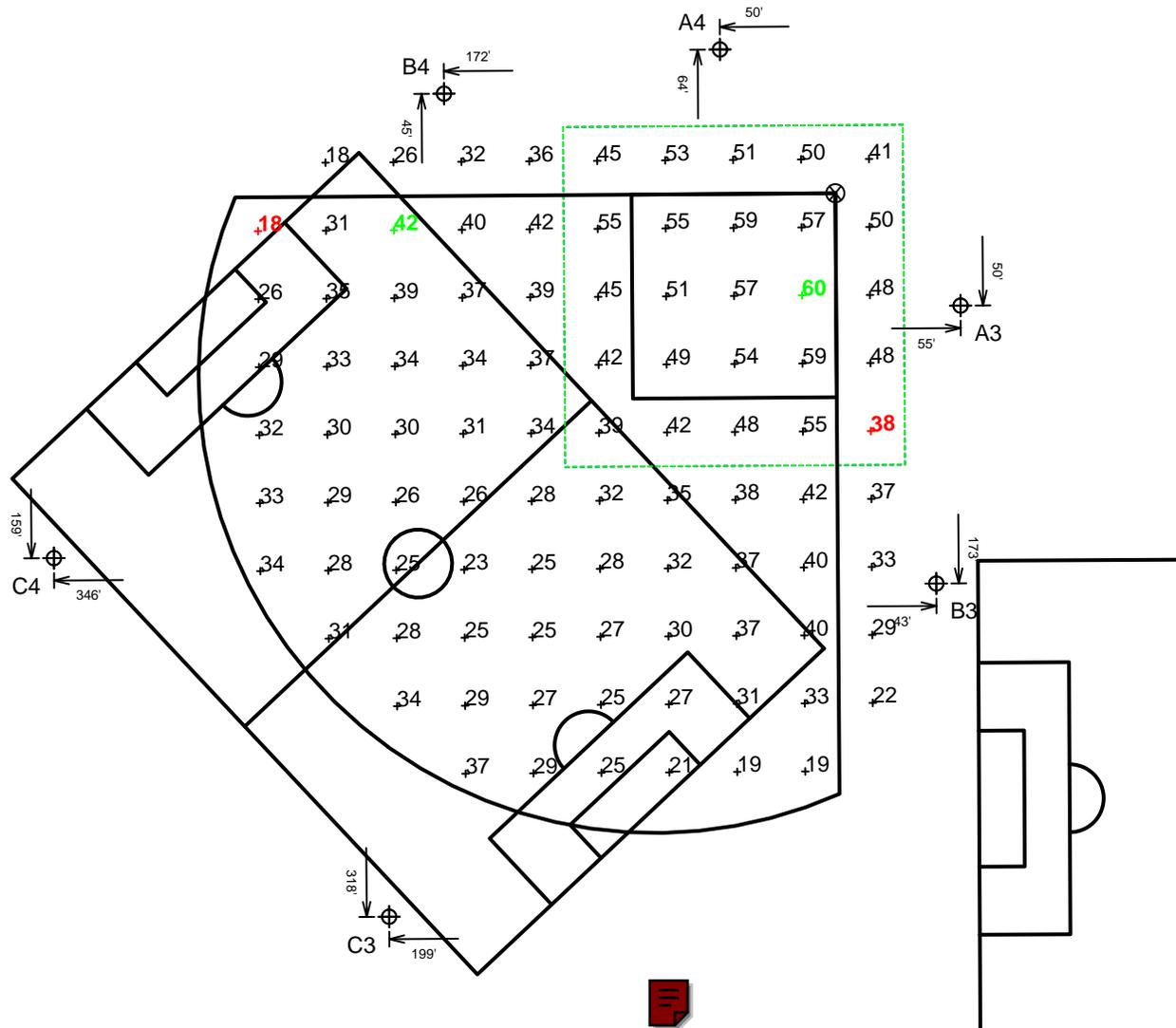
BASEBALL #2
HALL PROPERTY
ENCINITAS, CA

BASEBALL #2
 · Size: 265'/315'/265' - 90' Basepath
 · Grid Spacing = 30.0' x 30.0'
 · Values given at 3.0' above grade

· Luminaire Type: Green Generation
 · Rated Lamp Life: 5000 hours
 · Avg Lumens/Lamp: 134,000

CONSTANT ILLUMINATION HORIZONTAL FOOTCANDLES

	Infield	Outfield
No. of Target Points:	25	67
Average:	50.07	30.89
Maximum:	60	42
Minimum:	38	18
Avg/Min:	1.32	1.74
Max/Min:	1.58	2.39
UG (Adjacent Pts):	1.77	1.77
CV:	0	0
Average Lamp Tilt Factor:		1.000
Number of Luminaires:		40
Avg KWh Consumption over 5000 hours:		62.4



SCALE IN FEET 1 : 80



Pole location(s) ⚡ dimensions are relative to 0,0 reference point(s) ⊗

Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the rated life of the lamp.

Field Measurements: Averages shall be +/-10% in accordance with IESNA RP-6-01. Individual measurements may vary from computer predictions.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet of design locations.

By: T.Benson

Date: 10-Aug-05

File #: 110479tb2

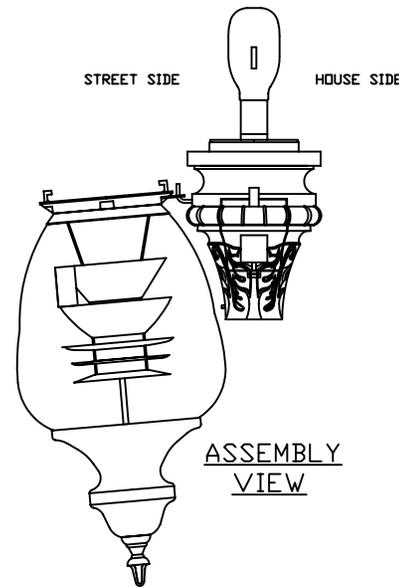
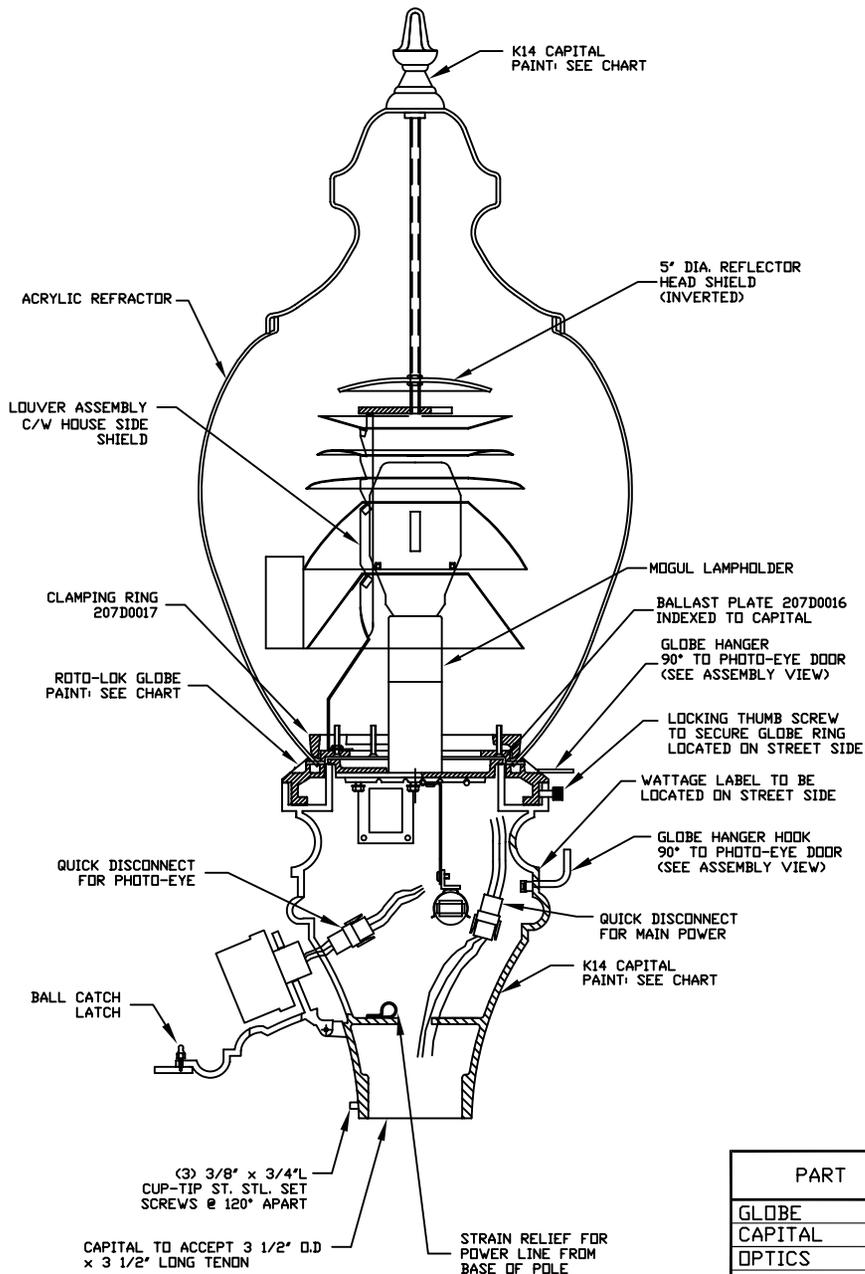
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APPENDIX

FIGURE A3.0 - A3.1 King Luminaire – Manufacturer Specification

REV.	ALTERATION	DATE	BY

PAIN:	
COLOUR:	



KING U.S. ORDER NO.:	CUSTOMER ORDER NO.:
----------------------	---------------------

SPECIFICATIONS

CATALOGUE NO.: K118-LAR-III-150(MDG)
-HPS-120-K14-TSS

QUANTITY:
GLOBE MAT'L: ACRYLIC
IES CLASSIFIC.: TYPE III
WATTAGE: 150W
LIGHT SOURCE: HIGH PRESSURE SODIUM
LINE VOLTAGE: 120V
POLE ADAPTOR: K14
LAMP BY OTHERS: 150W HPS (MDG) ANSI# S55

BALLAST INFORMATION:

BALLAST TYPE: REACTOR NPF
BALLAST MANU.: ADVANCE
CATALOG NUMBER: 71A8107-500DC

OPTIONS:

QUICK DISCONNECT

OTHER: INVERTED 5" Ø REFLECTOR
HEAT SHIELD



PART	PLANT REFERENCE DWG. #'S	REVISION
GLOBE		
CAPITAL		
OPTICS		
BALLAST		
FINIAL		
OTHERS		

CUSTOMER APPROVAL: _____



KING LUMINAIRE
COMPANY INC.

840 WALKER'S LINE, P.O. BOX 7,
BURLINGTON, ONTARIO, CANADA L7R 3X9
P.O. BOX 266 JEFFERSON, OHIO
1153 STATE ROUTE 46N
U.S.A. 44047

DRAWING NAME: APPROVAL DWG	DWG NUMBER K118-LAR-150W-K14	DATE: 03/23/04	DWG BY: M.M.	REV.
-------------------------------	---------------------------------	-------------------	-----------------	------

PROJECT/CUSTOMER: _____

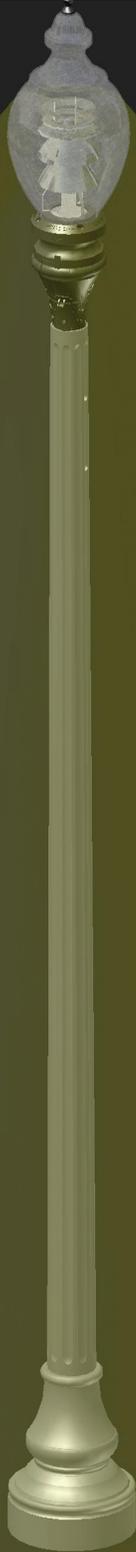
CERT. I.D. CS ET

SOUTHERN CALIFORNIA EDISON

\\SPEC\SCE\

SOUTHERN CALIFORNIA EDISON

A LIGHTING SOLUTIONS LEADER



Decorative Acorn Post Top Fixture

The most widely used of all acorns, this classic shape takes on a new life with the introduction of a Cut off optical system. The Decorative acorn fixture, shown below, uses the K14 capital which includes a hinged window section for a twistlock photocell. While reducing glare, this Cutoff luminaire style offers excellent performance and aesthetics.



Decorative Acorn Post Top Fixture



Features at a Glance

Designed to be Dark Sky Friendly

IES Cutoff Classification

Non-Glare internal reflector

Internal Shield to prevent trespass light in windows

Automatic on at dusk and off at dawn

Environmentally safe

Available in all HID wattages up to 250w

Achieves excellent spacing and uniformity

Heavy duty cast aluminum decorative castings.

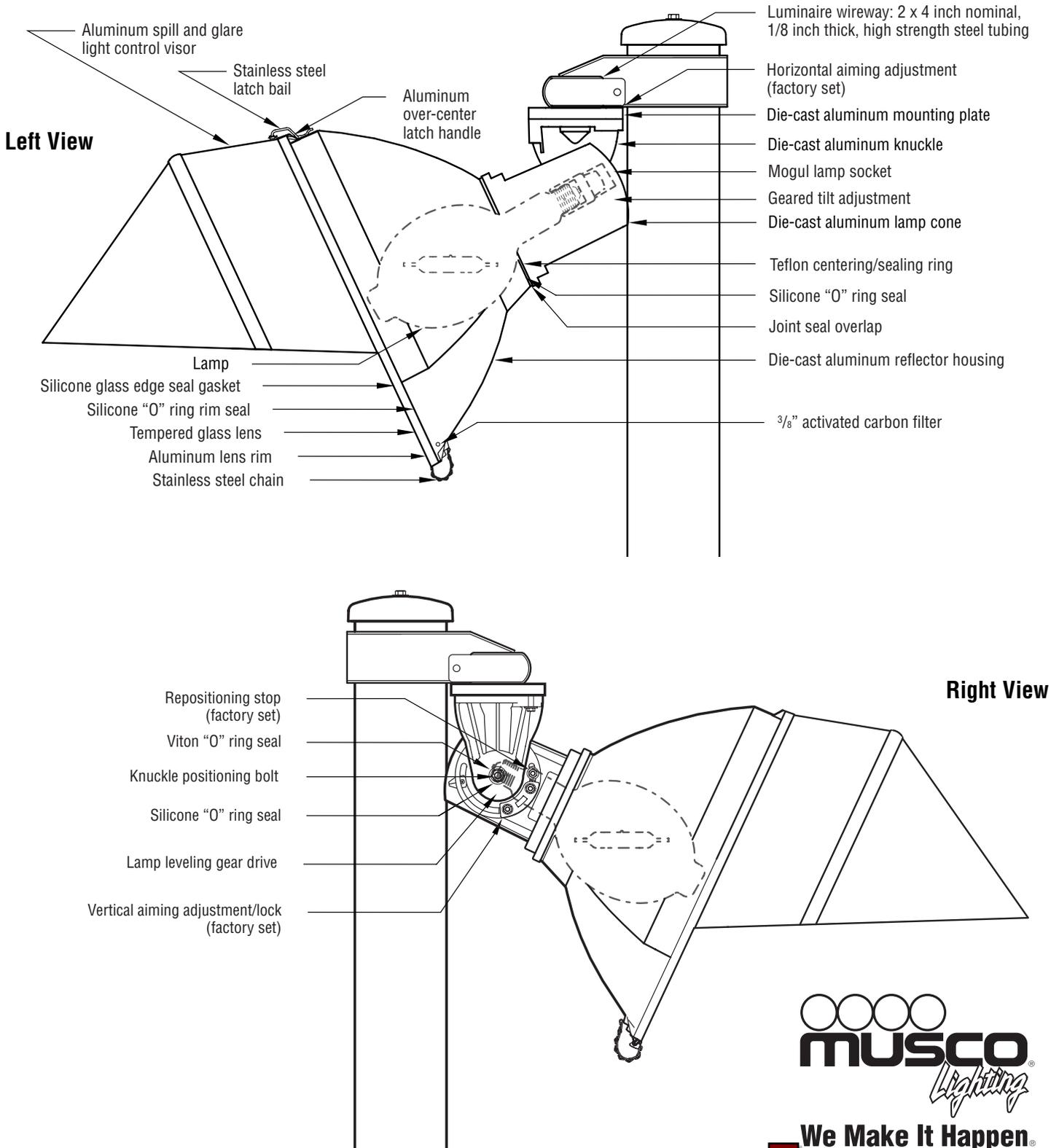


SOUTHERN CALIFORNIA
EDISON
An EDISON INTERNATIONAL™ Company

For more information, call
SOLO - Southern California Edison®
Street and Outdoor Lighting Organization:
800 655-4555
www.sce.com

APPENDIX

FIGURE A4.0 - A4.1 Musco Lighting – Manufacturer Specification



We Make It Happen.

800/825-6030

www.musco.com

lighting@musco.com

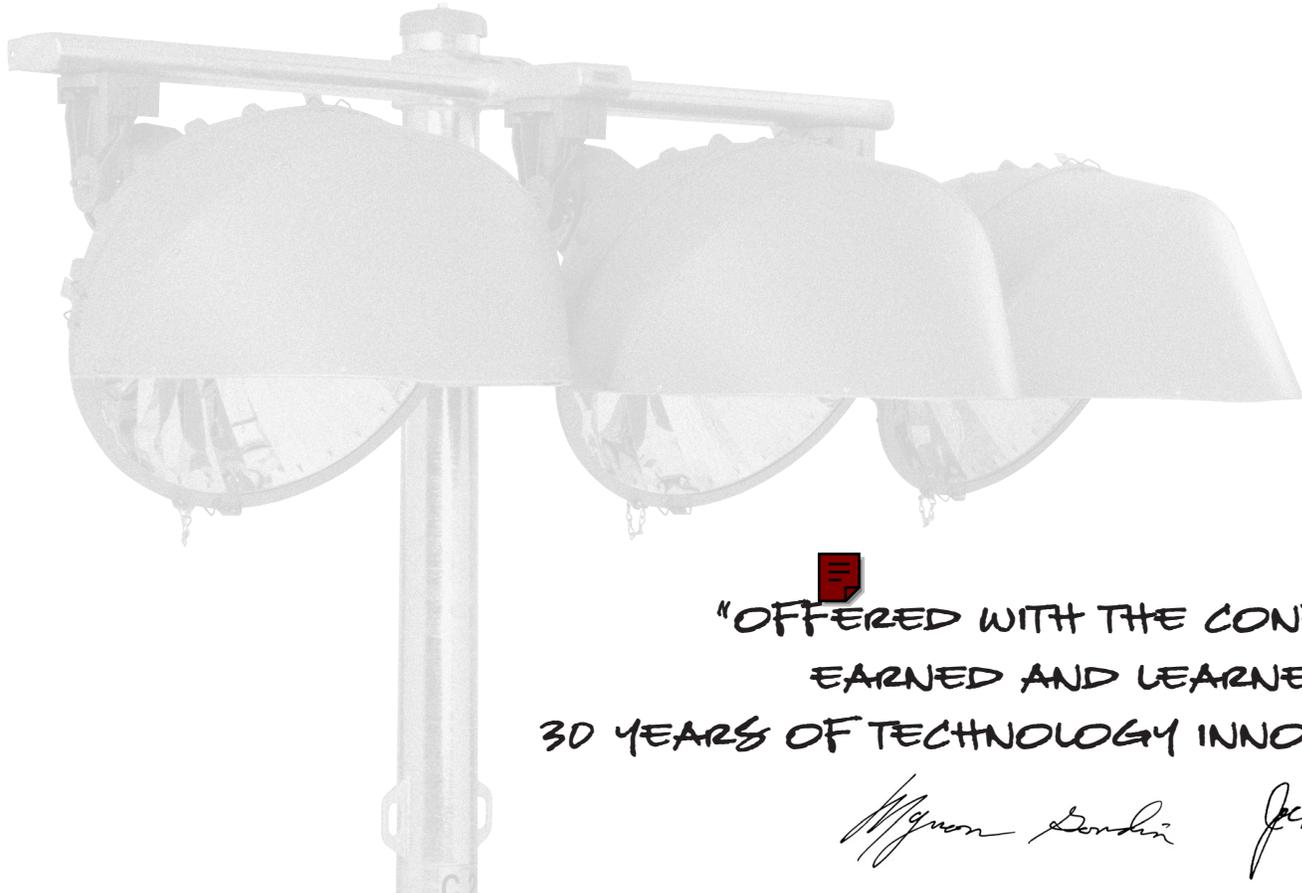
Musco products referenced or shown are protected by one or more of the following U.S. Patents: 4450507; 4725934; 4729077; 4811181; 4816974; 4947303; 4994716; 5012398; 5075828; 5134557; 5161883; 5211473; 5229681; 5377611; 5398478; 5423281; 5426577; 5600537; 5707142; 5794387; 5800048; 5816691; 5856721; 6036338; 6203176; 6250596; 6340790; 6398392; 6446408; 6692142; D337168; D353797; D353911; D411096. Australia Patents: 708912; Canada Patents: 70479; 73755; 74939; 89366; 2009749; 2026850; 2027033; 2035014; 2060585; 2110014; 2204958; 2200511; 2200515; 2217872; 2378279. EPC Patents: 440531; 821776. Germany Patents: 69601867.5. Mexico Patents: 175863; 183225. New Zealand Patents: 307705; 333806. South Korea Patents: 405147. Other patents pending.



INTRODUCING...

Light•Structure GREEN™

***For your budget,
for the environment.***



"OFFERED WITH THE CONFIDENCE
EARNED AND LEARNED FROM
30 YEARS OF TECHNOLOGY INNOVATION."

Myron Gordon *John Hoshorn*



Musco's Light-Structure GREEN™

Musco's Green friendly system will reduce by half or more, the cost of operating and maintaining your ballfield lighting system.

For Your Budget

Innovative photometric improvements of the luminaire result in substantially more efficient light control.

Musco's evolution of fundamental lamp principles creates a new operating system — Smart Lamp™.

Savings

25 Year Life Cycle Cost Savings

Prior Technology Fixture Quantity	52
Light-Structure Green™ Fixture Quantity	32
1. Energy — photometric improvement	\$23,080
2. Group Relamp	\$16,250
3. Lamp Maintenance	\$3,750
4. Energy — controls	\$5,770
5. Labor — controls	\$10,000
Total Projected Savings	\$58,850

- 300 hours per year, 9¢ per kilowatt hour
- \$125 per luminaire for relamp labor and materials.
- Average of 7.5 repairs at \$500 each.
- 25% savings by switching on and off 20 minutes closer to actual usage time.
- 15 minutes labor for turning on and for off at \$8 labor rate — 1000 operations.

Musco's journey to the Green Generation — 30 years of “good old fashioned” new technology

1976

Existing technology



1977

Factory assembled and wired light cluster — SportsCluster®. Predictable results, easier installation.



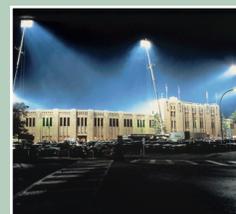
1981

Glare control research



1982

Temporary lighting service and rolling lab — Mobile Lighting System



1987

Easier maintenance — remote ballasts



... for a More Energy Conscious Generation.

Amazing new technology ... big cost benefits.

And best of all, it does wonderful things for the adjoining environment. It puts much less light on nearby properties. It protects the beauty of the dark night skies.

For The Environment

Spill and glare control features are now a standard part of every luminaire at no extra cost.

This green generation luminaire system cuts spill by half or more, even when compared to Musco's prior industry-leading technology.

Less Spill		
360' x 225' Soccer Field		
30fc Average Maintained	30fc Constant Illumination	
Light-Structure with Total Light Control™ photometric option	Fixture Type	Light-Structure Green™
1500W MZ	Lamp Type	1500W MZ
Vertical Illumination		
0.50 fc	Average	0.15 fc
0.74 fc	Maximum	0.26 fc
52	# of Luminaires	32

Now 25 years of unprecedented, trouble-free operation

Musco's *Constant 25™* warranty and maintenance program guarantees:

- Constant light levels and group lamp replacements at the end of rated lamp life
- Reduced energy consumption
- Monitoring, maintenance and remote on/off control services
- System structural integrity

1989

Glare control with efficiency — SportsCluster-2®



1991

Complete lighting and electrical system from foundation-to-poletop, Light-Structure System™



1997

Facility management services — 10 Club Service® and Control-Link®



2005

Energy, environment ... today's prices — Light-Structure Green™



Light-Structure Green™ System — still Five Easy Pieces™ plus:

Improved Luminaire Efficiency

- 1. Reflector system:** More than 2000 photometric patterns provide optimal energy efficiency and minimal spill light for each project.
- 2. Visor System:** Several visor choices provide energy efficient light on the field and minimal spill light. The aerodynamics reduce wind load on the poles.
- 3. Side Shift Beam Control:** Beams can be adjusted within the luminaire horizontally as well as vertically. We can now custom fit the light to the corners.

Smart Lamp™ Operating System

- 1. Lamp:** 30 years of lamp experience has taught Musco how to operate the lamp with less energy and extend its life with a system of timed power adjustments.
- 2. Geared tilt adjustment:** With a geared leveling mechanism, the lamp arc tube operates in the energy advantageous horizontal position.

Increased Durability, Assured Results

- 1. Die-Cast aluminum reflector housing:** Provides a rugged foundation for building and maintaining a sophisticated photometric unit.
- 2. Gasketing:** Improved material and gasket system design virtually eliminate “outgassing” and other contamination of the reflectors and lens.
- 3. Factory Assembled Luminaires:** The luminaire ships totally assembled: avoids contaminants, saves time, improves aiming accuracy.
- 4. Attaching Mechanism:** The factory assembled luminaire connects electrically and structurally to the crossarm with one simple attachment.
- 5. Factory Aiming:** Musco’s well established service of factory aiming is even better with Light-Structure Green™ . . . field changes can still be done.

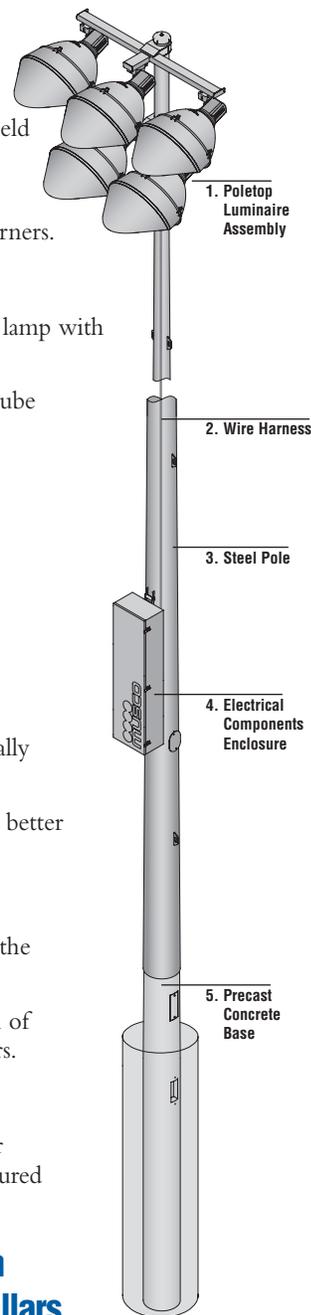
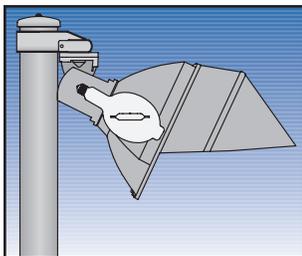
Solid control and flexible management

- 1. Controls and monitoring:** This system, in one simple cabinet, included in the base price, saves energy and gives you a solid, flexible management tool.
- 2. Control Link Central™:** Real people at Musco, 24/7, support the operation of your lights . . . from office, field or home . . . benefits field users and neighbors.

Ultimate guarantee

With **Green Generation Lighting**, Musco’s Constant 25™ guarantees it all for 25 years, plus free relamping at the end of the lamps rated life. All of this is assured by Musco’s field service department and their technicians.

Light Structure Green™ is the result of more than a dozen inventions and innovations from more than 10 million dollars of research and capital investment by Musco.



We Make It Happen.®

800/825-6030

www.musco.com

e-mail: lighting@musco.com

APPENDIX

TABLE A5.0 Potential Glare Impacts from Sports Lighting

LUMINAIRE CHARACTERISTICS										GLARE POTENTIAL										NUISANCE GLARE POTENTIAL									
QTY	POLE ID / LOCATION	POLE HEIGHT (m)	QTY / POLE	LUMINAIRE VISIBLE APERTURE - (ft)	LUMINAIRE VERTICAL AIMING ANGLE - range given in degrees (° vert)	REFERENCE ANGLE - angle pole is in relation to	HORIZONTAL AIMING ANGLE (per Musco)	RESULTANT HORIZONTAL AIMING ANGLE - degrees relative to 0° East (° horiz)	CLOSEST DISTANCE TO POTENTIAL LINE OF SIGHT TO PROPERTY LINE - (ft)	DIRECTION OF CLOSEST DISTANCE FROM LUMINAIRE TO PROPERTY LINE - (° horiz)	LINE OF SIGHT ANGLE AT CLOSEST DISTANCE - angle b/w line of sight above horizontal (° vert)	CLOSEST DISTANCE TO PROPERTY LINE OF SIGHT (° horiz) IS OUTSIDE DIRECTION OF AIMING ANGLE (° horiz - 7° horiz ± 180°) (OK or Not OK)	LUMINAIRE AM AVOIDS POTENTIAL DISCOMFORT GLARE if ?° horiz is inside 180° Field of View from ?° horiz (Not OK) and ?° vert = (° vert ± 8°) (True or False)	FURTHEST POTENTIAL LINE OF SIGHT TO PROPERTY LINE (assuming Normal Line of Sight is approx. horizontal and Field of View is 60° above horizon (max in feet))	APPROXIMATE DIRECTION OF FURTHEST DISTANCE FROM LUMINAIRE TO PROPERTY LINE - (° horiz)	LINE OF SIGHT ANGLE AT FURTHEST DISTANCE - angle b/w line of sight above horizontal (° vert)	FURTHEST DISTANCE TO PROPERTY LINE OF SIGHT (° horiz) IS OUTSIDE DIRECTION OF 75° BEAMS/SPREAD AIMING ANGLE (° horiz - 7° horiz ± 180°) (OK or Not OK)	LUMINAIRE IS WITHIN NORMAL FIELD OF VIEW - height is horizontal (True or False)	LUMINAIRE AM AVOIDS NOISANCE GLARE, ASSUMING HORIZONTAL LINE OF SIGHT AT FURTHEST DISTANCE = if ?° vert = (° vert ± 8°) (True or False)										
1	A1	80	1	43	31.35	90	-37.46	127.48	428	180	10	Not OK	TRUE	1560	136	15	Not OK	TRUE	TRUE										
1	A1	80	1	43	27.02	90	-16.87	106.67	428	180	10	Not OK	TRUE	1660	136	15	Not OK	TRUE	TRUE										
1	A1	80	1	43	28.51	90	-8.89	95.89	428	180	10	Not OK	TRUE	1560	136	15	Not OK	TRUE	TRUE										
1	A1	80	1	43	28.03	90	-17.8	72.2	428	180	10	Not OK	TRUE	1560	136	15	Not OK	TRUE	TRUE										
1	A1	80	1	43	42.82	90	-46.44	43.56	428	180	10	Not OK	TRUE	1560	136	15	Not OK	TRUE	TRUE										
1	A2	80	1	43	41.11	180	-43.37	220.37	354	0	12	Not OK	TRUE	1672	141	12	Not OK	TRUE	TRUE										
1	A2	80	1	43	24.84	180	-20.38	200.38	354	0	12	Not OK	TRUE	1572	141	12	Not OK	TRUE	TRUE										
1	A2	80	1	43	28.63	180	-4.94	175.06	354	0	12	OK	TRUE	1572	141	12	Not OK	TRUE	TRUE										
1	A2	80	1	43	28.55	180	-21.84	156.16	354	0	12	OK	TRUE	1572	141	12	Not OK	TRUE	TRUE										
1	A2	80	1	43	38	180	-42.35	137.65	354	0	12	OK	TRUE	1572	141	12	Not OK	TRUE	TRUE										
1	A3	80	1	43	40.29	180	-37.96	217.96	498	-90	9	OK	TRUE	1764	-90	16	OK	TRUE	TRUE										
1	A3	80	1	43	27.69	180	-15.81	195.81	498	-90	9	OK	TRUE	1764	-90	16	OK	TRUE	TRUE										
1	A3	80	1	43	30	180	0	180	498	-90	9	OK	TRUE	1764	-90	16	OK	TRUE	TRUE										
1	A3	80	1	43	30.01	180	-24.75	155.25	498	-90	9	OK	TRUE	1764	-90	16	OK	TRUE	TRUE										
1	A3	80	1	43	43.33	180	-54.92	125.09	498	-90	9	OK	TRUE	1764	-90	16	OK	TRUE	TRUE										
1	A4	80	1	43	41.93	270	-50.65	330.65	306	0	10	Not OK	TRUE	1608	0	15	Not OK	TRUE	TRUE										
1	A4	80	1	43	29.97	270	-27.4	297.4	436	0	10	Not OK	TRUE	1608	0	15	Not OK	TRUE	TRUE										
1	A4	80	1	43	29.54	270	-4.83	265.17	436	0	10	Not OK	TRUE	1608	0	15	Not OK	TRUE	TRUE										
1	A4	80	1	43	27.28	270	-16.35	233.65	436	0	10	Not OK	TRUE	1608	0	15	Not OK	TRUE	TRUE										
1	A4	80	1	43	42.45	270	-40.78	229.22	436	0	10	Not OK	TRUE	1608	0	15	Not OK	TRUE	TRUE										
1	A5	60	1	43	32.06	180	-31.22	211.22	267	0	12	Not OK	TRUE	2124	0	7	Not OK	TRUE	TRUE										
1	A5	60	1	43	27.63	180	-16.87	186.87	267	0	12	Not OK	TRUE	2124	0	7	Not OK	TRUE	TRUE										
1	A5	60	1	43	44.7	180	-44.57	135.43	267	0	12	OK	TRUE	2124	0	7	Not OK	TRUE	TRUE										
1	A6	60	1	43	41.03	270	-49.84	319.84	267	0	12	Not OK	TRUE	2016	0	7	Not OK	TRUE	TRUE										
1	A6	60	1	43	28.73	270	-13.13	256.87	267	0	12	Not OK	TRUE	2016	0	7	Not OK	TRUE	TRUE										
1	A6	60	1	43	35.6	270	-35.93	234.07	267	0	12	Not OK	TRUE	2016	0	7	Not OK	TRUE	TRUE										
1	B1	90	1	43	28.39	90	-25.53	115.53	303	180	16	Not OK	TRUE	1464	180	11	Not OK	TRUE	TRUE										
1	B1	90	1	43	28.38	90	-7.64	93.64	303	180	16	Not OK	TRUE	1464	180	11	Not OK	TRUE	TRUE										
1	B1	90	1	43	27.04	90	-6.96	83.04	303	180	16	Not OK	TRUE	1464	180	11	Not OK	TRUE	TRUE										
1	B1	90	1	43	27.31	90	-16.51	73.49	303	180	16	Not OK	TRUE	1464	180	11	Not OK	TRUE	TRUE										
1	B1	90	1	43	28.93	90	-27.42	62.58	303	180	16	Not OK	TRUE	1464	180	11	Not OK	TRUE	TRUE										
1	B1	90	1	43	35.09	90	-45.71	136.71	303	180	16	Not OK	TRUE	1464	180	11	Not OK	TRUE	TRUE										
1	B1	90	1	43	31.73	90	-35.47	128.47	303	180	16	Not OK	TRUE	1464	180	11	Not OK	TRUE	TRUE										
1	B1	90	1	43	32.73	90	-46.4	116.4	303	180	16	Not OK	TRUE	1464	180	11	Not OK	TRUE	TRUE										
1	B1	90	1	43	35.75	90	-67.35	22.65	303	180	16	Not OK	TRUE	1464	180	11	Not OK	TRUE	TRUE										
1	B2	90	1	43	30.02	180	-42.14	222.14	304	0	16	Not OK	TRUE	1488	0	11	Not OK	TRUE	TRUE										
1	B2	90	1	43	29.28	180	-26.4	206.4	304	0	16	Not OK	TRUE	1488	0	11	Not OK	TRUE	TRUE										
1	B2	90	1	43	27.8	180	-9.19	189.19	304	0	16	Not OK	TRUE	1488	0	11	Not OK	TRUE	TRUE										
1	B2	90	1	43	28.46	180	-1.13	197.13	304	0	16	Not OK	TRUE	1488	0	11	Not OK	TRUE	TRUE										
1	B2	90	1	43	29.47	180	-5.39	174.61	304	0	16	Not OK	TRUE	1488	0	11	Not OK	TRUE	TRUE										
1	B2	90	1	43	32.57	180	-68.28	248.28	304	0	16	Not OK	TRUE	1488	0	11	Not OK	TRUE	TRUE										
1	B2	90	1	43	29.17	180	-20.63	159.37	304	0	16	Not OK	TRUE	1488	0	11	Not OK	TRUE	TRUE										
1	B2	90	1	43	32.05	180	-29.34	150.66	304	0	16	Not OK	TRUE	1488	0	11	Not OK	TRUE	TRUE										
1	B2	90	1	43	34.16	180	-38.95	141.05	304	0	16	Not OK	TRUE	1488	0	11	Not OK	TRUE	TRUE										
1	B3	90	1	43	30.72	180	-14.89	194.89	316	-90	15	Not OK	TRUE	1848	-90	10	OK	TRUE	TRUE										
1	B3	90	1	43	29.95	180	-6.35	186.35	316	-90	15	Not OK	TRUE	1848	-90	10	OK	TRUE	TRUE										
1	B3	90	1	43	27.53	180	-1.9	178.1	316	-90	15	Not OK	TRUE	1848	-90	10	OK	TRUE	TRUE										
1	B3	90	1	43	27.44	180	-14.97	165.03	316	-90	15	Not OK	TRUE	1848	-90	10	OK	TRUE	TRUE										
1	B3	90	1	43	28.5	180	-26.71	154.29	316	-90	15	Not OK	TRUE	1848	-90	10	OK	TRUE	TRUE										
1	B3	90	1	43	39.3	180	-45.04	225.04	316	-90	15	Not OK	TRUE	1848	-90	10	OK	TRUE	TRUE										
1	B3	90	1	43	31.19	180	-32.46	212.46	316	-90	15	Not OK	TRUE	1848	-90	10	OK	TRUE	TRUE										
1	B3	90	1	43	29.95	180	-42.87	192.87	316	-90	15	Not OK	TRUE	1848	-90	10	OK	TRUE	TRUE										
1	B3	90	1	43	34	180	-62.85	117.05	316	-90	15	Not OK	TRUE	1848	-90	10	OK	TRUE	TRUE										
1	B4	90	1	43	29.66	270	-44.4	314.4	320	180	15	Not OK	TRUE	1536	180	12	Not OK	TRUE	TRUE										
1	B4	90	1	43	29.63	270	-26.4	296.4	320	180	15	Not OK	TRUE	1536	180	12	Not OK	TRUE	TRUE										
1	B4	90	1	43	28.61	270	-15.67	285.67	320	180	15	Not OK	TRUE	1536	180	12	Not OK	TRUE	TRUE										
1	B4	90	1	43	28.33	270	-2.34	272.34	320	180	15	Not OK	TRUE	1536	180	12	Not OK	TRUE	TRUE										
1	B4	90	1	43	29.18	270	-5.34	254.66	320	180	15	Not OK	TRUE	1536	180	12	Not OK	TRUE	TRUE										
1	B4	90	1	43	32.35	270	-60.77	330.77	320	180	15	Not OK	TRUE	1536	180	12	Not OK	TRUE	TRUE										
1	B4	90	1	43	29.32	270	-18.45	257.55	320	180	15	Not OK	TRUE	1536	180	12	Not OK	TRUE	TRUE										
1	B4	90	1	43	29.64	270	-35.17	234.83	320	180	15	Not OK	TRUE	1536	180	12	Not OK	TRUE	TRUE										
1	B4	90	1	43	37.94	270	-47.75	222.25	320	180	15	Not OK	TRUE	1536	180	12	Not OK	TRUE	TRUE										
1	B5	80	1	43	26.25	180	-19.36	199.36	138	0	28	Not OK	FALSE	2220	0	3	Not OK	TRUE	TRUE										
1	B5	80	1	43	26.49	180	-12.17	192.17	138	0	28	Not OK	FALSE	2220	0	3	Not OK	TRUE	TRUE										
1	B5	80	1	43	26.75	180	-0.82	180.82	138	0	28	Not OK	FALSE	2220	0	3	Not OK	TRUE	TRUE										
1	B5	80	1	43	27.51	180	-12.85	167.15	138	0	28	Not OK	FALSE	2220	0	3	Not OK	TRUE	TRUE										
1	B5	80	1	43	28.58	180	-19.16	210.29	138	0	28	Not OK	FALSE	2220	0	3	Not OK	TRUE	TRUE										
1	B5	80	1	43	30.33	180	-29.61	150.39	138	0	28	Not OK	FALSE	2220	0	3	Not OK	TRUE	TRUE										
1	B5	80	1	43	30.63	180	-44.07	135.93	138	0	28	Not OK	FALSE	2220	0	3	Not OK	TRUE	TRUE										
1	B6	80	1	43	25.22	270	-18.84	288.84	351	0	12	Not OK	TRUE	1872	0	10	Not OK	TRUE	TRUE										
1	B6	80	1	43	25	270	-11.91	281.91	351	0	12	Not OK	TRUE	1872	0	10	Not OK	TRUE	TRUE										
1	B6	80	1	43	25.14	270	-4.31	274.31	351	0	12	Not OK	TRUE	1872	0	10	Not OK	TRUE	TRUE										
1	B6	80	1	43	28.71	270	-7.16	262.84	351	0	12	Not OK	TRUE	1872	0	10	Not OK	TRUE	TRUE										
1	B6	80	1	43	45.3	270	-62.73	352.73	351	0	12	Not OK	TRUE	1872	0	10	Not OK	TRUE	TRUE										
1	B6	80	1	43	28.77	270	-29.93	299.93	351	0	12	Not OK	TRUE	1872	0	10	Not OK	TRUE	TRUE										
1	B6	80	1	43	28.58	270	-19.16	290.84	351	0	12	Not OK	TRUE	1872	0	10	Not OK	TRUE	TRUE										
1	B6	80	1	43	29.4	270	-53.16	216.84	351	0	12	Not OK	TRUE	1872	0	10	Not OK	TRUE	TRUE										
1	B6	80	1	43	31.05	270	-72.49	197.51																					

