MASTER PLAN

UNIVERSITY OF TEXAS—EL PASO

Campus-Wide Lighting Master Plan

CONCEPT GOALS

Yarnell Associates LLC
ARCHITECTURAL LIGHTING DESIGN

LIGHTWORKS INC.
DESIGN+ENGINEERING

Issued March 2015

Revised

PREPARED FOR:

The University of Texas—El Paso

Dr. Diana Natalicio—President

Cynthia Vizcaino Villa—Vice President of Business Affairs

Greg McNicol, AIA—Associate Vice President—Facilities Management

c/o Facility Services

3120 Sun Bowl Drive

El Paso, Texas 79968

Phone: 214.520.7204

Contact: Nestor Infanzon, FAIA
Director, Planning and Construction

PREPARED BY:

Yarnell Associates, LLC
12616 W. 71st Street
Shawnee, KS 66216
Phone: 913.962.0074
Contact: Bruce Yarnell

LightWorks, Inc.
361B Main
Weston, MO 64098
Phone: 816.640.9948
Contact: Kathi Vandel

Yarnell Associates LLC
ARCHITECTURAL LIGHTING DESIGN

LIGHTWORKS INC.
DESIGN+ENGINEERING

MASTER PLAN

Issued March 2015

Revised

CONCEPTUAL GOALS

The unique character of the University of Texas El Paso stems from its distinctive architectural style and its surrounding terrain. Nestled in the Chihuahua desert climate, charm of the rolling hills and the arroyos, the campus provides a great canvas to paint visual interpretations in light stokes for visitors and students alike. This is a unique opportunity that only occurs at UTEP.

The University of Texas El Paso shares a common concern with other universities to provide the safest campus possible. Lighting is one of the most important factors affecting the actual safety for a campus. Darkness can invite those with harmful intentions and lighting deficiency can lead to unnecessary dangerous conflict between pedestrians and vehicles.

Our primary goal in the campus relighting project is to increase the actual safety and security for students and visitors while being sensitive, responsive, and creative to the uniqueness offered by the terrain and architecture.

Assuming safety remains a primary goal, lighting design must also be parallel with existing guidelines and efforts to showcase the building character inspired by the architecture of Bhutan. No other university offers this particular inspiration that has given students and alumni a great sense of pride. We would be negligent to ignore or compromise the existing environment. Instead, lighting reactions will be defined to softly support and articulate the original architectural character. Vistas and accents should blend together in a beautiful y balanced rendering.

Because the effort is a large one and will have actual and emotional effects for many decades, the intent is to maximize the potential rewards of sensitive lighting design. A master plan approach is the best way to document this large effort. The expectation is to define lighting reactions to many existing conditions which will re-present themselves in future development of the university campus. For existing buildings, vehicular roadways and pedestrian pathways, solutions will be defined that can be implemented as funds become available. The report will act as a guiding document referred to for all changes we expect in the natural growth of a university.

For all future construction projects involving buildings, roads, pathways, plazas and art installation, it is anticipated that the outlined solutions will support the continuation of defined campus goals concerning appeal and safety.

CONCEPTUAL GOALS

Family of Fixture Designs

Both roadway and pedestrian pathway fixtures will be of similar design character and finish to enhance the feeling of family and cohesiveness. Family of fixtures will be expanded as necessary to cover the major uses needed by the university. Family will include:

- Typical roadway
- Typical pedestrian pathway
- Typical pedestrian bollard (shorter small path)
- Stylistic fixture to be used In open plaza and study areas

Other fixtures recorded in site visits and expected to be used in the future will include:

- Parking lot fixtures
- Parking garage fixtures
- Stair lighting typical solutions
- Building mounted lighting
- Building exit light fixtures
- Fixture types that can be used to accent artwork

Design is conceptualized to be a somewhat timeless attractive design which will not date the solution. Fixtures will all be selected to conform to “Fixture Glare and Dark Sky Initiatives” which minimize the light emitted above horizontal with the light source. Glare control of the source will be a major quality control component of the fixture selection. In no case do we want to have a light source that is glary.

Study and recommendations will include reactions to specific additional situations including:

- On-grade drop off points and handicapped parking (increased light levels)
- Parking lots (poles elevated on concrete bases to avoid damage from cars)
- Garage top level parking (poles set back from the parking deck edge to minimize looking into the fixture light source)

Control and recommendations in all areas with fixtures that are of similar character will enhance the total cohesive nature of the campus and define borders.

CONCEPTUAL GOALS

Light Source and Energy Reduction

At present and into the visible future, LED lighting appears to be the main developing light source for almost all applications including those mentioned for the campus. LED can be used in exteriors and interiors to minimize energy consumption. LED is a quality light source with extremely long life that assists in maintenance issues. LED can be dimmed or turned "on" and "off" without the common problems of cool-down and restart that was common with older sources.

LED also has excellent color rendering ability (CRI) and has been used in applications such as art galleries sensitive to ultra violet radiation and heat. For the University of Texas El Paso, the ability to render people with flattering light in a warm color is the element that we appreciate most. People will be exposed to a warm and comfortable space for nighttime walking or study. The aspect of a creating a comfortable learning environment is especially exciting!

As part of the master plan study for landscape conditions, a typical scenario will be developed to show re-lighting of classrooms and corridors. Yarnell Associates will be on call for reaction to existing campus situations concerning lighting.

Summary

The excitement of lighting is that is that is so multidimensional. Light as a media is a tool to increase safety and security while eliciting emotional responses from the people seeing and absorbed by it. This hard to define source has definable reactions and we intend to harvest all benefits of well thought out and specified lighting. While students receive illumination in ideas, theories, talents and history, lighting for the campus will be transformed into a viable important element in the process of learning.

After the master plan is defined and implemented, UTEP will be among the most forward thinking universities in the country. We are excited by the challenge and thrilled to paint with light.

UNIVERSITY OF TEXAS—EL PASO

Campus-Wide Lighting Master Plan

CRITERIA + REQUIREMENTS

Yarnell Associates LLC
ARCHITECTURAL LIGHTING DESIGN

LIGHTWORKS INC.
DESIGN+ENGINEERING

Issued March 2015

Revised

CRITERIA + REQUIREMENTS

Lighting Design:

1. All plans shall meet the design criteria of the University of Texas El Paso and shall be in compliance with industry lighting standards (Illuminating Engineering Society—The Lighting Handbook and Recommended Practice: RP-8) and the National Electrical Code.
2. All plans shall indicate design criteria including area, roadway classification, pavement classification, average luminance, average/minimum luminance, maximum/minimum luminance, average illuminance, average/minimum illuminance, and maximum veiling luminance ratio to all unique configurations on roadway plans. (photometric data/calculations) The street lighting designs shall satisfy the luminance, illuminance, veiling luminance, and pedestrian lighting horizontal illuminance standards et forth in ANSI/IES RP-8. Submit calculations with final plans.
3. New installations shall utilize equipment as set forth in this master plan.
4. All plans shall have details on luminaire type, type of distribution, type of optics, operating voltage, and manufacturer. All layouts shall be based on the use of LED lamps.
5. All plans shall have details of pole type, height, manufacturer information and location relative to curb. Poles shall be designed for a minimum 80mph wind load.
6. Maintenance factor shall be: 0.75 for LED lamping.
7. All plans shall have pole spacing as accurate as possible for the given photometrics. ANSI, IES, RP-8 standards are the bare minimum standards.
8. There will be no staggered spacing or randomly located staggered street lights. Narrow roads shall be designed to have uniform spacing on one side while wider roads shall use opposite spacing.
9. The design of intersection levels shall be based upon the actual sum of the minimal illuminance levels on each of the streets contributing to the intersection per ANSI/IES RP-8.
10. Provide luminaires with voltages to support available service in the area.
11. Contractors shall coordinate the disconnection and removal of existing pedestrian pathway lighting with the staff of the Planning and Construction team at UTEP. Contractors shall coordinate their work so that new lighting is in operation prior to old lighting being disconnected and removed. To ensure the safety of all pedestrians, if areas are to be left in total darkness during replacement/addition, then proper care shall be taken to limit pedestrian flow during the area at night. This includes, but is not limited to, the installation of temporary lighting fixtures. This will ensure that roadways and pathways are illuminated at all times during construction.

Administrative Requirements:

1. Estimated itemized construction cost shall be submitted with each plan.
2. Itemized quantities shall be submitted.

PERIMETER ROADWAYS

Proposed Lighting Requirements by Street Type

Placement of roadway lighting must be designed to provide required illumination levels for each street classification.

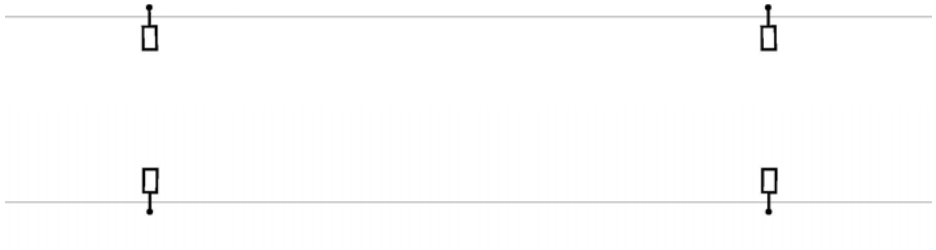
ROADWAY WITH WIDTH OF 50FT CURB TO CURB

- SunBowl Drive from Dawson to Schuster—two rows, opposite

ROADWAYS WITH WIDTH OF 65FT

- SunBowl East of Don Haskins Center

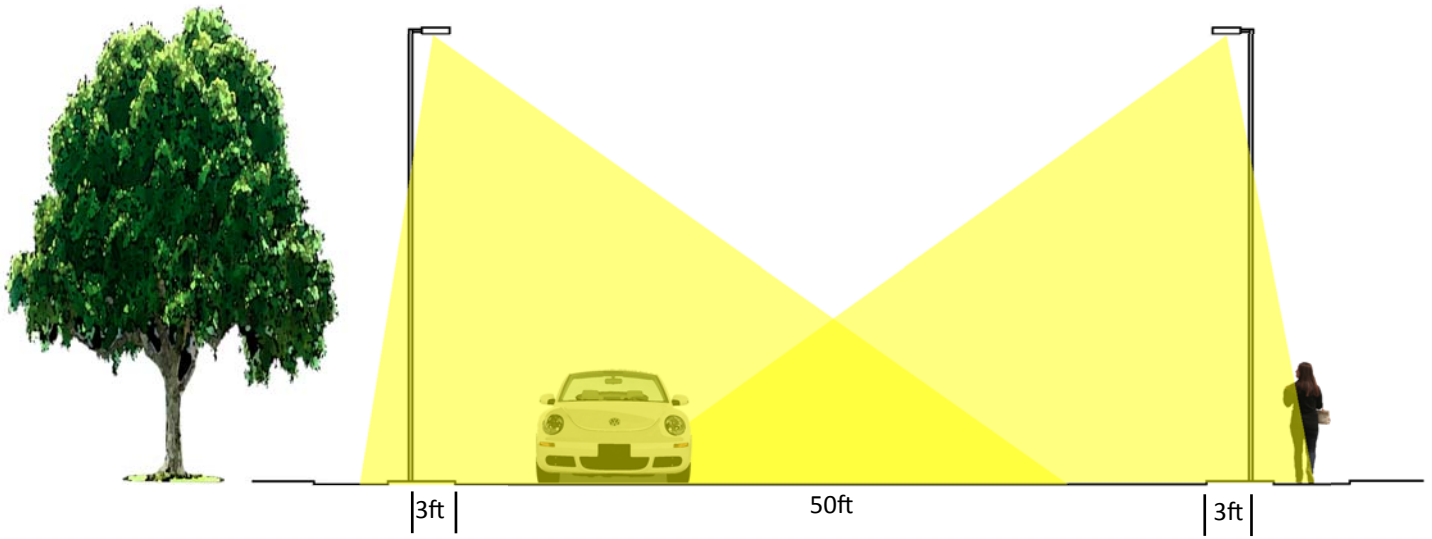
  Relocation of existing, Evolve LED, 5000K poles from interior campus to outer roadway is currently being handled by the University of Texas—El Paso and is not considered part of this masterplan.



Plan Notes:

1. 30ft high poles, opposite spacing.
2. Pole to pole spacing must meet IESNA requirements for specific roadway classification but shall not exceed 5 times the luminaire mounting height.
3. Calculated pole to pole spacing shall be reduced by 10% around curves in roadway.

Plan View



PERIMETER ROADWAYS

Recommended Target Illumination Level Requirements:

For perimeter campus roadways with a classification of Collector/Intermediate:

Luminance = 0.6fc, 3.5:1ave/min, 6:1 max/min*
Illuminance = 1fc minimum**, 6:1 ave/min*
Veiling Luminance = 0.4:1*

Fixture Head

*per Illumination Engineering Society of North America (IESNA) The Lighting Handbook, 9th Edition, Figure 22-8. Measured at grade.
**per UTEP requirements as decided in Transformation project. Measured at grade.

Material Specifications:

Single Headed Roadway Lighting Fixture Assembly to match surrounding State and City owned poles

Pole: **GE #ARTA-30** or approved equal.
Round tapered aluminum to provide 30ft mounting height. Provide dark bronze finish. Poles shaft shall be 7" diameter at base and 4" at top and designed for a maximum EPA for location and amenities. (ie: banner arms) Re: detail page 10.

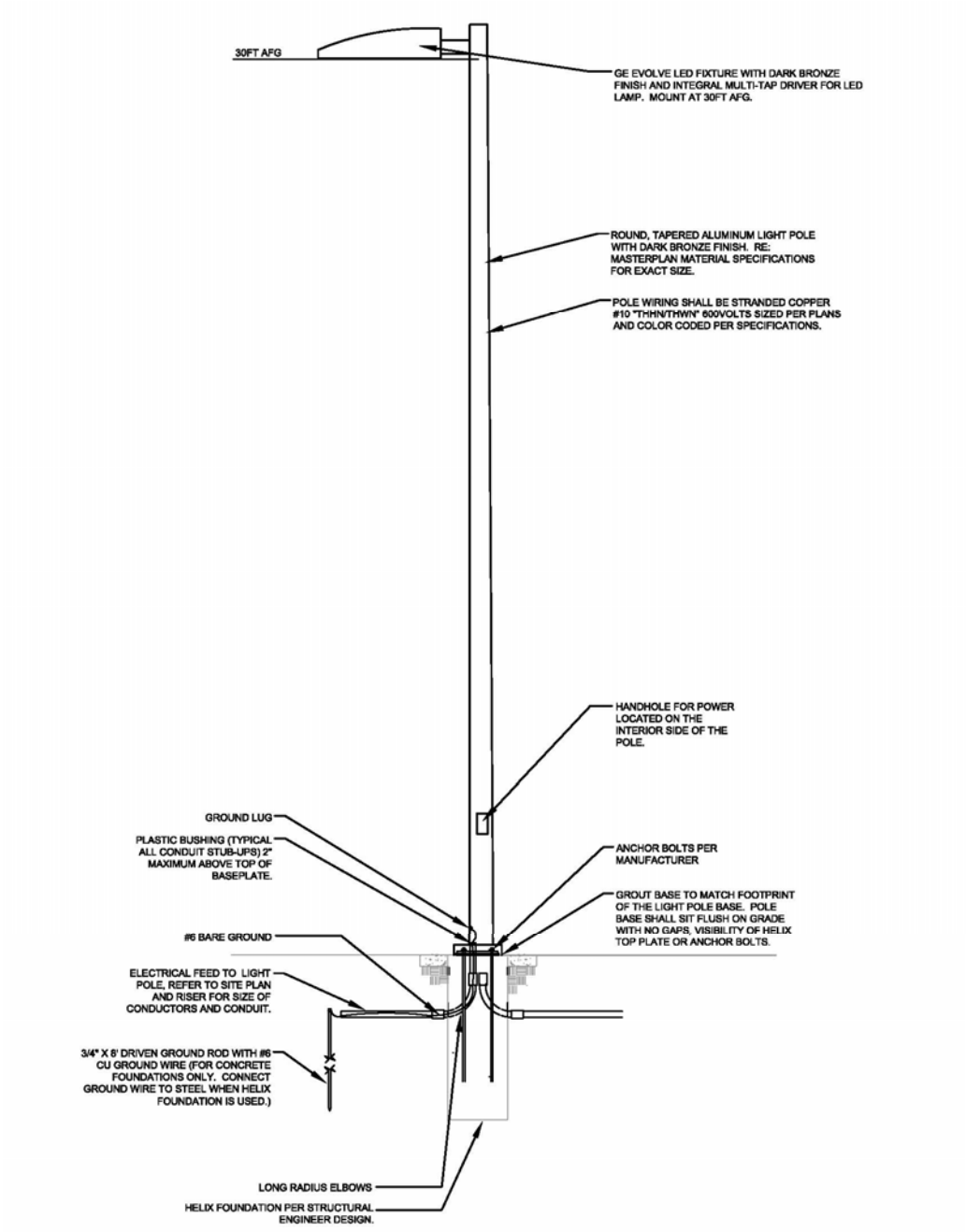
Luminaire: **GE Evolve #EAMM-0-K3-F-40-A-1-B-DBZ** or approved equal
Cobrahead style luminaire with high efficiency LEDs rated at 11,100 lumens, 4000K, 70CRI, asymmetric short distribution. Driver shall be integral to support LED lamps and available site voltage. Provide dark bronze finish.

Foundation: **Chance/Enterprise #C11242NG4VP-ATKC** or approved equal
Screw anchor, galvanized street light foundation, variable bolt circle, 14" helix, 8.63"x5ft shaft and integral cable retainer. Foundation shall be sized by a structural engineer to support the pole and any pole enhancements (ie: banner arms). Pole base shall completely cover top plate of helix foundation and shall site flush on grade.

Location: Roadway lighting poles shall be in line with trees and shall be centered within the 3ft or 4ft amenity zone designated from back of curb to edge of sidewalk. If amenity zone is not present, poles shall be offset 3ft from back of curb. Re: detail page 8. Spacing shall provide target illumination levels along entire roadway.

Control: Dusk to dawn photocell control or control to match surrounding City and State owned roadway systems.

PERIMETER ROADWAY POLE DETAIL



INTERIOR ROADWAYS

Proposed Lighting Requirements by Street Type

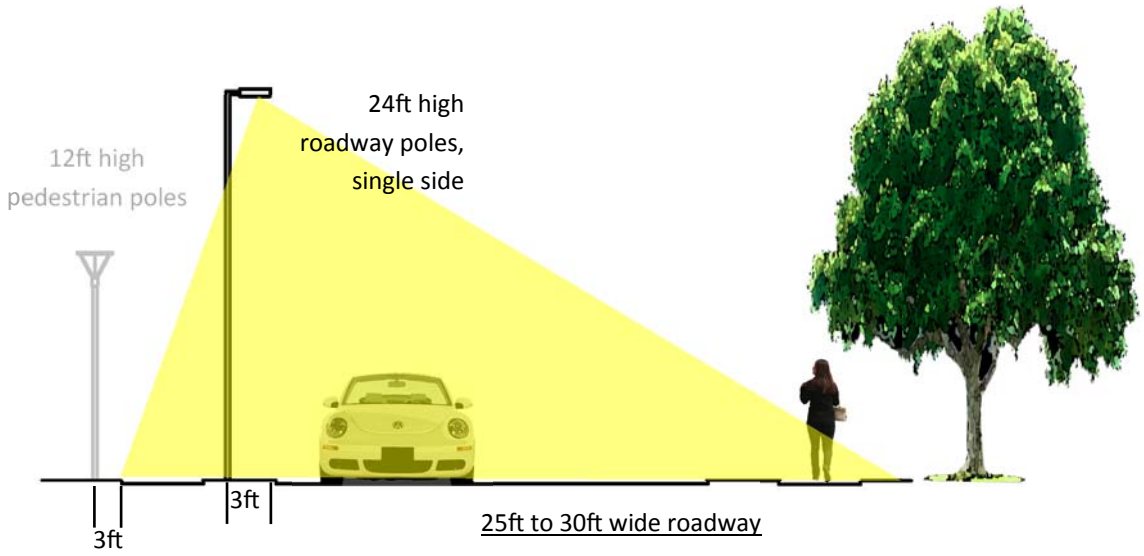
Placement of roadway lighting must be designed to provide required illumination levels for each street classification. For street widths, 30ft wide or less, a single row of evenly spaced luminaires shall be used. For street widths 35ft wide or greater, two rows of luminaires with opposite spacing shall be used.

ROADWAY WITH WIDTH OF 25FT , CURB TO CURB

- Bioscience Roadway
- Electric Road

ROADWAY WITH WIDTH OF 30FT , CURB TO CURB

- Dawson Road



INTERIOR ROADWAYS

Proposed Lighting Requirements by Street Type

ROADWAYS WITH WIDTH OF 40FT , CURB TO CURB

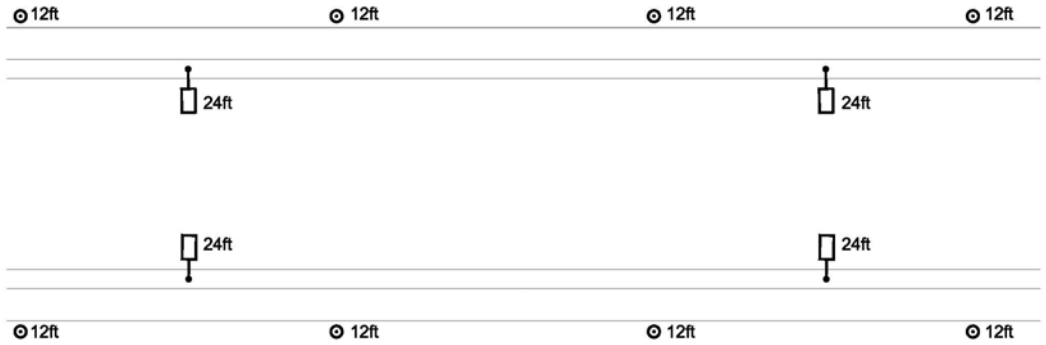
- University Avenue
- Randolph Drive
- Glory Road
- Robinson
- Baltimore

ROADWAY WITH WIDTH OF 45ft, CURB TO CURB

- Rim Road

ROADWAY WIDTH OF 60ft, CURB TO CURB

- University Avenue
- Hawthorne Street
- Wiggins Road
- Dormitory Road

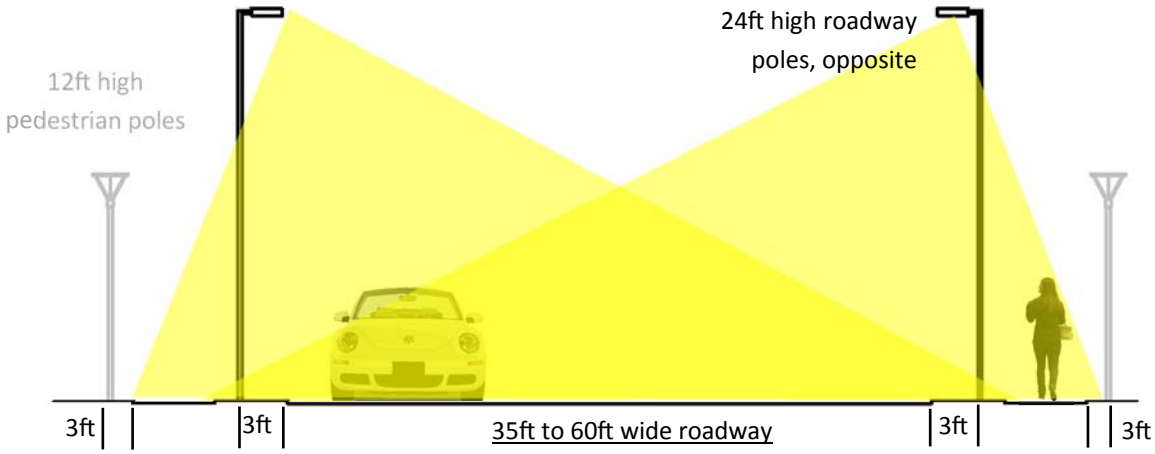


Plan Notes:

1. 24ft high roadway poles, opposite spacing.
2. Pole to pole spacing must meet IESNA requirements for specific roadway classification but not exceed a distance 5 times the luminaire mounting height.
3. Calculated pole to pole spacing shall be reduced by 10% around curves in roadway.

35ft to 60ft wide roadway

Plan View



INTERIOR ROADWAYS

Recommended Target Illumination Level Requirements: For interior campus roadways with a classification of local/ intermediate:

Luminance = 0.5fc, 6:1ave/min, 10:1 max/min*
Illuminance = 1fc minimum**, 6:1 ave/min*
Veiling Luminance = 0.4:1*

*per Illumination Engineering Society of North America (IESNA) The Lighting Handbook, 9th Edition, Figure 22-8. Measured at grade.
**per UTEP requirements as decided in Transformation project. Measured at grade.

Fixture Head

Material Specifications:

Single Head Roadway Lighting Fixture Assembly

Pole: **Cooper #RTA-6-L** or approved equal.
Round tapered aluminum to provide 24ft mounting height. Provide dark bronze finish. Poles shaft shall be 6" diameter at base and 4" at top and designed for a maximum EPA for location and amenities. (ie: banner arms) Re: detail page 13.

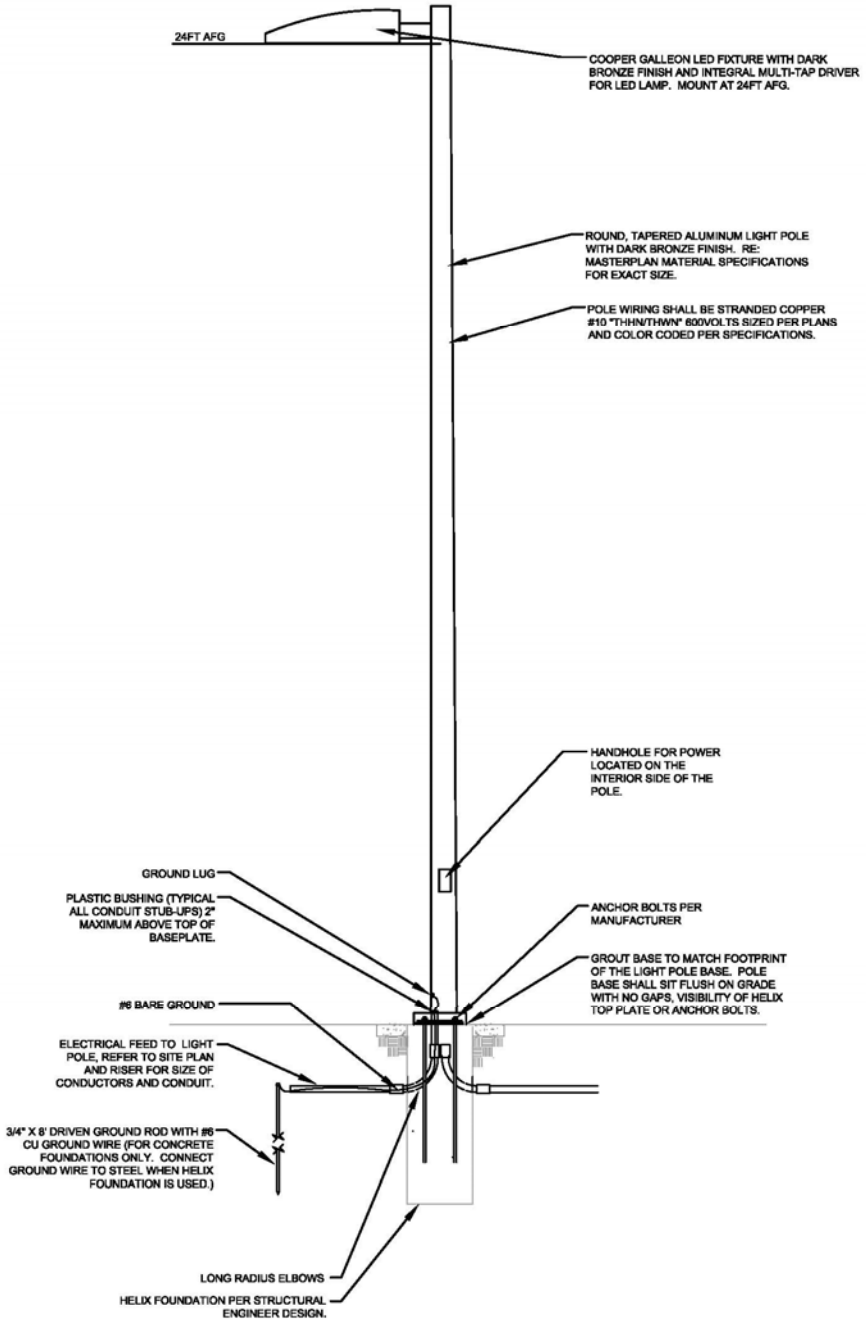
Luminaire: **McGraw Edison Galleon #GLEON-AE-02-LED-E1-SL3-DBZ**or approved equal
Area/site luminaire with high efficiency LEDs rated at 10,500lumens, 107W, 4000K, 70CRI, type 3 distribution with spill control, 7" arm. Driver shall be integral and dimmable driver to support LED lamps and available site voltage. Driver shall be mounted on removable tray for ease of maintenance. Provide dark bronze finish.

Foundation: **Chance/Enterprise #C11232JG3VL-ATKC** or approved equal
Screw anchor, galvanized street light foundation, variable bolt circle, 12" helix, 6.63"x5ft shaft and integral cable retainer. Foundation shall be sized by a structural engineer to support the pole and any pole enhancements (ie: banner arms). Pole base shall completely cover top plate of helix foundation and shall site flush on grade.

Location: Roadway lighting poles shall be in line with trees and shall be centered within the 3ft or 4ft amenity zone designated from back of curb to edge of sidewalk. If no amenity zone is present, poles shall be offset 3ft from back of curb. Re: detail page 12. Spacing shall provide target illumination levels along entire roadway.

Control: Integrate parking lot lighting control into a campus-wide wireless outdoor management system so that luminaires can be quickly maintained upon management system notice of pole failure. On/off, dusk to dawn control.

INTERIOR ROADWAY POLE DETAIL



PEDESTRIAN SIDEWALKS

Sidewalks around Health Sciences & Nursing Building

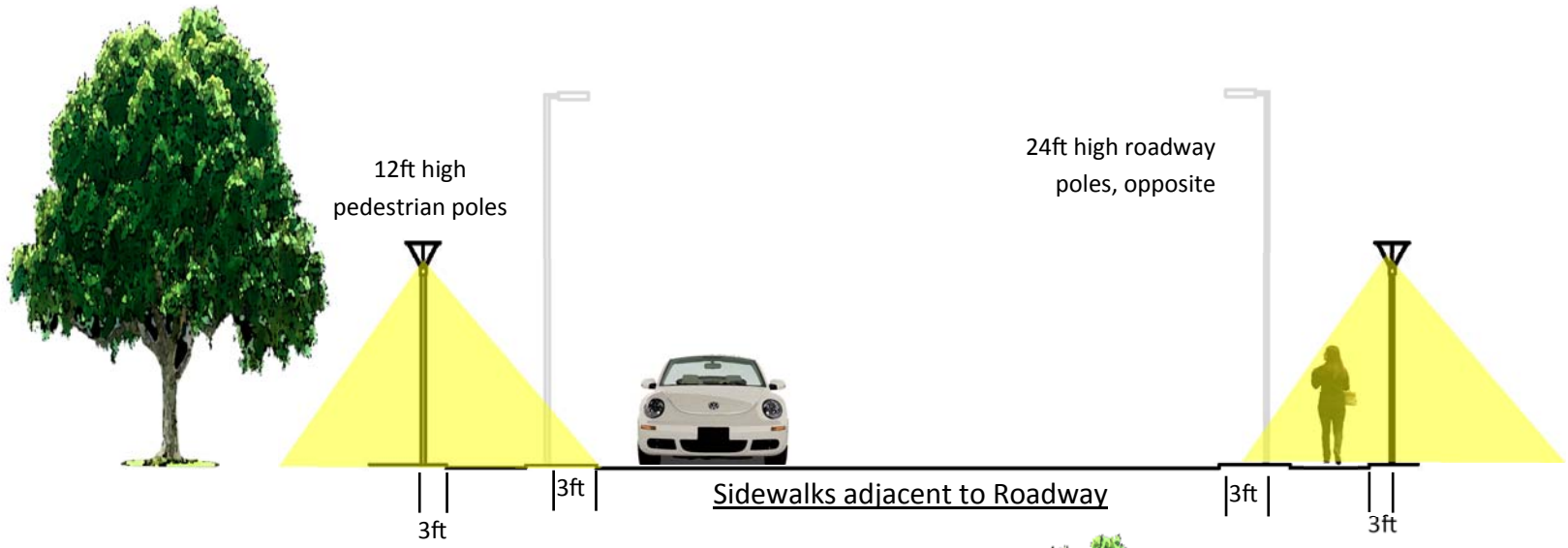
Existing pedestrian luminaires in this area to remain.

Sidewalks around Chemistry & Computer Science Building, Engineering & Science Complex, and Physical Sciences Building

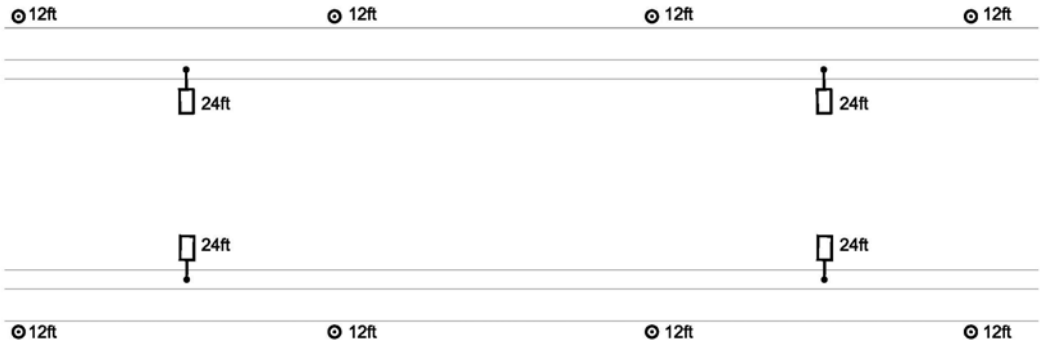
Existing pedestrian luminaires in this area to remain.

Sidewalks between University Library and Business Administration Building

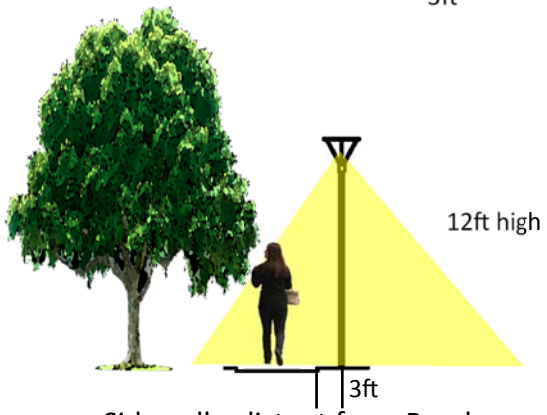
Existing pathway luminaires to be replaced with the new campus pedestrian luminaires.



Sidewalks adjacent to Roadway



Plan View



Sidewalks distant from Roadway

PEDESTRIAN SIDEWALKS

Recommended Target Illumination Level Requirements:

For Campus Sidewalks along roadside (commercial area):	For Campus Sidewalks distant from roadways:
Illuminance Horizontal = 1.0fc min average at grade*	Illuminance Horizontal = 0.5fc min average at grade*
Illuminance Vertical = 2.2fc average at 6' above walkway*	Illuminance Vertical = 0.5fc average at 6' above walkway*

Fixture Head

*per Illumination Engineering Society of North America (IESNA) The Lighting Handbook, 9th Edition, Figure 22-10.

**per UTEP requirements as decided in Transformation project. Measured at grade.

Material Specifications:

Pole Mounted Pedestrian Light Fixture Assembly

Pole: **Architectural Area Lighting #AAL PR44R12-125-PTF-SBC-MDG-ABT** or approved equal

Nominal 4" diameter, round straight pole to provide luminaire height of 14'-0" to the top of the fixture. Poles shall be designed with a maximum EPA for location. Provide satin aluminum, medium gray finish. Re: detail page 17.

Luminaire: **Architectural Area Lighting #SLVT-T5-56LED-3K-700-STND_MNT-MDG-WIRED120-277V** or approved equal

Nominal 25.5" wide by 20" high area luminaire with high efficiency LEDs rated at 127W, 3000K, 70 CRI minimum, Type 5 distribution, full cutoff. Driver shall be integral and dimmable to support LED lamps and available site voltage. Luminaire has top access for driver and emitter maintenance. Provide satin aluminum, medium gray finish.

Foundation: **Chance/Enterprise #**C11232JG3VL-ATKC or approved equal

Screw anchor, galvanized street light foundation, variable bolt circle, 12" helix, 6.63"x5ft shaft and integral cable retainer. Foundation shall be sized by a structural engineer to support the pole and any pole enhancements (ie: banner arms). Pole base shall completely cover top plate of helix foundation and shall site flush on grade.

Location: Pedestrian lighting poles shall be setback 3ft from edge of sidewalk and shall not fall behind a roadway pole. Re: detail page 15. Spacing shall provide target illumination levels along entire pathway.

Controls: Integrate pedestrian lighting control into a campus-wide wireless outdoor management system so that luminaires can be quickly maintained upon management system notice of pole failure. Controls will be fade up/fade down to desired levels.

PEDESTRIAN SIDEWALKS

Lighting Requirements

Sidewalks adjacent to Roadways:

Each new project is required to install pedestrian poles along all sidewalks adjacent to roadways to create a pedestrian zone, enforce a feeling of safety and security while on campus, and maintain campus continuity during the night time hours.

Center to center spacing of pedestrian luminaires shall shall not exceed 50' o.c. along sidewalks adjacent to roadways.

Sidewalks distant from Roadways:

Center to center spacing of pedestrian luminaires shall not exceed 50' o.c. along sidewalks adjacent to roadways.

Areas include:

Sidewalk going from Hawthorne Street to Wiggins Road running between the Administration & Physical Science Building

Add pedestrian lighting to the sidewalk to the north of the parking lot and the ramp leading out of the parking lot.

Sidewalk going from Hawthorne Street to Wiggins Road running between the Science & Engineering Complex & Physical Sciences Building

Existing pathways luminaires between the Science & Engineering Complex & the Physical Sciences Building to remain. Existing "mushroom" luminaires and metal halide shoebox luminaires are to be replaced with the new campus pedestrian luminaires.

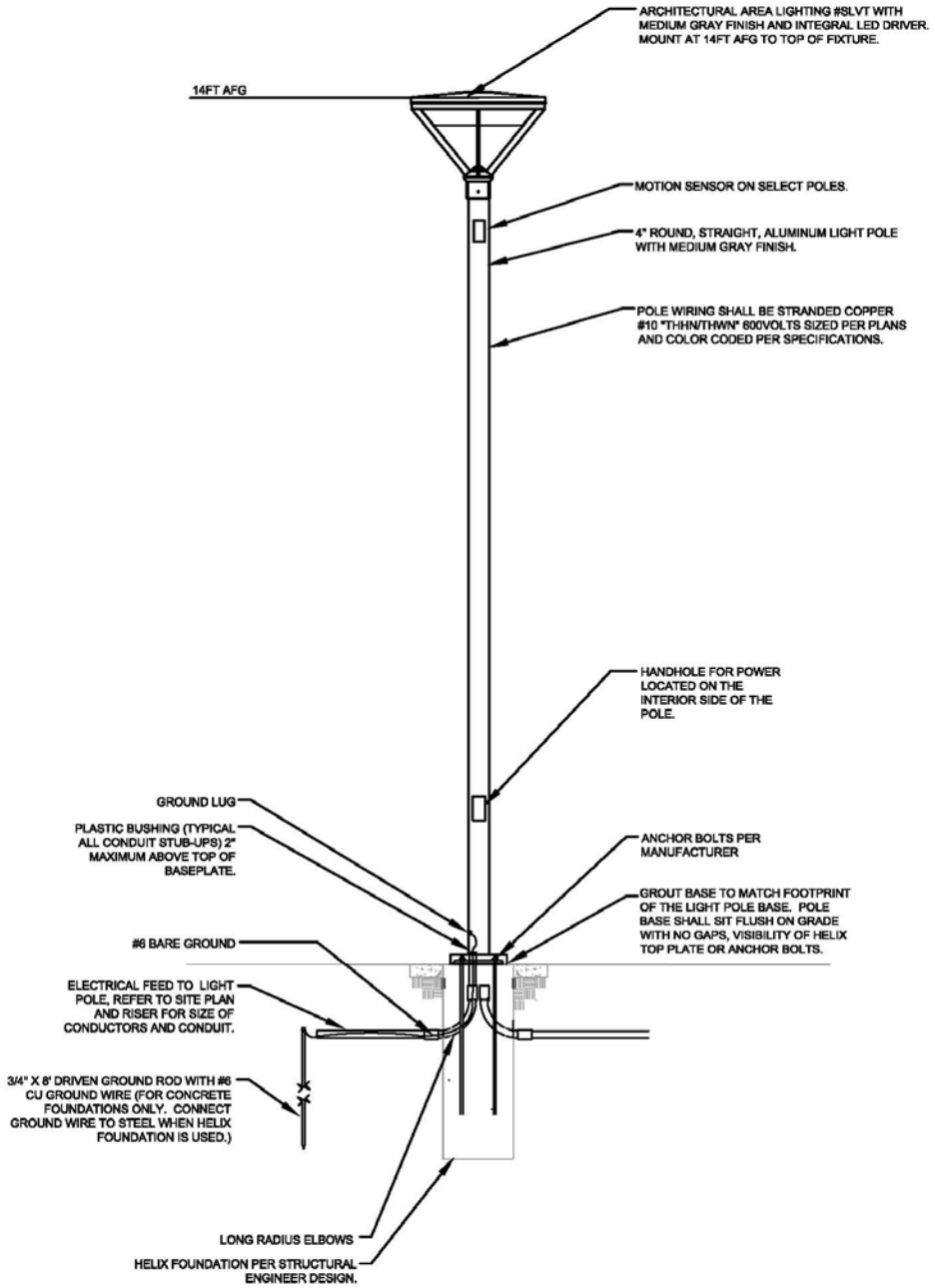
Sidewalks going to Rim Road from Science & Engineering Complex

Existing pathway luminaires to be replaced with the new campus pedestrian luminaires.

Sidewalks going from Wiggins Road to University Avenue running between Centennial Museum & Undergraduate Learning Center

Existing pathway luminaires to be replaced with the new campus pedestrian luminaires.

PEDESTRIAN POLE DETAIL

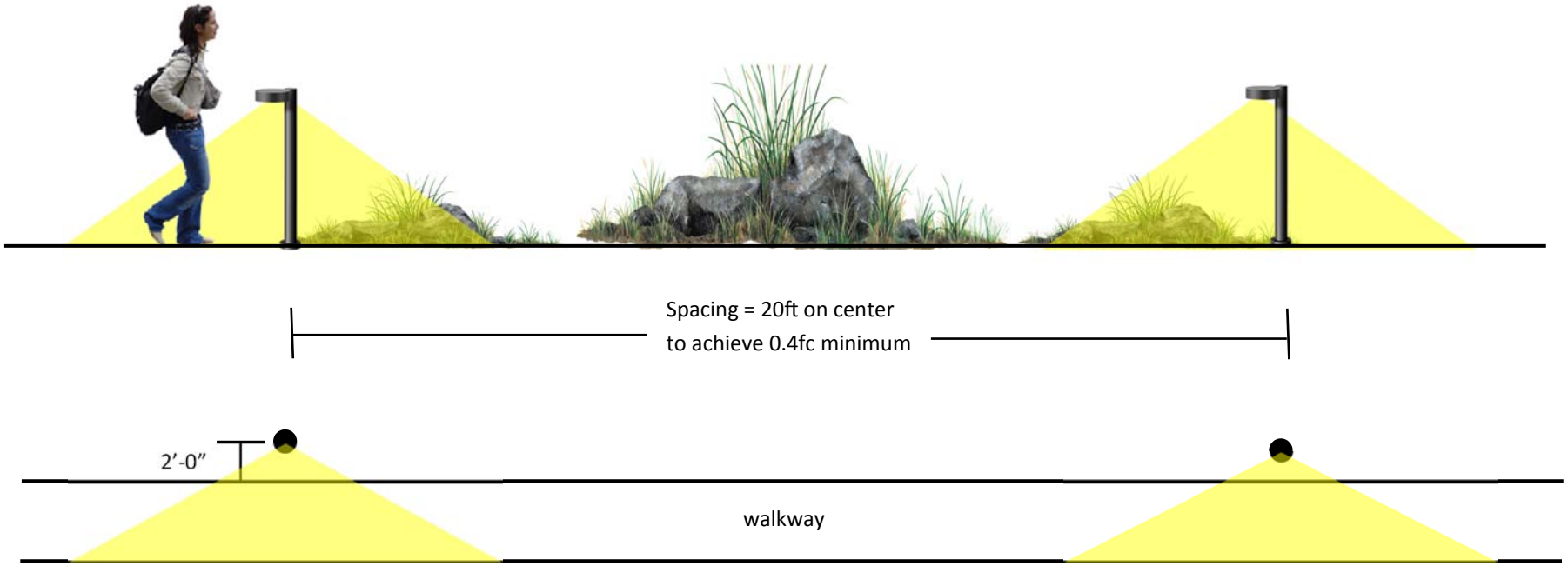


PEDESTRIAN PATHWAYS—MOUNTAIN TRAILS

Lighting Requirements

Each new project is required to install bollards along all mountain trails within project scope. Bollards enforce a feeling of safety and security and serve as markers to define path.

Center to center spacing of bollards shall be no more than 20ft on center.



Mountain trail

PEDESTRIAN PATHWAYS—MOUNTAIN TRAILS

Recommended Target Illumination Level Requirements:

No specific light level requirements. Bollards serve as markers to define paths.

Fixture

Material Specifications:

Bollard

Luminaire: **Ligman Lighting #USR-10477-40W-W30-X-06** or approved equal

Nominal 17.71" wide by 28.54" high area luminaire with high efficiency LEDs rated at 40W, 3000K, 70 CRI minimum, Type 5 distribution, full cutoff. Driver shall be integral and dimmable to support LED lamps and available site voltage. Luminaire has top access for driver and emitter maintenance. Provide bronze finish. Re: detail page 20

Foundation: Provide concrete foundation per manufacturer's instructions and verify with structural engineer prior to installation.

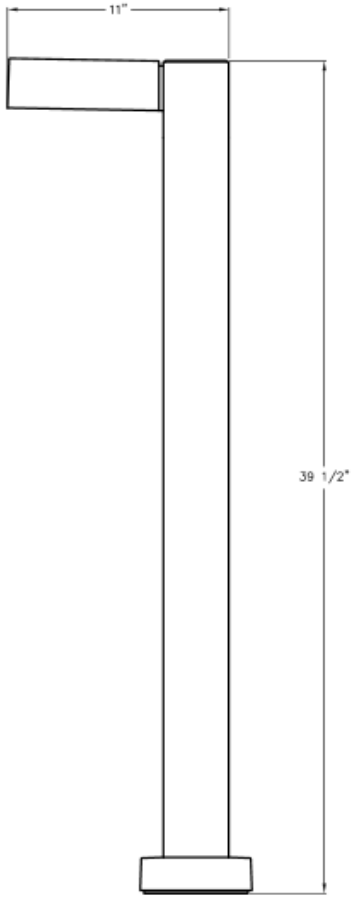
Location: Pedestrian lighting poles shall be setback 2ft from edge of mountain trail per detail page 19.

Controls: Integrate pedestrian lighting control into a campus-wide wireless outdoor management system so that luminaires can be quickly maintained upon management system notice of pole failure. Controls will be fade up/fade down to desired levels.

BOLLARD DETAIL

Note:

Install bollard per manufacturer's installation instructions.



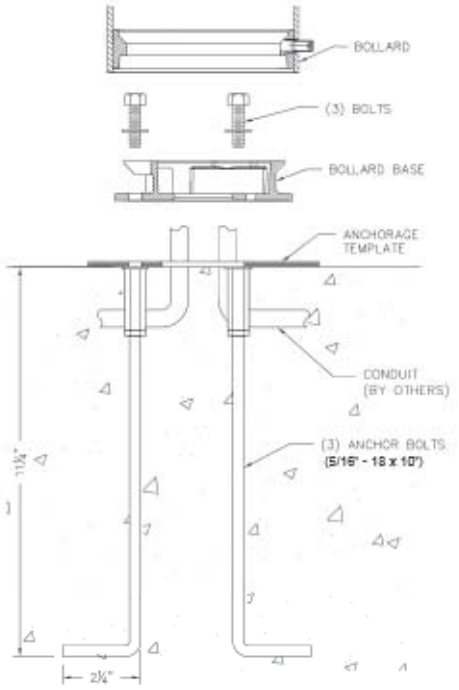
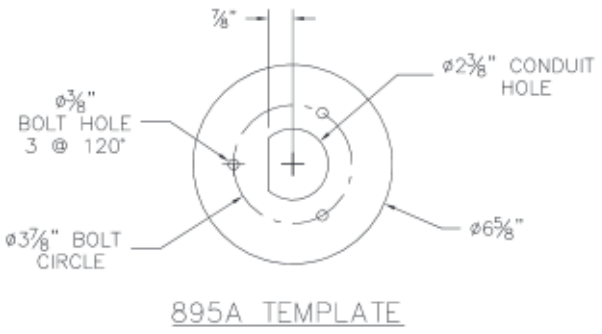


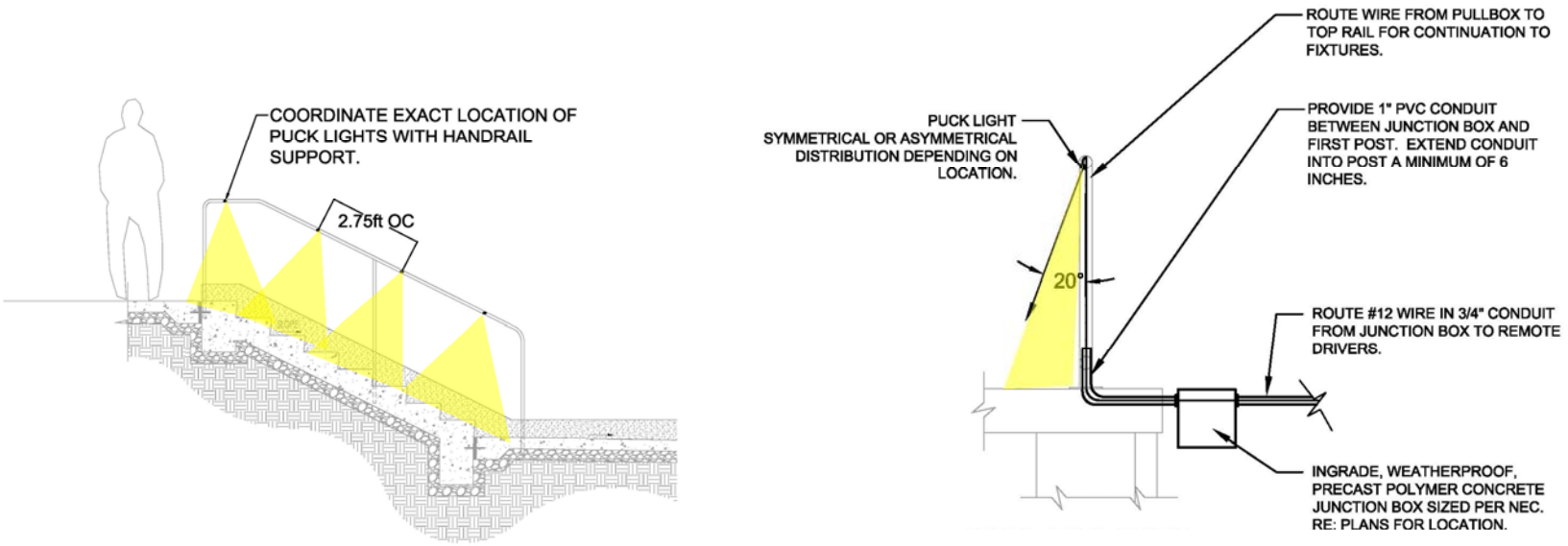
Fig-1:



STAIRS AND RAMPS

Lighting Requirements

Placement of handrail lighting must be designed to provide required illumination levels for stairs. For stairs with side rails only, asymmetric distribution luminaires shall be provided. For stairs with side and center handrails, asymmetric distribution luminaires shall be provided at sides with symmetric distribution luminaires within the center handrail. Electrical contractor shall install handrail lighting with equipment acquired through manufacturer and per manufacturer installation instructions.



Typical Handrail—asymmetric

STAIRS & RAMPS

Recommended Target Illumination Level Requirements:

Illuminance Horizontal = 1.0fc min and loss of single light shall result in maintained minimum of 0.2fc or greater*

*per NFPA 101 Section 7.8.1.2, MFPA 101 Section 7.8.1.4, and IBC Section 1006.2.

Handrail Puck Lights

Material Specifications:

Exterior Stairs and Exterior Ramps : Puck lighting in handrail

Puck Lighting: (Center Rail) **Planet Lighting #HLS VS HW CF WW 500ma** or approved equal
Nominal 15.9mm diameter puck light with vertical down symmetric distribution, curved face, and heavy wall at 1.55W, 3000K. Driver shall be dimmable and integral to railing and shall support LED lamps and available site voltage.

Puck Lighting: (Side Rails) **Planet Lighting #HLS VA HW CF WW 500ma** or approved equal
Nominal 15.9mm diameter puck light with vertical down asymmetric distribution, curved face, and heavy wall at 1.55W, 3000K. Driver shall be dimmable and integral to railing and shall support LED lamps and available site voltage.

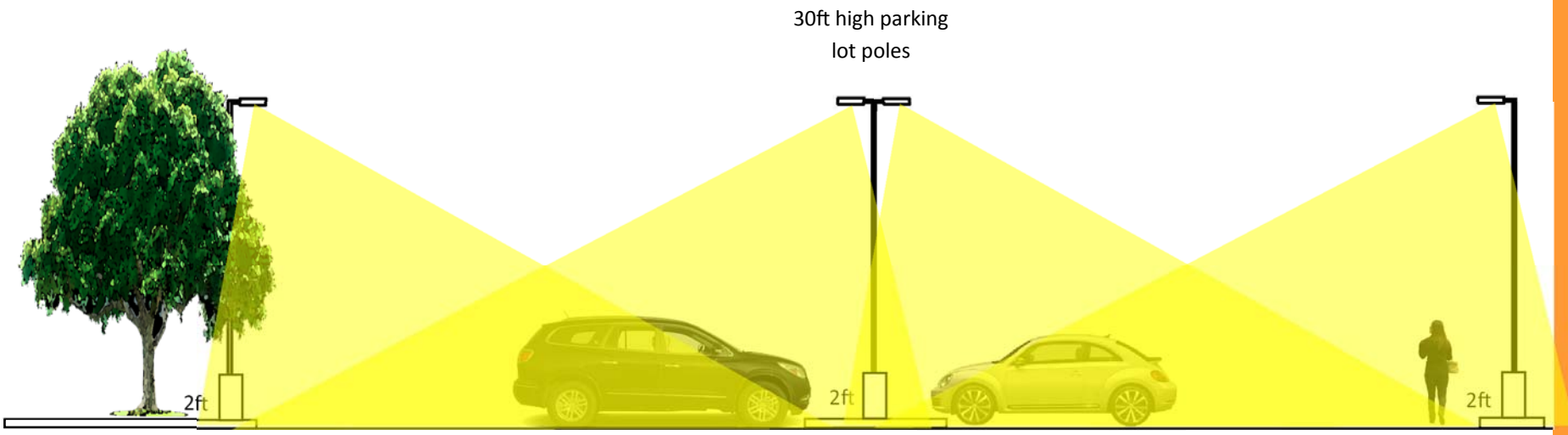
Location: Puck lights shall be spaced no greater than 2.75ft on center. Care shall be taken to locate pucks between vertical posts of railing where ever possible per detail page 22.

Controls: Integrate pedestrian lighting control into a campus-wide wireless outdoor management system so that luminaires can be quickly maintained upon management system notice of pole failure. Motion detector to initiate soft fade up/fade down late at night.

PARKING LOTS

Lighting Requirements

Placement of parking lot lighting must be designed to provide required illumination levels for parking lots. Perimeter poles shall have single luminaires while central poles shall be designed with dual luminaires.



Parking Lots

PARKING LOTS

PARKING LOT

Luminaire Schedule						
Symbol	Qty	Label	Lum. Watts	Total Lamp Lumens	LLF	Description
	18	OA2-4	421	N.A.	0.765	MCGRAW EDISON_GLEON-AE-08-LED-E1-SL4
	3	OA2-3	421	N.A.	0.765	MCGRAW EDISON_GLEON-AE-08-LED-E1-SL3

LPD Area Summary			
Label	Area	Total Watts	LPD
Parking	185574	8841	0.048

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
Parking	Illuminance	Fc	3.08	8.5	1.0	3.08	8.50

*FOR INFORMATION ONLY. Calculations shall be performed for each specific project to meet requirements within this master plan.

PARKING LOTS

Recommended Target Illumination Level Requirements:

PARKING LOTS: For surface parking lots at grade and on garage structure roof, ENHANCED SECURITY application:

Horizonatal Illuminance = 0.5fc minimum on parking surface, 15:1 max/min*

Vertical Illuminance = .25fc at 5ft above parking surface at point of lowest horizontal illuminance*

*per Illumination Engineering Society of North America (IESNA) The Lighting Handbook, 9th Edition.

Fixture Head
single or double as needed

Material Specifications:

Single Headed or Dual Headed Area Lighting Fixture Assembly

Pole: **Cooper #RTA-7-L** or approved equal.
Round tapered aluminum on 2-'0" high concrete foundation to provide overall 20ft mounting height. Provide dark bronze finish. Pole shaft shall be 7" diameter at base and 4" at top and designed for a maximum EPA for location and amenities. (ie: banner arms). Re: detail page 25.

Luminaire: **McGraw Edison Galleon #GLEON-AE-08-LED-E1-SL3 or SL4-DBZ** or approved equal

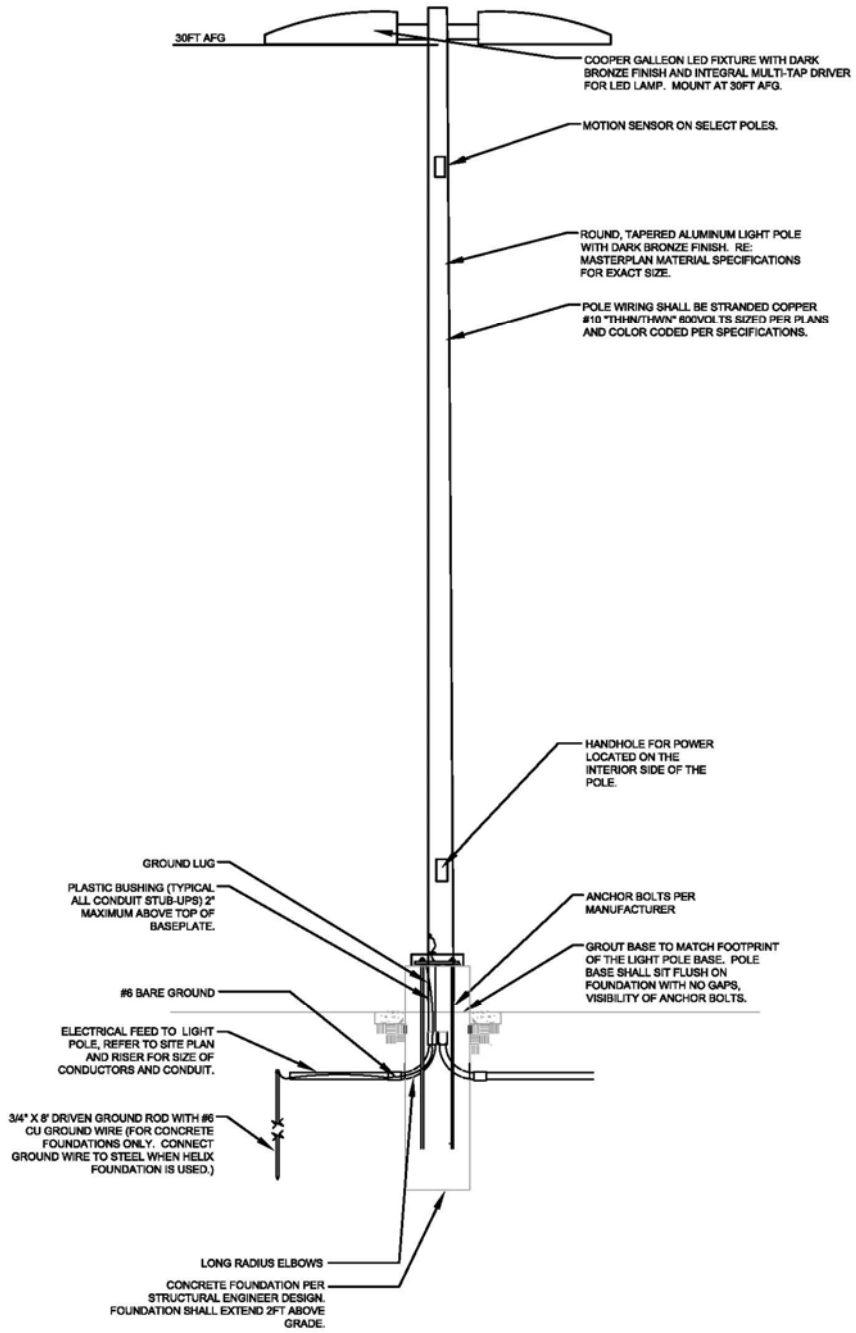
(1) or (2) Area/site luminaires, each with high efficiency LEDs rated at 41,128 (SL3) and 39,078 (SL4) lumens, 421W, 4000K, 70CRI, type 3 or 4 distribution with spill control, 7" arm. Driver shall be integral and dimmable to support LED lamps and available site voltage. Driver shall be mounted on removable tray for ease of maintenance. Provide dark bronze finish.

Foundation: Concrete. Foundation shall be sized by a structural engineer to support the pole and any pole enhancements (ie: banner arms). Foundation shall extend 2'-0" above grade to reduce pole damage from cars.

Location: Parking lot lighting poles shall be offset 3ft from back of curb and centered between parking stalls. Spacing shall provide target illumination levels over entire parking lot per detail page 24.

Control: Integrate parking lot lighting control into a campus-wide wireless outdoor management system so that luminaires can be quickly maintained upon management system notice of pole failure. Motion detector to initiate soft fade up/fade down.

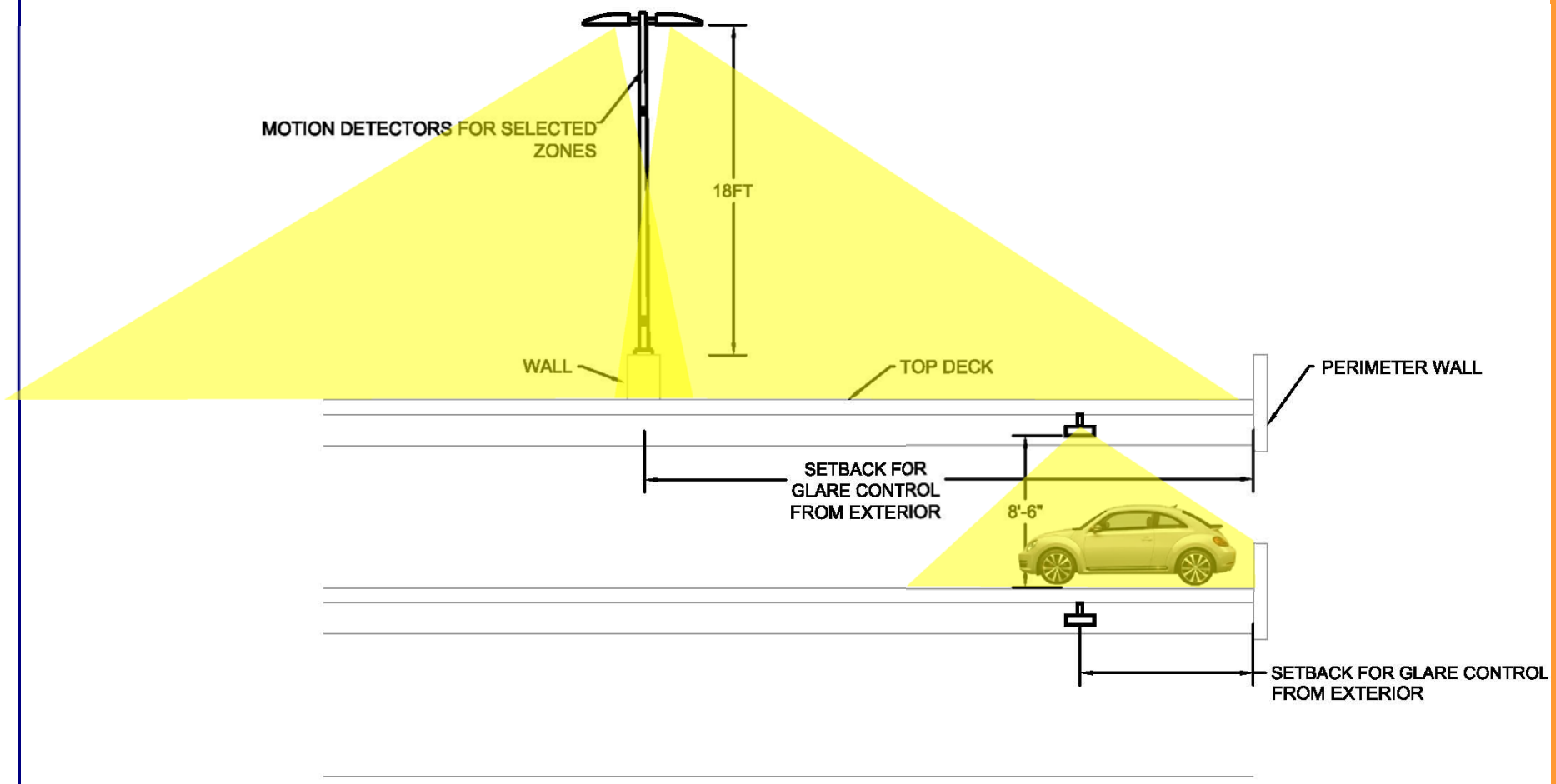
PARKING LOT POLE DETAIL



PARKING GARAGES

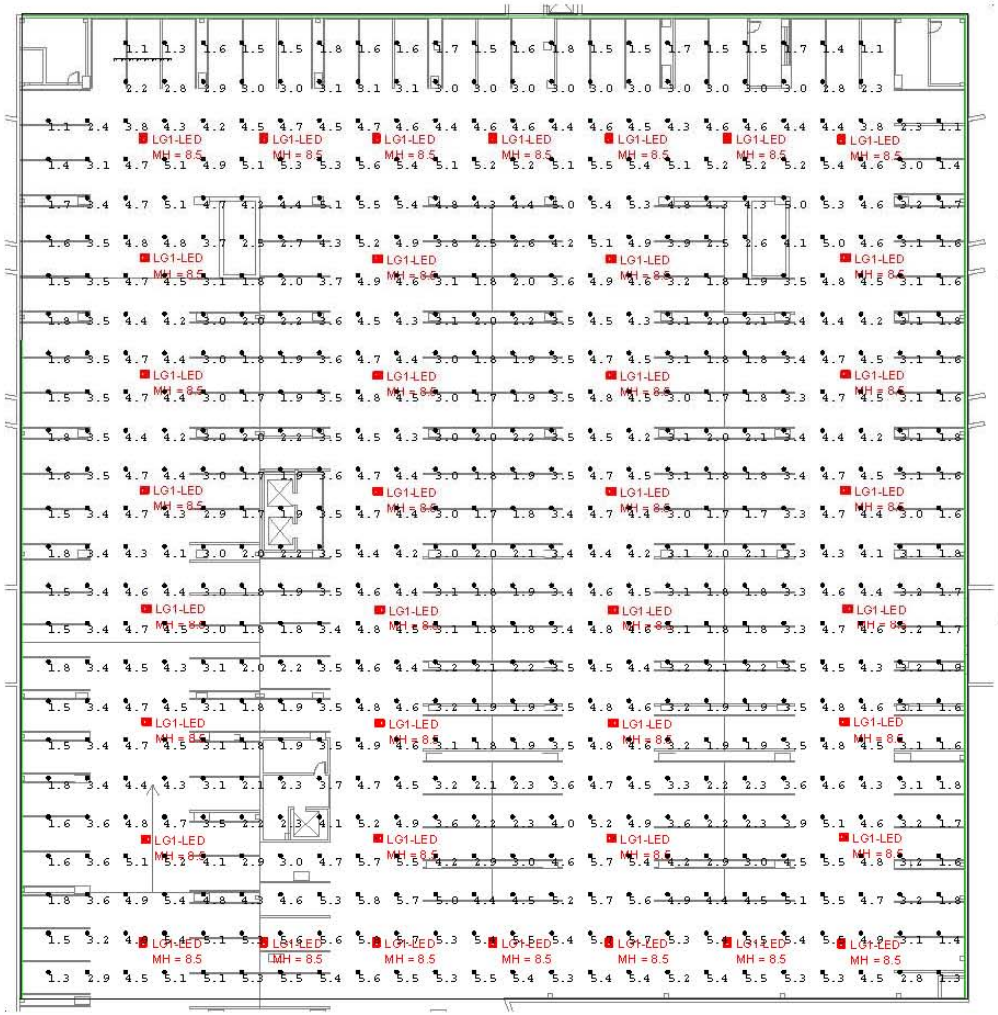
Lighting Requirements

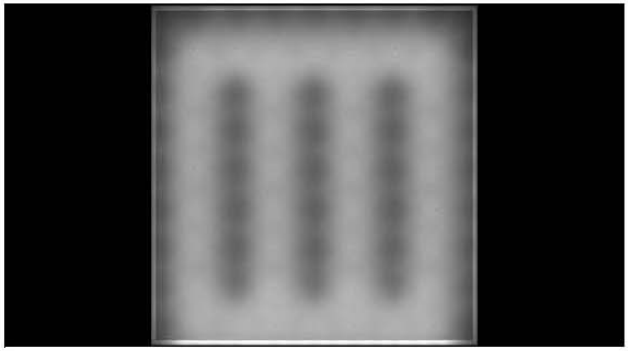
Placement of parking garage lighting must be designed to provide required illumination levels for parking garages and parking decks and shall be located away from perimeter as to provide glare control from exterior of garage.



Typical Garage Section

PARKING GARAGES





SAMPLE PARKING GARAGE CALCULATIONS - LED LIGHTING

Luminaire Schedule						
Symbol	Qty	Label	Lum. Watts	Total Lamp Lumens	LLF	Description
	38	LG1-LED	92	N.A.	0.729	LITHONIA_DSXPGT LED 40C 700 30K T5W MVOLT

LPD Area Summary			
Label	Area	Total Watts	LPD
LPD Area	62204	3496	0.056

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
Garage_Floor	Illuminance	Fc	3.55	5.8	1.1	3.23	5.27
Vertical at lowest horiz	Illuminance	Fc	0.86	1.1	0.8	1.08	1.38

NOTE: Reference typical parking lot layout for garage deck layout.

*FOR INFORMATION ONLY. Calculations shall be performed for each specific project to meet requirements within this master plan.

PARKING GARAGES

Recommended Target Illumination Level Requirements:

PARKING GARAGES:

Horizontal Illuminance = 1fc minimum, 10:1 max/min, 0.5 minimum fc vertical*

Ramps (Day) = 2fc minimum, 10:1 max/min, 1.0 minimum fc vertical*

Ramps (Night) = 1fc minimum, 10:1 max/min, 0.5 minimum fc vertical*

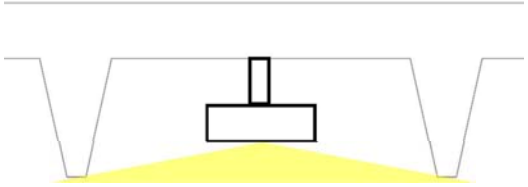
Entrance (Day) = 50fc minimum, 10:1 max/min, 25 minimum fc vertical*

Entrance (Night) 1fc minimum, 10:1 max/min, 0.5 minimum fc vertical

Stairways = 2fc minimum, 10:1 max/min, 1.0 minimum fc vertical*

*per Illumination Engineering Society of North America (IESNA) The Lighting Handbook, 9th Edition.

Luminaire



20degree minimum visual cutoff

Material Specifications:

Luminaire—Garage: **Lithonia D-Series Tandem #DSXPGT LED 40C 700ma 30K T5W MVOLT DDBXD** or approved equal

Nominal 17.75" x19.5" LED luminaire, surface or pendant mounted to 8'-6" AFF, with high efficiency LEDs rated at 6803 lumens, 3000K, 80CRI, type V wide distribution. Lamp hours approximately: 100,000hrs. Driver shall be integral and dimmable to support LED lamps and available site voltage. Provide dark bronze finish.

Luminaire—Top Deck: **McGraw Edison Galleon #GLEON-AE-08-LED-E1-SL3 or SL4-DBZ** or approved equal

(1) or (2) Area/site luminaires, each with high efficiency LEDs rated at 41,128 (SL3) and 39,078 (SL4) lumens, 421W, 4000K, 70CRI, type 3 or 4 distribution with spill control, 7" arm. Driver shall be integral and dimmable to support LED lamps and available site voltage. Driver shall be mounted on removable tray for ease of maintenance. Provide dark bronze finish.

Location: Spacing shall provide target illumination levels throughout entire garage and top deck. Re: detail page 28.

Control: Integrate parking garage lighting control into a campus-wide wireless outdoor management system with motion detectors so that specified zones can fade up/fade down and can be quickly maintained upon management system notice of luminaire failure.

BUILDING MOUNTED SECURITY—WALL PACKS

Wallpack

Recommended Target Illumination Level Requirements:

Illuminance Horizontal = 1.0fc min and loss of single light shall result in maintained minimum of 0.2fc or greater*

*per NFPA 101 Section 7.8.1.2, MFPA 101 Section 7.8.1.4, and IBC Section 1006.2.

Material Specifications:

Exterior Walking Surface at Exit Discharge: Wall Mounted Light Fixture Assembly

Luminaire: **Lumark #XTOR2A-N** or approved equal
Nominal 5.75” x 6.75” LED luminaire, wall mounted to 8’-6” AFF, with high efficiency LEDs rated 21W, 3500K, and 80CRI. Driver shall be integral and dimmable to support LED lamps and available site voltage. Provide dark bronze finish. Provide dual LED luminaire where required to meet egress illumination requirements.

Controls: Integrate pedestrian lighting control into a campus-wide wireless outdoor management system so that luminaires can be quickly maintained upon management system notice of pole failure. Dusk to remotely scheduled off plus motion sensor for assigned zones fade up/ fade down.

SITE ACCENT LUMINAIRES

While all accent pieces for the campus require independent and thoughtful design, lighting design should follow the following guidelines:

- All luminaires shall had LED sources.
- All luminaires shall be capable of precise beam control.
- Selection of color temperature shall coordinate with accent piece.
- Selection of sizes and power to be used at all distances.

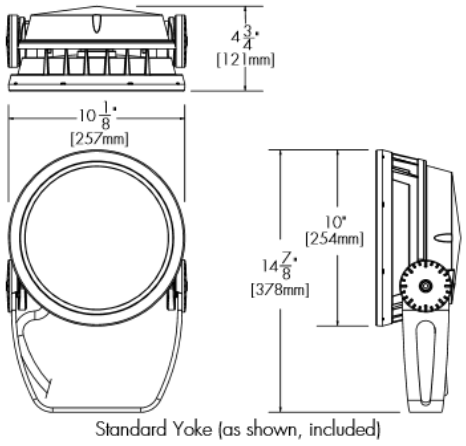
Discreet art accent floods

Material Specifications:

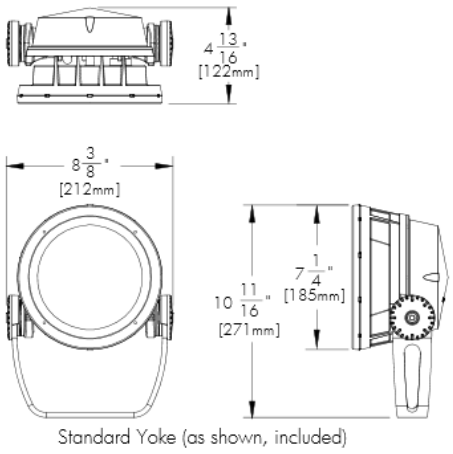
Luminaire: **Lumenpulse Lumenbeam** or approved equal

LED accent luminaire. Specifications shall be determined for each specific application. Luminaire shall be able to provide various beam optics and color temperatures. Provide dark bronze finish.

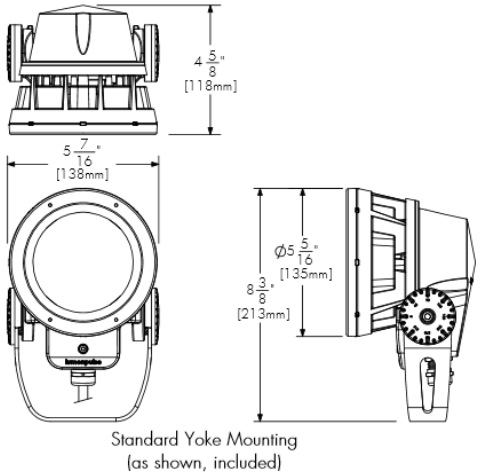
Control: Integrate site accent lighting control into a campus-wide wireless outdoor management system so that luminaires can be quickly maintained upon management system notice of failure. Motion detector to initiate soft fade up/fade down.



LUMENPULSE
LUMENBEAM LARGE



LUMENPULSE
LUMENBEAM MEDIUM



LUMENPULSE
LUMENBEAM SMALL

CONTROLS

Sculpture
Digital Control
Motion sensors—fade/up, fade/down

Building Accent
Photocell on/Timeclock off

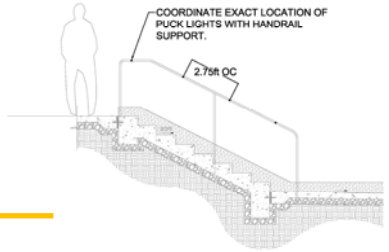
Campus Identity/Mountain
Photocell on/Timeclock off

Sidewalks
Digital Control
Motion sensors—fade/up, fade/down

Mountain Trails
Digital Control
Motion sensors—fade/up, fade/down

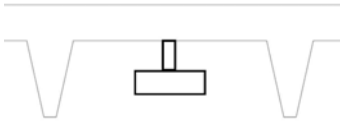
Interior Roadways
Photocell on/off

Network Lighting Control System



Stairs/Ramps
Digital Control
Motion sensors—fade/up, fade/down

Building Mounted Security
Digital Control
Motion sensors—fade/up, fade/down
Emergency system override at loss of power



Parking Garages
Digital dimming to 30% then full on when motion is detected through network control system.

Perimeter Roadways
Photocell control

CONTROLS

Control Goals + Requirements

- Conformance with the realization that we have to **Save Energy** as a world wide effort.
- **Reduce Energy Consumption** by the campus up to 80% for digital control areas
- Refine the campus identity to be a very safe but **Quieter Visual Statement** during times of minimal use
- **Respect** human desire to have some time during the night that gives us reprieve from Light so that we can **Experience Darkness**
- **Acknowledge Human Need** to have times of darkness to **Reset Our Body Clocks** and allow for better sleep
- Adhere to current efforts to **Reduce Light Pollution** and be **Night Sky Compliant** by reducing the times fixtures are "on" thus allowing viewing of the heavens
- Achieve **Energy Savings.**
- Showcase UTEP as an **energy conscious** campus.

*Lighting goals expressed above can be accomplished with a simple and quick "on/off" rapid response to orders. Pressing for a more sophisticated central control room allows the campus to tailor the control to "dim up/dim down" so that logical groups of fixtures are together in a soft and graceful dimming action which allows graceful change over 3 to 6 seconds. Dimming is the method that is friendly to students on campus and exhibits desires to make their campus experience even more beautiful without sacrificing safety. Dimming follows human eye response which is gradual.

Material Specifications:

Control System: **Acuity Brands: Roam, Cooper Lighting: LumaWatt** or approved equal

Campus-wide, wireless lighting control system shall provide the following:

A. Continuously monitor equipment malfunctions.

B. Group and schedule building, feature, and site lighting.

C. Enable scheduled on/off and dimming control for groups of fixtures to minimize cost.

D. Enable dimming control for unoccupied spaces.

E. Provide accurate measurement of operating hours and power from a single, web-based interface with customized reports.

F. Generate information for energy analysis, energy savings, warranty enforcement.

G. Deliver billable quality energy data.

Design Criteria for Energy-Efficient Lighting Systems

The objective of this document is to create a standard of increased energy-efficiency and cost effectiveness for multiple interior lighting applications.

NEW CONSTRUCTION AND RETROFITS

A. Average lighting levels and measurements must comply with the most current Illuminating Engineering Society of North America (IESNA) recommended practices.
B. Final light levels must meet the requirements of the end user and meet the satisfaction of all approving authorities having jurisdiction for specific applications.
C. The Engineer, Contractor or Supplier must confirm that the lighting levels will meet the illumination range stated in this document, or most current IESNA recommendations, for the applicable space type.
D. Retrofit designs should consider the recommended practice of:
    1. Reducing the number of lamps in the retrofit luminaire
    2. Conversions from 2-lamp, 8' T12 high output lamps to 2-lamp, 4' high-performance (or "super) T8 lamps with "L" (Low) Ballast Factor ballasts

I. LINEAR FLUORESCENT T8 LIGHTING SYSTEMS

A. 4-FT LAMPS
    1. For all possible fluorescent lighting applications, 4-ft high-performance (or "super") T8 fixtures to be chosen for maximum efficiency. T8 lamps and ballasts to meet the CEE High Performance criteria (www.cee1.org). High-performance lamps to be chosen as one of the following wattage levels: 32W, 28W, or 25W.
    2. 32W lamps to be CEE-Qualifying High-Performance 4-ft T8 lamps installed in conjunction with CEE-Qualifying High-Performance ballasts. A qualifying 32W lamp is rated at ≥ 3,100 initial lumens, ≥ 80 CRI, ≥ 24,000-hour life (at 3 hours per start), and ≥ 94% lumen maintenance.
    3. 28W lamps to be CEE-Qualifying Reduced-Wattage 4-ft T8 lamps, installed in conjunction with CEE-Qualifying Reduced-Wattage ballasts. A qualifying 28W lamp is rated at ≥ 2,585 initial lumens, ≥ 80 CRI, ≥ 20,000-hour life (at 3 hours per start), and ≥ 94% lumen maintenance.
    4. 25W lamps to be CEE-Qualifying Reduced-Wattage 4-ft T8 lamps, installed in conjunction with CEE-Qualifying Reduced-Wattage ballasts. A qualifying 25W lamp is rated at ≥ 2,400 initial lumens, ≥ 80 CRI, ≥ 20,000-hour life (at 3 hours per start), and ≥ 94% lumen maintenance.
    5. Ballasts for all 4-ft T8 fluorescent lighting to be CEE-Qualifying High Performance or Reduced-Wattage Ballasts (www.cee1.org).

B. LAMPS (all other types) – Prior written approval must be obtained from the owner for use/specification of any lamp type other than 4-ft. T8 as listed above.
    1. 2' lamps to be F17T8, nominal lamp of 17 watts or lower (high efficiency, premium lamps)
    2. 3' lamps to be F25T8, nominal lamp of 25 watts or lower (high efficiency, premium lamps)
    3. Color Rendering Index (CRI) to be a minimum of 80. For color critical applications, Color Rendering Index (CRI) to be a minimum of 86.
    4. Minimum lamp life for all 2ft, 3ft and 4ft T8 lamps to be a minimum of 20,000 hours, @ 3 hours per start, but recommended to be 24,000

II. LINEAR FLUORESCENT T5 LIGHTING SYSTEMS

A. T5HO LAMPS - 49W T5HO lamps are preferred over 54W T5HO in most high bay applications for increased energy savings with comparable lumen output.

B. T5 LAMPS (2', 3', 4') - Standard output T5 lamps are generally not recommended. Instead, "Super" T8 lamps are recommended over T5 lamps in space applications such as classrooms, offices, hallways, etc. for the following reasons:

1. Superior lamp life
2. Comparable lumen output
3. Superior energy efficiency
4. Materials cost – first cost and maintenance costs
5. Compatibility for lamp/ballast retrofit applications of T12 or older T8 systems without requiring new fixture installation.

III. HIGH INTENSITY DISCHARGE LIGHTING

High intensity discharge (HID) lamps are rarely appropriate for indoor use due to their low CRI, high energy usage and rated life expectancy. Because HID fixtures can be replaced by more-efficient high bay fluorescent (HBF) fixtures, induction lamps or compact fluorescent lamps, HID lamps should not be used for indoor lighting.

IV. HIGH BAY FLUORESCENT LIGHTING

High bay fluorescent (HBF) fixtures are to be installed in areas with high ceilings such as gymnasiums. The three primary types of HBF fixtures are as follows; refer to lamp criteria above:

1. 6-lamp 4-ft T8 fixture (with ballast factor of ≥ 1.0) – typical 400W HID replacement
2. 4-lamp 4-ft T5HO fixture – typical 400W HID replacement
3. 6-lamp 4-ft T5HO fixture – typical > 400W HID replacement

INCANDESCENT LIGHT BULBS	MINIMUM LIGHT OUTPUT	COMMON ENERGY STAR QUALIFIED LIGHT BULBS
WATTS	LUMENS	WATTS
40	450	9 - 13
60	800	13 - 15
75	1,100	18 - 25
100	1,600	23 - 30
150	2,600	30 - 52

VI. LIGHTING-LEVEL REQUIREMENTS

Lighting to be designed such that illumination levels fall within a given range, according to the space type. Average lighting levels are not to fall below the range's lower limit and not to exceed the range's upper limit. This is to assure all spaces are adequately lit but are not over-lit. The ranges apply to all working areas in a space, and should be sustained throughout lamp life. The following foot-candle (fc) ranges are derived primarily from IESNA recommended levels and NCAA gymnasium lighting best practices.

Space Type *	**Lighting Level Range (fc)**
Classroom	30 – 50
Science Lab	50 – 70
Library	30 – 50
Office	30 – 50
Computer Lab	3 – 30
Corridor / Common Space	10 – 20
Gym (recreational)	30 – 50
Gym (standard intercollegiate)	50 – 100
Gym (NCAA broadcasting)	100 – 150
Cafeteria	10 – 20
Kitchen	30 – 50
Pool	5 – 50
Parking Garage	10 – 20
Restroom	5 – 15
Mechanical Room	20 – 50

* IESNA recommended lighting levels to be used for other space-types not listed above.

VII. EXTERIOR LIGHTING – No Sodium lamps will be allowed

A. PATH/STEP – All path lighting to be as described. No encased step lighting will be permitted without prior written authorization.
B. PEDESTRIAN (3'-0" TO 15'-0") – All pedestrian lighting to be
C. STREET (15'-0" to 30'-0") – All street lighting to be _(250W Metal halide, 400W Metal Halide, or equivalent induction lamp).
D. HIGH MAST (30'-0" and up) – All high mast lighting to be ___.

VIII. LIGHTING CONTROLS

A. INTERIOR - All interior spaces to be controlled via dual technology (infrared & ultrasonic) occupancy sensors for energy conservation. In areas needing a minimum level of security or "stumble lighting", provide occasional full light fixtures or select ½ of the lamps within necessary light fixtures to be controlled by a "hot" circuit with the remaining fixtures or lamps controlled by the occupancy sensor.
B. EXTERIOR - Exterior light fixtures to be controlled via photocell for energy conservation. Provide security lighting connected to a "hot" circuit as needed for security camera operation.

IX. DESIGN GUIDELINES FOR COMMON SPACE-TYPES

Application	IESNA Recommended Light Levels (fc)	Typical Standard LPD (W/ft^2)	Mid-Efficiency LPD (W/ft^2)	High-Efficiency LPD (W/ft^2)	Estimated SCORE Incentive per 1,000 ft^2 [a]			Estimated Annual Electricity Cost Savings per 1,000 ft^2 ($ year)[b]	
					Standard Design	Mid-Eff. Design	High-Eff. Design	Mid-Efficiency Design above Standard Design	High-Efficiency Design above Standard Design
Classroom	30 - 50	1.1 - 1.5	0.9 - 1.1	0.6 - 0.9	$0 - $60	$60 - $80	$80 - $120	$0 - $60	$20 - $90
Lab	50 - 70	1.4 - 1.6	1.1 - 1.4	0.7 - 1.1	$0 - $10	$10 - $50	$50 - $110	$0 - $50	$30 - $90
Office	30 - 50	1.2 - 1.8	0.9 - 1.2	0.6 - 0.9	$0 - $40	$40 - $80	$80 - $120	$0 - $90	$30 - $110
Computer Lab	3 - 30	1.0 - 1.6	0.6 - 1.0	0.4 - 0.6	$0 - $70	$70 - $120	$120 - $150	$0 - $100	$40 - $110
Corridor/Common Space	10 - 20	0.8 - 1.0	0.6 - 0.8	0.4 - 0.6	$70 - $100	$100 - $120	$120 - $150	$0 - $40	$20 - $60
Library General Space	30 - 50	1.9 - 2.7	1.1 - 1.9	0.8 - 1.1	$0	$0 - $50	$50 - $100	$0 - $150	$80 - $180
Parking Garage	10 - 20	0.25 - 0.3	0.2 - 0.25	0.15 - 0.2	$0 - $10	$10 - $20	$20 - $30	$0 - $30	$20 - $50
Cafeteria	10 - 20	1.2 - 1.8	0.6 - 1.2	0.4 - 0.6	$0 - $40	$40 - $120	$120 - $150	$0 - $110	$60 - $130
Kitchen	30 - 50	1.1 - 1.9	0.9 - 1.1	0.7 - 0.9	$0 - $50	$50 - $80	$80 - $110	$0 - $90	$20 - $110
Gymnasium (non-competition)	5 - 30	1.8 - 2.3	0.8 - 1.8	0.4 - 0.8	$0	$0 - $100	$100 - $150	$0 - $140	$90 - $180
Gymnasium (competition)	50 - 100	1.6 - 2.6	1.3 - 1.6	0.8 - 1.3	$0	$0 - $30	$30 - $100	$0 - $120	$30 - $170
Pool	15 - 50	0.8 - 1.1	0.6 - 0.8	0.4 - 0.6	$60 - $100	$100 - $120	$120 - $150	$0 - $50	$20 - $70

[a] The SCORE incentive is $185 per kW saved.

[b] The estimated annual electricity cost savings is based on UTEP's electric rate of $0.04338/kWh.

The following table summarizes the lighting power densities found in standard design practice for various space types. Also presented are the IESNA recommended lighting level ranges for the space types, which should be followed to maintain comfortable lighting levels and energy-efficient lighting design. When lighting designs meet such lighting levels and energy-efficient lighting technology is used, better lighting power densities will be achieved, as indicated by "Mid-Efficiency LPD" and "High-Efficiency LPD" values in the table. The increased SCORE incentive and annual electricity cost savings for these higher-efficiency designs are presented in the table as well.