JAMES KLINE
SUNY CORTLAND
STUDENT LIFE CENTER
Cortland, NY

The Pennsylvania State University

Dep't of Architectural Engineering

An Architectural Engineering Study with Special Focus on Lighting and Electrical Design

Lighting & Electrical Option: Spring 2014

Faculty Advisor: Dr. Kevin Houser

STUDENT LIFE CENTER
SUNY CORTLAND
Cortland, NY

General Building Data

Building Name	Student Life Center
Location and Site	SUNY Cortland Campus, Cortland, NY
Building Occupant Name	SUNY Students and Staff
Occupancy or function types	Student Physical Training & Dining, Staff Offices
Size	148,329 SF
Number of stories above grade	2
Dates of Construction	November 2012 – August 2014
Cost information	$51.2 Million Overall Project cost
Project Delivery Method	Design-Bid-Build

Primary project team

Owner	The State University of New York
Architect	H2L2 Architects/Planners LLC
Associate Architects	Hastings + Chivetta Architects, Inc.
Structural and Civil Engineers	KS Engineers
Mechanical, Electrical, Plumbing	WSP Flack + Kurtz
Audio-Visual & Security Engineers	WSP Flack + Kurtz
Lighting Designers	Illumination Arts LLC
Landscape Architect	Trowbridge Wolf Michaels LLP
Storm Water Mngmt Eng.	Fisher Associates
Cost Estimation	The Tocci Group
Kitchen Consultant	Cini Little International, Inc.
Pool Consultant	Aquattica Pools & Water Parks, Inc.
General Contractor	FAHS Construction
Construction Manager	C&S Construction Management

LIGHTING SYSTEM

Sources: Flourescent, Metal Halide, LED

Special Design considerations:

- Natatorium lighting had to be designed to withstand environmental factors of the pool air
- Direct glare from sunlight penetrating multiple curtain wall facades was deterred through the use of exterior fins
- Full building management system allows for maximum control of lighting where necessary for daylight harvesting and occupancy purposes

MECHANICAL SYSTEM

Special Design considerations:

- Natatorium air must be handled separately in order to regulate humidity, chlorine, and other chemical senseitive properties
- Full building management system allows for maximum control of the system including occupancy sensing

STRUCTURAL SYSTEM

- Overall structure involves trusses to span large areas such as gymnasiums, weight/cardio space, and natatorium
- Exposed natatorium structure requires specially-ordered galvanized steel
- X-bracing and interior shear walls address lateral loads

ARCHITECTURE AND SUSTAINABILITY

- Two double-story main wings are connected by a single story entry lobby
- Green roof covers the entry lobby, views from the second story positions, and decreasing solar heat gain to the structure
- Large skylights in the gymnasiums, weight/cardio space, and natatorium bring quality diffuse daylight to these large open spaces
- Spinning room can harvest the energy created by bikers' exercise

JAMES KLINE Lighting/Electrical

Executive Summary

This report is the culmination of all work done on the PSU AE Senior Thesis beginning in June, 2013. This study has been completed using the State University of New York's new Student Life Center at the SUNY, Cortland campus.

There are four main sections to this report after the Building Introduction and Proposal Overview:

1. Lighting Depth
2. Electrical Depth
3. Façade Breadth
4. Mechanical Breadth

The Lighting Depth entails the redesign of the lighting systems for four spaces within the SLC. These spaces are the northeast courtyard; entrance lobby; weight lifting and cardio space; and running track. The criteria for which all design decisions were based on vary for each space, but a common design concept guided the overall lighting design. The energy savings from this lighting design achieved 11 points towards LEED, mainly by providing a lighting power density that was 30% below code.

The Electrical Depth involves the re-evaluation of existing lighting circuits, in order to redesign all panelboards to reflect the new lighting design. A short circuit analysis was completed as part of the electrical depth, along with the design of an energy harvesting system for the spinning room. This system will use power generated by the bikers to run the television at the front of the room. This system will also power indication lighting that will give feedback to all members of the class on how much energy they are producing.

The façade breadth and mechanical breadth are tightly connected, since both involve studies on rain screen façade types. Research was completed initially on rain screen facades, proving that they are advantageous in certain situations. These facades were designed initially to manage water penetration better than other façade types, but provide an advantage in that a lighter, more unique, and potentially cheaper cladding material can be utilized by the architect. They are also very effective thermally, but in the mechanical breadth, energy simulation proved that this makes only a small difference. This was because the majority of the space load was internal to the space used, which is also the case with most other building spaces and climates, so a rain screen façade should certainly not be selected for thermal purposes alone.

Acknowledgements

I would like to thank the following people for their advice, support, and guidance throughout the production of my thesis…

Professors

Dr. Kevin Houser
Dr. Richard Mistrick
Professor Kevin Parfitt
Leslie Beam

Illumination Arts LLC

Faith E. Baum
Ken Douglass
Elizabeth Johnson
Tara White

Architect

H2L2 Architects
Drew Jones

Lumenpulse

Greg Campbell

I would also like to thank my entire family, and all my friends who have given me support and advice throughout my time at Penn State.

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Section A

Building Overview

General Building Data

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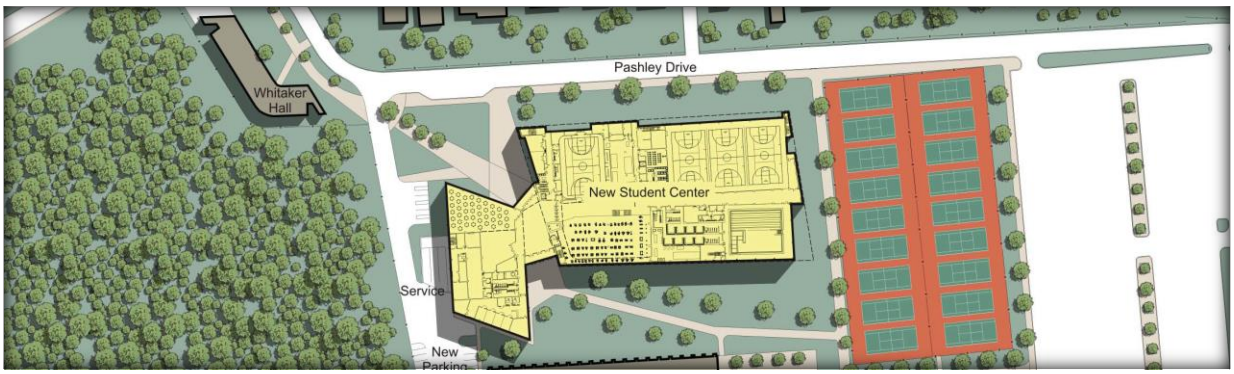
Architect	H2L2 Architects/Planners LLC http://www.h2l2.com/
Associate Architects	Hastings + Chivetta Architects, Inc. http://www.hastingschivetta.com/
Structural and Civil Engineers	KS Engineers http://www.ksengr.com/
Mechanical, Electrical, Plumbing	WSP Flack + Kurtz
Audio-Visual & Security Engineers	WSP Flack + Kurtz http://www.wspgroup.com/en/wsp-usa/
Lighting Designers	Illumination Arts LLC http://www.illuminationarts.com/
Landscape Architect	Trowbridge Wolf Michaels LLP http://www.twla.com/
Storm Water Mngmt Eng.	Fisher Associates http://www.fisherassoc.com/

Cost Estimation	The Tocci Group http://www.tocci.com/
Kitchen Consultant	Cini Little International, Inc. http://www.cinilittle.com/
Pool Consultant	Aquattica Pools & Water Parks, Inc. http://www.aquattica.com/
General Contractor	Waiting for response
Construction Manager	C&S Construction Management

Dates of Construction	November 2012 – August 2014
Cost information	$51.2 Million Overall Project cost
Project Delivery Method	Design-Bid-Build

Architecture

This structure consists of two double story main wings, with a single story connection structure in between. The South wing is the largest, and contains of an fitness center with weight lifting equipment and tread mills, a natatorium, spin room, mind body room, staff offices, large running track, 4 gymnasiums, 2 golf simulators, game room, climbing wall, and 2 cardio rooms in addition to standard amenities such as bathrooms, showers, and locker rooms. The North Wing serves as a dining space, and includes support spaces for food preparation in addition to bathrooms for all occupants and locker rooms for employees. The connection structure is known as the lobby, and also the main entrance to the building from either the East or West side.



Major national model codes:	Building Code of New York State 2010 ADA/FHA Compliant National Electric Code ASHRAE 90.1 2007
Zoning:	N/A: On campus
Historical Requirements:	None

Building Enclosure

Building facades

The Student Life Center utilizes two main types of building façades. On the Southeast corner, the entire façade is a curtain wall consisting of fully-tempered safety glass with type A and type C glass. Both panel types are a total of 1 inch thick, with low-e glazing, but type C has an acid-etched frosted inner panel, and the air space between the inner and outer sheets of both types is filled with Argon. These two specific panel types have a visible light transmittance around 70 percent and a solar heat gain coefficient around .38. U values of both are .29 for the winter night-time condition, and .28 for the summer daytime condition. All exterior glass has a center-of-glass maximum U value of .46, and a minimum e rating of .05.

Façades not utilizing glass utilize a rain screen. The rain screen wall structure is as follows, from interior to exterior:

- Metal Stud
- 5/8” Exterior Sheathing
- Non-permeable air barrier via sealant
- 7” Semi rigid moisture resistant insulation
- Sub-girt
- 2 ½” Metal comp. wall panel (Rain Screen)

Roofing

Roofing mainly consists of a modified bitumen roof membrane with scattered skylights bringing light to areas of emphasis in the fitness wing:

Twelve translucent skylight systems light the gymnasiums, weight training area, cardio loft, and natatorium. The system is comprised of 4" structurally reinforced translucent panels, with self-supporting framing. Panels have a U value of .14 and solar heat gain coefficient of .17.

Sustainability Features

The connection building between the two main wings - the main entrance - has a green roof which is accessible only for maintenance. This green roof is utilized for lowering the building's heat load, and for aesthetics, since the roof can be seen from multiple locations on the second floor. An energy harvesting system is an option in the spin room. This system would harvest electricity generated by the bikers as they work out and redistribute the energy back into the room to power various elements. A more detailed description of this system can be found in the electrical portion of the report here. Skylights and large exterior curtain walls in combination with daylight harvesting reduce the electric lighting load during the day. The rain screen façade system described above is the final sustainable feature of this building.

Primary Engineering Systems

Construction

The Natatorium needs special construction attention and consultants as well as dedicated mechanical equipment to regulate the environment. Due to the size of the mechanical system needed, a step down

section had to be specially dug just to accommodate the height of the system. All exposed steel in the natatorium is galvanized steel in order to prevent corrosion from the pool air.

Access control in the form of turnstiles is located in entry spaces when entering either the South wing or the North wing from the main lobby. Also, the exterior doors security system has the ability to lock exterior doors at predetermined times.

Electrical

The Student Life Center utilizes one 2000 Amp service switchboard at 480/277 Volts: three phase. The switchboard connects to multiple panelboard loads in addition to the dedicated photovoltaic system and lighting relay panels. Lighting relay panels are used in order to activate lighting throughout the building based on occupancy and daylight sensors. Mechanical systems also use these relay panels activated by occupancy sensors in specific areas of the building to conserve energy consumed by the mechanical system. The emergency power system is backed up by a natural gas fired generator via two automatic transfer switches.

Lighting

The lighting system is comprised of fluorescent, metal halide, and LED sources. The full building management system allows for maximum lighting control, daylighting, and occupancy control. Daylight harvesting is implemented in the main cardio and free weight area. Specialized controls in the Mind/Body room allow the instructor to be able to plug his/her iPod into a standard audio outlet, which connects to a lighting control system that will change the LED perimeter cove lighting based on the music. Similar technology allows the climbing and bouldering wall staff to select a variety of pre-programmed, color-changing scenes to be played accent lights. The option is also available to implement a Colorkinetics AuxBox, which would allow the lighting scenes to be triggered by a variety of devices, including motion sensors, time clocks, or temperature sensors.

Mechanical

This building uses multiple air handling units which distribute air to the building as demanded. VAV controllers in each space determine the amount of air that is dispersed into that space at any given moment. One chiller and two boilers are responsible for heating and cooling the air before it is sent to the VAV controllers. Remote air cooled condensers are used to reject heat from the system.

The pool has its own dedicated mechanical system which controls both the natatorium air and pool water. The water filtration system works in tandem with an infrared system to cleanse and treat the pool water. The air unit is specified to work specifically with the high humidity levels present in a natatorium atmosphere.

Electrical and data rooms have their own air conditioning units to help control the higher heat loads involved with the equipment in these spaces, as well as the recommended lower room temperatures for the equipment to operate optimally.

Structural

The second floor is slab on deck supported mainly by W16x45 & W16x26 steel beams shear connected to 12x12 steel columns. One specialized area of the building involves a suspended track which is supported by W10x26 beams connected to exterior columns on one side, and steel hangers on the other. The main roof structure is supported by multiple types of trusses in all large open spaces; the gymnasiums, cardio/weight training space, and natatorium. The architecturally featured circular exterior cut out is supported by a single cantilever beam. Lateral loads are accounted for through shear walls in the elevator shafts and X-bracing in multiple locations throughout the building.

Additional Engineering and Engineering Support Systems

Fire Protection

The Student Life Center is protected by a full building sprinkler system and smoke alarms. Speakers and strobes will activate on all floors and an alphanumeric text message will display on LCD screens in the case of a fire. A signal is transmitted to the campus command center via the campus monitoring system, return fans automatically stop, recirculating air fans stop, and the door releases on all floors activate via communication with the security system. Smoke control fans initiate as a final measure to increase safety for those evacuating the building.

Transportation

The Student Life Center utilizes one main entry building which connects the south wing and the north wing, and serves as the lobby. The building utilizes two elevators; one is located in the main lobby, while the other is located near the middle of the South wing. There are seven separate staircases, most of which are located around the exterior of the building for access to the exterior in case of emergency.

Telecommunications

Extensive telecommunications provide cable TV and campus visual messaging to all LCD TVs in the building. A PA system allows announcements to be made from the main desk and output to speakers located in most rooms throughout the building. Electronic white boards, projectors, and laptop ready stations in multiple rooms are conducive to providing multiple types of instruction. Several spaces have CD, radio, microphone, and iPod connections available for music and speaking.

Special Systems

The Green Roof utilizes an engineered soil-like material designed to retain moisture, manage plant nutrients, and support vigorous growth of the foliage. Included in its design is Electric Field Vector Mapping which is a leak location technique. The assembly will be a multi-course system, consisting of a 3 inch growth media layer installed over a synthetic sheet drain.

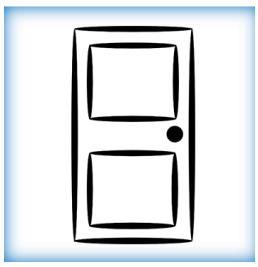
Section B

Proposal Overview

This thesis report will include a lighting and electrical depth, as well as the façade and mechanical breadths.

Lighting Depth

The lighting depth involves four spaces within the Student Life Center. These spaces include:

Main Purpose Space	Circulation Space	Exterior/Facade	Special Purpose Space
			
Weight lifting & Cardio Area	Entrance Lobby	NE Courtyard	Running Track

The lighting design is based off of one central concept which is identified at the beginning of the lighting depth section. The report outlines key design criteria for each space as well as how the criteria were successfully met. Energy efficient fixtures, as well as energy saving control techniques were used to aid in the creation of an overall sustainable design for the Student Life Center.

Electrical Depth

The electrical depth describes the necessary alterations that were made due to lighting system changes, as well as a short circuit analysis. The third section of the electrical depth is schematic design of the spin room. This building's spin room has to option of adding a system that will harvest the power generated by members of the cycling classes. An analysis displays how the system can be designed, the estimated power generation, and proposes a use for the energy harvested.

Breadths

The first breadth is a façade study, which will determine the advantages, disadvantages, and many other details concerning a pressurized rain skin. This façade system is popular and successful in Europe, but not widely adopted in America.

A mechanical study of the spaces in the Student Life Center will be the second breadth. This breadth will use heating and cooling load simulations, as well as a cost analysis to determine whether the façade system researched in the previous breadth is financially feasible for this building and if so, where.

Section C

Lighting Depth

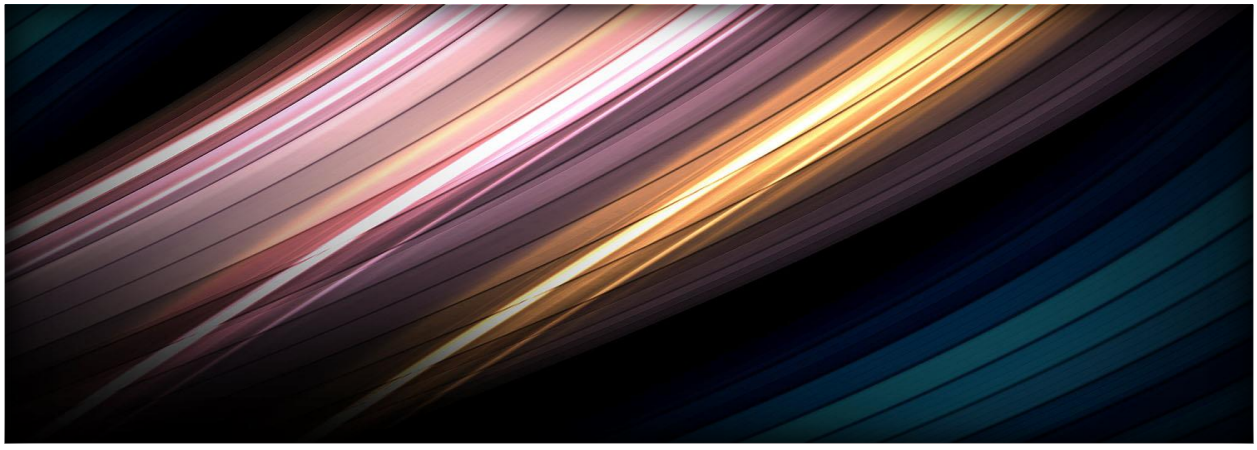
Concept of Design

This building was meant to promote and bring new life the SUNY Cortland campus. One thing that is very representative of life is **motion**. When we observe motion, we subconsciously connect that with life, whether it is a car passing by, a mouse pointer moving on a computer screen, or even leaves rustling across the road, mistaken for a mouse. None of these elements are alive, yet we assume life.

We can even assume motion – and therefore life – without actually seeing something move, as you may notice in these images. While we don't experience motion, we know from past experiences in life and visual clues, that motion is apparent here.

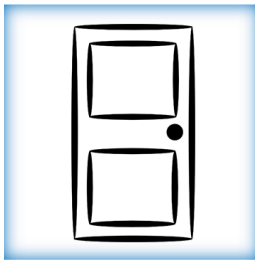
We can achieve the same phenomenon with architecture and light. Often times, including with the Student Life Center, architecture is designed to imply a direction of travel or encourage motion. I plan to do my part and encourage motion through these spaces with light.

My goal is to encourage motion with lighting using brightness, controls, and directional cues.

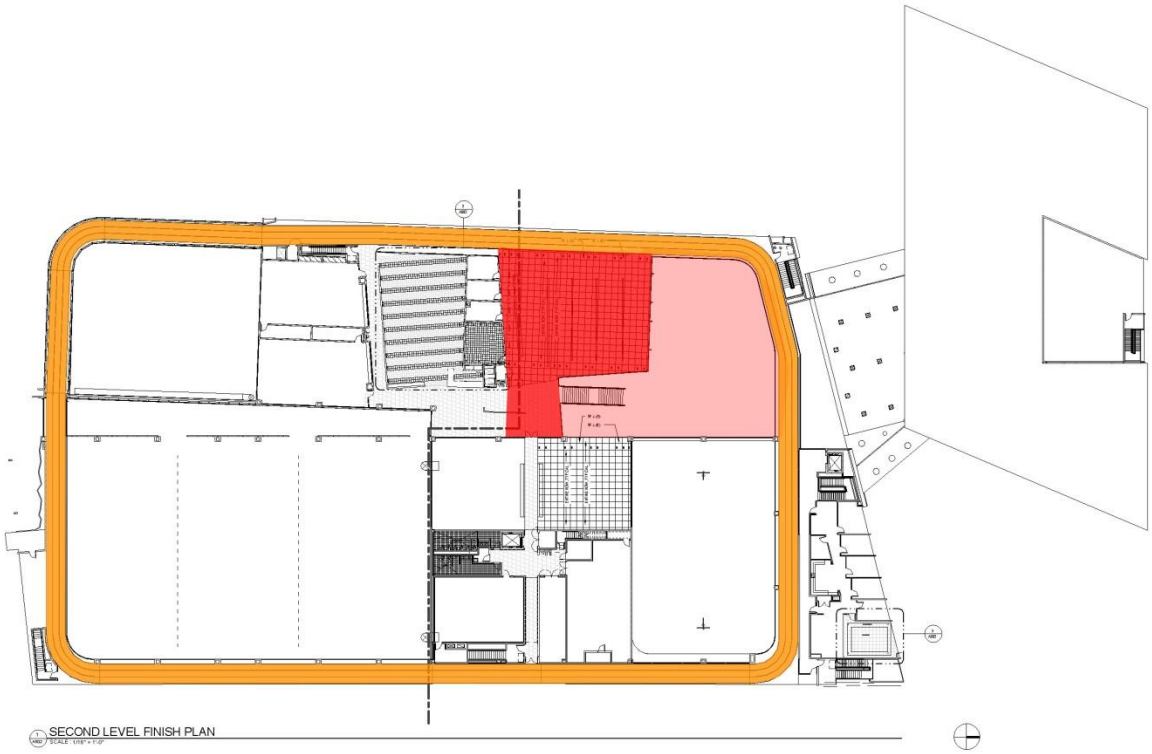


Design Overview

The lighting design involves four spaces as mentioned in the proposal overview. They are located on both the first and second level of this two story building. For clarity they are as follows:

Main Purpose Space	Circulation Space	Exterior/Facade	Special Purpose Space
			
Weight lifting & Cardio Area	Entrance Lobby	NE Courtyard	Running Track

By color, they are located according to the following two floor plans. Half of the weight lifting space (the south side) is covered by the cardio loft, as can be seen when comparing the first floor plan to the second floor plan – for full size floor plans at higher resolution, you may visit Appendix A.



The running track encompasses the entire second floor of the Southern Wing. When it traverses over the indoor swimming pool, the track is enclosed in a tube that suspends over the pool. This protects the track environment - including the lighting – from being effected by the harsh pool air conditions.

Elements Related to Lighting Included in this Section

- Weight Lifting & Cardio Lighting Design (w/ unique reflection)
- Running Track Lighting Design (w/ individual control system)
- Entrance Lobby Lighting Design
- Exterior Courtyard Lighting Design
- Control System Narrative
- LEED Qualifications
- Lighting Power Densities (by space and by building)
- Light Loss Factors Used

Elements Related to Lighting Included in Appendices

- Fixture Schedule — App. C
- Fixture Specification Sheets — App. C
- Lighting Drawings (incl. details and elevations) — App. B

Weight Lifting and Cardio Area

High Priority Criteria

1. Psychology

   The weight lifting and cardio area was chosen as the space to be designed based on the Flynn mode of "public." In order to convey a public feel in this space, overhead lighting should be the main source of illumination. Other aspects such as vertical surface lighting where possible are also acceptable in order to make the space feel more inviting and spacious.

2. Comfort

   This space will be one of the most utilized spaces in the Student life center. Therefore it should be comfortable, despite its public feel. This can be achieved with accent lighting and vertical surface lighting.

3. Daylighting sensors to provide energy savings.

4. Illuminance values as recommended by the IES.

Quantitative Design Criteria					
	Horizontal Illuminance (E_h)			Vertical Illuminance (E_v)	
Space/Task	Average (lux)	Ave:min	CV	Average (lux)	LPD (W/SF)
Weight Training Floor: E_h @ 2.5';E_v @ 5'	150	3:1	N/A	50	.72+.1+.1= .92
Cardio Loft Floor	150	3:1	N/A	50	
Walkway: E_h @ Floor;E_v @ 5'	30 (.2x150)	3:1	N/A	10	

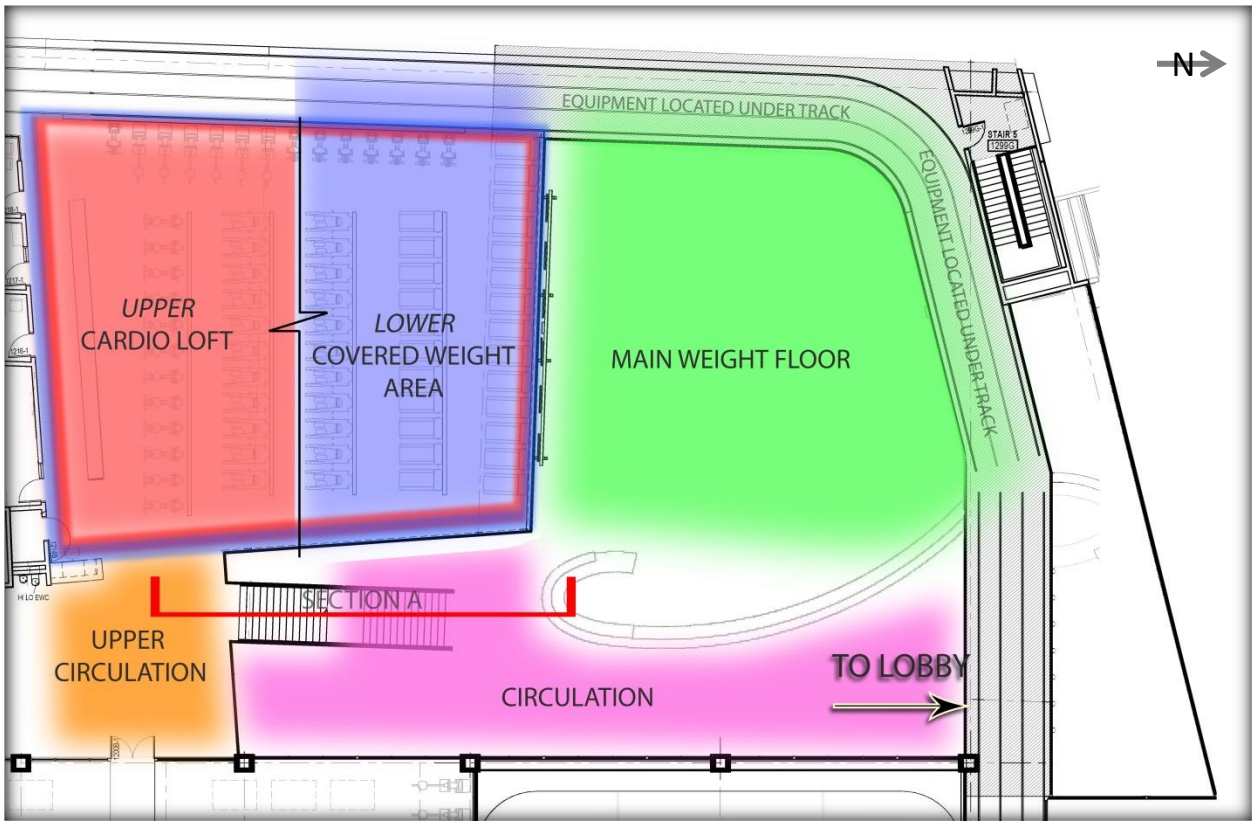
Lighting Plans can be found in Appendix B where the locations of each fixture type as well as daylight sensors can be found.

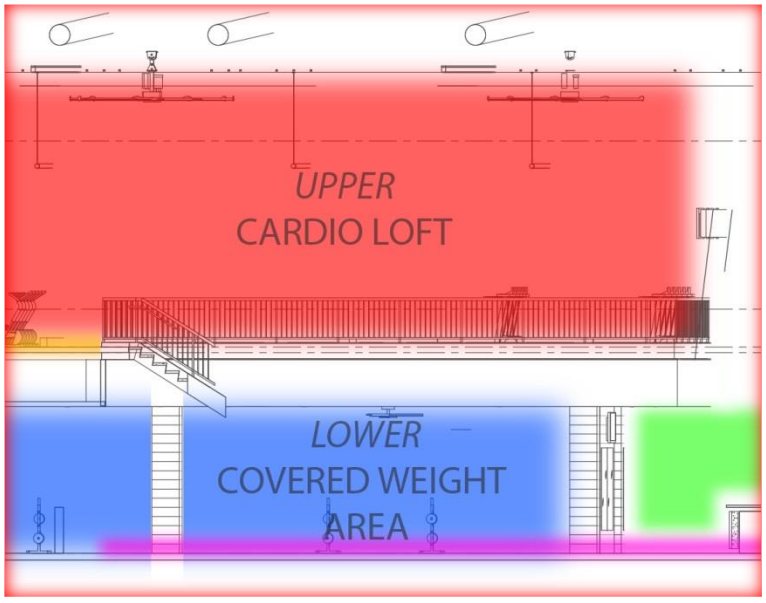
Reference Sheets:

L1 - Lighting Gym - Level 1
L2 - Lighting Gym - Level 2
L6 - Lighting Skylights - Level 2

Lighting Solution

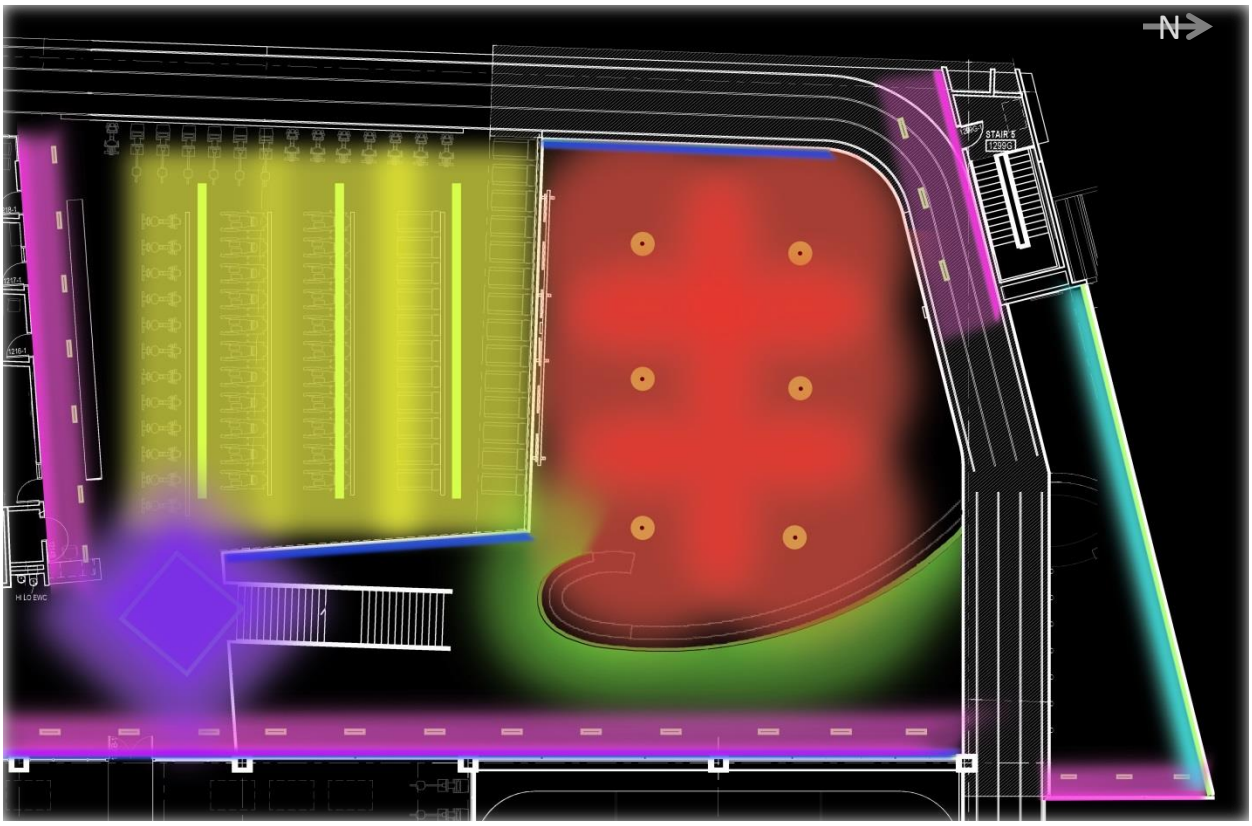
Please use the following image and section to become familiarized with the layout of the space. This is the largest space in the scope of this thesis. Referencing these images will help orient you much better than any written description. The main functions of this space include weight lifting, cardio-based exercise, and circulation to the remainder of the building after entering from the lobby.





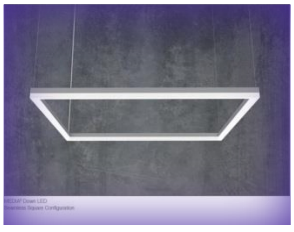
SECTION A

Please also use this image for a quick overview of fixture locations, a reference to locate fixtures within the space later, and to get an additional understanding of the space. This image does not include skylight fixtures, or the four LED strip fixtures beneath the cardio loft, all of which will be seen later.



The images below reference the lighting fixture types corresponding by color to the image above.

Luminaires



Weight Lifting Main Floor

The main weight lifting floor is lit using six high bay LED fixtures as the main source of light. After this, vertical illumination via wall washers on the second story vertical walls is used to add reflected light to the space. In addition, lighting from the track supplies reflected – and some direct – light to the weight lifting floor. Four foot recessed LED fixtures are placed on a standard interval around the outside of the space to provide illumination to areas where the high bay pendant lighting would otherwise cast strong shadows onto the first floor (See "Equipment located under track" in first image above). In addition, reflected light from the skylight fixtures apply diffuse light to the weight lifting floor. These fixtures will be seen below in the skylight image. Wall washers will be seen below in the circulation image.

Cardio Loft

The cardio loft is lit using continuous direct indirect LED pendants. These pendants are very similar to the direct recessed fixtures located throughout the rest of the building. And again, semi-recessed wall washers light the back wall of the cardio loft to prevent this large vertical surface from going dark. Reflecting light off of this wall, the ceiling, and the skylights above all provide very adequate vertical illumination to this section of the overall space. This is important since there will be a large quantity of treadmills, bikes, ellipticals, and other equipment here.

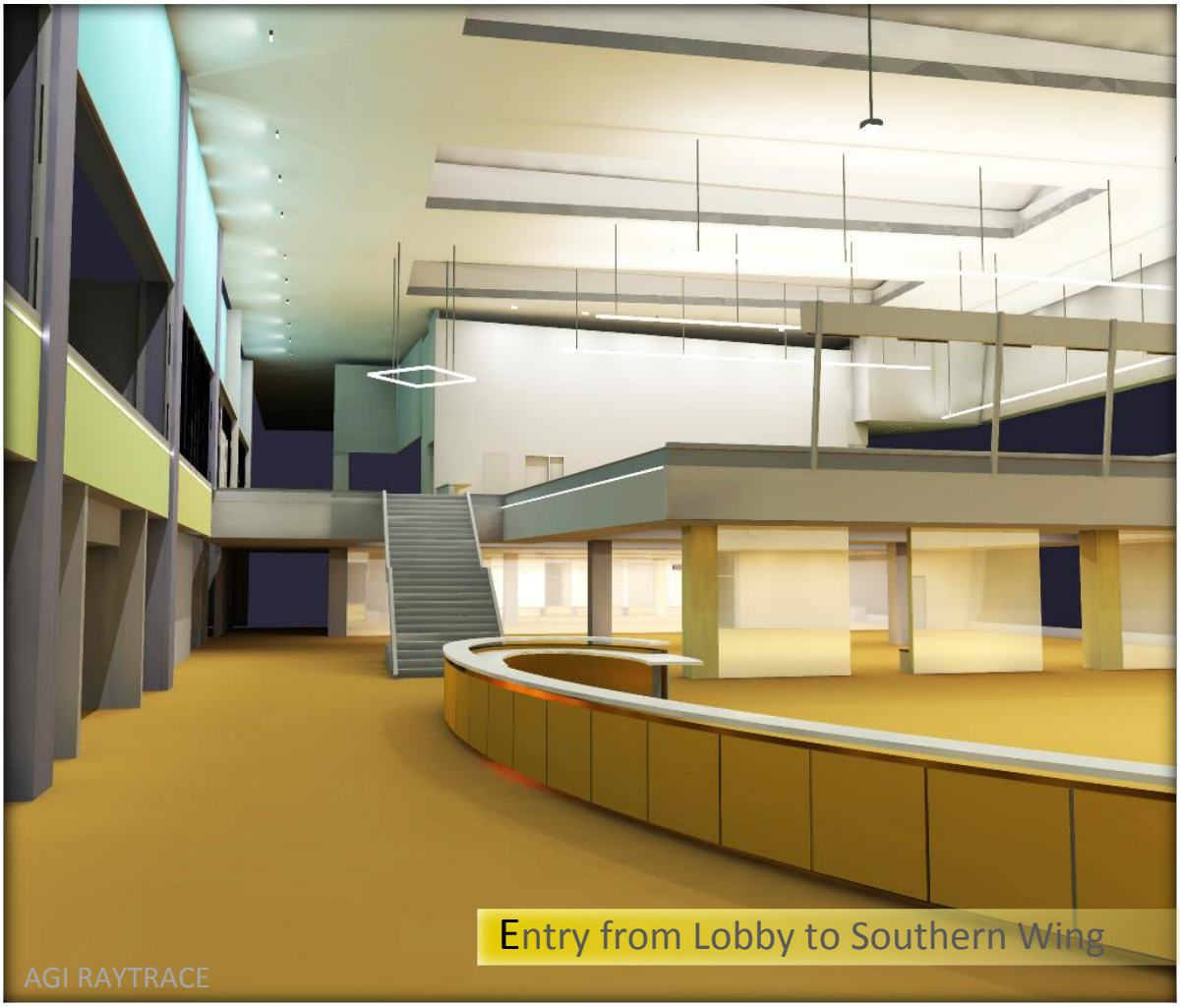
Weight Lifting Secondary Floor

In the second area of the weight floor – where the cardio loft covers it – continuous linear LED fixtures are recessed into the ceiling to provide general illumination and avoid glare. Since there are large amounts of glass and mirrors in this area specifically, avoiding glare is of the utmost importance. The below image is a clear indication of how glare has been reduced; only one continuous fixture is visible despite the fact that there are four total continuous fixtures in the space. One is out of view to the left, and the other two are hidden in the other recessed ceiling cavity further across the space.

Weight Training Space beneath Cardio Loft

Circulation

Above the circulation area of this space, metal halide wall washers provide vertical illumination to the brightly colored vertical surfaces. These fixtures prevent the upper and outer portions of this very tall space from going dark, in addition to adding reflected light for general illumination.



One key pendant is positioned at the top of the stairs to draw people through the space, both visually and physically. This luminaire acts as a key focal point, since it is at the top of the only staircase in the room, and in the general line of sight when looking down the passageway through the space. It distributes light not only down, but sideways. The lens on this linear fixture wraps up the sides of the luminaire, along the entire length of the fixture. This helps supply vertical illumination and facial rendering of students traveling up the steps and standing near the top of the stairs.

Open Cavity

A cove light along the length of the large curtain wall adds a bit of light as accent to this otherwise dark portion of the space. It also ties in with the overall concept to encourage motion since it is in the direction of travel of students running on the track. A linear strip mounted to the wall above the track adds accent to the space, and helps to reinforce the upward size of the space. This image is somewhat deceiving because the lobby lighting will actually reflect a moderate amount of light up into the cavity as well. This will also slightly reduce the contrast between the bright track and the darker lobby floor on the other side of the track.

Skylights

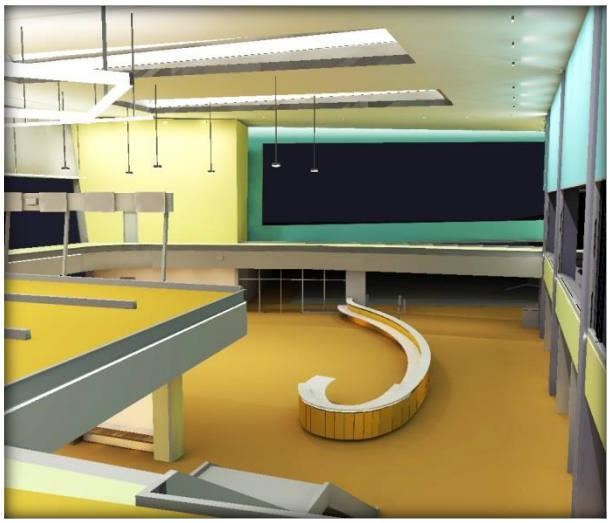
There are four skylights placed in the ceiling of this space. These skylights are actually made of a very reflective material; Kalwall. Light transmission is less than 20%. This allows us to bounce light off of the material, creating a very iconic image from the exterior, and also a very diffuse light source for the space below. Continuous indirect LED fixtures are mounted along the length of each skylight on just the Northern side.

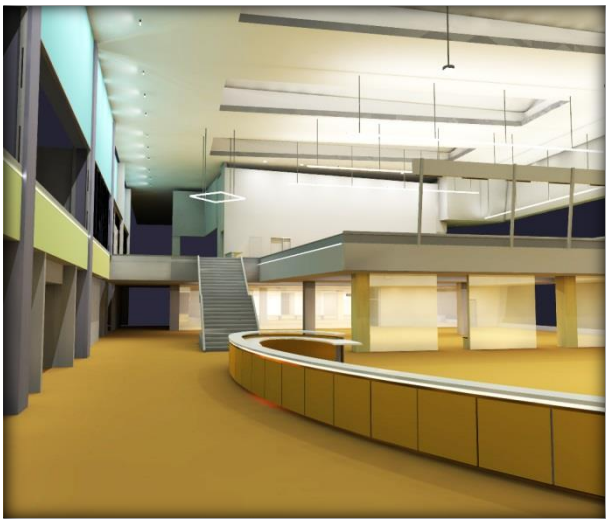
Keep in mind that this space is surrounded on many sides by glass, as can be seen in the perspective views of the space. Light from the surrounding spaces will likely increase the amount of light experienced in areas of the weight lifting and cardio area bordering these curtain walls. Specifically, the circulation area will receive a substantial amount of reflected light from the open gyms, since these spaces will be required to be lit very heavily. Also, the area near the lobby will receive additional reflected light from the lobby. Calculations did not include these sources of light, which is why it can be expected that values in these specific areas will be slightly greater in the constructed design.

Special Reflection

This space is extremely unique, and feels even more unique when seen at multiple angles. Simply by flipping through the images above, this is clear. The lighting solution has supported this phenomenon. Please review these images quickly, and you will see that different views will cause certain lighting elements to practically appear from nowhere. For example, since the skylights are lit from only one side, the aesthetics of the ceiling are completely different when looking into the space *from* the lobby compared to looking *towards* the lobby. Also, if an occupant simply walks from the lobby, through the circulation space, and into a deeper part of the building, they may never even notice the vertical accent strip above the track that is seen by weight lifters and cardio equipment users. Even a runner on the track may never see this strip either since they will be running counterclockwise. ☐

This is an interesting connection; the more a student widens their experience physically, the more they are able to experience the exceptionality of this space.



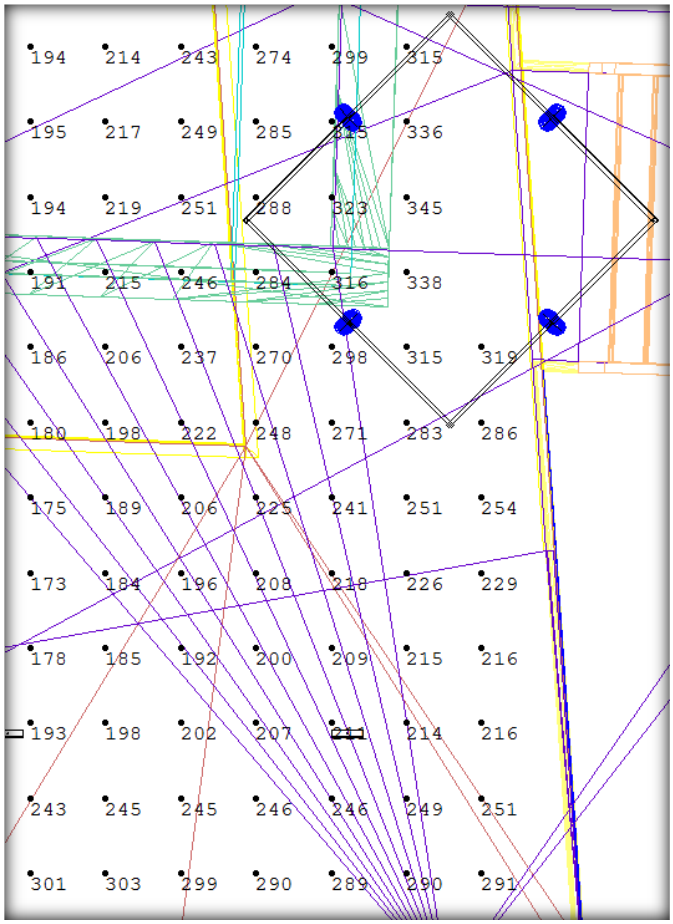


Overall, the lighting design for the weight training floor utilizes a large quantity of direct light, as well as some indirect light to make the space feel public. In addition, the weight training floor has one distinct advantage; it is bordered by an open circulation space. This circulation space can be darker than the rest of the room. This is advantageous because it does two things:

1. Makes students on the weight lifting floor feel as though they are “on stage” compared to the rest of the room. Psychologically, this is beneficial for athletes.
2. Subconsciously draws passing students towards the brighter area of the gym (physically and mentally), encouraging them to take part in physical exercise, regardless of whether they decide to take part at that moment, or another.

Quantitative Criteria and Calculations

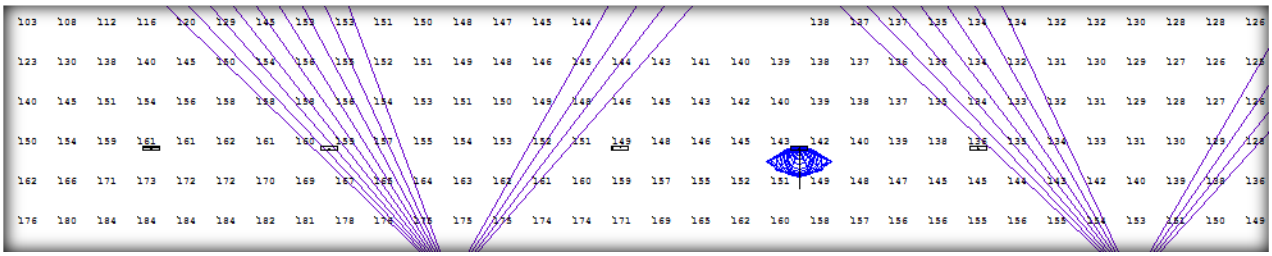
Quantitative Design Criteria					
	Horizontal Illuminance (E_h)			Vertical Illuminance (E_v)	
Space/Task	Average (lux)	Ave:min	CV	Average (lux)	LPD (W/SF)
Weight Training Floor: E_h @ 2.5';E_v @ 5'	218	1.75	N/A	128	.73
Cardio Loft Floor	294	1.53	N/A	213	
Walkway: E_h @ Floor;E_v @ 5'	138	1.90	N/A	83	

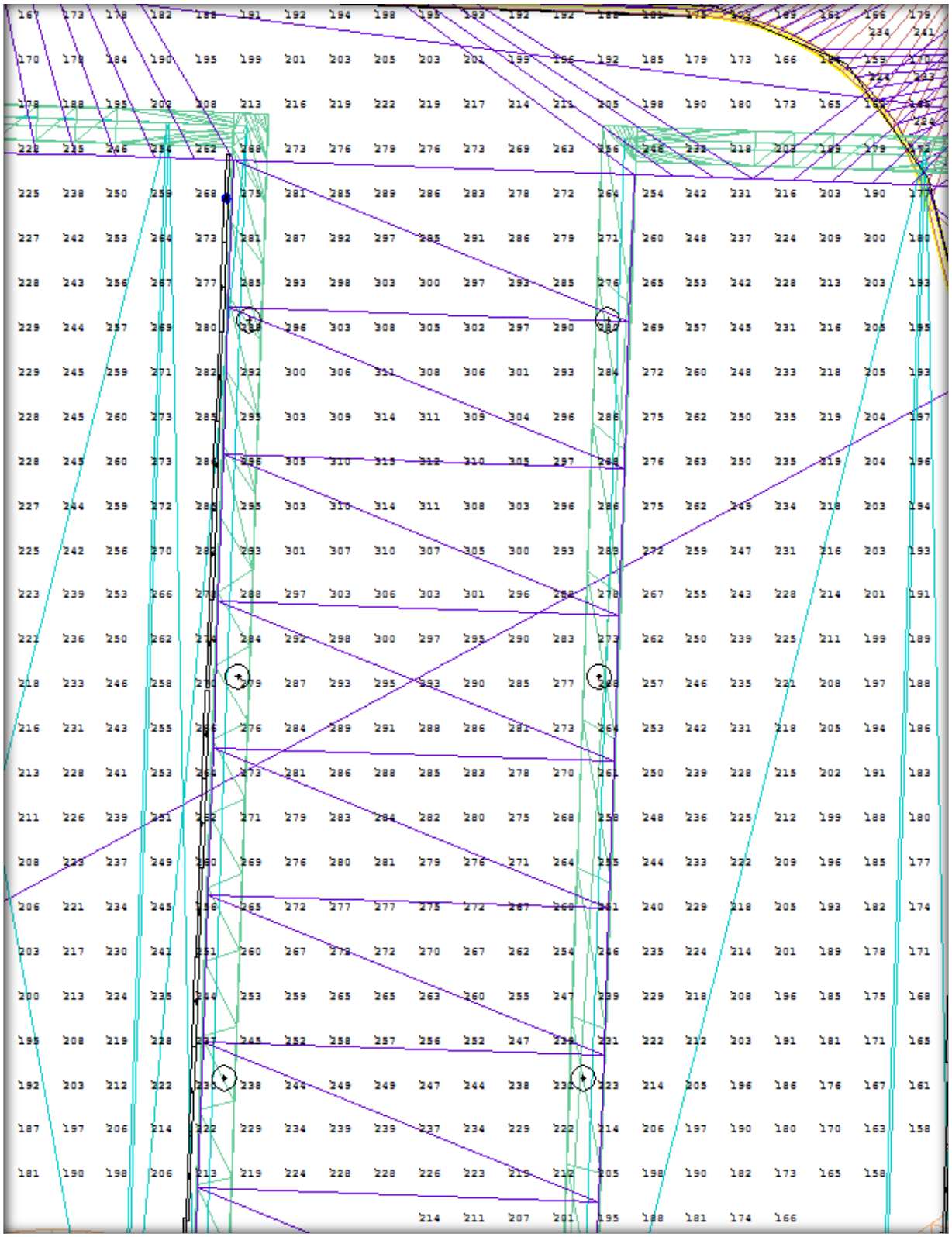


Left: Top of stairs illuminance values. The square pendant can be seen at the top right of the image, and one of the wall washers lighting the high blue walls can be seen near the bottom of the image.

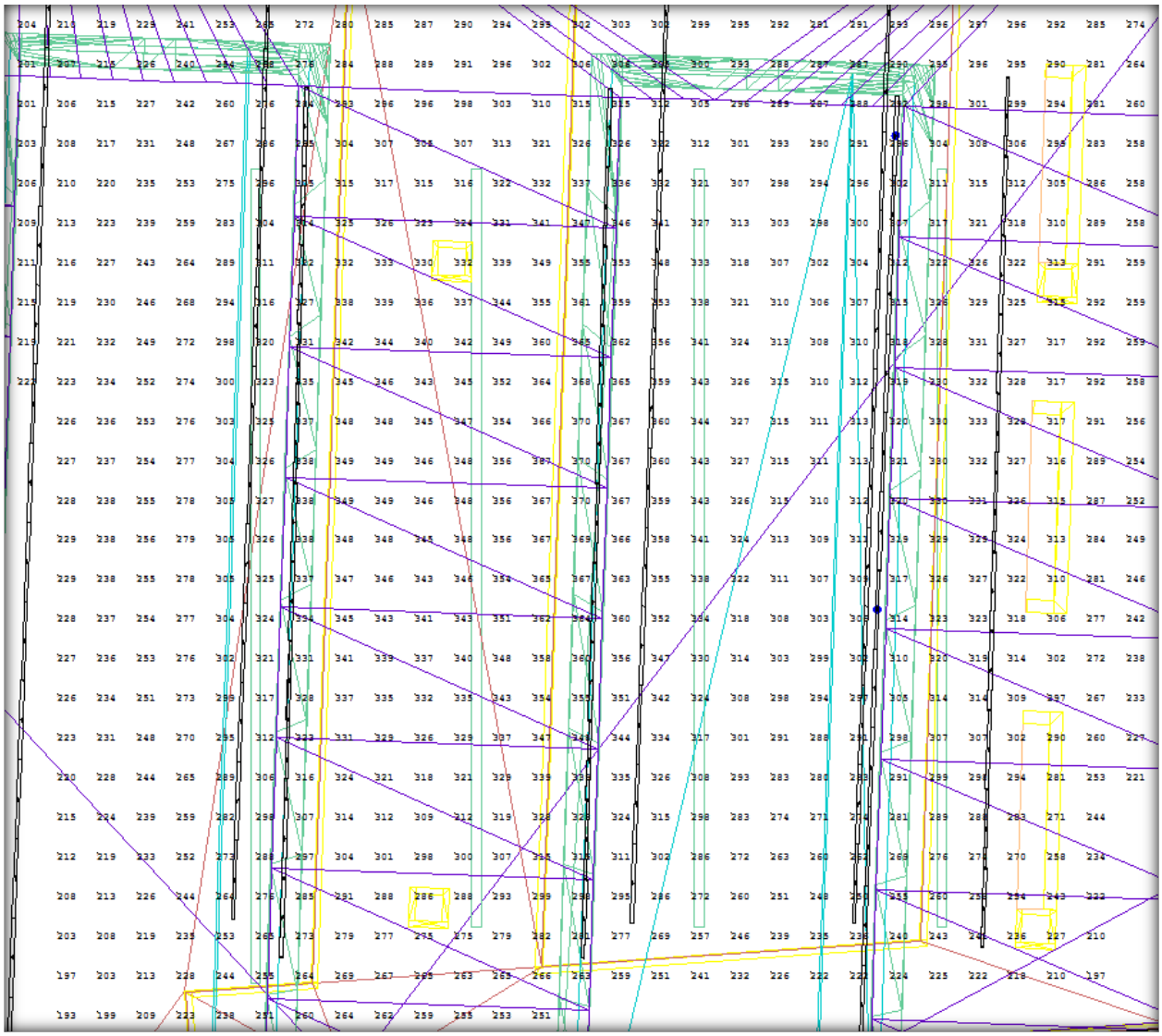
Note: Illuminance values are greater than recommended in all spaces. This is intentional because the floor surface of this room is very dark. At only 150 lux, the room would feel much darker than it actually is. Also, 150 lux is the bare minimum to begin with, since this is the recommendation based on 50% or more occupants being under the age of 25.

Bottom: Illumination values for the circulation area on the East side of the space (bottom of plan view) as identified above.





Illuminance values for the main weight lifting area. The six high bay pendants hung from the ceiling, but not under the skylights above can be seen in this image as circles.



Illuminance values for the cardio loft space. This image is not a good representation of fixture positions; it shows both the first level fixtures which are lighting the weight lifting space underneath the loft, in addition to the cardio loft fixtures. Reference the colored floor plan at the start of the Weight Lifting and Cardio section above to see fixture positions of the loft lighting. Reference the documented lighting plans in Appendix B for fixture positions of the weight lifting space underneath.

Running Track

High Priority Criteria

1. Control System

   The running track needs a high quality control system in order provide the pacing system via the lighting.

2. Glare

   Since runners will be traveling at high speeds on the track, glare and the strobe effect that could be experienced should be eliminated at all costs.

3. Illuminance values as recommended by the IES.

Quantitative Design Criteria						
	E_h			E_v		LPD
Space/Task	Average (lux)	Max:min	CV	Average (lux)	Max/min	(W/SF)
Running Track: 3' above Floor	150	3:1	.25	N/A	N/A	.82

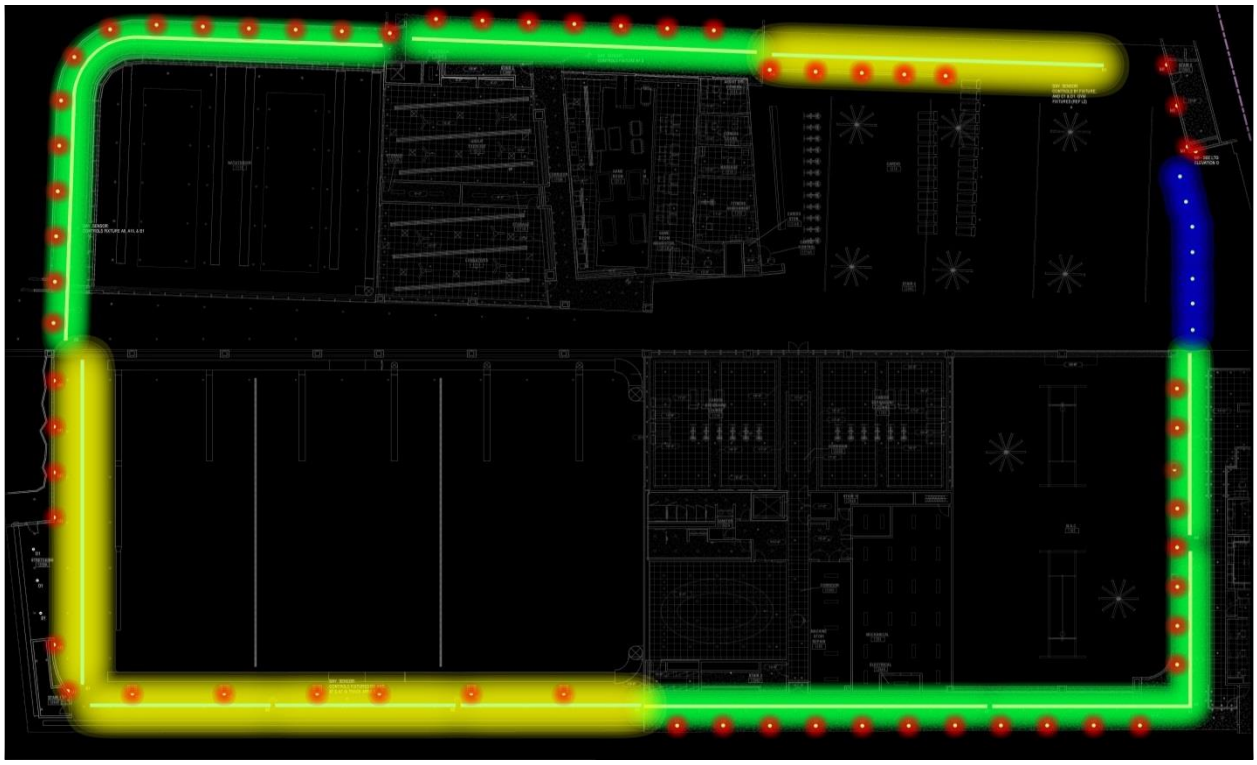
Lighting Plans can be found in Appendix B where the locations of each fixture type as well as daylight sensors can be found.

Reference Sheets:

L4 - Lighting Track - Area A
L5 - Lighting Track - Area B

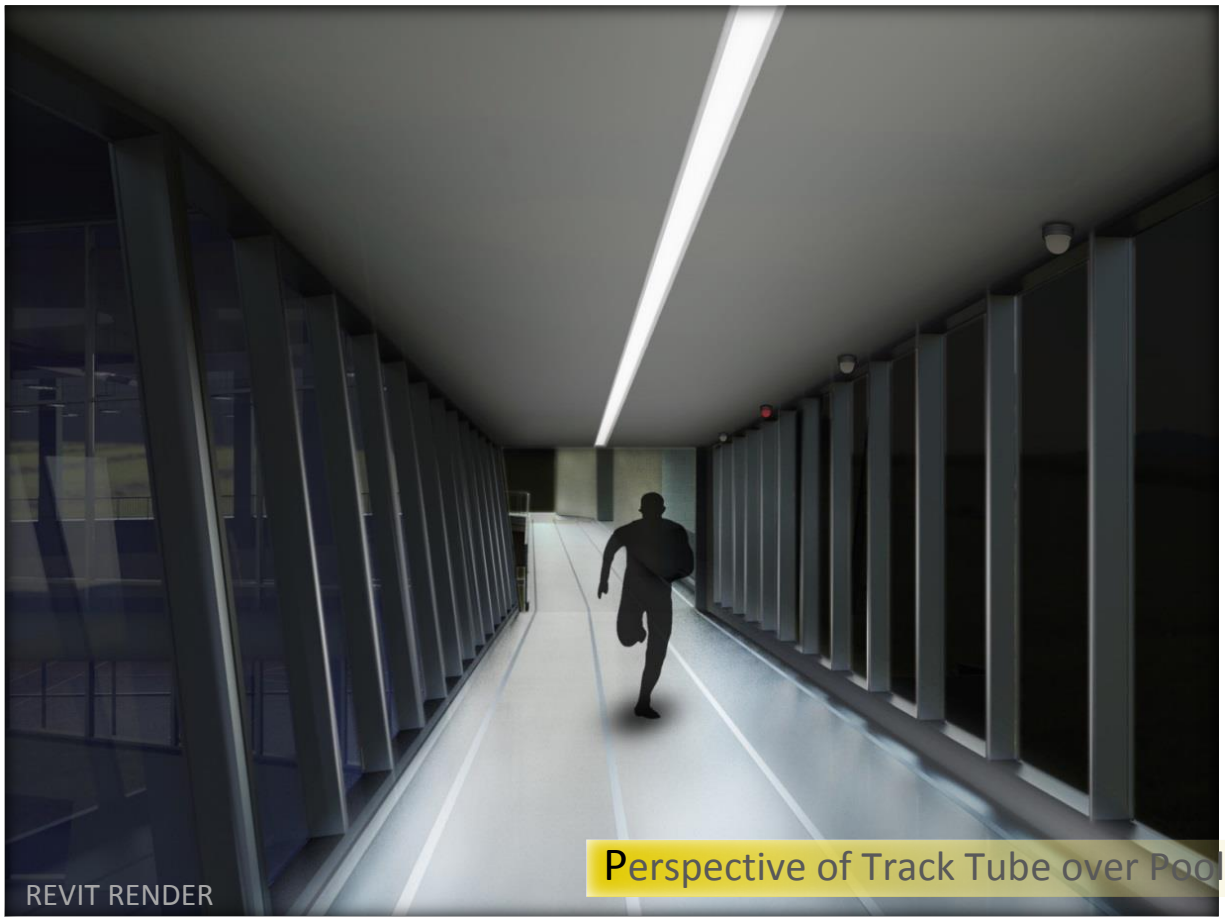
Lighting Solution

Please use the following image for a reference to locate fixtures within the space, as well as to get an overall understanding of the space.



The below images reference the lighting fixture types corresponding by color to the image above.

Luminaires



Perspective of Track Tube over Pool

Perspective of Track with Recessed Strip

In order to prevent the strobe effect from glare on the track, continuous recessed LED strips were mounted where gypsum ceilings provided proper ceiling heights.

In addition, half spherically lensed LED fixtures are mounted at a set interval around the track. The majority of the times, these fixtures are surface mounted to the ceiling, but at times, the architecture provides interesting places to mount these fixtures, such as to the side of columns, or to the side of walls. The next page explains the function of these fixtures.

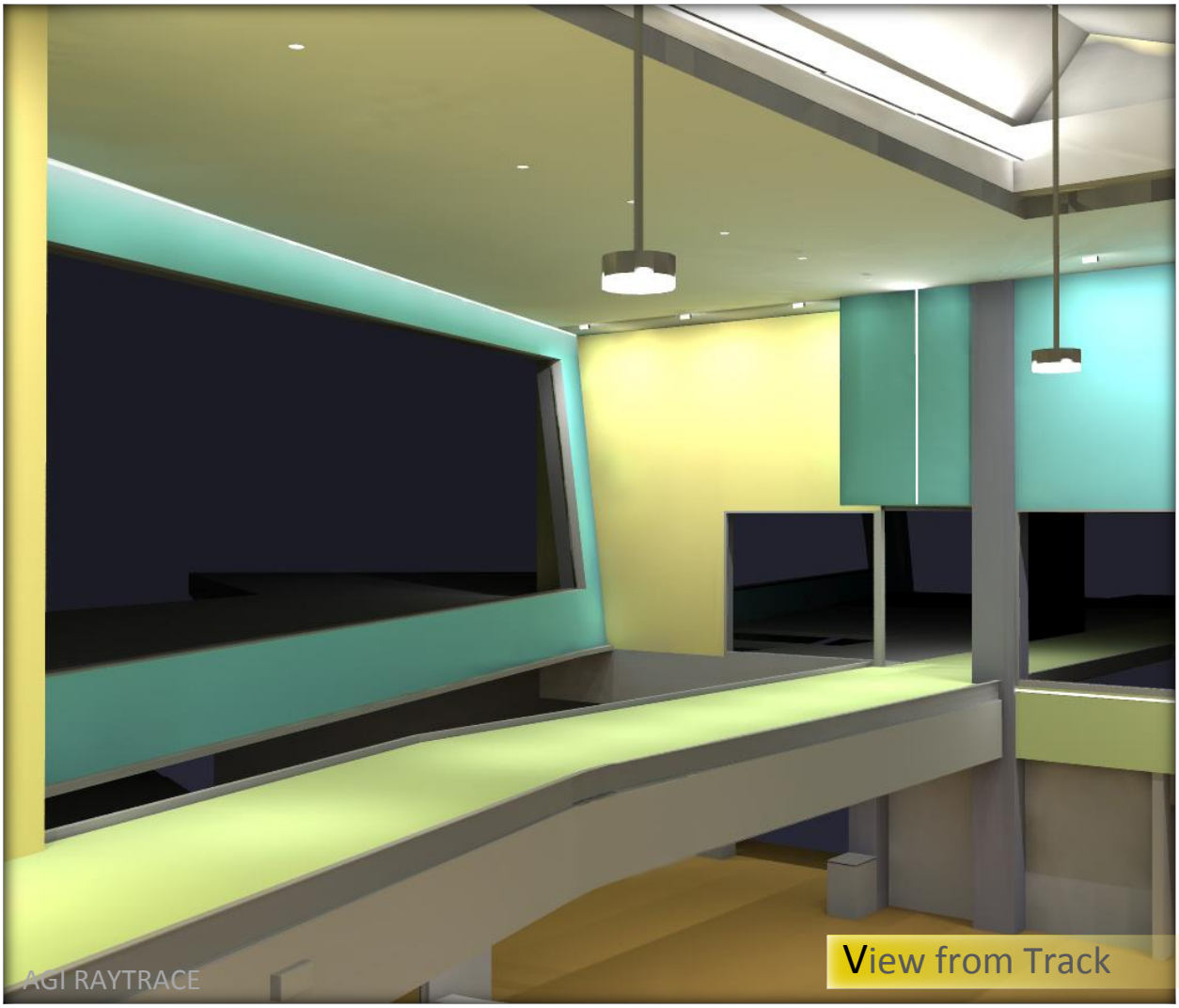
Lumentouch control system (track only)

These fixtures will be programmed using the Lumenpulse Lumentouch control system to light up by color in a pattern around the track. By corresponding with a Lumenpulse representative, it has been determined that this is the most user-friendly and most applicable control system for this situation since the Lumentouch control has a real time clock built in. This will allow each color to be programmed to correspond to a certain 1 mile pace. For example, the control system would turn on fixture 1 in the color red, then turn fixture 1 off and turn on fixture 2 , then turn 2 off and 3 on, and so on. It would do this in real time so that if one were to follow the dots around the track exactly alongside the red dot, he or she would run a nine minute mile. This can be repeated, but for different colors at different paces, and all be programmed into one scene. This allows the receptionist to simply activate “Scene 1” and the pacing scene will begin, turning on all of the colored pace indicators. Keeping all colors on at one time will prevent different scenes from having to be triggered, which would restart the system and interrupt someone who is running on the track already. The Lumentouch system is very versatile, so other schemes could be programmed just to provide interest to the building if desired. For example, since these fixtures will be visible from the pool, they could be programmed to pulse red and white for the SUNY Cortland school colors. The opportunities for this system or endless, and it can be programmed at any time, allowing extreme versatility for the system.

Lumentouch Touchpad Controller

In areas where ceiling heights were too great, direct indirect continuous linear pendants were suspended above the track. This image, seen before in the weight lifting and cardio section, shows the direct indirect lighting on the right side of the image.

Where the track travels over the weighting lifting space, tight beam downlights were used in order to avoid suspending luminaires and breaking up the view above the track in this location. These downlights supplement the reflected light already present in the space to provide adequate illuminance values. This change in lighting also helps to identify this section of track as special for the runner since it is the only section that is open on both the left and right side, seemingly floating over the space below.

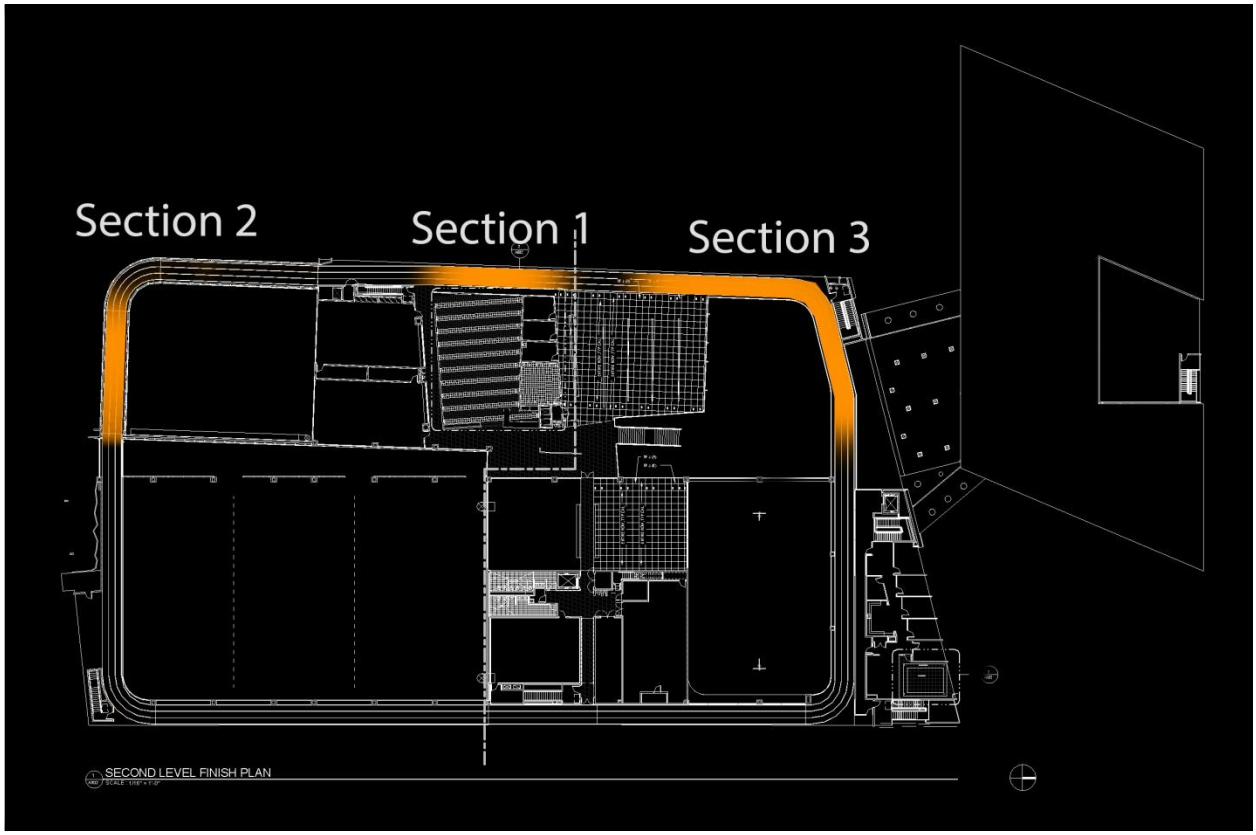


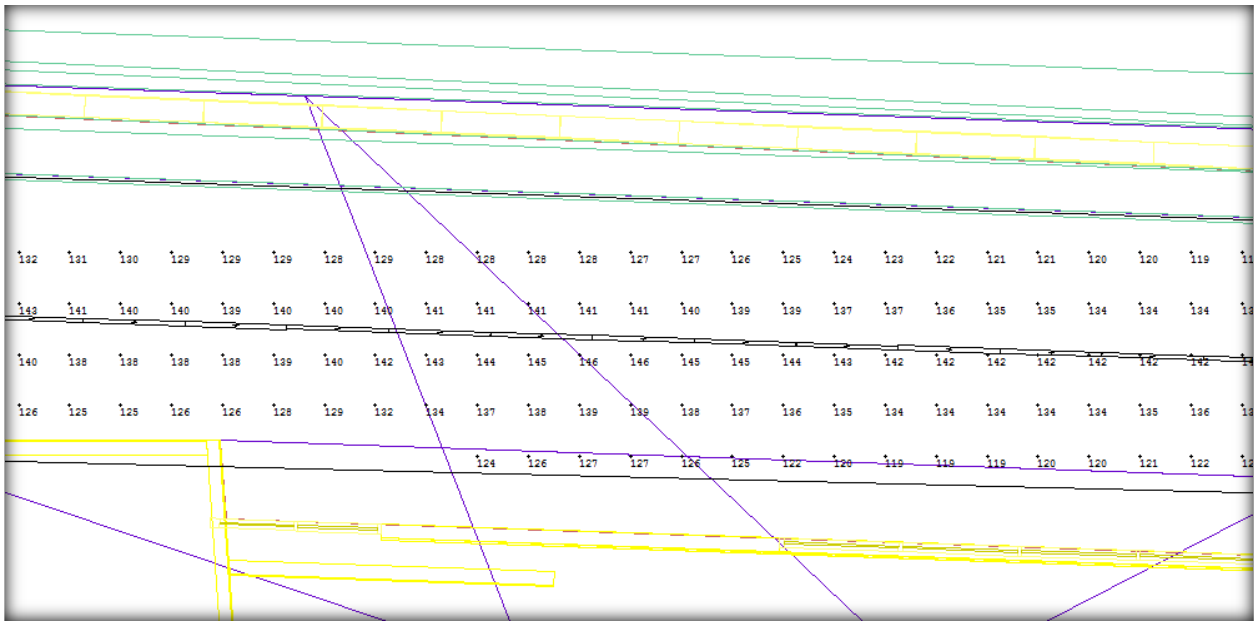
As mentioned in the weight lifting and cardio section, the track has a relatively high amount of contrast when compared to the floor below and the luminance of surrounding surfaces. This is not a negative thing, but rather a positive one, since it will heighten the sense that the runner and the track are floating.

Quantitative Criteria and Calculations

Quantitative Design Criteria: Dependent on Section of Track						
	E_h			E_v		LPD
Space/Task	Average (lux)	Max:min	CV	Average (lux)	Max/min	(W/SF)
Running Track: 3' above Floor Section 1	134	1.3	.06	N/A	N/A	.75
Running Track: 3' above Floor Section 2	137	3.1	.32	N/A	N/A	
Running Track: 3' above Floor Section 3	259	2.1	.13	N/A	N/A	

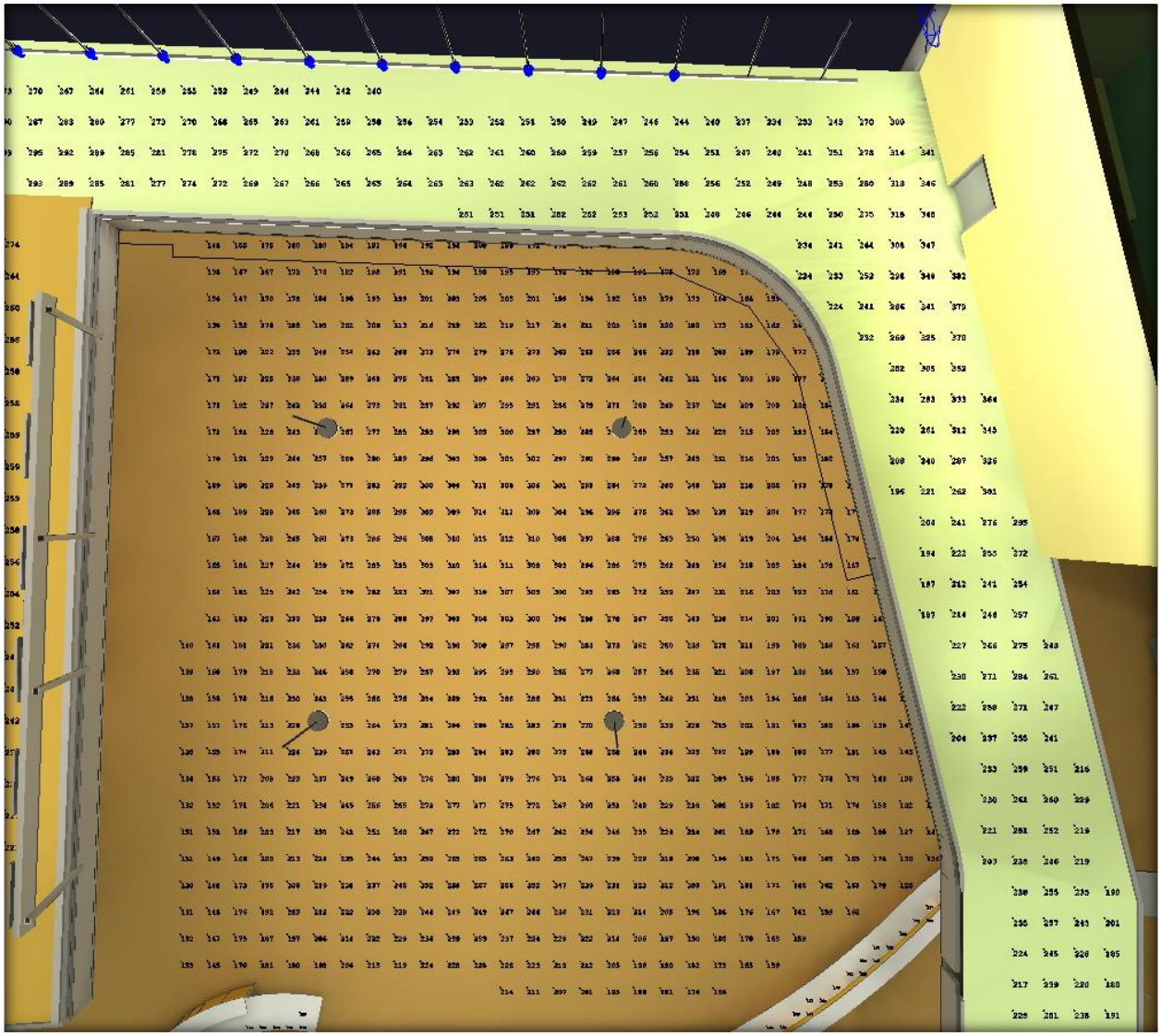
The following image shows the regions for which calculations were completed for the track. These calculations were done with no lighting placed in the surrounding spaces (except for section 3), even though the track is open on one or more sides the majority of the time. Since reflected light from surrounding spaces will spill on to the track surface, the illuminance values will be greater in the constructed space of various amounts depending on location. This is acceptable in this scenario, because the base illuminance for this design is only 150 lux. In addition, this change in illuminance by space will help the runner identify their current position on their adventure around the track.





This calculation is for section 1 of the track. This is typical of multiple locations around the track where recessed LED continuous strips are used.

This calculation is for section 2 of the track. This section is unique since it is the only section fully enclosed by the track tube because it is suspended above the pool. This specific section of track has illuminance values that are too high (274 lux) since it is fully enclosed. Because of this, the control system will be commissioned to place a high end trim of 50% on these fixtures.



This calculation is for section 3 of the track (green athletic material). This section is unique because it is not enclose on any side, and is actually part of the weight lifting and cardio space. Direct indirect pendants suspended above the track can be seen near the top of this image. Also, the yellow painted wall on the right side of the image is lit using three wall washers, which reflect light down onto the track below. Finally, the bottom right section of the track shown is lit with tight beam downlights as mentioned in the rendering description above.

Entrance Lobby

High Priority Criteria

1. Concept

   While the concept should be felt throughout the design as a whole, this space should reflect the concept as much as possible, since this is the space that all occupants must pass through to get to the rest of the building. By encouraging motion, and utilizing a streamline modern lighting design, the feeling of life should inherently present itself here.

2. Focal points

   The main focus point of the entrance lobby is the control desk. The control desk should be a unique feature that grabs the attention of an occupant. It can also help guide the eye toward the southern wing.

3. Illuminance values as recommended by the IES.

Quantitative Design Criteria					
	E_h			E_v	
Space/Task	Average (lux)	Ave:min	CV	Average (lux)	LPD (W/SF)
Lobby Floor Night E_h @ Floor;E_v @ 5'	25	3:1	N/A	10	.45
Lobby Floor Day E_h @ Floor;E_v @ 5'	50	3:1	N/A	25	
Control Desk	150	2:1	N/A	50	
Casual Seating Area	20	2:1	N/A	7.5	
Vestibules Night: Medium Activity Level E_h @ Floor;E_v @ 5'	25	2:1	N/A	15	

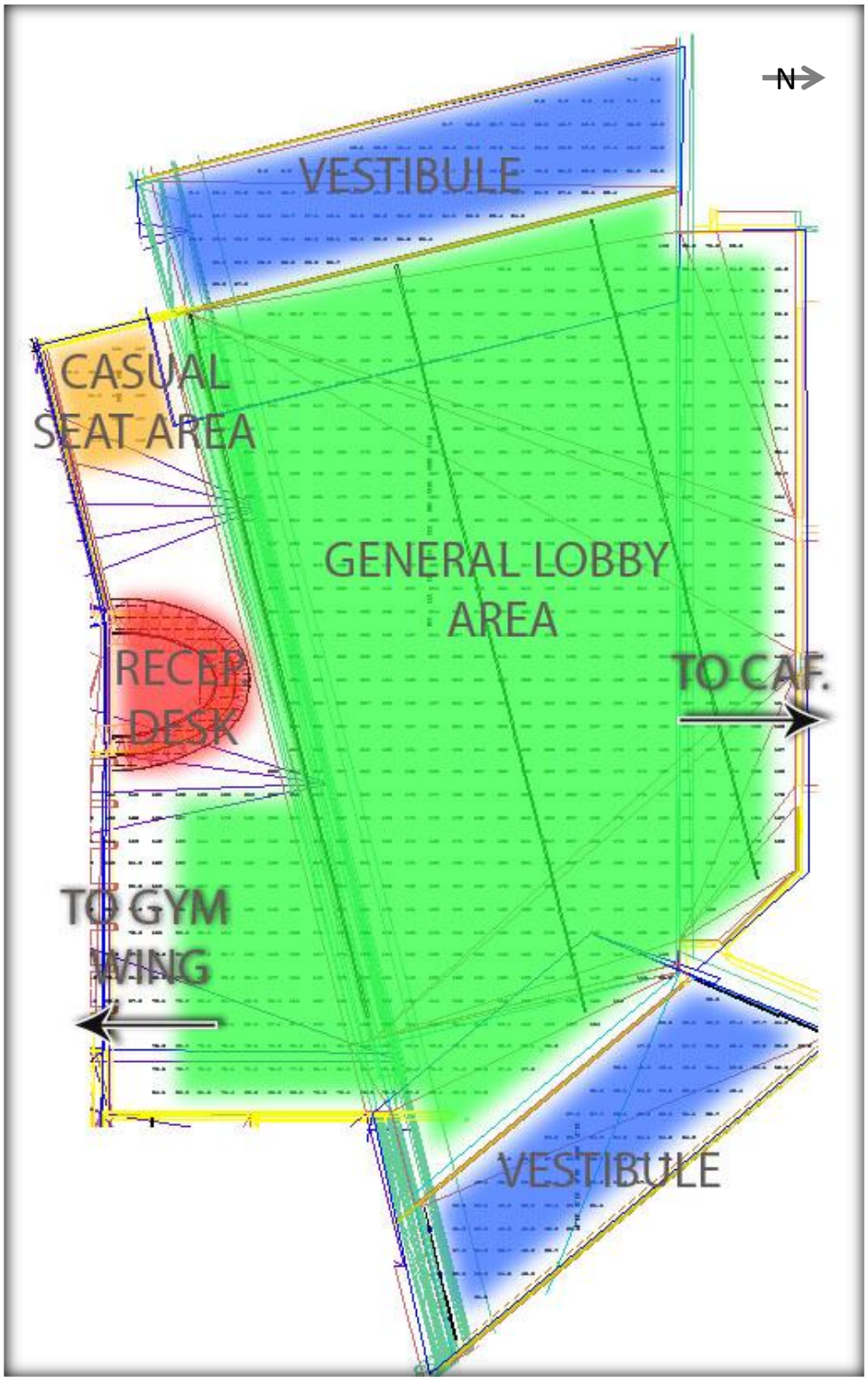
Lighting Plans can be found in Appendix B where the locations of each fixture type can be found.

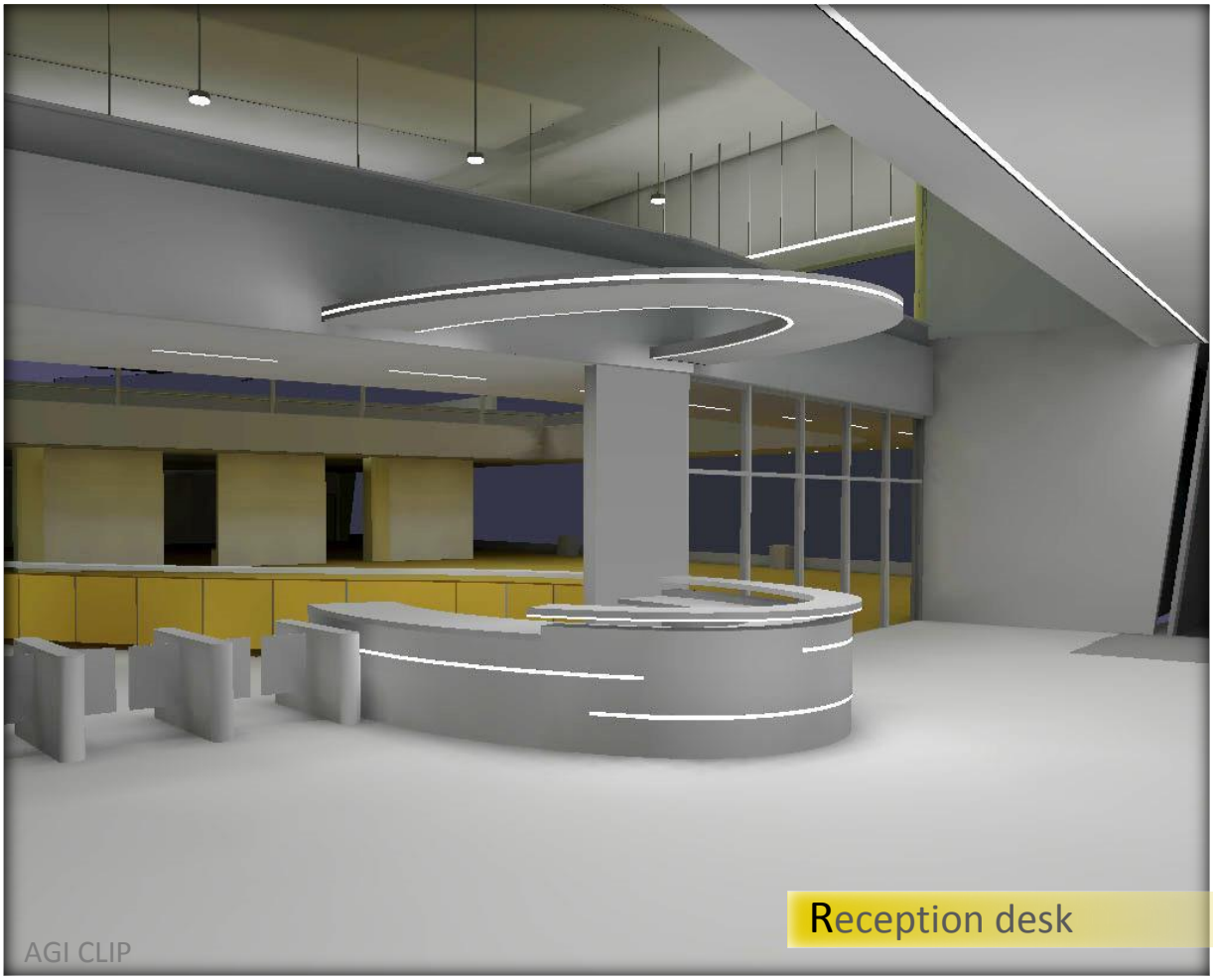
Reference Sheets:

L3 - Lighting Lobby

Lighting Solution

Please use the image below to orient yourself to the overall layout of the entrance lobby before proceeding.





Reception desk

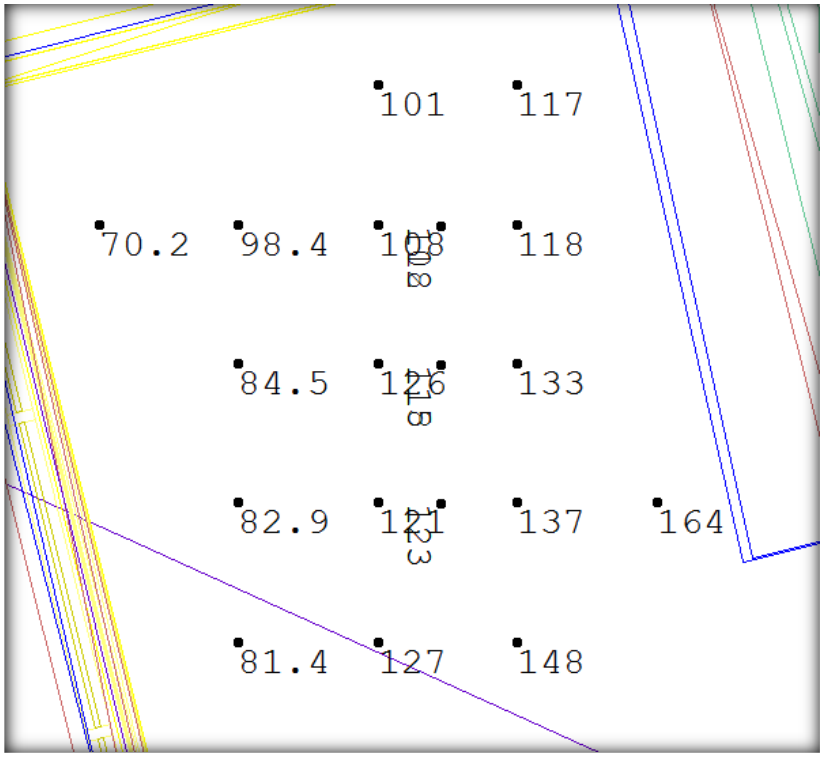
Vestibule Wall

The entrance lobby contains the main reception desk for the entire building. Since this is the main focal point of the space, is the brightest and most eye-catching element of the lobby. Most of the light illuminating the surface of the desk actually comes from the recessed LED general lighting strips in the main lobby area; especially the southernmost strip, which can be seen in the top right of the above image. The curved strip which is recessed into the underside of the drywall arch also provides task lighting to the desk. The curved strip which is recessed vertically into the outside of the same arch acts mainly as accent lighting, but also provides vertical illuminance to the surrounding areas. The recessed strips recessed vertically into the desk structure provide similar functions and help guide the eye into the main exercise area. For the vestibules, cove lighting along both side walls provide general illumination to the space, in addition to the spill light that passes through the lobby glass. This also helps support the concept since they are arranged in the direction of motion through the vestibule.

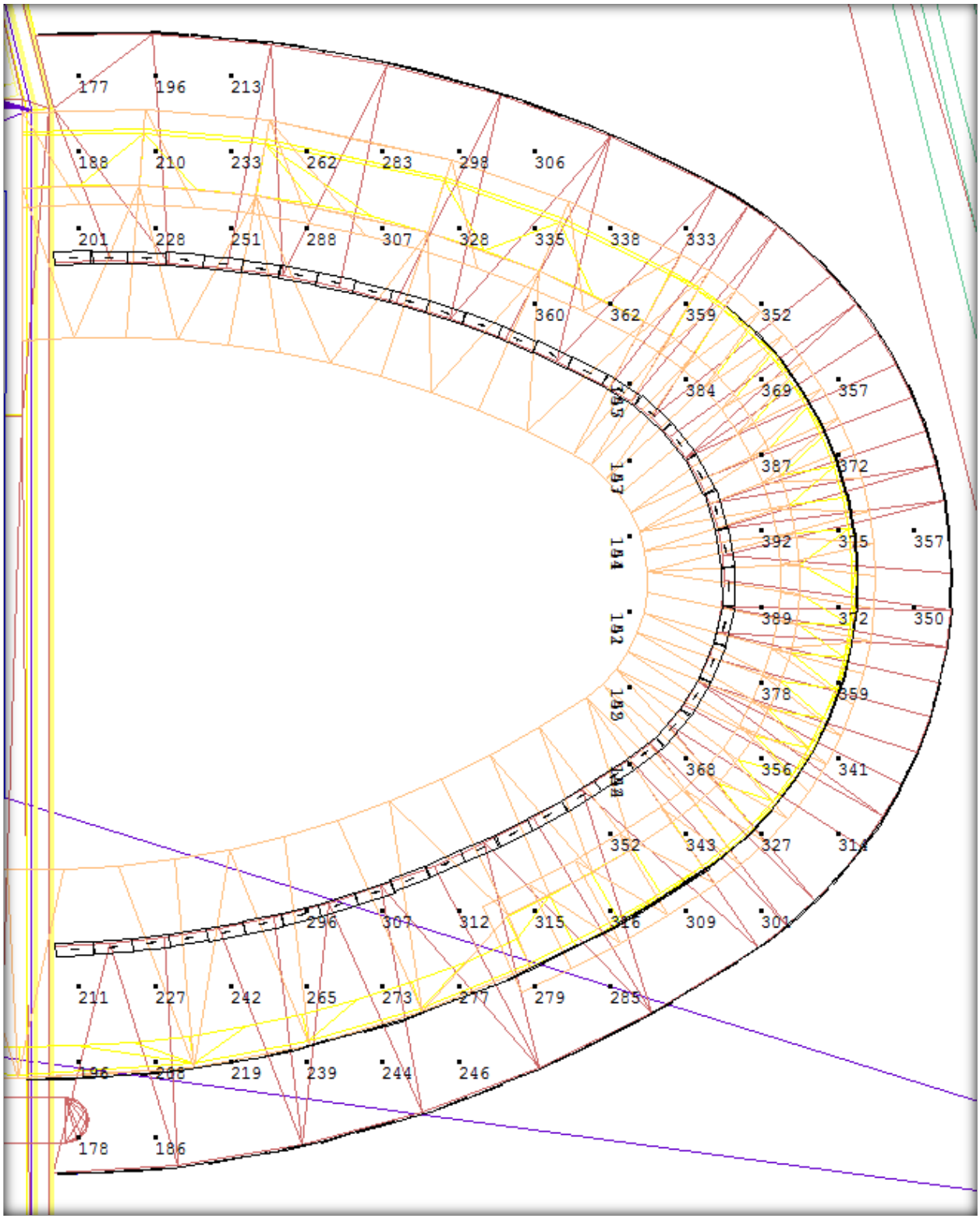
Continuous strips encourage motion from one side of the lobby to the other. This is important because this space will be used for passage from one side of campus to the other, not just as an entry point for the building. These LED strips provide general illumination to the space while keeping the total wattage low. This very uniform aesthetic draws the eye through the space as experienced in the above image. While we want occupants to pass through the space, we also want them to be drawn towards the reception desk, which is why the reception desk is brighter and is accented more. In order to compare the brightness of different elements in lobby, see the Pseudo Color Overlay below.

Quantitative Criteria and Calculations

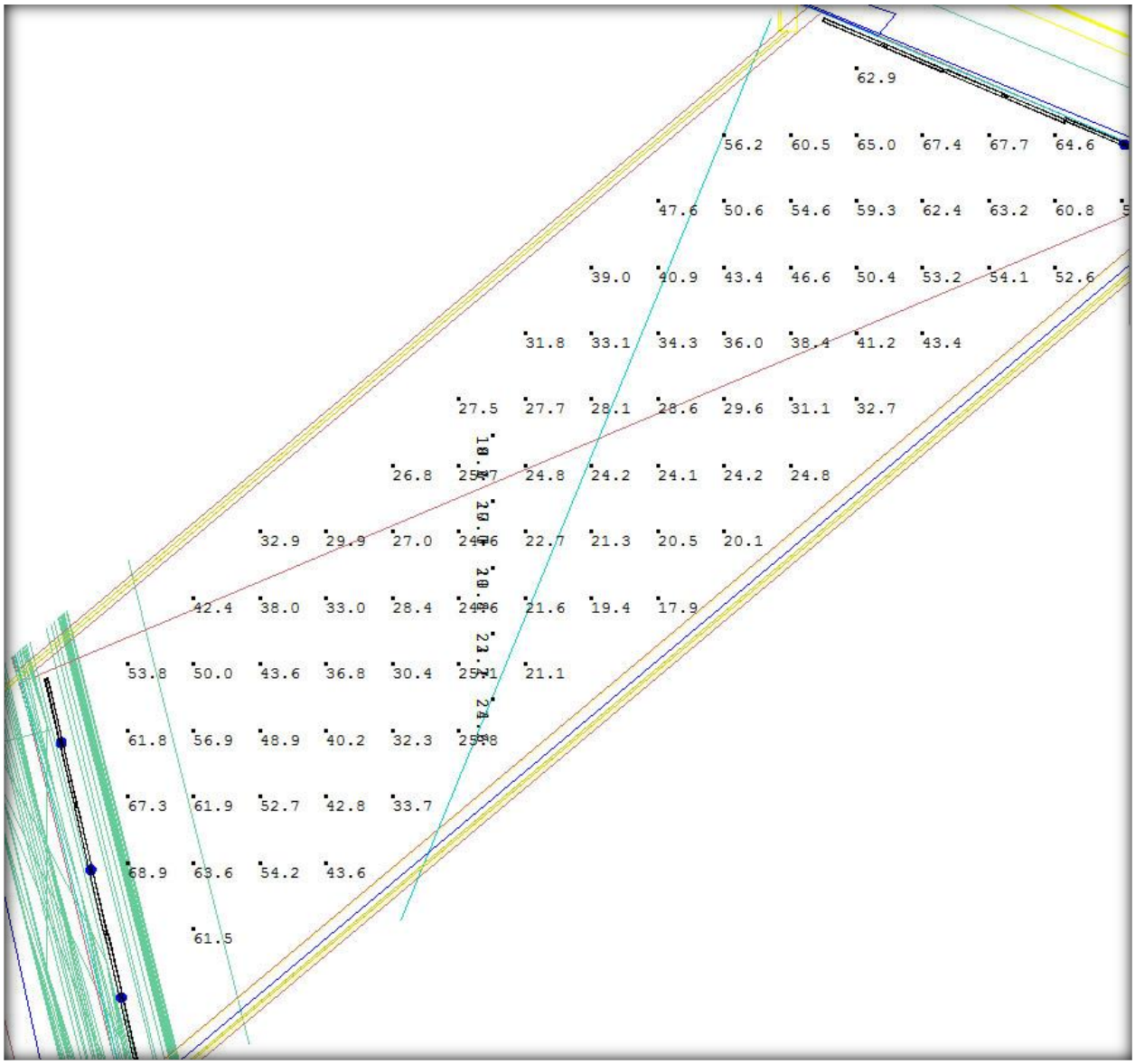
Quantitative Design Criteria					
	E_h			E_v	
Space/Task	Average (lux)	Ave:min	CV	Average (lux)	LPD (W/SF)
Lobby Floor **E_h @ Floor;E_v @ 5'**	160	3:1	N/A	118	.9
Control Desk	300	2:1	N/A	148	
Casual Seating Area	114	2:1	N/A	116	
Vestibules Night: **Medium Activity Level** **E_h @ Floor;E_v @ 5'**	41	2:1	N/A	21	



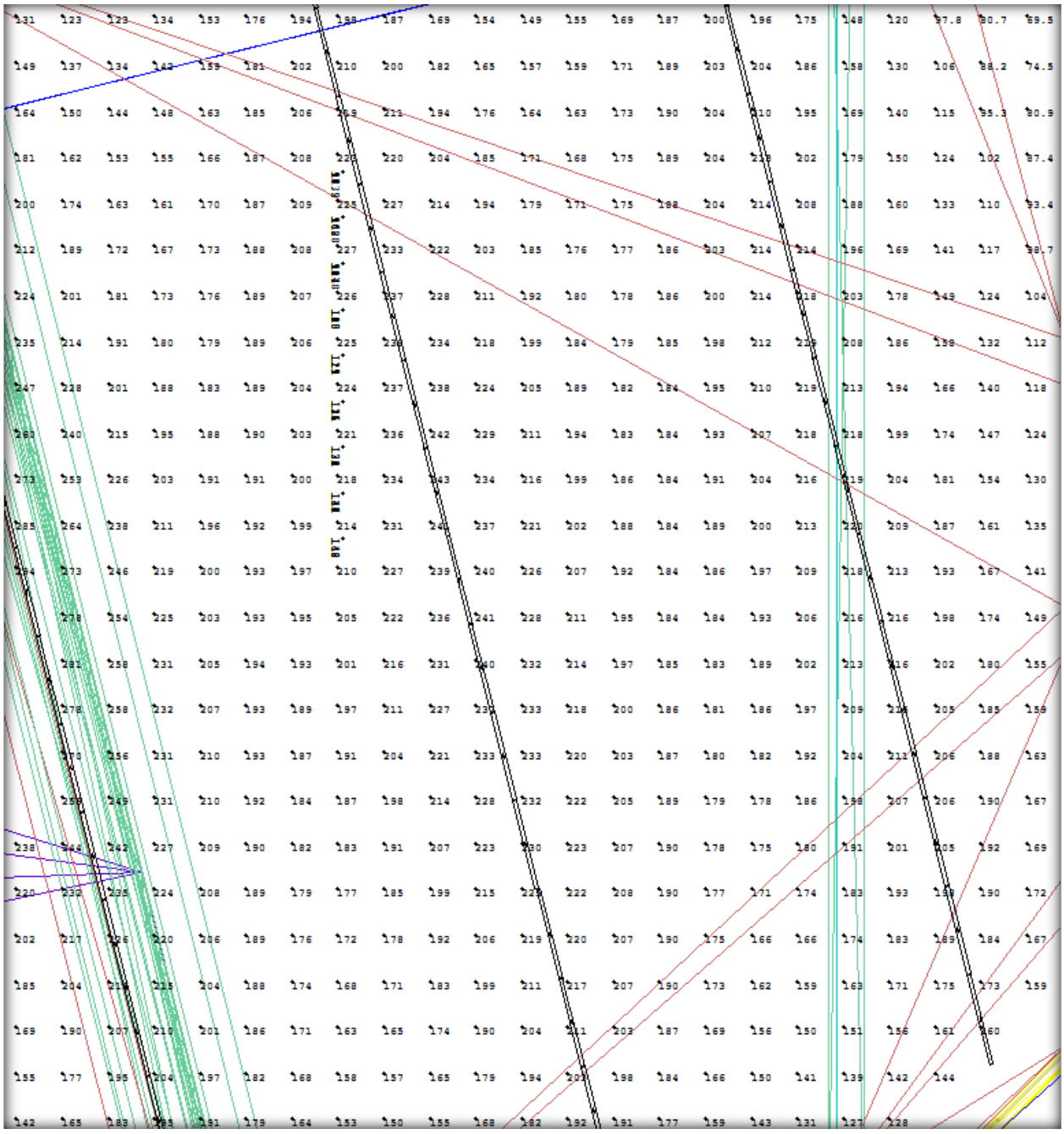
Illuminance values at the casual seating area.



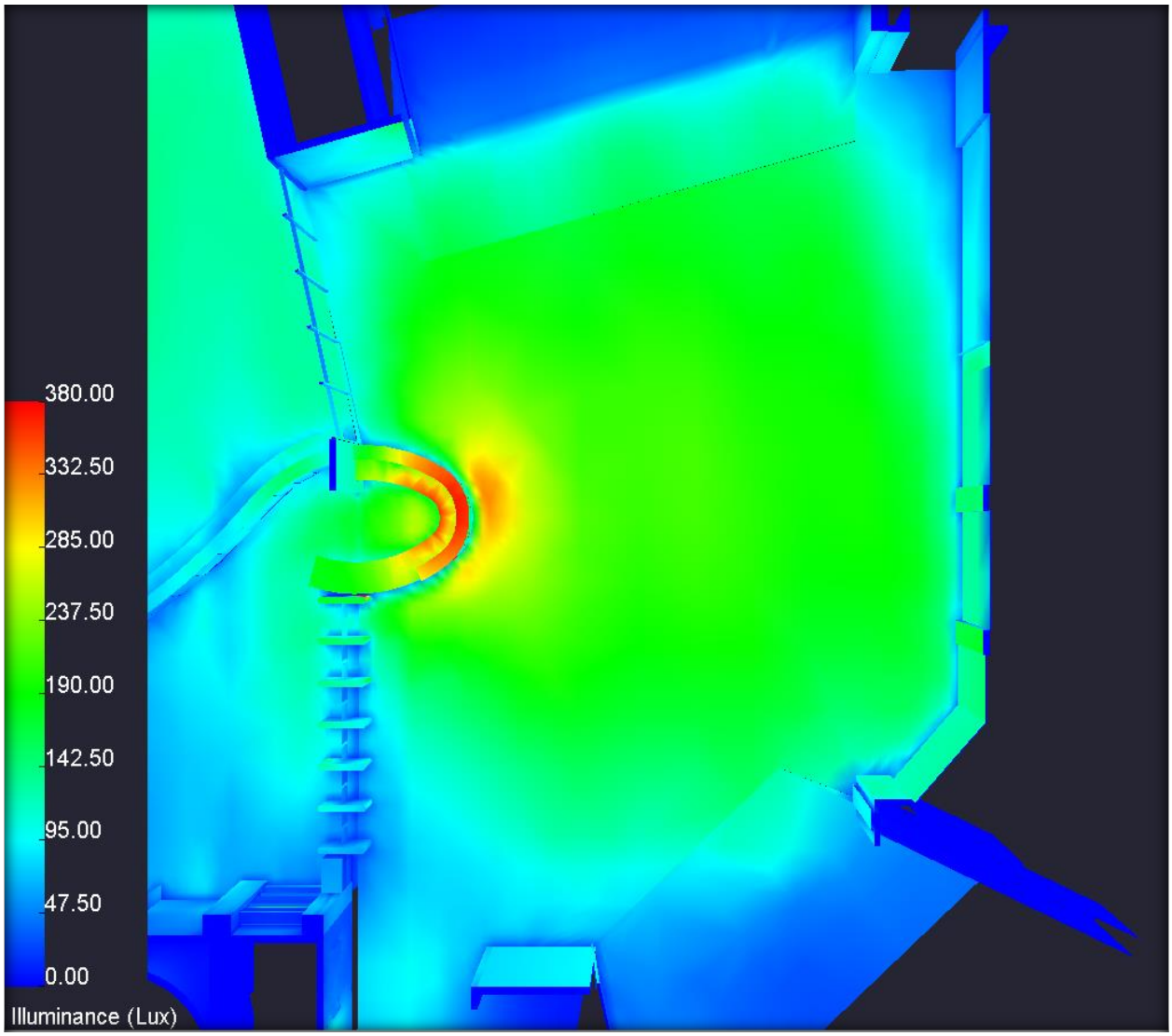
Reception Desk Illuminance values



Illuminance values typical of both vestibules.



Illuminance values across the main lobby floor.



Plan view in Pseudo Color overlay showing Illuminance values across the entire lobby. This image helps show that the desk is indeed the brightest and most important aspect of the space.

Exterior

High Priority Criteria

1. Psychology

   The most important aspect of the Northeast courtyard is how the students and faculty will be drawn to the space. The lighting should provide visual cues to help identify the pathways leading to the entrance, but not take away from the entrance itself, which will be glowing from inside.

2. Safety

   Lighting should provide students and faculty with safety as they pass through the courtyard.

3. Illuminance values as recommended by the IES.

Quantitative Design Criteria					
	E_h			E_v	LPD (W/SF)
Space/Task	Average (lux)	Max:min	CV	Average (lux)	
Sidewalks	10	2:1	N/A	2	.1
Landscaping	N/A	N/A	N/A	N/A	0

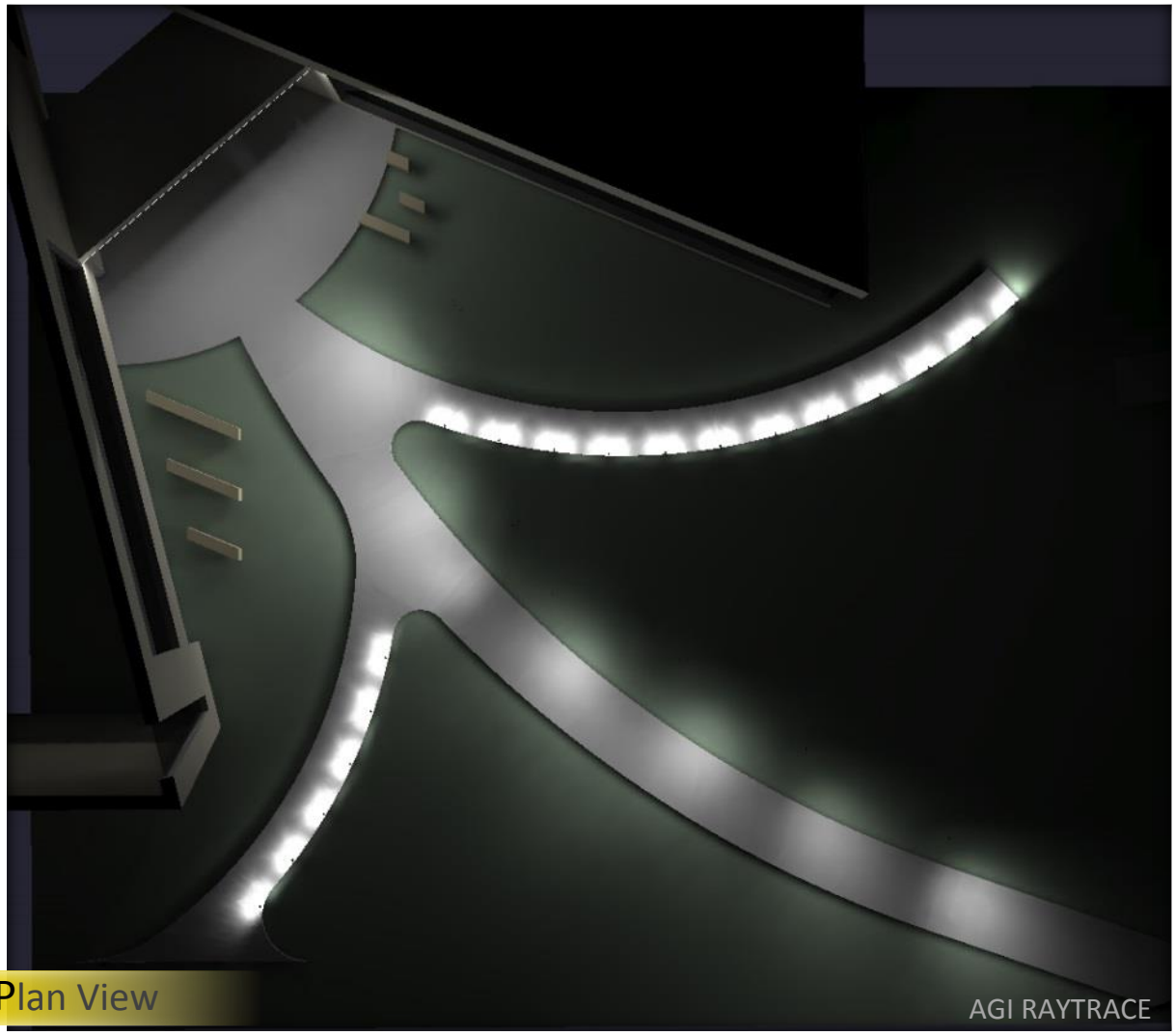
Lighting Plans can be found in Appendix B where the locations of each fixture type as well as daylight sensors can be found.

Reference Sheets:

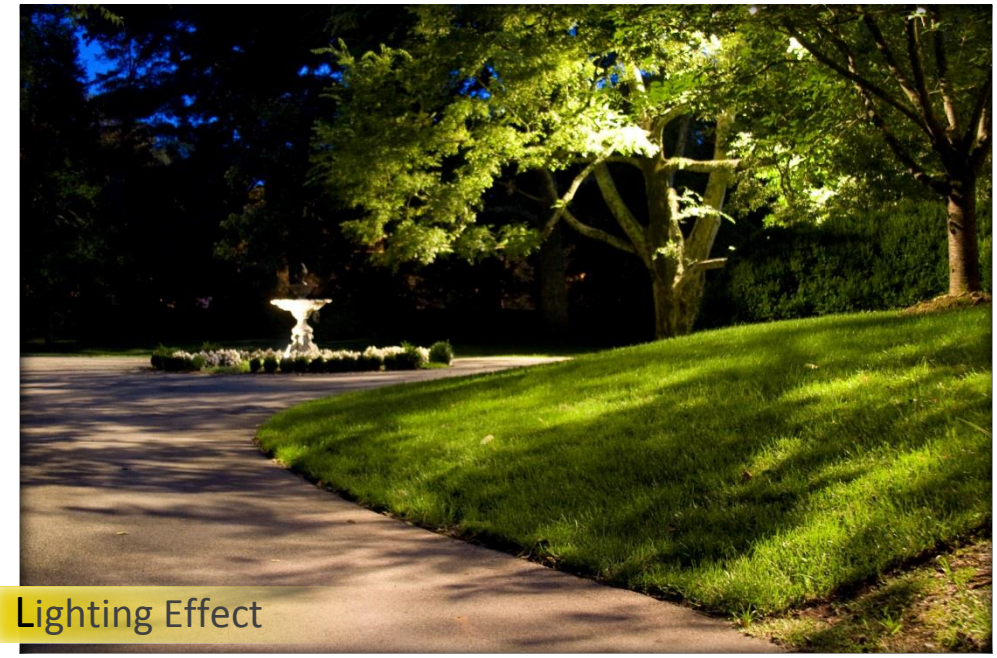
L7 - Lighting Exterior

Lighting Solution

First, most of the façade bordering the courtyard is a curtain wall, so a moderate amount of light will be spilling out of the building to provide ambient lighting to the courtyard. This has not been displayed in renderings or accounted for in calculations since there will be times that the interior lighting will be off while the exterior is on.



Bollards at ten foot spacing were used to light the two flanking pathways which converge into the central pathway. These 21 inch tall bollards provide adequate light levels while directing all light downward, reducing light pollution and glare. The central pathway is lit with Lumascape LED fixtures which use mini O-Clamps (image on the next page) to mount to tree branches along the path. The lighting plan shows where all trees are located in the exterior courtyard, and which trees these fixtures attach to. If placed where indicated, the fixtures can be aimed to create a relatively uniform – but interesting – pattern on the central walkway while providing adequate light.



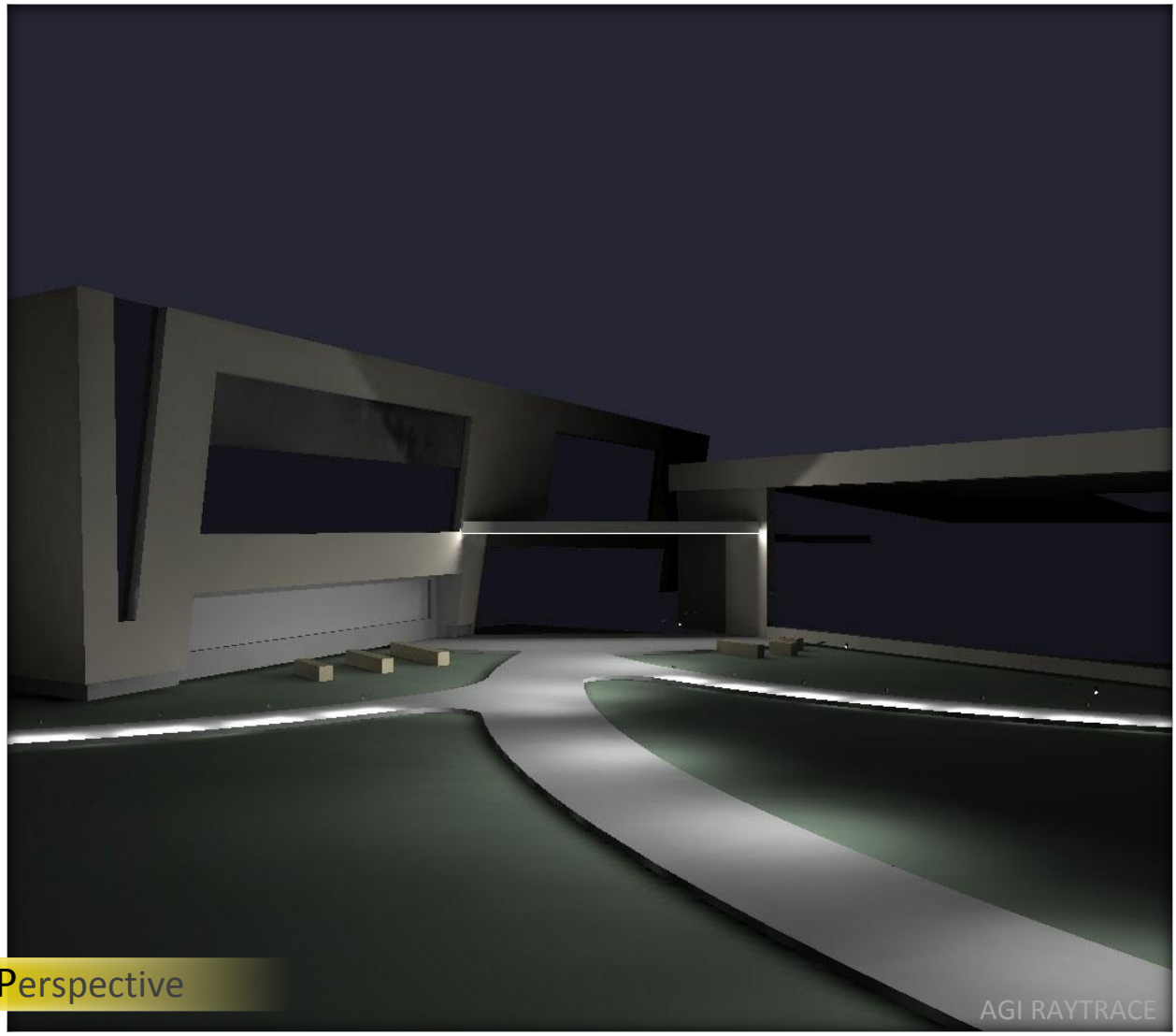
Lighting Effect

This is the type of effect that can be expected by attaching lighting to the tree branches. This creates a very unique and organic pattern on the pathway while avoiding uplighting in order to reduce light pollution. The only light will travel upward is what bounces off of the pathway. This is also important because it will reduce glare. There are several homes which have a view of the Student Life Center, so avoiding glare for these residences is a specific goal of the campus.

This pattern will create small dark spots on the pathway. This will result in a max/min ratio of greater than 2:1 for this space. Although this is outside of the recommendations by the IES, I believe it is acceptable in this scenario in order to achieve the effect seen above as well as some intentional visual patterns.

Mini-O-Clamp

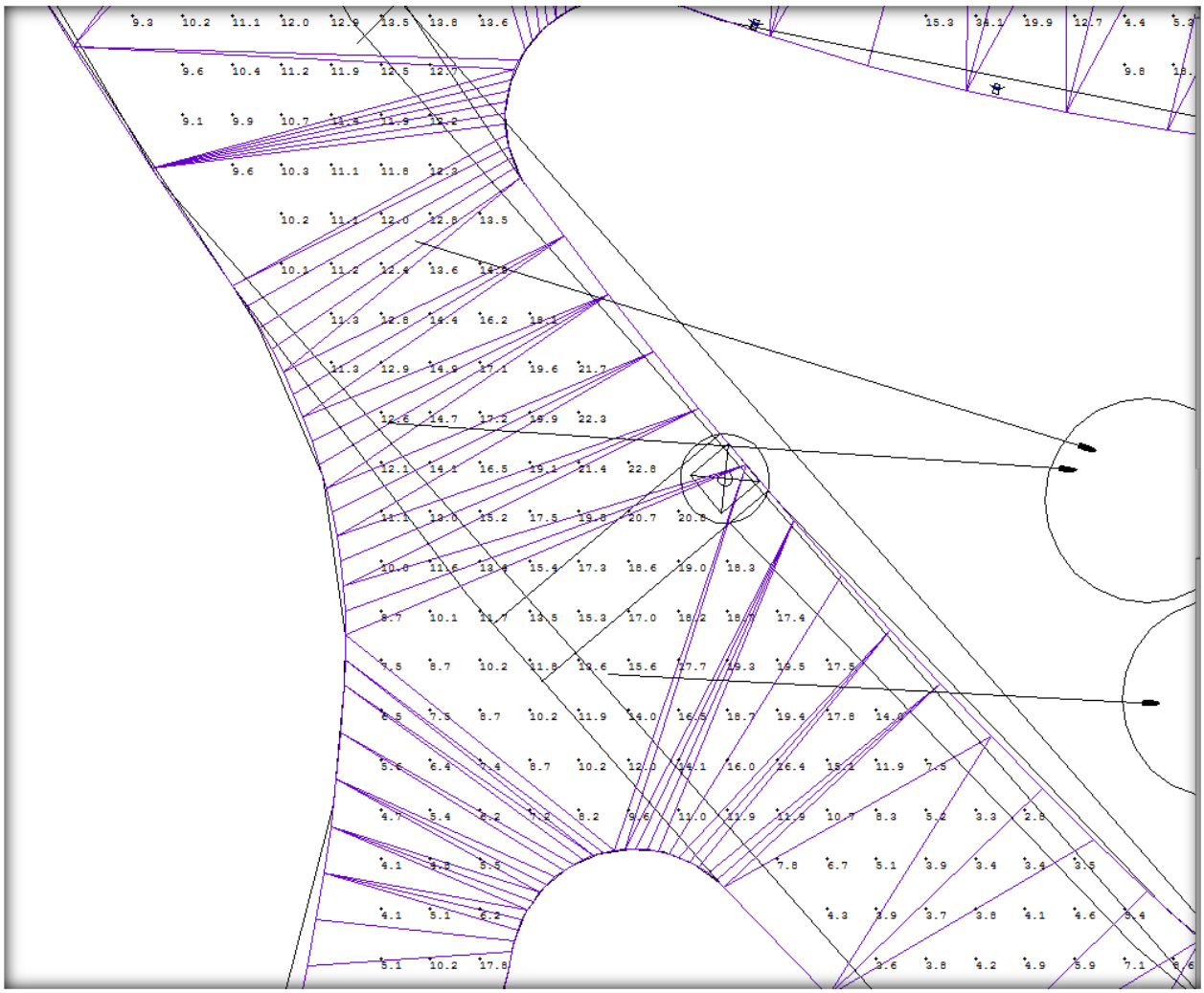
A small continuous LED strip attached to the underside of the entrance overhang provides interest and introduces this common theme that is seen throughout the rest of the interior lighting design. It provides a moderate amount of light onto the entrance patio, while adding a bit of visual flare.



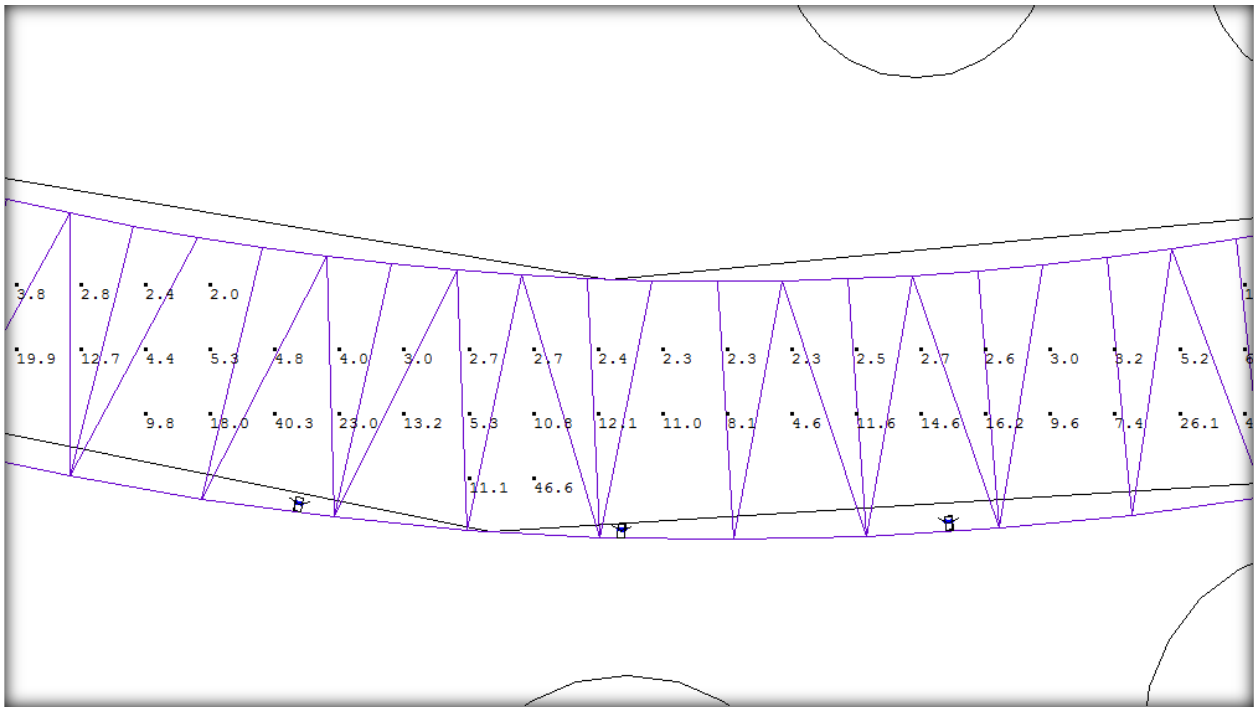
It may seem as though more lighting could have been applied to this space, but in order to achieve LEED requirements, no façade lighting or uplighting was used. Also, in order to conserve as much energy as possible, this scheme was kept very minimal: using only the strip, lighting effects, and landscaping to create an interesting space.

Quantitative Criteria and Calculations

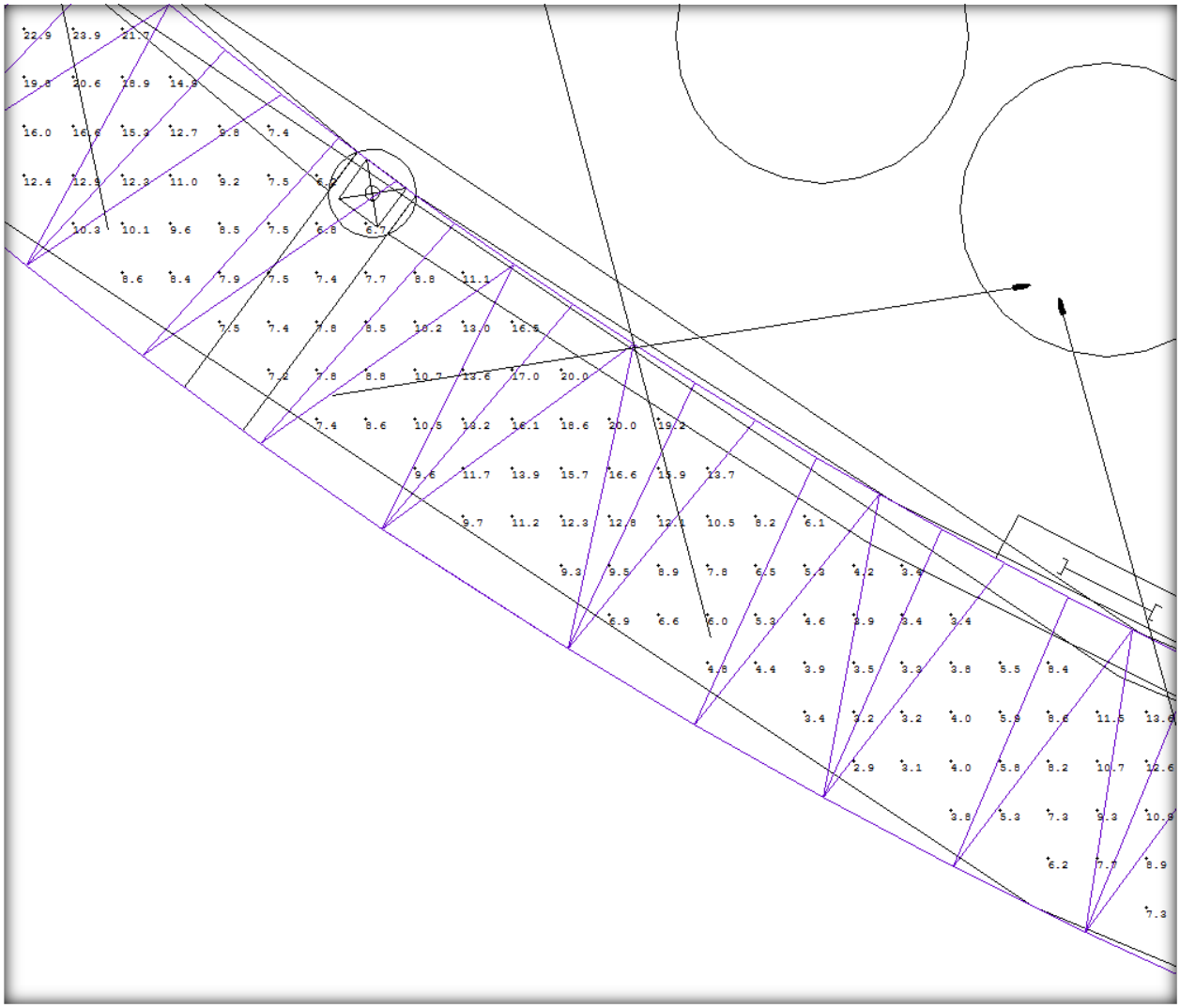
Quantitative Criteria : As Designed				
	E_h			E_v
Space/Task	Average (lux)	Max:min	CV	Average (lux)
Sidewalks	13.2	>2:1	N/A	2
Landscaping	N/A	N/A	N/A	N/A



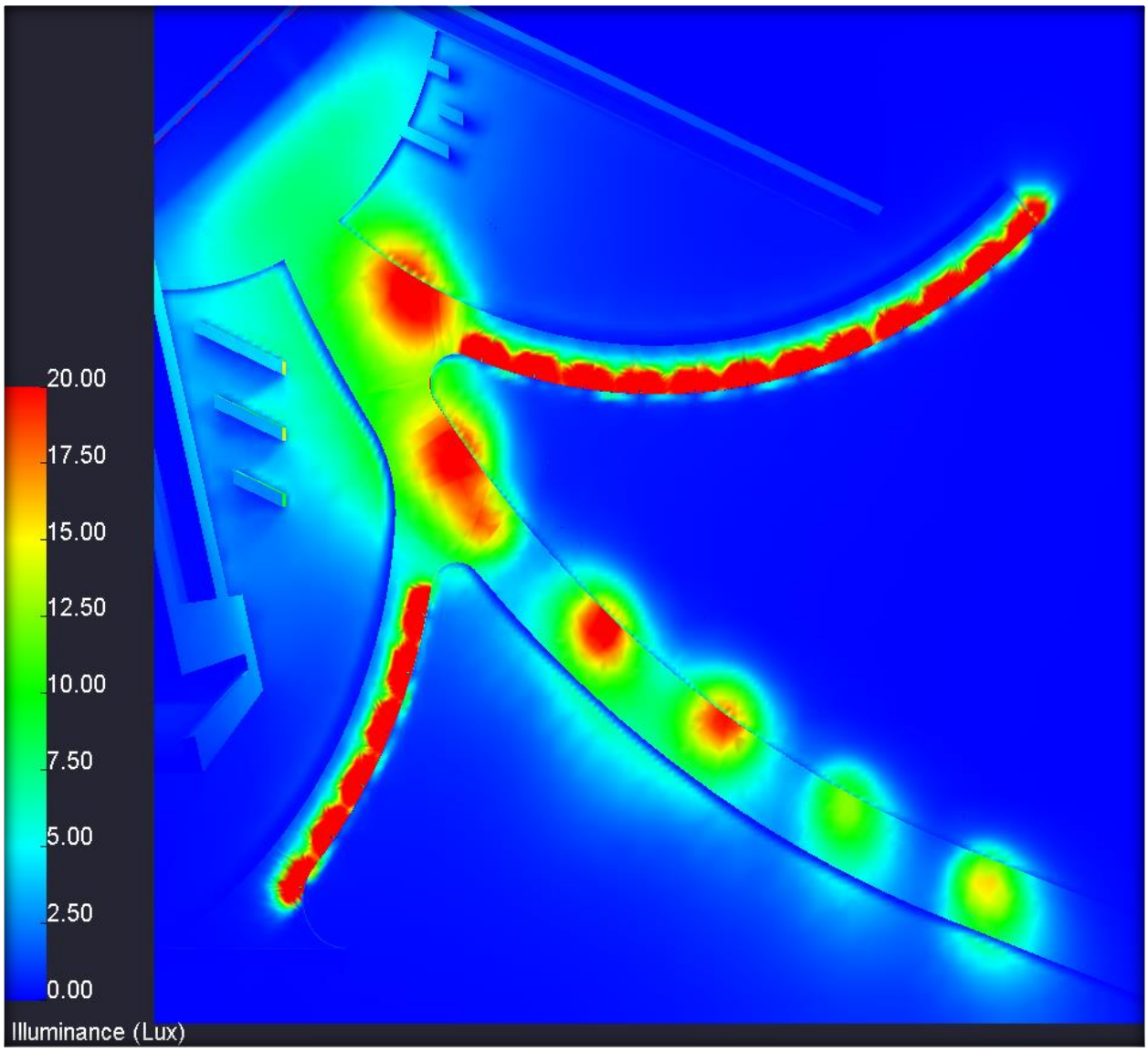
Illuminance values where the left flanking path converges into the middle pathway.



Typical distribution of bollard Illuminance values on the flanking pathways.



Typical distribution of illuminance values along the center pathway from tree mounted fixtures.



Plan view in Pseudo Color overlay showing Illuminance values across the entire area. As you can see, the lighting in general gets brighter as you move closer to the building. This helps draw people towards the building entrance.

Control System Narrative

The current control system for the SUNY Cortland Student Life Center uses Greenmax Relay cabinets which gathers and sends all data to and from fixtures, occupancy sensors, vacancy sensors, photosensors, control stations, wall switches, and even mechanical equipment. Thus, the overall control scheme for the building will remain the same. The existing equipment details and specific schemes can be found here.

The new control scheme though, will need to reflect lighting fixture changes. In addition, one system – the track pacing system – will need to be on an independent stand-alone system to ease software conflicts and user control.

Please refer to the Lighting Drawings to locate daylight sensors throughout the weight lifting/cardio space, and running track. The lobby will not utilize daylighting controls. On these drawings, notes identify which fixtures are controlled by which sensors, but here is a short list of new zones:

Weight Lifting/Cardio

1. C1 and D1 fixtures
2. B2 Fixtures
3. A6 Fixtures as noted

Running Track

1. Fixture B1 (West side, above weight lifting space)
2. Fixture A7 & A8 (West side)
3. Fixture A8, A10, B1 (South side)
4. B3 Fixtures (East side)
5. Fixture A1 & A7 (East side)

The building will close between 12:00AM and 5:00AM. A time clock setting should be set to shut off the lighting throughout the building between 12:30AM and 4:30AM. This will allow employees to enter and exit safely since they will likely be leaving after hours and returning early. Manual override switches will be available at control desks for employees to turn lighting on if necessary for early arrival, late nights, or cleaning.

For a description of the track pacing control system, please refer to the running track section where the system is already described here.

Finally, fixtures A8 (2) and A10, located in the track tube that suspends over the swimming pool will be commissioned with a 50% high end trim. The facilities personnel at the SUNY Cortland campus, according to the project team, are more than capable of increasing this trim later in the building's life if desired.

Lighting Power Densities (by space & by building)

Project: SUNY Cortland SLC

Date: 1/20/2014
Revised: 4/4/2014

Space	Design Wattage	SF or LF	LPD by Code	Watts Allowed	Design LPD
Lobby	2,435.7	5,469	0.90	4922.1	0.45
Gym	12,301.0	16,856	0.92	15507.52	0.73
Track	9,847.0	13,132	0.82	10768.24	0.75
Exterior Sidewalks	567.0	5,437	0.80	4349.6	0.10
Exterior Landscaping	0.0	17,070	0.05	853.5	0
Totals	25150.7	57,964.00	0.63	36,400.96	0.43
				% BETTER/WORSE THAN CODE*	30.91%

LEED Qualifications

There are three sets of requirements that could be achieved in LEED for this proposal.

- SS Credit 8: Light Pollution Reduction
- EA Credit 1: Optimize Energy Performance
- IEQ Credit 6.1: Controllability of systems — Lighting

Total points expected to through this design: 11

Break Down by Section:

SS Credit 8: Light Pollution Reduction ✓

Requirements:

Design exterior lighting so that all site and building mounted luminaires produce a maximum initial illuminance value no greater than 0.20 horizontal and vertical footcandles at the site boundary and no greater than 0.01 horizontal footcandles 15 feet beyond the site. Document that no more than 5% of the total initial designed fixture lumens are emitted at an angle of 90 degrees or higher from nadir (straight down).

Were they met?

This building was zoned LZ2 for the purposes of this design:
LZ2 – Low (primarily residential zones, neighborhood business districts, light industrial areas with limited nighttime use and residential mixed-use areas)

The site boundary is technically the edge of the SUNY Cortland campus, so site boundary conditions were certainly met. Also, no more than 5% of initial designed fixture lumens were emitted at an angle of 90 degrees or higher from nadir.

EA Credit 1: Optimize Energy Performance ✓

Requirements:

EA Credit 1: Optimize Energy Performance

1–19 Points

Intent

To achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.

Requirements

Select 1 of the 3 compliance path options described below. Project teams documenting achievement using any of the 3 options are assumed to be in compliance with EA Prerequisite 2: Minimum Energy Performance.

OPTION 1. Whole Building Energy Simulation (1–19 points)

Demonstrate a percentage improvement in the proposed building performance rating compared with the baseline building performance rating. Calculate the baseline building performance according to Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda[1]) using a computer simulation model for the whole building project. The minimum energy cost savings percentage for each point threshold is as follows:

New Buildings	Existing Building Renovations	Points
12%	8%	1
14%	10%	2
16%	12%	3
18%	14%	4
20%	16%	5
22%	18%	6
24%	20%	7
26%	22%	8
28%	24%	9
30%	26%	10
32%	28%	11
34%	30%	12
36%	32%	13
38%	34%	14
40%	36%	15
42%	38%	16
44%	40%	17
46%	42%	18
48%	44%	19

Were they met?

If a similar approach used for the lighting design of these four spaces was used for remainder of the building, lighting would achieve 10 of the energy performance points based on the lighting power densities calculated above.

IEQ Credit 6.1 Controllability of systems — Lighting ✗

Requirements:

Provide individual lighting controls for 90% or more of the building occupants to enable adjustments to suit individual task needs and preferences.

Provide lighting system controls for all shared multi-occupant spaces to enable adjustments that meet group needs and preferences.

Were they met?

The majority of the spaces designed for this proposal are very public spaces. Though, most of these spaces will be preprogrammed to operate without user interruption unless absolutely necessary, so this will not meet the requirement. While the track does house a very user involved system, the other spaces do not.

Light Loss Factors

Only two sources were used for this project, LED and Metal Halide. All products specified except one included drivers in their report; therefore no additional Light Loss Factors (LLF's) had to be added to account for new drivers. The only product that did not was an LED accent strip. This strip had such a minimal output that applying LLF's would be negligible in its effect on the space.

LLD = Lamp Lumen Depreciation
LDD = Lamp Dirt Depreciation
BF = Ballast Factor

Light Loss Factors

Source	LLD	LDD	BF
LED	0.8	0.9	Drivers included
Metal Halide	0.7	0.9	1
LED Accent Strip	Not used: strip is low output - LLFs negligible and output is negligible to space		

Section D

Electrical Depth

Introduction

The Electrical Depth consists of three parts:

1. Recircuiting of panel boards to address changes in the lighting design as explained in the Lighting Depth.
2. Short Circuit Analysis
3. Spin Room Schematic

1. Recircuiting of Panelboards

Overall, the total lighting load for the areas that were redesigned was only slightly less than the original design. In order to simplify the circuitry, one or two circuits were added to the Panelboards, and the names of some circuits were renamed from their previous identification. Also, some circuits were eliminated in the process. Emergency lighting circuitry was redone and the new loads were calculated as can be seen in the panelboards below. The following Panelboards had changes made to them:

1. HV-1-1
2. HV-1-2
3. HV-1-3
4. HV-2-1
5. HV-2-2
6. LV-1-2
7. EM-1-2
8. EM-1-3
9. EM-2-1

The following images, up until part 2, are the new panelboards. Altered circuits are highlighted and the new loads are placed into their proper column.

BRANCH CIRCUIT PANELBOARD SCHEDULE

PNL: HV-1-1		MOUNTING:		SURFACE	X		MAIN LUGS ONLY	x	MAIN BREAKER:	125A
480Y/277, 3 PHASE, 4 WIRE				FLUSH			SHUNT TRIP MAIN		Main Lugs Only: A	
14	,000MIN A.I.C. SYM			IN MCC			FEED THRU LUG		GROUND BUS:	X
NEUTRAL: 100%							NUMBER OF POLES:	42	ISOLATED GROUND BUS:	

CKT No.	LOAD	TRIP (AMP)	KVA / PHASE A	B	C		KVA / PHASE A	B	C	TRIP (AMP)	LOAD	CKT No.
1	RESTROOM/CLASSROOM	20	2.95				2.41			20	MER ROOM	2
3	STORAGE/LOBBY/CORR.	20		2.50				3.56		20	EQMPT. STORAGE	4
5	CIRCUIT/FREE WEIGHTS	20			3.96				1.91	20	GOLF SIM./CORRIDOR	6
7	45 KVA TRANSFORMER	70	15.00				.57			20	GYMNASIUM	8
9				15.00				0.00		20	SITE LIGHTING	10
11		3			15.00				1.30	20	SITE LIGHTING	12
13	SITE LIGHTING	20	1.07				1.04			20	SITE LIGHTING	14
15	SITE LIGHTING	20		1.22						20	LIGTHING (SPINNING RM)	16
17	SITE LIGHTING	20			1.15					20	SPARE	18
19	SPARE	20								20	SPARE	20
21	SPARE	20								20	SPARE	22
23	SPARE	20								20	SPARE	24

BRANCH CIRCUIT PANELBOARD SCHEDULE

PNL: HV-1-2		MOUNTING:		SURFACE	X		MAIN LUGS ONLY	x	MAIN BREAKER:	100A
480Y/277, 3 PHASE, 4 WIRE				FLUSH			SHUNT TRIP MAIN		Main Lugs Only: A	
14	,000MIN A.I.C. SYM			IN MCC			FEED THRU LUG		GROUND BUS:	X
NEUTRAL: 100%							NUMBER OF POLES:	18	ISOLATED GROUND BUS:	

CKT No.	LOAD	TRIP (AMP)	KVA / PHASE A	B	C		KVA / PHASE A	B	C	TRIP (AMP)	LOAD	CKT No.
1	CORRIDOR/POOL AREA	20	1.91				3.56			20	SHOWERS/FAM. CHG.	2
3	MECHANICAL ROOM	20		1.01				1.68		20	BOULDERING/NATATORIUM LTG	4
5	LOCKERS	20			3.23				1.29	20	CONCOURSE	6
7	45 KVA TRANSFORMER	70	15.00							20		8
9				15.00						20		10
11		3			15.00					20		12
13		20								20		14
15		20								20		16
17		20								20		18

BRANCH CIRCUIT PANELBOARD SCHEDULE

PNL: HV-1-3		MOUNTING:		SURFACE	X		MAIN LUGS ONLY	x	MAIN BREAKER:		75A			
480Y/277, 3 PHASE, 4 WIRE				FLUSH			SHUNT TRIP MAIN		Main Lugs Only: A					
14 ,000MIN A.I.C. SYM				IN MCC			FEED THRU LUG		GROUND BUS:		X			
NEUTRAL: 100%							NUMBER OF POLES:	18	ISOLATED GROUND BUS:					
CKT	LOAD	TRIP	KVA / PHASE				KVA / PHASE			TRIP	LOAD	CKT		
No.		(AMP)	A	B	C		A	B	C	(AMP)		No.		
1	LOBBY LTG.	20	2.00				1.79			20	LOCKERS / IT / BATH.	2		
3	SEATING AREA	20		1.56				1.84		20	CLASS./OFFICES/SERV.	4		
5	SEATING AREA	20			2.94				1.30	20	STORAGE/REPAIRS/BIKE	6		
7		50	10.00				0.50			20	EXTERIOR LTG (10 FK-6A)	8		
9	30 KVA TRANSFORMER			10.00						20		10		
11		3			10.00					20		12		
13	LOBBY LTG.	20	.49							20		14		
15		20								20		16		
17		20								20		18		

BRANCH CIRCUIT PANELBOARD SCHEDULE

PNL: HV-2-1		MOUNTING:		SURFACE	X		MAIN LUGS ONLY	x	MAIN BREAKER:					
480Y/277, 3 PHASE, 4 WIRE				FLUSH			SHUNT TRIP MAIN		Main Lugs Only: 200 A					
14 ,000MIN A.I.C. SYM				IN MCC			FEED THRU LUG		GROUND BUS:		X			
NEUTRAL: 100%							NUMBER OF POLES:	30	ISOLATED GROUND BUS:					
CKT	LOAD	TRIP	KVA / PHASE				KVA / PHASE			TRIP	LOAD	CKT		
No.		(AMP)	A	B	C		A	B	C	(AMP)		No.		
1	MIND/BODY, CARDIO EXP.	20	3.20				3.20			20	OFFICES	2		
3	MER/MAC ROOMS	20		2.52				1.48		20	ELEVATED TRACK LTG	4		
5	CONCOURSE/RESTROOM	20			3.50				4.21	20	CARDIO	6		
7	SPARE	20					4.15			20	CARDIO	8		
9	CARDIO	20		4.33				1.51		20	TRACK LTG	10		
11	CARDIO	20			3.06				2.88	20	GYMNASIUM	12		
13		70	15.00				2.88			20	GYMNASIUM	14		
15	45 KVA TRANSFORMER			15.00				3.11		20	GYMNASIUM	16		
17		3			15.00				2.39	20	MAC	18		
19	GYMNASIUM	20	3.11				2.39			20	MAC	20		
21	GYMNASIUM	20		3.11				0.10		20	MIND BODY	22		
23	GYMNASIUM	20			2.88				1.23	20	MIND BOBY	24		
25	SPARE	20					1.96			20	TRACK LTG	26		
27	SPARE	20								20	SPARE	28		
29	SPARE	20								20	SPARE	30		

BRANCH CIRCUIT PANELBOARD SCHEDULE

PNL: HV-2-2		MOUNTING:		SURFACE	X		MAIN LUGS ONLY	x	MAIN BREAKER:	150A
480Y/277, 3 PHASE, 4 WIRE				FLUSH			SHUNT TRIP MAIN		Main Lugs Only: 200 A	
14 ,000MIN A.I.C. SYM				IN MCC			FEED THRU LUG		GROUND BUS:	X
NEUTRAL: 100%							NUMBER OF POLES:	24	ISOLATED GROUND BUS:	

CKT No.	LOAD	TRIP (AMP)	KVA / PHASE A	B	C	KVA / PHASE A	B	C	TRIP (AMP)	LOAD	CKT No.
1	FREE WT/CARDIO LTG	20	1.63			1.66			20	FREE WT/CARDIO LTG	2
3	FREE WT/CARDIO LTG	20		1.63			2.11		20	ELEVATED TRACK LTG	4
5	ELEVATED TRACK LTG	20			2.50			2.42	20	FREE WT/CARDIO LTG	6
7	COMBATIVES	20	2.93			2.59			20	GAME ROOM	8
9	GROUP EXERCISE	20		2.99			2.69		20	GAME ROOM	10
11	CLAMP FIXTURES	20			1.25				20	SPARE	12
13	MAC RMS.	20	0.40			15.00			70		14
15		20					15.00			45 KVA TRANSFORMER	16
17		20						15.00	3		18
19		20							20		20
21		20							20		22
23		20							20		24

BRANCH CIRCUIT PANELBOARD SCHEDULE

PNL: LV-1-2 SECT 2		MOUNTING:		SURFACE	X		MAIN LUGS ONLY	x	MAIN BREAKER:	100A
208Y/120, 3 PHASE, 4 WIRE				FLUSH			SHUNT TRIP MAIN		Main Lugs Only: A	
10 ,000MIN A.I.C. SYM				IN MCC			FEED THRU LUG		GROUND BUS:	X
NEUTRAL: 100%							NUMBER OF POLES:	24	ISOLATED GROUND BUS:	

CKT No.	LOAD	TRIP (AMP)	KVA / PHASE A	B	C	KVA / PHASE A	B	C	TRIP (AMP)	LOAD	CKT No.
25	CONV. RECEPT.	20	1.26			1.44			20	conv recept	26
27	AV RECEPT.	20		1.00			0.36		20	conv recept	28
29	AV RECEPT.	20			1.00			1.50	20	SIGNAGE	30
31	CONV. RECEPT.	20	0.72			1.50			20	SIGNAGE	32
33	TV RECEPT.	20		1.20			0.80		20	TV RECEPT.	34
35	RECEPT.	20			1.08			1.08	20	RECEPT.	36
37	QUAD RECEPT. (2)	20	1.20			1.44			20	RECEPT.	38
39	ahu ltg	20		1.00			1.20		20	QUAD RECEPT. (2)	40
41	EF-1-3	20			0.67			1.40	20	CUH-1-5	42
43	CUH-1-18	20	1.40			1.40			20	CUH-1-6	44
45	CUH-1-19	20		1.40			1.40		20	CUH-1-7	46
47		20							20	SPARE	48

BRANCH CIRCUIT PANELBOARD SCHEDULE

PNL: HV-EM-1-2		MOUNTING:		SURFACE	X		MAIN LUGS ONLY	x	MAIN BREAKER:				
480Y/277, 3 PHASE, 4 WIRE				FLUSH			SHUNT TRIP MAIN		Main Lugs Only: 200 A				
14 ,000MIN A.I.C. SYM				IN MCC			FEED THRU LUG		GROUND BUS:	X			
NEUTRAL: 100%							NUMBER OF POLES:	12	ISOLATED GROUND BUS:				

CKT No.	LOAD	TRIP (AMP)	KVA / PHASE A	B	C		KVA / PHASE A	B	C	TRIP (AMP)	LOAD	CKT No.
1	LOCKERROOM LTG	20	2.26				0.45			20	EXT.LTG	2
3	STAIR 5	20		0.45						20		4
5	CIRCUIT FREE WEIGHTS	20			0.90					20		6
7	15 KVA TRANSFORMER	30	5.00							20		8
9				5.00						20		10
11		3			5.00					20		12

BRANCH CIRCUIT PANELBOARD SCHEDULE

PNL: HV-EM-1-3		MOUNTING:		SURFACE	X		MAIN LUGS ONLY	x	MAIN BREAKER:				
480Y/277, 3 PHASE, 4 WIRE				FLUSH			SHUNT TRIP MAIN		Main Lugs Only: A				
14 ,000MIN A.I.C. SYM				IN MCC			FEED THRU LUG		GROUND BUS:	X			
NEUTRAL: 100%							NUMBER OF POLES:	18	ISOLATED GROUND BUS:				

CKT No.	LOAD	TRIP (AMP)	KVA / PHASE A	B	C		KVA / PHASE A	B	C	TRIP (AMP)	LOAD	CKT No.
1	LOBBY	20	.53				0.45			20	EXT. LTG	2
3	SERV/TOILETS/SEATING	20		2.00				0.87		20	STAIR 8, MECH. RM	4
5	LIGHTING	20			2.02				2.10	20		6
7	15KVA TRANSFORMER	30	5.00				2.10				KX-R-4	8
9				5.00				2.10		20		10
11		3			5.00					20	SPARE	12
13		20	3.75							20	SPARE	14
15	KX-R-1,-3, -5			3.75						20	SPARE	16
17		3			3.75					20	SPARE	18

BRANCH CIRCUIT PANELBOARD SCHEDULE

PNL: HV-EM-2-1		MOUNTING:		SURFACE	X		MAIN LUGS ONLY		X	MAIN BREAKER:			
480Y/277, 3 PHASE, 4 WIRE				FLUSH			SHUNT TRIP MAIN			Main Lugs Only: A			
14 ,000MIN A.I.C. SYM				IN MCC			FEED THRU LUG			GROUND BUS:		X	
NEUTRAL: 100%							NUMBER OF POLES:		12	ISOLATED GROUND BUS:			

CKT No.	LOAD	TRIP (AMP)	KVA / PHASE A	B	C		KVA / PHASE A	B	C	TRIP (AMP)	LOAD	CKT No.
1	GYMNASIUM EM LTG.	20	2.78				3.22			20	RESTROOMS, STAIRS, CA	2
3	EMERGENCY LTG (A SECT	20		2.44				0.30		20	EXITS	4
5	TRACK, MER, OFFICE & CC	20			2.58				3.30	20	STAIR Z	6
7	9 KVA TRANSFORMER	20	3.00				1.48			20	LTG-CARDIO/GAME RM	8
9				3.00				.293		20	LIGHTING- TRACK	10
11		3			3.00				1.30	20	LTG-FREE WT/CARDIO	12
13	SPARE	20								20	SPARE	14
15	SPACE										SPACE	16
17	SPACE										SPACE	18

2. Short Circuit Analysis

Short Circuit Analysis

Leg 1: Transformer into Switchboard

$I_{FLA} = \frac{1,500*1,000}{480*1.732} = 1804A$

$Multiplier = \frac{100}{3.5} = 28.571$

$I_{S.C.} = 1804 * 28.571 = 51540A$

$f = \frac{1.732*10*51540}{134200*6*480} = .0023$

$M = \frac{1}{1+.0023} = .9977$

$I_{S.C.symRMS} = 51540 * .9977 = 51,421A$

Leg 2: Switchboard to Kitchen Transformer

$f = \frac{1.732*370*51421}{15082*6*480} = .758$

$M = \frac{1}{1+.758} = .569$

$I_{S.C.symRMS} = 51421 * .569 = 29,239A$

Leg 3: Kitchen Transformer to Kitchen Dist. Panel

$f = \frac{1.732*5*29239}{20566*480} = .026$

$M = \frac{1}{1+.026} = .975$

$I_{S.C.symRMS} = 29239 * .975 = 28,508A$

Leg 4: Kitchen Dist. Panel to LV KIT 1A

$f = \frac{1.732*5*28508}{15082*480} = .034$

$M = \frac{1}{1+.026} = .967$

$I_{S.C.symRMS} = 28508 * .967 = 27,570A$

3. Spin Room Schematic

This section explains the schematic that has been developed to install an energy harvesting system for the cycles in the spin room. This type of cycles has been used in multiple "green gyms" across the country including Energia Fitness, and Steve Nash's personal gym. The University of Massachusetts has also installed a retrofit system to a single existing cycle of theirs as part of study to use the energy for lighting a greenhouse.

The normal friction resistance mechanism installed on typical spinning bikes is replaced with a motor, that when run in reverse, produces electricity. The rider can have a handheld device attached to the cycle similar to the one seen in Figure D3.1 that will allow him or her to increase the resistance level of the motor, as well as see how much energy they are producing in Watts at any given moment. The greater the resistance and/or the harder the cyclist pedals, the more energy is produced. This handheld device is optional since the bikes can still have a manual crank that will increase or decrease resistance.

Figure D3.1: Handheld device for increasing resistance and monitoring energy output of biker.

While personal monitoring devices per bike can be used, I propose the use of a single wattage display located at the front of the room that will display the total wattage of the group instead. This will help members of the class to feel part of a larger purpose and part of a team, which is very beneficial in group exercise environments. Being part of a team gives you a sense responsibility to do your part as to not let the other members of the team down.

This single metric of wattage will also allow groups who attend regularly to set exact goals of how much energy they would like produce each workout, since it is directly correlated with how hard the group is working as a whole.

As you can see, the benefits of this system can reach beyond just the production of energy.

All necessary equipment that would be needed for the system has been identified and should include:

1. Energy Harvesting Spin Bike or Retrofit System
    a. Similar to bike or retrofit developed by the Green Revolution found here.
2. DC to AC Inverter
3. Programmable Automatic Transfer Switch (2)
4. Wattage Display (digital numerical)
5. All connection pieces and wiring as needed

Optional Equipment

1. Handheld Resistance Device

This schematic diagram outlines how the system should be set up (figure D3.2):

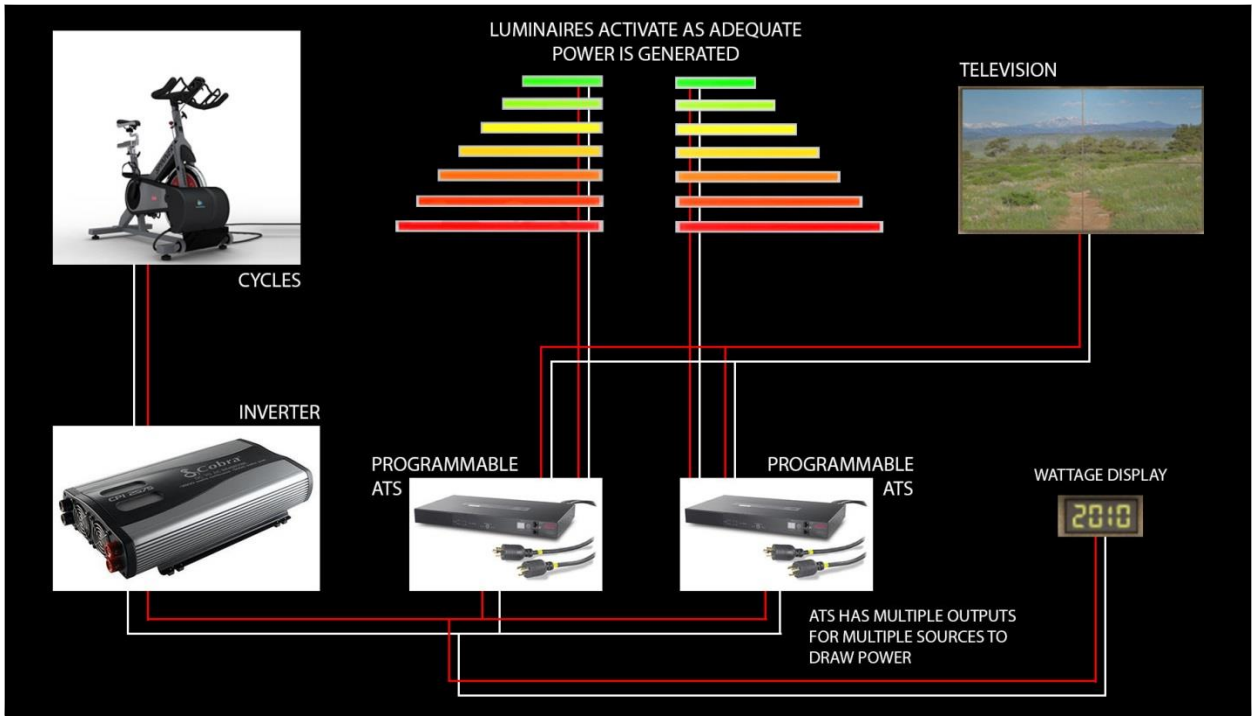


Figure D3.2: Spin Room Energy Harvesting Schematic Diagram.

The luminaires identified in the diagram should be color changing LED strips, recessed into the front wall of the room as shown in figure D3.3.

The television is already part of the current room design, and should be the first thing to turn on before the luminaires. This will allow for there to be no power from the main grid to be drawn for the television, and no need for instructors to turn the television on and off; it will simply turn on once the group provides it with enough power to do so.

Figure D3.3: Spin Room with signaling luminaires, television, and wattage meter shown as identified in Figure D3.1.

According to data gathered by Energia Fitness centers, the average biker produces approximately 110 Watts of energy in a 50 minute workout. With 25 bikes in this room, this tells us that there will certainly be enough energy to power the television and luminaires as the bikers exercise.

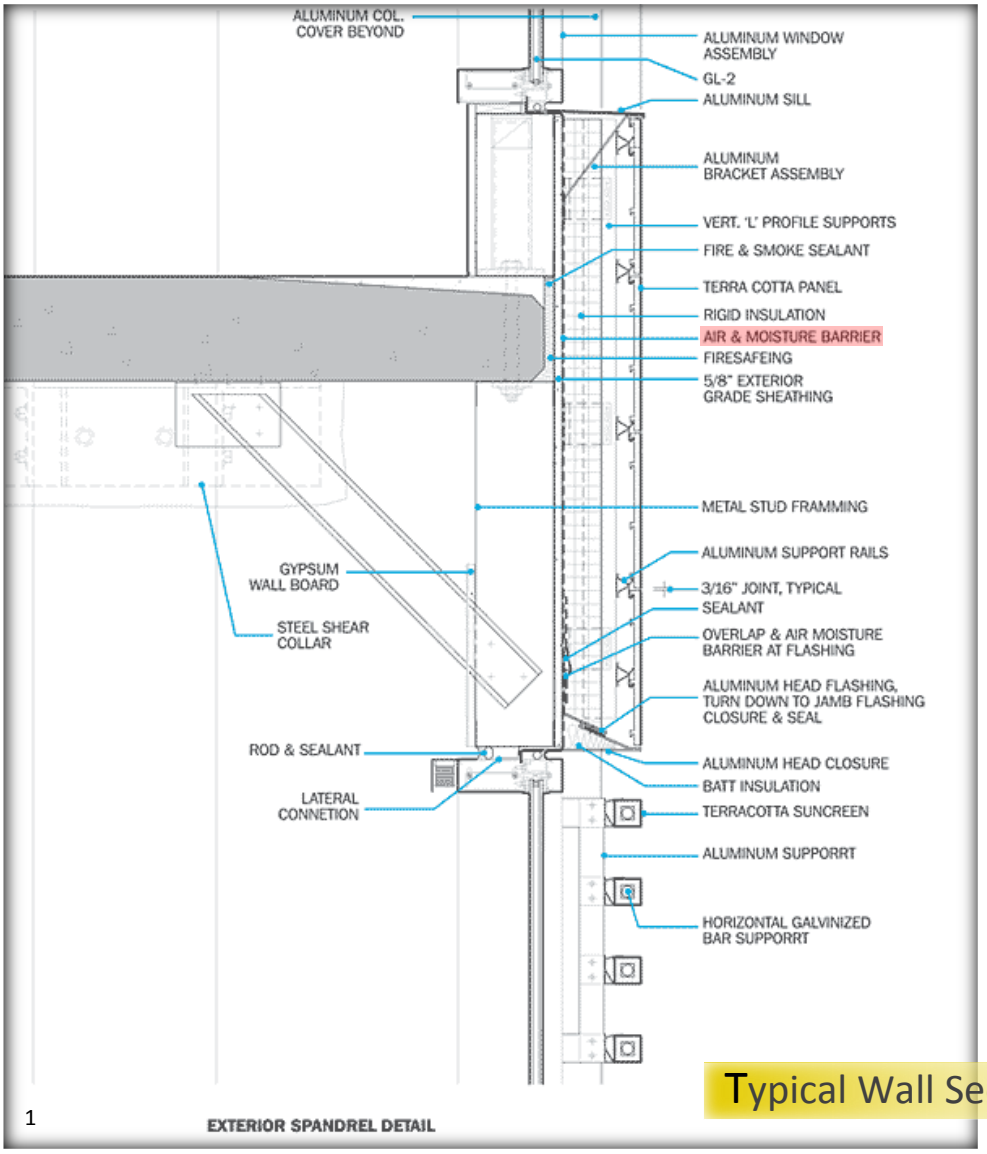
Section E

Façade Breadth

Rain Screen Façade Overview

Main purposes:

1. Prevent water from penetrating facades during construction
2. Create a façade clad with almost any material
3. Decrease total building energy usage
4. Create a more effective thermal barrier



Typical Wall Section

What it is:

A façade system using a specially designed flashed and drained cavity outside of a weather resistant barrier to wick water away from the building – a masonry w all could technically be considered a rain screen – but rain screens do not need to be made of masonry anymore.

The concept of rain screens are being used to create more unique facades out of materials such as terracotta, metal, and even fabric.

Study: Comparing Standard versus Pressure-Equalized Rain Screens

Water Management

"According to a more narrow definition, a rain-screen wall is one designed to neutralize wind currents on the inside and outside surfaces of cladding so that pressure differences do not drive water through gaps or flaws in an assembly and into a building interior."[1] These systems are also called or referred to as 'pressurized or pressure-equalized rain screens.'

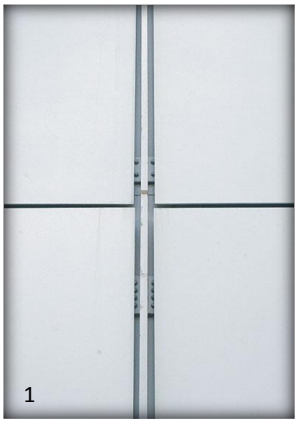
The National Research Council Canada recommends that the air cavity behind the cladding material (this cavity is what defines a rain screen) should be compartmentalized in order to best react to pressure changes due to wind. By introducing compartments, the movement of air from high pressure regions to low pressure regions in the air gap behind the façade will not occur. Without compartments, this phenomenon pulls moisture with it. When moisture is forced in varying directions against the façade, it can cause water to seep into the structure and damage interior elements of the wall, structural components, and even as far in as finishes. For this exact reason, an air and moisture barrier is absolutely necessary on the inside of the air cavity: this layer is highlighted in the section above. As an additional note, these compartments should be sized smaller at locations where large pressure variations can occur; parapets and corners. The larger – more-so taller – a building is, compartmentalization becomes more and more of an issue.

Conclusion 1:

> Pressure-equalized rain screens are better in the category of water management because they are more effective at protecting the inner layers of the façade by avoiding water movement due to pressure changes across the façade. Furthermore, compartmentalized pressure-equalized rain screens are even better at achieving this than a single cavity.

Thermal Properties

Rain screens have been utilized also for their thermal abilities. Using a rain screen on both new construction and renovation projects allows buildings to increase their insulation's effectiveness by varying amounts. This is due to the fact that the insulation is no longer broken by studs; it is placed directly on the exterior grade sheathing, after the air and moisture barrier. This creates on large continuous thermal break from interior to exterior. In a renovation done on a 32,000 square foot office building in Denver, the new façade –utilizing a rain screen – "increased the [building] insulation's effectiveness by about 30 percent."[2] This was a compartmentalized system, which used fins between the aluminum panels to prevent air flow in the cavity behind these panels.



1

[1] Gonchar, Joann. "Rain-Screen Facades Are More than Skin Deep." Architectural Record. McGraw Hill Financial, n.d. Web. 3 Apr. 2014. p. 2
[2] Ibid., p. 3

The 30% mentioned here is not the overall increase in effectiveness of the façade. The air cavity behind the aluminum panels would further increase thermal efficiency. In addition, compartmentalization would further increase the efficiency, since less airflow would reduce the effect of convection inside the cavity across the insulation.

Conclusion 2:

> In general, rain screen facades are much more efficient, thermally, than many standard façade types. Pressure-equalized rain screens are better than non-pressure-equalized rain screens because convection from air moving from side to side, bottom to top, or even top to bottom due to pressure changes from wind is reduced. Furthermore, highly compartmentalized pressure-equalized rain screens will be even better at achieving this.

Structural Weight

Rain screens have been utilized in many cases where structural issues do not allow heavy facades to be use; the outermost material of a rain screen is completely interchangeable for a lightweight material. This allows architects to specify lighter materials, to reduce the structural support needed, or to accommodate weaker existing structural systems. Although, the difference in weight between pressure-equalized rain screens and non-pressure-equalized rain screens will not be significant enough to claim that one is better than the other. Of course, compartmentalization will indeed be heavier, but in comparison to the exterior material, this compartmentalization will – in most cases – be insignificant. Times when this weight will be significant would be when extraordinarily light materials are used for the outermost layer since this layer is usually the heaviest.

Conclusion 3:

> In general, the difference in weight between pressure-equalized rain screens and non-pressure-equalized rain screens is not significant enough to claim that one is better than the other in this category. Overall though, rain screens are an effective choice to reduce the weight of a façade in any case.

Constructability and Cost

Rain screens are becoming more popular as the façade of choice, but the constructability and cost of the two types are not equal. Generally, all rain screen façades have one distinct advantage during construction; since the "architectural envelope is divorced from the weather barrier, quick erection of the building's enclosure is possible"[3] as quoted from John Starr in the Architectural Record article. This is especially true for buildings with minimal window openings such as museums. When comparing pressure equalized to non-pressure equalized rain screens, non-pressurized are easier to construct since there are less components, and one less step of coordination is needed all the way from the architect to

[3] Ibid., p. 4

the subcontractors. Less detailing and attention to these specific details will save time and money during the project when constructing non pressurized rain screens. This is apparent since less American structures are built using pressure equalized rain screens in comparison to Europe. Subcontractors in Europe have already mastered this system, while subcontractors in the United States are not as effective at constructing this type of system. For residential projects, rain screen have been reported to add 30% to the wall cost of a siding project.

Conclusion 4:

> Pressure-equalized rain screens take more coordination, time, detailing, and ultimately money than non-pressure-equalized rain screens due a decreased constructability. Whether this is significant enough to choose one over the other shall be up to the architect on the project.

Summary

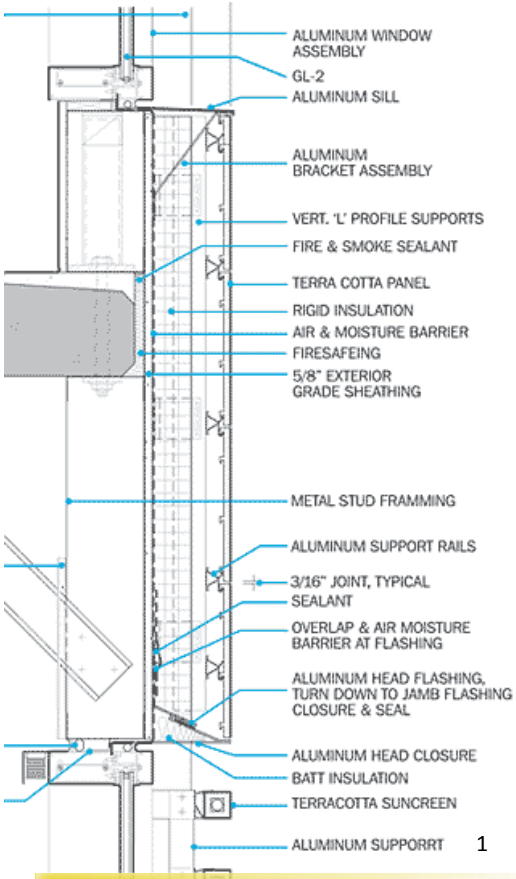
In conclusion, rain screen façades help protect a building from water penetration, increase the thermal efficiency, provide construction benefits, and even lower structural loads. In comparison, pressure equalized rain screens are slightly more expensive, but when needed, offer great benefits compared to non-pressure equalized rain screens. These benefits include greater thermal efficiency, and better water management. This results in a reduced load on the mechanical system of the building, and better preservation of the building materials over the lifetime of the structure.

Section F

Mechanical Breadth

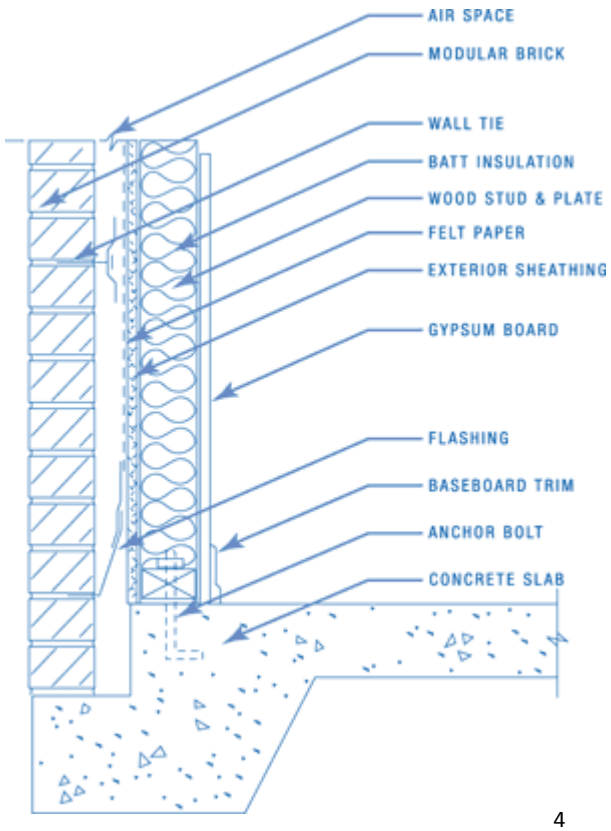
Introduction: Scope of Mechanical Breadth

This breadth involves an energy simulation which has been used to determine the thermal efficiency of a rain screen façade against another typical building façade type. A model was constructed in the simulation program TRACE, of which the geometry and orientation was based off of the 3-court gymnasium in the SUNY Cortland Student Life Center. This model was first created using a typical brick on metal stud wall construction (Alternate 1). This detail can be seen below as a comparison. This model was then duplicated and the exterior wall type was changed to reflect the characteristics of a rain screen façade with terra cotta cladding as seen in the section detail in the façade breadth above (Alt. 2). For quick reference, this wall section can be seen again below. All other aspects of the models were kept constant other than the exterior wall structure changes, and the U-values associated with them.



1

Rain Screen Section



4

Brick on Metal Stud Section

[4] "Cost Comparison for Common Commercial Wall Systems." *Brick the Solid Investment*. Brick Industry, n.d. Web. 4 Apr. 2014.

Documentation of TRACE Model, Methods, and Results

The 3-court gymnasium used for this simulation had the following dimensions and attributes input into the program:

Width	106’
Length	178’
Height	24’
Glass	30%
Exterior Walls	East and South
Interior Walls	West and North

For the two different wall types (Alternate 1 and Alternate 2), U-values were calculated using typical values of materials and the wall details above.

U-value comparison of Terra-cotta Rain Screen to Standard Wall				
Rain Screen			**Brick on M. Stud**	
Material	**R-value**		**Material**	**R-value**
Terre-cotta	12		Brick	0.8
Air Space	1		Air Space	1
R-19 Insulation	19		Exterior Sheathing	1.32
Exterior Sheathing	1.32		*	7.1
Metal Stud	0.005		GWB	0.56
GWB	0.56			
R-Value	33.885		**R-Value**	10.78
U-Value	0.0295		**U-Value**	0.0928

*R-19 Mineral Fiber Ins. with 2x6 metal studs @ 16" OC

As this chart shows, the two U-values were significantly different, but the simulation results showed that this made only a small change in the annual building load.

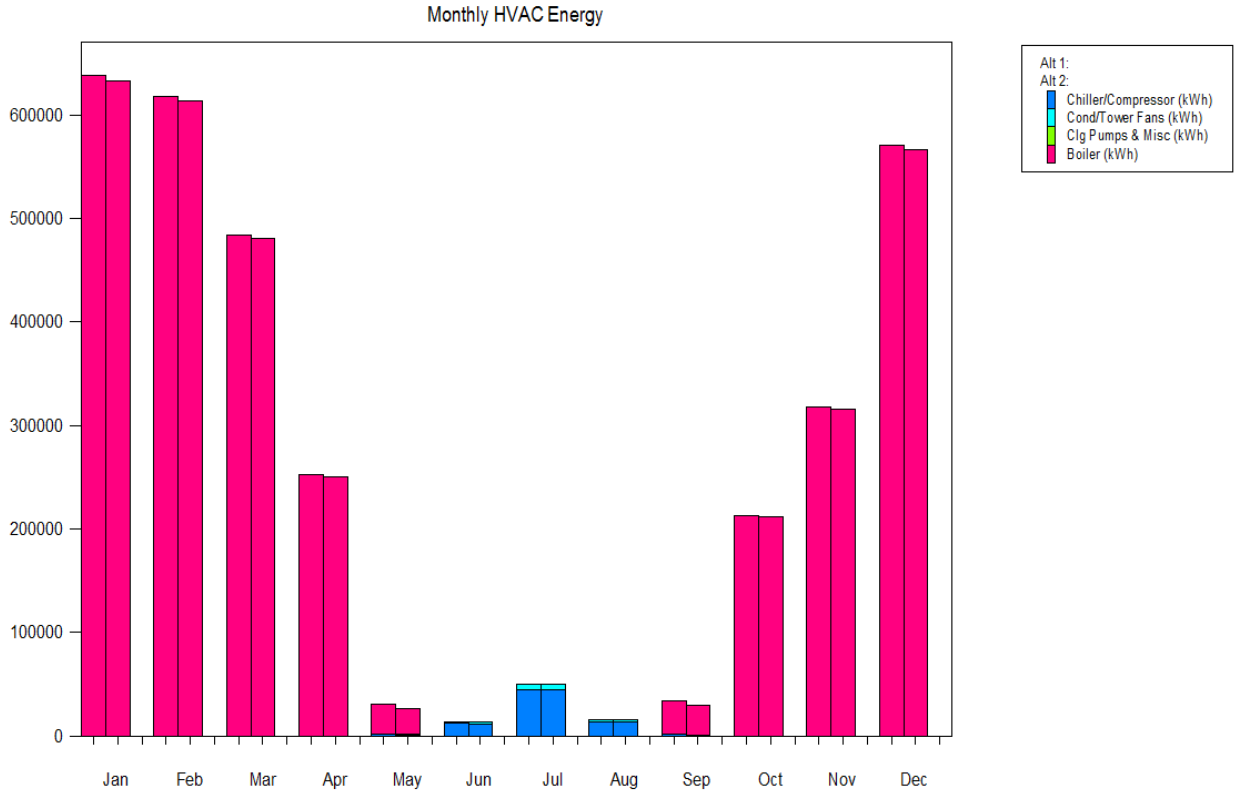
In addition, the infiltration rate was changed from one scenario to the other in an attempt to account for a tighter façade in the case of the rain screen. The infiltration rate was changed from .038 CFM/SF to .025 CFM/SF.

The actual results from the simulation can be found attached in Appendix D. In summary though, the total building energy load (kBtu/yr) was reduced from 11,670,187 to 11,549,675. This is a 1.03% change. Based on values interpolated by TRACE, this would also cause a decrease in the annual cost to run the system. The change here is from $45,684 to $45,171. This is a savings of $513, or 1.12%.

Conclusions

After running calculations for both wall types, it was determined that the rain screen façade system helped lower the mechanical load on the building – as expected. What was not expected is that this change in efficiency only resulted in a 1 percent difference. This is due to the simple fact that the majority of the load on the space comes from internal loads rather than external loads. Loads such as people and lighting mainly contributed to the amount of energy needed to heat and cool the space, rather than load from the outside temperature.

The following graph shows the change from one analysis to the next. The bars on the left of the two stack groups represent the load using the brick and metal stud façade, while the bars on the right represent results from the rain screen façade.



As you can see, the two sets of data are nearly equal, only resulting in approximately a 1 percent reduction in load. Fortunately, energy efficiency is not the only driving factor for selecting a rain screen façade, as you can see in the previous breadth discussion. While energy usage reduction does occur, there are many more reasons to choose a rain screen façade.

Summary & Conclusion

The Student Life Center is a structure meant to promote activity and new life for the students at the State University of New York Cortland campus. Its enticing architecture and intriguing shapes surely demand attention from both the interior and exterior. The entrance lobby provides a key focal point for the building both during the day and at night. A “streamline” lighting design is seen throughout all interior spaces, but is especially apparent here. Simple but strong lines provide adequate illumination, while also providing accent lighting at the reception desk. Through an interior curtain wall, occupants can observe others exercising in the main fitness area; the cardio loft and weight floor.

Vertical fins mounted on the structure’s façade provide captivating lighting formations on the weight floor during the day, while creative lighting transforms the space at night. Vertical illumination high in the space illuminates expressive paint colors while creating a comfortable space. A combination of direct and indirect lighting provide a space psychologically conducive to public activity. Accent lighting and a diamond shape pendant thoughtfully located encourage motion through the space and into deeper expanses of the building. Controls provide energy savings by dimming fixtures based on the current daylight conditions.

The runner will experience the entirety of this building, receiving a very diverse and thorough understanding of the building as they traverse around its perimeter. Different combinations of direct and indirect lighting provide a varied experience depending on where the runner is located at that moment. Specialized integrated controls provide a unique visual pacing system with one set of luminaires while dimming others based on daylight conditions.

The exterior has been designed with a minimal approach in order to save energy and avoid glare to residences within view of the Student Life Center. Tree mounted fixtures and bollards provide pathway lighting while a single LED strip defines the overhang over the entrance to the lobby. The energy savings from this space – in addition to others – has resulted in a design achieving 11 points towards LEED.

An energy harvesting system has been added to the spin room, which will power the television and indicator lighting at the front of the room. This indication system will help members of the class to feel part of a larger purpose and part of a team; a beneficial element in group exercise environments, since all members will be working toward a common cause. The added wattage meter also introduces a new metric to this type of exercise: Wattage, which is measuring the exact amount of energy that the group is exerting.

Research done on rain screen facades proved that they are advantageous in certain situations, especially those where lighter, more unique, and potentially cheaper cladding is desired by the architect. These facades have also been proven to manage water penetration better than most other façade types. They are also very effective thermally, but in the energy simulation completed, this proved to make little difference for a gymnasium since the majority of the space load is internal to begin with. This is also the case with most other building spaces and climates, so a rain screen façade should certainly not be selected for thermal purposes only.

Works Cited

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Appendix A

Existing Drawings

This Appendix includes:

1. Floor Plans
2. Existing Power Riser Diagram
3. Existing Control Component Details

FIRST LEVEL REFERENCE PLAN

SCALE: 1/16" = 1'-0"

0' 8'-0" 16'-0" 32'-0" 1/16" =1'-0"

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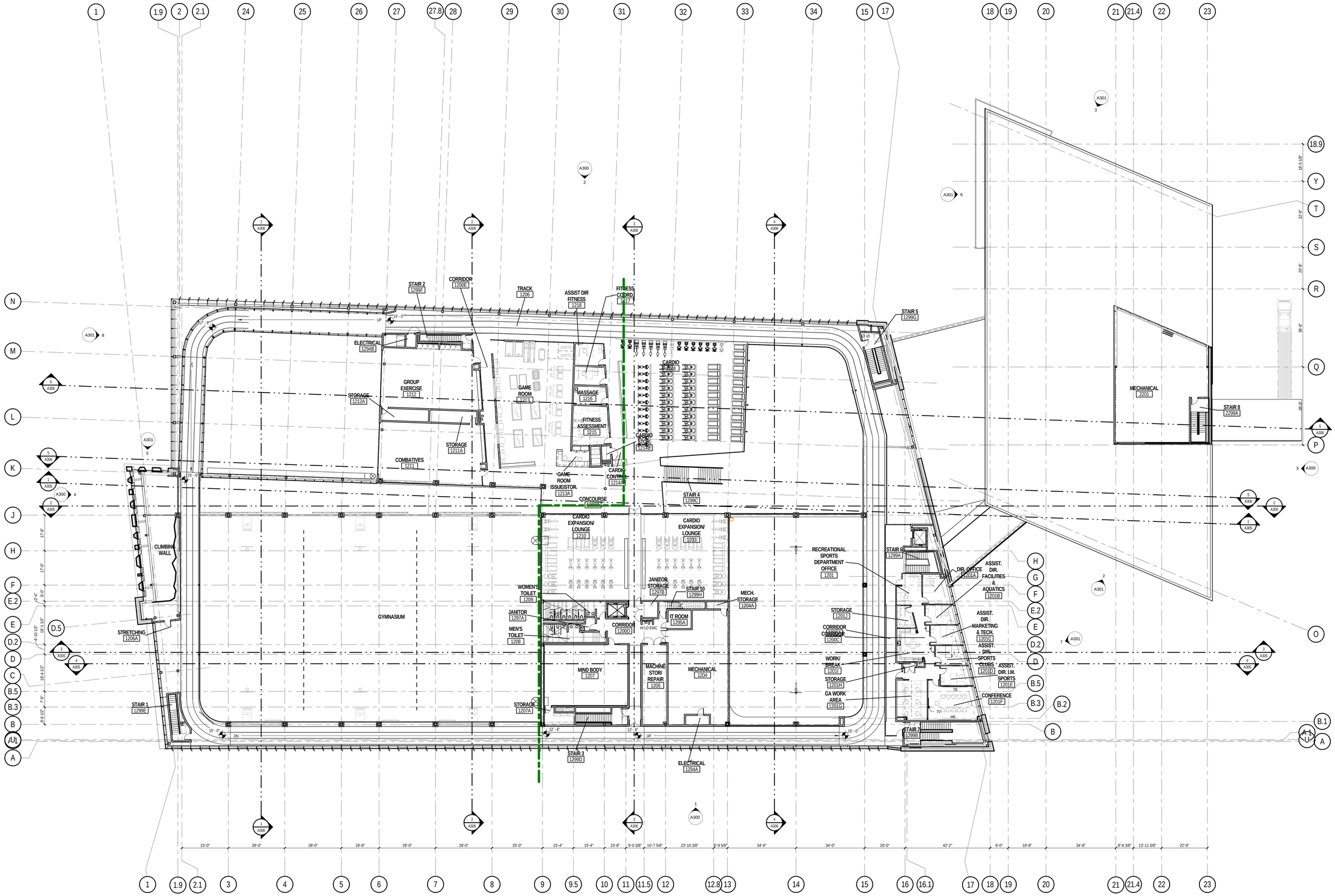

SECOND LEVEL REFERENCE PLAN

SCALE: 1/16" = 1'-0"

0" 8'-0" 16'-0" 32'-0"
1/16" =1'-0"

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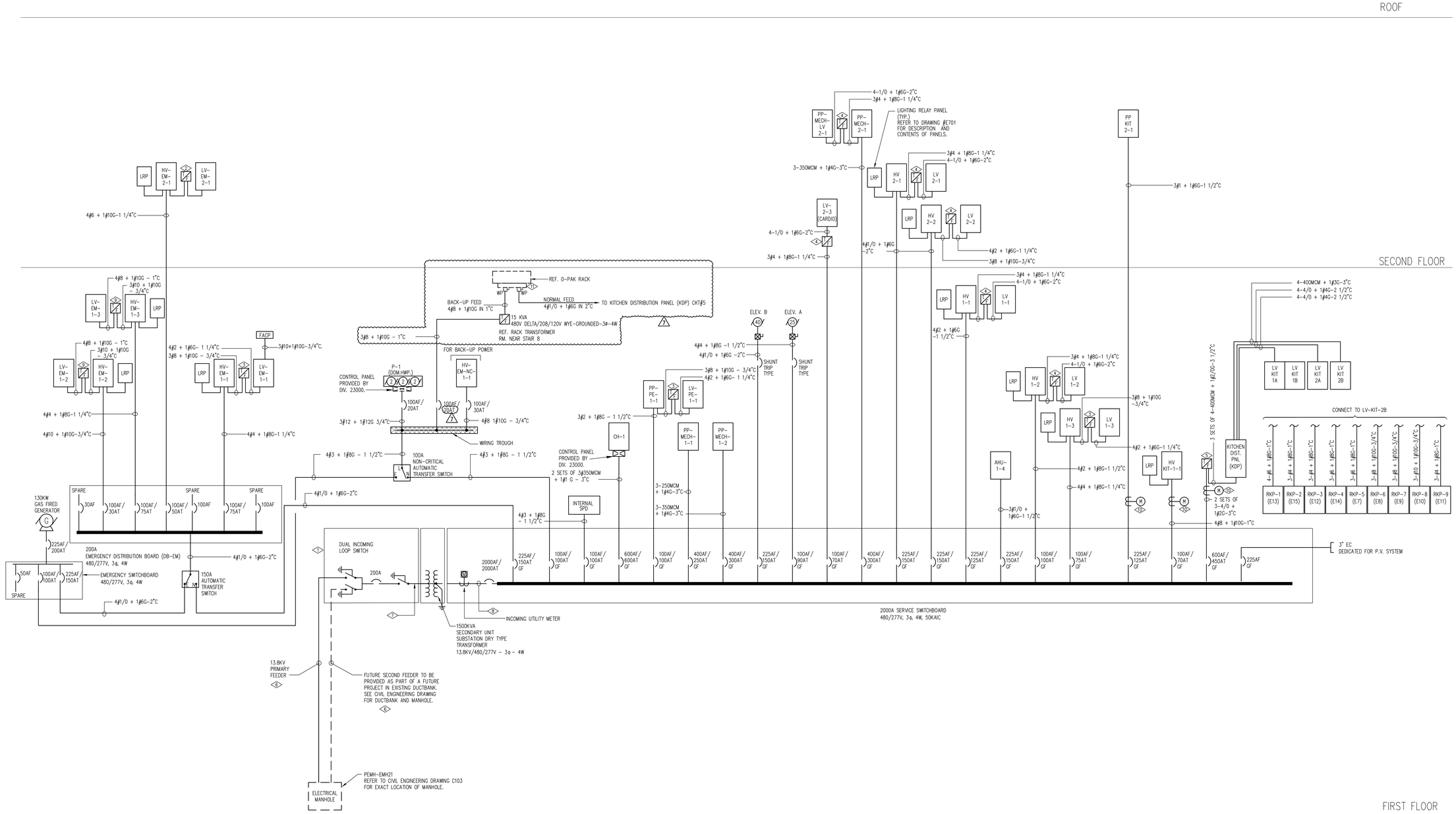

NOTES:

<1> G & W VANTAGE VACUUM INTERRUPTER LOOP SWITCH OR S & C VISTA WITH TWO INCOMING 3-POSITION (OPEN, CLOSED, GROUNDED) SWITCHED WAYS AND ONE OUTGOING VACUUM INTERRUPTER WAY WITH IN-LINE SWITCH TO FEED TRANSFORMER.

<2> 9 KVA 480V DELTA/208V/120V WYE-GROUND - 3ϕ - 4W

<3> 30 KVA 480V DELTA/208V/120V WYE-GROUND - 3ϕ - 4W

<4> 45 KVA 480V DELTA/208V/120V WYE-GROUND - 3ϕ - 4W

<5> 300 KVA 480V DELTA/208V/120V WYE-GROUND - 3ϕ - 4W

<6> SEE CIVIL DRAWING C105 FOR DUCTBANK AND FEEDER REQUIREMENTS.

<7> 3#2/0 + 1#8G - 3 1/2" CONDUIT.

<8> 6 SETS OF 4-400MCM + 1 #250MCMG - 6-3 1/2"CONDUITS.

<9> 15 KVA 480V DELTA/208V/120V WYE-GROUND - 3ϕ - 4W

<10> PROVIDE E-MON CLASS 3400 SMART METER WITH DUAL PROTOCAL COMMUNICATIONS. METER TO BE 277/480V, 3 PHASE WITH 3 SPALT-CORE CURRENT SENSORS. SIZE TO MATCH OVERCURRENT DEVICE FRAME SIZE. SUBMETER TO INCLUDE DEGITAL NETWORKED OWNER'S ELECTRIC SUBMETERS (DNOS) SERVING KITCHEN PANELS. DIGITAL NETWORKED SUBMETERS SHALL COMMUNICATE WITH BUILDING MANAGEMENT AND CONTROL SYSTEM (BMCS) VIA BACNET COMPATIBLE MS/TP COMMUNICATIONS. PROVIDE MANUFACTURER'S BACNET COMPATIBLE BTL TESTED COMMUNICATION GATEWAY FROM DNOS TO BMCS. COORDINATE DIGITAL COMMUNICATIONS BETWEEN DNOS AND BMCS. PROVIDE END TO END COMMUNICATIONS COORDINATION BETWEEN DNOS AND BMCS TREND DATABASE. THE FOLLOWING DATA SHALL BE TRENDED: KWH CONSUMPTION, KW REAL POWER, KVAR REACTIVE POWER , KVA APPARENT POWER, POWER FACTOR, VOLTAGE LINE TO LINE, VOLTAGE LINE TO NEUTRAL, AMPS, AVERAGE CURRENT, AMPS, PHASE A, AMPS PHASE B, AMPS PHASE C.

<11> REFRIGERATION RACK CONTROL PANEL AND DISCONNECTS PROVIDED WITH EQUIPMENT. PROVIDE ONE NORMAL FEED FROM KITCHEN DISTRIBUTION PANEL AND ONE BACK-UP FEED FROM NON-CRITICAL ATS WIRING TROUGH UPON LOSS OF UTILITY POWER, ONLY ONE COMBINATION COMPRESSOR & COOLER MAY OPERATE AT A TIME.

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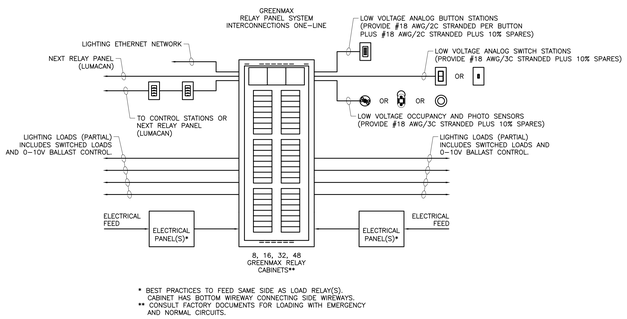
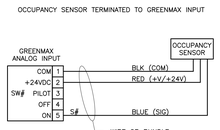
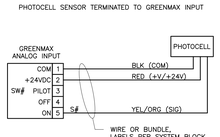
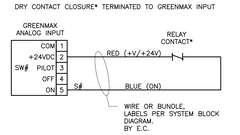


* BEST PRACTICES TO FEED SAME SIDE AS LOAD RELAY(S).
CABINET HAS BOTTOM LAMINATE CONNECTING SIDE WIREWAYS.
** CONSULT FACTORY DOCUMENTS FOR LOADING WITH EMERGENCY
AND NORMAL CIRCUITS.

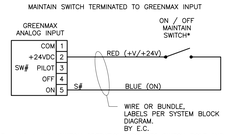
1/800 RELAY PANEL WIRING DETAIL



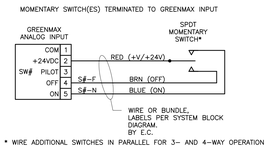




* CLOSURE MAY BE NORMALLY-OPEN OR NORMALLY CLOSED AND
TERMINATED TO "ON" OR "OFF". CABINET PROGRAMMING REQUIRED.



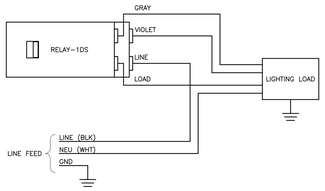
* 3- AND 4-WAY SWITCH OPERATION REQUIRES SWITCH POLE AND
LOW VOLTAGE CONDUCTOR CONFIGURATION SIMILAR TO STANDARD
LINE VOLTAGE 3- AND 4-WAY SWITCHES.



* WIRE ADDITIONAL SWITCHES IN PARALLEL FOR 3- AND 4-WAY OPERATION

2/800 RELAY PANEL INPUTS

GREENMAX RELAY TERMINATIONS



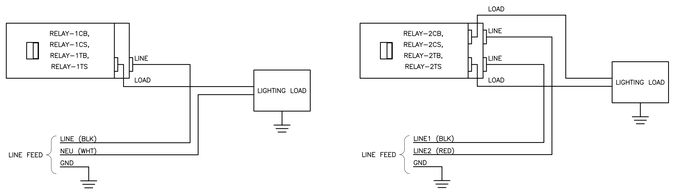
CONSOLIDATED GREENMAX RELAY RATINGS BY MODEL:

SINGLE POLE RELAYS
RELAY-1CB, -1CS, -1TB, -1TS
24-277VAC, 20A TUNGSTEN HALOGEN INCANDESCENT,
24-277VAC, 30A BALLAST, 347VAC, 20A BALLAST,
120VAC 1/2 HP MOTOR, 277VAC 1 HP MOTOR, 240VAC 1HP MOTOR

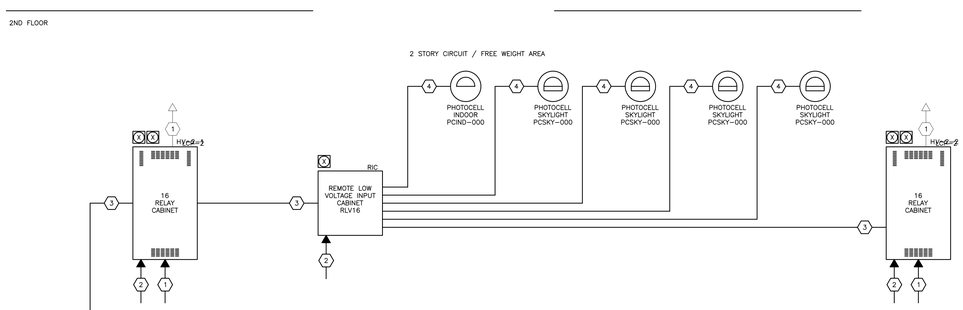
RELAY-1DS
24-277VAC, 30A 0-10V DIMMING FLUORESCENT

DOUBLE POLE RELAYS
RELAY-2CB , -2CS, -2TB, -2TS
208/240VAC, 20A TUNGSTEN HALOGEN INCANDESCENT,
208/240/480VAC, 30A BALLAST, 600VAC, 20A BALLAST,
208/240VAC 1HP MOTOR

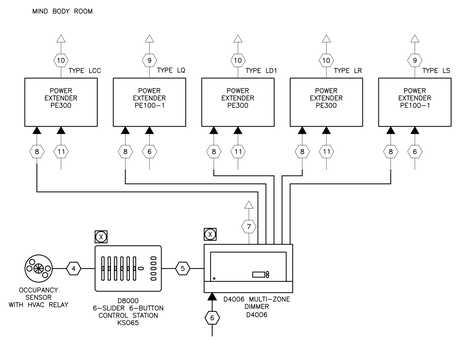
FOR COMPLETE DETAILS REFER TO PRODUCT SPECIFICATION DATA SHEET.



3/800 RELAY TERMINATIONS



4/800 BUILDING LIGHTING RELAY SYSTEM WIRING DIAGRAM



5/800 MIND BODY ROOM CONTROL DETAIL

WIRE RUNS

1. DEVICE FEED/LOAD CIRCUITS: UP TO (RELAY QUANTITY) 120VAC, 208VAC, 240VAC, 277VAC, 347VAC, 480VAC, 20A, 2 WIRE
2. 1A, 120VAC - 277VAC 2 WIRE PLUS GROUND, 60HZ.
3. (1) BELDEN 1872A OR EQUIVALENT. RUN LENGTH PER MANUFACTURER'S RECOMMENDATIONS.
4. (4) #18 AWG STRANDED CU CONTROL CONDUCTORS PER DEVICE.
5. (1) BELDEN 1502R OR EQUIVALENT. RUN LENGTH PER MANUFACTURER'S RECOMMENDATIONS.
6. 120VAC, 20A, 60HZ 2 WIRE PLUS GROUND.
7. 120VAC, 60HZ 2 WIRE PLUS GROUND. TOTAL LOAD NOT TO EXCEED 1920 WATTS.
8. 120VAC CONTROL WIRES TO POWER EXTENDER(S).
9. 20A, 120VAC, 2 WIRE PLUS GROUND, 50-60HZ.
10. 20A, 277VAC, 2 WIRE PLUS GROUND, 50-60HZ.
    -------- PLUS ----------
    (2) #18AWG WIRES PER ZONE ARE REQUIRED
11. 277VAC, 20A, 60HZ 2 WIRE PLUS GROUND.
12. UNLESS OTHERWISE NOTED, THE LIGHTING CONTROL PANEL FOR THE FOLLOWING SPACES SHALL BE PROGRAMMED TO PROVIDE MANUAL ON / AUTO OFF BY THE CONNECTED VACANCY SENSORS. SPACES THAT ALSO INCLUDE DAYLIGHT SENSORS WILL BE PROGRAMMED TO PROVIDE AUTOMATIC DIMMING CONTROL OF THE CONNECTED FLUORESCENT DIMMING BALLAST BASED ON THE AVAILABLE DAYLIGHT IN THE SPACE. THE AUTO OFF FUNCTION OF THE VACANCY SENSOR WILL KEEP THE LIGHTS OFF WHEN THE SPACE IS VACANT REGARDLESS OF AMBIENT LIGHT LEVEL IN THE SPACE. ELECTRICAL CONTRACTOR TO COORDINATE PROGRAMING REQUIREMENTS WITH MANUFACTURER'S FIELD SERVICE TECHNICIAN.
13. LIGHTING CONTROL PANELS CONTAINING EMERGENCY CIRCUITS SHALL BE PROGRAMMED SO THE ALL EMERGENCY CIRCUITS ARE DRIVEN TO FULL LIGHT OUTPUT UPON LOSS OF NORMAL POWER. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR CONNECTING OUTPUT OF EMERGENCY PANEL TO THE EMERGENCY INPUT OF EACH LIGHTING CONTROL PANEL AND COORDINATING PROGRAMMING WITH MANUFACTURER'S FIELD SERVICE TECHNICIAN.

H2L2 Architects / Planners LLC
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Construct Student Life Center
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ELECTRICAL LIGHTING CONTROL DETAILS

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SCALE: NONE	E800
DRAWN: SJA	
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PROJ. MNGR:	

09.25.2012 - FOR CONSTRUCTION

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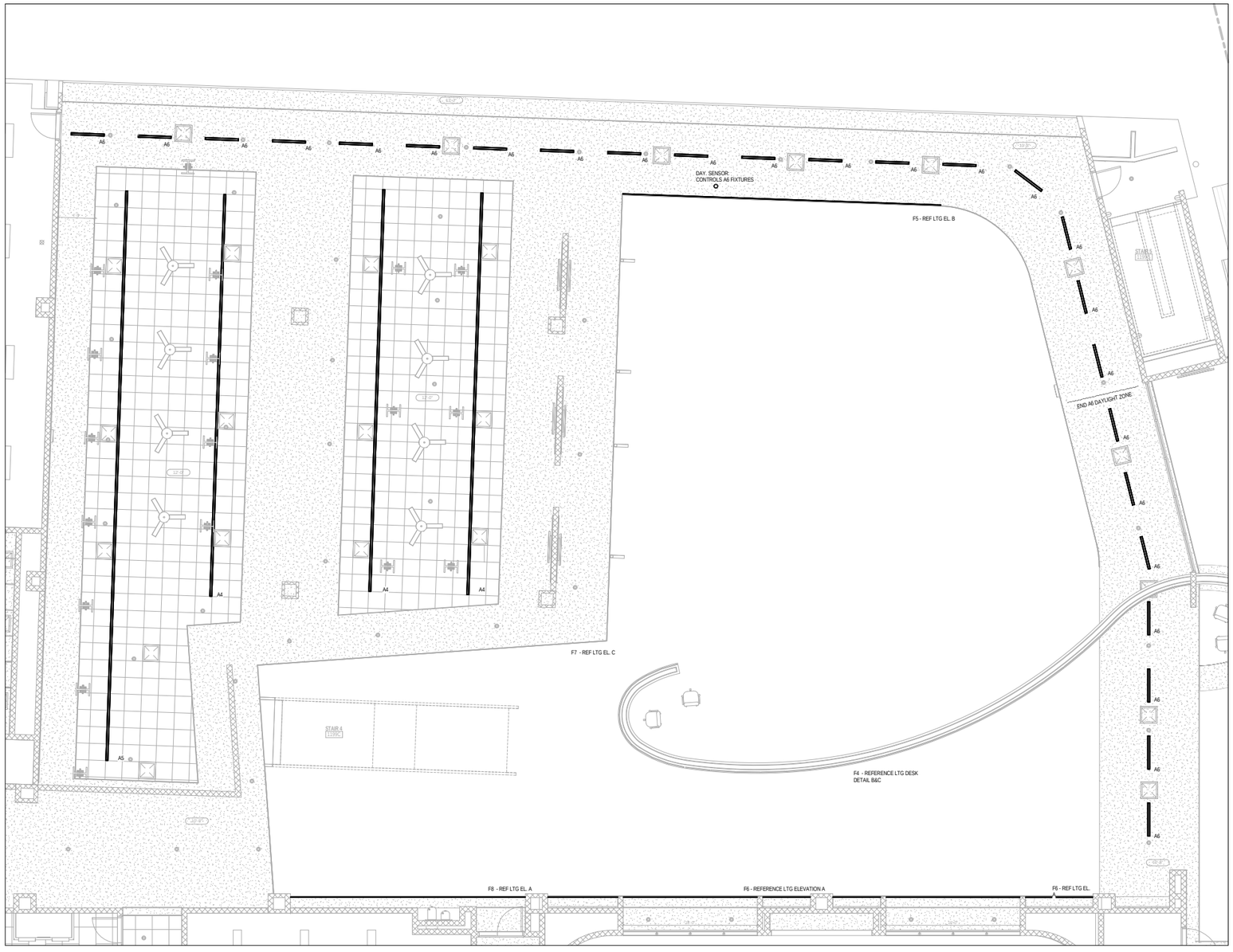
Appendix B

Lighting Drawings

Drawing List:

L1	Lighting Gym - Level 1
L2	Lighting Gym - Level 2
L3	Lighting Lobby
L4	Lighting Track - Area A
L5	Lighting Track - Area B
L6	Lighting Skylights - Level 2
L7	Lighting Exterior
LD1	Lighting Desk Details
LD2	Lighting Elevations
LD3	Lighting Elevations



1/8" Level 1 - Lighting Gym

SCALE: 1/4" = 1'-0"

FOR PSU AE SENIOR THESIS PROJECT

JAY KLINE

PSU AE SENIOR THESIS

LIGHTING/ELECTRICAL

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Lighting Gym - Level 1

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PROJ. MNGR:	Approver		

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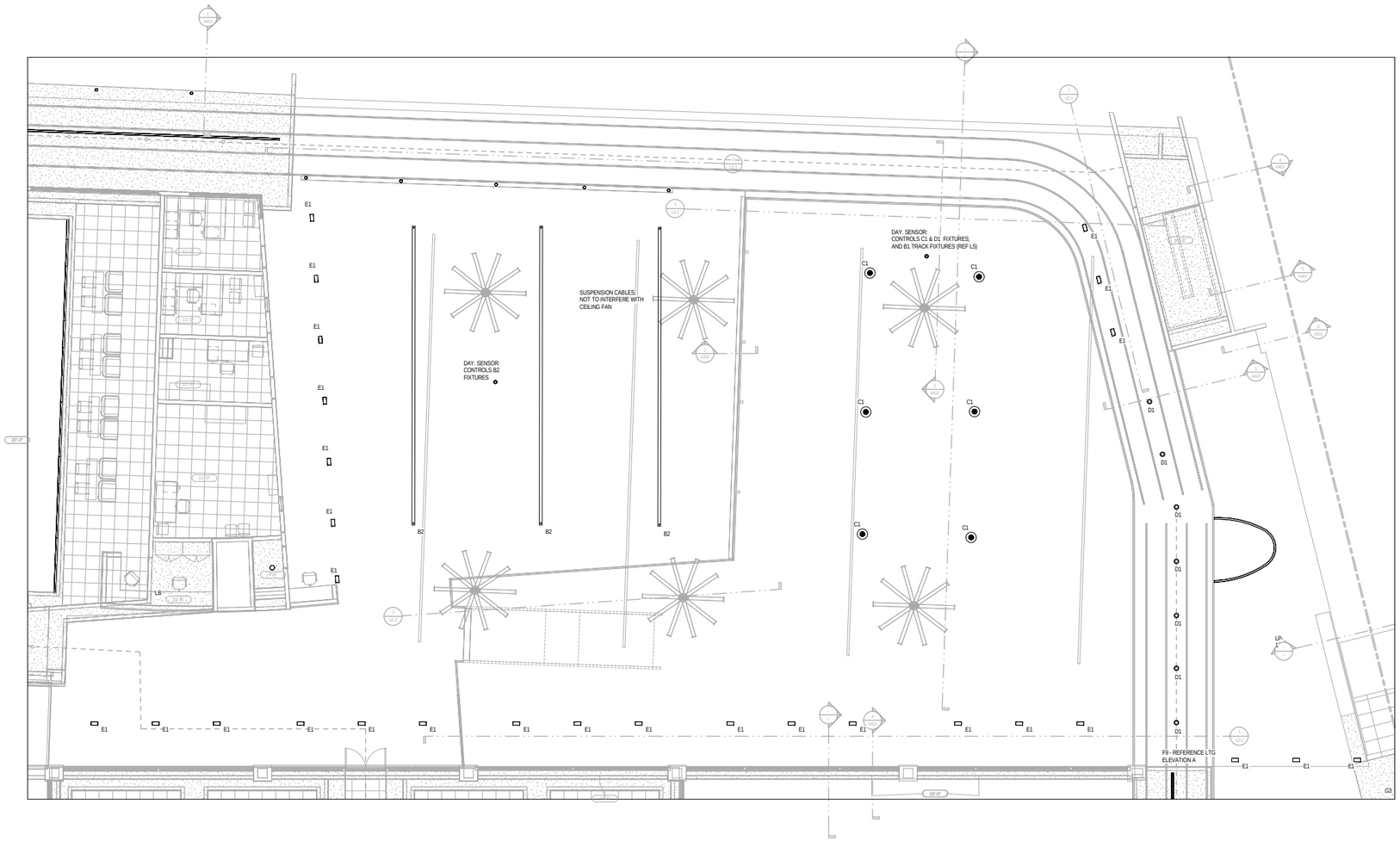

1/8" Level 2 - Lighting Gym

SCALE: 3/16" = 1'-0"

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Lighting Gym - Level 2

SHEET TITLE

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1/8" Level 1 - Lighting Lobby

SCALE: 1/4" = 1'-0"

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Lighting Lobby

SHEET TITLE

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DATE: 04.16.2014	SHEET No.
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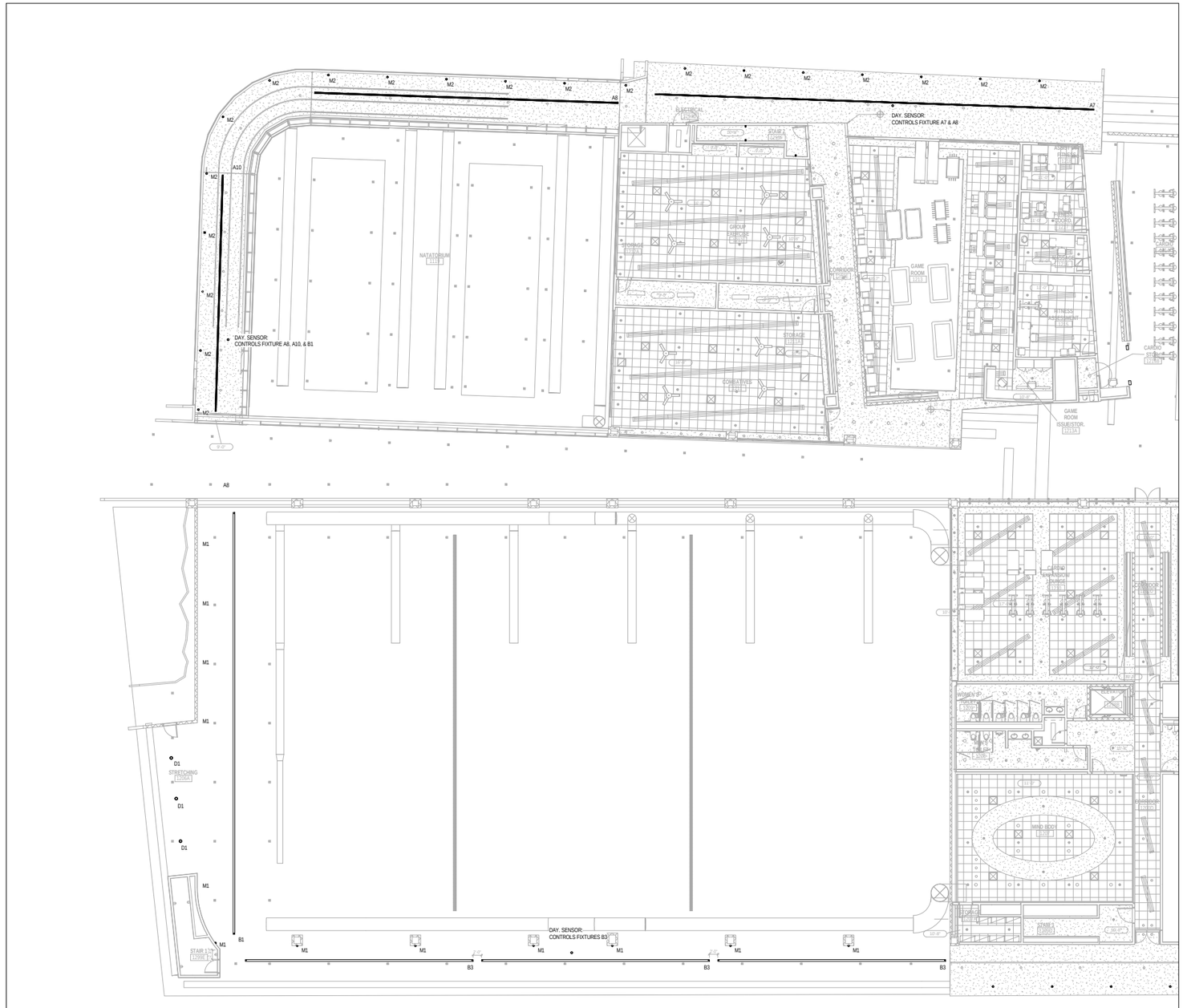

1/8" Level 2 - Lighting Track Area A

SCALE: 1/8" = 1'-0"

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LIGHTING/ELECTRICAL

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Lighting Track - Area A

SUCF #: 04339		H2L2 #: 5669.00	
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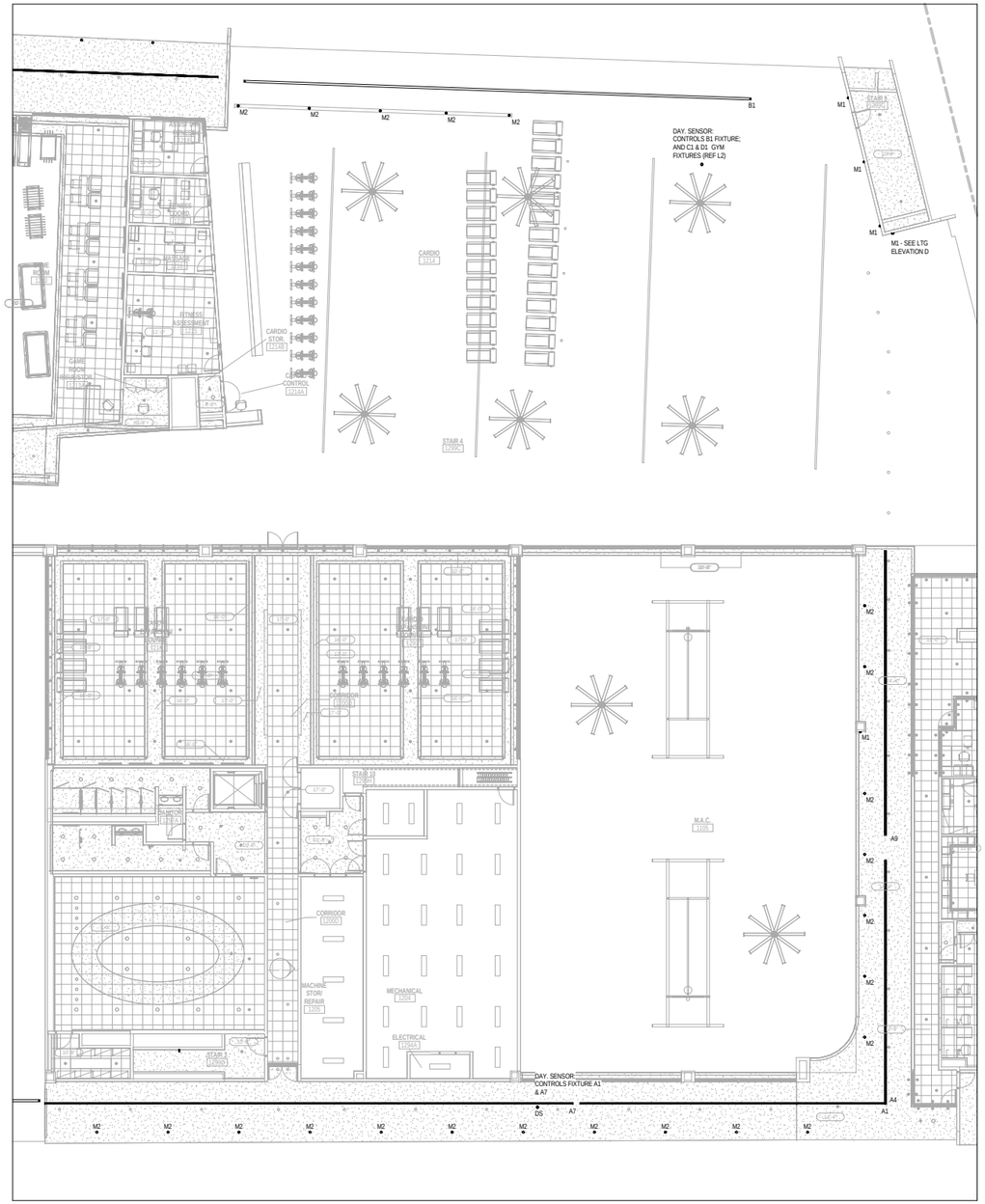

1/8" Level 2 - Lighting Track Area B

SCALE: 1/8" = 1'-0"

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Lighting Track - Area B

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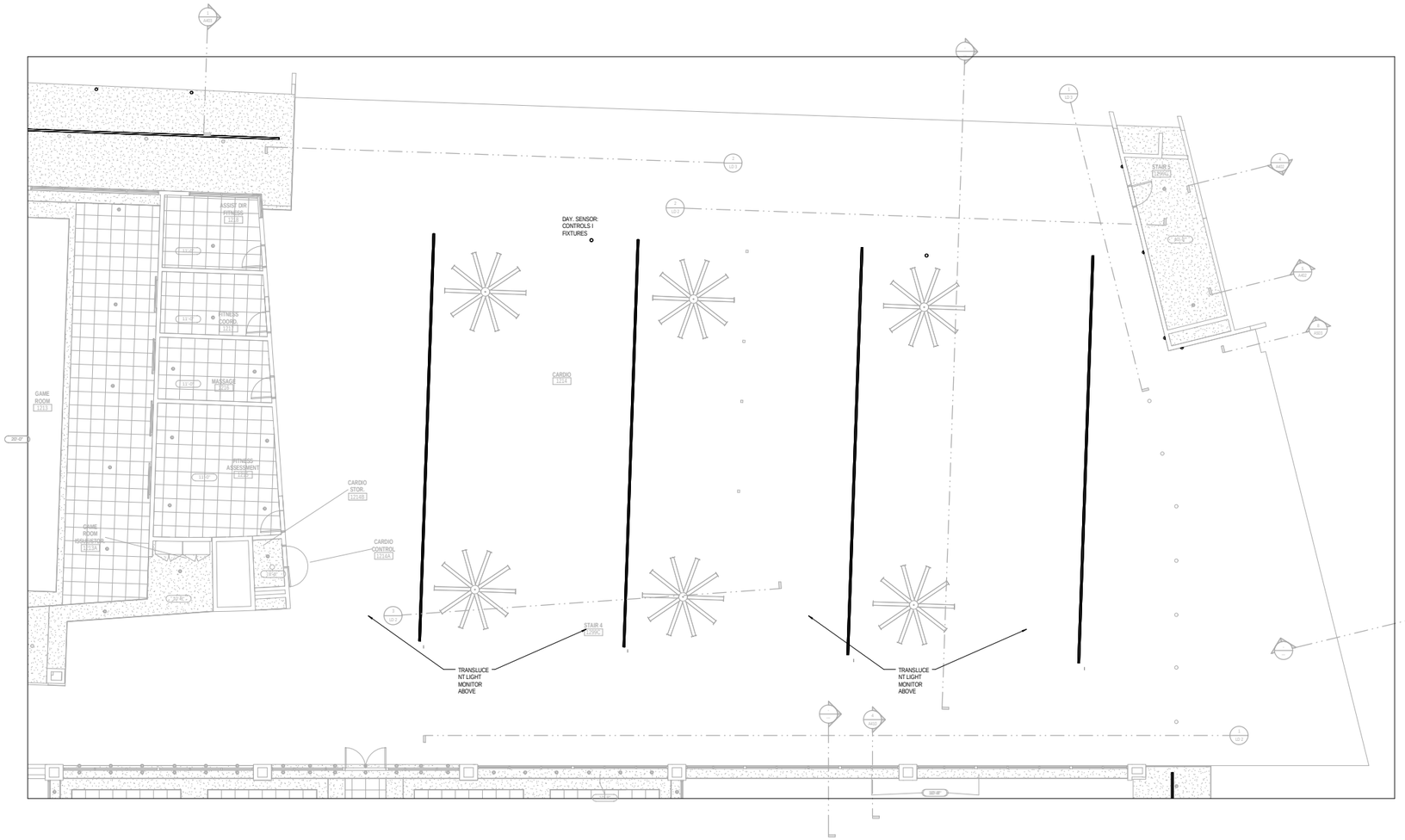

1/8" Level 2 - Lighting Skylights

SCALE: 3/16" = 1'-0"

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JAY KLINE

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Construct Student Life Center
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SHEET TITLE

Lighting Skylights - Area B

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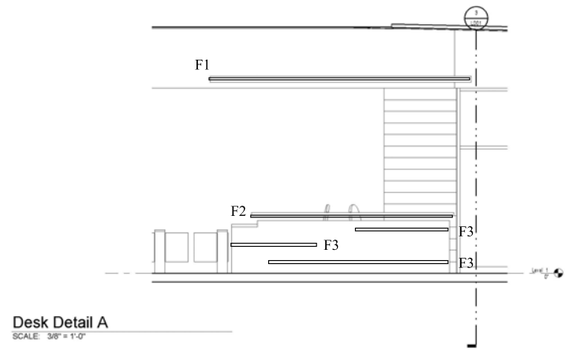

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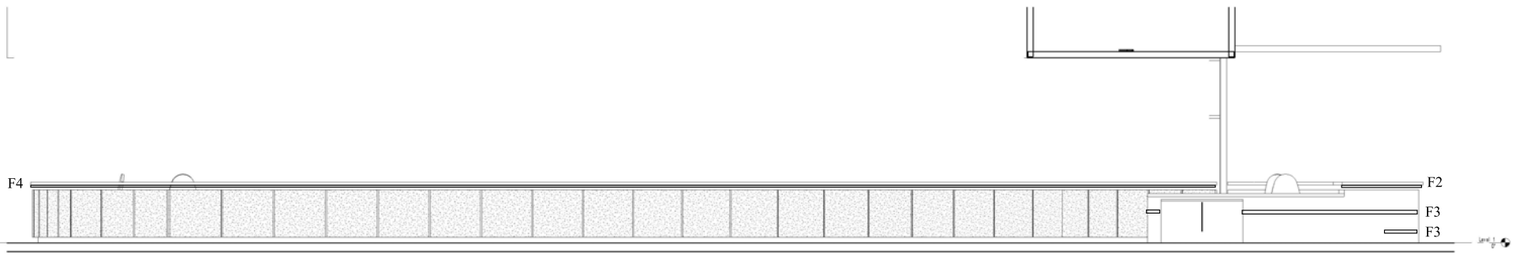

Desk Detail B
SCALE: 3/8" = 1'-0"

Desk Detail C
SCALE: 3/8" = 1'-0"

FOR PSU AE SENIOR THESIS PROJECT

JAY KLINE
PSU AE SENIOR THESIS
LIGHTING/ELECTRICAL

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2/12/13	ASI #013

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LTG DESK DETAILS

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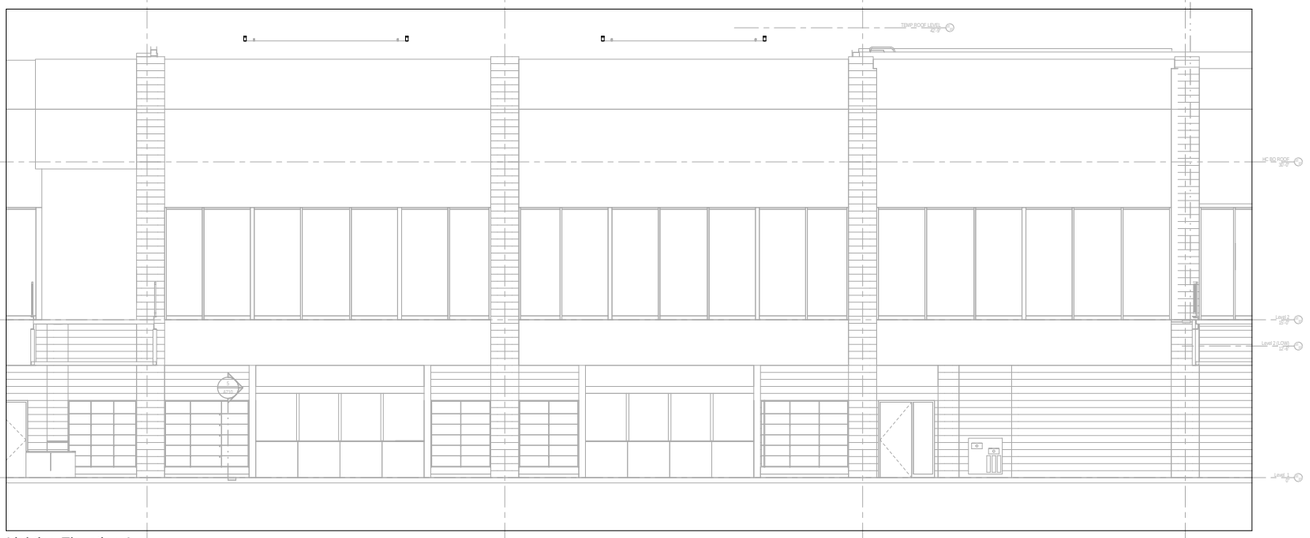

Lighting Elevation A
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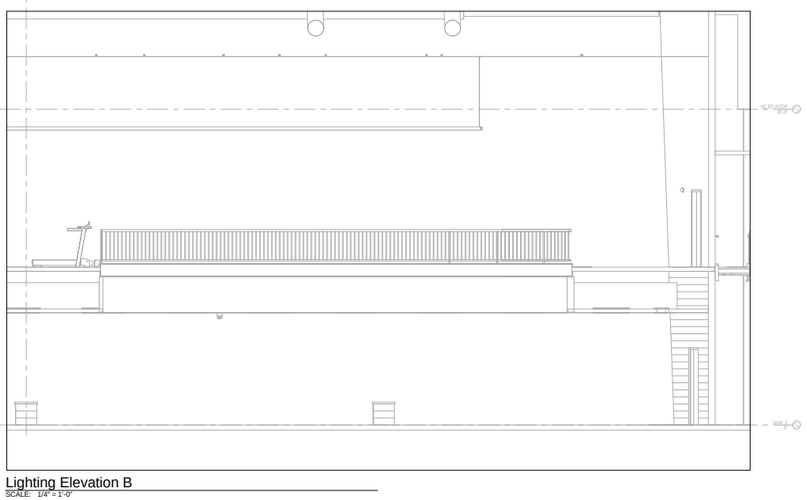
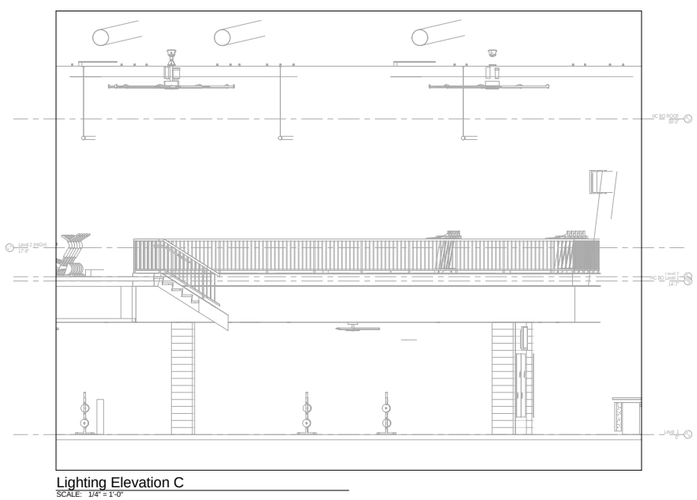


Lighting Elevation B
SCALE: 1/4" = 1'-0"



Lighting Elevation C
SCALE: 1/4" = 1'-0"

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Ithica, New York 14850
607.277.3400 T

Storm Water Management Engineers
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Albany, NY 12246
518.320.3210 T
518.689.2683 F

CLIENT

Construct Student Life Center
1 Pashley Drive
Cortland, NY 13045

PROJECT

LTG ELEVATIONS

SHEET TITLE

SUCF #: 04039		HOLZ #: 5669.00	
DATE:	04.16.2014	SHEET No.	
SCALE:	1/4" = 1'-0"		LD 2
DRAWN:	Author		
CHECKED:	Checker		
PROJ. MNGR:	Approver		

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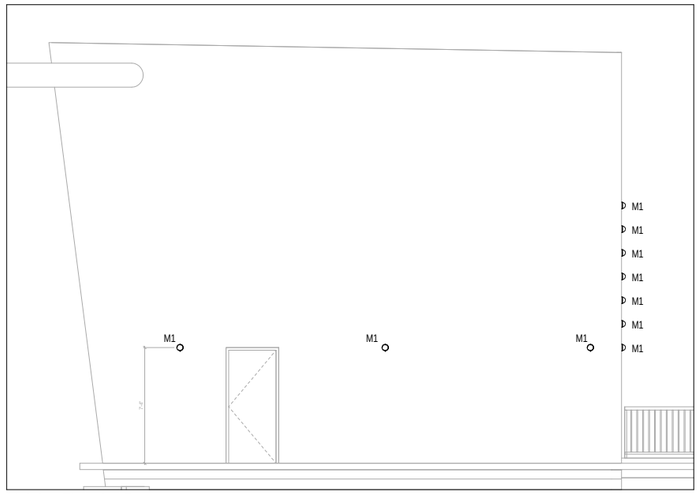
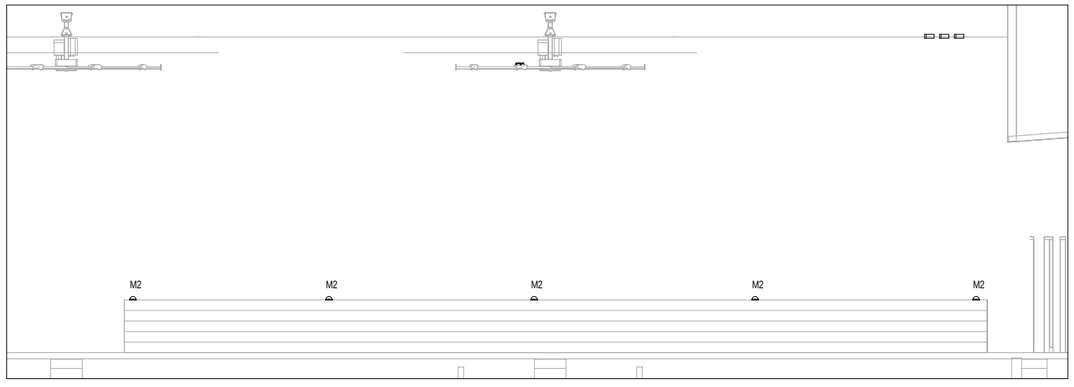


Lighting Elevation D

SCALE: 3/8" = 1'-0"



Lighting Elevation E

SCALE: 3/8" = 1'-0"

FOR PSU AE SENIOR THESIS PROJECT

E:_Thesis\Simplified\Interior Drawings.rvt 4/3/2014 10:45:40 PM

JAY KLINE

PSU AE SENIOR THESIS

LIGHTING/ELECTRICAL

REVISIONS

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Sturctural & Civil Engineers
KS Engineers
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973.242.2956 F

Mechanical, Elatrical, Plumbing, Audio-Visual & Security Engineers
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Cost Estimation
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Voorheesville, NY 12186
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Brockway Hall, Room 216
Cortland, NY 13045
607.753.5517 T

State University Construction Fund
285 Broadway
Albany, NY 12246
518.320.3210 T
518.689.2683 F

PROJECT

Construct Student Life Center
1 Pashley Drive
Cortland, NY 13045

SHEET TITLE

LTG ELEVATIONS

SUCF #: 04339	HOLZ #: 5669.00
DATE: 04.16.2014	SHEET No.
SCALE: 3/8" = 1'-0"	LD 3
DRAWN: Author	
CHECKED: Checker	
PROJ. MNGR: Approver	

Appendix C

Lighting Equipment

This Appendix includes:

1. Fixture Schedule
2. Fixture Specification Sheets
3. Lamp Catalog Information
4. Ballast/Power Source Catalog Information

SUNY Cortland Lighting Fixture Schedule

Symbol	Type	Manufacturer	Name	Product No.	Lamp Type	CRI	CCT	Lamp Life (hrs.)	Mounting	Volt	Lum or Lum/ft	W or W/Ft	Lum/W	Description
See Lighting Plans	A1	Lumenpulse	Lumenline Rec	LLI2R-227-C60-dRO40K-DMX1FX-FGL-WH	LED	86	4000k	100000	Recessed-Ceiling	277	1470	7	210.00	Acrylic lens, Continuous Run, Direct
	A2	Lumenpulse	Lumenline Rec	LLI2R-227-C64-dRO40K-DMX1FX-FGL-WH	LED	85	4000k	100000	Recessed-Ceiling	277	1470	7	210.00	Acrylic lens, Continuous Run, Direct
	A3	Lumenpulse	Lumenline Rec	LLI2R-227-C21-dRO40K-DMX1FX-FGL-WH	LED	87	4000k	100000	Recessed-Ceiling	277	1470	7	210.00	Acrylic lens, Continuous Run, Direct, Radial to Match Desk Overhang
	A4	Lumenpulse	Lumenline Rec	LLI2R-227-C48-dRO40K-DMX1FX-FGL-WH	LED	87	4000k	100000	Recessed-Ceiling	277	1470	7	210.00	Acrylic lens, Continuous Run, Direct
	A5	Lumenpulse	Lumenline Rec	LLI2R-227-C68-dRO40K-DMX1FX-FGL-WH	LED	87	4000k	100000	Recessed-Ceiling	277	1470	7	210.00	Acrylic lens, Continuous Run, Direct
	A6	Lumenpulse	Lumenline Rec	LLI2R-227-4-dRO40K-DMX1FX-FGL-WH	LED	87	4000k	100000	Recessed-Ceiling	277	1470	7	210.00	Acrylic lens, LED Direct
	A7	Lumenpulse	Lumenline Rec	LLI2R-227-C104-dRO40K-DMX1FX-FGL-WH	LED	87	4000k	100000	Recessed-Ceiling	277	1470	7	210.00	Acrylic lens, Continuous Run, Direct
	A8	Lumenpulse	Lumenline Rec	LLI2R-227-C72-dRO40K-DMX1FX-FGL-WH	LED	87	4000k	100000	Recessed-Ceiling	277	1470	7	210.00	Acrylic lens, Continuous Run, Direct
	A9	Lumenpulse	Lumenline Rec	LLI2R-227-C56-dRO40K-DMX1FX-FGL-WH	LED	87	4000k	100000	Recessed-Ceiling	277	1470	7	210.00	Acrylic lens, Continuous Run, Direct
	A10	Lumenpulse	Lumenline Rec	LLI2R-227-C30-dRO40K-DMX1FX-FGL-WH-SPECIAL	LED	87	4000k	100000	Recessed-Ceiling	277	1470	7	210.00	Acrylic lens, Continuous Run, Direct, Radial to Match Curvutare of Track
	B1	Lumenpulse	Lumenline Pend	LLI2P-DI-227-C100-dRO40K-iRO40K-DMX1FX-ACC50-WH	LED	88	4000k	100000	Pendant	277	3299	14	235.64	Acrylic lens, Continuous Run, Direct/Indirect
	B2	Lumenpulse	Lumenline Pend	LLI2P-DI-227-C44-dRO40K-iRO40K-DMX1FX-ACC50-WH	LED	88	4000k	100000	Pendant	277	3299	14	235.64	Acrylic lens, Continuous Run, Direct/Indirect
	B3	Lumenpulse	Lumenline Pend	LLI2P-DI-227-C54-dRO40K-iRO40K-DMX1FX-ACC50-WH	LED	88	4000k	100000	Pendant	277	3299	14	235.64	Acrylic lens, Continuous Run, Direct/Indirect
	C1	Lumenpulse	Lumenbeam Grande	LBG-227-40k-WFL-blank-WH-DMX1BD	LED	81	4000k	100000	Pendant	227	4922	99	49.72	LED pendant, direct
	D1	Gotham	Incito	ICO-40-20-6AR-blank-20-277-DMXR	LED	85	4000k	50000	Recessed-Ceiling	227	2000	28	71.43	Recessed Downlight
	E1	Lighting Quotient	Elliptipar Wall Washer	M205-150G-T-02-2-00-0	Metal Halide - CDM150/T6/942	96	4200k	12000	Semi-Recessed-Ceiling	227	12700	150	84.67	Metal Halide semi-recessed wall washer, Ballast: shown in Appendix C
	F1	LED Linear	VarioLED Flex Venus	VarioLED Flex VENUS W835/W30 TV IP67	LED	85	4100k	50000	Recessed-Wall	24	110	3	36.67	LED Continuous Flexible Strip
	F2	LED Linear	VarioLED Flex Venus	VarioLED Flex VENUS W835/W22 TV IP67	LED	85	4100k	50000	Recessed-Wall	24	110	3	36.67	LED Continuous Flexible Strip
	F3	LED Linear	VarioLED Flex Venus	VarioLED Flex VENUS W835/W18 TV IP67	LED	85	4100k	50000	Recessed-Wall	24	110	3	36.67	LED Continuous Flexible Strip
	F4	LED Linear	VarioLED Flex Venus	VarioLED Flex VENUS W835/W87 TV IP67	LED	85	4100k	50000	Recessed-Wall	24	110	3	36.67	LED Continuous Flexible Strip
	F5	LED Linear	VarioLED Flex Venus	VarioLED Flex VENUS W835/W38 TV IP67	LED	85	4100k	50000	Recessed-Wall	24	110	3	36.67	LED Continuous Flexible Strip
	F6	LED Linear	VarioLED Flex Venus	VarioLED Flex VENUS W835/W31 TV IP67	LED	85	4100k	50000	Recessed-Wall	24	110	3	36.67	LED Continuous Flexible Strip
	F7	LED Linear	VarioLED Flex Venus	VarioLED Flex VENUS W835/W41 TV IP67	LED	85	4100k	50000	Recessed-Wall	24	110	3	36.67	LED Continuous Flexible Strip
	F8	LED Linear	VarioLED Flex Venus	VarioLED Flex VENUS W835/W28 TV IP67	LED	85	4100k	50000	Recessed-Wall	24	110	3	36.67	LED Continuous Flexible Strip
	F9	LED Linear	VarioLED Flex Venus	VarioLED Flex VENUS W835/W10 TV IP67	LED	85	4100k	50000	Recessed-Wall	24	110	3	36.67	LED Continuous Flexible Strip
	G1	Lumenpulse	Lumencove	LCSRO-227-C11-40K-CL-RF-WH-DMX1FX	LED	85	4000k	100000	Cove	227	1383 (total)	25 (total)	55.00	LED Continuous Cove Light
	G2	Lumenpulse	Lumencove	LCSRO-227-C12-40K-CL-RF-WH-DMX1FX	LED	85	4000k	100000	Cove	227	1383 (total)	25 (total)	55.00	LED Continuous Cove Light
	G3	Lumenpulse	Lumencove	LCSRO-227-C72-40K-CL-RF-WH-DMX1FX	LED	85	4000k	100000	Cove	227	1383 (total)	25 (total)	55.00	LED Continuous Cove Light
	H	Lumascape	Omnio Mini	LS411LED-15W4-ME-C-09-CB	LED		4300k	Unavailable	Clamped	120	743	16	46.44	LED directional, mounted to branches for path lighting using
	I	Lumenpulse	Lumenline Wall	LLI2S-WM-I-227-C60-iRO40K-DMX1FX-WH	LED	86	4000k	100000	Wall Mount	277	1470	7	210.00	Acrylic lens, Continuous Run, Indirect
	J	Bega	Landscape Bollard	8657LED-120-BLK	LED	85	4000k	Unavailable	Bollard	120	729	13	56.08	IP67 Bollard, Black Finish, 21 inches Tall
	K	Delray	Media Square	M2LD-8x8-LOCW-BDMXMOD	LED	>80	4000k	Unavailable	Bollard	227	8652	13	665.54	Square LED Pendant, Aluminum Matte Anodized Finish
	L	LED Linear	VarioLED Flex Venus	VarioLED Flex VENUS W835/W51 TV IP67	LED	85	4100k	50000	Surface mounted	24	110	3	36.67	LED Continuous Flexible Strip, Surface mounted to bottom of facia plate, sideways bending
	M1	Lumenpulse	Lumendome	LMDM-48V-RGB-WH-WM	LED	NA	RGB	120000	Wall Mount	227	95	12	7.92	LED 6" Color changing dome. Power source found in Appendix C
	M2	Lumenpulse	Lumendome	LMDM-48V-RGB-WH-CN	LED	NA	RGB	120000	Surface mounted	227	95	12	7.92	LED 6" Color changing dome. Power source found in Appendix C

SPECIFICATION SHEET

lumenline™ 2

RECESSED

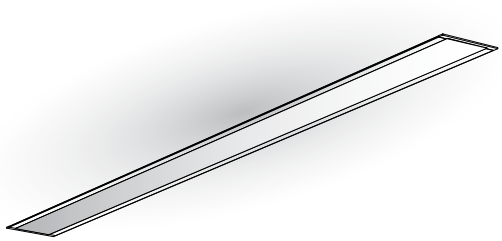
Client: _____

Project name: _____

Order #: _____

Type: _____ Qty: _____

FEATURES AND BENEFITS



Physical :

- Aluminum extrusion housing, 2" wide
- Available in 1', 2', 3', 4', 5', 6', 7' or 8' sections
- Durable polyester powder coat finish for trim
- Flange, flangeless and spackle flange trim options available
- Easy installation
- Extruded acrylic lens
- Illuminated corners available for custom configurations, consult factory for availability and orders
- Tool-less system for reflector assembly and control gear access
- Suitable for use with drywall ceiling and metal pan ceilings (millwork ceilings)
- Compatible with motion sensors
- CCEA option available

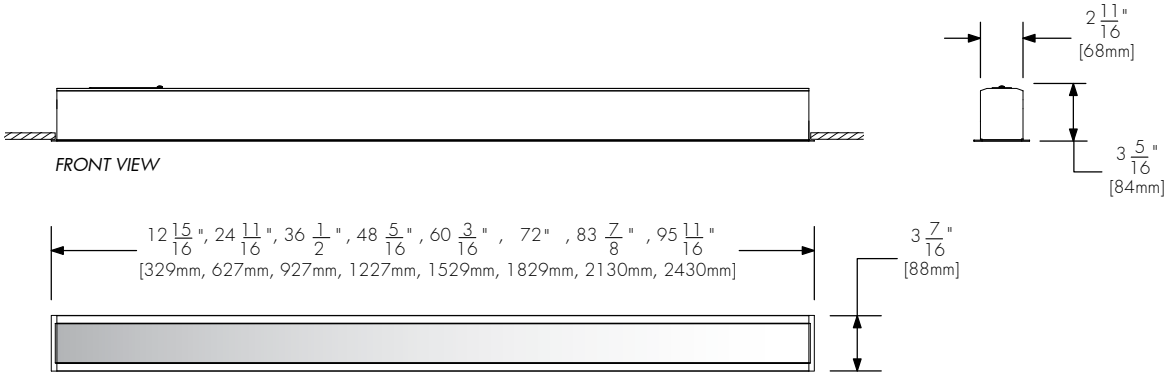
Performance :

- Available in 2700K, 3000K, 3500K, 4000K or RGB color mixing
- 55 lumens per watt (delivered, HO 3500K)
- CRI value: 80+
- Binning within a 3 step MacAdam ellipse
- Lumen maintenance: 100,000 hrs [L70 @ 25° C]
- Lumen measurements comply with LM - 79 - 08 standard
- Resolution per foot or per fixture
- Operating temperatures: -25° C to 50° C [-13F to 122F]

Lumens / 4ft	RO	HO
2700K	1200	2500
3000K	1352	2876
3500K	1460	3120
4000K	1744	3476
RGB	407	

Electrical :

- Line voltage luminaire for 120 to 277V
- 7W/ft Regular Output version
- 14.25W/ft High Output version
- Dimming options for white light: 0-10 volt, DMX, DALI, Lumentalk, or Lutron® EcoSystem® enabled
- 6W/ft optional RGB source, DMX 512 ready
- Quick connectors for continuous runs



FRONT VIEW

BOTTOM VIEW
FLANGE TRIM OPTION SHOWN

5 year warranty

Lumenpulse, 1751 Richardson, Suite 1505, Montreal (Quebec) Canada H3K 1G6 1.877.937.3003 P. 514.937.3003 F. 514.937.6289
info@lumenpulse.com **www.lumenpulse.com**

2014.01.21
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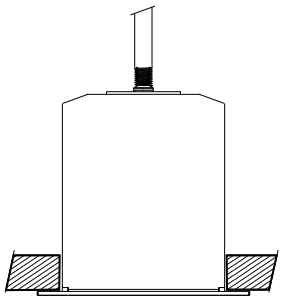
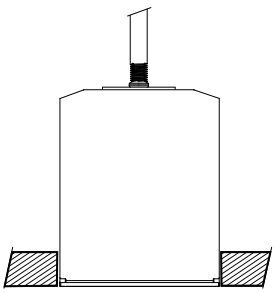
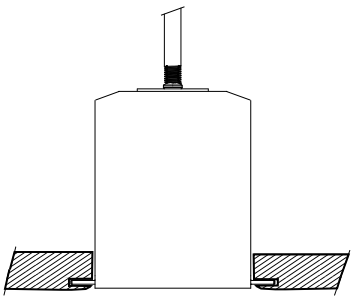
TRIM OPTION



FG
Flange trim option



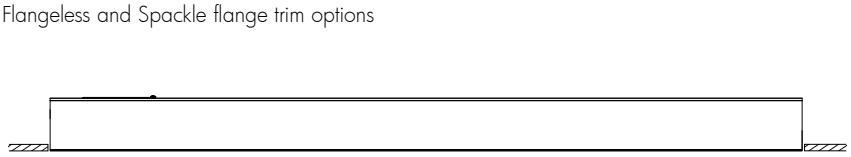
FGL
Flangeless trim option



SFG
Spackle Flange trim option

TRIM OPTIONS DIMENSIONS

Flangeless and Spackle flange trim options



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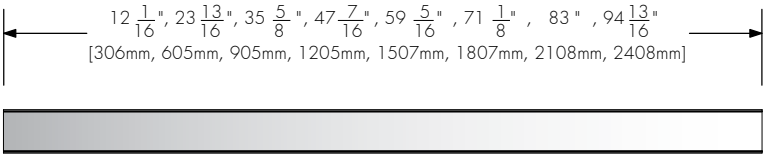
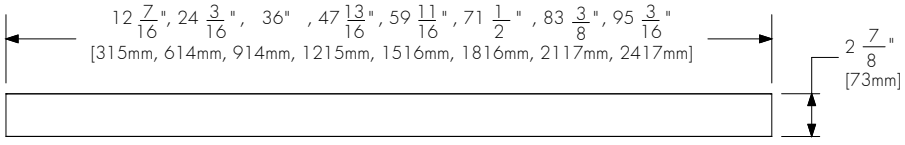
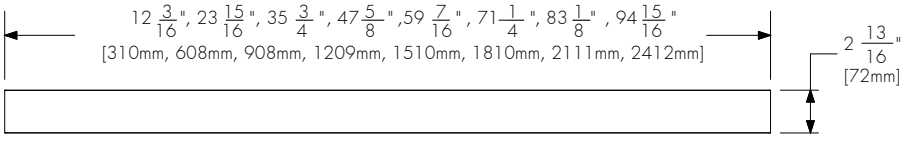


BOTTOM VIEW
FLANGELESS TRIM OPTION SHOWN
(USE SAME DIMENSIONS FOR SPACKLE FLANGE HOUSING)

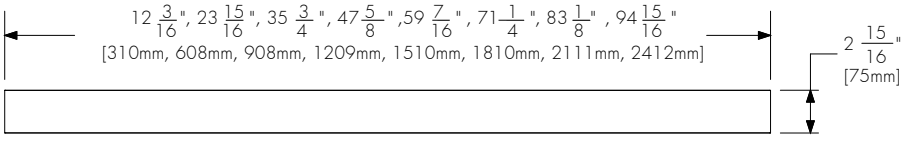
CEILING CUTOUT DIMENSIONS



FLANGE CEILING CUTOUT



FLANGELESS CEILING CUTOUT



SPACKLE FLANGE CEILING CUTOUT

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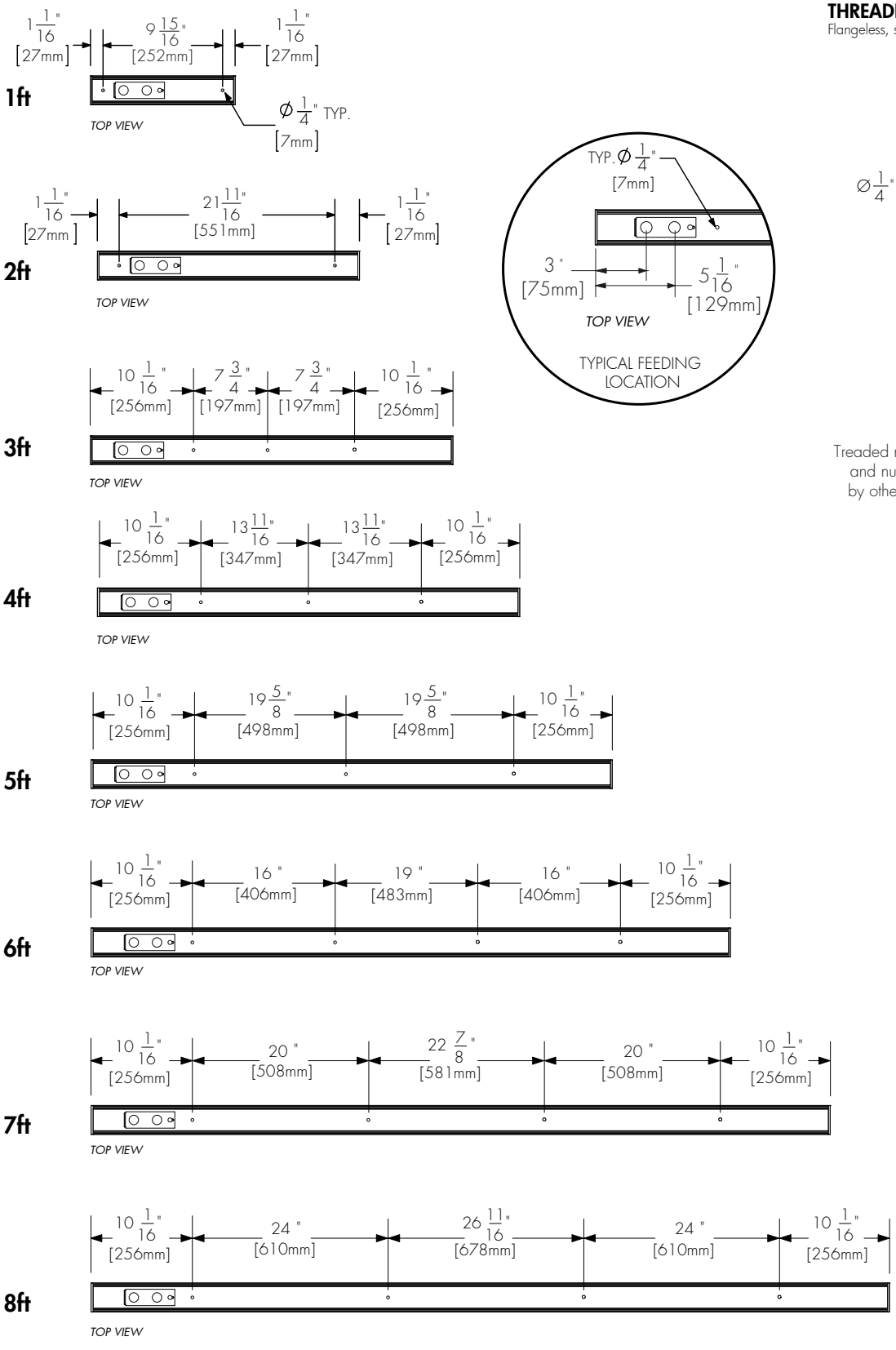
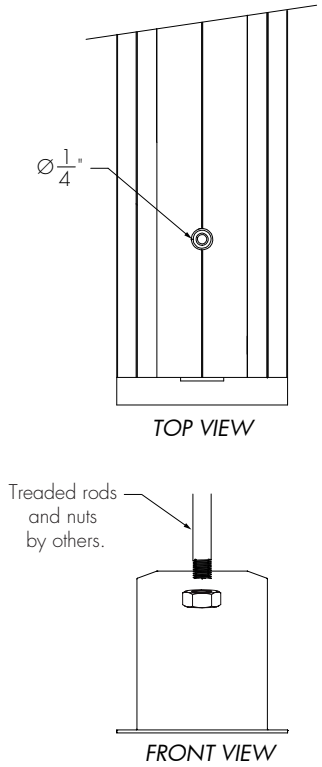
THREADED RODS MOUNTING HOLE PATTERN

Flangeless trim options shown



THREADED RODS MOUNTING DETAIL

Flangeless, spackle flange and flangeless trim options



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ACCESSORIES
Order separately

Control Systems:

LTO Lumentouch is a wall mount DMX 512 controller keypad

LCU Lumencue is a USB / mini SD DMX 512 controller

LID LumenID is a serializing and addressing DMX 512 controller.
It must be specified on all white DMX applications.
Refer to LID specification sheet for details.

LTN Lumentone is a simple pre-programmed DMX 512 controller with a push button rotary dial and live feedback.

CBOX :

iCBOX-___V-___-___ Interior DMX 512 data box.
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to four outputs to fixtures, M20 provision holes with plugs.
Please specify desired input voltage and finish.
Refer to iCBOX specification sheet for details.

CBOX-___V-___-___ DMX 512 data box.
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to four outputs to fixtures, M20 provision holes with plugs.
Please specify desired input voltage and finish.
Refer to CBOX specification sheet for details.

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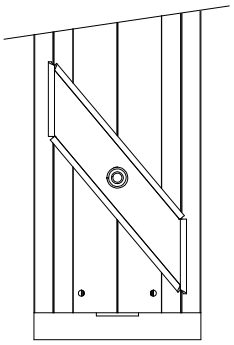
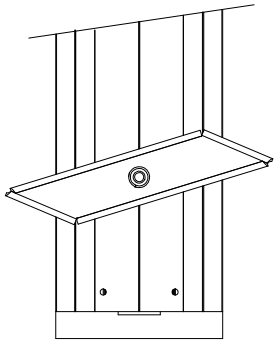
ROTATING CROSSBAR MOUNTING OPTION

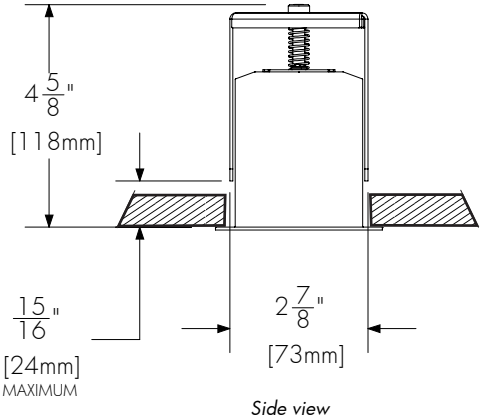
Available with Flange trim option only



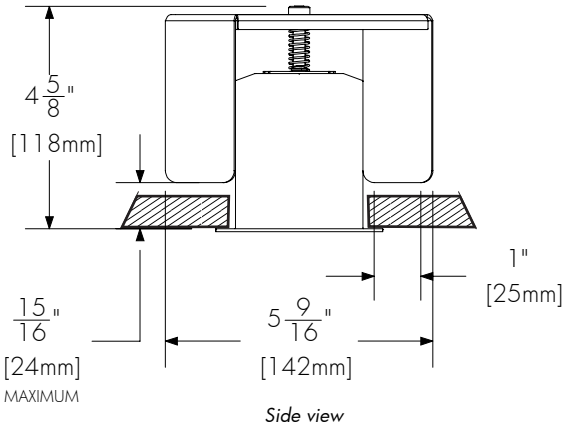
Top view
Rotating Crossbar CLOSED



Top view
Rotating Crossbar OPENED



Side view
Rotating Crossbar CLOSED



Side view
Rotating Crossbar OPENED

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info@lumenpulse.com **www.lumenpulse.com**

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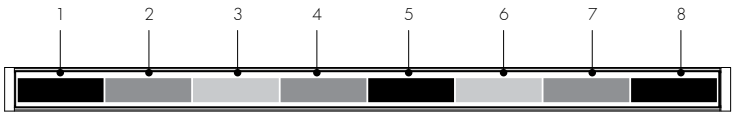
Sustainable architectural LED lighting systems

RESOLUTION DETAILS

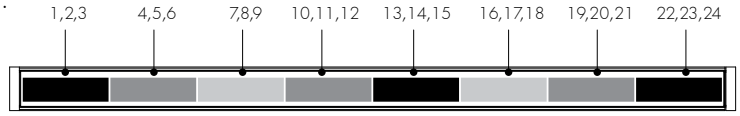
DMX 1FT - Resolution per foot: each foot is addressed independently .

WHITE DIMMING
DMX ADDRESSES:



BOTTOM VIEW
(8 ft fixture shown)

RGB
DMX ADDRESSES:



BOTTOM VIEW
(8 ft fixture shown)

DMX 1FX - Resolution per fixture: each 4 foot segment is addressed independently

WHITE DIMMING
DMX ADDRESSES:

BOTTOM VIEW
(8 ft fixture shown)

RGB
DMX ADDRESSES:

BOTTOM VIEW
(8 ft fixture shown)

*Warning: resolution is a factory setting and cannot be changed in the field.

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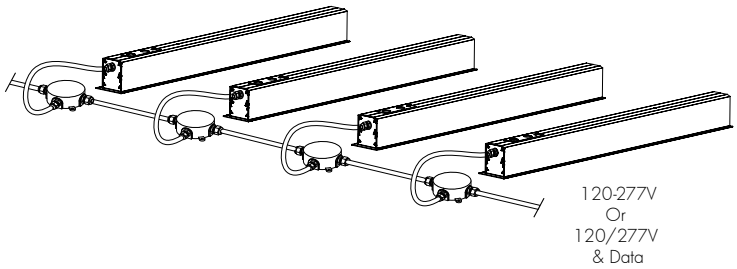
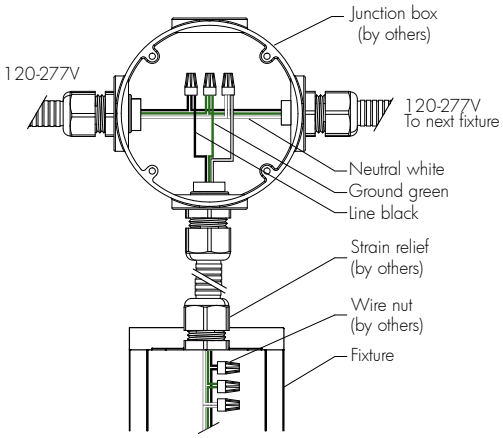
TYPICAL WIRING DIAGRAMS

Single units, daisy chain configuration
ON/OFF, 0/10V, DALI & EcoSystem dimming

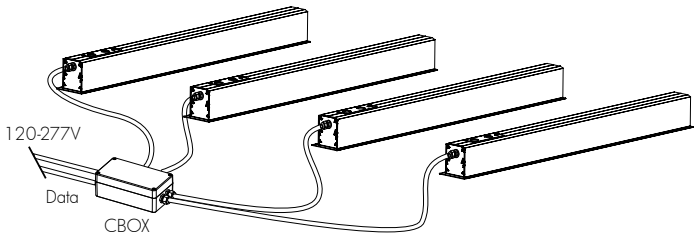


*Flange option shown

ON/OFF wiring detail

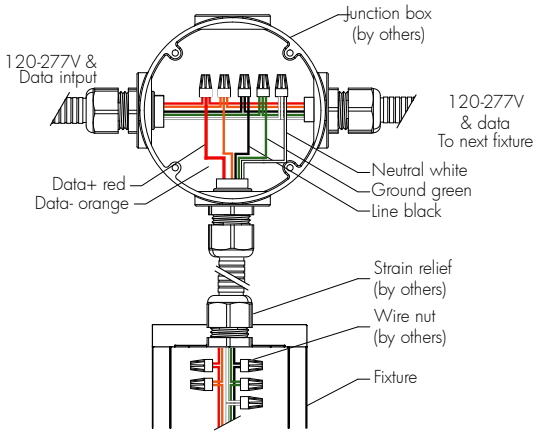


Single units, daisy chain configuration
Combined power and data input (DMX)

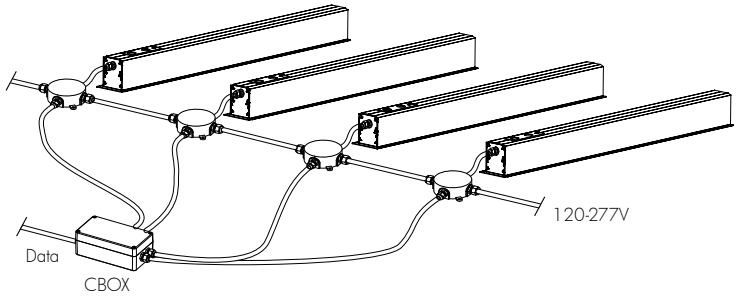


*Flange option shown
*For stable DMX data signal do not split more than 8 times

0/10V, DMX, DALI
& EcoSystem wiring detail
Combined power and data

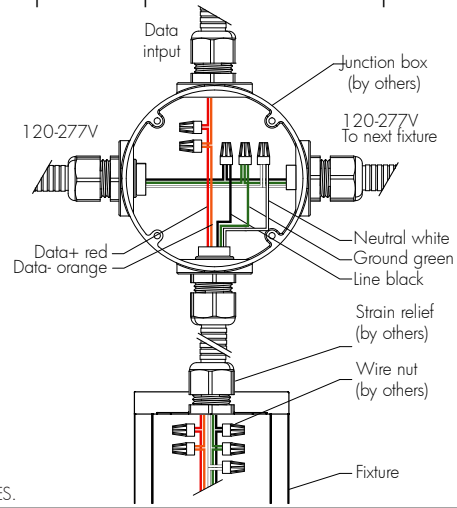


Single units, daisy chain configuration
Separated power and data inputs (DMX)



*Flange and vertical option shown
*For stable DMX data signal do not split more than 8 times

0/10V, DMX, DALI
& EcoSystem wiring detail
Separated power and data inputs



⚠ WARNING

SEPARATION OF FIELD INSTALLED POWER LIMITED CIRCUIT (DIMMING/DATA/CONTROL)
WIRING FROM THE BRANCH CIRCUIT WIRING IN THE OUTLET BOX ARE
TO BE MADE IN ACCORDANCE WITH LOCAL AND/OR NATIONAL ELECTRICAL INSTALLATION CODES.

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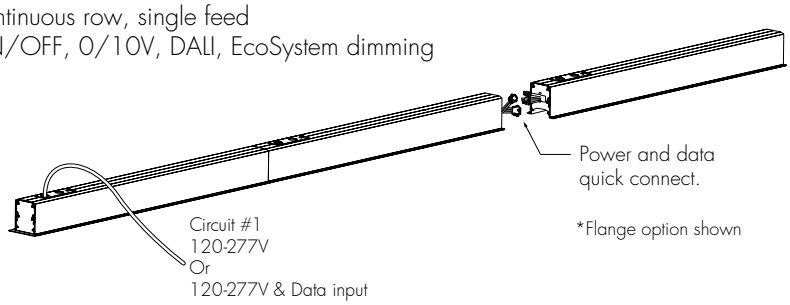
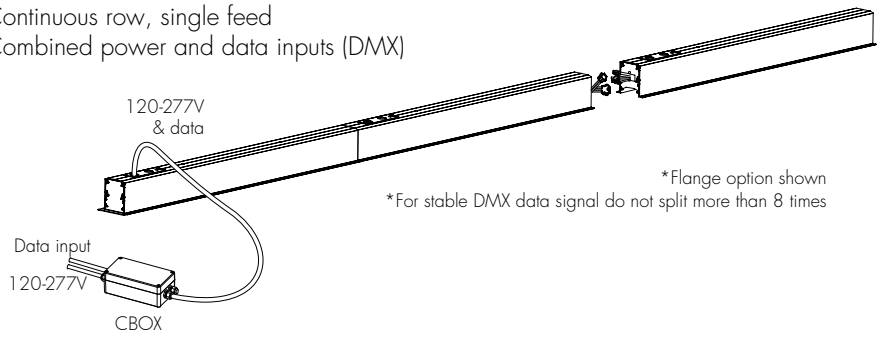
TYPICAL WIRING DIAGRAMS

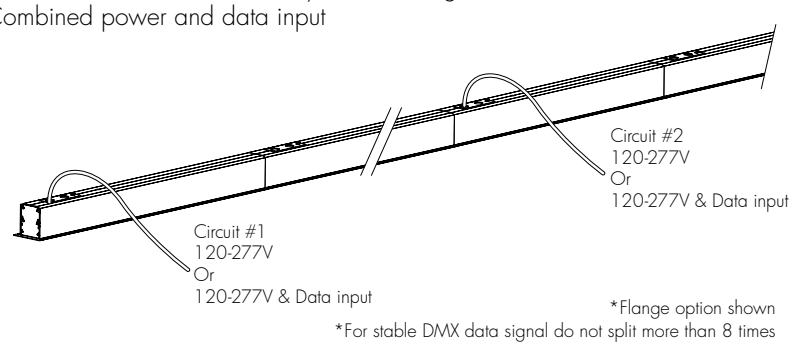
Continuous row, single feed
ON/OFF, 0/10V, DALI, EcoSystem dimming



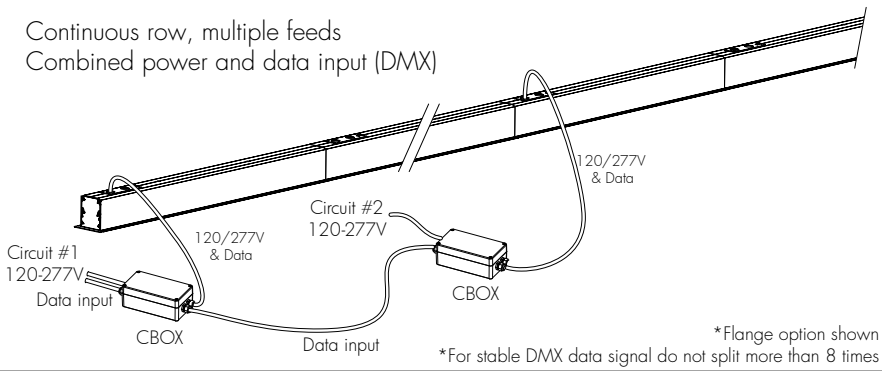
Continuous row, single feed
Combined power and data inputs (DMX)



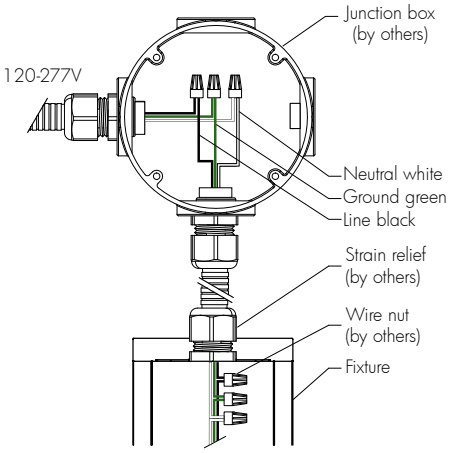
Continuous row, multiple feeds
ON/OFF, 0/10V, DALI, EcoSystem dimming
Combined power and data input



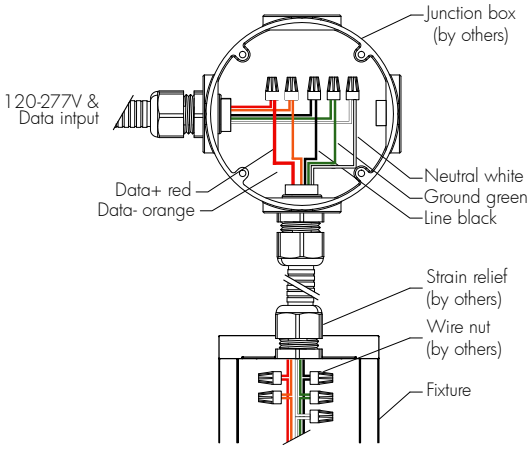
Continuous row, multiple feeds
Combined power and data input (DMX)



ON/OFF wiring detail



0/10V, DMX, DALI
& EcoSystem wiring detail
Combined power and data



Maximum run length by single circuit 7A maximum with 10 ft cable			
Configuration/Voltage	**120V**	**240V**	**277V**
RO Regular output	116ft	232ft	272ft
HO High output	56ft	116ft	132ft
RGB	128ft	272ft	312ft

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HOW TO ORDER

LLI2R	277	Select:	dRO 40K	DMX 1FX	FGL	WH	Select:
Housing	Voltage	Length	Output and color temperature	Control	Trim Option	Trim Finish	Option
1	2	3	4	5	6	7	8

See Fixture Schedule for different lengths.

See Fixture Schedule: A10 special.

1

Housing:

LLI2R - Lumenline™ Recessed, 2" wide

2

Voltage:

120 - 120 volts
208 - 208 volts
220/240 - 220 to 240 volts
277 - 277 volts

3

Length:

Dimension shown are for flangeless
1 - 12 1/16" (306mm)
2 - 23 13/16" (605mm)
3 - 35 5/8" (905mm)
4 - 47 7/16" (1205mm)
5 - 59 5/16" (1507mm)
6 - 71 1/8" (1806mm)
7 - 83" (2108mm)
8 - 94 13/16" (2408mm)
C__ - Continuous run, specify in 1' increments

4

Output and color temperature:

dRO 27K - 2700K regular output 7W/ft
dRO 30K - 3000K regular output 7W/ft
dRO 35K - 3500K regular output 7W/ft
dRO 40K - 4000K regular output 7W/ft
dHO 27K - 2700K high output 14.25W/ft*
dHO 30K - 3000K high output 14.25W/ft*
dHO 35K - 3500K high output 14.25W/ft*
dHO 40K - 4000K high output 14.25W/ft*
dRGB - Additive red, green and blue direct lighting 6W/ft
N.B. dRGB option requires DMX control to be specified in section 5.

5

Control:

NO - On/Off control
LT - Lumentalk (available with white light only)
(available for 2-8' lengths only)
(1% minimum dimming value)
DIM - 0-10V Dimming option
(10% minimum dimming value)
DMX 1FT - DMX Dimming option, resolution per foot
(1% minimum dimming value)
DMX 1FX - DMX Dimming option, resolution per fixture
(1% minimum dimming value)
DALI - DALI Dimming option
(1% minimum dimming value)
ES - Lutron® EcoSystem® Enabled Dimming (available with white light only)
(available for 2-8' lengths only)
(1% minimum dimming value)

6

Trim Option:

FG - Flange
FGL - Flangeless
SFG - Spackle Flange

7

Trim Finish:

WH - White
SI - Silver
CC - Custom (please specify RAL color)

8

Option:

CCEA - Chicago plenum rated option
RCB - Rotating Crossbar mounting, available for flange trim option only
(2 rotating crossbars included for 1-5' lengths,
3 rotating crossbars included for 6-8' lengths)

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SPECIFICATION SHEET

lumenline™ 2

PENDANT
DIRECT/INDIRECT LIGHTING

Client: _____

Project name: _____

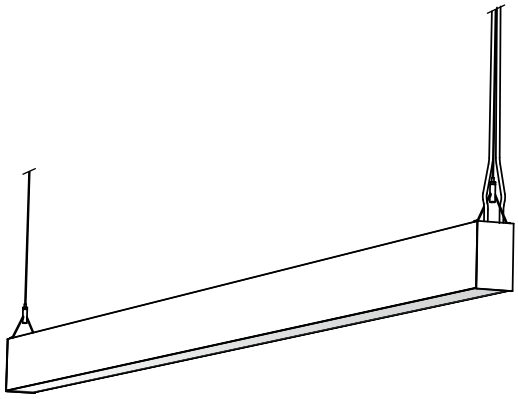
Order #: _____

Type: _____ Qty: _____

FEATURES AND BENEFITS

Physical :

- Aluminum extruded housing
- Available in 1', 2', 3', 4', 5', 6', 7' or 8' sections
- Continuous runs available in 1' increments
- Durable polyester powder coat finish
- Extruded acrylic lens
- High reflective matte white powder coated reflectors
- Easy installation
- Tool-less system for reflector assembly and control gear access
- Suitable for use with drywall, grid and metal pan ceilings (millwork ceilings)
- 1/16" galvanized aircraft cable adjustable suspension system
- Non illuminated corners available for custom configurations
- Compatible with motion sensors



Performance :

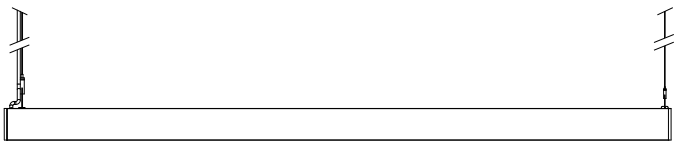
- Available in 2700K, 3000K, 3500K, 4000K or RGB color mixing for direct and indirect lighting
- 55 lumens per watt (delivered, HO 3500K)
- CRI value: 80+
- Binning within a 3 step MacAdam ellipse
- Lumen maintenance: 100,000 hrs [L70 @ 25° C]
- Lumen measurements comply with LM - 79 - 08 standard
- Resolution per foot or per fixture
- Operating temperatures: -25° C to 50° C [-13F to 122F]

Lumens / 4ft downlight / uplight	↓RO / ↑RO	↓RO / ↑HO	↓HO / ↑RO
2700K			2316 / 1393
3000K		1191 / 2690	2770 / 1768
3500K	1378 / 1910	1575 / 3709	
4000K	1660 / 1908		

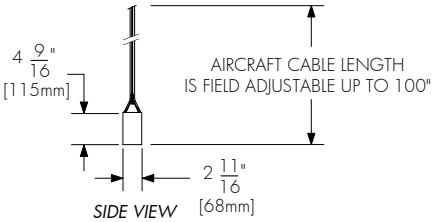
Electrical :

- Line voltage luminaire for 120 to 277V
- 7W/ft Regular Output version, direct or indirect lighting
- 14.25W/ft High Output version, direct or indirect lighting
- Dimming options for white light: 0-10 volt, DMX, DALI, Lumentalk, or Lutron® EcoSystem® enabled
- 6W/ft optional RGB source, DMX 512 ready
- Quick connectors for continuous runs

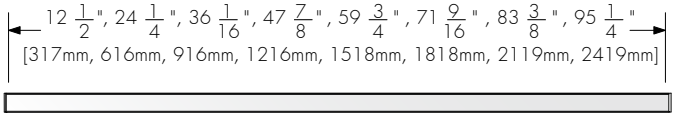
TOP VIEW



FRONT VIEW



SIDE VIEW



BOTTOM VIEW

5 year warranty

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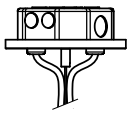
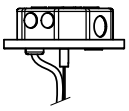
SUSPENSION SYSTEM MOUNTING ACCESSORIES

Included

Drywall ceiling accessories



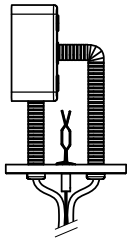
Feeder canopy
Power and data



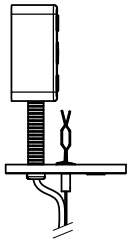
Feeder canopy
Power

Non-feeder canopy
(1/4-20 hardware required)

Suspended ceiling accessories



Feeder canopy
Power and data

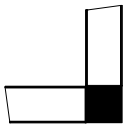


Feeder canopy
Power

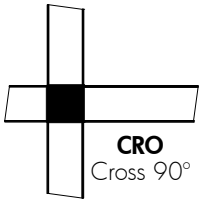
Non-feeder canopy

*Require a minimum of 1 hanging point per fixture

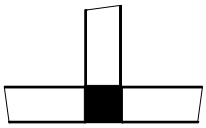
UNLIT JOINERS & CORNERS (CONSULT UNLIT JOINERS SPECIFICATION SHEET FOR DETAILS)



CRN
Corner 90°

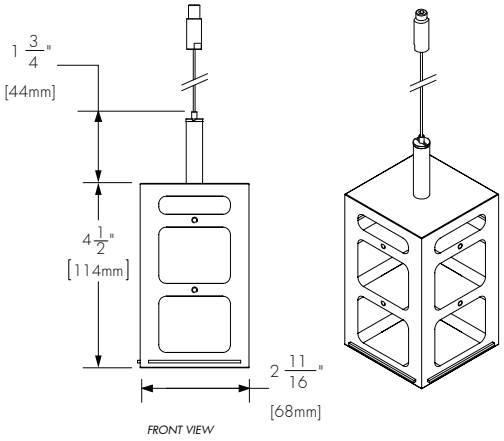


CRO
Cross 90°



TEE
Tee 90°

LNR
Linear 180°



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ACCESSORIES

Order separately

Control Systems:

LTO Lumentouch is a wall mount DMX 512 controller keypad

LCU Lumencue is a USB / mini SD DMX 512 controller

LID LumenID is a diagnostic and addressing DMX 512 controller.
It must be specified on all DMX applications.
Refer to LID specification sheet for details.

LTN Lumentone is a simple pre-programmed DMX 512 controller
with a push button rotary dial and live feedback.

CBOX :

iCBOX-___V-___-___ Interior DMX 512 data box.
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures, M20 provision holes with plugs.
Please specify desired input voltage and finish.
Refer to iCBOX specification sheet for details.

CBOX-___V-___-___ DMX 512 data box.
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures, M20 provision holes with plugs.
Please specify desired input voltage and finish.
Refer to CBOX specification sheet for details.

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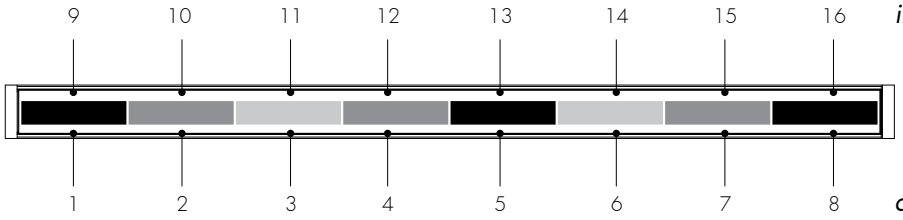
RESOLUTION DETAILS

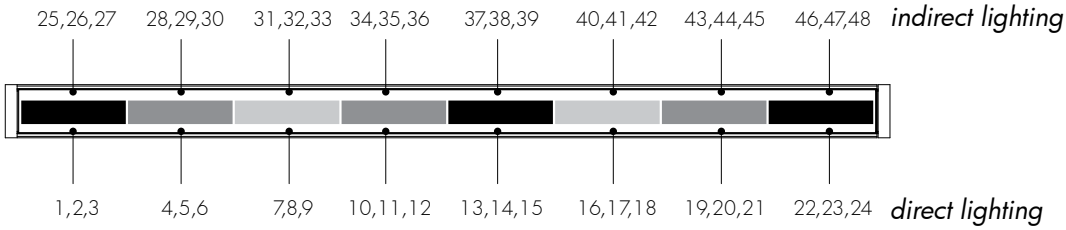
DMX 1FT - Resolution per foot: each foot is addressed independently .

DIRECT AND INDIRECT
WHITE DIMMING
DMX ADDRESSES:



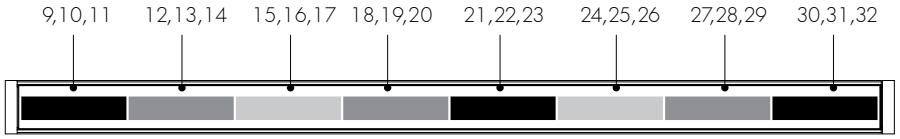
(8 ft fixture shown)

DIRECT AND INDIRECT
RGB DMX ADDRESSES:

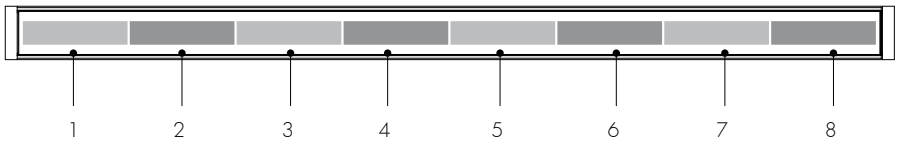


(8 ft fixture shown)

COMBINED
WHITE DIMMING
& RGB DMX ADDRESSES:



Top or bottom view
RGB
(8 ft fixture shown)



Top or bottom view
White dimming
(8 ft fixture shown)

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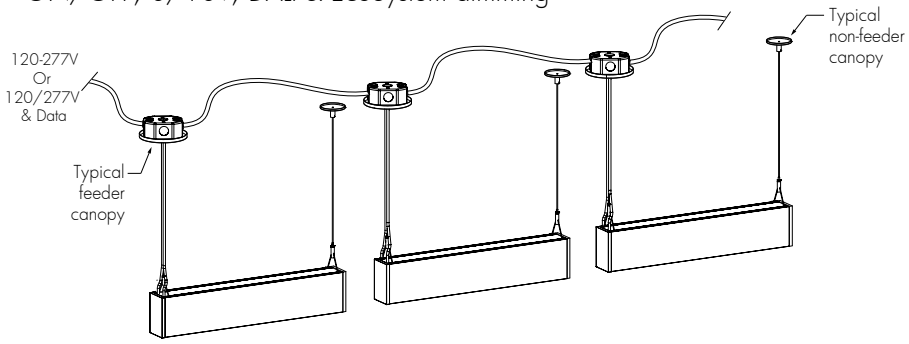
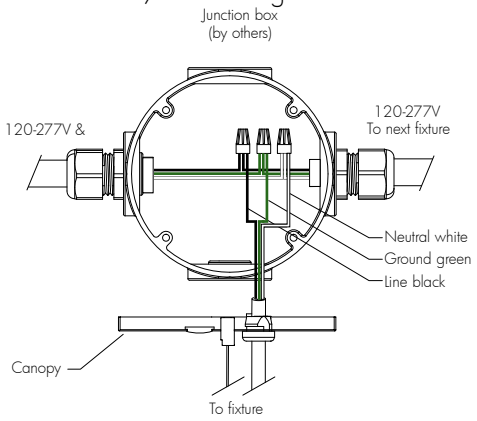
TYPICAL WIRING DIAGRAMS

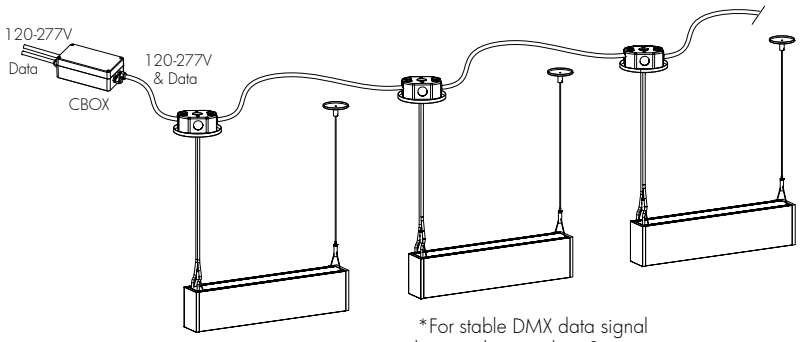
Single units, daisy chain configuration
ON/OFF, 0/10V, DALI & EcoSystem dimming



ON/OFF wiring detail

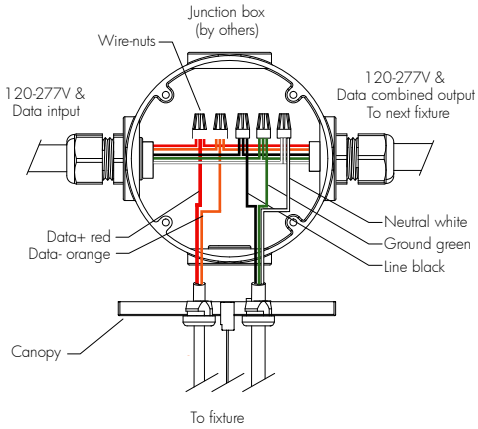


Single units, daisy chain configuration
Combined power and data inputs (DMX)

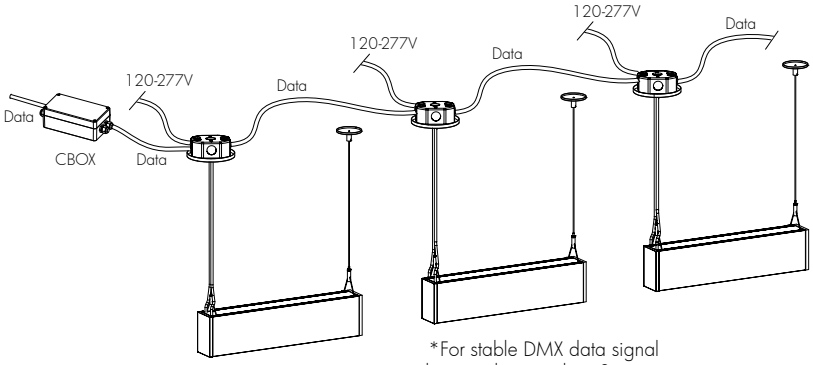


*For stable DMX data signal
do not split more than 8 times

0/10V, DMX, DALI
& EcoSystem wiring detail
Combined power and data

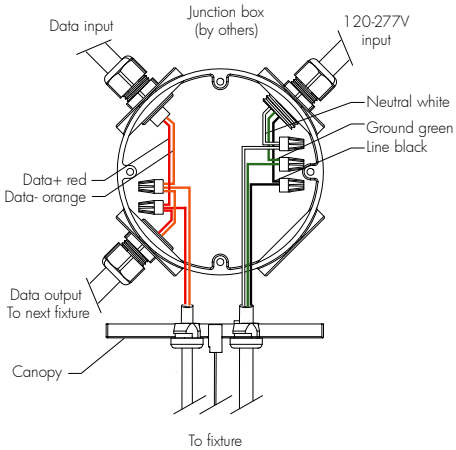


Single units, daisy chain configuration
Separated power and data inputs (DMX)



*For stable DMX data signal
do not split more than 8 times

0/10V, DMX, DALI
& EcoSystem wiring detail
Separated power and data



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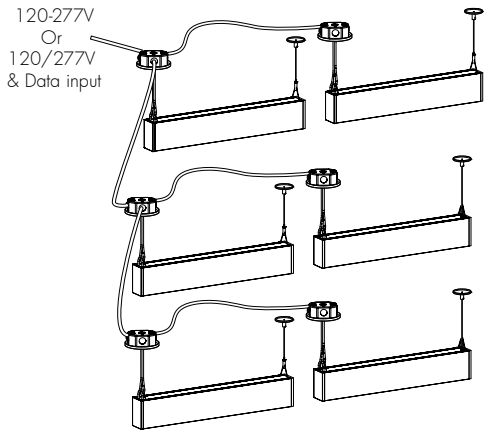
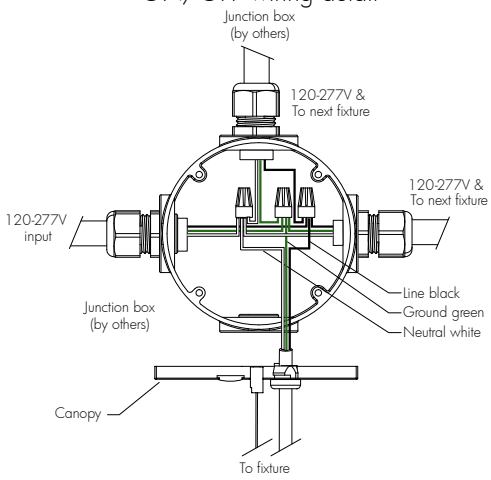
TYPICAL WIRING DIAGRAMS

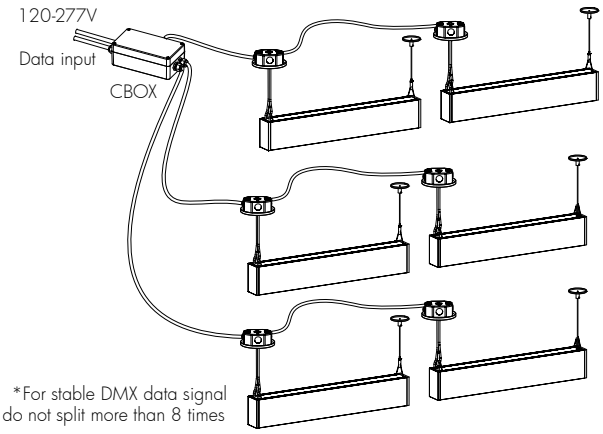
Single units, star layout configuration
ON/OFF, 0/10V, DALI, EcoSystem dimming



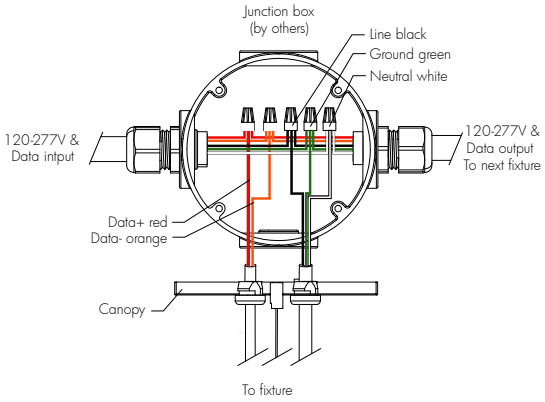
ON/OFF wiring detail



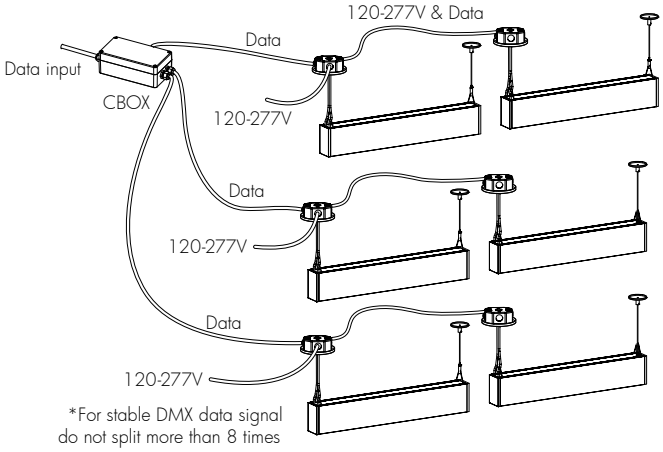
Single units, star layout configuration
Combined power and data inputs (DMX)



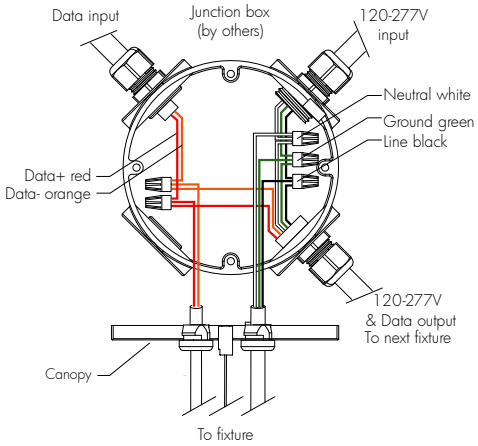
0/10V, DMX, DALI
& EcoSystem wiring detail
Combined power and data



Single units, star layout configuration
Separated power and data inputs (DMX)



0/10V, DMX, DALI
& EcoSystem wiring detail
Separated power and data



⚠ WARNING

SEPARATION OF FIELD INSTALLED POWER LIMITED CIRCUIT (DIMMING/DATA/CONTROL)
WIRING FROM THE BRANCH CIRCUIT WIRING IN THE OUTLET BOX ARE TO BE MADE IN ACCORDANCE

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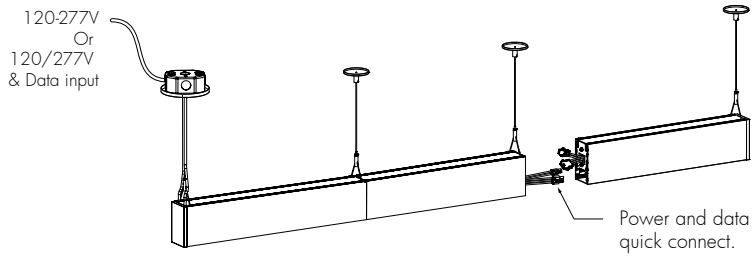
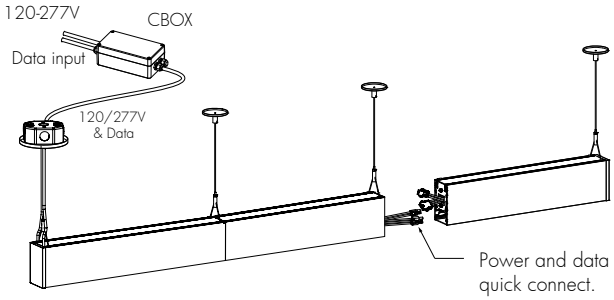
TYPICAL WIRING DIAGRAMS

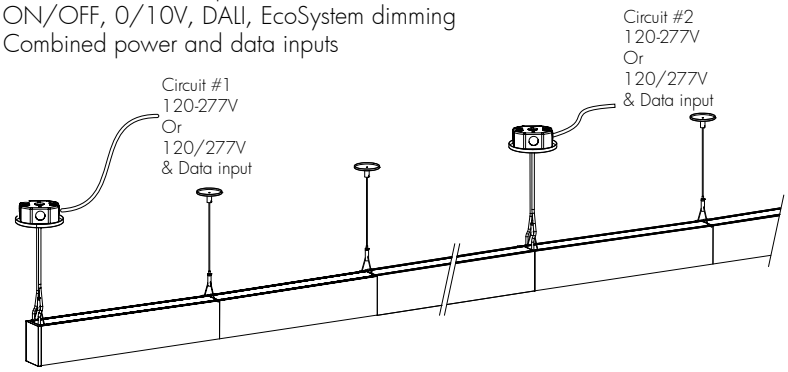
Continuous row, single feed
ON/OFF, 0/10V, DALI, EcoSystem dimming



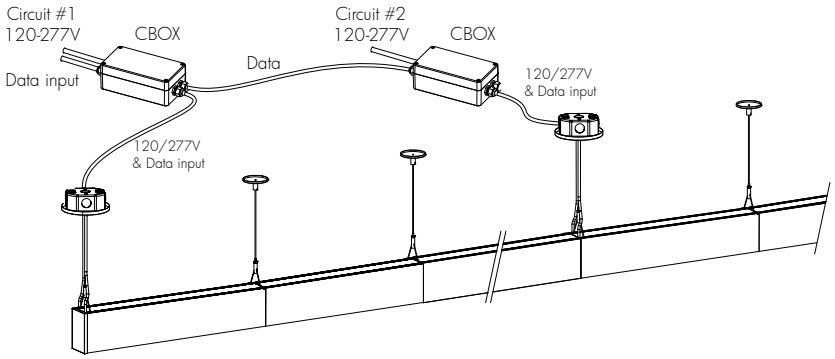
Continuous row, single feed
Combined power and data inputs (DMX)



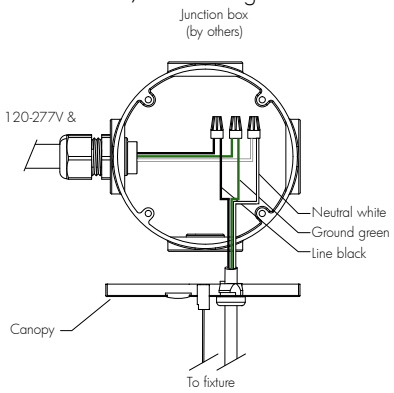
Continuous row, multiple feeds
ON/OFF, 0/10V, DALI, EcoSystem dimming
Combined power and data inputs



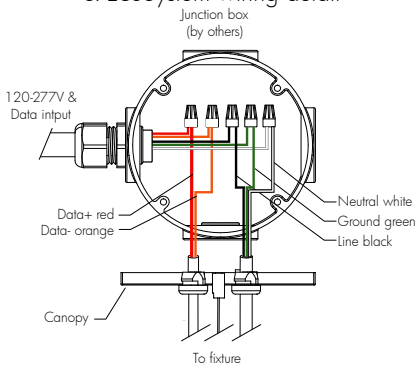
Continuous row, multiple feeds
Combined power and data (DMX)



ON/OFF wiring detail



0/10V, DMX, DALI
& EcoSystem wiring detail



⚠ WARNING

SEPARATION OF FIELD INSTALLED POWER LIMITED CIRCUIT (DIMMING/DATA/CONTROL) WIRING FROM THE BRANCH CIRCUIT WIRING IN THE OUTLET BOX ARE TO BE MADE IN ACCORDANCE WITH LOCAL AND/OR NATIONAL ELECTRICAL INSTALLATION CODES.

Maximum run length by single circuit
7A maximum with 10 ft cable

Configuration/Voltage		120V	240V	277V
RO-RO	Direct-indirect lighting	56ft	116ft	136ft
HO-RO	Direct-indirect lighting	36ft	76ft	88ft
HO-RGB	Direct-indirect lighting	36ft	76ft	88ft
RO-RGB	Direct-indirect lighting	56ft	116ft	136ft
RGB-RGB	Direct-indirect lighting	56ft	116ft	136ft

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SPECIFICATION SHEET

lumenline™ 2

PENDANT
DIRECT/INDIRECT LIGHTING

HOW TO ORDER

LLI2P	DI	277	Select:	dRO 40K	iRO 40K	DMX 1FX	ACC50	WH
Housing	Light Direction	Voltage	Length	Direct Lighting Output & Color temperature	Indirect Lighting Output & Color temperature	Control	Mounting	Finish
1	2	3	4	5	6	7	8	9

See Fixture Schedule for different lengths.

1

Housing:

LLI2P - Lumenline™ Pendant 2" wide

2

Light Direction:

DI - Direct/Indirect lighting

3

Voltage:

120 - 120 volts
208 - 208 volts
220/240 - 220 to 240 volts
277 - 277 volts

4

Length:

1 - 12 1/2 inches (317mm)
2 - 24 1/4 inches (616mm)
3 - 36 1/16 inches (916mm)
4 - 47 7/8 inches (1216mm)
5 - 59 3/4 inches (1518mm)
6 - 71 9/16 inches (1818mm)
7 - 83 3/8 inches (2119mm)
8 - 95 1/4 inches (2419mm)
C__ - Continuous run, specify in 1' increments.

5

Direct Lighting Output & Color temperature:

dRO 27K - 2700K regular output 7W/ft
dRO 30K - 3000K regular output 7W/ft
dRO 35K - 3500K regular output 7W/ft
dRO 40K - 4000K regular output 7W/ft
dHO 27K - 2700K high output 14.25W/ft*
dHO 30K - 3000K high output 14.25W/ft*
dHO 35K - 3500K high output 14.25W/ft*
dHO 40K - 4000K high output 14.25W/ft*

***High output direct lighting cannot be combined with High output indirect lighting.**

dRGB - Additive red, green and blue direct lighting 6W/ft
N.B. **dRGB** option requires DMX control to be specified in section 7.

6

Indirect Lighting Output & Color temperature:

iRO 27K - 2700K regular output 7W/ft
iRO 30K - 3000K regular output 7W/ft
iRO 35K - 3500K regular output 7W/ft
iRO 40K - 4000K regular output 7W/ft
iHO 27K - 2700K high output 14.25W/ft*
iHO 30K - 3000K high output 14.25W/ft*
iHO 35K - 3500K high output 14.25W/ft*
iHO 40K - 4000K high output 14.25W/ft*

***High output indirect lighting cannot be combined with High output direct lighting.**

iRGB - Additive red, green and blue indirect lighting 6W/ft
N.B. **iRGB** option requires DMX control to be specified in section 7.

7

Control:

NO - On/Off control
LT - Lumentalk (available with white light only) (available for 2-8' lengths only) (1% minimum dimming value)
DIM - 0-10V Dimming option (10% minimum dimming value)
DMX 1FT - DMX Dimming option, resolution per foot (1% minimum dimming value)
DMX 1FX - DMX Dimming option, resolution per fixture (1% minimum dimming value)
DALI - DALI Dimming option (1% minimum dimming value)
ES - Lutron® EcoSystem® Enabled Dimming (available with white light only) (available for 2-8' lengths only) (1% minimum dimming value)

8

Mounting:

ACC50 - Aircraft Cable, 50" (field adjustable)
ACC100 - Aircraft Cable, 100" (field adjustable)

9

Finish:

WH - White
SI - Silver
CC - Custom (please specify RAL color)

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SPECIFICATION SHEET

lumenbeam™

GRANDE
WHITE & STATIC COLORS

Client: _____

Project name: _____

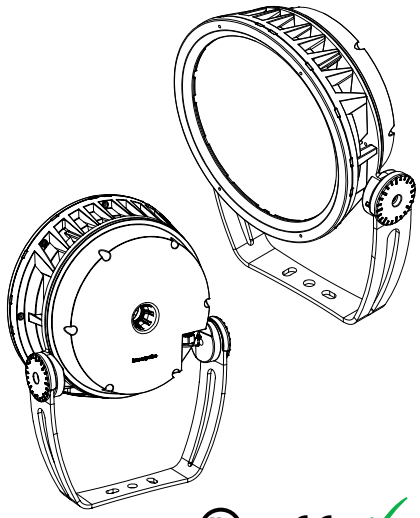
Order #: _____

Type: _____ Qty: _____

FEATURES AND BENEFITS

Physical :

- Low copper content high pressure die-cast aluminum housing
- Heavy aluminum formed yoke (standard yoke included)
- Stainless steel hardware
- Silicone sealing devices
- Clear tempered glass
- Dual chamber design for heat management and ease of maintenance
- Electro-statically applied polyester powder coat finish
- 10.90 kg / 24 lbs
- EPA: Front = 1.60 sq. ft. / 0.15 sq. m. Side = 0.97 sq. ft./ 0.090 sq. m.
- IP66
- Corrosion-resistant option for marine environments
- Meets 3G ANSI C136.31 Vibration standard for bridge applications



Performance :

- Minimum 1fc (10.7 lux) @ 571 feet (174m) distance (4000K, 6° optic)
- 5,178 delivered lumens and 326,433 candelas at nadir (4000K, 6° optic)
- 6°, 10°, 20°, 40° or 60°, Elliptical distribution on 10° to 20° optics
- Lumen maintenance 120,000 hrs [L70 @ 25°C]
- Resolution per board or per fixture (see page 6)
- Lumen measurements comply with LM - 79 - 08 standard
- Operating temperatures: -25° C to 50° C [-13F to 122F]

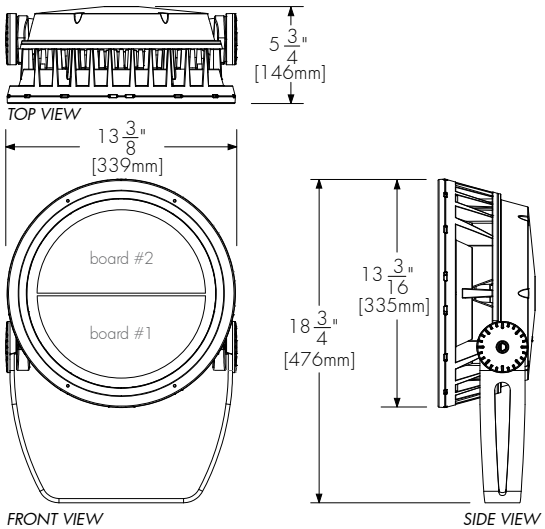
Electrical :

- Line voltage luminaire for 120 to 277V
- Power and data in 1 cable, 3ft/1 m cord (#16-5)
- 48 LEDs (24 LEDs per board)
- 100W
- Dimming options: 0-10 volt, DMX, DALI, Lumentalk, or Lutron® EcoSystem® enabled

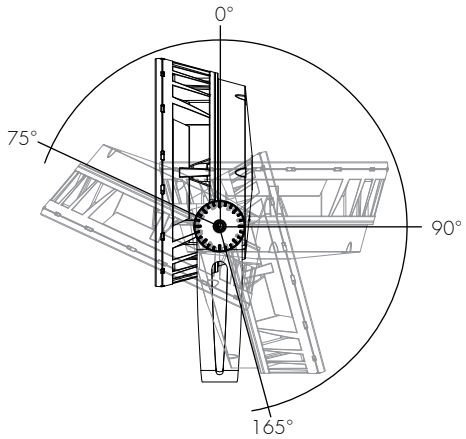
lumentalk™ EcoSystem® Enabled

Wiring detail

CE wire color	*US wire color*	*USE*
Yellow/Green	*Green*	*Ground*
Blue	*White*	*Neutral*
Brown	*Black*	*Live 120-277V*
Black	*Red*	*0-10V / data +*
Grey	*Orange*	*0-10V / data -*



Standard Yoke (as shown, included)



Standard Yoke Mounting
Adjustable pivot limits

5 year warranty

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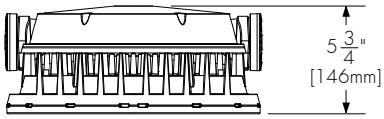
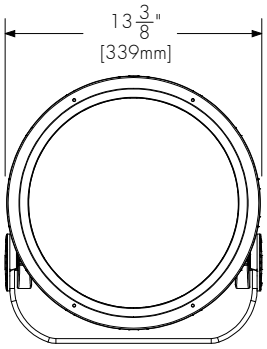
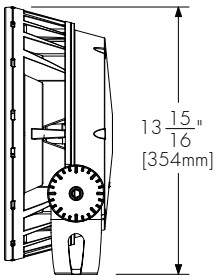
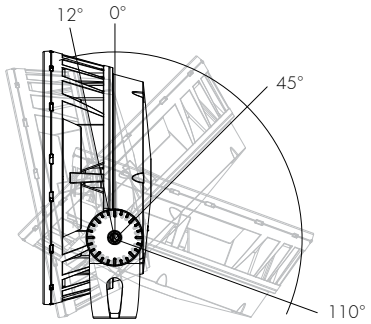
MOUNTING OPTION



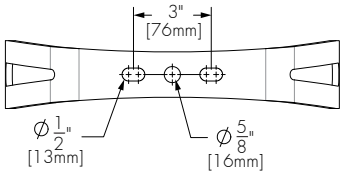




SY
Short Yoke mounting

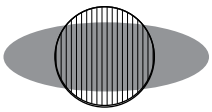


Short Yoke mounting
adjustable pivot limits



Standard and Short Yoke mounting
holes pattern

OPTICAL OPTIONS
***Factory installed**



LSLH
Linear Spread Lens
Horizontal distribution
(not adjustable on site)

LSLV
Linear Spread Lens
Vertical distribution
(not adjustable on site)

Factory installed, available for 6° to 20° optics.
See Optical Accessories for field adjustable spread lens.
*See photometric section for optical performance data with the spread lens.

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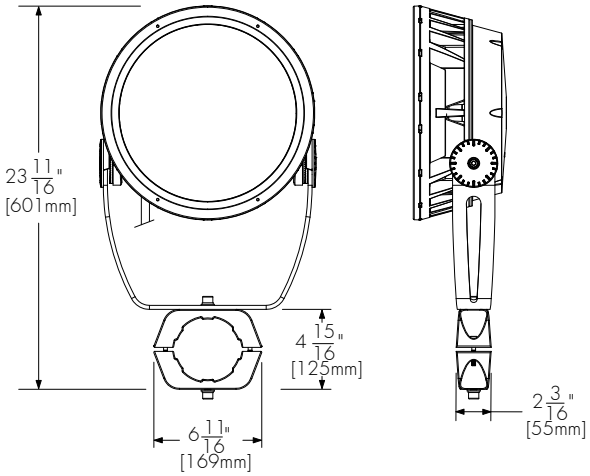
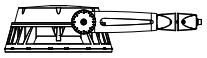
ACCESSORIES

Order separately

Mounting Accessories



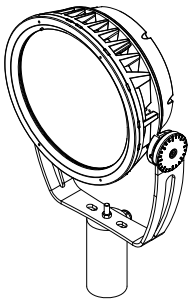
PM
Round Pole Mounting Accessory
*Consult factory for square pole section



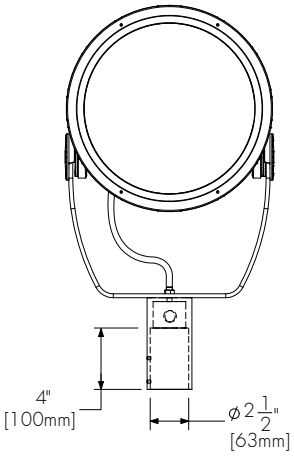
PM4-1, PM4.5-1, PM5-1
Round Pole Mounting accessory
single fixture

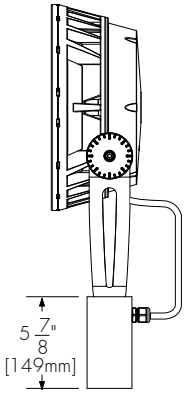
PM4-2, PM4.5-2, PM5-2
Round Pole Mounting accessory
twin fixtures

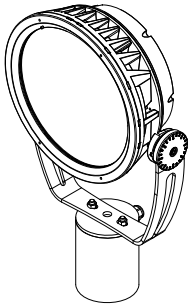
When **PM4-2, PM4.5-2 or PM5-2** are specified, one bracket assembly is supplied per 2 fixtures unless otherwise specified.



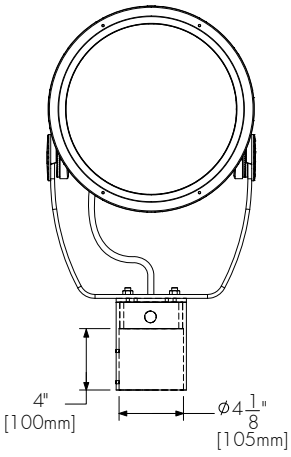
TN2
Tenon adapter
to fit on 2 3/8″ O.D. tenon

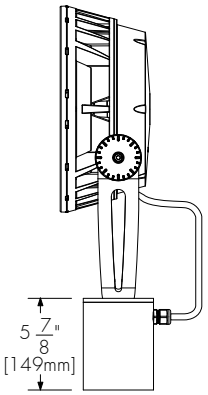






TN4
Tenon adapter
to fit on 4″ O.D. tenon





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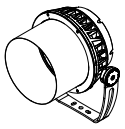
ACCESSORIES

Order separately

Optical Accessories:

LBG-SN-___-BK Snoot accessory. Please specify desired exterior finish :
*Interior surface painted black.
SI - Silver SandText
BKM - Matte black
WH - White
CC - Custom, please specify RAL color



LBG-SNW-___-BK Snoot Wide accessory. Please specify desired exterior finish :
*Interior surface painted black.
SI - Silver SandText
BKM - Matte black
WH - White
CC - Custom, please specify RAL color

LBG-VS-___-BK Visor accessory. Please specify desired exterior finish :
*Interior surface painted black.
SI - Silver SandText
BKM - Matte black
WH - White
CC - Custom, please specify RAL color

LBG-WG-___ Wire Guard accessory. Please specify desired exterior finish :
SI - Silver SandText
BKM - Matte black
WH - White
CC - Custom, please specify RAL color

LBG-LSLA-___ Linear Spread Lens Adjustable accessory. Please specify desired exterior finish :
SI - Silver SandText
BKM - Matte black
WH - White
CC - Custom, please specify RAL color

Accessory combinations:

+	Snoot	Snoot Wide	Visor	Wire Guard
Snoot	NO	NO	NO	YES
Visor	NO	NO	NO	YES
Linear Spread Lens Adjustable	YES	NO	YES	NO

Accessory combinations must be ordered together on a single line.
Ex: A Snoot + Wire Guard combination order code is **LBG-SN-WG-BK-BK.**

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ACCESSORIES

Order separately

Control Systems:

LTO Lumentouch is a wall mount DMX 512 controller keypad

LCU Lumencue is a USB / mini SD DMX 512 controller

LID LumenID is a diagnostic and addressing DMX 512 controller.
It must be specified on all DMX applications.
Refer to LID specification sheet for details.

LTN Lumentone is a simple pre-programmed DMX 512 controller
with a push button rotary dial and live feedback.

CBOX :

iCBOX-__V-__-__ Interior DMX 512 data box.
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures, M20 provision holes with plugs.
Please specify desired input voltage and finish.
Refer to iCBOX specification sheet for details.

CBOX-__V-__-__ DMX 512 data box.
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures, M20 provision holes with plugs.
Please specify desired input voltage and finish.
Refer to CBOX specification sheet for details.

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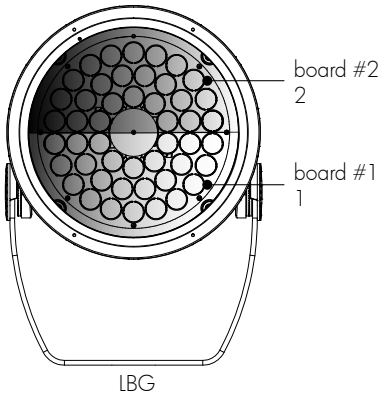
RESOLUTION DETAILS
APPLICABLE FOR DMX DIMMING OPTION ONLY

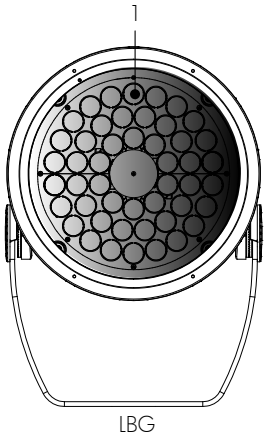
DMX 1BD - Resolution per board: each board is addressed independently (recommended for most installations).

DMX ADDRESSES:



DMX 1FX - Resolution per fixture: each fixture is addressed independently

DMX ADDRESSES:



*Warning: resolution is a factory setting and cannot be changed in the field.

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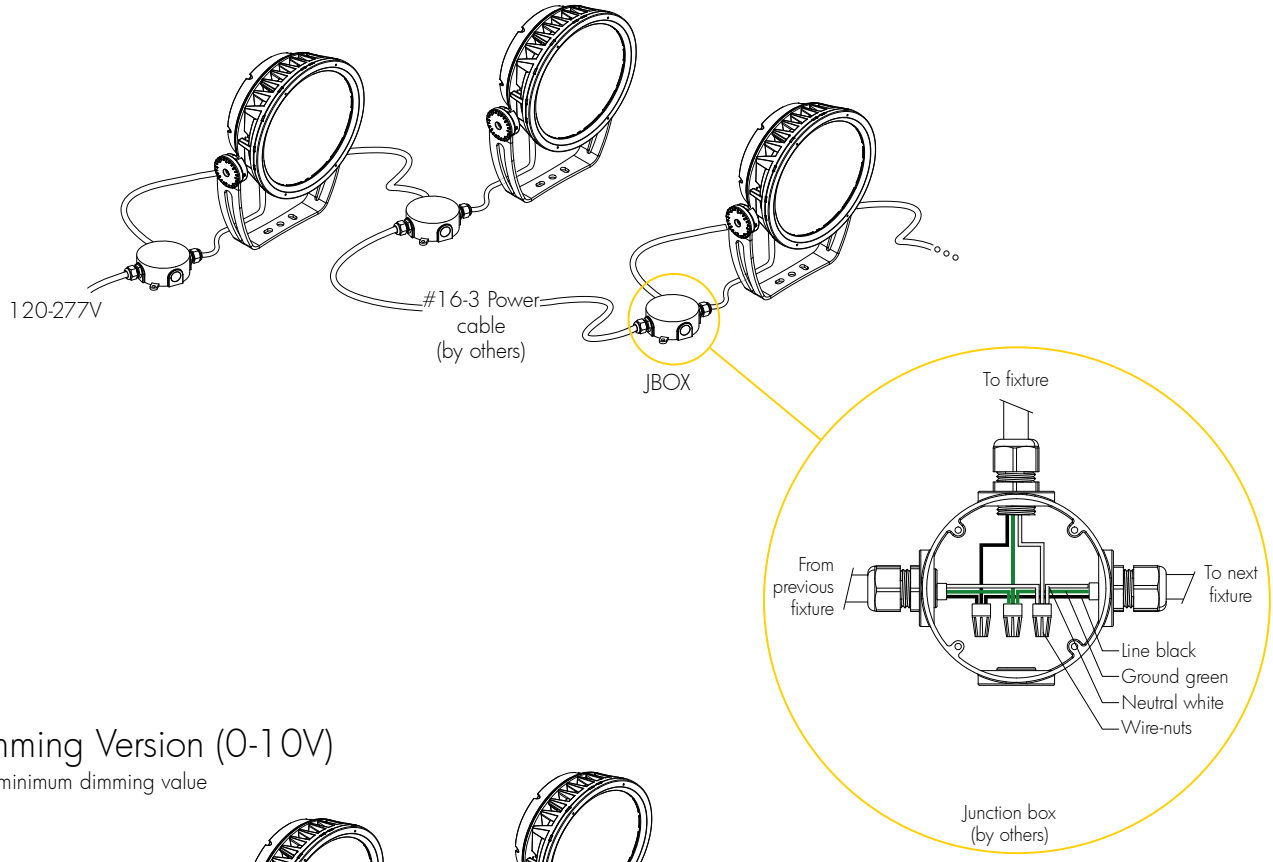
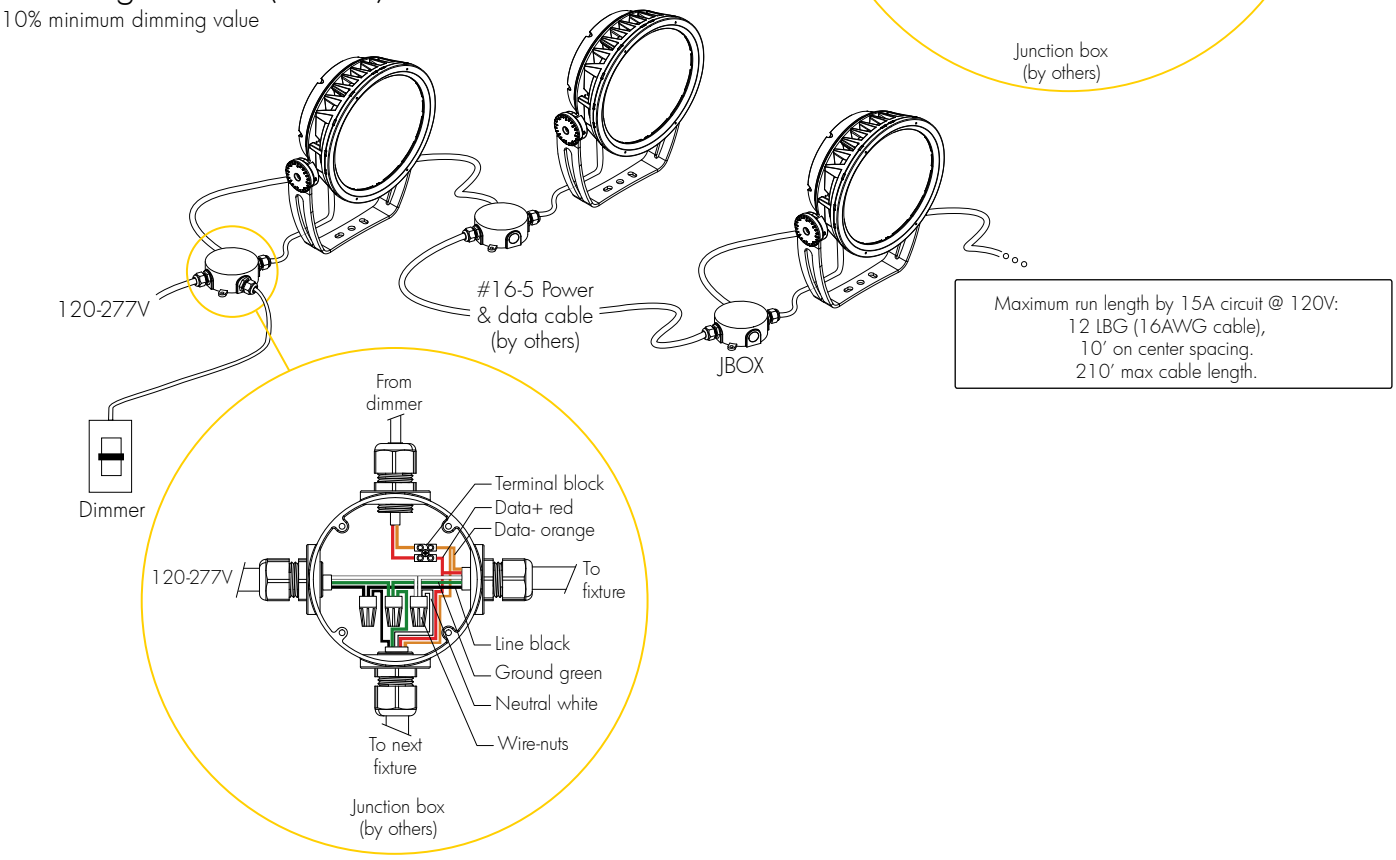
TYPICAL WIRING DIAGRAMS

Non-Dimming or Lumentalk Dimming Version



Dimming Version (0-10V)

10% minimum dimming value



Maximum run length by 15A circuit @ 120V:
12 LBG (16AWG cable),
10' on center spacing.
210' max cable length.

Lumenpulse, 1751 Richardson, Suite 1505, Montreal (Quebec) Canada H3K 1G6 1.877.937.3003 P. 514.937.3003 F. 514.937.6289
info@lumenpulse.com **www.lumenpulse.com**

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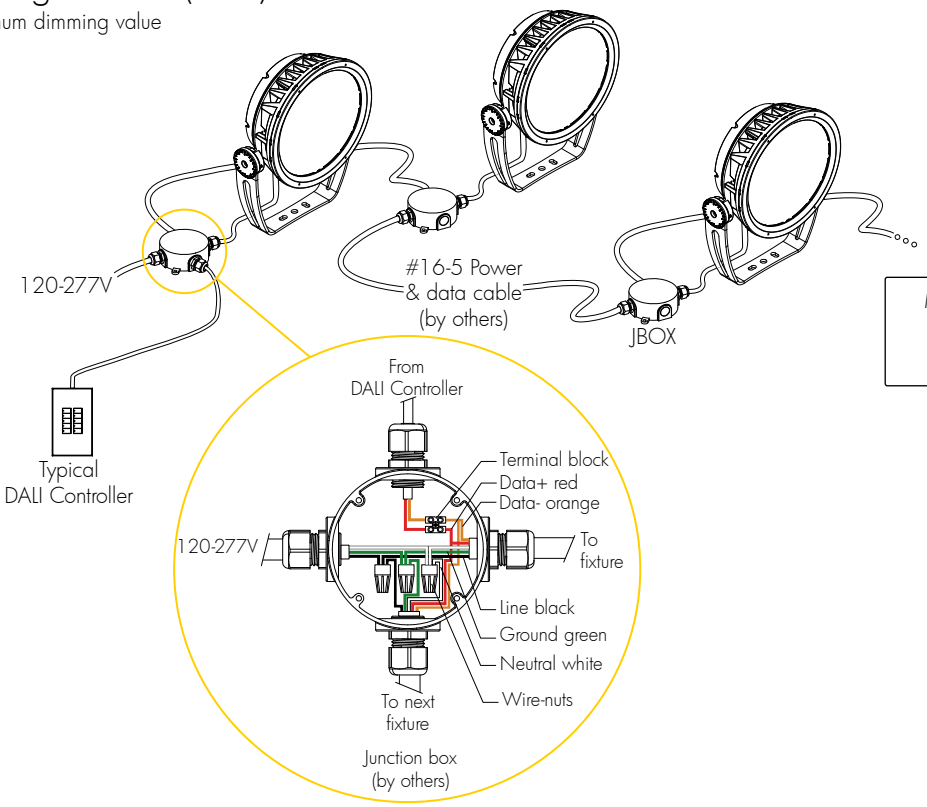
TYPICAL WIRING DIAGRAMS - continued

Dimming Version (DALI)

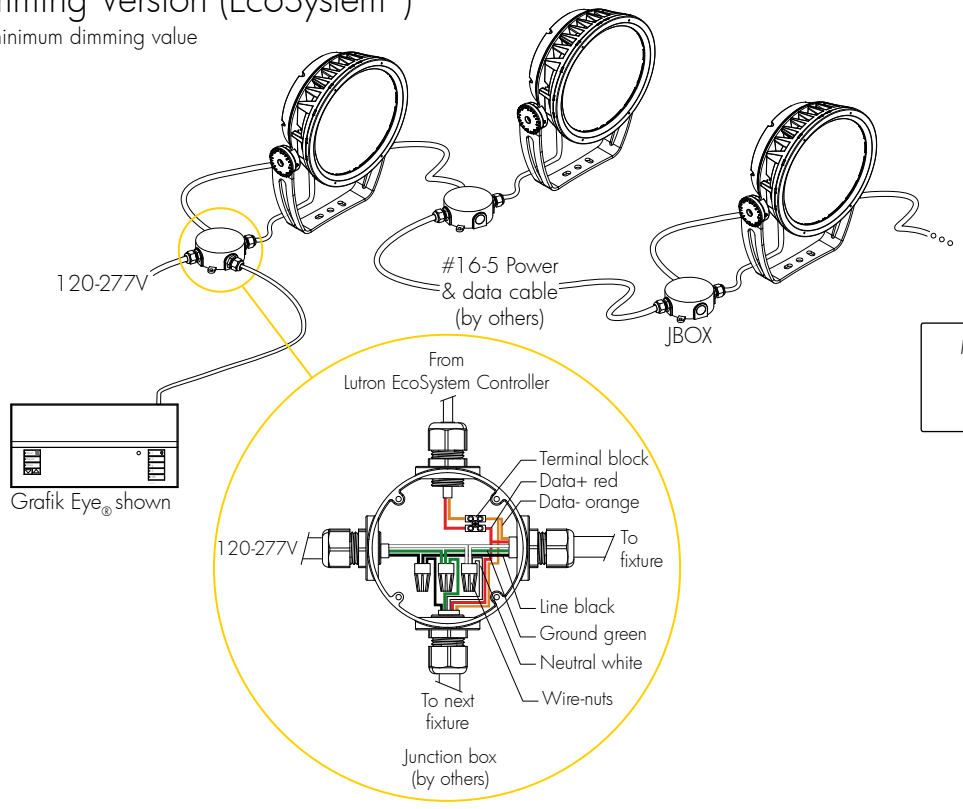
1% minimum dimming value



Maximum run length by 15A circuit @ 120V:
12 LBG (16AWG cable),
10' on center spacing.
210' max cable length.

Dimming Version (EcoSystem®)

1% minimum dimming value



Maximum run length by 15A circuit @ 120V:
12 LBG (16AWG cable),
10' on center spacing.
210' max cable length.

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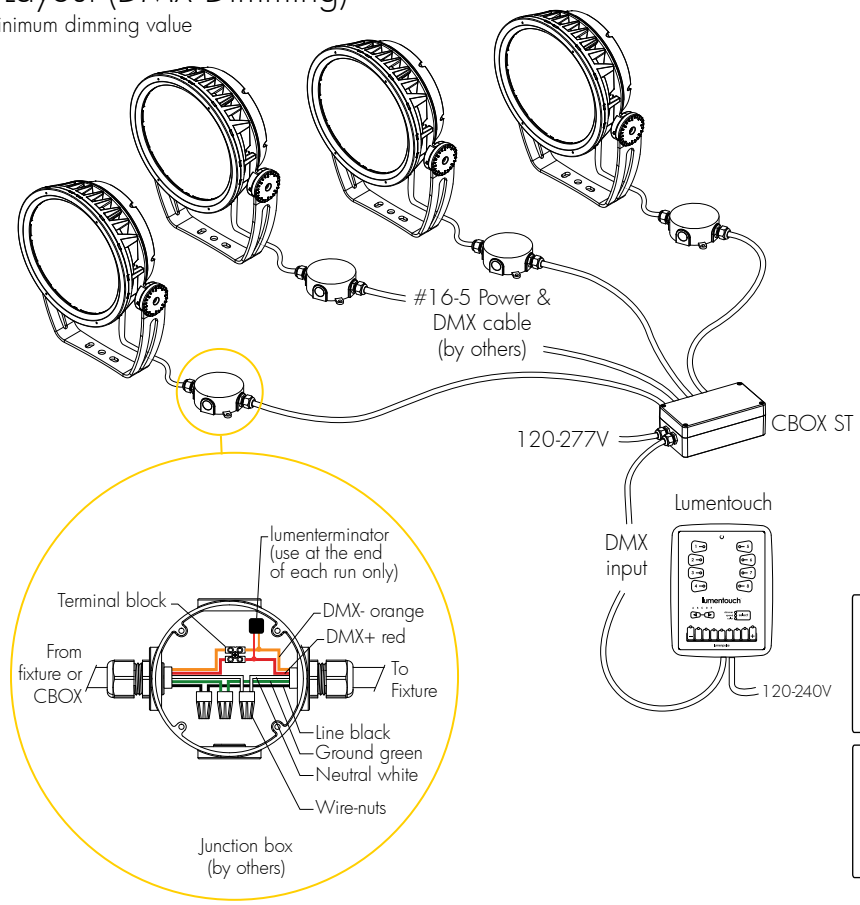
TYPICAL WIRING DIAGRAMS - continued

Star Layout (DMX Dimming)

1% minimum dimming value



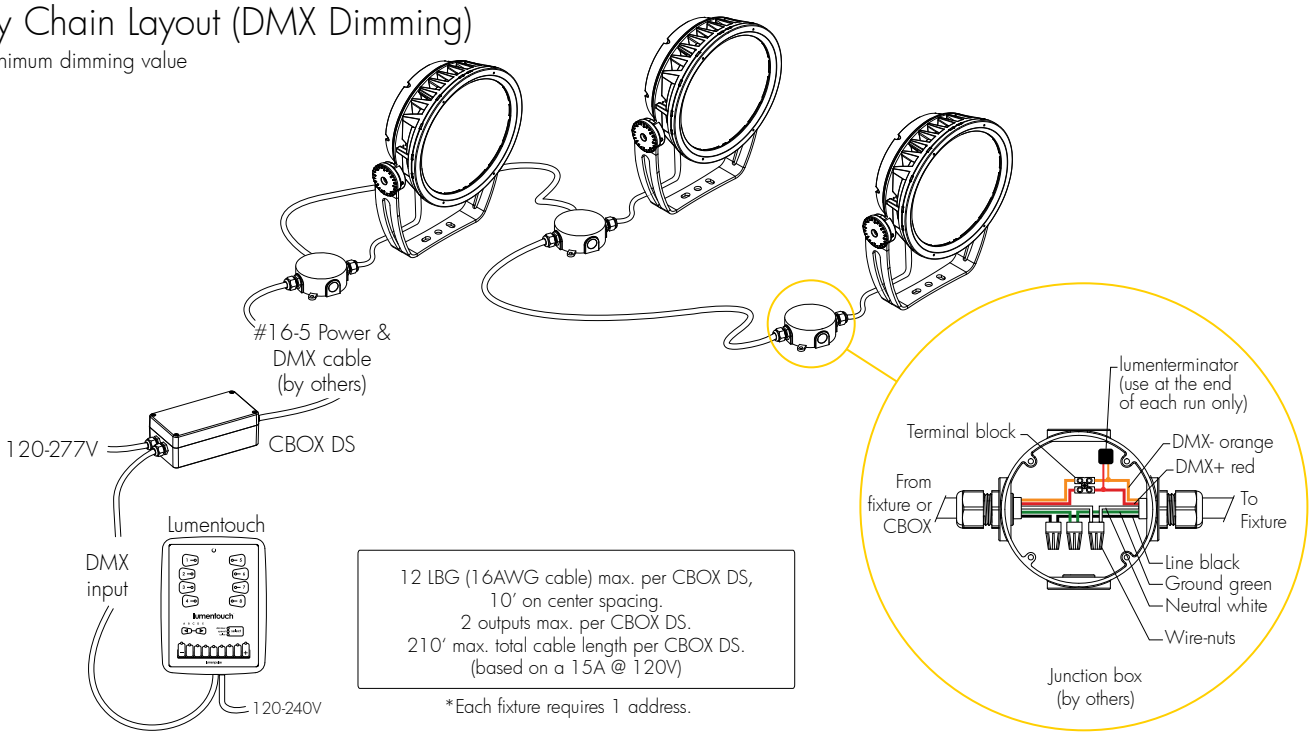
12 LBG (16AWG cable) max. per CBOX ST,
10' on center spacing.
6 outputs max. per CBOX ST.
210' max. total cable length per CBOX ST
(based on a 15A circuit @ 120V)

DMX terminator is required at the end
of each run to maintain data integrity.
(2x) DMX lumenterminator included per CBOX DS
(6x) DMX lumenterminator included per CBOX ST
See installation instructions for details.

*Each fixture requires 1 address.

Daisy Chain Layout (DMX Dimming)

1% minimum dimming value



12 LBG (16AWG cable) max. per CBOX DS,
10' on center spacing.
2 outputs max. per CBOX DS.
210' max. total cable length per CBOX DS.
(based on a 15A @ 120V)

*Each fixture requires 1 address.

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SPECIFICATION SHEET

lumenbeam™

GRANDE
WHITE & STATIC COLORS

HOW TO ORDER

LBG	277	40K	WFL/WFL	Select:	WH	DMX 1FX	Select:
Housing	Voltage	Colors and color temperatures	Board 1 / Board 2 Optic	Optical Option	Finish	Dimming	Option
1	2	3	4	5	6	7	8

1

Housing:

LBG - Lumenbeam™ Grande

2

Voltage:

120 - 120 volts
208 - 208 volts
220/240 - 220 to 240 volts
277 - 277 volts

3

Colors and Color temperatures:

27K - 2700K
30K - 3000K
35K - 3500K
40K - 4000K
57K - 5700K
RD - Red
GR - Green
BL - Blue

4

Optic (Please specify for each board):

VN - Very Narrow 6°

NS - Narrow Spot 10°

NF - Narrow Flood 20°

FL - Flood 40°
(cannot be combined with other optics)

WFL - Wide Flood 60°
(cannot be combined with other optics)

5

Optical Option:

LSLH - Linear Spread Lens Horizontal distribution
LSLV - Linear Spread Lens Vertical distribution

*Factory installed, available for 6° to 20° optics.
See Optical Accessories for field adjustable spread lens.

6

Finish:

SI - Silver SandText
BK - Black SandText
WH - White
CC - Custom (please specify RAL color)

7

Dimming:

NO - No Dimming
LT - Lumentalk (1% minimum dimming value)
DIM - 0-10V Dimming option
(10% minimum dimming value)
DMX 1BD - DMX Dimming option, resolution per board (2 addresses per fixture)
(1% minimum dimming value)
DMX 1FX - DMX Dimming option, resolution per fixture (1 address per fixture)
(1% minimum dimming value)
DALI - DALI Dimming option
(1% minimum dimming value)
ES - Lutron® EcoSystem® Enabled Dimming
(1% minimum dimming value)

8

Option:

SY - Short Yoke
SY-3GV - Reinforced Short Yoke to meet 3G ANSI C136.31 Vibration Rating standard
CRC - Corrosion-resistant Coating

Lumenpulse, 1751 Richardson, Suite 1505, Montreal (Quebec) Canada H3K 1G6 1.877.937.3003 P. 514.937.3003 F. 514.937.6289
info@lumenpulse.com **www.lumenpulse.com**

2013.11.28
EM - R4

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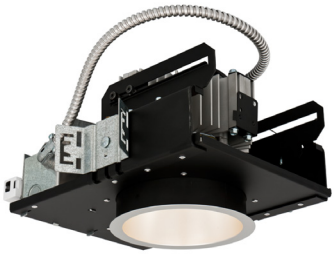
gotham®

Luminaire Type:
Catalog Number (autopopulated): WH



Gotham Architectural Downlighting
LED Downlights

6" Incito®
Open Downlight

Solid-State Lighting
(US and International Patents Pending)

FEATURES

OPTICAL SYSTEM
- Ten preset distribution patterns allow designers to achieve various objectives.
- Self-flanged semi-specular, matte-diffuse or specular lower reflector utilized in combination with a highly transmissive lens.
- Patented Bounding Ray™ Optical Principle design (U.S. Patent No. 5,800,050) provides source image for a smooth transition from top of the reflector to bottom.

MECHANICAL SYSTEM
- Light engine and driver are accessible from above or below ceiling.
- 16-gauge black painted steel mounting frame with C-channel mounting bars included. Post-installation adjustment possible from above or below ceiling.
- Galvanized steel junction box with hinged access covers and spring latch. Three combination 1/2"-3/4" and one 1/2" knockout for straight-through conduit runs. Capacity: 8 (4in, 4out) No. 12 AWG conductors rated for 90°C.
- Accommodates up to 1½"-thick ceilings.

ELECTRICAL SYSTEM
- Solid-state LED light engine available in 2700 K, 3000 K, 3500 K or 4000 K color temperatures. CRI: 85 typical.
- 0-10V driver standard with <1% dimming level.
- DALI driver available with <1% dimming level.
- DMX with RDM (remote device management) available with <1% dimming level.
- Rated system life of 50,000 hours at 70% output.
- Emergency battery pack with remote test switch available.

LISTINGS
- Fixtures are CSA certified to meet US and Canadian standards; wet location, covered ceiling.

WARRANTY
- 5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

ORDERING INFORMATION

EXAMPLE: ICO 30/50 6AR 20 120

				WH		
Series	Color temperature	Nominal lumen values	Aperture/Trim color	Finish	Beam	Voltage
ICO	**27/** 2700 K **30/** 3000 K **35/** 3500 K **40/** 4000 K	**20** 2000 lumens **25** 2500 lumens **30** 3000 lumens **35** 3500 lumens **40** 4000 lumens **45** 4500 lumens **50** 5000 lumens **55** 5500 lumens **60** 6000 lumens **65**[1] 6500 lumens	**6AR** Clear **6PR** Pewter **6WTR** Wheat **6GR** Gold **6WR**[2] White **6BR**[2] Black	(blank) Semi-specular **LD** Matte diffuse	**20** 20° beam angle **25** 25° beam angle **30** 30° beam angle **35** 35° beam angle **40** 40° beam angle **45** 45° beam angle **55** 55° beam angle **60** 60° beam angle **65** 65° beam angle **70** 70° beam angle	**120** **277** **347**[3]

Driver	
(blank)	0-10V dimming driver. Minimum dimming level <1%
DALIR	DALI dimming driver. Minimum dimming level <1%
DMXR	DMX with RDM (remote device management). Minimum dimming level <1%. Includes termination plug

Options			
SF	Single fuse	**BHSG**	Blacked-out housing
TRW[4]	White painted flange	**NEPP**[7]	Interface for Sensor Switch® nLight® network provided with integral power supply. Refer to TN-623-01. Not for use with emergency options.
TRBL[5]	Black painted flange	**NSD**[7]	Sensor Switch® nLight® one 5A relay with one 0-10 VDC dimming output; requires bus power, such as nPP16 power pack. Refer to nSP5-D. Not for use with emergency options.
ELR[6]	Emergency battery pack with remote test switch	**RRL__**	RELOC®-ready luminaire connectors enable a simple and consistent factory installed option across all ABL luminaire brands. Refer to RRL for complete nomenclature.
CP	Chicago plenum		
HAO	High ambient capability up to 40°C. Fixture height is 10-3/8".		

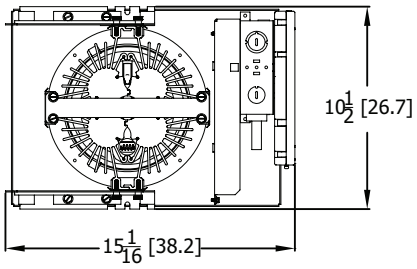
ACCESSORIES order as separate catalog numbers (shipped separately)	
SCA	Sloped ceiling adapter. Degree of slope must be specified (10D, 15D, 20D, 25D, 30D). Ex: SCA6D 10D. Refer to TECH-190.
NSP5 D ER KIT	Sensor Switch nLight secondary relay and dimming pack device used to switch and dim luminaires powered via an emergency circuit. Refer to NSP5 D ER KIT.

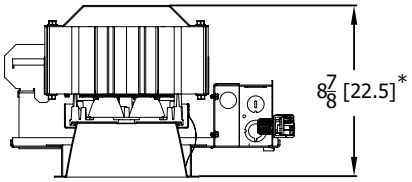
GOTHAM ARCHITECTURAL DOWNLIGHTING | 1400 Lester Road Conyers GA 30012 | P 800.315.4982 | gothamlighting.com

gotham®

DIMENSIONAL DATA

All dimensions are inches (centimeters) unless otherwise noted.





* HIGH AMBIENT FIXTURE HEIGHT - 10-5/8"

Aperture: 6-1/4 [15.8]
Ceiling Opening: 6-15/16 [17.6]
Overlap Trim: 7-1/2 [19.1]

ELECTRICAL

WATTAGE CONSUMPTION MATRIX										
	BEAM ANGLES									
LUMENS	20	25	30	35	40	45	55	60	65	70
6500	101W	101W	101W	101W	101W	101W	101W	101W	101W	101W
6000	95W	95W	95W	95W	95W	95W	95W	95W	95W	95W
5500	83W	83W	83W	83W	83W	83W	83W	83W	83W	83W
5000	75W	75W	75W	75W	75W	75W	75W	75W	75W	75W
4500	65W	65W	65W	65W	65W	64W	64W	64W	64W	64W
4000	57W	57W	57W	57W	57W	57W	57W	57W	57W	57W
3500	50W	50W	50W	50W	50W	50W	50W	50W	50W	50W
3000	42W	42W	42W	42W	42W	42W	42W	42W	42W	42W
2500	35W	35W	35W	35W	35W	35W	35W	35W	35W	35W
2000	28W	28W	28W	28W	28W	35W	35W	35W	35W	35W

NOTES

ORDERING NOTES

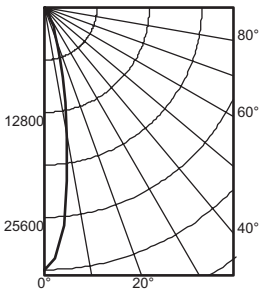
1. Only available in 20° through 40° beam angles.
2. Not available with finishes.
3. Add 2" to overall height.
4. Not available with white reflector.
5. Not available with black reflector.
6. For dimensional changes, refer to TECH-140. Not available with CP option.
7. For Emergency applications order non-nLight enabled fixture and NSP5 D ER KIT as an accessory. Refer to NSP5 D ER KIT.

PHOTOMETRY

Distribution Curve	Distribution Data	Output Data	Coefficient of Utilization	Illuminance: Single Luminaire 30" Above Floor

ICO 35/60 6AR 20 120

INPUT WATTS: 95.0, DELIVERED LUMENS: 6367.8, LM/W=67.0, 0.3 S/MH, TEST NO. LTL22079



	Ave	Lumens
0	32110	
5	26741	2177
15	8860	2511
25	2522	1212
35	537	370
45	82	72
55	21	19
65	4	4
75	0	2
85	1	1
90	0	

Zone	Lumens	% Lamp
0° - 30°	5899.8	92.6
0° - 40°	6269.6	98.5
0° - 60°	6360.7	99.9
0° - 90°	6367.8	100.0
90° - 180°	0.0	0.0
0° - 180°	6367.8	*100.0

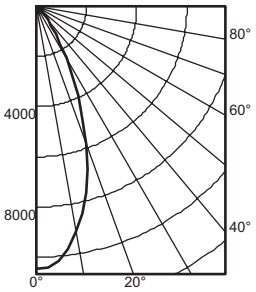
*Efficiency

pf / pc / pw	80% 50%	80% 30%	80% 10%	70% 50%	70% 30%	70% 10%	50% 50%	50% 30%	50% 10%
0	119	119	119	116	116	116	111	111	111
1	113	111	109	111	109	107	107	105	104
2	107	104	102	106	103	100	102	100	98
3	102	99	96	101	98	95	99	96	93
4	98	94	91	97	93	90	95	92	89
5	94	90	87	93	89	87	92	88	86
6	91	87	83	90	86	83	89	85	83
7	88	83	80	87	83	80	86	82	80
8	85	81	78	84	80	77	83	80	77
9	82	78	75	82	78	75	81	77	75
10	80	76	73	79	75	73	79	75	73

Mounting Height	Inital FC Center Beam	50% beam - 19.4° Diameter	50% beam - 19.4° FC	10% beam - 43.3° Diameter	10% beam - 43.3° FC
8.0	1061.5	1.9	530.6	4.4	106.2
10.0	570.8	2.6	285.3	6.0	57.1
12.0	355.8	3.2	177.8	7.5	35.6
14.0	242.8	3.9	121.4	9.1	24.3
16.0	176.2	4.6	88.1	10.7	17.6

ICO 35/60 6AR 40 120

INPUT WATTS: 96.0, DELIVERED LUMENS: 6071.4, LM/W=63.2, 0.7 S/MH, TEST NO. LTL22193



	Ave	Lumens
0	10482	
5	10161	936
15	7679	2102
25	3921	1795
35	1331	865
45	371	303
55	54	61
65	5	7
75	2	2
85	1	1
90	0	

Zone	Lumens	% Lamp
0° - 30°	4832.2	79.6
0° - 40°	5697.6	93.8
0° - 60°	6062.1	99.8
0° - 90°	6071.4	100.0
90° - 180°	0.0	0.0
0° - 180°	6071.4	*100.0

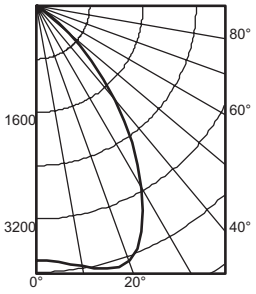
*Efficiency

pf / pc / pw	80% 50%	80% 30%	80% 10%	70% 50%	70% 30%	70% 10%	50% 50%	50% 30%	50% 10%
0	119	119	119	116	116	116	111	111	111
1	111	109	107	109	107	105	105	104	102
2	104	101	97	103	99	96	99	97	94
3	98	93	90	97	92	89	94	91	88
4	92	87	83	91	86	83	89	85	82
5	87	82	78	86	81	77	84	80	77
6	82	77	73	82	77	73	80	76	72
7	78	73	69	78	72	69	76	72	68
8	74	69	65	74	69	65	73	68	65
9	71	65	62	70	65	62	69	65	61
10	67	62	59	67	62	58	66	62	58

Mounting Height	Inital FC Center Beam	50% beam - 38.0° Diameter	50% beam - 38.0° FC	10% beam - 65.3° Diameter	10% beam - 65.3° FC
8.0	346.5	3.8	173.3	7.1	34.7
10.0	186.3	5.2	93.2	9.6	18.6
12.0	116.1	6.5	58.1	12.2	11.6
14.0	79.3	7.9	39.6	14.7	7.9
16.0	57.5	9.3	28.8	17.3	5.8

ICO 35/60 6AR 70 120

INPUT WATTS: 101.0, DELIVERED LUMENS: 5948.3 LM/W=58.9, 1.2 S/MH, TEST NO. LTL22088



	Ave	Lumens
0	3817	
5	3864	372
15	4088	1153
25	3738	1695
35	2493	1553
45	1173	915
55	235	239
65	12	15
75	4	4
85	1	1
90	1	

Zone	Lumens	% Lamp
0° - 30°	3220.1	54.1
0° - 40°	4773.3	80.2
0° - 60°	5927.6	99.7
0° - 90°	5948.3	100.0
90° - 180°	0.0	0.0
0° - 180°	5948.3	*100.0

*Efficiency

pf / pc / pw	80% 50%	80% 30%	80% 10%	70% 50%	70% 30%	70% 10%	50% 50%	50% 30%	50% 10%
0	119	119	119	116	116	116	111	111	111
1	110	107	104	108	105	103	103	101	100
2	101	96	92	99	95	91	96	92	89
3	93	87	82	91	86	82	88	84	80
4	85	79	74	84	78	74	82	77	73
5	79	72	67	78	71	67	76	70	66
6	73	66	61	72	65	61	70	65	60
7	67	61	56	67	60	56	65	59	55
8	63	56	51	62	56	51	61	55	51
9	58	52	47	58	51	47	57	51	47
10	54	48	44	54	48	44	53	47	43

Mounting Height	Inital FC Center Beam	50% beam - 62.0° Diameter	50% beam - 62.0° FC	10% beam - 91.1° Diameter	10% beam - 91.1° FC
8.0	126.2	6.6	63.1	11.2	12.6
10.0	67.9	9.0	33.9	15.3	6.8
12.0	42.3	11.4	21.1	19.4	4.2
14.0	28.9	13.8	14.4	23.4	2.9
16.0	20.9	16.2	10.5	27.5	2.1

PHOTOMETRY NOTES

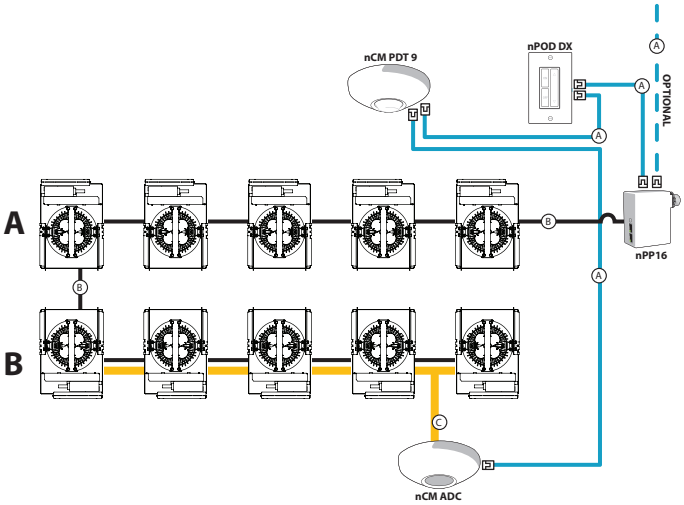
- Tested in accordance with IESNA LM-79-08.
- Tested to current IES and NEMA standards under stabilized laboratory conditions.
- Actual performance may differ as a result of end-user environment and application.
- Actual wattage may differ by +/- 10% when operating between 120-277V +/- 10%.
- CRI: 83 typical.
- Consult factory or IES file for microgroove baffle, black cone or other photometric reports.

Choose Wall Controls.
nLIGHT offers multiple styles of wall controls – each with varying features and user experience.

Push-Button WallPod
Traditional tactile buttons and LED user feedback

Touch WallPod
Contemporary capacitive touch style buttons with audible clicker for user feedback

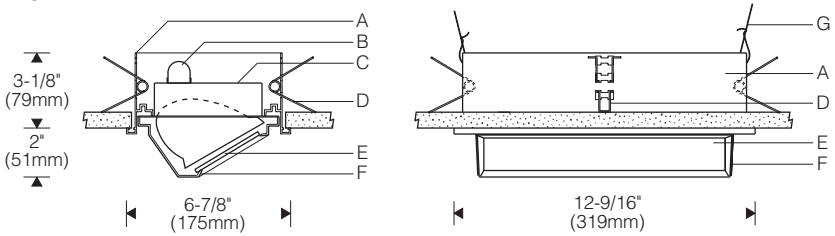
Graphic WallPod
Full color touch screen provides a sophisticated look and feel



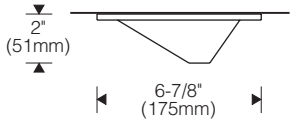
EXAMPLE
Single Level Control with One Daylight Harvesting Zone
Devices Installed:
nPP16 Power Pack
nPOD DX On/Off/Dim Touch WallPod®
nCM PDT 9 Ceiling Mount Dual Tech Occupancy Sensor
nCM ADC Daylight Sensor with Automatic Dimming Control

Description: This design makes use of available daylight in the space by incorporating a standalone photocell device to automatically dim the lights in row B. Both rows of lights are turned on and off together by a single relay (in the power pack) and occupancy sensor. An On/Off/Dim Touch WallPod enables users to raise and lower row B as required.

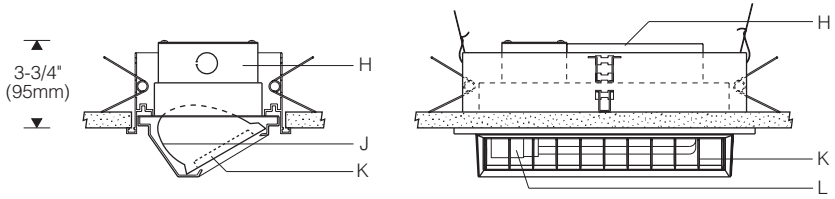
Style 201 1:8 Scale (Tungsten halogen, metal halide remote)



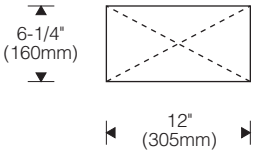
Profile (below ceiling)

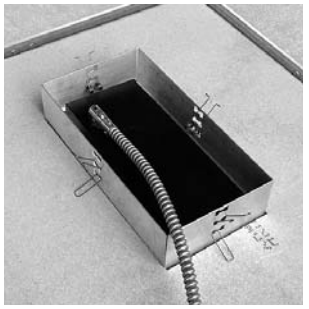


Style 205 1:8 Scale (Quad tube fluorescent, metal halide integral)*



Ceiling Cutout





* Diagram shows Style 205 for quad tube fluorescent. Snap-in baffle provided for quad tube only. Style 205 for metal halide is provided with lens as shown in upper Style 201 diagram.

Specifications

- **A** Extruded aluminum mounting/trim frame
- **B** Conduit connector (Style 201)
- **C** Aluminum back box
- **D** Spring clips (4 incl.)
- **E** Micro-prismatic tempered glass lens (tungsten halogen and metal halide units)
- **F** Die-cast aluminum hood
- **G** Supplemental wire supports (by others)
- **H** Integral ballast with splice compartment (Style 205)
- **J** Specular extruded aluminum reflector
- **K** Snap-in polycarbonate cross baffle (matte gray), 15° shielding (quad tube only)
- **L** Twist and lock lampholder (quad tube)

Finish:
Semi-gloss white hood and ceiling trim. Black back box.

Painted surfaces – 6 stage pretreatment and electrostatically applied thermoset powder coat.

Reflector – extruded high purity aluminum with clear anodized specular finish. All luminaire hardware – stainless steel.

Mounting:
Mounting/trim frame installs from below finished ceiling. Retrofits into existing non-accessible ceilings.

Spring clips provided for rigid ceilings (drywall, plaster) up to 1-3/4" (44mm) thick.

Supplemental support wires, bar hangers, etc. (by others) required for accessible ceilings. Where wire suspension is prohibited, order accessory universal mounting brackets for use with 1/2" EMT, 1-1/2" lathing or C channel (by others).

Standard:
UL listed or CSA certified for damp locations (TH and MH units with lens recommended for damp locations).

Minimum spacings for 200W/250W Style 201, all Style 205:
2' (0.6m) on center, 1' (0.3m) fixture center to side wall, 3" (76mm) to overhead building member.

Electrical:
Use 90°C wire for supply connections.

Style 201 (halogen, metal halide remote) – 5' (1.5m) wire leads in flexible conduit exit back box for connection to accessible junction box (by others), or to remote ballast (installation prior to finished ceiling recommended).

Style 205 (quad tube, 35W/70W metal halide integral) – splice compartment with two 7/8" diameter conduit entries.

Tungsten halogen – DC bayonet or RSC lampholders in patented clamping supports for maximum heat dissipation.

Fluorescent – integral HPF thermally protected electronic ballast with end-of-life protection. Optional dimming ballast; compatible dimmer switch required. Consult representative for compatibility. Twist & lock lampholder for easy relamping.

Metal halide – Style 201 remote: encapsulated high reactance autotransformer ballast (35W and 70W) or electronic ballast. Style 205 integral (35W, 70W only): electronic ballast provides improved voltage regulation, energy savings and automatic shut-off feature to eliminate end-of-life lamp cycling.

For complete ballast specifications, see Accessories Section.

REV. 8/08

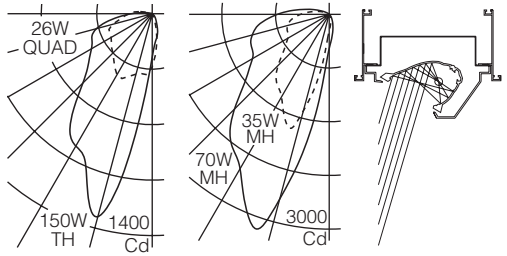
Features

- *Low profile – minimal silhouette focuses attention on the luminous wall, not the luminaire*
- *Evenly lights entire wall – reflector aperture is shielded*
- *Shallow recessed depth – fits under ducts at core walls*
- *Durable construction – extruded reflector and trim frame; die-cast hood, aluminum back box*

W 24.0

Performance

Two parabolic reflector sections drive light to the bottom of the wall. An elliptical section shields the lamp from normal viewing angles and redirects its light to a parabola. Glare is minimized and asymmetry of the beam is maximized resulting in high beam efficiency and superior surface uniformity.



For complete photometrics, see www.elliptipar.com.

elliptipar

To form a Catalog Number

M	205	-	150G	-	T	-	02	-	2	-	00	0
1	2		3		4		5		6		7	8

Project: _____ Type: _____

1 Source

F = Quad tube compact fluorescent
M = Metal halide
T = Tungsten halogen

2 Style

201 = Small semi-recessed with hood, **remote** ballast
Note: Available for tungsten halogen (no ballast) and metal halide only.
205 = Small semi-recessed with hood, **integral** ballast
Note: Available for quad tube compact fluorescent and 35W & 70W metal halide electronic only.

3 Lamp

Lamp Code	*Wattage*	*Lamp Number*	*Voltages*	*Remote Distance*
Quad Tube Fluorescent				
P126	26 (4-pin)	CFQ26W/G24q	**1, 2**	Integral
			T, V	
Ceramic Arc Tube Pulse Start Metal Halide (80+ CRI)*				
035G	35	CDM35/T6/830	**1, 2**	15' (4.5m)
			A, B	10' (3m)
070G	70	CDM70/T6/830	**1, 2**	15' (4.5m)
			A, B	20' (6m)
150G	150	CDM150/T6/830	**1, 2**	15' (4.5m)
Tungsten Halogen				
0100	100	Q100DC	**A**	
0150	150	Q150DC	**A**	
0200	200	Q200T3	**A**	
0250	250	Q250DC	**A**	

For complete lamp and ballast information, see Accessories Section.
* Standard lamp color is 3000K / 80+ CRI.

W 24.1

4 Mounting

T = Overlapping trim

5 Finish

02 = Semi-gloss white

6 Voltage/Ballast

Compact Fluorescent & Metal Halide Electronic (Style 205)*
1 = 120V
2 = 277

Compact Fluorescent Dimming (Style 205) **
T = 120V
V = 277V

Tungsten Halogen (Style 201)
A = 120V

Metal Halide (Style 201)
A = 120V magnetic
B = 277V magnetic
1 = 120V electronic
2 = 277V electronic

* Electronic ballast for 35 and 70W available in Style M205 integral only; for 150W in Style M201 remote only.
Dimming varies with ballast manufacturer and control type – see **www.elliptipar.com for specifications and limitations.

7 Option (See Accessories Section for specifications)

00 = No options
0C = Style 201 modified to comply with Chicago plenum code. **Not available for Style M205** integral CMH.
0E = Style 205 **remote** emergency battery pack for quad tube fluorescent. Max. distance from battery pack to fixture is 5' (1.5m). For use with non-dim ballasts only.
0H = Style 201 long distance remote metal halide ballast (encapsulated magnetic ballast for 35 and 70W only),
35W: 15' min. up to 50' max. (4.5m - 15m),
70W: up to 50' max. (15m)
0Y = Style 201 modified to comply with New York City code (Style 205 integral complies as is without modification).
XX = For modification not listed, include detailed description. Consult factory prior to specification.

8 Standard

0 = UL, Underwriters Laboratories
J = CSA, Canadian Standards Association

Example

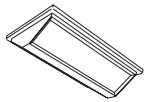
M205 - 035G - T - 02 - 1 - 000

Small semi-recessed with hood for use with 35W metal halide lamp. Overlapping ceiling trim. Semi-gloss white. Integral 120V electronic ballast. UL.

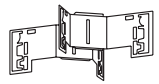
Accessories

Order separately. See Accessories Section for specifications.

AUV00030 = **Ultraviolet** (UV) filter glass lens (tungsten halogen and metal halide units only)

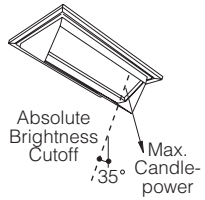


ASRBKT00 = Universal **mounting brackets** (set of two), accepts 1/2" EMT, 1-1/2" lathing, C channel or bar hangers (by others)



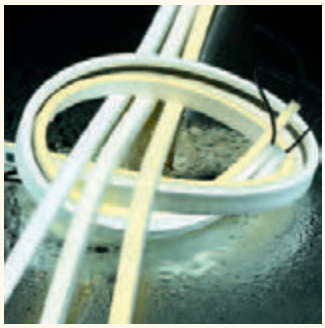
AFK000X ☐ = Ballast **fuse** kit
0 = UL
J = CSA

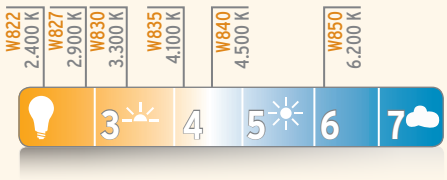
ASV02000 = Extended **hood visor**



elliptipar
114 Boston Post Road, West Haven, Connecticut 06516, USA
Voice 203.931.4455 • Fax 203.931.4464 • **www.elliptipar.com**

VarioLED™ Flex VENUS W TV IP67





10 Watt/meter

360 lumen/meter (lm/m)

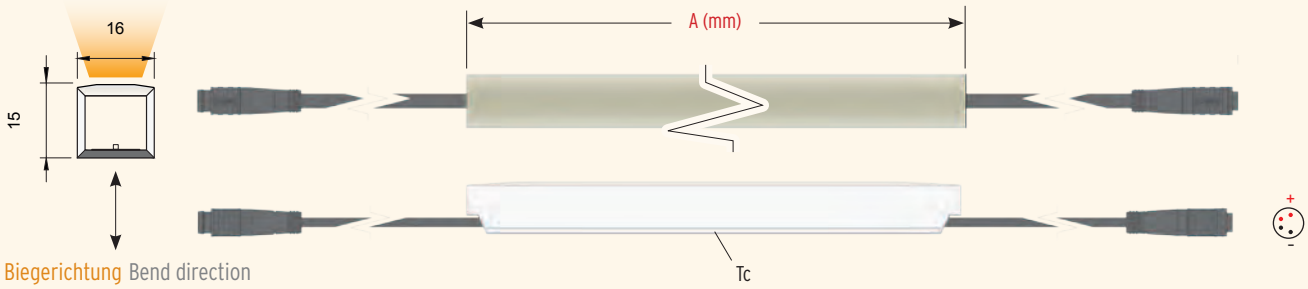
Ra/CRI 85

IP67

Abmessungen & Längen Dimensions & available length

R_{min} = 30 cm
R_{min} = 30 cm

110 mm IP67 Steckverbinder (Buchse/Stecker) an den Enden
110 mm IP67 plug in connector (male/female) on both ends



Biegerichtung Bend direction

Toleranz +/- 5 mm Tolerance +/- 5 mm

Tc-Punkt: Rückseite des Moduls Tc-point: Rear side of module

A = N x 54,67 + 25; N = 1 ... 135; A_{min} = 1 x 54,67 + 25 = 80; A_{max} = 135 x 54,67 + 25 = 7.405,5

Refer to Lighting Schedule for Different Lengths

Bestellnummer Order Code: VarioLED Flex VENUS Wxxx/A TV IP67

Elektrische & Optische Betriebsdaten Electrical & optical data

Abmessungen Dimensions	A x 15 mm x 16 mm
Leistung Power	10 W/meter
Spannung Voltage (V)	24 Volt (23 V_{min}, 25 V_{max})
Temperatur Temperature	tc_{min} = -25°C, tc_{max} = +60°C
Lagertemp. Storage temp.	t_{min} = -25°C, t_{max} = +85°C
Außentemperatur Ambient temp.	ta_{min} > -25°C, ta_{max} = 45°C

Lebensdauer
Lifetime

LM 79 konform
LM 79 compliant

LM 80 konform
LM 80 compliant

VarioLED™ Flex VENUS White TV IP67	lumen/meter (lm/m)	Ra/CRI	Farbtemperatur/ Color Temperature (K)
W822	330	80	2.400
W827	345	85	2.900
W830	345	85	3.300
W835	353	85	4.100
W840	360	85	4.500
W850	360	85	6.200

Nähere Erläuterungen zu Änderungen, Grenzwerten und Schwankungen im Herstellungsprozess finden Sie im LED Linear™ Hauptkatalog, Seite 361.

For more details regarding catalogue changes, min and max data sheet values and production tolerances see the LED Linear™ main catalogue, page 361.

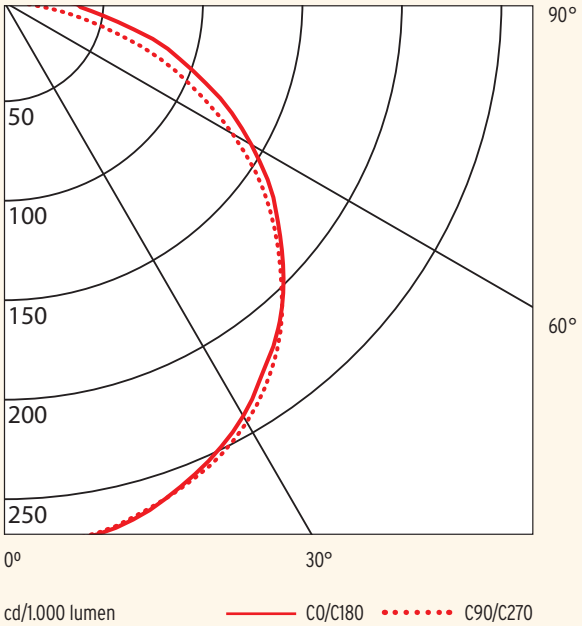
Sicherheits- und Montagehinweise: LED Linear™ Hauptkatalog, Seite 362 ff. Safety and assembly information: LED Linear™ main catalogue, page 364 ff.

Ausschreibungstext Specification text

VarioLED™ Flex VENUS White TV IP67
24 V, opal vergossene flexible LED Lichtlinie in IP67 für Architektur und Innenausbau. Mit selbstklebendem 3M Klebeband auf der Rückseite. Homogene lichtpunktfreie Ausleuchtung bei geringsten Bautiefen.
10 W/m, 360 lm/m. Querschnitt 15 mm x 16 mm. Länge bis zu 7,4 Meter. 110 mm IP67 Steckverbinder an beiden Enden. L80 von 50.000 h. Hohe Beständigkeit in rauen klimatischen Bedingungen. Salzwasser-, UV-, Chlor- und Lösungsmittelbeständig. Made in Germany.

VarioLED™ Flex VENUS White TV IP67
24 V, flexible fully opal encapsulated IP67 protected LED light line for architecture and interior design. 3M self adhesive tape on rear side. Homogeneous and dot free illumination in very low installation depths.
10 W/m, 360 lm/m. Cross section of 15 mm x 16 mm. Length up to 7.4 meter. 110 mm IP67 plug in connectors on both ends. L80 of 50,000 hrs. Easy installation and a rugged design for harsh environments (e. g. resistant to salt water, UV, chlorine and solvents). Made in Germany.

VarioLED™ Flex VENUS W840/244 TV IP67



UV geschützt
UV protected

Lösungsmittel geschützt
Resistant to solvents

Salzwasser geschützt
Saltwater resistant

Schutz beim Eintauchen
Temporary immersion protection

VarioLED™ Flex VENUS W TV basiert auf unserem Produkt VarioLED™ Flex ATON 2.

Durch die verwendete Venustechnologie ergibt sich eine Farbabweichung zum LED Flex Band, die jedoch keinen Einfluss auf die Gesamthomogenität hat.

VarioLED™ Flex VENUS W TV is based on our product VarioLED™ Flex ATON 2.

The encapsulation technology causes a color temperature drift compared to the flex tape color temperature. There is no effect on homogeneity.

Zubehör Accessories

erforderlich required

Konverter
Power supply unit

optional optional

Steuerprotokoll
Power control system

Profil VENUS TV
Contour VENUS TV

reddot design award winner 2012

Sicherheits- und Montagehinweise: LED Linear™ Hauptkatalog, Seite 362 ff. Safety and assembly information: LED Linear™ main catalogue, page 364 ff.

SPECIFICATION SHEET

lumencove®

WHITE & STATIC COLORS

Client: _____

Project name: _____

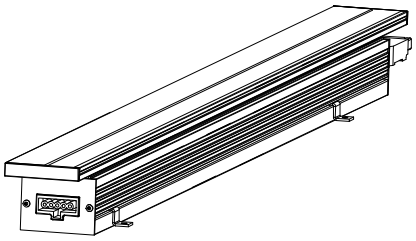
Order #: _____

Type: _____ Qty: _____

FEATURES AND BENEFITS

Physical :

- Low copper content extruded aluminum housing
- Available in 1', 2', 3', 4' or 8' sections
- Electro-statically applied polyester powder coat finish
- Tool-less LED frame adjustable mechanism
- Low profile design
- White standard finish
- Indoor applications, dry location only
- 1 locking mechanism is included per fixture, installed. (Two locks provided for 8ft sections.Locking mechanism is made of unpainted steel).
- Single feed option available for end of run fixtures



c UL us CE RoHS

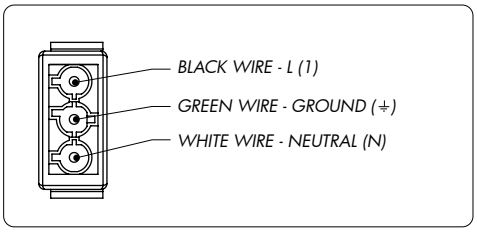
Performance :

- 2700K, 3000K, 3500K, 4000K, Red, Green, Blue static colors available
- Available in Regular Output or High Output versions
- 407 delivered lumens per foot (RO version)
- 773 delivered lumens per foot (HO version)
- Lumen maintenance L70 @ 25°C - 80,000 hrs
- Lumen measurements comply with LM - 79 - 08 standard
- Resolution per foot or per fixture (see page 9)
- Operating temperatures: -25° C to 50° C [-13F to 122F]

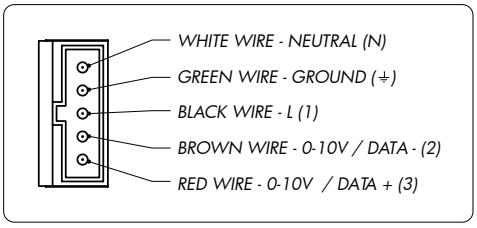
Electrical :

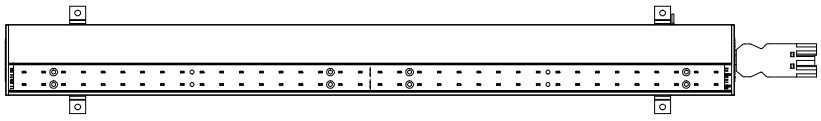
- Line voltage luminaire for 120 to 277V
- Power and data in 1 cable (#16-5)
- Up to 180 feet on 1 power feed (112 feet/HO version)
- 6W/ft - RO version, 12W/ft - HO version
- 0-10V, DMX or DALI dimming options

Wiring detail - non dimming

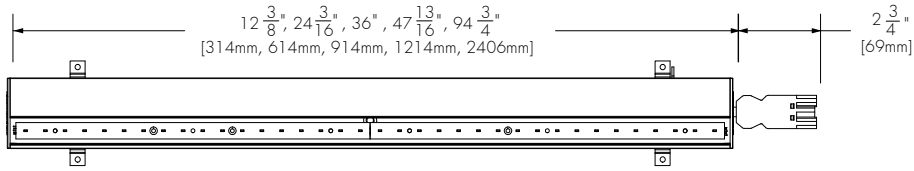


Wiring detail - dimming

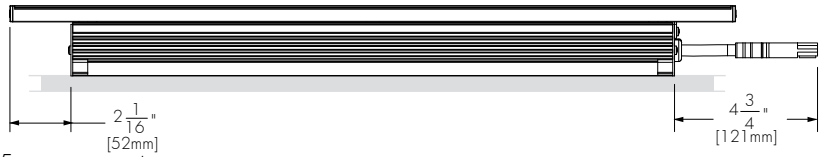




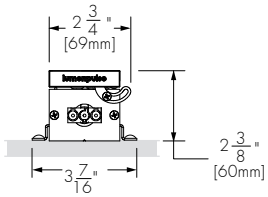
HIGH OUTPUT VERSION



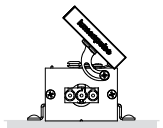
REGULAR OUTPUT VERSION



5 year warranty



Non-Dimming Fixture
(3-pin connector shown)



0-80° angle adjustment

Lumenpulse, 1751 Richardson, Suite 1505, Montreal (Quebec) Canada H3K 1G6 1.877.937.3003 P. 514.937.3003 F. 514.937.6289
info@lumenpulse.com **www.lumenpulse.com**

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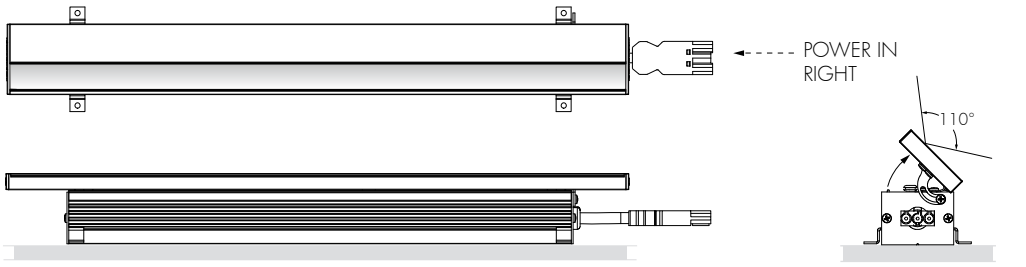
EM - R43

lumenpulse™

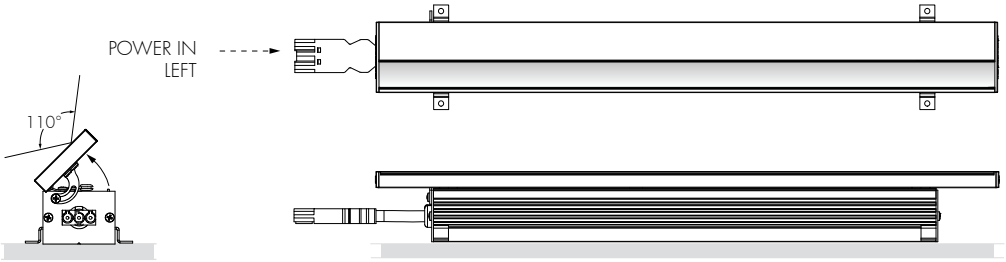
Sustainable architectural LED lighting systems

FEEDING SIDE



RF
Right Feeding side
standard clips shown

LED housing rotates
in a clockwise direction



LED housing rotates
in a counter-clockwise direction

LF
Left Feeding side
standard clips shown

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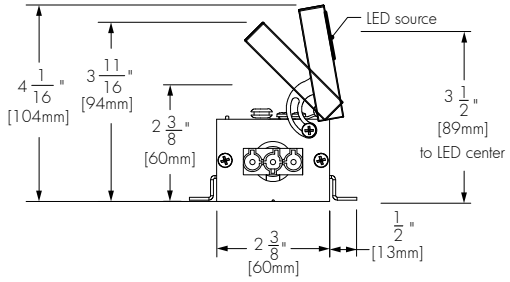
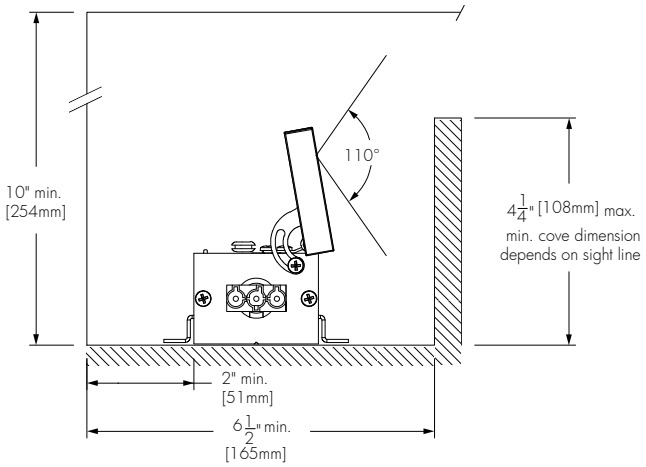
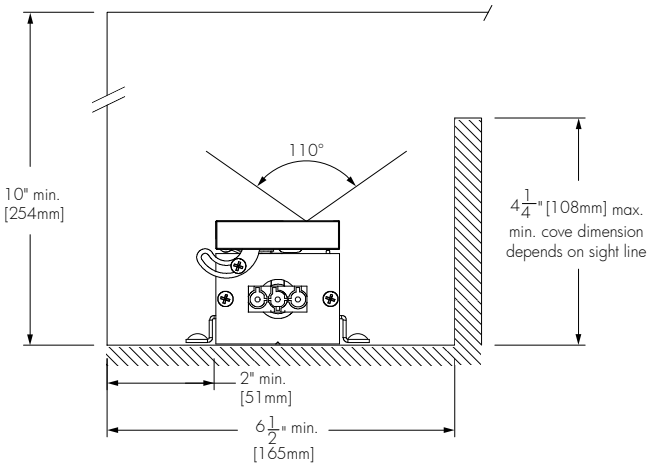
MOUNTING DETAILS

MINIMUM COVE DIMENSIONS





OUTWARD FACING



INWARD FACING

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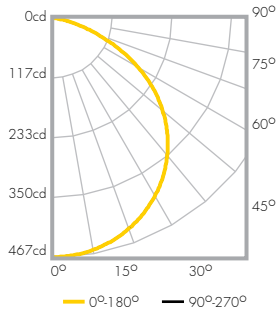
Sustainable architectural LED lighting systems

PHOTOMETRICS

Lumencove® RO 4'
2700K
clear lens

Lamping	25.4 W
Lumens	1269
Efficacy	50 lm/W

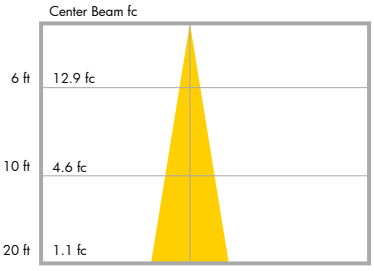
Polar Candela Distribution



Candela Table

	0	22.5	45	67.5	90
0	467	467	467	467	467
5	465	465	465	465	465
15	450	450	450	450	450
25	421	421	421	421	421
35	377	377	377	377	377
45	318	318	318	318	318
55	241	241	241	241	241
65	145	145	145	145	145
75	52	52	52	52	52
85	6	6	6	6	6
90	0	0	0	0	0

Illuminance at Distance

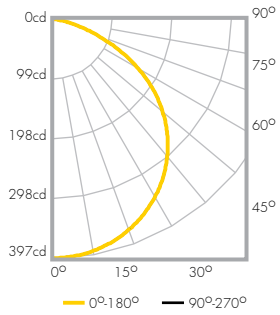


21.6 ft (6.5 m)
1 fc @ nadir maximum distance

Lumencove® RO 4'
2700K
frosted lens

Lamping	25.4 W
Lumens	1079
Efficacy	55 lm/W

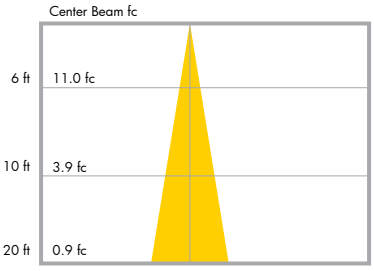
Polar Candela Distribution



Candela Table

	0	22.5	45	67.5	90
0	397	397	397	397	397
5	395	395	395	395	395
15	383	383	383	383	383
25	358	358	358	358	358
35	321	321	321	321	321
45	270	270	270	270	270
55	205	205	205	205	205
65	123	123	123	123	123
75	44	44	44	44	44
85	5	5	5	5	5
90	0	0	0	0	0

Illuminance at Distance

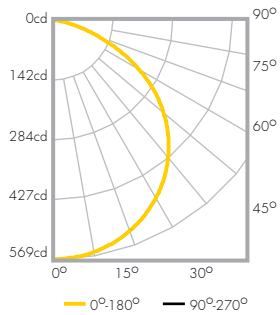


19.9 ft (6.0 m)
1 fc @ nadir maximum distance

Lumencove® RO 4'
3000K
clear lens

Lamping	25 W
Lumens	1513
Efficacy	60 lm/W

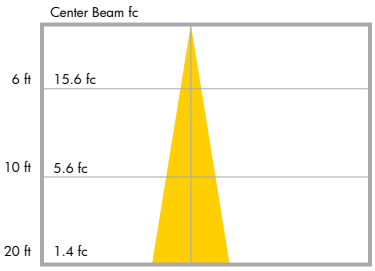
Polar Candela Distribution



Candela Table

	0	22.5	45	67.5	90
0	565	565	565	565	565
5	563	561	561	565	567
15	544	542	543	547	548
25	507	506	506	510	510
35	451	450	450	455	455
45	375	374	376	381	382
55	281	277	280	289	290
65	168	164	168	177	178
75	61	59	61	64	65
85	8	7	7	6	5
90	0	0	0	0	0

Illuminance at Distance

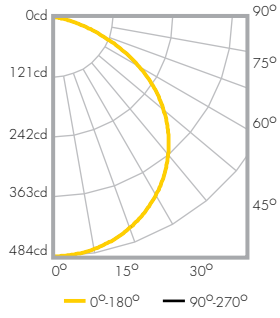


23.7 ft (7.2 m)
1 fc @ nadir maximum distance

Lumencove® RO 4'
3000K
frosted lens

Lamping	25 W
Lumens	1286
Efficacy	51 lm/W

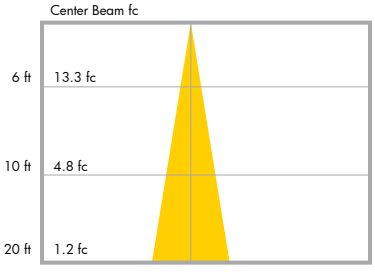
Polar Candela Distribution



Candela Table

	0	22.5	45	67.5	90
0	480	480	480	480	480
5	479	477	477	480	482
15	462	461	461	465	466
25	431	430	430	433	434
35	384	382	382	387	387
45	319	318	319	324	325
55	239	236	238	246	247
65	143	140	143	151	151
75	51	50	52	54	55
85	5	5	4	4	3
90	0	0	0	0	0

Illuminance at Distance



21.9 ft (6.6 m)
1 fc @ nadir maximum distance

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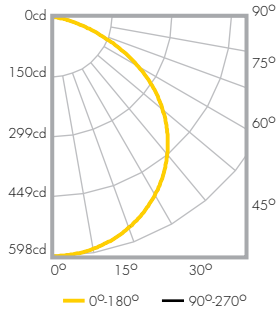
PHOTOMETRICS

Lumencove® RO 4'
4000K
clear lens

Lamping	25 W
Lumens	1627
Efficacy	65 lm/W

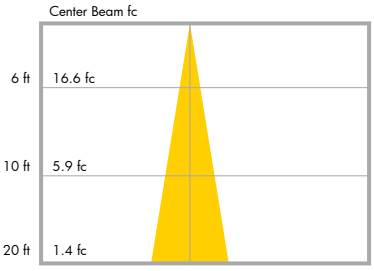
Polar Candela Distribution



Candela Table

	0	22.5	45	67.5	90
0	598	598	598	598	598
5	596	596	596	596	596
15	577	577	577	577	577
25	540	540	540	540	540
35	484	484	484	484	484
45	408	408	408	408	408
55	309	309	309	309	309
65	186	186	186	186	186
75	67	67	67	67	67
85	8	8	8	8	8
90	0	0	0	0	0

Illuminance at Distance

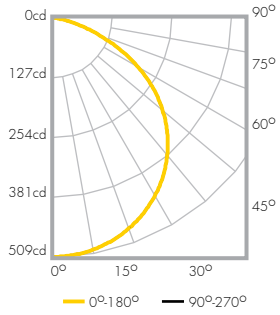


24.4 ft (7.4 m)
1 fc @ nadir maximum distance

Lumencove® RO 4'
4000K
frosted lens

Lamping	25 W
Lumens	1383
Efficacy	55 lm/W

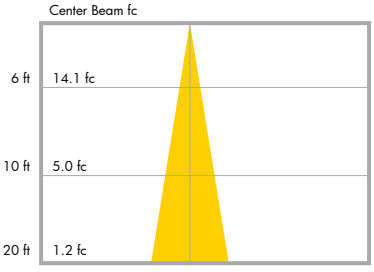
Polar Candela Distribution



Candela Table

	0	22.5	45	67.5	90
0	509	509	509	509	509
5	507	507	507	507	507
15	491	491	491	491	491
25	459	459	459	459	459
35	411	411	411	411	411
45	346	346	346	346	346
55	262	262	262	262	262
65	158	158	158	158	158
75	57	57	57	57	57
85	6	6	6	6	6
90	0	0	0	0	0

Illuminance at Distance



22.5 ft (6.8 m)
1 fc @ nadir maximum distance

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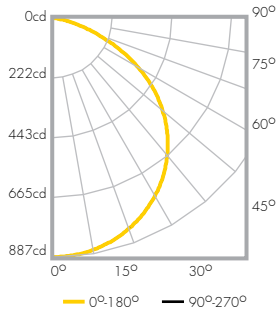
PHOTOMETRICS

Lumencove® HO 4'
2700K
clear lens

Lamping	45 W
Lumens	2412
Efficacy	53 lm/W

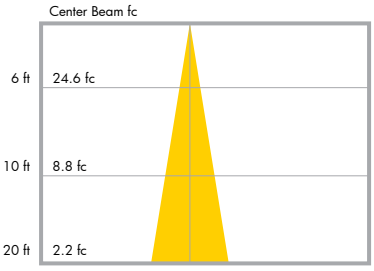
Polar Candela Distribution



Candela Table

	0	22.5	45	67.5	90
0	887	887	887	887	887
5	884	884	884	884	884
15	856	856	856	856	856
25	801	801	801	801	801
35	717	717	717	717	717
45	604	604	604	604	604
55	457	457	457	457	457
65	275	275	275	275	275
75	99	99	99	99	99
85	11	11	11	11	11
90	0	0	0	0	0

Illuminance at Distance

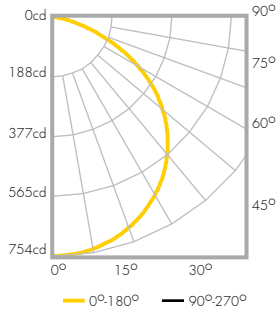


29.7 ft (9.0 m)
1 fc @ nadir maximum distance

Lumencove® HO 4'
2700K
frosted lens

Lamping	45 W
Lumens	2050
Efficacy	45 lm/W

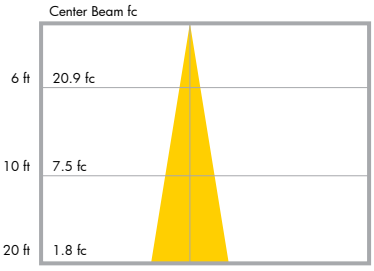
Polar Candela Distribution



Candela Table

	0	22.5	45	67.5	90
0	754	754	754	754	754
5	751	751	751	751	751
15	727	727	727	727	727
25	681	681	681	681	681
35	610	610	610	610	610
45	514	514	514	514	514
55	389	389	389	389	389
65	234	234	234	234	234
75	84	84	84	84	84
85	10	10	10	10	10
90	0	0	0	0	0

Illuminance at Distance

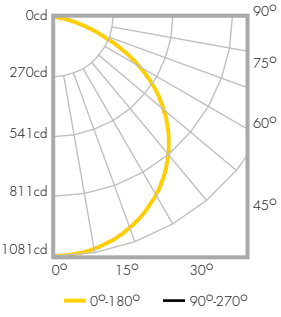


27.4 ft (8.3 m)
1 fc @ nadir maximum distance

Lumencove® HO 4'
3000K
clear lens

Lamping	45 W
Lumens	2876
Efficacy	63 lm/W

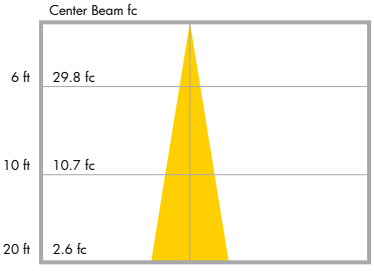
Polar Candela Distribution



Candela Table

	0	22.5	45	67.5	90
0	1075	1075	1075	1075	1075
5	1071	1067	1067	1074	1077
15	1034	1031	1032	1039	1041
25	964	961	961	969	970
35	858	855	855	865	865
45	713	711	714	725	727
55	534	527	533	550	552
65	319	313	319	337	338
75	115	113	116	122	123
85	15	14	14	12	11
90	0	0	0	0	0

Illuminance at Distance

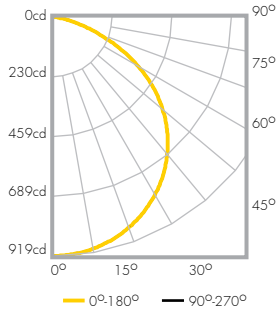


32.7 ft (9.9 m)
1 fc @ nadir maximum distance

Lumencove® HO 4'
3000K
frosted lens

Lamping	45 W
Lumens	2444
Efficacy	54 lm/W

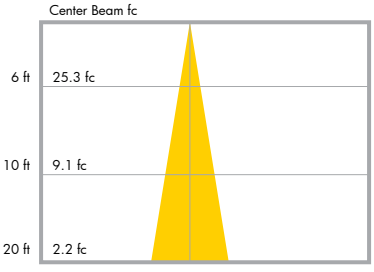
Polar Candela Distribution



Candela Table

	0	22.5	45	67.5	90
0	913	913	913	913	913
5	910	907	907	913	915
15	879	876	877	883	885
25	819	817	817	824	824
35	729	727	727	735	735
45	606	604	607	616	618
55	453	448	453	467	469
65	271	266	271	286	288
75	98	96	99	104	105
85	13	12	12	10	9
90	0	0	0	0	0

Illuminance at Distance



30.2 ft (9.2 m)
1 fc @ nadir maximum distance

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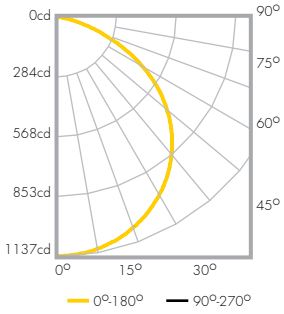
PHOTOMETRICS

Lumencove® HO 4'
4000K
clear lens

Lamping	45 W
Lumens	3092
Efficacy	68 lm/W

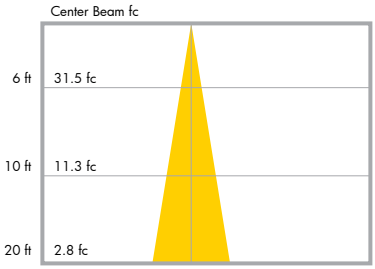
Polar Candela Distribution



Candela Table

	0	22.5	45	67.5	90
0	1137	1137	1137	1137	1137
5	1133	1133	1133	1133	1133
15	1097	1097	1097	1097	1097
25	1026	1026	1026	1026	1026
35	919	919	919	919	919
45	775	775	775	775	775
55	586	586	586	586	586
65	353	353	353	353	353
75	126	126	126	126	126
85	14	14	14	14	14
90	0	0	0	0	0

Illuminance at Distance

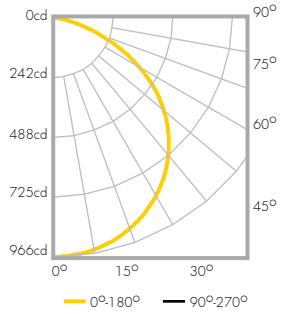


33.7 ft (10.2 m)
1 fc @ nadir maximum distance

Lumencove® HO 4'
4000K
frosted lens

Lamping	45 W
Lumens	2628
Efficacy	58 lm/W

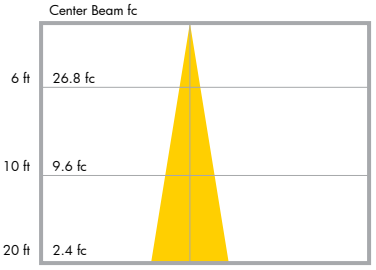
Polar Candela Distribution



Candela Table

	0	22.5	45	67.5	90
0	966	966	966	966	966
5	963	963	963	963	963
15	932	932	932	932	932
25	872	872	872	872	872
35	781	781	781	781	781
45	658	658	658	658	658
55	498	498	498	498	498
65	300	300	300	300	300
75	107	107	107	107	107
85	12	12	12	12	12
90	0	0	0	0	0

Illuminance at Distance



31.0 ft (9.4 m)
1 fc @ nadir maximum distance

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ACCESSORIES
Order separately

Control Systems:

LTO Lumentouch is a wall mount DMX 512 controller keypad

LCU Lumencue is a USB / mini SD DMX 512 controller

LID LumenID is a diagnostic and addressing DMX 512 controller.
It must be specified on all DMX applications.
Refer to LID specification sheet for details.

LTN Lumentone is a simple pre-programmed DMX 512 controller
with a push button rotary dial and live feedback.

CBOX :

iCBOX-___V-___-___ Interior DMX 512 data box.
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures, M20 provision holes with plugs.
Please specify desired input voltage and finish.
Refer to iCBOX specification sheet for details.

CBOX-___V-___-___ DMX 512 data box.
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures, M20 provision holes with plugs.
Please specify desired input voltage and finish.
Refer to CBOX specification sheet for details.

Leader Cable :

LCSLC___ Leader Cable for Lumencove® fixture (3 conductor cable).
Please add desired cable length : 6, 8 or 10 feet

LCSLCD___ Leader Cable for dimming Lumencove® fixture (5 conductor cable).
Please add desired cable length : 6, 8 or 10 feet

Jumper Cable :

LCSJC___ Jumper Cable for Lumencove® fixture (3 conductor cable).
Please add desired cable length : 1, 2, 4 or 8 feet

LCSJCD___ Jumper Cable for dimming Lumencove® fixture (5 conductor cable).
Please add desired cable length : 1, 2, 4 or 8 feet

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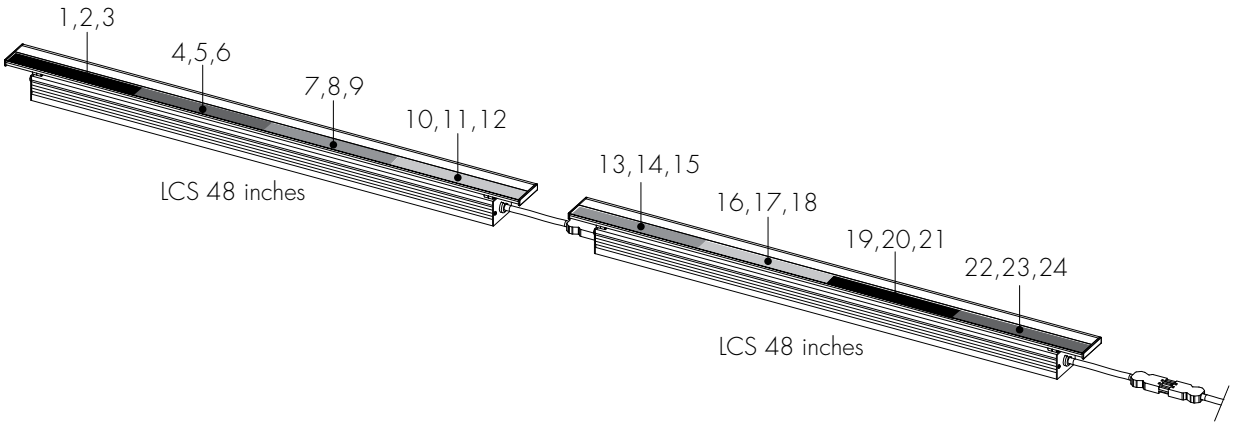
RESOLUTION DETAILS
APPLICABLE FOR DMX DIMMING OPTION ONLY

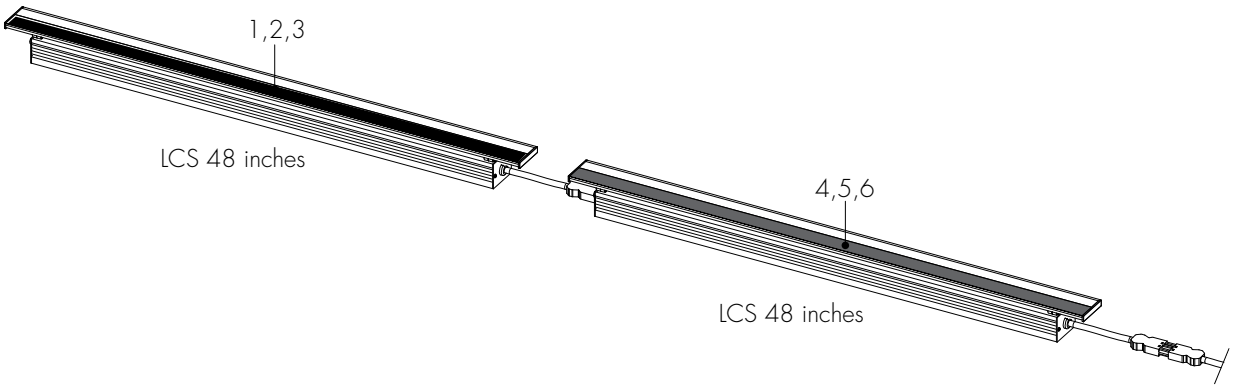
DMX 1FT - Resolution per foot: each foot is addressed independently (recommended for most installations).
1% minimum dimming value

DMX ADDRESSES:



DMX 1FX - Resolution per fixture: each fixture is addressed independently.
1% minimum dimming value

DMX ADDRESSES:



*Warning: resolution is a factory setting and cannot be changed in the field.

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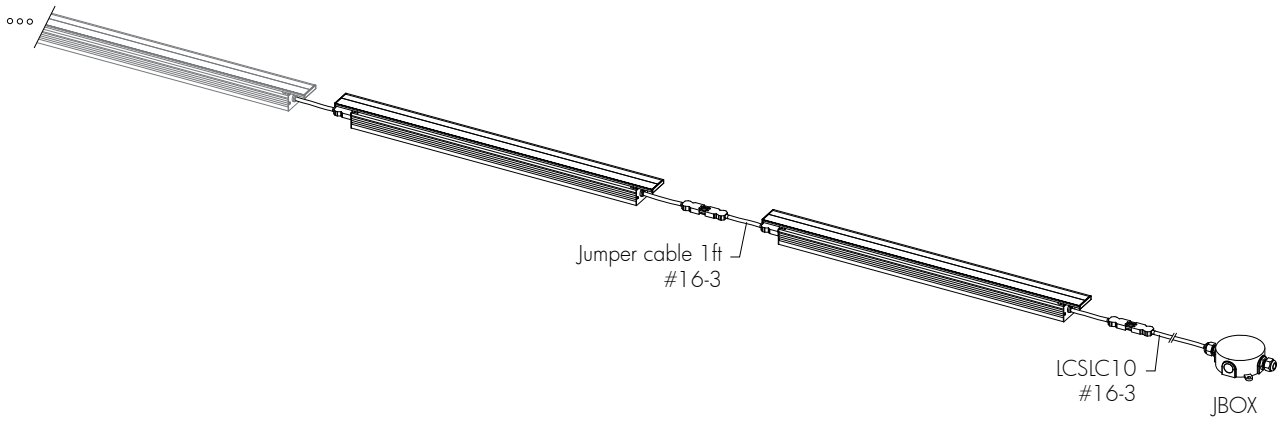
TYPICAL WIRING DIAGRAMS

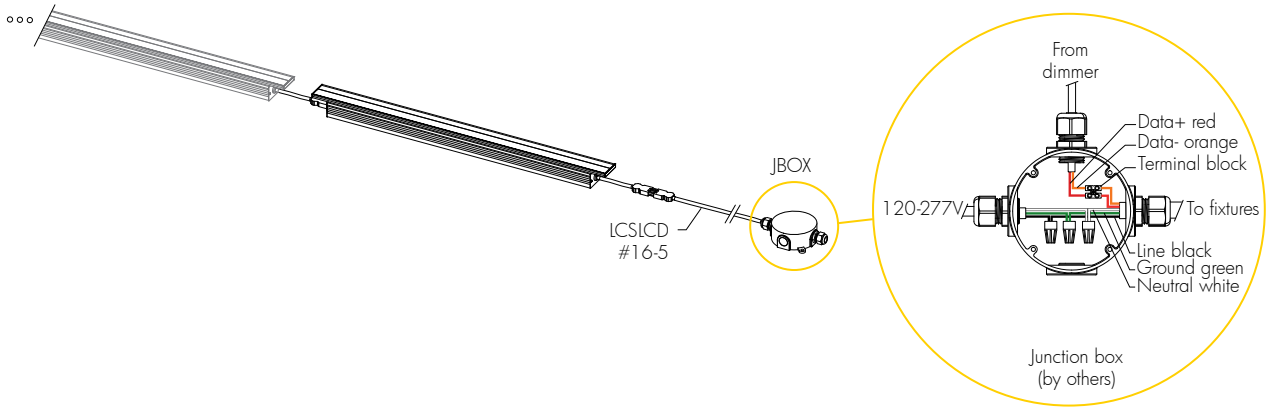
Non-Dimming Version



Maximum run length by 15A circuit - Lumencove® RO 6W/ft			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	180ft	292ft	300ft
50ft leader cable	152ft	260ft	292ft
Maximum run length by 15A circuit - Lumencove® HO 12W/ft			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	112ft	180ft	200ft
50ft leader cable	88ft	152ft	172ft

Dimming Version (0-10V)

10% minimum dimming value



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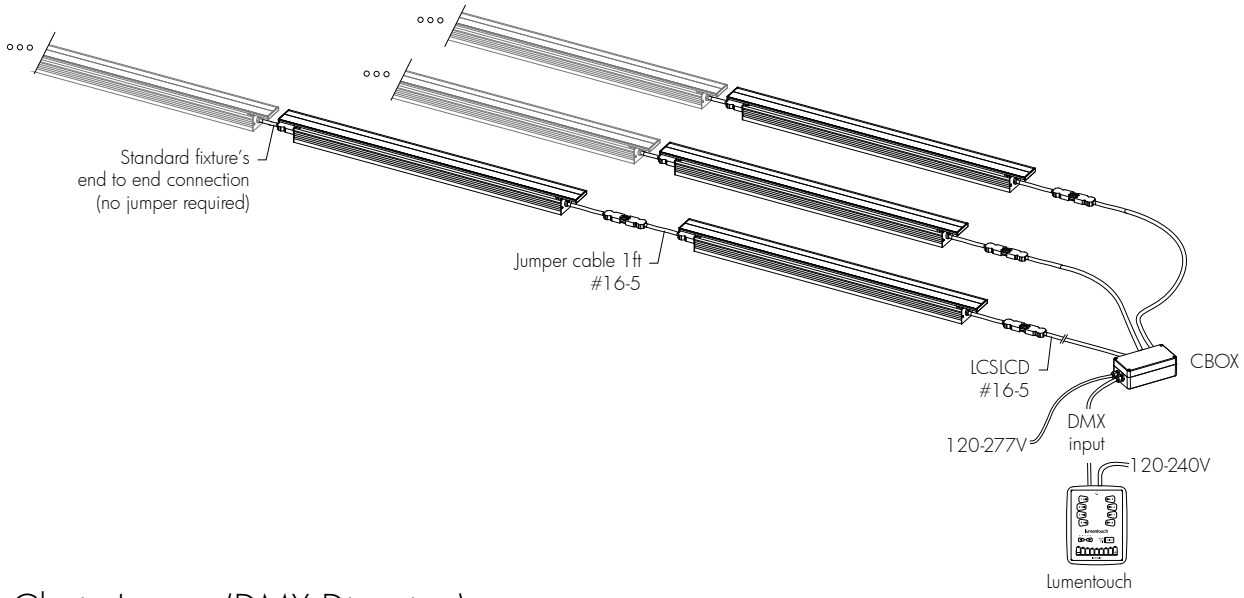
TYPICAL WIRING DIAGRAMS

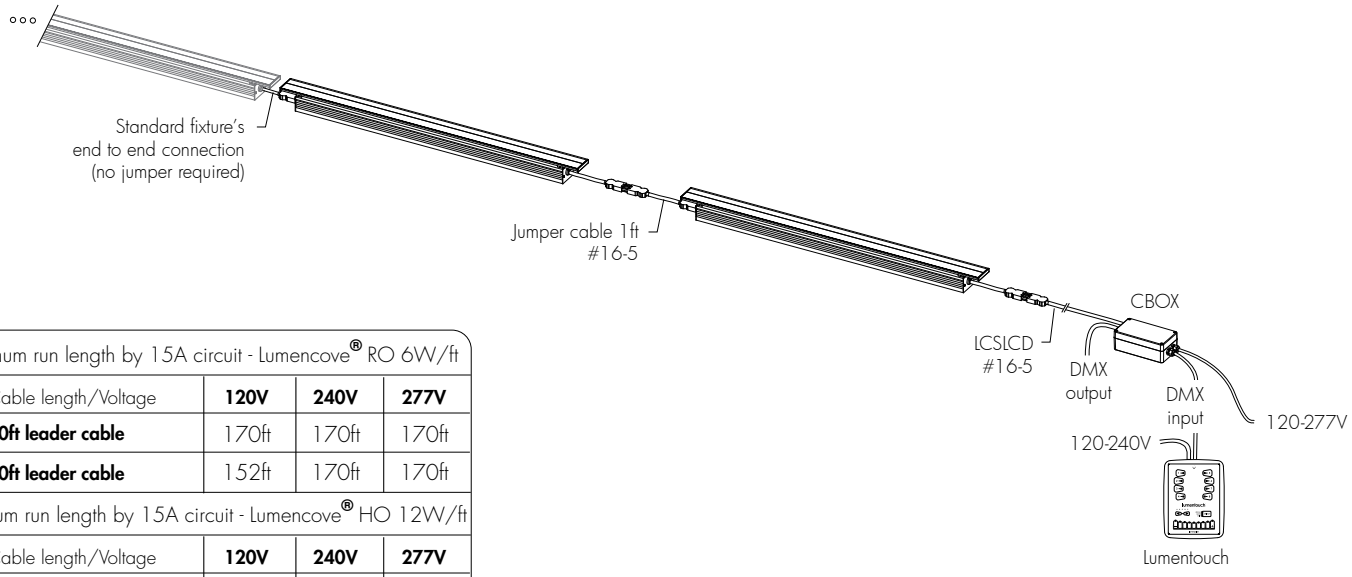
Star Layout (DMX Dimming)

*Make sure that the addition of all cable lengths and fixture lengths for each run do not exceed the recommended limit.
1% minimum dimming value



Daisy Chain Layout (DMX Dimming)

1% minimum dimming value



Maximum run length by 15A circuit - Lumencove® RO 6W/ft			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	170ft	170ft	170ft
50ft leader cable	152ft	170ft	170ft
Maximum run length by 15A circuit - Lumencove® HO 12W/ft			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	112ft	170ft	170ft
50ft leader cable	88ft	152ft	170ft

*Up to 170 individually addressable 1 foot sections per DMX run.
Consult factory for specific applications.

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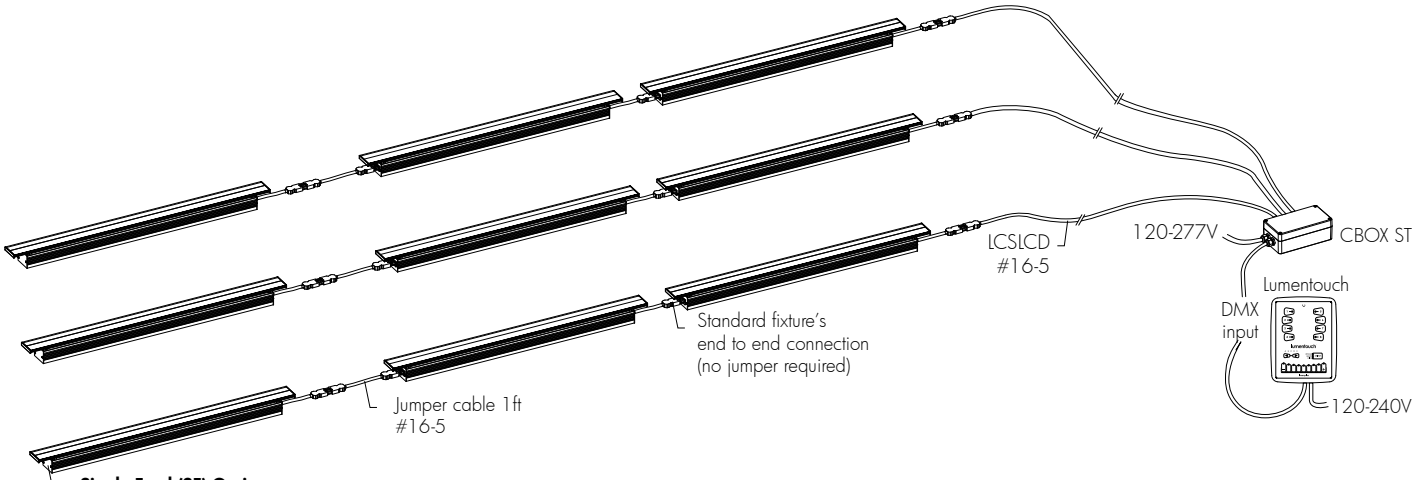
TYPICAL WIRING DIAGRAMS - Single Feed Option Shown

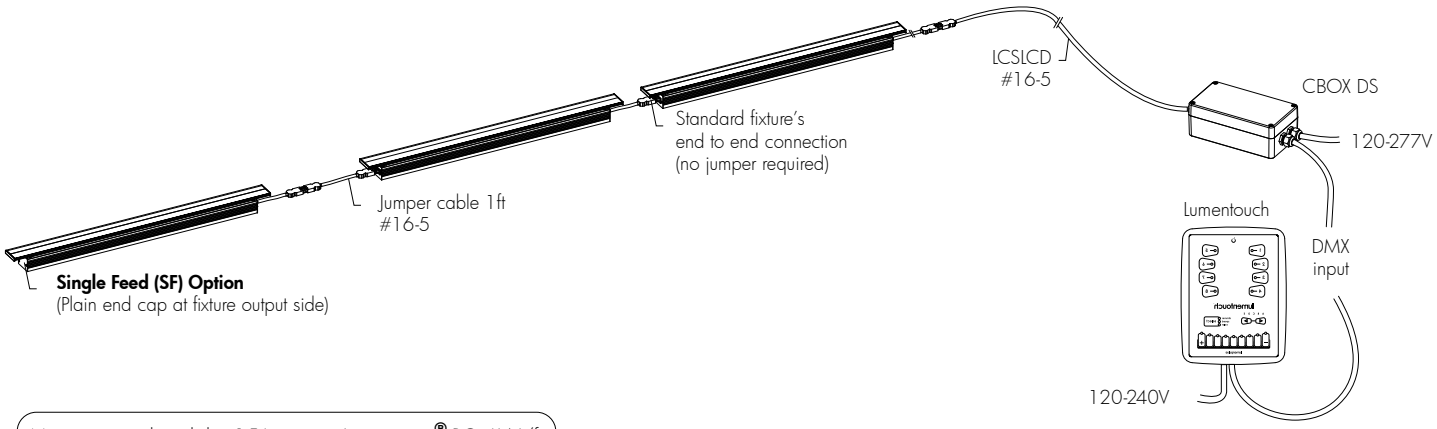
Star Layout (DMX Dimming)

*Make sure that the addition of all cable lengths and fixture lengths for each run do not exceed the recommended limit.
1% minimum dimming value



Daisy Chain Layout (DMX Dimming)

1% minimum dimming value



Maximum run length by 15A circuit - Lumencove® RO 6W/ft			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	170ft	170ft	170ft
50ft leader cable	152ft	170ft	170ft
Maximum run length by 15A circuit - Lumencove® HO 12W/ft			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	112ft	170ft	170ft
50ft leader cable	88ft	152ft	170ft

*Up to 170 individually addressable 1 foot sections per DMX run.
Consult factory for specific applications.

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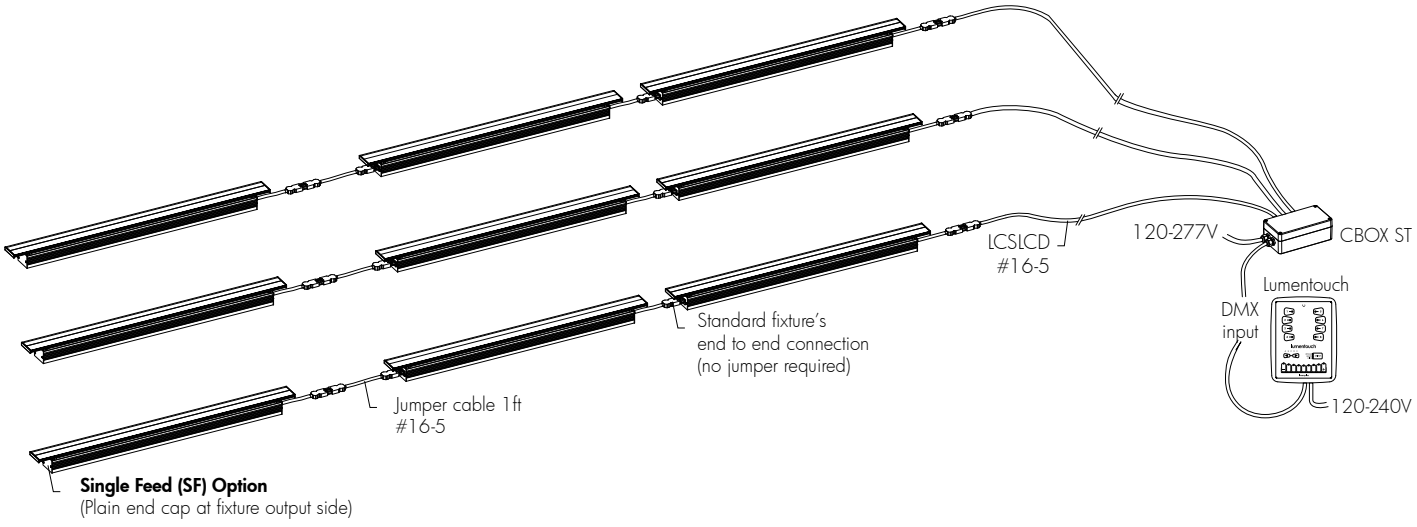
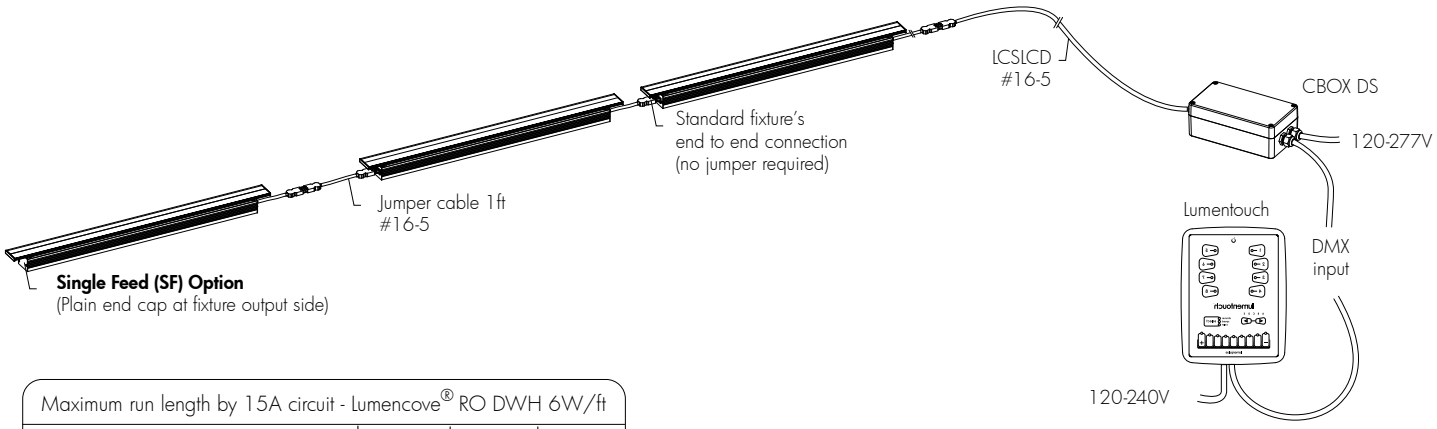
TYPICAL WIRING DIAGRAMS - Single Feed Option Shown

Star Layout

*Make sure that the addition of all cable lengths and fixture lengths for each run do not exceed the recommended limit.



Daisy Chain Layout



Maximum run length by 15A circuit - Lumencove® RO DWH 6W/ft			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	170ft	170ft	170ft
50ft leader cable	152ft	170ft	170ft
Maximum run length by 15A circuit - Lumencove® HO DWH 12W/ft			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	112ft	170ft	170ft
50ft leader cable	88ft	152ft	170ft

*Up to 170 individually addressable 1 foot sections per DMX run.
Consult factory for specific applications.

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2012.10.17
EM - R43

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Sustainable architectural LED lighting systems

SPECIFICATION SHEET

lumencove®

WHITE & STATIC COLORS

HOW TO ORDER

LCS RO			40K	CL	RF	WH	DMX1FX	
Housing	Voltage	Length	Colors and color temperatures	Lens	Feeding Side	Finish	Dimming	Option
1	2	3	4	5	6	7	8	9

Refer to Lighting Schedule for different lengths

1

Housing:

LCS RO - Lumencove® Regular Output 6W/ft

LCS HO - Lumencove® High Output 12W/ft

2

Voltage:

120 - 120 volts

208 - 208 volts

240 - 240 volts

277 - 277 volts

3

Length:

12 - 12 3/8 inches (314mm) (0.72 kg/1.59 lbs)

24 - 24 3/16 inches (614mm) (1.45 kg/3.19 lbs)

36 - 36 inches (914mm) (2.16 kg/4.77 lbs)

48 - 47 13/16 inches (1214mm) (2.57 kg/5.68 lbs)

96 - 94 3/4 inches (2406mm) (5.76 kg/12.72 lbs)

4

Colors and Color temperatures:

27K - 2700K

30K - 3000K

35K - 3500K

40K - 4000K

RD - Red

GR - Green

BL - Blue

5

Lens:

CL - Clear lens

FR - Frosted lens

6

Feeding Side:

Please specify one of the following:

(Right Feeding side is standard unless otherwise specified)

LF - Left Feeding side

RF - Right Feeding side

7

Finish:

WH - White (standard finish)

CC - Custom (please specify RAL color)

8

Dimming:

DIM - 0-10V Dimming option (10% minimum dimming value)

DMX 1FT - DMX Dimming option, resolution per foot (1% minimum dimming value)

DMX 1FX - DMX Dimming option, resolution per fixture (1% minimum dimming value)

DALI - DALI Dimming option (1% minimum dimming value)

NO - No Dimming

9

Option:

SF - Single Feed option
(Plain end cap at fixture output side)

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Sustainable architectural LED lighting systems

1300 Industrial Road, Unit #19
San Carlos, CA 94070
FREE CALL 1-866-695-5862 US & Canada
info@lumascape.com

LUMASCAPE USA INC.

LS411LED Omnio Mini

At Grade

humantouch™ opticlear™ microantileach™

CADdetails PWM DIM OPTIONAL IP67 Intertek

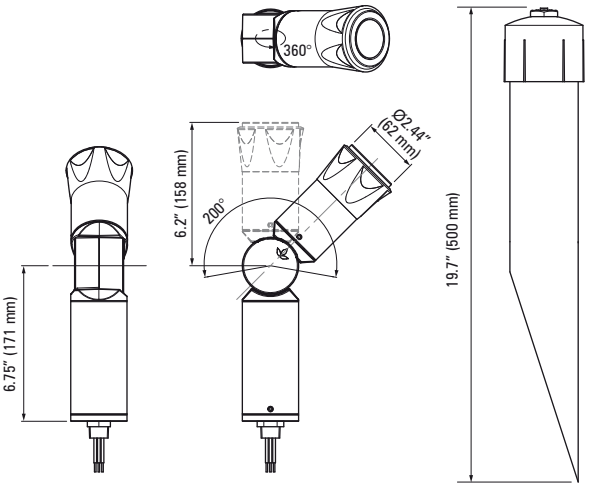
The LS411LED is a compact, adjustable luminaire with an aesthetically pleasing form, featuring integral line voltage driver and a wide range of adjustability making it ideal for general landscape lighting applications. The LS411LED is also supplied factory sealed, complete with 6.5' hookup wire. The epoxy coated, marine grade aluminum construction ensures a long service life, even in harsh environments.

Specifications

Lamp Source	9 W or 15 W LED □ White (4 300 K typical) Warm white (3 000 K typical) Blue (470 nm) *Other colors by request* RGB
Approved Use	Suitable for wet locations
Control Options	PWM
IP Rating	IP67
Construction	LM20 die-cast marine grade powder coated aluminum
Mounting Type	½" NPT
Standard Inclusions	Silicone handgrip to allow hot adjustment **MicroAntiLeach™** wire entry
Accessories *Order separately*	**LS6054** Groundmount stake
Remote Transformers / Power Supplies *Order separately*	Refer to Technical Data section for application specific options
Ambient Operating Temperature	-22 °F to 122 °F (-30 °C to +50 °C)
Photometrics	Refer to www.lumascape.com

Any luminaire can become hot - take care with appropriate use and placement

LS411LED Omnio Mini



LS6054 Groundmount Stake
(order separately)

LS411LED → [ ] → [ ] → **C** → [ ] → [ ]

LAMP

Description	Wattage	Color	Code
LED	9 W	White (4 300 K typ.)	**9W4**
		Warm white (3 000 K typ.)	**9H6**
		Blue (470 nm)	**9B4**
		RGB	**9M4**
	15 W	White (4 300 K typ.)	**15W4**
		Warm white (3 000 K typ.)	**15H6**
		Blue (470 nm)	**15B4**

OPTICAL SYSTEM

Beam		Code
Narrow Medium	25°	**NM**
Medium	30°	**ME**(1)
Linear	20° x 40°	**LN**

(1) Recommended for best RGB color mixing.

MOUNTING

Description	Code
½" NPT	**C**

INPUT VOLTAGE

Voltage	Code
120-277 V, 50/60 Hz	**09**(1)
12-15 V, 60 Hz or 12-24 V DC	**13**(1)(2)
PWM Dimmable Driver, 12-15 V, 60 Hz or 12-24 V DC	**13-DIM**(2)

(1) Not available for RGB.
(2) 9 W only. Requires appropriate transformer.

FINISH

Description	Material	Code
Black, powder coated	Aluminum	**CB**
White, powder coated	Aluminum	**CW**
Silver, powder coated	Aluminum	**CS**

Dimmable Wiring Diagram Reference

Input Voltage	LED Color	Control Type	Wiring Diagram
13-DIM	Single Color	PWM	6
13-DIM	RGB	PWM	8,9

Photometrics

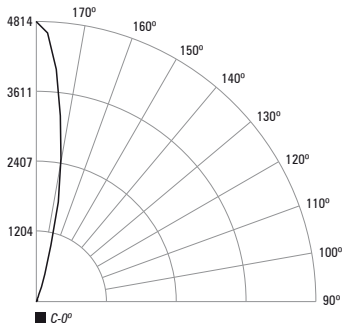
Photometric data is based on test results from a NIST traceable testing lab. IES data is available at www.lumascape.com.
Note: No depreciation factor is applied to the data shown.

LS411LED 4 300 K[1] 25° Beam Angle

Power Input	17.2
Lumens	807
Efficacy	47 Lm/W

[1] To approximate warm white data, multiply by 0.84. Refer web site for IES files for all color temperatures.

Polar Candela Distribution



	C 0°	C 15°	C 30°	C 45°	C 60°	C 75°	C 90°
90°	0	0	0	0	0	0	0
100°	0	0	0	0	0	0	0
110°	0	0	0	0	0	0	0
120°	0	0	0	0	0	0	0
130°	2	2	2	3	4	5	4
140°	23	24	23	20	18	17	18
150°	56	59	54	52	55	61	61
160°	272	281	302	329	354	363	379
170°	2498	2514	2529	2549	2590	2637	2677
180°	4814	4814	4814	4814	4814	4814	4814

Illuminance at a Distance

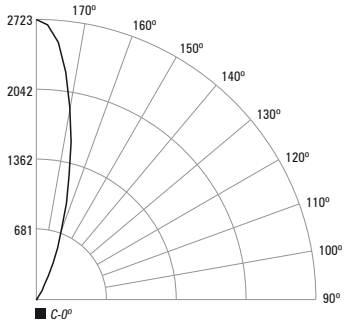
ft	Center Beam fc	Beam Ø
5	192.6	2 ft
10	48.1	4 ft
15	21.4	7 ft
25	7.7	11 ft
30	5.3	13 ft
40	3	18 ft
50	1.9	22 ft

LS411LED 4 300 K[1] 30° Beam Angle

Power Input	17.6
Lumens	785
Efficacy	45 Lm/W

[1] To approximate warm white data, multiply by 0.84. Refer web site for IES files for all color temperatures.

Polar Candela Distribution



	C 0°	C 15°	C 30°	C 45°	C 60°	C 75°	C 90°
90°	0	0	0	0	0	0	0
100°	0	0	0	0	0	0	0
110°	0	0	0	0	0	0	0
120°	0	0	0	0	0	0	0
130°	9	9	10	9	9	8	8
140°	35	39	38	33	33	33	31
150°	167	160	153	155	157	165	157
160°	741	742	733	727	702	681	667
170°	1903	1896	1873	1861	1845	1831	1827
180°	2723	2723	2723	2723	2723	2723	2723

Illuminance at a Distance

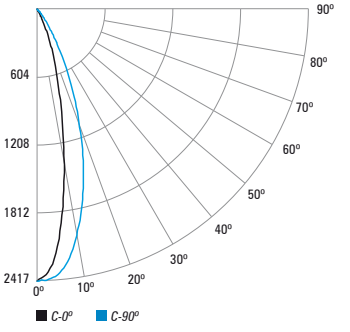
ft	Center Beam fc	Beam Ø
5	108.9	3 ft
10	27.2	5 ft
15	12.1	8 ft
25	4.4	13 ft
30	3	16 ft
40	1.7	21 ft
50	1.1	27 ft

LS411LED 4 300 K[1] 20° x 40° Beam Angle

Power Input	16
Lumens	743
Efficacy	46 Lm/W

[1] To approximate warm white data, multiply by 0.84. Refer web site for IES files for all color temperatures.

Polar Candela Distribution



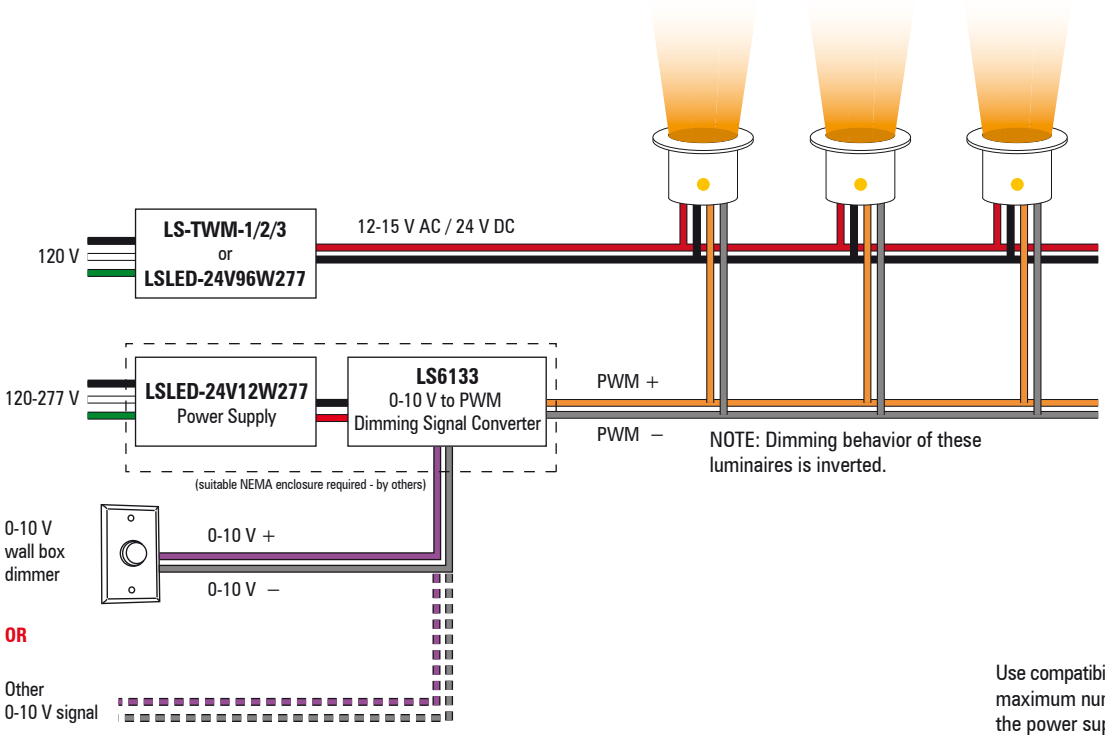
	C 0°	C 15°	C 30°	C 45°	C 60°	C 75°	C 90°
0°	2417	2417	2417	2417	2417	2417	2417
10°	1398	1447	1556	1706	1870	1984	2040
20°	405	439	515	640	807	999	1115
30°	55	67	96	147	225	308	368
40°	15	16	20	29	46	66	82
50°	5	5	6	8	9	13	20
60°	0	0	0	1	2	2	1
70°	0	0	0	0	0	0	0
80°	0	0	0	0	0	0	0
90°	0	0	0	0	0	0	0

Illuminance at a Distance

ft	Center Beam fc	Beam W	Beam L
5	96.7	2 ft	3 ft
10	24.2	4 ft	7 ft
15	10.7	6 ft	10 ft
25	3.9	10 ft	17 ft
30	2.7	12 ft	21 ft
40	1.5	16 ft	28 ft
50	1	19 ft	34 ft

Diagram 6 - 0-10 V Dimming - Low Voltage LED Luminaire on 12-15 V AC or 24 V DC Circuit

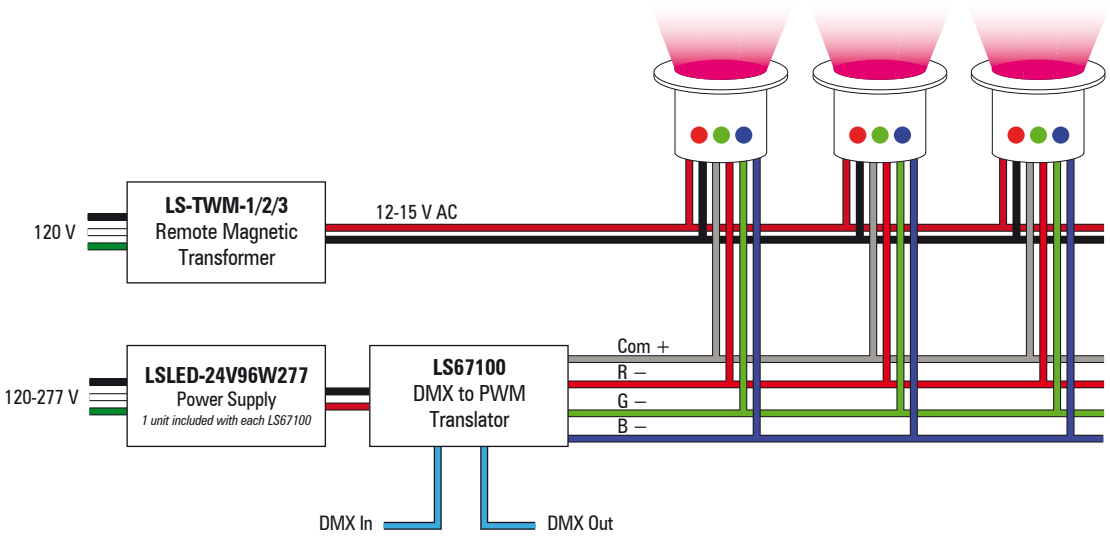
PWM DIM



Use compatibility table to determine maximum number of luminaires the power supply can support.

Diagram 8 - RGB via DMX for Low Voltage LED Luminaire on 12-15 V AC Circuit

PWM DIM

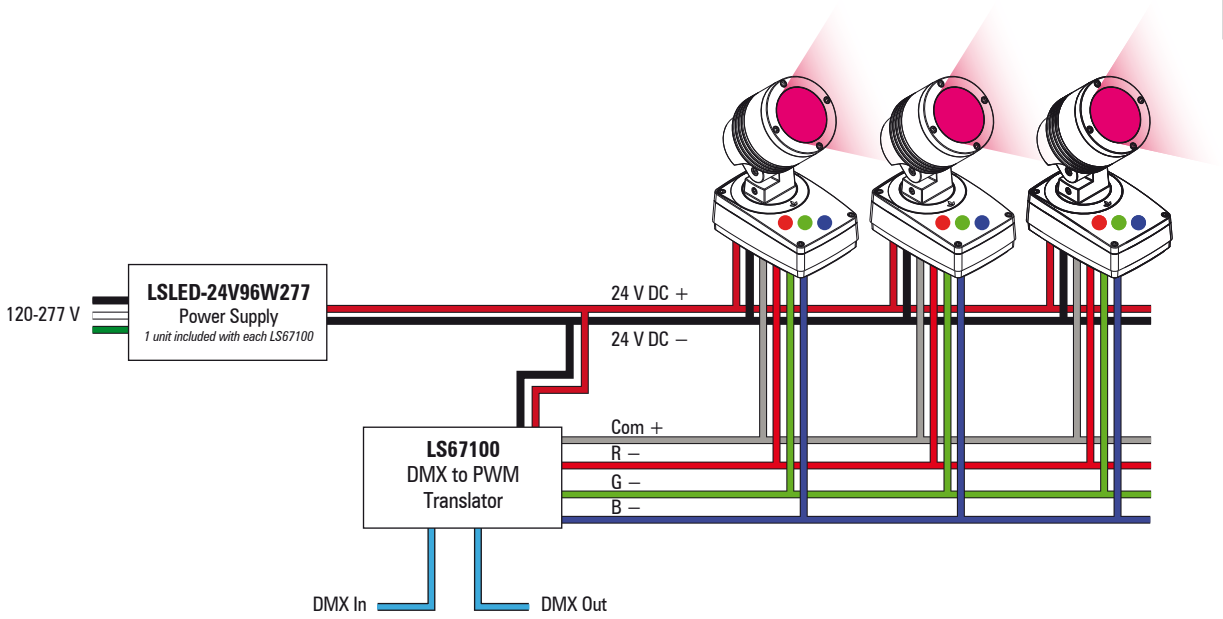


Use compatibility table to determine maximum number of luminaires the power supply can support.

NOTE: The above diagrams are intended to show electrical pathways between luminaires and ancillary devices. These diagrams are not intended to show type or color of cord/wire, wire gauge or approved use of the cord/wire supplied with luminaires.

Consult the luminaire-specific cutsheet or the factory for detailed specifications.

Diagram 9 - RGB via DMX for Low Voltage LED Luminaire on 24 V DC Circuit



Use compatibility table to determine maximum number of luminaires the power supply can support.

NOTE: The above diagrams are intended to show electrical pathways between luminaires and ancillary devices. These diagrams are not intended to show type or color of cord/wire, wire gauge or approved use of the cord/wire supplied with luminaires.

Consult the luminaire-specific cutsheet or the factory for detailed specifications.

Transformers and Power Supplies for Low Voltage LED Luminaires

The following list of transformers and power supplies are for use with luminaires specifically described as being compatible with either 12 V AC (wirewound only) transformers or with 12-24 V DC power supplies. Compatibility will be noted in the ordering code of the luminaire concerned, and will typically be referenced by Voltage Code '13' or '13-DIM'. In the case of '13-DIM' additional components may be required. Refer to the applicable wiring diagram/s.

Compatibility with each transformer or power supply is indicated by the value mentioned, representing the maximum number of luminaires that may be powered from each transformer or power supply. Please note, this does not take into consideration voltage drop or ampacity limits of the branch circuit. For assistance, please contact factory.

	Wall Mounted Landscape Lighting Transformers			Wall Mounted Transformers				Class 2 Power Supply	Direct Burial Transformer
	LS-TWM-1-300	**LS-TWM-2-600**	**LS-TWM-3-900**	**LS-TWM-50**	**LS-TWM-100**	**LS-TWM-150**	**LS-TWM-250**	**LSLED-24V96W277**	**LS-TDB1-300**
Input Voltage	120 V, 60 Hz	120 V, 60 Hz	120 V, 60 Hz	120 V, 60 Hz	120 V, 60 Hz	120 V, 60 Hz	120 V, 60 Hz	120-277 V, 50/60 Hz	120 V, 60 Hz
Output Voltage	12/13/14/15 V 60 Hz	12/13/14/15 V 60 Hz	12/13/14/15 V 60 Hz	12 V, 60 Hz	12 V, 60 Hz	12 V, 60 Hz	12 V, 60 Hz	24 V DC	12.5 V, 60 Hz
Wattage	1 x 300 W circuit	2 x 300 W circuits	3 x 300 W circuits	50 W	100 W	150 W	250 W	96 W	300 W
LS411LED, 9 Watt	12	24	36					7	12

SPECIFICATION SHEET

lumenline™ 2

SURFACE - WALL MOUNT
INDIRECT LIGHTING

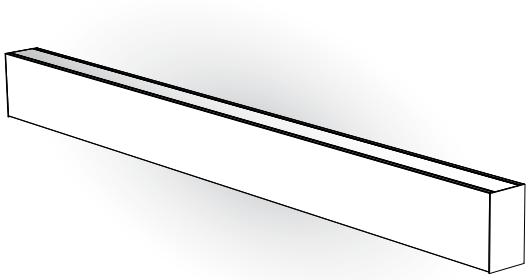
Client: _____

Project name: _____

Order #: _____

Type: _____ Qty: _____

FEATURES AND BENEFITS



Physical :

- Aluminum extruded housing, 2" wide
- Available in 1', 2', 3', 4', 5', 6', 7' or 8' sections
- Continuous runs available in 1' increments
- Durable polyester powder coat finish
- Extruded acrylic lens
- Wall mounted
- Tool-less system for reflector assembly and control gear access
- Easy installation
- Compatible with motion sensors
- Unlit joiners and corners available for custom configurations

Performance :

- Available in 2700K, 3000K, 3500K, 4000K or RGB color mixing
- 55 lumens per watt (delivered, HO 3500K)
- CRI value: 80+
- Binning within a 3 step MacAdam ellipse
- Lumen maintenance: 100,000 hrs [L70 @ 25° C]
- Lumen measurements comply with LM - 79 - 08 standard
- Resolution per foot or per fixture
- Operating temperatures: -25° C to 50° C [-13F to 122F]

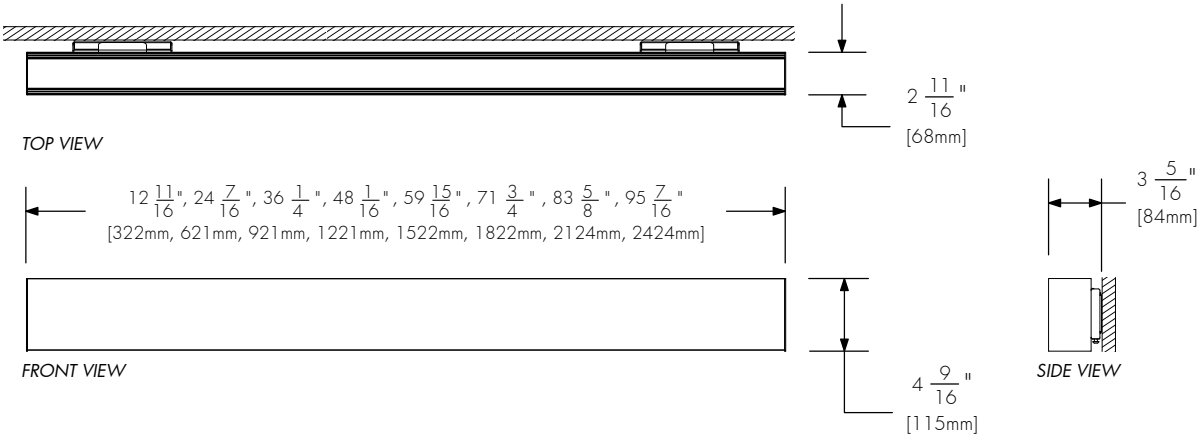
Electrical :

- Line voltage luminaire for 120 to 277V
- 7W/ft Regular Output version
- 14.25W/ft High Output version
- Dimming options for white light: 0-10 volt, DMX, DALI, Lumentalk, or Lutron® EcoSystem® enabled
- 6W/ft optional RGB source, DMX 512 ready
- Quick connectors for continuous runs

lumentalk™ EcoSystem® Enabled

Wiring detail

WIRE COLOR	/ *USE*
GREEN	*GROUND*
WHITE	*NEUTRAL*
BLACK	*LIVE 120-277V*
RED	*0-10V / DATA +*
ORANGE	*0-10V / DATA -*



5 year warranty

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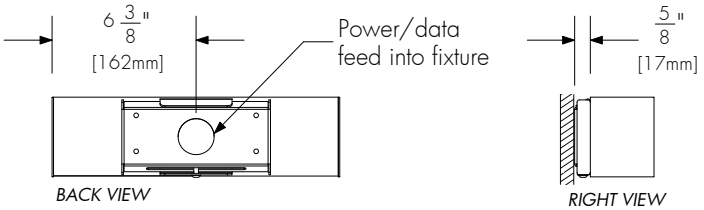
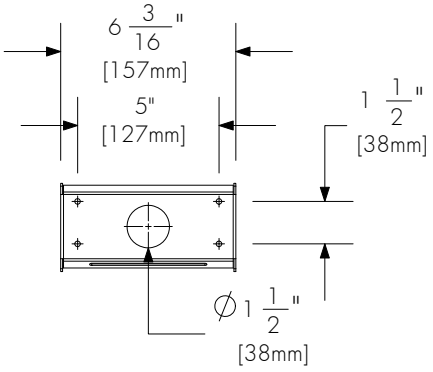
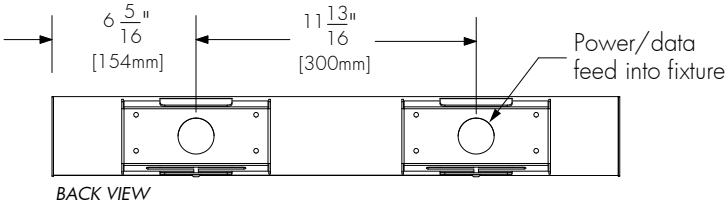
WALL MOUNTING DETAIL (SINGLE UNITS)



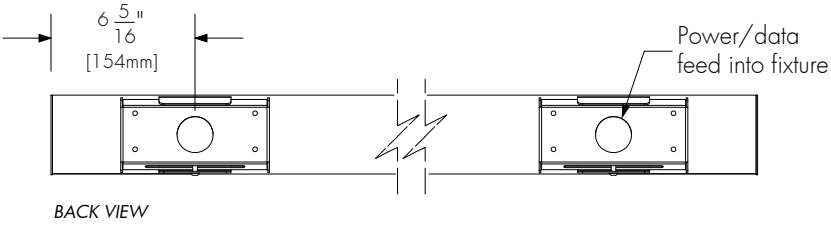
Wall mounting detail for 1′ units
N.B. Horizontal 2" x 4" jonction box required



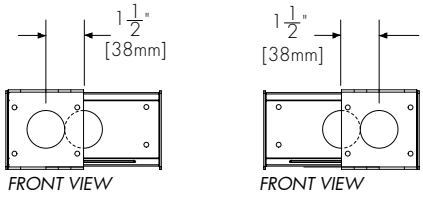
Mounting holes pattern for
Wall mounting plate



Wall mounting detail for 2′ units
N.B. Horizontal 2" x 4" jonction box required

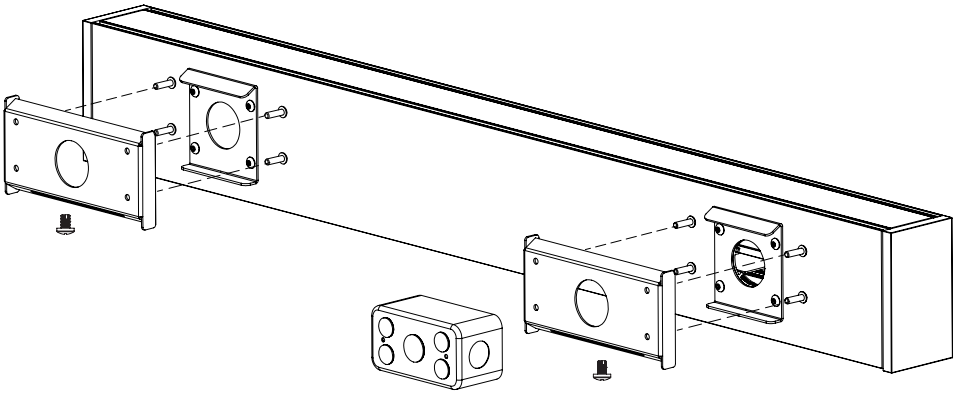


Wall mounting detail for 3′ to 8′ single units
N.B. Horizontal 2" x 4" jonction box required
Please consult factory for continuous runs.



Fixture's wall mounting plates
positioning horizontal tolerance

TYPICAL WALL MOUNTED FIXTURE EXPLODED VIEW



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ACCESSORIES

Order separately

Control Systems:

LTO Lumentouch is a wall mount DMX 512 controller keypad

LCU Lumencue is a USB / mini SD DMX 512 controller

LID LumenID is a diagnostic and addressing DMX 512 controller.
It must be specified on all DMX applications.
Refer to LID specification sheet for details.

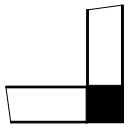
LTN Lumentone is a simple pre-programmed DMX 512 controller
with a push button rotary dial and live feedback.

CBOX :

iCBOX-___V-___-___ Interior DMX 512 data box.
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures, M20 provision holes with plugs.
Please specify desired input voltage and finish.
Refer to iCBOX specification sheet for details.

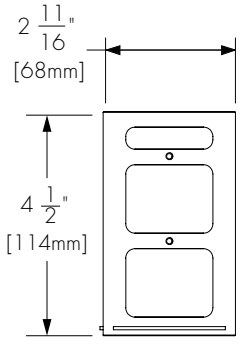
CBOX-___V-___-___ DMX 512 data box.
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures, M20 provision holes with plugs.
Please specify desired input voltage and finish.
Refer to CBOX specification sheet for details.

UNLIT JOINERS AND CORNERS
(CONSULT FACTORY FOR CUSTOM CONFIGURATIONS AVAILABILITY AND ORDERING)

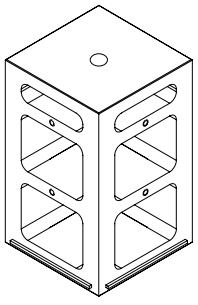


CRN
Corner 90°

LNR
Linear 180°



FRONT VIEW



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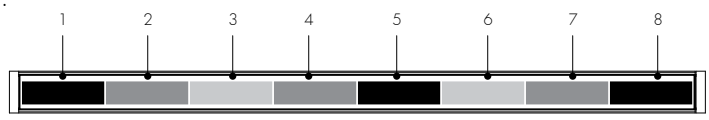
RESOLUTION DETAILS

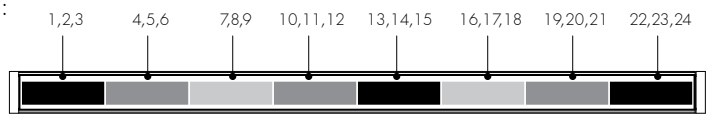
DMX 1FT - Resolution per foot: each foot is addressed independently .

WHITE DIMMING
DMX ADDRESSES:



TOP VIEW
(8 ft fixture shown)

RGB
DMX ADDRESSES:



TOP VIEW
(8 ft fixture shown)

DMX 1FX - Resolution per fixture: each 4 foot segment is addressed independently

WHITE DIMMING
DMX ADDRESSES:

TOP VIEW
(8 ft fixture shown)

RGB
DMX ADDRESSES:

TOP VIEW
(8 ft fixture shown)

*Warning: resolution is a factory setting and cannot be changed in the field.

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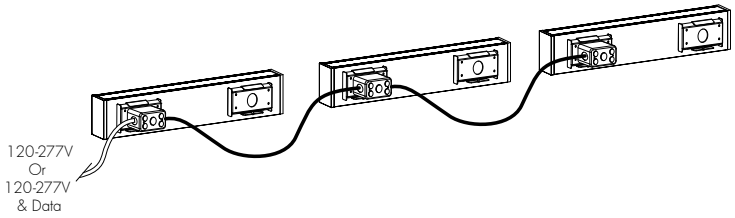
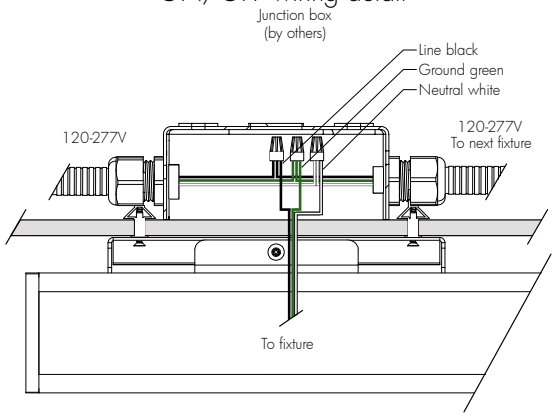
TYPICAL WIRING DIAGRAMS

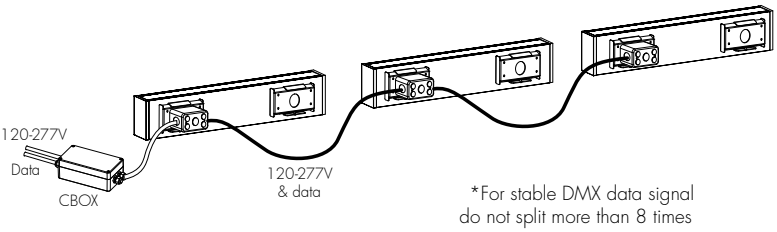
Single units, daisy chain configuration
ON/OFF, 0/10V, DALI & EcoSystem dimming



ON/OFF wiring detail

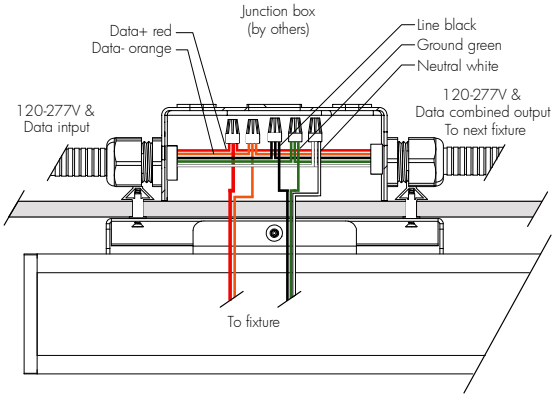


Single units, daisy chain configuration
Combined power and data input (DMX)

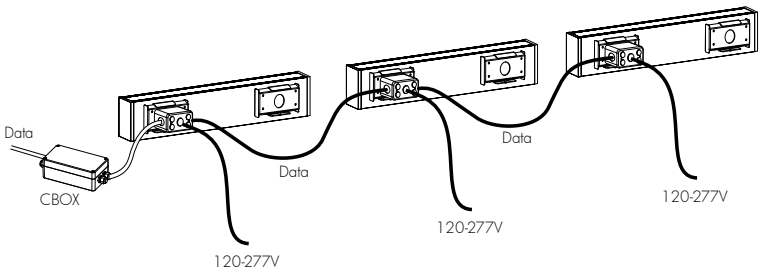


*For stable DMX data signal
do not split more than 8 times

0/10V, DMX, DALI
& EcoSystem wiring detail
Combined power and data input

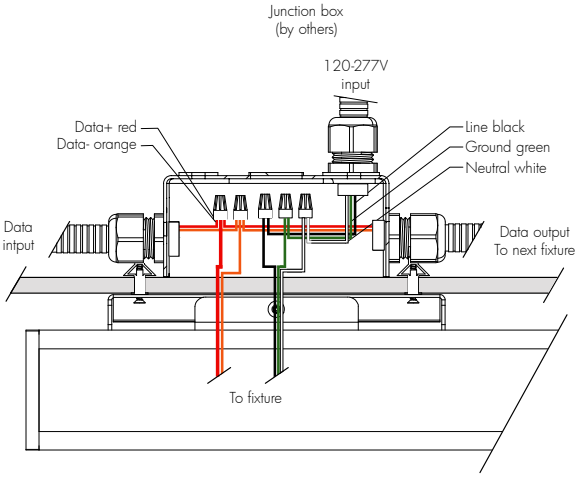


Single units, daisy chain configuration
Separated power and data inputs (DMX)



*For stable DMX data signal
do not split more than 8 times

0/10V, DMX, DALI
& EcoSystem wiring detail
Separated power and data inputs



⚠ WARNING

SEPARATION OF FIELD INSTALLED POWER LIMITED CIRCUIT (DIMMING/DATA/CONTROL) WIRING FROM THE BRANCH CIRCUIT WIRING IN THE OUTLET BOX ARE TO BE MADE IN ACCORDANCE WITH LOCAL AND/OR NATIONAL ELECTRICAL INSTALLATION CODES.

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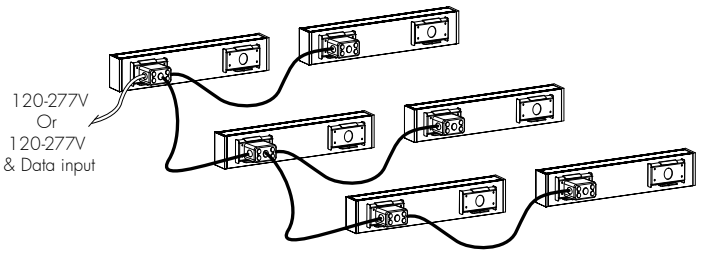
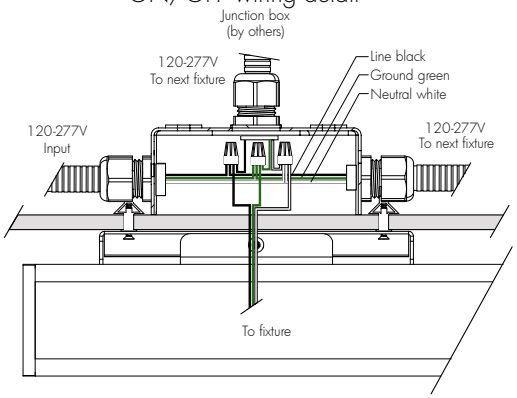
TYPICAL WIRING DIAGRAMS

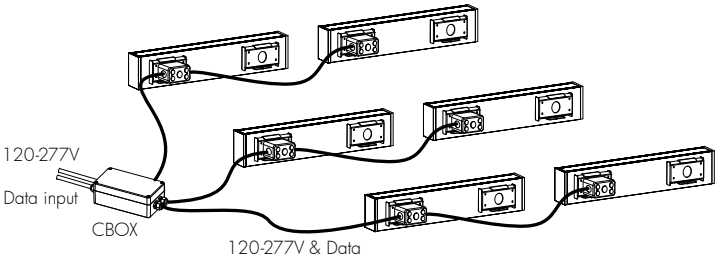
Single units, star layout configuration
ON/OFF, 0/10V, DALI, EcoSystem dimming



ON/OFF wiring detail

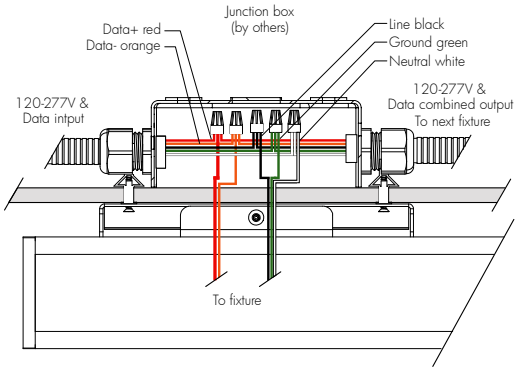


Single units, star layout configuration
Combined power and data input (DMX)

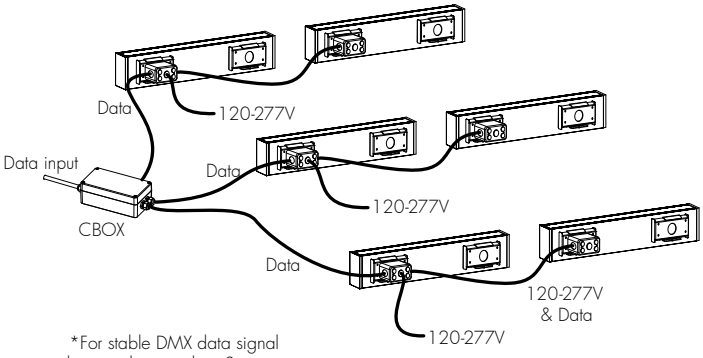


*For stable DMX data signal
do not split more than 8 times

0/10V, DMX, DALI
& EcoSystem wiring detail
Combined power and data input

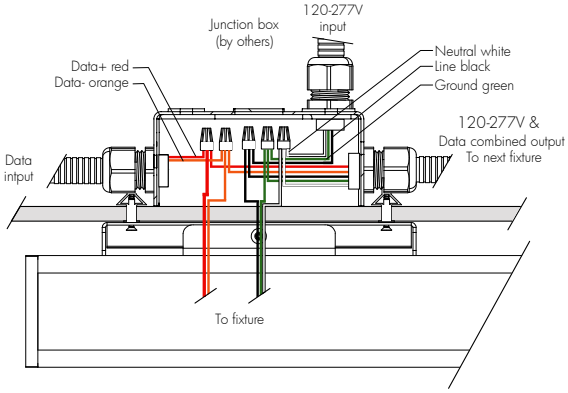


Single units, star layout configuration
Separated power and data inputs (DMX)



*For stable DMX data signal
do not split more than 8 times

0/10V, DMX, DALI
& EcoSystem wiring detail
Separated power and data inputs



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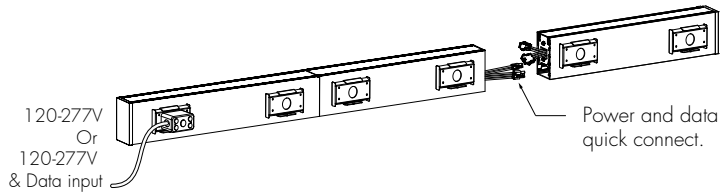
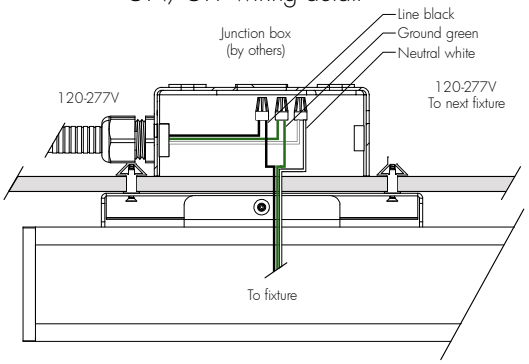
TYPICAL WIRING DIAGRAMS

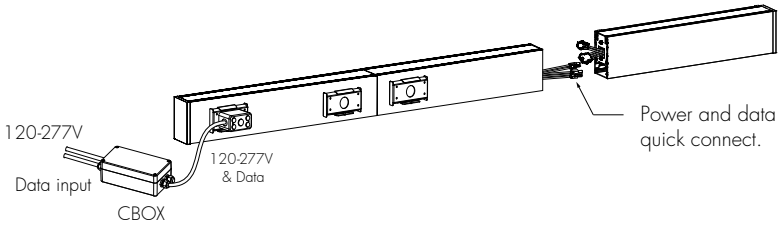
Continuous row, single feed
ON/OFF, 0/10V, DALI, EcoSystem dimming



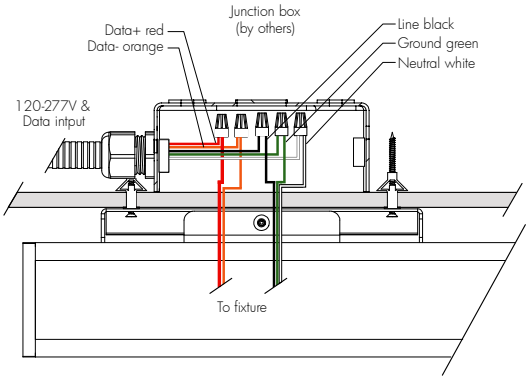
ON/OFF wiring detail



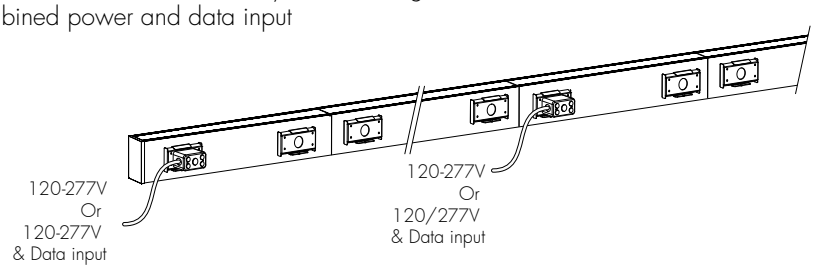
Continuous row, single feed
Combined power and data inputs (DMX)



0/10V, DMX, DALI
& EcoSystem wiring detail
Combined power and data



Continuous row, multiple feeds
ON/OFF, 0/10V, DALI, EcoSystem dimming
Combined power and data input



⚠ WARNING

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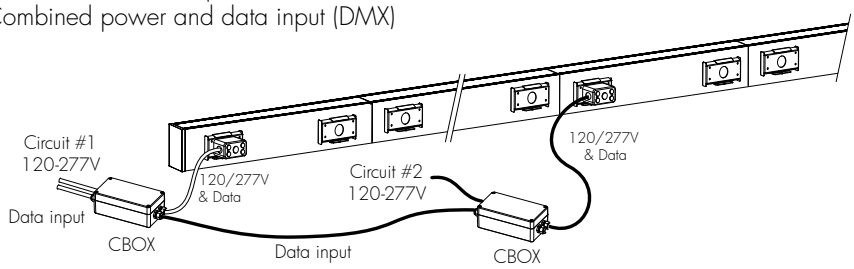
Continuous row, multiple feeds
Combined power and data input (DMX)



Maximum run length by single circuit 7A maximum with 10ft fixture cord			
Configuration/Voltage	**120V**	**240V**	**277V**
RO Regular output	116ft	232ft	272ft
HO High output	56ft	116ft	132ft
RGB	128ft	272ft	312ft

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HOW TO ORDER

LLI2S	WM	I			iRO40K		WH
Housing	Mounting	Light Direction	Voltage	Length	Indirect Lighting Output & Color temperature	Control	Finish
1	2	3	4	5	6	7	8

1

Housing:

LLI2S - Lumenline™ Surface, 2" wide

2

Mounting:

WM - Wall Mount

3

Light Direction:

I - Indirect lighting

4

Voltage:

120 - 120 volts
208 - 208 volts
220/240 - 220 to 240 volts
277 - 277 volts

5

Length:

1 - 12 11/16 inches (322mm)
2 - 24 7/16 inches (621mm)
3 - 36 1/4 inches (921mm)
4 - 48 1/16 inches (1221mm)
5 - 59 15/16 inches (1522mm)
6 - 71 3/4 inches (1822mm)
7 - 83 5/8 inches (2124mm)
8 - 95 7/16 inches (2424mm)
C__ - Continuous run, specify in 1' increments.

6

Indirect Lighting Output & Color temperature:

iRO 27K - 2700K regular output 7W/ft
iRO 30K - 3000K regular output 7W/ft
iRO 35K - 3500K regular output 7W/ft
iRO 40K - 4000K regular output 7W/ft
iHO 27K - 2700K high output 14.25W/ft*
iHO 30K - 3000K high output 14.25W/ft*
iHO 35K - 3500K high output 14.25W/ft*
iHO 40K - 4000K high output 14.25W/ft*
iRGB - Additive red, green and blue indirect lighting 6W/ft
N.B. **iRGB** options require DALI or DMX control specified in section 7.

7

Control:

NO - On/Off control
LT - Lumentalk (available with white light only)
(available for 2-8' lengths only)
(1% minimum dimming value)
DIM - 0-10V Dimming option
(10% minimum dimming value)
DMX 1FT - DMX Dimming option, resolution per foot
(1% minimum dimming value)
DMX 1FX - DMX Dimming option, resolution per fixture
(1% minimum dimming value)
DALI - DALI Dimming option
(1% minimum dimming value)
ES - Lutron® EcoSystem® Enabled Dimming (available with white light only)
(available for 2-8' lengths only)
(1% minimum dimming value)

8

Finish:

WH - White
SI - Silver
CC - Custom (please specify RAL color)

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Sustainable architectural LED lighting systems

Bollards for light directed downwards

Post construction: One piece extruded aluminum with a one piece die-cast aluminum top housing and a base internally welded into an assembly. All aluminum used in the construction is marine grade and copper free.

Lamp enclosure: One piece die-cast aluminum top housing removable for relamping, secured by two captive stainless steel screws threaded into stainless steel inserts. Clear tempered safety glass. Reflector made from pure anodized aluminum. Fully gasketed using a molded silicone high temperature gasket. Fully shielded to comply with LEED Zones 1 and higher.

Electrical: 13W LED luminaire, 15.3 total system watts, -25° C start temperature. Integral 120V through 277V electronic LED driver, dimming available with reverse phase control (trailing edge) dimmers. The LED and driver are mounted on a removable plate for easy replacement. Standard LED color temperature is 5000K with a 65 CRI. Available in 3000K (85 CRI) and 4000K (85 CRI); add suffix K3 or K4 respectively to order.

Finish: Available in four standard BEGA colors: Black (BLK); White (WHT); Bronze (BRZ); Silver (SLV). To specify, add appropriate suffix to catalog number. Custom colors supplied on special order.

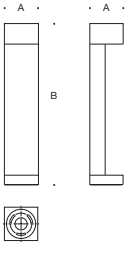
Anchor base: Heavy cast aluminum, slotted for precise alignment. Mounts to BEGA #895A anchorage kit. Bollards are secured to the post with one (1) stainless steel set screw.

UL listed, suitable for wet locations. Protection class: IP65.

Luminaire Lumens: 729
Tested in accordance with LM-79-08

Type:
BEGA Product:
Project:
Voltage:
Color:
Options:
Modified:

M



	Lamp	A	B	C	Anchorage
8657LED	13W LED	6⅜	21⅝	6⅜	**895A**

BEGA-US 1000 BEGA Way, Carpinteria, CA 93013 (805) 684-0533 FAX (805) 566-9474 www.bega-us.com

STICK MEDIA² SEAMLESS LED

TYPE: M

ORDER NUMBER: 205

PROJECT: Special: 8x8

150G

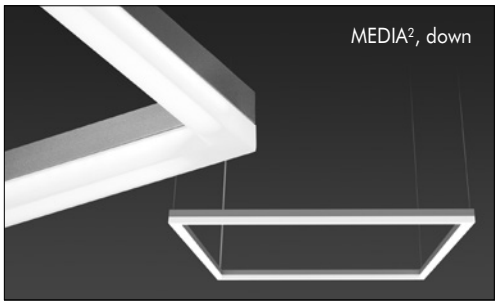
M2LD	Select	LOCW	BDMMXMOD	Select
Model #	**Size**	**LED**	**Options***	**Other Option**
M2LD–down **M2LS**–side	**2x2** **2x3** **2x4** **3x3** **3x4** **4x4**	**R**–red **B**–blue **RGB** **LOWW**–warm white* **LOCW**–cool white*	**BDIM-RGB** **BDIM-W** **BDMXMOD**	**SLRD**

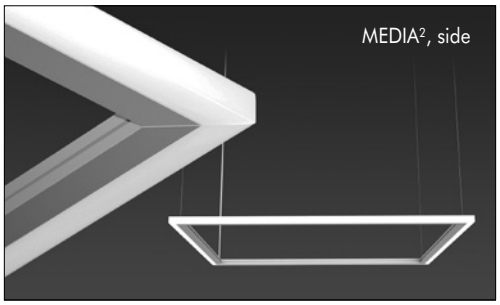
**See back page for details.*

Please review mounting info before ordering.

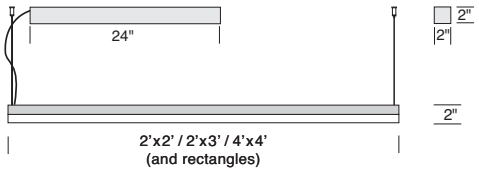
Traxon Light Drive* (order separately)

Qty **BTRAXW** (white) Qty **BTRAXB** (black)

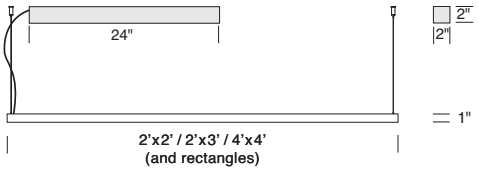




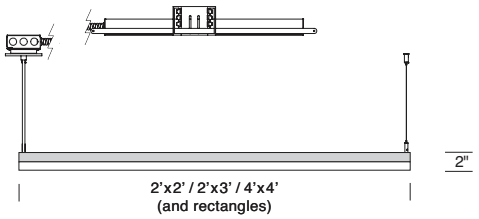
M2LD–Media Squared, Down, Pendant Mount



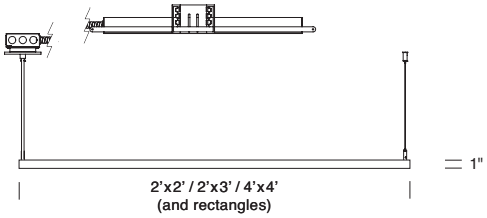
M2LS–Media Squared, Side, Pendant Mount



M2LD–Media Squared, Down, **SLRD** Mount



M2LS–Media Squared, Side, **SLRD** Mount



DELRAY LIGHTING INCORPORATED

MEDIA2 LED

BURBANK,
CALIFORNIA,
91505
WWW.
DELRAY
LIGHTING.
COM

JUN 2013

4′ X 4′ LED

M2LD4X4LOCW

CP DISTRIBUTION

Pending

COEFFICIENTS

Pending

NOTES

M2LD4X4LOCW
4'x 4' Seamless LED
Total lumens: *pending*

WATTAGE

LO–Low Output, 24W

LOWW	35K/24W	6W per ft.
LOCW	35K/24W	6W per ft.

STICK MEDIA² CONSTRUCTION

GEOMETRIC PENDANT

- *Media²* is a stand alone 2', 3', or 4' square or rectangular pendant fixture. Each fixture requires its own power feed.
- Aluminum extrusion, with a matte anodized finish, mitred corners.
- Diffuser is extruded, frosted white acrylic, mitred corners.
- Suspended with field-adjustable aircraft cable, with push-button glider.
- 8' gray 18 AWG power cord.
- Standard driver, constant voltage, 100W/24V, 120/277V, 50/60 Hz Class 2, in a remote housing.
- Back plate has a 7/8" opening for direct conduit feed and is not intended for J-box mount.
- U.L. listed for dry locations.

RGB INTERFACE CONTROL OPTIONS

RGB SEQUENCER OPTIONS
- Osram part no. OTRGBSEQUENCER, supplied.

BDIM-RGB
- Osram part no. OTRGBDIM, supplied.
- Dimming control interface for RGB LED that synchronizes the color in multiple fixtures.
- Colors are mixed manually by adjusting three 0-10V wall dimmers, or three 100K Ohm potentiometres. 0-10V converter is required for DMX control. Additional 18/4 control cable, from fixture to canopy, is supplied. Controls by others.

BDIM-White
- For white LEDs only.
- Osram part no. OT96W/24V UNV 0-10V supplied.
- Use with 0–10V, purple/gray wire analog dimmers.

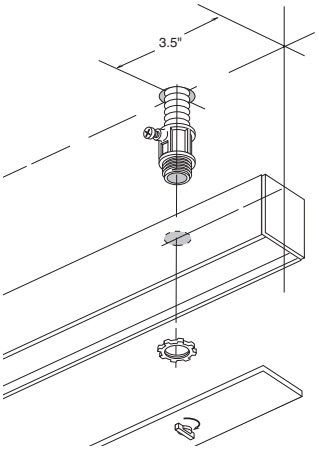
BDMXMOD
- Osram part no. OTDMXRGB supplied.
- DMX control interface for RGB LED.
- Provides DMX control with protocols that meet USITT DMX-512A or DMX512 (DIN 56930-2). No converter is required. DMX controls by others.
- A second 3-conductor control cable to fixture canopy is supplied.

TRAXON LIGHT-DRIVE RGB (order separately)

BTRAXW–white controller
BTRAXB–black controller (shown)
- Standalone, wall-mounted (12V power supply included) DMX controller for RGB LED that provides direct access to fixtures in two lighting zones.
- Tune color and brightness with the Light-Drive wheel.
- Two sequence modes enable continuous replay of all saved color settings, as well as a preset color-phase function, which can be adjusted in replay speed.
- Fully dimmable white mode button.
- See www.traxon-usa.com for details.

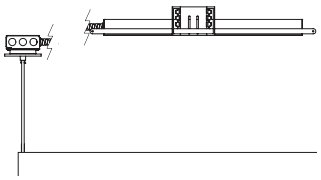
DRIVER/RAIL MOUNT INFO

Media² driver and rail housings are shipped with one opening for direct connection to conduit with a third party 1/2" fitting (as shown below). To locate input power elsewhere, an alternate 7/8" opening may be drilled at the job site anywhere along the top of the aluminum rail housing.



RECESSED LED DRIVER

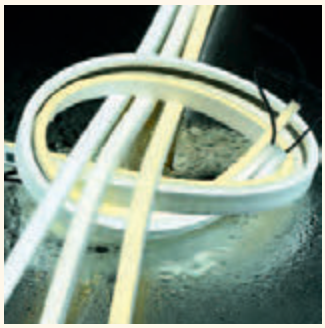
Driver must be accessible after installation. Order **SLRD**.

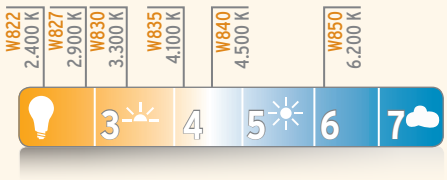


Max. Wiring Distance (at full load)

Wire Size (AWG)	Distance (ft.)
18	18
16	29
14	46
12	71
10	120

VarioLED™ Flex VENUS W TV IP67





10 Watt/meter

360 lumen/meter (lm/m)

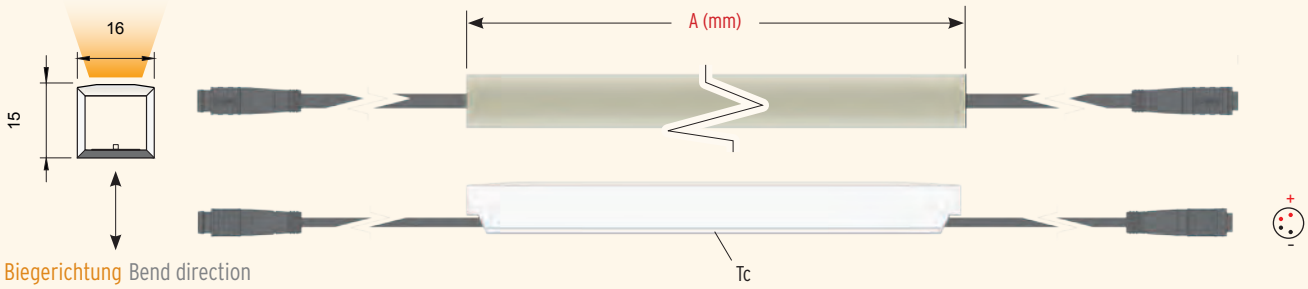
Ra/CRI 85

IP67

Abmessungen & Längen Dimensions & available length

R_{min} = 30 cm
R_{min} = 30 cm

110 mm IP67 Steckverbinder (Buchse/Stecker) an den Enden
110 mm IP67 plug in connector (male/female) on both ends



Biegerichtung Bend direction

Toleranz +/- 5 mm Tolerance +/- 5 mm

Tc-Punkt: Rückseite des Moduls Tc-point: Rear side of module

A = N x 54,67 + 25; N = 1 ... 135; A_{min} = 1 x 54,67 + 25 = 80; A_{max} = 135 x 54,67 + 25 = 7.405,5

Refer to Lighting Schedule for Different Lengths

Bestellnummer Order Code: VarioLED Flex VENUS Wxxx/A TV IP67

Elektrische & Optische Betriebsdaten Electrical & optical data

Abmessungen Dimensions	A x 15 mm x 16 mm
Leistung Power	10 W/meter
Spannung Voltage (V)	24 Volt (23 V_{min}, 25 V_{max})
Temperatur Temperature	tc_{min} = -25°C, tc_{max} = +60°C
Lagertemp. Storage temp.	t_{min} = -25°C, t_{max} = +85°C
Außentemperatur Ambient temp.	ta_{min} > -25°C, ta_{max} = 45°C

Lebensdauer
Lifetime

LM 79 konform
LM 79 compliant

LM 80 konform
LM 80 compliant

VarioLED™ Flex VENUS White TV IP67	lumen/meter (lm/m)	Ra/CRI	Farbtemperatur/ Color Temperature (K)
W822	330	80	2.400
W827	345	85	2.900
W830	345	85	3.300
W835	353	85	4.100
W840	360	85	4.500
W850	360	85	6.200

Nähere Erläuterungen zu Änderungen, Grenzwerten und Schwankungen im Herstellungsprozess finden Sie im LED Linear™ Hauptkatalog, Seite 361.

For more details regarding catalogue changes, min and max data sheet values and production tolerances see the LED Linear™ main catalogue, page 361.

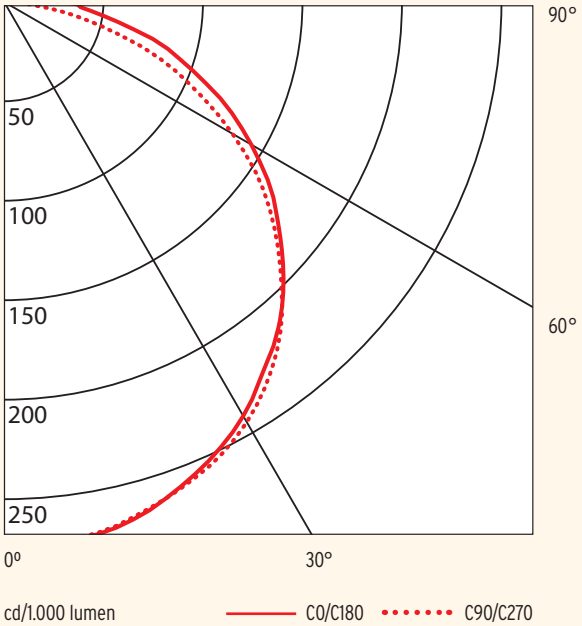
Sicherheits- und Montagehinweise: LED Linear™ Hauptkatalog, Seite 362 ff. Safety and assembly information: LED Linear™ main catalogue, page 364 ff.

Ausschreibungstext Specification text

VarioLED™ Flex VENUS White TV IP67
24 V, opal vergossene flexible LED Lichtlinie in IP67 für Architektur und Innenausbau. Mit selbstklebendem 3M Klebeband auf der Rückseite. Homogene lichtpunktfreie Ausleuchtung bei geringsten Bautiefen.
10 W/m, 360 lm/m. Querschnitt 15 mm x 16 mm. Länge bis zu 7,4 Meter. 110 mm IP67 Steckverbinder an beiden Enden. L80 von 50.000 h. Hohe Beständigkeit in rauen klimatischen Bedingungen. Salzwasser-, UV-, Chlor- und Lösungsmittelbeständig. Made in Germany.

VarioLED™ Flex VENUS White TV IP67
24 V, flexible fully opal encapsulated IP67 protected LED light line for architecture and interior design. 3M self adhesive tape on rear side. Homogeneous and dot free illumination in very low installation depths.
10 W/m, 360 lm/m. Cross section of 15 mm x 16 mm. Length up to 7.4 meter. 110 mm IP67 plug in connectors on both ends. L80 of 50,000 hrs. Easy installation and a rugged design for harsh environments (e. g. resistant to salt water, UV, chlorine and solvents). Made in Germany.

VarioLED™ Flex VENUS W840/244 TV IP67



UV geschützt
UV protected

Lösungsmittel geschützt
Resistant to solvents

Salzwasser geschützt
Saltwater resistant

Schutz beim Eintauchen
Temporary immersion protection

VarioLED™ Flex VENUS W TV basiert auf unserem Produkt VarioLED™ Flex ATON 2.

Durch die verwendete Venustechnologie ergibt sich eine Farbabweichung zum LED Flex Band, die jedoch keinen Einfluss auf die Gesamthomogenität hat.

VarioLED™ Flex VENUS W TV is based on our product VarioLED™ Flex ATON 2.

The encapsulation technology causes a color temperature drift compared to the flex tape color temperature. There is no effect on homogeneity.

Zubehör Accessories

erforderlich required

24 V DC
Konverter
Power supply unit

optional optional

1...10 V | DMX | Remote | DALI
Steuerprotokoll
Power control system

Profil VENUS TV
Contour VENUS TV

reddot design award winner 2012

Sicherheits- und Montagehinweise: LED Linear™ Hauptkatalog, Seite 362 ff. Safety and assembly information: LED Linear™ main catalogue, page 364 ff.

SPECIFICATION SHEET

lumendome™

MEDIUM
COLOR CHANGING

Client: _____

Project name: _____

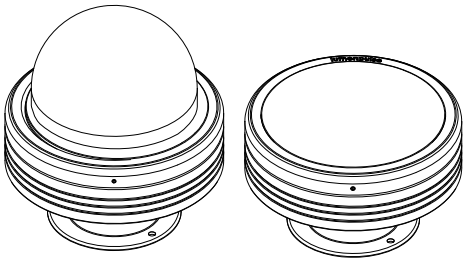
Order #: _____

Type: _____ Qty: _____

FEATURES AND BENEFITS

Physical :

- Low copper content machined aluminum housing
- Electro-statically applied polyester powder coat finish
- High impact UV protected polycarbonate lens
- Sealing gasket included
- Canopy or Wall Mount mounting options
- Flat Lens option
- 1,54 kg / 3,41 lbs
- IP66
- Corrosion-resistant option for marine environments



FLAT LENS OPTION SHOWN

Performance :

- 95 delivered lumens at full intensity
- 2,618 cd/m² @ 0°
- Lumen maintenance 120,000 hrs [L70 @ 25°C]
- Lumen measurements comply with LM - 79 - 08 standard
- Operating temperatures: -25° C to 50° C [-13F to 122F]

Electrical :

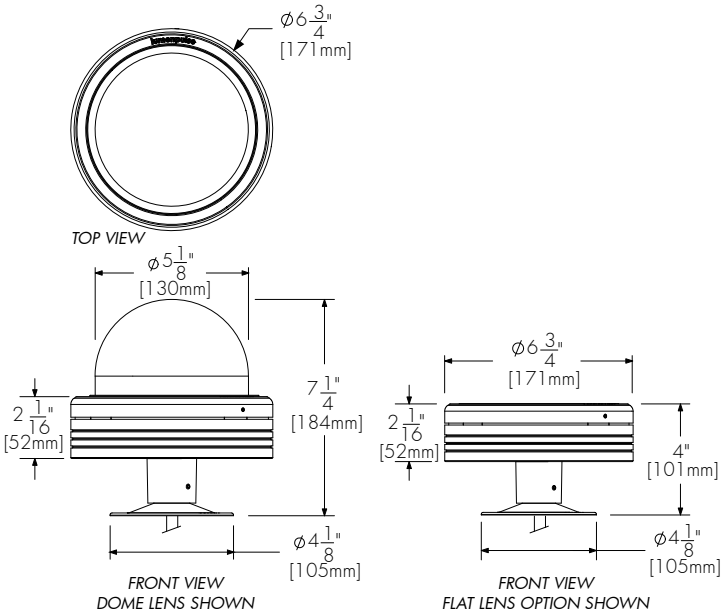
- 48V DC luminaire, remote driver & data supply available for 120-277V AC
- Power and data in 1 cable, 3ft /1m cord (#18-5)
- 12 watts DC power (total consumption varies according to remote power supply efficiency)
- DMX 512 ready

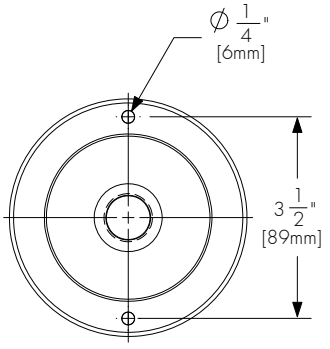
Wiring detail

WIRE COLOR /	*USE*
WHITE	*POWER - 48V*
GREEN	*GROUND*
BLACK	*POWER + 48V*
ORANGE	*DATA -*
RED	*DATA +*

CE Color Code

WIRE COLOR /	*USE*
BLUE	*POWER - 48V*
YELLOW/GREEN	*GROUND*
BROWN	*POWER + 48V*
GREY	*DATA -*
BLACK	*DATA +*





Canopy Mounting
Mounting base
screw hole pattern

5 year warranty

CN
Canopy Mounting

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info@lumenpulse.com **www.lumenpulse.com**

2013.04.22
EM - R4

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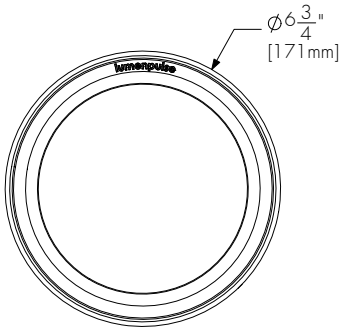
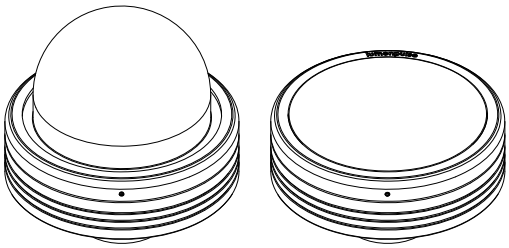
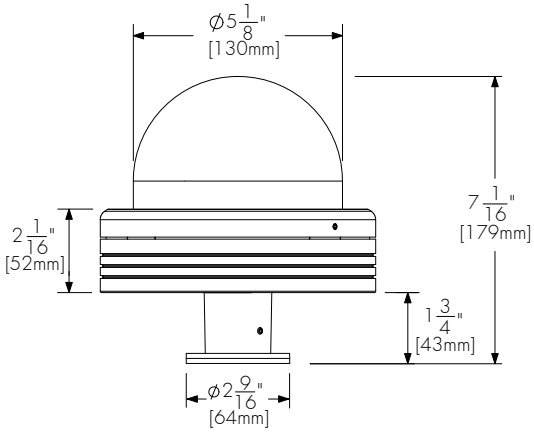
WALL MOUNT OPTION



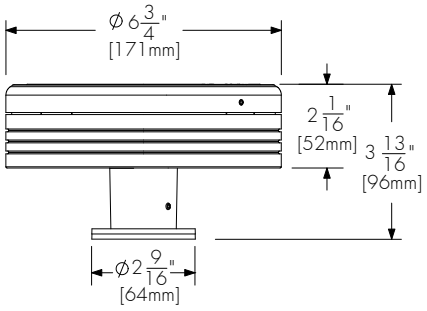
TOP VIEW



FLAT LENS OPTION SHOWN

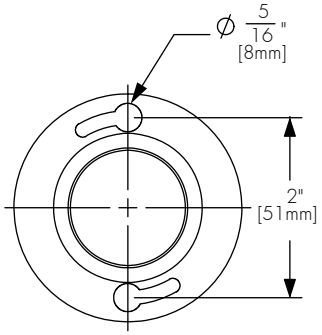


FRONT VIEW
DOME LENS SHOWN



FRONT VIEW
FLAT LENS OPTION SHOWN

WM
Wall Mount Option



Wall Mount Option
Mounting base
screw hole pattern

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ACCESSORIES

Order separately

Control Systems:

LTO Lumentouch is a wall mount DMX 512 controller keypad

LCU Lumencue is a USB / mini SD DMX 512 controller

LID LumenID is a diagnostic and addressing DMX 512 controller.
It must be specified on all DMX applications.
Refer to LID specification sheet for details.

LTN Lumentone is a simple pre-programmed DMX 512 controller
with a push button rotary dial and live feedback.

Exterior Remote Control Boxes

CBOX60-___-48V-___ Exterior power & data box, 60W load maximum
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures (48V DC & data), M20 provision holes with plugs.
Please specify input voltage and finish (SI - silver standard finish).
Refer to CBOX60 & CBOX100 specification sheet for details.

CBOX100-___-48V-___ Exterior power & data box, 100W load maximum
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures (48V DC & data), M20 provision holes with plugs.
Please specify input voltage and finish (SI - silver standard finish).
Refer to CBOX60 & CBOX100 specification sheet for details.

Interior Remote Control Boxes

iCBOX60-___-48V-___ Interior power & data box, 60W load maximum
(8X) 1/2" and (8X) 3/4" knockouts total.
Up to six outputs to fixtures (48V DC & data).
Please specify input voltage and finish.
Refer to iCBOX60 & iCBOX100 specification sheet for details.

iCBOX100-___-48V-___ Interior power & data box, 100W load maximum
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Up to six outputs to fixtures (48V DC & data).
Please specify input voltage and finish.
Refer to iCBOX60 & iCBOX100 specification sheet for details.

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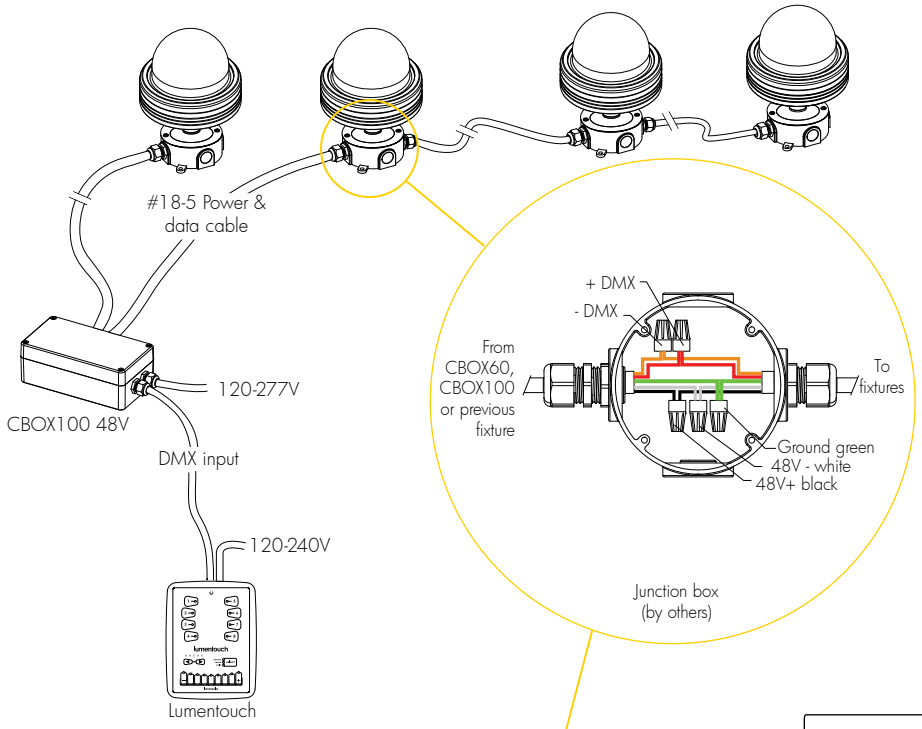
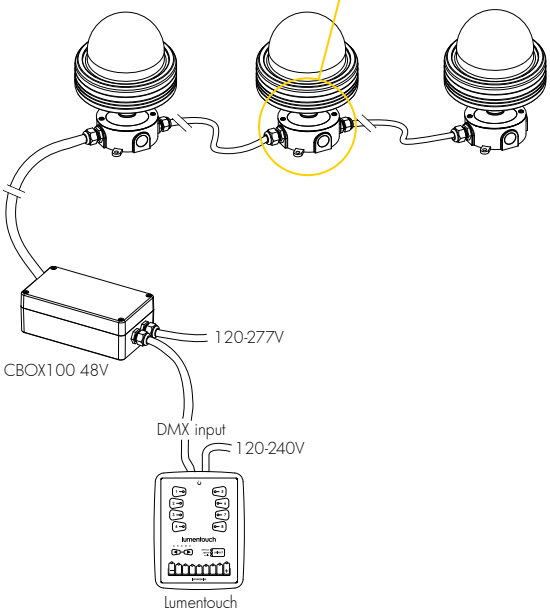
TYPICAL WIRING DIAGRAMS

Star Layout (DMX)



Maximum distance and quantity of fixtures per CBOX100:
7 Lumendome medium 48V DC
(10' on center spacing) - 220' of cable maximum.

Daisy Chain Layout (DMX)



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info@lumenpulse.com **www.lumenpulse.com**

HOW TO ORDER

LMDM	48V	RGB	WH	WM	
Housing	Voltage	Colors and color temperatures	Finish	Mounting Option	Option
1	2	3	4	5	6

1

Housing:

LMDM - Lumendome™ Medium

2

Voltage:

*48V DC fixture. Refer to accessories on page 3 for control & power supply box options.

3

Colors and Color temperatures:

RGB - Additive red, green and blue

4

Finish:

SI - Silver SandText

BK- Black SandText

WH - White

CC - Custom (please specify RAL color)

5

Mounting Option:

Please specify one of the following:

CN - Canopy cover mounting

WM - Wall Mount option

6

Option:

FTL - Flat Lens

CRC - Corrosion-resistant Coating

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EM - R4

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SPECIFICATION SHEET

lumendome™

MEDIUM
COLOR CHANGING

Client: _____

Project name: _____

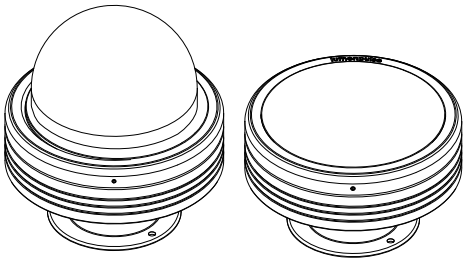
Order #: _____

Type: _____ Qty: _____

FEATURES AND BENEFITS

Physical :

- Low copper content machined aluminum housing
- Electro-statically applied polyester powder coat finish
- High impact UV protected polycarbonate lens
- Sealing gasket included
- Canopy or Wall Mount mounting options
- Flat Lens option
- 1,54 kg / 3,41 lbs
- IP66
- Corrosion-resistant option for marine environments



FLAT LENS OPTION SHOWN

Performance :

- 95 delivered lumens at full intensity
- 2,618 cd/m² @ 0°
- Lumen maintenance 120,000 hrs [L70 @ 25°C]
- Lumen measurements comply with LM - 79 - 08 standard
- Operating temperatures: -25° C to 50° C [-13F to 122F]

Electrical :

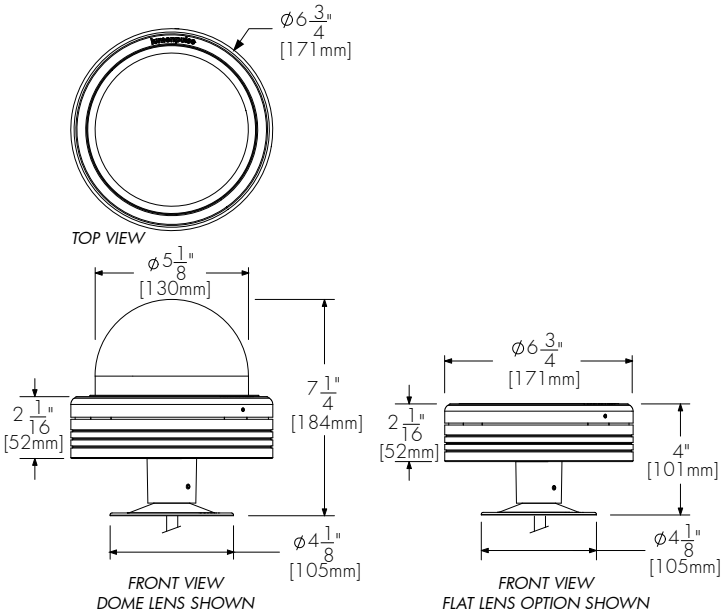
- 48V DC luminaire, remote driver & data supply available for 120-277V AC
- Power and data in 1 cable, 3ft /1m cord (#18-5)
- 12 watts DC power (total consumption varies according to remote power supply efficiency)
- DMX 512 ready

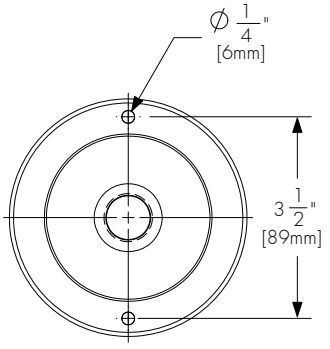
Wiring detail

WIRE COLOR /	*USE*
WHITE	*POWER - 48V*
GREEN	*GROUND*
BLACK	*POWER + 48V*
ORANGE	*DATA -*
RED	*DATA +*

CE Color Code

WIRE COLOR /	*USE*
BLUE	*POWER - 48V*
YELLOW/GREEN	*GROUND*
BROWN	*POWER + 48V*
GREY	*DATA -*
BLACK	*DATA +*





Canopy Mounting
Mounting base
screw hole pattern

5 year warranty

CN
Canopy Mounting

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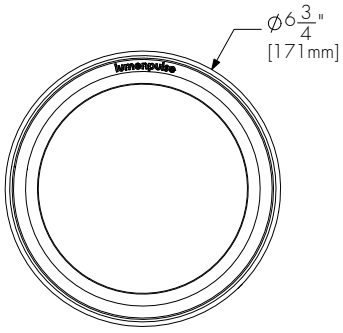
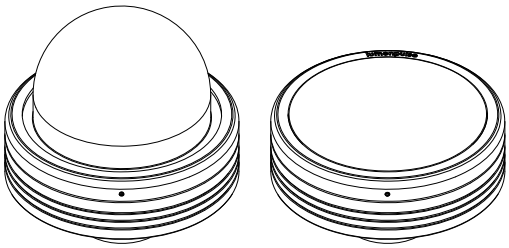
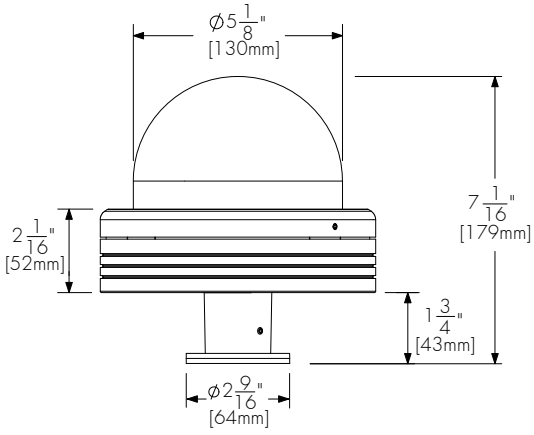
WALL MOUNT OPTION



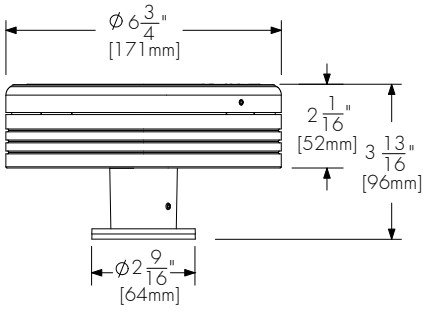
TOP VIEW



FLAT LENS OPTION SHOWN

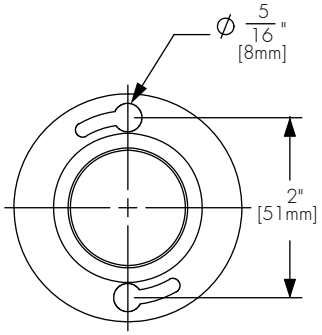


FRONT VIEW
DOME LENS SHOWN



FRONT VIEW
FLAT LENS OPTION SHOWN

WM
Wall Mount Option



Wall Mount Option
Mounting base
screw hole pattern

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info@lumenpulse.com **www.lumenpulse.com**

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ACCESSORIES

Order separately

Control Systems:

LTO Lumentouch is a wall mount DMX 512 controller keypad

LCU Lumencue is a USB / mini SD DMX 512 controller

LID LumenID is a diagnostic and addressing DMX 512 controller.
It must be specified on all DMX applications.
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LTN Lumentone is a simple pre-programmed DMX 512 controller
with a push button rotary dial and live feedback.

Exterior Remote Control Boxes

CBOX60-___-48V-___ Exterior power & data box, 60W load maximum
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures (48V DC & data), M20 provision holes with plugs.
Please specify input voltage and finish (SI - silver standard finish).
Refer to CBOX60 & CBOX100 specification sheet for details.

CBOX100-___-48V-___ Exterior power & data box, 100W load maximum
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures (48V DC & data), M20 provision holes with plugs.
Please specify input voltage and finish (SI - silver standard finish).
Refer to CBOX60 & CBOX100 specification sheet for details.

Interior Remote Control Boxes

iCBOX60-___-48V-___ Interior power & data box, 60W load maximum
(8X) 1/2" and (8X) 3/4" knockouts total.
Up to six outputs to fixtures (48V DC & data).
Please specify input voltage and finish.
Refer to iCBOX60 & iCBOX100 specification sheet for details.

iCBOX100-___-48V-___ Interior power & data box, 100W load maximum
(8X) 1/2" and (8X) 3/4" knockouts total.
Up to six outputs to fixtures (48V DC & data).
Please specify input voltage and finish.
Refer to iCBOX60 & iCBOX100 specification sheet for details.

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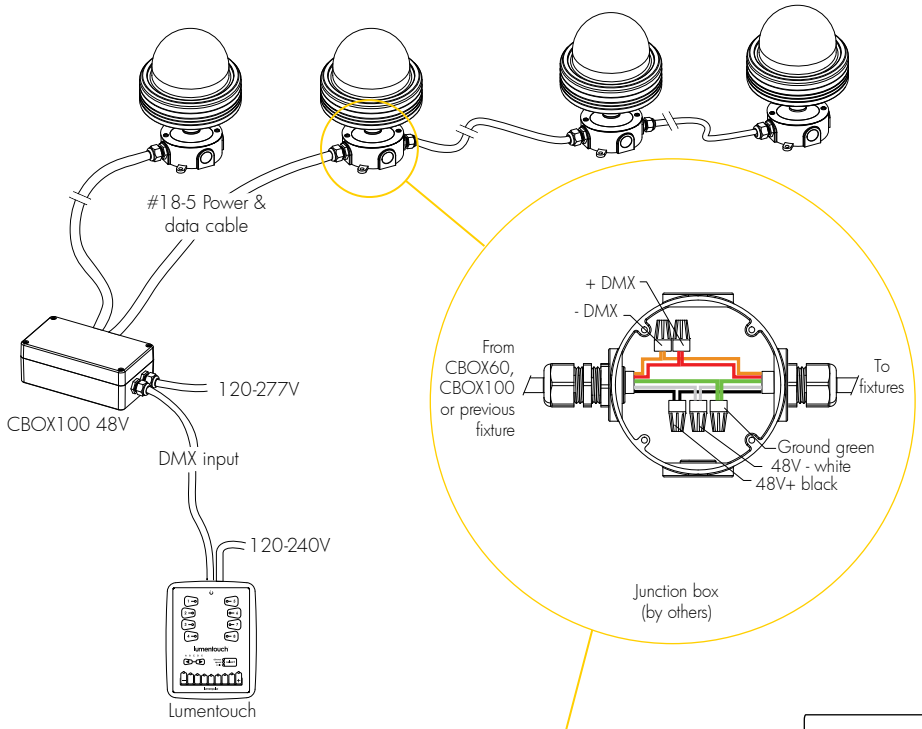
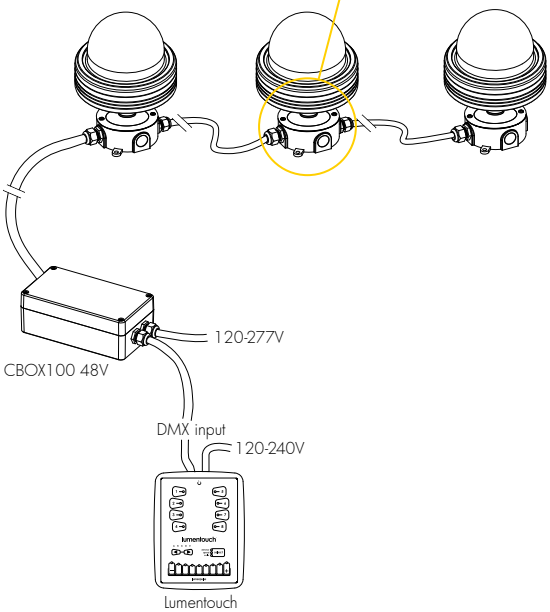
TYPICAL WIRING DIAGRAMS

Star Layout (DMX)



Maximum distance and quantity of fixtures per CBOX100:
7 Lumendome medium 48V DC
(10' on center spacing) - 220' of cable maximum.

Daisy Chain Layout (DMX)



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info@lumenpulse.com **www.lumenpulse.com**

HOW TO ORDER

LMDM	48V	RGB	WH	WM	
Housing	Voltage	Colors and color temperatures	Finish	Mounting Option	Option
1	2	3	4	5	6

1

Housing:

LMDM - Lumendome™ Medium

2

Voltage:

*48V DC fixture. Refer to accessories on page 3 for control & power supply box options.

3

Colors and Color temperatures:

RGB - Additive red, green and blue

4

Finish:

SI - Silver SandText

BK- Black SandText

WH - White

CC - Custom (please specify RAL color)

5

Mounting Option:

Please specify one of the following:

CN - Canopy cover mounting

WM - Wall Mount option

6

Option:

FTL - Flat Lens

CRC - Corrosion-resistant Coating

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info@lumenpulse.com **www.lumenpulse.com**

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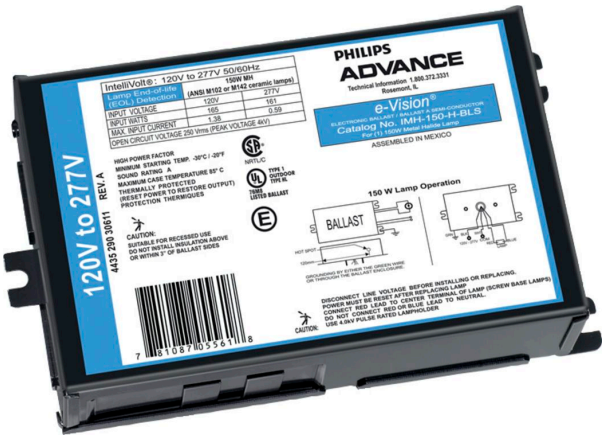
lumenpulse™

Sustainable architectural LED lighting systems



e-Vision Low Wattage 20-150W

E-VISION ELE MH BAL 150W M102/142 120-277V

Low frequency electronic HID ballasts such as the Philips Advance e-Vision line constantly measure and adjust the wattage, optimizing delivery of the ceramic lamps' superior color properties. This makes ceramic metal halide operated by e-Vision ballasts the premier choice for many applications previously illuminated by either tungsten halogen or incandescent sources, such as retail lighting.

Product data

• General Characteristics

Lamp Type	150W MH
Number of Lamps	1 piece
Input Voltage	120-277 V
Line Frequency	50/60 Hz
Ballast Type	Electronic HID
Base Model	IMH150HLF
Housing	H
Housing Dimensions	5.7" x 3.6" x 1.5"
Housing Material	Metal
Suitable for Outdoor use?	Yes
Lifetime 90% surv.@Tcaselife	50000 hr
Family Name	eVision

• Operating Characteristics

Ignition time	1200 s
Input Power Gear	165-161 W
Ballast factor	1 -
Power Factor	0.90
Lamp Current Crest Factor	1.8 -
Sound Rating	A
Max THD	15 %

• Wiring Characteristics

Color input terminals	No terminals
Color output terminals	No terminals
Connector type	No connector
Wire Striplength	0.50 mm
Control Wire Gauge	NA
Wire Gauge	18AWG
Wire Length by Color	All leads = 11"
Wire Type	Stranded
Allowed Wiring Config(Remote)	Yes
Allowed Wiring Config(Tandem)	No
Allowed Wiring Config(Through)	No

• System Chars on driver level

Rated Lamp Watts	150

• Temperature Characteristics

T-case maximum	85 C

• Product Dimensions

Length A1	6.3 in
Length A2	5.7 in
Length A3	6.0 in
Width B1	3.6 in
Height C1	1.5 in
Length A4	2.0 in
Width B2	2.9 in

• Approval & Application Chars

EMC Immunity	FCC Non-Consumer
CE marking	No
ENEC certificate	No
VDE certificate	No
UL Listed	Yes
CSA certificate	Yes
CEC Listing	No

PHILIPS

e-Vision Low Wattage 20-150W

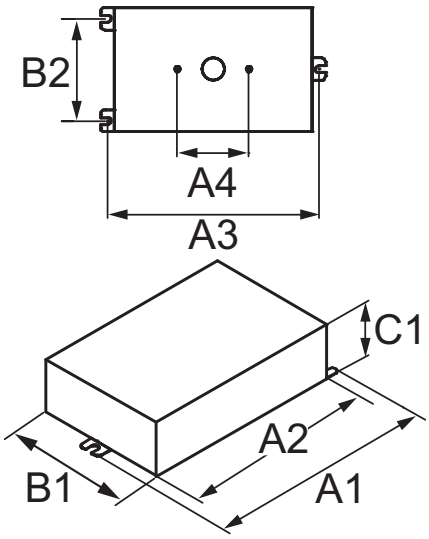
CSA Recognized	No
cUL certificate	No
EISA	No
FIDE Certificate	No
NOM certificate	Yes
RoHS Compliant	Yes
SASO Certificate	No
UL Recognized	No
ANSI Code	C102/M102, C142/M142

Full product name	ELE MH BAL 150W M102/142 120-277V
Short product name	ELE MH BAL 150W M102/142 120-277V
Pieces per Sku	1
Skus/Case	6
Bar code on pack	781087055595
Bar code on case	50781087055606
Logistics code(s)	913710295902
eop_net_weight_pp	0.885 kg

- Product Data

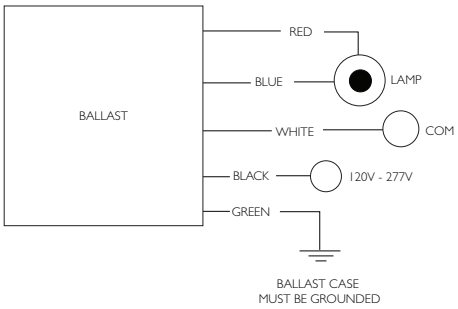
Product number	IMH150HLFM

Dimensional drawing



E-VISION ELE MH BAL 150W M102/142 120-277V

Product	A1 (Norm)	A2 (Norm)	A3 (Norm)	A4 (Norm)	A5 (Norm)	B1 (Norm)	B2 (Norm)	C1 (Norm)
ELE MH BAL 150W M102/142 120-277V	6.3	5.7	6.0	2.0	-	3.6	2.9	1.5



www.philips.com/lighting

2014, February 1
data subject to change

MasterColor Ceramic Metal Halide Tubular Single-Ended T6 Lamps (391, 392, 396, 397)

Enclosed luminaires only; lifetime color stability within ±200K

39	T6	G12	22328-9	★	CDM35/T6/830	C130/E	12	G, Clear, FadeBlock	2 7/32	3 15/16	12,000	3300	2600	81	3000
			20886-8	★	CDM35/T6/842	C130/E	12	G, Clear, FadeBlock	2 7/32	3 15/16	12,000	3300	2800	84	4200
70	T6	G12	22337-0	★	CDM70/T6/830	C139/E	12	G, Clear, FadeBlock	2 7/32	3 15/16	12,000	6600	4950	81	3000
			28137-8	★	CDM70/T6/942	C139/E	12	G, Clear, FadeBlock	2 7/32	3 15/16	12,000	6600	4620	92	4200
150	T6	G12	23272-8	★	CDM150/T6/830	C142/E	12	G, Clear, FadeBlock, also ANSI M102	2 7/32	4 11/32	12,000	14,000	9800	85	3000
			37369-6	★	CDM150/T6/942	C142/E	12	G, Clear, FadeBlock, also ANSI M102	2 7/32	4 11/32	12,000	12,700	8900	96	4200

SPECIFICATION SHEET

iCBOX60 & iCBOX100™

FOR 48V DC FIXTURES
PRELIMINARY

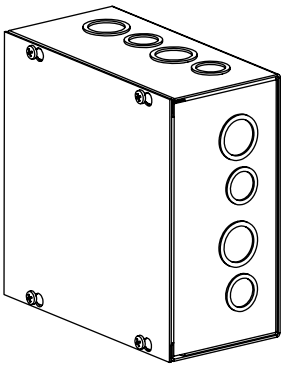
Client: _____

Project name: _____

Order # _____

Type: _____ Qty: _____

FEATURES AND BENEFITS



Physical :

- Steel enclosure and cover, 16 gauge
- Epoxy textured grey powder coat finish inside and out
- Data input, 1/2" NPT provision hole
- Power input, 1/2" NPT provision hole
- Up to six outputs, 1/2'' NPT provision holes
- Mounting holes on back
- Indoor applications only
- Operating temperatures: -25°C to 50°C [-13F to 122F]
- iCBOX60W: 2.70 kg / 5.90 lbs
- iCBOX100W: 3.65 kg / 8.00 lbs

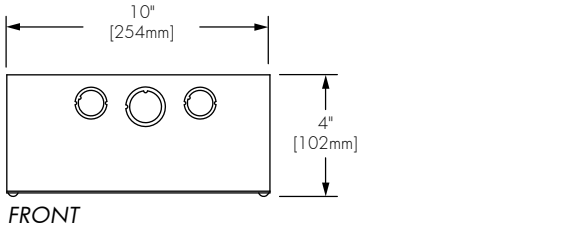
Electrical :

- 120 to 277V input
- 48V DC output
- 60W and 100W available
- Grounding screws included

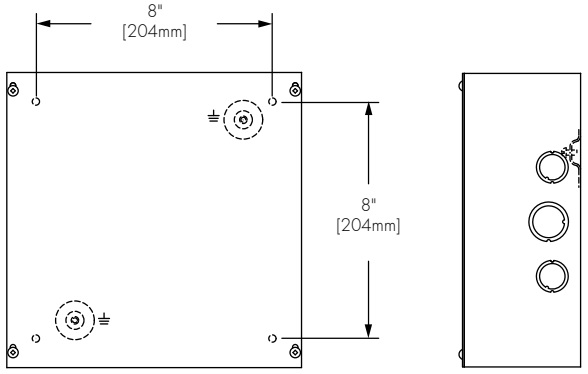
*Strain relief connectors and cables by others.

Related Products

LUMENDOME NANO WHITE, DMX DIMMING
LUMENDOME NANO COLOR CHANGING
LUMENDOME SMALL WHITE, DMX DIMMING
LUMENDOME SMALL COLOR CHANGING
LUMENDOME MEDIUM WHITE, DMX DIMMING
LUMENDOME MEDIUM COLOR CHANGING

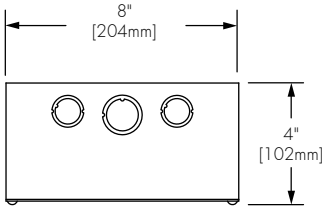


FRONT



TOP
iCBOX100W DIMENSIONS

RIGHT



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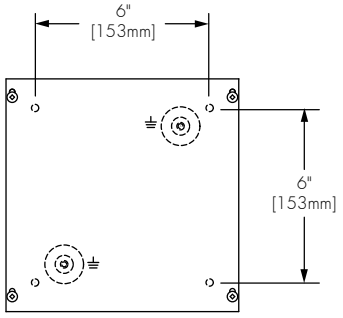
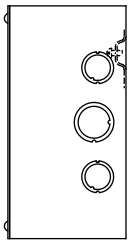


TOP
iCBOX60W DIMENSIONS



RIGHT

5 year warranty

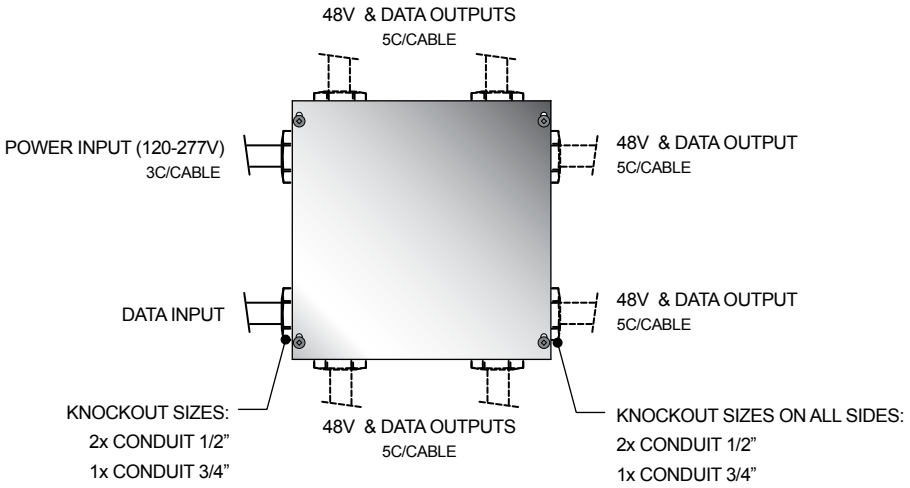
Lumenpulse, 1751 Richardson, Suite 1505, Montreal (Quebec) Canada H3K 1G6 1.877.937.3003 P. 514.937.3003 F. 514.937.6289
info@lumenpulse.com **www.lumenpulse.com**

2012.06.15
EM - R1

lumenpulse™
Sustainable architectural LED lighting systems

iCBOX60 & iCBOX100

*Strain relief connectors and cables by others.

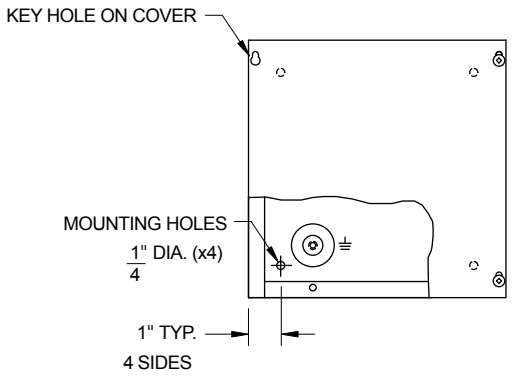


OUTPUT QUANTITY DEPENDS ON PROJECT LAYOUT.

UP TO 6 OUTPUTS TO FIXTURES.

ADD UP ALL FIXTURE RUN LOADS AND BE SURE THEY DO NOT EXCEED THE CAPACITY OF THE iCBOX .

MOUNTING



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info@lumenpulse.com www.lumenpulse.com

2012.06.15
EM - R15

lumenpulse™
Sustainable architectural LED lighting systems

HOW TO ORDER

iCBOX	277	48V	GT
Housing	Input Voltage	Output Voltage	Finish
1	2	3	4

1

Housing:

iCBOX60 - Interior DMX 512 power & data box 60W
2 separate inputs for line voltage & data
Up to (6) outpu(s) for low voltage power & data combined

iCBOX100 - Interior DMX 512 power & data box 100W
2 separate inputs for line voltage & data
Up to (6) outpu(s) for low voltage power & data combined

2

Input Voltage:

120 - 120 volts

208 - 208 volts

220/240 - 220 to 240 volts

277 - 277 volts

3

Output Voltage :

48V - 48 volts DC

4

Finish:

GT - Standard grey polyester - epoxy textured

CC - Custom (please specify RAL color)

Lumenpulse, 1751 Richardson, Suite 1505, Montreal (Quebec) Canada H3K 1G6 1.877.937.3003 P. 514.937.3003 F. 514.937.6289
info@lumenpulse.com **www.lumenpulse.com**

2012.06.15
EM - R1

lumenpulse™

Sustainable architectural LED lighting systems

Appendix D

TRACE Export Data (Mechanical Breadth)

Energy Cost Budget / PRM Summary

By ACADEMIC

Project Name:	Date: April 04, 2014
City:	Weather Data: Syracuse, New York

Note: The percentage displayed for the "Proposed/ Base %" column of the base case is actually the percentage of the total energy consumption.

* Denotes the base alternative for the ECB study.

		* Alt-1			Alt-2		
		Energy 10^6 Btu/yr	Proposed / Base %	Peak kBtuh	Energy 10^6 Btu/yr	Proposed / Base %	Peak kBtuh
Lighting - Conditioned	Electricity	507.7	4	58	507.7	100	58
Space Heating	Electricity	102.7	1	19	101.6	99	19
	Gas	10,774.6	92	3,816	10,662.9	99	3,792
Space Cooling	Electricity	253.9	2	546	247.2	97	541
Heat Rejection	Electricity	31.3	0	60	30.3	97	59
Total Building Consumption		**11,670.2**			**11,549.7**		

		* Alt-1	Alt-2
Total	**Number of hours heating load not met**	0	0
	Number of hours cooling load not met	0	0

	* Alt-1		Alt-2	
	Energy 10^6 Btu/yr	Cost/yr $/yr	Energy 10^6 Btu/yr	Cost/yr $/yr
Electricity	895.6	6,686	886.8	6,609
Gas	10,774.6	38,997	10,662.9	38,562
Total	**11,670**	**45,684**	**11,550**	**45,171**

ENERGY CONSUMPTION SUMMARY

By ACADEMIC

	Elect Cons. (kWh)	Gas Cons. (kBtu)	% of Total Building Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Alternative 1					
Primary heating					
Primary heating		10,774,589	92.3 %	10,774,589	11,341,673
Other Htg Accessories	30,093		0.9 %	102,708	308,155
Heating Subtotal	**30,093**	**10,774,589**	**93.2** %	**10,877,297**	**11,649,828**
Primary cooling					
Cooling Compressor	74,236		2.2 %	253,369	760,183
Tower/Cond Fans	9,179		0.3 %	31,327	93,989
Condenser Pump			0.0 %	0	0
Other Clg Accessories	144		0.0 %	493	1,479
Cooling Subtotal....	**83,560**		**2.4** %	**285,189**	**855,651**
Auxiliary					
Supply Fans			0.0 %	0	0
Pumps			0.0 %	0	0
Stand-alone Base Utilities			0.0 %	0	0
Aux Subtotal....			0.0 %	0	0
Lighting					
Lighting	148,755		4.4 %	507,702	1,523,258
Receptacle					
Receptacles			0.0 %	0	0
Cogeneration					
Cogeneration			0.0 %	0	0
Totals					
Totals**	**262,408**	**10,774,589**	**100.0** %	**11,670,187**	**14,028,737**

* Note: Resource Utilization factors are included in the Total Source Energy value.
** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.

ENERGY CONSUMPTION SUMMARY

By ACADEMIC

	Elect Cons. (kWh)	Gas Cons. (kBtu)	% of Total Building Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Alternative 2					
Primary heating					
Primary heating		10,662,873	92.3 %	10,662,873	11,224,077
Other Htg Accessories	29,755		0.9 %	101,552	304,688
Heating Subtotal	**29,755**	**10,662,873**	**93.2** %	**10,764,425**	**11,528,765**
Primary cooling					
Cooling Compressor	72,293		2.1 %	246,738	740,287
Tower/Cond Fans	8,886		0.3 %	30,328	90,993
Condenser Pump			0.0 %	0	0
Other Clg Accessories	141		0.0 %	482	1,447
Cooling Subtotal....	**81,321**		**2.4** %	**277,548**	**832,727**
Auxiliary					
Supply Fans			0.0 %	0	0
Pumps			0.0 %	0	0
Stand-alone Base Utilities			0.0 %	0	0
Aux Subtotal....			0.0 %	0	0
Lighting					
Lighting	148,755		4.4 %	507,702	1,523,258
Receptacle					
Receptacles			0.0 %	0	0
Cogeneration					
Cogeneration			0.0 %	0	0
Totals					
Totals**	**259,831**	**10,662,873**	**100.0** %	**11,549,675**	**13,884,749**

* Note: Resource Utilization factors are included in the Total Source Energy value.
** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.