Final Thesis Report

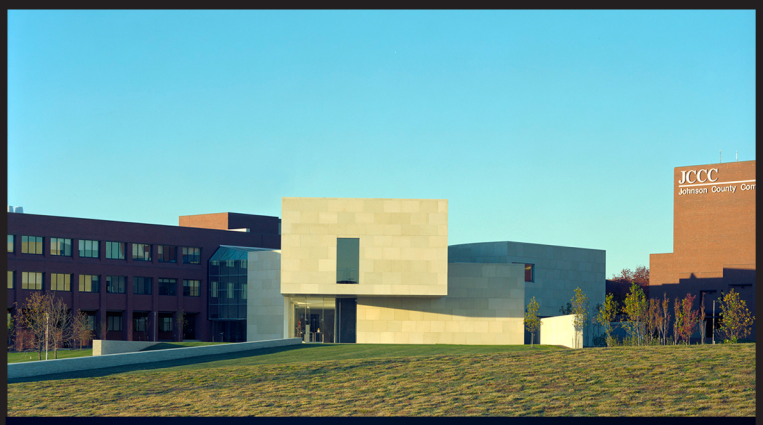
jack risser | lighting/electrical

s. good | the nerman museum

overland park, kansas | feb 16th, 2014

The Nerman Museum of Contemporary Art

Jack Risser | Lighting / Electrical



Project Team

Architect | Kyu Sung Woo Architects

Lighting | Lam Partners

MEP | Smith & Boucher

Structural | Walter P. Moore

Contractor | JE Dunn Construction

Statistics

Location | Overland Park, KS

Occupancy | Museum

Size | 38,190 FT^2 (GSF)

Levels | 2 above grade | 2 total

Construction | April 05 - August 07

Delivery | Design - Bid - Build

Building Systems

Lighting

Using a combination of compact fluorescent and halogen downlights, the general ambient lighting is satisfied for most of the spaces in the building. Halogen PAR lamps on track provide all of the display and art lighting. A light installation by Leo Villareal on the underside of the cantilever block serves as a decorative showcase.

Electrical

Primary service to the building is provided by JCCC. The primary utility transformer steps power down to 480/277V 3P 4W to distribute to mechanical and kitchen equipment. The lighting and receptacle loads are then stepped down by another secondary dry type transformer to a 208/120V Delta-Wye. Emergency power is provided by existing college generator and utilizes an onsite ATS.

Mechanical

Six air handling units – three inside and three outside – provide a total of 66500 CFM to the building. One air cooled chiller and Variable air volume terminal units are used within the branch duct scheme.

Structural

The overall structural system is concrete slab on concrete load bearing walls. The cantilever is supported by upturn beams. Slab on grade with transfer girders transfer the foundation loads to a pier system.

Architecture

Designed by Kyu Sung Woo Architects in Cambridge, MA, The Nerman Museum of Contemporary Art stands out from the other Johnson County Community College buildings it belongs to. Built in a modern, clean approach, the architecture is simple and elegant. Local white limestone covers the façade while expansive glass windows create voids. The dramatic cantilever overhang that is part of the second floor creates a bold entrance for the museum. The Nerman Museum is meant to be a piece of art, just as much as the art it is intended to protect inside.

Executive Summary:

This report will focus on a lighting design depth, an electrical analysis depth, a structural breath, and an acoustical breadth. These studies were also examined for their integration with each other. By looking at these systems and how they are put together, a thorough overall design was completed. The five spaces that will be focused on are: The exterior and grounds, the solarium, the café, the auditorium, and a second floor gallery.

The grounds and exterior of the museum was left largely intact, with just a few adjustments to walkway lighting that further enhanced the minimal architecture. The solarium was transformed into a piece of art. By using the wind and sun to its advantage, the space was converted to a place of visual interest much like the LED light installation found at the buildings entrance. The café, using existing lines of architecture and forms, was made into a glowing leaf that promotes warmth and comfort. By bringing in daylight to the auditorium, the space feels more bright and alert, while adding some visual interest. Being the main attraction, the gallery space needed to focus on the art. By hiding the track fixtures into the grazed fabric panels, the art is allowed to stand out and not compete with lines of track fixtures carving into the ceiling.

The electrical system was also redesigned for those areas touched by the lighting depth. A branch circuit redesign, short circuit study provides the safety needed for overcurrent and power outages. These analyses were imperative to make sure the new lighting was up to date and reasonable at an engineering perspective. Integration between the solar protection system in the solarium and a wind power harvesting system was also studied as part of an art installation. While this power system may not generate a lot of useable electricity for the building, its connection to the power of the wind and time of day, will prove to be an informative form of art.

A structural redesign was also needed to fully realize the lighting concept in the auditorium. By introducing skylights into the space, the joists needed to span more, creating the need to resize the metal roof deck, and joists above the ceiling in the auditorium.

Due to the redesigned ceiling in the auditorium and the added PVC material, a study into how these ceiling panels would affect the acoustics of the space was needed. It was found that the absorptive quality of these panels lowered the RT too far. The back wall also needed to be redesign to another material in order for the whole room to function acoustically.

Table of Contents:

Background:

Location Building name

The Nerman Museum of Contemporary Art

Location and site

Johnson County Community College

Overland Park, KS

Building Occupant Name

The Nerman Museum

Occupancy or function types

Education | Art Gallery | Café

Size

38,190 SF

Number of stories above grade / total levels

2 stories above grade | 2 total

Dates of construction

Start: April 2005

Completion: August 2007

Actual cost information

Approx. $15 million

Details not released

Project delivery method

Design Bid Build

Building Statistics:

General Building Data

Building name

The Nerman Museum of Contemporary Art

Location and site

Johnson County Community College

Overland Park, KS

Building Occupant Name

The Nerman Museum

Occupancy or function types

The building occupants primarily consist of the patrons of the museum and the staff that maintain it. Being attached to an existing college building allows the students and staff to easily flow through each space, creating a connection between the arts and academia.

Education | Art Gallery | Café

Size

38,190 SF

Number of stories above grade / total levels

2 stories above grade | 2 total

Primary Project Team

Owner: The Nerman Museum of Contemporary Art | Johnson County Community College | http://www.nermanmuseum.org/welcome

Construction Manager: JE Dunn Construction | http://www.jedunn.com/

Architect: Kyu Sung Woo Architects, Inc | http://www.kswa.com/

Architect of Record: Gould Evans Goodman | http://www.gouldevans.com/

Landscape Architect: Reed Hilderbrand | http://www.reedhilderbrand.com/

Structural Engineer: Walter P. Moore| http://www.walterpmoore.com/

MEP Engineer: Smith & Boucher| http://www.smithboucher.com/

Civil Engineer: Kaw Valley Engineering | http://www.kveng.com/

Tech Consultant: KJWW Engineering Consultants | http://www.kjww.com/

Acoustical Consultant: Acoustical Design Group| http://www.heieng.com/Pages/ADGAcquisition/

Food Service: Santee Becker | no link available

Dates of construction

Start: April 2005

Completion: August 2007

Actual cost information

Aprox. $15 million

Details not released

Project delivery method

Design Bid Build

Architecture

Architecture

Using bold and regular geometrical shapes, Kyu Sung Woo created an elegant, minimalist building that houses a wide range of activities. Its main function is to house the modern art that the museum displays. By using a plain, minimal approach, the interior architecture fades into the background, allowing the art to stand alone. The façade is made of local white limestone, and strategically placed windows. This style stands out from a more classical style building and reflects the modern art inside. The museum is experiential. Not only in the art that one comes to see, but in the building itself. Art can be found in the dramatic, central staircase, the gallery clerestories and giant windows, and the glass encased solarium. The Nerman Museum is meant to be a piece of art, as much as the art it protects inside.

Major national model codes

IBC 2003

NEC 2005

International Existing Building Code

International Fire Code

International Plumbing Code

International Energy Code

International Mechanical Code

International Fuel Gas Code

International Property Maintenance Code

International Private Sewage Disposal Code

Zoning

Chapter 18.27

Commercial – 2 Zoning: Planned General Business District

Pertinent excerpts:

No building height limit

Minimum front yard – 10 feet

"Any lighting used to illuminate an off-street parking area, sign or other structure shall be arranged as to deflect light away from any adjoining residentially zoned property or from public streets. Direct or sky-reflected glare, from flood-lights or commercial operations, shall not be directed into any adjoining property. The source of lights shall be hooded or controlled. Bare incandescent light bulbs shall not be permitted in view of adjacent property or public right-of-way. Any light or combination of lights that cast light on a public street shall not exceed one foot-candle (meter reading) as measured from the centerline of the street. Any light or combination of lights that cast light on adjacent residentially zoned property shall not exceed 0.5 foot-candles (meter reading) as measured from said property line."

Link: http://www.opkansas.org/wp-content/uploads/downloads/18270-c-2-general-business-district-and-cp-2-planned-general-business-district.pdf

IBC Section 304.1 Business Group B: Educational occupancies for students above the 12th grade

Assembly Group A-3

Historical requirements

None

Building Enclosure

Building facades

Clad in local Kansas limestone. Expansive glazing on first floor with strategic window placement on second floor. Solarium, joining the two buildings, is covered in glass on 2 sides and the roof as well as perforated metal for daylight control. The overall shape of the building is very regular with clean edges

which results in the absence of any cornicing or footings. At the top of the façade walls, limestone coping is applied.

Roofing

The main roofing for the building is in-set behind the cover of walls that come up to give the building the look of a flat roof from below. Some of the mechanical equipment is in fact located on the roof, but from the ground floor, one would never see it. The roofing system is a lightweight insulating concrete slab on top of a concrete roof deck system that is supported by load bearing walls. An APP (Atactic Polypropylene) roofing membrane is then used on top of the lightweight concrete for waterproofing, increased UV protection, and improved energy performance.

Sustainability features

Daylight features with ceiling slots over gallery areas to allow light in to supplement the ambient light in the space.

Primary Engineering Systems

Construction

The construction of the Nerman Museum was completed by JE Dunn Construction. The design-bid-build contract is estimated at $15 million. The attached building was also constructed during the construction of the Nerman Museum which is called the Regnier Technology Center. Construction started in 2005 and ended in 2007.

Electrical

The primary service comes into the building on the north end through an outside transformer. JCCC owns the primary campus electrical loop. The primary utility transformer steps down the power to 480/277V 3P 4W and is carried inside the building to the main 1600A panel board. From there it is distributed to the mechanical and kitchen equipment service panels as well as the receptacle and lighting panels found on the first and second floors. A secondary step-down transformer provides 208/120V power to the lighting and receptacle equipment as necessary. Emergency power is provided by existing college generator and utilizes an onsite ATS for quick transfer during a power outage.

Lighting

The lighting for the Nerman Museum integrates electrical light with natural sunlight. The gallery spaces, solarium, and most of the offices utilize daylighting as a main aspect in their design. Most rooms have windows that can let in natural light. Compact fluorescents and halogen fixtures are used for most of the ambient lighting. PAR lamps in track fixtures provide the lighting for display art. A lighting

installation by Leo Villareal on the underside of the main cantilever block serves as a decorative showcase of art.

Mechanical

Seven outdoor air handling units that range from VAV, multi-zone, and single-zone applications provide the chilled water cooling and electric heat for the building spaces. A series of variable air volume terminals are used throughout the building to supplement the electric heating. Convector baseboard heater units use a finned tube configuration and are found near the floor to provide general heating. Exhaust fans are found in the kitchen and toilet areas of the building.

Structural

The overall structural system of the Nerman Museum is a concrete slab on concrete load bearing walls. A beam and column system transfers the loads down to the foundation. The cantilever part of the building is supported by upturn beams. Slab on grade with transfer girders transfer the foundation loads to a pier system underneath the building.

Primary Engineering Systems

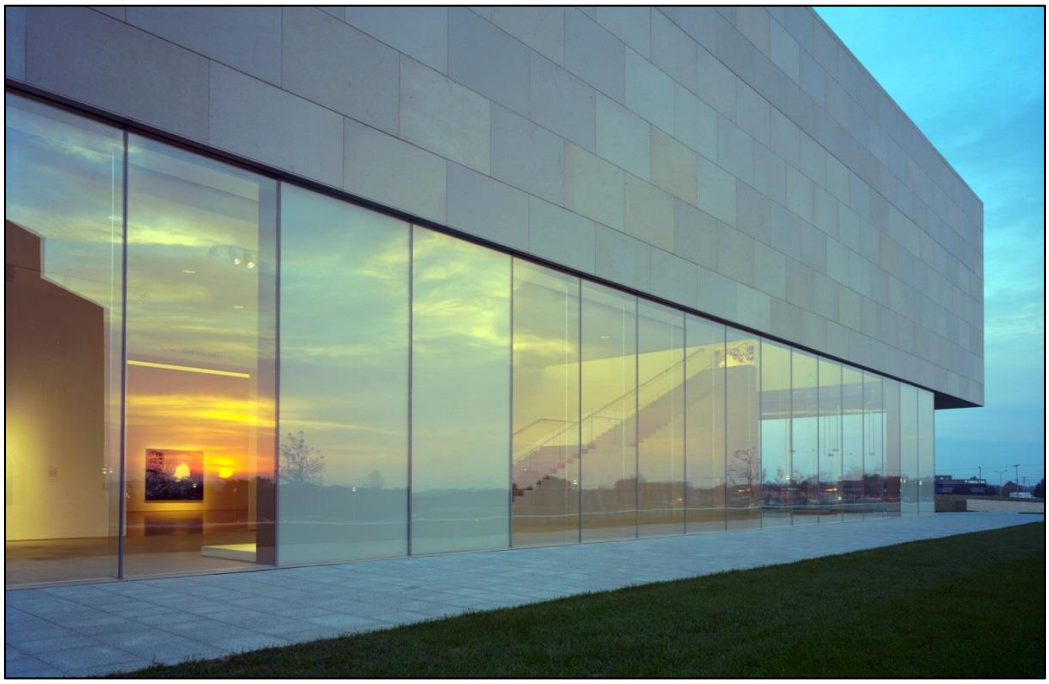
Fire Protection

Fire protection is applied in the building through sprayed fireproofing on the structural concrete. These members on the first and second floor are rated for two hour protection. The firewall construction allows 1-2 hour protection for the partition drywall. Room protection to prevent the spread of a fire consists of sprinklers on each floor.

Transportation

Two elevators are used as transportation from the first floor to the second. One of these elevators is the freight elevator to move art pieces to the second floor galleries. Two staircases also connect the visitors to the first and second floor galleries as well as the auditorium and office spaces.

Pictures



Façade: Local limestone with glazing | photo courtesy of KSWA

Architecture: Dramatic cantilever with regular geometric shapes | photo courtesy of KSWA

Lighting Depth:

The lighting depth will focus on five spaces of the Nerman Museum of Contemporary Art: The grounds/exterior, the solarium, the café, the auditorium, and a 2nd floor gallery space.

Concept

The lighting design concept comes directly from the design of the architecture. The Nerman Museum's architectural is one of minimalism. It provides subdued palette of colors and highly sophisticated levels of finish within a vastly controlled structure. It comprises leanness, space, linearity, simplicity, and contemplation.

When first looking at this building, the first thing that jumped out was how different the Nerman Museum was. As much as it is meant to house art, the building itself can be viewed as a piece of art. You were first meant to experience the art, then the design of building.

The building's design, like most minimalist structures, focuses the occupant's perspective not into the home, but out. The landscape and the environment are really at the forefront. Focusing our attention outward then enhances the feeling of space and form. This creates feelings of ease, calm, and evokes the power of soothing nature.

The lighting design takes it cues from this minimal architecture. It enhances the experience of regular geometry, orderly forms, efficient use of space, well-ordered systems, and well-organized lighting schemes. It also reflects the building's outwardly turn to its environment, drawing from the natural world imagery for each space.

Exterior and Grounds

description

The Site of the Nerman Museum is located on a fairly flat campus. It sits on the edge of the campus at the NE end. Another building is attached via the solarium on the south side of the building. The main entrance and lawn are located to the east of the museum. A walkway leading up from a parking lot leads you up to the main entrance at the large cantilever part of the building. The walkway continues on the edge of the building arriving at the solarium entrance.

The entrance also has an LED light installation located on the underside of the cantilevered area. This feature is a huge attraction and should be one of the main focal points of the exterior.

Figure 1.1
LED Light Installation

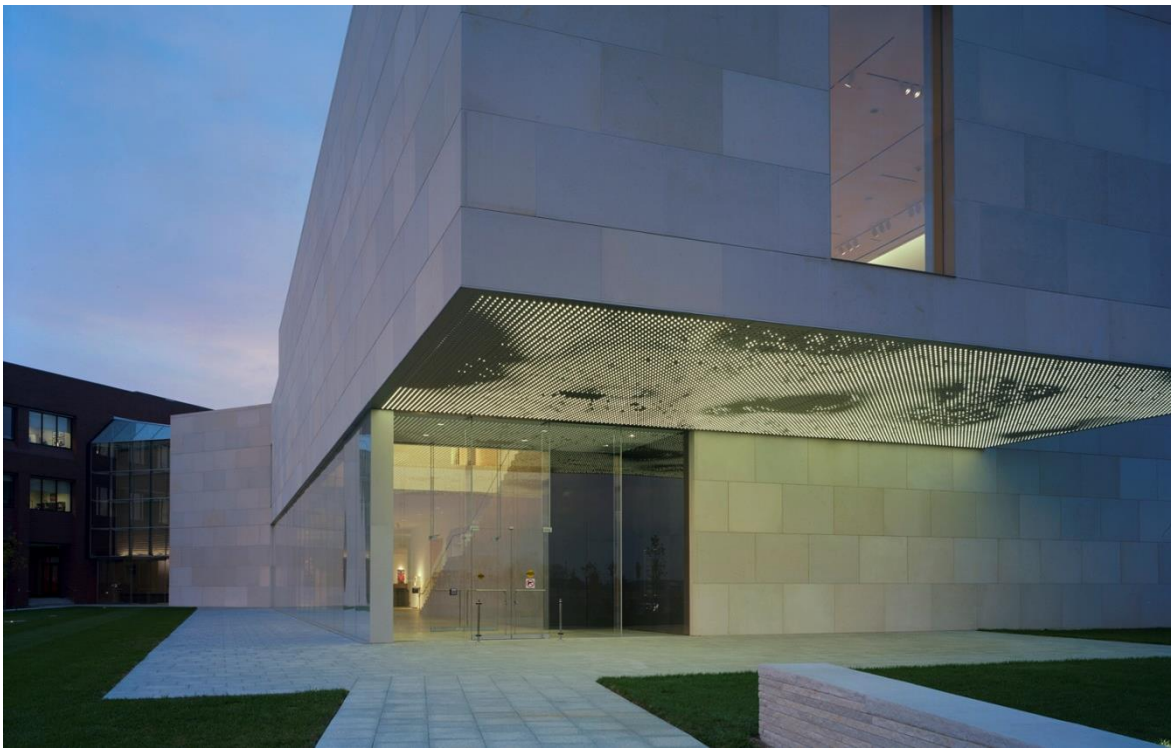


Figure 1.1
Site Plan

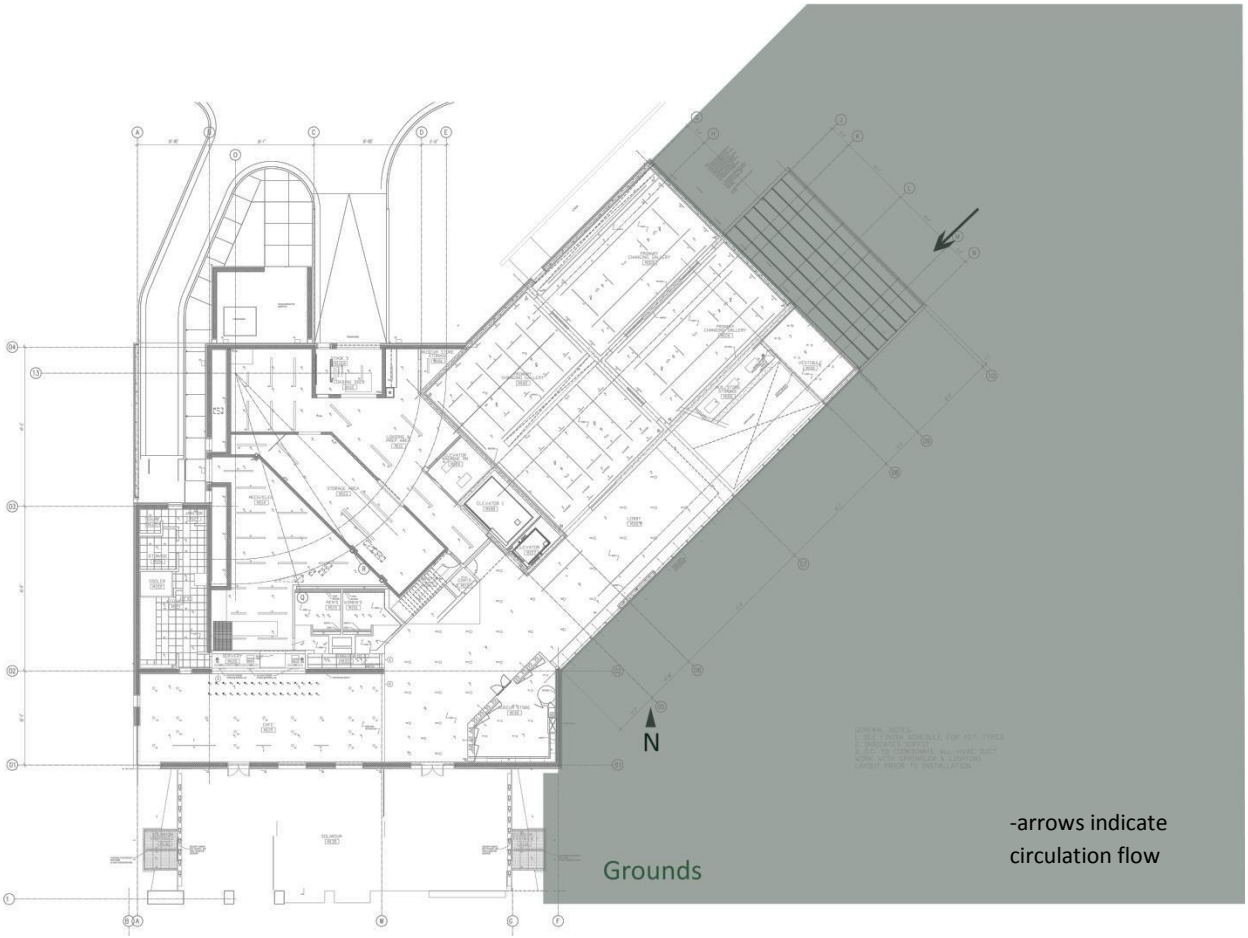


Figure 1.1
Exterior and Grounds Site Plan

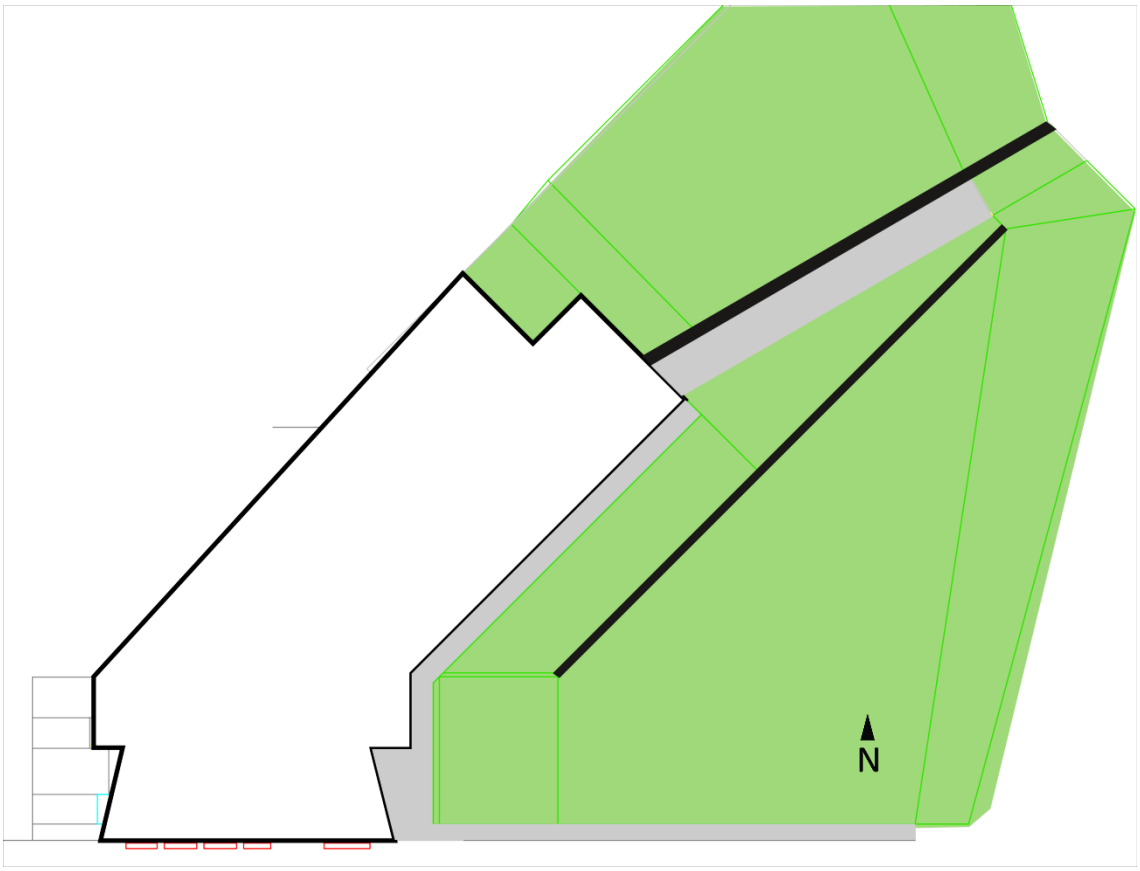


Table 1.1
Exterior and Grounds Finishes

Type	Description	Color	Reflectance	Manufacturer
grounds	grass	green	0.3	-
walkways	pavers - stone	grey	0.6	-
building exterior	white limestone	off white / silver	0.7	-
adjacent building exterior	brick	dark red	0.25	-
windows	glazing	glass	t=0.7	-
led light installation	led dynamic light art installation located on the underside of the cantilever	white led	-	artist - Leo Villareal

overall design goals

The main design objective for the exterior and grounds is to create an orientation to the museum as you walk around it, establishing a connection with the architecture, and, to help create that sense of connection, form a response to the lighted environment. The form of the architecture is really what needs to be celebrated here. By washing the white limestone façade softly and letting the window voids pop against the dim structure, the architecture's geometry is reinforced. This lighting will allow the Nerman Museum to become just another dune in the landscape, while allowing the minimal lines of the building to show forth. The marker lights added to the walk way will add an additional focus to the architectural forms. It takes the shape of the dramatic sole window in the cantilever form.

The window profile is replicated in the in the profile of the maker lights marching down the pathway. These will grow brighter as patrons move through this space to create orientation as well as the lighting responding to its dynamic environment.

tasks + activities

The main activities on the grounds will be to view the architecture of the museum and moving from one destination to another. The first impression of the building will be made from here to entice the patrons into the museum.

design criteria

The illuminance values as well as certain design criteria were taken from IESNA Lighting Handbook. The lighting power density values were taken from ASHRAE/IESNA 90.1.

quantity of light

Table 1.1
Exterior and Grounds Illuminace (IES recommendations)

Space	E_h (lux)	E_v (lux)
exterior - pathway	3	-

Table 1.1
Exterior and Grounds LPD

Space	Allowance (W/SF)
exterior – pathway (width>10ft)(zone 2)	0.14
exterior – façade (zone 2)	0.1

quality of light

orientation

The main entrance, when entering from the west parking lot, has to be a visually strong one. This is also where the cantilever part of the building is with its LED light art underneath it. Creating orientation and direction is the landscape. A straight path leads up to the front glass doors. Adding marker lights down the path at 15' increments provides additional directionality.

association with the architecture

The added marker lights will take the form factor of the one window in the second story of the building. This window has a profile of a 2 to 1 rectangle. The marker lights will have a dimension of 1'x1'x2'. These lights will be a small indication of the minimalist architecture and reinforce the regular lines found in the building.

response to the environment

In addition to marking the pathway towards the museum, the rectangular marker lights will glow brighter when a person walks past them. Occupancy sensors will allow the fixture to "know" when something is moving past. This active response to the people moving through will strengthen the lighting's connection to the environment.

first impression

Being most outsiders first look at the Nerman Museum, it has to impress visually. By balancing the lighting and allowing the architecture to stand front and center, the museum can be true to its original form. While the museum will look undoubtedly different from the daylight, it will still be able to uniquely its own building by letting the voids shine.

glare

Because the building's façade is being washed from the ground plane, glare will be in issue. Making sure the fixture's main photometry is focused on the upper building will be crucial. The luminance of the glowing marker lights will also need to be balanced as to not be too bright, but still put the required amount of light on the pathway.

fixture housing requirements

The housing's for all the fixtures will need to be rated for outdoor conditions. An IP67 rating will be a goal.

color temperature

The interior of the building will be using a color temperature of 3500K. To be consistent from inside to outside, the exterior and the grounds will use 3500K CCT as well.

fixtures and equipment

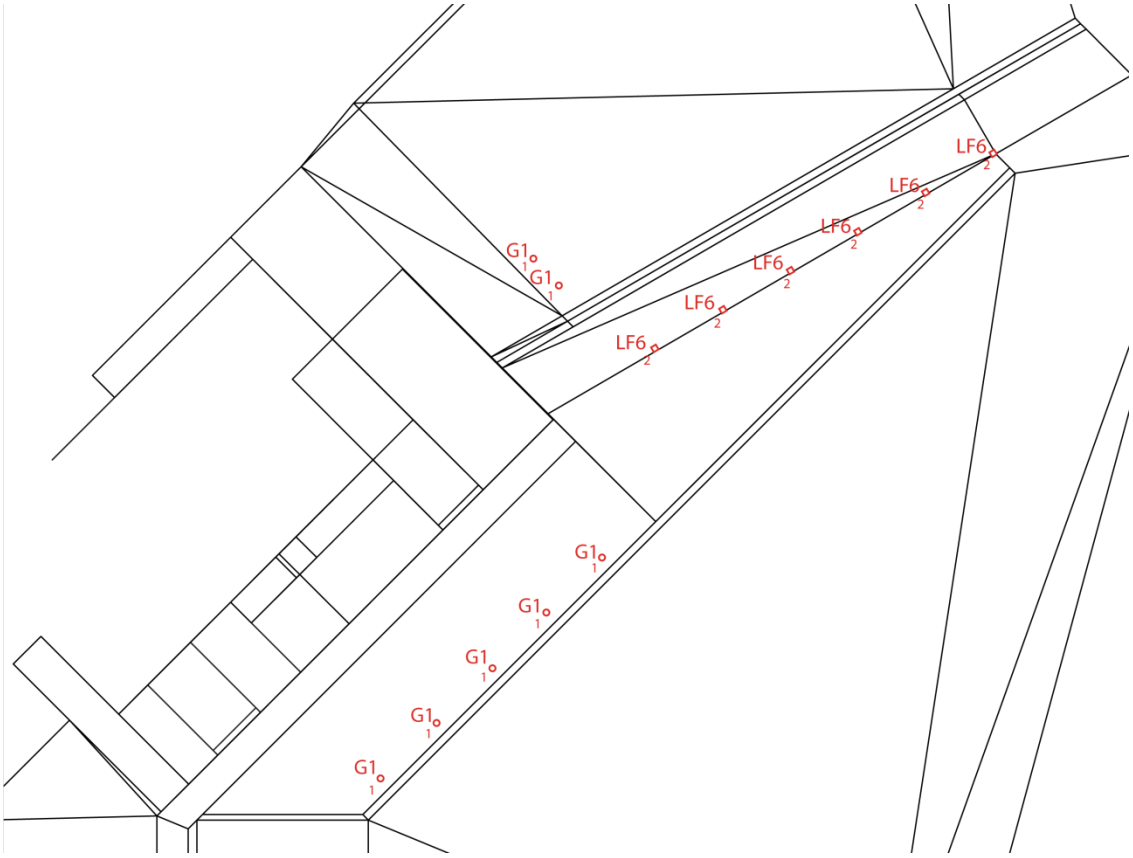
Table 1.1
Exterior and Grounds Equipment Schedule

Type		Manufacturer	Description
	G1	We-ef	24W LED in grade outdoor fixture with asymmetrical throw. 2000 lms. Medium beam distribution. IP67.
	LF6	3Form	One layer 1" Chroma material with C3 Ghost layer for light diffusion. Integral slot into paver walkway. LED light board uplighting in grade for even distribution. Light to be on all 5 sides of the form.
	L8	3Form	LT series LED tape 3500K. No Channel. 1.8 watts per foot. Warm White. 30 lumens/foot.

controls

Controls are needed for the marker light's function in responding to its environment. An occupancy sensor coupled with a timed dimmer is needed realize the lighting design. As patrons move though the walkway, the marker lights glow slightly brighter. This will promote direction to the Nerman Museum and help visitors along their way. It's also an entertaining and dynamic control in the spirit with the Nerman's art and overall themes.

grounds: lighting plan



Renderings

Figure 1.1
Exterior and Grounds: Pseudo Color Rendering (Nighttime)(Perspective View)

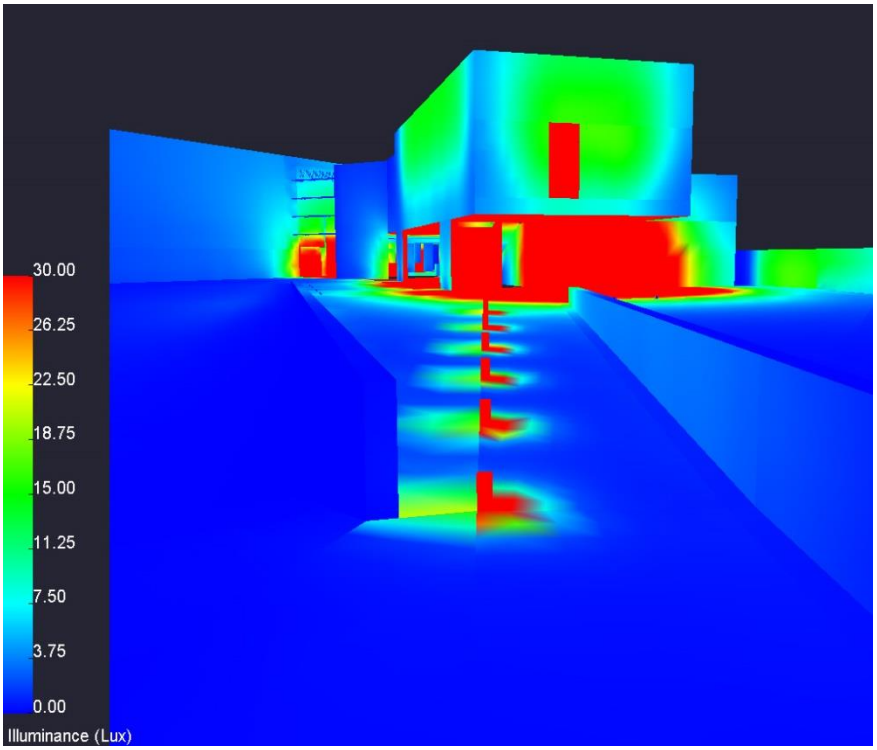


Figure 1.1
Exterior and Grounds: Nighttime Perspective Rendering

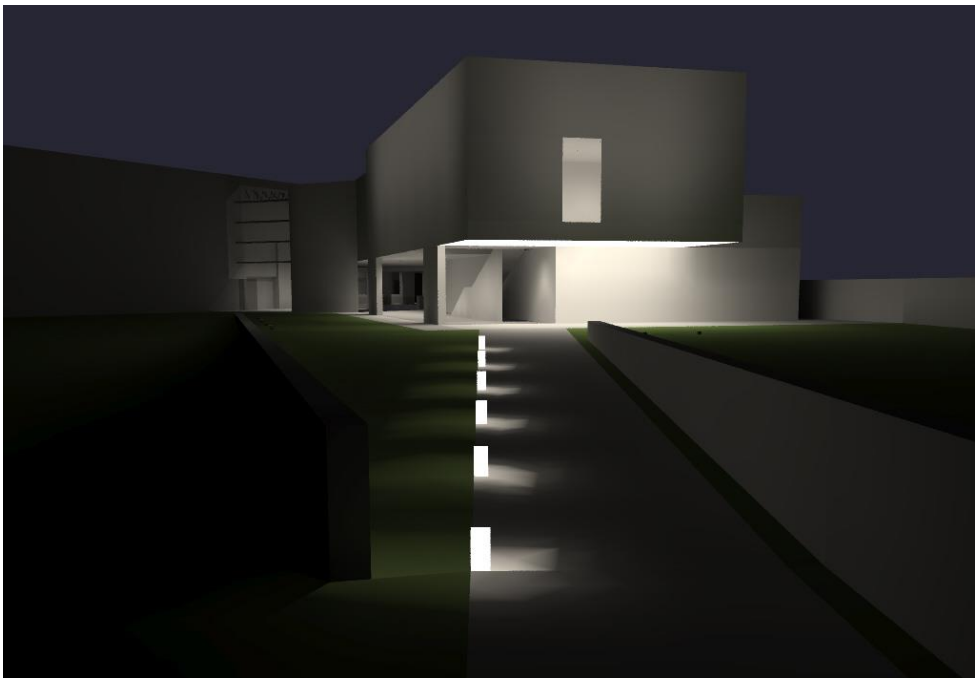
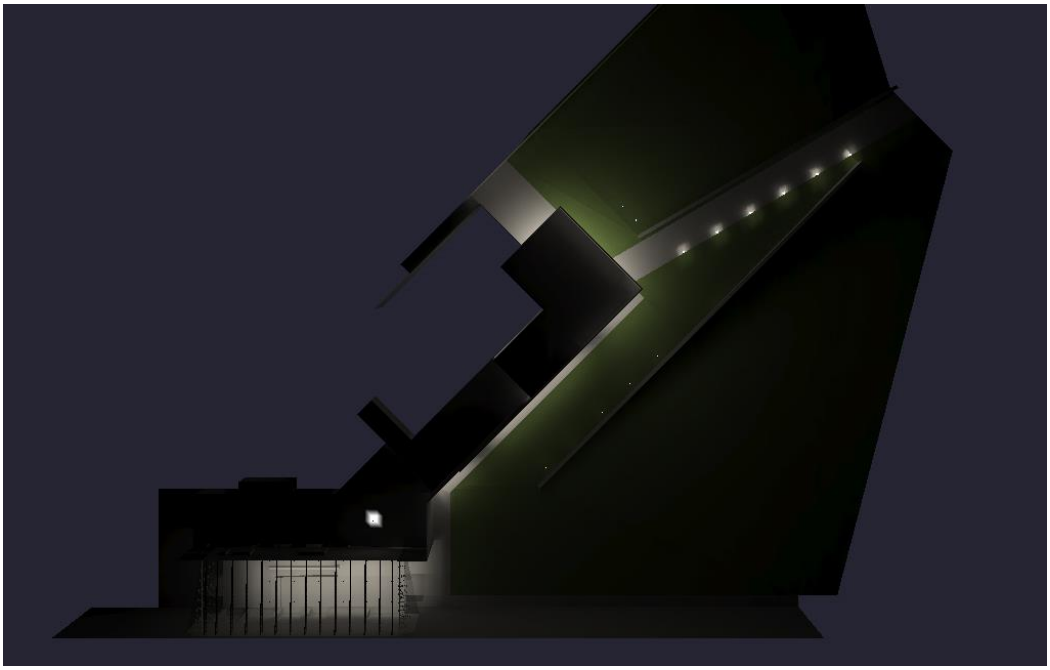


Figure 1.1
Exterior and Grounds: Nighttime Overhead Rendering



calculations

Illuminance

Figure 1.1
Exterior and Grounds: Pseudo Color Rendering (Nighttime)(Overhead View)

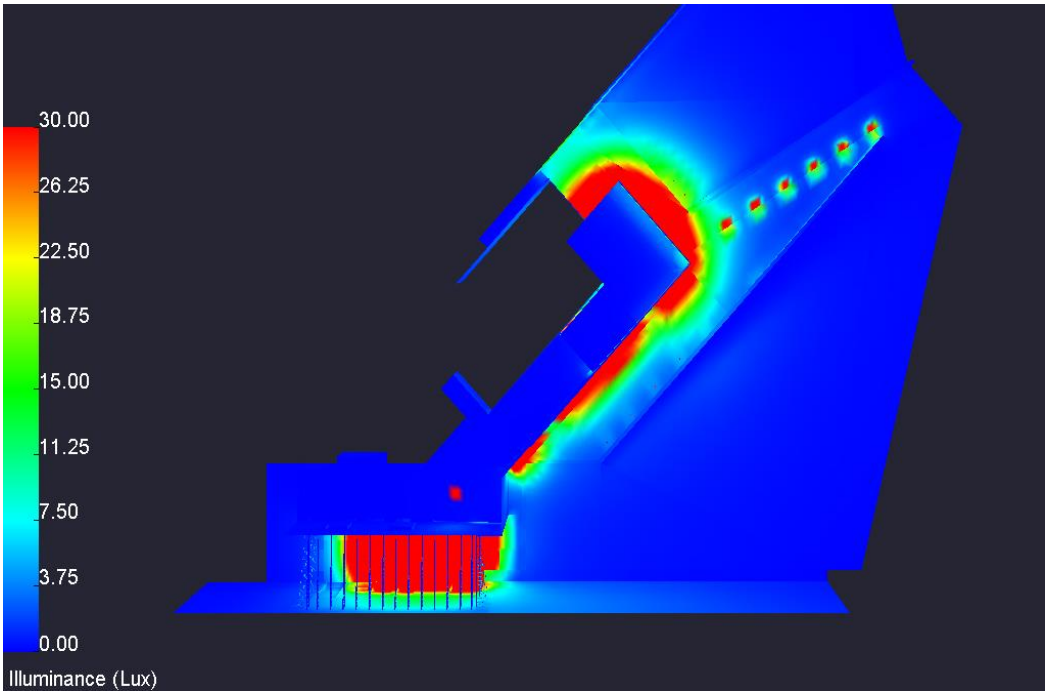
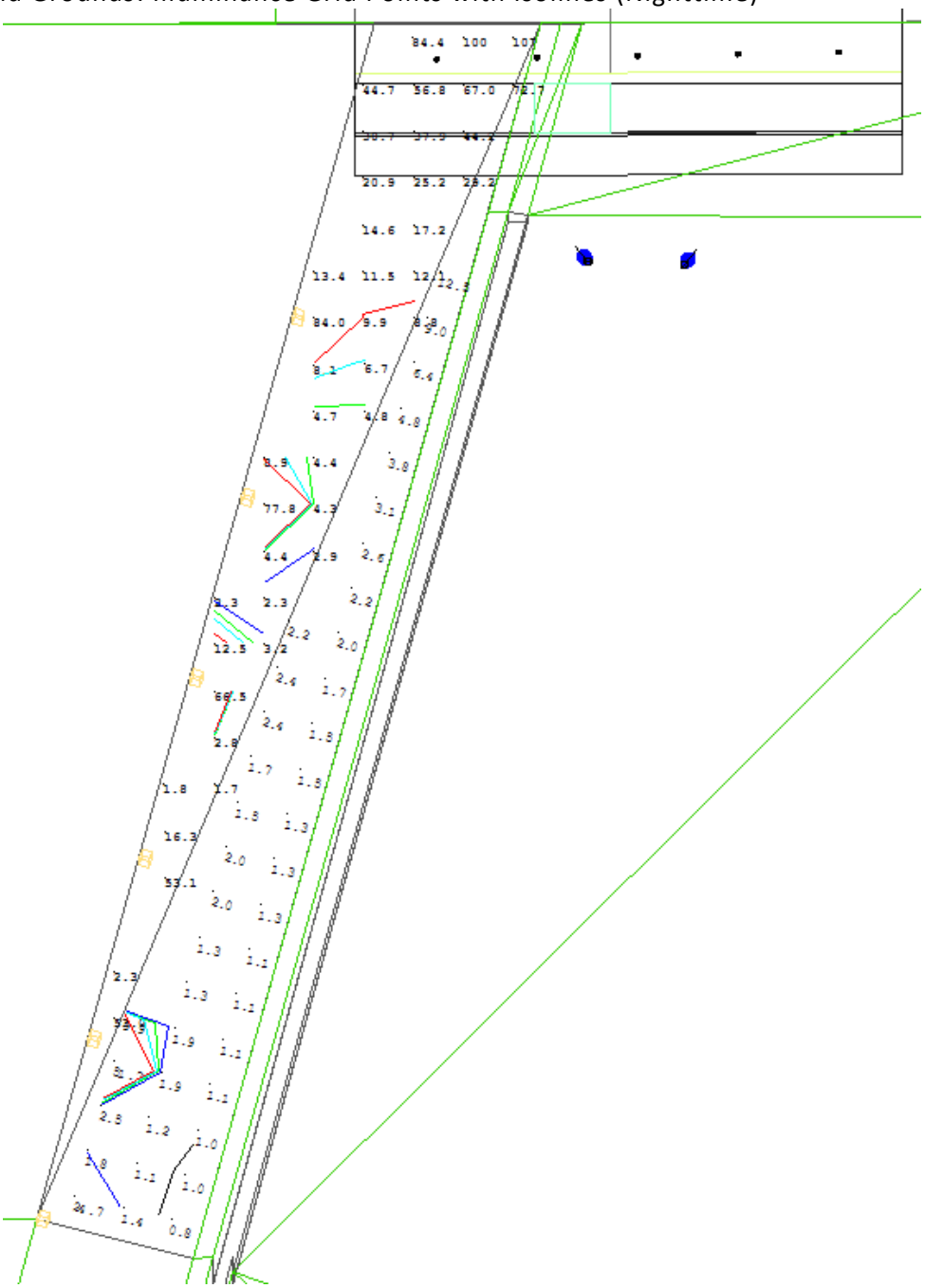


Figure 1.1

Exterior and Grounds: Illuminance Grid Points with Isolines (Nighttime)



An average of at least 3lux can be found on the walkway – with an increase found near the building entrance.

Table 1.1
Exterior and Grounds Illuminance Calculation Summary (workplane 1.5')

Space	E_h Recommendation (lux)	E_h Calculated (lux)
exterior - pathway	3	6

Lighting Power Density

Table 1.1
Exterior and Grounds Lighting Power Density: Walkway 10ft or wider (Zone 2)

Fixture Type	System Wattage	Quantity	Total Watts
G1	24	7	168
Total Watts			168
Area (SF)			2194.5
Watts/SF			0.08
ASHRAE 90.1 compliant?			0.1 - Yes

Table 1.1
Exterior and Grounds Lighting Power Density: Façade (Zone 2)

Fixture Type	System Wattage	Quantity	Total Watts
LF6	5.4	6	32.4
Total Watts			32.4
Area (SF)			5425
Watts/SF			0.01
ASHRAE 90.1 compliant?			0.14 - Yes

evaluation

The Grounds already has a main focal point in the LED light installation on the underside of the cantilever. The proposed lighting is just meant to highlight the form of the architecture, and blend into the landscape. By softly washing the sides of the limestone, the stark rectangular box that is the Nerman Museum glows in the darkness. This is a subtle approach and one that adds value to the understated building.

Solarium

description

The Solarium is located in-between an existing community college building and the Nerman Museum. It is the main connection point for the campus side of the building. The space is almost as tall as it is long. The multi-story space is very large and open to facilitate movement by simulating the outdoors. It is surrounded by three sides of glazing, which is unlike the other part of the building, but relates well to the overall architecture. The two solid sides of the existing building and the museum create a cavern, making the glass appear suspended in the void.

Figure 1.1
1st Floor Plan

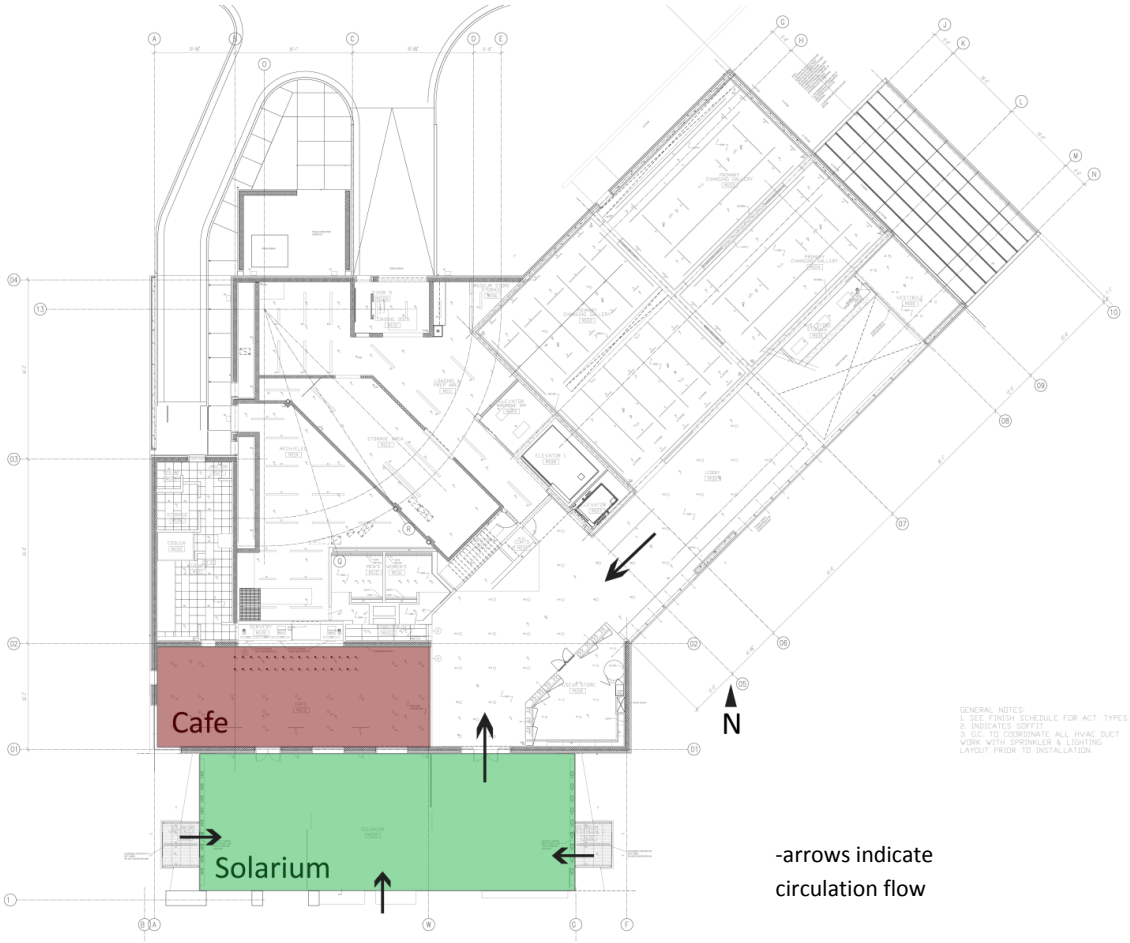


Figure 1.1
Solarium Floor Plan

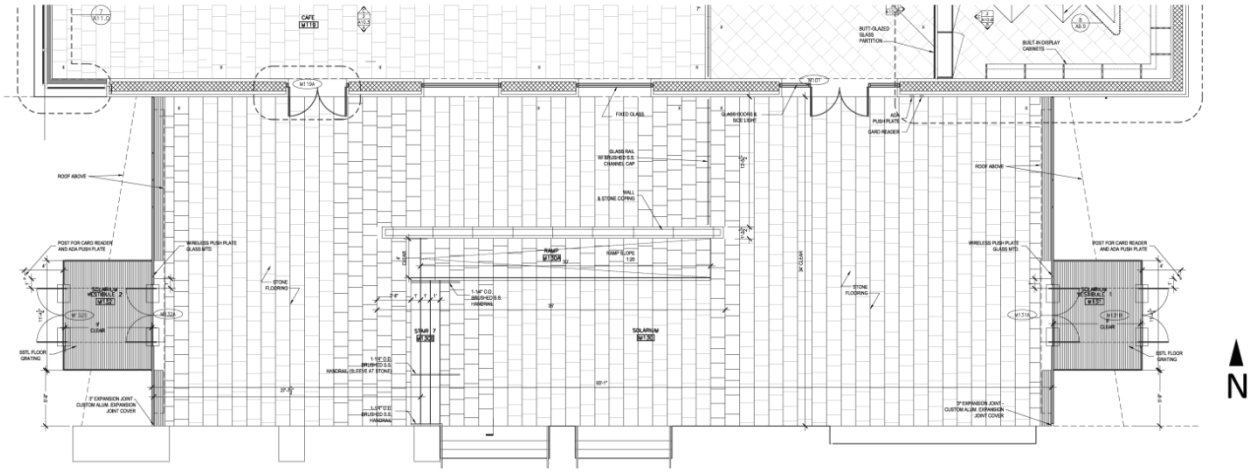


Table 1.1
Solarium Finishes

Type	Description	Color	Reflectance	Manufacturer
floor	stone	off white	0.6	-
base	aluminum	silver / painted	0.7	-
wall (Nerman Museum)	white limestone	off white / stone	0.7	-
wall (adjacent building)	brick	red	0.25	-
window	glazing	glass	t=0.7	-
truss	steel	grey metal	0.5	-

overall design goals

The main lighting design goals for the solarium are to create a visually comfort environment while still adding visual interest. Glare was a huge concern because of the amount of glazing used in this space. A new solar protection panel system was designed to create continuity to the themes of the building, as well as providiving glare protection.

Just as a stary night sky inspires and intreages us, so does the effect from the newly designed solar panel system.

tasks + activities

The main task for the solarium is a meeting spot. Being a junction for two buildings and the campus side of the Nerman Museum, it is a major connection point. There is also seating for the café that is located adjacent to the solarium space. People will mainly be passing through the space to get to the museum or the rest of campus. The sheer amount of volume this space offers is a major point of interest to the visitors.

design criteria

The illuminance values as well as certain design criteria were taken from IESNA Lighting Handbook. The lighting power density values were taken from ASHRAE/IESNA 90.1.

quantity of light

Table 1.1
Solarium Illuminace (IES recommendations)

Space	E_h (lux)	E_v (lux)
work area	150	50
social/waiting area	40	15

Table 1.1
Solarium LPD

Space	Allowance (W/SF)
solarium - circulation	0.02 per foot (height)
	0.02 x 44' = 0.88 W/SF

quality of light

spaciousness

Closing off the solarium in the fear of glare could be the worst thing you could do for this space. Knowing this space is meant to feel like an outdoor space is a main draw for visitor's interest. Keeping the glazing on all three sides and not over using solar protection are keys to making this space feel spacious during the day. During the night, the space also should feel open to the night. By lighting the vertical surfaces and ceiling, the space can create that spaciousness during night time conditions.

glare

Glare is a major concern anytime a lot of glazing is used in a space. For most of the solarium, glare doesn't matter too much because it's just a circulation point and is directly connected to the outside. The idea of a solarium is a sun filled room. The area of concern is the café

seating area that is located on the museum's side of the space. This will receive direct light during the summer months of the year. Providing a solar protection system that limits full direct sun will be used.

visual interest

Creating visual interest for this space can really add value to the Nerman Museum overall. By taking cues from the lighting installation in the front of the building, the visual interest comes from the daylighting directly. The solar protection system uses a peppered-hole design, with disks that spin to cut off the direct light with the power of the wind. This dynamic system will create a shimmering wall of daylight. By creating this ever-changing solar condition, the lighting will create visual interest and draw visitors inside.

circulation

Having the lighting promote a clear line of circulation and task importance hierarchy will support the flow of people in and out of the museum. Using higher light levels at the café seating area will produce a pivot point for the rest of the circulation area. The rest of the open area will be lighted dimmer.

luminance contrast

Luminance contrast between the solar protection system, the sky, the sun and the vertical surfaces will need to be studied. Creating too high of a contrast will make the space feel dark and unfriendly. High brightness overall is needed to create a spacious area.

color temperature + rendering

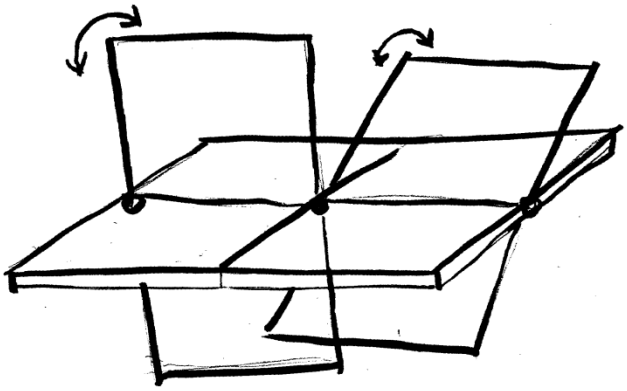
Since this space receives a lot of daylight, and also needs to be sensitive to artwork and the color rendering of traditional light sources, a middle of the road color temperature was selected throughout the building (3500K). Track lighting, whenever lighting a piece of art, requires a CRI in the 90s, but the general ambient light in the space can be a lower CRI in the 80s.

fixtures and equipment

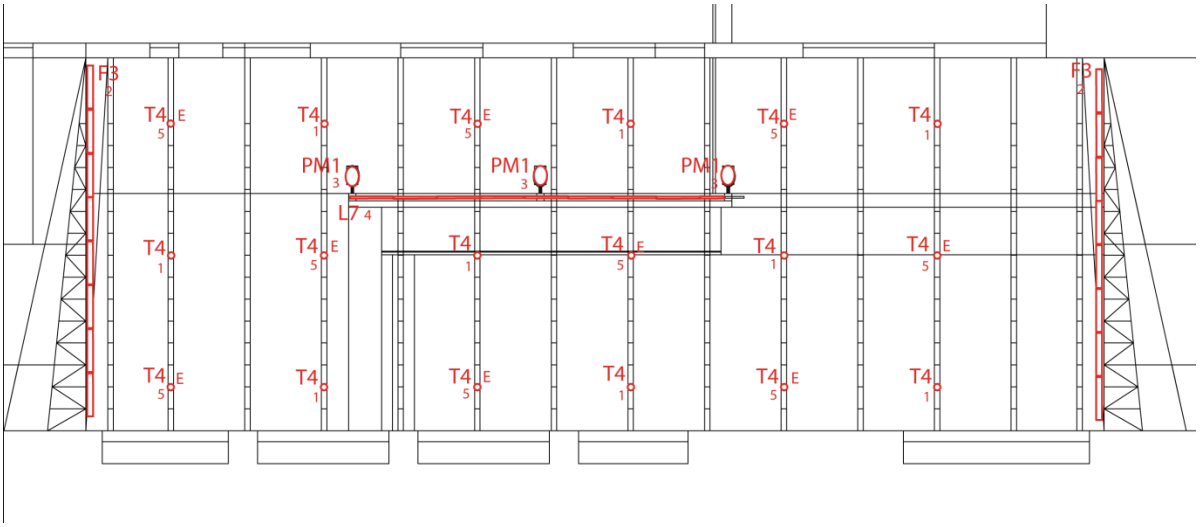
Table 1.1
Solarium Equipment Schedule

Type		Manufacturer	Description
	L7	Lumenpulse	4 foot LED strip. 8.5 watts/foot, Regular Output. 60x60 degree beam spread. Remote driver with standard dimming.
	F3	Litecontrol	(2) T8 fluorescent 4' length. Concealed cove fixture. 3500K 81CRI. 64W
	T4	Edison Price	Hanging LED tack system, integrated with fabric panel system, 1500 lumen package, 80+ CRI. 20 degree beam spread. Dimmable standard driver. 3500K
	PM1	Bega	52W LED pole mounted fixture. Clear acrylic diffused light distribution optic with 3500K. 4,900 lumen package. Type IV (IES classification).

Detail Solar Control Panel



solarium: lighting plan



Renderings

Figure 1.1
Solarium: Pseudo Color Rendering (Plan View)

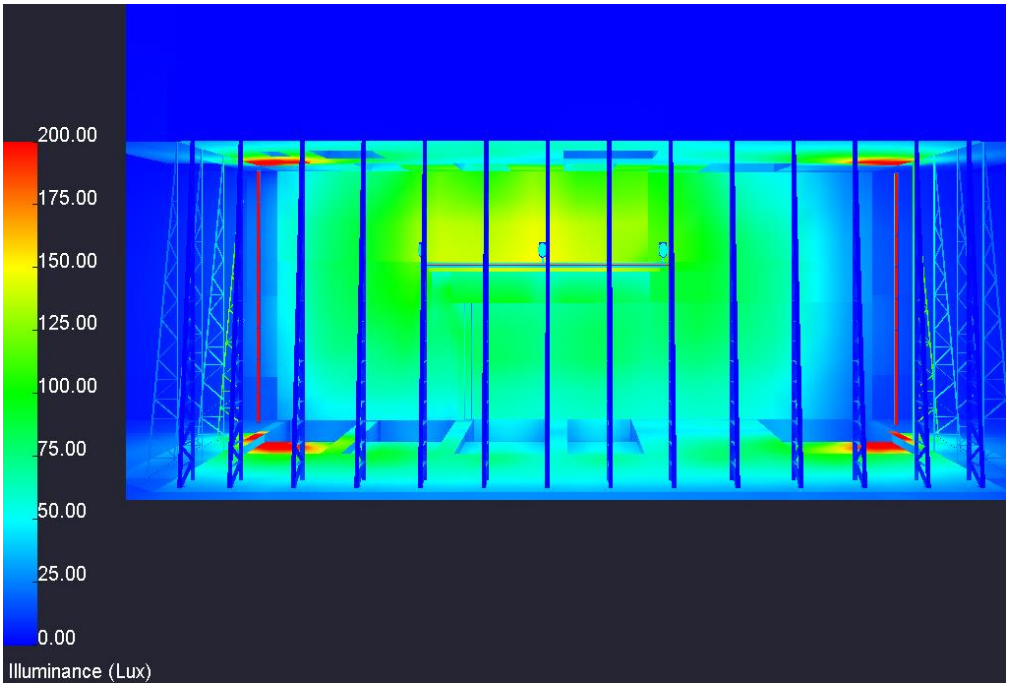


Figure 1.1
Solarium: Pseudo Color Rendering (Perspective View)

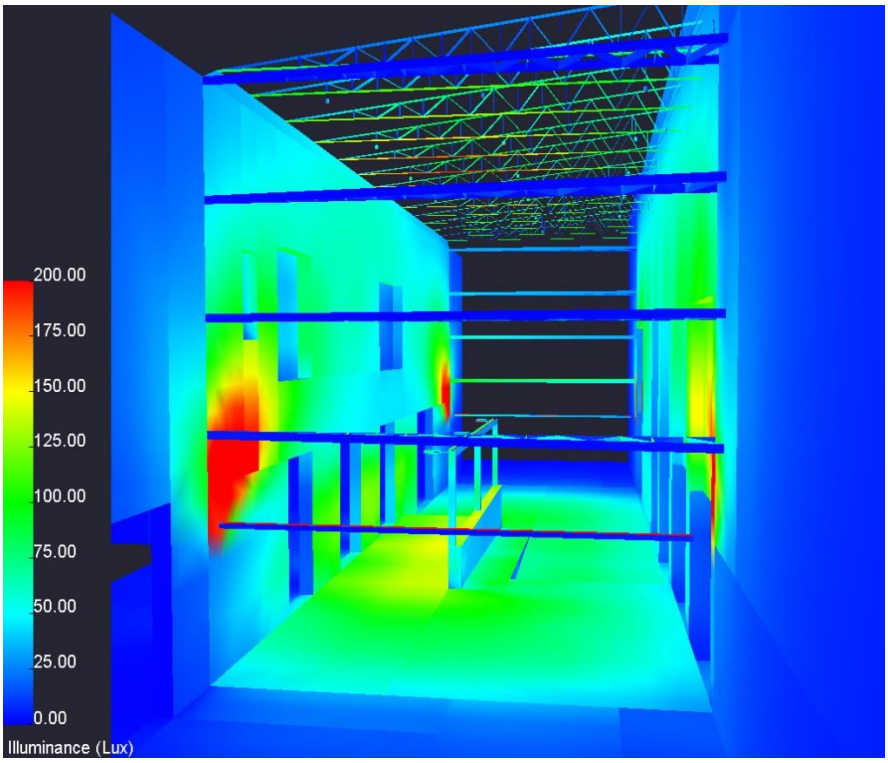


Figure 1.1
Solarium: Perspective Rendering (March 15th 11:00 a.m. – Sunny day)

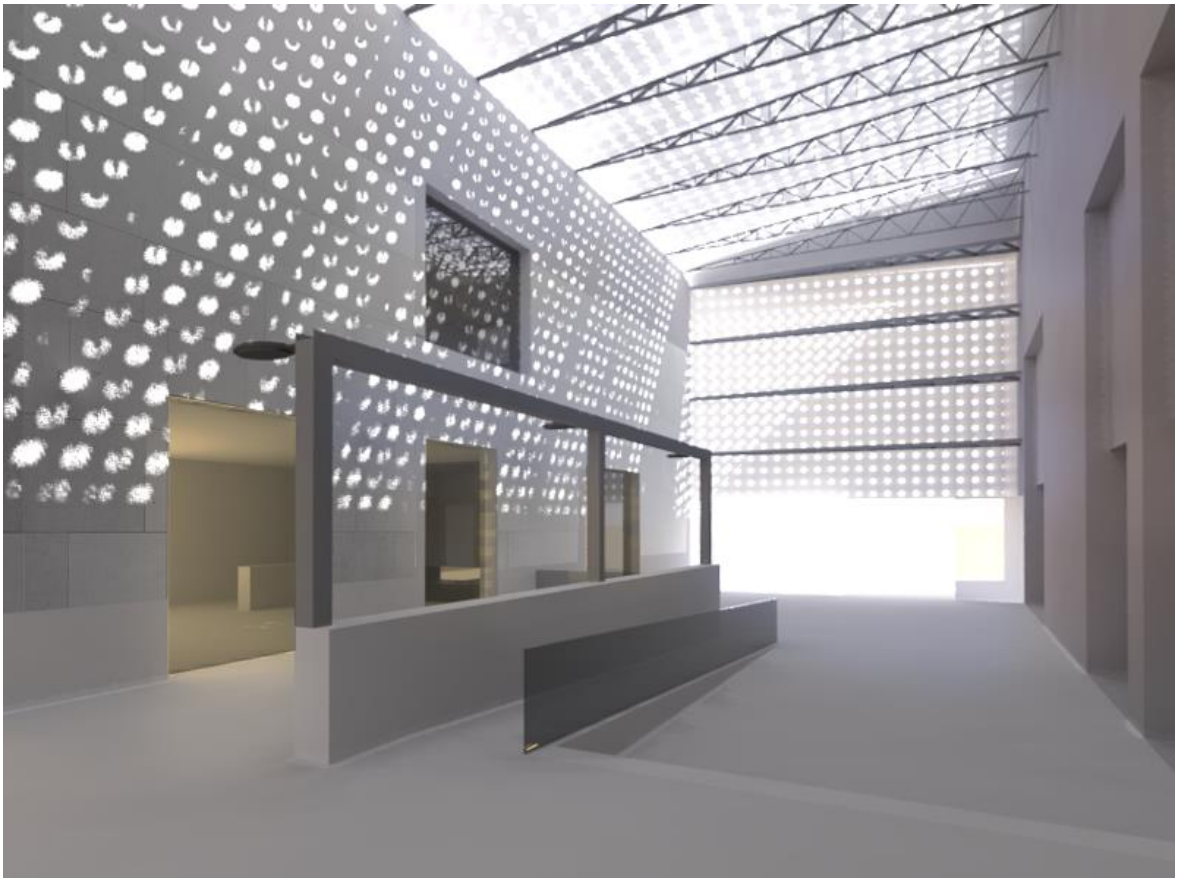


Figure 1.1
Solarium: Perspective Rendering (March 15th 11:00 a.m. – Sunny day)\

calculations

Illuminance

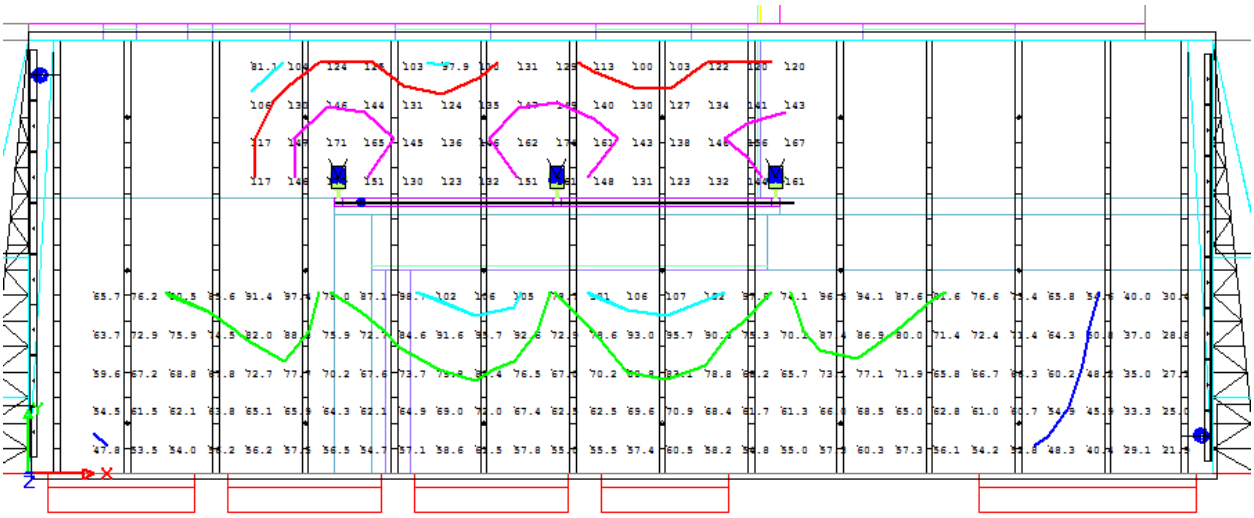


Table 1.1
Solarium Illuminance Calculation Summary (workplane 1.5')

Space	E_h Recommendation (lux)	E_h Calculated (lux)
work area (seating area)	150	135
social/waiting area (circulation space)	40	68.5

Lighting Power Density

Table 1.1
Solarium Lighting Power Density

Fixture Type	System Wattage	Quantity	Total Watts
L6	29	9	261
F3	56	16	896
TC	60	18	1080
PM1	57	3	171
Total Watts			2,408
Area (SF)			3,500
Watts/SF			0.69
ASHRAE 90.1 compliant?			0.88 - Yes

evaluation

The solarium, from this lighting design, is now much more than just a circulation space. During the day, its wall is turned into art itself. The solar protection system creates a shimming wall of lighting that inspires and adds to the overall plan of the Nerman Museum. At night, it is a very functional space that generates spaciousness and movement to and from the museum and the campus itself.

Cafe

description

The café is located on the first floor, adjacent to the main entrance and the solarium. This makes the space a pivot point as it joins two high traffic areas. Steps are positioned at the entrance, raising the café area and setting it apart from the bordering hallway. Measuring 65' x 25' x 12'(h), the space feels long while it covers around 1,625 SF. Seating for the café is also available in the solarium. The café and solarium are connected by doorway that allows for easy access between the two spaces.

Figure 1.1
1st Floor Plan

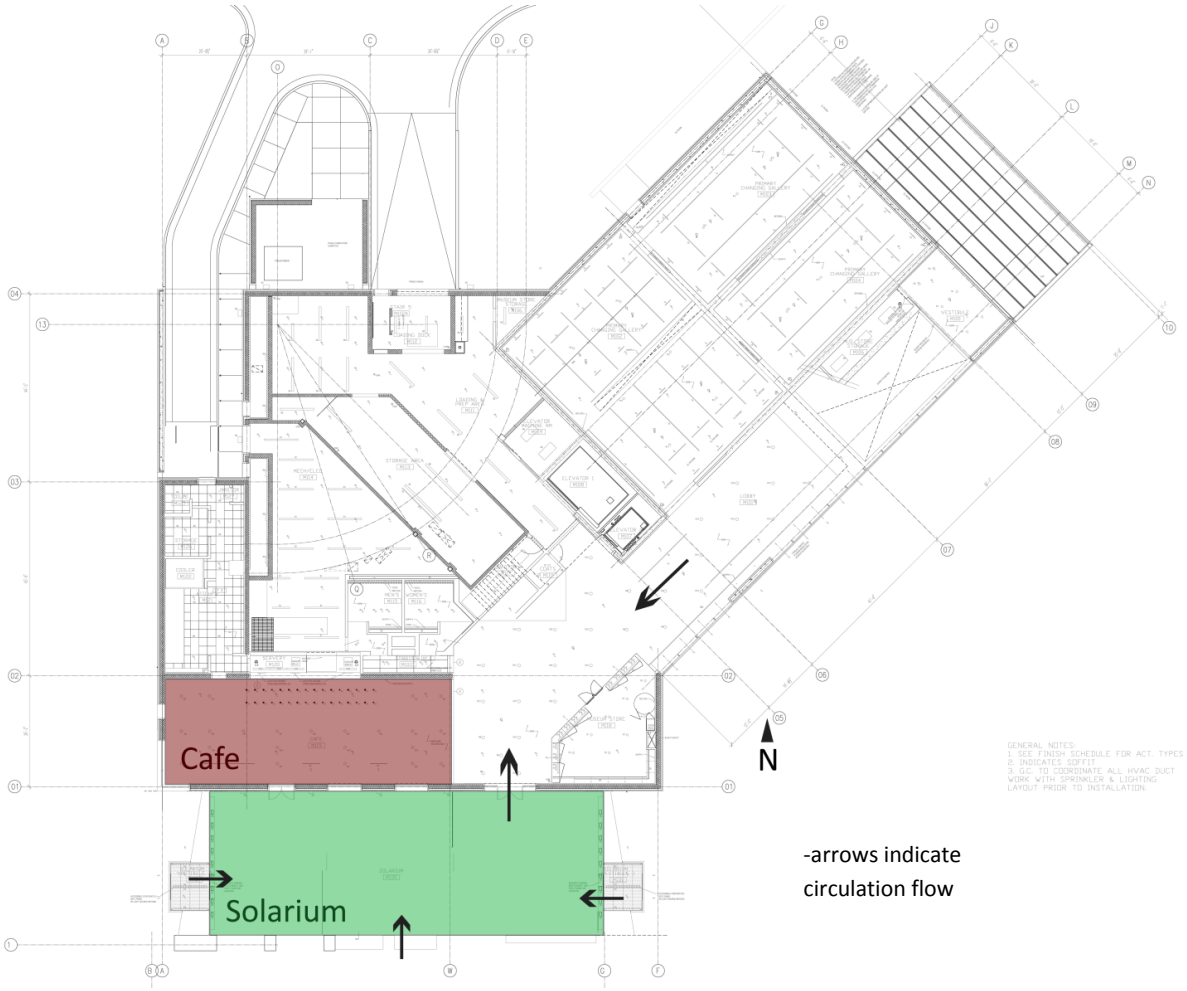


Figure 1.1
Café Floor Plan

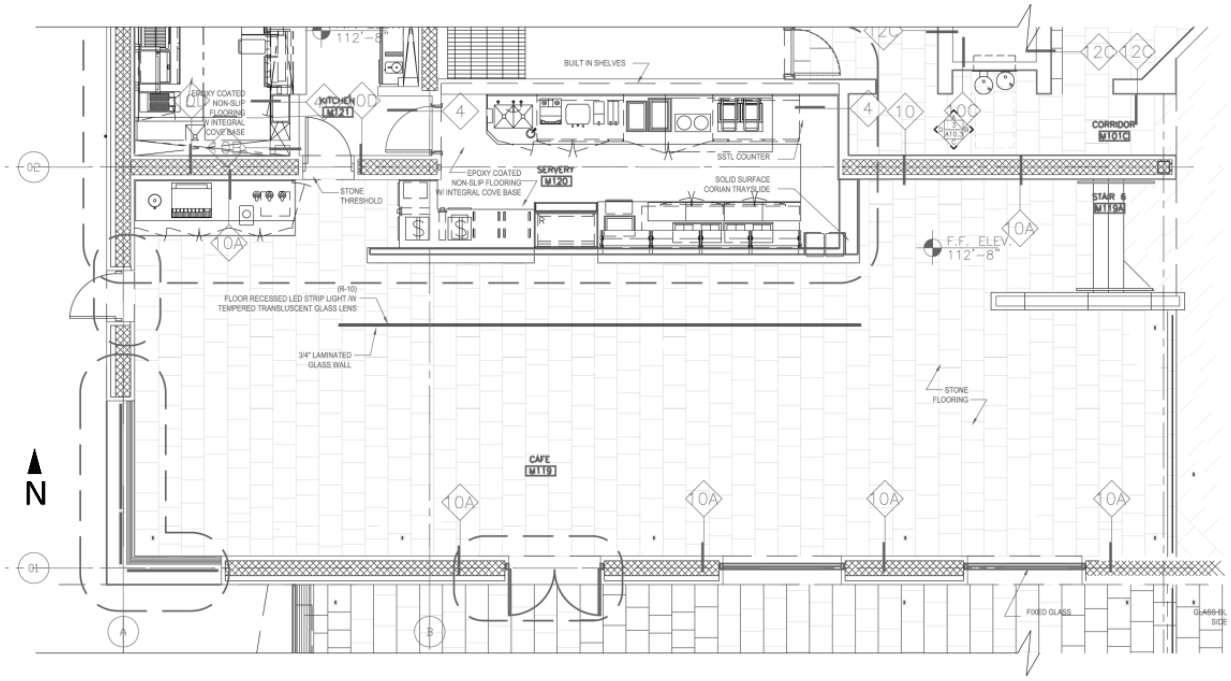


Table 1.1
Café Finishes

Type	Description	Color	Reflectance	Manufacturer
floor	stone	off white	0.6	-
base	aluminum	silver / painted	0.7	-
walls	GWB	off white / painted	0.7	-
ceiling	perf. GWB	off white / painted	0.7	-
window	glazing	glass	t=0.7	-
luminous panel	backlighted ceiling panel	white	t=0.71	Newmat stretch ceiling systems

overall design goals

The main lighting design goals for the café are to create a visually comfort environment while still adding intimacy into the space. Sight lines from the solarium, main hallway, and the outside were considered for reduced glare. Lighted forms dominate the space. Large light sources create intimacy and drama. The luminances of these light forms were not to create a glaring object, but one of visual comfort.

Just as a leaf's biological structure glows by daylight, so do the architectural lighted panels and forms.

tasks + activities

Café Tempo (as it's called), starting at 7am, is open into the evening to all who come to the museum. Patrons as well as passing students can sit down and have a range of different foods. The café also allows for party reservations. It has received a silver medal in the "retail sales-stand-alone" category of the National Association of College and University Food Services Dining Awards. The main activities in this space are dinning and serving food.

design criteria

The illuminance values as well as certain design criteria were taken from IESNA Lighting Handbook. The lighting power density values were taken from ASHRAE/IESNA 90.1.

quantity of light

Table 1.1
Café Illuminace (IES recommendations)

Space	E_h (lux)	E_v (lux)
coffee shop	100	30
servery-employee served	500	200

Table 1.1
Café LPD

Space	Allowance (W/SF)
bar lounge/leisure dining	1.31

table 1

quality of light

visual comfort

Since this is a space where patrons and students come to eat and relax, the visual experience has to be pleasing. Lighted vertical surfaces and ceilings provide comfort to the space which creates an inviting place to unwind.

reinforcement of architecture

The geometry of the large window forms in-between the café and solarium serve as inspiration for the back lighted ceiling surfaces illuminating the main seating area. These lighted panels follow the vertical lines of the window up onto and across the ceiling to envelope the space. The lighted cantilevered form projecting out over the servery imitates

the large architectural cantilever at the entrance to the museum. These lighted forms strengthen the minimalist architecture and creates a space full of interest.

creating intimacy

The minimal back lighted forms instill drama into the space. By having such large bright areas and, in contrast, such large dark areas, the café feels intimate and cozy; a place to feel inspired and connected to the people across from you. Creating light as well as shadows provide some visual interest into the space this is fairly plain.

luminances of light sources

Since these back lighted panels provide all of the illumination for the space they need to be bright enough for the café tasks. But these sources should not be overly bright, whereas the luminance should not exceed 150 cd/SF.

modeling of faces

Eating and socializing at the café tables is a personal experience. Therefore the lighting should have quality modeling of faces. Provided area light sources with highlights from track lighting and half height partition walls should give adequate definition on faces.

directionality / circulation

Creating a hierarchy of space relationship within the café is essential for circulation and way finding. The servery, which requires more detailed attention than eating at the seating area, also requires a higher magnitude visual cue. The cantilevered lighted form acts as a beacon to the servery by enclosing the vertical space it surrounds. This leads your eye toward this space while entering.

visual interest

The visual interest for this space comes from the lighted forms and panels. Creating interest also inspires, which is important in any school/museum building.

color temperature + rendering

Since this space receives a lot of daylight, and also needs to be sensitive to artwork and the color rendering of traditional light sources, a middle of the road color temperature was selected throughout the building (3500K). Track lighting, whenever lighting a piece of art, requires a CRI in the 90s, but the general ambient light in the space can be a lower CRI in the 80s.

fixtures and equipment

Table 1.1
Café Equipment Schedule

Type		Manufacturer	Description
	LF1	Newmat	NewLight double-layer ceiling system using T0B/white translucent with T8/clear membranes backlighted with florescent strips
	LF2	Newmat	NewLight double-layer ceiling system using T0B/white translucent with T8/clear membranes backlighted with florescent strips
	LF3	Newmat	NewLight double-layer ceiling system using T0B/white translucent with T8/clear membranes backlighted with florescent strips
	LF4	3 Form	Acrylic cantilever form. One layer 1" Chroma material with 2 layers of vapor material for light diffusion. Integral slot into paver walkway. LED light board side-lighting wall side for gradient distribution. Light to be on all 5 sides of the form.
	LF5	3 Form	Acrylic partition wall. One layer 1" Chroma material with 3 layers of vapor material for light diffusion. Integral slot into paver walkway. LED light board uplighting in grade for gradient distribution. Light to be on all 5 sides of the form.
	L2	Acolyte	LED RibbonLyte static white 3500K. No Channel. 1.5 watts per foot. ~90 lumens/foot package.
	L3	Acolyte	LED RibbonLyte static white 3500K. No Channel. 5 watts per foot. ~440 lumens/foot package.
	L4	Acolyte	LED RibbonLyte static white 3500K. No Channel. 8.8 watts per foot. ~650 lumens/foot package.

	T2	Edison Price	Hanging LED tack system, 1000 lumen package, artist series 97 CRI. 40 degree beam spread. Dimmable standard driver. 3500K

Back-Lighted Panels

The luminous panels overhead of the eating area will be backlighted with LED strips. A ceiling cavity will be made in the profile of the specified panels with 18" depth. L2 luminaires will be use directed straight down, backlighting the PVC Newmat material. To achieve an even distribution of light a mock up would be done. But a spacing of 2' O.C. is a general good rule of thumb. So four strips will be used for the bigger, front panels, while three strips will be used for the smaller, back panels.

Edge-Lighted Partition Wall

The luminous glass partition wall will be lighted from the ground level with an in-grade LED strip. 3From Chroma material will be used as the tranlusent form. A system of three sheets will be installed: One that slides into the raise stone floor and around the LED fixture to ensure stability for the form. One that is used as a thin film, nearly transparent sheet, and finally one that rests on the stone floor to create a perfect seam.

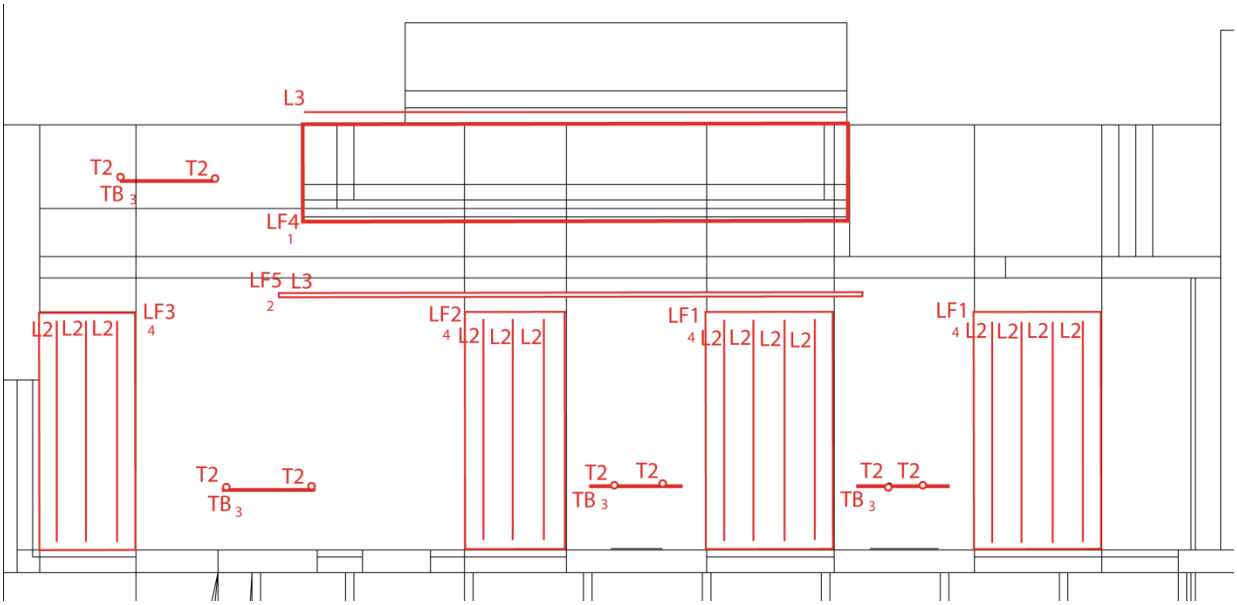
Edge-Lighted Cantilevered Form

The luminous cantilevered form will take special attention to realize. Using tube-steel as the structural support and a multi-layered system of 3Form Chroma material, a completely lighted form could be possible. This form would rest on top of the steel support system and be edge lit from behind the servery. Three LED strips will be needed to have enough light to have an adequately amount of lumens. A removable panel in the ceiling of the servery is used to access the LED luminaires when they need maintenance.

controls

The café will be open for breakfast, lunch, and dinner, as well as for special dinning events for parties. The lighting, therefore, needs to be highly flexible in scene control. Because of the amount of daylight coming into the space, the control schemes also need to be highly reactive. Due to the solarium receiving an abundance of light during all hours of the day, the café will experience, through the connected windows, an adequate amount of light sufficient enough to allow for dimming and off conditions.

café: lighting plan



Renderings

Figure 1.1
Café: Pseudo Color Rendering (Plan View)

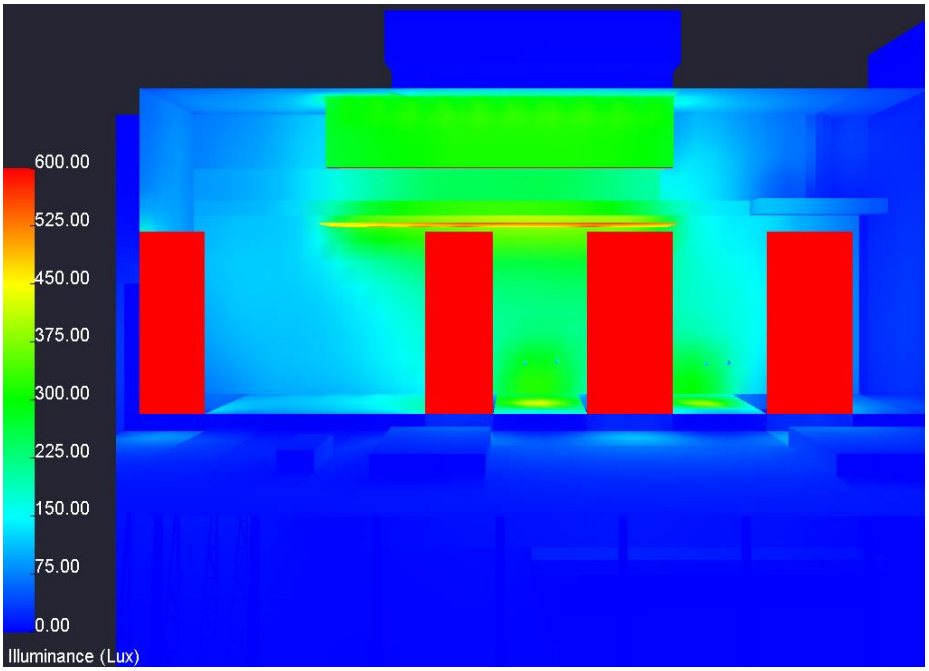


Figure 1.1
Café: Perspective Rendering

calculations

Illuminance

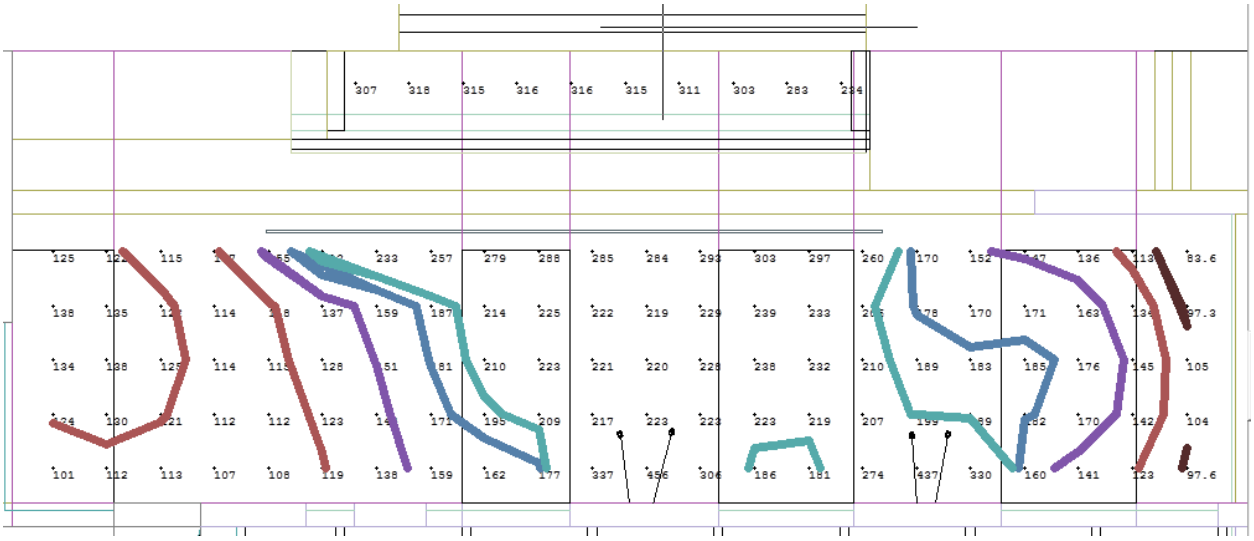


Table 1.1
Café Illuminance Calculation Summary (workplane 1.5')

Space	E_h Recommendation (lux)	E_h Calculated (lux)
coffee shop - eating area	100	183
servery	500	302

Lighting Power Density

Table 1.1
Café Lighting Power Density

Fixture Type	System Wattage	Quantity	Total Watts
LF1	78	2	156
LF2	59	1	59
LF3	59	1	59
LF4	450	1	450
LF5	290.4	1	290.4
TB	120	4	480
Total Watts			1,494.4
Area (SF)			1,625
Watts/SF			0.92
ASHRAE 90.1 compliant?			1.31 - Yes

evaluation

The café, being a place that people come together to relax and enjoy a tasty lunch from the chefs, needed a lighting design that promoted intimacy and visual comfort. By using luminance back-lighted panels in accordance with the architecture, it created a soft, warm atmosphere by which to eat by. The lit forms of the space (partition wall, cantilevered form) bring a little drama and visual interest while still holding true the overall design goals of the museum's minimalism.

Auditorium

description

The Auditorium is located on the second floor, and is connected to the main staircase and elevators. This space is used for presentations and as a classroom. The different programs in the space are very flexible. The space is geometrically a quarter-circle, making the curved wall the back of the room and focusing the front of the room on the center of the circle. The side walls measure 42' while the radius of the circle is 60'. The ceiling is set up in a radial fan pattern, sloping up in the front of the room and down toward the back. The total square footage is about 3,180 SF. Nine rows of desks are located around the quarter circle and slopes down toward the front of the room.

Figure 1.1
2nd Floor Plan

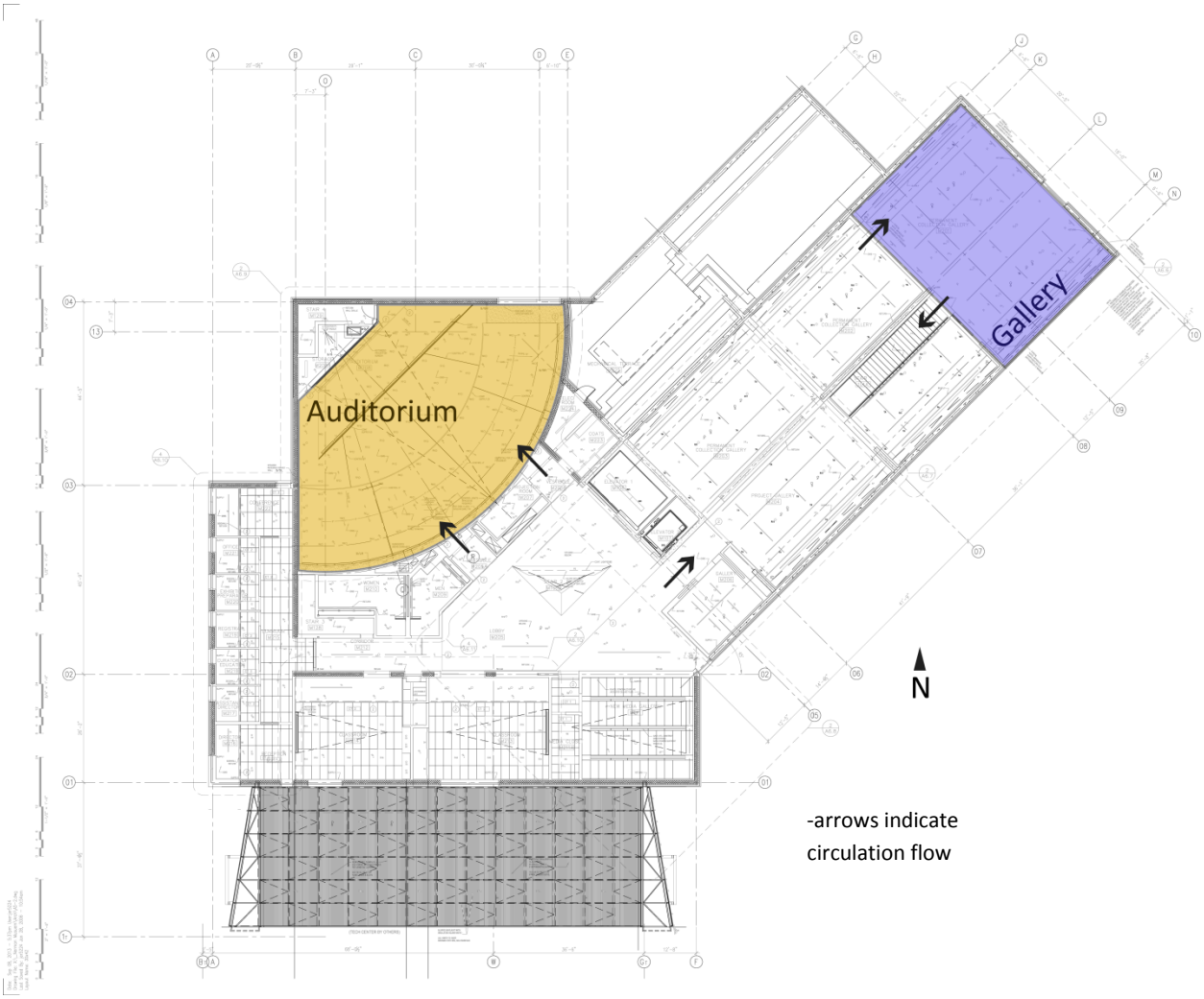


Figure 1.1
Auditorium Floor Plan

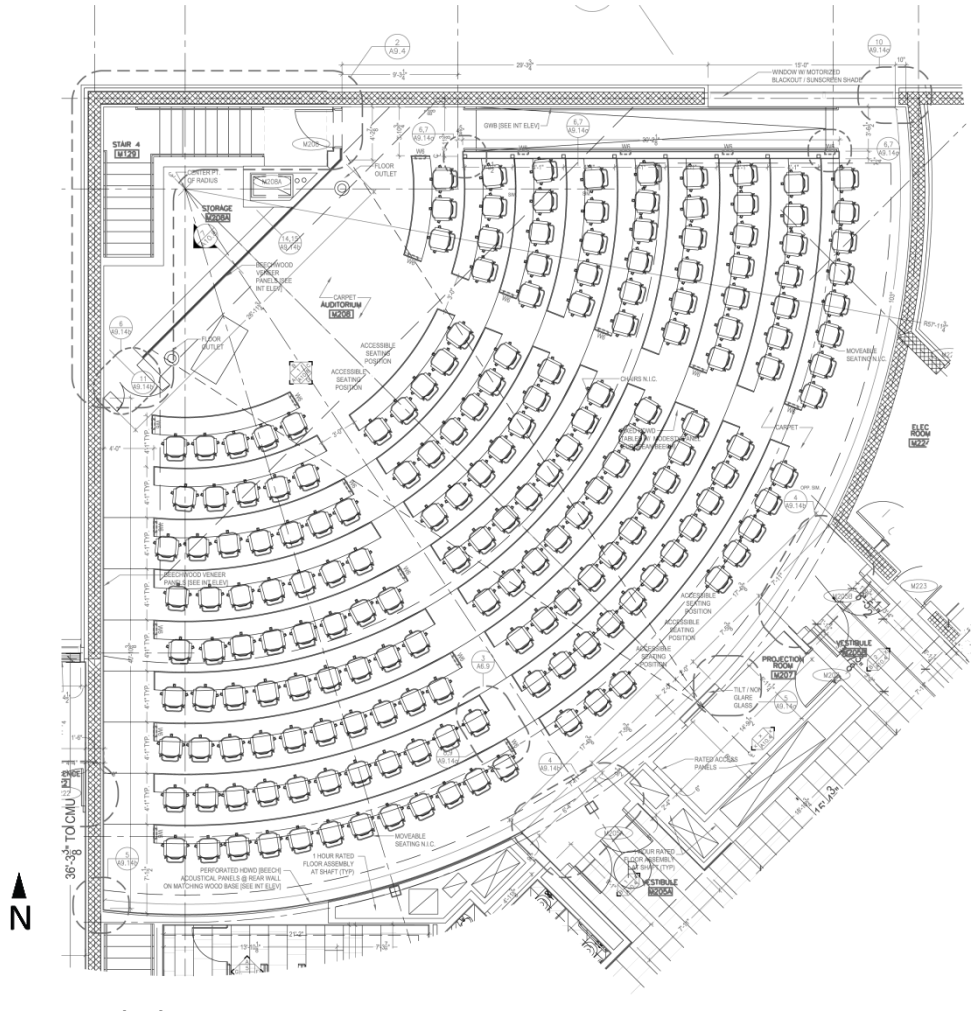


Table 1.1
Auditorium Finishes

Type	Description	Color	Reflectance	Manufacturer
floor	carpet	tan	0.35	-
base	aluminum	silver / painted	0.7	-
walls(side)	GWB / acoustic	off white / painted	0.7	-
walls(front / back)	wood / acoustic	light stain brown	0.5	-
ceiling(behind ceiling panels)	open to metal deck and truss system	grey	0.25	-
window(side)	glazing	glass	t=0.7	-
window(skylight)	diffuse skylight	acrylic	t=0.3	TBD
luminous ceiling panel	backlighted ceiling panel	white	t=0.71	Newmat stretch ceiling systems

overall design goals

The main lighting design goals for the auditorium are to create a relationship with the outside, creating center room focus, providing flexibility to the lighting scheme, creating a general brightness for alertness, and the right amount of illuminance for reading and writing on the desks. By simulating a cheery, overhead sky for the back-lighted ceiling panels, the room be provided with a relationship to the environment. The amount of light will fluctuate a little bit during the day while clouds move overhead. Skylights will provide daylight above the ceiling panels.

Just as a cloudy sky is contrasted by sunlight filtering through, so do the back-lighted ceiling panels.

tasks + activities

The auditorium is mainly used as a classroom throughout the day (8 am – evening classes). Being a part of the Johnson County Community College, the space will need to provide for a variety of different activities. Presentation on art and the work of the Nerman Museum will also take place in the auditorium.

design criteria

The illuminance values as well as certain design criteria were taken from IESNA Lighting Handbook. The lighting power density values were taken from ASHRAE/IESNA 90.1.

quantity of light

Table 1.1
Auditorium Illuminace (IES recommendations)

Space	E_h (lux)	E_v (lux)
av and notes	50	15
av no notes	10	6
feature presentations	10	6
no av	100	40
screen	-	10
speaker face	-	3x audience task
demonstration	1000	500
reading/writing	300	100

Table 1.1
Auditorium LPD

Space	Allowance (W/SF)
classroom/lecture/training	1.24

quality of light

relationship to the outside

By reshaping the ceiling and installing skylights above the auditorium, a connection to the outside will be created. As the clouds over head move, and as the sun moves around the building, the ceiling will change slightly in luminance. It is important to feel that connection to the environment because it will reinforce the heart of the Kyu Sung Woo's architecture.

center room focus

Establishing center room focus at the front of the room and the speaker or lecture is very important to any classroom and auditorium. A higher illuminance and luminance will be needed to achieve this hierarchy of space relationship.

flexibility

Since this space will need to house many different functions, the lighting will need to change accordingly. When the function calls for all the lights to be out, and just the AV running, motorized black-out shades will be deployed over the skylights for total darkness (under daylight condition). All fixtures will have dimming capabilities for the teacher to change as they please, with preset scenes also implemented for easy control. It is very import to have a lighting system that changes as much as the different programs occurring in the auditorium space.

brightness for alertness

A general brightness, that will keep the students awake and at attention, is needed for the overall classroom function of this space. During the daytime hours, when the skylights are being used, the illuminance will be brighter than most times. Lighting the ceiling, walls, and highlighting the front of the room will create a brighter room psychologically, even if the illuminance is at a normal level.

task illuminance

Because students will be using this space as a classroom, it is important that they have enough light to see general reading and writing tasks. Therefore the task illuminance at the work plane (2.5' height) will reach the target IES recommendation.

rendering of faces

Since the auditorium will have different lecturers, moving around the front of the room, it is important to light their faces well. Track lighting will highlight their faces from multiple locations in the ceiling, while a soft wash on the front wall will give depth to the scene.

visual interest

Creating some visual interest is fairly important because this is a school building and museum. The visual scale and brightness of the ceiling will provide the some additional visual interest to the space that is already rich with interesting architecture.

color temperature

Staying consistent with 3500K color temperature for the light sources is very important. When moving from space to space, a constant feel or tone is needed to create a total visual experience.

fixtures and equipment

Table 1.1
Auditorium Equipment Schedule

Type		Manufacturer	Description
	F1	Bartco	4 foot linear fluorescent strip. Integral ballast. (1) T8 lamp.
	F2	Bartco	4 foot linear fluorescent strip. Integral ballast. (2) T8 lamp.
	P1	Indy (Juno)	Pendant mount LED 9 inch cylinder downlight. 2000 lumen package. 31 watts. Open aperture with integral driver.
	P2	Indy (Juno)	Pendant mount LED 9 inch cylinder downlight. 2800 lumen package. 46 watts. Open aperture with integral driver.
	L5	Lumenpulse	1 foot LED strip. 8.5 watts/foot, Regular Output. 10x60 degree beam spread. Integral driver with standard dimming.
	L6	Lumenpulse	4 foot LED strip. 8.5 watts/foot, Regular Output. 10x60 degree beam spread. Integral driver with standard dimming.

	T4	Edison Price	Hanging LED tack system, integrated with fabric panel system, 1500 lumen package, 80+ CRI. 20 degree beam spread. Dimmable standard driver. 3500K
	T5	Edison Price	Hanging LED tack system, integrated with fabric panel system, 1500 lumen package, 80+ CRI. 40 degree beam spread. Dimmable standard driver. 3500K

Ceiling Redesign

To fully realize the lighting design concept for the auditorium, a new ceiling design was needed to let more daylight into the room. Respect to the architecture and its overall concept was kept in mind when coming up with the new ceiling. Taking cues from the architecture's clean lines, regular geometry, and use of voided space, a series of radial panels in the shape of a fan were designed. By sloping up in the front of the room, and coming back down toward the back of the room, the auditorium is transformed into a vaulted space. The overlap of the panels adds depth and a focal point to the front of the room, marking the pinnacle of the space. The vaulted ceiling also adds acoustical performance by relaying speech to the back of the room more effectively.

Figure 1.1
Initial Ceiling Design

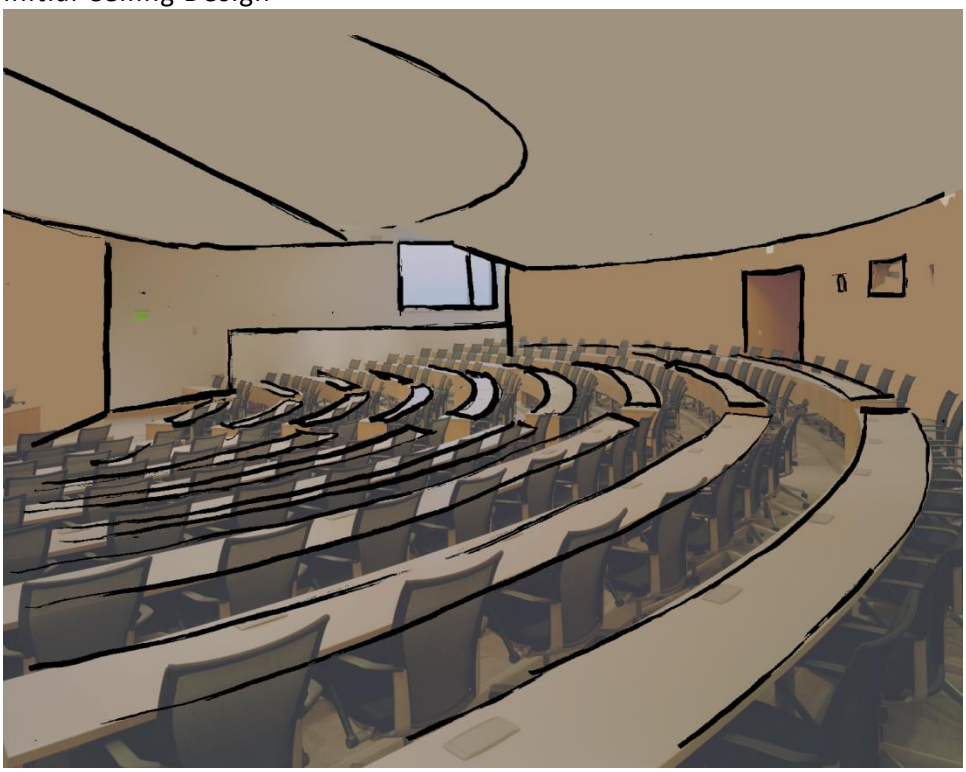


Figure 1.1
New Ceiling Design – Concept

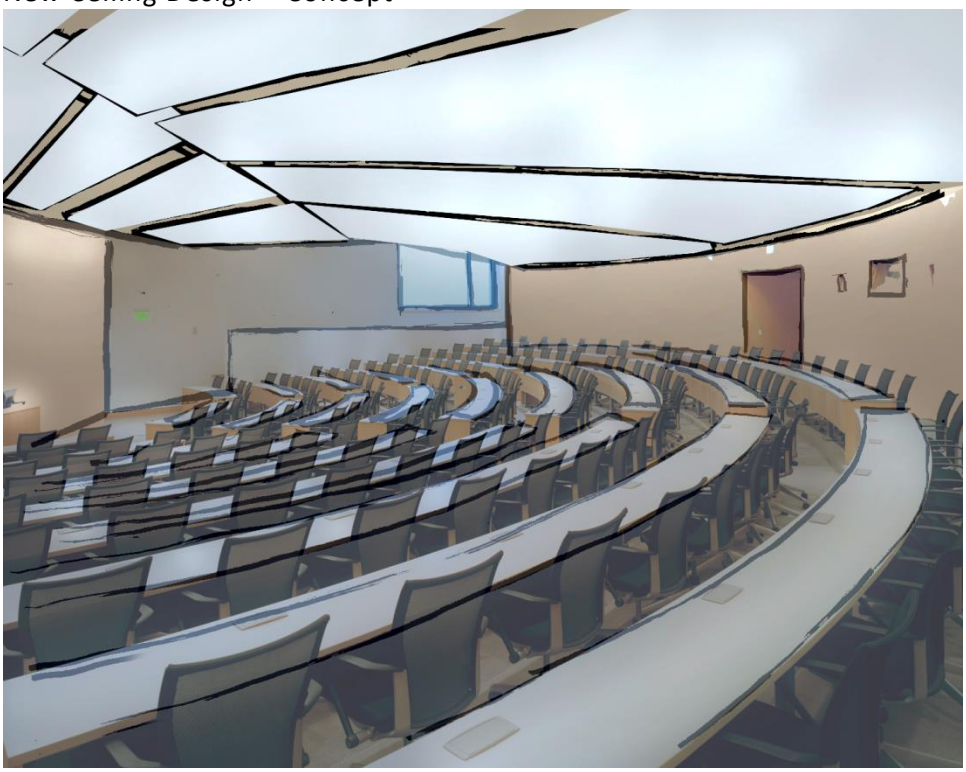
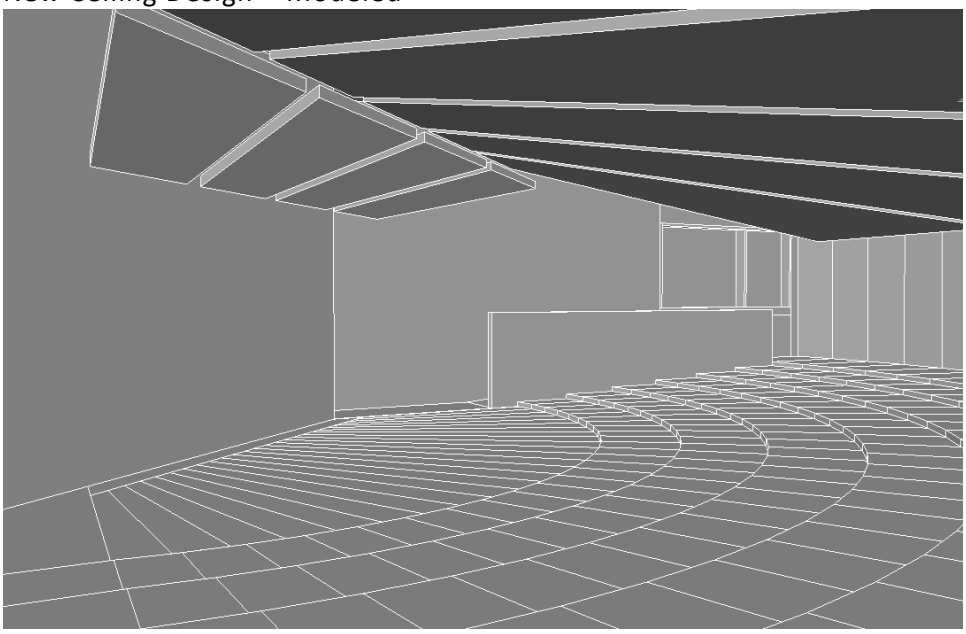


Figure 1.1
New Ceiling Design – Modeled



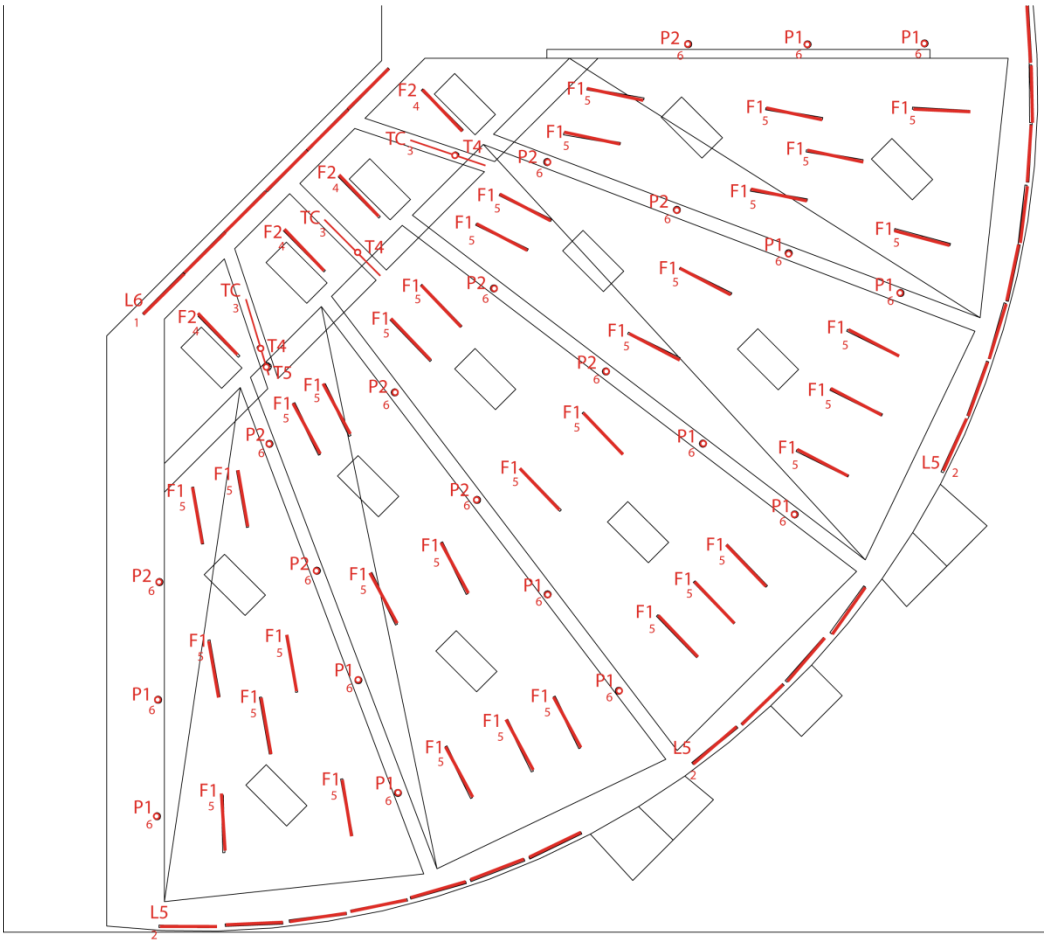
controls

A workable control scheme for the auditorium is imperative to make this space function. Being a space that's also a classroom, total darkness is needed from time to time to view AV presentations. Controls for manual black-out shades for the skylights, and the window will be used, so that any time the presenter needs a dark room, a button can be pressed to achieve it.

Balancing light levels across the space is also very important to a space that can't have too many distractions. The overall light contribution from the skylights is minimal, but during the day, all the supplementary fluorescent fixtures can be turned off. Dimming of the LED cylinders will be utilized on a photo-sensor. A closed loop photo-sensor placed at 3 points throughout the room will work together to dim these LED cylinder luminaires to the desired light levels. This will save energy and maintain appropriate light levels.

Each the back and front wall grazing luminaires can be turned on and off separately to added control. All fixtures are dimmable. But there will be a control panel that has a few pre-set scenes for AV, AV with notes, full on, and daylight scene. These are simple, and make up for most of the scene needed throughout the year. Some settings can be found at the calculations part of this section.

auditorium: lighting plan



Renderings

Figure 1.1
Auditorium: Pseudo Color Rendering (Nighttime)(Perspective View) Calculation is in Fc

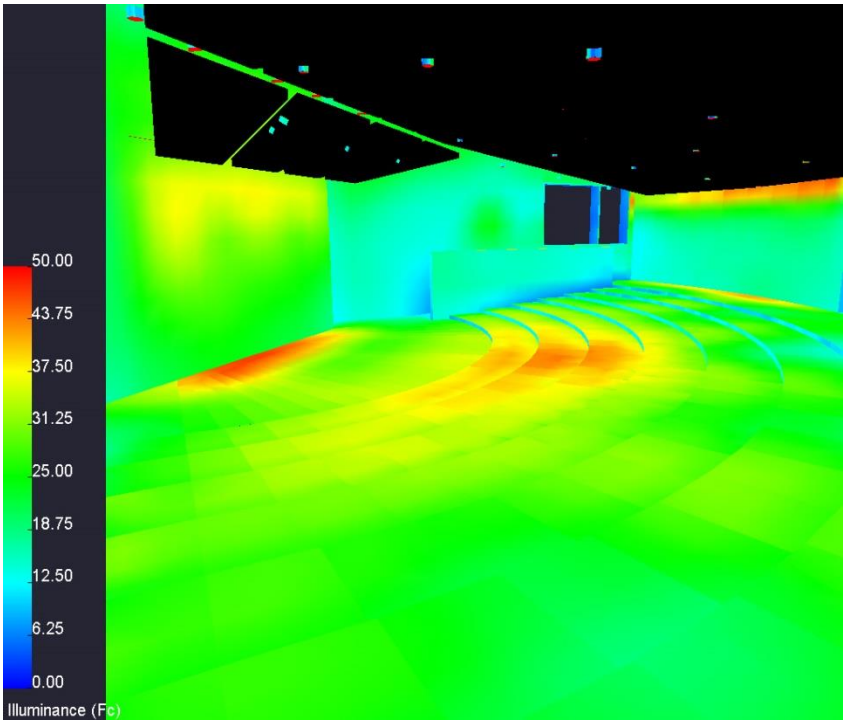


Figure 1.1
Auditorium: AV Scene (Perspective View) Calculation is in lux

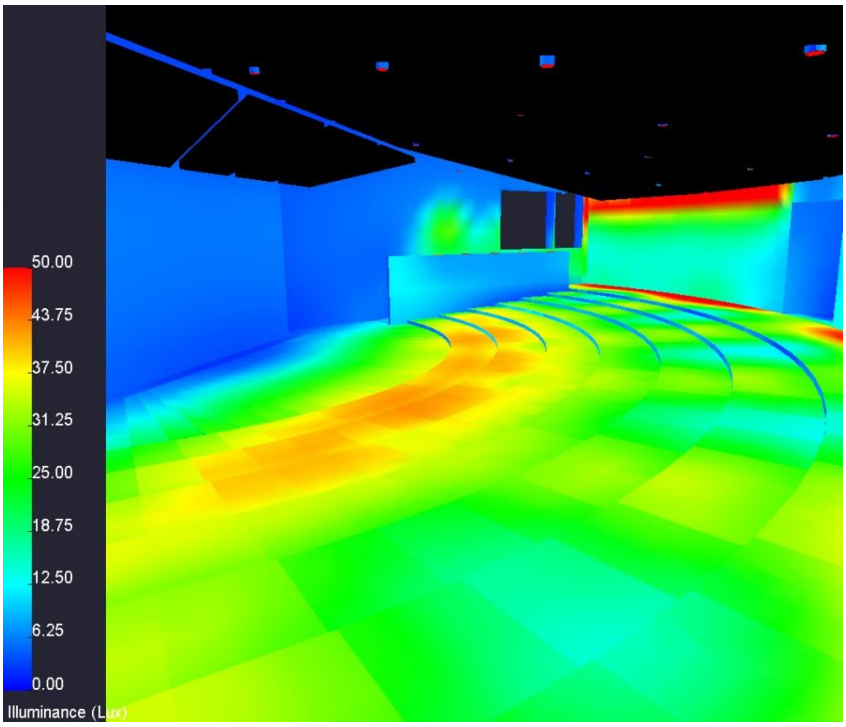


Figure 1.1
Auditorium: Daytime June 21st 1:00 pm – clear sky (Perspective View) Calculation is in lux

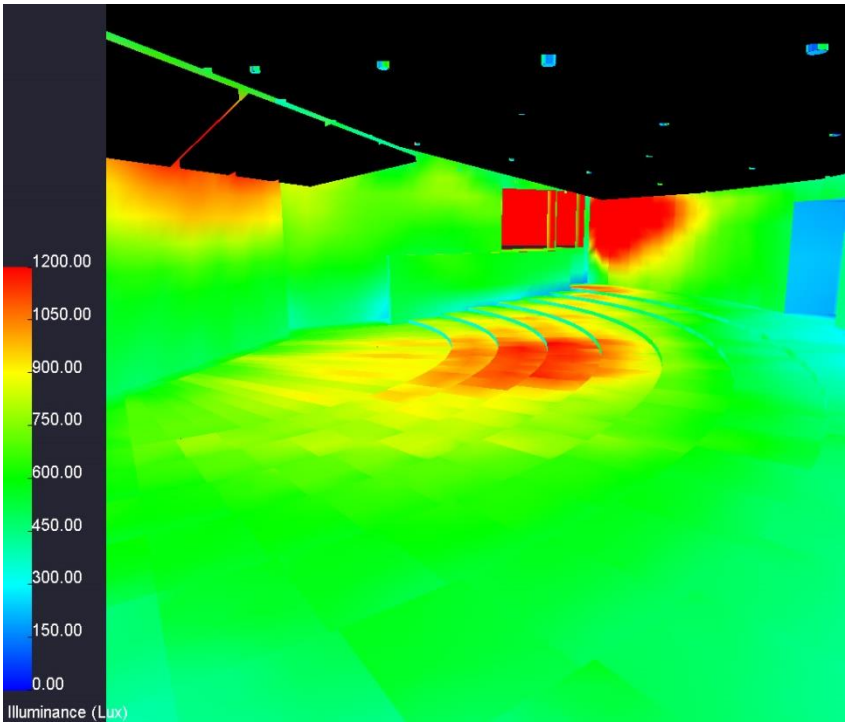


Figure 1.1
Auditorium: Daytime June 21st 1:00 pm – clear sky (Perspective View) Calculation is in lux

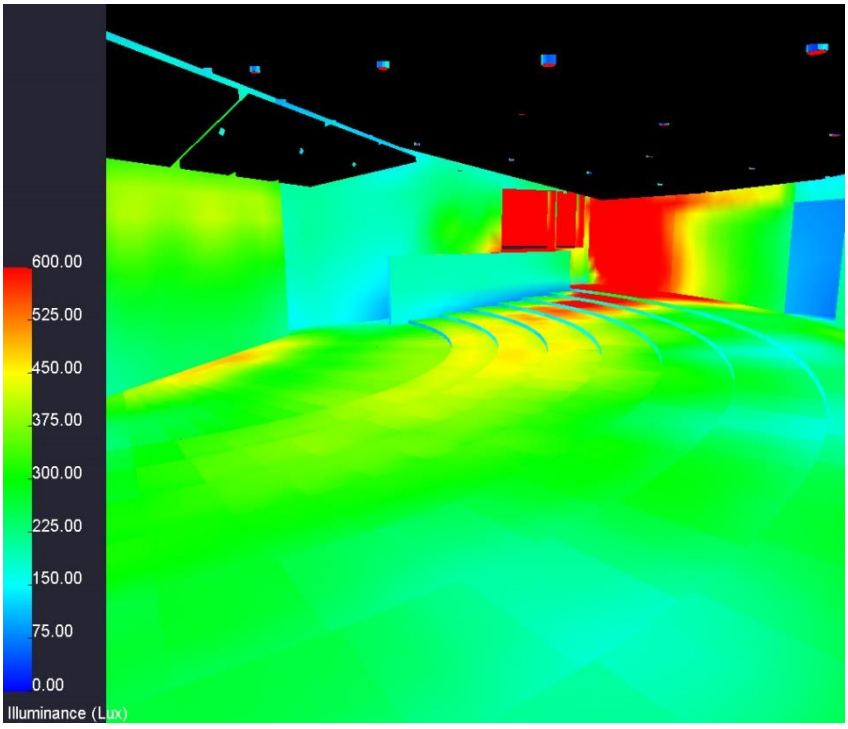


Figure 1.1
Auditorium: Nighttime Perspective Rendering #1 (All lighting on)

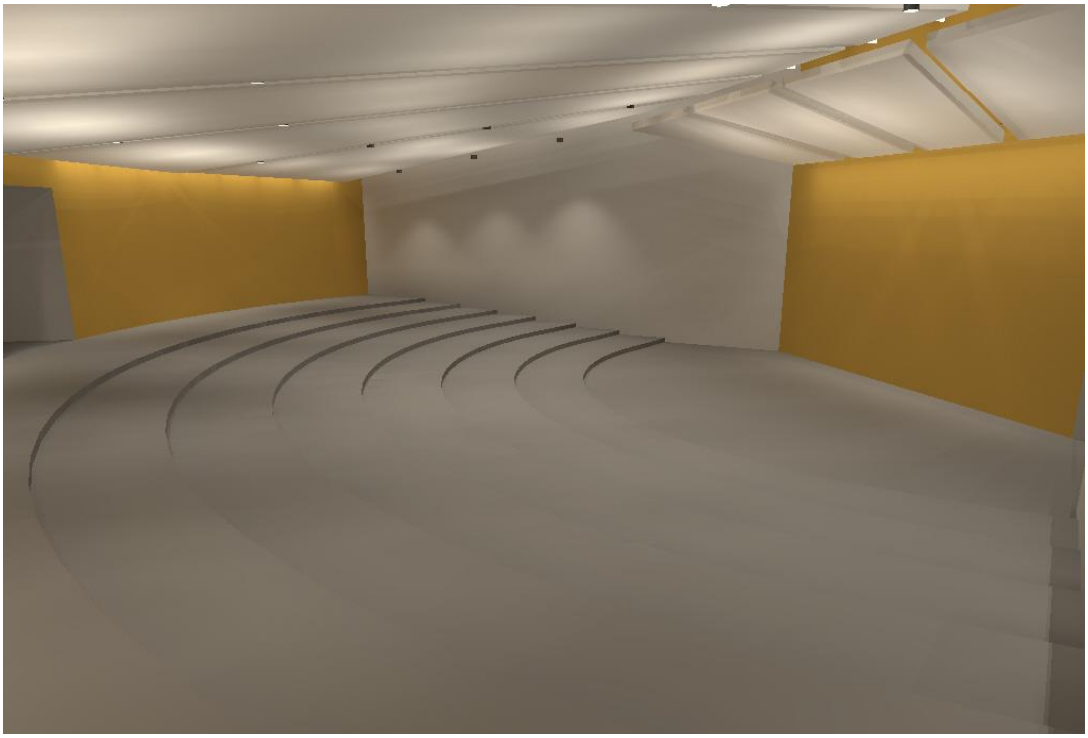


Figure 1.1
Auditorium: Nighttime Perspective Rendering #2(All lighting on)

Figure 1.1
Auditorium: AV Scene Perspective Rendering

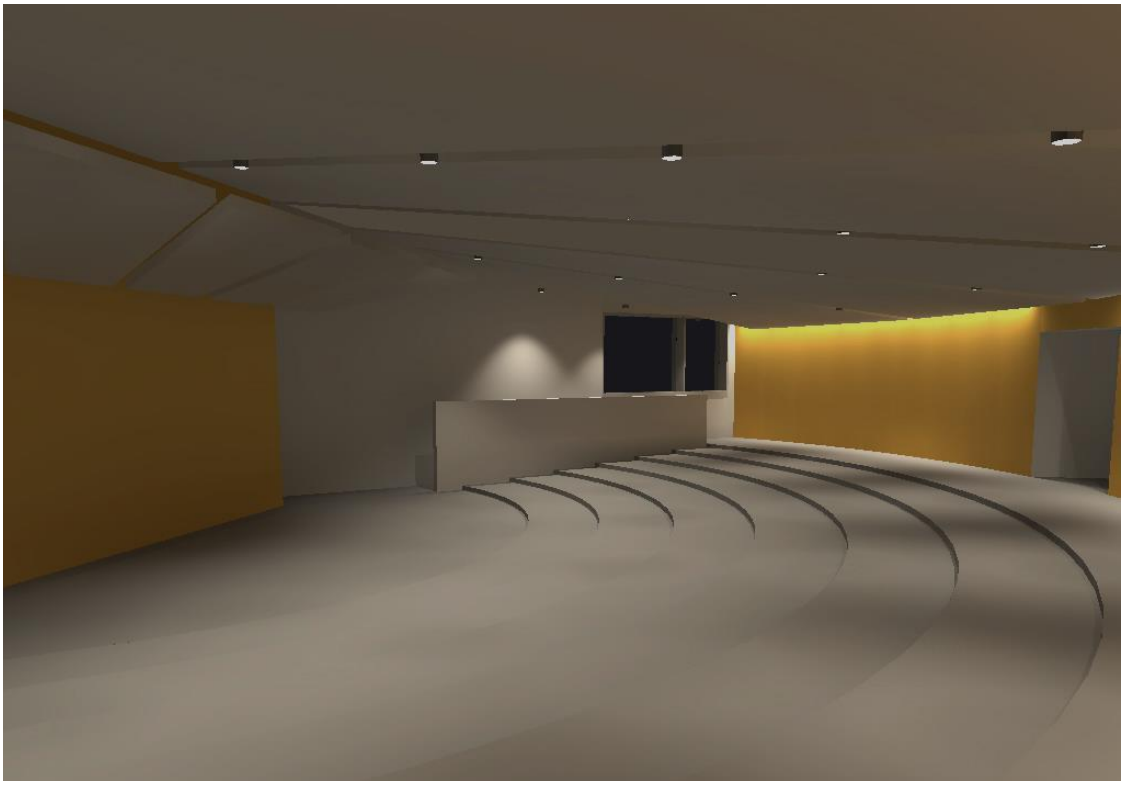


Figure 1.1
Auditorium: Perspective Rendering (Daytime June 21st 1:00 pm – clear sky)

Figure 1.1
Auditorium: Perspective Rendering (Daytime June 21st 1:00 pm – overcast sky)

calculations

Illuminance

Figure 1.1
Auditorium: Illuminance Grid Points with Isolines (Nighttime) All lighting on

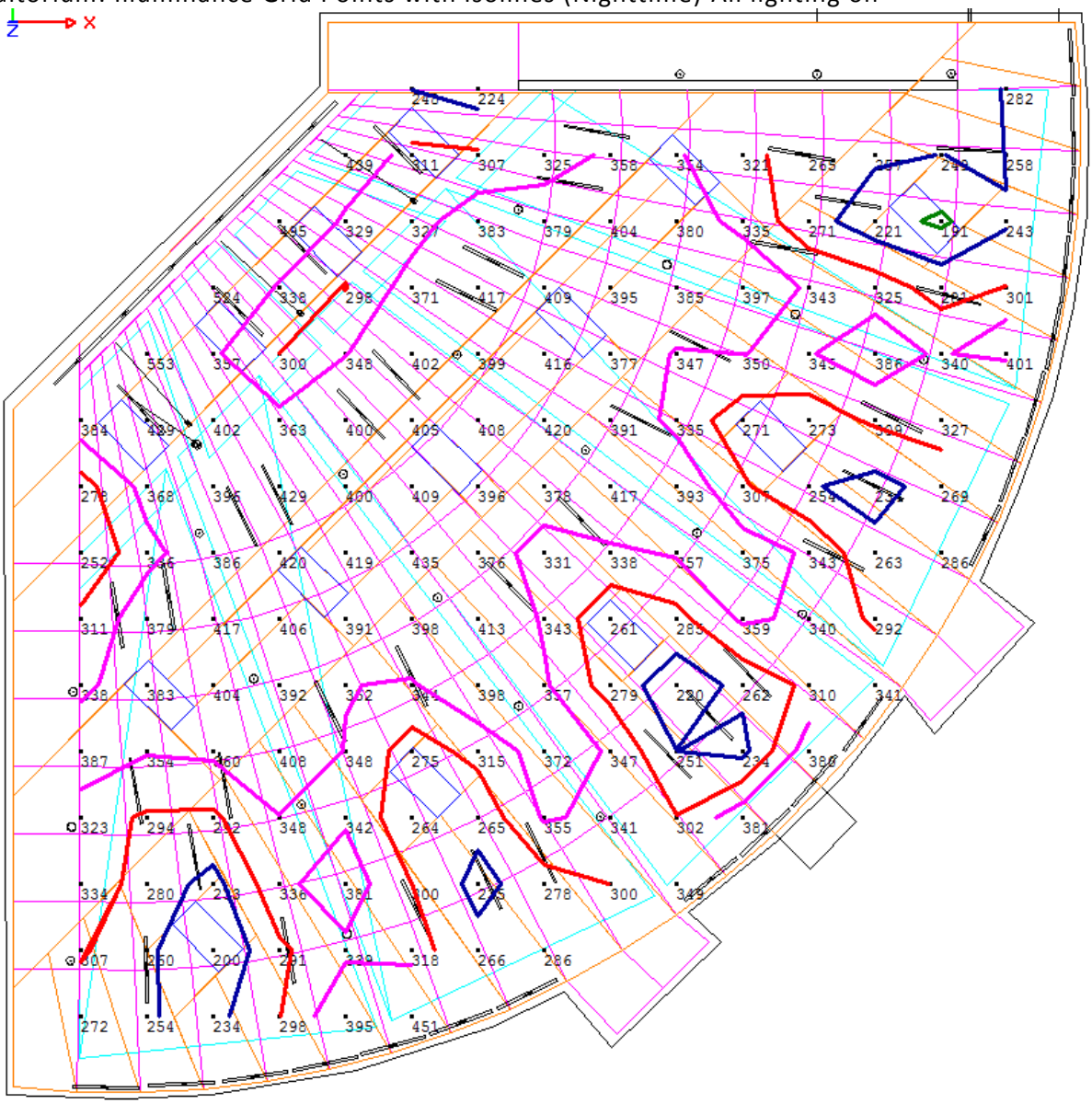


Figure 1.1

Auditorium: Illuminance Grid Points with Isolines (Nighttime) All lighting on

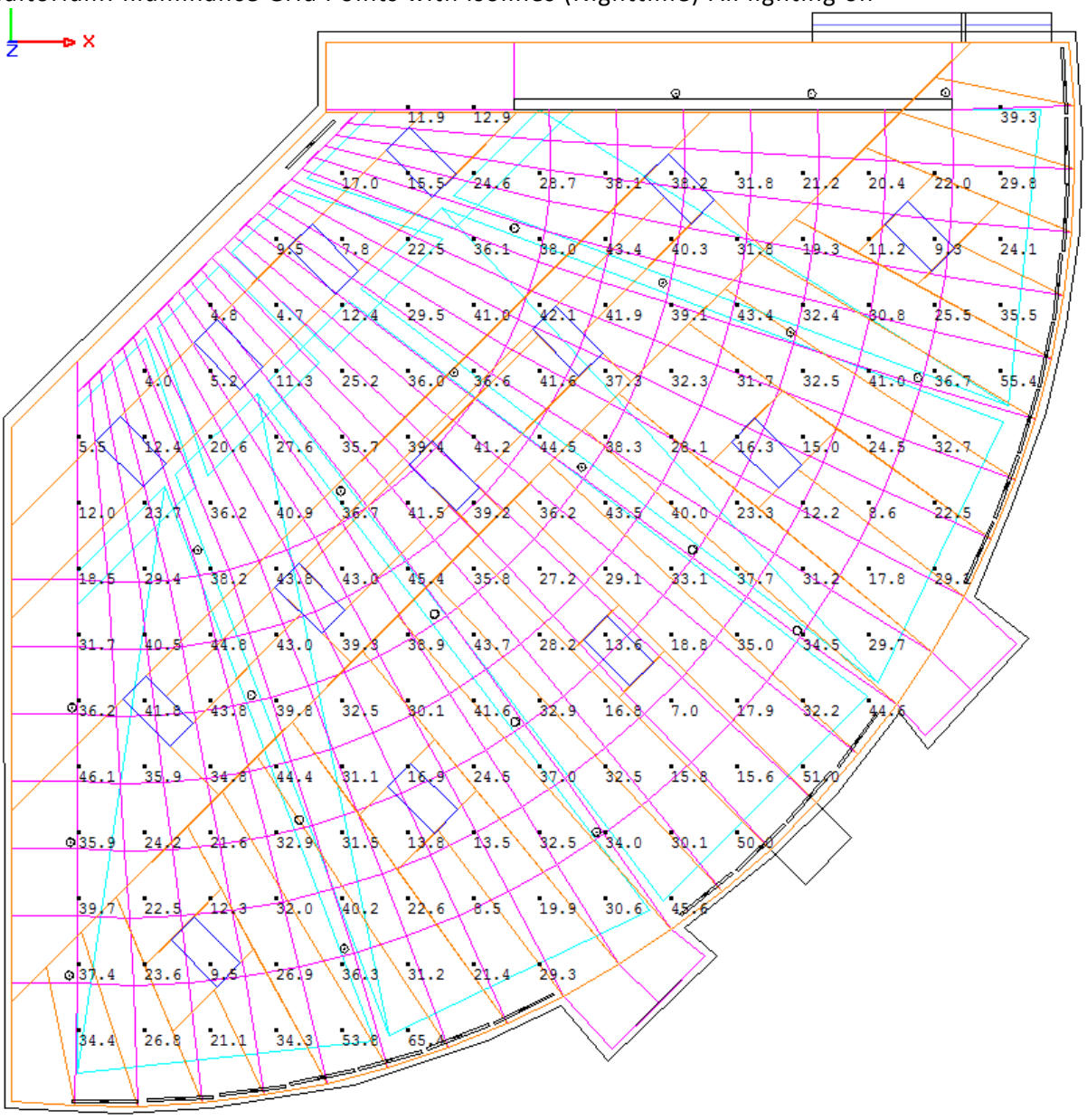


Figure 1.1

Auditorium: Illuminance Grid Points with Isolines (Daytime June 21st 1:00 pm – clear sky)

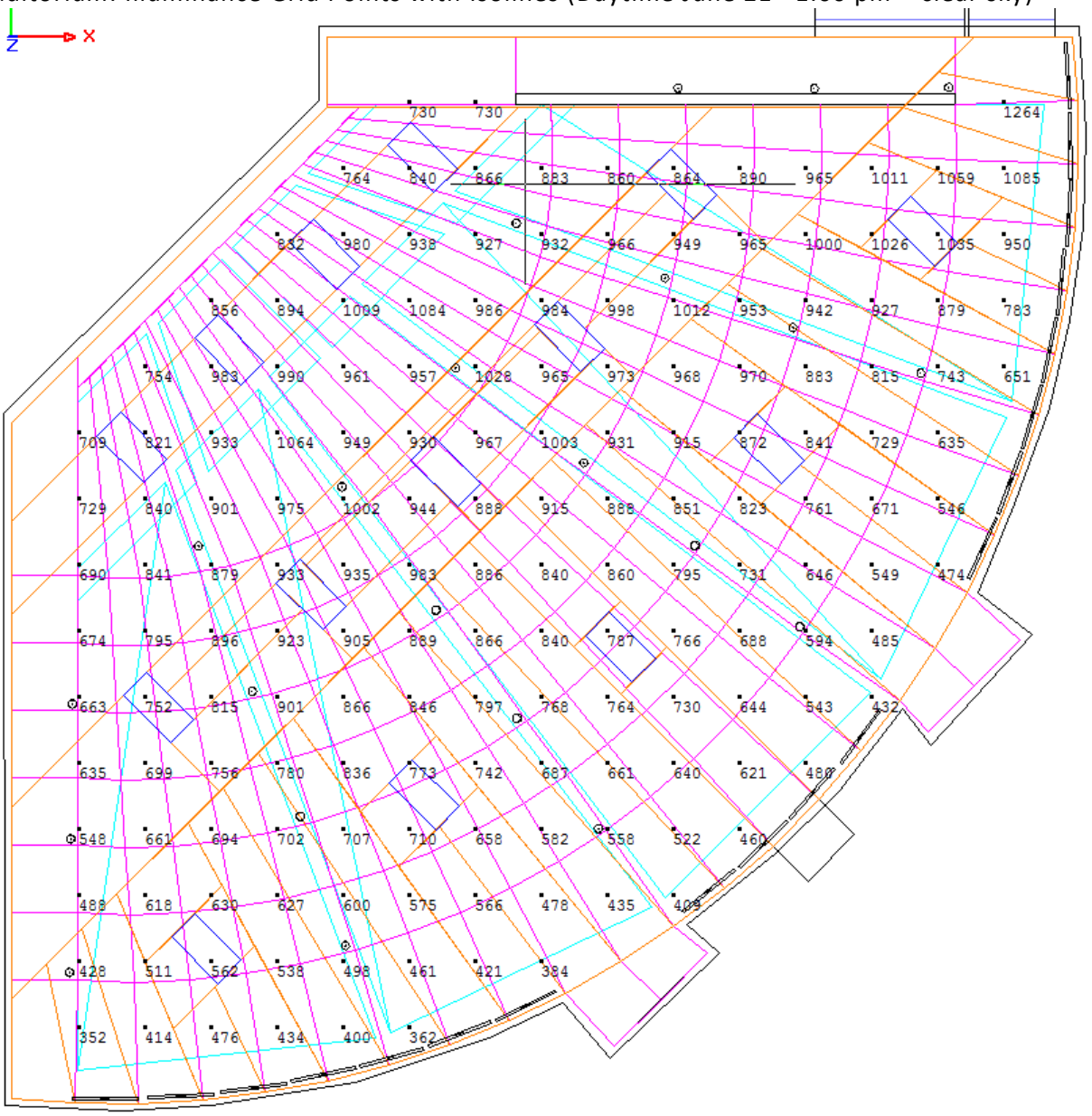


Figure 1.1

Auditorium: Illuminance Grid Points with Isolines (Daytime June 21st 1:00 pm – overcast sky)

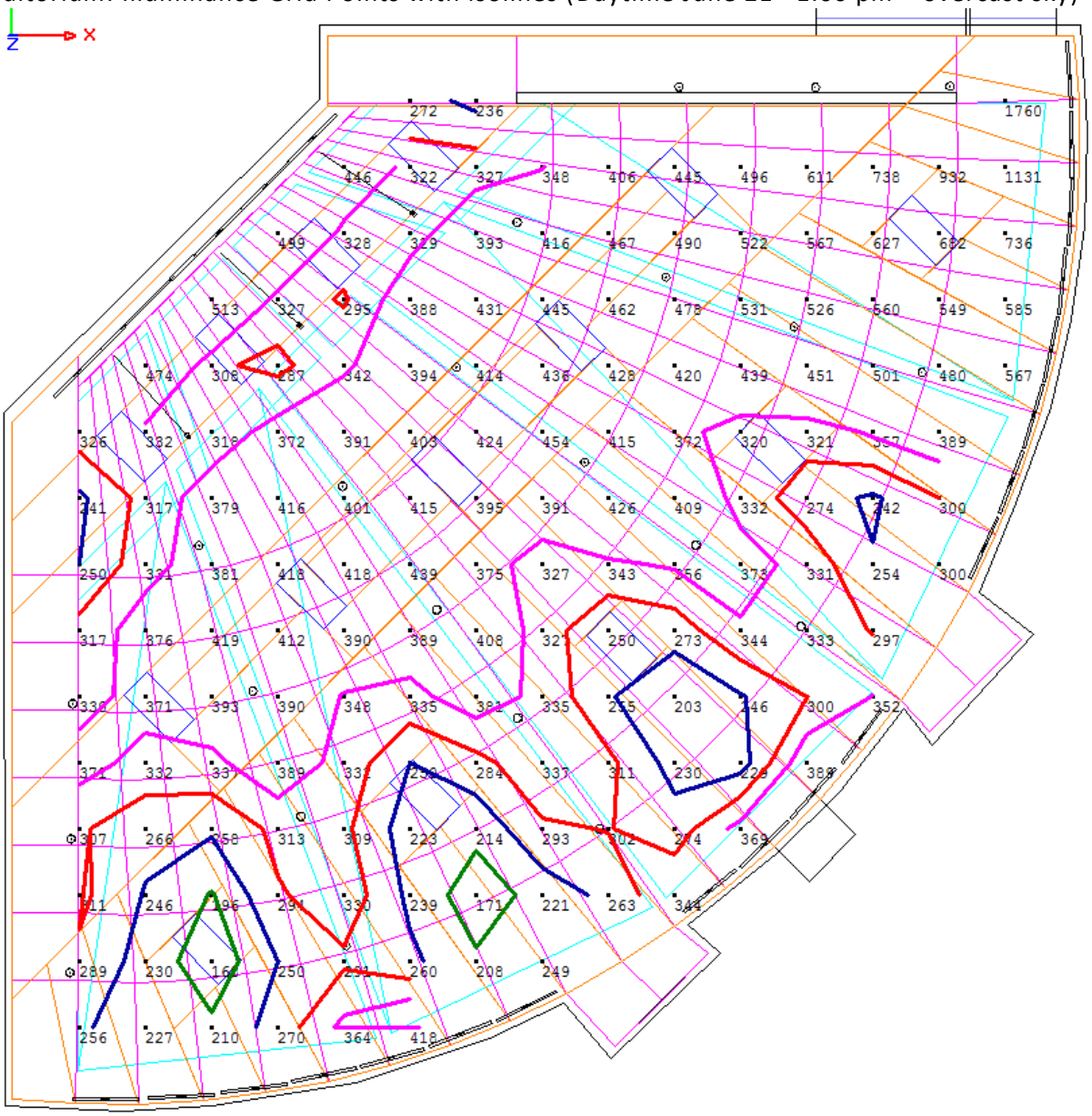


Table 1.1

Auditorium Illuminance Calculation Summary (workplane 1.5')

Space	E_h Recommendation (lux)	E_h Calculated (lux)
classroom reading and writing	300	336
AV & Notes	50	30
Daylight on clear day	-	940
Daylight on overcast day	-	378

Lighting Power Density

Table 1.1
Auditorium Lighting Power Density

Fixture Type	System Wattage	Quantity	Total Watts
F1	33	32	1,056
F2	66	7	462
P1	31	13	403
P2	46	10	460
L5	8.5	76	646
L6	34	6	204
TB	120	3	360
Total Watts			3,591
Area (SF)			3,350
Watts/SF			1.07
ASHRAE 90.1 compliant?			1.24 - Yes

evaluation

The Auditorium, originally having little connection to the outside environment, now has a fully dynamic day-lit space. This adds some visual interest and overall brightness to the room for alertness. Controls are used to achieve highly flexible lighting scenes that are necessary for classroom functions. Overall, the space feels more lively, interesting, and visually comforting.

Gallery

description

The Gallery of study is located on the second floor, in the cantilever part of the building. This gallery is also the only gallery with a side window making it problematic with glare issues. There are two entrances and/or exits for this gallery. One is through another adjacent gallery, and the other is through a doorway and down a set of stairs that lead to the main first floor hallway. It measures 51' x 36' x 16'(h). This makes the space one large box that amounts to 1,836 SF. Art work can be found on all four sides as well as the potential for sculpture in the middle of the space.

Figure 1.1
2nd Floor Plan

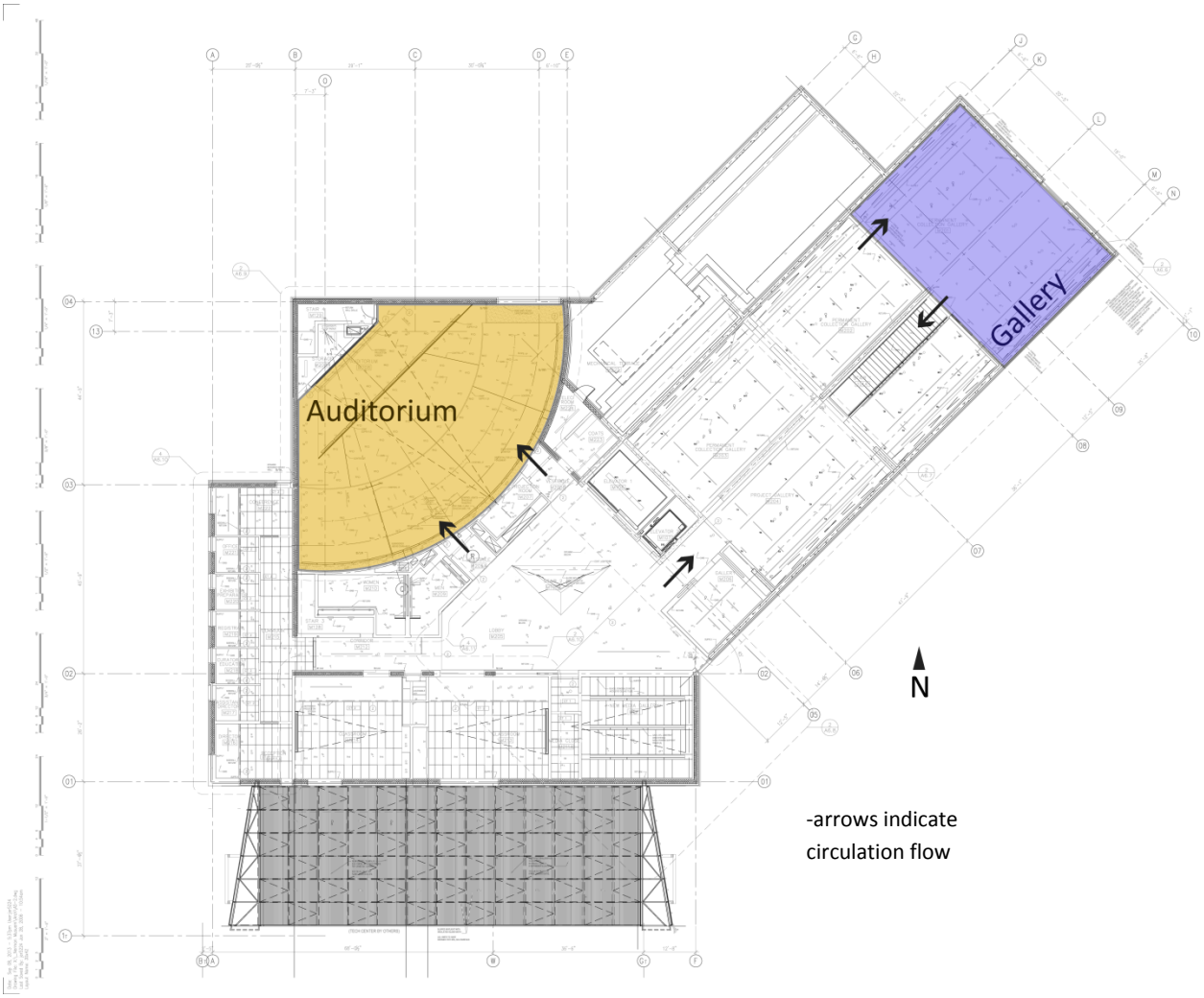


Figure 1.1
Gallery Floor Plan

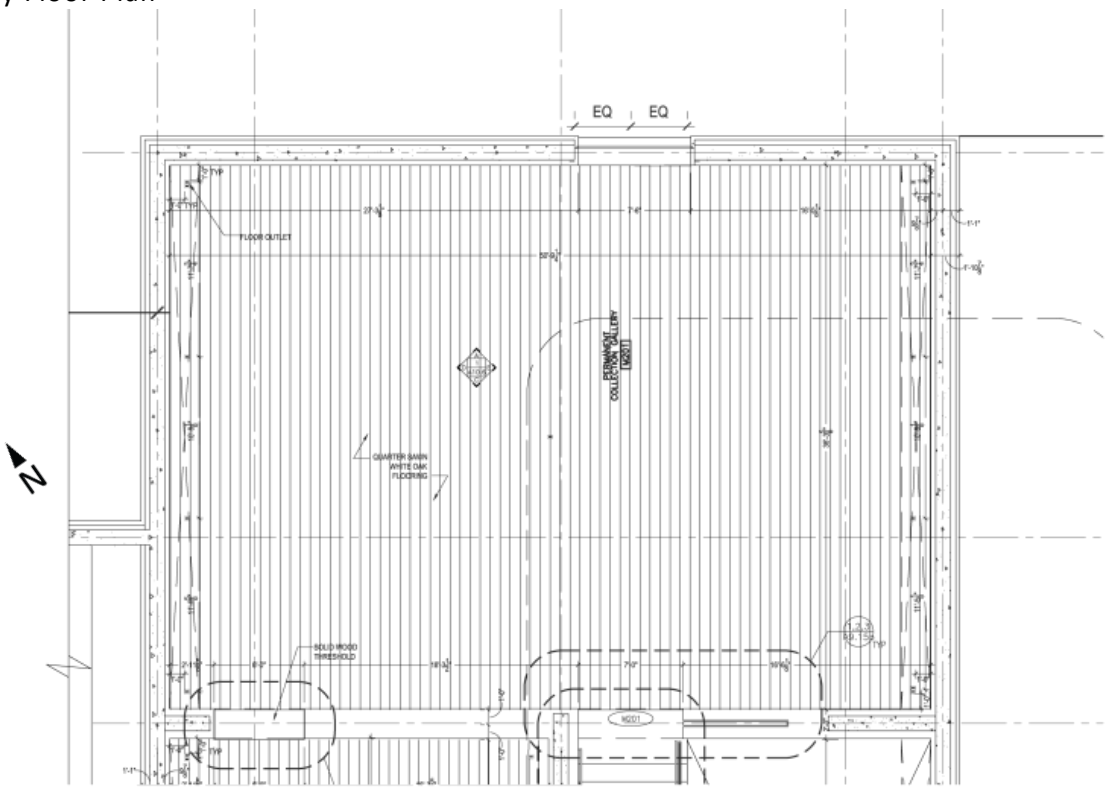


Table 1.1
Gallery Finishes

Type	Description	Color	Reflectance	Manufacturer
floor	stone	brown	0.6	-
base	aluminum	silver / painted	0.7	-
walls	GWB	off white / painted	0.7	-
ceiling	perf. GWB	off white / painted	0.7	-
window	glazing	glass	t=0.7	-
fabric panel	stretched fabric over track system	fairly translucent	openness= TBD	TBD

overall design goals

The main design objective for the gallery, first and foremost, is to compel the artwork to standout. The lighting will also take into account the contrast, particularly during daytime hours, reinforcing architectural form, protecting the artwork from harmful electromagnetic light, and creating an overall pleasant space to look at art in. The ceiling will be reconfigured to have three drop down fabric panels. The track lighting will be integrated into the framing system. These fabric panels will be grazed at the edge of the frame to create a gradient sky. This strengthens the connection to the buildings environment.

Just as a sky's horizon is painted with a gradient, so are the grazed fabric ceiling panels.

tasks + activities

The main activities in this space will be to view the artwork. During off hours, the lighting will have to accommodate work conditions to change or alter art in the space.

design criteria

The illuminance values as well as certain design criteria were taken from IESNA Lighting Handbook. The lighting power density values were taken from ASHRAE/IESNA 90.1.

quantity of light

Table 1.1
Gallery Illuminace (IES recommendations)

Space	E_h (lux)	E_v (lux)
art(high sensitivity)- moderate focals	-	50
art(low sensitivity)- moderate focals	-	200
art(no sensitivity)- moderate focals	-	1000
gallery general- moderate focals	0.1x E_v of art w/ $\geq$ 10	-
security	30	30
work light	150	30

Table 1.1
Gallery LPD

Space	Allowance (W/SF)
gallery - artwork	1.05
ASHRAE 90.1 section 9.6.2: additional interior lighting power for highlighting art (+1.0 W/SF)	1.00 + 1.05 = 2.05

quality of light

contrast

Balancing the luminances between the window, walls, and art work is imperative to allowing the art work to stand out. Using IES recommended values for moderate artwork focus will be used to create a pleasing viewing experience. Too much contrast and the viewers will become fatigued, while not enough contrast won't allow the art to stand out.

flexibility

Flexibility for the different artwork moving around the space is crucial. Wherever the art director of the museum needs to put the art, he or she needs the appropriate aiming angles. A track system will be used in the space to allow for maximum flexibility, but also the track placement also has to well thought-out and adaptable.

architectural form

The minimalist box that is the space also needs to be preserved by the lighting design. Consideration to fixture locations will be looked at.

luminances visual surfaces

The luminances of the artworks and room area will be balanced under a moderate focus according to IES recommendations.

protecting the artwork

Pieces of art often are very sensitive to UV and IR light. They can deteriorate the art over long exposures. Although most contemporary artwork is not as susceptible to UV light as ancient artworks, consideration still needs to be made. Paint finishes as well as fixture filters will be studied to protect the artworks from harmful electromagnetic radiation.

color rendering

Color rendering is very important to lighting pieces of art. A high CRI (+90s) is required to fully see the accurate colors of the artwork. By considering LEDs, the light engine must be looked at to make sure the CRI will render all colors accurately. Halogen sources are traditionally used because of their high color rendering properties.

visual interest

Creating some visual interest that reinforces the architecture and overall design is important to strengthen the total visual experience of the Nerman Museum.

color temperature

Since this space receives a lot of daylight, and also needs to be sensitive to artwork and the color rendering of traditional light sources, a middle of the road color temperature was

selected throughout the building (3500K). Track lighting, whenever lighting a piece of art, requires a CRI in the 90s, but the general ambient light in the space can be a lower CRI in the 80s.

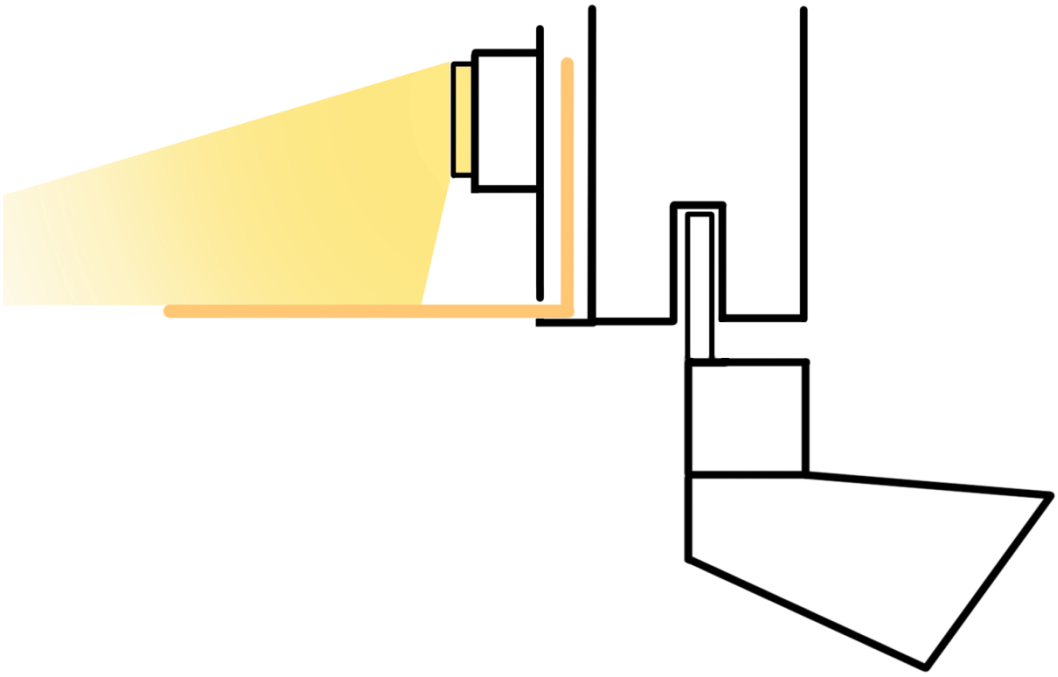
fixtures and equipment

Table 1.1
Gallery Equipment Schedule

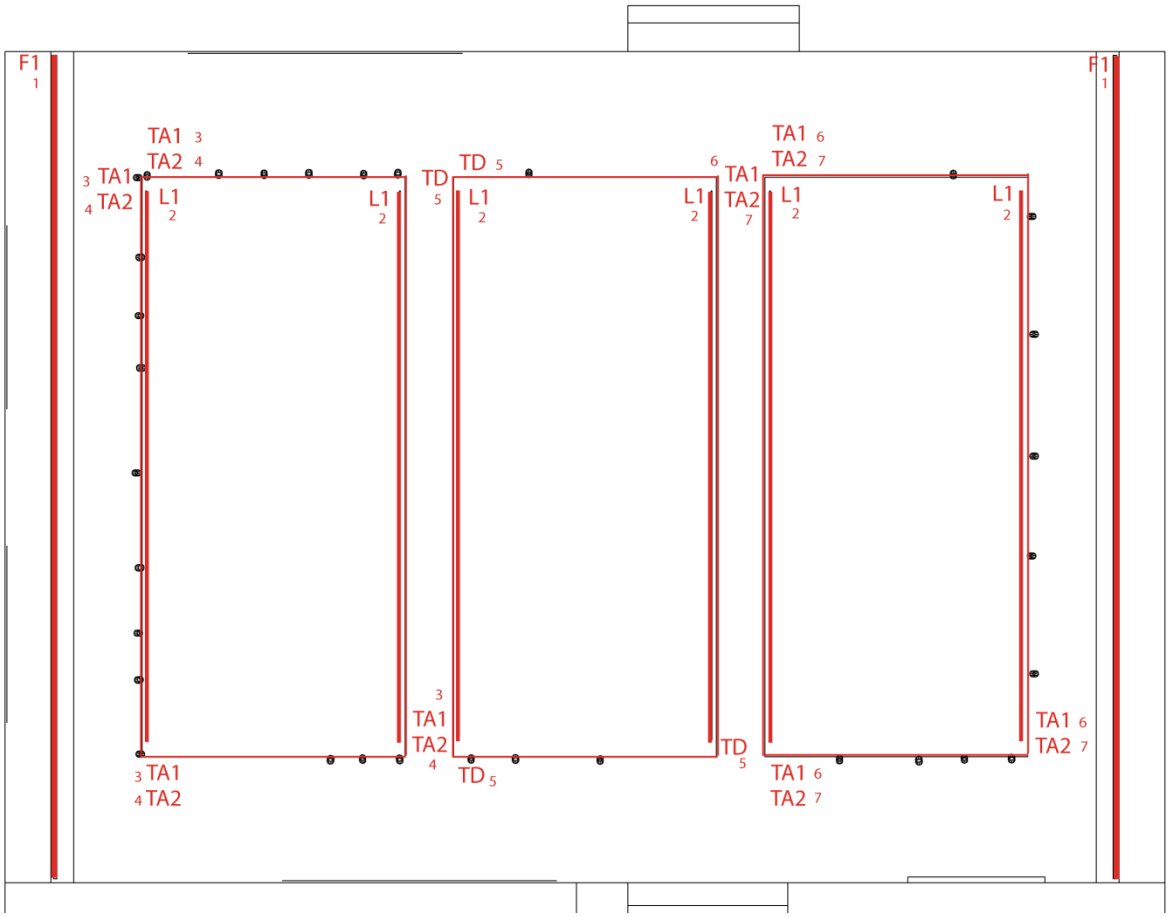
Type		Manufacturer	Description
	F1	Bartco	4 foot linear fluorescent strip. Integral ballast. (1) T8 lamp.
	L1	Acolyte	LED RibbonLyte static white 3500K. AT3 Channel with 30 degree beam spread. 1.5 watts per foot.
	T1	Edison Price	Hanging LED tack system, integrated with fabric panel system, 1000 lumen package, artist series 97 CRI. 20 degree beam spread. Dimmable standard driver. 3500K
	T2	Edison Price	Hanging LED tack system, integrated with fabric panel system, 1000 lumen package, artist series 97 CRI. 40 degree beam spread. Dimmable standard driver. 3500K
	T3	Edison Price	Hanging LED tack system, integrated with fabric panel system, 1000 lumen package, artist series 97 CRI. 60 degree beam spread wall washer. Dimmable standard driver. 3500K

Detail of Track Integration into Fabric Panel System

The stretched fabric is fully integrated with the track system. This system is hanging a full 1' off the ceilng. This lets the form of the space remain intact and not full of track fixtures. The LED strip is mounted directly behind the fabric to gently graze it. A grating pattern for the fabric will be used. This system allows for flexibility with different aiming points while still adding ambient light to the middle of the gallery.



gallery: lighting plan



Renderings

Figure 1.1
Gallery: Pseudo Color Rendering (Nighttime)(Perspective View)

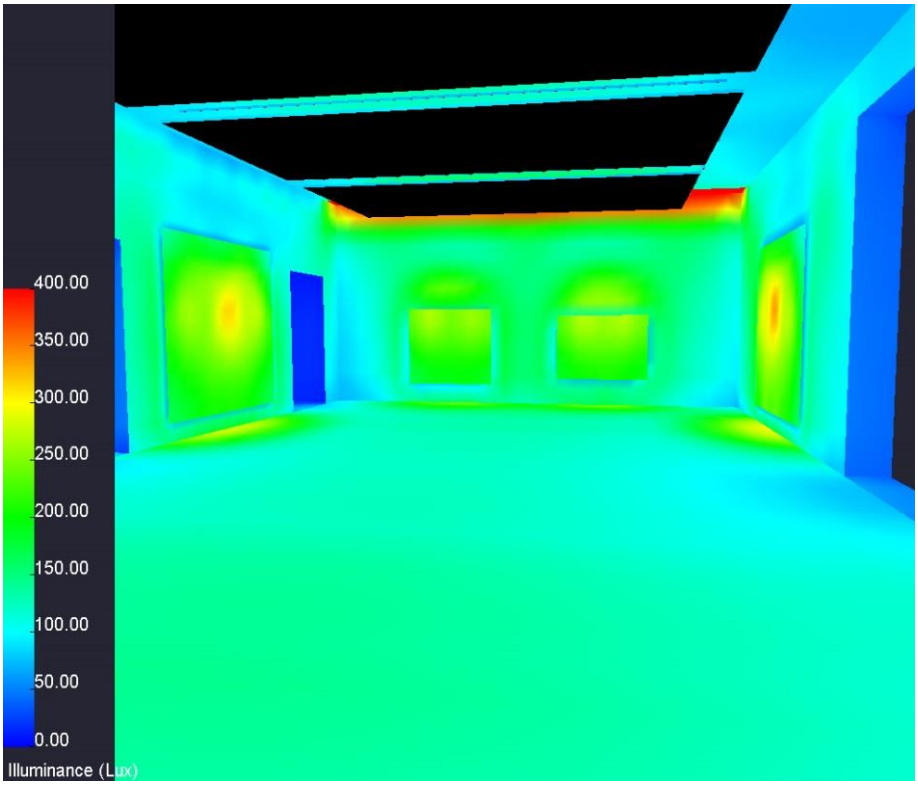


Figure 1.1
Gallery: Daytime Perspective Rendering (June 20th 1:00 p.m. – Overcast sky)

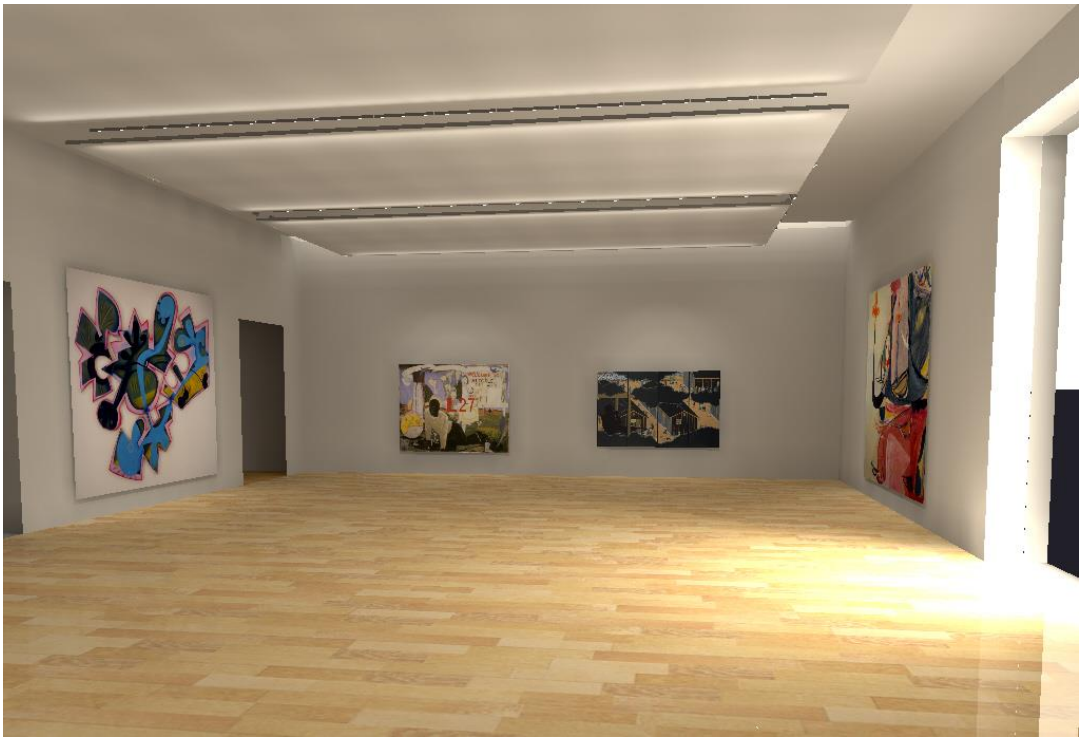
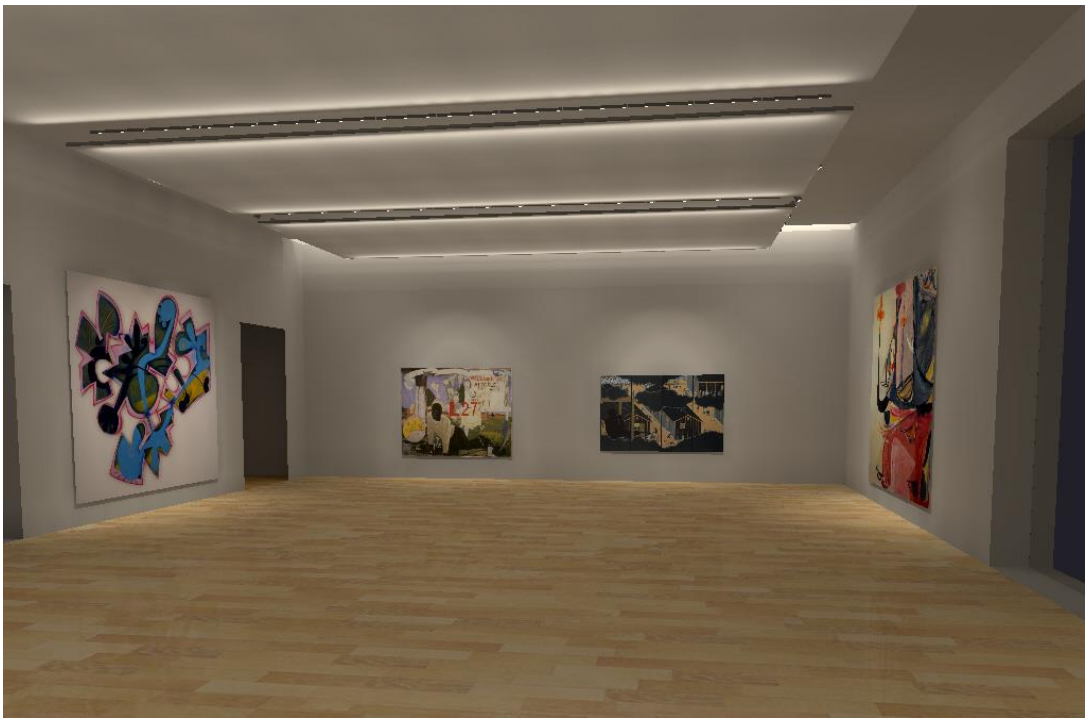


Figure 1.1
Gallery: Nighttime Perspective Rendering



calculations

Illuminance

Figure 1.1
Gallery: Illuminance Grid Points with Isolines (Nighttime)

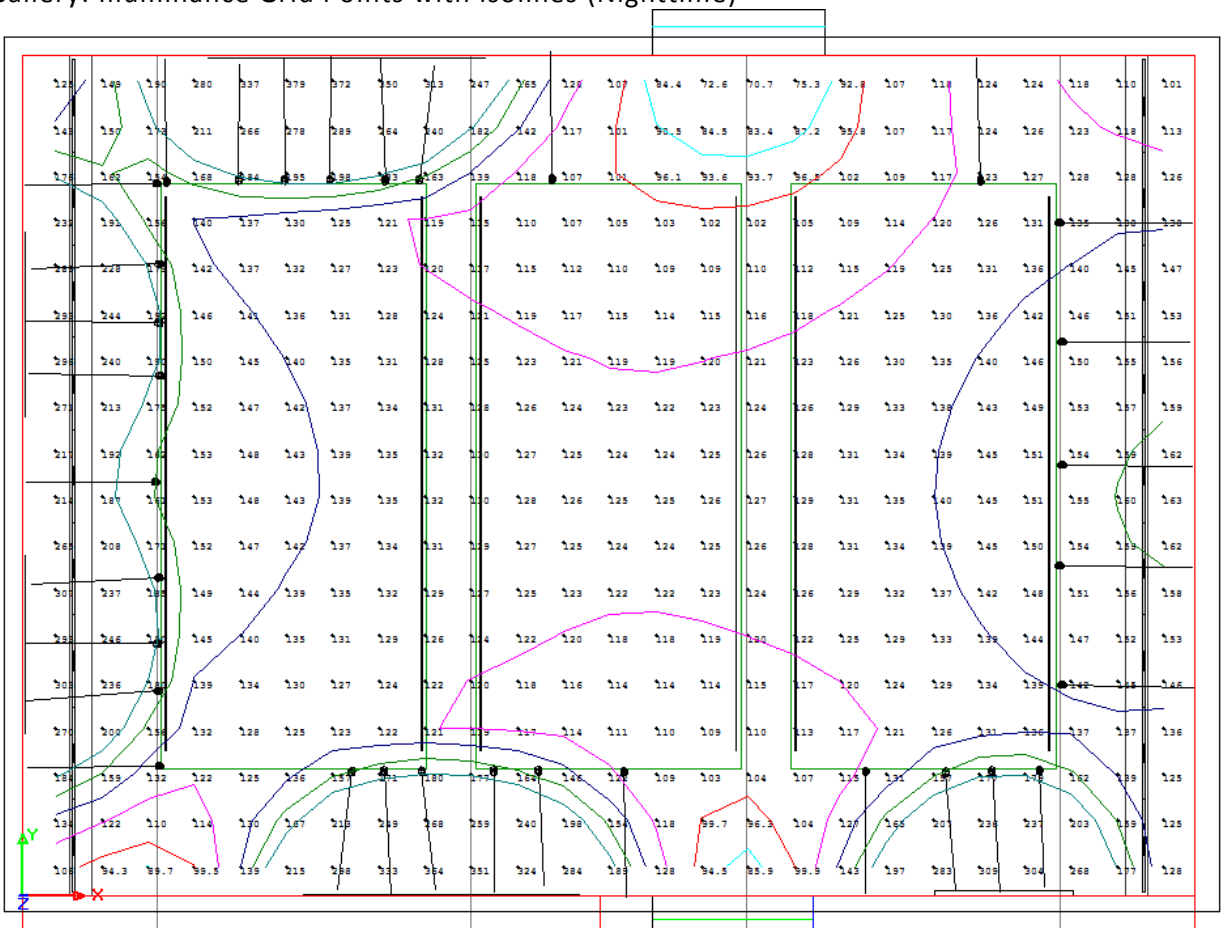


Table 1.1
Gallery Illuminance Calculation Summary (workplane 1.5')

Space	E_h Recommendation (lux)	E_h Calculated (lux)
gallery floor space	20	115
artwork (typical)	200 (E_v)	305(E_v)

Lighting Power Density

Table 1.1
Gallery Lighting Power Density

Fixture Type	System Wattage	Quantity	Total Watts
F1	33.5	18	603
L1	4.4	72	316.8
TA1	600	2	1200
TA2	600	2	1200
TD	600	1	600
Total Watts			3,919.8
Area (SF)			1,990
Watts/SF			1.97
ASHRAE 90.1 compliant?			2.05 - Yes

The LPD currently used in the gallery falls under the ASHRAE requirement of 1.05 W/SF with an additional 1.0 W/SF for spaces which the lighting is specific to highlighting art or exhibits by section 9.6.2. ASHRAE also states that track fixtures are to be counted as 30 W/LF, but with the alternative of using a permanent current-limiting device on the system by section 9.1.4. By using current limiters of 5A per circuit, the track lighting can stay under ASHRAE requirements. The table below highlights the calculations used to split up each circuit under each panel's track system.

Table 1.1
Gallery Track Lighting Current Limiter Design

track: TA	LF	W	W/LF	# of Fixtures	# of Fixtures
end panel1	72	600	8.3	28.6	28
end panel2	72	600	8.3	28.6	28
middle panel	72	600	8.3	28.6	28
end panel1	72	600	8.3	28.6	28
end panel2	72	600	8.3	28.6	28
total	360	3000		total	140
		603			
		316.8			
	total W	3919.8			

*The end panels have (2) 5A current limiters: two-way track system
*The middle panel has (1) 5A current limiter: one-way track system

evaluation

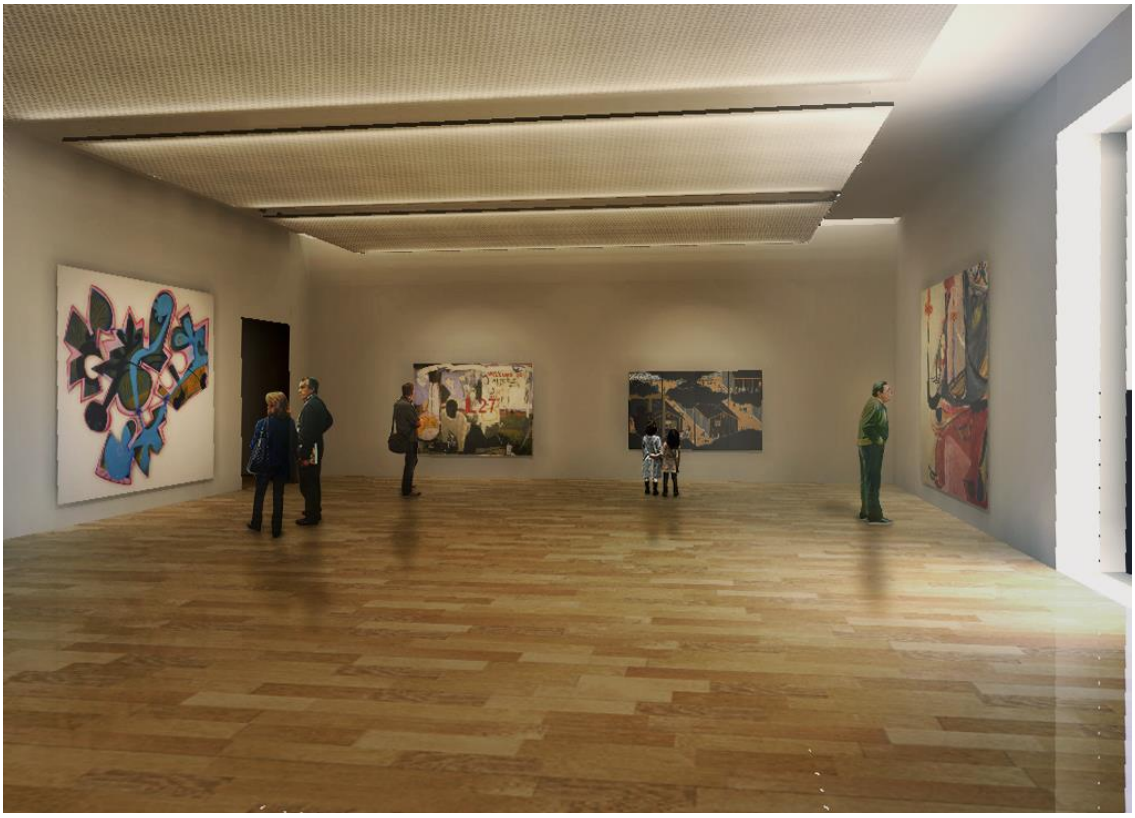
The Gallery benefits from the new lighting design by adding to architectural forms. Using three drop down panels of stretched fabric which is grazed from behind adds depth to the room while still having a flexible track system to light art wherever it may be located.

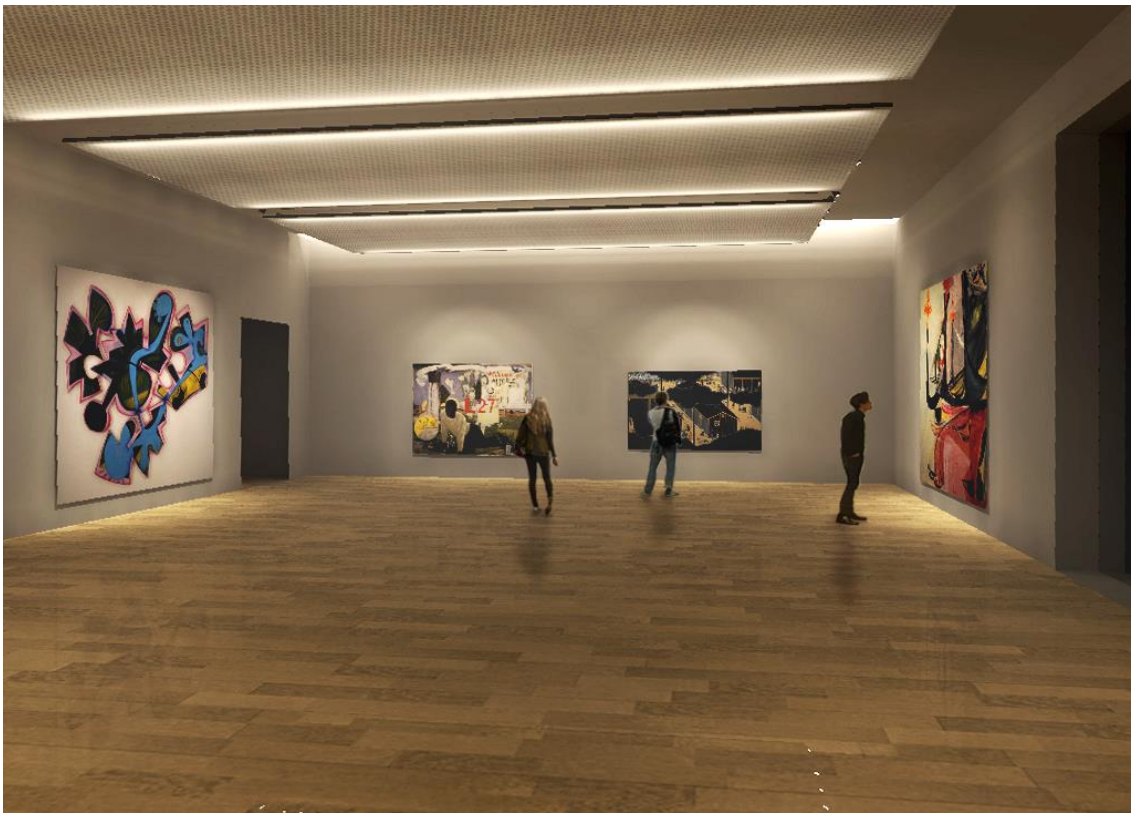
Final Visualizations

These renderings were done for the final presentation as a visualization technique to further the skills needed to display one's lighting designs. The following renders are the night and day conditions for the gallery and solarium spaces.

solarium:

gallery:





Electrical Depth:

The electrical depth will focus on a branch circuit redesign for the five spaces redesigned in the lighting depth, a short circuit protection study, and a wind powered electricity generation system integrated into the solarium's solar protection panel.

overview

Since the Nerman Museum is located on a college campus, the main service power is coming off the primary Johnson County Community College's loop. The power comes into the building on the north side where the utility transformer is located. It is then transferred down to 480/277V that feeds into the main switchboard. A TVSS is located here to clean up the power that results from harmonic loading downstream. The main switchboard is (MS-E1) is located in the mechanical / electrical room "M114," on the first floor. This room has access to the loading dock on the north part of the building. Five sets of 4-#400 MCM, 3" Conduit comes into the switchboard from the transformer.

This room also houses most of the secondary panelboards that distribute power to the kitchen and first floor lighting and receptacle loads. Metering is applied at the service entrance before the main 1600A breaker on the switchboard, but after the primary transformer. Grounding is also utilized through a concrete encased electrode as well as the water pipe and building steel to ground the switchboard and whole electrical system.

Branch Circuit Redesign

The electrical loads for the five redesigned spaces under the lighting depth will be calculated in this section. The resulting lighting loads will be divided between existing circuits on existing local panelboards. These branch circuits will then be resized. The redesigned lighting loads will affect each of the following panelboards:

Table 1.1
Panelboards to be Modified

Space	Panel Type	Voltage	Panelboard
Grounds	Normal	208Y/120	1L1
	Emergency	208Y/120	E1L1
Solarium	Normal	208Y/120	1L1
	Emergency	208Y/120	E1L1
Café	Normal	208Y/120	1L1
	Emergency	208Y/120	E1L1
Auditorium	Normal	208Y/120	2L1
	Emergency	208Y/120	E1L1
Gallery	Normal	208Y/120	2L1
	Emergency	208Y/120	E1L1

Grounds Electrical Redesign

normal power

Table 1.1
Grounds: Total VA

Fixture Type	System VA	Quantity	Total VA
G1	24	7	168
LF6	5.4	6	32.4
	Total VA		200.4

Table 1.1
Grounds: Volt-Amps to go on Panelboard 1L1

Fixture Type	VA
G1	168
LF6	32.4
Total VA	200.4

The following panelboards show first, the existing panelboard with the locations affected by the redesigned lighting highlighted in orange. The second panelboard has the new lighting loads applied to the panelboard and the initial loads taken off. These loads are highlighted in red. In the case of the grounds, there was no pervious load associated.

Table 1.1

Lighting Panelboard 1L1 – Grounds Existing Panelboard

120/208 Volt 3-PH / 4-W (2) 42 Space 1 -Nema Rating					400 Main Bus Amps 400 Main Breaker ISO. GRND. BUS					10,000 AIC Rating			Mountin Surface	
Notes	Load (VA)	Description	Type	Wire	CB	CK #	PH	CKT #	CB	Wire	Type	Description	Load (VA)	Notes
	720	Recept Rm 102	R	12	20/	1	A	2	20/	12	R	Recept Rm 103	720	
	720	Recept Rm 102	R	12	20/	3	B	4	20/	12	R	Recept Rm 103	720	
	720	Recept Rm 1119-	R	12	20/	5	C	6	20/	12	R	Recept Rm 104	720	
	720	Recept Rm 100	R	12	20/	7	A	8	20/	12	R	Recept Rm 104	720	
	720	Recept Rm 110	R	12	20/	9	B	10	20/	12	R	Recept Rm 118	720	
	720	Recept Rm 110	R	12	20/	11	C	12	20/	12	R	Recept Rm 100-	720	
	720	Recept Rm 110	R	12	20/	13	A	14	20/	12	L	Ltg Rm M101	1920	
	1920	Ltg Rm M119,	L	12	20/	15	B	16	20/	12	L	Ltg Rm M101	1920	
	900	Ltg Rm M119,	L	12	20/	17	C	18	20/	12	L	Ltg Rm M118	1920	
	1920	Ltg Rm M119,	L	12	20/	19	A	20	20/	12	L	Ltg Rm M118	1920	
	700	Ltg Rm M119,	L	12	20/	21	B	22	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	23	C	24	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	25	A	26	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	27	B	28	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	29	C	30	20/	12	L	Ltg Rm M103	1920	
	1920	Ltg Rm M103	L	12	20/	31	A	32	20/	12	L	Ltg Rm M103	1920	
	1920	Ltg Rm M103	L	12	20/	33	B	34	20/	12	L	Ltg Rm M104	1920	
	1920	Ltg Rm M104	L	12	20/	35	C	36	20/	12	L	Ltg Rm M104	1920	
	1920	Ltg Rm M104	L	12	20/	37	A	38	20/	12	L	Ltg Rm M118	384	
	1296	Ltg Rm M119,	L	12	20/	39	B	40	20/	12	L	Ltg Rm M102	324	
	320	Ltg Rm M119,	L	12	20/	41	C	42	20/	12	L	Ltg Rm M103	324	
	800	Ltg Rm M101	L	12	20/	43	A	44	20/	12	L	Ltg Rm M101	286	
	130	Ltg Rm M101	L	12	20/	45	B	46	20/	12	L	Ltg Rm M100	168	
	1920	Ltg Rm M230	L	12	20/	47	C	48	20/	12	L	Ltg Rm M230	1920	
	1920	Ltg Rm M230	L	12	20/	49	A	50	20/	12	L	Ltg Rm M230	1920	
	1920	Ltg Rm M230	L	12	20/	51	B	52	20/	12	L	Ltg Rm M230	4125	
	1920	Ltg Rm M230	L	12	20/	53	C	54	20/	12	L	Ltg Rm M230	750	
		Spare		0	-	55	A	56	-	0				
		Spare		0	-	57	B	58	-	0		Spare		
		Spare		0	-	59	C	60	-	0		Spare		
		Spare		0	-	61	A	62	-	0		Spare		
		Spare		0	-	63	B	64	-	0		Spare		
		Spare		0	-	65	C	66	-	0		Spare		
		Spare		0	-	67	A	68	-	0		Spare		
		Spare		0	-	69	B	70	-	0		Spare		
		Spare		0	-	71	C	72	-	0		Spare		
		Spare		0	-	73	A	74	-	0		Spare		
		Spare		0	-	75	B	76	-	0		Spare		
		Spare		0	-	77	C	78	-	0		Spare		
		Spare		0	-	79	A	80	-	0		Spare		
		Spare		0	-	81	B	82	-	0		Spare		
		Spare		0	-	83	C	84	-	0		Spare		
	36,066	Subtotal										Subtotal	37,561	

N.E.C.	Load Type	Conn.	Fct.	Diversity
220.44	(R) Recept.	9,360		9,360
220.56	(K) Kitchen	0	100	0
220.60	(C) Cooling	0	0%	0
220.60	(H) Heating	0	0%	0
220.60	(F) Fans	0	100	0
	(M) Misc.	0	100	0

N.E.C.	Load Type	Conn.	Fct.	Diversity
210.20(a)	(L)	64,267	125	80,334
	(EL) Ext. Ltg.	0	125	0
620.14	(E) Elevators	0	0%	0
	(WH) Water Ht.	0	100	0
220.5	(MT) Lrg. Mot.	0	125	0
	(SP) Sub Panel	0	100	0

Total Connected	73,627	VA	204.5	AM	Location of MECH/ELEC M114
Total Load (Diversified)=	89,694	VA	249.1	AM	

Table 1.1

Lighting Panelboard 1L1– Grounds Modified Panelboard

120/208 Volt 3-PH / 4-W (2) 42 Space 1 -Nema Rating			400 Main Bus Amps 400 Main Breaker ISO. GRND. BUS						10,000 AIC Rating			Mounting: Surface	
Notes	Load (VA)	Description	Type	Wire	CB	CK #	PH	CKT #	CB	Wire	Type	Description	Load (VA)	Notes
	720	Recept Rm 102	R	12	20/	1	A	2	20/	12	R	Recept Rm 103	720	
	720	Recept Rm 102	R	12	20/	3	B	4	20/	12	R	Recept Rm 103	720	
	720	Recept Rm 1119-	R	12	20/	5	C	6	20/	12	R	Recept Rm 104	720	
	720	Recept Rm 100	R	12	20/	7	A	8	20/	12	R	Recept Rm 104	720	
	720	Recept Rm 110	R	12	20/	9	B	10	20/	12	R	Recept Rm 118	720	
	720	Recept Rm 110	R	12	20/	11	C	12	20/	12	R	Recept Rm 100-	720	
	720	Recept Rm 110	R	12	20/	13	A	14	20/	12	L	Ltg Rm M101	1920	
	1920	Ltg Rm M119,	L	12	20/	15	B	16	20/	12	L	Ltg Rm M101	1920	
	900	Ltg Rm M119,	L	12	20/	17	C	18	20/	12	L	Ltg Rm M118	1920	
	1920	Ltg Rm M119,	L	12	20/	19	A	20	20/	12	L	Ltg Rm M118	1920	
	700	Ltg Rm M119,	L	12	20/	21	B	22	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	23	C	24	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	25	A	26	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	27	B	28	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	29	C	30	20/	12	L	Ltg Rm M103	1920	
	1920	Ltg Rm M103	L	12	20/	31	A	32	20/	12	L	Ltg Rm M103	1920	
	1920	Ltg Rm M103	L	12	20/	33	B	34	20/	12	L	Ltg Rm M104	1920	
	1920	Ltg Rm M104	L	12	20/	35	C	36	20/	12	L	Ltg Rm M104	1920	
	1920	Ltg Rm M104	L	12	20/	37	A	38	20/	12	L	Ltg Rm M118	**384**	
	1296	Ltg Rm M119,	L	12	20/	39	B	40	20/	12	L	Ltg Rm M102	**324**	
	320	Ltg Rm M119,	L	12	20/	41	C	42	20/	12	L	Ltg Rm M103	**324**	
	800	Ltg Rm M101	L	12	20/	43	A	44	20/	12	L	Ltg Rm M101	**286**	
	130	Ltg Rm M101	L	12	20/	45	B	46	20/	12	L	Ltg Rm M100	**168**	
	1920	Ltg Rm M230	L	12	20/	47	C	48	20/	12	L	Ltg Rm M230	**1920**	
	1920	Ltg Rm M230	L	12	20/	49	A	50	20/	12	L	Ltg Rm M230	**1920**	
	1920	Ltg Rm M230	L	12	20/	51	B	52	20/	12	L	Ltg Rm M230	4125	
	1920	Ltg Rm M230	L	12	20/	53	C	54	20/	12	L	Ltg Rm M230	750	
	200.4	Grounds	L	12	20/	55	A	56	-	0		Spare		
		Spare		0	-	57	B	58	-	0		Spare		
		Spare		0	-	59	C	60	-	0		Spare		
		Spare		0	-	61	A	62	-	0		Spare		
		Spare		0	-	63	B	64	-	0		Spare		
		Spare		0	-	65	C	66	-	0		Spare		
		Spare		0	-	67	A	68	-	0		Spare		
		Spare		0	-	69	B	70	-	0		Spare		
		Spare		0	-	71	C	72	-	0		Spare		
		Spare		0	-	73	A	74	-	0		Spare		
		Spare		0	-	75	B	76	-	0		Spare		
		Spare		0	-	77	C	78	-	0		Spare		
		Spare		0	-	79	A	80	-	0		Spare		
		Spare		0	-	81	B	82	-	0		Spare		
		Spare		0	-	83	C	84	-	0		Spare		
	36,266	Subtotal										Subtotal	37,561	

N.E.C.	Load Type	Conn.	Fct.	Diversity
220.44	(R) Recept.	9,360		9,360
220.56	(K) Kitchen	0	100	0
220.60	(C) Cooling	0	0%	0
220.60	(H) Heating	0	0%	0
220.60	(F) Fans	0	100	0
	(M) Misc.	0	100	0

N.E.C.	Load Type	Conn.	Fct.	Diversit
210.20(a)	(L)	64,467	125	80,584
	(EL) Ext. Ltg.	0	125	0
620.14	(E) Elevators	0	0%	0
	(WH) Water Ht.	0	100	0
220.5	(MT) Lrg. Mot.	0	125	0
	(SP) Sub Panel	0	100	0

Total Connected	73,827	VA	205.1	AM
Total Load (Diversified)=	89,944	VA	249.8	AM

Location of MECH/ELEC M114

Solarium Electrical Redesign

normal power

Table 1.1
Solarium: Total VA

Fixture Type	System VA	Quantity	Total VA
L6	29	9	261
F4	56	16	896
TC	150 (2' of track)	18	2,700
PM1	57	3	171
	Total VA		4,028

Table 1.1
Solarium: Volt-Amps to go on Panelboard 1L1 (circuit 1)

Fixture Type	VA
L6	261
F4	896
PM1	171
Total VA	1,328

Table 1.1
Solarium: Volt-Amps to go on Panelboard 1L1 (circuit 2)

Fixture Type	VA
TC	1,350
Total VA	1,350

Table 1.1
Solarium: Volt-Amps to go on Panelboard 1L1 (circuit 3)

Fixture Type	VA
TC	1,350
Total VA	1,350

The following panelboards show first, the existing panelboard with the locations affected by the redesigned lighting highlighted in orange. The second panelboard has the new lighting loads applied to the panelboard and the initial loads taken off. These loads are highlighted in red.

Table 1.1

Lighting Panelboard 1L1– Solarium Existing Panelboard

120/208 Volt 3-PH / 4-W						400 Main Bus Amps				10,000 AIC Rating			Mounting:	
(2) 42 Space						400 Main Breaker							Surface	
1 -Nema						ISO. GRND. BUS								
Notes	Load (VA)	Description	Type	Wire	CB	CK #	PH	CKT #	CB	Wire	Type	Description	Load (VA)	Notes
	720	Recept Rm 102	R	12	20	1	A	2	20	12	R	Recept Rm	720	
	720	Recept Rm 102	R	12	20	3	B	4	20	12	R	Recept Rm	720	
	720	Recept Rm	R	12	20	5	C	6	20	12	R	Recept Rm	720	
	720	Recept Rm 100	R	12	20	7	A	8	20	12	R	Recept Rm	720	
	720	Recept Rm 110	R	12	20	9	B	10	20	12	R	Recept Rm	720	
	720	Recept Rm 110	R	12	20	11	C	12	20	12	R	Recept Rm	720	
	720	Recept Rm 110	R	12	20	13	A	14	20	12	L	Ltg Rm M101	1920	
	1920	Ltg Rm M119,	L	12	20	15	B	16	20	12	L	Ltg Rm M101	1920	
	900	Ltg Rm M119,	L	12	20	17	C	18	20	12	L	Ltg Rm M118	1920	
	1920	Ltg Rm M119,	L	12	20	19	A	20	20	12	L	Ltg Rm M118	1920	
	700	Ltg Rm M119,	L	12	20	21	B	22	20	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20	23	C	24	20	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20	25	A	26	20	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20	27	B	28	20	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20	29	C	30	20	12	L	Ltg Rm M103	1920	
	1920	Ltg Rm M103	L	12	20	31	A	32	20	12	L	Ltg Rm M103	1920	
	1920	Ltg Rm M103	L	12	20	33	B	34	20	12	L	Ltg Rm M104	1920	
	1920	Ltg Rm M104	L	12	20	35	C	36	20	12	L	Ltg Rm M104	1920	
	1920	Ltg Rm M104	L	12	20	37	A	38	20	12	L	Ltg Rm M118	**384**	
	1296	Ltg Rm M119,	L	12	20	39	B	40	20	12	L	Ltg Rm M102	**324**	
	320	Ltg Rm M119,	L	12	20	41	C	42	20	12	L	Ltg Rm M103	**324**	
	800	Ltg Rm M101	L	12	20	43	A	44	20	12	L	Ltg Rm M101	**286**	
	130	Ltg Rm M101	L	12	20	45	B	46	20	12	L	Ltg Rm M100	**168**	
	1920	Ltg Rm M130	L	12	20	47	C	48	20	12	L	Ltg Rm M130	**1920**	
	1920	Ltg Rm M130	L	12	20	49	A	50	20	12	L	Ltg Rm M130	**1920**	
	1920	Ltg Rm M130	L	12	20	51	B	52	20	12	L	Ltg Rm M130	4125	
	1920	Ltg Rm M130	L	12	20	53	C	54	20	12	L	Ltg Rm M130	750	
		Spare		0	-	55	A	56	-	0				
		Spare		0	-	57	B	58	-	0		Spare		
		Spare		0	-	59	C	60	-	0		Spare		
		Spare		0	-	61	A	62	-	0		Spare		
		Spare		0	-	63	B	64	-	0		Spare		
		Spare		0	-	65	C	66	-	0		Spare		
		Spare		0	-	67	A	68	-	0		Spare		
		Spare		0	-	69	B	70	-	0		Spare		
		Spare		0	-	71	C	72	-	0		Spare		
		Spare		0	-	73	A	74	-	0		Spare		
		Spare		0	-	75	B	76	-	0		Spare		
		Spare		0	-	77	C	78	-	0		Spare		
		Spare		0	-	79	A	80	-	0		Spare		
		Spare		0	-	81	B	82	-	0		Spare		
		Spare		0	-	83	C	84	-	0		Spare		
	36,066	Subtotal										Subtotal	37,561	

N.E.C.	Load Type	Conn.	Fct.	Diversity
220.44	(R) Recept.	9,360		9,360
220.56	(K) Kitchen	0	100	0
220.60	(C) Cooling	0	0%	0
220.60	(H) Heating	0	0%	0
220.60	(F) Fans	0	100	0
	(M) Misc.	0	100	0

N.E.C.	Load Type	Conn.	Fct.	Diversit
210.20(a)	(L)	64,267	125	80,334
	(EL) Ext. Ltg.	0	125	0
620.14	(E) Elevators	0	0%	0
	(WH) Water	0	100	0
220.5	(MT) Lrg. Mot.	0	125	0
	(SP) Sub Panel	0	100	0

Total Connected Load =	73,627	VA	204.5	AM
Total Load (Diversified)=	89,694	VA	249.1	AM

Location of MECH/ELEC M114

Table 1.1

Lighting Panelboard 1L1– Solarium Modified Panelboard

120/208 Volt 3-PH / 4-W (2) 42 Space 1 -Nema Rating			400 Main Bus Amps 400 Main Breaker ISO. GRND. BUS							10,000 AIC Rating			Mounting: Surface	
Notes	Load (VA)	Description	Type	Wire	CB	CK #	PH	CKT #	CB	Wire	Type	Description	Load (VA)	Notes
	720	Recept Rm 102	R	12	20/	1	A	2	20/	12	R	Recept Rm 103	720	
	720	Recept Rm 102	R	12	20/	3	B	4	20/	12	R	Recept Rm 103	720	
	720	Recept Rm 1119-	R	12	20/	5	C	6	20/	12	R	Recept Rm 104	720	
	720	Recept Rm 100	R	12	20/	7	A	8	20/	12	R	Recept Rm 104	720	
	720	Recept Rm 110	R	12	20/	9	B	10	20/	12	R	Recept Rm 118	720	
	720	Recept Rm 110	R	12	20/	11	C	12	20/	12	R	Recept Rm	720	
	720	Recept Rm 110	R	12	20/	13	A	14	20/	12	L	Ltg Rm M101	1920	
	1920	Ltg Rm M119,	L	12	20/	15	B	16	20/	12	L	Ltg Rm M101	1920	
	900	Ltg Rm M119,	L	12	20/	17	C	18	20/	12	L	Ltg Rm M118	1920	
	1920	Ltg Rm M119,	L	12	20/	19	A	20	20/	12	L	Ltg Rm M118	1920	
	700	Ltg Rm M119,	L	12	20/	21	B	22	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	23	C	24	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	25	A	26	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	27	B	28	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	29	C	30	20/	12	L	Ltg Rm M103	1920	
	1920	Ltg Rm M103	L	12	20/	31	A	32	20/	12	L	Ltg Rm M103	1920	
	1920	Ltg Rm M103	L	12	20/	33	B	34	20/	12	L	Ltg Rm M104	1920	
	1920	Ltg Rm M104	L	12	20/	35	C	36	20/	12	L	Ltg Rm M104	1920	
	1920	Ltg Rm M104	L	12	20/	37	A	38	20/	12	L	Ltg Rm M118	384	
	1296	Ltg Rm M119,	L	12	20/	39	B	40	20/	12	L	Ltg Rm M102	324	
	320	Ltg Rm M119,	L	12	20/	41	C	42	20/	12	L	Ltg Rm M103	324	
	800	Ltg Rm M101	L	12	20/	43	A	44	20/	12	L	Ltg Rm M101	286	
	130	Ltg Rm M101	L	12	20/	45	B	46	20/	12	L	Ltg Rm M100	168	
	1350	Ltg Rm M130	L	12	20/	47	C	48	20/	12	L	Ltg Rm M130	1328	
	1350	Ltg Rm M130	L	12	20/	49	A	50	-	0		Spare		
		Spare		0	-	51	B	52	-	0		Spare		
		Spare		0	-	53	C	54	-	0		Spare		
		Spare		0	-	55	A	56	-	0		Spare		
		Spare		0	-	57	B	58	-	0		Spare		
		Spare		0	-	59	C	60	-	0		Spare		
		Spare		0	-	61	A	62	-	0		Spare		
		Spare		0	-	63	B	64	-	0		Spare		
		Spare		0	-	65	C	66	-	0		Spare		
		Spare		0	-	67	A	68	-	0		Spare		
		Spare		0	-	69	B	70	-	0		Spare		
		Spare		0	-	71	C	72	-	0		Spare		
		Spare		0	-	73	A	74	-	0		Spare		
		Spare		0	-	75	B	76	-	0		Spare		
		Spare		0	-	77	C	78	-	0		Spare		
		Spare		0	-	79	A	80	-	0		Spare		
		Spare		0	-	81	B	82	-	0		Spare		
		Spare		0	-	83	C	84	-	0		Spare		
	31,086	Subtotal										Subtotal	30,174	

N.E.C.	Load Type	Conn.	Fct.	Diversity
220.44	(R) Recept.	9,360		9,360
220.56	(K) Kitchen	0	100	0
220.60	(C) Cooling	0	0%	0
220.60	(H) Heating	0	0%	0
220.60	(F) Fans	0	100	0
	(M) Misc.	0	100	0

N.E.C.	Load Type	Conn.	Fct.	Diversit
210.20(a)	(L)	50,280	125	62,850
	(EL) Ext. Ltg.	0	125	0
620.14	(E) Elevators	0	0%	0
	(WH) Water	0	100	0
220.5	(MT) Lrg. Mot.	0	125	0
	(SP) Sub Panel	0	100	0

Total Connected	59,640	VA	165.7	AM
Total Load (Diversified)=	72,210	VA	200.6	AM

Location of MECH/ELEC M114

emergency power

The emergency power for this egress section of the building specified to an emergency panelboard (E1L1) supplied by an offsite generator. Every other row of the track lighting will be wired for emergency power so when there is a power outage, these few fixtures will come on to illuminate to 50 lux. This will allow occupants to remain safe through this part of the egress path. A total of 250VA will be needed for this circuit due to 9 locations of 9 individual track fixtures as specified as "T4" under the fixture schedule. These track luminaires will have fixed aiming angles and locations.

Café Electrical Redesign

normal power

Table 1.1
Café: Total VA

Fixture Type	System VA	Quantity	Total VA
LF1	78	2	156
LF2	59	1	59
LF3	59	1	59
LF4	450	1	450
LF5	290.4	1	290.4
TB	300 (4' of track)	4	1,200
	Total VA		2,214.4

Table 1.1
Café: Volt-Amps to go on Panelboard 1L1 (circuit 1)

Fixture Type	VA
LF1	156
LF2	59
LF3	59
LF4	450
LF5	290.4
Total VA	1,014.4

Table 1.1
Café: Volt-Amps to go on Panelboard 1L1 (circuit 2)

Fixture Type	VA
TB	1,200
Total VA	1,200

The following panelboards show first, the existing panelboard with the locations affected by the redesigned lighting highlighted in orange. The second panelboard has the new lighting loads applied to the panelboard and the initial loads taken off. These loads are highlighted in red.

Table 1.1

Lighting Panelboard 1L1– Café Existing Panelboard

120/208 Volt 3-PH / 4-W				400 Main Bus Amps						10,000 AIC Rating			Mounting:	
(2) 42 Space				400 Main Breaker									Surface	
1 -Nema Rating				ISO. GRND. BUS										
Notes	Load (VA)	Description	Type	Wire	CB	CK #	PH	CKT #	CB	Wire	Type	Description	Load (VA)	Notes
	720	Recept Rm 102	R	12	20/	1	A	2	20/	12	R	Recept Rm 103	720	
	720	Recept Rm 102	R	12	20/	3	B	4	20/	12	R	Recept Rm 103	720	
	720	Recept Rm 1119-	R	12	20/	5	C	6	20/	12	R	Recept Rm 104	720	
	720	Recept Rm 100	R	12	20/	7	A	8	20/	12	R	Recept Rm 104	720	
	720	Recept Rm 110	R	12	20/	9	B	10	20/	12	R	Recept Rm 118	720	
	720	Recept Rm 110	R	12	20/	11	C	12	20/	12	R	Recept Rm	720	
	720	Recept Rm 110	R	12	20/	13	A	14	20/	12	L	Ltg Rm M101	1920	
	1920	Ltg Rm M119,	L	12	20/	15	B	16	20/	12	L	Ltg Rm M101	1920	
	900	Ltg Rm M119,	L	12	20/	17	C	18	20/	12	L	Ltg Rm M118	1920	
	1920	Ltg Rm M119,	L	12	20/	19	A	20	20/	12	L	Ltg Rm M118	1920	
	700	Ltg Rm M119,	L	12	20/	21	B	22	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	23	C	24	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	25	A	26	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	27	B	28	20/	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20/	29	C	30	20/	12	L	Ltg Rm M103	1920	
	1920	Ltg Rm M103	L	12	20/	31	A	32	20/	12	L	Ltg Rm M103	1920	
	1920	Ltg Rm M103	L	12	20/	33	B	34	20/	12	L	Ltg Rm M104	1920	
	1920	Ltg Rm M104	L	12	20/	35	C	36	20/	12	L	Ltg Rm M104	1920	
	1920	Ltg Rm M104	L	12	20/	37	A	38	20/	12	L	Ltg Rm M118	384	
	1296	Ltg Rm M119,	L	12	20/	39	B	40	20/	12	L	Ltg Rm M102	324	
	320	Ltg Rm M119,	L	12	20/	41	C	42	20/	12	L	Ltg Rm M103	324	
	800	Ltg Rm M101	L	12	20/	43	A	44	20/	12	L	Ltg Rm M101	286	
	130	Ltg Rm M101	L	12	20/	45	B	46	20/	12	L	Ltg Rm M100	168	
	1920	Ltg Rm M230	L	12	20/	47	C	48	20/	12	L	Ltg Rm M230	1920	
	1920	Ltg Rm M230	L	12	20/	49	A	50	20/	12	L	Ltg Rm M230	1920	
	1920	Ltg Rm M230	L	12	20/	51	B	52	-	12	L	Ltg Rm M230	4125	
	1920	Ltg Rm M230	L	12	20/	53	C	54	-	12	L	Ltg Rm M230	750	
		Spare		0	-	55	A	56	-	0				
		Spare		0	-	57	B	58	-	0		Spare		
		Spare		0	-	59	C	60	-	0		Spare		
		Spare		0	-	61	A	62	-	0		Spare		
		Spare		0	-	63	B	64	-	0		Spare		
		Spare		0	-	65	C	66	-	0		Spare		
		Spare		0	-	67	A	68	-	0		Spare		
		Spare		0	-	69	B	70	-	0		Spare		
		Spare		0	-	71	C	72	-	0		Spare		
		Spare		0	-	73	A	74	-	0		Spare		
		Spare		0	-	75	B	76	-	0		Spare		
		Spare		0	-	77	C	78	-	0		Spare		
		Spare		0	-	79	A	80	-	0		Spare		
		Spare		0	-	81	B	82	-	0		Spare		
		Spare		0	-	83	C	84	-	0		Spare		
	36,066	Subtotal										Subtotal	37,561	

N.E.C.	Load Type	Conn.	Fct.	Diversity
220.44	(R) Recept.	9,360		9,360
220.56	(K) Kitchen	0	100	0
220.60	(C) Cooling	0	0%	0
220.60	(H) Heating	0	0%	0
220.60	(F) Fans	0	100	0
	(M) Misc.	0	100	0

N.E.C.	Load Type	Conn.	Fct.	Diversit
210.20(a)	(L)	64,267	125	80,334
	(EL) Ext. Ltg.	0	125	0
620.14	(E) Elevators	0	0%	0
	(WH) Water	0	100	0
220.5	(MT) Lrg. Mot.	0	125	0
	(SP) Sub Panel	0	100	0

Total Connected	73,627	VA	204.5	AM
Total Load (Diversified)=	89,694	VA	249.1	AM

Location of MECH/ELEC M114

Table 1.1

Lighting Panelboard 1L1– Café Modified Panelboard

120/208 Volt 3-PH / 4-W						400 Main Bus Amps				10,000 AIC Rating			Mounting:	
(2 42 Space						400 Main Breaker							Surface	
1 -Nema						ISO. GRND. BUS								
Notes	Load (VA)	Description	Type	Wire	CB	CK #	PH	CKT #	CB	Wire	Type	Description	Load (VA)	Notes
	720	Recept Rm 102	R	12	20	1	A	2	20	12	R	Recept Rm	720	
	720	Recept Rm 102	R	12	20	3	B	4	20	12	R	Recept Rm	720	
	720	Recept Rm	R	12	20	5	C	6	20	12	R	Recept Rm	720	
	720	Recept Rm 100	R	12	20	7	A	8	20	12	R	Recept Rm	720	
	720	Recept Rm 110	R	12	20	9	B	10	20	12	R	Recept Rm	720	
	720	Recept Rm 110	R	12	20	11	C	12	20	12	R	Recept Rm	720	
	720	Recept Rm 110	R	12	20	13	A	14	20	12	L	Ltg Rm M101	1920	
	1014	Ltg Rm M119,	L	12	20	15	B	16	20	12	L	Ltg Rm M101	1920	
	1920	Ltg Rm M102	L	12	20	17	C	18	20	12	L	Ltg Rm M118	1920	
	1920	Ltg Rm M102	L	12	20	19	A	20	20	12	L	Ltg Rm M118	1920	
	1920	Ltg Rm M102	L	12	20	21	B	22	20	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20	23	C	24	20	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M103	L	12	20	25	A	26	20	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M103	L	12	20	27	B	28	20	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M104	L	12	20	29	C	30	20	12	L	Ltg Rm M103	1920	
	1920	Ltg Rm M104	L	12	20	31	A	32	20	12	L	Ltg Rm M103	1920	
	800	Ltg Rm M101	L	12	20	33	B	34	20	12	L	Ltg Rm M104	1920	
	130	Ltg Rm M101	L	12	20	35	C	36	20	12	L	Ltg Rm M104	1920	
	1920	Ltg Rm M230	L	12	20	37	A	38	20	12	L	Ltg Rm M118	**384**	
	1920	Ltg Rm M230	L	12	20	39	B	40	20	12	L	Ltg Rm M102	**324**	
	1920	Ltg Rm M230	L	12	20	41	C	42	20	12	L	Ltg Rm M103	**324**	
	1920	Ltg Rm M230	L	12	20	43	A	44	20	12	L	Ltg Rm M101	**286**	
	1200	Ltg Rm M119,	L	12	20	45	B	46	20	12	L	Ltg Rm M100	**168**	
		Spare		0	-	47	C	48	20	12	L	Ltg Rm M230	**1920**	
		Spare		0	-	49	A	50	20	12	L	Ltg Rm M230	**1920**	
		Spare		0	-	51	B	52	20	12	L	Ltg Rm M230	4125	
		Spare		0	-	53	C	54	20	12	L	Ltg Rm M230	750	
		Spare		0	-	55	A	56	-	0		Spare		
		Spare		0	-	57	B	58	-	0		Spare		
		Spare		0	-	59	C	60	-	0		Spare		
		Spare		0	-	61	A	62	-	0		Spare		
		Spare		0	-	63	B	64	-	0		Spare		
		Spare		0	-	65	C	66	-	0		Spare		
		Spare		0	-	67	A	68	-	0		Spare		
		Spare		0	-	69	B	70	-	0		Spare		
		Spare		0	-	71	C	72	-	0		Spare		
		Spare		0	-	73	A	74	-	0		Spare		
		Spare		0	-	75	B	76	-	0		Spare		
		Spare		0	-	77	C	78	-	0		Spare		
		Spare		0	-	79	A	80	-	0		Spare		
		Spare		0	-	81	B	82	-	0		Spare		
		Spare		0	-	83	C	84	-	0		Spare		
	30,504	Subtotal										Subtotal	37,561	

N.E.C.	Load Type	Conn.	Fct.	Diversity
220.44	(R) Recept.	9,360		9,360
220.56	(K) Kitchen	0	100	0
220.60	(C) Cooling	0	0%	0
220.60	(H) Heating	0	0%	0
220.60	(F) Fans	0	100	0
	(M) Misc.	0	100	0

N.E.C.	Load Type	Conn.	Fct.	Diversit
210.20(a)	(L)	58,705	125	73,381
	(EL) Ext. Ltg.	0	125	0
620.14	(E) Elevators	0	0%	0
	(WH) Water	0	100	0
220.5	(MT) Lrg. Mot.	0	125	0
	(SP) Sub Panel	0	100	0

Total Connected Load =	68,065	VA	189.1	AM
Total Load (Diversified)=	82,741	VA	229.8	AM

Location of MECH/ELEC M114

Auditorium Electrical Redesign

normal power

Table 1.1
Auditorium: Total VA

Fixture Type	System VA	Quantity	Total VA
F2	33	32	1,056
F3	66	7	462
P1	31	13	403
P2	46	10	460
L5	8.5	76	646
L6	34	6	204
TB	300	3	900
Total VA			4,131

Table 1.1
Auditorium: Volt-Amps to go on Panelboard 2L1 (circuit 1)

Fixture Type	VA
F2	1,056
Total VA	1,056

Table 1.1
Auditorium: Volt-Amps to go on Panelboard 2L1 (circuit 2)

Fixture Type	VA
L5	646
L6	204
TB	900
Total VA	1,750

Table 1.1
Auditorium: Volt-Amps to go on Panelboard 2L1 (circuit 3)

Fixture Type	VA
F3	462
P1	403
P2	460
Total VA	1,325

The following panelboards show first, the existing panelboard with the locations affected by the redesigned lighting highlighted in orange. The second panelboard has the new lighting loads applied to the panelboard and the initial loads taken off. These loads are highlighted in red.

Table 1.1

Lighting Panelboard 2L1– Auditorium Existing Panelboard

120/208 Volt 3-PH / 4-W (2) 42 Space 1 -Nema						400 Main Bus Amps 400 Main Breaker ISO. GRND. BUS				10,000 AIC Rating			Mounting: Surface	
Notes	Load (VA)	Description	Type	Wire	CB	CK #	PH	CKT #	CB	Wire	Type	Description	Load (VA)	Notes
	1500	Ltg Rm	L	12	20/	1	A	2	20/	12	L	Ltg Rm M208	1500	
	1600	Ltg Rm	L	12	20/	3	B	4	20/	12	L	Ltg Rm M208	1600	
	40	Ltg Rm	L	12	20/	5	C	6	20/	12	L	Ltg Rm M205	1920	
	1920	Ltg Rm	L	12	20/	7	A	8	20/	12	L	Ltg Rm M201	1920	
	1920	Ltg Rm	L	12	20/	9	B	10	20/	12	L	Ltg Rm M201	1920	
	1920	Ltg Rm	L	12	20/	11	C	12	20/	12	L	Ltg Rm M201	1920	
	1920	Ltg Rm	L	12	20/	13	A	14	20/	12	L	Ltg Rm M201	1920	
	1920	Ltg Rm	L	12	20/	15	B	16	20/	12	L	Ltg Rm M202	1920	
	1920	Ltg Rm	L	12	20/	17	C	18	20/	12	L	Ltg Rm M202	1920	
	1920	Ltg Rm	L	12	20/	19	A	20	20/	12	L	Ltg Rm M202	1920	
	1920	Ltg Rm	L	12	20/	21	B	22	20/	12	L	Ltg Rm M101	1920	
	1920	Ltg Rm	L	12	20/	23	C	24	20/	12	L	Ltg Rm M203	1920	
	1920	Ltg Rm	L	12	20/	25	A	26	20/	12	L	Ltg Rm M204	1920	
	1920	Ltg Rm	L	12	20/	27	B	28	20/	12	L	Ltg Rm M204	1920	
	1920	Ltg Rm	L	12	20/	29	C	30	20/	12	L	Ltg Rm M206	1920	
	1920	Ltg Rm	L	12	20/	31	A	32	20/	12	L	Ltg Rm M222	162	
	1920	Ltg Rm	L	12	20/	33	B	34	20/	12	L	Ltg Rm M228,	1875	
	3186	Ltg Rm	L	12	20/	35	C	36	20/	12	L	Ltg Rm M201	192	
	1920	Ltg Rm	L	12	20/	37	A	38	20/	12	L	Ltg Rm M203	192	
	17	Ltg Rm	L	12	20/	39	B	40	20/	12	L	Ltg Rm M101	192	
	192	Ltg Rm	L	12	20/	41	C	42	20/	12	L	Ltg Rm M222	192	
	192	Ltg Rm	L	12	20/	43	A	44	20/	12	L	Ltg Rm M215	1920	
	192	Ltg Rm	L	12	20/	45	B	46	20/	12	L	Ltg Rm M222	1920	
	1920	Ltg Rm	L	12	20/	47	C	48	-	0		Spare		
		Spare		0	-	49	A	50	-	0		Spare		
		Spare		0	-	51	B	52	-	0		Spare		
		Spare		0	-	53	C	54	-	0		Spare		
		Spare		0	-	55	A	56	-	0		Spare		
		Spare		0	-	57	B	58	-	0		Spare		
		Spare		0	-	59	C	60	-	0		Spare		
		Spare		0	-	61	A	62	-	0		Spare		
		Spare		0	-	63	B	64	-	0		Spare		
		Spare		0	-	65	C	66	-	0		Spare		
		Spare		0	-	67	A	68	-	0		Spare		
		Spare		0	-	69	B	70	-	0		Spare		
		Spare		0	-	71	C	72	-	0		Spare		
		Spare		0	-	73	A	74	-	0		Spare		
		Spare		0	-	75	B	76	-	0		Spare		
		Spare		0	-	77	C	78	-	0		Spare		
		Spare		0	-	79	A	80	-	0		Spare		
		Spare		0	-	81	B	82	-	0		Spare		
		Spare		0	-	83	C	84	-	0		Spare		
	37,639	Subtot										Subtotal	34,705	

N.E.C.	Load Type	Conn.	Fct.	Diversity
220.44	(R) Recept.	0		0
220.56	(K) Kitchen	0	100	0
220.60	(C) Cooling	0	0%	0
220.60	(H) Heating	0	0%	0
220.60	(F) Fans	0	100	0
	(M) Misc.	0	100	0

N.E.C.	Load Type	Conn.	Fct.	Diversit
210.20(a)	(L)	72,344	125	90,430
	(EL) Ext. Ltg.	0	125	0
620.14	(E) Elevators	0	0%	0
	(WH) Water	0	100	0
220.5	(MT) Lrg. Mot.	0	125	0
	(SP) Sub Panel	0	100	0

Total Connected	72,344	VA	201.0	AM
Total Load (Diversified)=	90,430	VA	251.2	AM

Location of MECH/ELEC C215

Table 1.1

Lighting Panelboard 2L1– Auditorium Modified Panelboard

120/208 Volt 3-PH / 4-W (2 42 1 -Nema			400 Main Bus Amps 400 Main Breaker ISO. GRND. BUS							10,000 AIC Rating			Mounting: Surface	
Notes	Load (VA)	Description	Typ	Wire	CB	CK #	PH	CKT #	CB	Wire	Type	Description	Load (VA)	Notes
	1056	Ltg Rm M208	L	12	20/	1	A	2	20/	12	L	Ltg Rm M205	1920	
	1750	Ltg Rm M208	L	12	20/	3	B	4	20/	12	L	Ltg Rm M201	1920	
	40	Ltg Rm M205	L	12	20/	5	C	6	20/	12	L	Ltg Rm M201	1920	
	1920	Ltg Rm M205	L	12	20/	7	A	8	20/	12	L	Ltg Rm M201	1920	
	1920	Ltg Rm M201	L	12	20/	9	B	10	20/	12	L	Ltg Rm M201	1920	
	1920	Ltg Rm M201	L	12	20/	11	C	12	20/	12	L	Ltg Rm M202	1920	
	1920	Ltg Rm M201	L	12	20/	13	A	14	20/	12	L	Ltg Rm M202	1920	
	1920	Ltg Rm M201	L	12	20/	15	B	16	20/	12	L	Ltg Rm M202	1920	
	1920	Ltg Rm M202	L	12	20/	17	C	18	20/	12	L	Ltg Rm M101	1920	
	1920	Ltg Rm M101	L	12	20/	19	A	20	20/	12	L	Ltg Rm M203	1920	
	1920	Ltg Rm M203	L	12	20/	21	B	22	20/	12	L	Ltg Rm M204	1920	
	1920	Ltg Rm M203	L	12	20/	23	C	24	20/	12	L	Ltg Rm M204	1920	
	1920	Ltg Rm M203	L	12	20/	25	A	26	20/	12	L	Ltg Rm M206	1920	
	1920	Ltg Rm M204	L	12	20/	27	B	28	20/	12	L	Ltg Rm M222	162	
	1920	Ltg Rm M204	L	12	20/	29	C	30	20/	12	L	Ltg Rm M228,	1875	
	1920	Ltg Rm M206	L	12	20/	31	A	32	20/	12	L	Ltg Rm M201	192	
	1920	Ltg Rm M222	L	12	20/	33	B	34	20/	12	L	Ltg Rm M203	192	
	1920	Ltg Rm M222	L	12	20/	35	C	36	20/	12	L	Ltg Rm M101	192	
	192	Ltg Rm M201	L	12	20/	37	A	38	20/	12	L	Ltg Rm M222	192	
	192	Ltg Rm M202	L	12	20/	39	B	40	20/	12	L	Ltg Rm M215	**1920**	
	192	Ltg Rm M204	L	12	20/	41	C	42	20/	12	L	Ltg Rm M222	1920	
	1920	Ltg Rm M215	L	12	20/	43	A	44	20/	12	L	Ltg Rm M208	**1325**	
		Spare		0	-	45	B	46	-	0		Spare		
		Spare		0	-	47	C	48	-	0		Spare		
		Spare		0	-	49	A	50	-	0		Spare		
		Spare		0	-	51	B	52	-	0		Spare		
		Spare		0	-	53	C	54	-	0		Spare		
		Spare		0	-	55	A	56	-	0		Spare		
		Spare		0	-	57	B	58	-	0		Spare		
		Spare		0	-	59	C	60	-	0		Spare		
		Spare		0	-	61	A	62	-	0		Spare		
		Spare		0	-	63	B	64	-	0		Spare		
		Spare		0	-	65	C	66	-	0		Spare		
		Spare		0	-	67	A	68	-	0		Spare		
		Spare		0	-	69	B	70	-	0		Spare		
		Spare		0	-	71	C	72	-	0		Spare		
		Spare		0	-	73	A	74	-	0		Spare		
		Spare		0	-	75	B	76	-	0		Spare		
		Spare		0	-	77	C	78	-	0		Spare		
		Spare		0	-	79	A	80	-	0		Spare		
		Spare		0	-	81	B	82	-	0		Spare		
		Spare		0	-	83	C	84	-	0		Spare		
	33,602	Subtota										Subtotal	32,930	

N.E.C.	Load Type	Conn.	Fct.	Diversity
220.44	(R) Recept.	0		0
220.56	(K) Kitchen	0	100	0
220.60	(C) Cooling	0	0%	0
220.60	(H) Heating	0	0%	0
220.60	(F) Fans	0	100	0
	(M) Misc.	0	100	0

N.E.C.	Load Type	Conn.	Fct.	Diversit
210.20(a)	(L)	66,532	125	83,165
	(EL) Ext. Ltg.	0	125	0
620.14	(E) Elevators	0	0%	0
	(WH) Water	0	100	0
220.5	(MT) Lrg. Mot.	0	125	0
	(SP) Sub Panel	0	100	0

Total Connected	66,532	VA	184.8	AM	Location of MECH/ELEC C215
Total Load (Diversified)=	83,165	VA	231.0	AM	

Gallery Electrical Redesign

normal power

Table 1.1
Gallery: Total VA

Fixture Type	System VA	Quantity	Total VA
F1	33.5	18	603
L1	4.4	72	316.8
TA1	600	2	1200
TA2	600	2	1200
TD	600	1	600
Total VA			3,919.8

Table 1.1
Gallery: Volt-Amps to go on Panelboard 1L1(circuit 1)

Fixture Type	VA
F1	1,056
L1	462
Total VA	1,518

Table 1.1
Gallery: Volt-Amps to go on Panelboard 1L1(circuit 2)

Fixture Type	VA
TA1	1200
Total VA	1200

Table 1.1
Gallery: Volt-Amps to go on Panelboard 1L1(circuit 3)

Fixture Type	VA
TA2	1200
Total VA	1200

Table 1.1
Gallery: Volt-Amps to go on Panelboard 1L1(circuit 4)

Fixture Type	VA
TD	600
Total VA	600

The following panelboards show first, the existing panelboard with the locations affected by the redesigned lighting highlighted in orange. The second panelboard has the new lighting loads applied to the panelboard and the initial loads taken off. These loads are highlighted in red.

Table 1.1

Lighting Panelboard 2L1– Gallery Existing Panelboard

120/208 Volt 3-PH / 4-W			400 Main Bus Amps						10,000 AIC Rating			Mounting:		
(2) 42 Space			400 Main Breaker									Surface		
1 -Nema Rating			ISO. GRND. BUS											
Notes	Load (VA)	Description	Type	Wire	CB	CK #	PH	CKT #	CB	Wire	Type	Description	Load (VA)	Notes
	1500	Ltg Rm M208	L	12	20/	1	A	2	20/	12	L	Ltg Rm M208	1500	
	1600	Ltg Rm M208	L	12	20/	3	B	4	20/	12	L	Ltg Rm M208	1600	
	40	Ltg Rm M205	L	12	20/	5	C	6	20/	12	L	Ltg Rm M205	1920	
	1920	Ltg Rm M205	L	12	20/	7	A	8	20/	12	L	Ltg Rm M201	1920	
	1920	Ltg Rm M201	L	12	20/	9	B	10	20/	12	L	Ltg Rm M201	1920	
	1920	Ltg Rm M201	L	12	20/	11	C	12	20/	12	L	Ltg Rm M201	1920	
	1920	Ltg Rm M201	L	12	20/	13	A	14	20/	12	L	Ltg Rm M201	1920	
	1920	Ltg Rm M201	L	12	20/	15	B	16	20/	12	L	Ltg Rm M202	1920	
	1920	Ltg Rm M202	L	12	20/	17	C	18	20/	12	L	Ltg Rm M202	1920	
	1920	Ltg Rm M101	L	12	20/	19	A	20	20/	12	L	Ltg Rm M202	1920	
	1920	Ltg Rm M203	L	12	20/	21	B	22	20/	12	L	Ltg Rm M101	1920	
	1920	Ltg Rm M203	L	12	20/	23	C	24	20/	12	L	Ltg Rm M203	1920	
	1920	Ltg Rm M203	L	12	20/	25	A	26	20/	12	L	Ltg Rm M204	1920	
	1920	Ltg Rm M204	L	12	20/	27	B	28	20/	12	L	Ltg Rm M204	1920	
	1920	Ltg Rm M204	L	12	20/	29	C	30	20/	12	L	Ltg Rm M206	1920	
	1920	Ltg Rm M206	L	12	20/	31	A	32	20/	12	L	Ltg Rm M222	162	
	1920	Ltg Rm M222	L	12	20/	33	B	34	20/	12	L	Ltg Rm M228,	1875	
	3186	Ltg Rm M208	L	12	20/	35	C	36	20/	12	L	Ltg Rm M201	192	
	1920	Ltg Rm M222	L	12	20/	37	A	38	20/	12	L	Ltg Rm M203	192	
	17	Ltg Rm M208	L	12	20/	39	B	40	20/	12	L	Ltg Rm M101	192	
	192	Ltg Rm M201	L	12	20/	41	C	42	20/	12	L	Ltg Rm M222	192	
	192	Ltg Rm M202	L	12	20/	43	A	44	20/	12	L	Ltg Rm M215	1920	
	192	Ltg Rm M204	L	12	20/	45	B	46	20/	12	L	Ltg Rm M222	1920	
	1920	Ltg Rm M215	L	12	20/	47	C	48	-	0		Spare		
		Spare		0	-	49	A	50	-	0		Spare		
		Spare		0	-	51	B	52	-	0		Spare		
		Spare		0	-	53	C	54	-	0		Spare		
		Spare		0	-	55	A	56	-	0		Spare		
		Spare		0	-	57	B	58	-	0		Spare		
		Spare		0	-	59	C	60	-	0		Spare		
		Spare		0	-	61	A	62	-	0		Spare		
		Spare		0	-	63	B	64	-	0		Spare		
		Spare		0	-	65	C	66	-	0		Spare		
		Spare		0	-	67	A	68	-	0		Spare		
		Spare		0	-	69	B	70	-	0		Spare		
		Spare		0	-	71	C	72	-	0		Spare		
		Spare		0	-	73	A	74	-	0		Spare		
		Spare		0	-	75	B	76	-	0		Spare		
		Spare		0	-	77	C	78	-	0		Spare		
		Spare		0	-	79	A	80	-	0		Spare		
		Spare		0	-	81	B	82	-	0		Spare		
		Spare		0	-	83	C	84	-	0		Spare		
	37,639	Subtotal										Subtotal	34,705	

N.E.C.	Load Type	Conn.	Fct.	Diversity
220.44	(R) Recept.	0		0
220.56	(K) Kitchen	0	100	0
220.60	(C) Cooling	0	0%	0
220.60	(H) Heating	0	0%	0
220.60	(F) Fans	0	100	0
	(M) Misc.	0	100	0

N.E.C.	Load Type	Conn.	Fct.	Diversit
210.20(a)	(L)	72,344	125	90,430
	(EL) Ext. Ltg.	0	125	0
620.14	(E) Elevators	0	0%	0
	(WH) Water Ht.	0	100	0
220.5	(MT) Lrg. Mot.	0	125	0
	(SP) Sub Panel	0	100	0

Total Connected	72,344	VA	201.0	AM
Total Load	90,430	VA	251.2	AM

Location of MECH/ELEC C215

Table 1.1

Lighting Panelboard 2L1– Gallery Modified Panelboard

120/208 Volt 3-PH / 4-W			400 Main Bus Amps						10,000 AIC Rating			Mounting:		
(2) 42 Space			400 Main Breaker									Surface		
1 -Nema Rating			ISO. GRND. BUS											
Notes	Load (VA)	Description	Type	Wire	CB	CK #	PH	CKT #	CB	Wire	Type	Description	Load (VA)	Notes
	1500	Ltg Rm M208	L	12	20/	1	A	2	20/	12	L	Ltg Rm M208	1500	
	1600	Ltg Rm M208	L	12	20/	3	B	4	20/	12	L	Ltg Rm M208	1600	
	40	Ltg Rm M205	L	12	20/	5	C	6	20/	12	L	Ltg Rm M205	1920	
	1920	Ltg Rm M205	L	12	20/	7	A	8	20/	12	L	Ltg Rm M202	1920	
	1200	Ltg Rm M201	L	12	20/	9	B	10	20/	12	L	Ltg Rm M202	1920	
	1200	Ltg Rm M201	L	12	20/	11	C	12	20/	12	L	Ltg Rm M202	1920	
	600	Ltg Rm M201	L	12	20/	13	A	14	20/	12	L	Ltg Rm M101	1920	
	1518	Ltg Rm M201	L	12	20/	15	B	16	20/	12	L	Ltg Rm M203	1920	
	1920	Ltg Rm M202	L	12	20/	17	C	18	20/	12	L	Ltg Rm M204	1920	
	1920	Ltg Rm M101	L	12	20/	19	A	20	20/	12	L	Ltg Rm M204	1920	
	1920	Ltg Rm M203	L	12	20/	21	B	22	20/	12	L	Ltg Rm M206	1920	
	1920	Ltg Rm M203	L	12	20/	23	C	24	20/	12	L	Ltg Rm M222	162	
	1920	Ltg Rm M203	L	12	20/	25	A	26	20/	12	L	Ltg Rm M228,	1875	
	1920	Ltg Rm M204	L	12	20/	27	B	28	20/	12	L	Ltg Rm M203	192	
	1920	Ltg Rm M204	L	12	20/	29	C	30	20/	12	L	Ltg Rm M101	192	
	1920	Ltg Rm M206	L	12	20/	31	A	32	20/	12	L	Ltg Rm M222	192	
	1920	Ltg Rm M222	L	12	20/	33	B	34	20/	12	L	Ltg Rm M215	1920	
	3186	Ltg Rm M208	L	12	20/	35	C	36	20/	12	L	Ltg Rm M222	1920	
	1920	Ltg Rm M222	L	12	20/	37	A	38	-	0		Spare		
	17	Ltg Rm M208	L	12	20/	39	B	40	-	0		Spare		
	192	Ltg Rm M202	L	12	20/	41	C	42	-	0		Spare		
	192	Ltg Rm M204	L	12	20/	43	A	44	-	0		Spare		
	1920	Ltg Rm M215	L	12	20/	45	B	46	-	0		Spare		
		Spare		0	-	47	C	48	-	0		Spare		
		Spare		0	-	49	A	50	-	0		Spare		
		Spare		0	-	51	B	52	-	0		Spare		
		Spare		0	-	53	C	54	-	0		Spare		
		Spare		0	-	55	A	56	-	0		Spare		
		Spare		0	-	57	B	58	-	0		Spare		
		Spare		0	-	59	C	60	-	0		Spare		
		Spare		0	-	61	A	62	-	0		Spare		
		Spare		0	-	63	B	64	-	0		Spare		
		Spare		0	-	65	C	66	-	0		Spare		
		Spare		0	-	67	A	68	-	0		Spare		
		Spare		0	-	69	B	70	-	0		Spare		
		Spare		0	-	71	C	72	-	0		Spare		
		Spare		0	-	73	A	74	-	0		Spare		
		Spare		0	-	75	B	76	-	0		Spare		
		Spare		0	-	77	C	78	-	0		Spare		
		Spare		0	-	79	A	80	-	0		Spare		
		Spare		0	-	81	B	82	-	0		Spare		
		Spare		0	-	83	C	84	-	0		Spare		
	34,285	Subtotal										Subtotal	26,833	

N.E.C.	Load Type	Conn.	Fct.	Diversity
220.44	(R) Recept.	0		0
220.56	(K) Kitchen	0	100	0
220.60	(C) Cooling	0	0%	0
220.60	(H) Heating	0	0%	0
220.60	(F) Fans	0	100	0
	(M) Misc.	0	100	0

N.E.C.	Load Type	Conn.	Fct.	Diversit
210.20(a)	(L)	61,118	125	76,398
	(EL) Ext. Ltg.	0	125	0
620.14	(E) Elevators	0	0%	0
	(WH) Water Ht.	0	100	0
220.5	(MT) Lrg. Mot.	0	125	0
	(SP) Sub Panel	0	100	0

Total Connected	61,118	VA	169.8	AM
Total Load	76,398	VA	212.2	AM

Location of MECH/ELEC C215

Lighting Redesign: Total Modified Panelboards

The following panelboards are the result of all the new lighting loads applied to the 1L1 and 2L1 panelboards. These panels have the new loads added while the initial loads for each space taken off. All other spaces on the panelboard have their initial design loads. New electrical loads are highlighted in red.

Lighting Panelboard 1L1 Redesign

Lighting Panelboard 1L1 – Modified (All Spaces)

120/208 Volt 3-PH / 4-W			400 Main Bus Amps							10,000 AIC Rating			Mounting:	
(2 42 Space			400 Main Breaker										Surface	
1 -Nema			ISO. GRND. BUS											
Notes	Load (VA)	Description	Type	Wire	CB	CK #	PH	CKT #	CB	Wire	Type	Description	Load (VA)	Notes
	720	Recept Rm 102	R	12	20	1	A	2	20	12	R	Recept Rm	720	
	720	Recept Rm 102	R	12	20	3	B	4	20	12	R	Recept Rm	720	
	720	Recept Rm	R	12	20	5	C	6	20	12	R	Recept Rm	720	
	720	Recept Rm 100	R	12	20	7	A	8	20	12	R	Recept Rm	720	
	720	Recept Rm 110	R	12	20	9	B	10	20	12	R	Recept Rm	720	
	720	Recept Rm 110	R	12	20	11	C	12	20	12	R	Recept Rm	720	
	720	Recept Rm 110	R	12	20	13	A	14	20	12	L	Ltg Rm M101	1920	
	1920	Ltg Rm M102	L	12	20	15	B	16	20	12	L	Ltg Rm M101	1920	
	1014	Ltg Rm M119,	L	12	20	17	C	18	20	12	L	Ltg Rm M118	1920	
	1920	Ltg Rm M102	L	12	20	19	A	20	20	12	L	Ltg Rm M118	1920	
	1920	Ltg Rm M102	L	12	20	21	B	22	20	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M102	L	12	20	23	C	24	20	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M103	L	12	20	25	A	26	20	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M103	L	12	20	27	B	28	20	12	L	Ltg Rm M102	1920	
	1920	Ltg Rm M104	L	12	20	29	C	30	20	12	L	Ltg Rm M103	1920	
	800	Ltg Rm M101	L	12	20	31	A	32	20	12	L	Ltg Rm M103	1920	
	1920	Ltg Rm M104	L	12	20	33	B	34	20	12	L	Ltg Rm M104	1920	
	1350	Ltg Rm M130	L	12	20	35	C	36	20	12	L	Ltg Rm M104	1920	
	130	Ltg Rm M101	L	12	20	37	A	38	20	12	L	Ltg Rm M118	384	
	200	Grounds	L	12	20	39	B	40	20	12	L	Ltg Rm M102	324	
	1350	Ltg Rm M100	L	12	20	41	C	42	20	12	L	Ltg Rm M119,	1200	
	1328	Ltg Rm M130	L	12	20	43	A	44	20	12	L	Ltg Rm M101	286	
	168	Spare		0	-	45	B	46	20	12	L	Ltg Rm M103	324	
		Spare		0	-	47	C	48	-	0		Spare		
		Spare		0	-	49	A	50	-	0		Spare		
		Spare		0	-	51	B	52	-	0		Spare		
		Spare		0	-	53	C	54	-	0		Spare		
		Spare		0	-	55	A	56	-	0		Spare		
		Spare		0	-	57	B	58	-	0		Spare		
		Spare		0	-	59	C	60	-	0		Spare		
		Spare		0	-	61	A	62	-	0		Spare		
		Spare		0	-	63	B	64	-	0		Spare		
		Spare		0	-	65	C	66	-	0		Spare		
		Spare		0	-	67	A	68	-	0		Spare		
		Spare		0	-	69	B	70	-	0		Spare		
		Spare		0	-	71	C	72	-	0		Spare		
		Spare		0	-	73	A	74	-	0		Spare		
		Spare		0	-	75	B	76	-	0		Spare		
		Spare		0	-	77	C	78	-	0		Spare		
		Spare		0	-	79	A	80	-	0		Spare		
		Spare		0	-	81	B	82	-	0		Spare		
		Spare		0	-	83	C	84	-	0		Spare		
	26,740	Subtotal										Subtotal	29,878	

N.E.C.	Load Type	Conn.	Fct.	Diversity
220.44	(R) Recept.	9,360		9,360
220.56	(K) Kitchen	0	100	0
220.60	(C) Cooling	0	0%	0
220.60	(H) Heating	0	0%	0
220.60	(F) Fans	0	100	0
	(M) Misc.	0	100	0

N.E.C.	Load Type	Conn.	Fct.	Diversit
210.20(a)	(L)	44,918	125	56,148
	(EL) Ext. Ltg.	0	125	0
620.14	(E) Elevators	0	0%	0
	(WH) Water	0	100	0
220.5	(MT) Lrg. Mot.	0	125	0
	(SP) Sub Panel	0	100	0

Total Connected Load =	56,618	VA	157.3	AM
Total Load (Diversified)=	68,433	VA	190.1	AM

Location of MECH/ELEC M114

Panelboard 1L1 Phase Loading

PHASE LOADING					
RIGHT SIDE OF PANEL			LEFT SIDE OF PANEL		
PHASE A	PHASE B	PHASE C	PHASE A	PHASE B	PHASE C
720	-	-	720	-	-
-	720	-	-	720	-
-	-	720	-	-	720
720	-	-	720	-	-
-	720	-	-	720	-
-	-	720	-	-	720
1,920	-	-	720	-	-
-	1,920	-	-	1,920	-
-	-	1,920	-	-	1,014
1,920	-	-	1,920	-	-
-	1,920	-	-	1,920	
-	-	1,920	-	-	1,920
1,920	-	-	1,920	-	-
-	1,920	-	-	1,920	
-	-	1,920	-	-	1,920
1,920	-	-	800	-	-
-	1,920	-	-	1,920	
-	-	1,920	-	-	1,350
384	-	-	130	-	-
-	324	-	-	200	
-	-	1,200	-	-	1,350
286	-	-	1,328	-	-
	324			168	
9,790	9,768	10,320	8,258	9,488	8,994

PHASE LEG	(VA/PHASE)
PHASE A =	18,048
PHASE B =	19,256
PHASE C =	19,314

Lighting Panelboard 2L1 Redesign

Lighting Panelboard 2L1 – Modified (All Spaces)

120/208 Volt 3-PH / 4-W				400 Main Bus Amps						10,000 AIC Rating			Mounting:	
(2) 42 Space				400 Main Breaker									Surface	
1 -Nema Rating				ISO. GRND. BUS										
Notes	Load (VA)	Description	Type	Wire	CB	CK #	PH	CKT #	CB	Wire	Type	Description	Load (VA)	Notes
	1056	Ltg Rm M208	L	12	20/	1	A	2	20/	12	L	Ltg Rm M205	1920	
	1750	Ltg Rm M208	L	12	20/	3	B	4	20/	12	L	Ltg Rm M202	1920	
	40	Ltg Rm M205	L	12	20/	5	C	6	20/	12	L	Ltg Rm M202	1920	
	1920	Ltg Rm M205	L	12	20/	7	A	8	20/	12	L	Ltg Rm M202	1920	
	1200	Ltg Rm M201	L	12	20/	9	B	10	20/	12	L	Ltg Rm M101	1920	
	1200	Ltg Rm M201	L	12	20/	11	C	12	20/	12	L	Ltg Rm M203	1920	
	600	Ltg Rm M201	L	12	20/	13	A	14	20/	12	L	Ltg Rm M204	1920	
	1518	Ltg Rm M201	L	12	20/	15	B	16	20/	12	L	Ltg Rm M204	1920	
	1920	Ltg Rm M202	L	12	20/	17	C	18	20/	12	L	Ltg Rm M206	1920	
	1920	Ltg Rm M101	L	12	20/	19	A	20	20/	12	L	Ltg Rm M222	162	
	1920	Ltg Rm M203	L	12	20/	21	B	22	20/	12	L	Ltg Rm M228,	1875	
	1920	Ltg Rm M203	L	12	20/	23	C	24	20/	12	L	Ltg Rm M203	192	
	1920	Ltg Rm M203	L	12	20/	25	A	26	20/	12	L	Ltg Rm M101	192	
	1920	Ltg Rm M204	L	12	20/	27	B	28	20/	12	L	Ltg Rm M222	192	
	1920	Ltg Rm M204	L	12	20/	29	C	30	20/	12	L	Ltg Rm M215	1920	
	1920	Ltg Rm M206	L	12	20/	31	A	32	20/	12	L	Ltg Rm M222	1920	
	1920	Ltg Rm M222	L	12	20/	33	B	34	20/	12	L	Ltg Rm M202	192	
	1920	Ltg Rm M222	L	12	20/	35	C	36	20/	12	L	Ltg Rm M204	192	
	1325	Ltg Rm M208	L	12	20/	37	A	38	20/	12	L	Ltg Rm M215	1920	
		Spare		0	-	39	B	40	-	0		Spare		
		Spare		0	-	41	C	42	-	0		Spare		
		Spare		0	-	43	A	44	-	0		Spare		
		Spare		0	-	45	B	46	-	0		Spare		
		Spare		0	-	47	C	48	-	0		Spare		
		Spare		0	-	49	A	50	-	0		Spare		
		Spare		0	-	51	B	52	-	0		Spare		
		Spare		0	-	53	C	54	-	0		Spare		
		Spare		0	-	55	A	56	-	0		Spare		
		Spare		0	-	57	B	58	-	0		Spare		
		Spare		0	-	59	C	60	-	0		Spare		
		Spare		0	-	61	A	62	-	0		Spare		
		Spare		0	-	63	B	64	-	0		Spare		
		Spare		0	-	65	C	66	-	0		Spare		
		Spare		0	-	67	A	68	-	0		Spare		
		Spare		0	-	69	B	70	-	0		Spare		
		Spare		0	-	71	C	72	-	0		Spare		
		Spare		0	-	73	A	74	-	0		Spare		
		Spare		0	-	75	B	76	-	0		Spare		
		Spare		0	-	77	C	78	-	0		Spare		
		Spare		0	-	79	A	80	-	0		Spare		
		Spare		0	-	81	B	82	-	0		Spare		
		Spare		0	-	83	C	84	-	0		Spare		
	29,809	Subtotal										Subtotal	26,037	

N.E.C.	Load Type	Conn.	Fct.	Diversity
220.44	(R) Recept.	0		0
220.56	(K) Kitchen	0	100	0
220.60	(C) Cooling	0	0%	0
220.60	(H) Heating	0	0%	0
220.60	(F) Fans	0	100	0
	(M) Misc.	0	100	0

N.E.C.	Load Type	Conn.	Fct.	Diversit
210.20(a)	(L)	56,572	125	70,715
	(EL) Ext. Ltg.	0	125	0
620.14	(E) Elevators	0	0%	0
	(WH) Water Ht.	0	100	0
220.5	(MT) Lrg. Mot.	0	125	0
	(SP) Sub Panel	0	100	0

Total Connected	57,112	VA	158.6	AM
Total Load	71,390	VA	198.3	AM

Location of MECH/ELEC C215

Panelboard 2L1 Phase Loading

PHASE LOADING					
RIGHT SIDE OF PANEL			LEFT SIDE OF PANEL		
PHASE A	PHASE B	PHASE C	PHASE A	PHASE B	PHASE C
1,920	-	-	1,056	-	-
-	1,920	-	-	1,750	-
-	-	1,920	-	-	40
1,920	-	-	1,920	-	-
-	1,920	-	-	1,200	-
-	-	1,920	-	-	1,200
1,920	-	-	600	-	-
-	1,920	-	-	1,518	-
-	-	1,920	-	-	1,920
162	-	-	1,920	-	-
-	1,875	-	-	1,920	-
-	-	192	-	-	1,920
192	-	-	1,920	-	-
-	192	-	-	1,920	-
-	-	1,920	-	-	1,920
192	-	-	1,920	-	-
-	1,920	-	-	1,920	-
-	-	192	-	-	3,186
1,920	-	-	1,325	-	-
8,226	9,747	8,064	10,661	10,228	10,186

PHASE LEG	(VA/PHASE)
PHASE A =	18,887
PHASE B =	19,975
PHASE C =	18,250

Short Circuit Analysis

Analysis for the short circuit study started at the existing one line diagram. I will be focusing on the path of the 1L1 panelboard. This includes the cable to the main switchboard (MS-E1), the cable to a high density panelboard (1H1), the cable to the transformer (T1L1), the transformer itself (T1L1), and finally the cable to the lighting panelboard (1L1).

This short circuit study was analyzed by X & R ratio methods. A list of equations for this study are as follows:

Transformers:

$$XFMR_{Xu} = \frac{(X)(Base\ kVA)}{XFMR\ kVA}\ ;\ XFMR_{Ru} = \frac{(R)(Base\ kVA)}{XFMR\ kVA}$$

Components (cables):

$$X_u = \frac{(X)(Base\ kVA)}{(1000)(kV)^2}\ ;\ R_u = \frac{(R)(Base\ kVA)}{(1000)(kV)^2}$$

$I_{short\ circuit}$:

$$I_{sc} = \frac{(Base\ kVA)}{(\sqrt{3})(kV)(Z_u)}$$

Resultant Z_u:

$$(Z_u)^2 = (R_u)^2 + (X_u)^2$$

Short Circuit Study Path:
The five "X's" note the locations where each fault-current was found.

The following tables were made in excel to study each location. The X and R components build further and further down the circuit path until it stops at panelboard 1L1. These excel tables use the above equations and use a base kVA of 25,000. Table 14 is used for transformers and table 17 is used for cables. These charts can be found at the end of this short circuit study.

To Main Switchboard (MS-E1) (1st "X")

xfmr		
Base kVA	25000	
Xfmr kVA	0	
	From Table 14	
%X	0.00%	
%R	0.00%	
Ru	#DIV/0!	
Xu	#DIV/0!	

cable1 - to MPB		
Base kVA	25000	
Length	55	
Cable	400MCM	
sets	5	
	Fromt Table 17	Adjusted
%X	0.0409	0.00045
%R	0.0348	0.000383
Ru	0.041536458	
Xu	0.048817274	

Type	X	R
Base	0.691038289	0.691038
Cable1	0.048817274	0.041536
total	0.739855563	0.732575

Final		
kV	0.48	
	Z2=X2+R2	
Z2	1.041178186	
Isc	28881.06	A
	28.88	kA

To Panelboard (1H1) (2nd "X")

xfmr	
Base kVA	25000
Xfmr kVA	0
	From Table 14
%X	0.00%
%R	0.00%
Ru	#DIV/0!
Xu	#DIV/0!

cable1 - to MPB		
Base kVA	25000	
Length	55	
Cable	400MCM	
sets	5	
	Fromt Table 17	Adjusted
%X	0.0409	0.00045
%R	0.0348	0.000383
Ru	0.041536458	
Xu	0.048817274	

cable2 - to 1H1		
Base kVA	25000	
Length	15	
Cable	250MCM	
sets	1	
	Fromt Tab	Adjusted
%X	0.0428	0.000642
%R	0.0534	0.000801
Ru	0.086914	
Xu	0.069661	

Type	X	R
Base	0.691038289	0.691038
Cable1	0.048817274	0.041536
Cable2	0.069661458	0.086914
total	0.809517021	0.819489

Final	
kV	0.48
	Z2=X2+R2
Z2	1.151902651
Isc	26104.92 A
	26.10 kA

To Transformer (T1L1) (3rd "X")

xfmr	
Base kVA	25000
Xfmr kVA	0
	From Table 14
%X	0.00%
%R	0.00%
Ru	#DIV/0!
Xu	#DIV/0!

cable1 - to MPB		
Base kVA	25000	
Length	55	
Cable	400MCM	
sets	5	
	Fromt Table 17	Adjusted
%X	0.0409	0.00045
%R	0.0348	0.000383
Ru	0.041536458	
Xu	0.048817274	

cable2 - to 1H1		
Base kVA	25000	
Length	15	
Cable	250MCM	
sets	1	
	Fromt Tab	Adjusted
%X	0.0428	0.000642
%R	0.0534	0.000801
Ru	0.086914	
Xu	0.069661	

cable3 - to T1L1 xfmr		
Base kVA	25000	
Length	15	
Cable	#4	
sets	1	
	Fromt Tab	Adjusted
%X	0.0492	0.000738
%R	0.3114	0.004671
Ru	0.506836	
Xu	0.080078	

Type	X	R
Base	0.691038289	0.691038
Cable1	0.048817274	0.041536
Cable2	0.069661458	0.086914
Cable3	0.080078125	0.506836
total	0.889595146	1.326325

Final	
kV	0.48
	Z2=X2+R2
Z2	1.597033769
Isc	18828.86 A
	18.83 kA

Transformer (T1L1) (4th "X")

xfmr - T1L1	
Base kVA	25000
Xfmr kVA	45
	From Table 14
%X	1.73%
%R	2.52%
Ru	14
Xu	9.611111111

cable1 - to MPB		
Base kVA	25000	
Length	55	
Cable	400MCM	
sets	5	
	Fromt Table 17	Adjusted
%X	0.0409	0.00045
%R	0.0348	0.000383
Ru	0.041536458	
Xu	0.048817274	

cable2 - to 1H1		
Base kVA	25000	
Length	15	
Cable	250MCM	
sets	1	
	Fromt Tab	Adjusted
%X	0.0428	0.000642
%R	0.0534	0.000801
Ru	0.086914	
Xu	0.069661	

cable3 - to T1L1 xfmr		
Base kVA	25000	
Length	15	
Cable	#4	
sets	1	
	Fromt Tab	Adjusted
%X	0.0492	0.000738
%R	0.3114	0.004671
Ru	0.506836	
Xu	0.080078	

Type	X	R
Base	0.691038289	0.691038
Cable1	0.048817274	0.041536
Cable2	0.069661458	0.086914
Cable3	0.080078125	0.506836
Xfmr	9.611111111	14
total	10.50070626	15.32632

Final	
kV	0.48
	Z2=X2+R2
Z2	18.57851076
Isc	1618.55 A
	1.62 kA

To Panelboard (1L1) (5th "X")

xfmr - T1L1	
Base kVA	25000
Xfmr kVA	45
	From Table 14
%X	1.73%
%R	2.52%
Ru	14
Xu	9.611111111

cable1 - to MPB		
Base kVA	25000	
Length	55	
Cable	400MCM	
sets	5	
	Fromt Table 17	Adjusted
%X	0.0409	0.00045
%R	0.0348	0.000383
Ru	0.041536458	
Xu	0.048817274	

cable2 - to 1H1		
Base kVA	25000	
Length	15	
Cable	250MCM	
sets	1	
	Fromt Tab	Adjusted
%X	0.0428	0.000642
%R	0.0534	0.000801
Ru	0.086914	
Xu	0.069661	

cable3 - to T1L1 xfmr		
Base kVA	25000	
Length	15	
Cable	#4	
sets	1	
	Fromt Tab	Adjusted
%X	0.0492	0.000738
%R	0.3114	0.004671
Ru	0.506836	
Xu	0.080078	

cable4 - to 1L1		
Base kVA	25000	
Length	15	
Cable	#1	
sets	1	
	Fromt Tab	Adjusted
%X	0.0371	0.000557
%R	0.1553	0.00233
Ru	0.252767	
Xu	0.060384	

Type	X	R
Base	0.691038289	0.691038
Cable1	0.048817274	0.041536
Cable2	0.069661458	0.086914
Cable3	0.080078125	0.506836
Xfmr	9.611111111	14
Cable4	0.060384115	0.252767
total	10.56109037	15.57909

Final	
kV	0.48
	$Z^2=X^2+R^2$
Z2	18.82139015
Isc	1597.67 A
	1.60 kA

So the final I_{sc} for this circuit that ends with panelboard 1L1 comes to 1,598 Amps of fault-current.

Table 1.1

Fault Current Analysis Summary

Switchgear	Available Fault (kA)	Standard Breaker Rating (kA)
Main Switchboard (MS-E1)	28.88	65
Panelboard (1H1)	26.1	30
To Transformer (T1L1)	18.86	22
Transformer (T1L1)	1.62	10
Panelboard (1L1)	1.6	10

Table 1.1

TABLE 14—Dry-type transformers—Type QHT, % Impedance, Reactance and Resistance ‡

kVA	Single-phase			Three-phase			
	%IX	%IR	%IZ	kVA	%IX	%IR	%IZ
5	1.68	2.94	3.4	6	1.72	2.72	3.2
7.5	1.84	2.42	3.0	9	1.16	2.31	2.6
10	1.92	2.04	2.75	15	1.82	2.1	2.8
15	2.02	1.60	2.6	30	1.37	3.8	4.0
25	2.3	1.4	2.7	45	1.73	2.52	3.1
37.5	2.7	3.6	4.5	75	1.91	2.27	3.0
50	2.8	3.1	4.2	112½	3.87	2.43	4.6
75	3.7	2.48	4.45	150	5.0	2.35	5.5
100	3.55	2.12	4.14	225	5.5	1.15	5.9
167	3.25	1.60	3.63	300	4.5	1.8	4.9
				500	5.9	1.6	6.1

‡Typical values based on data from several manufacturers.

Table 1.1

TABLE 17—Cables

Approximate 60-cycle resistance and reactance of copper and aluminum cable, 75 C conductor temperature. 600 volts, 5 kV and 15 kV. Magnetic and nonmagnetic conduit ohms/1000 ft l-n*.

Cable Size	Copper Conductor							
	Cable in Magnetic Conduit				Cable in Nonmagnetic Conduit			
	1/C Conductor		3/C Conductor		1/C Conductor		3/C Conductor	
	R	X	R	X	R	X	R	X
600 Volts								
8 AWG	0.7873	0.0514	0.7873	0.0394	0.7873	0.0411	0.7873	0.0343
6 AWG	.4954	.0521	.4954	.0399	.4954	.0417	.4954	.0347
4 AWG	.3114	.0492	.3114	.0377	.3114	.0393	.3114	.0328
3 AWG	.247	.0479	.247	.0367	.247	.0383	.247	.0319
2 AWG	.1959	.0466	.1959	.0357	.1959	.0373	.1959	.0311
1 AWG	.1553	.0485	.1553	.0371	.1553	.0388	.1553	.0323
1/0 AWG	.1231	.0457	1231	.035	.1231	.0366	.1231	.0305
2/0 AWG	.0977	.0446	.0977	.0341	.0977	.0356	.0977	.0297
3/0 AWG	.0775	.0435	.0775	.0333	.0775	.0348	.0775	.029
4/0 AWG	.0614	.0425	.0614	.0326	.0614	.034	.0614	.0283
250 MCM	.0534	.0428	.0534	.0328	.0529	.0342	.0529	.0285
300 MCM	.0452	.042	.452	.032	.0443	.0336	.0443	.028
350 MCM	.0392	.0414	.0392	.0315	.0383	.0331	.0383	.0276
400 MCM	.0348	.0409	.0348	.0311	.0337	.0327	.0337	.0273
500 MCM	.0287	.0402	.0287	.0301	.0275	.0321	.0275	.0268
600 MCM	.0249	.0404	.0249	.0299	.0234	.0323	.0234	.0269
750 MCM	.0213	.0396	.0213	.0288	.0194	.0317	.0194	.0264
1000 MCM	.0179	.0388	.0179	.0276	.0155	.031	.0155	.0259
1250 MCM	.0161	.0388	.0161	.0271	.0131	.031	.0131	.0258
1500 MCM	.0149	.0383	.0149	.0265	.0115	.0306	.0115	.0255
1750 MCM	.0141	.0378	.0141	.026	.0104	.0302	.0104	.0252
2000 MCM	.0135	.0375	.0135	.0257	.0096	.03	.0096	.025

Wind Power Generation

This section will be discussing a wind powered electricity generation system. This system is integrated into the solar shading system that protects the solarium. This shading system is part of my proposed lighting depth. An in-depth description can be found in that section of this report.

design + components

Using the power of the wind, the disks found in the solar shading system will rotate when propelled. This rotation is what will be harnessed into electric energy. The system essentially turns kinetic energy in the form of wind and turns it into electricity. The rotating part of the disk will turn a small individual induction motor. This motor will have a small output of 6 watts, but with each disk having its own motor, there will be a total of 1,298 small induction motors. Therefore, this system can then power about 7,788 watts. The output is 120/208V A/C power. This is then daisy-chained together to a separate panelboard. The power will be split onto six circuits with 1,298 watts per circuit.

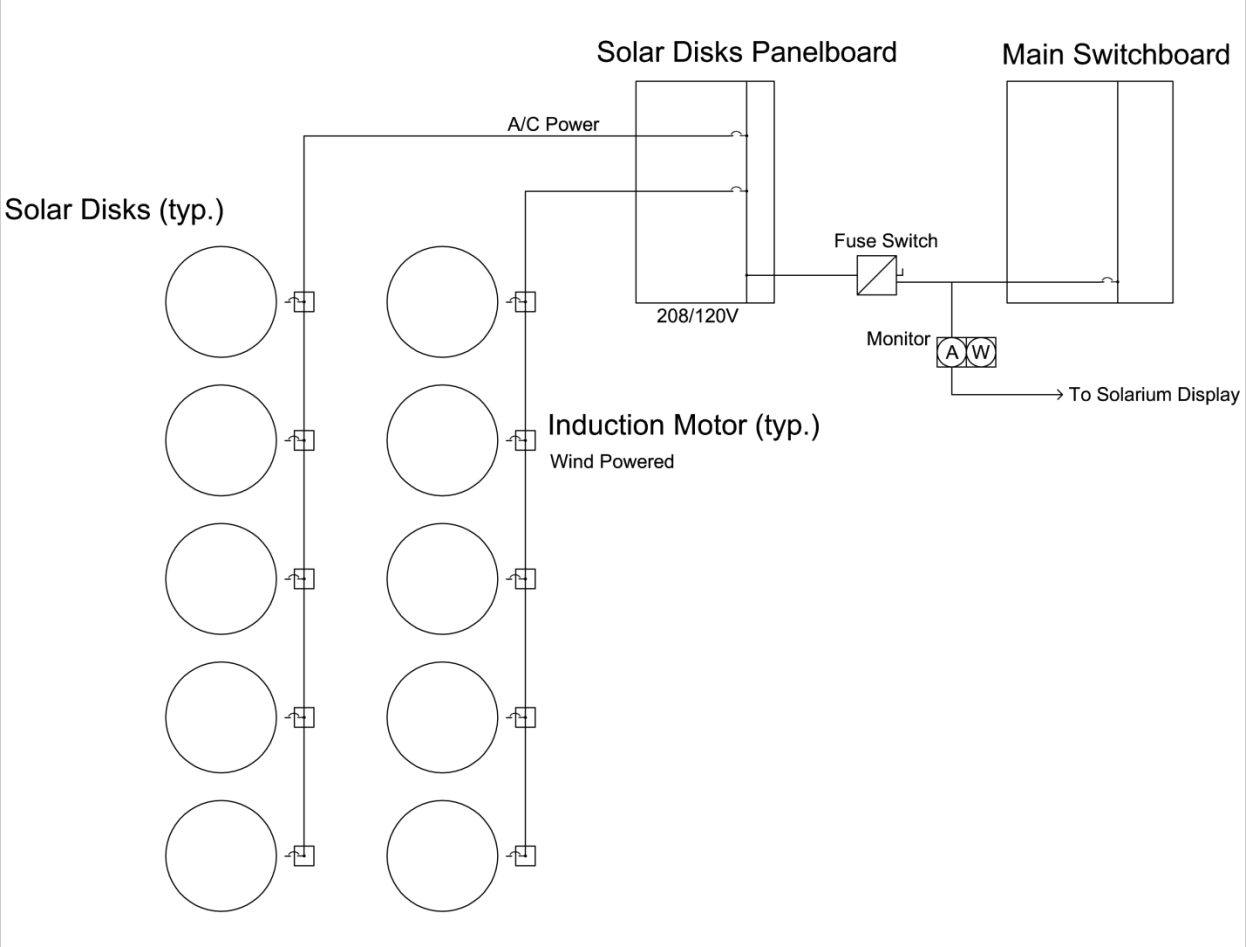
In order to protect the main switchboard, and when shut-off is needed, a fused switch will be needed in-between the main switchboard and the solar disk panelboard. A monitor will also be used here to observe the amount of energy the system is generating at each point of the day. The power can then be brought back to the main switchboard, which is then apart of the museum's power it can use. This system could reduce the total power consumption of the building by 0.59%.

This power generation is not meant to fill a large portion of the total power usage of the Nerman Museum. Instead it is used as part of an art installation. Fitting with the theme of the buildings minimal design, and connection to its surroundings, this system is meant to further realize that link to nature. By putting numbers to nature, and literally, putting the forces of nature back into the building, the museum as a whole grows stronger in its overall design.

The power generated by this system will be for the whole museum to see. In the solarium, there will be a LED screen with data on the power generation of these spinning disks. It will have totals for the day, month, and year as well as a timeline of different parts of the day's wind generation. This installation can become a learning experience for the patrons that come to the museum.

single line integration

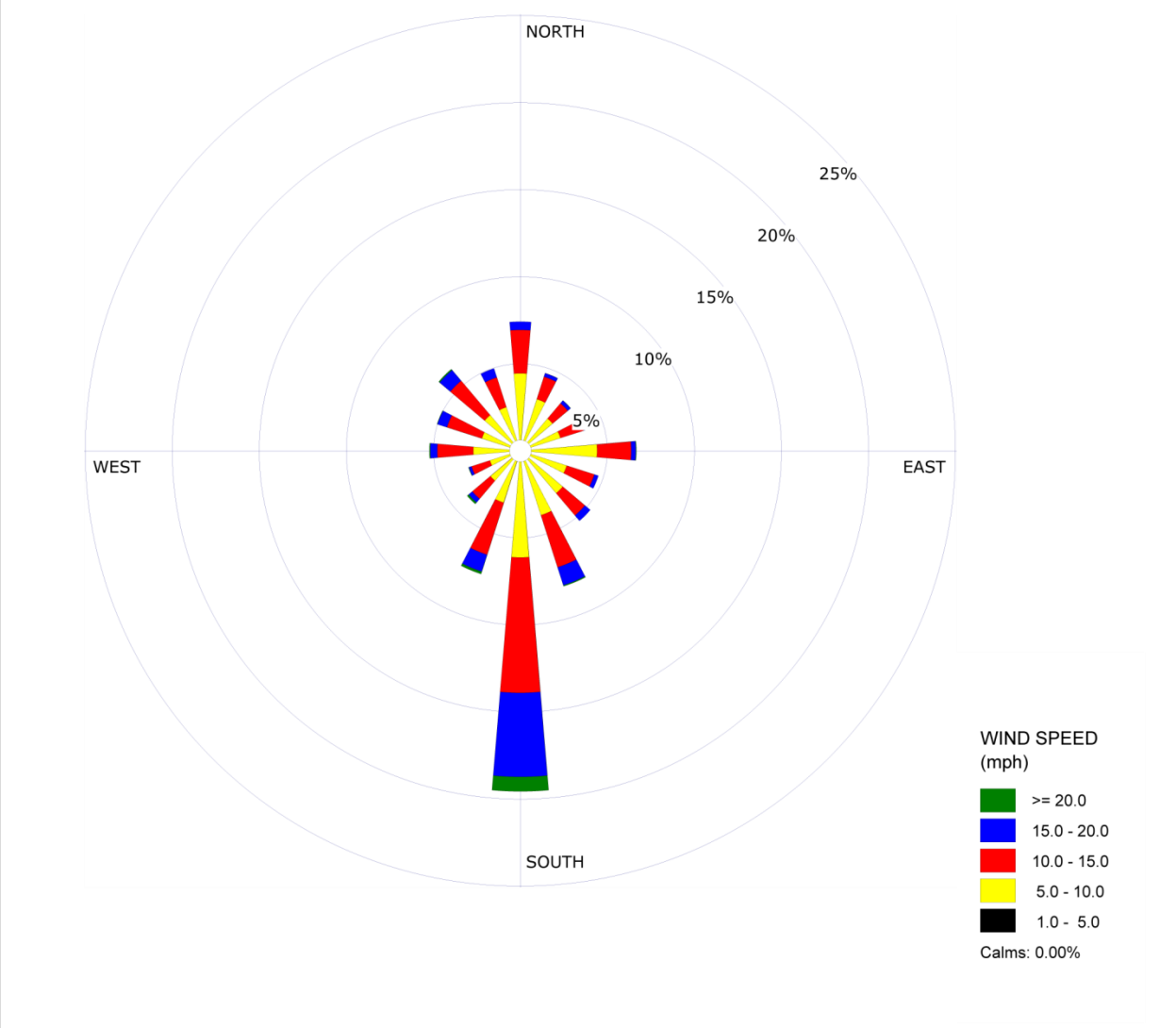
Figure 1.1



proformance

overland park wind rose

Figure 1.1



This wind rose shows that wind is mostly from the south. In order for the disks to spin, there needs to be east or west direction wind. By this wind rose, you can see that wind comes from the East 22% of the time, and from the West, also about 22% of the time. So totally, the solar disks should be able to be spinning about 44% of the day. This means they could spin up to 10.5 hours out of the day. The wind rose also shows that the average wind speed is about 10 mph.

The radius of the solar disks are 8" each. This means if the wind speed is 10 mph constantly, the disks will spin 210 rotations per minute. Now this is not a perfect system and there are certainly losses with the torque needed to turn each disk as well as the small surface area that can be forced to turn by the wind. This system will not perform at this optimum output.

$$RPM = \left(\frac{1}{16\ inches\ (diameter)}\right)\left(\frac{1}{\pi}\right)\left(\frac{10\ miles}{hour}\right)\left(\frac{63360\ inches}{1\ mile}\right)\left(\frac{1\ hour}{60\ mins}\right) = 210\ RPM$$

Below is an induction motor's frequency setting. By choosing a 7.5 ratio, the motor will need to spin at 200 RPM to maintain a 6 watt output. This will allow for minimum torque needed to spin the motor.

Freqency	Ratio		3	3.6	5	6	7.5	9	10	12.5	15	18	20	25
50HZ	Output Speed	r/min	500	417	300	250	200	166	150	120	100	83	75	60
	Allow Toruqe	N.m	0.13	0.15	0.21	0.21	0.32	0.38	0.42	0.53	0.63	0.76	0.76	0.95
		kgf.cm	1.3	1.5	2.1	2.1	3.2	3.9	4.3	5.4	6.4	7.7	7.7	9.7

Frequency	Ratio		30	36	40	50	60	75	90	100	120	150	180	200
50HZ	Output Speed	r/min	50	41	37	30	25	20	16	15	12	10	8	7.5
	Allow Toruqe	N.m	1.14	1.36	1.52	1.72	2.06	2.57	2.94	2.94	2.94	2.94	2.94	2.94

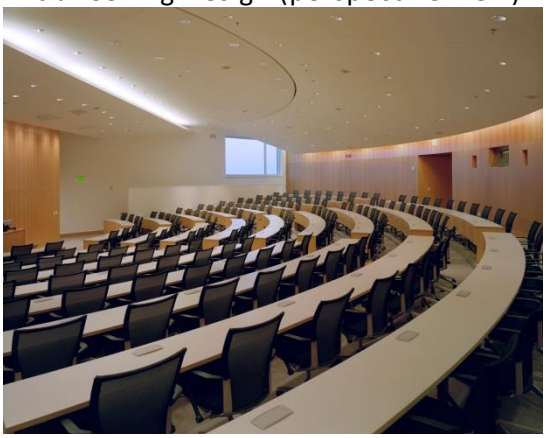
Since the disks will only be spinning, on average, 44% of the time, the power generated will not be the full 6 watts. It will therefore only generate about 3427 watts of power. This will also see significant losses that were discussed above. At losses of about 70%, the system could produce around 1000 watts total. As stated above, this system is not meant to provide a large amount of power to the building, but more to support the museums overall design concept and atmosphere.

Breadth I - Structural:

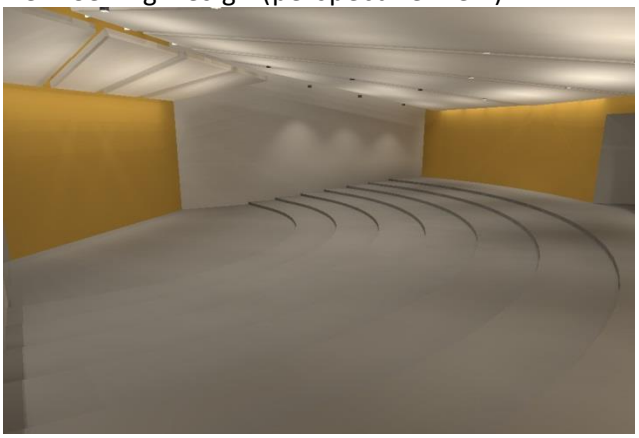
Breadth I is a structural study into the joist and roof deck of the auditorium. It is necessary to redesign these systems due to the changes made during the lighting depth. During the redesign of the lighting in the auditorium, skylights were added overhead. New ceiling panels were also designed to take reflect the overall lighting design concept. Working with optimal sky-lighting placement and total joist spans, a compromise was found between the lighting and structural requirements for the space. This breadth deals with the structural portion of the design.

New Ceiling Design

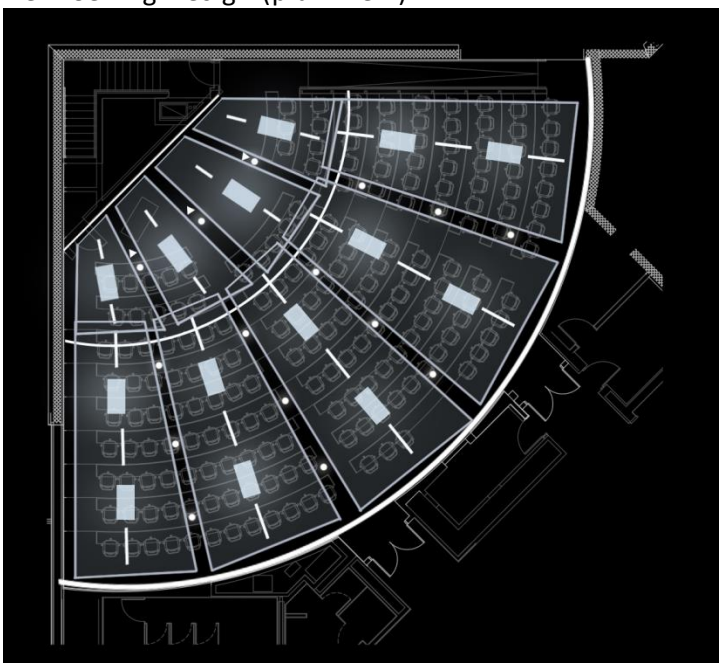
Initial Ceiling Design (perspective view):



New Ceiling Design (perspective view):



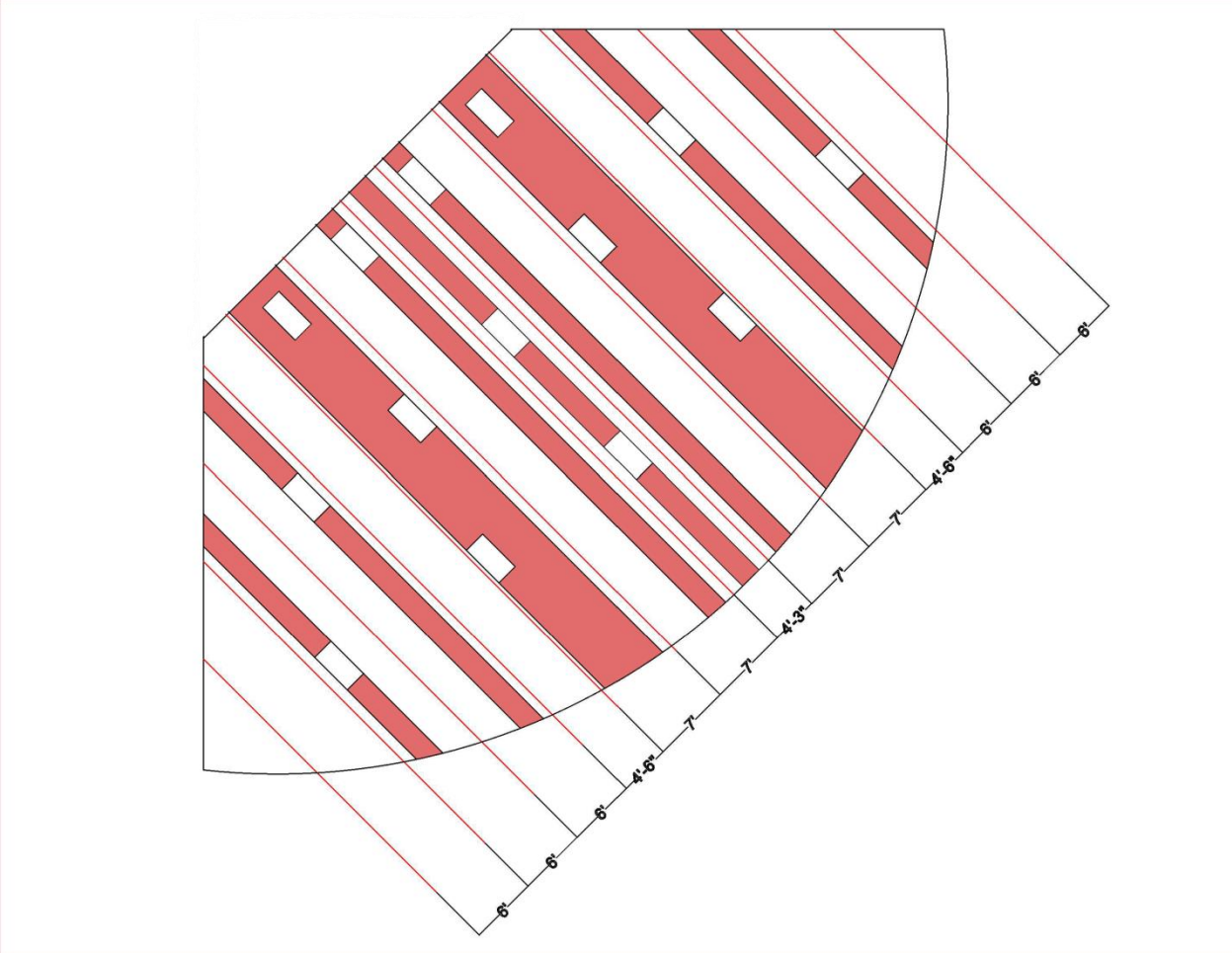
New Ceiling Design (plan view):



Design Process

The first part of the design was placing the skylights in optimal locations over the drop ceiling panels so that they could be evenly distributed over the space, and to the desired effect of the lighting concept. With the skylights placed, the locations where the joists may run at full span could be looked at.

Figure 1.1
Area study for joist placement



In the figure above, the skylight spans are highlighted in red to show where the structural joist cannot be placed. Only in the white parts could the joists span the whole length of the auditorium. Slight adjustments were needed to the placement of the skylights in order to accommodate the spans between joists. A span of 7' was chosen to be the largest span acceptable. This decision was based on the upper limitations of LH joists with they're depth and self-weight restrictions.

Roof Deck Calculation:

The analysis started with the roof deck. The roof deck needed to be redesign due to the increase spans needed (7 feet). The old deck can be found below.

(9) TYPICAL ROOF DECK IS 1½" DEEP x 22 GAGE WIDE RIB (TYPE B) GALVANIZED METAL ROOF DECK. WELD TO SUPPORTING STRUCTURE WITH ⅝"ø PUDDLE WELDS @6"OC MAXIMUM AND #10 TEK SCREWS SIDE LAP FASTENERS @6"OC MAXIMUM TYPICAL. (MAXIMUM DECK SPAN ALLOWED = 5'-6").

This deck could only span 5'-6" and the newly design roof deck needed to be able to span 7'. For the roof deck calculation, a list of load assumptions used is as followed:

Metal deck = 2 psf
Rigid Insulation = 2 psf
Built-up roof = 20 psf
Misc. deal load = 10 psf (lighting, ductwork, new ceiling panels) (less due to added skylights)
Self-weights of joist girders = 5 psf
Live load = 20 psf
Snow load = 20 psf (Kansas)

Since the live load and snow load are the same, the dynamic loading is 20 psf by default.

Loading Equation:

$$\boldsymbol{W_u = 1.2(Dead) + 1.6(Live\ or\ Snow)}$$

$$\boldsymbol{W_u = 1.2(2 + 2 + 20 + 10 + 5) + 1.6(20) = 78.8\ psf}$$

This total, 78.8 psf, was then used to find an appropriate roof deck using Vulcraft (manufacture)(Roof Deck catalog excerpt found at end of section). Two evaluations were used to test against the decks max stress and deflection. A Vulcraft 1.5B20 was specified to span 7'-0".

Max Stress:

$$\boldsymbol{78.8\ psf \leq Allowable\ stress\ (black\ \#)}$$

$$\boldsymbol{78.8\ psf \leq 82}\ \checkmark$$

Max Deflection:

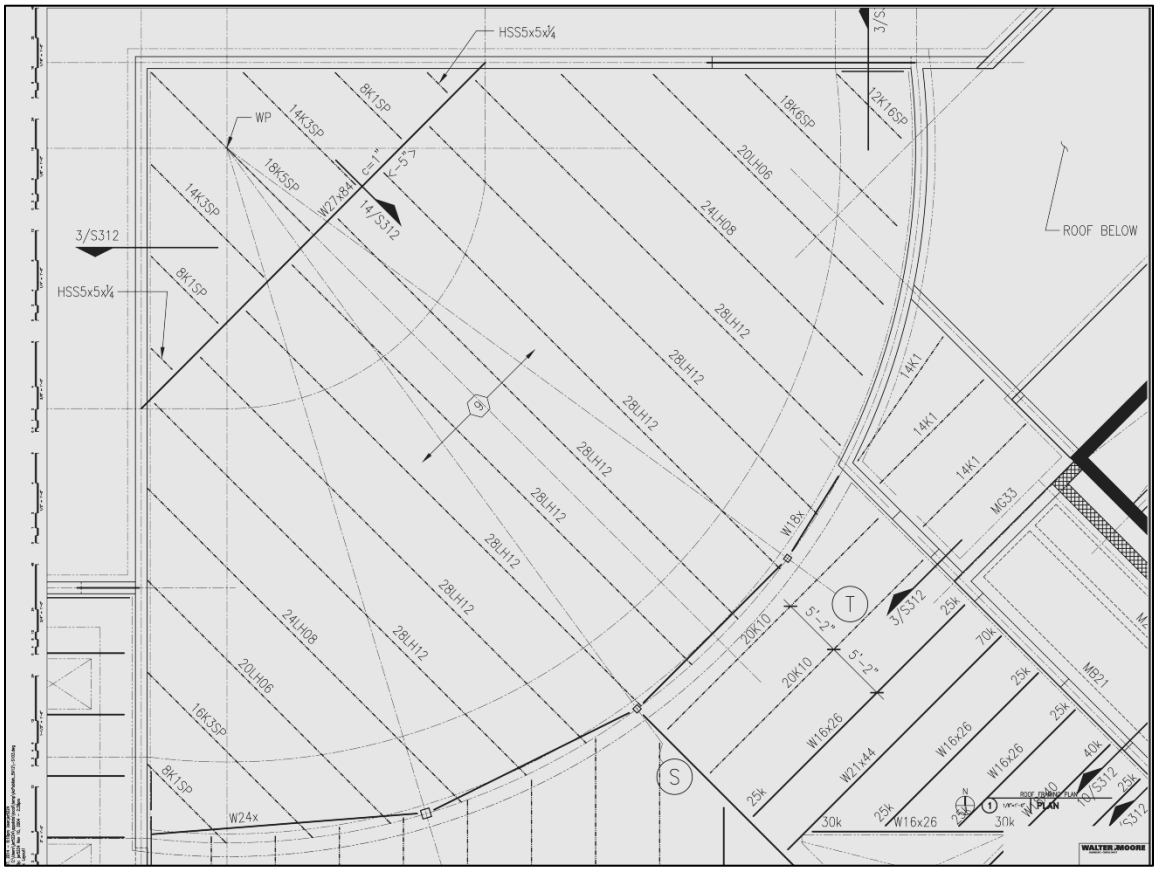
$$\boldsymbol{78.8\ psf \leq Allowable\ stress\ (red\ \#)} \times \frac{\boldsymbol{240}}{\boldsymbol{180}}$$

$$\boldsymbol{78.8\ psf \leq 101.33}\ \checkmark$$

Joist Calculation:

The joists then needed to be resized according to the new spans. Since 7'-0" was the biggest span needed, a spacing of 7'-0" was used for all joists to be conservative. The initial joist layout can be found below:

Figure 1.1
Initial Joist Design



A factored and unfactored load was then calculated to compare to the max load (factored) and the max deflection (unfactored). An L/240 deflection equation was used to find the joist design. The Vulcraft catalog provides L/360, which is a more stringent design criterion. The max load is taken from the roof decking assumptions.

Dead load = 39 psf
Live load = 20 psf
Snow load = 20 psf

Loading Equation in linear feet (for influence area):

$$\boldsymbol{W_u(plf) = W_u(psf) \times 7ft\ (span)}$$

Factored Load Equation in linear feet:

$$\boldsymbol{W_u(plf) = 78.8(psf) \times 7ft\ (span) = 551.6\ plf}$$

Unfactored Load Equation in linear feet (for L/240):

$$\boldsymbol{W_u(plf) = (29 + 20)(psf) \times 7ft\ (span) = 413\ plf}$$

Max Loading Equation:

$$\boldsymbol{551.6\ plf + 1.2(self\ wt) \leq max\ loading\ (black\ \#)}$$

Max Deflection Equation (for L/240):

$$\boldsymbol{413\ plf + (self\ wt) \leq 1.5\ \times\ max\ deflection\ (red\ \#)}$$

These two loads were then compared to the max load and max deflection stats for joists in the Vulcraft catalog. After multiple comparisons a joist was selected for each joist length.

Joists needing sized:

- (6) 50’ length joists
- (2) 42’ length joists
- (2) 34’ length joists
- (2) 25’ length joists
- (2) 14’ length joists

(6) 50’ length joists – Vulcraft 28LH11

Factored: $\boldsymbol{551.6\ plf + 1.2(25) \leq 841\ (black\ \#)}$ ✓

Unfactored: $\boldsymbol{413\ plf + 25 \leq 1.5\ \times\ 294\ (red\ \#)}$ ✓

(2) 42’ length joists – Vulcraft 28LH07

Factored: $\mathbf{551.6\,plf + 1.2(17) \leq 726\ (black\ \#)}$ ✓

Unfactored: $\mathbf{413\,plf + 17 \leq 1.5 \times 305\ (red\ \#)}$ ✓

(2) 34’ length joists – Vulcraft 24LH05

Factored: $\mathbf{551.6\,plf + 1.2(13) \leq 669\ (black\ \#)}$ ✓

Unfactored: $\mathbf{413\,plf + 13 \leq 1.5 \times 297\ (red\ \#)}$ ✓

(2) 25’ length joists – Vulcraft 18K5

Factored: $\mathbf{551.6\,plf + 1.2(7.7) \leq 600\ (black\ \#)}$ ✓

Unfactored: $\mathbf{413\,plf + 7.7 \leq 1.5 \times 281\ (red\ \#)}$ ✓

(2) 14’ length joists – Vulcraft 10K1

Factored: $\mathbf{551.6\,plf + 1.2(5) \leq 618\ (black\ \#)}$ ✓

Unfactored: $\mathbf{413\,plf + 5 \leq 1.5 \times 289\ (red\ \#)}$ ✓

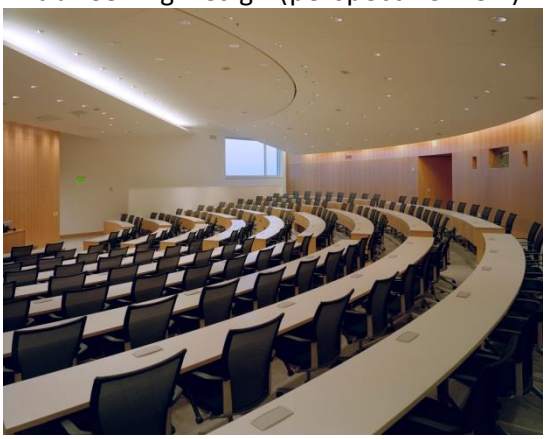
Conclusion:

The integration of the lighting and structural system came together here to create a workable solution. The structural design may be conservative by sizing each joist to 7’ spans, but compromise is needed to achieve a high quality design. The overall joist depth was never design over 28” which allows the ceiling panels to be higher in the room, creating a much needed feeling of space.

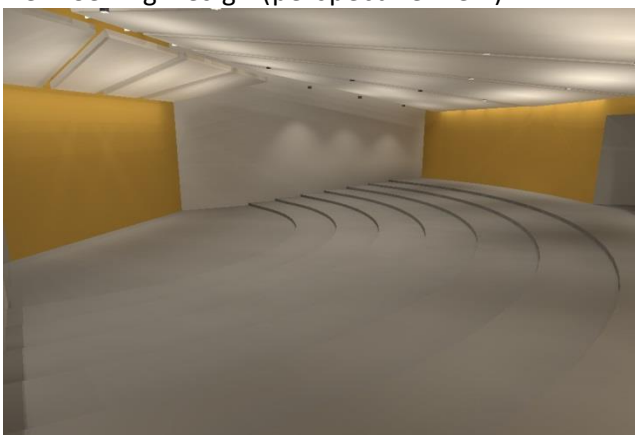
Breadth II - Acoustical:

Breadth II is an acoustical study into the redesign of the auditorium. Due to the lighting concept for this space, the ceiling of the auditorium was designed to let sunlight into the space. The shape and material of the ceiling were changed to achieve the lighting goals.

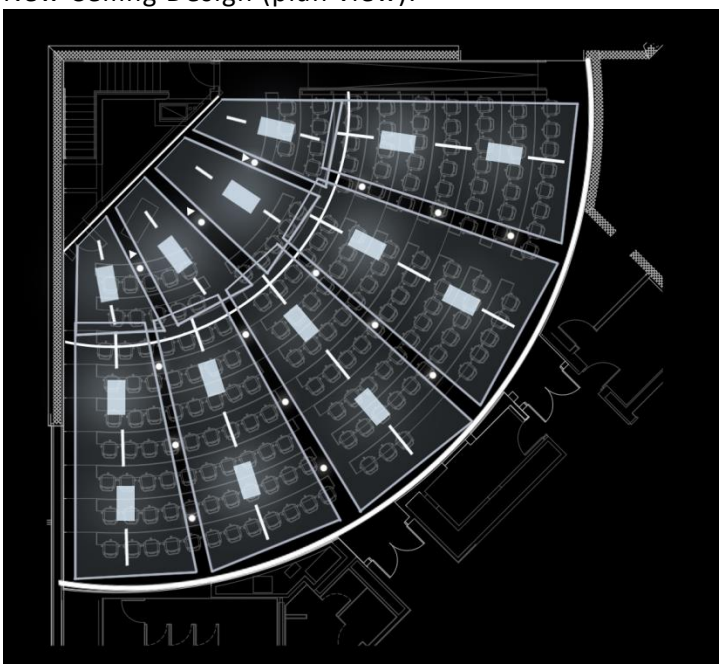
Initial Ceiling Design (perspective view):



New Ceiling Design (perspective view):



New Ceiling Design (plan view):



The pictures above illustrate the new ceiling design for the auditorium. The original ceiling, made of GWB, slopes up in the front of the room, levels off in the middle and then slopes back toward the back of the room. The new ceiling is laid out in a radial fan pattern. It is made up of nine panels of

PVC Newmat stretch material. The panels slope up in the front of the room, and then gradually back down toward the back of the room. This overall new ceiling design lessens the total volume of the room and decreases the total surface area.

Performance Criteria

The acoustical performance study will be based on the appropriate reverberation time (RT) for a lecture room or classroom where the main activity is speaking. The Nerman Musuem's auditorium is 47,142 ft^3 and the main function of the space presenting lectures with some classroom activities. The figure below outlines the appropriate RTs for a speech auditorium at a certain volume. The museum's auditorium falls at approximately 0.7 RT_{500}. The new ceiling design will decrease the overall volume of the space to 43,920 ft^3 which will make the new target 0.65 RT_{500}.

Figure 1.1

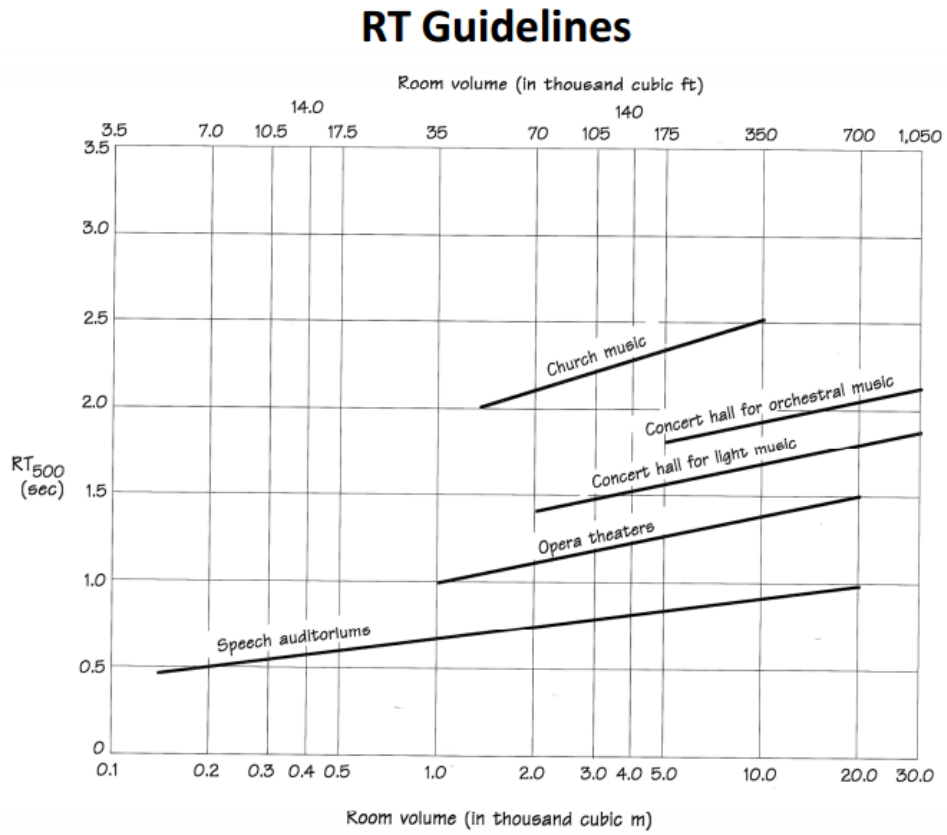


Figure 10.12 Suggested optimum RTs for various space purposes
(Architectural Acoustics by Mehta *et al* 1999)

The American National Standards Institute (ANSI) also has developed performance criteria concerning school and college buildings under ANSI S12.60. Learning spaces in schools should not have background noise levels (BNLs) that exceeds 35 dBA and a reverberation time of 0.6-0.7 seconds which is also based on the volume of the room. The table below outlines these guidelines.

Table 1.1
Limits on Background Noise Levels and RT times

Learning Spaces	SPL – Background Exterior Noise (dBA/C)	SPL – Background Interior Noise (dBA/C)	Maximum Permitted RT
Spaces ≤ 10,000 ft^3	35/55	35/55	0.6s
Spaces > 10,000 ft^3 ≤ 20,000 ft^3	35/55	35/55	0.7s
Spaces ≤ 10,000 ft^3 and all ancillary learning spaces	40/60	40/60	none

Performance Analysis

Sound absorption coefficients (α) were found for each material used in the space. This was then converted into sabines by the formula below:

$$\boldsymbol{Sabine} = \left(\boldsymbol{A_{surface}}\right)(\propto)$$

The sabines for each material were added together in their respectable frequencies and averaged over the total surface area of the room. This was then used in the Reverberation Time Equations:

Sabine Equation: When α < 0.2

$$\boldsymbol{RT} = \frac{\boldsymbol{0.049V}}{\boldsymbol{S_T} \propto \boldsymbol{+4mV}}$$

Norris-Eyring Equation: When α ≥ 0.2

$$\boldsymbol{RT} = \frac{\boldsymbol{0.049V}}{\boldsymbol{S_T\, ln(1-\propto)\, + 4mV}}$$

Where S_T = Total surface area of the room in ft;
m = Air attenuation constant;
V = Volume of room in ft^3

Results

Original Ceiling Design RT Calculation:

Table 1.1

Room Volume and SA

Volume (ft³) [V]	47,142.00
Total Surface Area (sqft) [Stot]	10,052.25

			Sound Absorption Coefficient (α)						S*α (sabines)					
			Frequency [f] (Hz)						Frequency [f] (Hz)					
Surface Description	**Surface Area [S] (ft²)**	**Material Description**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**125**	**250**	**500**	**1000**	**2000**	**4000**
Front Wall	580.50	Veneer Panel System	0.1	0.11	0.1	0.08	0.08	0.11	58.05	63.86	58.05	46.44	46.44	63.86
Side Wall Right	881.50	Veneer Panel System	0.1	0.11	0.1	0.08	0.08	0.11	88.15	96.97	88.15	70.52	70.52	96.97
Side Wall Left	1,307.25	5/8" PTD GWB	0.22	0.08	0.05	0.04	0.03	0.03	287.60	104.58	65.36	52.29	39.22	39.22
Back Wall	2,052.00	Perf HDWD 5/8" Decoustics Solo Board Panels w 1" Accoustical Fiberglass	0.1	0.45	1.03	0.96	0.71	0.69	205.20	923.40	2113.56	1969.92	1456.92	1415.88
Window Left	120.00	Window	0.35	0.25	0.18	0.12	0.07	0.04	42.00	30.00	21.60	14.40	8.40	4.80
Front Ceiling	286.00	5/8" GWB	0.22	0.08	0.05	0.04	0.03	0.03	62.92	22.88	14.30	11.44	8.58	8.58
Middle Ceiling	975.00	5/8" GWB	0.22	0.08	0.05	0.04	0.03	0.03	214.50	78.00	48.75	39.00	29.25	29.25
Back Ceiling	550.00	5/8" GWB	0.22	0.08	0.05	0.04	0.03	0.03	121.00	44.00	27.50	22.00	16.50	16.50
Floor Carpet	1,320.00	Carpet	0.03	0.05	0.09	0.2	0.3	0.4	39.60	66.00	118.80	264.00	396.00	528.00
Floor Desks	990.00	P-Lam Top	0.02	0.03	0.03	0.03	0.03	0.02	19.80	29.70	29.70	29.70	29.70	19.80
Floor Seating	990.00	Light uphostered Seating	0.35	0.45	0.57	0.61	0.59	0.55	346.50	445.50	564.30	603.90	584.10	544.50
	10,052.25													
								Sum S*α=	1485.32	1904.88	3150.07	3123.61	2685.63	2767.35
								Avg α=	0.147759	0.189498	0.31337	0.310737	0.267167	0.275296
								Air apsorption constant for 20 degC and 40% RH (m)=	0	0.001	0.0003	0.0004	0.009	0.027
								Sabine =	1.555197	1.103423	0.720366	0.722079	0.527058	0.293937
								Norris-Eyring =	1.437239	1.004086	0.602209	0.605303	0.479073	0.27737
								Calculated RT(s) =	1.555197	1.103423	0.602209	0.605303	0.479073	0.27737

New Ceiling Design RT Calculation:

Table 1.1

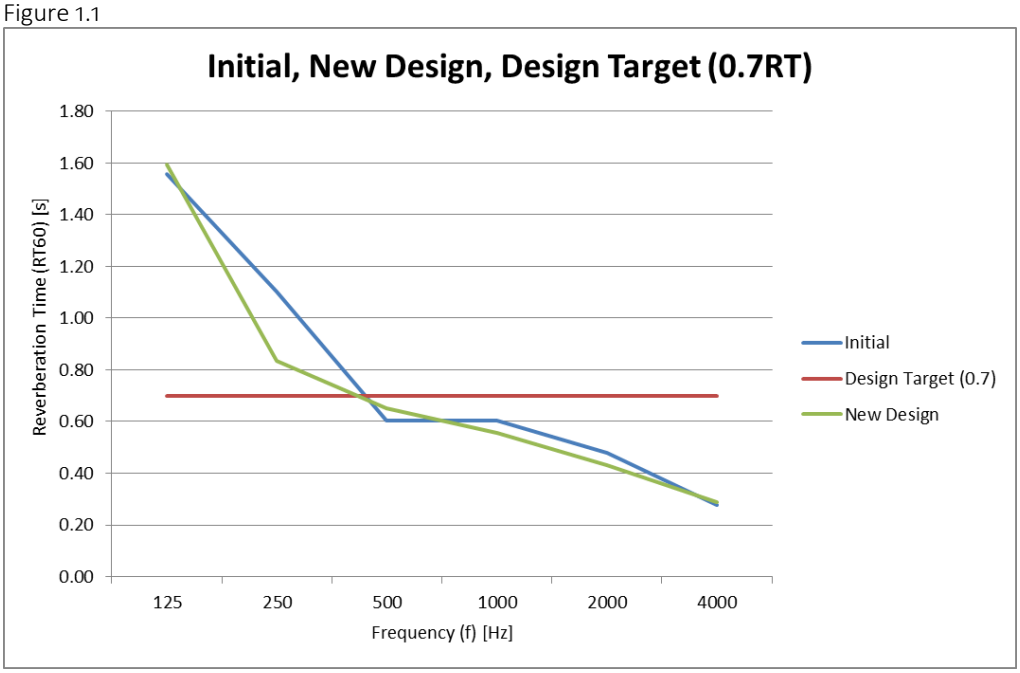
Room Volume and SA

Volume (ft³) [V]	43,920.00
Total Surface Area (sqft) [Stot]	9,907.25

			Sound Absorption Coefficient (α)						S*α (sabines)					
			Frequency [f] (Hz)						Frequency [f] (Hz)					
Surface Description	**Surface Area**	**Material Description**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**125**	**250**	**500**	**1000**	**2000**	**4000**
Front Wall	580.50	Veneer Panel System	0.1	0.11	0.1	0.08	0.08	0.11	58.05	63.86	58.05	46.44	46.44	63.86
Side Wall Right	881.50	Veneer Panel System	0.1	0.11	0.1	0.08	0.08	0.11	88.15	96.97	88.15	70.52	70.52	96.97
Side Wall Left	1,307.25	5/8" PTD GWB	0.22	0.08	0.05	0.04	0.03	0.03	287.60	104.58	65.36	52.29	39.22	39.22
Back Wall	2,052.00	Perf HDWD 5/8" Decoustics Solo Board Panels	0.09	0.12	0.37	0.82	0.68	0.4	184.68	246.24	759.24	1682.64	1395.36	820.80
Window Left	120.00	Window	0.35	0.25	0.18	0.12	0.07	0.04	42.00	30.00	21.60	14.40	8.40	4.80
Front Ceiling	286.00	PVC Newmat stretched film	0.17	0.63	0.64	0.24	0.19	0.14	48.62	180.18	183.04	68.64	54.34	40.04
Middle Ceiling	1,380.00	PVC Newmat stretched film	0.17	0.63	0.64	0.24	0.19	0.14	234.60	869.40	883.20	331.20	262.20	193.20
									0.00	0.00	0.00	0.00	0.00	0.00
Floor Carpet	1,320.00	Carpet	0.03	0.05	0.09	0.2	0.3	0.4	39.60	66.00	118.80	264.00	396.00	528.00
Floor Desks	990.00	P-Lam Top	0.02	0.03	0.03	0.03	0.03	0.02	19.80	29.70	29.70	29.70	29.70	19.80
Floor Seating	990.00	Light uphostered Seating	0.35	0.45	0.57	0.61	0.59	0.55	346.50	445.50	564.30	603.90	584.10	544.50
	9,907.25													
								Sum S*α=	1349.60	2132.42	2771.44	3163.73	2886.28	2351.18
								Avg α=	0.136223	0.215238	0.279739	0.319335	0.29133	0.237319
								Air apsorption constant for 20 degC and 40% RH (m)=	0	0.001	0.0003	0.0004	0.009	0.027
								Sabine =	1.594612	0.932403	0.762028	0.665454	0.48173	0.303343
								Norris-Eyring =	1.48335	0.835126	0.651418	0.554454	0.431034	0.289749
								Calculated RT(s) =	1.594612	0.835126	0.651418	0.554454	0.431034	0.289749

Graph of Initial, New & Target Design:

Figure 1.1



From the graph above, you can see that the RT_{500} of the new ceiling design is right underneath the target RT of 0.7. At 500 Hz the new design results in an RT of 0.65. The initial design does provide an RT of 0.6, which is also very good for this space.

In order for the new design to perform well, the back wall acoustical material had to change. Originally, the back wall was made of Decousitcs Solo 8-25 wood panels with a fiber glass backer. This material made up for a lot of the absorption in the room. The ceiling was GWB. By adding in the new ceiling design, and the PVC stretch material, it added additional absorption. An adjustment was then made to the back wall to lower the total absorption. The back wall was changed to a Decousitcs Solo 8-25 wood panel but without a fiber glass backer. This reduced the absorption significantly. The specs can be found below:

Table 1.1
Decoustics Solo Sound Absorption Coefficients

		Frequency (Hz)							
Description	**Thickness**	125	250	500	1000	2000	4000	NRC	SAA
*Solo 8-25**	*1 5/8 (41mm)*	*0.1*	*0.45*	*1.03*	*0.96*	*0.51*	*0.51*	*0.75*	*0.73*
*Solo 8-50**	*2 5/8 (67mm)*	*0.36*	*0.97*	*1.15*	*0.92*	*0.71*	*0.69*	*0.95*	*0.95*
*Solo 8***	*5/8 (16mm)*	*0.09*	*0.12*	*0.37*	*0.82*	*0.68*	*0.40*	*0.50*	*0.50*

** Type A Mounting (with 1" (Solo 8-25), or 2" (Solo 8-50) fiber glass backer)*

*** Type F25 Mounting (1" (25mm) furring/airspace - no backer)*

Evaluation

In this new design, the main acoustical materials in the space are more spread out over the area of the room. In the initial design, they were confined to the back wall. In the new ceiling design, the Newmat PVC ceiling panels add additional absorption, while the back wall doesn't need as much absorption. This creates an overall better system and the sound quality should reflect that.

Summary + Conclusions + Credits:

The goal of the AE senior thesis is to integrate our own individual specialties, with our overall background in Architectural Engineering. Seeing how my lighting and electrical depths could affect other systems in the building allowed for a better understanding of all aspects on designing a building. The result of this report, after many hours of design development, performance analysis, and research into technical challenges, lead to a new design that tries to enhance the performance, aesthetics, and overall design integrity of the Nerman Museum of Contemporary Art.

The lighting depth improved the total design goals of the museum and added to the original Kyu Sung Woo's architectural vision. The electrical redesign of the branch circuits was studied as well as overcurrent protection to make sure this lighting system was a safe design. A wind powered electricity generation scheme was integrated into the solarium's solar protection panels. The structural breath investigated the effect of the added skylights into the auditorium, and the acoustical breath focused on the effect of the PVC Newmat ceiling panels on the RT of the space.

Acknowledgements

I'd like to thank the following people. I could never hope to finish my thesis project without your help.

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Dr. Kevin Houser

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Lee Brandt - HLB
Lee Waldron - GWA

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Justin Brown
Glenn Heinmiller

Finally, I'd like to thank my family and friends, especially those in the Architectural Engineering at Penn State, who work harder than anyone, anywhere.

References

Texts:

ASHRAE Standard 90.1-2010. Atlanta, GA: American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., 2010

Houser, Mistrick, and Stefy (2011) The IESNA Lighting Handbook: Reference & Application (10th ed.).Illuminating Engineering Society of North America. New York, NY.

National Electric Code 2008, Quincy, MA: National Fire Protection Association, Inc., 2011

Software:

AutoCAD 2014
AGI32
Radiance
Photoshop CS6

The Nerman Museum of Contemporary Art: Luminaire Schedule

Type		Manufacturer	Description	Catalog Number	Lamp	Voltage	Power Supply	Input Watts
	F1	Bartco	4 foot linear fluorescent strip. Integral ballast. (1) T8 lamp.	MiT8-1T-32/UNV D 48"	(1) T8	120 V	Integral Dimmng Ballast	32
	F2	Bartco	4 foot linear fluorescent strip. Integral ballast. (2) T8 lamp.	BFL257-32	(2) T8s	120 V	Integral Dimmng Ballast	64
	F3	LiteControl	(2) T8 fluorescent 4' length. Concealed cove fixture. 3500K 81CRI. 64W	CC-AI-30-2-4-T8-CWM-ELB DIM-120	(2) T8s	120 V	Integral Dimmng Ballast	64
	G1	We-ef	24W LED in grade outdoor fixture with asymmetrical throw. 2000 lms. Medium beam distribution. IP67.	311-4020 ETC140-GB	LED	120 V	Integral [ECG] electronic driver	24
	L1	Acolyte	LED RibbonLyte static white 3500K. AT3 Channel with 30 degree beam spread. 1.5 watts per foot.	RB-IP65-12-1.5-35 with AT3	LED	120 V	Remote Driver	1.5 W/LF
	L2	Acolyte	LED RibbonLyte static white 3500K. No Channel. 1.5 watts per foot. ~90 lumens/foot package.	RB-IP65-12-1.5-35	LED	120 V	Remote Driver	1.5 W/LF
	L3	Acolyte	LED RibbonLyte static white 3500K. No Channel. 5 watts per foot. ~440 lumens/foot package.	RB-IP65-12-5-35	LED	120 V	Remote Driver	5 W/LF
	L4	Acolyte	LED RibbonLyte static white 3500K. No Channel. 8.8 watts per foot. ~650 lumens/foot package.	RB-IP65-12-8.8-35	LED	120 V	Remote Driver	8.8 W/LF
	L5	Lumenpulse	1 foot LED strip. 8.5 watts/foot, Regular Output. 10x60 degree beam spread. Integral driver with standard dimming.	LOGiRO-120-12-35K-10x60-UMAS-SI-DIM	LED	120 V	Remote Driver with 0-10V DIM	8.5 W/FT
	L6	Lumenpulse	4 foot LED strip. 8.5 watts/foot, Regular Output. 10x60 degree beam spread. Integral driver with standard dimming.	LOGiRO-120-48-35K-10x60-UMAS-SI-DIM	LED	120 V	Remote Driver with 0-10V DIM	8.5 W/FT
	L7	Lumenpulse	4 foot LED strip. 8.5 watts/foot, Regular Output. 60x60 degree beam spread. Remote driver with standard dimming.	LOGiRO-120-48-35K-60x60-UMAS-SI-DIM	LED	120 V	Remote Driver with 0-10V DIM	8.5 W/FT
	L8	3Form	LT series LED tape 3500K. No Channel. 1.8 watts per foot. Warm White. 30 lumens/foot.	3-60-117	LED	120 V	Class II AC/DC Remote Driver	1.8 W/FT
	LF1	Newmat	NewLight double-layer ceiling system using T0B/white translucent with T8/clear membranes backlighted with LED strips	see cutsheet	L2	120 V	see L2	1.5 W/LF
	LF2	Newmat	NewLight double-layer ceiling system using T0B/white translucent with T8/clear membranes backlighted with LED strips	see cutsheet	L2	120 V	see L2	1.5 W/LF
	LF3	Newmat	NewLight double-layer ceiling system using T0B/white translucent with T8/clear membranes backlighted with LED strips	see cutsheet	L2	120 V	see L2	1.5 W/LF
	LF4	3Form	Acrylic cantilever form. One layer 1" Chroma material with 2 layers of vapor material for light diffusion. Integral slot into paver walkway. LED light board side-lighting wall side for gradient distribution. Light to be on all 5 sides of the form.	see cutsheet	L3	120 V	see L3	5 W/LF
	LF5	3Form	Acrylic partition wall. One layer 1" Chroma material with 3 layers of vapor material for light diffusion. Integral slot into paver walkway. LED light board uplighting in grade for gradient distribution. Light to be on all 5 sides of the form.	see cutsheet	L4	120 V	see L4	8.8 W/LF
	LF6	3Form	One layer 1" Chroma material with C3 Ghost layer for light diffusion. Integral slot into paver walkway. LED light board uplighting in grade for even distribution. Light to be on all 5 sides of the form.	see cutsheet	L8	120 V	see L8	5.4

	P1	Indy (Juno)	Pendant mount LED 9 inch cylinder downlight. 2000 lumen package. 31 watts. Open aperture with integral driver.	9P-LED-20351W-W3-DM	LED	120 V	Integral Driver	31
	P2	Indy (Juno)	Pendant mount LED 9 inch cylinder downlight. 2800 lumen package. 46 watts. Open aperture with integral driver.	9P-LED-28351W-W3-DM	LED	120 V	Integral Driver	46
	PM1	Bega	52W LED pole mounted fixture. Clear acrylic diffused light distribution optic with 3500K. 4,900 lumen package. Type IV (IES classification).	7836LED	LED	120 V	Integral Driver	52
	T1	Edison Price	Hanging LED tack system, integrated with fabric panel system, 1000 lumen package, artist series 97 CRI. 20 degree beam spread. Dimmable standard driver. 3500K	MM-XSM2-O-LH-L10A-35K-20D-LU-DMI	LED	120 V	Integral Driver	21
	T2	Edison Price	Hanging LED tack system, 1000 lumen package, artist series 97 CRI. 40 degree beam spread. Dimmable standard driver. 3500K	MM-XSM2-O-LH-L10A-35K-40D-LU-DMI	LED	120 V	Integral Driver	21
	T3	Edison Price	Hanging LED tack system, integrated with fabric panel system, 1000 lumen package, artist series 97 CRI. 60 degree beam spread wall washer. Dimmable standard driver. 3500K	MM-XSM2-O-LH-L10A-35K-60D-LU-DMI	LED	120 V	Integral Driver	21
	T4	Edison Price	Hanging LED tack system, integrated with fabric panel system, 1500 lumen package, 80+ CRI. 20 degree beam spread. Dimmable standard driver. 3500K	MM-XSM2-O-LH-L15S-35K-20D-LU-DMI	LED	120 V	Integral Driver	23
	T5	Edison Price	Hanging LED tack system, integrated with fabric panel system, 1500 lumen package, 80+ CRI. 40 degree beam spread. Dimmable standard driver. 3500K	MM-XSM2-O-LH-L15S-35K-40D-LU-DMI	LED	120 V	Integral Driver	23
	TA1	Edison Price	Surface mounted track system. Two way track with 120V for circuit 1. Track to be integrated into stretched fabric system with feeders every 8'. Track specified to end panels in gallery. 5A Limter. White housing.	SLS/8 | SLSLIM5	Track	120 V	N/A	-
	TA2	Edison Price	Surface mounted track system. Two way track with 120V for circuit 2. Track to be integrated into stretched fabric system with feeders every 8'. Track specified to end panels in gallery. 5A Limter. White housing.	SLS/8 | SLSLIM5	Track	120 V	N/A	-
	TB	Edison Price	Hanging track system. One way track with 120V. Track to have feeders every 4'. No amp limiter. White housing.	SLP/4	Track	120 V	N/A	-
	TC	Edison Price	Surface mounted track system. One way track with 120V for circuit 2. Track to be integrated into metal framing in solarium glazing system. 2' track length. No amp limter. White housing.	SLS/2	Track	120 V	N/A	-
	TD	Edison Price	Surface mounted track system. One way track with 120V. Track to be integrated into stretched fabric system with feeders every 8'. Track specified to middle panel in gallery. 5A Limter. White housing.	SLS/8 | SLSLIM5	Track	120 V	N/A	-

patent no. US 6,652,119 B1

MiT8

type: F1

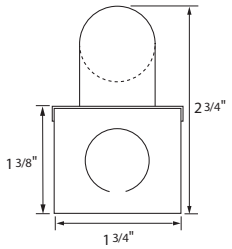
LINEAR T8 FLUORESCENT

low profile T8 fluorescent fixture

SPECIFICATIONS |

- Fully assembled housing is formed and welded, 20 ga. steel, chemically treated to resist corrosion and enhance paint adhesion
- Standard finish is high reflectance white powder coat, applied post production
- Knock-outs accept standard electrical fittings (by others)
- Rotational locking lamp holders
- Available for one or two T8 17W, 25W, 32W or 40W linear fluorescent lamps
- Standard Universal voltage electronic high power factor ballast is pre-wired to the lamp holders
- Dimming and emergency battery back up options available (consult factory for availability and system compatibility)
- UL and ULC listed for dry and damp locations
- IBEW

1T



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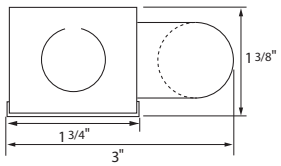

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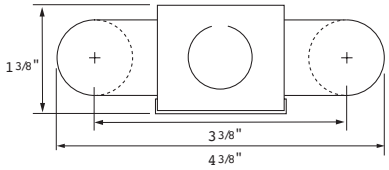

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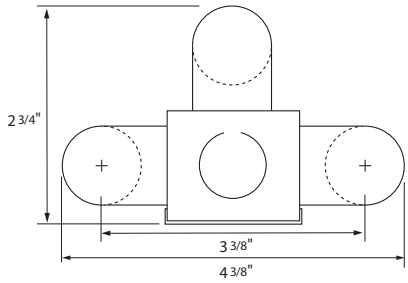

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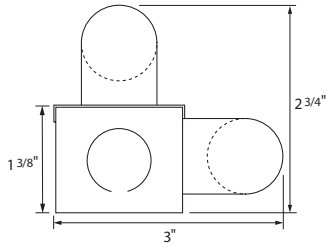
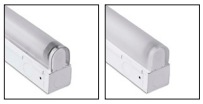


SPECIFICATION / ORDER FORMAT					DIMENSIONAL INFO.
model no.	lamp position	wattage - lamp	voltage	options	overall length
MiT8	-1T	17 - 17w T8	/UNV	Dimming - (consult factory)	24"
	-1S	25 - 25w T8		/EB - emergency ballast (consult factory)	36"
	-2S	32 - 32w T8		/DL - damp location	48"
	-3S	40 - 40w T8		/CU - custom finish (consult factory)	60"
	-RA				

bartco
VISIONS BROUGHT TO LIGHT™ t.714.230.3200 | f.714.230.3222 www.bartcoLIGHTING.com

LENSES | Two-piece system comprised of polycarbonate channel and striated snap-on cover



U8LNP	Clear fine prismatic acrylic lens with mounting clips (sold by the foot)	___ft.
U8LNCF	Frosted acrylic lens with mounting clips (sold by the foot)	___ft.

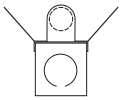
TUBE GUARD |

TG	Tube Guard (sold by the foot)	___ft.

CABLE KIT |

BAC-4N-W	Aircraft suspension kit, 4', white
BAC-4P-W	Aircraft suspension kit w/ power feed, 4', white

REFLECTORS | 20 ga. steel construction, white powder coat finish (consult factory for optional reflector materials and finishes)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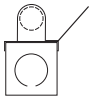
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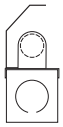
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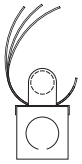
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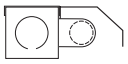
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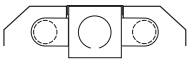
R5

SYMMETRICAL	for fixture model
MiT8-1T-R1-17	MiT8-1T17
MiT8-1T-R1-25	MiT8-1T25
MiT8-1T-R1-32	MiT8-1T32
MiT8-1T-R1-40	MiT8-1T40
ASYMMETRICAL	
MiT8-1T-R2-17	MiT8-1T17
MiT8-1T-R2-25	MiT8-1T25
MiT8-1T-R2-32	MiT8-1T32
MiT8-1T-R2-40	MiT8-1T40
INSIDE ASYMMETRICAL	
MiT8-1T-R3-17	MiT8-1T17
MiT8-1T-R3-25	MiT8-1T25
MiT8-1T-R3-32	MiT8-1T32
MiT8-1T-R3-40	MiT8-1T40
ELLIPTICAL	
MiT8-1T-RE-17	MiT5-1T17
MiT8-1T-RE-25	MiT5-1T25
MiT8-1T-RE-32	MiT5-1T32
MiT8-1T-RE-40	MiT5-1T40
MiT8-1S-R4-17	MiT8-1S17
MiT8-1S-R4-25	MiT8-1S25
MiT8-1S-R4-32	MiT8-1S32
MiT8-1S-R4-40	MiT8-1S40
MiT8-2S-R5-17	MiT8-2S17
MiT8-2S-R5-25	MiT8-2S25
MiT8-2S-R5-32	MiT8-2S32
MiT8-2S-R5-40	MiT8-2S40

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BFL257

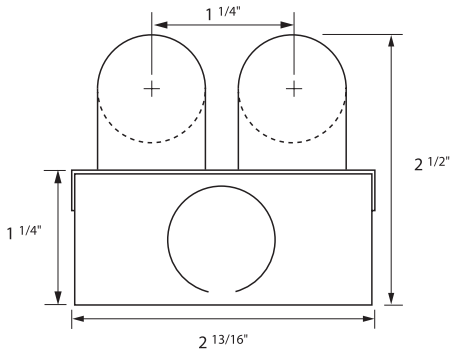
type:

LINEAR T8 FLUORESCENT

low profile two lamp T8 fluorescent fixture

SPECIFICATIONS |

- Fully assembled housing is formed and welded, 20 ga. steel, chemically treated to resist corrosion and enhance paint adhesion
- Standard finish is high reflectance white powder coat, applied post production
- Knock-outs accept standard electrical fittings (by others)
- Available for T8 13W, 14W, 15W, 17W, 25W, 32W or 40W linear fluorescent lamps
- Standard 120V, 277V or Universal electronic high power factor ballast is pre-wired to the lamp holders
- Dimming and emergency battery back up options available **(consult factory for availability and system compatibility)**
- UL and ULC listed for dry and damp locations
- IBEW manufactured and labeled
- Made in the U.S.A.



SPECIFICATION / ORDER FORMAT			DIMENSIONAL INFO.	
model no.	voltage	options	lamp	overall length
BFL257-13	/120	Dimming - (consult factory)	2 x 13w T8	12"
BFL257-14	/277	/EB - emergency ballast (consult factory)	2 x 14w T8	15"
BFL257-15		/DL - damp location	2 x 15w T8	18"
		/CU - custom finish (consult factory)		
BFL257-17	/UNV		2 x 17w T8	24"
BFL257-25			2 x 25w T8	36"
BFL257-32			2 x 32w T8	48"
BFL257-40			2 x 40w T8	60"

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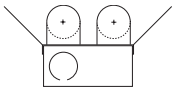
TUBE GUARD |

	TG	Tube Guard (sold by the foot) ___ft. **NOTE: Two tubes required per fixture**

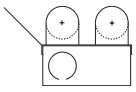
CABLE KIT |

BAC-4N-W	Aircraft suspension kit, 4', white
BAC-4P-W	Aircraft suspension kit w/ power feed, 4', white

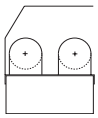
REFLECTORS | 20 ga. steel construction, white powder coat finish (consult factory for optional reflector materials and finishes)


R1

SYMMETRICAL	for fixture models
257-R1-13	BFL257-13
257-R1-14	BFL257-14
257-R1-15	BFL257-15
257-R1-17	BFL257-17
257-R1-25	BFL257-25
257-R1-32	BFL257-32
257-R1-40	BFL257-40


R2

ASYMMETRICAL	
257-R2-13	BFL257-13
257-R2-14	BFL257-14
257-R2-15	BFL257-15
257-R2-17	BFL257-17
257-R2-25	BFL257-25
257-R2-32	BFL257-32
257-R2-40	BFL257-40


R3

INSIDE ASYMMETRICAL	
257-R3-13	BFL257-13
257-R3-14	BFL257-14
257-R3-15	BFL257-15
257-R3-17	BFL257-17
257-R3-25	BFL257-25
257-R3-32	BFL257-32
257-R3-40	BFL257-40

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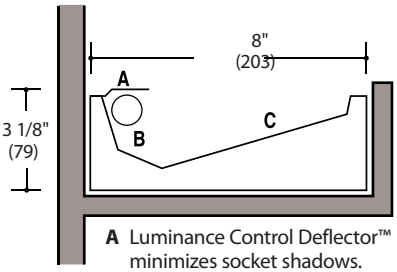
LITECONTROL

Fixture Type:
Project Name:

F3



A Luminance Control Deflector™ minimizes socket shadows.

B High reflectance aluminum reflector section for maximum horizontal light projection.

C High-reflectance white reflector section for efficient indirect distribution.

Cove-30

CC-AI-3000

Mounting and Distribution

Product Description

Concealed Cove steel fixture with excellent asymmetric distribution for effective perimeter lighting within an architectural cove. cULus Listed.

Ordering Guide

Product, lamping, & length

CC -	AI -	30			
Mounting	Distribution	Series	Lamp Count	Nominal Length(ft)	Lamp Type
CC Concealed Cove	**AI** Asymmetric indirect	**30**	1* 2 →	2 →	**T8**
			1* 2 →	3 →	**T5HO**
			1* 2 →	4 →	**T5**
			2, 4 →	6 →	
			2, 4 →	8 →	
			1 →	2 →	**BX40**
			2 →	4 →	**BX50**
			4 →	8 →	
			2 →	3 →	**BX39**
			4 →	6 →	
			see **notes**		

Options

CWM -					
Finish	Ballast Options	Tandem Wiring	Circuiting	Other Options	Volts
CWM (matte white) is standard	**ELB** is std. for T8 or BX **ELB/PS** is std. for T5 or T5HO **DIM** see **Ballast Options**	-- → **TW** → see **notes**	**1CWQ** **2CWQ**	**AMA** **F** **EF** **WKC/WP** see **Other Options**	**120** **277**

notes:

Lamp count = total number of lamps in the fixture

* For applications using 1-lamp in cross-section T5 or T5HO see Cove-25.

Tandem wiring not available for one-lamp cross-section fixtures

For ordering guide information in shaded areas, choose selection by reading ACROSS the shaded areas for correct specifications.

CC-AI-3024T8-CWM-ELB-TW-2CWQ-F-120 is a typical catalog number for a 2-lamp (2 lamps in cross-section), 4-foot long T8 fixture, matte white finish, electronic ballast, tandem-wired, pre-wired with two circuits, fuse, 120 volts.

Cross-section lamping

1-T8 | **2-T8** | **2-T5 or T5HO** | **1-BX39,40 or 50**

Ballast Options

Specify in place of **ELB** or **ELB/PS:**

DIM Dimming options are available. Please contact factory and provide make and model of requested dimming ballast to confirm fit and compatibility with the specified lamp configuration.

Other Options

AMA Adjustable Mounting Angle. Quick-attach component to tilt housing either **5°** or **10°**.

F Fuse. Slow or fast blow, determined by Litecontrol.

EF Emergency Fluorescent Ballast. Battery-powered ballast from a listed manufacturer will operate one T5 or T5HO lamp for 1 1/2 hours.

WKC/WP Corner Wiring Kit. With quick-connects.

Questions to Ask

1. Row information, including desired fixture lengths?
2. Lamp type? **3.** Ballast options? **4.** Other options? **5.** 120 or 277 volt?

Specifications

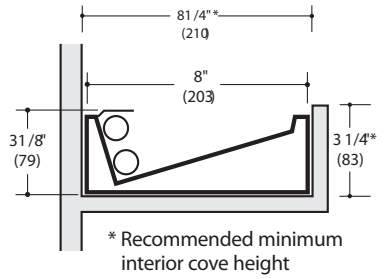
HOUSING. Die-formed steel. Ends provided with a 7/8" hole to accommodate pre-wiring.
REFLECTORS. Die-formed steel, finished in high-reflectance white, precisely shaped for maximum horizontal light projection. Configuration with four reflector surfaces includes a high-reflectance specular aluminum insert. Luminance Control Deflector™ (**LCD**), finished in high-reflectance white, reduces wall brightness directly above fixture and minimizes socket shadows between fixtures.
LAMPING. Available in one- and two-lamp T5, T5HO or T8; one-lamp 39-, 40-, or 50-watt twin-tube compact fluorescent cross-sections .
BALLAST. Electronic Ballast (**ELB** - for T8 lamping) or (**ELB/PS** - for T5 or T5HO lamping), high power factor, thermally protected Class P, Sound Rated A, manufactured by a UL Listed manufacturer, as available, determined by Litecontrol. Ballasts with a voltage range of 120 to 277 will be used when fixture configuration and ballast availability allow. The minimum number of ballasts will be used.
TANDEM WIRING. When selected from Ordering Guide, fixtures wired to switch in-line lamps separately, providing two (two-lamp cross-section fixtures only) levels of light.
CIRCUITING. Fixtures are wired such that one end will have factory-installed push-in quick-connects. The other end will be stripped back 1/2" for quick connection in field. For fixtures to accommodate special circuits such as night light and emergency in-field wiring may be required. See Pre-wiring Information online for details.
BALLAST DISCONNECT. Fixture supplied with a ballast disconnect device to enable compliance with the NEC.
MOUNTING. Fixtures are installed in cove provided by others. See Planning for installation for detailed information.
CERTIFICATION. Fixtures are UL Listed for United States and Canada. Fixtures are rated for damp locations. Consult factory for details.
Note: Litecontrol reserves the right to change specifications without notice for product development and improvement.

Planning for installation

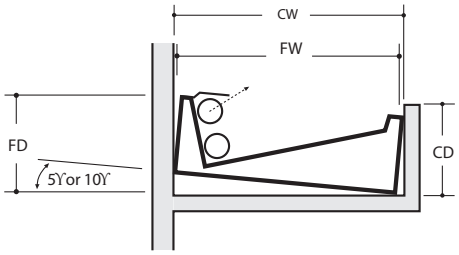
Cove provided by others. Interior cove dimensions should allow for 3 1/8" x 8" fixture cross-section to fit within cove, taking into consideration as-built tolerances. For maximum efficiency, wall and ceiling above cove should have matte surfaces with high reflectances. See design guidelines below. Maximum fixture weight per foot is four pounds.

Corner Wiring Kit
Provides the advantages of pre-wiring around corners. Make connections at each end of the flexible whip, push wires into fixtures, then snap onto headers. Specify **WKC/WP** (with push-in quick-connects).

Adjustable Mounting Angle (AMA) Option
When room geometry allows, fixture may be tilted, thereby lowering the beam and resulting in a more effective distribution of light into the room. **AMA** (Adjustable Mounting Angle) quick attach component snaps onto housing to raise back of fixture 5° or 10°. Recommended cove sizes are shown.



* Recommended minimum interior cove height



Angle of Tilt	Ordering Option	Fixture Depth (**FD**)	Fixture Width (**FW**)	Recommended Cove Depth (**CD**)	Recommended Cove Width (**CW**)
0	**(standard)**	3 1/8"	8"	3 1/4"	8 1/4"
5°	**AMA**	3 3/4"	8 1/4"	3 1/4"	8 5/8"
10°	**AMA**	4 1/4"	8 3/8"	3 1/4"	8 5/8"

Design guidelines

For maximum illumination level flexibility, five lamp combinations are available. For a one-lamp T5 or T5HO fixture in a 2 1/16" deep x 6" wide housing refer to Cove-25 (CC-AI-2500).

As the distance from fixture to ceiling is increased, light distribution becomes more uniform. To avoid excessive brightness on ceiling, maximize the distance from the fixture to the ceiling. A fixture with less output (i.e., one-lamp T8) may be tolerated closer to ceiling than one with higher output. To best evaluate an acceptable mounting position, a mock-up is recommended.

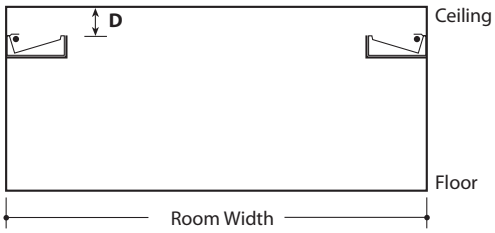
Position fixtures along walls as desired to satisfy visual design goals. To avoid excess corner brightness, stop fixtures 9-15" short of end walls; 0-6" from outside corner.

If using high-output T5 lamps, be advised that lamp lumens per foot for each of the lamp lengths are different. Caution is advised when mixing fixture lengths in rows.

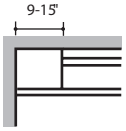
For even lower beam throw and better distribution, consider the Adjustable Mounting Angle (**AMA**) option. This lowers the beam throw by 5° or 10°. Size the cove to hide lamps and fixture. This should only be considered if viewing angles prevent a direct view of the raised portion of the fixture, or if a cut-off angle below horizontal is deemed acceptable.

If the zonal cavity method is used to calculate an average illumination, it is advised in a perimeter layout to derate the illuminance by 10%.

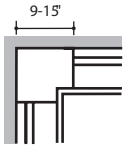
If uniformity of light levels is desired, room width should not exceed the following:
Fixtures along one wall: 6xD
Fixtures on opposite walls: 12xD



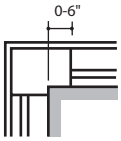
Single row end clearance



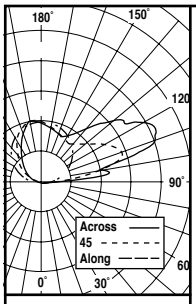
Inside corner positioning



Outside corner positioning



Photometric data



1-T5HO

CANDLEPOWER SUMMARY
0° PLANE PERPENDICULAR TO LAMPS

ANGLE	0	45	90	135	180	OUTPUT LUMENS
180	950	950	950	950	950	
175	977	964	957	928	923	91
170	991	976	949	903	890	
165	949	976	932	873	854	260
160	851	933	910	830	820	
155	758	854	881	802	816	387
150	671	768	847	751	898	
145	591	687	803	758	1001	485
140	510	602	756	805	1164	
135	439	517	698	864	1365	579
130	370	441	639	957	1563	
125	304	366	576	1091	1657	675
120	256	301	506	1217	1922	
115	209	237	431	1308	2006	750
110	169	183	350	1365	1913	
105	135	135	260	1246	1313	614
100	105	97	164	815	1020	
95	51	66	68	707	908	315
90	3	3	10	149	212	

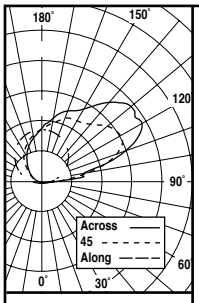
CC-AI-3014T5HO-LP/ELB 83.0 % Efficiency
Litecontrol Certified Test Report #29616000

RCC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	.79	.79	.79	.79	.68	.68	.68	.68	.46	.46	.46	.26	.26	.26	.08	.08	.08	.00
1	.72	.69	.66	.63	.61	.59	.56	.53	.40	.39	.37	.23	.22	.22	.07	.07	.07	.00
2	.65	.60	.55	.51	.56	.51	.47	.44	.35	.33	.31	.20	.19	.18	.06	.06	.06	.00
3	.60	.52	.47	.43	.51	.45	.41	.37	.31	.28	.26	.18	.17	.15	.06	.05	.05	.00
4	.54	.46	.40	.36	.46	.40	.35	.31	.27	.24	.22	.16	.14	.13	.05	.05	.04	.00
5	.50	.40	.35	.30	.42	.35	.30	.26	.24	.21	.19	.14	.12	.11	.04	.04	.04	.00
6	.46	.36	.30	.26	.39	.31	.26	.23	.22	.18	.16	.13	.11	.09	.04	.03	.03	.00
7	.42	.32	.26	.22	.36	.28	.23	.19	.19	.16	.14	.11	.09	.08	.04	.03	.03	.00
8	.39	.29	.23	.19	.33	.25	.20	.17	.17	.14	.12	.10	.08	.07	.03	.03	.02	.00
9	.36	.26	.21	.17	.30	.23	.18	.15	.16	.13	.10	.09	.07	.06	.03	.02	.02	.00
10	.33	.24	.18	.15	.28	.21	.16	.13	.14	.11	.09	.08	.07	.05	.03	.02	.02	.00

Floor Cavity Reflectance .20

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	4151	83.03	100.00
90-0°	0	.00	.00
180-0°	4151	83.03	100.00



2-T5HO

CANDLEPOWER SUMMARY
0° PLANE PERPENDICULAR TO LAMPS

ANGLE	0	45	90	135	180	OUTPUT LUMENS
180	1682	1682	1682	1682	1682	
175	1610	1616	1684	1781	1872	163
170	1485	1545	1669	1909	2080	
165	1345	1435	1646	2048	2306	494
160	1214	1315	1601	2185	2439	
155	1086	1210	1556	2247	2537	793
150	954	1090	1496	2266	2770	
145	846	966	1422	2324	3055	1062
140	733	847	1339	2454	3345	
135	624	744	1223	2623	3604	1302
130	532	626	1135	2760	3762	
125	433	520	1025	2892	3636	1449
120	365	425	907	2933	3671	
115	297	338	773	2818	3416	1422
110	248	263	625	2559	2834	
105	192	190	465	2006	1886	998
100	154	141	295	1195	1297	
95	64	98	120	910	1013	421
90	8	2	9	186	265	

CC-AI-3024T5HO-LP/ELB 81.0 % Efficiency
Litecontrol Certified Test Report #29626000

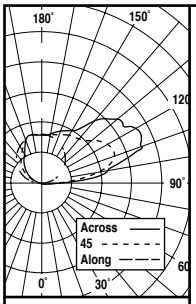
RCC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	.77	.77	.77	.77	.66	.66	.66	.66	.45	.45	.45	.26	.26	.26	.08	.08	.08	.00
1	.70	.67	.64	.61	.60	.57	.55	.52	.39	.38	.37	.23	.22	.21	.07	.07	.07	.00
2	.64	.58	.54	.50	.54	.50	.46	.43	.34	.32	.30	.20	.19	.18	.06	.06	.06	.00
3	.58	.51	.46	.42	.49	.44	.40	.36	.30	.27	.25	.17	.16	.15	.06	.05	.05	.00
4	.53	.45	.39	.35	.45	.39	.34	.30	.27	.24	.21	.15	.14	.13	.05	.05	.04	.00
5	.48	.39	.34	.29	.41	.34	.29	.26	.24	.20	.18	.14	.12	.11	.04	.04	.04	.00
6	.44	.35	.29	.25	.38	.30	.26	.22	.21	.18	.16	.12	.11	.09	.04	.03	.03	.00
7	.41	.32	.26	.22	.35	.27	.22	.19	.19	.16	.13	.11	.09	.08	.04	.03	.03	.00
8	.38	.29	.23	.19	.32	.24	.20	.16	.17	.14	.12	.10	.08	.07	.03	.03	.02	.00
9	.35	.26	.20	.16	.30	.22	.17	.14	.15	.12	.10	.09	.07	.06	.03	.02	.02	.00
10	.32	.23	.18	.14	.28	.20	.16	.13	.14	.11	.09	.08	.06	.05	.03	.02	.02	.00

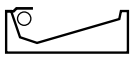
Floor Cavity Reflectance .20

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	8099	81.00	100.00
90-0°	0	.00	.00
180-0°	8099	81.00	100.00

Photometric data





1-T8

CANDLEPOWER SUMMARY

0° PLANE PERPENDICULAR TO LAMPS

ANGLE	0	45	90	135	180	OUTPUT LUMENS
180	467	467	467	467	467	
175	470	469	467	469	475	45
170	474	473	463	481	494	
165	464	474	454	489	510	135
160	419	456	442	494	529	
155	378	419	430	500	559	212
150	336	378	408	504	595	
145	297	338	392	509	690	276
140	258	299	367	533	795	
135	224	257	339	589	885	340
130	189	221	309	659	955	
125	156	186	278	709	954	386
120	134	153	243	741	1048	
115	108	120	205	753	1056	408
110	89	88	165	744	1016	
105	69	69	125	674	775	337
100	56	48	80	489	627	
95	31	34	36	360	439	171
90	1	3	4	98	128	

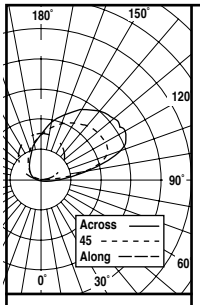
CC-AI-3014T8-LP/ELB 79.5 % Efficiency
Litecontrol Certified Test Report #29611000

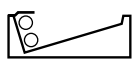
RCC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	.76	.76	.76	.76	.65	.65	.65	.65	.44	.44	.44	.25	.25	.25	.08	.08	.08	.00
1	.69	.66	.63	.60	.59	.56	.54	.51	.38	.37	.36	.22	.21	.21	.07	.07	.07	.00
2	.62	.57	.53	.49	.53	.49	.45	.42	.34	.31	.29	.19	.18	.17	.06	.06	.06	.00
3	.57	.50	.45	.41	.49	.43	.39	.35	.30	.27	.25	.17	.16	.15	.05	.05	.05	.00
4	.52	.44	.38	.34	.44	.38	.33	.30	.26	.23	.21	.15	.14	.12	.05	.04	.04	.00
5	.48	.38	.33	.29	.40	.34	.29	.25	.23	.20	.18	.13	.12	.11	.04	.04	.03	.00
6	.44	.35	.29	.25	.37	.30	.25	.22	.21	.18	.15	.12	.10	.09	.04	.03	.03	.00
7	.40	.31	.25	.21	.34	.27	.22	.19	.18	.15	.13	.11	.09	.08	.03	.03	.03	.00
8	.37	.28	.22	.18	.31	.24	.19	.16	.17	.14	.11	.10	.08	.07	.03	.03	.02	.00
9	.34	.25	.20	.16	.29	.22	.17	.14	.15	.12	.10	.09	.07	.06	.03	.02	.02	.00
10	.32	.23	.18	.14	.27	.20	.15	.12	.14	.11	.09	.08	.06	.05	.03	.02	.02	.00

Floor Cavity Reflectance .20

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	2305	79.51	100.00
90-0°	0	.00	.00
180-0°	2305	79.51	100.00





2-T8

CANDLEPOWER SUMMARY

0° PLANE PERPENDICULAR TO LAMPS

ANGLE	0	45	90	135	180	OUTPUT LUMENS
180	776	776	776	776	776	
175	685	711	770	837	879	74
170	599	648	766	896	970	
165	546	588	749	958	1068	220
160	493	539	732	1009	1168	
155	445	491	709	1058	1252	360
150	400	446	678	1099	1348	
145	353	403	642	1146	1424	483
140	307	356	601	1182	1501	
135	270	310	554	1211	1549	579
130	231	265	503	1226	1600	
125	191	224	451	1243	1577	633
120	164	185	392	1245	1611	
115	136	148	330	1215	1549	629
110	113	118	265	1142	1347	
105	92	88	194	958	1044	485
100	75	67	122	674	747	
95	38	48	51	366	430	206
90	3	1	5	97	139	

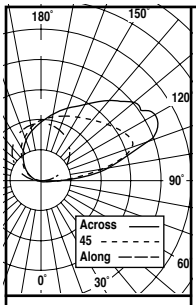
CC-AI-3024T8-LP/ELB 63.2 % Efficiency
Litecontrol Certified Test Report #29521000

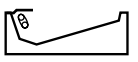
RCC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	.60	.60	.60	.60	.51	.51	.51	.51	.35	.35	.35	.20	.20	.20	.06	.06	.06	.00
1	.55	.52	.50	.48	.47	.45	.43	.41	.31	.30	.28	.18	.17	.17	.06	.05	.05	.00
2	.50	.45	.42	.39	.42	.39	.36	.33	.27	.25	.23	.15	.14	.14	.05	.05	.04	.00
3	.45	.40	.36	.32	.39	.34	.31	.28	.24	.21	.20	.14	.13	.12	.04	.04	.04	.00
4	.41	.35	.31	.27	.35	.30	.26	.24	.21	.18	.17	.12	.11	.10	.04	.04	.03	.00
5	.38	.30	.26	.23	.32	.27	.23	.20	.18	.16	.14	.11	.09	.08	.03	.03	.03	.00
6	.35	.28	.23	.20	.29	.24	.20	.17	.16	.14	.12	.10	.08	.07	.03	.03	.02	.00
7	.32	.25	.20	.17	.27	.21	.17	.15	.15	.12	.10	.09	.07	.06	.03	.02	.02	.00
8	.29	.22	.18	.15	.25	.19	.15	.13	.13	.11	.09	.08	.06	.05	.02	.02	.02	.00
9	.27	.20	.16	.13	.23	.17	.14	.11	.12	.10	.08	.07	.06	.05	.02	.02	.02	.00
10	.25	.18	.14	.11	.21	.16	.12	.10	.11	.09	.07	.06	.05	.04	.02	.02	.01	.00

Floor Cavity Reflectance .20

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	3664	63.18	100.00
90-0°	0	.00	.00
180-0°	3664	63.18	100.00





2-BX

CANDLEPOWER SUMMARY

0° PLANE PERPENDICULAR TO LAMPS

ANGLE	0	45	90	135	180	OUTPUT LUMENS
180	963	963	963	963	963	
175	898	916	961	1006	1046	93
170	827	862	954	1061	1127	
165	776	811	935	1117	1219	274
160	701	766	907	1156	1309	
155	631	705	882	1204	1394	440
150	565	638	843	1253	1477	
145	500	572	802	1289	1604	585
140	440	506	754	1331	1745	
135	383	440	694	1382	1879	711
130	326	376	633	1469	2015	
125	267	321	567	1540	2044	807
120	229	264	497	1617	2194	
115	188	209	416	1649	2168	843
110	154	164	339	1598	1956	
105	116	121	247	1395	1377	660
100	100	91	153	929	1092	
95	45	63	62	587	635	289
90	1	1	5	118	158	

CC-AI-3024BX-ELB 74.5 % Efficiency
Litecontrol Certified Test Report #29620000

RCC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	.71	.71	.71	.71	.61	.61	.61	.61	.41	.41	.41	.24	.24	.24	.08	.08	.08	.00
1	.65	.62	.59	.57	.55	.53	.51	.48	.36	.35	.34	.21	.20	.20	.07	.06	.06	.00
2	.59	.54	.49	.46	.50	.46	.42	.40	.31	.29	.28	.18	.17	.16	.06	.06	.05	.00
3	.54	.47	.42	.38	.46	.40	.36	.33	.28	.25	.23	.16	.15	.14	.05	.05	.04	.00
4	.49	.41	.36	.32	.41	.36	.31	.28	.24	.22	.20	.14	.13	.12	.05	.04	.04	.00
5	.45	.36	.31	.27	.38	.32	.27	.24	.22	.19	.17	.13	.11	.10	.04	.04	.03	.00
6	.41	.33	.27	.23	.35	.28	.23	.20	.19	.16	.14	.11	.10	.08	.04	.03	.03	.00
7	.38	.29	.24	.20	.32	.25	.21	.17	.17	.14	.12	.10	.08	.07	.03	.03	.02	.00
8	.35	.26	.21	.17	.29	.23	.18	.15	.16	.13	.11	.09	.08	.06	.03	.02	.02	.00
9	.32	.24	.18	.15	.27	.20	.16	.13	.14	.11	.09	.08	.07	.06	.03	.02	.02	.00
10	.30	.21	.17	.13	.25	.18	.14	.12	.13	.10	.08	.08	.06	.05	.02	.02	.02	.00

Floor Cavity Reflectance .20

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	4696	74.54	100.00
90-0°	0	.00	.00
180-0°	4696	74.54	100.00

TOTAL LUMENS	2484.0 lm	TOTAL LUMENS	2059.2 lm
Tj	85°	Ta	25°C

CHANNEL

Our RibbonLyte can be mounted in countless ways, and offers lighting designers nearly infinite possibilities to be creative with lighting in ways they never could before. But for straight, linear installations we always recommend mounting in channel. It is the best way to keep your RibbonLyte secure and it gives you the ability to easily create a custom fixture tailored to the exact length you specify.

Pictured: Round and AV1 channel

CHANNEL AT3

Available in 1 and 2 meter lengths

Slim profile, grazer lens

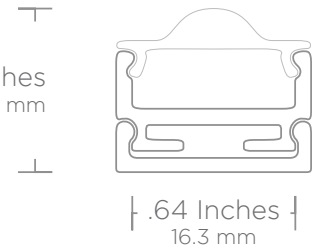
Top channel slides into fixed base channel

UV resistant

IP20 grade aluminum

End caps provide a finished look to the fixture

DIMENSIONS



PART NUMBER BUILDER for purchasing channel individually

Category		Model		Length		Lens		
CH	+	AT3	+	[ ]	+	[ ]	=	Your Part Number
				1 - 1 Meter 2 - 2 Meter		Blank - None G - Grazer		Example: CHAT32G

PART NUMBER BUILDER for purchasing channel and ribbonlyte as a package

Category		Channel Model		Channel Lens		LED Voltage		LED Waterproof Rating	
CH	+	AT3	+	[ ]	+	[ ]	+	[ ]	+
				Blank - None G - Grazer		12 - 12 Volts 24 - 24 Volts		Blank - None 65 - IP65 68 - IP68	

LED Wattage		LED Color (Temp.)		Length		
[ ]	+	[ ]	+	[ ]	=	Your Part Number
See RibbonLyte Section for Available Wattages		See RibbonLyte Section for Available Colors and Color Temperatures		Your Desired Length in Feet		Example: CHAT3G124.42410

Rev. 2013.09.05

CHANNEL AT3

ACCESSORIES FOR **AT3**

End cap with wiring hole
CHCAPAT30

End cap without hole
CHCAPAT3

Grazer lens
CHLENSAT31G
CHLENSAT32G

Mounting Rail
CHMNTAT3

RIBBONLYTE **COMPATIBILITY**

The following RibbonLyte will fit in AT3 channel:

Non-Waterproof (IP40 + IP65)	Static White:	1.5	2.2	3.0	4.4	5.0	6.0	8.8
	Variable White:	3.0	VWA	VWR				
	Static Color:	1.5	2.2	3.0	4.4	5.0	6.0	8.8
	RGB:	2.2	4.4	RGBW	RGBA			
	Side:	2.9						
IP68	Static White:	1.5	2.2	3.0	4.4	5.0	6.0	
	Variable White:	3.0	VWA	VWR				
	Static Color:	1.5	2.2	3.0	4.4	5.0	6.0	
	RGB:	2.2	4.4	RGBW	RGBA	Addressable		
	Side (IP67):	2.9						

Rev. 2013.09.05

CHANNEL MATRIX

AC1

Part: CHAC1
Dimensions: 0.63” W x 0.63” H
Lenses: Clear, Milky, Frosted
Mounting Clips

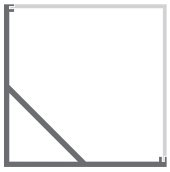
AC2

Part: CHAC2
Dimensions: 0.63” W x 0.63” H
Lenses: Clear, Milky, Frosted
Mounting Clips

AC3

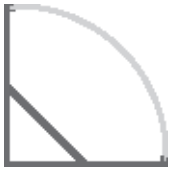
Part: CHAC3
Dimensions: 0.73” W x 0.73” H
Lenses: Clear, Milky, Frosted
Mounting Clips

AC4



Part: CHAC4
Dimensions: 1.17” W x 1.17” H
Lenses: Clear, Milky, Frosted

AC5



Part: CHAC5
Dimensions: 1.17” W x 1.17” H
Lenses: Clear, Milky, Frosted

AA

Part: CHAA
Dimensions: 0.76” W x 0.32” H
Lenses: Clear, Milky, Frosted

AR1

Part: CHAR1
Dimensions: 0.90” W x 0.35” H
Lenses: Clear, Milky, Frosted

AR2

Part: CHAR2
Dimensions: 0.92” W x 0.60” H
Lenses: Clear, Milky, Frosted

AR3

Part: CHAR3
Dimensions: 1.32” W x 0.41” H
Lenses: Clear, Milky, Frosted

AR4

Part: CHAR4
Dimensions: 0.86” W x 0.48” H
Lenses: Clear, Milky, Frosted

AS1

Part: CHAS1
Dimensions: 0.67” W x 0.35” H
Lenses: Clear, Milky, Frosted
Mounting Clips

AS2

Part: CHAS2
Dimensions: 0.68” W x 0.60” H
Lenses: Clear, Milky, Frosted
Mounting Clips

Rev. 2013.09.05

CHANNEL MATRIX

AS3

Part: CHAS3
Dimensions: 0.92” W x 0.41” H
Lenses: Clear, Milky, Frosted
Mounting Clips

AS4

Part: CHAS4
Dimensions: 0.63” W x 0.48” H
Lenses: Clear, Milky, Frosted
Mounting Clips

AT1

Part: CHAT1
Dimensions: 0.78” W x 0.78” H
Lenses: Clear, Milky, Frosted
Mounting Rail

AT2

Part: CHAT2
Dimensions: 0.78” W x 0.78” H
Lenses: Clear, Milky, Frosted
Mounting Rail

AT3

Part: CHAT3
Dimensions: 0.78” W x 0.62” H
Lenses: Grazer
Mounting Rail

AV1

Part: CHAV1
Dimensions: 0.75” W x 0.75” H
Lenses: Clear, Milky, Frosted
Mounting Clips

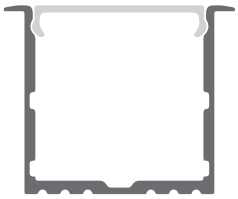
AP1

Part: CHAP1
Dimensions: 0.75” W x 0.82” H
Lenses: Clear, Milky, Frosted
Tiltable Stands

AL60

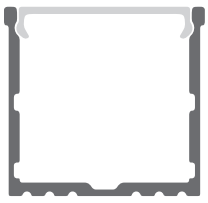
Part: CHAL60
Dimensions: 0.67” W x 0.54” H
Lenses: Grazer

W31



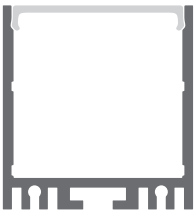
Part: CHW31
Dimensions: 1.72” W x 1.38” H
Lenses: Clear, Milky, Frosted

W35



Part: CHW35
Dimensions: 1.38” W x 1.38” H
Lenses: Clear, Milky, Frosted

WH35



Part: CHW35
Dimensions: 1.38” W x 1.48” H
Lenses: Clear, Milky, Frosted
Hanging Kit

ROUND

Part: CHROUND
Dimensions: 0.80” Diameter
Lenses: Clear, Milky, Frosted
Mounting Clips

Rev. 2013.09.05

STATIC WHITE RIBBONLYTE

White lighting is the way we see the world. With so many variations of color temperature and wattage, our Static White RibbonLyte will help you create the ultimate lighting scheme.

Whether you want to imitate the warm glow of candelight, or provide a high visibility work environment similar to a bright afternoon outdoors, we can provide a solution to fill your needs.

Not only do we offer a variety of color temperatures, but our RibbonLyte comes in a number of wattages as well. As energy costs rise, the benefits of our lower wattage LEDs are even more apparent.

Pictured: RibbonLyte 4.4 3000K @Fetta Panini Bar, Toronto Pearson Intl Airport, Mississagua, ON
Designed by ICRAVE

ACOLYTE LED 251 West 30th St, Suite 12E New York, NY 10001 **212.629.6830** INFO@**ACOLYTELED.COM**

White

RIBBONLYTE 1.5

RoHS Compliant

Dry or wet location flexible LEDs

12 or 24 Volt

1.5 Watts per foot, 18 LEDs per foot

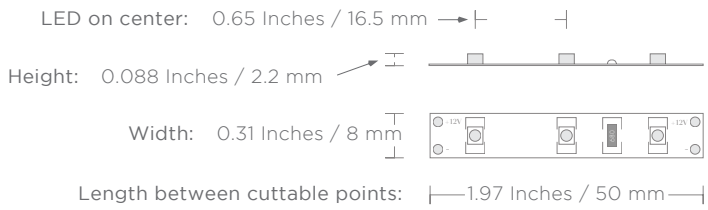
IP65 and IP68 versions are UV resistant

2400K, 2700K, 3000K, 3500K, 4100K, and 6000K

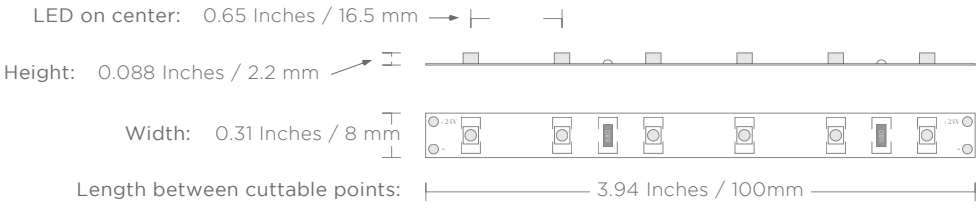
Cuttable every 1.97 inches (12V) or 3.94 inches (24V)

DIMENSIONS

1.5 - 12 Volt



1.5 - 24 Volt



PART NUMBER BUILDER

Category		Waterproof		Voltage		Wattage		Color Temperature		
RB	+		+		+	1.5	+		=	Your Part Number Example: RB121.527
		65 - IP65 68 - IP68 Blank - None (IP40)		12 - 12V 24 - 24V				24 - 2400K 27 - 2700K 30 - 3000K 35 - 3500K 41 - 4100K 60 - 6000K		

Rev. 2013.08.08

SPECIFICATIONS **RIBBONLYTE 1.5**

Operating Voltage	12 Volt / 24 Volt
Power Consumption	1.5 Watts / Linear Foot
Amperage	12v: 125 mA / Foot 24v: 63 mA / Foot
Protection Rating	IP40/IP65/IP68
Dimming	Triac / 0-10 Volt / DMX / Lutron A-Series 1% dimming LED drivers
Operating Temperature	-40° C to 70° C
Color Temperature	2400K 2700K 3000K 3500K 4100K 6000K
Lumen Output	2400K: 92.86 lm/ft; 2700K: 80.46 lm/ft; 3000K: 82.8 lm/ft; 3500K: 96.84 lm/ft; 4100K: 85.68 lm/ft; 6000K: 89.64 lm/ft
Binning Tolerance	+/- 100K
LED Beam Angle	160°
Lamp Life	50,000 Hours
Cuttable	12v: Every 1.97" (50 mm) 24v: Every 3.94" (100 mm)
CRI* *CRI >90 available upon request	2400K: >50.4; 2700K: >56; 3000K: >62.8; 3500K: >66.3; 4100K: >69.2; 6000K: >73.8
Lumens per Watt (per ft)	2400K: 61.91 lm/W; 2700K: 53.64 lm/W; 3000K: 55.2 lm/W; 3500K: 64.56 lm/W; 4100K: 57.12 lm/W; 6000K: 59.76 lm/W
Constant Voltage	Yes
Max Length Before Additional Power is Needed	12V: 29' 4.6" (9 Meters) 24V: 68' 7.5" (21 Meters)

DIMENSIONS **RIBBONLYTE 1.5**

IP40 + IP65

Width	0.31" / 8 mm
Length	Up to 29' 4.6" (12V) in ~2 inch sections or 68' 7.5" (24V) in ~4 inch sections
Height	IP40: 0.088" / 2.2 mm IP65: 0.125" / 3.2 mm

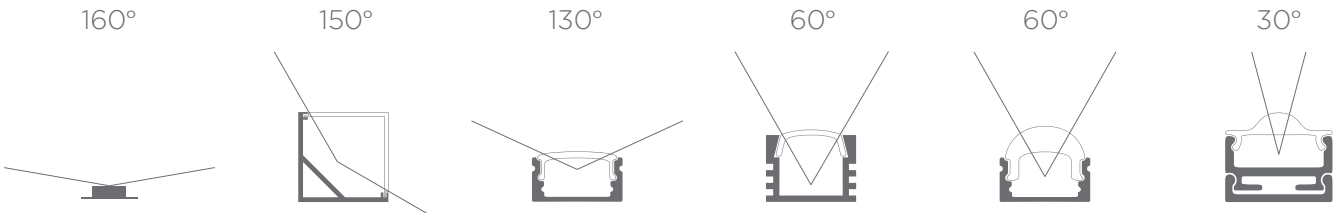
OUTDOOR - IP68

Width	0.41" / 10.4 mm
Length	Up to 29' 4.6" (12V) in ~2 inch sections or 68' 7.5" (24V) in ~4 inch sections
Height	0.18" / 4.5 mm

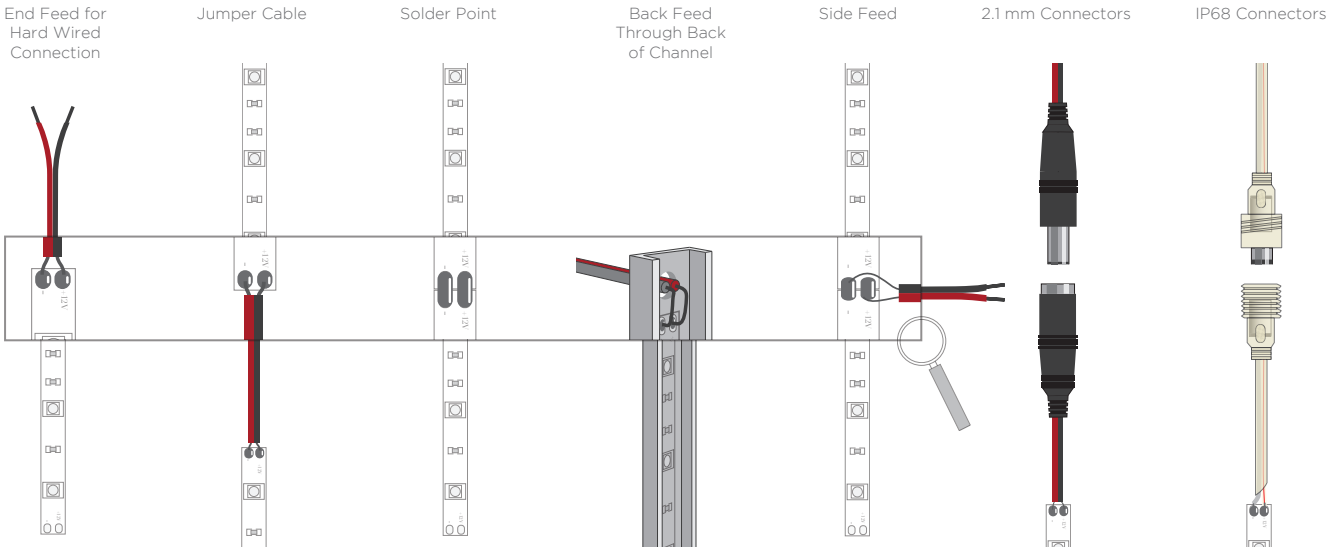
Rev. 2013.08.08

RIBBONLYTE 1.5

SAMPLE **BEAM ANGLES**



CONNECTION **OPTIONS**



CHANNEL **COMPATIBILITY**

Protection	Compatible Channels
Non-Waterproof (IP40)	All Channel
IP65	All Channel
IP68	All Channel

Rev. 2013.08.08

USAGE **GUIDELINES**

Compatible with a wide variety of control products including the entire line of Lutron dimming systems.

For use with Acolyte drivers, triac dimming modules, 0-10 modules and interface controllers (DMXINF models).

Use with non-Acolyte triac, MLV or ELV drivers is not supported or warrantied.

Due to the nature of the product, RibbonLyte cuttable lengths are generally longer or shorter than the customer requested length. Unless specified, RibbonLyte is factory cut at the shorter cuttable point.

IP65 and IP68 versions can be used in wet, outdoor locations around swimming pools and spa tubs, but not submerged in swimming pools and spa tubs.

We reserve the right to make changes to product lineup, specifications, design and finishes at any time without notice.

ACCESSORIES **RIBBONLYTE 1.5**

CHANNEL
See Acolyte Channel Guide

DRIVERS
See Acolyte Drivers Guide

CONTROLLERS
See Acolyte Controllers Guide

PARTS AND ACCESSORIES
See Acolyte Parts and Accessories Guide

STATIC WHITE RIBBONLYTE COMPARISON GUIDE

SPECIFICATIONS	1.5	2.2	3.0	4.4	5.0	6.0	8.8
Operating Voltage	12 V and 24 V versions						24 V
Power Consumption	1.5 W / Ft	2.2 W / Ft	3.0 W / Ft	4.4 W / Ft	5.0 W / Ft	6.0 W / Ft	8.8 W / Ft
Current (mA) - 12 V	125	183	250	366	417	500	--
Current (mA) - 24 V	63	92	125	183	208	250	367
Protection Rating	IP45, IP65 and IP68						
Beam Angle	160°						
Color Temperatures	2400K, 2700K, 3000K, 3500K, 4100K, 6000K (5.0 is only avail. in 3000K, 4100K, 6000K)						
LED's / Foot	18	9	36	18	15	72	36
Width - IP45 / IP65	0.31"	0.39"	0.31"	0.39"	0.41"	0.50"	0.59"
Width - IP68	0.41"	0.52"	0.41"	0.52"	0.54"	0.66"	0.70"
Cuttable Length - 12 V	1.97"	3.94"	0.98"	1.97"	2.46"	1.97"	--
Cuttable Length - 24 V	3.94"	6.55"	1.97"	3.94"	4.92"	3.94"	1.97"
Max Length - 12 V	29' 4.6"	26' 3"	19' 8.2"	16' 4.9"	16' 4.9"	16' 4.9"	--
Max Length - 24 V	68' 7.5"	45' 10.3"	32' 9.7"	26' 3"	32' 9.7"	26' 3.0"	25' 7.1"
Lumen / Ft - 2400 K	92.86	149.13	185.73	298.26	--	371.46	596.52
Lumen / Ft - 2700 K	80.46	153.99	160.92	307.98	--	321.84	615.96
Lumen / Ft - 3000 K	82.80	175.68	165.60	351.36	438.91	331.20	702.72
Lumen / Ft - 3500 K	96.84	161.10	193.68	322.20	--	387.36	644.40
Lumen / Ft - 4100 K	85.68	157.23	171.36	314.46	441.96	342.72	628.92
Lumen / Ft - 6000 K	89.64	169.38	179.28	338.76	445.01	358.56	677.52
Lumens / Watt - 2400 K	61.91	67.79	61.91	67.79	--	61.91	67.69
Lumens / Watt - 2700 K	53.64	70.00	53.64	70.00	--	53.64	70.00
Lumens / Watt - 3000 K	55.2	79.85	55.2	79.85	87.78	55.20	79.85
Lumens / Watt - 3500 K	64.56	73.23	64.56	73.23	--	64.56	73.23
Lumens / Watt - 4100 K	57.12	71.47	57.12	71.47	88.39	57.12	71.47
Lumens / Watt - 6000 K	59.76	77.00	59.76	77.00	89.00	59.76	77.00
CRI - 2400 K	50.4	50.5	50.4	50.5	--	50.4	50.5
CRI - 2700 K	56.0	58.9	56.0	58.9	--	56.0	58.9
CRI - 3000 K	62.8	63.0	62.8	63.0	72.0	62.8	63.0
CRI - 3500 K	66.3	65.3	66.3	65.3	--	66.3	65.3
CRI - 4100 K	69.2	70.8	69.2	70.8	70.0	69.2	70.8
CRI - 6000 K	73.8	73.4	73.8	73.4	69.0	73.8	73.4

Rev. 2013.08.08

L2

STATIC WHITE RIBBONLYTE

White lighting is the way we see the world. With so many variations of color temperature and wattage, our Static White RibbonLyte will help you create the ultimate lighting scheme.

Whether you want to imitate the warm glow of candelight, or provide a high visibility work environment similar to a bright afternoon outdoors, we can provide a solution to fill your needs.

Not only do we offer a variety of color temperatures, but our RibbonLyte comes in a number of wattages as well. As energy costs rise, the benefits of our lower wattage LEDs are even more apparent.

Pictured: RibbonLyte 4.4 3000K @Fetta Panini Bar, Toronto Pearson Intl Airport, Mississagua, ON
Designed by ICRAVE

ACOLYTE LED 251 West 30th St, Suite 12E New York, NY 10001 **212.629.6830** INFO@**ACOLYTELED.COM**

White

RIBBONLYTE 1.5

RoHS Compliant

Dry or wet location flexible LEDs

12 or 24 Volt

1.5 Watts per foot, 18 LEDs per foot

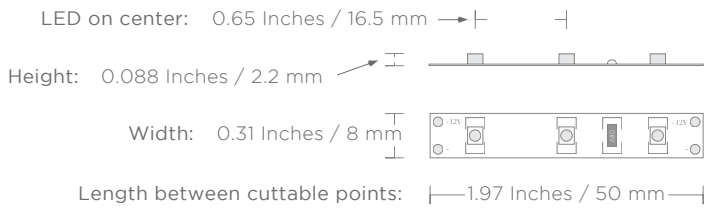
IP65 and IP68 versions are UV resistant

2400K, 2700K, 3000K, 3500K, 4100K, and 6000K

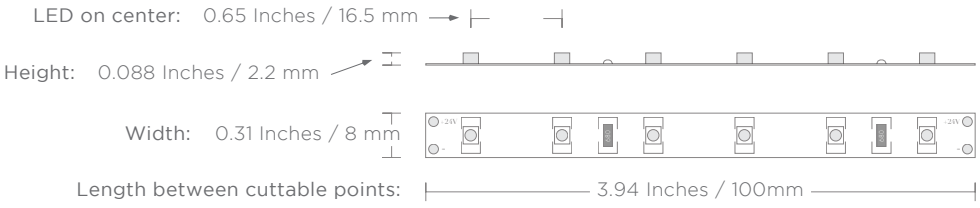
Cuttable every 1.97 inches (12V) or 3.94 inches (24V)

DIMENSIONS

1.5 - 12 Volt



1.5 - 24 Volt



PART NUMBER BUILDER

Category		Waterproof		Voltage		Wattage		Color Temperature		
RB	+		+		+	1.5	+		=	Your Part Number Example: RB121.527
		65 - IP65 68 - IP68 Blank - None (IP40)		12 - 12V 24 - 24V				24 - 2400K 27 - 2700K 30 - 3000K 35 - 3500K 41 - 4100K 60 - 6000K		

Rev. 2013.08.08

SPECIFICATIONS **RIBBONLYTE 1.5**

Operating Voltage	12 Volt / 24 Volt
Power Consumption	1.5 Watts / Linear Foot
Amperage	12v: 125 mA / Foot 24v: 63 mA / Foot
Protection Rating	IP40/IP65/IP68
Dimming	Triac / 0-10 Volt / DMX / Lutron A-Series 1% dimming LED drivers
Operating Temperature	-40° C to 70° C
Color Temperature	2400K 2700K 3000K 3500K 4100K 6000K
Lumen Output	2400K: 92.86 lm/ft; 2700K: 80.46 lm/ft; 3000K: 82.8 lm/ft; 3500K: 96.84 lm/ft; 4100K: 85.68 lm/ft; 6000K: 89.64 lm/ft
Binning Tolerance	+/- 100K
LED Beam Angle	160°
Lamp Life	50,000 Hours
Cuttable	12v: Every 1.97" (50 mm) 24v: Every 3.94" (100 mm)
CRI* *CRI >90 available upon request	2400K: >50.4; 2700K: >56; 3000K: >62.8; 3500K: >66.3; 4100K: >69.2; 6000K: >73.8
Lumens per Watt (per ft)	2400K: 61.91 lm/W; 2700K: 53.64 lm/W; 3000K: 55.2 lm/W; 3500K: 64.56 lm/W; 4100K: 57.12 lm/W; 6000K: 59.76 lm/W
Constant Voltage	Yes
Max Length Before Additional Power is Needed	12V: 29' 4.6" (9 Meters) 24V: 68' 7.5" (21 Meters)

DIMENSIONS **RIBBONLYTE 1.5**

IP40 + IP65

Width	0.31" / 8 mm
Length	Up to 29' 4.6" (12V) in ~2 inch sections or 68' 7.5" (24V) in ~4 inch sections
Height	IP40: 0.088" / 2.2 mm IP65: 0.125" / 3.2 mm

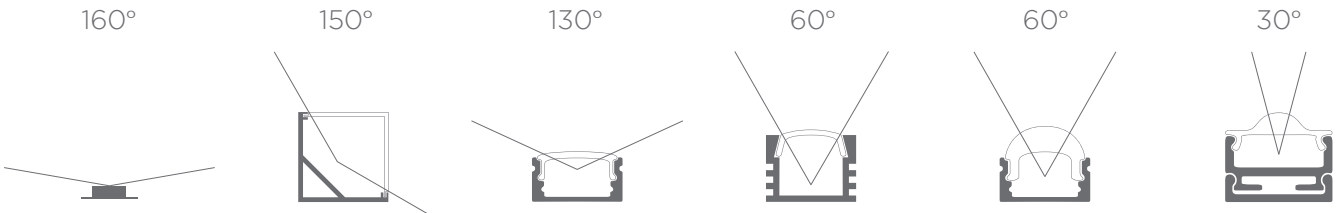
OUTDOOR - IP68

Width	0.41" / 10.4 mm
Length	Up to 29' 4.6" (12V) in ~2 inch sections or 68' 7.5" (24V) in ~4 inch sections
Height	0.18" / 4.5 mm

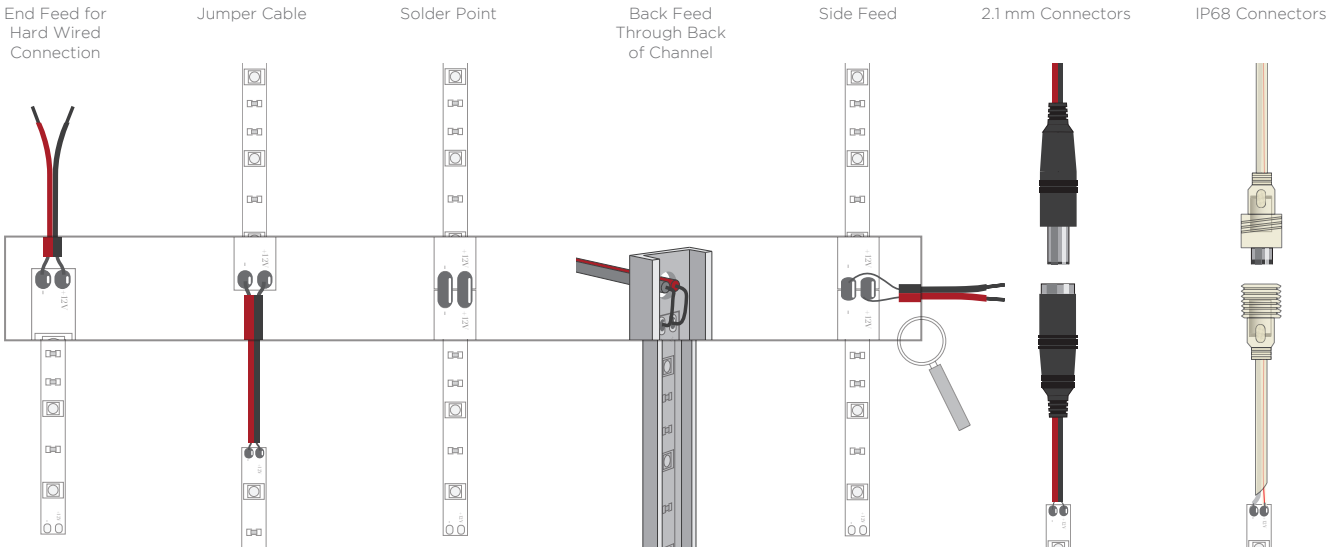
Rev. 2013.08.08

RIBBONLYTE 1.5

SAMPLE **BEAM ANGLES**



CONNECTION **OPTIONS**



CHANNEL **COMPATIBILITY**

Protection	Compatible Channels
Non-Waterproof (IP40)	All Channel
IP65	All Channel
IP68	All Channel

Rev. 2013.08.08

USAGE **GUIDELINES**

Compatible with a wide variety of control products including the entire line of Lutron dimming systems.

For use with Acolyte drivers, triac dimming modules, 0-10 modules and interface controllers (DMXINF models).

Use with non-Acolyte triac, MLV or ELV drivers is not supported or warrantied.

Due to the nature of the product, RibbonLyte cuttable lengths are generally longer or shorter than the customer requested length. Unless specified, RibbonLyte is factory cut at the shorter cuttable point.

IP65 and IP68 versions can be used in wet, outdoor locations around swimming pools and spa tubs, but not submerged in swimming pools and spa tubs.

We reserve the right to make changes to product lineup, specifications, design and finishes at any time without notice.

ACCESSORIES **RIBBONLYTE 1.5**

CHANNEL
See Acolyte Channel Guide

DRIVERS
See Acolyte Drivers Guide

CONTROLLERS
See Acolyte Controllers Guide

PARTS AND ACCESSORIES
See Acolyte Parts and Accessories Guide

STATIC WHITE RIBBONLYTE COMPARISON GUIDE

SPECIFICATIONS	1.5	2.2	3.0	4.4	5.0	6.0	8.8
Operating Voltage	12 V and 24 V versions						24 V
Power Consumption	1.5 W / Ft	2.2 W / Ft	3.0 W / Ft	4.4 W / Ft	5.0 W / Ft	6.0 W / Ft	8.8 W / Ft
Current (mA) - 12 V	125	183	250	366	417	500	--
Current (mA) - 24 V	63	92	125	183	208	250	367
Protection Rating	IP45, IP65 and IP68						
Beam Angle	160°						
Color Temperatures	2400K, 2700K, 3000K, 3500K, 4100K, 6000K (5.0 is only avail. in 3000K, 4100K, 6000K)						
LED's / Foot	18	9	36	18	15	72	36
Width - IP45 / IP65	0.31"	0.39"	0.31"	0.39"	0.41"	0.50"	0.59"
Width - IP68	0.41"	0.52"	0.41"	0.52"	0.54"	0.66"	0.70"
Cuttable Length - 12 V	1.97"	3.94"	0.98"	1.97"	2.46"	1.97"	--
Cuttable Length - 24 V	3.94"	6.55"	1.97"	3.94"	4.92"	3.94"	1.97"
Max Length - 12 V	29' 4.6"	26' 3"	19' 8.2"	16' 4.9"	16' 4.9"	16' 4.9"	--
Max Length - 24 V	68' 7.5"	45' 10.3"	32' 9.7"	26' 3"	32' 9.7"	26' 3.0"	25' 7.1"
Lumen / Ft - 2400 K	92.86	149.13	185.73	298.26	--	371.46	596.52
Lumen / Ft - 2700 K	80.46	153.99	160.92	307.98	--	321.84	615.96
Lumen / Ft - 3000 K	82.80	175.68	165.60	351.36	438.91	331.20	702.72
Lumen / Ft - 3500 K	96.84	161.10	193.68	322.20	--	387.36	644.40
Lumen / Ft - 4100 K	85.68	157.23	171.36	314.46	441.96	342.72	628.92
Lumen / Ft - 6000 K	89.64	169.38	179.28	338.76	445.01	358.56	677.52
Lumens / Watt - 2400 K	61.91	67.79	61.91	67.79	--	61.91	67.69
Lumens / Watt - 2700 K	53.64	70.00	53.64	70.00	--	53.64	70.00
Lumens / Watt - 3000 K	55.2	79.85	55.2	79.85	87.78	55.20	79.85
Lumens / Watt - 3500 K	64.56	73.23	64.56	73.23	--	64.56	73.23
Lumens / Watt - 4100 K	57.12	71.47	57.12	71.47	88.39	57.12	71.47
Lumens / Watt - 6000 K	59.76	77.00	59.76	77.00	89.00	59.76	77.00
CRI - 2400 K	50.4	50.5	50.4	50.5	--	50.4	50.5
CRI - 2700 K	56.0	58.9	56.0	58.9	--	56.0	58.9
CRI - 3000 K	62.8	63.0	62.8	63.0	72.0	62.8	63.0
CRI - 3500 K	66.3	65.3	66.3	65.3	--	66.3	65.3
CRI - 4100 K	69.2	70.8	69.2	70.8	70.0	69.2	70.8
CRI - 6000 K	73.8	73.4	73.8	73.4	69.0	73.8	73.4

Rev. 2013.08.08

STATIC WHITE RIBBONLYTE

White lighting is the way we see the world. With so many variations of color temperature and wattage, our Static White RibbonLyte will help you create the ultimate lighting scheme.

Whether you want to imitate the warm glow of candelight, or provide a high visibility work environment similar to a bright afternoon outdoors, we can provide a solution to fill your needs.

Not only do we offer a variety of color temperatures, but our RibbonLyte comes in a number of wattages as well. As energy costs rise, the benefits of our lower wattage LEDs are even more apparent.

Pictured: RibbonLyte 4.4 3000K @Fetta Panini Bar, Toronto Pearson Intl Airport, Mississagua, ON
Designed by ICRAVE

ACOLYTE LED 251 West 30th St, Suite 12E New York, NY 10001 **212.629.6830** INFO@**ACOLYTELED.COM**

White

RIBBONLYTE 5.0

RoHS Compliant

Dry or wet location flexible LEDs

12 or 24 Volt

5.0 Watts per foot, 15 LEDs per foot

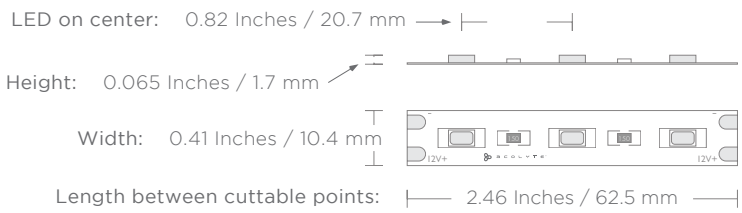
IP65 and IP68 versions are UV resistant

3000K, 4100K, and 6000K

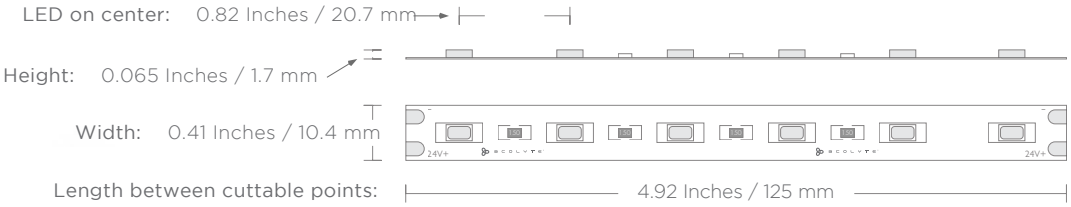
Cuttable every 2.46 inches (12V) or 4.92 inches (24V)

DIMENSIONS

5.0 - 12 Volt



5.0 - 24 Volt



PART NUMBER BUILDER

Category		Waterproof		Voltage		Wattage		Color Temperature		
RB	+		+		+	5.0	+		=	Your Part Number
		65 - IP65 68 - IP68 Blank - None (IP40)		12 - 12V 24 - 24V				30 - 3000K 41 - 4100K 60 - 6000K		Example: RB125.030

Rev. 2013.08.08

SPECIFICATIONS **RIBBONLYTE 5.0**

Operating Voltage	12 Volt / 24 Volt
Power Consumption	5.0 Watts / Linear Foot
Milliamperes	12v: 417 mA / Foot 24v: 208 mA / Foot
Protection Rating	IP40/IP65/IP68
Dimming	Triac / 0-10 Volt / DMX / Lutron A-Series 1% dimming LED drivers
Operating Temperature	-40° C to 70° C
Color Temperature	3000K, 4100K and 6000K
Lumen Output	3000K: 438.91 lm/ft; 4100K: 441.96 lm/ft; 6000K: 445.01 lm/ft
Binning Tolerance	+/- 100K
LED Beam Angle	160°
Lamp Life	50,000 Hours
Cuttable	12v: Every 2.46" (62.5 mm) 24v: Every 4.92" (125 mm)
CRI* *CRI >90 available upon request	3000K: >72; 4100K: >70; 6000K: >69
Lumens per Watt (per ft)	3000K: 87.78 lm/W; 4100K: 88.39 lm/W; 6000K: 89.00 lm/W
Constant Voltage	Yes
Max Length Before Additional Power is Needed	12V: 16' 4.9" (5 Meters) 24V: 32' 9.7" (10 Meters)

DIMENSIONS **RIBBONLYTE 5.0**

IP40 + IP65

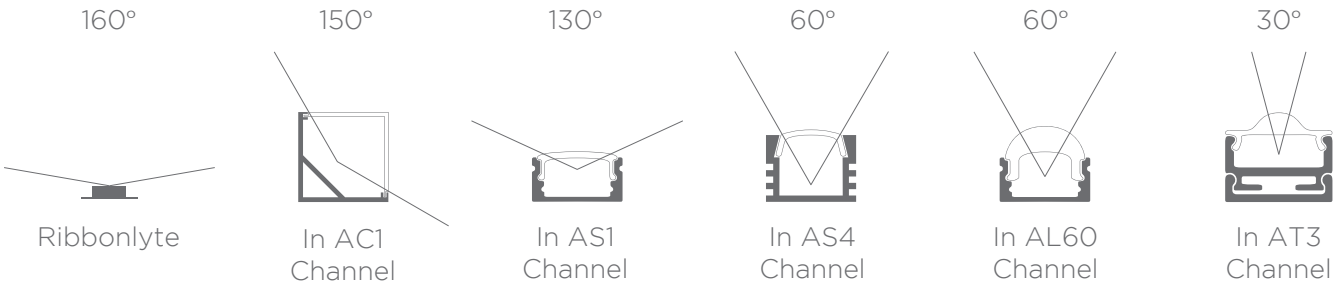
Width	0.41" / 10.41 mm
Length	Up to 16' 4.9" (12V) in ~2.5 inch sections or 32' 9.7" (24V) in ~5 inch sections
Height	IP40: 0.065" / 1.65 mm IP65: 0.125" / 3.2 mm

OUTDOOR - IP68

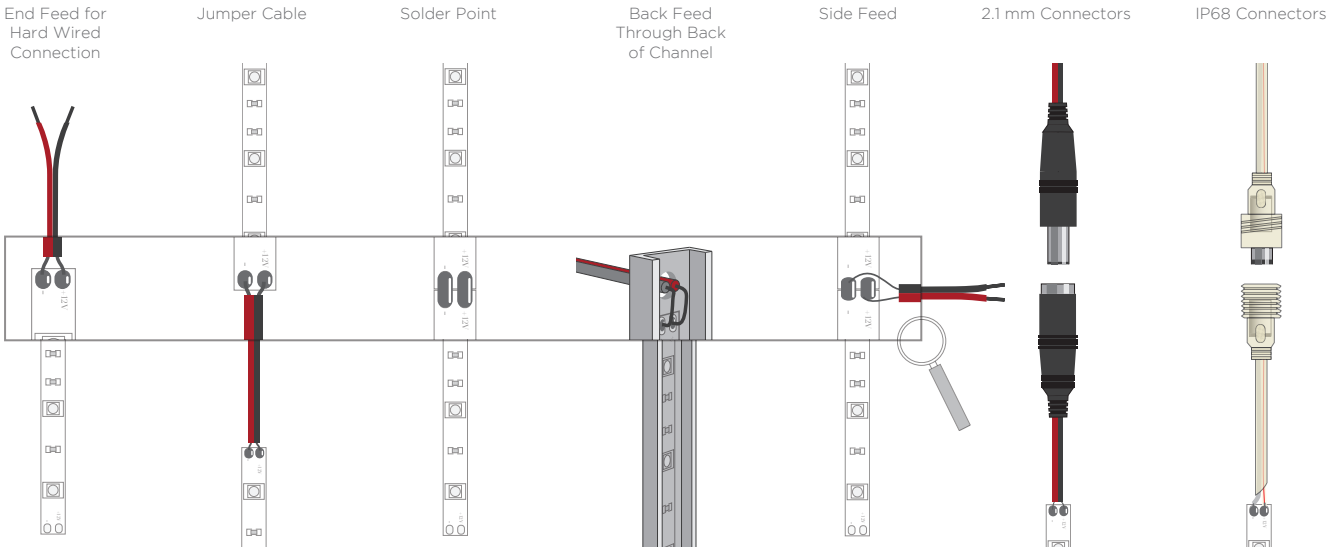
Width	0.54" / 13.3 mm
Length	Up to 16' 4.9" (12V) in ~2.5 inch sections or 32' 9.7" (24V) in ~5 inch sections
Height	0.19" / 4.8 mm

Rev. 2013.08.08

SAMPLE **BEAM ANGLES**



CONNECTION **OPTIONS**



CHANNEL **COMPATIBILITY**

Protection	Compatible Channels
Non-Waterproof (IP40)	All Channel
IP65	All Channel
IP68	AC1, AC2, AC4, AC5, AR3, AS3, AT1, AT2, AT3, AP1, W31, W35, WH35

Rev. 2013.08.08

USAGE **GUIDELINES**

Compatible with a wide variety of control products including the entire line of Lutron dimming systems.

For use with Acolyte drivers, triac dimming modules, 0-10 modules and interface controllers (DMXINF models).

Use with non-Acolyte triac, MLV or ELV drivers is not supported or warrantied.

Due to the nature of the product, RibbonLyte cuttable lengths are generally longer or shorter than the customer requested length. Unless specified, RibbonLyte is factory cut at the shorter cuttable point.

IP65 and IP68 versions can be used in wet, outdoor locations around swimming pools and spa tubs, but not submerged in swimming pools and spa tubs.

We reserve the right to make changes to product lineup, specifications, design and finishes at any time without notice.

ACCESSORIES **RIBBONLYTE 5.0**

CHANNEL
See Acolyte Channel Guide

DRIVERS
See Acolyte Drivers Guide

CONTROLLERS
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PARTS AND ACCESSORIES
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STATIC WHITE RIBBONLYTE COMPARISON GUIDE

SPECIFICATIONS	1.5	2.2	3.0	4.4	5.0	6.0	8.8
Operating Voltage	12 V and 24 V versions						24 V
Power Consumption	1.5 W / Ft	2.2 W / Ft	3.0 W / Ft	4.4 W / Ft	5.0 W / Ft	6.0 W / Ft	8.8 W / Ft
Current (mA) - 12 V	125	183	250	366	417	500	--
Current (mA) - 24 V	63	92	125	183	208	250	367
Protection Rating	IP45, IP65 and IP68						
Beam Angle	160°						
Color Temperatures	2400K, 2700K, 3000K, 3500K, 4100K, 6000K (5.0 is only avail. in 3000K, 4100K, 6000K)						
LED's / Foot	18	9	36	18	15	72	36
Width - IP45 / IP65	0.31"	0.39"	0.31"	0.39"	0.41"	0.50"	0.59"
Width - IP68	0.41"	0.52"	0.41"	0.52"	0.54"	0.66"	0.70"
Cuttable Length - 12 V	1.97"	3.94"	0.98"	1.97"	2.46"	1.97"	--
Cuttable Length - 24 V	3.94"	6.55"	1.97"	3.94"	4.92"	3.94"	1.97"
Max Length - 12 V	29' 4.6"	26' 3"	19' 8.2"	16' 4.9"	16' 4.9"	16' 4.9"	--
Max Length - 24 V	68' 7.5"	45' 10.3"	32' 9.7"	26' 3"	32' 9.7"	26' 3.0"	25' 7.1"
Lumen / Ft - 2400 K	92.86	149.13	185.73	298.26	--	371.46	596.52
Lumen / Ft - 2700 K	80.46	153.99	160.92	307.98	--	321.84	615.96
Lumen / Ft - 3000 K	82.80	175.68	165.60	351.36	438.91	331.20	702.72
Lumen / Ft - 3500 K	96.84	161.10	193.68	322.20	--	387.36	644.40
Lumen / Ft - 4100 K	85.68	157.23	171.36	314.46	441.96	342.72	628.92
Lumen / Ft - 6000 K	89.64	169.38	179.28	338.76	445.01	358.56	677.52
Lumens / Watt - 2400 K	61.91	67.79	61.91	67.79	--	61.91	67.69
Lumens / Watt - 2700 K	53.64	70.00	53.64	70.00	--	53.64	70.00
Lumens / Watt - 3000 K	55.2	79.85	55.2	79.85	87.78	55.20	79.85
Lumens / Watt - 3500 K	64.56	73.23	64.56	73.23	--	64.56	73.23
Lumens / Watt - 4100 K	57.12	71.47	57.12	71.47	88.39	57.12	71.47
Lumens / Watt - 6000 K	59.76	77.00	59.76	77.00	89.00	59.76	77.00
CRI - 2400 K	50.4	50.5	50.4	50.5	--	50.4	50.5
CRI - 2700 K	56.0	58.9	56.0	58.9	--	56.0	58.9
CRI - 3000 K	62.8	63.0	62.8	63.0	72.0	62.8	63.0
CRI - 3500 K	66.3	65.3	66.3	65.3	--	66.3	65.3
CRI - 4100 K	69.2	70.8	69.2	70.8	70.0	69.2	70.8
CRI - 6000 K	73.8	73.4	73.8	73.4	69.0	73.8	73.4

Rev. 2013.08.08

STATIC WHITE RIBBONLYTE

White lighting is the way we see the world. With so many variations of color temperature and wattage, our Static White RibbonLyte will help you create the ultimate lighting scheme.

Whether you want to imitate the warm glow of candelight, or provide a high visibility work environment similar to a bright afternoon outdoors, we can provide a solution to fill your needs.

Not only do we offer a variety of color temperatures, but our RibbonLyte comes in a number of wattages as well. As energy costs rise, the benefits of our lower wattage LEDs are even more apparent.

Pictured: RibbonLyte 4.4 3000K @Fetta Panini Bar, Toronto Pearson Intl Airport, Mississagua, ON
Designed by ICRAVE

White

RIBBONLYTE 8.8

RoHS Compliant

Dry or wet location flexible LEDs

24 Volt Only

8.8 Watts per foot, 36 LEDs per foot

IP65 and IP68 versions are UV resistant

2400K, 2700K, 3000K, 3500K, 4100K, and 6000K

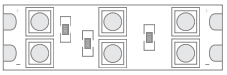
Cuttable every 1.97 inches

DIMENSIONS

8.8 - 24 Volt

LED on center: 0.67 Inches / 17 mm

Height: 0.09 Inches / 2.3 mm



Width: 0.59 Inches / 15 mm

Length between cuttable points: 1.97 Inches / 50 mm

PART NUMBER BUILDER

Category		Waterproof		Voltage		Wattage		Color Temperature		
RB	+		+	24	+	8.8	+		=	Your Part Number Example: RB248.827

65 - IP65
68 - IP68
Blank - None (IP40)

24 - 2400K
27 - 2700K
30 - 3000K
35 - 3500K
41 - 4100K
60 - 6000K

Rev. 2013.08.08

SPECIFICATIONS **RIBBONLYTE 8.8**

Operating Voltage	24 Volt
Power Consumption	8.8 Watts / Linear Foot
Milliamperes	367 mA / Foot
Protection Rating	IP40/IP65/IP68
Dimming	Triac / 0-10 Volt / DMX / Lutron A-Series 1% dimming LED drivers
Operating Temperature	-40° C to 70° C
Color Temperature	2400K, 2700K, 3000K, 3500K, 4100K and 6000K
Lumen Output	2400K: 596.52 lm/ft; 2700K: 615.96 lm/ft; 3000K: 702.72 lm/ft; 3500K: 644.4 lm/ft; 4100K: 628.92 lm/ft; 6000K: 677.52 lm/ft
Binning Tolerance	+/- 100K
LED Beam Angle	160°
Lamp Life	50,000 Hours
Cuttable	Every 1.97" (50 mm)
CRI * *CRI >90 available upon request	2400K: >50.5; 2700K: >58.9; 3000K: >63; 3500K: >65.3; 4100K: >70.8; 6000K: >73.4
Lumens per Watt (per ft)	2400K: 67.79 lm/W; 2700K: 70.00 lm/W; 3000K: 79.85 lm/W; 3500K: 73.23 lm/W; 4100K: 71.47 lm/W; 6000K: 77.00 lm/W
Constant Voltage	Yes
Max Length Before Additional Power is Needed	25' 7.1" (7.80 m)

DIMENSIONS **RIBBONLYTE 8.8**

IP40 + IP65

Width		0.59" / 15 mm
Length		Up to 25' 7.1" / 7.80 m
Height	IP40: 0.088" / 2.2 mm	IP65: 0.172" / 4.4 mm

OUTDOOR - IP68

Width	0.70" / 17.8 mm
Length	Up to 25' 7.1" / 7.80 m
Height	0.19" / 4.8 mm

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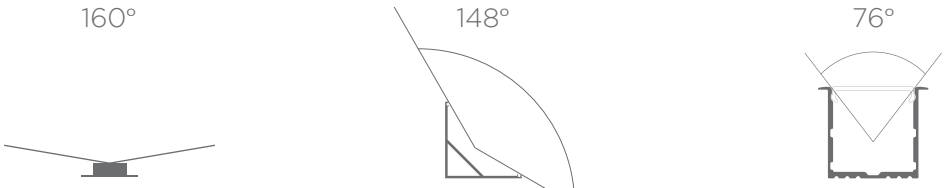
RIBBONLYTE 8.8

SAMPLE **BEAM ANGLES**

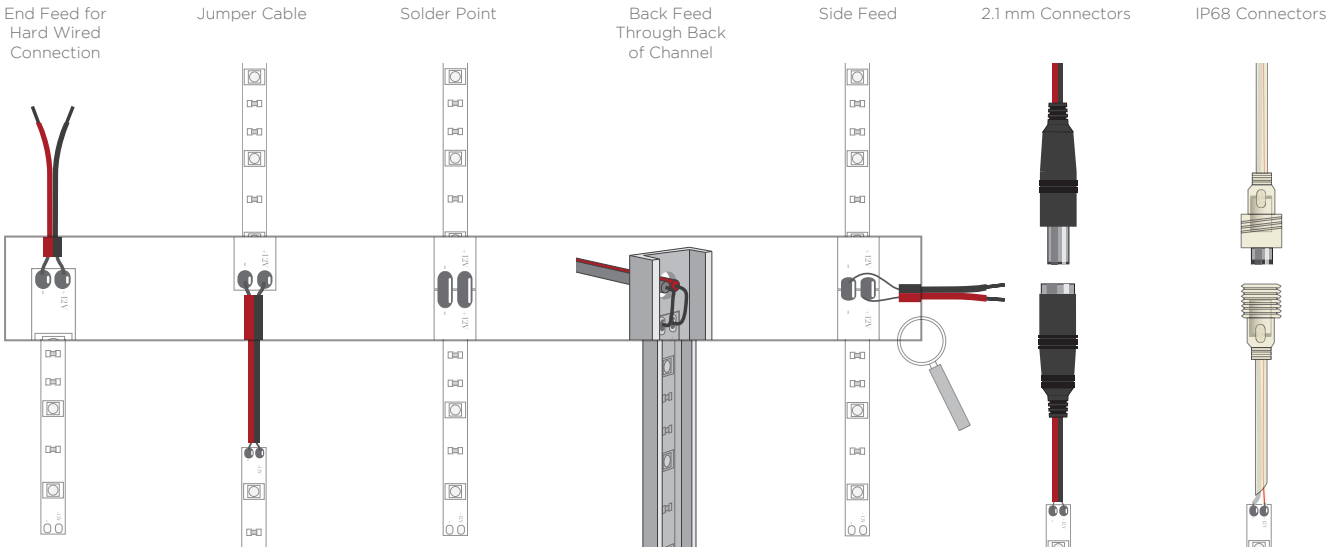


Ribbonlyte

In AC4/AC5 Channel

In W31 Channel

CONNECTION **OPTIONS**



CHANNEL **COMPATIBILITY**

Protection	Compatible Channels
Non-Waterproof (IP40)	AC4, AC5, AR3, AS3, AT1, AT2, AT3, AP1, W31, W35, WH35
IP65	AC4, AC5, AR3, AS3, AT1, AT2, AT3, AP1, W31, W35, WH35
IP68	AC4, AC5, AR3, AS3, W31, W35, WH35

Rev. 2013.08.08

USAGE **GUIDELINES**

Compatible with a wide variety of control products including the entire line of Lutron dimming systems.

For use with Acolyte drivers, triac dimming modules, 0-10 modules and interface controllers (DMXINF models).

Use with non-Acolyte triac, MLV or ELV drivers is not supported or warrantied.

Due to the nature of the product, RibbonLyte cuttable lengths are generally longer or shorter than the customer requested length. Unless specified, RibbonLyte is factory cut at the shorter cuttable point.

IP65 and IP68 versions can be used in wet, outdoor locations around swimming pools and spa tubs, but not submerged in swimming pools and spa tubs.

We reserve the right to make changes to product lineup, specifications, design and finishes at any time without notice.

ACCESSORIES **RIBBONLYTE 8.8**

CHANNEL
See Acolyte Channel Guide

DRIVERS
See Acolyte Drivers Guide

CONTROLLERS
See Acolyte Controllers Guide

PARTS AND ACCESSORIES
See Acolyte Parts and Accessories Guide

STATIC WHITE RIBBONLYTE COMPARISON GUIDE

SPECIFICATIONS	1.5	2.2	3.0	4.4	5.0	6.0	8.8
Operating Voltage	12 V and 24 V versions						24 V
Power Consumption	1.5 W / Ft	2.2 W / Ft	3.0 W / Ft	4.4 W / Ft	5.0 W / Ft	6.0 W / Ft	8.8 W / Ft
Current (mA) - 12 V	125	183	250	366	417	500	--
Current (mA) - 24 V	63	92	125	183	208	250	367
Protection Rating	IP45, IP65 and IP68						
Beam Angle	160°						
Color Temperatures	2400K, 2700K, 3000K, 3500K, 4100K, 6000K (5.0 is only avail. in 3000K, 4100K, 6000K)						
LED's / Foot	18	9	36	18	15	72	36
Width - IP45 / IP65	0.31"	0.39"	0.31"	0.39"	0.41"	0.50"	0.59"
Width - IP68	0.41"	0.52"	0.41"	0.52"	0.54"	0.66"	0.70"
Cuttable Length - 12 V	1.97"	3.94"	0.98"	1.97"	2.46"	1.97"	--
Cuttable Length - 24 V	3.94"	6.55"	1.97"	3.94"	4.92"	3.94"	1.97"
Max Length - 12 V	29' 4.6"	26' 3"	19' 8.2"	16' 4.9"	16' 4.9"	16' 4.9"	--
Max Length - 24 V	68' 7.5"	45' 10.3"	32' 9.7"	26' 3"	32' 9.7"	26' 3.0"	25' 7.1"
Lumen / Ft - 2400 K	92.86	149.13	185.73	298.26	--	371.46	596.52
Lumen / Ft - 2700 K	80.46	153.99	160.92	307.98	--	321.84	615.96
Lumen / Ft - 3000 K	82.80	175.68	165.60	351.36	438.91	331.20	702.72
Lumen / Ft - 3500 K	96.84	161.10	193.68	322.20	--	387.36	644.40
Lumen / Ft - 4100 K	85.68	157.23	171.36	314.46	441.96	342.72	628.92
Lumen / Ft - 6000 K	89.64	169.38	179.28	338.76	445.01	358.56	677.52
Lumens / Watt - 2400 K	61.91	67.79	61.91	67.79	--	61.91	67.69
Lumens / Watt - 2700 K	53.64	70.00	53.64	70.00	--	53.64	70.00
Lumens / Watt - 3000 K	55.2	79.85	55.2	79.85	87.78	55.20	79.85
Lumens / Watt - 3500 K	64.56	73.23	64.56	73.23	--	64.56	73.23
Lumens / Watt - 4100 K	57.12	71.47	57.12	71.47	88.39	57.12	71.47
Lumens / Watt - 6000 K	59.76	77.00	59.76	77.00	89.00	59.76	77.00
CRI - 2400 K	50.4	50.5	50.4	50.5	--	50.4	50.5
CRI - 2700 K	56.0	58.9	56.0	58.9	--	56.0	58.9
CRI - 3000 K	62.8	63.0	62.8	63.0	72.0	62.8	63.0
CRI - 3500 K	66.3	65.3	66.3	65.3	--	66.3	65.3
CRI - 4100 K	69.2	70.8	69.2	70.8	70.0	69.2	70.8
CRI - 6000 K	73.8	73.4	73.8	73.4	69.0	73.8	73.4

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SPECIFICATION SHEET

lumenfacade™

INTERIOR
WHITE & STATIC COLORS

Client: _____

Project name: _____

Order #: _____

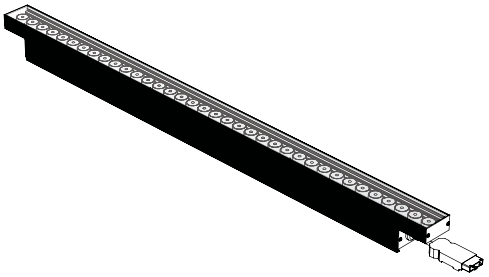
Type: _____ Qty: _____

L5

FEATURES AND BENEFITS

Physical :

- Low copper content extruded aluminum housing
- Available in 1', 2', 3' or 4' sections
- Electro-statically applied polyester powder coat finish
- Aluminum end caps
- Stainless steel hardware
- Clear acrylic lens
- 10° x 10°, 10° x 60°, 30° x 60° or 60° x 60° optics
- Interior applications only



Performance :

- Minimum 1fc (10.7 lux) @ 114.7 feet (34.9m) distance (4000K, 10° x 60° optic, HO version)
- 2,455 delivered lumens and 13,172 candelas at nadir (4000K, 4' unit, 10° x 60° optic, HO version)
- CRI values: 85+ (2700K), 80+ (3000K), 78+ (4000K)
- Lumen maintenance 120,000 hrs [L70 @ 25°C]
- Lumen measurements comply with LM - 79 - 08 standard
- Resolution per foot or per fixture (see page 5)
- Operating temperatures: -25° C to 50° C [-13F to 122F]

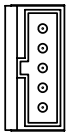
Electrical :

- Line voltage luminaire for 100 to 277 volts
- Power and data in 1 cable (#16)
- Up to 88 feet with a single 120V power feed, HO version
- 5W/ft version meets ASHRAE standards for linear lighting on building facades
- 8.5W/ft (15.25W/ft HO version)
- Dimming options: 0-10 volt, DMX, DALI, Lumentalk, or Lutron® EcoSystem® enabled

c UL us CE RoHS

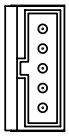
lumentalk EcoSystem Enabled

Wiring detail

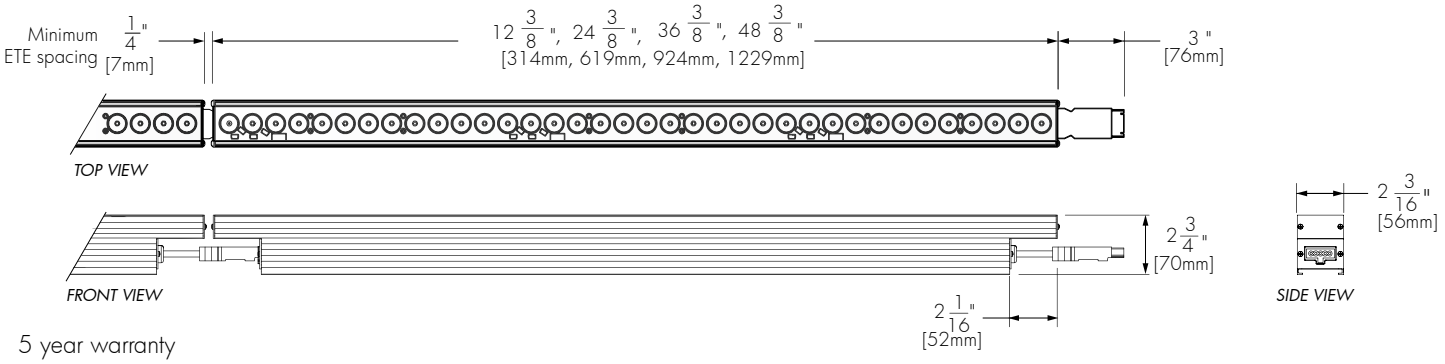


PIN ID /	WIRE COLOR /	USE
(N)	WHITE	NEUTRAL
(⏚)	GREEN	GROUND
(1)	BLACK	LIVE 120-277V
(2)	ORANGE	0-10V / DATA-
(3)	RED	0-10V / DATA+

CE Wiring detail



PIN ID /	WIRE COLOR /	USE
(N)	BLUE	NEUTRAL
(⏚)	GREEN/YELLOW	GROUND
(1)	BROWN	LIVE 120-277V
(2)	GRAY	0-10V / DATA-
(3)	BLACK	0-10V / DATA+



5 year warranty

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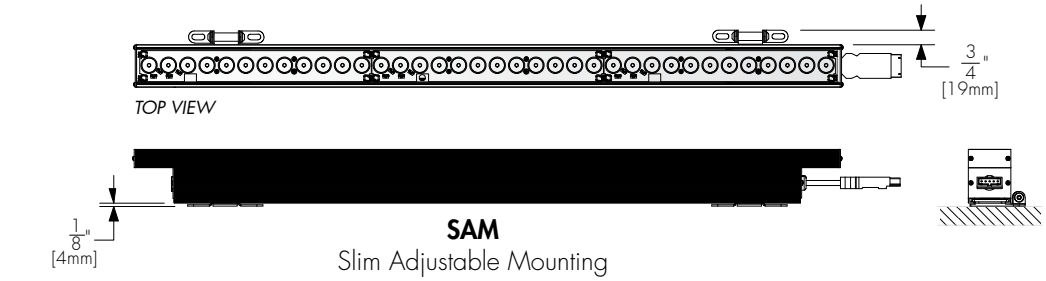
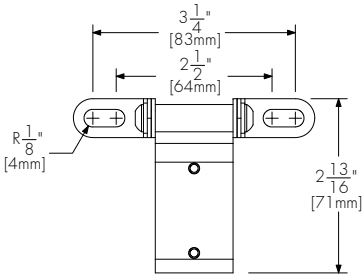
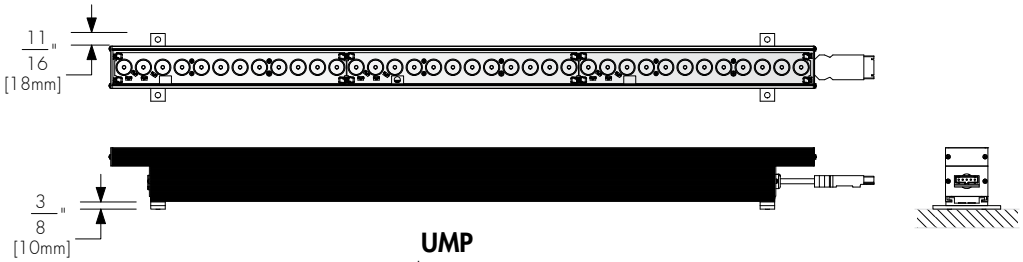
MOUNTING OPTIONS



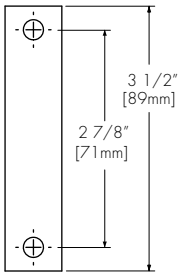
SAM
Slim Adjustable Mounting



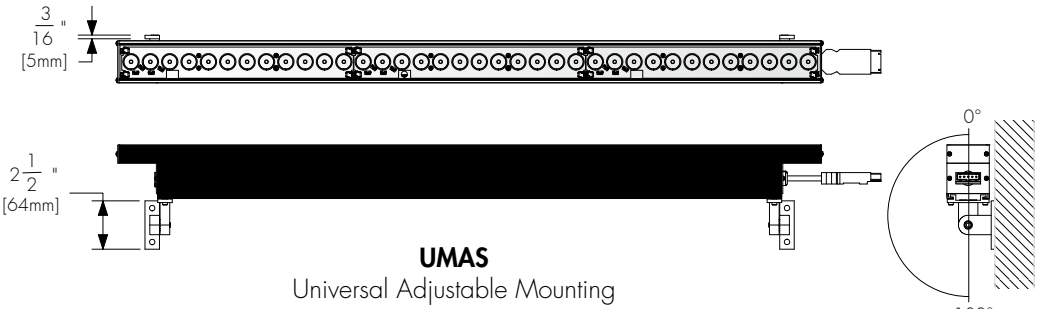
SAM
Mounting Hole Pattern



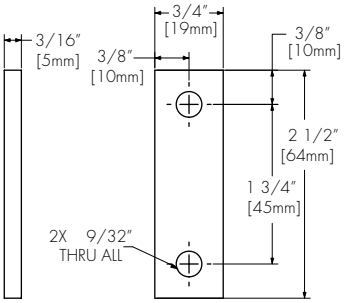
UMP
Fixed Mounting



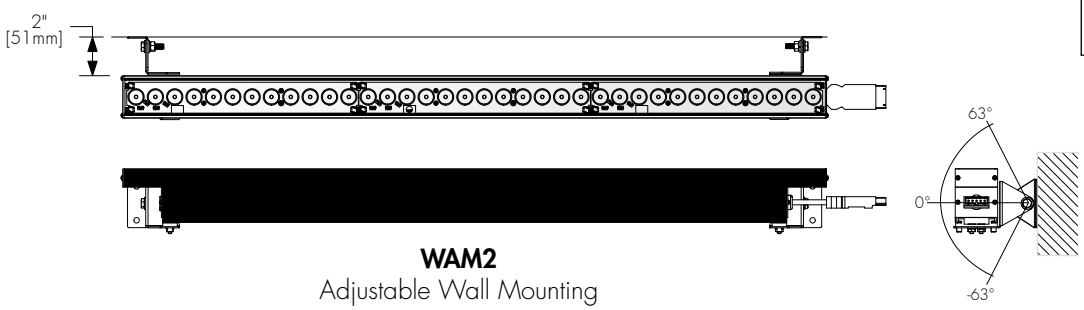
UMP
Mounting Hole Pattern



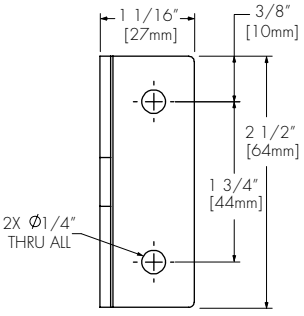
UMAS
Universal Adjustable Mounting



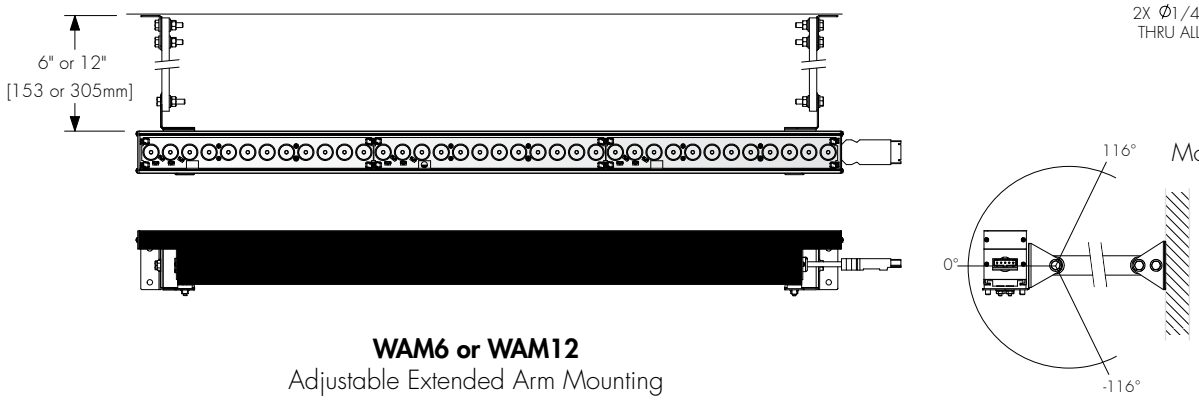
UMAS
Mounting Hole Pattern



WAM2
Adjustable Wall Mounting



WAM
Mounting Hole Pattern



WAM6 or WAM12
Adjustable Extended Arm Mounting

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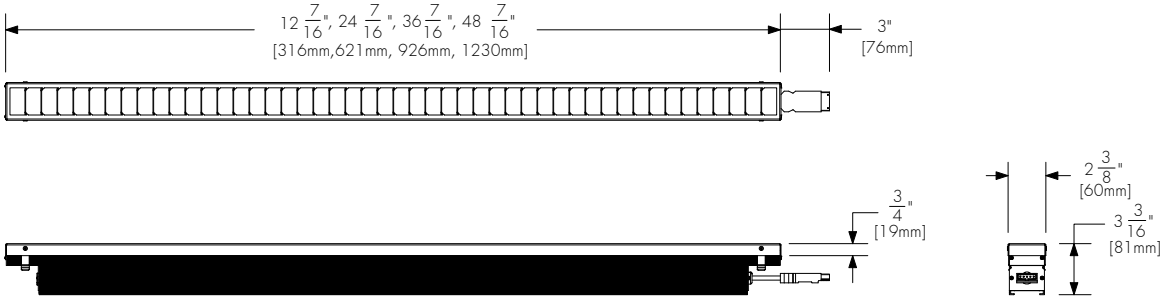
LOUVER ACCESSORY INSTALLATION DETAIL



LOGiRD
Radial Louver for Lumenfacade Interior
(see page 4 for ordering code)

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ACCESSORIES

Order separately

Control Systems:

LTO2 Lumentouch 2.0 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 :

LOGiLCD___ Leader Cable for Lumenfacade interior.
Please add desired cable length : 10, 25 or 50 feet
Sealing endcap is mandatory for any unused connector.
(1) included with every leader cable

Jumper Cable :

LOGiJCD___ Jumper Cable for Lumenfacade interior.
Please add desired cable length : 1, 2, 4, 8, 10, 15 or 20 feet

Radial Louver :

LOGiRD___-___ Radial louver for Lumenfacade.

1. Please specify desired nominal length: 1', 2', 3' or 4'.
2. Please specify finish as BK - Black SandText
   (Custom color available on request, please specify as CC together with RAL color : _____)

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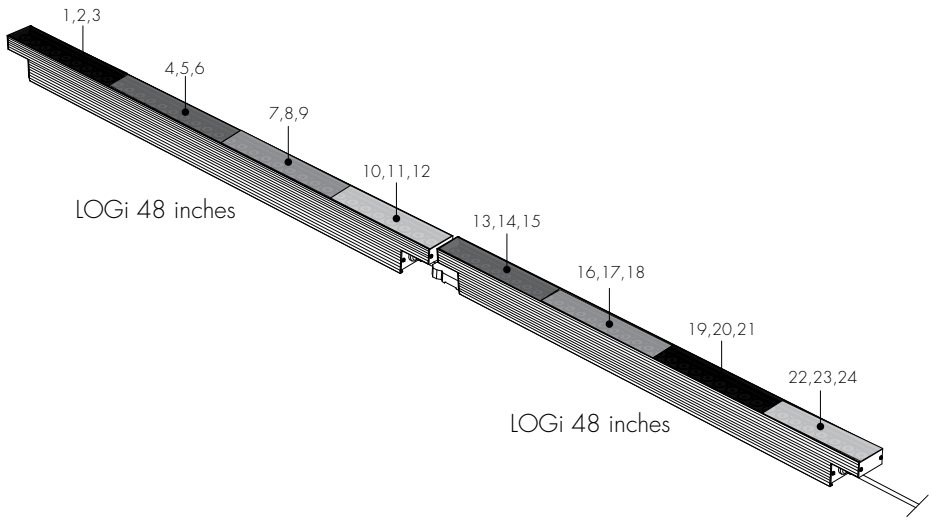
RESOLUTION DETAILS
APPLICABLE FOR DMX DIMMING OPTION ONLY

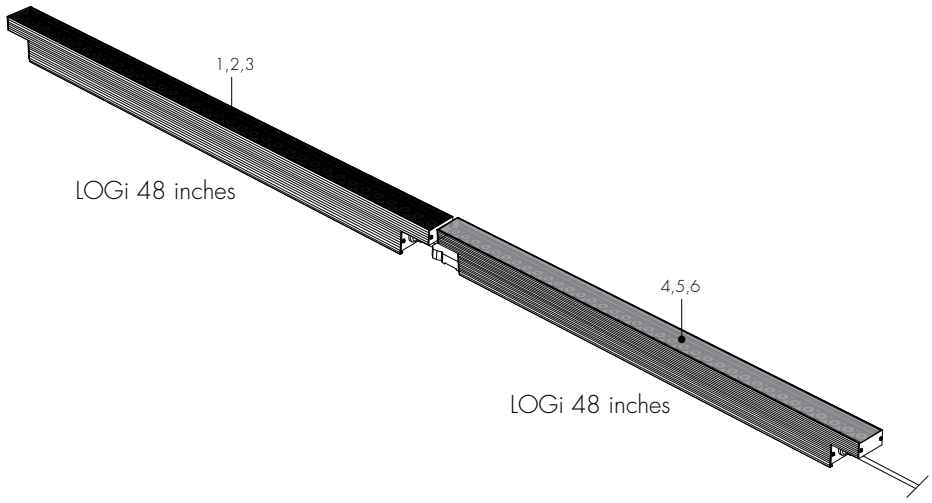
DMX 1FT - Resolution per foot: each foot is addressed independently (recommended for most installations)
1% minimum dimming value

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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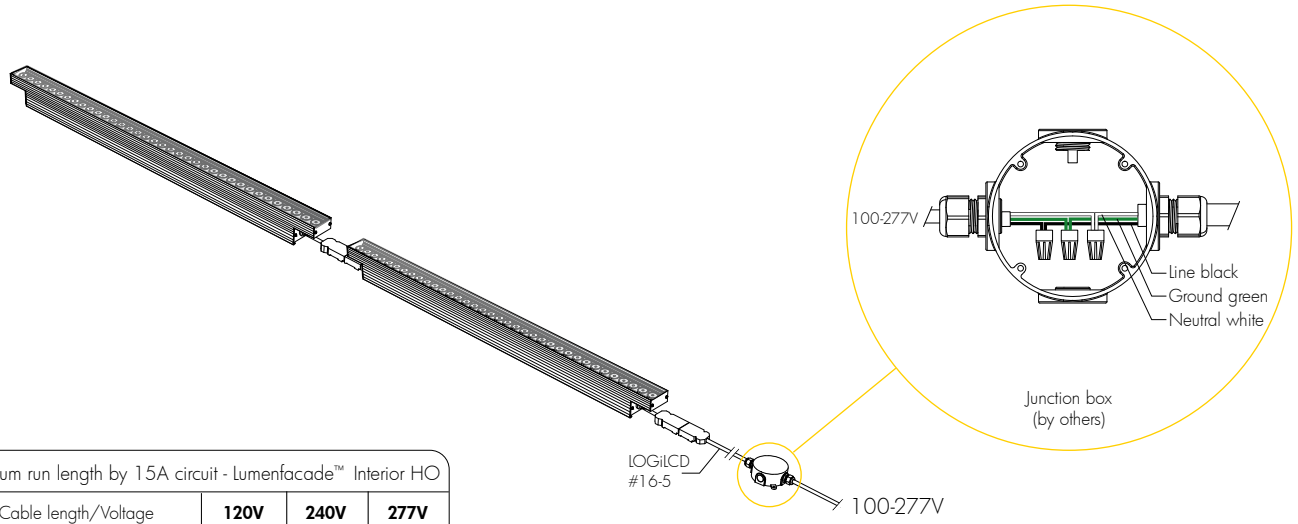
TYPICAL WIRING DIAGRAMS

Non-Dimming or Lumentalk Dimming Version

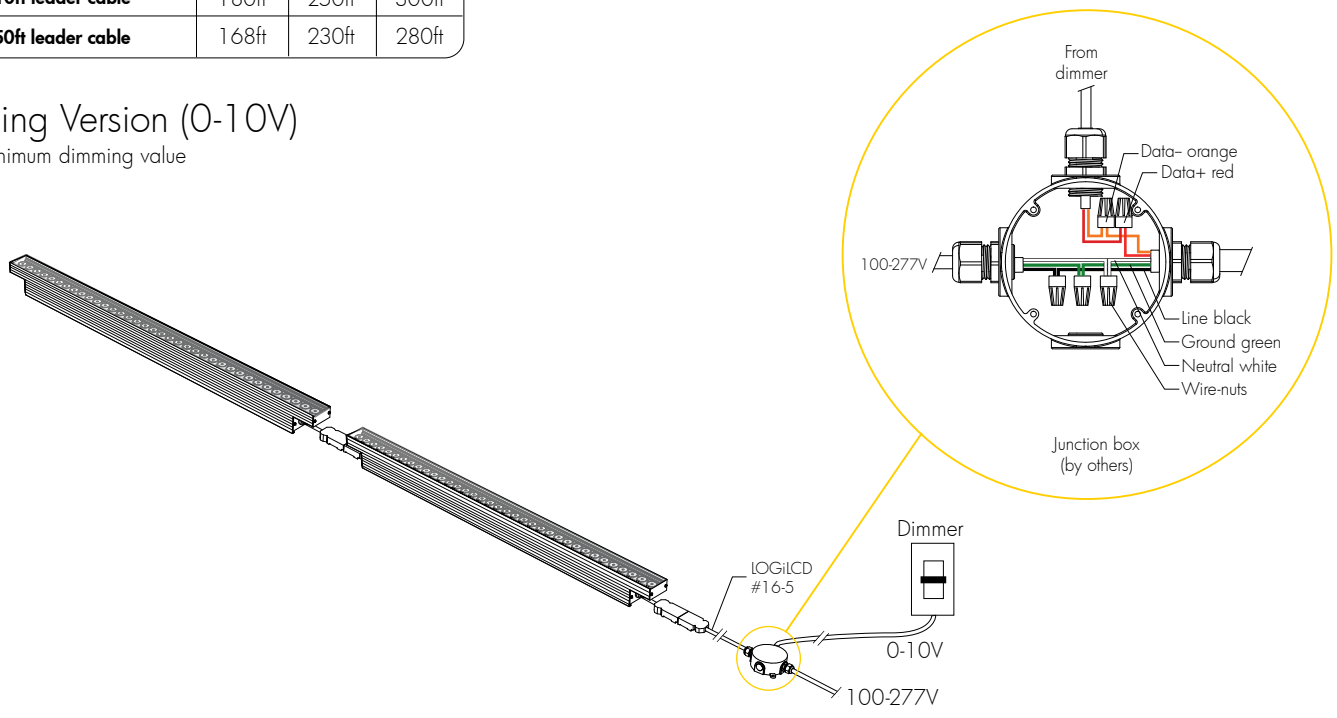


Maximum run length by 15A circuit - Lumenfacade™ Interior HO			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	88ft	100ft	112ft
50ft leader cable	68ft	76ft	84ft
Maximum run length by 15A circuit - Lumenfacade™ Interior RO			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	148ft	168ft	184ft
50ft leader cable	120ft	132ft	148ft

ASHRAE Code Compliant - Lumenfacade™ 5W/ft Maximum run length by 15A circuit			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	180ft	250ft	300ft
50ft leader cable	168ft	230ft	280ft

Dimming Version (0-10V)

10% minimum dimming value



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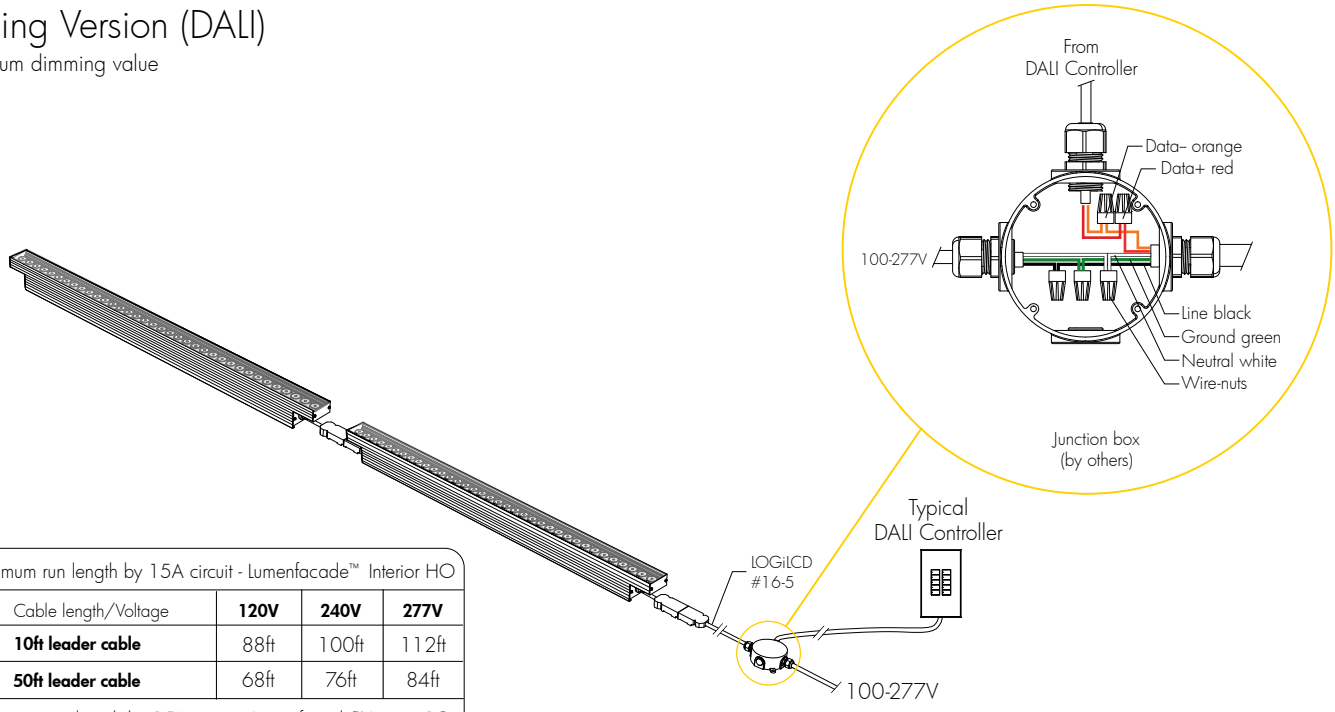
TYPICAL WIRING DIAGRAMS - continued

Dimming Version (DALI)

1% minimum dimming value



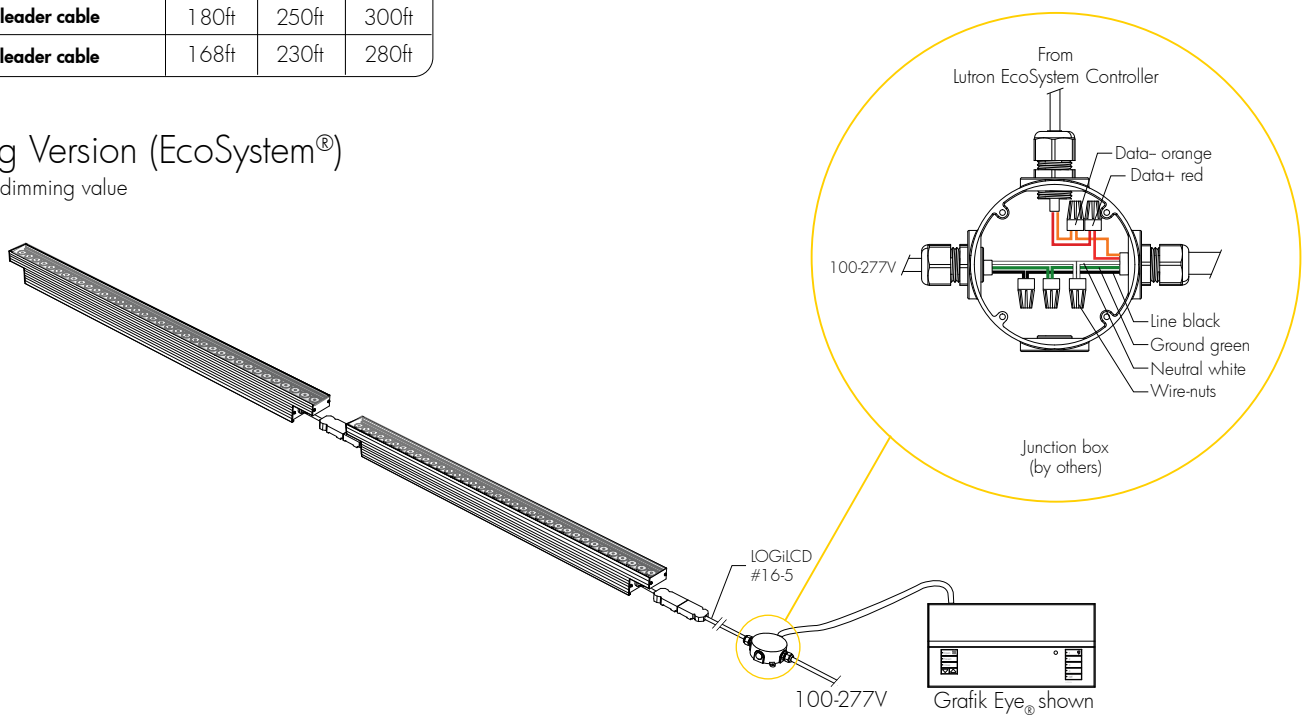
Maximum run length by 15A circuit - Lumenfacade™ Interior HO			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	88ft	100ft	112ft
50ft leader cable	68ft	76ft	84ft

Maximum run length by 15A circuit - Lumenfacade™ Interior RO			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	148ft	168ft	184ft
50ft leader cable	120ft	132ft	148ft

ASHRAE Code Compliant - Lumenfacade™ 5W/ft Maximum run length by 15A circuit			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	180ft	250ft	300ft
50ft leader cable	168ft	230ft	280ft

Dimming Version (EcoSystem®)

1% minimum dimming value



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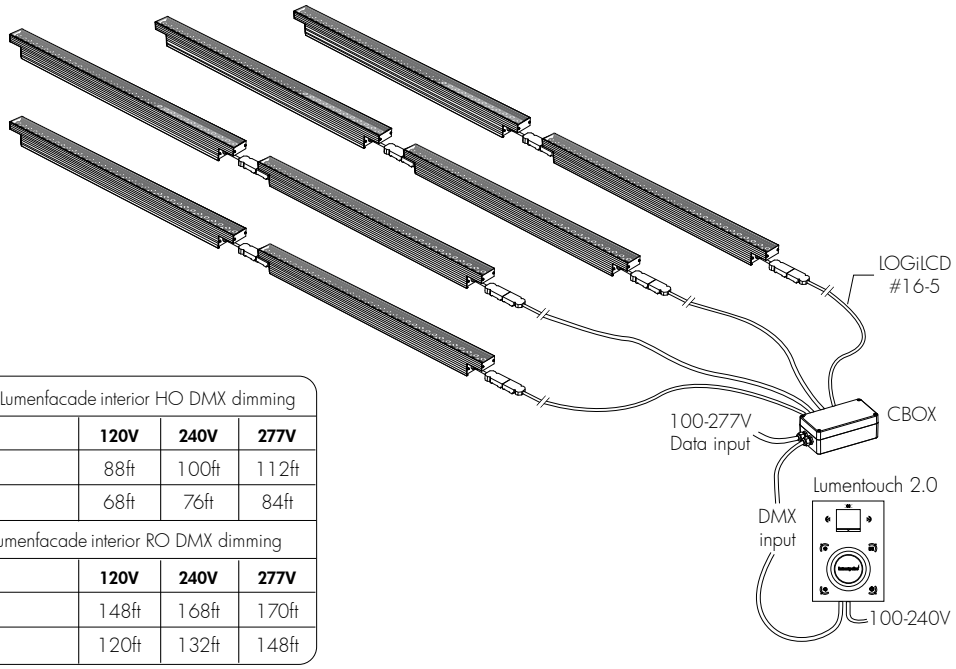
TYPICAL WIRING DIAGRAMS - continued

DMX Dimming Version (Star layout)

1% minimum dimming value



Maximum run length by 15A circuit - Lumenfacade interior HO DMX dimming			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	88ft	100ft	112ft
50ft leader cable	68ft	76ft	84ft
Maximum run length by 15A circuit - Lumenfacade interior RO DMX dimming			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	148ft	168ft	170ft
50ft leader cable	120ft	132ft	148ft

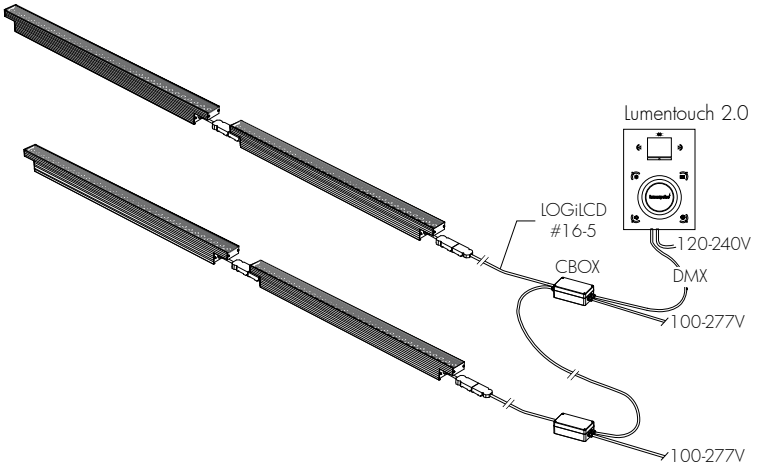
*Up to 170 individually addressable 1 foot sections per DMX run.
Consult factory for specific applications.

ASHRAE Code Compliant - Lumenfacade™ 5W/ft DMX dimming Maximum run length by 15A circuit			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	170ft	170ft	170ft
50ft leader cable	168ft	170ft	170ft

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

DMX Dimming Version (Daisy Chain Layout)

1% minimum dimming value



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Sustainable architectural LED lighting systems

HOW TO ORDER

LOGi Select:	Select:	Select:	Select:	Select:	Select:	Select:	Select:
Housing	Voltage	Length	Colors and color temperatures	Optic	Mounting Option	Finish	Control
1	2	3	4	5	6	7	8

1

Housing:

LOGi ASHRAE - Lumenfacade™ interior, 5W/ft, ASHRAE compliant

LOGi RO - Lumenfacade™ interior Regular Output,8.5W/ft

LOGi HO - Lumenfacade™ interior High Output, 15.25W/ft

2

Voltage:

100 - 100 volts
120 - 120 volts
208 - 208 volts
220 - 220 volts
240 - 240 volts
277 - 277 volts

3

Length:

12 - 12 3/8 inches (314mm) (0.95 kg/2.1 lbs)
24 - 24 3/8 inches (619mm) (1.68 kg/3.7 lbs)
36 - 36 3/8 inches (924mm) (2.41 kg/5.3 lbs)
48 - 48 3/8 inches (1229mm) (3.08 kg/6.8 lbs)

4

Colors and Color temperatures:

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

5

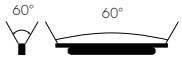
Optics:

10x10 - 10° x 10°
*For best results use with HO fixtures at a 6-inch (15cm) setback from surface. Contact factory for application support.

10x60 - 10° x 60°

30x60 - 30° x 60°

60x60 - 60° x 60°



6

Mounting Option:

SAM - Slim Adjustable Mounting
UMP - Fixed Mounting
UMAS - Universal Adjustable Mounting
WAM2 - Adjustable Wall Mounting 2"
WAM6 - Adjustable Extended Arm Mounting 6"
WAM12 - Adjustable Extended Arm Mounting 12"

7

Finish:

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

8

Control:

NO - No Dimming
LT - Lumentalk Dimming (available for 2', 3' and 4' 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 for 2', 3' and 4' lengths only) (1% minimum dimming value)

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SPECIFICATION SHEET

lumenfacade™

INTERIOR
WHITE & STATIC COLORS

Client: _____

Project name: _____

Order #: _____

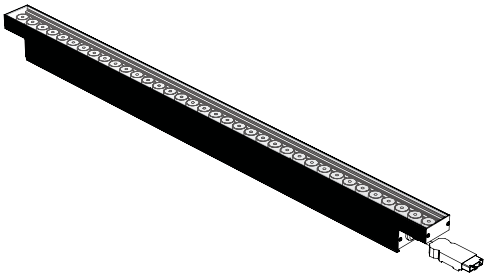
Type: _____ Qty: _____

L6

FEATURES AND BENEFITS

Physical :

- Low copper content extruded aluminum housing
- Available in 1', 2', 3' or 4' sections
- Electro-statically applied polyester powder coat finish
- Aluminum end caps
- Stainless steel hardware
- Clear acrylic lens
- 10° x 10°, 10° x 60°, 30° x 60° or 60° x 60° optics
- Interior applications only



Performance :

- Minimum 1fc (10.7 lux) @ 114.7 feet (34.9m) distance (4000K, 10° x 60° optic, HO version)
- 2,455 delivered lumens and 13,172 candelas at nadir (4000K, 4' unit, 10° x 60° optic, HO version)
- CRI values: 85+ (2700K), 80+ (3000K), 78+ (4000K)
- Lumen maintenance 120,000 hrs [L70 @ 25°C]
- Lumen measurements comply with LM - 79 - 08 standard
- Resolution per foot or per fixture (see page 5)
- Operating temperatures: -25° C to 50° C [-13F to 122F]

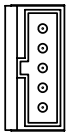
Electrical :

- Line voltage luminaire for 100 to 277 volts
- Power and data in 1 cable (#16)
- Up to 88 feet with a single 120V power feed, HO version
- 5W/ft version meets ASHRAE standards for linear lighting on building facades
- 8.5W/ft (15.25W/ft HO version)
- Dimming options: 0-10 volt, DMX, DALI, Lumentalk, or Lutron® EcoSystem® enabled

c UL us CE RoHS

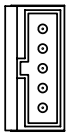
lumentalk EcoSystem Enabled

Wiring detail

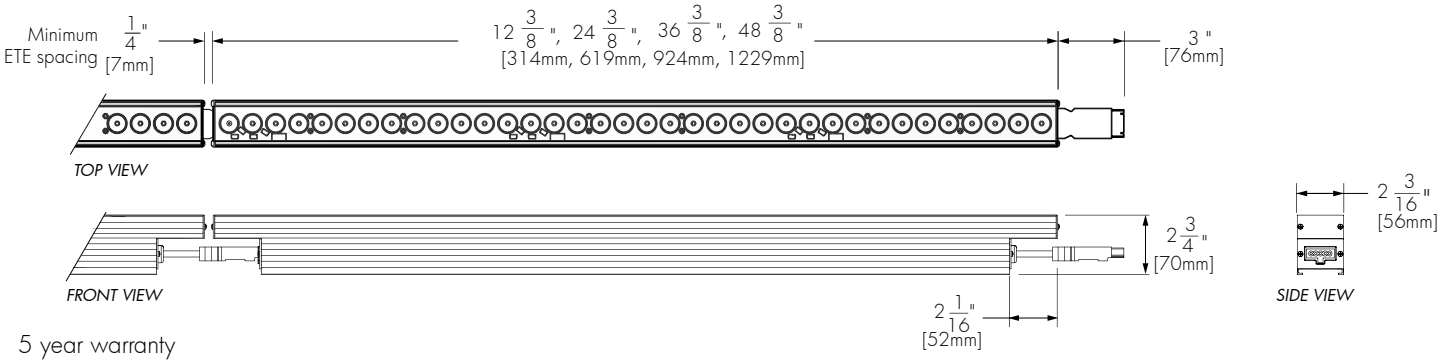


PIN ID /	WIRE COLOR /	USE
(N)	WHITE	NEUTRAL
(⏚)	GREEN	GROUND
(1)	BLACK	LIVE 120-277V
(2)	ORANGE	0-10V / DATA-
(3)	RED	0-10V / DATA+

CE Wiring detail



PIN ID /	WIRE COLOR /	USE
(N)	BLUE	NEUTRAL
(⏚)	GREEN/YELLOW	GROUND
(1)	BROWN	LIVE 120-277V
(2)	GRAY	0-10V / DATA-
(3)	BLACK	0-10V / DATA+



5 year warranty

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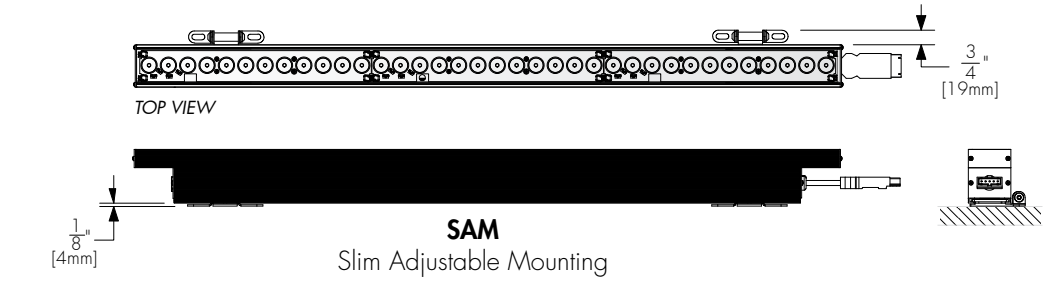
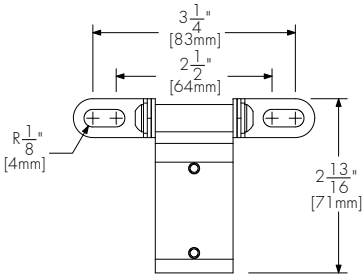
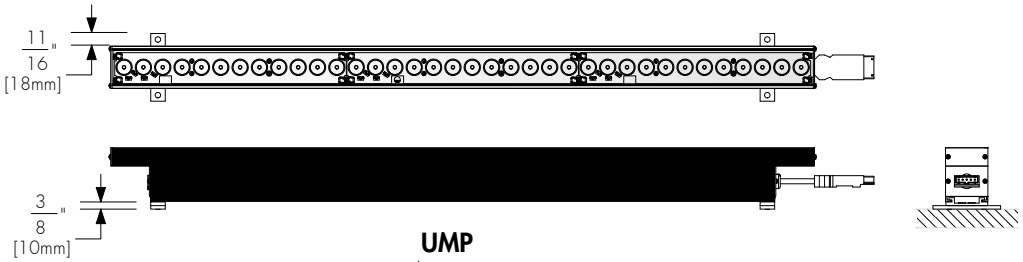
MOUNTING OPTIONS



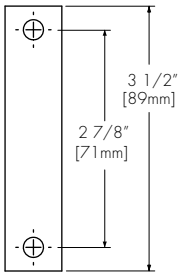
SAM
Slim Adjustable Mounting



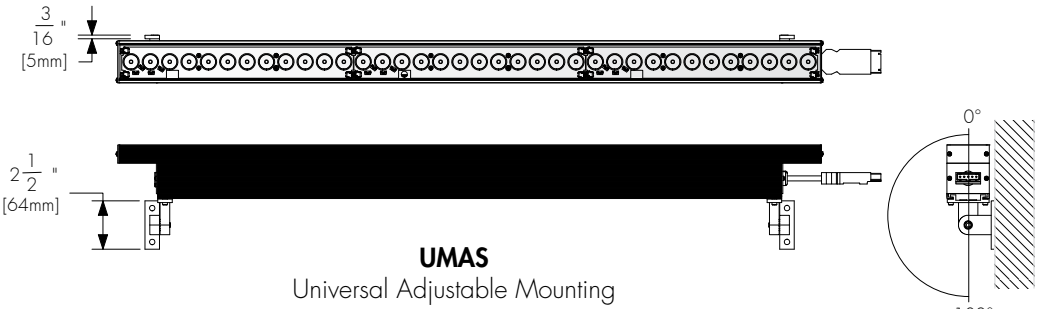
SAM
Mounting Hole Pattern



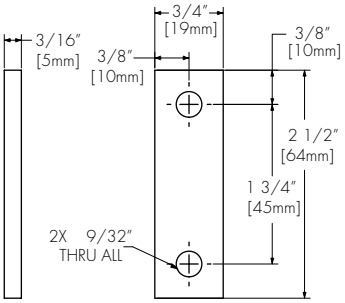
UMP
Fixed Mounting



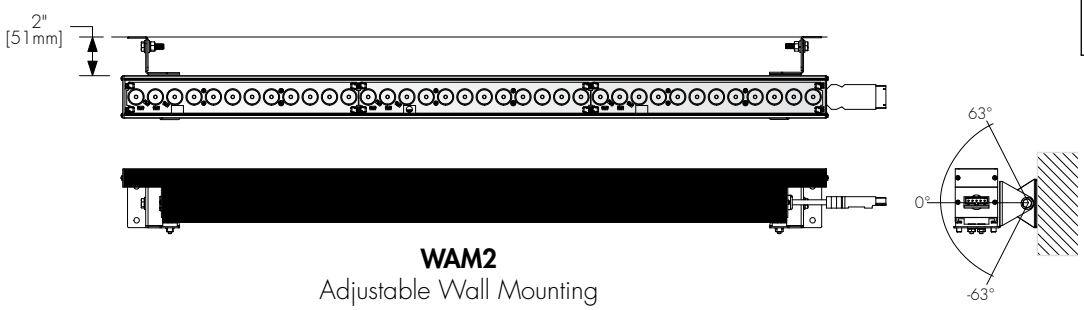
UMP
Mounting Hole Pattern



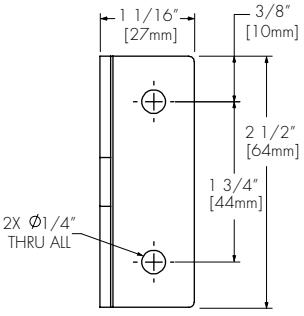
UMAS
Universal Adjustable Mounting



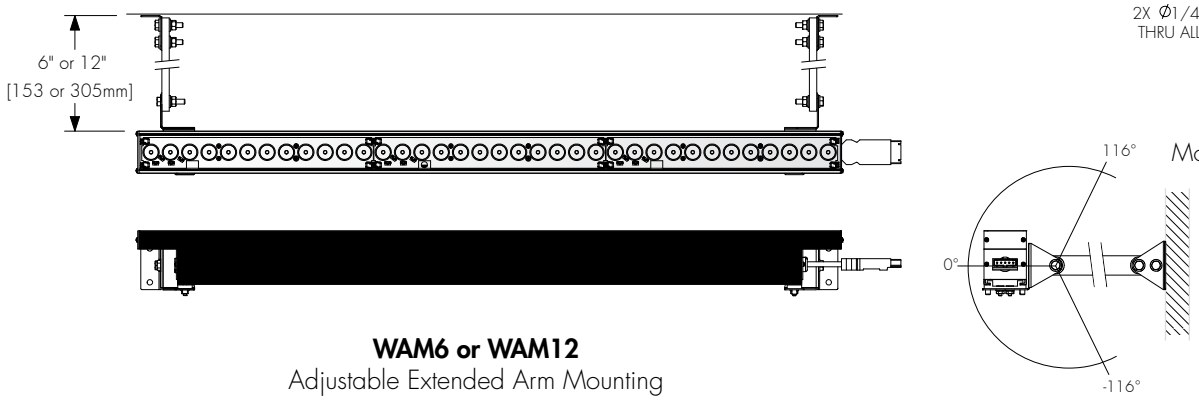
UMAS
Mounting Hole Pattern



WAM2
Adjustable Wall Mounting



WAM
Mounting Hole Pattern



WAM6 or WAM12
Adjustable Extended Arm Mounting

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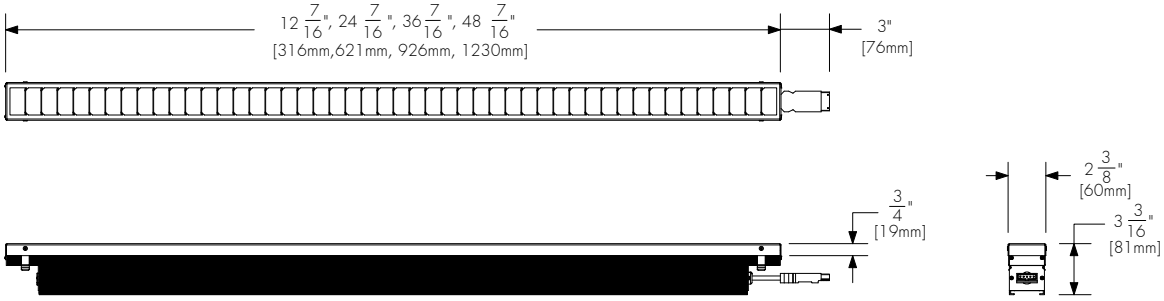
LOUVER ACCESSORY INSTALLATION DETAIL



LOGiRD
Radial Louver for Lumenfacade Interior
(see page 4 for ordering code)

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ACCESSORIES

Order separately

Control Systems:

LTO2 Lumentouch 2.0 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 :

LOGiLCD___ Leader Cable for Lumenfacade interior.
Please add desired cable length : 10, 25 or 50 feet
Sealing endcap is mandatory for any unused connector.
(1) included with every leader cable

Jumper Cable :

LOGiJCD___ Jumper Cable for Lumenfacade interior.
Please add desired cable length : 1, 2, 4, 8, 10, 15 or 20 feet

Radial Louver :

LOGiRD___-___ Radial louver for Lumenfacade.

1. Please specify desired nominal length: 1', 2', 3' or 4'.
2. Please specify finish as BK - Black SandText
   (Custom color available on request, please specify as CC together with RAL color : _____)

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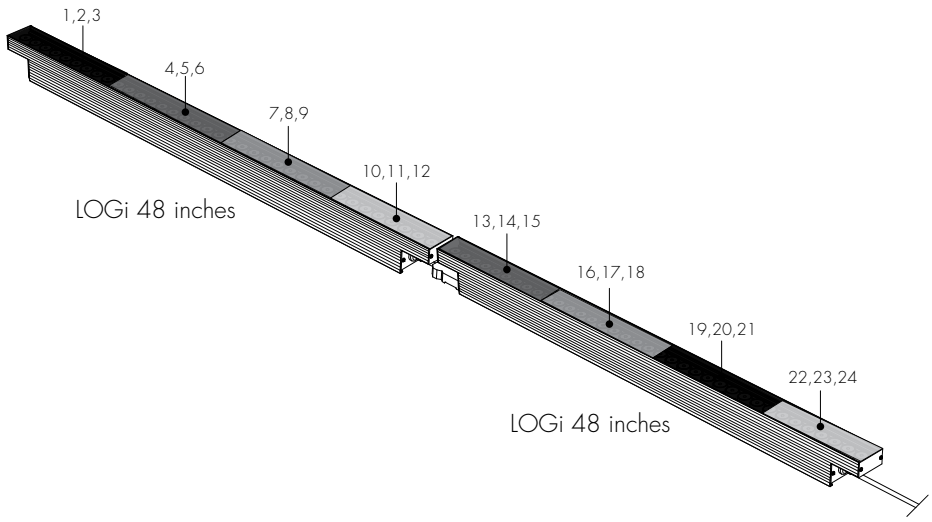
RESOLUTION DETAILS
APPLICABLE FOR DMX DIMMING OPTION ONLY

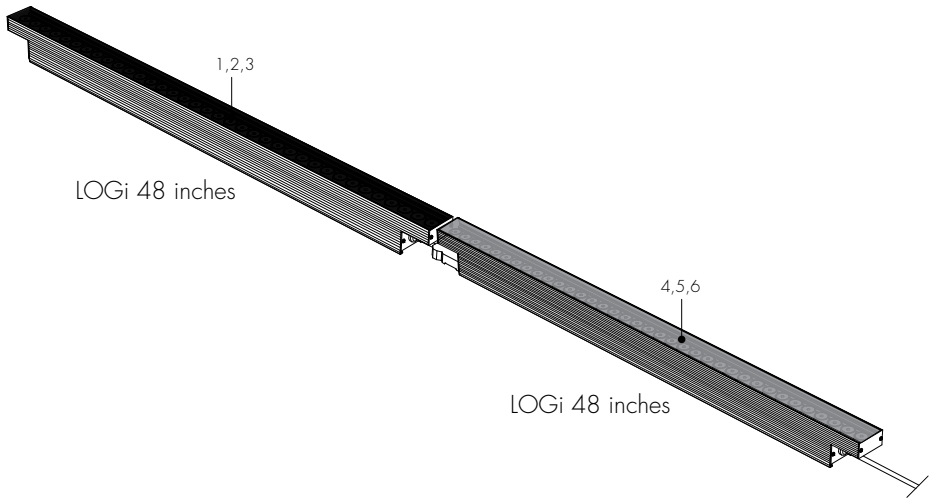
DMX 1FT - Resolution per foot: each foot is addressed independently (recommended for most installations)
1% minimum dimming value

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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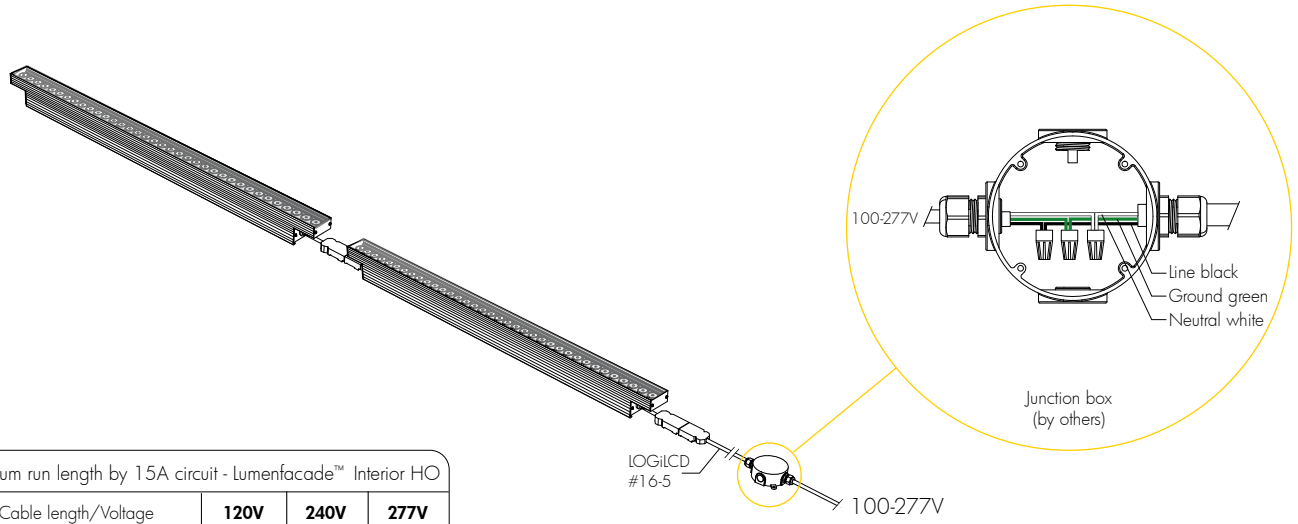
TYPICAL WIRING DIAGRAMS

Non-Dimming or Lumentalk Dimming Version

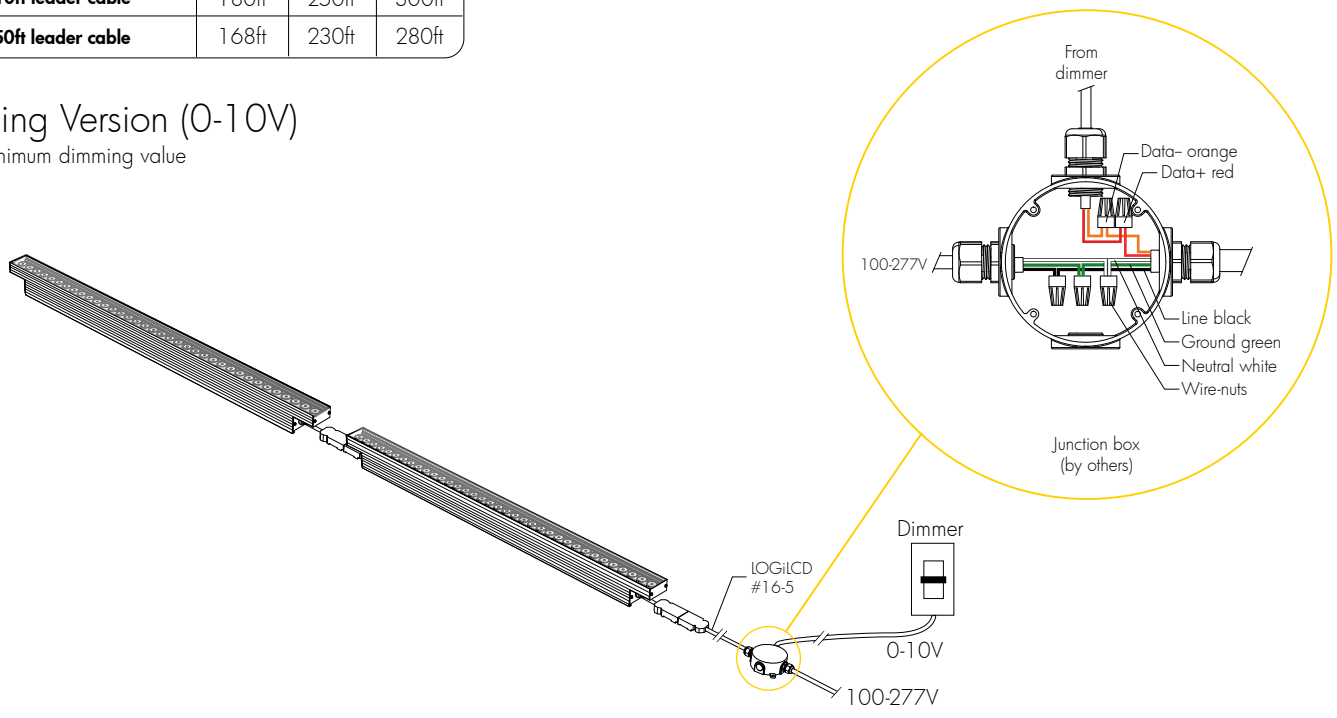


Maximum run length by 15A circuit - Lumenfacade™ Interior HO			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	88ft	100ft	112ft
50ft leader cable	68ft	76ft	84ft
Maximum run length by 15A circuit - Lumenfacade™ Interior RO			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	148ft	168ft	184ft
50ft leader cable	120ft	132ft	148ft

ASHRAE Code Compliant - Lumenfacade™ 5W/ft Maximum run length by 15A circuit			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	180ft	250ft	300ft
50ft leader cable	168ft	230ft	280ft

Dimming Version (0-10V)

10% minimum dimming value



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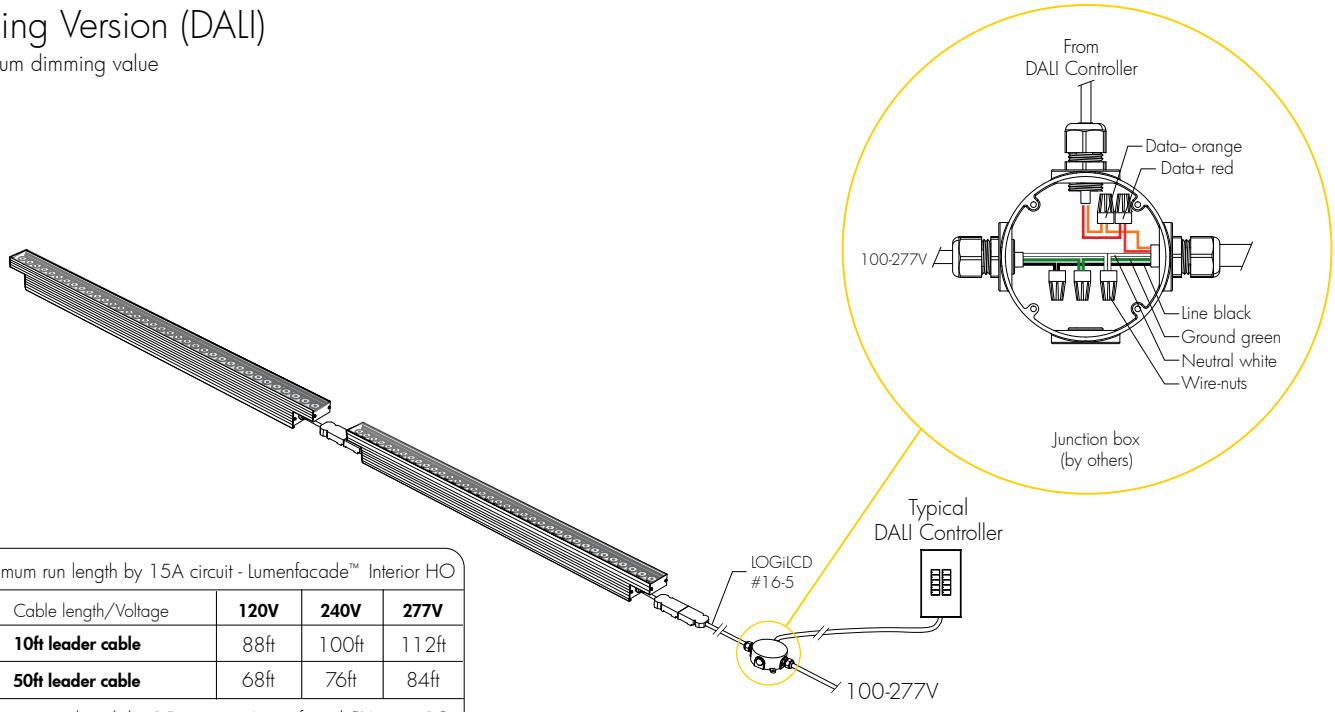
TYPICAL WIRING DIAGRAMS - continued

Dimming Version (DALI)

1% minimum dimming value



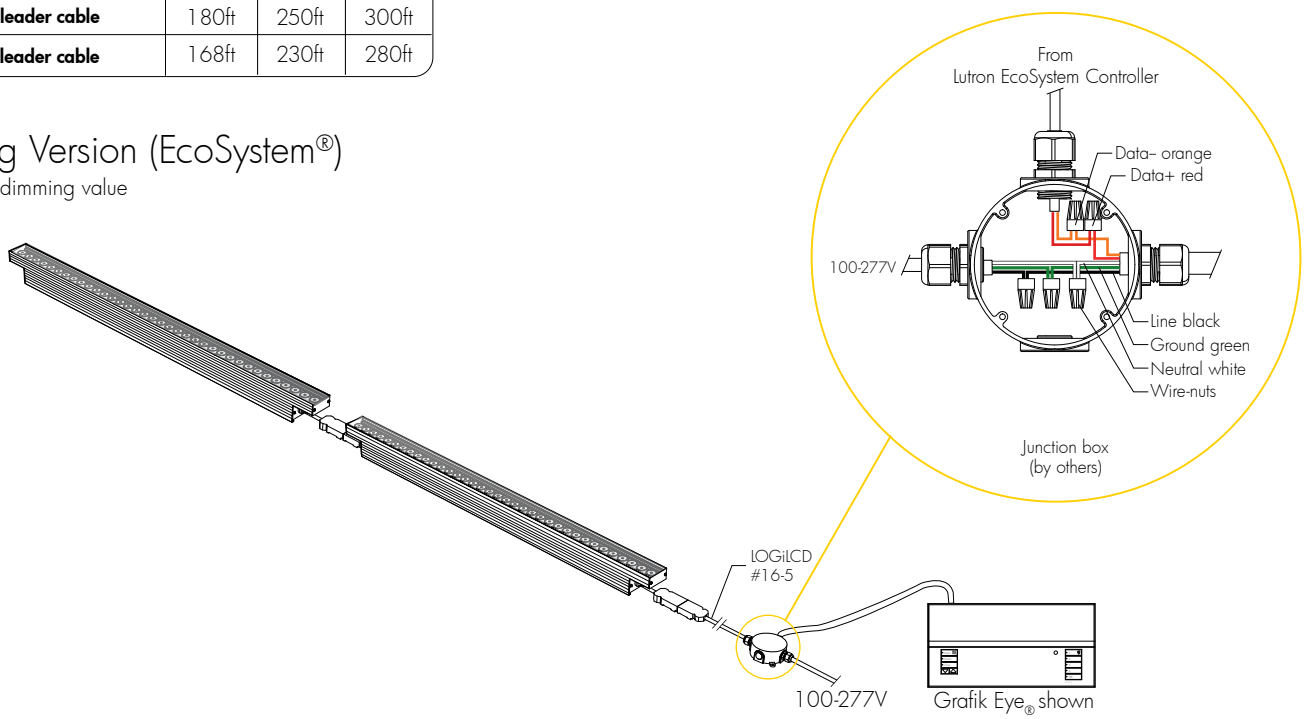
Maximum run length by 15A circuit - Lumenfacade™ Interior HO			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	88ft	100ft	112ft
50ft leader cable	68ft	76ft	84ft

Maximum run length by 15A circuit - Lumenfacade™ Interior RO			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	148ft	168ft	184ft
50ft leader cable	120ft	132ft	148ft

ASHRAE Code Compliant - Lumenfacade™ 5W/ft Maximum run length by 15A circuit			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	180ft	250ft	300ft
50ft leader cable	168ft	230ft	280ft

Dimming Version (EcoSystem®)

1% minimum dimming value



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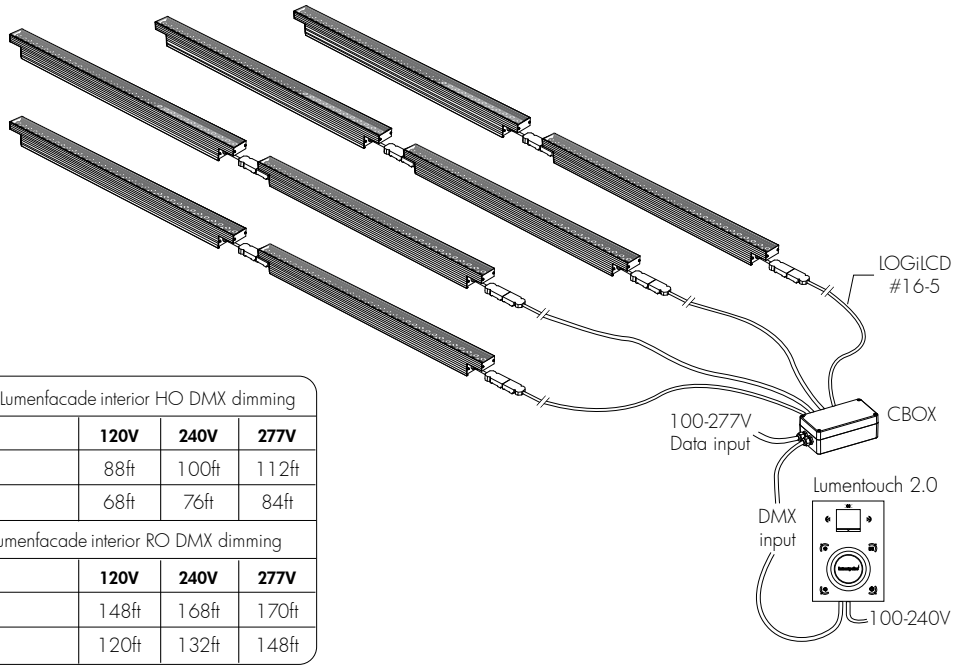
TYPICAL WIRING DIAGRAMS - continued

DMX Dimming Version (Star layout)

1% minimum dimming value



Maximum run length by 15A circuit - Lumenfacade interior HO DMX dimming			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	88ft	100ft	112ft
50ft leader cable	68ft	76ft	84ft
Maximum run length by 15A circuit - Lumenfacade interior RO DMX dimming			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	148ft	168ft	170ft
50ft leader cable	120ft	132ft	148ft

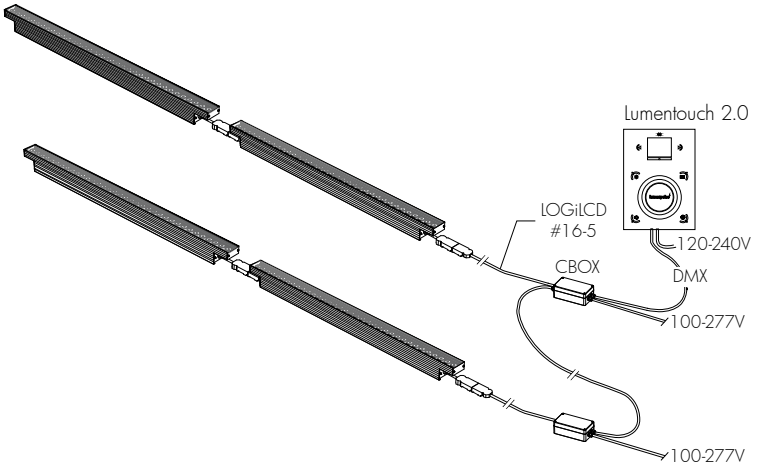
*Up to 170 individually addressable 1 foot sections per DMX run.
Consult factory for specific applications.

ASHRAE Code Compliant - Lumenfacade™ 5W/ft DMX dimming Maximum run length by 15A circuit			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	170ft	170ft	170ft
50ft leader cable	168ft	170ft	170ft

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

DMX Dimming Version (Daisy Chain Layout)

1% minimum dimming value



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AJ - R30

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Sustainable architectural LED lighting systems

HOW TO ORDER

LOGi Select:	Select:	Select:	Select:	Select:	Select:	Select:	Select:
Housing	Voltage	Length	Colors and color temperatures	Optic	Mounting Option	Finish	Control
1	2	3	4	5	6	7	8

1

Housing:

LOGi ASHRAE - Lumenfacade™ interior, 5W/ft, ASHRAE compliant

LOGi RO - Lumenfacade™ interior Regular Output,8.5W/ft

LOGi HO - Lumenfacade™ interior High Output, 15.25W/ft

2

Voltage:

100 - 100 volts
120 - 120 volts
208 - 208 volts
220 - 220 volts
240 - 240 volts
277 - 277 volts

3

Length:

12 - 12 3/8 inches (314mm) (0.95 kg/2.1 lbs)
24 - 24 3/8 inches (619mm) (1.68 kg/3.7 lbs)
36 - 36 3/8 inches (924mm) (2.41 kg/5.3 lbs)
48 - 48 3/8 inches (1229mm) (3.08 kg/6.8 lbs)

4

Colors and Color temperatures:

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

5

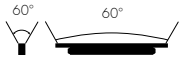
Optics:

10x10 - 10° x 10°
*For best results use with HO fixtures at a 6-inch (15cm) setback from surface. Contact factory for application support.

10x60 - 10° x 60°

30x60 - 30° x 60°

60x60 - 60° x 60°



6

Mounting Option:

SAM - Slim Adjustable Mounting
UMP - Fixed Mounting
UMAS - Universal Adjustable Mounting
WAM2 - Adjustable Wall Mounting 2"
WAM6 - Adjustable Extended Arm Mounting 6"
WAM12 - Adjustable Extended Arm Mounting 12"

7

Finish:

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

8

Control:

NO - No Dimming
LT - Lumentalk Dimming (available for 2', 3' and 4' 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 for 2', 3' and 4' lengths only) (1% minimum dimming value)

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SPECIFICATION SHEET

lumenfacade™

INTERIOR
WHITE & STATIC COLORS

Client: _____

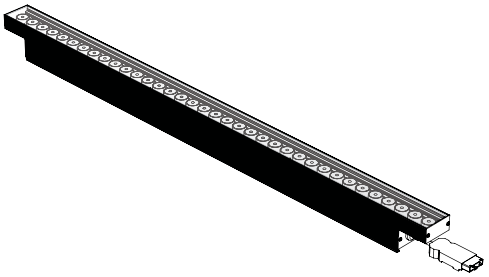
Project name: _____

Order #: _____

Type: _____ Qty: _____

L7

FEATURES AND BENEFITS



Physical :

- Low copper content extruded aluminum housing
- Available in 1', 2', 3' or 4' sections
- Electro-statically applied polyester powder coat finish
- Aluminum end caps
- Stainless steel hardware
- Clear acrylic lens
- 10° x 10°, 10° x 60°, 30° x 60° or 60° x 60° optics
- Interior applications only

Performance :

- Minimum 1fc (10.7 lux) @ 114.7 feet (34.9m) distance (4000K, 10° x 60° optic, HO version)
- 2,455 delivered lumens and 13,172 candelas at nadir (4000K, 4' unit, 10° x 60° optic, HO version)
- CRI values: 85+ (2700K), 80+ (3000K), 78+ (4000K)
- Lumen maintenance 120,000 hrs [L70 @ 25°C]
- Lumen measurements comply with LM - 79 - 08 standard
- Resolution per foot or per fixture (see page 5)
- Operating temperatures: -25° C to 50° C [-13F to 122F]

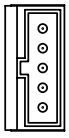
Electrical :

- Line voltage luminaire for 100 to 277 volts
- Power and data in 1 cable (#16)
- Up to 88 feet with a single 120V power feed, HO version
- 5W/ft version meets ASHRAE standards for linear lighting on building facades
- 8.5W/ft (15.25W/ft HO version)
- Dimming options: 0-10 volt, DMX, DALI, Lumentalk, or Lutron® EcoSystem® enabled

c UL us CE RoHS

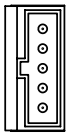
lumentalk EcoSystem Enabled

Wiring detail

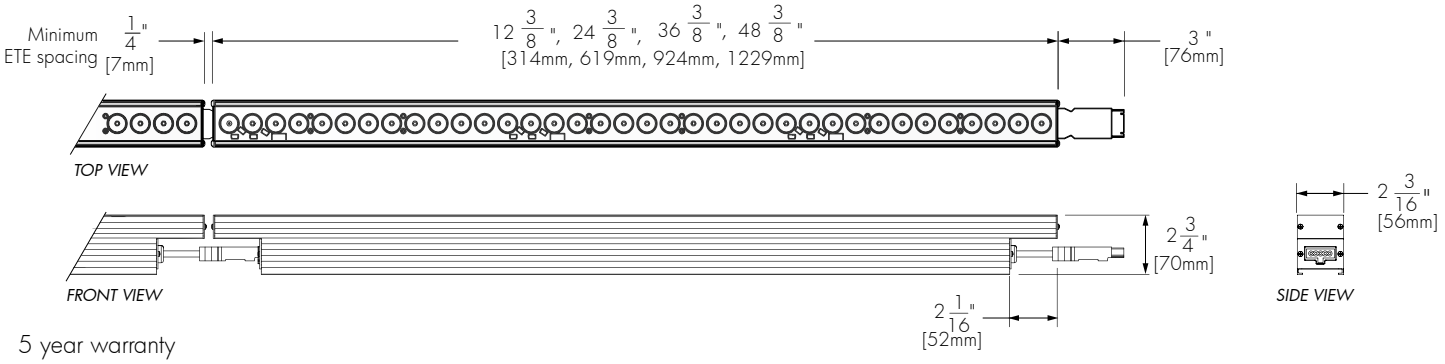


PIN ID /	WIRE COLOR /	USE
(N)	WHITE	NEUTRAL
(⏚)	GREEN	GROUND
(1)	BLACK	LIVE 120-277V
(2)	ORANGE	0-10V / DATA-
(3)	RED	0-10V / DATA+

CE Wiring detail



PIN ID /	WIRE COLOR /	USE
(N)	BLUE	NEUTRAL
(⏚)	GREEN/YELLOW	GROUND
(1)	BROWN	LIVE 120-277V
(2)	GRAY	0-10V / DATA-
(3)	BLACK	0-10V / DATA+



5 year warranty

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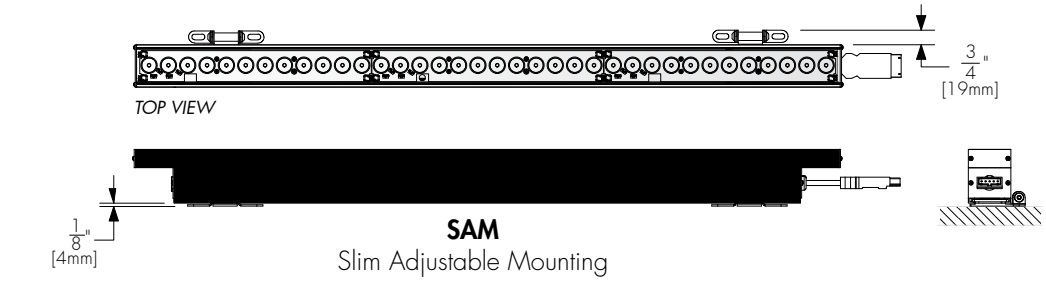
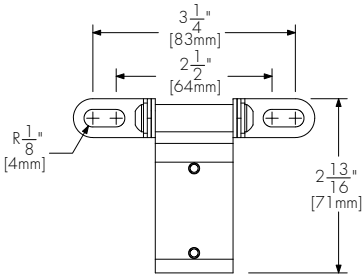
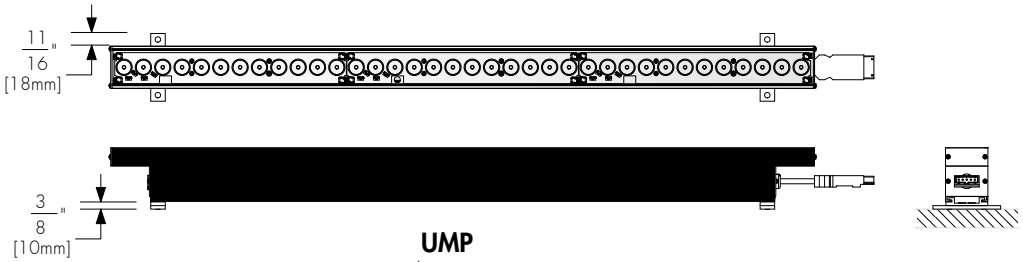
MOUNTING OPTIONS



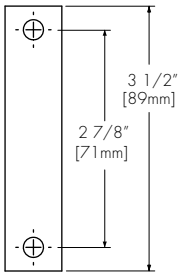
SAM
Slim Adjustable Mounting



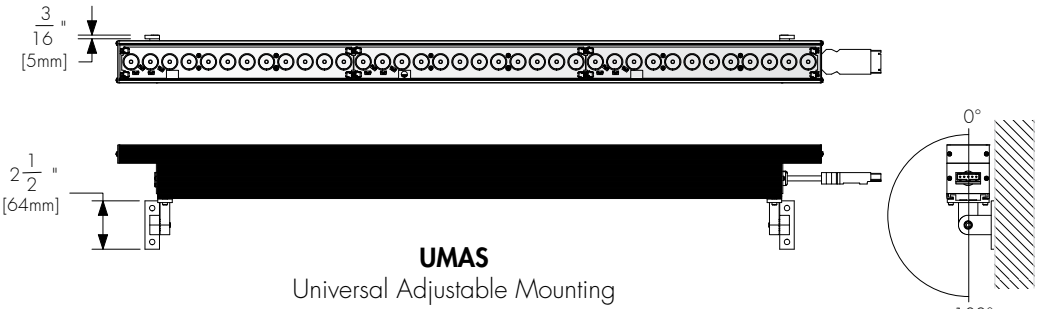
SAM
Mounting Hole Pattern



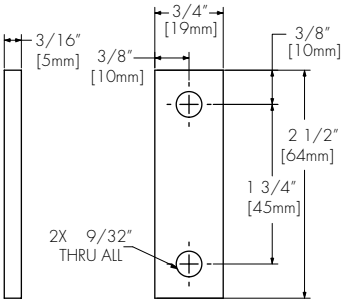
UMP
Fixed Mounting



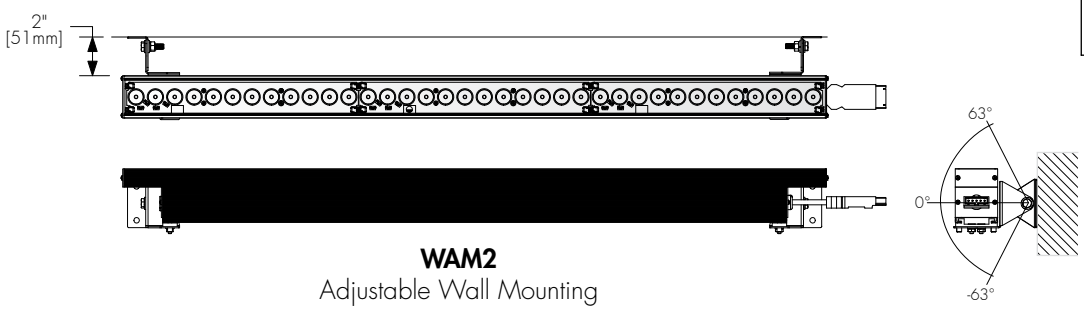
UMP
Mounting Hole Pattern



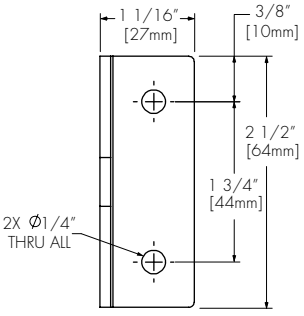
UMAS
Universal Adjustable Mounting



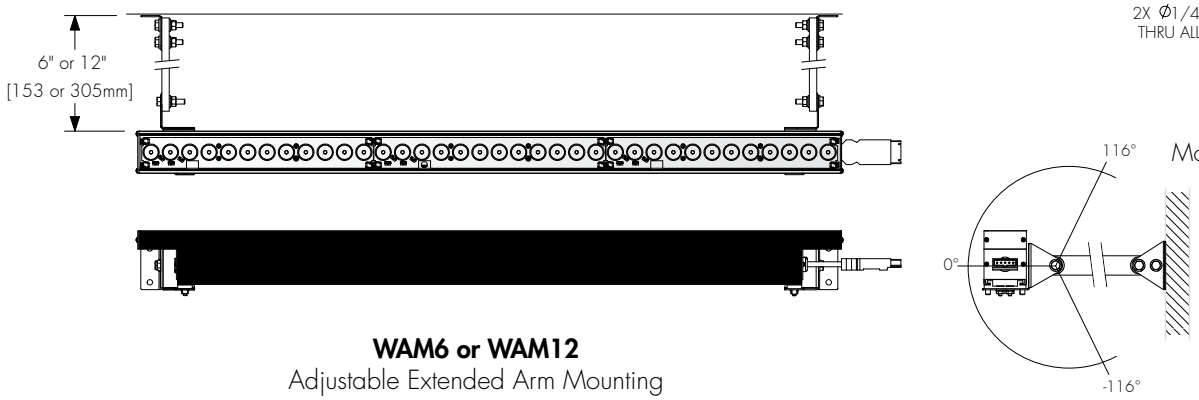
UMAS
Mounting Hole Pattern



WAM2
Adjustable Wall Mounting



WAM
Mounting Hole Pattern



WAM6 or WAM12
Adjustable Extended Arm Mounting

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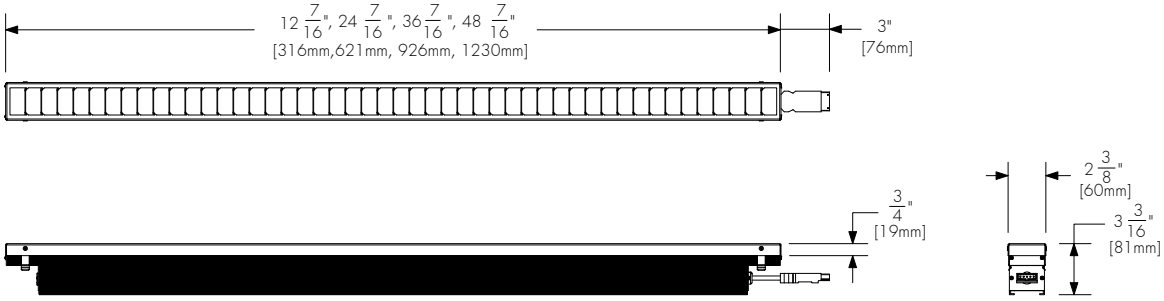
LOUVER ACCESSORY INSTALLATION DETAIL



LOGiRD
Radial Louver for Lumenfacade Interior
(see page 4 for ordering code)

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ACCESSORIES

Order separately

Control Systems:

LTO2 Lumentouch 2.0 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 :

LOGiLCD___ Leader Cable for Lumenfacade interior.
Please add desired cable length : 10, 25 or 50 feet
Sealing endcap is mandatory for any unused connector.
(1) included with every leader cable

Jumper Cable :

LOGiJCD___ Jumper Cable for Lumenfacade interior.
Please add desired cable length : 1, 2, 4, 8, 10, 15 or 20 feet

Radial Louver :

LOGiRD___-___ Radial louver for Lumenfacade.

1. Please specify desired nominal length: 1', 2', 3' or 4'.
2. Please specify finish as BK - Black SandText
   (Custom color available on request, please specify as CC together with RAL color : _____)

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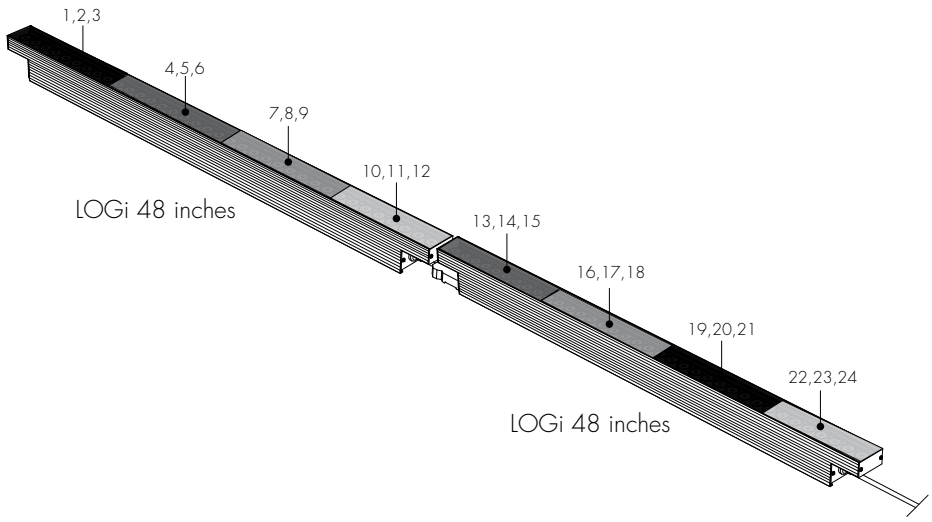
RESOLUTION DETAILS
APPLICABLE FOR DMX DIMMING OPTION ONLY

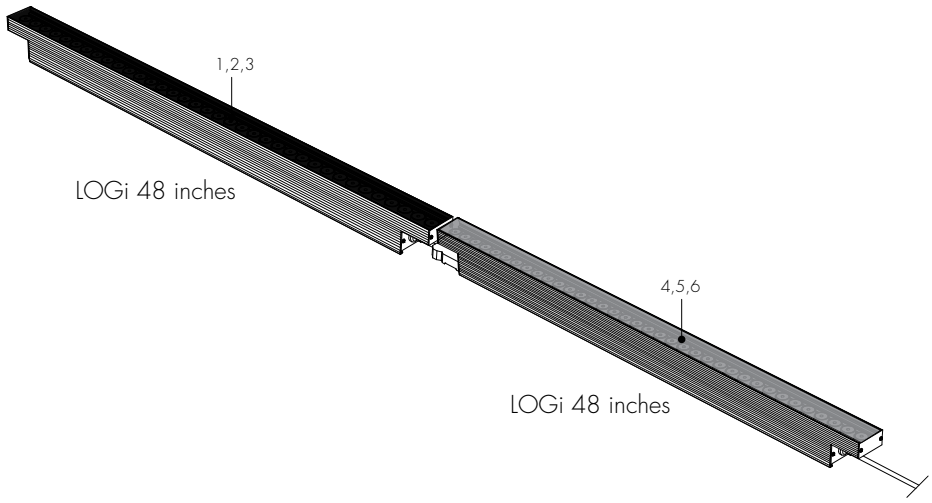
DMX 1FT - Resolution per foot: each foot is addressed independently (recommended for most installations)
1% minimum dimming value

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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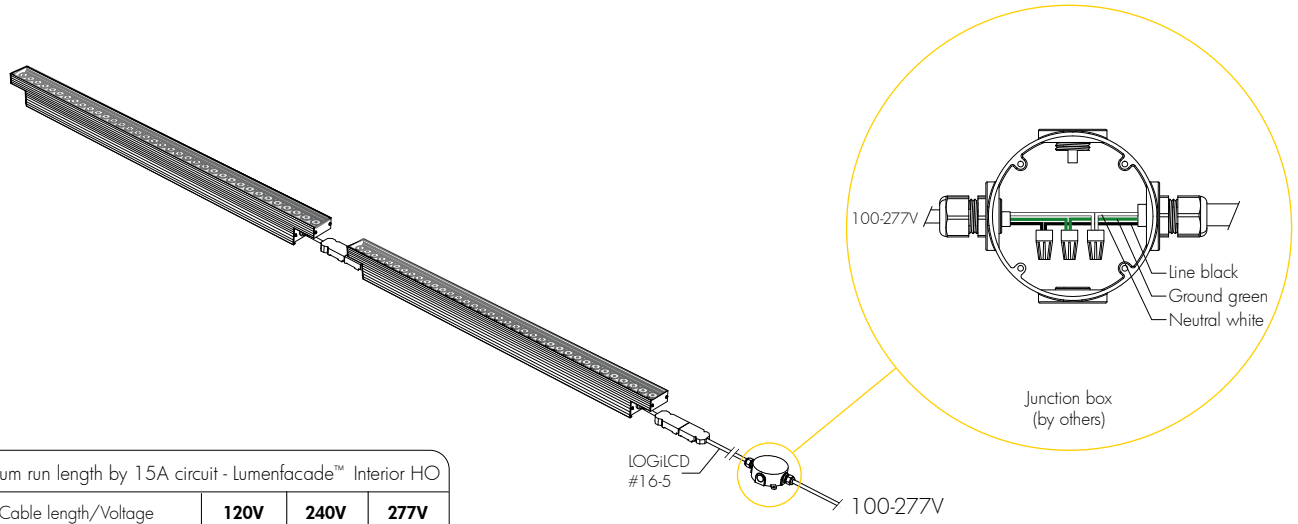
TYPICAL WIRING DIAGRAMS

Non-Dimming or Lumentalk Dimming Version

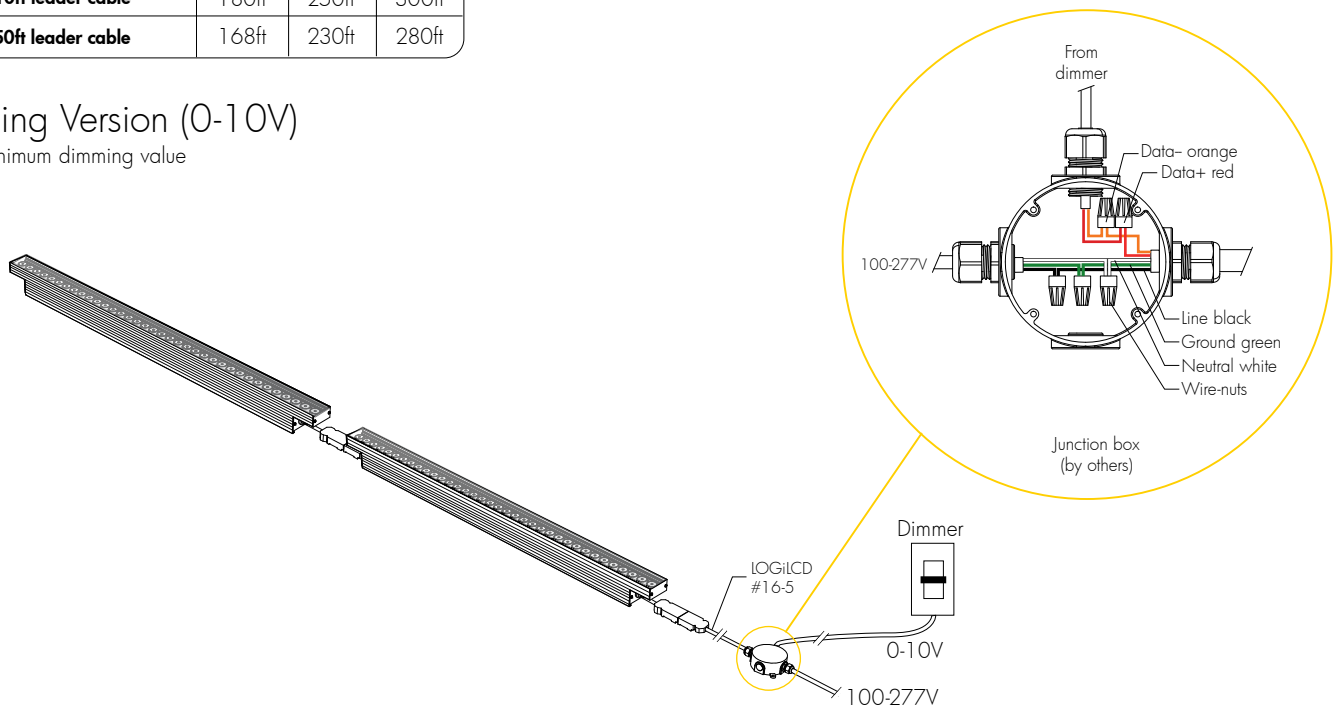


Maximum run length by 15A circuit - Lumenfacade™ Interior HO			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	88ft	100ft	112ft
50ft leader cable	68ft	76ft	84ft
Maximum run length by 15A circuit - Lumenfacade™ Interior RO			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	148ft	168ft	184ft
50ft leader cable	120ft	132ft	148ft

ASHRAE Code Compliant - Lumenfacade™ 5W/ft Maximum run length by 15A circuit			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	180ft	250ft	300ft
50ft leader cable	168ft	230ft	280ft

Dimming Version (0-10V)

10% minimum dimming value



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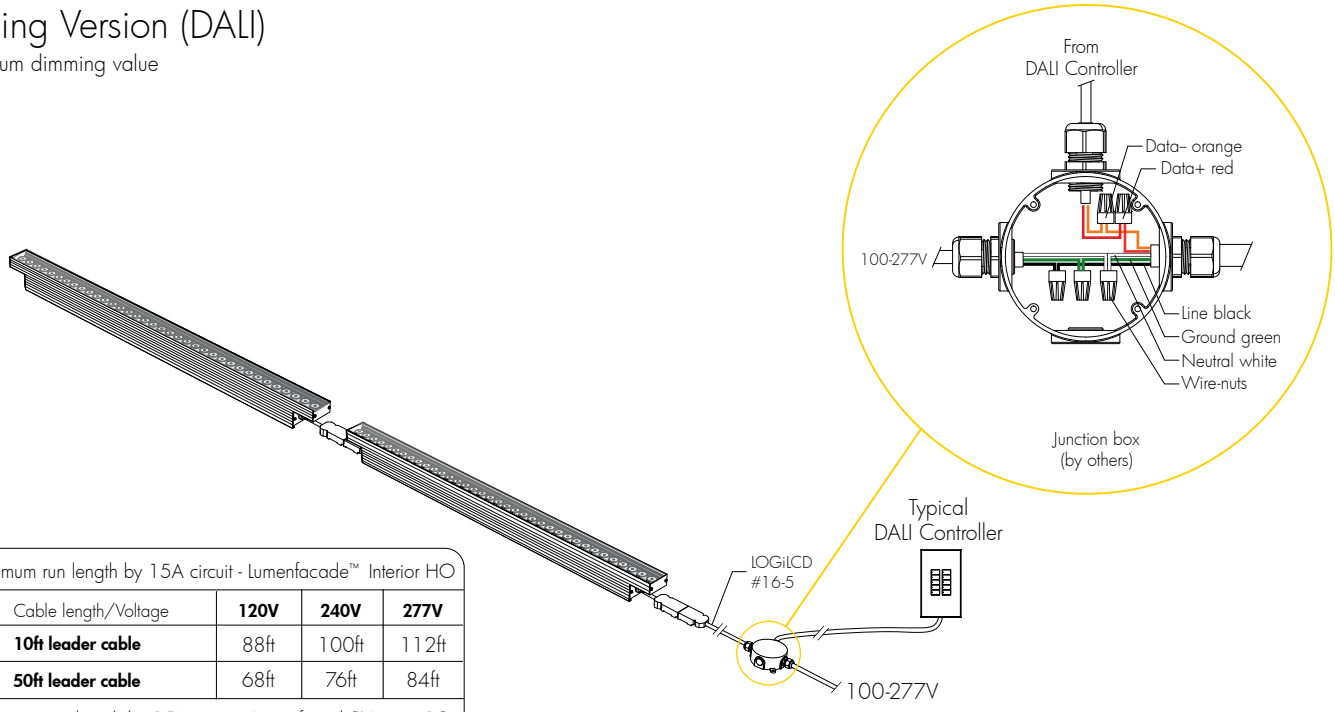
TYPICAL WIRING DIAGRAMS - continued

Dimming Version (DALI)

1% minimum dimming value



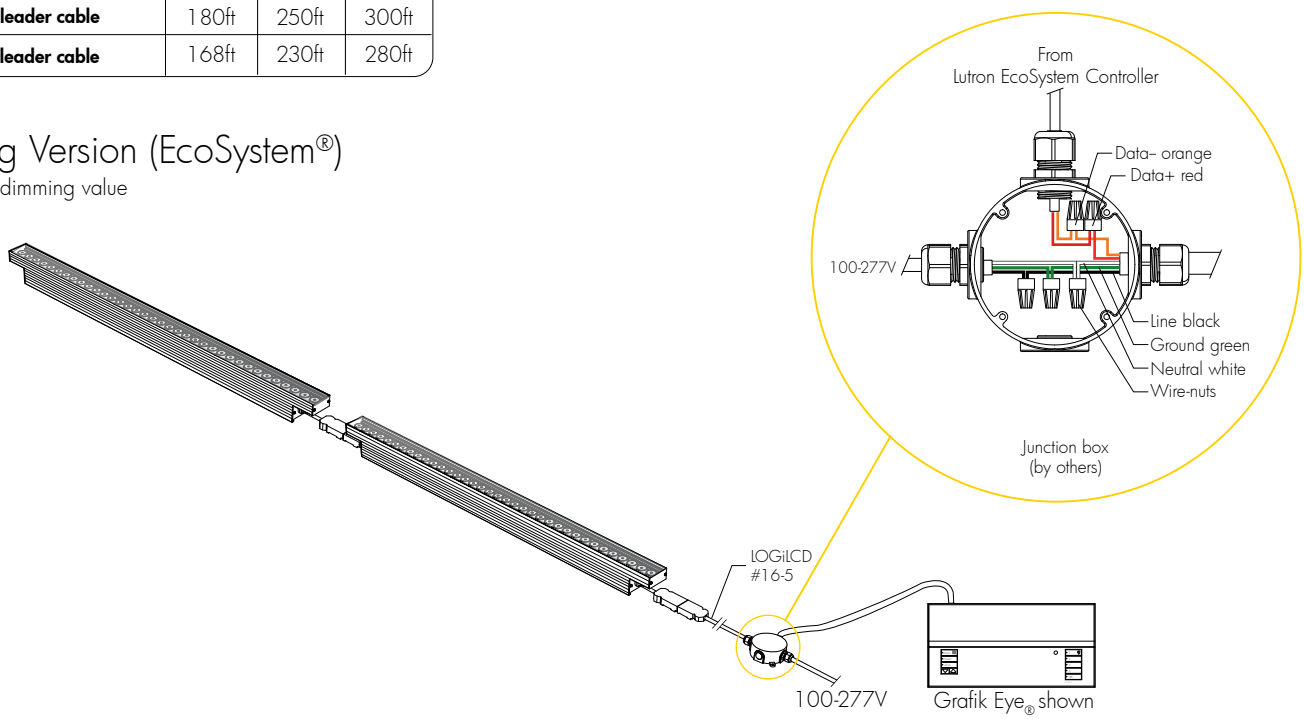
Maximum run length by 15A circuit - Lumenfacade™ Interior HO			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	88ft	100ft	112ft
50ft leader cable	68ft	76ft	84ft

Maximum run length by 15A circuit - Lumenfacade™ Interior RO			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	148ft	168ft	184ft
50ft leader cable	120ft	132ft	148ft

ASHRAE Code Compliant - Lumenfacade™ 5W/ft Maximum run length by 15A circuit			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	180ft	250ft	300ft
50ft leader cable	168ft	230ft	280ft

Dimming Version (EcoSystem®)

1% minimum dimming value



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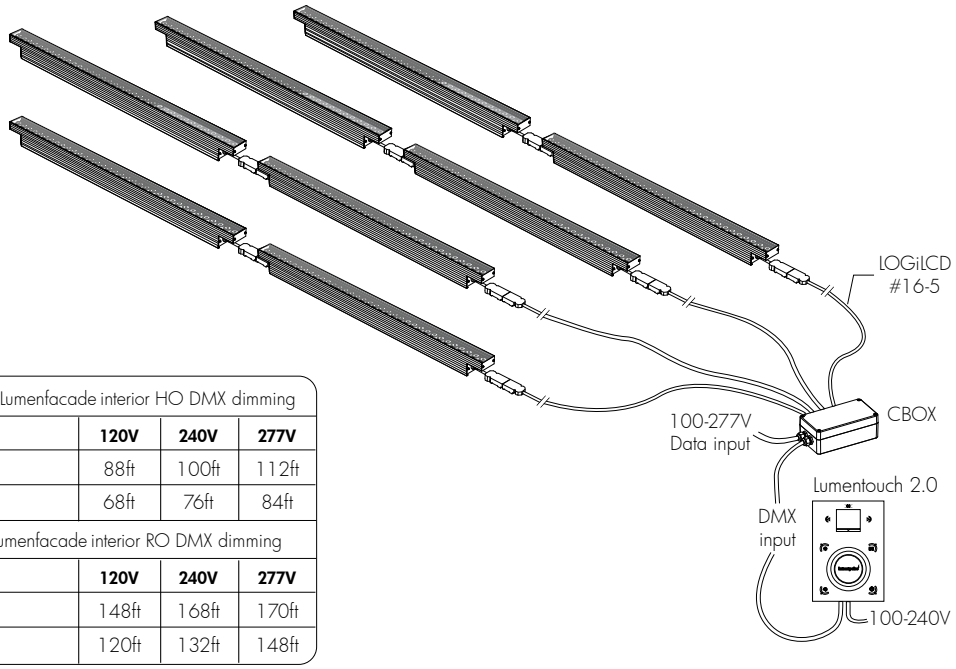
TYPICAL WIRING DIAGRAMS - continued

DMX Dimming Version (Star layout)

1% minimum dimming value



Maximum run length by 15A circuit - Lumenfacade interior HO DMX dimming			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	88ft	100ft	112ft
50ft leader cable	68ft	76ft	84ft
Maximum run length by 15A circuit - Lumenfacade interior RO DMX dimming			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	148ft	168ft	170ft
50ft leader cable	120ft	132ft	148ft

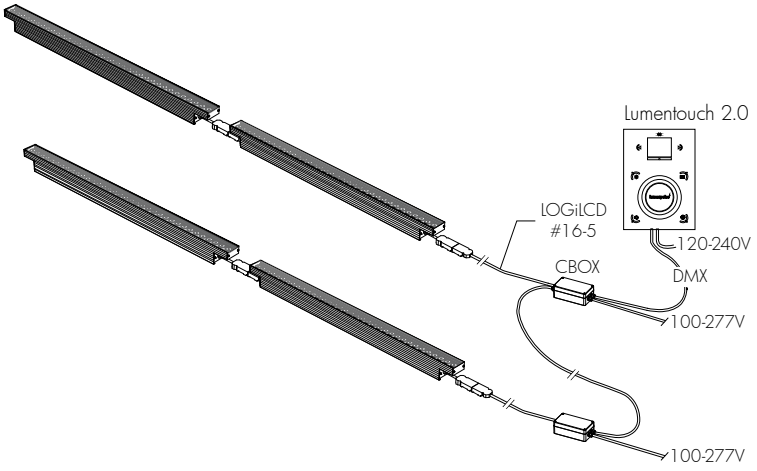
*Up to 170 individually addressable 1 foot sections per DMX run.
Consult factory for specific applications.

ASHRAE Code Compliant - Lumenfacade™ 5W/ft DMX dimming Maximum run length by 15A circuit			
Cable length/Voltage	**120V**	**240V**	**277V**
10ft leader cable	170ft	170ft	170ft
50ft leader cable	168ft	170ft	170ft

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

DMX Dimming Version (Daisy Chain Layout)

1% minimum dimming value



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HOW TO ORDER

LOGi Select:	Select:	Select:	Select:	Select:	Select:	Select:	Select:
Housing	Voltage	Length	Colors and color temperatures	Optic	Mounting Option	Finish	Control
1	2	3	4	5	6	7	8

1

Housing:

LOGi ASHRAE - Lumenfacade™ interior, 5W/ft, ASHRAE compliant

LOGi RO - Lumenfacade™ interior Regular Output,8.5W/ft

LOGi HO - Lumenfacade™ interior High Output, 15.25W/ft

2

Voltage:

100 - 100 volts
120 - 120 volts
208 - 208 volts
220 - 220 volts
240 - 240 volts
277 - 277 volts

3

Length:

12 - 12 3/8 inches (314mm) (0.95 kg/2.1 lbs)
24 - 24 3/8 inches (619mm) (1.68 kg/3.7 lbs)
36 - 36 3/8 inches (924mm) (2.41 kg/5.3 lbs)
48 - 48 3/8 inches (1229mm) (3.08 kg/6.8 lbs)

4

Colors and Color temperatures:

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

5

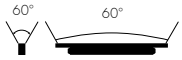
Optics:

10x10 - 10° x 10°
*For best results use with HO fixtures at a 6-inch (15cm) setback from surface. Contact factory for application support.

10x60 - 10° x 60°

30x60 - 30° x 60°

60x60 - 60° x 60°



6

Mounting Option:

SAM - Slim Adjustable Mounting
UMP - Fixed Mounting
UMAS - Universal Adjustable Mounting
WAM2 - Adjustable Wall Mounting 2"
WAM6 - Adjustable Extended Arm Mounting 6"
WAM12 - Adjustable Extended Arm Mounting 12"

7

Finish:

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

8

Control:

NO - No Dimming
LT - Lumentalk Dimming (available for 2', 3' and 4' 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 for 2', 3' and 4' lengths only) (1% minimum dimming value)

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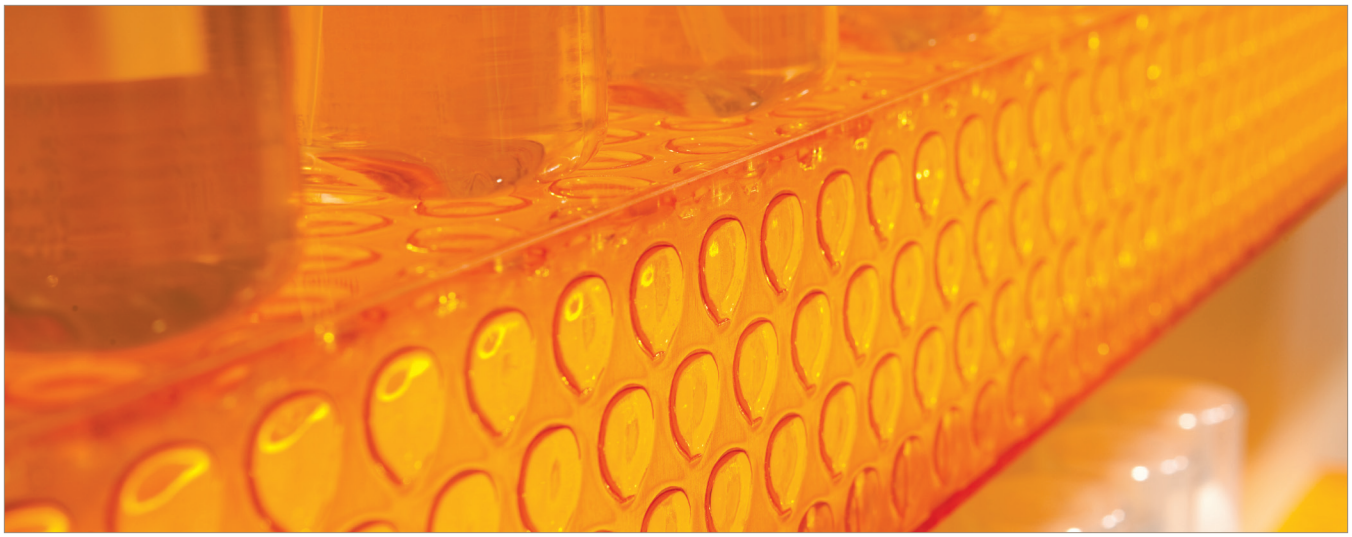
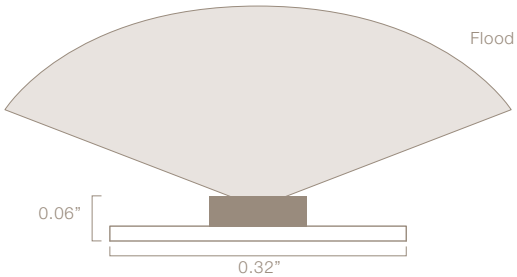
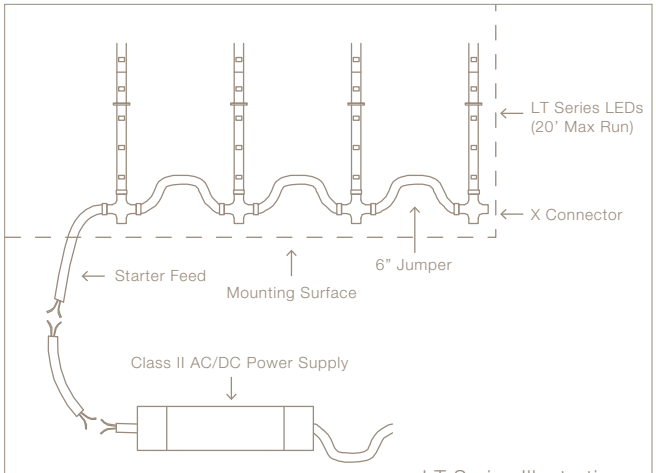


Features and Specifications

- LED Life of approximately 35K hours, under normal operating conditions
- Low wattage, low voltage, low heat 24VDC Operation
- 12 inch joinable segments
- Adhesive Backed
- Ability to cut to length
- Available in warm white, cool white, blue, red, green, and yellow. (RGB available upon request)



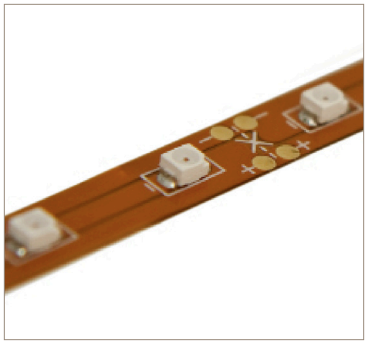
LT Series Beam Angles



LT Series Illustrative
Wiring Diagram (24V, 1.8W/ft)

LED Tape

PART NUMBER	COLOR	POWER (W/FT)	LUMENS PER FT	COLOR TEMPERATURE
3-60-117	WARM WHITE	1.8	30	3000K
3-60-118	COOL WHITE	1.8	30	6500K
3-60-119	BLUE	1.8	6	470NM
3-60-120	RED	1.2	36	624NM
3-60-121	GREEN	1.8	18	515NM
3-60-122	YELLOW	1.2	30	590NM

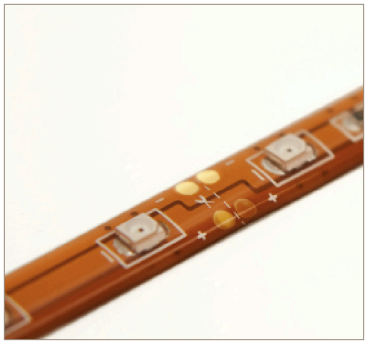


LED Tape Drivers and Accessories

PART NUMBER	ACCESSORIES AND DRIVER
3-60-123	6" LED Tape Jumper
3-60-124	12" LED Tape Jumper
3-60-097	X Connectors
3-60-251	Starter Feed for LED Tape
3-60-205	Starter Feed for Waterproof LED Tape
3-60-098	100W Dimmable Driver
3-60-099	40W Dimmable Driver
3-60-131	10W - 24V Driver
3-60-132	20W - 24V Driver
3-60-134	60W - 24V Driver
3-60-135	45W - 24V Driver
3-60-136	150W - 24V Driver

Waterproof LED Tape

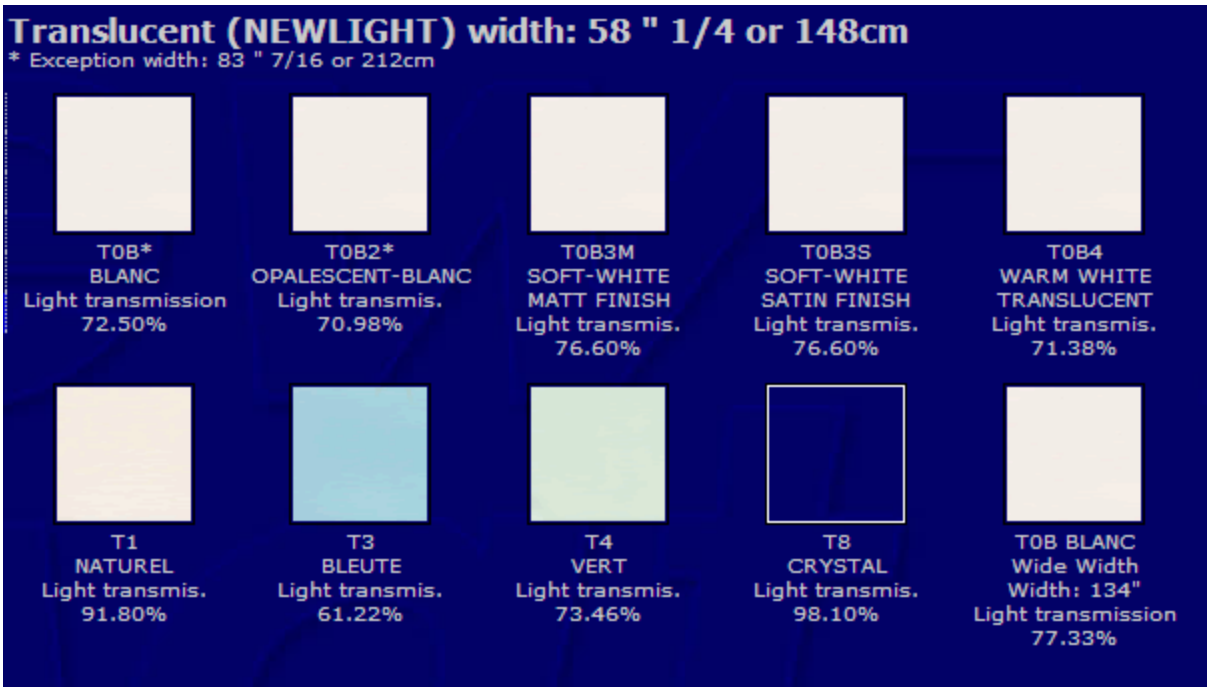
PART NUMBER	COLOR	POWER (W/FT)	VOLTS	TEMPERATURE / WAVELENGTH
3-60-125	WARM WHITE	1.8	24	3000K
3-60-126	COOL WHITE	1.8	24	6500K
3-60-127	BLUE	1.8	12	470NM
3-60-128	RED	1.2	12	624NM
3-60-129	GREEN	1.8	12	515NM
3-60-130	YELLOW	1.2	12	590NM



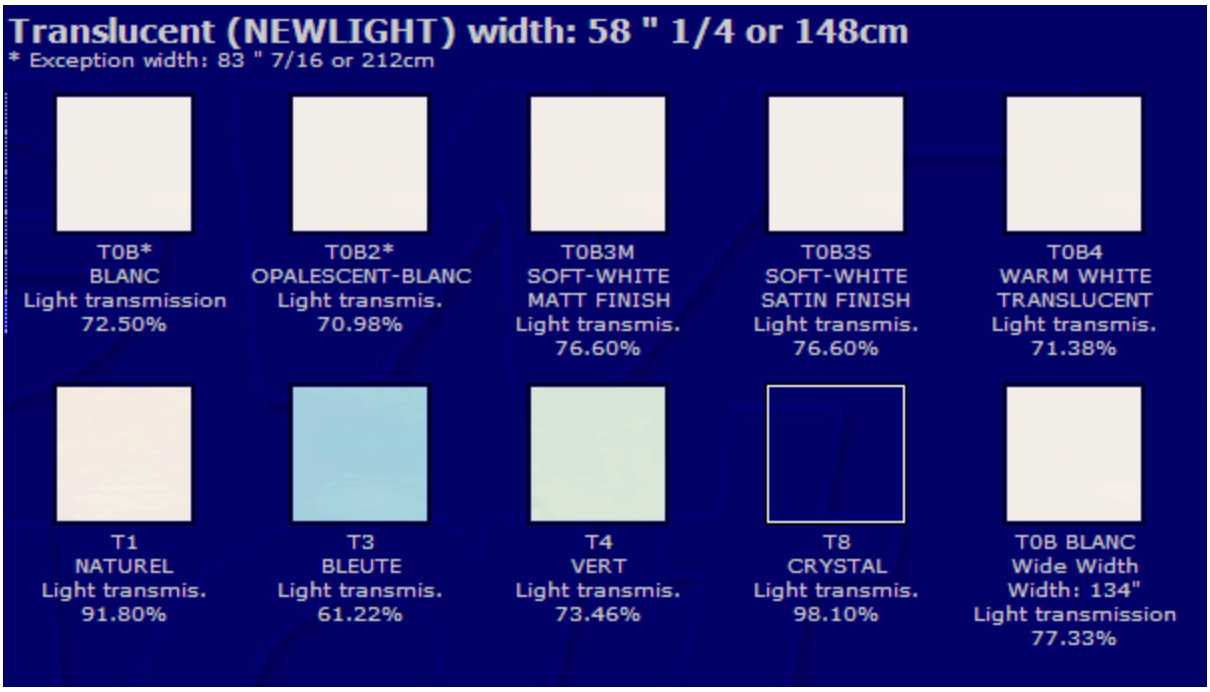
Waterproof LED Tape Features

- Same features as standard LT Series LED Tape in waterproof format.
- 16' Long Rolls (Sold by the roll)
- Once field cut, cut off portion is unusable.

LF1


Translucent (NEWLIGHT) width: 58 " 1/4 or 148cm
* Exception width: 83 " 7/16 or 212cm
T0B*
BLANC
Light transmission
72.50%
T0B2*
OPALESCENT-BLANC
Light transmis.
70.98%
T0B3M
SOFT-WHITE
MATT FINISH
Light transmis.
76.60%
T0B3S
SOFT-WHITE
SATIN FINISH
Light transmis.
76.60%
T0B4
WARM WHITE
TRANSLUCENT
Light transmis.
71.38%
T1
NATUREL
Light transmis.
91.80%
T3
BLEUTE
Light transmis.
61.22%
T4
VERT
Light transmis.
73.46%
T8
CRYSTAL
Light transmis.
98.10%
T0B BLANC
Wide Width
Width: 134"
Light transmission
77.33%

LF2


Translucent (NEWLIGHT) width: 58 " 1/4 or 148cm
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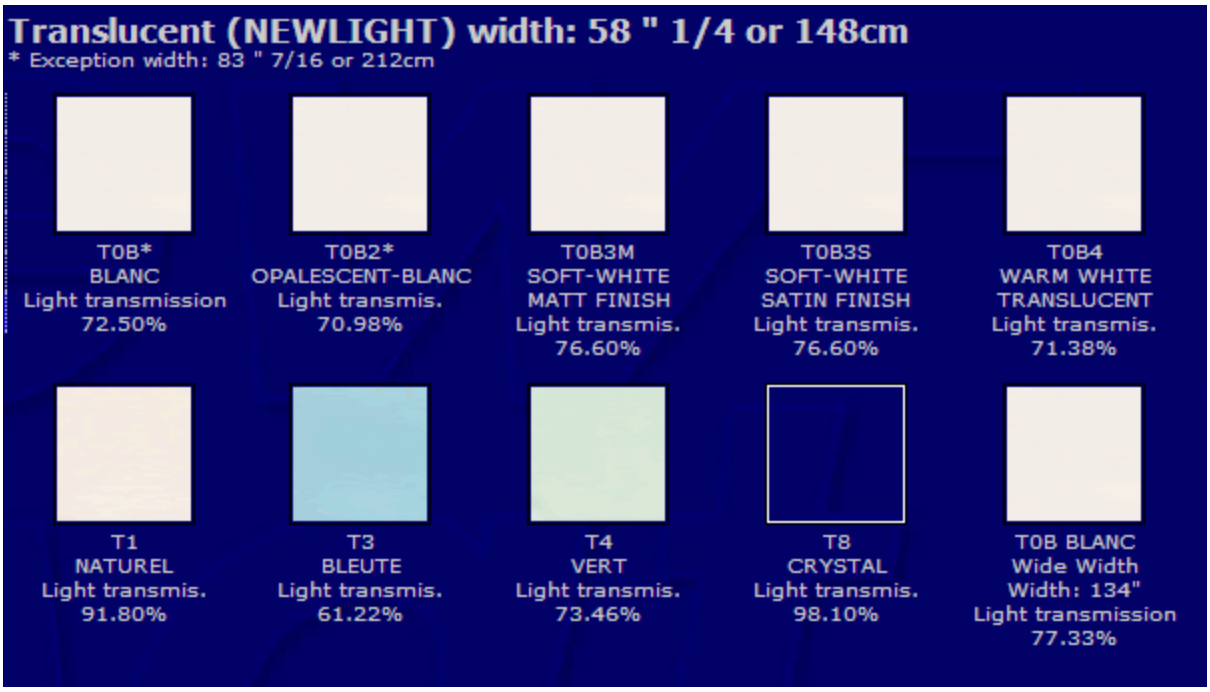
T0B*
BLANC
Light transmission
72.50%
T0B2*
OPALESCENT-BLANC
Light transmis.
70.98%
T0B3M
SOFT-WHITE
MATT FINISH
Light transmis.
76.60%
T0B3S
SOFT-WHITE
SATIN FINISH
Light transmis.
76.60%
T0B4
WARM WHITE
TRANSLUCENT
Light transmis.
71.38%
T1
NATUREL
Light transmis.
91.80%
T3
BLEUTE
Light transmis.
61.22%
T4
VERT
Light transmis.
73.46%
T8
CRYSTAL
Light transmis.
98.10%
T0B BLANC
Wide Width
Width: 134"
Light transmission
77.33%

LF3


Translucent (NEWLIGHT) width: 58 " 1/4 or 148cm
* Exception width: 83 " 7/16 or 212cm
T0B*
BLANC
Light transmission
72.50%
T0B2*
OPALESCENT-BLANC
Light transmis.
70.98%
T0B3M
SOFT-WHITE
MATT FINISH
Light transmis.
76.60%
T0B3S
SOFT-WHITE
SATIN FINISH
Light transmis.
76.60%
T0B4
WARM WHITE
TRANSLUCENT
Light transmis.
71.38%
T1
NATUREL
Light transmis.
91.80%
T3
BLEUTE
Light transmis.
61.22%
T4
VERT
Light transmis.
73.46%
T8
CRYSTAL
Light transmis.
98.10%
T0B BLANC
Wide Width
Width: 134"
Light transmission
77.33%

LF4

3form® chroma®

Product Description

3form Chroma is produced from optical grade engineered resin. Chroma is available in thick-gauge formats which lends itself well for use in many horizontal applications. Chroma is a highly functional material that brings impact when color is introduced. Chroma is produced with brilliant colors that can be layered (up to five colors) to create an enormous range of hues, opacities and amazing effects. The surface of Chroma features a durable renewable matte texture that can be easily refinished throughout its lifetime. Chroma incorporates 38% recycled content* (29% pre-consumer, 9% post-consumer) without compromising its amazing clarity. *2" Chroma does not contain recycled content

Chroma XT is exterior grade Chroma suitable for use as signage, lighting, awnings, tables or canopies. Use Chroma XT to bring amazing color and design to your exterior applications.

FEATURES AND BENEFITS

- Great for edge lighting – tremendous optical properties and high light transmission
- Rigid - stable and sturdy material for horizontal applications
- Qualifies for 3form Reclaim™ – keeping end-of-life material out of landfills
- Combine up to five colors to create any color imaginable
- Surface is able to be completely refinished to maintain product "newness"

AVAILABLE COLORS

3form Chroma comes in a variety of translucent warm and cool colors. Colors can be made opaque with the addition of the color - White Out.

(Visit www.3-form.com for the complete list of available color options.)

CHROMA REFLECT

3form Chroma Reflect™ pairs beautiful 3form colors with a reflective opaque mirror. The result is a breathtaking panel that glows and radiates color like you've never seen. Chroma Reflect panels are 1-sided and opaque. Chroma Reflect can only be paired with one Chroma color. The back finish of Chroma Reflect is left unfinished to allow for more versatility during fabrication. Chroma Reflect adds an extra 1/8" (3 mm) to the standard thickness of Chroma panels. Additionally, Chroma Reflect is not suitable for exterior use and requires special fabrication techniques.

TEXTURES/PATTERNS/FINISHES

All Chroma sheets come standard with a Renewable matte finish on the front face that allows the product to be continually rejuvenated if ever desired or necessary during the service life of the material. The back side of 3form Chroma in translucent colors is finished with a matte finish, but this side should not be renewed. Chroma Clear comes standard with renewable matte surfaces on front and back.

Chroma panels can be ordered with an optional Renewable Matte Back Finish, that allows refinishing of both sides of the panel. The Renewable Matte Back Finish increases the thickness by an extra 1/16" (1.5 mm).

Chroma panels that are opaque (unless specified differently) are finished with a gloss backside texture to allow for more versatility during fabrication. Chroma is also available with an optional Patent finish. Patent is a high gloss finish with the highest light transmittance, but does not allow for refinishing. (Chroma Reflect is not available with Patent finishes)

PANEL SIZES AND TOLERANCES

All dimensions and squareness (standard or custom) are subject to a +1/4" or - 3/16" (+6 mm or -5 mm) tolerance. Squareness (standard or custom) is subject to a 1/8" (3.1 mm) tolerance.

Chroma is available in 1/4 inch (6.3 mm), 1/2 inch (12.7 mm), 1 inch (25.4 mm) and 2 inch (50.8 mm) thicknesses.

PANEL SIZE TABLE

NOMINAL GAUGE	PANEL DIMENSIONS
1/4" (6.3 mm)	48" x 96" (122 cm x 243.8 cm), 48" x 120" (122 cm x 304.8 cm)
1/2" (12.7 mm)	48" x 96" (122 cm x 243.8 cm), 48" x 120" (122 cm x 304.8 cm)
1" (25.4 mm)	48" x 96" (122 cm x 243.8 cm), 48" x 120" (122 cm x 304.8 cm)
2" (50.8 mm)	48" x 96" (122 cm x 243.8 cm)

Given the unique manufacturing process for 3form Chroma, a given gauge is subject to a +/- 10% thickness tolerance. Thickness values are based on measurements 2-3" (50-75 mm) from the edge, along both long edges of each panel.

THICKNESS TOLERANCE TABLE

STANDARD CHROMA, HIRES AND XT PANELS (XT NOT AVAILABLE IN 1/4")

GAUGE*	MINIMUM ALLOWANCE	MAXIMUM ALLOWANCE
1/4" (6.3 mm)	0.200" (5.1 mm)	0.335" (8.5 mm)
1/2" (12.7 mm)	0.450" (11.4 mm)	0.585" (14.9 mm)
1" (25.4 mm)	0.900" (22.9 mm)	1.100" (27.9 mm)
2" (50.8 mm)	1.800" (45.7 mm)	2.200" (55.9 mm)

REFLECT AND PANELS WITH RENEWABLE MATTE BACK FINISH

GAUGE*	MINIMUM ALLOWANCE	MAXIMUM ALLOWANCE
5/8" (15.9 mm)	0.515" (13.1 mm)	0.710" (18.0 mm)
1-1/8" (28.6 mm)	0.965" (24.5 mm)	1.225" (31.1 mm)
2-1/8" (53.9 mm)	1.865" (47.4 mm)	2.325" (59.1 mm)

*Chroma Reflect adds 1/8" (3 mm) and renewable matte back finish materials add 1/16" (1.5 mm) to overall thickness.

FLATNESS TOLERANCE

Chroma panels shall not have distortion in the form of a wrinkle, twist or scallop along the perimeter of the sheet. Overall warp in the form of a curve (bow warp) extending across the sheet is permitted to a maximum of 1/4" (6.3 mm) for each 48" (1.2 m), or fraction thereof. Panel is to be measured when laying horizontally under its own weight on a flat continuous surface.

Specifications

FLAMMABILITY & SMOKE TEST RESULTS
BUILDING CODE APPROVALS

3form Chroma conforms to the 2009 International Building Code® for light-transmitting plastics. The provisions of these codes provide adequate regulation for most applications of light-transmitting plastics [unless otherwise noted, data is based on 0.236" (6 mm) thickness]:

TEST	3FORM CHROMA	RESULT
ASTM D 2843 Smoke Density	4.1%	PASS Less than 75
ASTM D 635 Flame Spread	Rate of burning: 1.2 in/min	PASS CC2
ASTM D 1929 Self-ignition Temp.	852°F	PASS Greater than 650°F
ASTM E 84-03 Flame Spread, 1" Thickness Smoke Developed	 115 150	 Class C (76-200) 450 (less than 450)

PANEL WEIGHT

THICKNESS (INCHES)	WEIGHT FLUX (LB/FT²)
1/4" (6.3 mm)	1.5 lb/ft² (7.3 kg/m²)
1/2" (12.7 mm)	3.1 lb/ft² (15.1 kg/m²)
1" (25.4 mm)	6.2 lb/ft² (30.2 kg/m²)
2" (50.8 mm)	12.4 lb/ft² (60.5 kg/m²)

***Chroma XT panels weigh an additional 0.4 lb/lf² (1.9 kg/m²)**

****Chroma Reflect panels weigh an additional 0.8 lb/lf² (3.8 kg/m²)**

EXPANSION/CONTRACTION ALLOWANCES

Like all resin products, 3form Chroma will expand and contract nominally with fluctuations in temperature. The following formula provides allowances that should be made in framed or fitted applications:

- Longest length of panel (inches) x temperature change of the sheet (°F) x 0.00004 =Amount of Linear Expansion/Contraction (inches)

example:

- A 48" x 96" panel that experiences a 50°F temperature change will expand/contract: 96 inches x 50 degrees x 0.00004 = 0.192 inches

Installers should take extra precautions if installation is occurring before the HVAC systems are operational. Allowances should also be made in the following situations:

- Fastening points
- Channel depths in frames
- Holes for standoffs and other hardware
- Meeting points for multiple sheets of 3form Chroma

ETCHING

3form Chroma may be etched with two different finishing options to produce patterns, text, or anything imaginable. When etching, two different surface finishes may be specified: Polished and Renewable matte. Following are some limitations to the etching process:

Chroma XT products are not able to accept etching as the etching process creates part stress that could induce crazing.

Only 1/2"-2" Chroma may be etched.

- Limited to 1/8" deep
- Etch must be greater than 1/2" wide

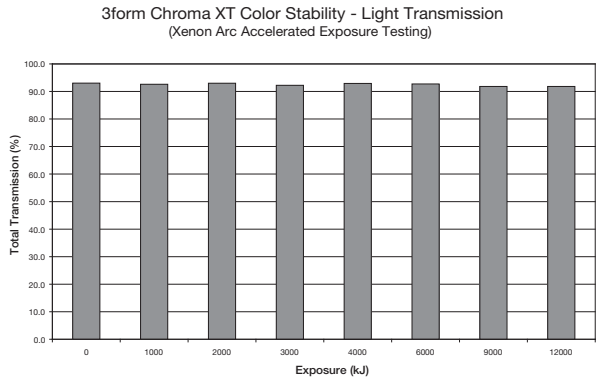
UV EXPOSURE PERFORMANCE

Chroma XT is an excellent choice for exterior applications. The chart demonstrates that the change in light transmission remains unchanged. (12,000 kJ of exposure represents approximately 10 years of outdoor exposure in Florida) Should your application be for exterior use, please notify your 3form Sales Representative.

*Chroma Reflect cannot be used in exterior applications.

USAGE LIMITATIONS

3form Chroma should never come in direct contact with metal fasteners. Non-metallic* gaskets, washers, and tubing are to be utilized in conjuntion with mechanical connections such as point supports and frames. Holes for fasteners must be located a minimum of 2" from the edge of



the hole to the edge of the panel.

Please contact the 3form Technical Help Line should you have any questions regarding the use of Chroma with mechanical fasteners.

*Gaskets, washers and tubing must be produced with a non-plasticized material. Suitable materials include: neoprene, teflon, nylon, silicone.

DEFLECTION

3form Chroma will exhibit different amounts of deflection given a variety of factors: fastening techniques, loads, gauges and panel dimensions to list a few. Your 3form Representative can assist you with general deflection guidelines for your application using the Chroma Deflection Charts. If your application has specific engineering requirements, please contact the 3form Technical Help Desk for additional direction at 801-649-2670.

HEAT FORMING/COLD BENDING

3form Chroma can be heated and formed to produce simple or even complex curves and shapes. The table below lists the minimum inner radius for a heat formed shape. Tighter radii may be possible, contact 3form Technical Service for details.

THICKNESS	MINIMUM HEATFORMING RADIUS
1/4" (6.3 mm)	4" (101.6 mm)
1/2" (12.7 mm)	4" (101.6 mm)
1" (25.4 mm)	8" (203.2 mm)
2" (50.8 mm)	12" (304.8 mm)

The optimal forming temperature ranges from 300º- 330ºF. Large and complex forming geometries should be specified to be produced by the 3form Fabrication experts.

SPECIAL CONSIDERATIONS FOR THE HEAT-FORMING OF CHROMA HIGHRES.

1/2" thickness only (Maximum finished sizes of 46" x 94" and 46" x 118")
Renewable Matte finishes only
No Complex Curves

Though 3form Chroma is commonly used in flat or heat curved applications, the polymeric nature of the material allows a minimal

amount of cold bending for a given panel. Cold bending is not possible on 1" and 2" gauges. The table below shows the minimum suggested radius for 3form Chroma at a given gauge:

THICKNESS	MINIMUM BEND RADIUS
0.250" (6.3 mm)	150" (381 cm)
0.500" (12.7 mm)	225" (571 cm)

EDGE FINISHING

Edges of 3form Chroma panels are able to be machined or routed into a variety of different forms. In addition to a straight edge, edges may accept beveling, rounding, etc. Additional finishing, such as sanding or polishing, can also be provided to some edges.

FABRICATION LIMITATIONS

Chroma Reflect requires special consideration during fabrication. When cutting panels using table saws or panels saws where the blade is situated below the panel, the back side (reflect side) of the panel needs to be facing UP. The back side of the panel should be facing down if it is being cut by a circular saw or a panel saw where the blade is above the panel.

Chroma reflect panels can be cut with a CNC router or a plunge router. Chroma Reflect MUST be scored with a 1/16" or 1/8" blade or tool before routing. All CNC cutting must be done from the back side. Chroma Reflect panels CAN NOT be cut with a jig saw or reciprocating saw.

REFINISHING

One of the unique benefits of 3form Chroma is its ability to be refinished. If 3form Chroma needs to be refinished for any reason, the panels may be renewed by sanding. Make sure to sand the entire surface to obtain a uniform finish over the whole panel. Begin by dry sanding with a course grit paper (100 or 150 grit) to remove blemishes/scratches. Continue sanding with gradually finer grit papers until the surface is smooth and level and the blemish/scratches are removed. Complete the refinishing process by sanding with a 220 grit paper to attain a matte finish. Only the primary surface (non-colored side) is refinishable. After sanding, clean the surface with warm water and a mild detergent. Dry with a clean, cotton cloth and finish by treating the panel with Countertop Magic®. Even finer grit papers may be used to attain a satin or semi-polished appearance. With papers greater than 400 grit, wet sanding (with water) should be employed. Be sure to keep sanders in motion at all times when refinishing surfaces or edges. Only use light pressure with power sanders in order to maintain evenness and avoid overheating of the sheet surface.

SOUND TRANSMISSION CLASS (STC) VALUES FOR CHROMA

Measurement protocol: ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

THICKNESS	STC VALUES
1/2" (12.7 mm)	32
1" (25.4 mm)	36

THERMAL INSULATION VALUES FOR CHROMA

Insulation values are a function of both the convective properties (U-Values and shading coefficients) and the conductive properties (thermal conductivity).

CHROMA RENEW/RENEW THICKNESS	WINTER U-VALUE (BTU/HR-FT²-°F)	SUMMER U-VALUE (BTU/HR-FT²-°F)
1/2" (12.7 mm)	0.82	0.81
1" (25.4 mm)	0.65	0.65
2" (50.8 mm)	NOT TESTED	NOT TESTED

Select Mechanical and Physical Properties for 3form Chroma

		TYPICAL VALUES	
PROPERTY	**ASTM METHOD**	**US CUSTOM**	**METRIC**
GENERAL			
Density	D1505	1.19 g/cm^3	1.19 x 10^{-3} kg/cm^3
Water Absorption	D579 24hrs @ 73°F	0.2%	0.2%
MECHANICAL			
Tensile Strength	D638	10,000 psi	69 MPa
Elongation at Rupture	D638	4.5%	4.5%
Tensile Modulus	D638	400,000 psi	2800 MPa
Flexural Strength (rupture)	D790	17,000 psi	117 MPa
Flexural Modulus	D790	480,000 psi	3300 MPa
Compressive Strength (yield)	D695	17,000 psi	117 MPa
Compressive Deformation	D621 4000 psi, 122ºF, 24 hours)	≤0.85%	
Shear Ultimate Strength	D732	10,000 psi	703 kg/cm^2
Shear Modulus	D5279	167,000 psi	1151 MPa
Impact Strength (charpy method)	D256 notched	2.1 lbf*in/in	0.9 kgf*cm/cm
	D256 un-notched	7 lbf*in/in	3.17 kgf*cm/cm
Izod Impact Strength	D256 notched	≤0.25 ft-lb/in	≤13.3 J/m
Rockwell Hardness	D785	M-93	M-93
Barcol Hardness	D2583	48	48
Residual Shrinkage (internal strain)	D702	2%	2%
Coefficient of Friction	D2047 dry D2047 wet	0.73 0.79	
Poisson's Ratio	E132	0.35-0.40	
OPTICAL			
Refractive Index	D542	1.49	1.49
Light Transmission (total)	D1003	92%	92%
Haze	D1003	<1%	<1%
THERMAL			
Max Continuous Use Temperature		180ºF	82ºC
Max Instantaneous Use Temperature		212ºF	100ºC
Deflection Temperature	D648 @ 264 psi	195ºF	90ºC
Vicat Softening Point	D1525	239ºF	115ºC
Forming Temperature		300-330ºF	149-157ºC
Coefficient of Thermal Conductivity (k-factor)	cenco-fitch	1.3 btu/(hr)ft^2(ºF)	0.19 w/mºK
Coefficient of Thermal Expansion	D696 @ 60ºF (16ºC)	4.0 x 10^{-5}(in/in/ºF)	7.2 x 10^{-5}(mm/mm/ºC)

Chemical Resistance of 3form Chroma to Select Compounds

7 DAY FULL IMMERSION TESTING @ 73°F (23°C)

Polymer materials are affected by chemicals in different ways. Changes in performance or appearance when exposed to chemicals can be attributed to fabrication methods, exposure conditions, concentration of chemical substances or exposure duration. Such factors can even influence the final effect on substances that 3form Chroma is considered "Resistant" to under test conditions. Further details are explained below:

FABRICATION

Stresses generated from sanding, grinding, drilling, polishing, machining, sawing and/or forming (hot or cold).

EXPOSURE

Exposure duration, stresses imparted during the application life-cycle due to loads, temperature changes, heat, environments, etc.

APPLICATION OF CHEMICALS

Application from contact, rubbing, wiping, spraying, soaking, etc. Also having an affect is the relative concentration of the chemical in question.

The following table provides indicative performance of the chemical resistance characteristics of clear 3form Chroma panels. The following codes are used to describe the chemical resistance characteristics:

R = RESISTANT

3form Chroma is able to withstand the identified compound for long exposure periods. (7 days, full immersion)

LR = LIMITED RESISTANCE

3form Chroma is only resistant when in contact with this compound for short periods at room temperature. It is advised that further determination of the effect of the substance be further tested in your particular application.

N = NOT RESISTANT

3form Chroma is not resistant to the compound. The material will swell, craze, haze, dissolve or experience some physical change when exposed to this substance.

REAGENT	RESULT	REAGENT	RESULT
acetic acid (5%)	R	hydrochloric acid	R
acetic acid (glacial)	N	hydrofluoric acid (40%)	N
acetic anhydride	LR	hydrogen peroxide (3%)	R
acetone	N	hydrogen peroxide (28%)	N
acrylic paints and lacquers	LR	iso octane	R
ammonia (aqueous solution)	R	isopropyl alcohol	LR
ammonium chloride (saturated)	R	kerosene	R
ammonium hydroxide (10%)	R	lacquer thinner	N
ammonium hydroxide (conc.)	R	lactic acid (80%)	LR
aniline	N	methane	R
battery Acid	R	methyl alcohol (50%)	LR
benzaldehyde	N	methyl alcohol (100%)	N
benzene	N	methyl ethyl ketone (MEK)	N
bituminous emulsion	N	methylene chloride	N
bleach (see sodium hypochlorite)	R	mineral oil	R
bromine	N	mortar	R
butanol	LR	motor fuel (benzene-free)	R
butyl acetate	N	motor fuel (with benzene)	N
calcium chloride (saturated)	R	muriatic acid (20%)	R
calcium hypochlorite	R	nitric acid (10%)	R
carbon tetrachloride	N	nitric acid (40%)	LR
cement	R	nitric acid (conc.)	N
chlorine water	LR	oil paints (pure)	R
chloroform	N	olive oil	R
chromic acid (40%)	N	oxygen	R
citric acid (10%)	R	ozone	R
cottonseed oil (edible)	R	phenol solution (5%)	N
detergent solution	R	phosphoric acid (10%)	R
diesel oil	R	plaster of paris	R
diethyl ether	N	soap solution (ivory)	R
dimethyl formamide	N	sodium carbonate (2%)	R
dioctyle formamide	N	sodium carbonate (20%)	R
ethyl acetate	N	sodium chloride (10%)	R
ethyl alcohol (50%)	LR	sodium hydroxide (1%)	R
ethyl alcohol (95%)	N	sodium hydroxide (10%)	R
ethyl dichloride	N	sodium hydroxide (60%)	R
ethylene gycol	R	sodium hypochlorite (5%)	R
2-ethylhexyl sebacate	R	stearic acid	R
formaldehyde (40%)	R	sulfuric acid (3%)	R
formic acid (2%)	R	sulfuric acid (30%)	R
formic acid (40%)	LR	sulfuric acid (conc.)	N
gasoline (regular, leaded)	LR	thinners (general)	N
glycerine	R	toluene	N
glycerol	R	tricholoroethylene	N
glycol	R	turpentine	LR
heptane	R	urine	R
hexane	R	water (distilled)	R
hot bitumen	LR	xylene	N

Cleaning Instructions

3form Chroma, like all thermoplastic materials should be cleaned periodically. A regular cleaning program will help to maintain the aesthetics and life of the material. 3form recommends the use of Novus® No. 1 and Brillianize® plastic cleaners. Both products are specifically for use on plastics and help panels to resist finger-marking and static.

Rinse or wipe the sheet with lukewarm water. Remove dust and dirt from 3form Chroma with a damp, soft cloth or sponge and a solution of mild soap and/or liquid detergent in water. Rinse or wipe the 3form Chroma again thoroughly with lukewarm water. For more stubborn stains, dirty spots or grease, surface cleaners like Fantastik® or Formula 409® also work well. A scotch brite sponge can also help remove tough grease stains. After all cleaning steps, be sure to rinse thoroughly with lukewarm water.

Always use a soft, damp cloth to blot dry. Rubbing with a dry cloth can scratch the material and create a static charge. Never use scrapers or squeegees on 3form Chroma. Also avoid scouring compounds, gasoline, benzene, acetone, carbon tetrachloride, certain deicing fluids, lacquer thinner or other strong solvents.

DO NOT:

- Use squeegees or scrapers as they may scratch the sheet
- Use scouring compounds or solvents such as: acetone, gasoline, benzene, carbon tetrachloride, or lacquer thinner to clean the sheet
- Use abrasives or highline alkaline cleaners
- Use a dry cloth or a cloth of synthetic fiber such as rayon or polyester as they may scratch the sheet.
- Use Windex® or Glass Plus® cleaners

DO:

- Use warm water, mild detergent and a soft cloth or chamois
- Rinse surface thoroughly after cleaning with lukewarm water
- Blot dry with slightly damp, soft cloth or chamois

IMPORTANT

If a cleaning material is found to be incompatible in a short-term test, it will usually be found to be incompatible in the field. The converse, however, is not always true. Favorable performance is no guarantee that actual end-use conditions have been duplicated. Therefore, these results should be used as a guide only and it is recommended that the user test the products under actual end-use conditions.

For more information, please visit 3-form.com or call 877-649-2670.

3form® chroma®

Product Description

3form Chroma is produced from optical grade engineered resin. Chroma is available in thick-gauge formats which lends itself well for use in many horizontal applications. Chroma is a highly functional material that brings impact when color is introduced. Chroma is produced with brilliant colors that can be layered (up to five colors) to create an enormous range of hues, opacities and amazing effects. The surface of Chroma features a durable renewable matte texture that can be easily refinished throughout its lifetime. Chroma incorporates 38% recycled content* (29% pre-consumer, 9% post-consumer) without compromising its amazing clarity. *2" Chroma does not contain recycled content

Chroma XT is exterior grade Chroma suitable for use as signage, lighting, awnings, tables or canopies. Use Chroma XT to bring amazing color and design to your exterior applications.

FEATURES AND BENEFITS

- Great for edge lighting – tremendous optical properties and high light transmission
- Rigid - stable and sturdy material for horizontal applications
- Qualifies for 3form Reclaim™ – keeping end-of-life material out of landfills
- Combine up to five colors to create any color imaginable
- Surface is able to be completely refinished to maintain product "newness"

AVAILABLE COLORS

3form Chroma comes in a variety of translucent warm and cool colors. Colors can be made opaque with the addition of the color - White Out.

(Visit www.3-form.com for the complete list of available color options.)

CHROMA REFLECT

3form Chroma Reflect™ pairs beautiful 3form colors with a reflective opaque mirror. The result is a breathtaking panel that glows and radiates color like you've never seen. Chroma Reflect panels are 1-sided and opaque. Chroma Reflect can only be paired with one Chroma color. The back finish of Chroma Reflect is left unfinished to allow for more versatility during fabrication. Chroma Reflect adds an extra 1/8" (3 mm) to the standard thickness of Chroma panels. Additionally, Chroma Reflect is not suitable for exterior use and requires special fabrication techniques.

TEXTURES/PATTERNS/FINISHES

All Chroma sheets come standard with a Renewable matte finish on the front face that allows the product to be continually rejuvenated if ever desired or necessary during the service life of the material. The back side of 3form Chroma in translucent colors is finished with a matte finish, but this side should not be renewed. Chroma Clear comes standard with renewable matte surfaces on front and back.

Chroma panels can be ordered with an optional Renewable Matte Back Finish, that allows refinishing of both sides of the panel. The Renewable Matte Back Finish increases the thickness by an extra 1/16" (1.5 mm).

Chroma panels that are opaque (unless specified differently) are finished with a gloss backside texture to allow for more versatility during fabrication. Chroma is also available with an optional Patent finish. Patent is a high gloss finish with the highest light transmittance, but does not allow for refinishing. (Chroma Reflect is not available with Patent finishes)

PANEL SIZES AND TOLERANCES

All dimensions and squareness (standard or custom) are subject to a +1/4" or - 3/16" (+6 mm or -5 mm) tolerance. Squareness (standard or custom) is subject to a 1/8" (3.1 mm) tolerance.

Chroma is available in 1/4 inch (6.3 mm), 1/2 inch (12.7 mm), 1 inch (25.4 mm) and 2 inch (50.8 mm) thicknesses.

PANEL SIZE TABLE

NOMINAL GAUGE	PANEL DIMENSIONS
1/4" (6.3 mm)	48" x 96" (122 cm x 243.8 cm), 48" x 120" (122 cm x 304.8 cm)
1/2" (12.7 mm)	48" x 96" (122 cm x 243.8 cm), 48" x 120" (122 cm x 304.8 cm)
1" (25.4 mm)	48" x 96" (122 cm x 243.8 cm), 48" x 120" (122 cm x 304.8 cm)
2" (50.8 mm)	48" x 96" (122 cm x 243.8 cm)

Given the unique manufacturing process for 3form Chroma, a given gauge is subject to a +/- 10% thickness tolerance. Thickness values are based on measurements 2-3" (50-75 mm) from the edge, along both long edges of each panel.

THICKNESS TOLERANCE TABLE

STANDARD CHROMA, HIRES AND XT PANELS (XT NOT AVAILABLE IN 1/4")

GAUGE*	MINIMUM ALLOWANCE	MAXIMUM ALLOWANCE
1/4" (6.3 mm)	0.200" (5.1 mm)	0.335" (8.5 mm)
1/2" (12.7 mm)	0.450" (11.4 mm)	0.585" (14.9 mm)
1" (25.4 mm)	0.900" (22.9 mm)	1.100" (27.9 mm)
2" (50.8 mm)	1.800" (45.7 mm)	2.200" (55.9 mm)

REFLECT AND PANELS WITH RENEWABLE MATTE BACK FINISH

GAUGE*	MINIMUM ALLOWANCE	MAXIMUM ALLOWANCE
5/8" (15.9 mm)	0.515" (13.1 mm)	0.710" (18.0 mm)
1-1/8" (28.6 mm)	0.965" (24.5 mm)	1.225" (31.1 mm)
2-1/8" (53.9 mm)	1.865" (47.4 mm)	2.325" (59.1 mm)

*Chroma Reflect adds 1/8" (3 mm) and renewable matte back finish materials add 1/16" (1.5 mm) to overall thickness.

FLATNESS TOLERANCE

Chroma panels shall not have distortion in the form of a wrinkle, twist or scallop along the perimeter of the sheet. Overall warp in the form of a curve (bow warp) extending across the sheet is permitted to a maximum of 1/4" (6.3 mm) for each 48" (1.2 m), or fraction thereof. Panel is to be measured when laying horizontally under its own weight on a flat continuous surface.

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BUILDING CODE APPROVALS

3form Chroma conforms to the 2009 International Building Code® for light-transmitting plastics. The provisions of these codes provide adequate regulation for most applications of light-transmitting plastics [unless otherwise noted, data is based on 0.236" (6 mm) thickness]:

TEST	3FORM CHROMA	RESULT
ASTM D 2843 Smoke Density	4.1%	PASS Less than 75
ASTM D 635 Flame Spread	Rate of burning: 1.2 in/min	PASS CC2
ASTM D 1929 Self-ignition Temp.	852°F	PASS Greater than 650°F
ASTM E 84-03 Flame Spread, 1" Thickness Smoke Developed	 115 150	 Class C (76-200) 450 (less than 450)

PANEL WEIGHT

THICKNESS (INCHES)	WEIGHT FLUX (LB/FT²)
1/4" (6.3 mm)	1.5 lb/ft² (7.3 kg/m²)
1/2" (12.7 mm)	3.1 lb/ft² (15.1 kg/m²)
1" (25.4 mm)	6.2 lb/ft² (30.2 kg/m²)
2" (50.8 mm)	12.4 lb/ft² (60.5 kg/m²)

***Chroma XT panels weigh an additional 0.4 lb/lf² (1.9 kg/m²)**

****Chroma Reflect panels weigh an additional 0.8 lb/lf² (3.8 kg/m²)**

EXPANSION/CONTRACTION ALLOWANCES

Like all resin products, 3form Chroma will expand and contract nominally with fluctuations in temperature. The following formula provides allowances that should be made in framed or fitted applications:

- Longest length of panel (inches) x temperature change of the sheet (°F) x 0.00004 =Amount of Linear Expansion/Contraction (inches)

example:

- A 48" x 96" panel that experiences a 50°F temperature change will expand/contract: 96 inches x 50 degrees x 0.00004 = 0.192 inches

Installers should take extra precautions if installation is occurring before the HVAC systems are operational. Allowances should also be made in the following situations:

- Fastening points
- Channel depths in frames
- Holes for standoffs and other hardware
- Meeting points for multiple sheets of 3form Chroma

ETCHING

3form Chroma may be etched with two different finishing options to produce patterns, text, or anything imaginable. When etching, two different surface finishes may be specified: Polished and Renewable matte. Following are some limitations to the etching process:

Chroma XT products are not able to accept etching as the etching process creates part stress that could induce crazing.

Only 1/2"-2" Chroma may be etched.

- Limited to 1/8" deep
- Etch must be greater than 1/2" wide

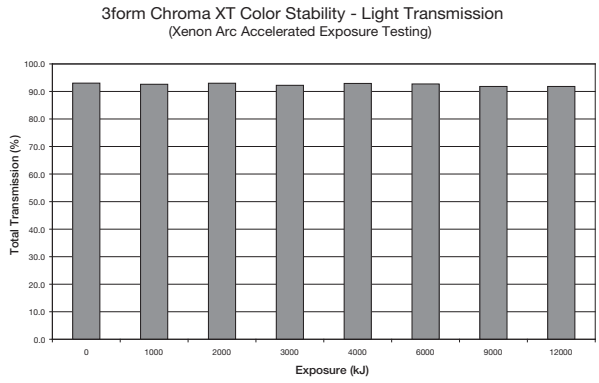
UV EXPOSURE PERFORMANCE

Chroma XT is an excellent choice for exterior applications. The chart demonstrates that the change in light transmission remains unchanged. (12,000 kJ of exposure represents approximately 10 years of outdoor exposure in Florida) Should your application be for exterior use, please notify your 3form Sales Representative.

*Chroma Reflect cannot be used in exterior applications.

USAGE LIMITATIONS

3form Chroma should never come in direct contact with metal fasteners. Non-metallic* gaskets, washers, and tubing are to be utilized in conjuntion with mechanical connections such as point supports and frames. Holes for fasteners must be located a minimum of 2" from the edge of



the hole to the edge of the panel.

Please contact the 3form Technical Help Line should you have any questions regarding the use of Chroma with mechanical fasteners.

*Gaskets, washers and tubing must be produced with a non-plasticized material. Suitable materials include: neoprene, teflon, nylon, silicone.

DEFLECTION

3form Chroma will exhibit different amounts of deflection given a variety of factors: fastening techniques, loads, gauges and panel dimensions to list a few. Your 3form Representative can assist you with general deflection guidelines for your application using the Chroma Deflection Charts. If your application has specific engineering requirements, please contact the 3form Technical Help Desk for additional direction at 801-649-2670.

HEAT FORMING/COLD BENDING

3form Chroma can be heated and formed to produce simple or even complex curves and shapes. The table below lists the minimum inner radius for a heat formed shape. Tighter radii may be possible, contact 3form Technical Service for details.

THICKNESS	MINIMUM HEATFORMING RADIUS
1/4" (6.3 mm)	4" (101.6 mm)
1/2" (12.7 mm)	4" (101.6 mm)
1" (25.4 mm)	8" (203.2 mm)
2" (50.8 mm)	12" (304.8 mm)

The optimal forming temperature ranges from 300º- 330ºF. Large and complex forming geometries should be specified to be produced by the 3form Fabrication experts.

SPECIAL CONSIDERATIONS FOR THE HEAT-FORMING OF CHROMA HIGHRES.

1/2" thickness only (Maximum finished sizes of 46" x 94" and 46" x 118")
Renewable Matte finishes only
No Complex Curves

Though 3form Chroma is commonly used in flat or heat curved applications, the polymeric nature of the material allows a minimal

amount of cold bending for a given panel. Cold bending is not possible on 1" and 2" gauges. The table below shows the minimum suggested radius for 3form Chroma at a given gauge:

THICKNESS	MINIMUM BEND RADIUS
0.250" (6.3 mm)	150" (381 cm)
0.500" (12.7 mm)	225" (571 cm)

EDGE FINISHING

Edges of 3form Chroma panels are able to be machined or routed into a variety of different forms. In addition to a straight edge, edges may accept beveling, rounding, etc. Additional finishing, such as sanding or polishing, can also be provided to some edges.

FABRICATION LIMITATIONS

Chroma Reflect requires special consideration during fabrication. When cutting panels using table saws or panels saws where the blade is situated below the panel, the back side (reflect side) of the panel needs to be facing UP. The back side of the panel should be facing down if it is being cut by a circular saw or a panel saw where the blade is above the panel.

Chroma reflect panels can be cut with a CNC router or a plunge router. Chroma Reflect MUST be scored with a 1/16" or 1/8" blade or tool before routing. All CNC cutting must be done from the back side. Chroma Reflect panels CAN NOT be cut with a jig saw or reciprocating saw.

REFINISHING

One of the unique benefits of 3form Chroma is its ability to be refinished. If 3form Chroma needs to be refinished for any reason, the panels may be renewed by sanding. Make sure to sand the entire surface to obtain a uniform finish over the whole panel. Begin by dry sanding with a course grit paper (100 or 150 grit) to remove blemishes/scratches. Continue sanding with gradually finer grit papers until the surface is smooth and level and the blemish/scratches are removed. Complete the refinishing process by sanding with a 220 grit paper to attain a matte finish. Only the primary surface (non-colored side) is refinishable. After sanding, clean the surface with warm water and a mild detergent. Dry with a clean, cotton cloth and finish by treating the panel with Countertop Magic®. Even finer grit papers may be used to attain a satin or semi-polished appearance. With papers greater than 400 grit, wet sanding (with water) should be employed. Be sure to keep sanders in motion at all times when refinishing surfaces or edges. Only use light pressure with power sanders in order to maintain evenness and avoid overheating of the sheet surface.

SOUND TRANSMISSION CLASS (STC) VALUES FOR CHROMA

Measurement protocol: ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

THICKNESS	STC VALUES
1/2" (12.7 mm)	32
1" (25.4 mm)	36

THERMAL INSULATION VALUES FOR CHROMA

Insulation values are a function of both the convective properties (U-Values and shading coefficients) and the conductive properties (thermal conductivity).

CHROMA RENEW/RENEW THICKNESS	WINTER U-VALUE (BTU/HR-FT²-°F)	SUMMER U-VALUE (BTU/HR-FT²-°F)
1/2" (12.7 mm)	0.82	0.81
1" (25.4 mm)	0.65	0.65
2" (50.8 mm)	NOT TESTED	NOT TESTED

Select Mechanical and Physical Properties for 3form Chroma

		TYPICAL VALUES	
PROPERTY	**ASTM METHOD**	**US CUSTOM**	**METRIC**
GENERAL			
Density	D1505	1.19 g/cm^3	1.19 x 10^{-3} kg/cm^3
Water Absorption	D579 24hrs @ 73°F	0.2%	0.2%
MECHANICAL			
Tensile Strength	D638	10,000 psi	69 MPa
Elongation at Rupture	D638	4.5%	4.5%
Tensile Modulus	D638	400,000 psi	2800 MPa
Flexural Strength (rupture)	D790	17,000 psi	117 MPa
Flexural Modulus	D790	480,000 psi	3300 MPa
Compressive Strength (yield)	D695	17,000 psi	117 MPa
Compressive Deformation	D621 4000 psi, 122ºF, 24 hours)	≤0.85%	
Shear Ultimate Strength	D732	10,000 psi	703 kg/cm^2
Shear Modulus	D5279	167,000 psi	1151 MPa
Impact Strength (charpy method)	D256 notched	2.1 lbf*in/in	0.9 kgf*cm/cm
	D256 un-notched	7 lbf*in/in	3.17 kgf*cm/cm
Izod Impact Strength	D256 notched	≤0.25 ft-lb/in	≤13.3 J/m
Rockwell Hardness	D785	M-93	M-93
Barcol Hardness	D2583	48	48
Residual Shrinkage (internal strain)	D702	2%	2%
Coefficient of Friction	D2047 dry D2047 wet	0.73 0.79	
Poisson's Ratio	E132	0.35-0.40	
OPTICAL			
Refractive Index	D542	1.49	1.49
Light Transmission (total)	D1003	92%	92%
Haze	D1003	<1%	<1%
THERMAL			
Max Continuous Use Temperature		180ºF	82ºC
Max Instantaneous Use Temperature		212ºF	100ºC
Deflection Temperature	D648 @ 264 psi	195ºF	90ºC
Vicat Softening Point	D1525	239ºF	115ºC
Forming Temperature		300-330ºF	149-157ºC
Coefficient of Thermal Conductivity (k-factor)	cenco-fitch	1.3 btu/(hr)ft^2(ºF)	0.19 w/mºK
Coefficient of Thermal Expansion	D696 @ 60ºF (16ºC)	4.0 x 10^{-5}(in/in/ºF)	7.2 x 10^{-5}(mm/mm/ºC)

Chemical Resistance of 3form Chroma to Select Compounds

7 DAY FULL IMMERSION TESTING @ 73°F (23°C)

Polymer materials are affected by chemicals in different ways. Changes in performance or appearance when exposed to chemicals can be attributed to fabrication methods, exposure conditions, concentration of chemical substances or exposure duration. Such factors can even influence the final effect on substances that 3form Chroma is considered "Resistant" to under test conditions. Further details are explained below:

FABRICATION

Stresses generated from sanding, grinding, drilling, polishing, machining, sawing and/or forming (hot or cold).

EXPOSURE

Exposure duration, stresses imparted during the application life-cycle due to loads, temperature changes, heat, environments, etc.

APPLICATION OF CHEMICALS

Application from contact, rubbing, wiping, spraying, soaking, etc. Also having an affect is the relative concentration of the chemical in question.

The following table provides indicative performance of the chemical resistance characteristics of clear 3form Chroma panels. The following codes are used to describe the chemical resistance characteristics:

R = RESISTANT

3form Chroma is able to withstand the identified compound for long exposure periods. (7 days, full immersion)

LR = LIMITED RESISTANCE

3form Chroma is only resistant when in contact with this compound for short periods at room temperature. It is advised that further determination of the effect of the substance be further tested in your particular application.

N = NOT RESISTANT

3form Chroma is not resistant to the compound. The material will swell, craze, haze, dissolve or experience some physical change when exposed to this substance.

REAGENT	RESULT	REAGENT	RESULT
acetic acid (5%)	R	hydrochloric acid	R
acetic acid (glacial)	N	hydrofluoric acid (40%)	N
acetic anhydride	LR	hydrogen peroxide (3%)	R
acetone	N	hydrogen peroxide (28%)	N
acrylic paints and lacquers	LR	iso octane	R
ammonia (aqueous solution)	R	isopropyl alcohol	LR
ammonium chloride (saturated)	R	kerosene	R
ammonium hydroxide (10%)	R	lacquer thinner	N
ammonium hydroxide (conc.)	R	lactic acid (80%)	LR
aniline	N	methane	R
battery Acid	R	methyl alcohol (50%)	LR
benzaldehyde	N	methyl alcohol (100%)	N
benzene	N	methyl ethyl ketone (MEK)	N
bituminous emulsion	N	methylene chloride	N
bleach (see sodium hypochlorite)	R	mineral oil	R
bromine	N	mortar	R
butanol	LR	motor fuel (benzene-free)	R
butyl acetate	N	motor fuel (with benzene)	N
calcium chloride (saturated)	R	muriatic acid (20%)	R
calcium hypochlorite	R	nitric acid (10%)	R
carbon tetrachloride	N	nitric acid (40%)	LR
cement	R	nitric acid (conc.)	N
chlorine water	LR	oil paints (pure)	R
chloroform	N	olive oil	R
chromic acid (40%)	N	oxygen	R
citric acid (10%)	R	ozone	R
cottonseed oil (edible)	R	phenol solution (5%)	N
detergent solution	R	phosphoric acid (10%)	R
diesel oil	R	plaster of paris	R
diethyl ether	N	soap solution (ivory)	R
dimethyl formamide	N	sodium carbonate (2%)	R
dioctyle formamide	N	sodium carbonate (20%)	R
ethyl acetate	N	sodium chloride (10%)	R
ethyl alcohol (50%)	LR	sodium hydroxide (1%)	R
ethyl alcohol (95%)	N	sodium hydroxide (10%)	R
ethyl dichloride	N	sodium hydroxide (60%)	R
ethylene gycol	R	sodium hypochlorite (5%)	R
2-ethylhexyl sebacate	R	stearic acid	R
formaldehyde (40%)	R	sulfuric acid (3%)	R
formic acid (2%)	R	sulfuric acid (30%)	R
formic acid (40%)	LR	sulfuric acid (conc.)	N
gasoline (regular, leaded)	LR	thinners (general)	N
glycerine	R	toluene	N
glycerol	R	tricholoroethylene	N
glycol	R	turpentine	LR
heptane	R	urine	R
hexane	R	water (distilled)	R
hot bitumen	LR	xylene	N

Cleaning Instructions

3form Chroma, like all thermoplastic materials should be cleaned periodically. A regular cleaning program will help to maintain the aesthetics and life of the material. 3form recommends the use of Novus® No. 1 and Brillianize® plastic cleaners. Both products are specifically for use on plastics and help panels to resist finger-marking and static.

Rinse or wipe the sheet with lukewarm water. Remove dust and dirt from 3form Chroma with a damp, soft cloth or sponge and a solution of mild soap and/or liquid detergent in water. Rinse or wipe the 3form Chroma again thoroughly with lukewarm water. For more stubborn stains, dirty spots or grease, surface cleaners like Fantastik® or Formula 409® also work well. A scotch brite sponge can also help remove tough grease stains. After all cleaning steps, be sure to rinse thoroughly with lukewarm water.

Always use a soft, damp cloth to blot dry. Rubbing with a dry cloth can scratch the material and create a static charge. Never use scrapers or squeegees on 3form Chroma. Also avoid scouring compounds, gasoline, benzene, acetone, carbon tetrachloride, certain deicing fluids, lacquer thinner or other strong solvents.

DO NOT:

- Use squeegees or scrapers as they may scratch the sheet
- Use scouring compounds or solvents such as: acetone, gasoline, benzene, carbon tetrachloride, or lacquer thinner to clean the sheet
- Use abrasives or highline alkaline cleaners
- Use a dry cloth or a cloth of synthetic fiber such as rayon or polyester as they may scratch the sheet.
- Use Windex® or Glass Plus® cleaners

DO:

- Use warm water, mild detergent and a soft cloth or chamois
- Rinse surface thoroughly after cleaning with lukewarm water
- Blot dry with slightly damp, soft cloth or chamois

IMPORTANT

If a cleaning material is found to be incompatible in a short-term test, it will usually be found to be incompatible in the field. The converse, however, is not always true. Favorable performance is no guarantee that actual end-use conditions have been duplicated. Therefore, these results should be used as a guide only and it is recommended that the user test the products under actual end-use conditions.

For more information, please visit 3-form.com or call 877-649-2670.

LF6

3form® chroma®

Product Description

3form Chroma is produced from optical grade engineered resin. Chroma is available in thick-gauge formats which lends itself well for use in many horizontal applications. Chroma is a highly functional material that brings impact when color is introduced. Chroma is produced with brilliant colors that can be layered (up to five colors) to create an enormous range of hues, opacities and amazing effects. The surface of Chroma features a durable renewable matte texture that can be easily refinished throughout its lifetime. Chroma incorporates 38% recycled content* (29% pre-consumer, 9% post-consumer) without compromising its amazing clarity. *2" Chroma does not contain recycled content

Chroma XT is exterior grade Chroma suitable for use as signage, lighting, awnings, tables or canopies. Use Chroma XT to bring amazing color and design to your exterior applications.

FEATURES AND BENEFITS

- Great for edge lighting – tremendous optical properties and high light transmission
- Rigid - stable and sturdy material for horizontal applications
- Qualifies for 3form Reclaim™ – keeping end-of-life material out of landfills
- Combine up to five colors to create any color imaginable
- Surface is able to be completely refinished to maintain product "newness"

AVAILABLE COLORS

3form Chroma comes in a variety of translucent warm and cool colors. Colors can be made opaque with the addition of the color - White Out.

(Visit www.3-form.com for the complete list of available color options.)

CHROMA REFLECT

3form Chroma Reflect™ pairs beautiful 3form colors with a reflective opaque mirror. The result is a breathtaking panel that glows and radiates color like you've never seen. Chroma Reflect panels are 1-sided and opaque. Chroma Reflect can only be paired with one Chroma color. The back finish of Chroma Reflect is left unfinished to allow for more versatility during fabrication. Chroma Reflect adds an extra 1/8" (3 mm) to the standard thickness of Chroma panels. Additionally, Chroma Reflect is not suitable for exterior use and requires special fabrication techniques.

TEXTURES/PATTERNS/FINISHES

All Chroma sheets come standard with a Renewable matte finish on the front face that allows the product to be continually rejuvenated if ever desired or necessary during the service life of the material. The back side of 3form Chroma in translucent colors is finished with a matte finish, but this side should not be renewed. Chroma Clear comes standard with renewable matte surfaces on front and back.

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All dimensions and squareness (standard or custom) are subject to a +1/4" or - 3/16" (+6 mm or -5 mm) tolerance. Squareness (standard or custom) is subject to a 1/8" (3.1 mm) tolerance.

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example:

- A 48" x 96" panel that experiences a 50°F temperature change will expand/contract: 96 inches x 50 degrees x 0.00004 = 0.192 inches

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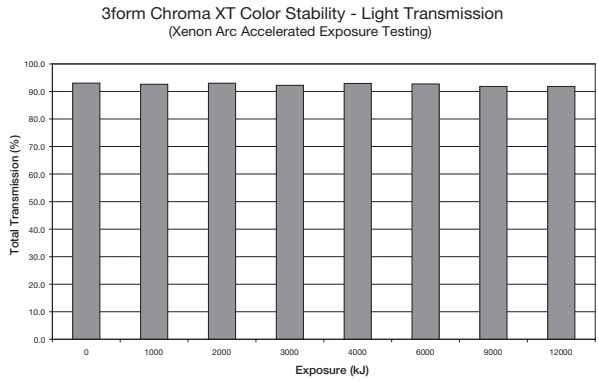
*Chroma Reflect cannot be used in exterior applications.

USAGE LIMITATIONS

3form Chroma should never come in direct contact with metal fasteners. Non-metallic* gaskets, washers, and tubing are to be utilized in conjuntion with mechanical connections such as point supports and frames. Holes for fasteners must be located a minimum of 2" from the edge of



the hole to the edge of the panel.

Please contact the 3form Technical Help Line should you have any questions regarding the use of Chroma with mechanical fasteners.

*Gaskets, washers and tubing must be produced with a non-plasticized material. Suitable materials include: neoprene, teflon, nylon, silicone.

DEFLECTION

3form Chroma will exhibit different amounts of deflection given a variety of factors: fastening techniques, loads, gauges and panel dimensions to list a few. Your 3form Representative can assist you with general deflection guidelines for your application using the Chroma Deflection Charts. If your application has specific engineering requirements, please contact the 3form Technical Help Desk for additional direction at 801-649-2670.

HEAT FORMING/COLD BENDING

3form Chroma can be heated and formed to produce simple or even complex curves and shapes. The table below lists the minimum inner radius for a heat formed shape. Tighter radii may be possible, contact 3form Technical Service for details.

THICKNESS	MINIMUM HEATFORMING RADIUS
1/4" (6.3 mm)	4" (101.6 mm)
1/2" (12.7 mm)	4" (101.6 mm)
1" (25.4 mm)	8" (203.2 mm)
2" (50.8 mm)	12" (304.8 mm)

The optimal forming temperature ranges from 300º- 330ºF. Large and complex forming geometries should be specified to be produced by the 3form Fabrication experts.

SPECIAL CONSIDERATIONS FOR THE HEAT-FORMING OF CHROMA HIGHRES.

1/2" thickness only (Maximum finished sizes of 46" x 94" and 46" x 118")
Renewable Matte finishes only
No Complex Curves

Though 3form Chroma is commonly used in flat or heat curved applications, the polymeric nature of the material allows a minimal

amount of cold bending for a given panel. Cold bending is not possible on 1" and 2" gauges. The table below shows the minimum suggested radius for 3form Chroma at a given gauge:

THICKNESS	MINIMUM BEND RADIUS
0.250" (6.3 mm)	150" (381 cm)
0.500" (12.7 mm)	225" (571 cm)

EDGE FINISHING

Edges of 3form Chroma panels are able to be machined or routed into a variety of different forms. In addition to a straight edge, edges may accept beveling, rounding, etc. Additional finishing, such as sanding or polishing, can also be provided to some edges.

FABRICATION LIMITATIONS

Chroma Reflect requires special consideration during fabrication. When cutting panels using table saws or panels saws where the blade is situated below the panel, the back side (reflect side) of the panel needs to be facing UP. The back side of the panel should be facing down if it is being cut by a circular saw or a panel saw where the blade is above the panel.

Chroma reflect panels can be cut with a CNC router or a plunge router. Chroma Reflect MUST be scored with a 1/16" or 1/8" blade or tool before routing. All CNC cutting must be done from the back side. Chroma Reflect panels CAN NOT be cut with a jig saw or reciprocating saw.

REFINISHING

One of the unique benefits of 3form Chroma is its ability to be refinished. If 3form Chroma needs to be refinished for any reason, the panels may be renewed by sanding. Make sure to sand the entire surface to obtain a uniform finish over the whole panel. Begin by dry sanding with a course grit paper (100 or 150 grit) to remove blemishes/scratches. Continue sanding with gradually finer grit papers until the surface is smooth and level and the blemish/scratches are removed. Complete the refinishing process by sanding with a 220 grit paper to attain a matte finish. Only the primary surface (non-colored side) is refinishable. After sanding, clean the surface with warm water and a mild detergent. Dry with a clean, cotton cloth and finish by treating the panel with Countertop Magic®. Even finer grit papers may be used to attain a satin or semi-polished appearance. With papers greater than 400 grit, wet sanding (with water) should be employed. Be sure to keep sanders in motion at all times when refinishing surfaces or edges. Only use light pressure with power sanders in order to maintain evenness and avoid overheating of the sheet surface.

SOUND TRANSMISSION CLASS (STC) VALUES FOR CHROMA

Measurement protocol: ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

THICKNESS	STC VALUES
1/2" (12.7 mm)	32
1" (25.4 mm)	36

THERMAL INSULATION VALUES FOR CHROMA

Insulation values are a function of both the convective properties (U-Values and shading coefficients) and the conductive properties (thermal conductivity).

CHROMA RENEW/RENEW THICKNESS	WINTER U-VALUE (BTU/HR-FT²-°F)	SUMMER U-VALUE (BTU/HR-FT²-°F)
1/2" (12.7 mm)	0.82	0.81
1" (25.4 mm)	0.65	0.65
2" (50.8 mm)	NOT TESTED	NOT TESTED

Select Mechanical and Physical Properties for 3form Chroma

		TYPICAL VALUES	
PROPERTY	**ASTM METHOD**	**US CUSTOM**	**METRIC**
GENERAL			
Density	D1505	1.19 g/cm^3	1.19 x 10^{-3} kg/cm^3
Water Absorption	D579 24hrs @ 73°F	0.2%	0.2%
MECHANICAL			
Tensile Strength	D638	10,000 psi	69 MPa
Elongation at Rupture	D638	4.5%	4.5%
Tensile Modulus	D638	400,000 psi	2800 MPa
Flexural Strength (rupture)	D790	17,000 psi	117 MPa
Flexural Modulus	D790	480,000 psi	3300 MPa
Compressive Strength (yield)	D695	17,000 psi	117 MPa
Compressive Deformation	D621 4000 psi, 122ºF, 24 hours)	≤0.85%	
Shear Ultimate Strength	D732	10,000 psi	703 kg/cm^2
Shear Modulus	D5279	167,000 psi	1151 MPa
Impact Strength (charpy method)	D256 notched	2.1 lbf*in/in	0.9 kgf*cm/cm
	D256 un-notched	7 lbf*in/in	3.17 kgf*cm/cm
Izod Impact Strength	D256 notched	≤0.25 ft-lb/in	≤13.3 J/m
Rockwell Hardness	D785	M-93	M-93
Barcol Hardness	D2583	48	48
Residual Shrinkage (internal strain)	D702	2%	2%
Coefficient of Friction	D2047 dry D2047 wet	0.73 0.79	
Poisson's Ratio	E132	0.35-0.40	
OPTICAL			
Refractive Index	D542	1.49	1.49
Light Transmission (total)	D1003	92%	92%
Haze	D1003	<1%	<1%
THERMAL			
Max Continuous Use Temperature		180ºF	82ºC
Max Instantaneous Use Temperature		212ºF	100ºC
Deflection Temperature	D648 @ 264 psi	195ºF	90ºC
Vicat Softening Point	D1525	239ºF	115ºC
Forming Temperature		300-330ºF	149-157ºC
Coefficient of Thermal Conductivity (k-factor)	cenco-fitch	1.3 btu/(hr)ft^2(ºF)	0.19 w/mºK
Coefficient of Thermal Expansion	D696 @ 60ºF (16ºC)	4.0 x 10^{-5}(in/in/ºF)	7.2 x 10^{-5}(mm/mm/ºC)

Chemical Resistance of 3form Chroma to Select Compounds

7 DAY FULL IMMERSION TESTING @ 73°F (23°C)

Polymer materials are affected by chemicals in different ways. Changes in performance or appearance when exposed to chemicals can be attributed to fabrication methods, exposure conditions, concentration of chemical substances or exposure duration. Such factors can even influence the final effect on substances that 3form Chroma is considered "Resistant" to under test conditions. Further details are explained below:

FABRICATION

Stresses generated from sanding, grinding, drilling, polishing, machining, sawing and/or forming (hot or cold).

EXPOSURE

Exposure duration, stresses imparted during the application life-cycle due to loads, temperature changes, heat, environments, etc.

APPLICATION OF CHEMICALS

Application from contact, rubbing, wiping, spraying, soaking, etc. Also having an affect is the relative concentration of the chemical in question.

The following table provides indicative performance of the chemical resistance characteristics of clear 3form Chroma panels. The following codes are used to describe the chemical resistance characteristics:

R = RESISTANT

3form Chroma is able to withstand the identified compound for long exposure periods. (7 days, full immersion)

LR = LIMITED RESISTANCE

3form Chroma is only resistant when in contact with this compound for short periods at room temperature. It is advised that further determination of the effect of the substance be further tested in your particular application.

N = NOT RESISTANT

3form Chroma is not resistant to the compound. The material will swell, craze, haze, dissolve or experience some physical change when exposed to this substance.

REAGENT	RESULT	REAGENT	RESULT
acetic acid (5%)	R	hydrochloric acid	R
acetic acid (glacial)	N	hydrofluoric acid (40%)	N
acetic anhydride	LR	hydrogen peroxide (3%)	R
acetone	N	hydrogen peroxide (28%)	N
acrylic paints and lacquers	LR	iso octane	R
ammonia (aqueous solution)	R	isopropyl alcohol	LR
ammonium chloride (saturated)	R	kerosene	R
ammonium hydroxide (10%)	R	lacquer thinner	N
ammonium hydroxide (conc.)	R	lactic acid (80%)	LR
aniline	N	methane	R
battery Acid	R	methyl alcohol (50%)	LR
benzaldehyde	N	methyl alcohol (100%)	N
benzene	N	methyl ethyl ketone (MEK)	N
bituminous emulsion	N	methylene chloride	N
bleach (see sodium hypochlorite)	R	mineral oil	R
bromine	N	mortar	R
butanol	LR	motor fuel (benzene-free)	R
butyl acetate	N	motor fuel (with benzene)	N
calcium chloride (saturated)	R	muriatic acid (20%)	R
calcium hypochlorite	R	nitric acid (10%)	R
carbon tetrachloride	N	nitric acid (40%)	LR
cement	R	nitric acid (conc.)	N
chlorine water	LR	oil paints (pure)	R
chloroform	N	olive oil	R
chromic acid (40%)	N	oxygen	R
citric acid (10%)	R	ozone	R
cottonseed oil (edible)	R	phenol solution (5%)	N
detergent solution	R	phosphoric acid (10%)	R
diesel oil	R	plaster of paris	R
diethyl ether	N	soap solution (ivory)	R
dimethyl formamide	N	sodium carbonate (2%)	R
dioctyle formamide	N	sodium carbonate (20%)	R
ethyl acetate	N	sodium chloride (10%)	R
ethyl alcohol (50%)	LR	sodium hydroxide (1%)	R
ethyl alcohol (95%)	N	sodium hydroxide (10%)	R
ethyl dichloride	N	sodium hydroxide (60%)	R
ethylene gycol	R	sodium hypochlorite (5%)	R
2-ethylhexyl sebacate	R	stearic acid	R
formaldehyde (40%)	R	sulfuric acid (3%)	R
formic acid (2%)	R	sulfuric acid (30%)	R
formic acid (40%)	LR	sulfuric acid (conc.)	N
gasoline (regular, leaded)	LR	thinners (general)	N
glycerine	R	toluene	N
glycerol	R	tricholoroethylene	N
glycol	R	turpentine	LR
heptane	R	urine	R
hexane	R	water (distilled)	R
hot bitumen	LR	xylene	N

Cleaning Instructions

3form Chroma, like all thermoplastic materials should be cleaned periodically. A regular cleaning program will help to maintain the aesthetics and life of the material. 3form recommends the use of Novus® No. 1 and Brillianize® plastic cleaners. Both products are specifically for use on plastics and help panels to resist finger-marking and static.

Rinse or wipe the sheet with lukewarm water. Remove dust and dirt from 3form Chroma with a damp, soft cloth or sponge and a solution of mild soap and/or liquid detergent in water. Rinse or wipe the 3form Chroma again thoroughly with lukewarm water. For more stubborn stains, dirty spots or grease, surface cleaners like Fantastik® or Formula 409® also work well. A scotch brite sponge can also help remove tough grease stains. After all cleaning steps, be sure to rinse thoroughly with lukewarm water.

Always use a soft, damp cloth to blot dry. Rubbing with a dry cloth can scratch the material and create a static charge. Never use scrapers or squeegees on 3form Chroma. Also avoid scouring compounds, gasoline, benzene, acetone, carbon tetrachloride, certain deicing fluids, lacquer thinner or other strong solvents.

DO NOT:

- Use squeegees or scrapers as they may scratch the sheet
- Use scouring compounds or solvents such as: acetone, gasoline, benzene, carbon tetrachloride, or lacquer thinner to clean the sheet
- Use abrasives or highline alkaline cleaners
- Use a dry cloth or a cloth of synthetic fiber such as rayon or polyester as they may scratch the sheet.
- Use Windex® or Glass Plus® cleaners

DO:

- Use warm water, mild detergent and a soft cloth or chamois
- Rinse surface thoroughly after cleaning with lukewarm water
- Blot dry with slightly damp, soft cloth or chamois

IMPORTANT

If a cleaning material is found to be incompatible in a short-term test, it will usually be found to be incompatible in the field. The converse, however, is not always true. Favorable performance is no guarantee that actual end-use conditions have been duplicated. Therefore, these results should be used as a guide only and it is recommended that the user test the products under actual end-use conditions.

For more information, please visit 3-form.com or call 877-649-2670.

ENVIRONMENTALLY FRIENDLY, ENERGY EFFICIENT

- Comparable light output to 26W, 32W, 42W and 2x26W CFL while consuming 18, 21, 31 and 46 watts.
- No harmful ultraviolet or infrared wavelengths
- No lead or mercury

9" 1100/1300/2000/2800 LUMEN LED DOWNLIGHT CYLINDER

OPEN APERTURE

9-LED SERIES

Type Cat. No.

Project:

Notes:

PRODUCT SPECIFICATIONS

Optics

Cone: Self-flanged, low iridescent satin or specular Alzak® cone standard • Cone available in clear, gold, black, pewter, wheat, and bronze Alzak® finishes; see trim options • Computer-optimized reflector maximizes fixture efficiency • Deep regression of source produces a very low glare system with 40° cut-off to lamp and lamp image • Lensed mixing chamber conceals the LEDs to produce uniform aperture luminance

Electrical

LED Light Engine: Innovative light engine utilizes remote phosphor lens and mixing chamber to ensure perfectly mixed light, resulting in uniform colors and superior color consistency from fixture to fixture • 2700K, 3000K, 3500K and 4100K color temperatures available • CRI>80 • Cast aluminum heat sink integrated directly with housing provides superior thermal management with LEDs operating below manufacturer's published junction temperature to ensure attainment of rated life of the LEDs • Light engine mounts directly to heat sink and is easily replaceable • Light engine/reflector system produces 900 to 2500 lumens while using only 18 to 46 watts of energy and incorporates the latest generation of high lumen LEDs.

Dimming: Dimmable via 0-10V protocol, increasing efficiency up to 30% while dimming • For a list of compatible dimmers, see LED-DIM.

LED Driver: Universal driver accommodates 120V to 277V input volts AC at 50/60Hz, 2800 lumen unit is voltage specific • Power factor >0.9 • Dimmable via 0-10V protocol, increasing efficiency up to 30% while dimming

Life: Rated for 50,000 hours at 70% lumen maintenance

Mechanical

Housing: One piece heavy gauge steel with white or black baked textured powder coat finish.

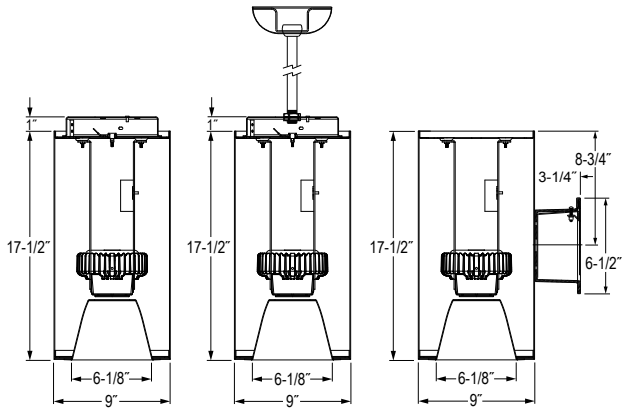
Mounting: Available for surface, pendant or wall mounting • Pendant mounting features hang straight pendant mounting kits that allows for mounting on to sloped ceiling with an angle up to 45° • Hinged reveal allows single person installation.

Labels and Listings

- UL listed for damp locations • I.B.E.W. Union made
- UL and cUL, RoHS complaint • EMI complies with FCC 47, Part 15, Class A
- Energy Star qualified, page 2 for designated products
- ARRA compliant

Warranty: 5 years when used in accordance with manufacturing guidelines. Product specifications subject to change without notice.

DIMENSIONS



ENGINEERING DATA

Voltage	120V - 277V			
Light Engine Lumens	1100	1300	2000	2800
CCT	4K/35K/3K/27K	4K/35K/3K/27K	4K/35K/3K/27K	4K/35K/3K/27K
Input Wattage	18W/18W/19W/19W	20W/21W/22W/22W	30W/31W/33W/33W	46W/46W/49W/49W
Input Frequency	50/60Hz	50/60Hz	50/60Hz	50/60Hz
Power Factor	0.9	0.9	0.9	0.9

347 Volt available, consult factory.

ORDERING INFORMATION: Rough-in, reflector and accessories each ordered separately.

Examples: **9-LED-1327W-CS3 / 9-LED-1135W-CL3-WH / 9-LED-13402B-GS3-PD**

Cat. #	Lumens	Color Temp.	♦Voltage	Housing Color	Trim Options	Generation	Options
	-			*	-		3 -

9-LED Surface Mount
9P-LED ▪ Pendant Mount
9B-LED Wall Mount

Lumens	Color Temp.	♦Voltage
11 1100	27 2700K	1 120V
13 1300	30 3000K	2 277V
20 2000	35 3500K	3 347V
♦28 2800	40 4100K	

W White
B Black

Alzak® Finish Options:

	Satin	Specular
Clear	CS	CL
Gold	GS	GL
Black	BS	BL
Pewter	PTS	PTL
Wheat	WTS	WTL
Bronze	BZS	BZL

Painted Finish Options

White W

Options

- **WH** White Flange
- **WS** Single Wall Wash
- **BP** Emergency Battery Pack w/ Test switch (Battery & test switch remotely mounted)
- **347** 347 Volt (1100/1300/2000 lumen units only)
- †**R1** Reverse Phase Dimming (1100/1300/2000Lm, 120V only) *STD. on 2800 Lumen/120V
- **D1** DALI Conrol Dimming (1100/1300Lm, 120V only)
- **PD** Lutron Dimming Driver (1100, 1300Lm Only)

Example: **P24-W**

Pendant Kits/Accessories

- **P18-W** 18" Hang Straight Mounting Kit, White
- **P18-B** 18" Hang Straight Mounting Kit, Black
- **P24-W** 24" Hang Straight Mounting Kit, White
- **P24-B** 24" Hang Straight Mounting Kit, Black
- **P36-W** 36" Hang Straight Mounting Kit, White
- **P36-B** 36" Hang Straight Mounting Kit, Black
- **DM** For (0-10V) standard Dimming Example: **-P24-W-DM**
- **DM-PD** For use with Lutron Dimming Driver option. Example: **-P24-W-DM-PD**
- **DM-D1** For use with Dali Control option Example: **-P24-W-DM-D1**
- **BP-FRTM** For Battery Pack add **'-BP-FRTM'** to Pendant Kit. Example: **-P24-W-BP-FRTM**

♦2800 Lumen unit is voltage specific, all others are universal voltage.

▪See accessories for pendant mounting of fixtures with dimming or emergency battery pack.

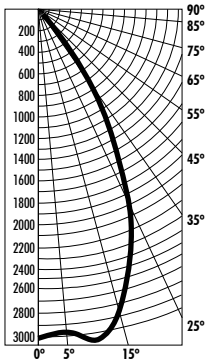
†R1 Uses standard stem accessories

Rev. 1 09/13

Juno Lighting Group by Schneider Electric
1300 South Wolf Road • Des Plaines, Illinois 60018
PHONE 800-367-5866 • FAX 888-708-6578
www.junolightinggroup.com

2700K, 3000K, 3500K & 4100K CCT

Catalog Number: 9-LED-28351W-CL3
PHOTOMETRIC REPORT
Test Number: PR10121883
Total Lumen Output: 2559 Lumens
Luminaire Efficacy: 52.2 lm/w (2700K), 52.2 lm/w (3000K)
55.6 lm/w (3500K), 55.6 lm/w (4100K)
Luminaire Spacing Criteria: 0.89
Luminaire: Clear specular Alzak® reflector. Open bottom.
CIE-Type: Direct



Candlepower Distribution
(Candelas)

Angle	Candela	Lumens
0°	3009	
5°	2966	283
15°	2870	813
25°	2009	930
35°	809	508
45°	10	8
55°	0	0
65°	0	0
75°	0	0
85°	0	0

Lumen Multiplier: 2000 x 0.69
1300 x 0.45
1100 x 0.39

Initial Footcandles

Distance to Illuminated Plane (Feet)	Footcandles Beam Center	Footcandles Beam Edge	Beam Diameter
6′	83.6	29.0	6.6′
7′	61.4	21.3	7.7′
8′	47.0	16.3	8.8′
9′	37.1	12.9	9.9′
10′	30.1	10.4	11.0′
11′	24.9	8.6	12.1′
12′	20.9	7.2	13.2′
13′	17.8	6.2	14.2′
14′	15.4	5.3	15.3′
15′	13.4	4.6	16.4′

Luminance Data

Angle in Degrees	Candela/M²
45°	783
55°	201
65°	670
75°	787
85°	2922

Zonal Lumen Summary

Zone	Lumens%	%Fixture
0-30°	2026	79.2
0-40°	2535	99.1
0-60°	2545	99.4
0-90°	2559	100.0
90-180°	0	0.0
0-180°	2559	100.0

AVERAGE INITIAL FOOTCANDLES
Reflectances: 80% Ceiling, 50% Walls, 30% Floors

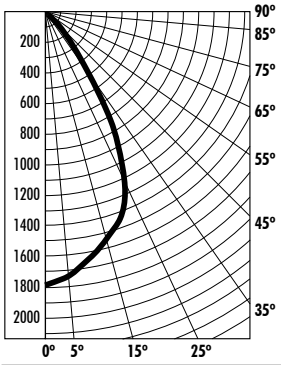
Luminaire Spacing	Room Cavity Ratio RCR1	RCR4	RCR8
5′ x 5′	114	94	75
6′ x 6′	79	65	52
7′ x 7′	58	48	38
8′ x 8′	44	37	29
9′ x 9′	35	29	23
10′ x 10′	28	24	19
11′ x 11′	23	19	15
12′ x 12′	20	16	13

COEFFICIENTS OF UTILIZATION - % (Zonal Cavity Method)
Effective Floor Reflectance 20%

PCC	80				70				50			30			10		0
PW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	114	111	109	107	111	109	107	105	105	103	102	101	100	99	98	97	96	94
2	108	104	100	97	106	102	99	96	99	96	94	96	94	92	93	91	90	88
3	103	97	93	89	101	96	92	88	93	90	87	91	88	95	89	86	84	83
4	99	91	86	82	97	90	85	82	88	84	81	86	83	80	84	81	79	77
5	94	86	81	76	92	85	80	76	83	79	75	82	78	75	80	77	74	73
6	90	81	76	71	88	80	75	71	79	74	71	78	73	70	76	73	70	68
7	85	77	71	67	84	76	71	67	75	70	66	74	69	66	72	69	66	64
8	82	73	67	63	80	72	67	63	71	66	63	70	65	62	69	65	62	61
9	78	69	63	59	77	68	63	59	67	62	59	66	62	59	66	62	59	57
10	74	65	60	56	73	65	60	56	64	59	56	63	59	56	63	58	55	54

2700K, 3000K, 3500K & 4100K CCT

Catalog Number: 9-LED-2035W-CS3
PHOTOMETRIC REPORT
Test Number: PR10121891
Total Lumen Output: 1603 Lumens
Luminaire Efficacy: 48.6 lm/w (2700K), 48.6 lm/w (3000K)
51.5 lm/w (3500K), 53.4 lm/w (4100K)
Luminaire Spacing Criteria: 0.94
Luminaire: Clear satin Alzak® reflector. Open bottom.
CIE-Type: Direct



Candlepower Distribution
(Candelas)

Angle	Candela	Lumens
0°	1795	
5°	1749	167
15°	1535	435
25°	1220	565
35°	514	323
45°	111	86
55°	22	20
65°	3	3
75°	0	0
85°	0	0

Lumen Multiplier: 2800 x 1.44
1300 x 0.64
1100 x 0.55

Initial Footcandles

Distance to Illuminated Plane (Feet)	Footcandles Beam Center	Footcandles Beam Edge	Beam Diameter
6′	49.9	16.3	6.9′
7′	36.6	12.0	8.0′
8′	28.0	9.2	9.2′
9′	22.2	7.2	10.3′
10′	18.0	5.9	11.4′
11′	14.8	4.9	12.6′
12′	12.5	4.1	13.7′
13′	10.6	3.5	14.9′
14′	9.2	3.0	16.0′
15′	8.0	2.6	17.2′

Luminance Data

Angle in Degrees	Candela/M²
45°	8636
55°	2100
65°	396
75°	0
85°	2326

Zonal Lumen Summary

Zone	Lumens%	%Fixture
0-30°	1167	72.8
0-40°	1490	92.9
0-60°	1596	99.6
0-90°	1603	100.0
90-180°	0	0.0
0-180°	1603	100.0

AVERAGE INITIAL FOOTCANDLES
Reflectances: 80% Ceiling, 50% Walls, 30% Floors

Luminaire Spacing	Room Cavity Ratio RCR1	RCR4	RCR8
5′ x 5′	71	58	45
6′ x 6′	49	40	31
7′ x 7′	36	29	23
8′ x 8′	28	23	18
9′ x 9′	22	18	14
10′ x 10′	18	14	11
11′ x 11′	15	12	9
12′ x 12′	12	10	8

COEFFICIENTS OF UTILIZATION - % (Zonal Cavity Method)
Effective Floor Reflectance 20%

PCC	80				70				50			30			10		0
PW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	113	111	108	106	111	109	106	104	104	103	101	101	99	98	97	96	95	93
2	108	103	99	96	106	101	98	94	98	95	92	95	93	90	92	90	89	87
3	102	96	91	87	100	95	90	86	92	88	85	90	86	84	87	85	82	81
4	97	90	84	80	95	88	83	79	86	82	78	84	81	78	82	79	77	75
5	92	84	78	74	91	83	77	73	81	76	73	79	75	72	78	74	71	70
6	88	79	73	68	86	78	72	68	76	71	68	75	71	67	74	70	67	65
7	83	74	68	64	82	73	68	63	72	67	63	71	66	63	70	66	62	61
8	79	70	64	59	78	69	63	59	68	63	59	67	62	59	66	62	59	57
9	75	66	60	56	74	65	60	56	64	59	55	63	59	55	62	58	55	54
10	72	62	56	52	71	62	56	52	61	56	52	60	55	52	59	55	52	51

Energy Star Qualified:

	Product #	Fixture Configurations = Energy Star	
ENERGY STAR	9-LED-(XX)(YY)-CS3 9-LED-(XX)(YY)-CL3	Lumen Package: CCT:	1100 / 1300 / 2000 / 2800 (XX = 11, 13, 20, 28) 2700K / 3000K / 3500K / 4000K (YY = 27, 30, 35, 40)
ENERGY STAR	'Reverse Phase' Dimming (-R1) 9-LED-(XX)(YY)-CS3-R1 9-LED-(XX)(YY)-CL3-R1 9-LED-(XX)(YY)-CS3-R1 9-LED-(XX)(YY)-CL3-R1	Lumen Package: CCT:	1100 / 1300 / 2000 (XX = 11, 13, 20) 2700K / 3000K / 3500K / 4000K (YY = 27, 30, 35, 40)
ENERGY STAR	'Dali' Dimming (-D1) 9-LED-11(YY)-CS3-D1 9-LED-11(YY)-CL3-D1 9-LED-13(YY)-CS3-D1 9-LED-13(YY)-CL3-D1	CCT:	2700K / 3000K / 3500K / 4000K (YY = 27, 30, 35, 40)

Fixtures tested to IES recommended standard for solid state lighting per LM-79-08. Photometric performance on a single unit represents a baseline of performance for the fixture. Results may vary in the field.

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PERFORMANCE DATA

2700K, 3000K, 3500K & 4100K CCT LUMINAIRES SPACED 3′ FROM WALL

Catalog Number: 9-LED-28351W-CL3-WS
Spread: Single Wall

Single Unit						Lamp	Multiple Units On 2′ Centers*			Multiple Units On 3′ Centers*			Multiple Units On 4′ Centers*		
Lateral Distance From Fixture 3′ From Wall						DLM-2800 2700K/3000K/3500K/4100K	Spaced 3′ From Wall			Spaced 3′ From Wall			Spaced 3′ From Wall		
0′	1′	2′	3′	4′	5′	Distance From Ceiling	CL		CL	CL		CL	CL		CL
7	6	4	2	2	2	1′	15	15	15	11	11	11	9	7	9
15	13	8	5	3	2	2′	33	33	33	24	23	24	20	16	20
17	15	10	6	4	3	3′	41	41	41	30	29	30	23	21	23
15	14	10	7	4	3	4′	40	40	40	30	30	30	23	22	23
13	11	9	6	5	4	5′	36	36	36	26	26	26	20	20	20
10	10	8	6	5	4	6′	32	32	32	23	23	23	18	18	18
9	8	7	6	4	4	7′	28	28	28	21	21	21	16	16	16
7	7	6	5	4	3	8′	24	25	24	18	18	18	14	13	14
5	5	5	4	3	3	9′	20	20	20	15	15	15	12	11	12

LUMEN MULTIPLIER:
2000 X .69
1300 X .45
1100 X .39

***Based on minimum of five luminaires. Reflectances: 80, 50, 20. Values are rounded to nearest whole footcandle.**

2700K, 3000K, 3500K & 4100K CCT LUMINAIRES SPACED 4′ FROM WALL

Catalog Number: 9-LED-28351W-CL3-WS
Spread: Single Wall

Single Unit						Lamp	Multiple Units On 2′ Centers*			Multiple Units On 3′ Centers*			Multiple Units On 4′ Centers*		
Lateral Distance From Fixture 4′ From Wall						DLM-2800 2700K/3000K/3500K/4100K	Spaced 4′ From Wall			Spaced 4′ From Wall			Spaced 4′ From Wall		
0′	1′	2′	3′	4′	5′	Distance From Ceiling	CL		CL	CL		CL	CL		CL
4	3	3	2	2	2	1′	9	9	9	7	7	7	6	5	6
8	7	5	4	3	2	2′	21	21	21	16	15	16	13	11	13
10	9	7	5	4	3	3′	29	29	29	21	21	21	17	16	17
11	10	8	6	4	3	4′	31	32	31	23	23	23	18	18	18
10	9	8	6	5	4	5′	31	31	31	23	23	23	18	18	18
9	8	7	6	5	4	6′	29	29	29	22	22	22	17	17	17
8	7	6	5	4	4	7′	26	27	26	20	20	20	16	15	16
7	7	6	5	4	4	8′	24	25	24	18	19	18	15	14	15
6	5	5	4	4	3	9′	20	21	20	16	16	16	12	12	12

LUMEN MULTIPLIER:
2000 X .69
1300 X .45
1100 X .39

***Based on minimum of five luminaires. Reflectances: 80, 50, 20. Values are rounded to nearest whole footcandle.**

Fixtures tested to IES recommended standard for solid state lighting per LM-79-08. Photometric performance on a single unit represents a baseline of performance for the fixture. Results may vary in the field.

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PERFORMANCE DATA

2700K, 3000K, 3500K & 4100K CCT LUMINAIRES SPACED 3′ FROM WALL

Catalog Number: 9-LED-2035W-CS3-WS
Spread: Single Wall

Single Unit						Lamp	Multiple Units On 2′ Centers*			Multiple Units On 3′ Centers*			Multiple Units On 4′ Centers*		
Lateral Distance From Fixture 3′ From Wall						DLM-2000 2700K/3000K/3500K/4100K	Spaced 3′ From Wall			Spaced 3′ From Wall			Spaced 3′ From Wall		
0′	1′	2′	3′	4′	5′	Distance From Ceiling	CL		CL	CL		CL	CL		CL
4	4	2	1	1	1	1′	9	9	9	7	7	7	6	5	6
9	8	5	3	2	2	2′	21	21	21	15	14	15	13	10	13
11	9	6	4	2	2	3′	26	26	26	19	18	19	15	13	15
10	9	6	4	3	2	4′	25	25	25	18	18	18	14	14	14
8	7	6	4	3	2	5′	22	23	22	16	16	16	13	12	13
7	6	5	4	3	2	6′	20	20	20	15	15	15	12	11	12
5	5	4	4	3	2	7′	18	18	18	13	13	13	10	10	10
4	4	4	3	2	2	8′	15	15	15	12	12	12	9	9	9
3	3	3	3	2	2	9′	12	12	12	10	10	10	7	7	7

LUMEN MULTIPLIER:
2800 X 1.44
1300 X 0.64
1100 X 0.55

***Based on minimum of five luminaires. Reflectances: 80, 50, 20. Values are rounded to nearest whole footcandle.**

2700K, 3000K, 3500K & 4100K CCT LUMINAIRES SPACED 4′ FROM WALL

Catalog Number: 9-LED-2035W-CS3-WS
Spread: Single Wall

Single Unit						Lamp	Multiple Units On 2′ Centers*			Multiple Units On 3′ Centers*			Multiple Units On 4′ Centers*		
Lateral Distance From Fixture 4′ From Wall						DLM-2000 2700K/3000K/3500K/4100K	Spaced 4′ From Wall			Spaced 4′ From Wall			Spaced 4′ From Wall		
0′	1′	2′	3′	4′	5′	Distance From Ceiling	CL		CL	CL		CL	CL		CL
2	2	2	1	1	1	1′	6	6	6	5	4	5	4	3	4
5	5	3	2	2	2	2′	13	13	13	10	10	10	8	7	8
7	6	5	3	2	2	3′	18	18	18	13	13	13	10	10	10
7	6	5	4	3	2	4′	19	20	19	14	15	14	11	11	11
6	6	5	4	3	2	5′	19	20	19	14	14	14	11	11	11
6	5	5	4	3	2	6′	18	18	18	14	14	14	11	11	11
5	5	4	3	3	2	7′	17	17	17	13	13	13	10	10	10
4	4	4	3	3	2	8′	15	15	15	12	12	12	9	9	9
4	3	3	3	2	2	9′	13	13	13	10	10	10	8	7	8

LUMEN MULTIPLIER:
2800 X 1.44
1300 X 0.64
1100 X 0.55

***Based on minimum of five luminaires. Reflectances: 80, 50, 20. Values are rounded to nearest whole footcandle.**

Fixtures tested to IES recommended standard for solid state lighting per LM-79-08. Photometric performance on a single unit represents a baseline of performance for the fixture. Results may vary in the field.

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9" 1100/1300/2000/2800 LUMEN LED DOWNLIGHT CYLINDER

OPEN APERTURE

9-LED SERIES

ENVIRONMENTALLY FRIENDLY, ENERGY EFFICIENT

- Comparable light output to 26W, 32W, 42W and 2x26W CFL while consuming 18, 21, 31 and 46 watts.
- No harmful ultraviolet or infrared wavelengths
- No lead or mercury

Type Cat. No.

Project:

Notes:

PRODUCT SPECIFICATIONS

Optics

Cone: Self-flanged, low iridescent satin or specular Alzak® cone standard • Cone available in clear, gold, black, pewter, wheat, and bronze Alzak® finishes; see trim options • Computer-optimized reflector maximizes fixture efficiency • Deep regression of source produces a very low glare system with 40° cut-off to lamp and lamp image • Lensed mixing chamber conceals the LEDs to produce uniform aperture luminance

Electrical

LED Light Engine: Innovative light engine utilizes remote phosphor lens and mixing chamber to ensure perfectly mixed light, resulting in uniform colors and superior color consistency from fixture to fixture • 2700K, 3000K, 3500K and 4100K color temperatures available • CRI>80 • Cast aluminum heat sink integrated directly with housing provides superior thermal management with LEDs operating below manufacturer's published junction temperature to ensure attainment of rated life of the LEDs • Light engine mounts directly to heat sink and is easily replaceable • Light engine/reflector system produces 900 to 2500 lumens while using only 18 to 46 watts of energy and incorporates the latest generation of high lumen LEDs.

Dimming: Dimmable via 0-10V protocol, increasing efficiency up to 30% while dimming • For a list of compatible dimmers, see LED-DIM.

LED Driver: Universal driver accommodates 120V to 277V input volts AC at 50/60Hz, 2800 lumen unit is voltage specific • Power factor >0.9 • Dimmable via 0-10V protocol, increasing efficiency up to 30% while dimming

Life: Rated for 50,000 hours at 70% lumen maintenance

Mechanical

Housing: One piece heavy gauge steel with white or black baked textured powder coat finish.

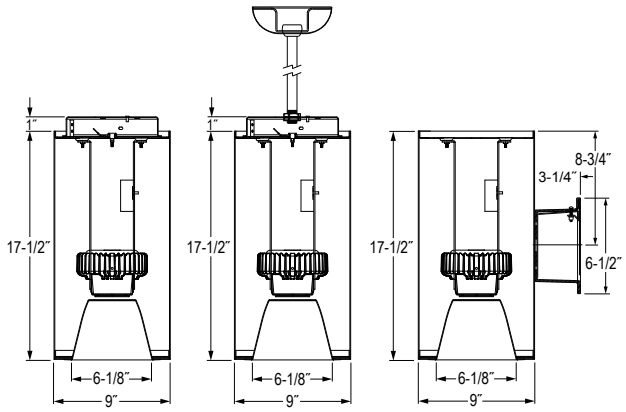
Mounting: Available for surface, pendant or wall mounting • Pendant mounting features hang straight pendant mounting kits that allows for mounting on to sloped ceiling with an angle up to 45° • Hinged reveal allows single person installation.

Labels and Listings

- UL listed for damp locations • I.B.E.W. Union made
- UL and cUL, RoHS complaint • EMI complies with FCC 47, Part 15, Class A
- Energy Star qualified, page 2 for designated products
- ARRA compliant

Warranty: 5 years when used in accordance with manufacturing guidelines. Product specifications subject to change without notice.

DIMENSIONS



ENGINEERING DATA

Voltage	120V - 277V			
Light Engine Lumens	1100	1300	2000	2800
CCT	4K/35K/3K/27K	4K/35K/3K/27K	4K/35K/3K/27K	4K/35K/3K/27K
Input Wattage	18W/18W/19W/19W	20W/21W/22W/22W	30W/31W/33W/33W	46W/46W/49W/49W
Input Frequency	50/60Hz	50/60Hz	50/60Hz	50/60Hz
Power Factor	0.9	0.9	0.9	0.9

347 Volt available, consult factory.

ORDERING INFORMATION: Rough-in, reflector and accessories each ordered separately.

Examples: **9-LED-1327W-CS3 / 9-LED-1135W-CL3-WH / 9-LED-13402B-GS3-PD**

Cat. #	Lumens	Color Temp.	♦Voltage	Housing Color	Trim Options	Generation	Options
	-			*	-		3 -

9-LED Surface Mount
9P-LED ▪ Pendant Mount
9B-LED Wall Mount

Lumens	Color Temp.	♦Voltage	Housing Color
11 1100	27 2700K	1 120V	W White
13 1300	30 3000K	2 277V	B Black
20 2000	35 3500K	3 347V	
♦28 2800	40 4100K		

Alzak® Finish Options:

	Satin	Specular
Clear	CS	CL
Gold	GS	GL
Black	BS	BL
Pewter	PTS	PTL
Wheat	WTS	WTL
Bronze	BZS	BZL

Painted Finish Options

White W

Options

- **WH** White Flange
- **WS** Single Wall Wash
- **BP** Emergency Battery Pack w/ Test switch (Battery & test switch remotely mounted)
- **347** 347 Volt (1100/1300/2000 lumen units only)
- †**R1** Reverse Phase Dimming (1100/1300/2000Lm, 120V only) *STD. on 2800 Lumen/120V
- **D1** DALI Conrol Dimming (1100/1300Lm, 120V only)
- **PD** Lutron Dimming Driver (1100, 1300Lm Only)

Example: **P24-W**

Pendant Kits/Accessories

- **P18-W** 18" Hang Straight Mounting Kit, White
- **P18-B** 18" Hang Straight Mounting Kit, Black
- **P24-W** 24" Hang Straight Mounting Kit, White
- **P24-B** 24" Hang Straight Mounting Kit, Black
- **P36-W** 36" Hang Straight Mounting Kit, White
- **P36-B** 36" Hang Straight Mounting Kit, Black
- **DM** For (0-10V) standard Dimming Example: **-P24-W-DM**
- **DM-PD** For use with Lutron Dimming Driver option. Example: **-P24-W-DM-PD**
- **DM-D1** For use with Dali Control option Example: **-P24-W-DM-D1**
- **BP-FRTM** For Battery Pack add **'-BP-FRTM'** to Pendant Kit. Example: **-P24-W-BP-FRTM**

♦2800 Lumen unit is voltage specific, all others are universal voltage.

▪See accessories for pendant mounting of fixtures with dimming or emergency battery pack.

†R1 Uses standard stem accessories

Rev. 1 09/13

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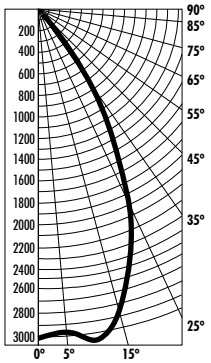
2700K, 3000K, 3500K & 4100K CCT

Catalog Number: 9-LED-28351W-CL3
PHOTOMETRIC REPORT
Test Number: PR10121883
Total Lumen Output: 2559 Lumens
Luminaire Efficacy: 52.2 lm/w (2700K), 52.2 lm/w (3000K)
55.6 lm/w (3500K), 55.6 lm/w (4100K)
Luminaire Spacing Criteria: 0.89
Luminaire: Clear specular Alzak® reflector. Open bottom.
CIE-Type: Direct



Candlepower Distribution
(Candelas)

Angle	Candela	Lumens
0°	3009	
5°	2966	283
15°	2870	813
25°	2009	930
35°	809	508
45°	10	8
55°	0	0
65°	0	0
75°	0	0
85°	0	0

Lumen Multiplier: 2000 x 0.69
1300 x 0.45
1100 x 0.39

Initial Footcandles

Distance to Illuminated Plane (Feet)	Footcandles Beam Center	Footcandles Beam Edge	Beam Diameter
6′	83.6	29.0	6.6′
7′	61.4	21.3	7.7′
8′	47.0	16.3	8.8′
9′	37.1	12.9	9.9′
10′	30.1	10.4	11.0′
11′	24.9	8.6	12.1′
12′	20.9	7.2	13.2′
13′	17.8	6.2	14.2′
14′	15.4	5.3	15.3′
15′	13.4	4.6	16.4′

Luminance Data

Angle in Degrees	Candela/M²
45°	783
55°	201
65°	670
75°	787
85°	2922

Zonal Lumen Summary

Zone	Lumens%	%Fixture
0-30°	2026	79.2
0-40°	2535	99.1
0-60°	2545	99.4
0-90°	2559	100.0
90-180°	0	0.0
0-180°	2559	100.0

AVERAGE INITIAL FOOTCANDLES
Reflectances: 80% Ceiling, 50% Walls, 30% Floors

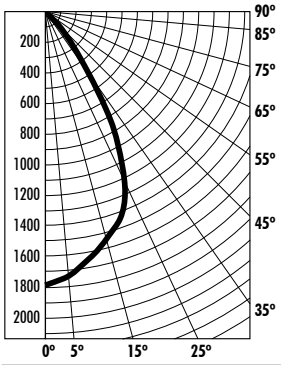
Luminaire Spacing	Room Cavity Ratio RCR1	RCR4	RCR8
5′ x 5′	114	94	75
6′ x 6′	79	65	52
7′ x 7′	58	48	38
8′ x 8′	44	37	29
9′ x 9′	35	29	23
10′ x 10′	28	24	19
11′ x 11′	23	19	15
12′ x 12′	20	16	13

COEFFICIENTS OF UTILIZATION - % (Zonal Cavity Method)
Effective Floor Reflectance 20%

PCC	80				70				50			30			10		0
PW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	114	111	109	107	111	109	107	105	105	103	102	101	100	99	98	97	96	94
2	108	104	100	97	106	102	99	96	99	96	94	96	94	92	93	91	90	88
3	103	97	93	89	101	96	92	88	93	90	87	91	88	95	89	86	84	83
4	99	91	86	82	97	90	85	82	88	84	81	86	83	80	84	81	79	77
5	94	86	81	76	92	85	80	76	83	79	75	82	78	75	80	77	74	73
6	90	81	76	71	88	80	75	71	79	74	71	78	73	70	76	73	70	68
7	85	77	71	67	84	76	71	67	75	70	66	74	69	66	72	69	66	64
8	82	73	67	63	80	72	67	63	71	66	63	70	65	62	69	65	62	61
9	78	69	63	59	77	68	63	59	67	62	59	66	62	59	66	62	59	57
10	74	65	60	56	73	65	60	56	64	59	56	63	59	56	63	58	55	54

2700K, 3000K, 3500K & 4100K CCT

Catalog Number: 9-LED-2035W-CS3
PHOTOMETRIC REPORT
Test Number: PR10121891
Total Lumen Output: 1603 Lumens
Luminaire Efficacy: 48.6 lm/w (2700K), 48.6 lm/w (3000K)
51.5 lm/w (3500K), 53.4 lm/w (4100K)
Luminaire Spacing Criteria: 0.94
Luminaire: Clear satin Alzak® reflector. Open bottom.
CIE-Type: Direct



Candlepower Distribution
(Candelas)

Angle	Candela	Lumens
0°	1795	
5°	1749	167
15°	1535	435
25°	1220	565
35°	514	323
45°	111	86
55°	22	20
65°	3	3
75°	0	0
85°	0	0

Lumen Multiplier: 2800 x 1.44
1300 x 0.64
1100 x 0.55

Initial Footcandles

Distance to Illuminated Plane (Feet)	Footcandles Beam Center	Footcandles Beam Edge	Beam Diameter
6′	49.9	16.3	6.9′
7′	36.6	12.0	8.0′
8′	28.0	9.2	9.2′
9′	22.2	7.2	10.3′
10′	18.0	5.9	11.4′
11′	14.8	4.9	12.6′
12′	12.5	4.1	13.7′
13′	10.6	3.5	14.9′
14′	9.2	3.0	16.0′
15′	8.0	2.6	17.2′

Luminance Data

Angle in Degrees	Candela/M²
45°	8636
55°	2100
65°	396
75°	0
85°	2326

Zonal Lumen Summary

Zone	Lumens%	%Fixture
0-30°	1167	72.8
0-40°	1490	92.9
0-60°	1596	99.6
0-90°	1603	100.0
90-180°	0	0.0
0-180°	1603	100.0

AVERAGE INITIAL FOOTCANDLES
Reflectances: 80% Ceiling, 50% Walls, 30% Floors

Luminaire Spacing	Room Cavity Ratio RCR1	RCR4	RCR8
5′ x 5′	71	58	45
6′ x 6′	49	40	31
7′ x 7′	36	29	23
8′ x 8′	28	23	18
9′ x 9′	22	18	14
10′ x 10′	18	14	11
11′ x 11′	15	12	9
12′ x 12′	12	10	8

COEFFICIENTS OF UTILIZATION - % (Zonal Cavity Method)
Effective Floor Reflectance 20%

PCC	80				70				50			30			10		0
PW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	113	111	108	106	111	109	106	104	104	103	101	101	99	98	97	96	95	93
2	108	103	99	96	106	101	98	94	98	95	92	95	93	90	92	90	89	87
3	102	96	91	87	100	95	90	86	92	88	85	90	86	84	87	85	82	81
4	97	90	84	80	95	88	83	79	86	82	78	84	81	78	82	79	77	75
5	92	84	78	74	91	83	77	73	81	76	73	79	75	72	78	74	71	70
6	88	79	73	68	86	78	72	68	76	71	68	75	71	67	74	70	67	65
7	83	74	68	64	82	73	68	63	72	67	63	71	66	63	70	66	62	61
8	79	70	64	59	78	69	63	59	68	63	59	67	62	59	66	62	59	57
9	75	66	60	56	74	65	60	56	64	59	55	63	59	55	62	58	55	54
10	72	62	56	52	71	62	56	52	61	56	52	60	55	52	59	55	52	51

Energy Star Qualified:

	Product #	Fixture Configurations = Energy Star	
ENERGY STAR	9-LED-(XX)(YY)-CS3 9-LED-(XX)(YY)-CL3	Lumen Package: CCT:	1100 / 1300 / 2000 / 2800 (XX = 11, 13, 20, 28) 2700K / 3000K / 3500K / 4000K (YY = 27, 30, 35, 40)
ENERGY STAR	'Reverse Phase' Dimming (-R1) 9-LED-(XX)(YY)-CS3-R1 9-LED-(XX)(YY)-CL3-R1 9-LED-(XX)(YY)-CS3-R1 9-LED-(XX)(YY)-CL3-R1	Lumen Package: CCT:	1100 / 1300 / 2000 (XX = 11, 13, 20) 2700K / 3000K / 3500K / 4000K (YY = 27, 30, 35, 40)
ENERGY STAR	'Dali' Dimming (-D1) 9-LED-11(YY)-CS3-D1 9-LED-11(YY)-CL3-D1 9-LED-13(YY)-CS3-D1 9-LED-13(YY)-CL3-D1	CCT:	2700K / 3000K / 3500K / 4000K (YY = 27, 30, 35, 40)

Fixtures tested to IES recommended standard for solid state lighting per LM-79-08. Photometric performance on a single unit represents a baseline of performance for the fixture. Results may vary in the field.

JUNO LIGHTING GROUP by Schneider Electric

1300 S. Wolf Road • Des Plaines, IL 60018 • Phone (800) 367-5866 • Fax (888) 708-6578
Visit us at www.junolightinggroup.com

PERFORMANCE DATA

2700K, 3000K, 3500K & 4100K CCT LUMINAIRES SPACED 3′ FROM WALL

Catalog Number: 9-LED-28351W-CL3-WS
Spread: Single Wall

Single Unit						Lamp	Multiple Units On 2′ Centers*			Multiple Units On 3′ Centers*			Multiple Units On 4′ Centers*		
Lateral Distance From Fixture 3′ From Wall						DLM-2800 2700K/3000K/3500K/4100K	Spaced 3′ From Wall			Spaced 3′ From Wall			Spaced 3′ From Wall		
0′	1′	2′	3′	4′	5′	Distance From Ceiling	CL		CL	CL		CL	CL		CL
7	6	4	2	2	2	1′	15	15	15	11	11	11	9	7	9
15	13	8	5	3	2	2′	33	33	33	24	23	24	20	16	20
17	15	10	6	4	3	3′	41	41	41	30	29	30	23	21	23
15	14	10	7	4	3	4′	40	40	40	30	30	30	23	22	23
13	11	9	6	5	4	5′	36	36	36	26	26	26	20	20	20
10	10	8	6	5	4	6′	32	32	32	23	23	23	18	18	18
9	8	7	6	4	4	7′	28	28	28	21	21	21	16	16	16
7	7	6	5	4	3	8′	24	25	24	18	18	18	14	13	14
5	5	5	4	3	3	9′	20	20	20	15	15	15	12	11	12

LUMEN MULTIPLIER:
2000 X .69
1300 X .45
1100 X .39

***Based on minimum of five luminaires. Reflectances: 80, 50, 20. Values are rounded to nearest whole footcandle.**

2700K, 3000K, 3500K & 4100K CCT LUMINAIRES SPACED 4′ FROM WALL

Catalog Number: 9-LED-28351W-CL3-WS
Spread: Single Wall

Single Unit						Lamp	Multiple Units On 2′ Centers*			Multiple Units On 3′ Centers*			Multiple Units On 4′ Centers*		
Lateral Distance From Fixture 4′ From Wall						DLM-2800 2700K/3000K/3500K/4100K	Spaced 4′ From Wall			Spaced 4′ From Wall			Spaced 4′ From Wall		
0′	1′	2′	3′	4′	5′	Distance From Ceiling	CL		CL	CL		CL	CL		CL
4	3	3	2	2	2	1′	9	9	9	7	7	7	6	5	6
8	7	5	4	3	2	2′	21	21	21	16	15	16	13	11	13
10	9	7	5	4	3	3′	29	29	29	21	21	21	17	16	17
11	10	8	6	4	3	4′	31	32	31	23	23	23	18	18	18
10	9	8	6	5	4	5′	31	31	31	23	23	23	18	18	18
9	8	7	6	5	4	6′	29	29	29	22	22	22	17	17	17
8	7	6	5	4	4	7′	26	27	26	20	20	20	16	15	16
7	7	6	5	4	4	8′	24	25	24	18	19	18	15	14	15
6	5	5	4	4	3	9′	20	21	20	16	16	16	12	12	12

LUMEN MULTIPLIER:
2000 X .69
1300 X .45
1100 X .39

***Based on minimum of five luminaires. Reflectances: 80, 50, 20. Values are rounded to nearest whole footcandle.**

Fixtures tested to IES recommended standard for solid state lighting per LM-79-08. Photometric performance on a single unit represents a baseline of performance for the fixture. Results may vary in the field.

Juno Lighting Group
by Schneider Electric

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Visit us at www.junolightinggroup.com

PERFORMANCE DATA

2700K, 3000K, 3500K & 4100K CCT LUMINAIRES SPACED 3′ FROM WALL

Catalog Number: 9-LED-2035W-CS3-WS
Spread: Single Wall

Single Unit						Lamp	Multiple Units On 2′ Centers*			Multiple Units On 3′ Centers*			Multiple Units On 4′ Centers*		
Lateral Distance From Fixture 3′ From Wall						DLM-2000 2700K/3000K/3500K/4100K	Spaced 3′ From Wall			Spaced 3′ From Wall			Spaced 3′ From Wall		
0′	1′	2′	3′	4′	5′	Distance From Ceiling	CL		CL	CL		CL	CL		CL
4	4	2	1	1	1	1′	9	9	9	7	7	7	6	5	6
9	8	5	3	2	2	2′	21	21	21	15	14	15	13	10	13
11	9	6	4	2	2	3′	26	26	26	19	18	19	15	13	15
10	9	6	4	3	2	4′	25	25	25	18	18	18	14	14	14
8	7	6	4	3	2	5′	22	23	22	16	16	16	13	12	13
7	6	5	4	3	2	6′	20	20	20	15	15	15	12	11	12
5	5	4	4	3	2	7′	18	18	18	13	13	13	10	10	10
4	4	4	3	2	2	8′	15	15	15	12	12	12	9	9	9
3	3	3	3	2	2	9′	12	12	12	10	10	10	7	7	7

LUMEN MULTIPLIER:
2800 X 1.44
1300 X 0.64
1100 X 0.55

***Based on minimum of five luminaires. Reflectances: 80, 50, 20. Values are rounded to nearest whole footcandle.**

2700K, 3000K, 3500K & 4100K CCT LUMINAIRES SPACED 4′ FROM WALL

Catalog Number: 9-LED-2035W-CS3-WS
Spread: Single Wall

Single Unit						Lamp	Multiple Units On 2′ Centers*			Multiple Units On 3′ Centers*			Multiple Units On 4′ Centers*		
Lateral Distance From Fixture 4′ From Wall						DLM-2000 2700K/3000K/3500K/4100K	Spaced 4′ From Wall			Spaced 4′ From Wall			Spaced 4′ From Wall		
0′	1′	2′	3′	4′	5′	Distance From Ceiling	CL		CL	CL		CL	CL		CL
2	2	2	1	1	1	1′	6	6	6	5	4	5	4	3	4
5	5	3	2	2	2	2′	13	13	13	10	10	10	8	7	8
7	6	5	3	2	2	3′	18	18	18	13	13	13	10	10	10
7	6	5	4	3	2	4′	19	20	19	14	15	14	11	11	11
6	6	5	4	3	2	5′	19	20	19	14	14	14	11	11	11
6	5	5	4	3	2	6′	18	18	18	14	14	14	11	11	11
5	5	4	3	3	2	7′	17	17	17	13	13	13	10	10	10
4	4	4	3	3	2	8′	15	15	15	12	12	12	9	9	9
4	3	3	3	2	2	9′	13	13	13	10	10	10	8	7	8

LUMEN MULTIPLIER:
2800 X 1.44
1300 X 0.64
1100 X 0.55

***Based on minimum of five luminaires. Reflectances: 80, 50, 20. Values are rounded to nearest whole footcandle.**

Fixtures tested to IES recommended standard for solid state lighting per LM-79-08. Photometric performance on a single unit represents a baseline of performance for the fixture. Results may vary in the field.

Juno Lighting Group by Schneider Electric
1300 S. Wolf Road • Des Plaines, IL 60018 • Phone (800) 367-5866 • Fax (888) 708-6578
Visit us at www.junolightinggroup.com

PM1

Pole top luminaires with asymmetrical wide spread light distribution

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

Housing: Die-cast aluminum housing and slip fitter. Slip fits 3" O.D. pole top, secures to pole with six stainless steel set screws. Die-cast aluminum knuckle allows for 0° or 15° tilt adjustment from horizontal. All aluminum used in the construction is marine grade and copper free.

Enclosure: Faceplate is constructed of die-cast aluminum and can be opened without tools for easy maintenance. Clear acrylic diffuser with optical texture. Fully gasketed with a molded silicone gasket.

Electrical: 52 W LED luminaire, 58.7 total system watts, -30° C start temperature. Integral 120 V through 277 V electronic LED driver. Standard LED color temperature is 4000K with a >80 CRI. Available in 3000K (>80 CRI); add suffix K3 to order.
Note: LEDs supplied with luminaire. Due to the dynamic nature of LED technology, LED luminaire data on this sheet is subject to change at the discretion of BEGA-US. For the most current technical data, please refer to www.bega-us.com.

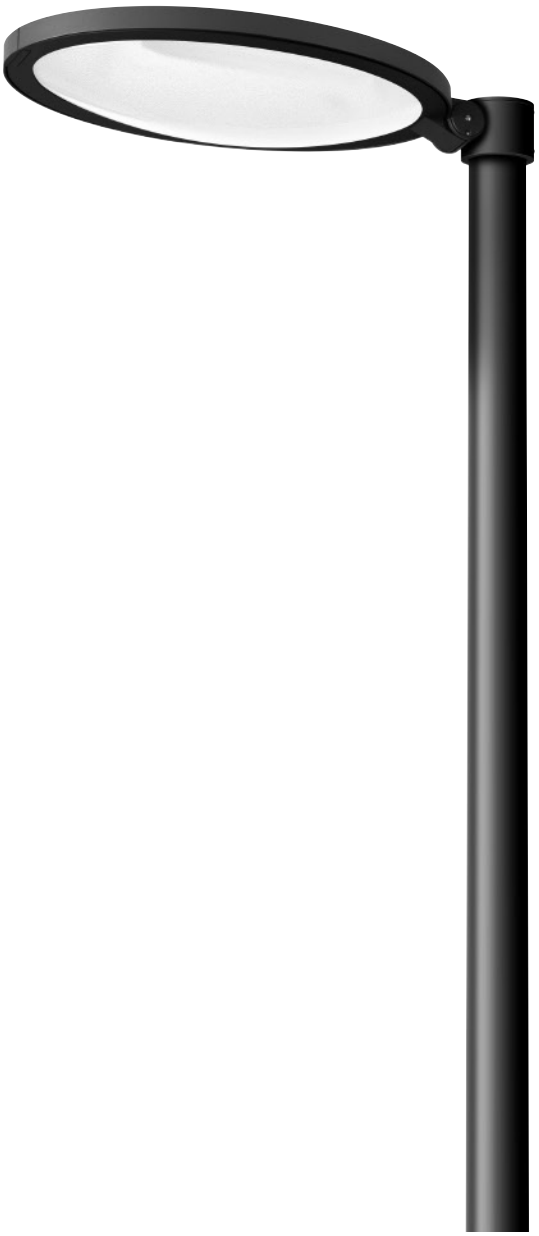
Finish: These luminaires are available in four standard BEGA colors: Black (BLK); White (WHT); Bronze (BRZ); Silver (SLV). To specify, add appropriate suffix to catalog number. Custom colors supplied on special order.

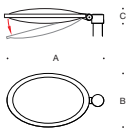
UL listed, suitable for wet locations. Protection class: IP66.

Weight: 16.5 lbs.

Effective Projection Area (EPA): 0.8 ft²

Luminaire Lumens: 4898
Tested in accordance with LM-79-08





Single pole-top luminaires

	Lamp	A	B	C
7836LED	52 W LED	29 ½	15 ⅜	5 ⅜

Recommended for use with 14' to 16' poles.

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

MINIMAX™ LED O LH T1

track mounted LED accent light (no cross baffle)

Spec Sheet

TRACK FIXTURES 11-101

FEATURES

MiniMax LED O LH is a track mounted accent light powered by one of a number of Xicato LED modules – including Artist Series and Vibrant Series modules – all of which are distinguished by extraordinary color consistency (within 1x2-step MacAdam ellipse). See tables on the reverse for wattages and efficacies.

With a standard track adapter, luminaire may be powered by one of eighteen 20-amp 120-volt track systems. With optional track adapters, luminaire may be powered by one of sixteen 50 or 60-amp 120-volt track systems or one of six 277-volt track systems.

Luminaire, on 120-volt track only, may be dimmed to 10% by an electronic low voltage (ELV) dimmer.

Beam spread is changed by removing the spring-mounted lens holder assembly, replacing one 'twist and lock' reflector with another, and re-inserting the lens holder assembly. Luminaire is ordered with a single reflector; one or both of the other reflectors may be ordered as accessories.

An on-off rocker switch, mounted flush in the circular top of the luminaire, is included standard on luminaires equipped for 120 volt service only.

A concealed swivel provides 385° horizontal rotation and vertical adjustment from 0° to 90°. The swivel is permanently tensioned, allowing the luminaire to remain fixed at any angle. Luminaire can be locked in place by depressing a hinged (`lever lock') bar so that it lies flush with the top of the housing. Lifting the lever lock frees the swivel.

Lens holder assembly accepts one or two of a number of Optical Accessories including spread lenses and color filters. Complimentary Beam Smoother is included. Note that, for enhanced efficiency, cross-baffles are not included. Lens holder assembly is spring-mounted for easy removal and adjustment.

MiniMax luminaires have seamless aluminum housings and cast aluminum tops for lightweight durability and heat dissipation. Standard finish is matte white; also available in black and silver. A white switch is provided with white luminaires and a black switch with black or silver luminaires. For custom color luminaires (CC) specifier must indicate white or black switch.

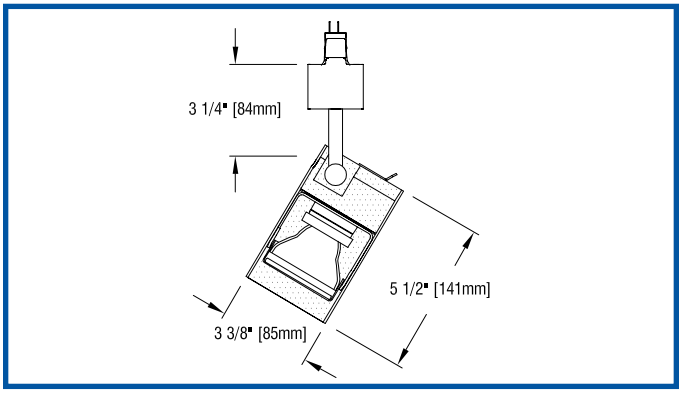
APPLICATIONS

Luminaire is suitable for highlighting vertical or horizontal surfaces, as well as objects in museums, galleries, showrooms, residences, offices and stores.

Luminaire is individually fused and cSAus listed for mounting on Edison Price Lighting 120-volt or 277-volt track.

Fixture Spacing Requirements The track adapters of MiniMax LED's are 8" long. For this reason they cannot be mounted closer than 8 ¼ " on center and they cannot be used with any of our three Unicep single-fixture track units.

For the outlet box mounted version of this luminaire, see **MiniMax LED O LH-OBM**.



PRODUCT CODE

For complete product code, list basic unit and select one item from each following box.

Basic Unit MM-XSM2-O-LH

Light Output

700 lumens / CRI 97 Artist	- L07A
1000 lumens / CRI 97 Artist	- L10A
1000 lumens / CRI 80+	- L10S
1500 lumens / CRI 80+ Vibrant *3000K only*	- L15V
1500 lumens / CRI 80+	- L15S
2100 lumens / CRI 80+	- L21S

Light Color

2700 K *not available on 2100 lumen model*	-27K
3000 K	- 30K
3500 K	- 35K
4000 K	- 40K

Beam Spread Reflector *(specify one to ship with fixture)*

20° spot	- 20D
40° flood	- 40D
60° wide flood	- 60D

OPTIONS *Specify by adding to the product code.*

Dimmable ..... standard driver is dimmable to 10% with ELV dimmer on 120-volt track only. Dimming not available on 277-volt track.

Dimmable to 1% with Lutron driver controlled by incandescent dimmer on 120-volt service only; not available on 277-volt track ..... – LU-DMI

60-amp adapter required for fixtures to be used on DoubleLine-50, AutoTrak-50 UpLine-50 or AutoBus-120 track systems (fixture's appearance remains the same) ..... – 1C

277-volt adapter required for fixtures to be used on HighLine or AutoBus-277 track systems. Note: Fixtures on 277-volt track cannot be dimmed and do not include an on-off switch. ..... – HC

matte black housing finish ..... – BLK

Industrial Silver housing finish ..... – SIL

custom color paint housing finish *identify color in specification* ..... – CC

EXTRA REFLECTORS *Specify as separate line items.*

20° spot reflector	XSM-REF20
40° flood reflector	XSM-REF40
60° wide flood reflector	XSM-REF60

OPTICAL ACCESSORIES ▼ *See next page*

EDISON PRICE LIGHTING

41-50 22ND STREET, LIC NY 11101 TEL 718.685.0700 FAX 718.786.8530 www.epl.com

MINIMAX LED O LH

EDISON PRICE LIGHTING

OPTICAL ACCESSORIES

Specify as separate line items.
All are 2¾" (70mm) dia. Lenses and filters are glass; screens are aluminum.

diffuse glass DGS/2.75
prismatic lens (Solite) PLS/2.75
55° spread lens LENS/2.75
40° x 70° spread lens LENS/2.75-4070
beam smoother *included with fixture* CLR/2.75
color filters
Daylight Blue DAY/2.75
Surprise Pink PNK/2.75
amber AMB/2.75
blue BLU/2.75
green GRN/2.75
red RED/2.75
33% light reduction screen SCR33/2.75
50% light reduction screen SCR50/2.75

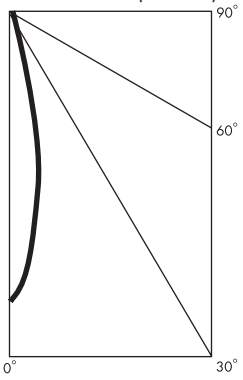
PHOTOMETRIC REPORT (tested per IESNA LM-79-2008)

Data prorated from UL Verification Services Report No. 331261. Original test report furnished upon request.

Luminaire ..... track-mounted LED accent light with a 20° reflector and black lens holder (NO LENS)
Lamp ..... Xicato XSM LED Module, 1500 lumens, 3000K
Lamp Life ..... rated 50.000 hours based on L70/B50 criteria. LM80 report by LED manufacturer furnished upon request
Luminaire Light Output ..... 1146 lumens

CANDLEPOWER DISTRIBUTION *(Candela)*

Vertical Angle	*Horizontal Angle* 0
0	4975
5	4278
15	1576
25	567
35	13
45	0
55	0
65	0
75	0
85	0
90	0



LUMINANCE DATA

Vertical Angle	*Candela/m²*
45	3076
55	1759
65	1014
75	0
85	0

DRIVER INFORMATION

(UL Class 2, dry and damp location)
Dimmable to 10% with trailing edge (ELV) dimmers

Voltage	*120*	*277*
Input Watts (700A/1000A/1000/1500/2100 lumens)	16/21/15/23/26	16/21/15/23/26
Input Current (A) (700A/1000A/1000/1500/2100 lumens)	.13/.18/.13/.19/.22	.06/.08/.05/.08/.09
Output Current (mA)	500-1050	500-1050
Min. Power Factor	0.99	0.99
Operating Temperature Range (F)	–13 to 122	–13 to 122

LUMINAIRE LIGHT OUTPUT AND EFFICACY

LED Module Type	*Luminaire Light Output*	*Luminaire Efficacy (lms/watt)*	*System Wattage*
700 Lumens Artist	516*	32	16*
1000 Lumens Artist	653*	31	21*
1000 Lumens standard	721*	48	15
1500 Lumens standard & Vibrant	1146*	50	23*
2100 Lumens standard	1455*	56	26

**estimated values*

LIGHT OUTPUT MULTIPLIER

700 lumens Artist	*1000 lumens Artist*	*1000 lumens*	*1500 lumens standard & Vibrant*	*2100 lumens*
.45 *(estimated)*	.57 *(estimated)*	.63 *(estimated)*	1	1.27 *(estimated)*

MINIMAX™ LED O LH T2

track mounted LED accent light (no cross baffle)

Spec Sheet

TRACK FIXTURES 11-101

FEATURES

MiniMax LED O LH is a track mounted accent light powered by one of a number of Xicato LED modules – including Artist Series and Vibrant Series modules – all of which are distinguished by extraordinary color consistency (within 1x2-step MacAdam ellipse). See tables on the reverse for wattages and efficacies.

With a standard track adapter, luminaire may be powered by one of eighteen 20-amp 120-volt track systems. With optional track adapters, luminaire may be powered by one of sixteen 50 or 60-amp 120-volt track systems or one of six 277-volt track systems.

Luminaire, on 120-volt track only, may be dimmed to 10% by an electronic low voltage (ELV) dimmer.

Beam spread is changed by removing the spring-mounted lens holder assembly, replacing one 'twist and lock' reflector with another, and re-inserting the lens holder assembly. Luminaire is ordered with a single reflector; one or both of the other reflectors may be ordered as accessories.

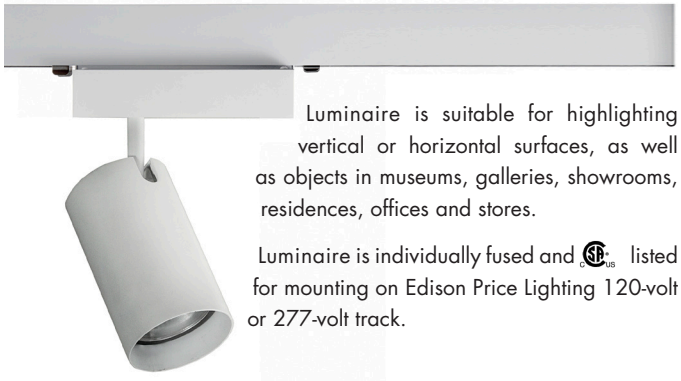
An on-off rocker switch, mounted flush in the circular top of the luminaire, is included standard on luminaires equipped for 120 volt service only.

A concealed swivel provides 385° horizontal rotation and vertical adjustment from 0° to 90°. The swivel is permanently tensioned, allowing the luminaire to remain fixed at any angle. Luminaire can be locked in place by depressing a hinged (`lever lock') bar so that it lies flush with the top of the housing. Lifting the lever lock frees the swivel.

Lens holder assembly accepts one or two of a number of Optical Accessories including spread lenses and color filters. Complimentary Beam Smoother is included. Note that, for enhanced efficiency, cross-baffles are not included. Lens holder assembly is spring-mounted for easy removal and adjustment.

MiniMax luminaires have seamless aluminum housings and cast aluminum tops for lightweight durability and heat dissipation. Standard finish is matte white; also available in black and silver. A white switch is provided with white luminaires and a black switch with black or silver luminaires. For custom color luminaires (CC) specifier must indicate white or black switch.

APPLICATIONS

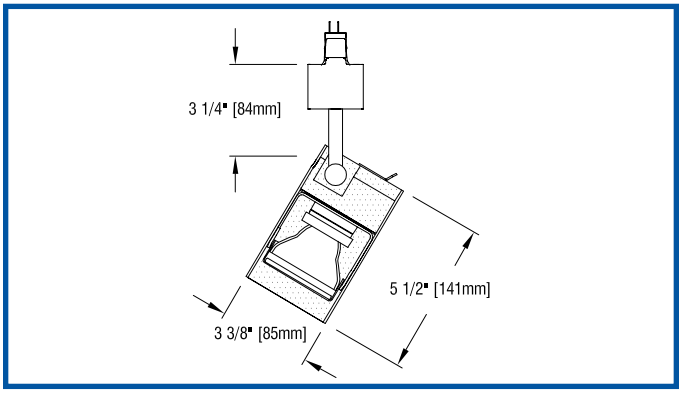


Luminaire is suitable for highlighting vertical or horizontal surfaces, as well as objects in museums, galleries, showrooms, residences, offices and stores.

Luminaire is individually fused and cSAus listed for mounting on Edison Price Lighting 120-volt or 277-volt track.

Fixture Spacing Requirements The track adapters of MiniMax LED's are 8" long. For this reason they cannot be mounted closer than 8 ¼ " on center and they cannot be used with any of our three Unicep single-fixture track units.

For the outlet box mounted version of this luminaire, see **MiniMax LED O LH-OBM**.



PRODUCT CODE

For complete product code, list basic unit and select one item from each following box.

Basic Unit MM-XSM2-O-LH

Light Output

700 lumens / CRI 97 Artist	- L07A
1000 lumens / CRI 97 Artist	- L10A
1000 lumens / CRI 80+	- L10S
1500 lumens / CRI 80+ Vibrant *3000K only*	- L15V
1500 lumens / CRI 80+	- L15S
2100 lumens / CRI 80+	- L21S

Light Color

2700 K *not available on 2100 lumen model*	-27K
3000 K	- 30K
3500 K	- 35K
4000 K	- 40K

Beam Spread Reflector *(specify one to ship with fixture)*

20° spot	- 20D
40° flood	- 40D
60° wide flood	- 60D

OPTIONS *Specify by adding to the product code.*

Dimmable ..... standard driver is dimmable to 10% with ELV dimmer on 120-volt track only. Dimming not available on 277-volt track.

Dimmable to 1% with Lutron driver controlled by incandescent dimmer on 120-volt service only; not available on 277-volt track ..... – LU-DMI

60-amp adapter required for fixtures to be used on DoubleLine-50, AutoTrak-50 UpLine-50 or AutoBus-120 track systems (fixture's appearance remains the same) ..... – 1C

277-volt adapter required for fixtures to be used on HighLine or AutoBus-277 track systems. Note: Fixtures on 277-volt track cannot be dimmed and do not include an on-off switch. ..... – HC

matte black housing finish ..... – BLK

Industrial Silver housing finish ..... – SIL

custom color paint housing finish *identify color in specification* ..... – CC

EXTRA REFLECTORS *Specify as separate line items.*

20° spot reflector	XSM-REF20
40° flood reflector	XSM-REF40
60° wide flood reflector	XSM-REF60

OPTICAL ACCESSORIES ▼ *See next page*

EDISON PRICE LIGHTING

41-50 22ND STREET, LIC NY 11101 TEL 718.685.0700 FAX 718.786.8530 www.epl.com

MINIMAX LED O LH

EDISON PRICE LIGHTING

OPTICAL ACCESSORIES

Specify as separate line items.
All are 2¾" (70mm) dia. Lenses and filters are glass; screens are aluminum.

diffuse glass DGS/2.75
prismatic lens (Solite) PLS/2.75
55° spread lens LENS/2.75
40° x 70° spread lens LENS/2.75-4070
beam smoother *included with fixture* CLR/2.75
color filters
Daylight Blue DAY/2.75
Surprise Pink PNK/2.75
amber AMB/2.75
blue BLU/2.75
green GRN/2.75
red RED/2.75
33% light reduction screen SCR33/2.75
50% light reduction screen SCR50/2.75

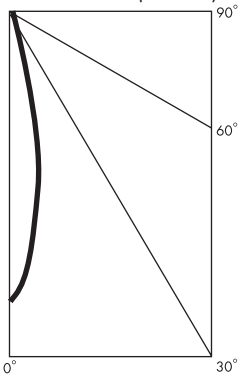
PHOTOMETRIC REPORT (tested per IESNA LM-79-2008)

Data prorated from UL Verification Services Report No. 331261. Original test report furnished upon request.

Luminaire ..... track-mounted LED accent light with a 20° reflector and black lens holder (NO LENS)
Lamp ..... Xicato XSM LED Module, 1500 lumens, 3000K
Lamp Life ..... rated 50.000 hours based on L70/B50 criteria. LM80 report by LED manufacturer furnished upon request
Luminaire Light Output ..... 1146 lumens

CANDLEPOWER DISTRIBUTION *(Candela)*

Vertical Angle	*Horizontal Angle* 0
0	4975
5	4278
15	1576
25	567
35	13
45	0
55	0
65	0
75	0
85	0
90	0



LUMINANCE DATA

Vertical Angle	*Candela/m²*
45	3076
55	1759
65	1014
75	0
85	0

DRIVER INFORMATION

(UL Class 2, dry and damp location)
Dimmable to 10% with trailing edge (ELV) dimmers

Voltage	*120*	*277*
Input Watts (700A/1000A/1000/1500/2100 lumens)	16/21/15/23/26	16/21/15/23/26
Input Current (A) (700A/1000A/1000/1500/2100 lumens)	.13/.18/.13/.19/.22	.06/.08/.05/.08/.09
Output Current (mA)	500-1050	500-1050
Min. Power Factor	0.99	0.99
Operating Temperature Range (F)	–13 to 122	–13 to 122

LUMINAIRE LIGHT OUTPUT AND EFFICACY

LED Module Type	*Luminaire Light Output*	*Luminaire Efficacy (lms/watt)*	*System Wattage*
700 Lumens Artist	516*	32	16*
1000 Lumens Artist	653*	31	21*
1000 Lumens standard	721*	48	15
1500 Lumens standard & Vibrant	1146*	50	23*
2100 Lumens standard	1455*	56	26

**estimated values*

LIGHT OUTPUT MULTIPLIER

700 lumens Artist	*1000 lumens Artist*	*1000 lumens*	*1500 lumens standard & Vibrant*	*2100 lumens*
.45 *(estimated)*	.57 *(estimated)*	.63 *(estimated)*	1	1.27 *(estimated)*

MINIMAX™ LED O LH T3

track mounted LED accent light (no cross baffle)

Spec Sheet

TRACK FIXTURES
11-101

FEATURES

MiniMax LED O LH is a track mounted accent light powered by one of a number of Xicato LED modules – including Artist Series and Vibrant Series modules – all of which are distinguished by extraordinary color consistency (within 1x2-step MacAdam ellipse). See tables on the reverse for wattages and efficacies.

With a standard track adapter, luminaire may be powered by one of eighteen 20-amp 120-volt track systems. With optional track adapters, luminaire may be powered by one of sixteen 50 or 60-amp 120-volt track systems or one of six 277-volt track systems.

Luminaire, on 120-volt track only, may be dimmed to 10% by an electronic low voltage (ELV) dimmer.

Beam spread is changed by removing the spring-mounted lens holder assembly, replacing one 'twist and lock' reflector with another, and re-inserting the lens holder assembly. Luminaire is ordered with a single reflector; one or both of the other reflectors may be ordered as accessories.

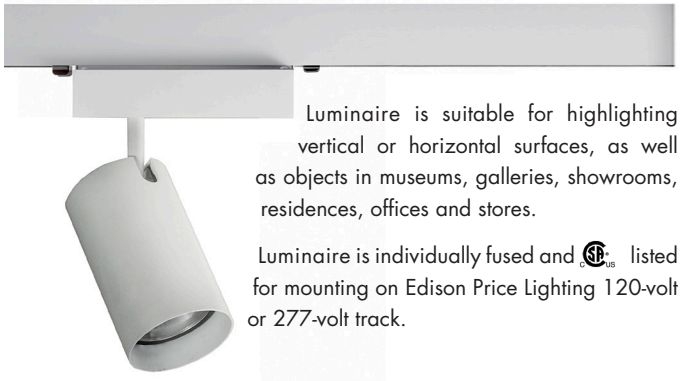
An on-off rocker switch, mounted flush in the circular top of the luminaire, is included standard on luminaires equipped for 120 volt service only.

A concealed swivel provides 385° horizontal rotation and vertical adjustment from 0° to 90°. The swivel is permanently tensioned, allowing the luminaire to remain fixed at any angle. Luminaire can be locked in place by depressing a hinged (`lever lock') bar so that it lies flush with the top of the housing. Lifting the lever lock frees the swivel.

Lens holder assembly accepts one or two of a number of Optical Accessories including spread lenses and color filters. Complimentary Beam Smoother is included. Note that, for enhanced efficiency, cross-baffles are not included. Lens holder assembly is spring-mounted for easy removal and adjustment.

MiniMax luminaires have seamless aluminum housings and cast aluminum tops for lightweight durability and heat dissipation. Standard finish is matte white; also available in black and silver. A white switch is provided with white luminaires and a black switch with black or silver luminaires. For custom color luminaires (CC) specifier must indicate white or black switch.

APPLICATIONS

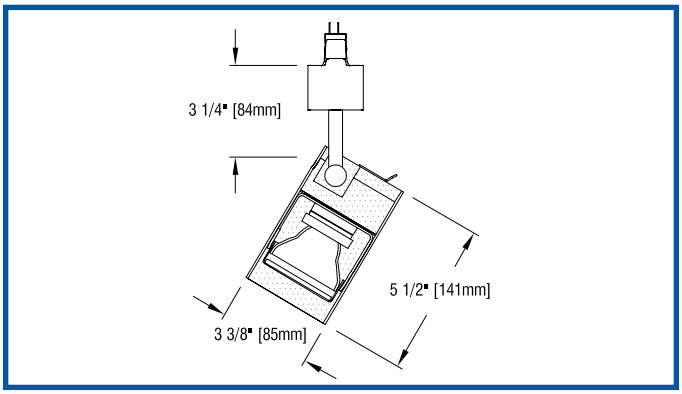


Luminaire is suitable for highlighting vertical or horizontal surfaces, as well as objects in museums, galleries, showrooms, residences, offices and stores.

Luminaire is individually fused and cSAus listed for mounting on Edison Price Lighting 120-volt or 277-volt track.

Fixture Spacing Requirements The track adapters of MiniMax LED's are 8" long. For this reason they cannot be mounted closer than 8 ¼ " on center and they cannot be used with any of our three Unicep single-fixture track units.

For the outlet box mounted version of this luminaire, see **MiniMax LED O LH-OBM**.



PRODUCT CODE

For complete product code, list basic unit and select one item from each following box.

Basic Unit MM-XSM2-O-LH

Light Output
- 700 lumens / CRI 97 Artist ..... - L07A
- 1000 lumens / CRI 97 Artist..... - L10A
- 1000 lumens / CRI 80+..... - L10S
- 1500 lumens / CRI 80+ Vibrant ..... *3000K only* ..... - L15V
- 1500 lumens / CRI 80+..... - L15S
- 2100 lumens / CRI 80+..... - L21S

Light Color
- 2700 K ..... *not available on 2100 lumen model* ..... -27K
- 3000 K..... - 30K
- 3500 K ..... - 35K
- 4000 K..... - 40K

Beam Spread Reflector *(specify one to ship with fixture)*
- 20° spot ..... - 20D
- 40° flood ..... - 40D
- 60° wide flood ..... - 60D

OPTIONS *Specify by adding to the product code.*

Dimmable.....standard driver is dimmable to 10% with ELV dimmer on 120-volt track only. Dimming not available on 277-volt track.

Dimmable to 1% with Lutron driver controlled by incandescent dimmer on 120-volt service only; not available on 277-volt track .....– LU-DMI

60-amp adapter required for fixtures to be used on DoubleLine-50, AutoTrak-50 UpLine-50 or AutoBus-120 track systems (fixture's appearance remains the same) .....– 1C

277-volt adapter required for fixtures to be used on HighLine or AutoBus-277 track systems. Note: Fixtures on 277-volt track cannot be dimmed and do not include an on-off switch. ..... – HC

matte black housing finish .....– BLK

Industrial Silver housing finish ..... – SIL

custom color paint housing finish *identify color in specification* ..... – CC

EXTRA REFLECTORS *Specify as separate line items.*

- **20° spot reflector** XSM-REF20
- **40° flood reflector**..... XSM-REF40
- **60° wide flood reflector** XSM-REF60

OPTICAL ACCESSORIES ▼ *See next page*

EDISON PRICE LIGHTING

41-50 22ND STREET, LIC NY 11101 TEL 718.685.0700 FAX 718.786.8530 www.epl.com

MINIMAX LED O LH

EDISON PRICE LIGHTING

OPTICAL ACCESSORIES

Specify as separate line items.
All are 2¾" (70mm) dia. Lenses and filters are glass; screens are aluminum.

diffuse glass DGS/2.75
prismatic lens (Solite) PLS/2.75
55° spread lens LENS/2.75
40° x 70° spread lens LENS/2.75-4070
beam smoother *included with fixture* CLR/2.75
color filters
Daylight Blue DAY/2.75
Surprise Pink PNK/2.75
amber AMB/2.75
blue BLU/2.75
green GRN/2.75
red RED/2.75
33% light reduction screen SCR33/2.75
50% light reduction screen SCR50/2.75

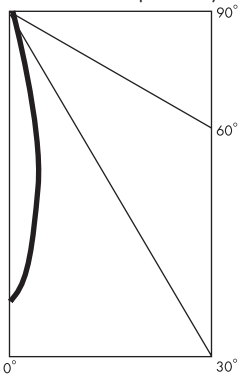
PHOTOMETRIC REPORT (tested per IESNA LM-79-2008)

Data prorated from UL Verification Services Report No. 331261. Original test report furnished upon request.

Luminaire ..... track-mounted LED accent light with a 20° reflector and black lens holder (NO LENS)
Lamp ..... Xicato XSM LED Module, 1500 lumens, 3000K
Lamp Life ..... rated 50.000 hours based on L70/B50 criteria. LM80 report by LED manufacturer furnished upon request
Luminaire Light Output ..... 1146 lumens

CANDLEPOWER DISTRIBUTION *(Candela)*

Vertical Angle	*Horizontal Angle* 0
0	4975
5	4278
15	1576
25	567
35	13
45	0
55	0
65	0
75	0
85	0
90	0



LUMINANCE DATA

Vertical Angle	*Candela/m²*
45	3076
55	1759
65	1014
75	0
85	0

DRIVER INFORMATION

(UL Class 2, dry and damp location)
Dimmable to 10% with trailing edge (ELV) dimmers

Voltage	*120*	*277*
Input Watts (700A/1000A/1000/1500/2100 lumens)	16/21/15/23/26	16/21/15/23/26
Input Current (A) (700A/1000A/1000/1500/2100 lumens)	.13/.18/.13/.19/.22	.06/.08/.05/.08/.09
Output Current (mA)	500-1050	500-1050
Min. Power Factor	0.99	0.99
Operating Temperature Range (F)	–13 to 122	–13 to 122

LUMINAIRE LIGHT OUTPUT AND EFFICACY

LED Module Type	*Luminaire Light Output*	*Luminaire Efficacy (lms/watt)*	*System Wattage*
700 Lumens Artist	516*	32	16*
1000 Lumens Artist	653*	31	21*
1000 Lumens standard	721*	48	15
1500 Lumens standard & Vibrant	1146*	50	23*
2100 Lumens standard	1455*	56	26

**estimated values*

LIGHT OUTPUT MULTIPLIER

700 lumens Artist	*1000 lumens Artist*	*1000 lumens*	*1500 lumens standard & Vibrant*	*2100 lumens*
.45 *(estimated)*	.57 *(estimated)*	.63 *(estimated)*	1	1.27 *(estimated)*

MINIMAX™ LED O LH T4

track mounted LED accent light (no cross baffle)

Spec Sheet

TRACK FIXTURES
11-101

FEATURES

MiniMax LED O LH is a track mounted accent light powered by one of a number of Xicato LED modules – including Artist Series and Vibrant Series modules – all of which are distinguished by extraordinary color consistency (within 1x2-step MacAdam ellipse). See tables on the reverse for wattages and efficacies.

With a standard track adapter, luminaire may be powered by one of eighteen 20-amp 120-volt track systems. With optional track adapters, luminaire may be powered by one of sixteen 50 or 60-amp 120-volt track systems or one of six 277-volt track systems.

Luminaire, on 120-volt track only, may be dimmed to 10% by an electronic low voltage (ELV) dimmer.

Beam spread is changed by removing the spring-mounted lens holder assembly, replacing one 'twist and lock' reflector with another, and re-inserting the lens holder assembly. Luminaire is ordered with a single reflector; one or both of the other reflectors may be ordered as accessories.

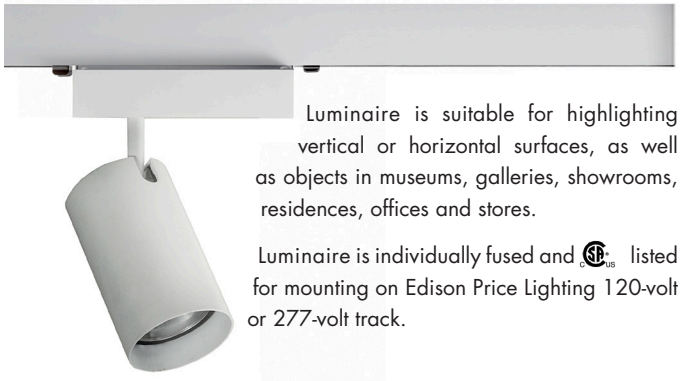
An on-off rocker switch, mounted flush in the circular top of the luminaire, is included standard on luminaires equipped for 120 volt service only.

A concealed swivel provides 385° horizontal rotation and vertical adjustment from 0° to 90°. The swivel is permanently tensioned, allowing the luminaire to remain fixed at any angle. Luminaire can be locked in place by depressing a hinged (`lever lock') bar so that it lies flush with the top of the housing. Lifting the lever lock frees the swivel.

Lens holder assembly accepts one or two of a number of Optical Accessories including spread lenses and color filters. Complimentary Beam Smoother is included. Note that, for enhanced efficiency, cross-baffles are not included. Lens holder assembly is spring-mounted for easy removal and adjustment.

MiniMax luminaires have seamless aluminum housings and cast aluminum tops for lightweight durability and heat dissipation. Standard finish is matte white; also available in black and silver. A white switch is provided with white luminaires and a black switch with black or silver luminaires. For custom color luminaires (CC) specifier must indicate white or black switch.

APPLICATIONS

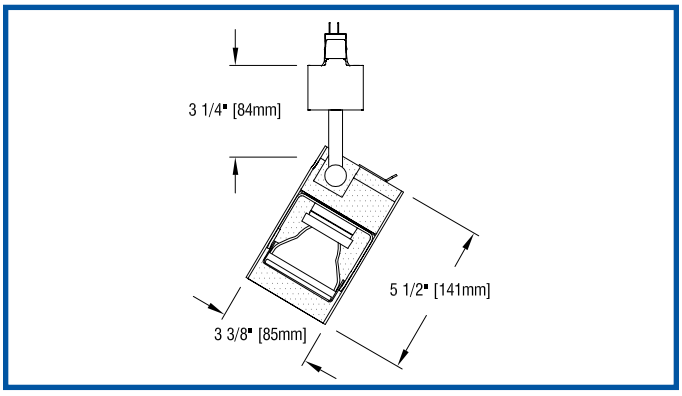


Luminaire is suitable for highlighting vertical or horizontal surfaces, as well as objects in museums, galleries, showrooms, residences, offices and stores.

Luminaire is individually fused and cSAus listed for mounting on Edison Price Lighting 120-volt or 277-volt track.

Fixture Spacing Requirements The track adapters of MiniMax LED's are 8" long. For this reason they cannot be mounted closer than 8 ¼ " on center and they cannot be used with any of our three Unicep single-fixture track units.

For the outlet box mounted version of this luminaire, see **MiniMax LED O LH-OBM**.



PRODUCT CODE

For complete product code, list basic unit and select one item from each following box.

Basic Unit MM-XSM2-O-LH

Light Output
- 700 lumens / CRI 97 Artist ..... - L07A
- 1000 lumens / CRI 97 Artist..... - L10A
- 1000 lumens / CRI 80+..... - L10S
- 1500 lumens / CRI 80+ Vibrant ..... *3000K only* ..... - L15V
- 1500 lumens / CRI 80+..... - L15S
- 2100 lumens / CRI 80+..... - L21S

Light Color
- 2700 K ..... *not available on 2100 lumen model* ..... -27K
- 3000 K..... - 30K
- 3500 K ..... - 35K
- 4000 K..... - 40K

Beam Spread Reflector *(specify one to ship with fixture)*
- 20° spot ..... - 20D
- 40° flood ..... - 40D
- 60° wide flood ..... - 60D

OPTIONS *Specify by adding to the product code.*

Dimmable.....standard driver is dimmable to 10% with ELV dimmer on 120-volt track only. Dimming not available on 277-volt track.

Dimmable to 1% with Lutron driver controlled by incandescent dimmer on 120-volt service only; not available on 277-volt track .....– LU-DMI

60-amp adapter required for fixtures to be used on DoubleLine-50, AutoTrak-50 UpLine-50 or AutoBus-120 track systems (fixture's appearance remains the same) .....– 1C

277-volt adapter required for fixtures to be used on HighLine or AutoBus-277 track systems. Note: Fixtures on 277-volt track cannot be dimmed and do not include an on-off switch. ..... – HC

matte black housing finish .....– BLK

Industrial Silver housing finish ..... – SIL

custom color paint housing finish *identify color in specification* ..... – CC

EXTRA REFLECTORS *Specify as separate line items.*

- **20° spot reflector** XSM-REF20
- **40° flood reflector**..... XSM-REF40
- **60° wide flood reflector** XSM-REF60

OPTICAL ACCESSORIES ▼ *See next page*

EDISON PRICE LIGHTING

41-50 22ND STREET, LIC NY 11101 TEL 718.685.0700 FAX 718.786.8530 www.epl.com

MINIMAX LED O LH

EDISON PRICE LIGHTING

OPTICAL ACCESSORIES

Specify as separate line items.
All are 2¾" (70mm) dia. Lenses and filters are glass; screens are aluminum.

diffuse glass DGS/2.75
prismatic lens (Solite) PLS/2.75
55° spread lens LENS/2.75
40° x 70° spread lens LENS/2.75-4070
beam smoother *included with fixture* CLR/2.75
color filters
Daylight Blue DAY/2.75
Surprise Pink PNK/2.75
amber AMB/2.75
blue BLU/2.75
green GRN/2.75
red RED/2.75
33% light reduction screen SCR33/2.75
50% light reduction screen SCR50/2.75

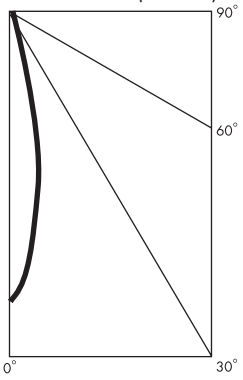
PHOTOMETRIC REPORT (tested per IESNA LM-79-2008)

Data prorated from UL Verification Services Report No. 331261. Original test report furnished upon request.

Luminaire ..... track-mounted LED accent light with a 20° reflector and black lens holder (NO LENS)
Lamp ..... Xicato XSM LED Module, 1500 lumens, 3000K
Lamp Life ..... rated 50.000 hours based on L70/B50 criteria. LM80 report by LED manufacturer furnished upon request
Luminaire Light Output ..... 1146 lumens

CANDLEPOWER DISTRIBUTION *(Candela)*

Vertical Angle	*Horizontal Angle* 0
0	4975
5	4278
15	1576
25	567
35	13
45	0
55	0
65	0
75	0
85	0
90	0



LUMINANCE DATA

Vertical Angle	*Candela/m²*
45	3076
55	1759
65	1014
75	0
85	0

DRIVER INFORMATION

(UL Class 2, dry and damp location)
Dimmable to 10% with trailing edge (ELV) dimmers

Voltage	*120*	*277*
Input Watts (700A/1000A/1000/1500/2100 lumens)	16/21/15/23/26	16/21/15/23/26
Input Current (A) (700A/1000A/1000/1500/2100 lumens)	.13/.18/.13/.19/.22	.06/.08/.05/.08/.09
Output Current (mA)	500-1050	500-1050
Min. Power Factor	0.99	0.99
Operating Temperature Range (F)	–13 to 122	–13 to 122

LUMINAIRE LIGHT OUTPUT AND EFFICACY

LED Module Type	*Luminaire Light Output*	*Luminaire Efficacy (lms/watt)*	*System Wattage*
700 Lumens Artist	516*	32	16*
1000 Lumens Artist	653*	31	21*
1000 Lumens standard	721*	48	15
1500 Lumens standard & Vibrant	1146*	50	23*
2100 Lumens standard	1455*	56	26

**estimated values*

LIGHT OUTPUT MULTIPLIER

700 lumens Artist	*1000 lumens Artist*	*1000 lumens*	*1500 lumens standard & Vibrant*	*2100 lumens*
.45 *(estimated)*	.57 *(estimated)*	.63 *(estimated)*	1	1.27 *(estimated)*

MINIMAX™ LED O LH T5

track mounted LED accent light (no cross baffle)

Spec Sheet

TRACK FIXTURES
11-101

FEATURES

MiniMax LED O LH is a track mounted accent light powered by one of a number of Xicato LED modules – including Artist Series and Vibrant Series modules – all of which are distinguished by extraordinary color consistency (within 1x2-step MacAdam ellipse). See tables on the reverse for wattages and efficacies.

With a standard track adapter, luminaire may be powered by one of eighteen 20-amp 120-volt track systems. With optional track adapters, luminaire may be powered by one of sixteen 50 or 60-amp 120-volt track systems or one of six 277-volt track systems.

Luminaire, on 120-volt track only, may be dimmed to 10% by an electronic low voltage (ELV) dimmer.

Beam spread is changed by removing the spring-mounted lens holder assembly, replacing one 'twist and lock' reflector with another, and re-inserting the lens holder assembly. Luminaire is ordered with a single reflector; one or both of the other reflectors may be ordered as accessories.

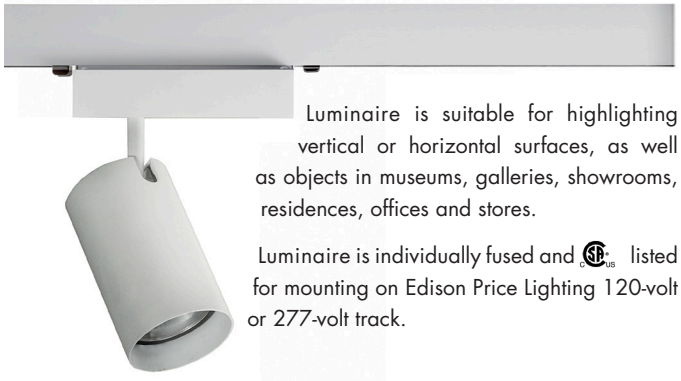
An on-off rocker switch, mounted flush in the circular top of the luminaire, is included standard on luminaires equipped for 120 volt service only.

A concealed swivel provides 385° horizontal rotation and vertical adjustment from 0° to 90°. The swivel is permanently tensioned, allowing the luminaire to remain fixed at any angle. Luminaire can be locked in place by depressing a hinged (`lever lock') bar so that it lies flush with the top of the housing. Lifting the lever lock frees the swivel.

Lens holder assembly accepts one or two of a number of Optical Accessories including spread lenses and color filters. Complimentary Beam Smoother is included. Note that, for enhanced efficiency, cross-baffles are not included. Lens holder assembly is spring-mounted for easy removal and adjustment.

MiniMax luminaires have seamless aluminum housings and cast aluminum tops for lightweight durability and heat dissipation. Standard finish is matte white; also available in black and silver. A white switch is provided with white luminaires and a black switch with black or silver luminaires. For custom color luminaires (CC) specifier must indicate white or black switch.

APPLICATIONS

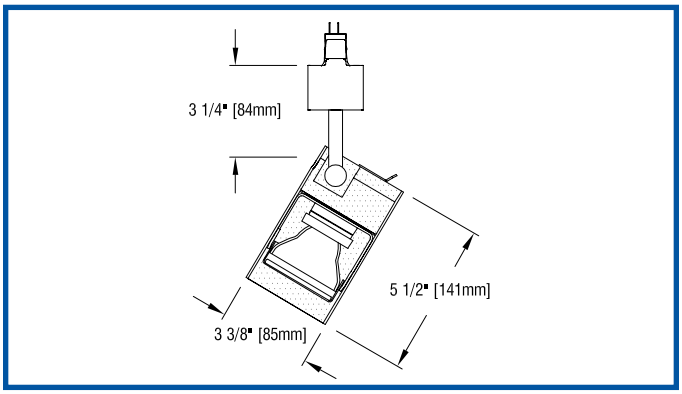


Luminaire is suitable for highlighting vertical or horizontal surfaces, as well as objects in museums, galleries, showrooms, residences, offices and stores.

Luminaire is individually fused and cSAus listed for mounting on Edison Price Lighting 120-volt or 277-volt track.

Fixture Spacing Requirements The track adapters of MiniMax LED's are 8" long. For this reason they cannot be mounted closer than 8 ¼ " on center and they cannot be used with any of our three Unicep single-fixture track units.

For the outlet box mounted version of this luminaire, see **MiniMax LED O LH-OBM**.



PRODUCT CODE

For complete product code, list basic unit and select one item from each following box.

Basic Unit MM-XSM2-O-LH

Light Output
- 700 lumens / CRI 97 Artist ..... - L07A
- 1000 lumens / CRI 97 Artist..... - L10A
- 1000 lumens / CRI 80+..... - L10S
- 1500 lumens / CRI 80+ Vibrant ..... *3000K only* ..... - L15V
- 1500 lumens / CRI 80+..... - L15S
- 2100 lumens / CRI 80+..... - L21S

Light Color
- 2700 K ..... *not available on 2100 lumen model* ..... -27K
- 3000 K..... - 30K
- 3500 K ..... - 35K
- 4000 K..... - 40K

Beam Spread Reflector *(specify one to ship with fixture)*
- 20° spot ..... - 20D
- 40° flood ..... - 40D
- 60° wide flood ..... - 60D

OPTIONS *Specify by adding to the product code.*

Dimmable.....standard driver is dimmable to 10% with ELV dimmer on 120-volt track only. Dimming not available on 277-volt track.

Dimmable to 1% with Lutron driver controlled by incandescent dimmer on 120-volt service only; not available on 277-volt track .....– LU-DMI

60-amp adapter required for fixtures to be used on DoubleLine-50, AutoTrak-50 UpLine-50 or AutoBus-120 track systems (fixture's appearance remains the same) .....– 1C

277-volt adapter required for fixtures to be used on HighLine or AutoBus-277 track systems. Note: Fixtures on 277-volt track cannot be dimmed and do not include an on-off switch. ..... – HC

matte black housing finish .....– BLK

Industrial Silver housing finish ..... – SIL

custom color paint housing finish *identify color in specification* ..... – CC

EXTRA REFLECTORS *Specify as separate line items.*

- **20° spot reflector** XSM-REF20
- **40° flood reflector**..... XSM-REF40
- **60° wide flood reflector** XSM-REF60

OPTICAL ACCESSORIES ▼ *See next page*

EDISON PRICE LIGHTING

41-50 22ND STREET, LIC NY 11101 TEL 718.685.0700 FAX 718.786.8530 www.epl.com

MINIMAX LED O LH

EDISON PRICE LIGHTING

OPTICAL ACCESSORIES

Specify as separate line items.
All are 2¾" (70mm) dia. Lenses and filters are glass; screens are aluminum.

diffuse glass DGS/2.75
prismatic lens (Solite) PLS/2.75
55° spread lens LENS/2.75
40° x 70° spread lens LENS/2.75-4070
beam smoother *included with fixture* CLR/2.75
color filters
Daylight Blue DAY/2.75
Surprise Pink PNK/2.75
amber AMB/2.75
blue BLU/2.75
green GRN/2.75
red RED/2.75
33% light reduction screen SCR33/2.75
50% light reduction screen SCR50/2.75

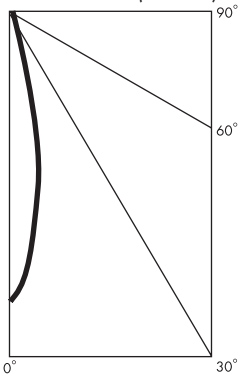
PHOTOMETRIC REPORT (tested per IESNA LM-79-2008)

Data prorated from UL Verification Services Report No. 331261. Original test report furnished upon request.

Luminaire ..... track-mounted LED accent light with a 20° reflector and black lens holder (NO LENS)
Lamp ..... Xicato XSM LED Module, 1500 lumens, 3000K
Lamp Life ..... rated 50.000 hours based on L70/B50 criteria. LM80 report by LED manufacturer furnished upon request
Luminaire Light Output ..... 1146 lumens

CANDLEPOWER DISTRIBUTION *(Candela)*

Vertical Angle	*Horizontal Angle* 0
0	4975
5	4278
15	1576
25	567
35	13
45	0
55	0
65	0
75	0
85	0
90	0



LUMINANCE DATA

Vertical Angle	*Candela/m²*
45	3076
55	1759
65	1014
75	0
85	0

DRIVER INFORMATION

(UL Class 2, dry and damp location)
Dimmable to 10% with trailing edge (ELV) dimmers

Voltage	*120*	*277*
Input Watts (700A/1000A/1000/1500/2100 lumens)	16/21/15/23/26	16/21/15/23/26
Input Current (A) (700A/1000A/1000/1500/2100 lumens)	.13/.18/.13/.19/.22	.06/.08/.05/.08/.09
Output Current (mA)	500-1050	500-1050
Min. Power Factor	0.99	0.99
Operating Temperature Range (F)	–13 to 122	–13 to 122

LUMINAIRE LIGHT OUTPUT AND EFFICACY

LED Module Type	*Luminaire Light Output*	*Luminaire Efficacy (lms/watt)*	*System Wattage*
700 Lumens Artist	516*	32	16*
1000 Lumens Artist	653*	31	21*
1000 Lumens standard	721*	48	15
1500 Lumens standard & Vibrant	1146*	50	23*
2100 Lumens standard	1455*	56	26

**estimated values*

LIGHT OUTPUT MULTIPLIER

700 lumens Artist	*1000 lumens Artist*	*1000 lumens*	*1500 lumens standard & Vibrant*	*2100 lumens*
.45 *(estimated)*	.57 *(estimated)*	.63 *(estimated)*	1	1.27 *(estimated)*

SIGHTLINE® S

surface track system

Spec Sheet

TA1

TRACK SYSTEMS 10-100

FEATURES

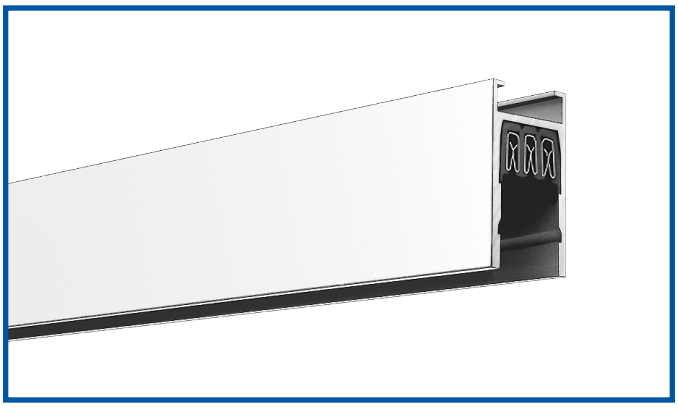
SightLine S is a surface mounted track system suitable for wiring with one or two 20 amp circuits. Tracks can be cut to length in the field. Tracks are mounted to ceilings or walls by means of heavy-duty hanger assemblies which separate the track only ¼" from the mounting surface.

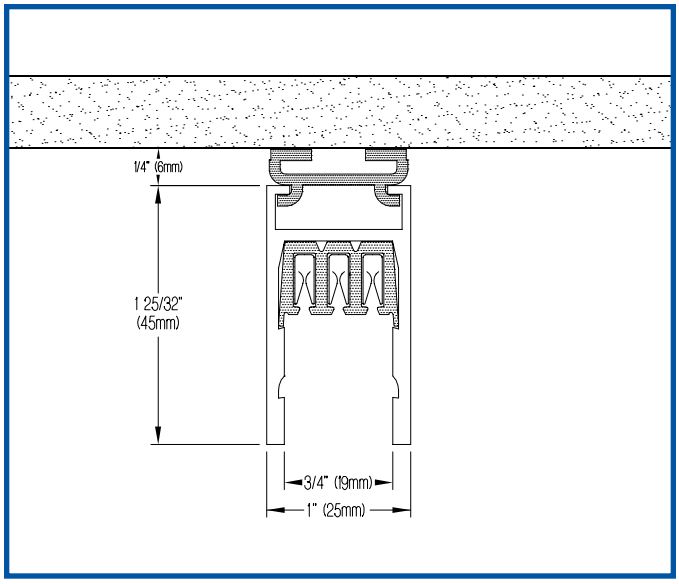
Extruded aluminum tracks, feeds and joints offer a number of benefits:

- elegant appearance, with hairline joints between components
- 6' spans between attachment points, rather than the usual 4'
- exceptional durability for heavy use and long life.

SightLine S is designed so that it completely contains the adapter of the fixture. This feature allows track fixtures to hang from simple ½" diameter stems free of unsightly screws, levers or knobs.

The SightLine S system consists of 15 components, including L, T and X joints and seven kinds of electrical feed. All outlet box feeds include a unique tool-free cover. Standard finish for SightLine S components is matte white; also available in black and Industrial Silver matte paint finishes *(see over)*.

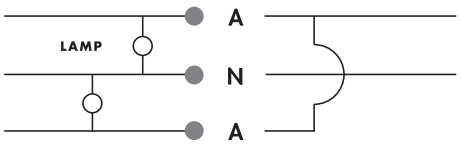




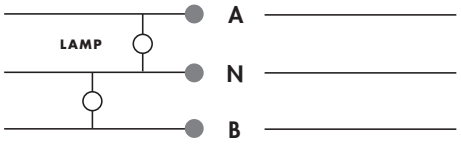
WIRING

SightLine can be wired in two ways.

Single Circuit limited to 120 volts, 20 amps, single phase.



Two-Circuit limited to 20 amps each, 120/240 volts, split single phase.



APPLICATIONS

System is recommended for museums, galleries, showrooms, retail stores, offices, schools or residences – wherever adjustable wallwash or accent lighting is required and especially where the lighting program is changed often.

SightLine S is designed to be mounted to ceilings and vertical surfaces and to support and power Edison Price Lighting track fixtures prepared for 20-amp, 120-volt service only.

System is 3-conductor, continuously grounded. It may be supplied by one or two individually switched, 120 volt, 20 amp branch circuits. Total capacity is 40 amps when supplied by a single phase, 120/240 volt, three-wire branch circuit. Prewired feeds use #12 stranded wire. Service wire brought directly to feed terminals must be #12 AWG solid wire.

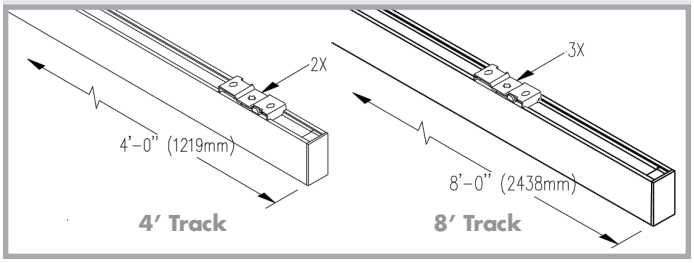
All components are c UL us listed for indoor use only.

EDISON PRICE LIGHTING

41-50 22ND STREET, LIC NY 11101 TEL 718.685.0700 FAX 718.786.8530 www.epl.com

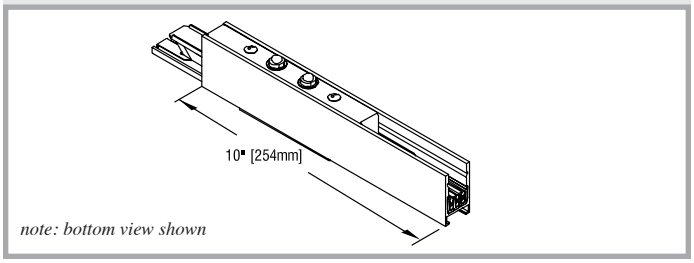
SIGHTLINE S

TRACK



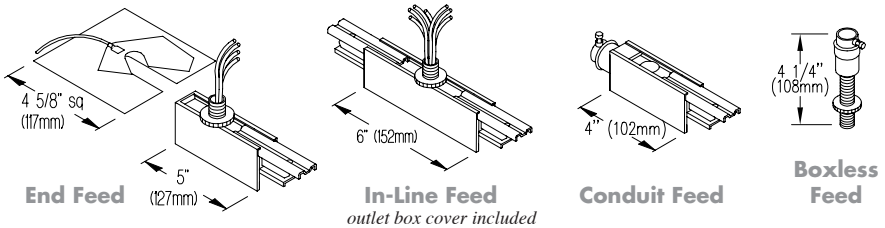
CURRENT LIMITERS

for use where required by local code

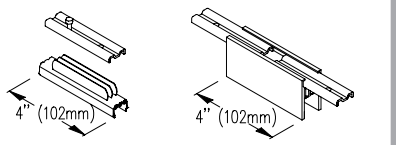


note: bottom view shown

FEEDS

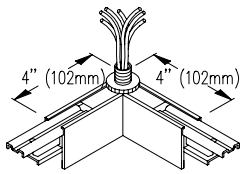


SPLICES



L-JOINT AND L-JOINT FEED

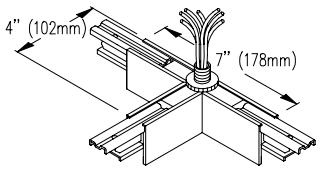
outlet box cover incl.



L-Joint is identical to L-Joint Feed (shown) but without wire leads

T-JOINT AND T-JOINT FEED

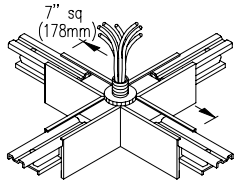
outlet box cover incl.



T-Joint is identical to T-Joint Feed (shown) but without wire leads

X-JOINT AND X-JOINT FEED

outlet box cover incl.



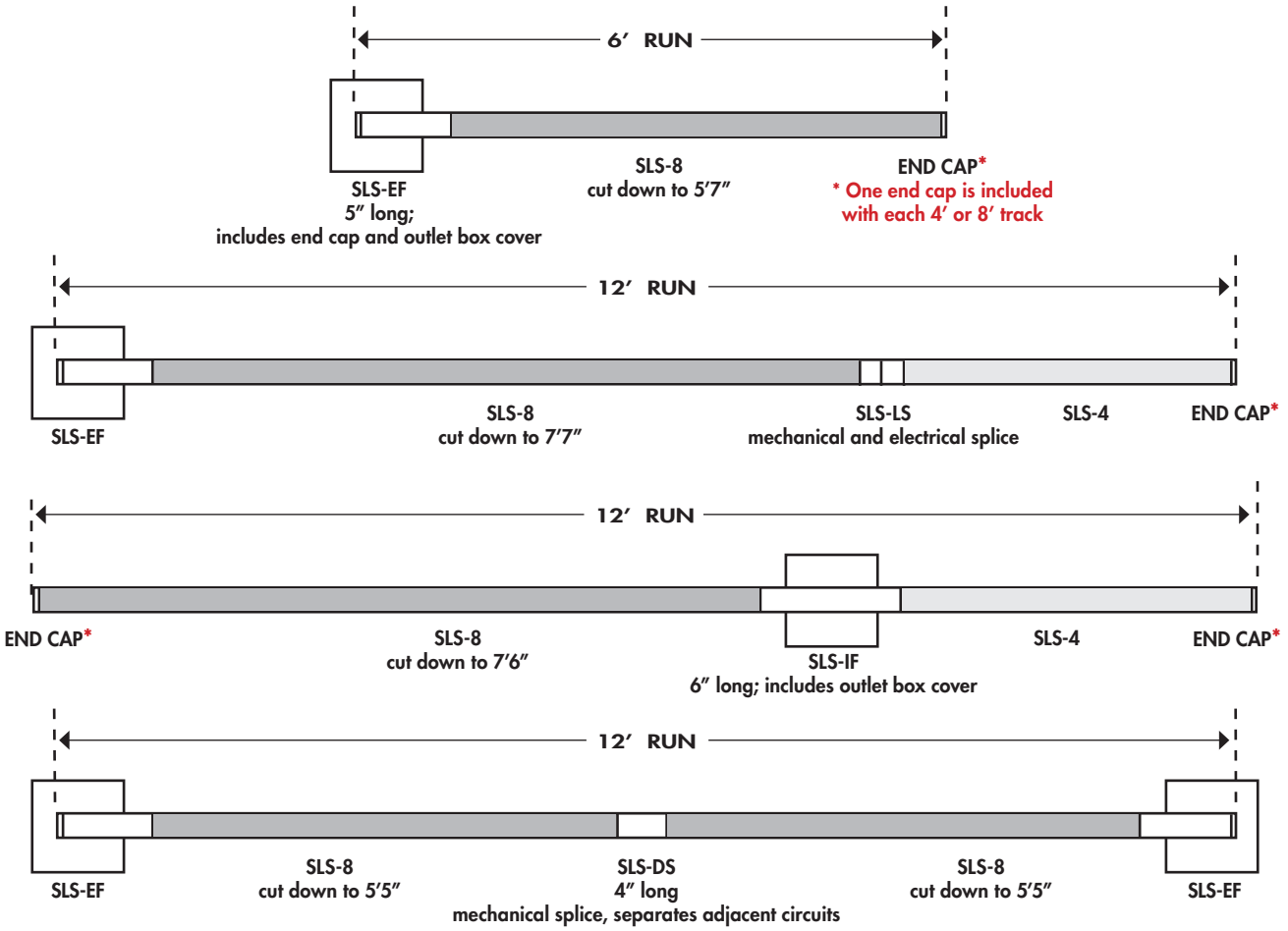
X-Joint is identical to X-Joint Feed (shown) but without wire leads

Component	Product Codes			Description
	White	Black	Silver	
4' Track	SLS/4	SLS/4B	SLS/4S	Individual 4'0" length of track with one end cap and two hangers.
8' Track*	SLS/8	SLS/8B	SLS/8S	Individual 8'0" length of track with one end cap and three hangers.
End Feed	SLS/EF	SLS/EFB	SLS/EFS	Prewired feed for electrical service from an outlet box at the end of a track. Includes outlet box cover.
In-Line Feed	SLS/IF	SLS/IFB	SLS/IFS	Prewired feed for electrical service between tracks, from an outlet box above. Includes outlet box cover.
Conduit Feed	SLS/CF	SLS/CFB	SLS/CFS	Feed for electrical service directly into end of track. Includes adapter for ⅜" conduit or BX.
Boxless Feed	SLS/BLF	SLS/BLFB	SLS/BLFS	Feed for electrical service directly through ceiling without an outlet box. For use with End Feed, In-Line Feed, L-Joint, T-Joint or X-Joint.
Live Splice	SLS/LS	SLS/LS	SLS/LS	Components for joining two tracks and connecting their electrical conductors. Fits within track.
Dead Splice	SLS/DS	SLS/DSB	SLS/DSS	Component for joining two tracks without connecting their electrical conductors. Adds 4" to length of track.
L-Joint	SLS/LJ	SLS/LJB	SLS/LJS	90° joint prewired to connect circuits of adjacent tracks. Includes loose wire leads and an outlet box cover which allow conversion to an electrical feed.
L-Joint Feed	SLS/LJF	SLS/LJFB	SLS/LJFS	90° joint prewired to connect circuits of adjacent tracks and provide electrical service. Incl. outlet box cover.
T-Joint	SLS/TJ	SLS/TJB	SLS/TJS	T-joint prewired to connect circuits of adjacent tracks. Includes loose wire leads and an outlet box cover which allow conversion to an electrical feed.
T-Joint Feed	SLS/TJF	SLS/TJFB	SLS/TJFS	T-joint prewired to connect circuits of adjacent tracks and provide electrical service. Incl. outlet box cover.
X-Joint	SLS/XJ	SLS/XJB	SLS/XJS	X-joint prewired to connect circuits of adjacent tracks. Includes loose wire leads and an outlet box cover which allow conversion to an electrical feed.
X-Joint Feed	SLS/XJF	SLS/XJFB	SLS/XJFS	X-joint prewired to connect circuits of adjacent tracks and provide electrical service. Incl. outlet box cover.
5A Limiter	SLS/LIM5	SLS/LIM5B	SLS/LIM5S	5-amp capacity current limiter with one reset button for each circuit. California Energy Commission approved.
10A Limiter	SLS/LIM10	SLS/LIM10B	SLS/LIM10S	10-amp capacity current limiter with one reset button for each circuit. California Energy Commission approved.

** Note: • 12' lengths of track are available on special order; contact factory.*
• For wall-mounted installations specify "double hangers" and mount hangers at 24" intervals.

SIGHTLINE S

layout examples



more examples

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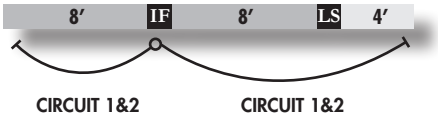
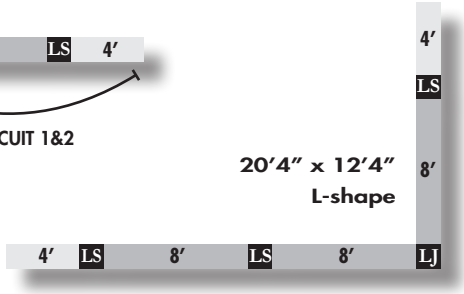
20′5″ RUN

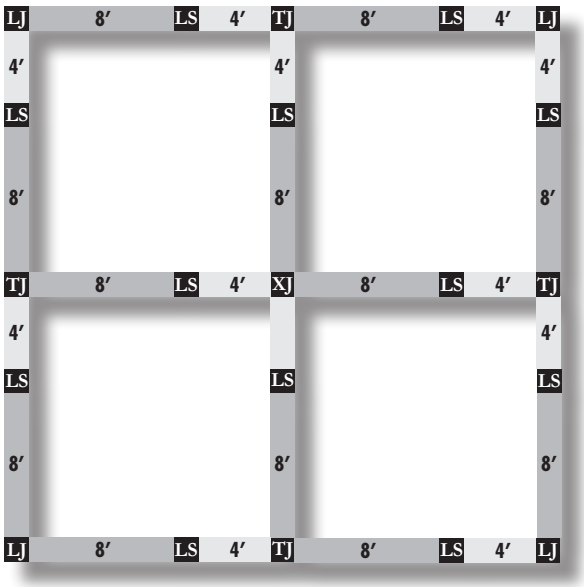
20′6″ RUN



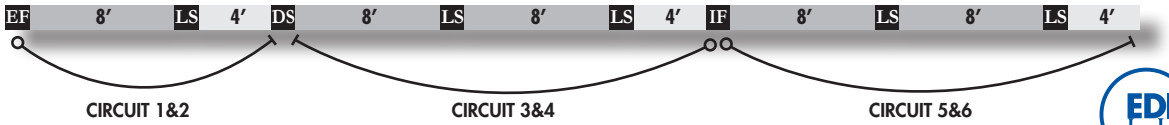
20′4″ x 12′4″ L-shape



25′3″ x 25′3″ GRID



53′3″ RUN



EDISON PRICE LIGHTING

SIGHTLINE® S

surface track system

Spec Sheet

TA2

TRACK SYSTEMS
10-100

FEATURES

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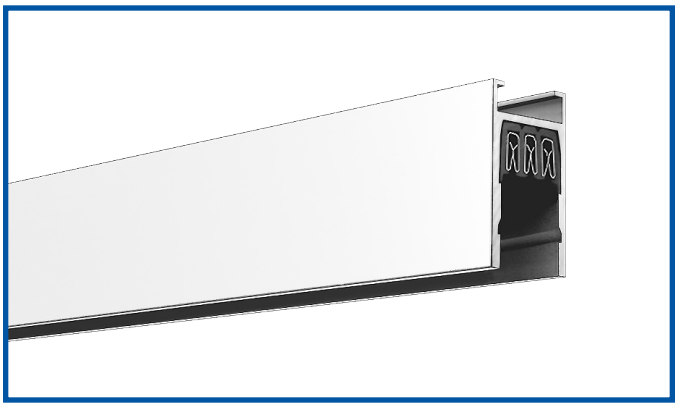

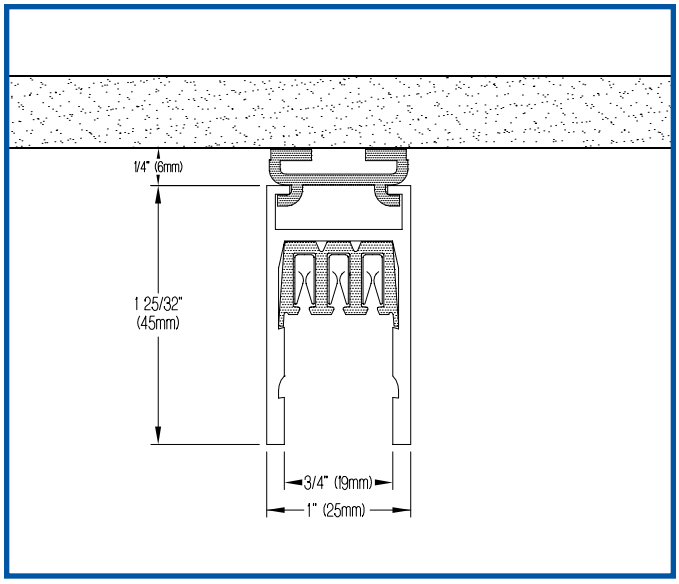

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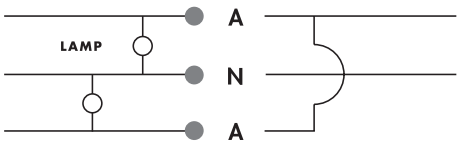

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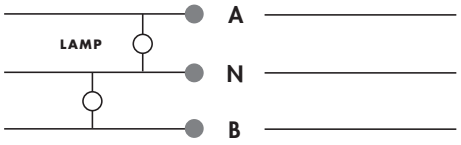

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EDISON PRICE LIGHTING

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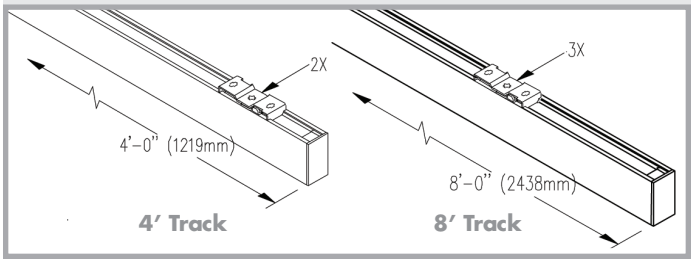
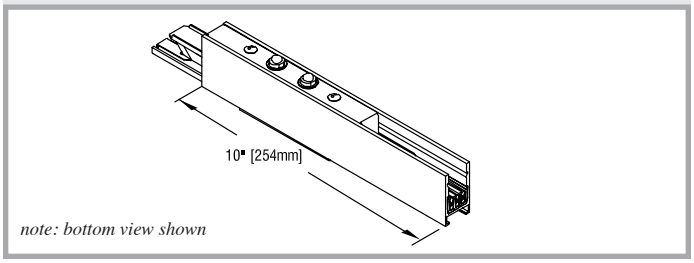
SIGHTLINE S

TRACK



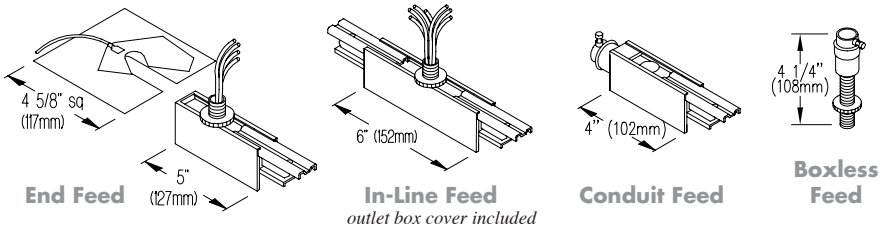
CURRENT LIMITERS

for use where required by local code

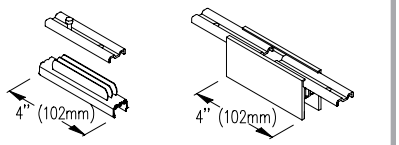


note: bottom view shown

FEEDS

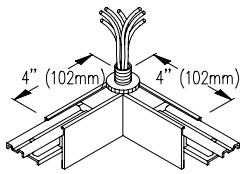


SPLICES



L-JOINT AND L-JOINT FEED

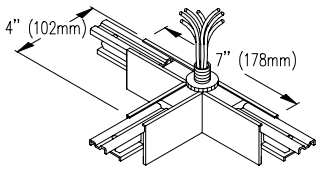
outlet box cover incl.



L-Joint is identical to L-Joint Feed (shown) but without wire leads

T-JOINT AND T-JOINT FEED

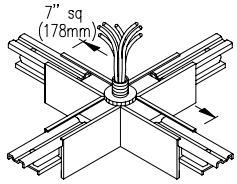
outlet box cover incl.



T-Joint is identical to T-Joint Feed (shown) but without wire leads

X-JOINT AND X-JOINT FEED

outlet box cover incl.



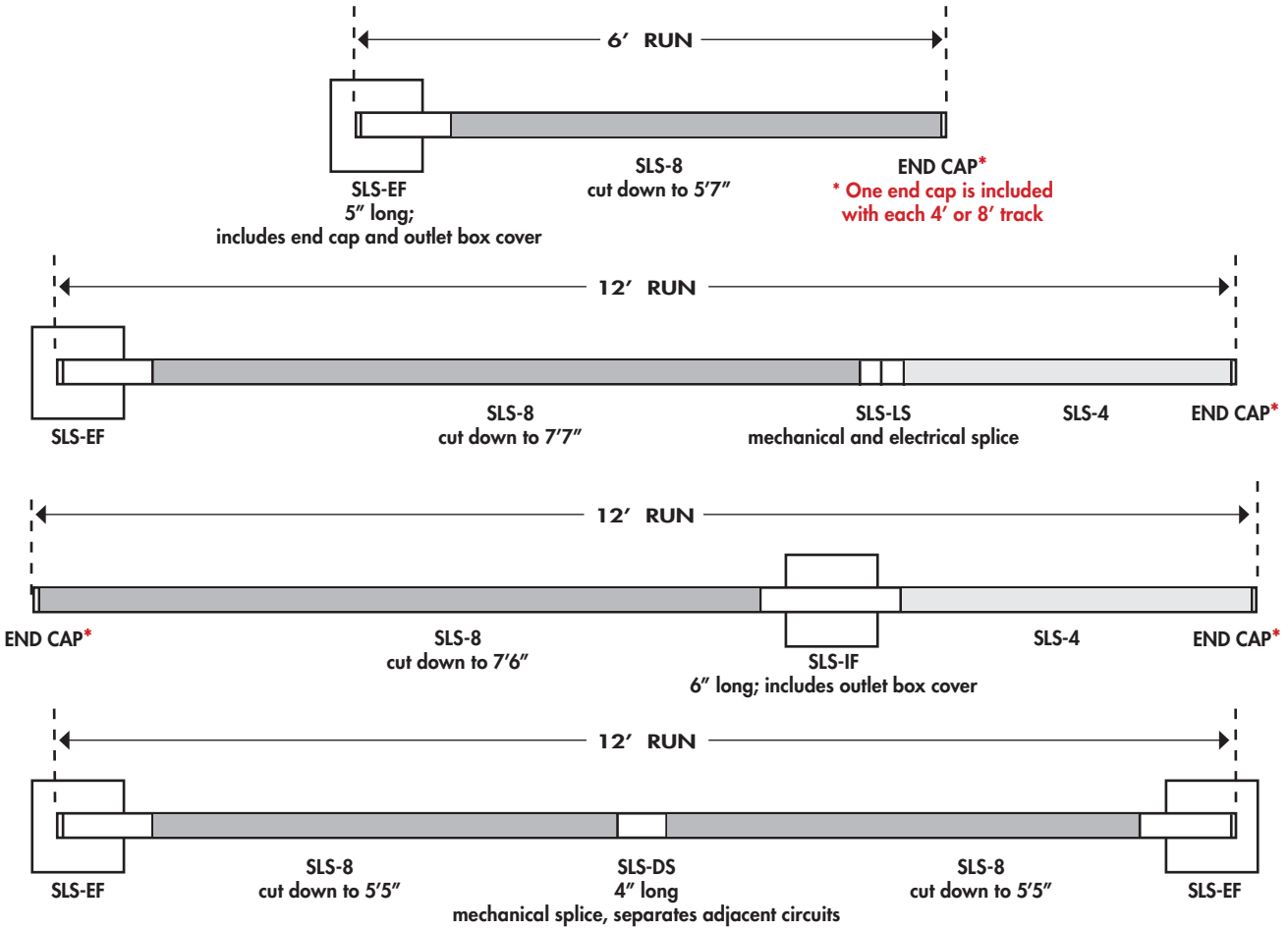
X-Joint is identical to X-Joint Feed (shown) but without wire leads

Component	Product Codes			Description
	White	Black	Silver	
4' Track	SLS/4	SLS/4B	SLS/4S	Individual 4'0" length of track with one end cap and two hangers.
8' Track*	SLS/8	SLS/8B	SLS/8S	Individual 8'0" length of track with one end cap and three hangers.
End Feed	SLS/EF	SLS/EFB	SLS/EFS	Prewired feed for electrical service from an outlet box at the end of a track. Includes outlet box cover.
In-Line Feed	SLS/IF	SLS/IFB	SLS/IFS	Prewired feed for electrical service between tracks, from an outlet box above. Includes outlet box cover.
Conduit Feed	SLS/CF	SLS/CFB	SLS/CFS	Feed for electrical service directly into end of track. Includes adapter for ⅜" conduit or BX.
Boxless Feed	SLS/BLF	SLS/BLFB	SLS/BLFS	Feed for electrical service directly through ceiling without an outlet box. For use with End Feed, In-Line Feed, L-Joint, T-Joint or X-Joint.
Live Splice	SLS/LS	SLS/LS	SLS/LS	Components for joining two tracks and connecting their electrical conductors. Fits within track.
Dead Splice	SLS/DS	SLS/DSB	SLS/DSS	Component for joining two tracks without connecting their electrical conductors. Adds 4" to length of track.
L-Joint	SLS/LJ	SLS/LJB	SLS/LJS	90° joint prewired to connect circuits of adjacent tracks. Includes loose wire leads and an outlet box cover which allow conversion to an electrical feed.
L-Joint Feed	SLS/LJF	SLS/LJFB	SLS/LJFS	90° joint prewired to connect circuits of adjacent tracks and provide electrical service. Incl. outlet box cover.
T-Joint	SLS/TJ	SLS/TJB	SLS/TJS	T-joint prewired to connect circuits of adjacent tracks. Includes loose wire leads and an outlet box cover which allow conversion to an electrical feed.
T-Joint Feed	SLS/TJF	SLS/TJFB	SLS/TJFS	T-joint prewired to connect circuits of adjacent tracks and provide electrical service. Incl. outlet box cover.
X-Joint	SLS/XJ	SLS/XJB	SLS/XJS	X-joint prewired to connect circuits of adjacent tracks. Includes loose wire leads and an outlet box cover which allow conversion to an electrical feed.
X-Joint Feed	SLS/XJF	SLS/XJFB	SLS/XJFS	X-joint prewired to connect circuits of adjacent tracks and provide electrical service. Incl. outlet box cover.
5A Limiter	SLS/LIM5	SLS/LIM5B	SLS/LIM5S	5-amp capacity current limiter with one reset button for each circuit. California Energy Commission approved.
10A Limiter	SLS/LIM10	SLS/LIM10B	SLS/LIM10S	10-amp capacity current limiter with one reset button for each circuit. California Energy Commission approved.

** Note: • 12' lengths of track are available on special order; contact factory.*
• For wall-mounted installations specify "double hangers" and mount hangers at 24" intervals.

SIGHTLINE S

layout examples

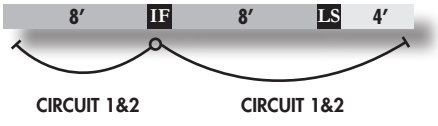


more examples

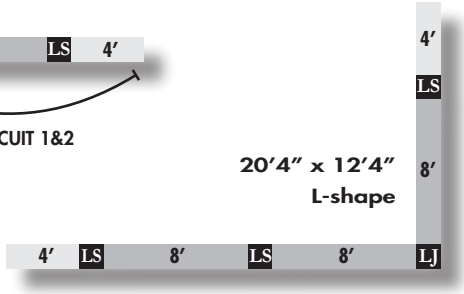
REMEMBER: You can cut Sightline S to the lengths you need for your project.

20′5″ RUN

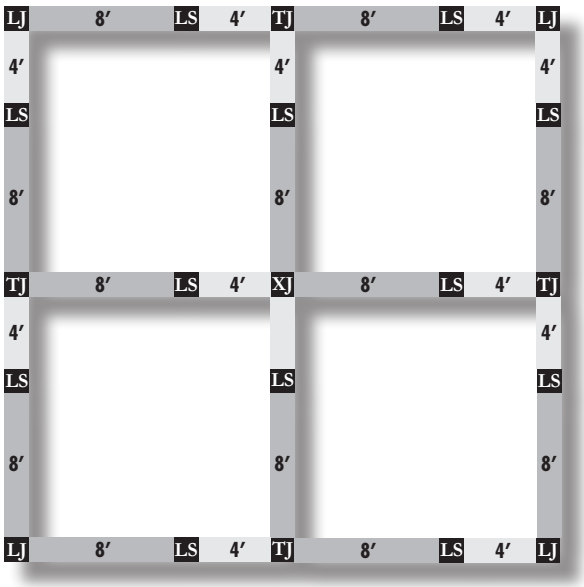
20′6″ RUN



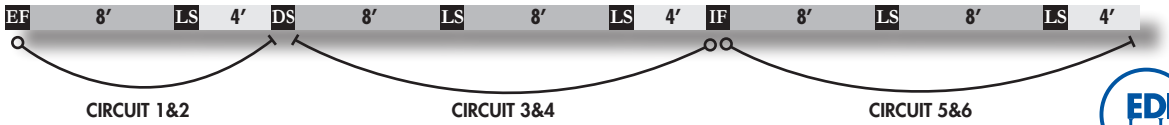
20′4″ x 12′4″ L-shape



25′3″ x 25′3″ GRID



53′3″ RUN



EDISON PRICE LIGHTING

SIGHTLINE® P

pendant mounted track system

TB

Spec Sheet

FEATURES

SightLine P is a pendant mounted track system suitable for wiring with one or two 20 amp circuits. Tracks can be cut to length in the field. Tracks are hung from ceilings by means of ½" or .675" outside diameter pendants.

Pendants of ½" OD can each contain four #12 feed wires (by others), sufficient for two 20 amp circuits; 3/8 IPS pendants (.675" OD) can each contain seven #12 feed wires (by others), sufficient for four 20 amp circuits.

Extruded aluminum tracks, feeds and joints offer a number of benefits:

- elegant appearance, with hairline joints between components
- 6' spans between attachment points, rather than the usual 4'
- exceptional durability for heavy use and long life.

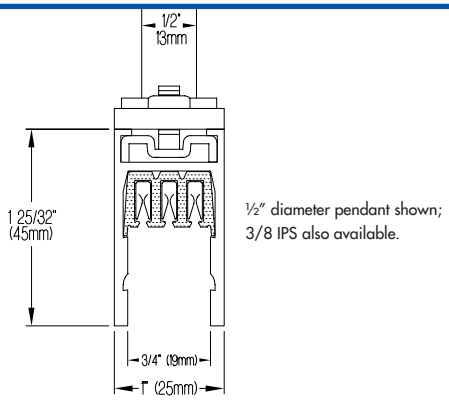
SightLine P consists of 11 components *(see over)*. Components are available in matte white, black and Industrial Silver paint finishes.

APPLICATIONS

System is recommended for museums, galleries, showrooms, retail stores, offices, schools or residences – wherever adjustable lighting is required and especially where the lighting program is changed often.

SightLine P is designed to be mounted to ceilings from a 4" x 2 ⅛" deep octagonal outlet box with an ⅜ IPS stud that has been mounted sucrely to the ceiling structure. SightLine P is intended to support and power Edison Price Lighting track fixtures prepared for 20-amp, 120-volt service only.

System is 3-conductor, continuously grounded. It may be supplied by one or two individually switched, 120 volt, 20 amp branch circuits. Total capacity is 40 amps when supplied by a single phase, 120/240 volt, three-wire branch circuit. Service wire brought to feed terminals must be #12 AWG solid wire. All components are c UL us listed for indoor use only.



½" diameter pendant shown; 3/8 IPS also available.

COMPONENTS

▶ SightLine P consists of 11 components described on the reverse side.

▶ SightLine P pendants should be hung from 4" x 2 ⅛" deep octagonal outlet boxes complete with 3/8 IPS studs (both by others) securely mounted to the ceiling structure.

PENDANTS

All pendants may be cut and rethreaded in the field.

18" pendant, white. ½" (13mm) OD; can contain four #12 wires (by others); ¼–18 NPS thread 18P
same 18" pendant, **black** 18PB
same 18" pendant, **Industrial Silver** 18PS

36" pendant, white 36P
same 36" pendant, **black** 36PB
same 36" pendant, **Industrial Silver** 36PS

18" high capacity pendant, white. ⅜ IPS (.675"/17mm OD); can contain seven #12 wires (by others); ⅜–18 NPS thread 18PX
same 18" high capacity pendant, **black** 18PXB
same 18" high capacity pendant, **Industrial Silver** 18PXS

36" high capacity pendant, white 36PX
same 36" high capacity pendant, **black** 36PXB
same 36" high capacity pendant, **Industrial Silver** 36PXS

PENDANT HARDWARE

▶ All items below may be used with either ½" (13mm) or .675" (17mm) OD pendants.

▶ All items below are designed for use with 4" x 2 ⅛" deep octagonal outlet boxes complete with 3/8 IPS studs (both by others) securely mounted to the ceiling structure.

outlet box cover kit, white. flat 4 ½" (114mm) ..... OBC
same cover, **black** ..... OBCB
same cover, **Industrial Silver** ..... OBCS

canopy kit, white. 5" (127mm) dia x 1⅝" (41mm) deep ..... CPY
same canopy, **black** ..... CPYB
same canopy, **Industrial Silver** ..... CPYS

swivel kit, white. 4 ½" (114mm) dia; 45° max sloped ceiling ..... SVL
same swivel, **black** ..... SVLB
same swivel, **Industrial Silver** ..... SVLS

WIRING

Wiring preparations are identical to SightLine S. See wiring diagram on page 10-100.

EDISON PRICE LIGHTING

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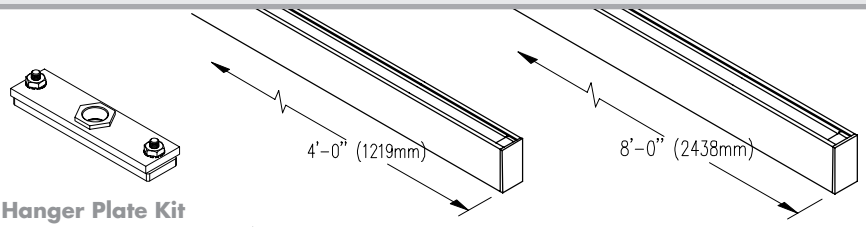
SIGHTLINE® P

EDISON PRICE LIGHTING

TRACK

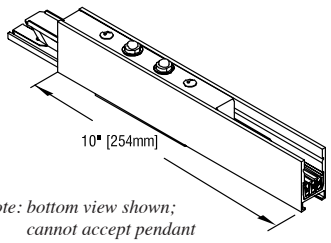


Hanger Plate Kit
one included with each 4' Track
two included with each 8' Track

4' Track

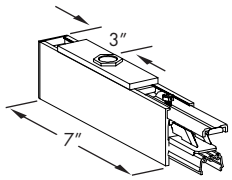
8' Track

CURRENT LIMITERS *for use where required by local code*

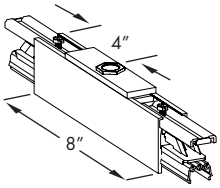


note: bottom view shown; cannot accept pendant

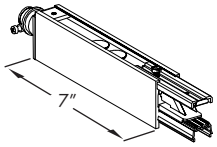
FEEDS



End Feed

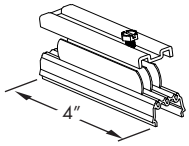


In-Line Feed

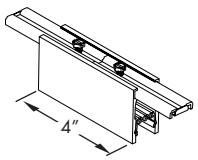


Conduit Feed
note: cannot accept pendant

SPLICES

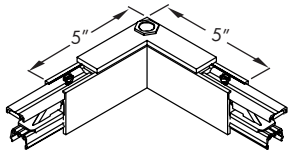


Live Splice

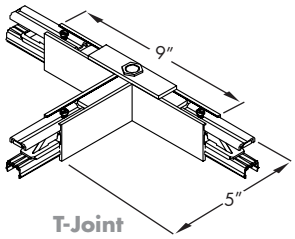


Dead Splice

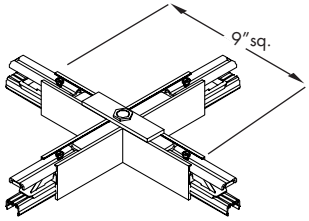
JOINTS



L-Joint



T-Joint



X-Joint

Component	Product Codes			Description
	White	Black	Silver	
4' Track	SLP/4	SLP/4B	SLP/4S	Individual 4'0" length of track with one end cap and one hanger plate.
8' Track*	SLP/8	SLP/8B	SLP/8S	Individual 8'0" length of track with one end cap and two hanger plates.
End Feed	SLP/EF	SLP/EFB	SLP/EFS	Feed for electrical service through a pendant; for use at end of track run.
In-Line Feed	SLP/IF	SLP/IFB	SLP/IFS	Feed for electrical service through a pendant; for use at an intermediate location on track run.
Conduit Feed	SLP/CF	SLP/CFB	SLP/CFS	Feed for electrical service directly into end of track. Includes adapter for ¾" conduit or BX.
Live Splice	SLP/LS	SLP/LS	SLP/LS	Components for joining two tracks and connecting their electrical conductors. Fits within track.
Dead Splice	SLP/DS	SLP/DSB	SLP/DSS	Component for joining two tracks without connecting their electrical conductors. Adds 4" to length of track.
L-Joint	SLP/LJ	SLP/LJB	SLP/LJS	90° joint prewired to connect circuits of adjacent tracks by means of removable 'jumper' wires. May also be used for electrical service through a pendant.
T-Joint	SLP/TJ	SLP/TJB	SLP/TJS	T-joint prewired to connect circuits of adjacent tracks by means of removable 'jumper' wires. May also be used for electrical service through a pendant.
X-Joint	SLP/XJ	SLP/XJB	SLP/XJS	X-joint prewired to connect circuits of adjacent tracks by means of removable 'jumper' wires. May also be used for electrical service through a pendant.
5A Limiter	SLP/LIM5	SLP/LIM5B	SLP/LIM5S	5-amp capacity current limiter with reset button for ea. circuit. California Energy Commission approved.
10A Limiter	SLP/LIM10	SLP/LIM10B	SLP/LIM10S	10-amp capacity current limiter with reset button for ea. circuit. California Energy Commission approved.

** Note: 12' lengths of track are available on special order; contact factory.*

SIGHTLINE® S

surface track system

Spec Sheet

TC

TRACK SYSTEMS 10-100

FEATURES

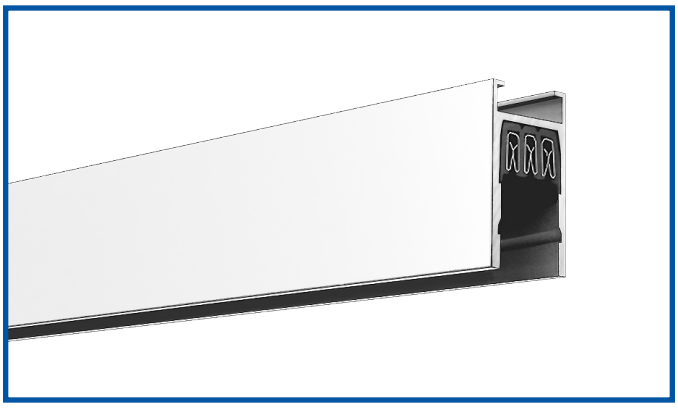
SightLine S is a surface mounted track system suitable for wiring with one or two 20 amp circuits. Tracks can be cut to length in the field. Tracks are mounted to ceilings or walls by means of heavy-duty hanger assemblies which separate the track only ¼" from the mounting surface.

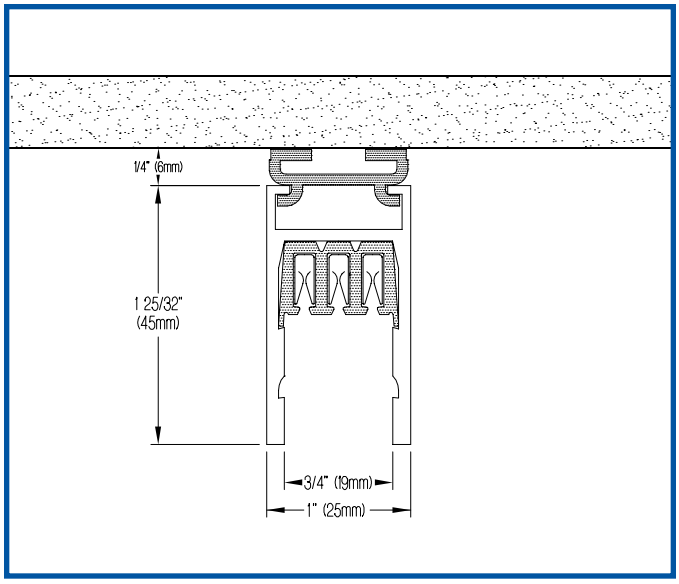
Extruded aluminum tracks, feeds and joints offer a number of benefits:

- elegant appearance, with hairline joints between components
- 6' spans between attachment points, rather than the usual 4'
- exceptional durability for heavy use and long life.

SightLine S is designed so that it completely contains the adapter of the fixture. This feature allows track fixtures to hang from simple ½" diameter stems free of unsightly screws, levers or knobs.

The SightLine S system consists of 15 components, including L, T and X joints and seven kinds of electrical feed. All outlet box feeds include a unique tool-free cover. Standard finish for SightLine S components is matte white; also available in black and Industrial Silver matte paint finishes *(see over)*.

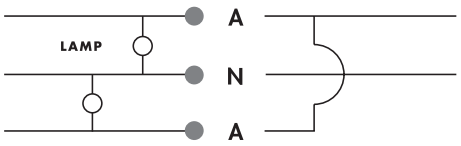




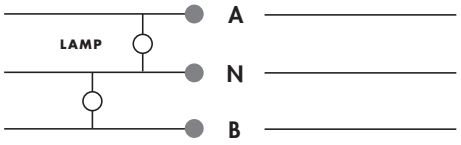
WIRING

SightLine can be wired in two ways.

Single Circuit limited to 120 volts, 20 amps, single phase.



Two-Circuit limited to 20 amps each, 120/240 volts, split single phase.



APPLICATIONS

System is recommended for museums, galleries, showrooms, retail stores, offices, schools or residences – wherever adjustable wallwash or accent lighting is required and especially where the lighting program is changed often.

SightLine S is designed to be mounted to ceilings and vertical surfaces and to support and power Edison Price Lighting track fixtures prepared for 20-amp, 120-volt service only.

System is 3-conductor, continuously grounded. It may be supplied by one or two individually switched, 120 volt, 20 amp branch circuits. Total capacity is 40 amps when supplied by a single phase, 120/240 volt, three-wire branch circuit. Prewired feeds use #12 stranded wire. Service wire brought directly to feed terminals must be #12 AWG solid wire.

All components are c UL us listed for indoor use only.

EDISON PRICE LIGHTING

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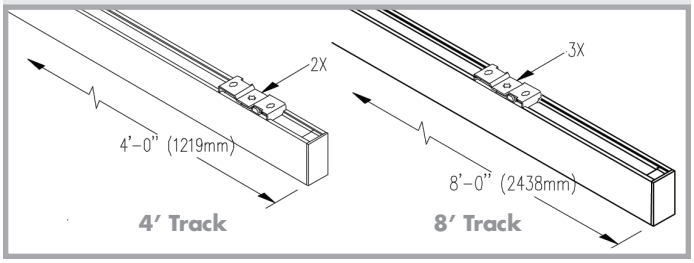
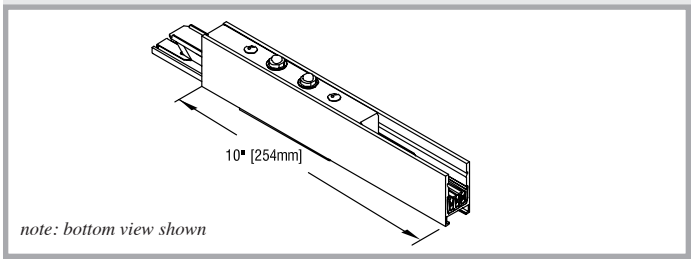
SIGHTLINE S

TRACK



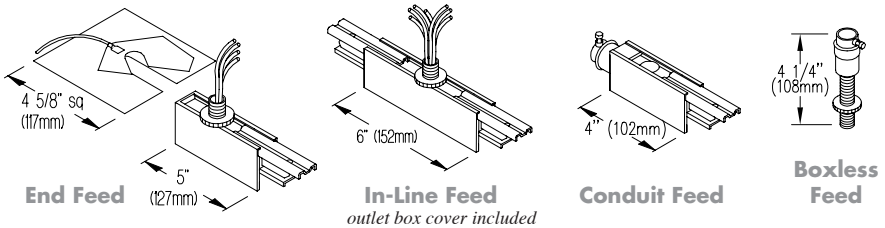
CURRENT LIMITERS

for use where required by local code

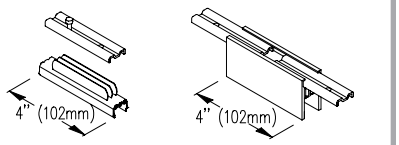


note: bottom view shown

FEEDS

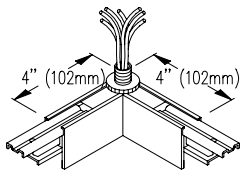


SPLICES



L-JOINT AND L-JOINT FEED

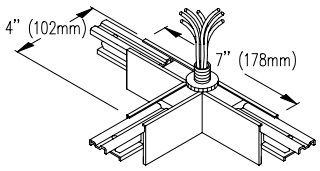
outlet box cover incl.



L-Joint is identical to L-Joint Feed (shown) but without wire leads

T-JOINT AND T-JOINT FEED

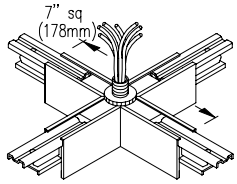
outlet box cover incl.



T-Joint is identical to T-Joint Feed (shown) but without wire leads

X-JOINT AND X-JOINT FEED

outlet box cover incl.



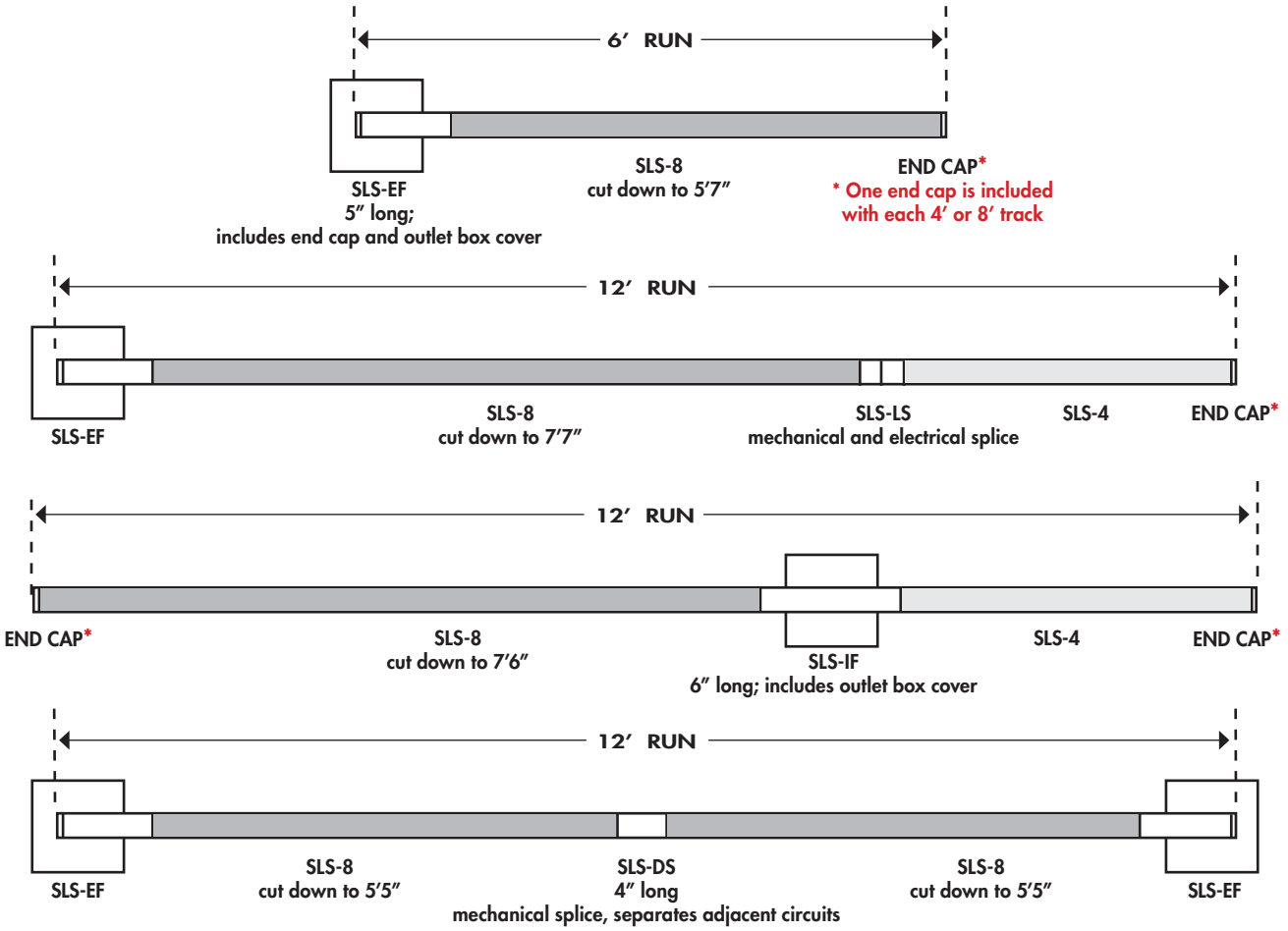
X-Joint is identical to X-Joint Feed (shown) but without wire leads

Component	Product Codes			Description
	White	Black	Silver	
4' Track	SLS/4	SLS/4B	SLS/4S	Individual 4'0" length of track with one end cap and two hangers.
8' Track*	SLS/8	SLS/8B	SLS/8S	Individual 8'0" length of track with one end cap and three hangers.
End Feed	SLS/EF	SLS/EFB	SLS/EFS	Prewired feed for electrical service from an outlet box at the end of a track. Includes outlet box cover.
In-Line Feed	SLS/IF	SLS/IFB	SLS/IFS	Prewired feed for electrical service between tracks, from an outlet box above. Includes outlet box cover.
Conduit Feed	SLS/CF	SLS/CFB	SLS/CFS	Feed for electrical service directly into end of track. Includes adapter for ⅜" conduit or BX.
Boxless Feed	SLS/BLF	SLS/BLFB	SLS/BLFS	Feed for electrical service directly through ceiling without an outlet box. For use with End Feed, In-Line Feed, L-Joint, T-Joint or X-Joint.
Live Splice	SLS/LS	SLS/LS	SLS/LS	Components for joining two tracks and connecting their electrical conductors. Fits within track.
Dead Splice	SLS/DS	SLS/DSB	SLS/DSS	Component for joining two tracks without connecting their electrical conductors. Adds 4" to length of track.
L-Joint	SLS/LJ	SLS/LJB	SLS/LJS	90° joint prewired to connect circuits of adjacent tracks. Includes loose wire leads and an outlet box cover which allow conversion to an electrical feed.
L-Joint Feed	SLS/LJF	SLS/LJFB	SLS/LJFS	90° joint prewired to connect circuits of adjacent tracks and provide electrical service. Incl. outlet box cover.
T-Joint	SLS/TJ	SLS/TJB	SLS/TJS	T-joint prewired to connect circuits of adjacent tracks. Includes loose wire leads and an outlet box cover which allow conversion to an electrical feed.
T-Joint Feed	SLS/TJF	SLS/TJFB	SLS/TJFS	T-joint prewired to connect circuits of adjacent tracks and provide electrical service. Incl. outlet box cover.
X-Joint	SLS/XJ	SLS/XJB	SLS/XJS	X-joint prewired to connect circuits of adjacent tracks. Includes loose wire leads and an outlet box cover which allow conversion to an electrical feed.
X-Joint Feed	SLS/XJF	SLS/XJFB	SLS/XJFS	X-joint prewired to connect circuits of adjacent tracks and provide electrical service. Incl. outlet box cover.
5A Limiter	SLS/LIM5	SLS/LIM5B	SLS/LIM5S	5-amp capacity current limiter with one reset button for each circuit. California Energy Commission approved.
10A Limiter	SLS/LIM10	SLS/LIM10B	SLS/LIM10S	10-amp capacity current limiter with one reset button for each circuit. California Energy Commission approved.

** Note: • 12' lengths of track are available on special order; contact factory.*
• For wall-mounted installations specify "double hangers" and mount hangers at 24" intervals.

SIGHTLINE S

layout examples

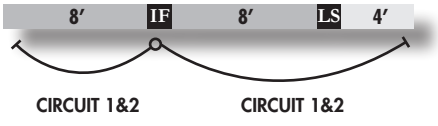


more examples

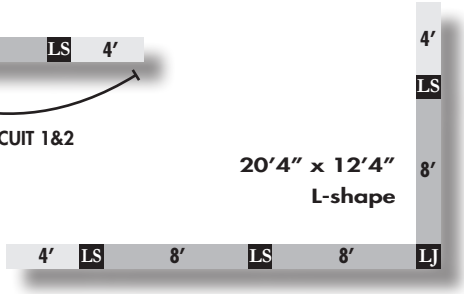
REMEMBER: You can cut Sightline S to the lengths you need for your project.

20′5″ RUN

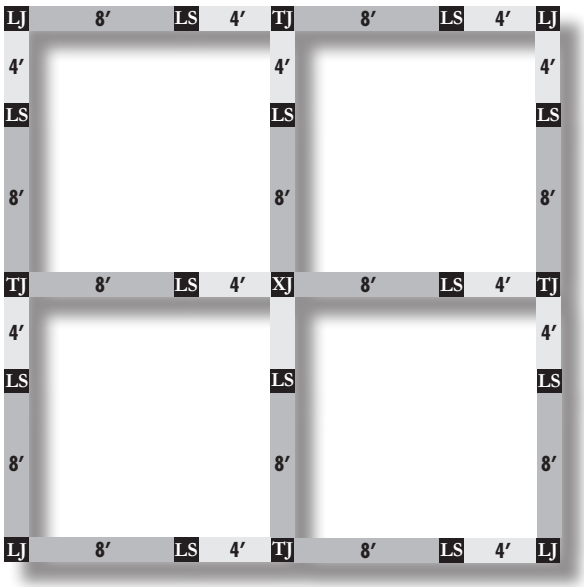
20′6″ RUN



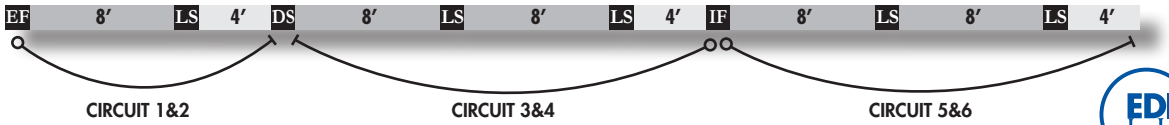
20′4″ x 12′4″ L-shape



25′3″ x 25′3″ GRID



53′3″ RUN



EDISON PRICE LIGHTING

SIGHTLINE® S

surface track system

Spec Sheet

TD

TRACK SYSTEMS
10-100

FEATURES

SightLine S is a surface mounted track system suitable for wiring with one or two 20 amp circuits. Tracks can be cut to length in the field. Tracks are mounted to ceilings or walls by means of heavy-duty hanger assemblies which separate the track only ¼" from the mounting surface.

Extruded aluminum tracks, feeds and joints offer a number of benefits:

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- 6' spans between attachment points, rather than the usual 4'
- exceptional durability for heavy use and long life.

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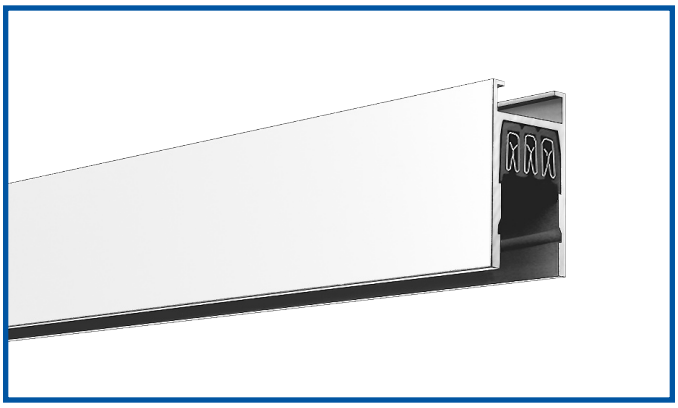
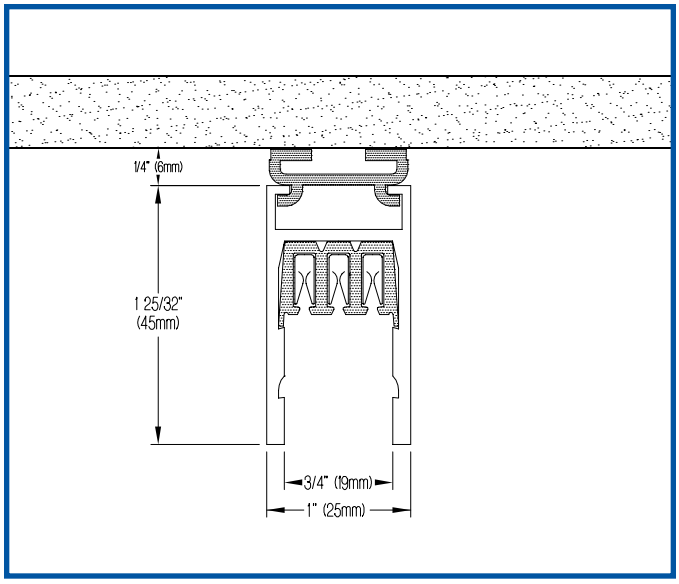
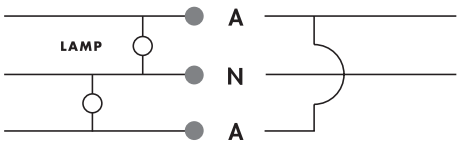




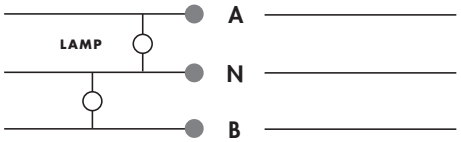
WIRING

SightLine can be wired in two ways.

Single Circuit limited to 120 volts, 20 amps, single phase.



Two-Circuit limited to 20 amps each, 120/240 volts, split single phase.



APPLICATIONS

System is recommended for museums, galleries, showrooms, retail stores, offices, schools or residences – wherever adjustable wallwash or accent lighting is required and especially where the lighting program is changed often.

SightLine S is designed to be mounted to ceilings and vertical surfaces and to support and power Edison Price Lighting track fixtures prepared for 20-amp, 120-volt service only.

System is 3-conductor, continuously grounded. It may be supplied by one or two individually switched, 120 volt, 20 amp branch circuits. Total capacity is 40 amps when supplied by a single phase, 120/240 volt, three-wire branch circuit. Prewired feeds use #12 stranded wire. Service wire brought directly to feed terminals must be #12 AWG solid wire.

All components are c UL us listed for indoor use only.

EDISON PRICE LIGHTING

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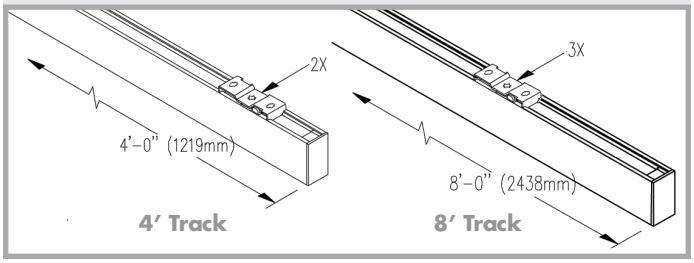
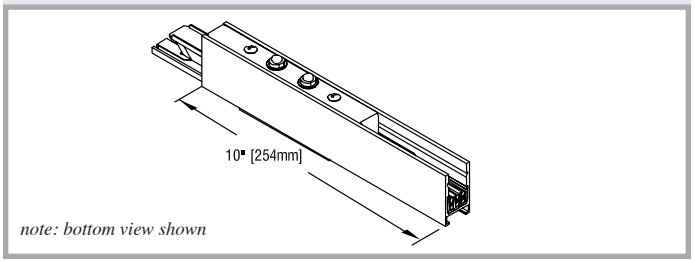
SIGHTLINE S

TRACK



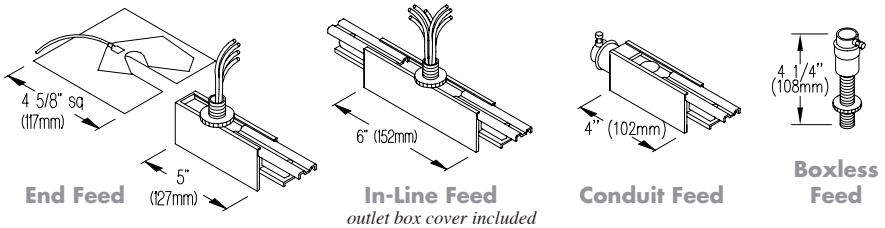
CURRENT LIMITERS

for use where required by local code

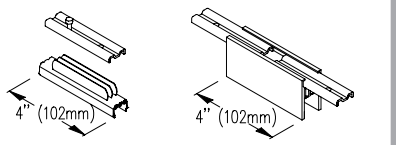


note: bottom view shown

FEEDS

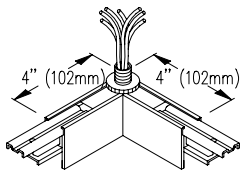


SPLICES



L-JOINT AND L-JOINT FEED

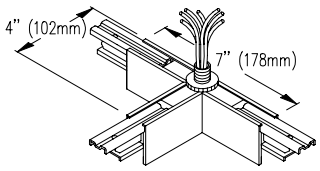
outlet box cover incl.



L-Joint is identical to L-Joint Feed (shown) but without wire leads

T-JOINT AND T-JOINT FEED

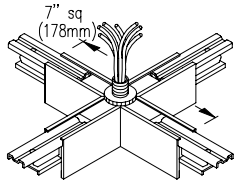
outlet box cover incl.



T-Joint is identical to T-Joint Feed (shown) but without wire leads

X-JOINT AND X-JOINT FEED

outlet box cover incl.



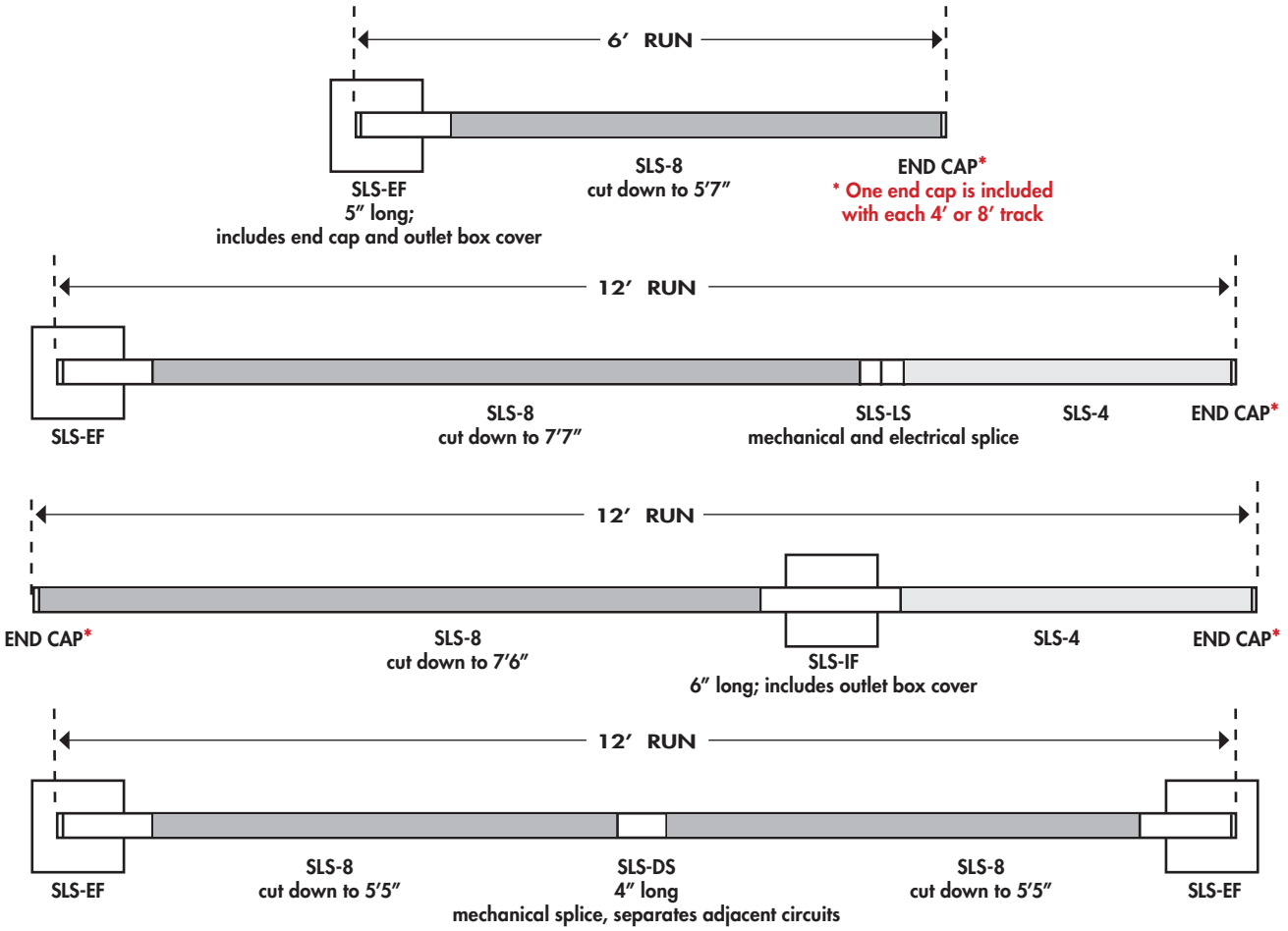
X-Joint is identical to X-Joint Feed (shown) but without wire leads

Component	Product Codes			Description
	White	Black	Silver	
4' Track	SLS/4	SLS/4B	SLS/4S	Individual 4'0" length of track with one end cap and two hangers.
8' Track*	SLS/8	SLS/8B	SLS/8S	Individual 8'0" length of track with one end cap and three hangers.
End Feed	SLS/EF	SLS/EFB	SLS/EFS	Prewired feed for electrical service from an outlet box at the end of a track. Includes outlet box cover.
In-Line Feed	SLS/IF	SLS/IFB	SLS/IFS	Prewired feed for electrical service between tracks, from an outlet box above. Includes outlet box cover.
Conduit Feed	SLS/CF	SLS/CFB	SLS/CFS	Feed for electrical service directly into end of track. Includes adapter for ⅜" conduit or BX.
Boxless Feed	SLS/BLF	SLS/BLFB	SLS/BLFS	Feed for electrical service directly through ceiling without an outlet box. For use with End Feed, In-Line Feed, L-Joint, T-Joint or X-Joint.
Live Splice	SLS/LS	SLS/LS	SLS/LS	Components for joining two tracks and connecting their electrical conductors. Fits within track.
Dead Splice	SLS/DS	SLS/DSB	SLS/DSS	Component for joining two tracks without connecting their electrical conductors. Adds 4" to length of track.
L-Joint	SLS/LJ	SLS/LJB	SLS/LJS	90° joint prewired to connect circuits of adjacent tracks. Includes loose wire leads and an outlet box cover which allow conversion to an electrical feed.
L-Joint Feed	SLS/LJF	SLS/LJFB	SLS/LJFS	90° joint prewired to connect circuits of adjacent tracks and provide electrical service. Incl. outlet box cover.
T-Joint	SLS/TJ	SLS/TJB	SLS/TJS	T-joint prewired to connect circuits of adjacent tracks. Includes loose wire leads and an outlet box cover which allow conversion to an electrical feed.
T-Joint Feed	SLS/TJF	SLS/TJFB	SLS/TJFS	T-joint prewired to connect circuits of adjacent tracks and provide electrical service. Incl. outlet box cover.
X-Joint	SLS/XJ	SLS/XJB	SLS/XJS	X-joint prewired to connect circuits of adjacent tracks. Includes loose wire leads and an outlet box cover which allow conversion to an electrical feed.
X-Joint Feed	SLS/XJF	SLS/XJFB	SLS/XJFS	X-joint prewired to connect circuits of adjacent tracks and provide electrical service. Incl. outlet box cover.
5A Limiter	SLS/LIM5	SLS/LIM5B	SLS/LIM5S	5-amp capacity current limiter with one reset button for each circuit. California Energy Commission approved.
10A Limiter	SLS/LIM10	SLS/LIM10B	SLS/LIM10S	10-amp capacity current limiter with one reset button for each circuit. California Energy Commission approved.

** Note: • 12' lengths of track are available on special order; contact factory.*
• For wall-mounted installations specify "double hangers" and mount hangers at 24" intervals.

SIGHTLINE S

layout examples

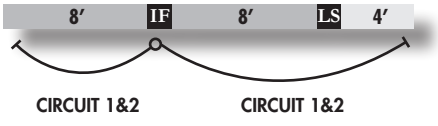


more examples

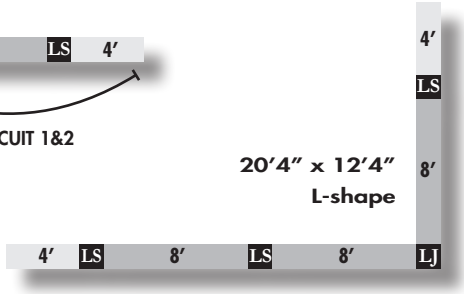
REMEMBER: You can cut Sightline S to the lengths you need for your project.

20′5″ RUN

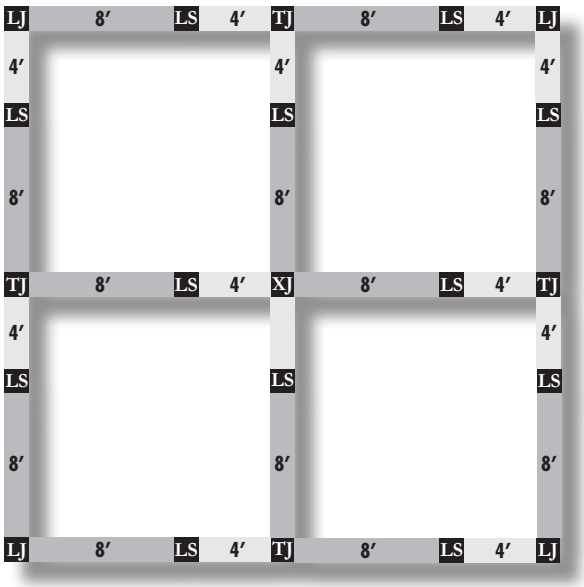
20′6″ RUN



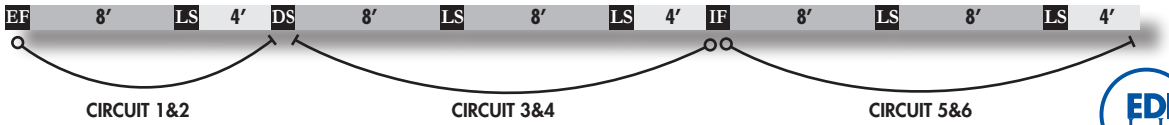
20′4″ x 12′4″ L-shape



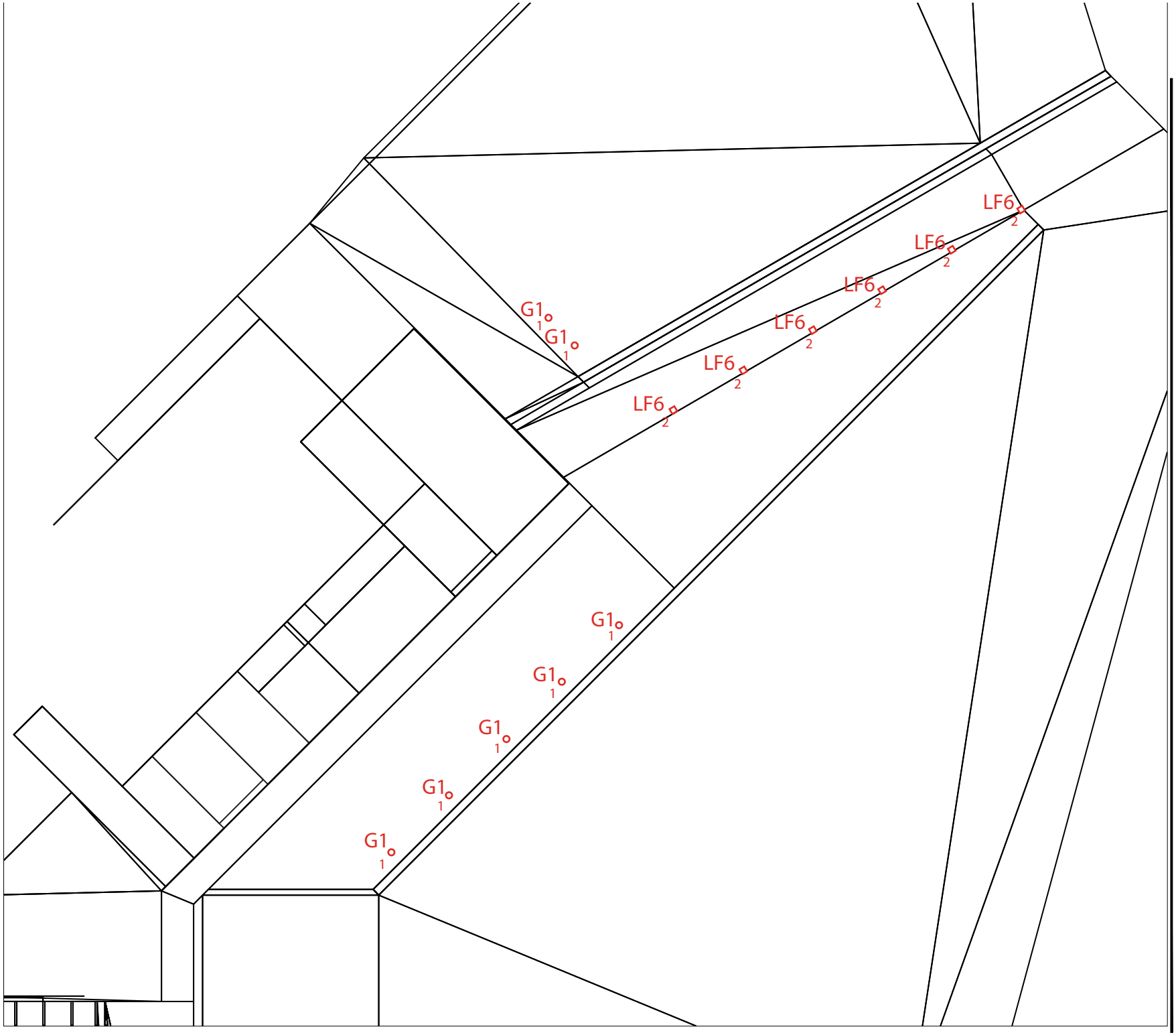
25′3″ x 25′3″ GRID



53′3″ RUN



EDISON PRICE LIGHTING



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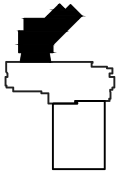
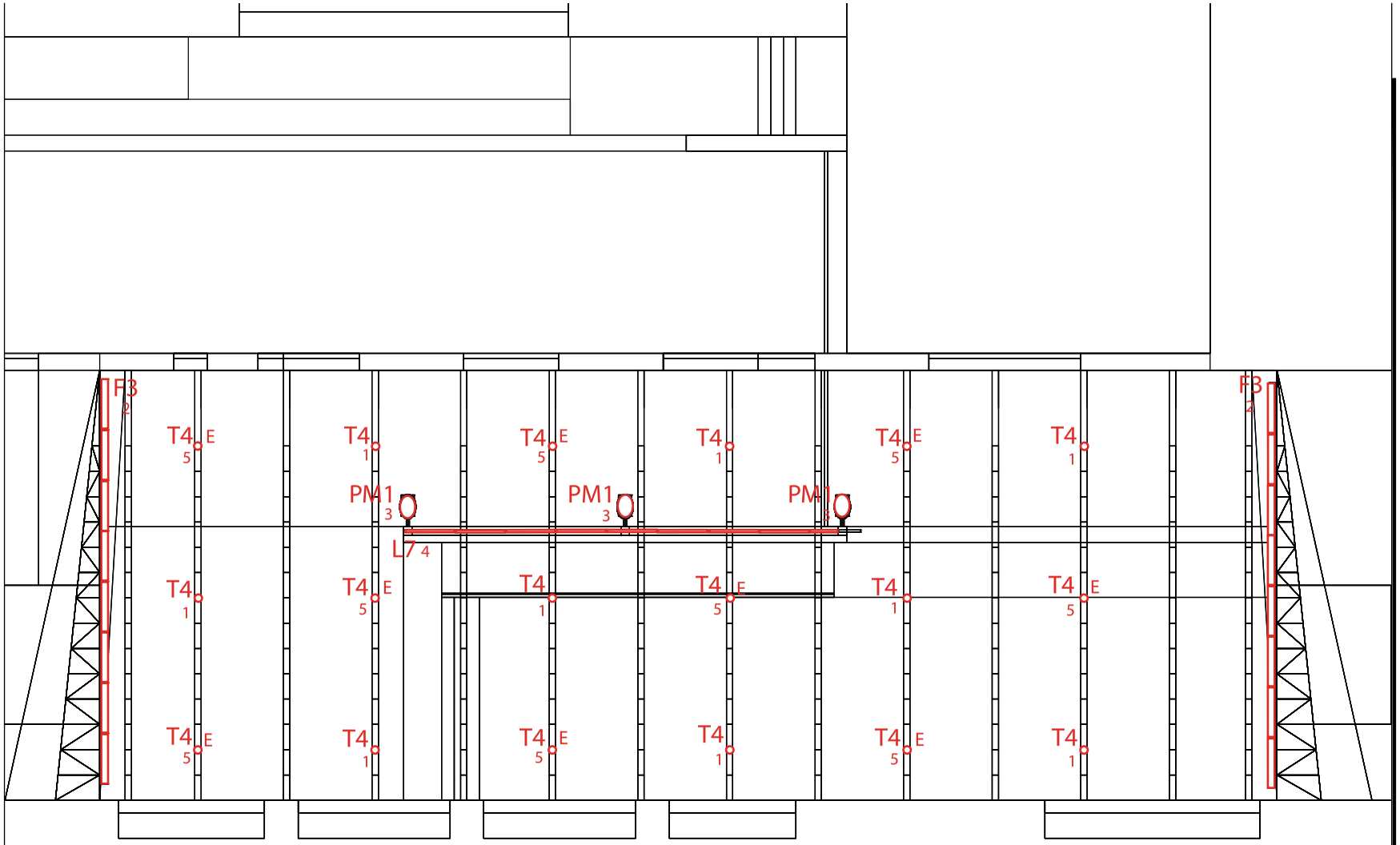


REVISION	DATE

Date: April 8, 2014

Lgt Plan - Grounds
PLAN

E1.1



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REVISION DATE

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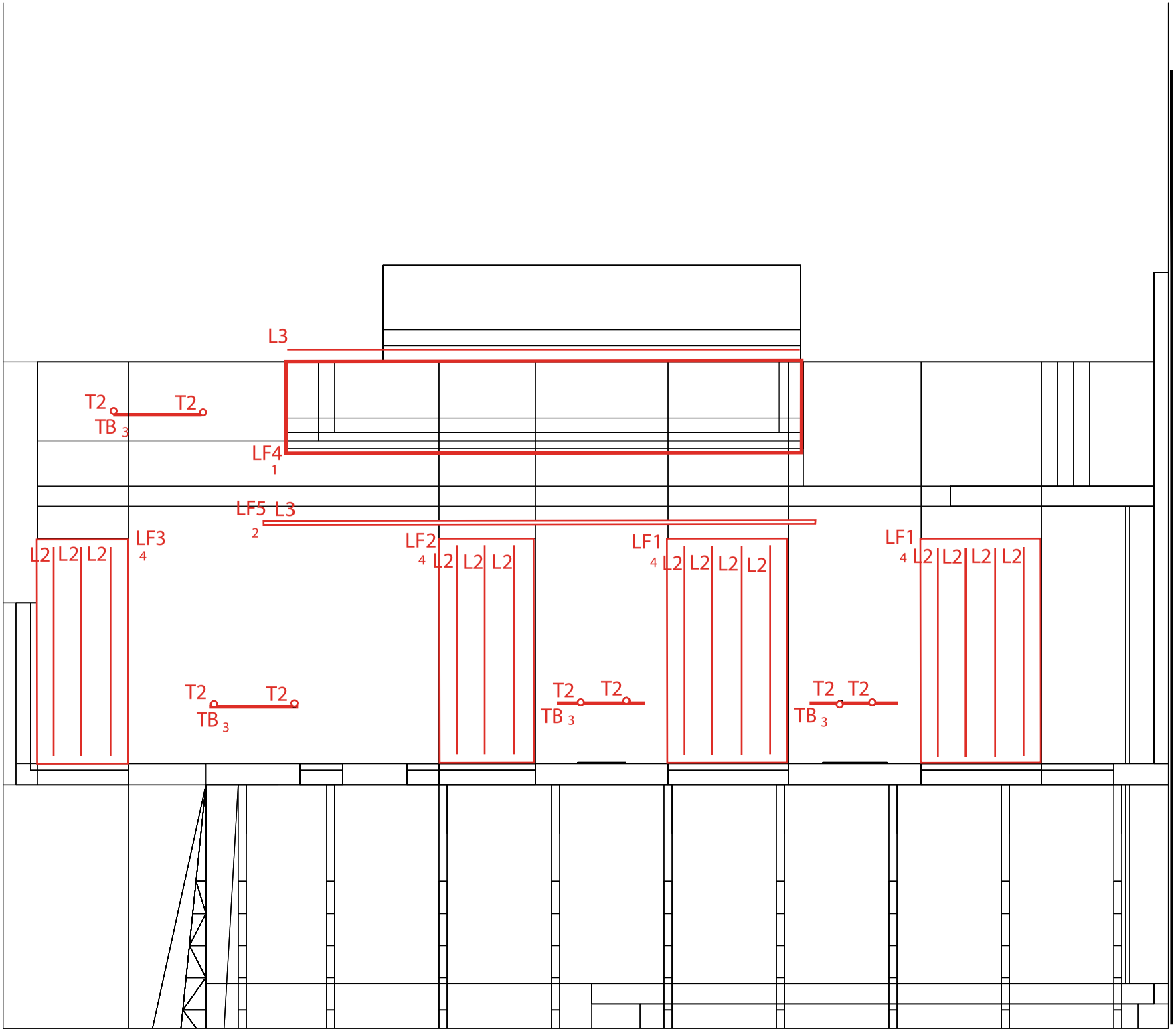
Lgt Plan - Solarium
PLAN

E1.2



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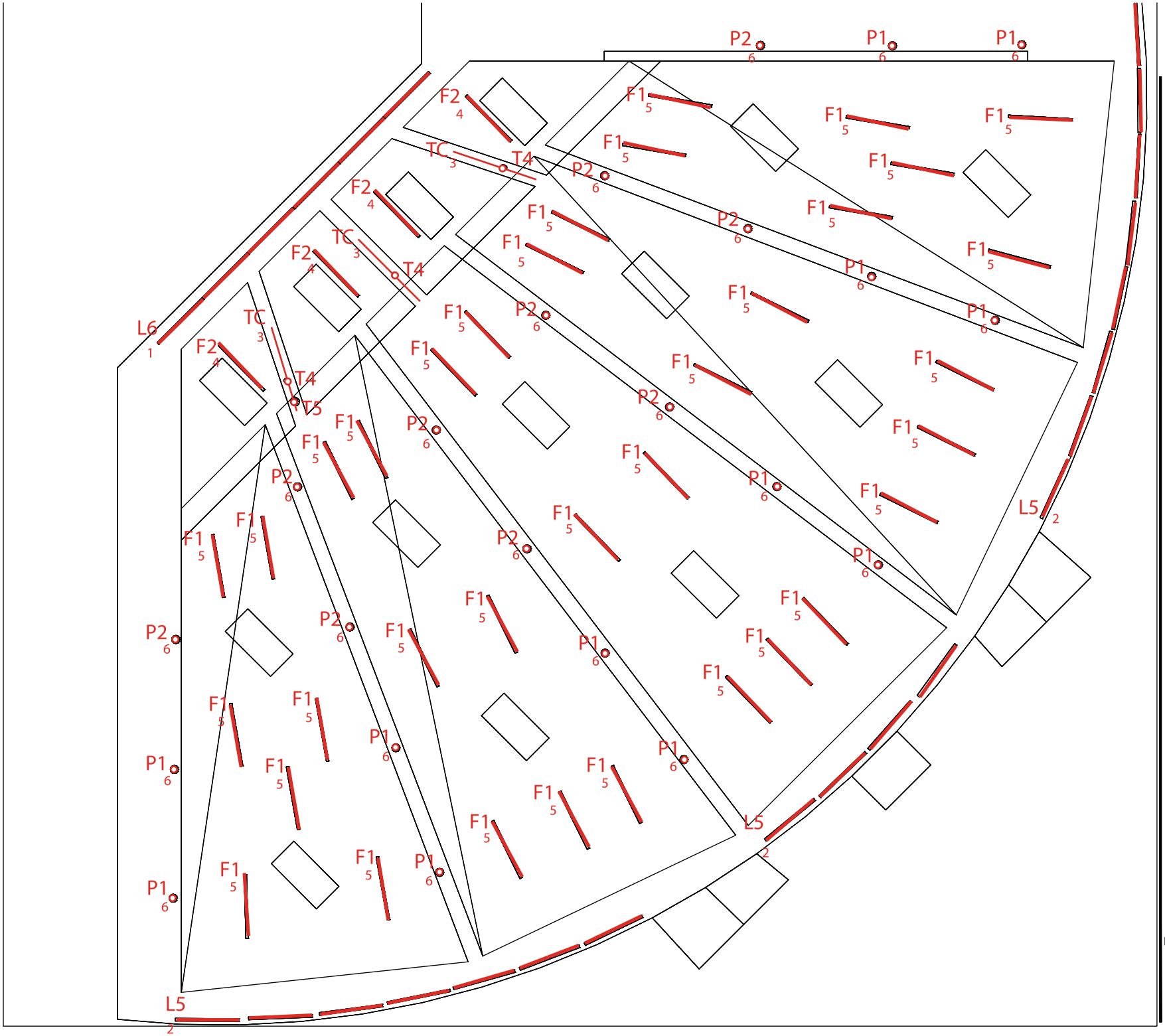
Lgt Plan - Cafe
PLAN

E1.3



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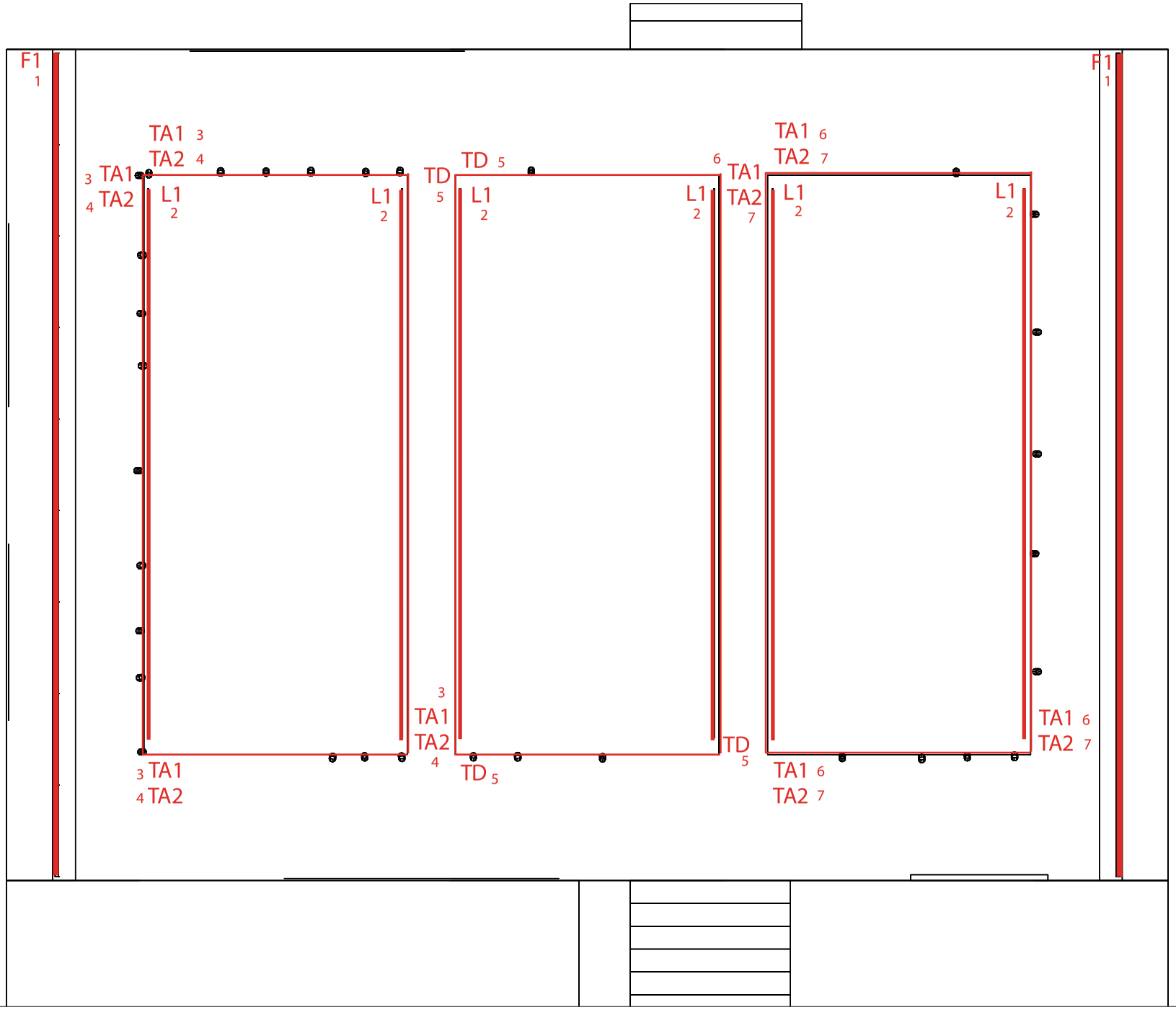
Lgt Plan - Auditorium
PLAN

E2.1



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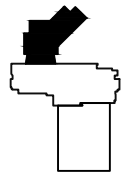

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Date: April 8, 2014

Lgt Plan - Gallery
PLAN

E2.2