

CHRISTOPHER NEWPORT UNIVERSITY

Paul & Rosemary Tribble Library



Madeline Hess

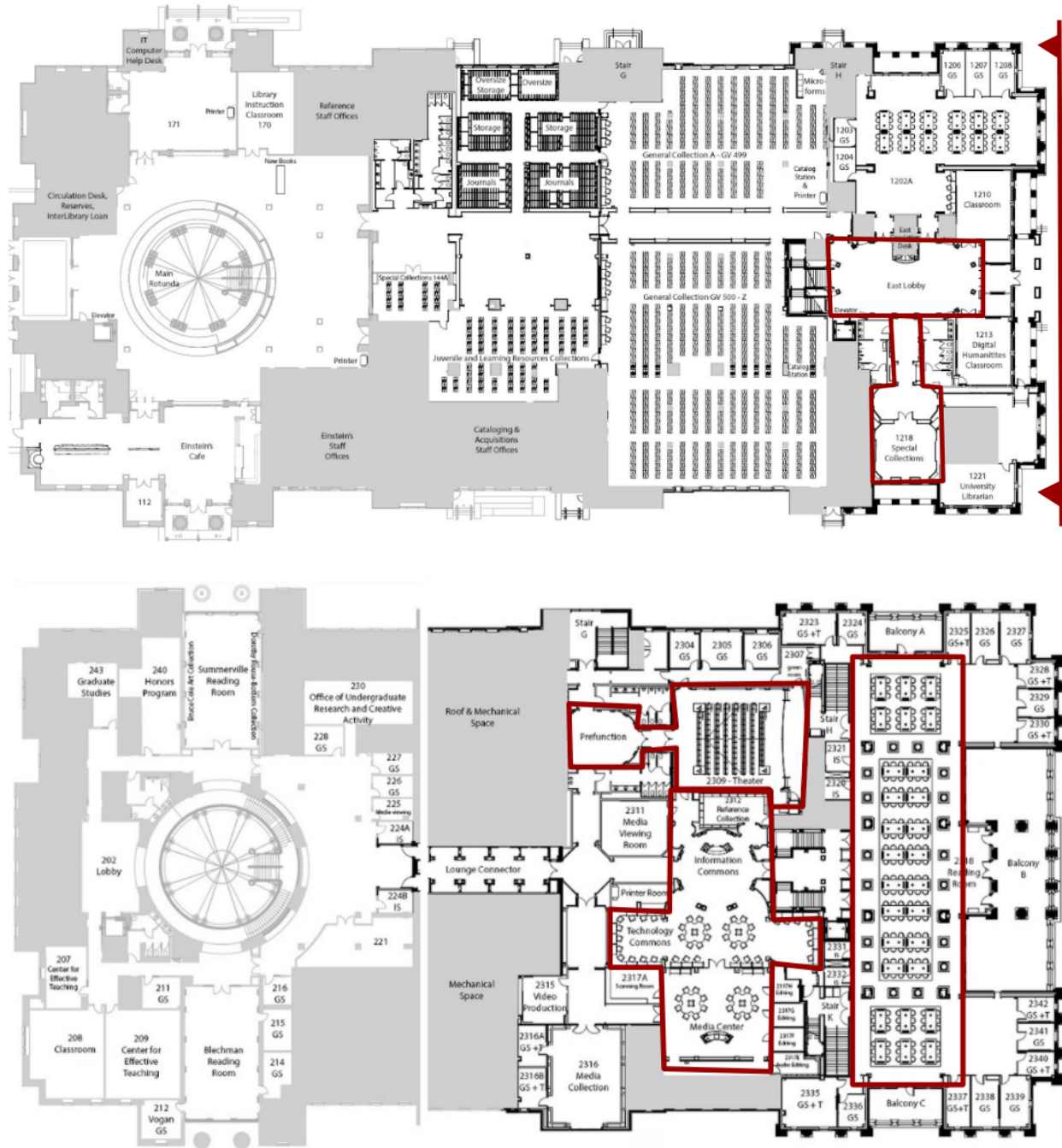
04.05.2021

Final Report

LIGHTING DEPTH | ELECTRICAL DEPTH | MAE DEPTH | ACOUSTIC BREADTH | STRUCTURAL BREADTH

NOTE: All images used in this report courtesy of Lam Partners, Christopher Newport University, and Glave and Holmes Architecture.

SPACES OF STUDY



CONTENTS

INTRODUCTION

Executive Summary	3
Building Statistics	4
Project Goals	5

LIGHTING DEPTH

Concept Development	6
Reading Guide	7
Redesign of Six Spaces	8

ELECTRICAL DEPTH

Existing Controls Analysis	37
Control Redesign	44

MAE COMPUTER OPTIMIZATION & DAYLIGHTING DEPTH

Introduction	57
Model Construction	58
Optimization	59

ACOUSTIC BREADTH

Study of 100-Person Theater	63
-----------------------------	----

STRUCTURAL BREADTH

Redesign of Commons Roof	70
--------------------------	----

CONCLUSION

Closing Remarks	77
ABET Accreditation	78
Acknowledgements	80

INTRODUCTION

Executive Summary

The Paul & Rosemary Tribble Library at Christopher Newport University in Newport News, VA, has served as a focal point of the school's campus since 1966. Successive additions and renovations have kept the building relevant and useful for students, the most recent of which was, up to the point of this project, in 2008. 2016 saw the completion of the 63,000 square foot Phase II renovation, which increased the Library's seating capacity from 200 to 1,000, and included an expanded media center, a café, a lecture hall, and a new two-story reading room, among other improvements. The content of this project focuses on this most recent renovation, which has helped the Library transition into a modern, student-oriented hub.

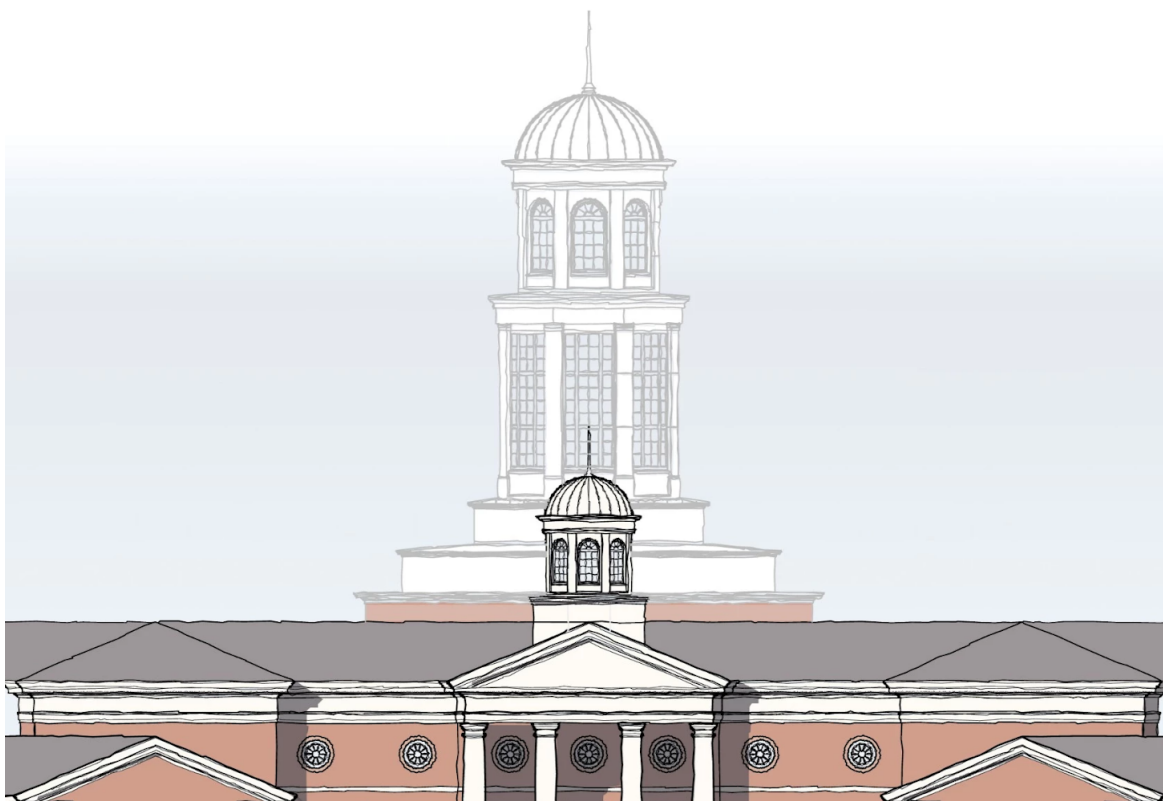
The following report is a compilation of a year's study into the library's architectural systems, both aesthetic and functional. Included are the analyses listed below.

- Conceptual and schematic lighting designs for selected spaces of importance, conforming to design criteria set forward by IES
- Introduction of daylight to a large, windowless interior space, including analysis of daylight autonomy metrics
- Integration of new skylights with an altered structural roof system
- Qualitative and quantitative acoustical analysis of a theater space, and proposed noise mitigation techniques
- Analysis and redesign of controls systems present in key spaces to respond to daylight and provide dynamic lighting options

As a whole, the proposed design modifications to Tribble Library aim to best serve the building's goals of providing a beautiful, pleasant environment which promotes student connection and curiosity, while also promoting modern and energy-efficient design solutions.

Building Statistics

<u>Building name</u>	Paul & Rosemary Tribble Library
<u>Location and site</u>	Newport News, VA
<u>Building Occupant Name</u>	Christopher Newport University
<u>Occupancy / function types</u>	Use types per VUSBC A3 - Assembly (Library), B - Business (Office), S1 - Moderate-Hazard Storage
<u>Size (total square feet)</u>	156,407 SF
<u>Stories above grade / total levels</u>	4 stories above grade (L4 is an attic)
<u>Dates of construction</u>	1966 (original completion), 1978 (addition), 1993 (addition), 2008 (major addition/renovation) 2014-2016 (Phase II renovation)



Project Goals

Despite the many disparate analyses that comprise this year-long study, a unified goal is present as an undercurrent of the project. The best definition of what this building is appears on the Library's website as a mission statement:

“ The Tribble Library is the intellectual center of Christopher Newport University. We help students develop research skills and support the **scholarly and personal growth** essential to the study of the liberal arts and sciences. We combine the best of a **traditional library with modern technology** to create an interactive learning experience for the 21st century. ”

This marked the project's goal very clearly: encourage the minds of students - their curiosity, their determination, and their love of learning - by synthesizing the past and present. The architectural design of the building lent itself to this, as the neoclassical and colonial elements are already modern echoes of past design languages. But this idea goes beyond the purely aesthetic. In analyzing and designing each system I had chosen to investigate, I focused on the inclusion of distinctly modern elements. This extends from daylighting-based and networked lighting controls to the implementation of an integrated lighting and acoustic system.

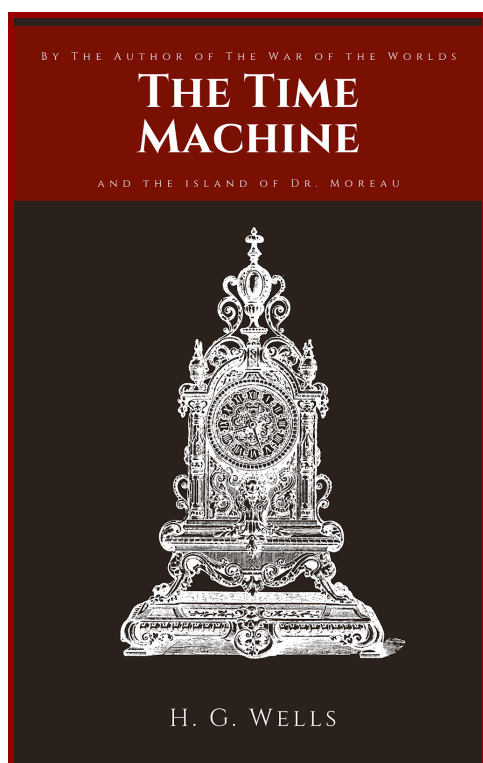
Through the creation of spaces which are visually steeped in the past but decidedly modern in function, a contrast appears which emphasizes the positive aspects of both disparate elements. Not only will students be able to inhabit a comfortable, beautiful series of spaces, but they will also be encouraged to engage with the mission statement the University itself put forth for them.

LIGHTING DEPTH

CONCEPT DEVELOPMENT

Books and knowledge as a whole serve as a form of time travel. They are ideas which are encapsulated and sent into the future for us to find. The neoclassical elements woven into the design of the library provide this same time capsule feeling - so what better place to start for this library's design than a book? And, by extension, what better book than H.G. Wells' *The Time Machine*, the story of a man so bent on exploration and discovery that he throws himself into an entirely different world.

The choice to take inspiration from this book wasn't arbitrary; H.G. Wells was not only an author, but a futurist. He wrote many pieces on how man could improve himself, and on predictions concerning technology and human rights. The redesign of the Library's lighting is unified by Wells' futurism, which has been distilled into some of his most important points and applied as design concepts in each space.



These concepts include:

UTOPIA

NETWORK

GENETICS

EXPLORATION

NATURE

INCLUSION

READING ROOM

100-PERSON THEATER

SPECIAL COLLECTIONS

LOBBY

MEDIA COMMONS

EAST FACADE

This translates into a concerted effort to emphasize the Library's neoclassical elements through the contrast of distinctly simplistic, modern lighting design.

READING GUIDE

*As there are many moving parts to the communication of the lighting depth, this guide aims to provide clarity and an idea of what to expect while reading. For each of the six spaces, with the exception of the slightly less-comprehensive facade redesign, there are **six** main pages of content.*

- PAGE 1** - Overview of the space, qualitative / quantitative criteria, key plan
- PAGE 2** - Concept development, precedent images, and / or concept illustrations
- PAGE 3** - Pseudocolor and proof of met quantitative requirements
- PAGE 4** - 3D lighting plan with main fixture types highlighted¹
- PAGE 5+** - Rendered and additional view(s) of final design²

*Note 1: In an effort to keep this report streamlined and accessible, full fixture schedules and tagged plans have been excluded from the main written portion. For a complete master lighting fixture schedule and tagged lighting plans, please refer to **Appendix I**.*

*Note 2: As the facade lighting is not in need of a major redesign, only a rudimentary final rendering will be shown. For rendering base / component image citations, please refer to **Appendix IV**.*

Reading Room

Description

The double-height reading room serves as the focal point of the library both physically and thematically. Students gather here to study, read for leisure, and share ideas.

This space will be the heart of the redesign's concept, the most blatant meeting of past and future.

Qualitative Criteria

Daylight

Respond to and make use of the large amounts of available daylight

Ornament

Call attention to the major decorative elements, including the composite columns and cupola

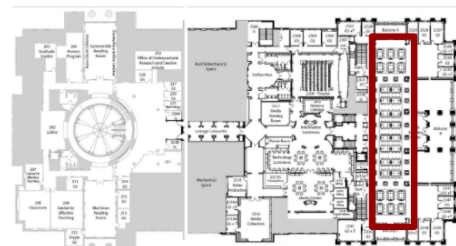
Task

Maintain a sense of individual focus at each student workstation, while creating a cohesive whole

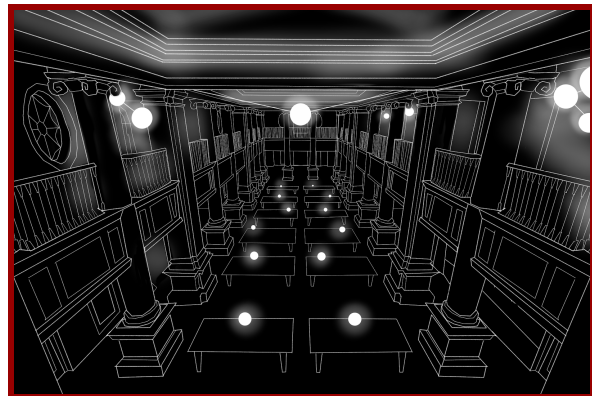
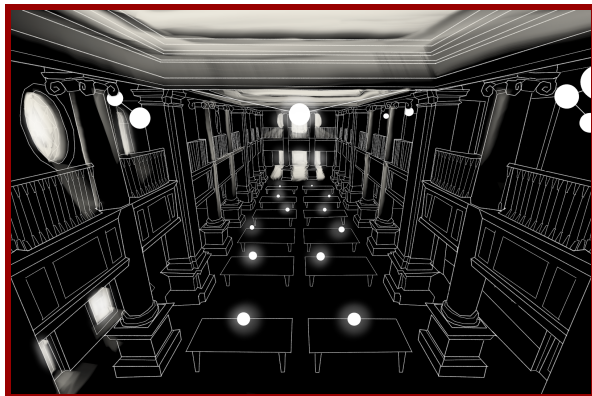
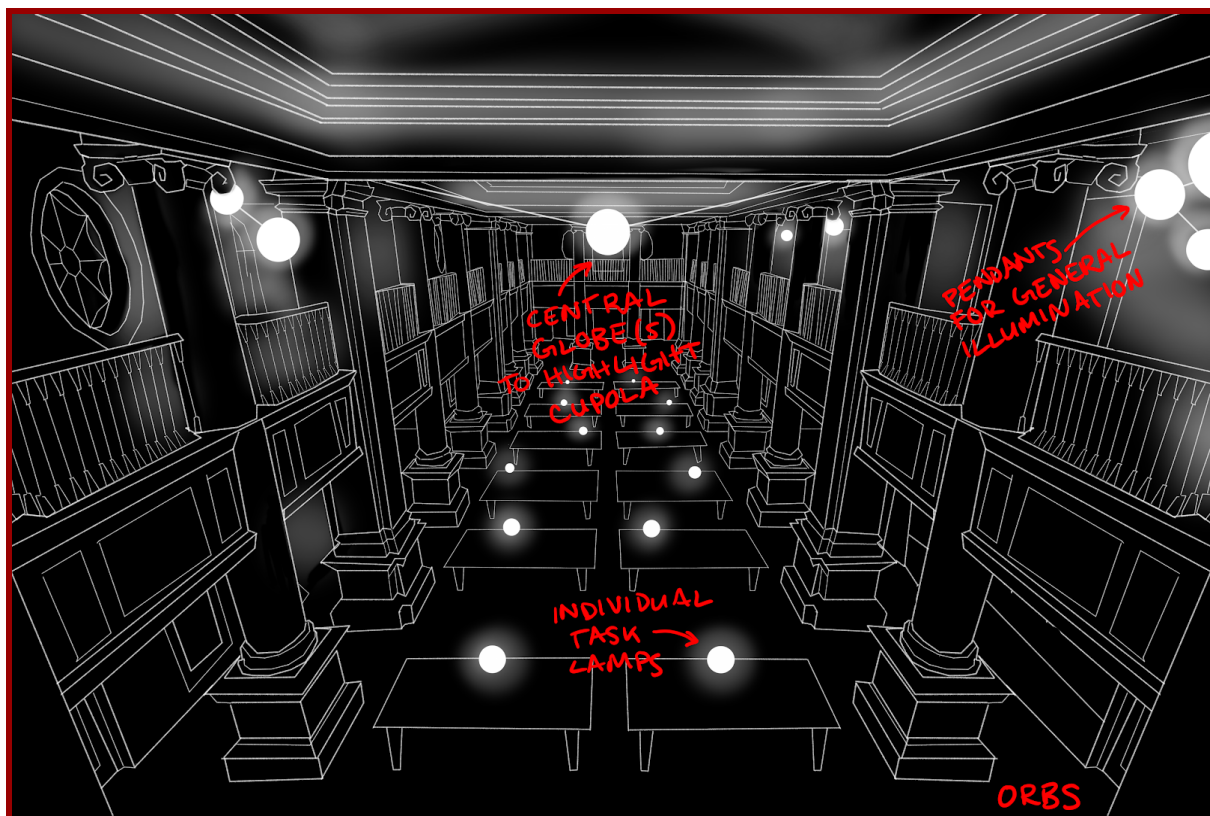
Quantitative Criteria

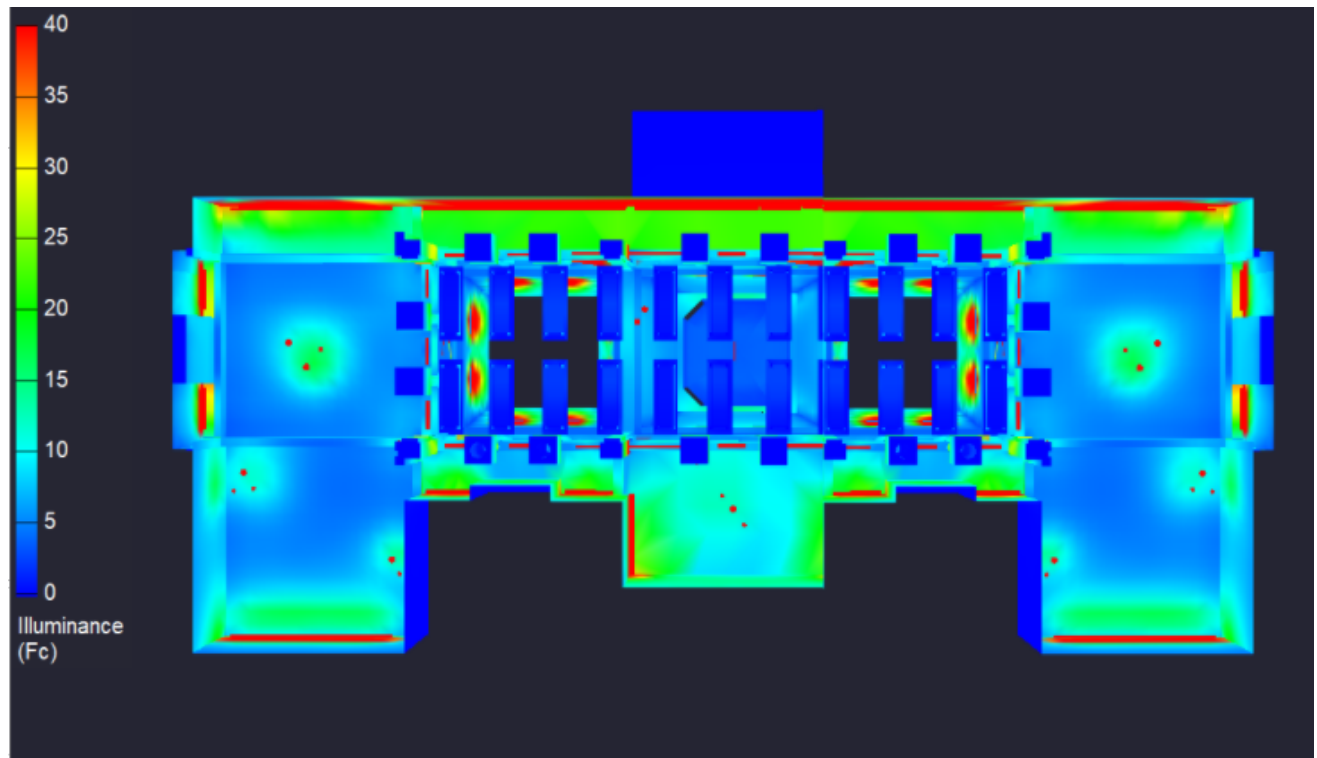
IES recommendations (lux)	Plane	E_h	E_v	Uniformity
Grand reading room	2'6" AFF	200	75	2:1
Tables & chairs	2'6" AFF	200	100	2:1

Power allowance (ASHRAE 90.1, 2013)	LPD
Library (Reading Room)	1.06



All the futurist writings and musings of H.G. Wells come together in his idea of Utopia, a perfect society of enlightenment, beauty, and freedom from pain. This appears not only in *The Time Machine*, but also in a number of his other works. And it's not just Wells who strives for this idea of Utopia. Whether writers and musicians and architects know it or not, they're all working toward their idea of Utopia, this better world, by putting their best work into our current one. This concept was meant to apply the simplistic round forms often employed to represent a society from which all the rough edges have been smoothed away, highlighting the detailed neoclassicism by contrast to simplicity.



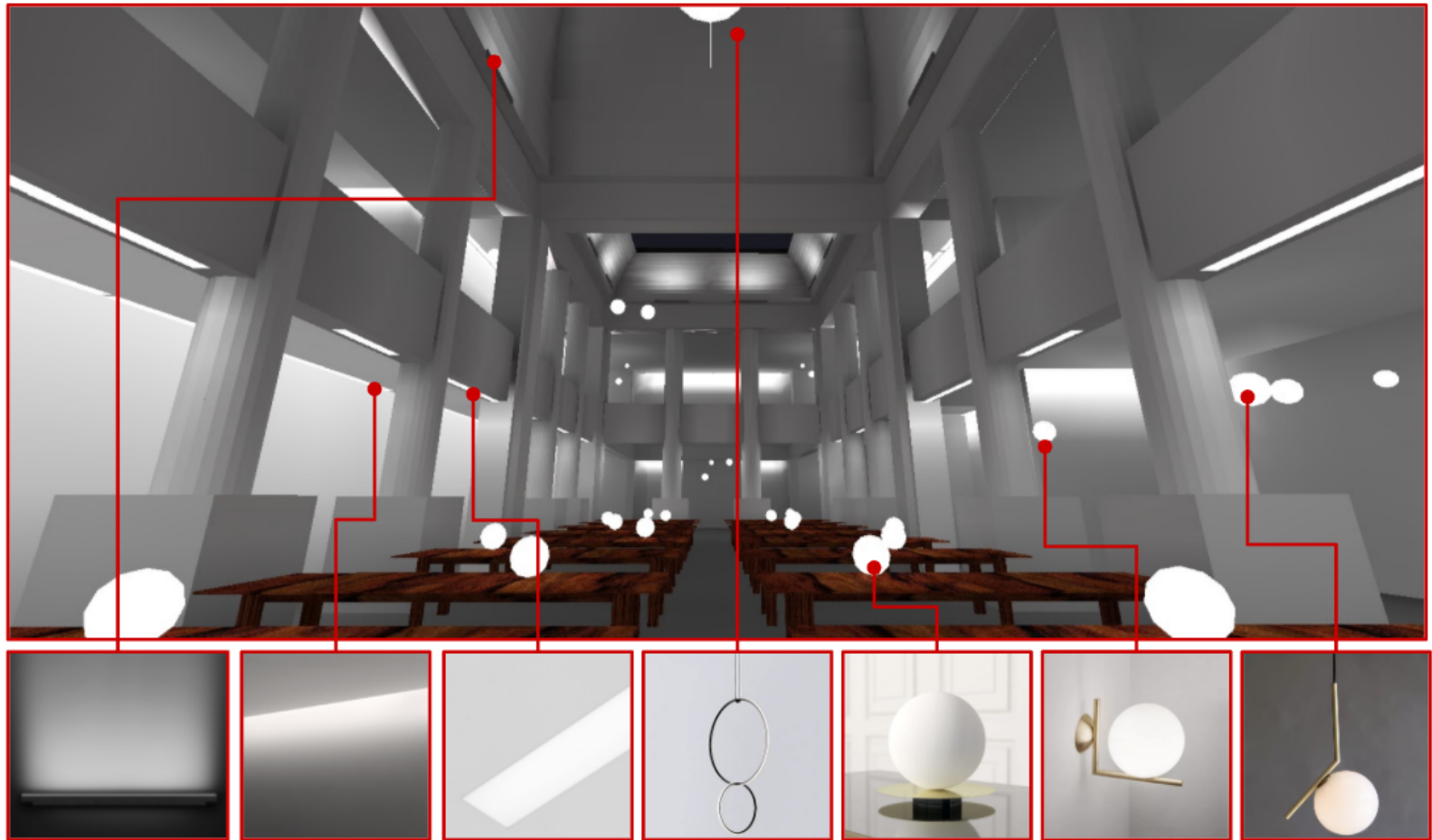


Lighting criteria	IES level	Design level	IES Uniformity	Design Uniformity
Grand reading room / tables - F1	200	234	2:1	2.02:1
Grand reading room / tables - F2	200	161	2:1	1.91:1

Power allowance	ASHRAE LPD	Design LPD
Library (Reading Room)	1.06	0.288

Please note that, due to the complex nature of the roof of the Reading Room, this pseudocolor was taken from beneath the structure.

Due to the complex nature of the space, a perspective view is shown, rather than a flat plan.



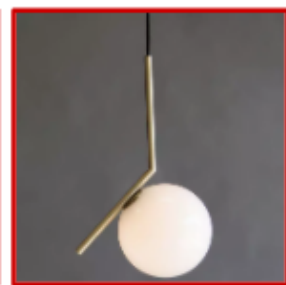
Multi-part chandelier



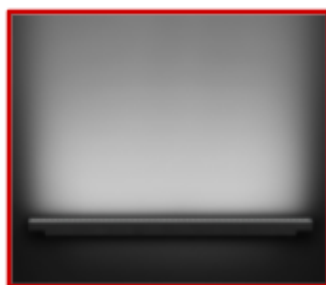
12" globe table lamp



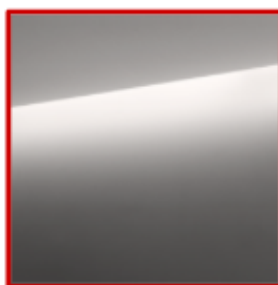
12" globe wall sconce



12" globe brass pendant



30x60 linear wall graze



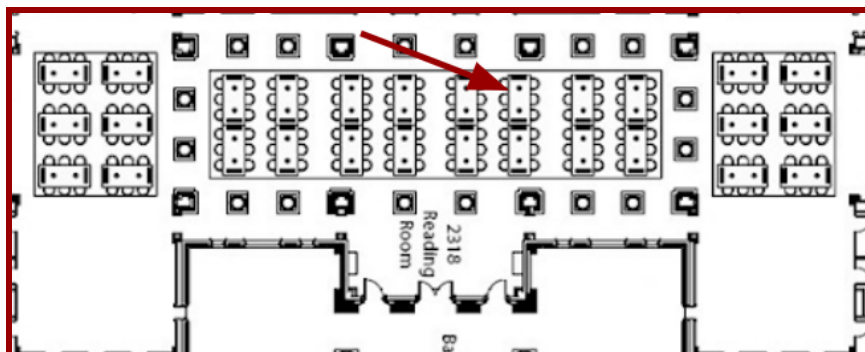
Low-profile wall wash



6" recessed linear

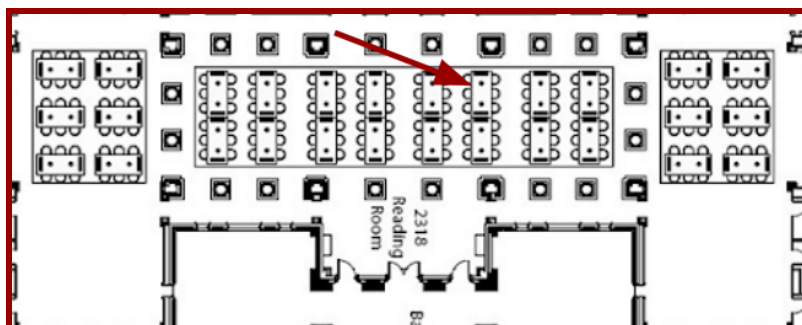


This image shows the Reading Room in daylight. In reality, most lights would be dimmed or off in this scenario. Outputs are exaggerated to show effect.





This image shows the Reading Room in the evening or at night. Note that the table lamps have been switched on. The wings and upper level are more subdued study areas, while the center is more brightly lit.



100-Person Theater

Description

This small theater is available to be used for lectures and visiting guest speakers.

Subtle but modern lighting should be used to highlight, rather than mimic, the classical elements present in the theater, while helping provide a psychological impression of spaciousness.

Qualitative Criteria

Spaciousness

Create a feeling of spaciousness should be created in this otherwise crowded space

Controls

Provide responsive, adaptive controls which offer a greater degree of versatility to a small space

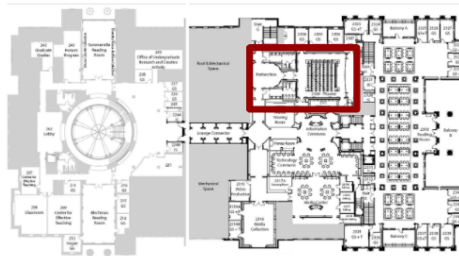
Era

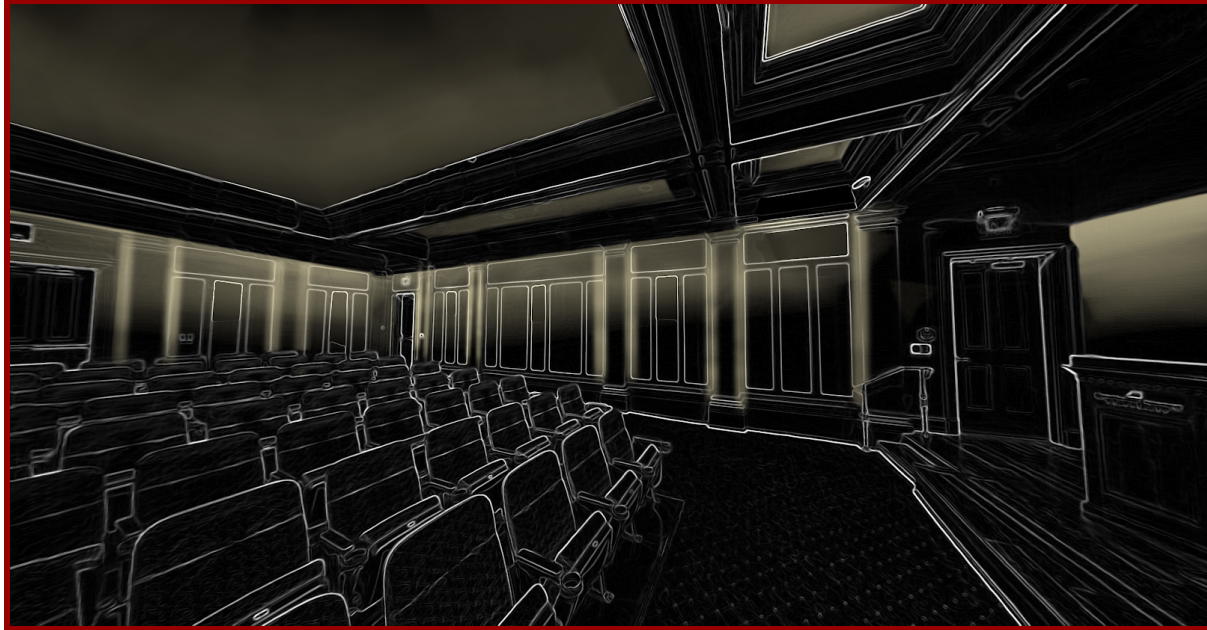
Avoid simple mimicry of the past — help it stand out by including contrasting design choices

Quantitative Criteria

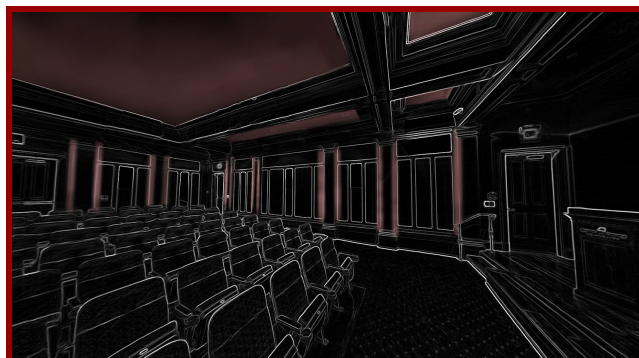
IES recommendation (lux)	Plane	E_h	E_v	Uniformity
Audience (during show) / (pre/post)	Floor	2 / 100	1 / 30	2:1
Circulation	Floor	10	—	3:1
Stage	Floor	50	—	—

Power allowance (ASHRAE 90.1, 2013)	LPD
Auditorium	0.73

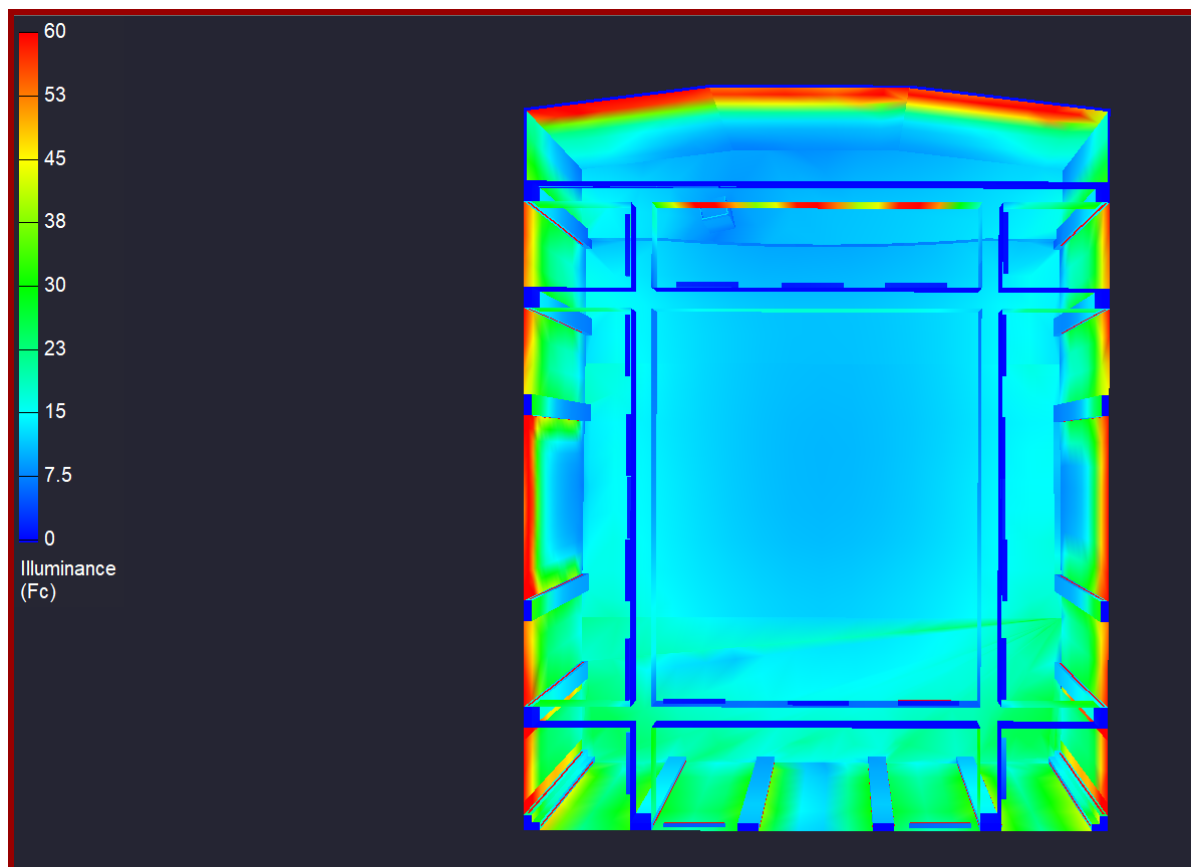




One of HG Wells' most impressive predictions was that we would all one day be connected through a wireless network. That connectedness translates well to a space for speakers sharing knowledge and connection through the arts. It also lends itself well to something I've personally worked with in a theater capacity: DMX networks. In a relatively small space with many functions, DMX can help keep things versatile, especially when coupled with RGBA / RGBW fixtures. This space also promotes a Flynn mode of spaciousness. An open feeling is achieved through perimeter lighting, particularly from the ceiling through wall slots, creating a floating ceiling effect. Additional soft lighting on the ceiling helps to reinforce this. Finally, to highlight the classicism present in the space, backlighting the pilasters emphasizes them cleanly and naturally, while continuing the verticality and sense of lift toward the ceiling. This also increases the aisle / circulation lighting.

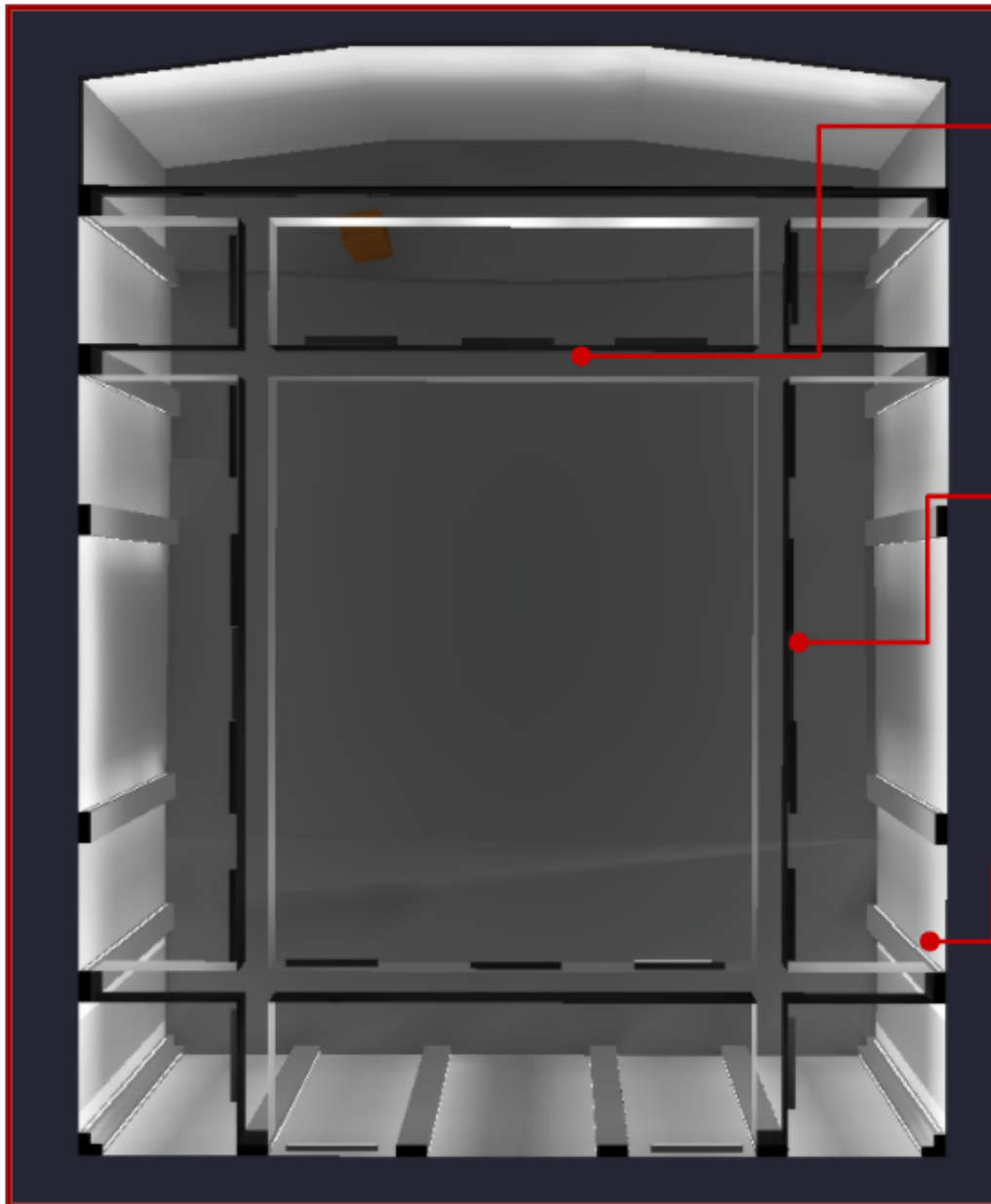


The image on the left is an example of a more closed-off, subdued mode of lighting for a serious keynote speaker, while the right is a brighter, more ethereal mode, perhaps for a small music recital.

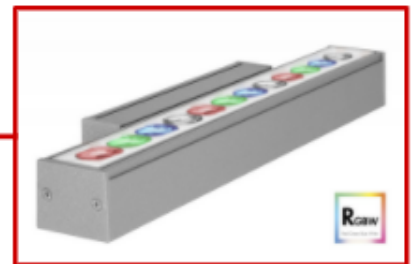


Lighting criteria	IES level	Design level	IES Uniformity	Design Uniformity
Audience (during show) / (pre/post)	2 / 100	144	2:1	1.25:1
Prefunction (during show) / (pre/post)	50 / 150	163	3:1	2.4:1
Circulation	10	144	3:1	1.25:1
Stage	50 min.	120	—	1.6:1

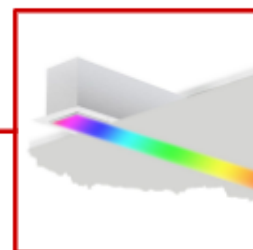
Power allowance	ASHRAE LPD	Design LPD
Auditorium	0.73	0.716



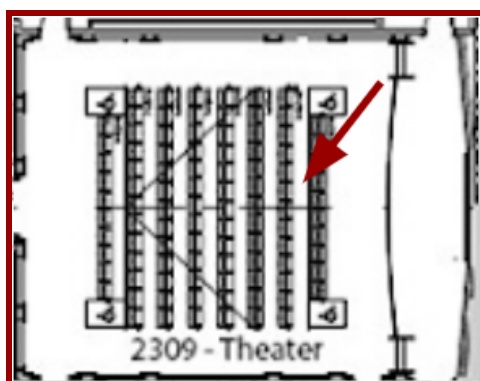
4' linear RGBW with 8x8
distribution to illuminate ceiling



4' linear RGBW with asymmetric
wall-wash distribution



1' aperture linear RGBW with
frosted lens



The key plan to the left corresponds to the renderings on the following page.

The top image shows the pre/post show mode; the bottom represents one RGBW option.



Special Collections & Display Gallery

Description

The special collections and display gallery houses paintings and other media, requiring dim lighting, so as not to damage any delicate materials.

A deliberately subdued, delicate design will help highlight the works on display here without distracting from them.

Qualitative Criteria

Delicacy

Protect the works on display from damage due to overexposure

Flexibility

Create a quiet, intimate space to contrast with the lobby, which is directly adjacent and may be loud

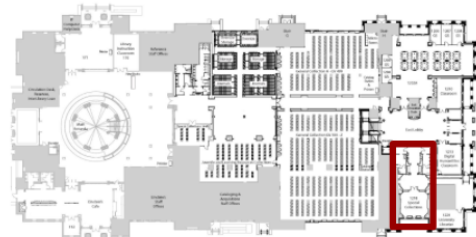
Intimacy

Incorporate the ability to accommodate multiple exhibition types and various collections

Quantitative Criteria

IES recommendation (lux)	Plane	E_h	E_v	Uniformity
Displays (subdued focals)	Floor	0.2x object	0.2x object	4:1
Objects (high sensitivity)	At object	25	25	2:1
Special collections (archival storage)	3' AFF	150	50	2:1

Power allowance (ASHRAE 90.1, 2013)	LPD
Museum	1.05
Library (stacks)	1.71



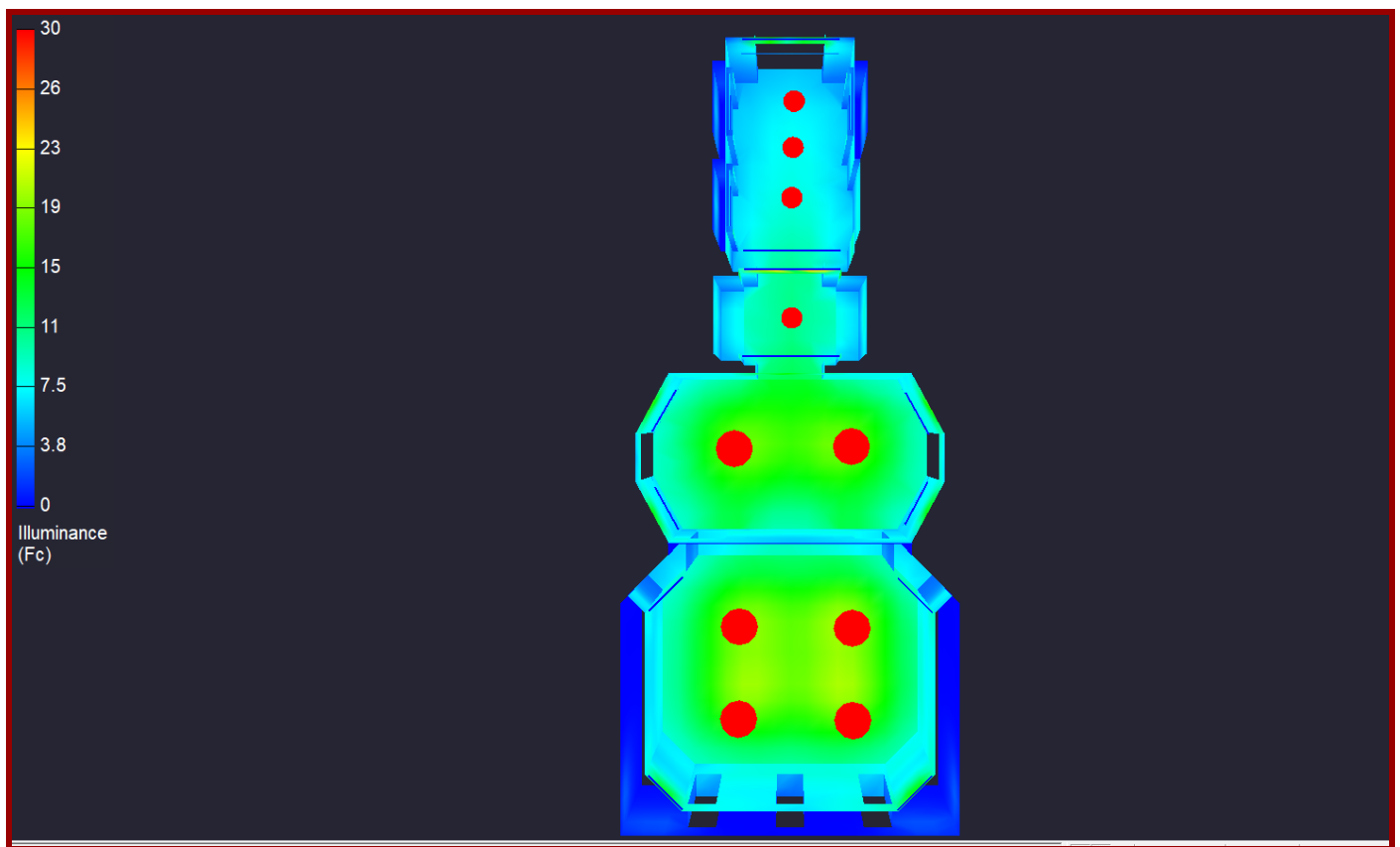


The conceptual development of this space was focused on soft, organic forms in order to echo H.G. Wells' writings on genetics. His interest in the subject makes itself known in *The Time Machine* in the far future, when humans have been refined into gentle, subdued, small beings. That sense of gentleness, as well as the organic forms and smallness of DNA itself, are used here to create a delicate mode of lighting for precious materials.

Quiet, gentle clusters of light are spread through the space, providing both general

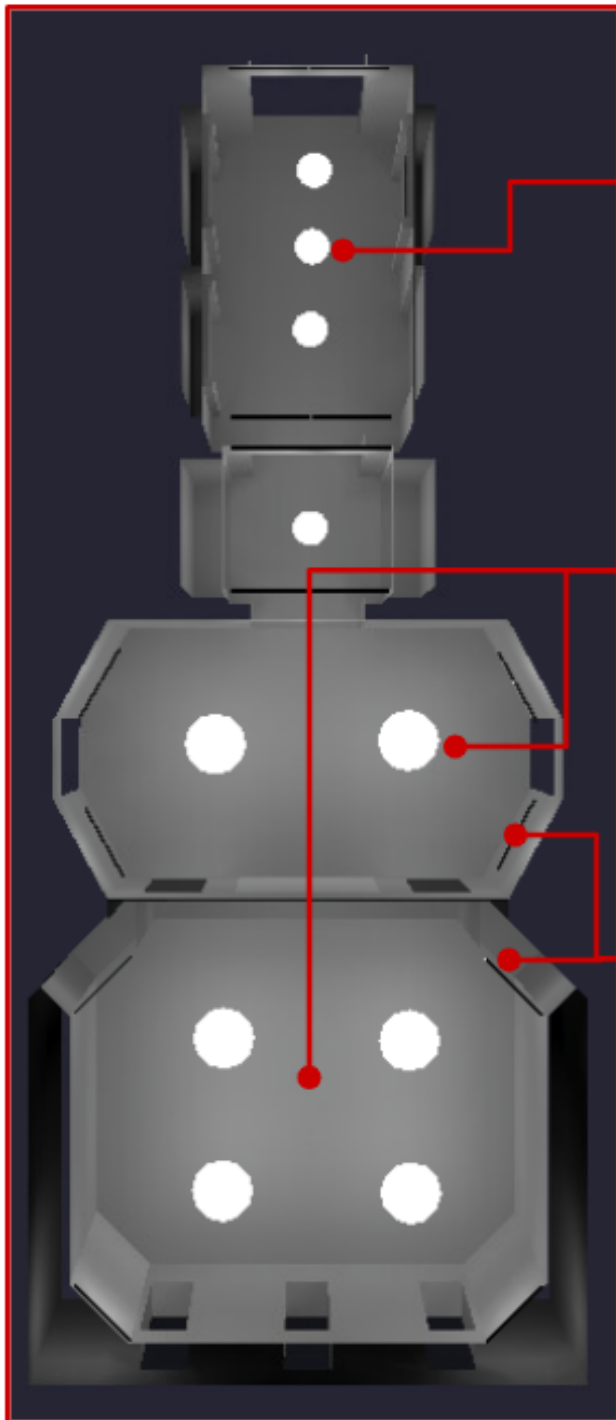


illumination and decoration. What's more, the amorphous form of this lighting makes it possible to arrange shelves or displays in the Special Collections area in any configuration, while still achieving the same effect. The display lighting inside the cases highlights the exhibits, while the soft general illumination guides guests through the space, creating a decidedly quieter mood from that of the adjacent lobby.



Lighting criteria	IES level	Design level	IES Uniformity	Design Uniformity
Displays (subdued focals)	0.2x object	130		
Objects (high sensitivity)	25 max	23 max	2:1	1.13:1
Special collections (archival storage)	150	130	2:1	1.73:1

Power allowance	ASHRAE LPD	Design LPD
Museum	1.05	0.356
Library (stacks)	1.71	0.356



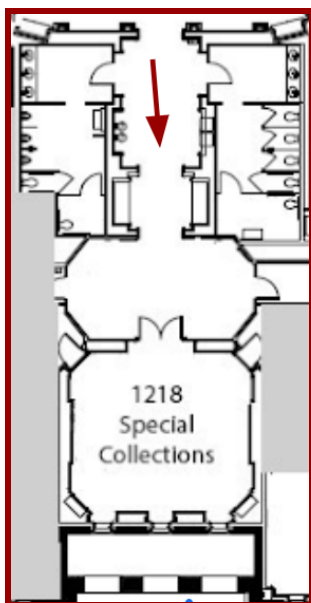
FIRST: Wood pendant lamp with
dimmable bulb

SECOND: Simple chandelier with
black finish

THIRD: 1" aperture recessed linear



This image is a more conceptual rendering of the display gallery. The organic shapes of the chandeliers and warm wood tones create a relaxed atmosphere in which to appreciate what's on display.



Lobby

Description

The lobby has many opportunities for accent lighting, particularly on the numerous neoclassical columns. Additionally, the information desk should be addressed.

Because this is the main entrance of the library, the design should promote both lingering and movement, and evoke the overarching theme strongly to set the tone.

Qualitative Criteria

Wayfinding

Provide a design precedent for navigating the building for both students and visitors

Wow factor

Engineer a memorable experience, as this is the main entrance of the library and a main point on campus

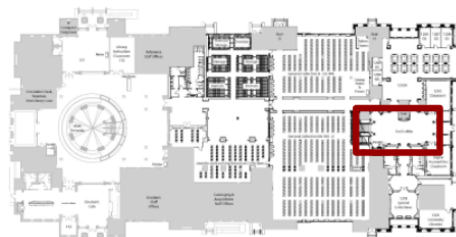
Focal points

Take advantage of the numerous classical elements present in the space as points of interest

Quantitative Criteria

IES recommendation (lux)	Plane	E_h	E_v	Uniformity
Lobby at building entrance (day)	Floor	50	25	4:1
Lobby at building entrance (night)	Floor	15	10	4:1
Lobby desktop	3'6" AFF	75	25	4:1

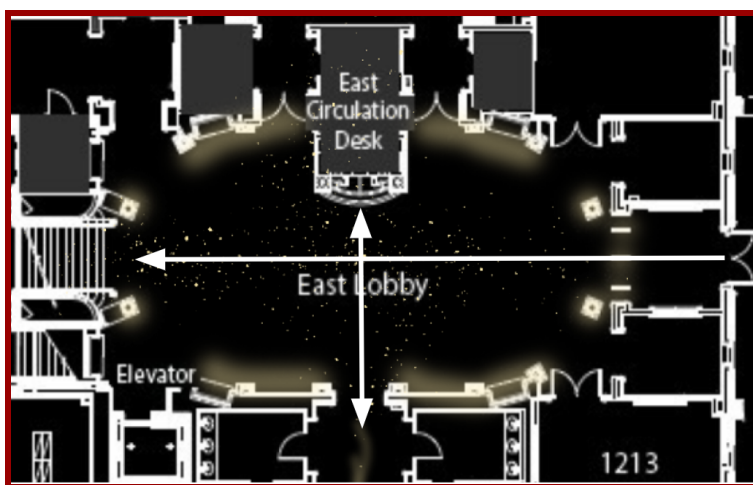
Power allowance (ASHRAE 90.1, 2013)	LPD
Lobby	0.9

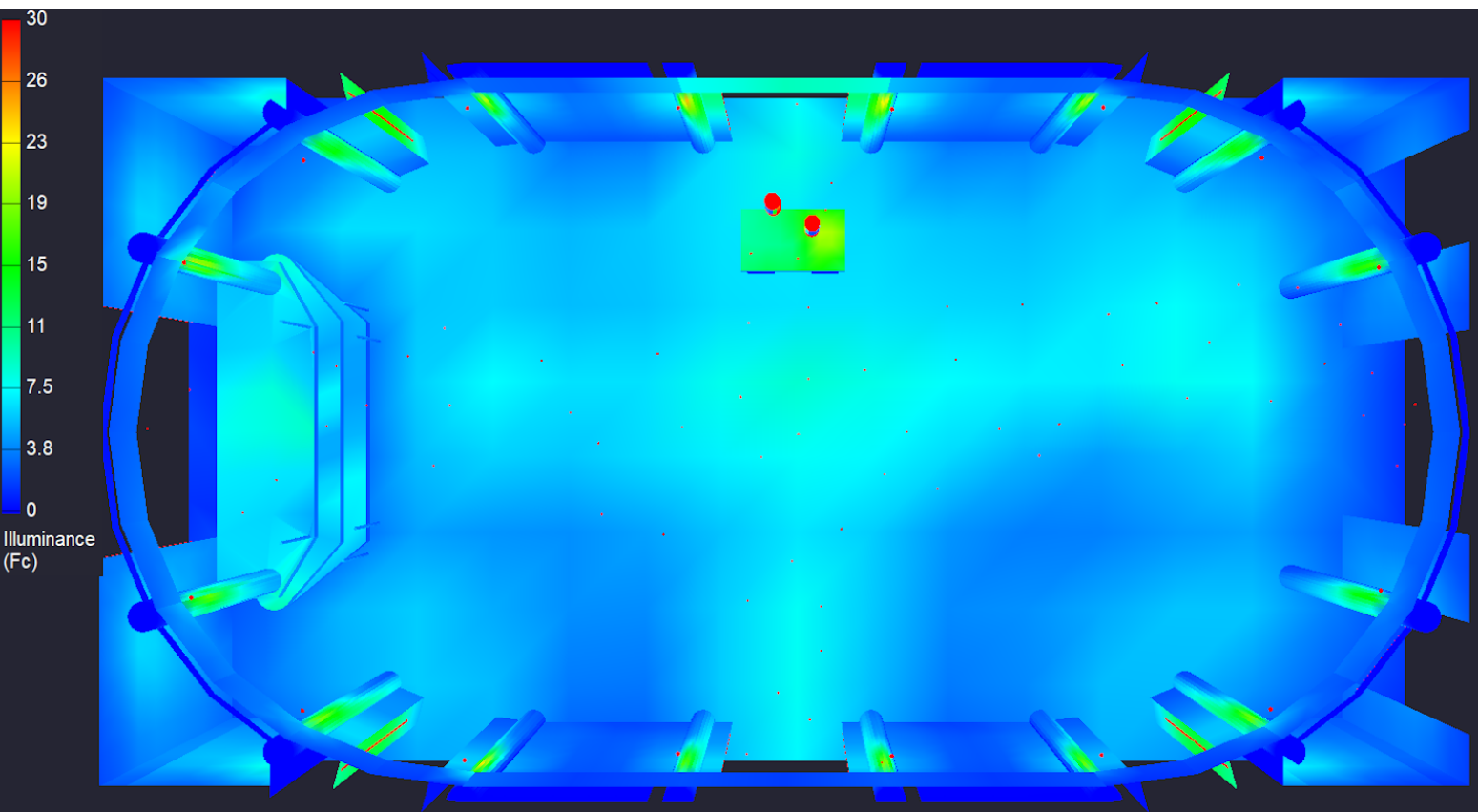


An idea many of Wells' writings hinged on, *The Time Machine* most of all, is that of exploration. He wrote a great deal about not only travels through time, but space. As the first room students will encounter, the lobby should foster a desire to explore and learn. Although the space is relatively small, with 12-foot ceilings, it's possible to create a "wow" factor and a sense of wonder through the installation of a fiber optic system.



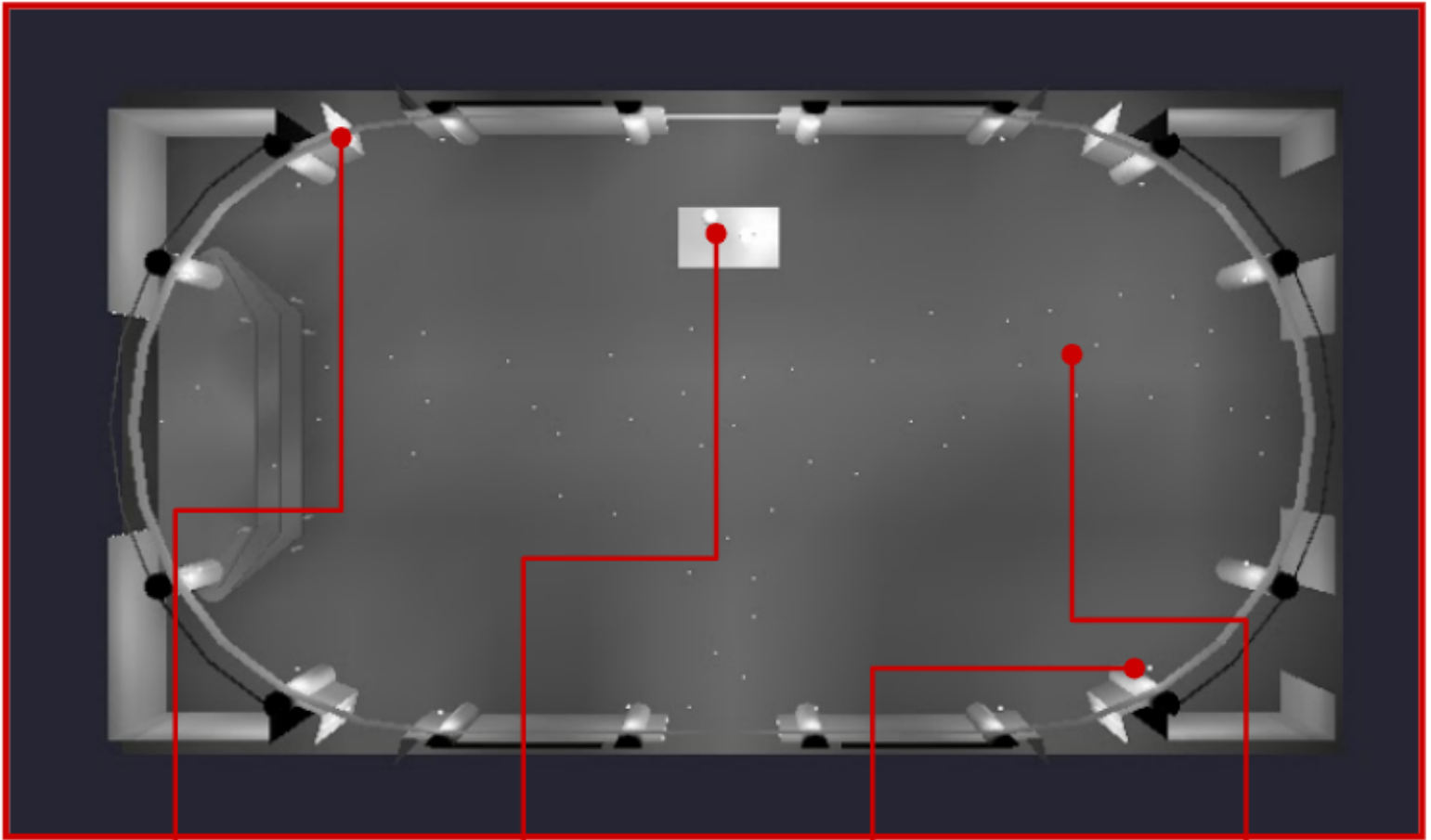
These precedent images show relatively low ceilings transformed into night skies, with soft perimeter and accent lighting also on display in the left image. These combined modes of lighting, when applied to the lobby, will create an ethereal experience of wonderment for any student - or visitor - that enters. The stars on the ceiling will also be made to provide a subtle wayfinding element, clustered more strongly along the main axes of movement in the space, as can be seen below.



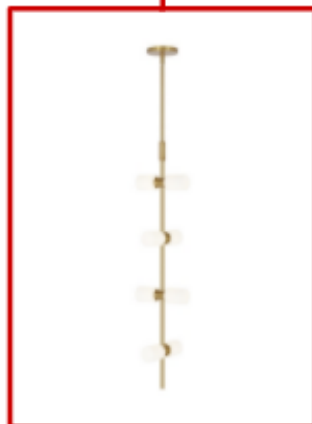


Lighting criteria	IES level	Design level	IES Uniformity	Design Uniformity
Lobby at building entrance (day)	50	65	4:1	2:1
Lobby at building entrance (night)	15	15	4:1	2:1
Lobby desktop	75	150	2:1	1.3:1

Power allowance	ASHRAE LPD	Design LPD
Lobby	0.9	0.265



ABOVE: 1" wide recessed linear
RIGHT: Modern decorative
pendant

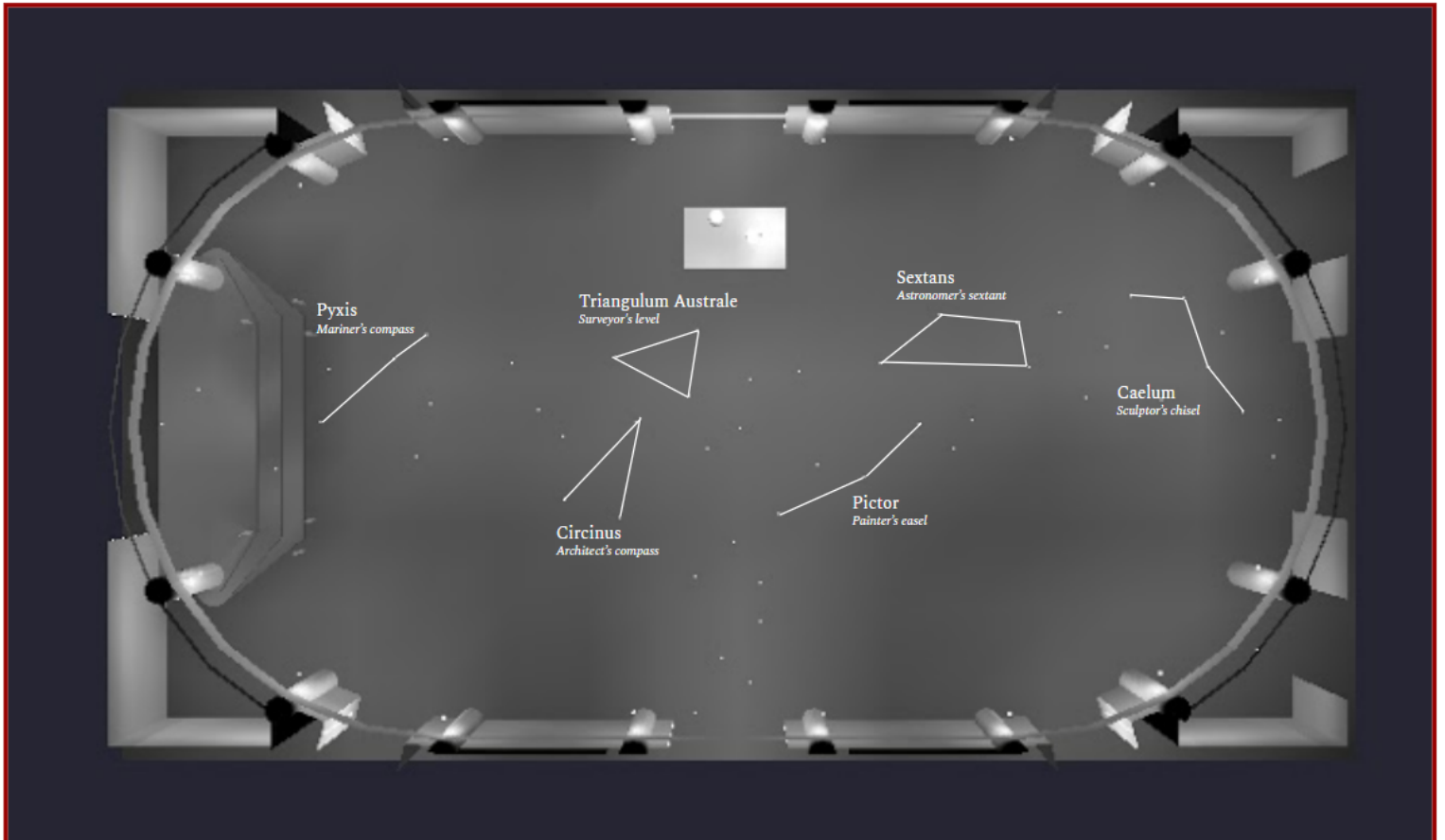


2" adjustable accent downlight



Fiber-optic star system with up to
336 points (64 used)

Before displaying the final rendering, it's apt to note the inclusion of six constellations in the layout of stars on the ceiling of the lobby. Each of these represents a tool of exploration, whether physical, mental, or creative.



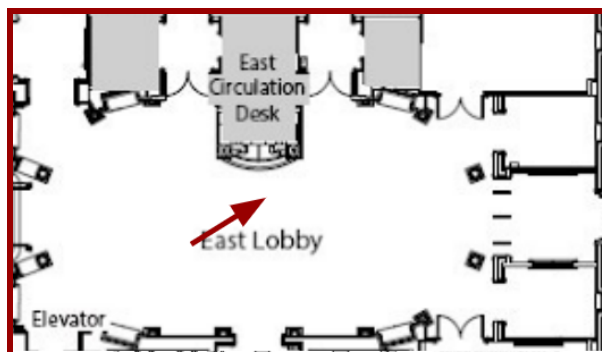
While not explicitly obvious to anyone except (maybe) the most enthusiastic astronomers, these provide a subtle nod to all the ways in which our world can be explored.

From left to right

PYXIS	Mariner's compass
CIRCINUS	Architect's compass
TRIANGULUM AUSTRALE	Surveyor's level
PICTOR	Painter's easel
SEXTANS	Astronomer's sextant
CAELUM	Sculptor's chisel



This image of the lobby is from the perspective of, nearly, the center of the space. Due to the lack of windows, the space will achieve a similar effect at all times of day.



Media Commons

Description

The large combined spaces of the information and technology commons (media commons) was given a simple 2x4 solution, with high levels of general illumination.

There's a noticeable lack of connection to the outdoors in this windowless space, which will be addressed by the addition of skylights and a more organic design language.

Qualitative Criteria

Collaboration

Promote collaborative work through copious general and circulation illumination

Daylight

Account for the lack of daylight in the space; bring the outside in and respond to new skylights

Focus

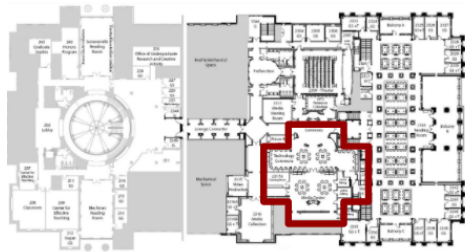
Keep highlights of architectural elements subdued so as not to distract, and provide task light

Quantitative Criteria

IES recommendation (lux)	Plane	E_h	E_v	Uniformity
Computer center	2'6" AFF	150	50	2:1
Open office	2'6" AFF	150	50	2:1
Lobby info desktop	3'6" AFF	75	25	4:1

See below for power allowance and key plan.

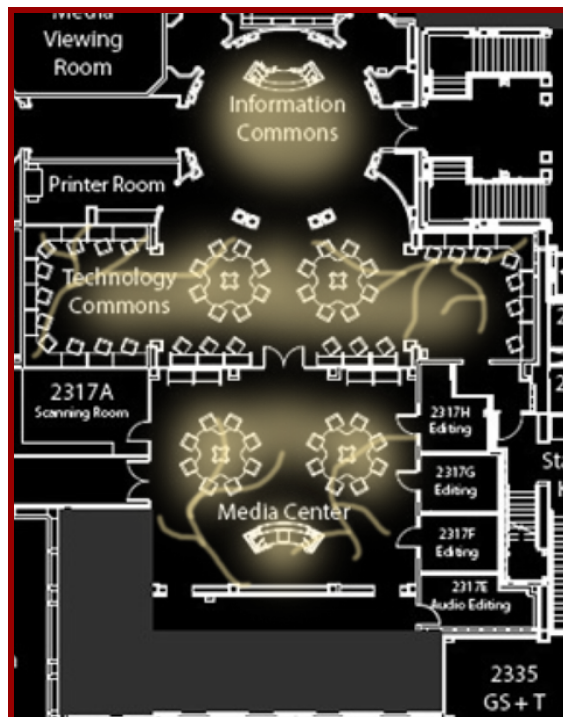
Power allowance (ASHRAE 90.1, 2013)	LPD
Computer room	1.71
Office (open plan)	0.98



As a futurist, Wells often touted the idea of nature overtaking manmade structures. The narrator of *The Time Machine* finds this himself when he reaches the far future, where plant life has consumed old buildings and people live in harmony with nature. Bringing in organic shapes to this inorganic space devoid of daylight will provide visual interest

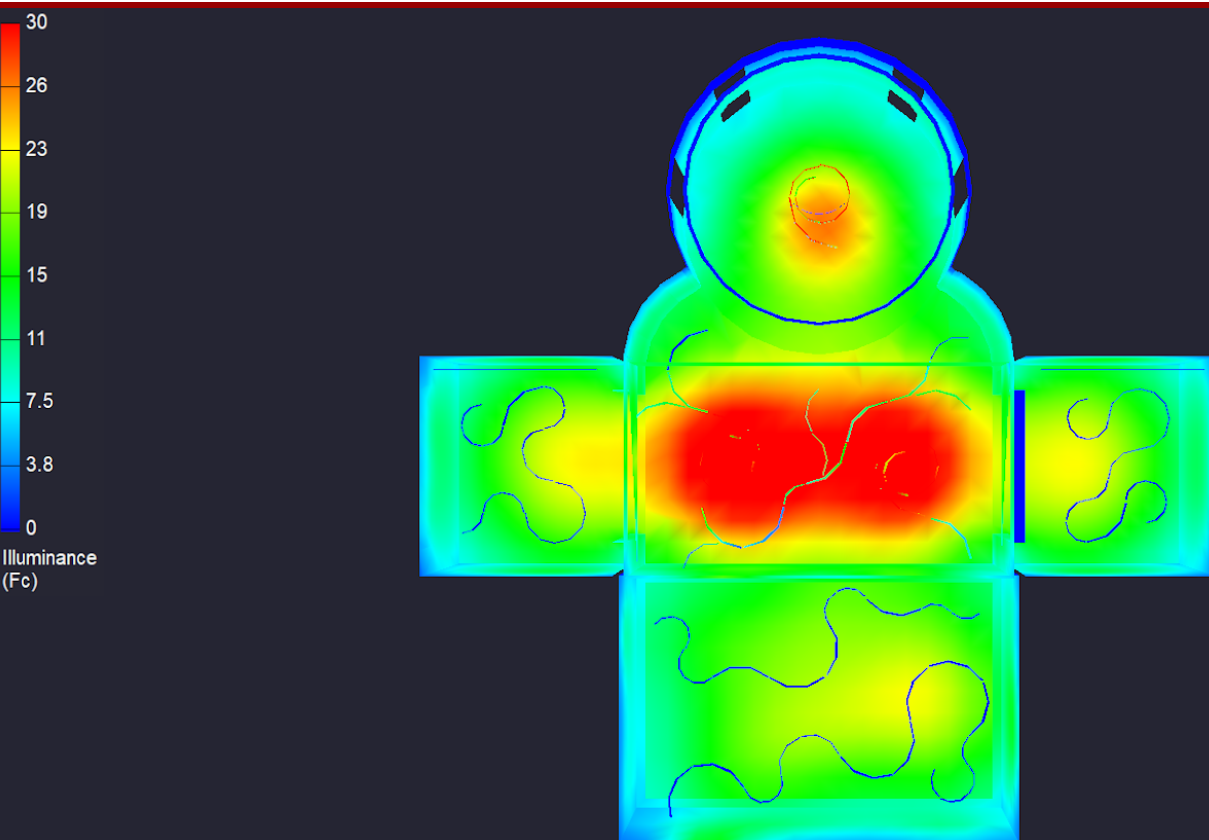
by contrast, while staying relatively subtle (see precedent image in lower right).

Keeping an eye to the floor and furniture plan, the major clusters of collaboration will be brightly illuminated overhead, not by 2x4 troffers but by daylight, supplemented by subtle LED fixtures. At



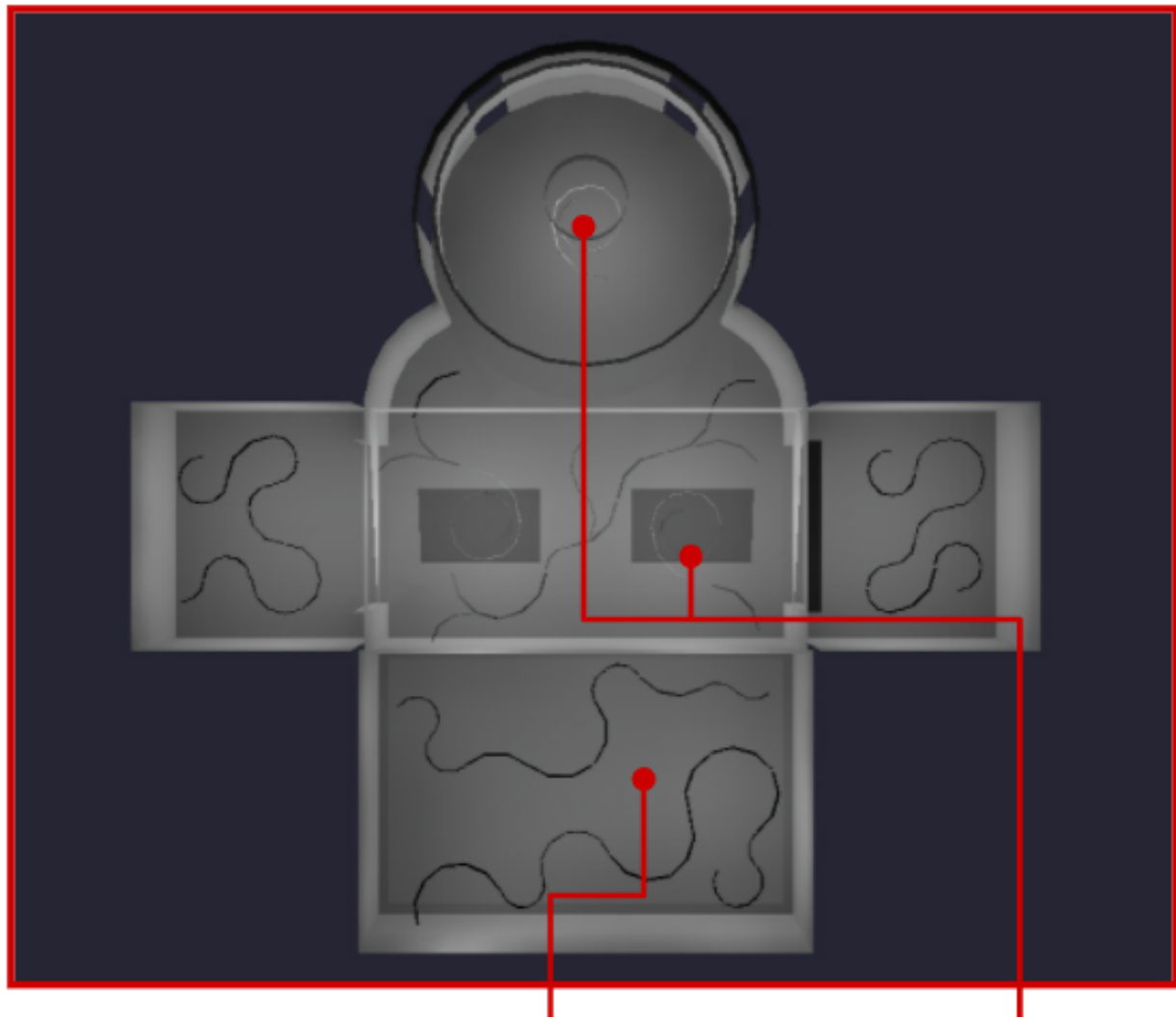
the fringes of the space are more private workstations, which will be subconsciously indicated by a change in shape language, moving from large patches of light to more subdued, uniform pools. The strips in the design are reminiscent of branches, while the center of the space promotes collaboration with the round / spiral chandeliers.





Lighting criteria	IES level	Design level	IES Uniformity	Design Uniformity
Computer center	150	207	2:1	2.55:1
Open office	150	207	2:1	2.55:1
Lobby info desktop	75	372	4:1	1.24:1

Power allowance	ASHRAE LPD	Design LPD
Computer room	1.71	0.495
Office (open plan)	0.98	0.495



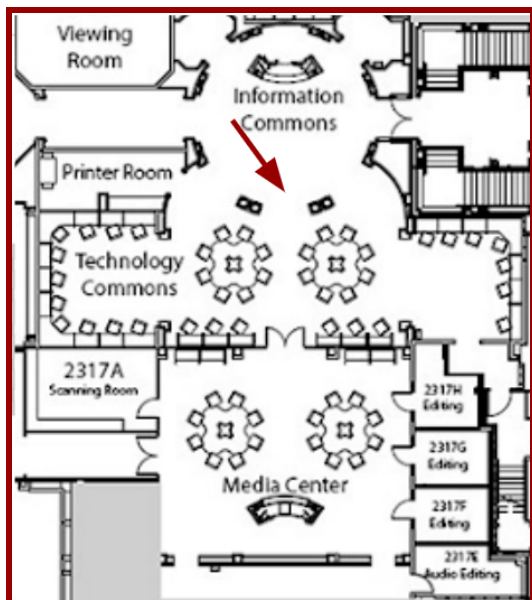
1" aperture configurable surface- and pendant- mounted rings and quarter arcs



1" configurable arcs w/ rotated connectors



This rendering of the Media Commons is meant to emphasize how daylight interacts with the forms of the space. For a large area without any windows, it manages to feel very open and collaborative.



East Facade

Description

The main facade has a multi-faceted design of layered arcades, colonnades, porches, and other ornaments, including precast pediments and columns.

These various layers of design should all be highlighted in some way, without detracting from the modernity and function of the facilities therein.

Qualitative Criteria

Classicism	Cohesion	Function
Emphasize the importance of the facade's neoclassical and colonial revival elements	Ensure cohesion with the existing portion of the library and the surrounding campus structures	Clarify and highlight the usable spaces on the outside of the building, such as porches and arcades

Quantitative Criteria

IES recommendation (lux)	Plane	E_h	E_v	Uniformity
Building entrance, LZ3	Grade	7.5	4	2:1

Power allowance (ASHRAE 90.1, 2013)	LPD
Facade walls	0.15 / wall
Entry canopy	0.4



PAUL & ROSEMARY TRIBLE LIBRARY
CHRISTOPHER NEWPORT UNIVERSITY

MADELINE HESS
ADVISOR: SHAWN GOOD
L/E OPTION, MAE PROGRAM



H.G. Wells may be more famous for his fiction, but he was also a prolific writer for human rights and inclusion. His essay on human rights was actually adopted by the UN, and is used as a standard to this day. This design, based on the idea of inclusion, aims to reach out and welcome students into a space of public knowledge.



The design itself illuminates the entry arcade in a wash, making it clear to students where they can enter and that they are welcome. By highlighting the columns from the bottom up, the design is kept more on the pedestrian's level, rather than seeming stately and intimidating. Finally, soft

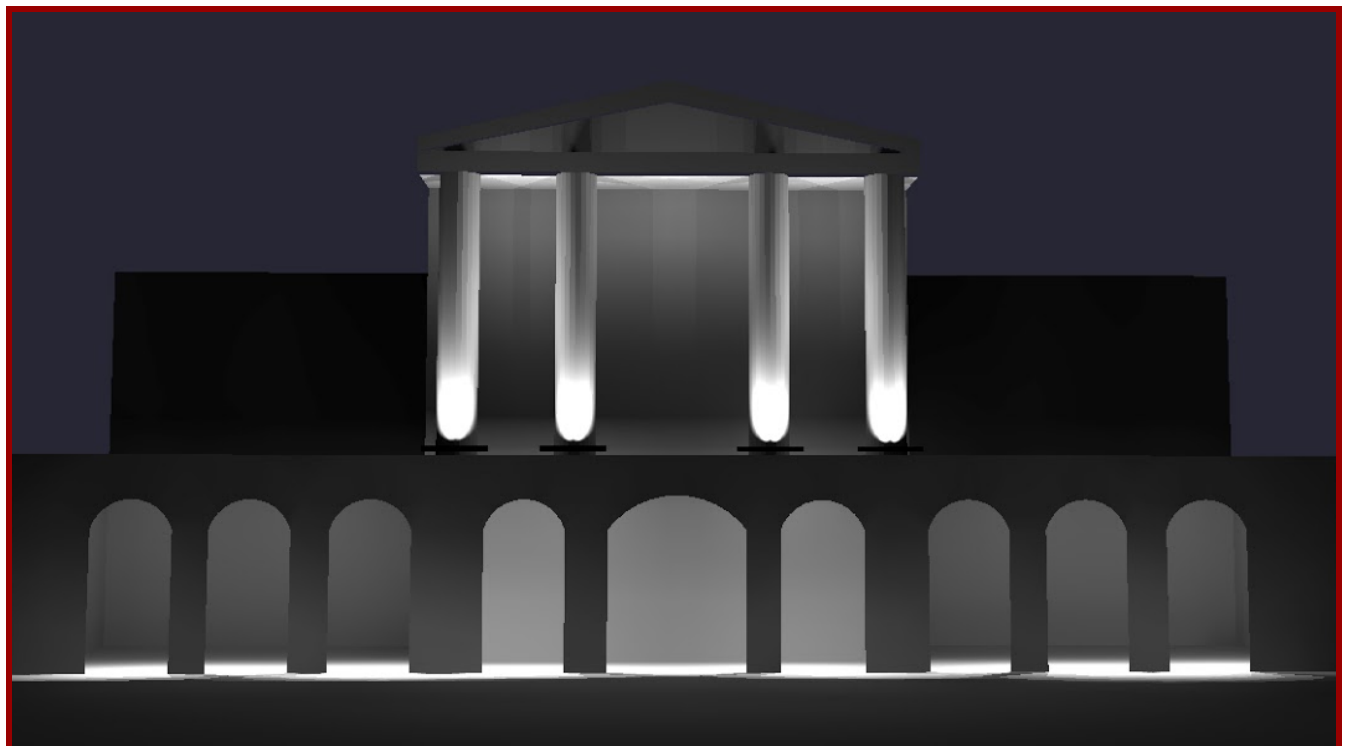
uplights on the pediments and cupola complement the uplighting on the columns.

Lighting criteria	IES level	Design level	IES Uniformity	Design Uniformity
Building entrance, LZ3	7.5	60 (with dimming capabilities)	2:1	2.7:1

Power allowance	ASHRAE LPD	Design LPD
Facade walls	0.15/wall	0.0799
Entry canopy	0.4	0.0849



The above 30x60 accent fixture is the primary one used in this design.



ELECTRICAL DEPTH

Existing Controls Analysis

BUILDING CONTROLS OVERVIEW

Much of the Tribble Library is controlled through a facility management system, the Lutron GRAFIK Eye. This consists of programmable wall-mounted control panels, linked to various specified lighting zones in selected spaces by lighting relay panels. These control panels are programmed to respond to assigned time-of-day shutoffs and, in the case of the exterior control panel, photocell signals. Certain spaces in the library are powered by circuits that bypass these panels, and instead have dedicated occupancy sensors, dimming switches, and/or other controls.

As a general note, no occupancy or vacancy sensors are present in any of the selected spaces in the original design. Photocell controls are present, but only on the exterior of the building, in order to relay a general sense of the time of day to some of the designated room lighting control panels.

The following summary details how each space of study in this thesis is linked to the facility management network, as well as any dedicated controls outside of the network.

READING ROOM

There are multiple room lighting control panels in the two-story reading room, all of which have pre-set scenes, time of day auto shutoff controls, and a corresponding lighting zone override switch.

FIRST FLOOR

The main study space is designated as Zone 6, controlled by RLC6 (room lighting control panel 6). The panel is located along the back wall of a hallway, accessible when exiting the room.

CONTROL PANEL: RLC6				
ZONE	CIRCUIT	RELAY PANEL	OVERRIDE	DESCRIPTION
Z6a	EH1-29	LRP2E	S010	Downlights around north and south skylights
Z6b	NH3-16	LRP2	S010	Strip light around skylights
Z6c	NH3-16	LRP2	S010	Linear lighting around central cupola
Z6d	EH1-23	LRP2E	S010	Statement chandelier in central cupola
Z6e	EH1-23	LRP2E	S010	Statement chandelier in north and south skylights
Z6f	EH1-29	LRP2E	S010	Downlights around north and south skylights
Z6g	EH1-29	LRP2E	S010	Downlights around north and south skylights
Z6h	EH1-33	LRP2E	S05	Downlights in hall adjacent to central space
Z6i	EP1-11	LRP2E	S010	Entryway chandeliers
Z6j	EH1-33	LRP2E	S010	Downlights in hall / entryway adjacent to central space
Z6k	EH1-33	LRP2E	S010	Downlights / chandeliers in stairway adjacent to central space

General illumination in the rooms adjacent to the main study space are marked as Zones 7 and 8, controlled by room lighting control panels RLC7 and RLC8. They are controlled in identical manners from the two control panels.

CONTROL PANEL: RLC7 / RLC8				
ZONE	CIRCUIT	RELAY PANEL	OVERRIDE	DESCRIPTION
Z7a / Z8a	EH1-33	LRPE2	S05	General illumination recessed downlights
Z7b / Z8b	EH1-33	LRPE2	S05	Recessed downlights in adjacent hall / circulation space
Z7c / Z8c	EP1-7 / EP1-17	LRPE2	S05 / S014	Chandeliers in central north wing
Z7d / Z8d	EP1-7 / EP1-17	LRPE2	S05 / S014	Chandeliers in west portion of north wing
Z7e / Z8e	EH1-33	LRPE2	S05	General illumination recessed downlights

The downlights on circuit EH1-33 are also connected to manual dimmer switches in hallways directly adjacent to the reading room, implying that they can be dimmed separately from scene and timeclock control, according to occupant preference.

SECOND FLOOR

The second floor mezzanine of the Reading Room has two wings, which are designated as Zones 3 and 5. These controls are identical to each other, much like Zones 7 and 8. RLC3 and 5 are located in their respective rooms of control.

CONTROL PANEL: RLC3 / RLC5				
ZONE	CIRCUIT	RELAY PANEL	OVERRIDE	DESCRIPTION
Z3a / Z5a	NL3A-3 / NL3A-1	LRPE2	S05 / S014	General illumination recessed downlights
Z3b / Z5b	NL3A-3 / NL3A-1	LRPE2	S05 / S014	Perimeter recessed downlights
Z3c / Z5c	NL3A-3 / NL3A-1	LRPE2	S05 / S014	Chandeliers

The central area of the second floor is designated Zone 4. RLC4 is located centrally on the second floor of the reading room.

CONTROL PANEL: RLC4				
ZONE	CIRCUIT	RELAY PANEL	OVERRIDE	DESCRIPTION
Z4a	NL3A-1	LRP3	S09	Recessed downlights in adjacent hall
Z4b	NL3A-1	LRP3	S09	Recessed downlights in adjacent hall
Z4c	NL3A-3	LRP3	S09	Downlights in space adjacent to main area
Z4e	NL3A-3	LRP3	S09	Chandeliers
Z4f	NL3A-3	LRP3	S09	Downlights in space adjacent to main area
Z4g	NL3A-3	LRP3	S09	Downlights in space adjacent to main area
Z4h	NL3A-1	LRP3	S09	Chandeliers in space adjacent to main area
Z4i	NL3A-3	LRP3	S09	Downlights in space adjacent to main area
Z4j	NL3A-3	LRP3	S09	Recessed downlights in adjacent hall
Z4k	NL3A-3	LRP3	S09	Recessed downlights in adjacent hall

Three additional 4-scene control switches are located in the main sections of the second floor of the reading room, next to the room control panels, presumably able to override the scenes dictated by the RLCs.

CONCLUSION: Although the room lighting control panels are attuned to a timeclock and exterior photocells, a form of dimming with respect to the daylight in the space could greatly improve the responsiveness of this design. Energy could be saved with the addition of occupancy / vacancy sensors in the wings, while they may not prove effective in the larger double-height spaces. Greater small-scale controllability in the various spaces could also increase preference for the students who are studying in them.

100-PERSON THEATER & PREFUNCTION

The theater is designated as control Zone 10, controlled from RLC10, located in the back of the theater adjacent to the exit.

CONTROL PANEL: RLC10				
ZONE	CIRCUIT	RELAY PANEL	OVERRIDE	DESCRIPTION
Z10a	NL2C-17	LRP2	S019	Wall sconces
Z10b	EH1-17	LRP2E	S014	Downlights in back aisle
Z10c	EH1-17	LRP2E	S014	Downlights along side aisles
Z10d	EH1-17	LRP2E	S014	Downlights in center of space
Z10e	NL2C-17	LRP2	S019	Chandeliers
Z10f	EH1-17	LRP2E	S014	Downlights on stage
Z10g	EH1-17	LRP2E	S014	Downlights in front of stage
Z10h	EH1-17	LRP2E	S014	Adjustable accent lights in front of stage

The prefunction space is not zoned for specific RLC panel control, but the downlights and chandeliers present in the space are served by circuit NL2C-15, and have dimming controls just outside the prefunction entrance. Circuit NL2C-15 is also designated override switch 18, which is adjacent to the space. Override switch 19 is located next to RLC 10, while override switch 14 is located in the Reading Room.

CONCLUSION: The number of zones keeps this space relatively versatile, but it's limited by the type of fixtures (incandescent and fluorescent, rather than RGB). The addition of DMX controls and RGBW or RGBA fixtures would offer a more comprehensive and responsive solution.

SPECIAL COLLECTIONS & DISPLAY GALLERY

CIRCUIT	RELAY PANEL	OVERRIDE
EP1-3	LRP1E	S06
NL1B-19	LRP1	S06

Because these lights are not zoned for control via a room lighting control panel (RLC), their dedicated controls will be detailed here. Two dimmer switches are located next to the entrance of the Display Gallery. The chandeliers in the Gallery are connected to one dimmer switch, while the spaces' sconces and an additional ceiling fixture are controlled by the other. The downlights and additional chandeliers in the space are controlled by their own dedicated dimmers. In the special collections room, the two modes of lighting (sconces over paintings and general illumination chandeliers) are controlled by dedicated dimmers.

CONCLUSION: There is not a great deal of versatility in this room. A connection to the facility network, as well as a photocontrol device in the special collections room, could prove more effective and a better measure for protecting sensitive materials.

LOBBY

CIRCUIT	RELAY PANEL	OVERRIDE
EP1-3	LRP1E	S06
EH1-7	LRP1E	S05

The chandeliers in the main lobby, as well as in the entry vestibule, are controlled by dimmer switches located beside the front door and in the vestibule. The downlights and linear fixtures providing general illumination are controlled by another dimmer switch next to the front door.

Override switch 6 is located in the Lobby, next to the front entrance; override switch 5 is located in rooms adjacent to the Lobby.

CONCLUSION: The lighting redesign for the Lobby is far more complex than the current design, and will require either a 4-button scene switch or an additional room lighting control panel. The addition of ceiling-mounted vacancy sensors will also be an energy-saving measure.

MEDIA COMMONS

CIRCUIT	RELAY PANEL	OVERRIDE
EH1-19	LRP2E	S016
EH1-21	LRP2E	S017

The Commons are not zoned for control via a room lighting control panel, so the controls are detailed here. Two modes of lighting in the space's dome (downlights and a strip around the perimeter) are controlled via separate dimmers. The rest of the space has a gridded ceiling populated by 2x4s and round perimeter downlights, which are also controlled by separate dimming switches.

Override switch 15 is located in this space.

CONCLUSION: This space has the least comprehensive controls, despite being one of the most heavily-occupied in the library. Vacancy or occupancy sensors, as well as photocells to react to the skylights added in the MAE Daylighting depth, will improve energy consumption and space versatility.

EAST FACADE

The lighting on the east facade (main entry) of the building is controlled by a panel which responds to a programmed timeclock and the exterior photocells. The photocells are mounted on the roof and aimed north.

CONTROL PANEL: RLC0				
ZONE	CIRCUIT	RELAY PANEL	OVERRIDE	DESCRIPTION
Z01	EH1-2	LRP1E	Photocell	Exterior linear fixtures (floor 2, 3)
Z02	EH1-2	LRP1E	Photocell	Exterior linear fixtures (floor 2)
Z06	EH1-2	LRP1E	Photocell	Exterior linear fixtures (floor 3)
Z09	EH1-2	LRP1E	Photocell	Exterior round downlights
Z010	EH1-2	LRP1E	Photocell	Exterior round downlights
Z011	EH1-2	LRP1E	S019	Hanging and wall-mounted lanterns

Controls Redesign

The control goals for each space, while discussed above, are compiled below in a table, along with the devices required to achieve them.

SPACE	GOALS	DEVICES
Reading Room	Daylight dimming, occupancy / vacancy capabilities, greater occupant control	Photocell, occupancy / vacancy sensor, dimmer switches
Theater	Greater versatility, RGBW capabilities, integration with A/V equipment	DMX network / controller, ethernet communication between lights & A/V
Special Collections	Daylight dimming, low exposure of materials, integration with existing facility controls	Photocell, vacancy sensor, dimmer switches, existing facility management device
Lobby	Occupancy controls, greater versatility, integration with existing facility controls	Occupancy sensor, 4-button switch, existing facility management device
Media Commons ¹	Daylight dimming, occupancy control	Photocell, occupancy sensor
Facade	Additional dimming control	Dimmer switch

1: In the case of the Media Commons, ASHRAE 2010, 9.4.1. 5 states that any room with a top lighted area of over 900 ft² requires lighting control and dimming by at least one (1) daylight sensor.

CONTROLS MATRICES

The following matrices detail the intended modes of control in the six spaces of study, as well as their sequence of operations. Much of the controllability (time clock, exterior photocell, etc.) is provided by the existing (or newly-connected) room control panel.

NOTE: See bottom of the controls matrices section for the sequence of operations legend. For a larger version of these tables, refer to **Appendix II**.

READING ROOM

SPACE NAME	ROOM NUMBER	MANUAL ON	MANUAL OFF	DIMMING SWITCH	OVERRIDE SWITCH	TIMECLOCK ON/OFF	OCCUPANCY SENSOR	VACANCY SENSOR	PHOTOCONTROL DIMMING	EXTERIOR PHOTOCELL ON/OFF	FACILITY MANAGEMENT TOOL	4-BUTTON SCENE CONTROL	NETWORKED CONTROLS (DMX)	SEQUENCE OF OPERATIONS
Main Reading Room - F1 / F2	2318B	X	X		X	X	X		X	X	X			1
North Wing - F1	2318A	X	X		X	X	X		X	X	X			1
South Wing - F1	2318C	X	X		X	X	X		X	X	X			1
Entry - F1	2318B	X	X	X	X	X	X		X	X	X			2
North Wing - F2	3001A	X	X		X	X	X		X	X	X			1
South Wing - F2	3001D	X	X		X	X	X		X	X	X			1
Front Study Room - F2	3001C	X	X	X	X	X	X		X	X	X	X		3
Rear Study Room - F2	3001B	X	X	X	X	X	X		X	X	X	X		3

100-PERSON THEATER & PREFUNCTION

SPACE NAME	ROOM NUMBER	MANUAL ON	MANUAL OFF	DIMMING SWITCH	OVERRIDE SWITCH	TIMECLOCK ON/OFF	OCCUPANCY SENSOR	VACANCY SENSOR	PHOTOCONTROL DIMMING	EXTERIOR PHOTOCELL ON/OFF	FACILITY MANAGEMENT TOOL	4-BUTTON SCENE CONTROL	NETWORKED CONTROLS (DMX)	SEQUENCE OF OPERATIONS
Audience	2309	X	X		X	X					X		X	4
Stage	2313	X	X		X	X					X		X	4
Prefunction	L2-C-07	X	X		X	X					X	X		5
Prefunction Hall	2309A	X	X	X	X	X					X			6

SPECIAL COLLECTIONS & DISPLAY GALLERY

SPACE NAME	ROOM NUMBER	MANUAL ON	MANUAL OFF	DIMMING SWITCH	OVERRIDE SWITCH	TIMECLOCK ON/OFF	OCCUPANCY SENSOR	VACANCY SENSOR	PHOTOCONTROL DIMMING	EXTERIOR PHOTOCELL ON/OFF	FACILITY MANAGEMENT TOOL	4-BUTTON SCENE CONTROL	NETWORKED CONTROLS (DMX)	SEQUENCE OF OPERATIONS
Display Gallery	L1-C-02	X	X	X	X	X	X			X	X	X		7
Display Gallery Hall	L1-C-03	X	X	X	X	X		X		X	X			9
Special Collections	1218	X	X	X	X	X		X	X	X	X	X		8

LOBBY

SPACE NAME	ROOM NUMBER	MANUAL ON	MANUAL OFF	DIMMING SWITCH	OVERRIDE SWITCH	TIMECLOCK ON/OFF	OCCUPANCY SENSOR	VACANCY SENSOR	PHOTOCONTROL DIMMING	EXTERIOR PHOTOCELL ON/OFF	FACILITY MANAGEMENT TOOL	4-BUTTON SCENE CONTROL	NETWORKED CONTROLS (DMX)	SEQUENCE OF OPERATIONS
Main Lobby	L1-C-01	X	X	X	X	X	X			X	X	X		7

MEDIA COMMONS

SPACE NAME	ROOM NUMBER	MANUAL ON	MANUAL OFF	DIMMING SWITCH	OVERRIDE SWITCH	TIMECLOCK ON/OFF	OCCUPANCY SENSOR	VACANCY SENSOR	PHOTOCONTROL DIMMING	EXTERIOR PHOTOCELL ON/OFF	FACILITY MANAGEMENT TOOL	4-BUTTON SCENE CONTROL	NETWORKED CONTROLS (DMX)	SEQUENCE OF OPERATIONS
Info Commons (Dome)	L2-C-13	X	X	X	X	X	X		X	X				10
Technology Commons	2314	X	X	X	X	X	X		X	X				10
Media Center	2317	X	X	X	X	X	X		X	X				10

EAST FACADE

SPACE NAME	ROOM NUMBER	MANUAL ON	MANUAL OFF	DIMMING SWITCH	OVERRIDE SWITCH	TIMECLOCK ON/OFF	OCCUPANCY SENSOR	VACANCY SENSOR	PHOTOCONTROL DIMMING	EXTERIOR PHOTOCELL ON/OFF	FACILITY MANAGEMENT TOOL	4-BUTTON SCENE CONTROL	NETWORKED CONTROLS (DMX)	SEQUENCE OF OPERATIONS
East Facade	N/A	X	X		X	X				X	X			11

SEQUENCE OF OPERATIONS LEGEND

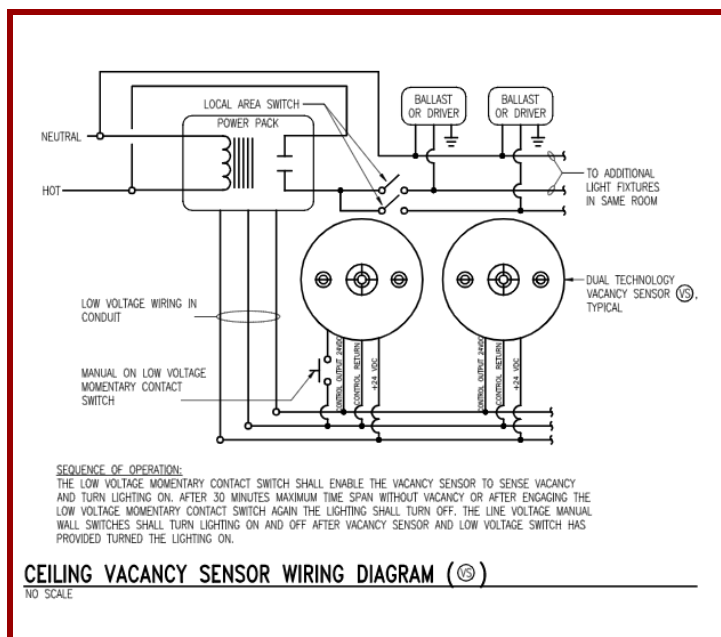
SEQUENCE OF OPERATIONS LEGEND	
1	At 7:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. Lights will DIM according to daylight sensors. At 10:00 PM the zone will turn OFF. Overrides include a user-operated manual ON/OFF.
2	At 7:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. Lights will DIM according to daylight sensors. At 10:00 PM the zone will turn OFF. Overrides include a user-operated manual ON/OFF and user-operated manual dimming.
3	At 7:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. Lights will DIM according to daylight sensors. At 10:00 PM the zone will turn OFF. Overrides include a user-operated manual ON/OFF, user-operated manual dimming, and user-operated 4-button scenes.
4	At 8:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. At 8:00 PM the zone will turn OFF. Overrides include DMX network controls and user-operated manual ON/OFF.
5	At 8:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. At 8:00 PM the zone will turn OFF. Overrides include user-operated manual ON/OFF and a user-operated 4-button scene switch.
6	At 8:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. At 8:00 PM the zone will turn OFF. Overrides include user-operated manual ON/OFF and a user-operated dimming switch.
7	At 7:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. At 10:00 PM the zone will turn OFF. Overrides include a 4-button scene switch, a dimming switch, and user-operated manual ON/OFF.
8	At 7:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the vacancy sensor detects no movement. At 10:00 PM the zone will turn OFF. Overrides include a 4-button scene switch, a dimming switch, and user-operated manual ON/OFF.
9	At 7:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the vacancy sensor detects no movement. At 10:00 PM the zone will turn OFF. Overrides include a dimming switch and a user-operated manual ON/OFF.
10	Upon entrance to the space, the occupancy sensor will turn the zone ON. The lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. Lights will DIM according to daylight sensors. Overrides include a user-operated manual ON/OFF and user-operated dimming.
11	At 5:00 PM the timeclock of the facility management system will switch the designated zones ON (if exterior photocell conditions are met); at 7:00 AM, the system will switch them OFF (again, if photocell conditions are met). Override is a manual ON/OFF switch.

NOTE: for a larger version of these tables, as well as the sequence of operations legend, please refer to **Appendix II.**

POWER SUPPLY FOR NEW CONTROLS

An investigation of the drawings shows that the existing sensors are powered at 24V DC, connected by low-voltage wiring to a power pack which is, in turn, powered by 120V line voltage. In the case of the vacancy sensor example given in the drawings (pictured below, from Sheet E5.10), there is a

momentary contact switch, allowing a form of override.



In keeping with this, the chosen new sensors will operate at a 24V DC input, with line-voltage connected transforming power packs rather than a comprehensive low-voltage panel. This will provide better integration into the existing system, as well as streamlined maintenance for one type of power distribution rather than two different modes.

The other lighting control devices (toggle switches, dimmers, facility

management panels) will operate at 120V line voltage, as the existing Lutron Grafik Eye QS system requires 120V input for LED control.

PRODUCT SELECTION

Using the control goals, required devices, and the knowledge of how the existing building controls are powered, product selection is now viable. Section 260923 - Lighting Control Devices of the project manual for Tribble Library provides details on the existing controls; in an effort to integrate with the current design, these will be used as guidelines for product selection.

While the existing Lutron GRAFIK Eye QS System is sufficient for facility management and will be used in this redesign (albeit reconfigured), additional devices are also required. The list below details the additional devices selected for each space, as well as if and how they meet the requirements (option offered by chosen device denoted by underline).

See **Appendix II** for manufacturer's data of selected products.

BASICS (needed in most spaces)

Toggle switches (overrides): **Leviton 1223-SW Toggle Switch**

Requirements

- NEMA WD 1, UL 20, and FS W-S-896 compliant ✓
- Rated for 20A at 120/277V AC ✓

120V AC line-voltage power.

Dimmer switches: **Lutron MA-1000-WH**

Requirements

- Solid-state with integral on/off switches ✓
- EMI/RFI suppression filter ✓
- Adjustable slider with single-pole or three-way switching ✓
- Compliant with UL 1472 ✓
- 0-10% dimming for LEDs ✓

Line-voltage input at 120V.

READING ROOM

Daylight sensors (photocells): **Cooper Greengate Open Loop Daylight Sensor**

Requirements

- 1.5 to 10fc range (0.3 to 30fc, adjustable) ✓
- 30s delay minimum (5, 15, or 30 minutes, selectable) ✓
- UL 508 listed ✓

24V DC with class 2 low-voltage wiring; ships with included power pack. Three daylight settings are included: Low (0.3-30 fc), High (3-300 fc), and Direct Sun (30-300 fc). 60 degree view field; acceptable for both sidelight (ceiling mount) and skylight (wall mount) applications.

Occupancy sensors: **Lutron LOS C Series Occupancy Sensor**

Requirements

- Ceiling mounted
 - Solid-state line or low voltage with separate power pack ✓
 - Adjustable delay up to 30 minutes (8-30 minutes) ✓
 - Power pack 20A load rated at 120/277V AC ✓
 - PIR, ultrasonic, and dual-tech type are all acceptable ✓

24V DC with class 2 low-voltage wiring; power pack / transformer required. 360 field of view, 1500 ft² coverage when mounted at 8-12'. PIR was chosen as it is better for major motion.

100-PERSON THEATER & PREFUNCTION

DMX System

Requirements

- Integration with digital A/V equipment using RS232 serial communication or over ethernet (included in Lutron Grafik Eye QS system) ✓

Addressable Fixtures

LUMENPULSE Lumenfacade Nano Horizontal Color Changing 8x8

LUMENPULSE Lumenfacade Horizontal Color Changing Wall Wash

ALCON 1" Aperture RGBW Linear

See **Appendix I** for fixture schedule and cutsheets.

Auxiliary Devices

DMX controller(s): **Aspect LED Wireless RGBW Multi-Zone Wall Controller**

24V DC power input, with wireless addressing, full RGBW control, and 0-100% brightness control / dimming.

DMX cables: unnecessary due to wireless control.

SPECIAL COLLECTIONS & DISPLAY GALLERY

Daylight sensors (photocells): **Cooper Greengate Open Loop Daylight Sensor**

Requirements: specified above in READING ROOM

Dimmer switch: **Lutron MA-1000-WH**

Requirements: specified above in BASICS

Vacancy and occupancy sensors: **Lutron Maestro Dual Technology Vacancy Sensor Switch, Lutron LOS C Series Occupancy Sensor**

Requirements

- Wall-switch sensor
 - 180-degree view field (adjustable from 180 to 40 degrees) ✓
 - Minimum coverage area of 900 ft² (900 ft² major motion, 400 ft² minor motion) ✓
 - Preferably dual technology ✓

LOBBY

4-button switch: **HomeWorks QS Wired seeTouch Keypad**

Requirements

- No visible attachment for faceplate ✓
- Removable button assemblies for configuration needs (replacement kits available) ✓
- Backlighting option ✓
- 4 scenes with raise/lower master and on/off ✓

24V DC with class 2 low-voltage wiring; power pack / transformer required. Compatible with Lutron Grafik Eye QS system.

Occupancy sensors: **Lutron LOS C Series Occupancy Sensor**

Requirements: specified above in READING ROOM

MEDIA COMMONS

Daylight sensors (photocells): **Cooper Greengate Open Loop Daylight Sensor**

Requirements: specified above in READING ROOM

Occupancy sensors: **Lutron LOS C Series Occupancy Sensor**

Requirements: specified above in READING ROOM

EAST FACADE

Dimmer switch: **Lutron MA-1000-WH**

Requirements: specified above in BASICS

DAYLIGHT CONTROLS AND ZONING: MEDIA COMMONS EXAMPLE

In order to provide more comprehensive controls in the Media Commons, a new RLCP (room lighting control panel) must be introduced, and the new lights need to be put on new circuits zoned for control. The current light fixtures in the space are on circuits EH1-19 and EH1-21; this panelboard has ample spare capacity, so these fixtures can be kept on the same panel, albeit in a few more slots. What follows is 1) the original EH1 panelboard schedule and 2) the revised EH1 panelboard schedule, as well as load calculations for the new fixtures. For the spreadsheet version, please refer to **Appendix II**.

PANELBOARD EH1 SCHEDULE

RATED FOR 100 A (REFERENCED FROM RISER DIAGRAM)													
LOAD SERVED	LOAD (AMPS)			BKR TRIP	CKT NO.	PHASE A B C	CKT NO.	BKR TRIP	LOAD (AMPS)			LOAD SERVED	
	A	B	C						A	B	C		
LTG 143D	8.5			20/1P	1	A	2	20/1P				LTG EXTERIOR	
LTG 143D		8.0		20/1P	3	B	4	20/1P				SPARE	
LTG 142,3,154-6			9.0	20/1P	5	C	6	20/1P				SPARE	
LTG 1202, 1211-3, L1-C-01, 9	12.2			20/1P	7	A	8	20/1P				SPARE	
LTG 1211, 2, 4, 6, 8, 20, L1-C-02		8.2		20/1P	9	B	10	20/1P				SPARE	
LTG 2302, L2-C-02, 3			8.6	20/1P	11	C	12	20/1P				SPARE	
LTG 2308-10, L2-C-05-09	6.3			20/1P	13	A	14	20/1P				SPARE	
LTG ST-G		1.2		20/1P	15	B	16	20/1P				SPARE	
LTG 2309			4.2	20/1P	17	C	18	20/1P				SPARE	
LTG 2314, 2317	6.3			20/1P	19	A	20	20/1P				SPARE	
LTG 2316, L2-C-13, 12, 3, 6, 7, 8, 4		10.3		20/1P	21	B	22	20/1P				SPARE	
LTG ST-H			1.9	20/1P	23	C	24	20/1P				SPARE	
LTG 2319, ST-J	3.1			20/1P	25	A	26	20/1P				SPARE	
LTG ST-L, K		3.2		20/1P	27	B	28	20/1P				SPARE	
LTG 3001			3.8	20/1P	29	C	30	20/1P				SPARE	
LTG 3001	11.1			20/1P	31	A	32	20/1P				SPARE	
LTG 2318B		9.9		20/1P	33	B	34	20/1P				SPARE	
LTG ATTIC			6.0	20/1P	35	C	36	20/1P			4.0	GAS SHUT-OFF	
SPARE				20/1P	37	A	38	20/1P	26			PANEL EP1 VIA XFMR	
SPARE				20/1P	39	B	40	20/1P		14.2			
SPARE				20/1P	41	C	42	20/1P			11.8		
TOTAL	47.5	40.8	33.5	TOTAL CONNECTED AMPS			A: 73.5	B: 55.0	C: 49.3	26	14.2	15.8	TOTAL

The load names highlighted in **red** are those that are a part of the Media Commons (Information & Technology Commons combined spaces). All of circuit 19 can be altered; however, circuit 21 contains other loads. The total load of the new space was found to be 9.41 A (refer to **Appendix II** for spreadsheet calculation). Assuming that the designs are comparable, LTG L2-C-13 contributes approximately 3.1 A of load, leaving 7.2 A on circuit 21.

In order to better balance the phases of the panelboard, the new lighting circuits will be strategically placed on phases B and C.

NEW CIRCUIT	LOAD (A)
LTG 2317	2.36
LTG 2314 WEST	1.02
LTG 2314 EAST	1.02
LTG 2314 CENTRAL, LC-2-13	4.96

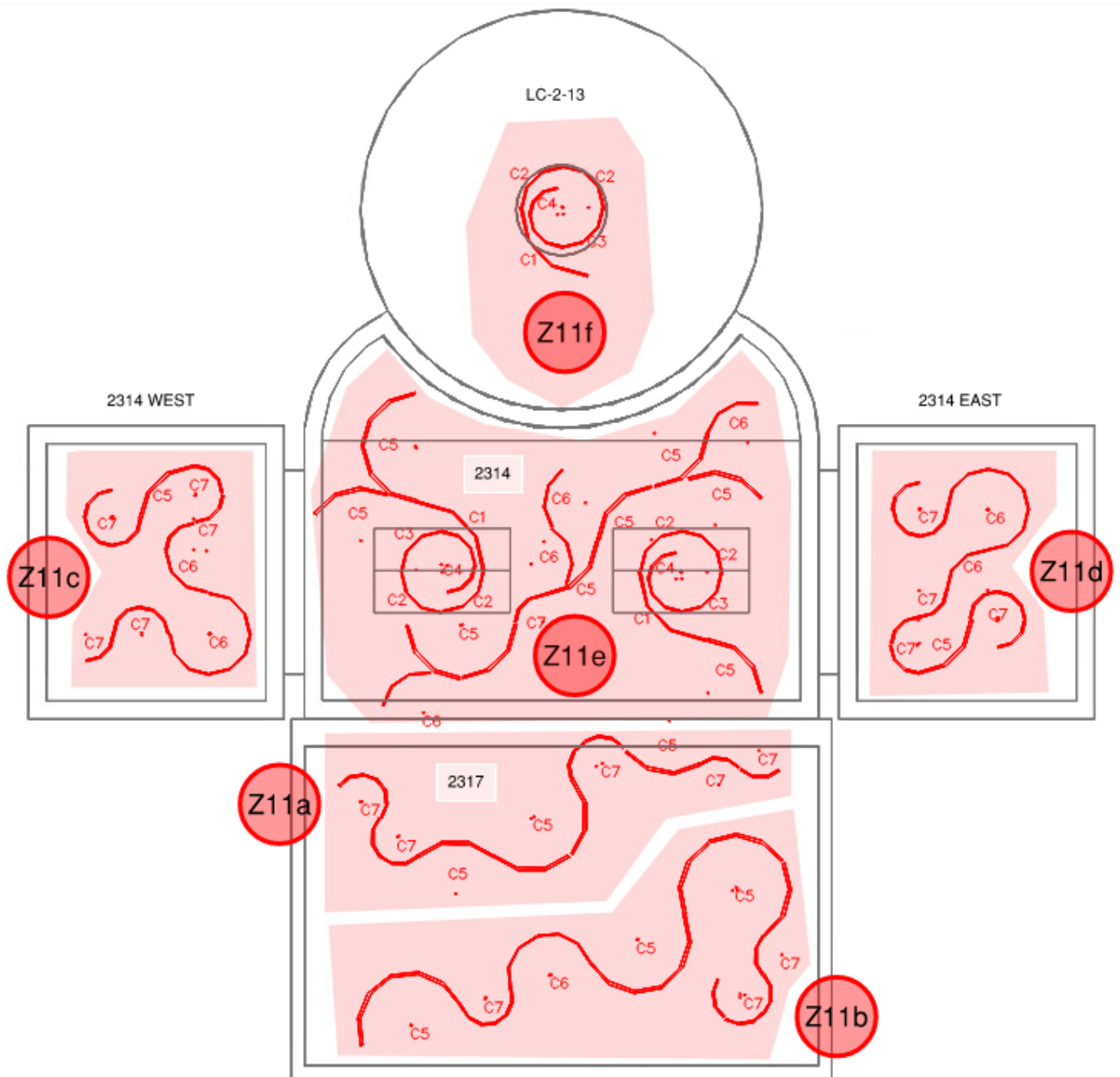
The space was divided into four separate circuits, which not only promotes ease and clarity of control, but also provides a break where a long and costly span of conduit would have otherwise been required. These new circuit loads were calculated as shown in the image to the right. The fixture types on each circuit were counted, their total wattage

summed, then converted to an amperage load by the equation $I_A = P_W / \sqrt{3} * PF * V$, where $PF = 0.9$ and $V = 120V$. For the full calculations, again, please refer to **Appendix II**.

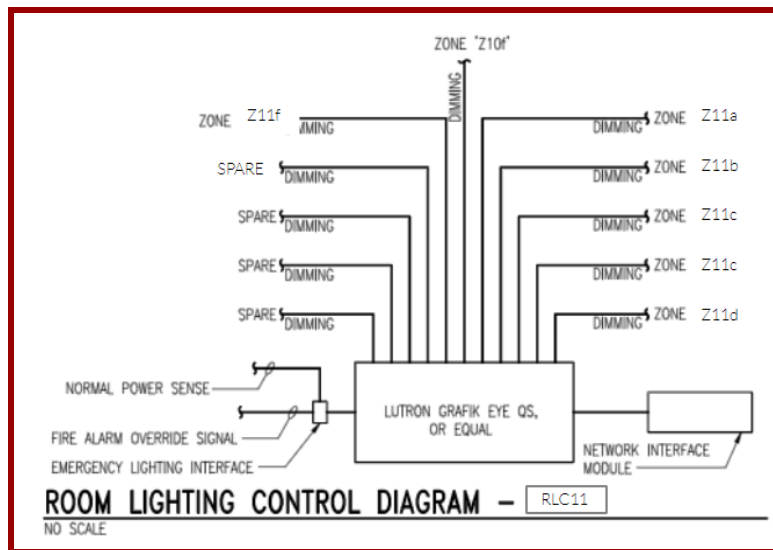
The new panelboard is shown below. Note that the phases are slightly more balanced.

PANELBOARD EH1 SCHEDULE - NEW CONTROLS												
RATED FOR 100 A (REFERENCED FROM RISER DIAGRAM)												
LOAD SERVED	LOAD (AMPS)			BKR	CKT	PHASE	CKT	BKR TRIP	LOAD (AMPS)			LOAD SERVED
	A	B	C	TRIP	NO.	A B C	NO.		A	B	C	
LTG 143D	8.5			20/1P	1	A	2	20/1P				LTG EXTERIOR
LTG 143D		8.0		20/1P	3	B	4	20/1P				SPARE
LTG 142,3,154-6			9.0	20/1P	5	C	6	20/1P				SPARE
LTG 1202, 1211-3, L1-C-01, 9	12.2			20/1P	7	A	8	20/1P				SPARE
LTG 1211, 2, 4, 6, 8, 20, L1-C-02		8.2		20/1P	9	B	10	20/1P				SPARE
LTG 2302, L2-C-02, 3			8.6	20/1P	11	C	12	20/1P				SPARE
LTG 2308-10, L2-C-05-09	6.3			20/1P	13	A	14	20/1P				SPARE
LTG ST-G		1.2		20/1P	15	B	16	20/1P		2.4		LTG 2317
LTG 2309			4.2	20/1P	17	C	18	20/1P			5.0	LTG 2314 CENTRAL, LC-2-13
LTG 2314 WEST	1.0			20/1P	19	A	20	20/1P				SPARE
LTG 2314 EAST, 2316, L2-C-04, 12, 3, 6, 7, 8		8.2		20/1P	21	B	22	20/1P				SPARE
LTG ST-H			1.9	20/1P	23	C	24	20/1P				SPARE
LTG 2319, ST-J	3.1			20/1P	25	A	26	20/1P				SPARE
LTG ST-L, K		3.2		20/1P	27	B	28	20/1P				SPARE
LTG 3001			3.8	20/1P	29	C	30	20/1P				SPARE
LTG 3001	11.1			20/1P	31	A	32	20/1P				SPARE
LTG 2318B		9.9		20/1P	33	B	34	20/1P				SPARE
LTG ATTIC			6.0	20/1P	35	C	36	20/1P			4.0	GAS SHUT-OFF
SPARE				20/1P	37	A	38	20/1P	26			
SPARE				20/1P	39	B	40	20/1P		14.2		PANEL EP1 VIA XFMR
SPARE				20/1P	41	C	42	20/1P			11.8	
TOTAL	42.2	38.7	33.5						26	16.6	20.8	TOTAL
TOTAL CONNECTED AMPS						A: 68.2	B: 55.3	C: 54.3				

MEDIA COMMONS ZONING AND SENSOR LAYOUT

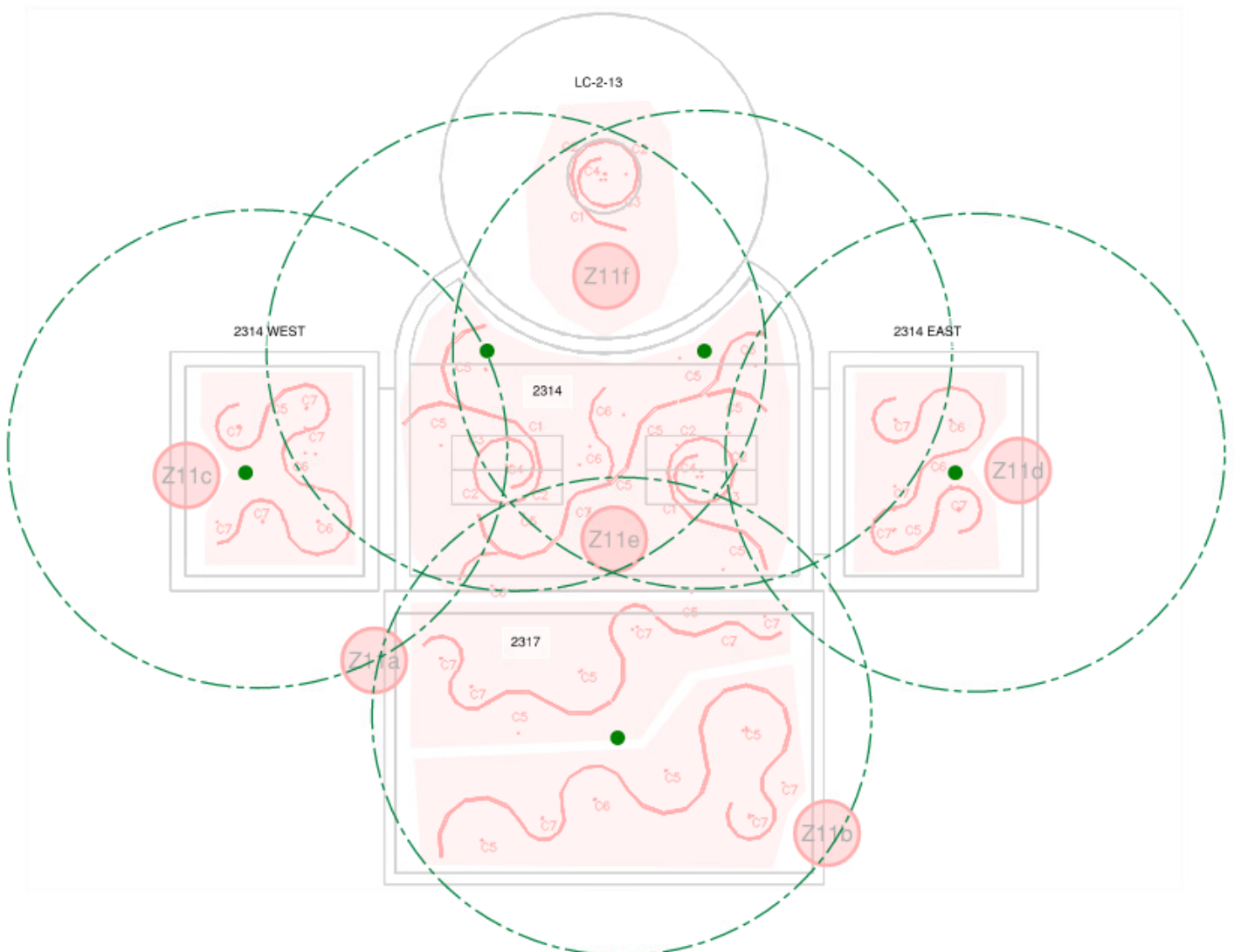


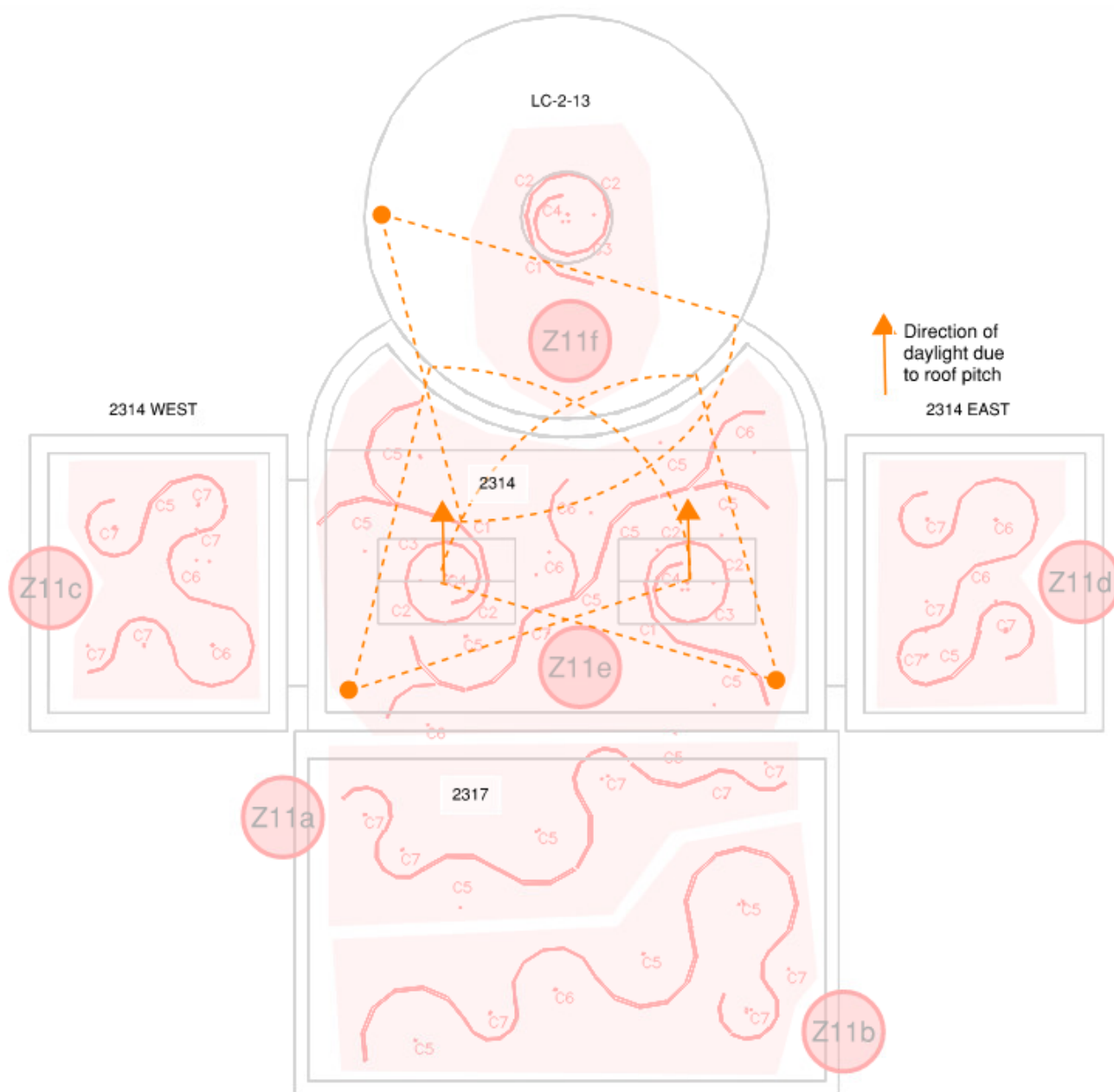
Above is an indication of the new control zones, as well as the room names for the new and altered circuits 16, 18, 19, and 21.



To the left is the control diagram for the new RLC11.

The below image is an occupancy sensor layout diagram, which indicates the proposed locations of five new occupancy sensors. Their coverage of 1500 ft² is indicated as a dotted line around the sensor. All are mounted at 12' or below, the requirement for this level of coverage.





The above image is a diagram showing the placement of three new 60-degree daylight sensors. As this space receives a very high amount of daylight (sDA 88.7; see **MAE Depth**), the High (3-300 fc) daylight input setting will be chosen for all three. The two southmost sensors are mounted on the pitched ceiling, behind the skylights in relation to where most of the daylight will enter. Although the high mounting decreases the range of the sensors, this should be mitigated by the sheer amount of daylight in the space. The third sensor, mounted at 12' on the underside of the dome's cornice detail, accounts for the large amount of daylight in the southern half of room LC-2-13.

MAE COMPUTER OPTIMIZATION & DAYLIGHTING DEPTH

INTRODUCTION

The Media Commons (combined Information & Technology Commons) is a large space centrally located in the library that serves a major workspace for students. Despite this, there is no natural light in the space, whether from windows or skylights.

MOTIVATION & SCOPE

Because natural light has been proven to have positive effects on mood, health, and productivity, the addition of skylights to the main roof of the space should be investigated. Number, size, and placement of skylights, as well as roof pitch, play an important role in providing ample daylight. This analysis optimizes the arrangement and roof pitch with respect to the maximum value of sDA (spatial daylight autonomy) achievable in the space.

Optimal skylight layouts can be calculated by hand; however, the efficiency of the process can be vastly improved by an optimization algorithm. This study makes use of the Rhino companion analysis software, Grasshopper, as well as the plugin DIVA and the optimization tools Radical and Galapagos. All tool authors are cited in **Appendix IV** attached to this thesis.

ANALYSIS SUMMARY

In short, this analysis details the construction of the Rhino / Grasshopper model of the Media Commons, the subsequent optimization of sDA with two different algorithms, and the associated interpretations and product selection.

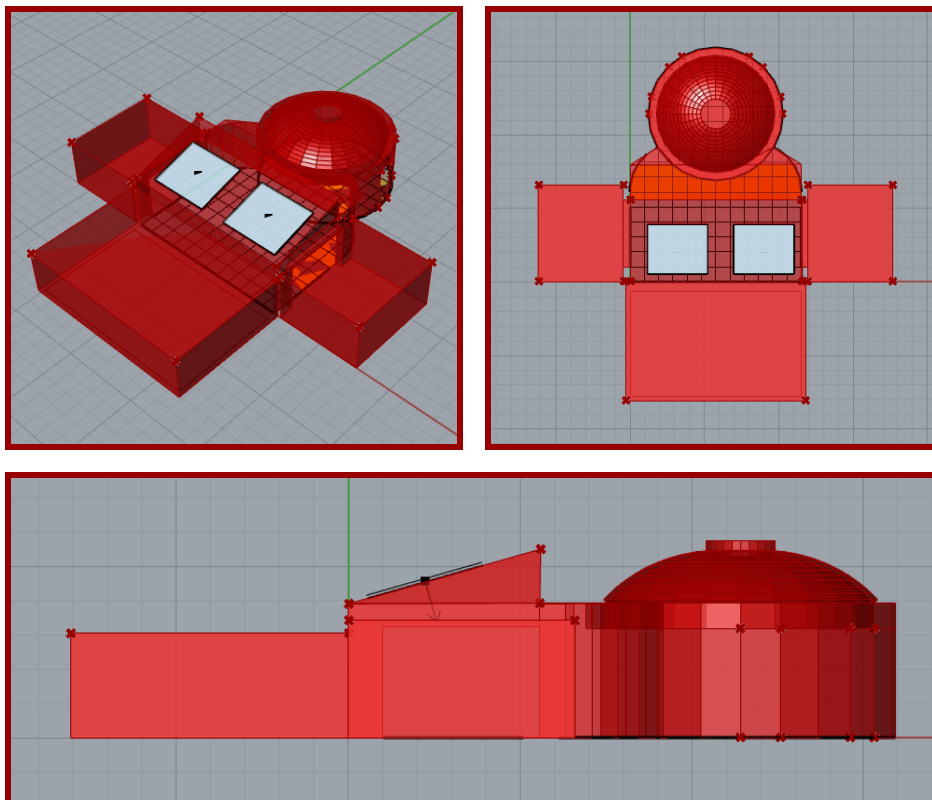
As a note, rectangular skylights were chosen as the objective for optimization. While tubular skylights have comparable energy-saving benefits and daylight capture, their aesthetic and thematic function is different. One of the goals of this study is to connect the Media Commons to the outside; therefore, clear-glazed rectangular skylights were chosen rather than daylight tubes, which mimic artificial light fixtures.

MODEL CONSTRUCTION & PARAMETERS

The model of the Media Commons was constructed in Sketchup Pro software, then imported to Rhino. The ceiling was left out and reconstructed in Grasshopper, in order to make it parametrically configurable. The following parametric variables were set forward:

VARIABLE	UNIT	BOUNDS
Rows	--	1 - 5
Columns	--	1 - 5
Left Boundary	% of curve division length	0.1 - 0.4
Right Boundary	% of curve division length	0.5 - 0.9
Upper Boundary	% of curve division length	0.1 - 0.4
Bottom Boundary	% of curve division length	0.5 - 0.9
Roof Height	m (increments of 0.5)	3.9 - 9

These values were used to create a wide array of skylight configurations, with different numbers, sizes, and roof pitches. To give an idea of the model's appearance and orientation, the following images have been included.



A daylight simulation was set up in DIVA, with the following parameters:

GRID SPACING: 1 meter

GRID PLACEMENT: At finished floor

MATERIAL REFLECTANCES: 80 / 60 / 20

SKYLIGHT GLAZING: Double-glazed; 80% VT

LOCATION: Dulles International Airport (.EPW file)

PRIMARY OPTIMIZATION WITH GALAPAGOS

After ensuring a successful daylighting simulation, an optimization was set up in Galapagos to maximize sDA. The image on the right shows the parameters specified for the optimization. The evolutionary solver algorithm was used, with Fitness (objective function) set to sDA and Genome (variables) set to those referenced in the table on the previous page.

Included below is a table of the starting values of each parametric variable in the simulation.

The screenshot shows the Galapagos Editor window with the following settings:

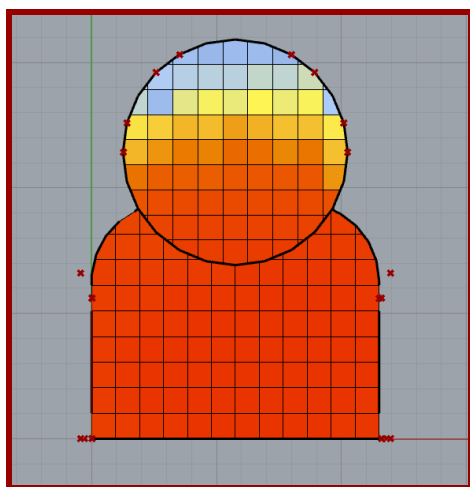
- Options:** Solvers, Record
- Generic:**
 - Fitness: Maximize
 - Threshold: 100
 - Runtime Limit: ☒ Enable
 - Max. Duration: 3 Hours, 0 Minutes
- Evolutionary Solver:**
 - Max. Stagnant: 50
 - Population: 50
 - Initial Boost: 2
 - Maintain: 5%
 - Inbreeding: 75%
- Annealing Solver:**
 - Temperature: 100%
 - Cooling: 0.9500
 - Drift Rate: 0.25%

VARIABLE	UNIT	STARTING VALUE
Rows	--	1
Columns	--	1
Left Boundary	% of curve division length	0.4
Right Boundary	% of curve division length	0.5
Upper Boundary	% of curve division length	0.4
Bottom Boundary	% of curve division length	0.5
Roof Height	m (increments of 0.5)	3.9

After the simulation, Galapagos yielded a **maximum sDA of 88.7**, at the following values:

VARIABLE	UNIT	OPTIMAL VALUE (Galapagos)
Rows	--	1
Columns	--	2
Left Boundary	% of curve division length	0.1
Right Boundary	% of curve division length	0.7
Upper Boundary	% of curve division length	0.1
Bottom Boundary	% of curve division length	0.8
Roof Height	m (increments of 0.5)	5.5 (from floor)

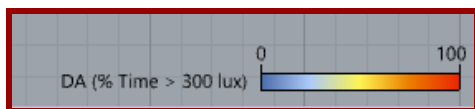
As one can see from the sDA grid to the left, the main space has been fully maximized to sDA 100, while the dome (Information Commons) has lower values, dipping into the 50s and below.



The **optimal roof pitch angle**, using the roof height value, was calculated to be **15.695815 degrees**. This will be referenced later in the Structural breadth.

On the following page is the summary of a secondary analysis using a different tool, as well as the interpretation and implementation of results.

NOTE: Grasshopper and associated Rhino files can be provided upon request of the reader.



SECONDARY OPTIMIZATION WITH RADICAL

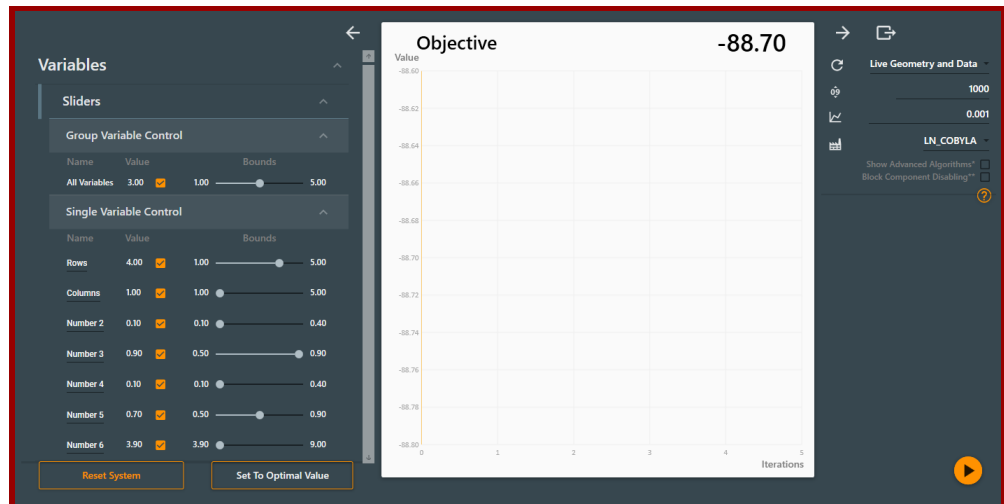
A second optimization was conducted with the Radical tool, part of the Design Space Exploration plugin for Grasshopper. This was done to confirm the analysis conducted by Galapagos; below is an image of its

output. This tool also yielded a **maximum sDA value of 88.7**.

NOTE:

The value given in the image is negative due to the nature of the Radical tool. It is built to minimize

values, rather than maximize. Therefore, the sDA value was multiplied by -1 before being optimized in Radical, yielding a negative maximum value.



INTERPRETATION & IMPLEMENTATION OF RESULTS

This analysis suggests that two large skylights, tilted at an angle of approximately 16 degrees, will provide optimal usable daylight to this space, based on its orientation and solar location. The question now is: can this computer-generated solution be practically implemented?

First, we must determine the actual dimensions of the optimal skylights. Due to the nature of the parametric variables (in percentage of divided curve length), this will need to be done proportionally. The ceiling in the x-direction is 11.5 meters, and in the y-direction is 5.5 meters long. The x-calculation yields: $11.5 / 2 = 5.75 * 0.7 - 5.75 * 0.1 = 3.45$ m. The y-calculation yields $5.5 / 2 = 2.75 * 0.8 - 2.75 * 0.1 = 1.925$ m. Therefore, skylights of dimensions 3.45 x 1.925 m, or **11.3 x 6.3 ft**, will be needed.

As a rule of thumb, skylights should not take up more than 15% of a given space's floor area. The floor area of the space chosen for study, the Information Commons and main room of the Technology Commons, is 1645.74 ft², so the maximum skylight area should be 246.861 ft². The current skylight area is **142.38 ft²**, which is within the 15% window. That said, an 11x6 skylight is very large, and is not practical to specify or install

Instead, the chosen skylight will be the Wasco SkyMax large-span skylight, with a maximum area of 32 ft². Two of these **10' x 3' 2 1/2" skylights**, placed side by side, should provide as similar an effect as possible to each of the 11' 3 3/8" x 6' 3 3/8" optimal skylights. The chosen skylight is pictured below.

The SkyMax is suitable for roof pitches from 1 to 60 degrees, meets IECC energy code in all climate zones, and its specified glazing is a double layer: one of 1/16" Solarban 70XL Low-E coated glass and one of clear glass, with a VT of 64% and SHGC of 0.27. See **Appendix II** for the chosen skylight's technical documents and further specifications.

Running the sDA calculation again, with the adjusted VT and glazing properties, the result is **85.0**.



CONCLUSION

Calculating skylight layouts by hand, while possible, can be improved upon through the use of computer optimization, as long as the user has a grasp on what is and is not realistic in terms of implementation.

Upon installation, these skylights will provide ample spatial daylight autonomy to the students in the Media Commons, improving physical wellbeing and productivity. Furthermore, the low solar heat gain coefficient, paired with the new daylighting controls detailed in the electrical depth, will help improve energy consumption.

To investigate the required structural alterations to the designated roof section, please refer to the Structural Breadth on **page 70**.

ACOUSTIC BREATH

INTRODUCTION

The 100-Person Theater on the second floor, while small, does not have a dedicated system for mitigating the noise from visiting speakers or performances. This analysis aims to evaluate the current ability of the space to absorb this noise, to provide a comprehensive measure of acoustic treatment, and to re-analyze the space's acoustic properties post-noise mitigation.

MOTIVATION & SCOPE

Because most of the Tribble Library is devoted to quiet study, a speaker or performance in the 100-person theater could create enough sound trespass to potentially disrupt these endeavors. Measures may need to be taken to keep the library surrounding the theater quiet during these times; this study aims to discern how much mitigation is needed.

This analysis will be done through a calculation of the theater's room sound absorption and reverberation time before and after the new acoustic treatment (if deemed necessary), as well as a study of sound trespass into an adjacent space in the library proper. Three calculation cases will be considered, for three of the standard octave band center frequencies: 500 Hz, 1000 Hz, and 2000 Hz. These frequencies were chosen as they are typically used to calculate the acoustic properties of materials for commercial distribution.

ROOM SOUND ABSORPTION

The tables on the following page detail the absorption coefficient for each major material present in the theater, for the three specified octave band center frequencies. They also indicate the total surface area takeoff for each material region.

These values have been provided both in the Pennsylvania State University's AE 309 (Acoustics) course and by the LEED v4 handbook, used for assigning acoustic points to LEED candidate buildings.

Following the tables is a calculation of the total room sound coefficient for each octave band center frequency.

500 Hz

ELEMENT	MATERIAL	α	AREA (ft ²)
FLOOR	Broadloom carpet	0.15	1027.48
WALLS	Plaster	0.02	1271.88
CEILING	Gypsum	0.05	1519.16
DOORS	Wood	0.1	196.14
STAGE	Wood	0.1	280.96
FURNITURE	Med. upholstered seats	0.70 / 0.82 occupied	493.03

1000 Hz

ELEMENT	MATERIAL	α	AREA
FLOOR	Broadloom carpet	0.3	1027.48
WALLS	Plaster	0.03	1271.88
CEILING	Gypsum	0.04	1519.16
DOORS	Wood	0.07	196.14
STAGE	Wood	0.07	280.96
FURNITURE	Med. upholstered seats	0.72 / 0.85 occupied	493.03

2000 Hz

ELEMENT	MATERIAL	α	AREA
FLOOR	Broadloom carpet	0.5	1027.48
WALLS	Plaster	0.04	1271.88
CEILING	Gypsum	0.07	1519.16
DOORS	Wood	0.06	196.14
STAGE	Wood	0.06	280.96
FURNITURE	Med. upholstered seats	0.68 / 0.86 occupied	493.03

INITIAL ROOM SOUND ABSORPTION (cont.)

$$A_T = \sum A_i = \sum S_i \alpha_i$$

	500 Hz	1000 Hz	2000 Hz
A_T (sabins) - UNOCCUPIED	648.35	795.54	1034.84
A_T (sabins) - OCCUPIED	707.51	859.64	1123.59
UNOCCUPIED α	0.135	0.166	0.216
OCCUPIED α	0.148	0.180	0.235

INITIAL REVERBERATION TIME

CONSTANT VALUES

Total volume of space: 22,223.7 ft³

Total surface area of space: 4,788.65 ft²

Air attenuation constants:

500 Hz - 0.001 dB / ft

1000 Hz - 0.001 dB / ft

2000 Hz - 0.003 dB / ft

SABINE EQUATION (for $\alpha_T < 0.20$)

$$RT_{500} = 0.049V / (S_T \alpha + 4a_a V)$$

$$= 0.049(22223.7) / (4788.65 * 0.135 + 4 * 0.001 * 22223.7)$$

$$= \mathbf{1.48 \text{ s, UNOCCUPIED}}$$

$$= 0.049(22223.7) / (4788.65 * 0.148 + 4 * 0.001 * 22223.7)$$

$$= \mathbf{1.54 \text{ s, OCCUPIED}}$$

$$RT_{1000} = 0.049V / (S_T \alpha + 4a_a V)$$

$$= 0.049(22223.7) / (4788.65 * 0.166 + 4 * 0.001 * 22223.7)$$

$$= \mathbf{1.23s, UNOCCUPIED}$$

$$= 0.049(22223.7) / (4788.65 * 0.180 + 4 * 0.001 * 22223.7)$$

$$= \mathbf{1.14s, OCCUPIED}$$

NORRIS-EYRING EQUATION (for $\alpha_T > 0.20$)

$$RT_{2000} = 0.049V / (-S_T \ln(1 - \alpha) + 4a_a V)$$

$$= 0.049(22223.7) / (-4788.65 * \ln(1 - 0.216) + 4 * 0.003 * 22223.7)$$

$$= \mathbf{0.84s, UNOCCUPIED}$$

$$= 0.049(22223.7) / (-4788.65 * \ln(1 - 0.235) + 4 * 0.003 * 22223.7)$$

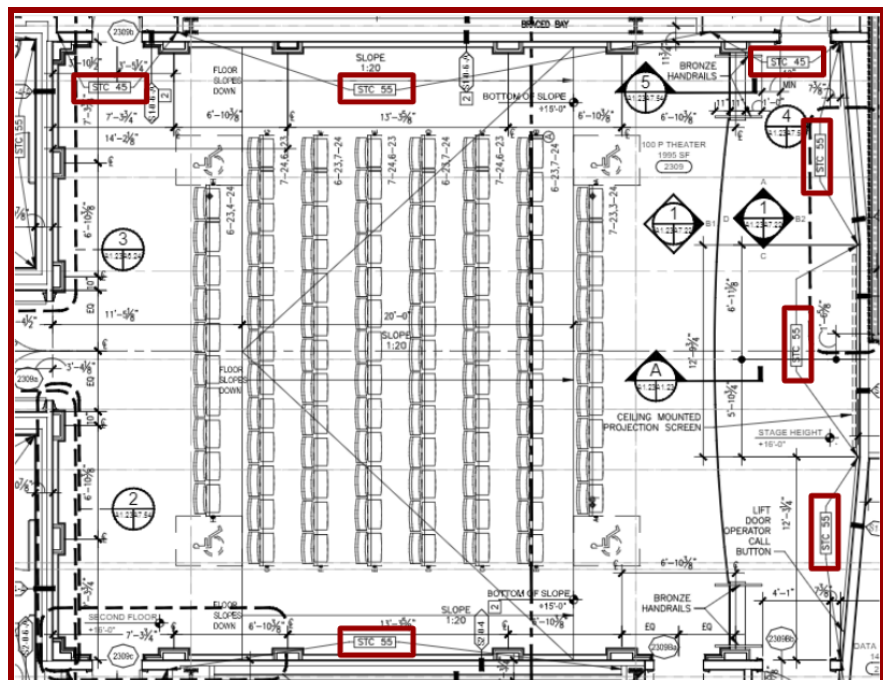
$$= \mathbf{0.78s, OCCUPIED}$$

The desired reverberation time for a small auditorium is generally said to be between **1.5 - 2.0 seconds**. As can be seen here, the values are within, or in fact, lower than this threshold. The slightly lower values are ideal for a library where sound absorption is a design goal, so no extra measures will be taken to increase the calculated values for the 1000Hz and 2000Hz octave band center frequencies.

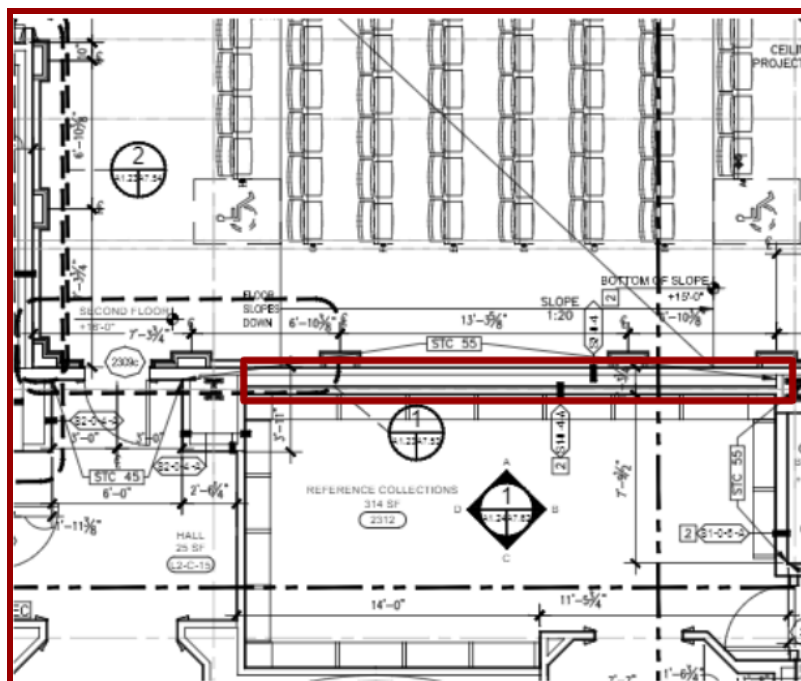
WALL STC RATINGS

The image to the right, taken from the architect-provided drawings (Sheet A1.23) indicates the STC (sound transmission class) rating for the walls of the theater.

For the purpose of this study, we will focus on the south wall, with an STC of 55. This wall borders the



Reference Collections room, a quiet library storage and reading space. The common partition is indicated in the image below, and is 25' 5 3/4" in length.



Converting the STC of 55, the FSTC (field sound transmission class) rating of the current wall is 50. These values are considered minimum quality in terms of acoustic absorbance, and may not be sufficient for this room. Generally, performance and speaking-based spaces should have walls of a minimum STC of 60, or 55 FSTC.

Next, we'll look at the noise criteria set for these two rooms.

	NC	SPL, 500Hz	SPL, 1000Hz	SPL, 2000Hz
Theater (small auditorium, <500 seats)	NC-30	35	31	29
Reference Collections (library)	NC-35	40	37	35

Interestingly, the noise criterion for the Reference Collections is higher than that of the theater. Still, conducting a small study into sound transmission between the spaces will be useful for determining whether STC 55 is high enough for the partition between the spaces.

$$L_R = L_S - R + 10 \log (S_w / A_r)$$

L_r = Receiving room average SPL (dB)

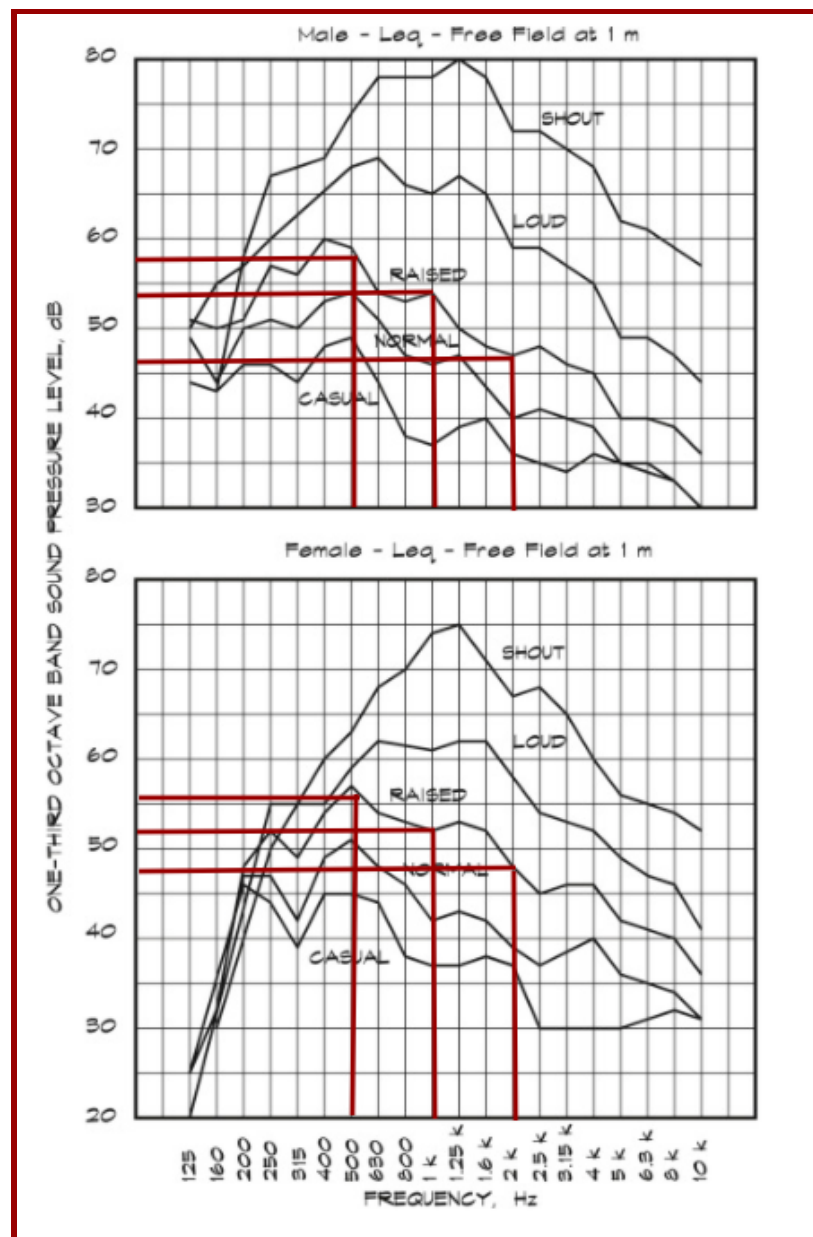
L_s = Source room average SPL (dB)

R = Field transmission loss (dB)

S_w = Common / transmitting surface area (ft²)

A_r = Room constant of the receiving room (ft² sabins)

L_s , the sound pressure level (SPL) in the source room should be determined. The charts below detail sound pressure levels at the three chosen octave band center frequencies, for male and female voices. The *raised* voice curve was chosen as, in this space, most of the use cases will be guest lectures or small performances, implying a voice amplified by a microphone.



The values, averaged between male and female, are as follows:

500 Hz = **56.5 dB**
1000 Hz = **53 dB**
2000 Hz = **46.5 dB**

Field transmission loss, R , is calculated by the equation $10 \log \tau$, where τ is transmission loss. According to the STC 55 contour, transmission loss of the partition is:

500 Hz = 53
1000 Hz = 60
2000 Hz = 61

Using the equation, R is as follows:

500 Hz = **17.24**
1000 Hz = **17.78**
2000 Hz = **17.85**

S_w , the common partition area, is 25' 5 3/4" x 11' 3" (ceiling height) = **286.64 ft²**.

Finally, A_r , the room constant, is calculated as $S \cdot \alpha / 1 - \alpha$, or the surface area of the room times

the average absorption coefficient, over one minus the average absorption coefficient. These values have been calculated assuming that the source room (theater) is occupied.

500 Hz = **829.8**

$$1000 \text{ Hz} = \mathbf{1047.6}$$

$$2000 \text{ Hz} = \mathbf{1432.4}$$

The compiled values:

$$L_r = \text{unknown}$$

$$L_s = 56.5, 53, 46.5$$

$$R = 17.24, 17.28, 17.85$$

$$S_w = 286.64$$

$$A_r = 829.8, 1047.6, 1432.4$$

$$L_R = L_s - R + 10 \log (S_w / A_r)$$

$$L_{R 500 \text{ Hz}} = 56.5 - 17.24 + 10 \log (286.64 / 829.8) = 34.74 \text{ dB}$$

$$L_{R 1000 \text{ Hz}} = 53 - 17.28 + 10 \log (286.64 / 1047.6) = 30.09 \text{ dB}$$

$$L_{R 2000 \text{ Hz}} = 46.5 - 17.85 + 10 \log (286.64 / 1432.4) = 21.66 \text{ dB}$$

To summarize, the noise criteria of the Reference Collections are detailed below and compared to the found SPLs transmitted by the adjacent room.

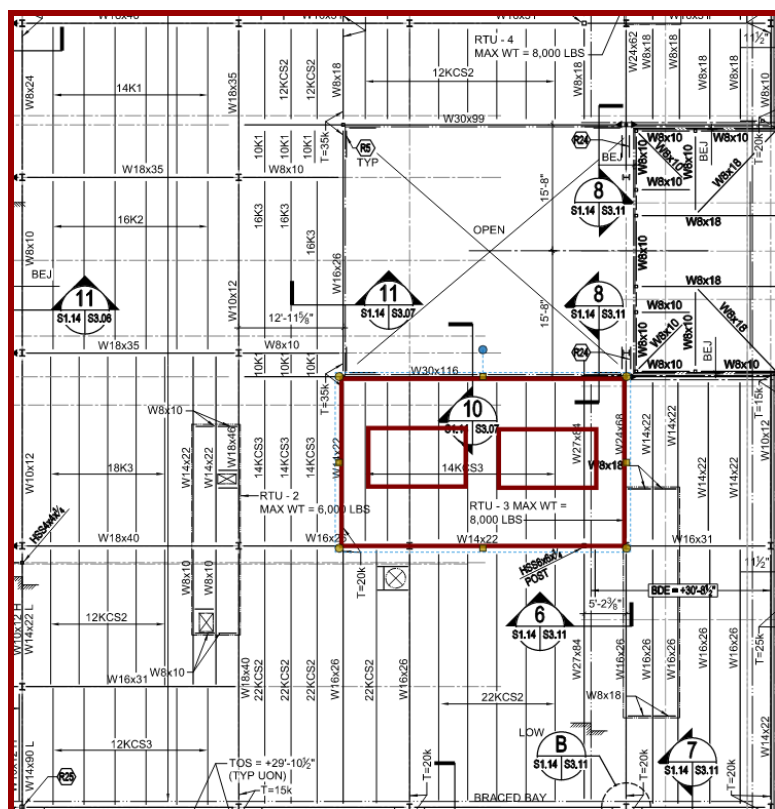
	NC	SPL, 500Hz	SPL, 1000Hz	SPL, 2000Hz
Reference Collections (library)	NC-30	40	37	35
Sound received from Theater		35	30	22

These values are within the sound pressure levels given by the noise criteria, so no change in common partition is needed. That said, a reduction could be helpful as the values, especially at 500 and 1000 Hz, do approach the upper limit of acceptability. A slightly higher STC partition, perhaps 60, would be more in line with the typical standards for an acoustically-sensitive space.

INTRODUCTION

MOTIVATION & SCOPE

determined algorithmically in the Daylighting depth to be 15.69 degrees, which has been rounded to 16 degrees here as a worst-case loading scenario. The area of the affected roof is 34.5'x 19.5'.



The following study calculates the adjusted dead, live, snow, wind uplift, and wind downlift loads on the pitched roof. New structural framing is laid out in the adjusted roof and around the skylights. Finally, in the structural loading simulation software ETABS, the required members are sized using these hand-calculated assigned loads.

Because the Tribble Library renovation follows IBC 2012, ASCE

710 is applied and referenced throughout the following load adjustment calculations.

CALCULATION OF ADJUSTED LOADS

The following loads were referenced from Sheet S0.01 of the provided drawings, and can be safely assumed as unaltered by roof pitch.

Load Type	Load	Unit
Live	20	PSF
Dead	10	PSF
Snow	16.5	PSF

The wind load is more complex, as it is altered by an increased roof pitch. Values for the load cases of both wind uplift and wind downlift needed to be calculated. The following is a summarized version of these calculations, the rough hand versions of which are included in **Appendix III** of this report.

A few values given on Sheet S0.01 were necessary for the calculation:

Useful given values

Wind speed: 120 MPH

Exposure category: B

Internal pressure coefficient: +/- 0.18

The wind load equation is as follows for both load cases, uplift and downlift:

$$p = q_z * G * C_p - q_z * (G * C_{pi})$$

where

q_z = wind pressure

G = 0.85 (standard)

C_p = pressure coefficient = -0.826 (uplift); -0.16632 (downlift)

This value is found by interpolation of values in Figure 27.4-1 in ASCE 710.

It is partially determined by the ratio of roof height vs. length, or the pitch.

See full calculations for interpolation.

C_{pi} = internal pressure coefficient = +/- 0.18 (uplift/downlift)

Wind pressure, q_z , is calculated by the following equation:

$$q_z = 0.00256 K_z * K_{zt} * K_d * V^2$$

where

$$K_z = 2.01 (z/z_g)^{2/a} = 0.58$$

$$z = \text{mean roof height, } 15.8'; z_g = 1200, a = 7.0$$

See full calculations for further information.

$$K_{zt} = 1 \text{ (due to mostly flat topography)}$$

$$K_d = 0.5 \text{ (standard)}$$

$$V = \text{wind speed} = 120 \text{ MPH}$$

$$q_z = \mathbf{10.69 \text{ PSF}}$$

Reapplying wind pressure to the wind load case equation:

$$p = q_z * G * C_p - q_z * (G * C_{pi})$$

$$p = (q_z * G) * (C_p - C_{pi})$$

UPLIFT

$$p = (10.69 * 0.85) * (-0.826 - 0.18)$$

$$\mathbf{p_{UPLIFT} = -9.141 \text{ PSF}}$$

DOWNLIFT

$$p = (10.69 * 0.85) * (-0.16632 + 0.18)$$

$$\mathbf{p_{DOWNLIFT} = 0.1243 \text{ PSF}}$$

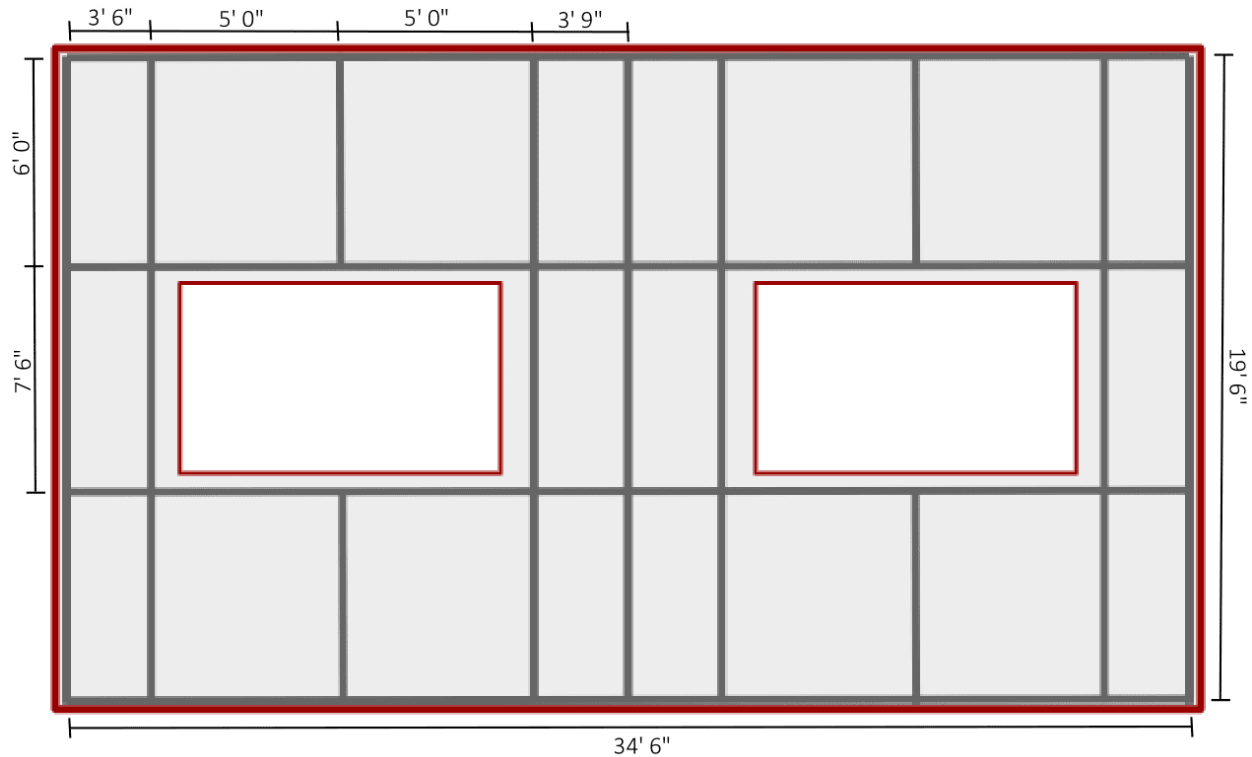
With the new wind loads calculated, the loads were as follows:

Load Type	Load	Unit
Live	20	PSF
Dead	10	PSF
Snow	16.5	PSF
Wind (uplift)	-9.141	PSF
Wind (downlift)	0.1243	PSF

Following this calculation of the raw PSF for each load, tributary width was determined and total loads were calculated in Excel for each member. If desired, please contact msh5424@psu.edu for the full structural calculation operable spreadsheet.

FRAMING DESIGN

Along with the horizontal members of the original design, additional framing was needed around the new skylights. The following design was proposed:



APPLICATION OF LOAD CASES

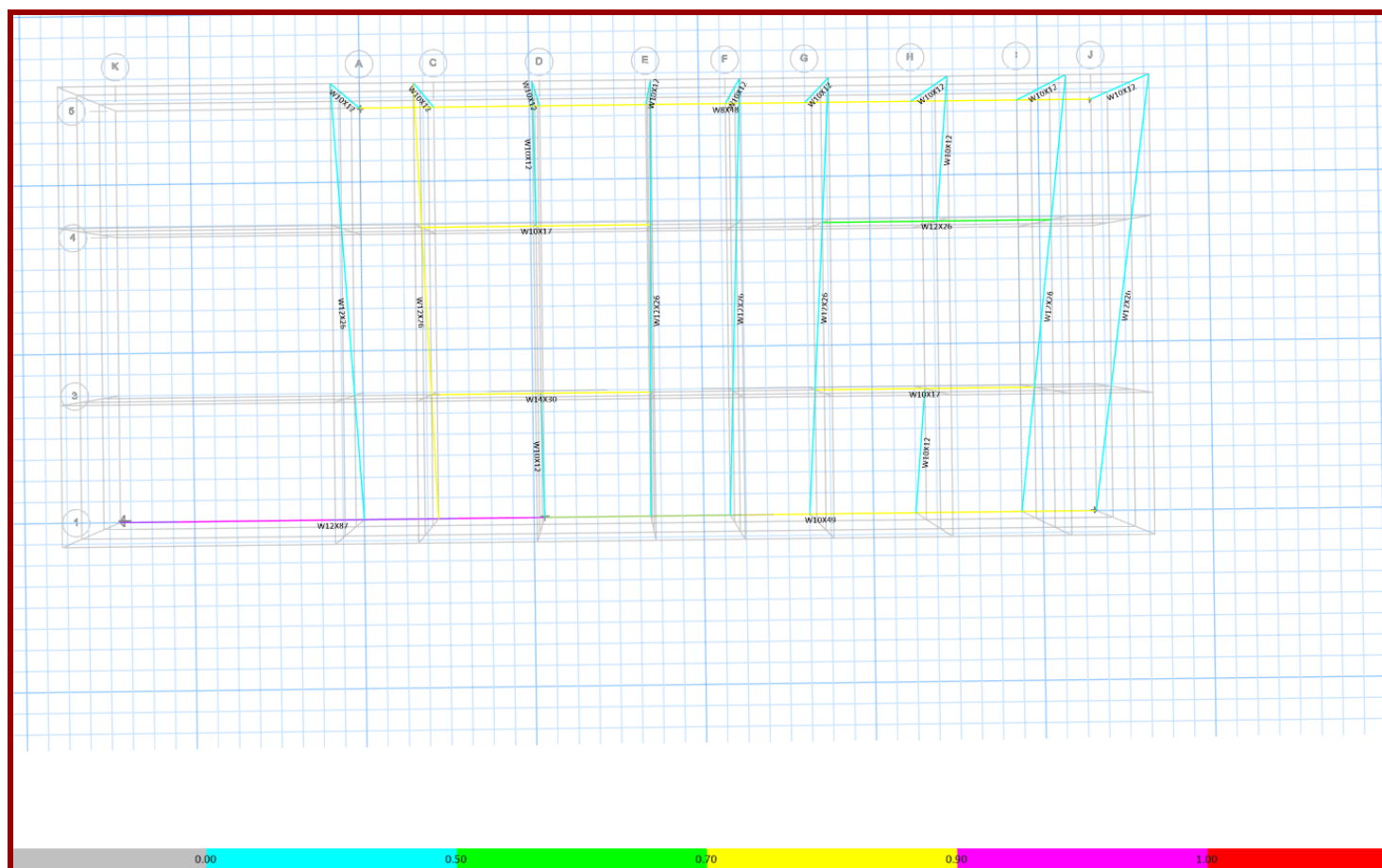
Four of the load combinations (weighted combinations of individual loads) presented in ASCE 710 were relevant to this roof adjustment. D denotes dead load; L, live load; and $W_{U,D}$, wind uplift and downlift, respectively. Note that snow load is not used - ASCE gives the option of calculating with live or snow load, so the higher of the two was chosen.

Combo 1	$1.4D$
Combo 3	$1.2D + 1.6L + 0.5W_D$
Combo 4	$1.2D + 1.0W_{U,D} + 0.5L$
Combo 6	$0.9D + 1.0W_U$

The total load values calculated in Excel were applied to these weighted expressions in ETABS, which is detailed below.

The ETABS software allowed for the input of the four main load combinations present for this roof. The load values, as calculated in Excel, were also inputted. To see the individual load type applications on each member, see **Appendix III**.

A simulation was then run to find the appropriate size for each member. The following is the output of said simulation. Member sizes are listed adjacent to the member, while color indicates the relative stress in each member.



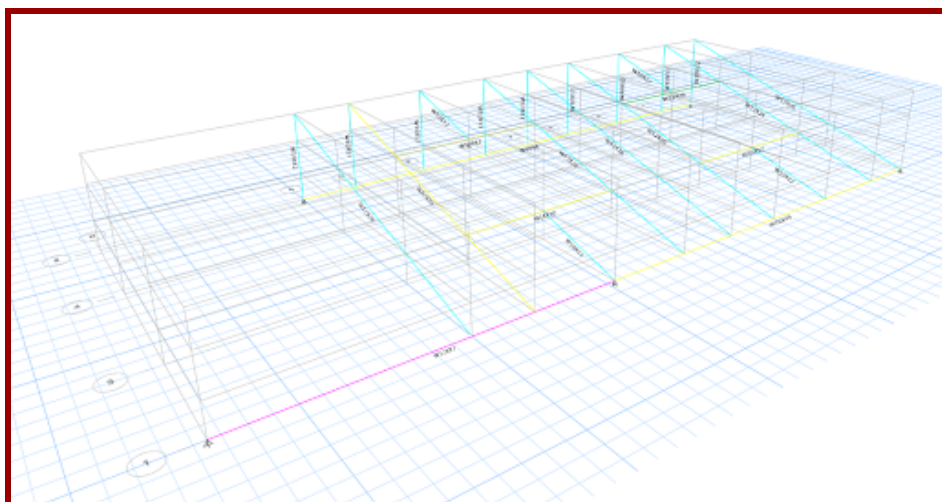
On the following page is another image which gives a better idea of the mass and layout of the new structural framing design. For a larger version of these images, please refer to **Appendix III**.

Horizontal members: W12x26

Roof-height columns: W10x12

Large-span members: W8x48 (back), W10x49 (front), W12x87 (far left)

Skylight framing: W10x17 (upper left, lower right), W12x26 (upper right), W14x30 (lower left)



POTENTIAL ERROR

As can be seen in the simulation output, there is a minor source of error. A member that continued beyond the portion of the roof being renovated was included in the simulation to increase

accuracy. Its tributary width of 26' was included in the full Excel calculations of total load. However, the neighboring member (of size W10x49) was treated as if isolated from the other side of its tributary. Assuming a slightly higher total load on that member, then, the size likely would have been nearer to its neighbor, at W12x87.

Despite this, multiple measures were taken that mitigate the error. There existed a continuous effort to round all values up; to assume the highest possible loads; and to include load combinations that may not be applicable except in extreme situations (combination 1, 1.4D).

CONCLUSION

Although the change in roof pitch was dramatic, the sizes of the members and relative stress indicate that the new design is still well within the realm of feasibility. Completely horizontal (rather than pitched with the roof) members were considered, but it was ultimately decided that they would interrupt the daylight and aesthetic flow of the space. This output demonstrates that they were indeed not necessary, providing a new open and airy ceiling with copious daylight to the previously dark and enclosed Media Commons.

CONCLUSION

Closing Remarks

This year-long comprehensive study represents what one person, given the opportunity, would change about an already-beautiful, already-complete project. The takeaway, then, shouldn't be that the proposed redesigns are necessary or superior. Rather, this is proof of the wonderful thing about design work: while there are many viable solutions to any given problem, the person behind a project is what makes it unique. And I should revise that, as well: the *people* behind a project are what makes it unique.

Producing this individual thesis is a radically different experience to anything we as architectural engineers do beforehand in our coursework and afterward in our careers, because the art and science of comprehensive building design is intrinsically collaborative. The total creative control, the cohesive deliverables, the lack of asking the mechanical team to move their diffuser to a luminaire can go there instead, please — all of that is a welcome break at first. However, especially in an isolation and pandemic-driven time, that company is soon missed. I look forward to the day where a project like this can once again be shared with a team.

To speak to the paper itself, the references to H.G. Wells' writings (particularly *The Time Machine*) present in the Lighting Depth echo into the other corners of study. His drive to keep moving forward in technology, human rights, and environmental protection is the same one a fully-developed architectural engineer should strive to have. I hope it's evident that threaded throughout this thesis is a line of curiosity and a desire to hold that drive.

To wrap up, I hope you learned something, felt something, or at least made it through while reading this — now it's your turn! Go and make something!

ABET Accreditation

PSU AE - ABET 2.3

The fixture changes proposed in the Lighting depth, as well as the more comprehensive sensor-based controls introduced in the Electrical depth, will positively affect HVAC loads and energy consumption, as many of the fixtures within the current building design are not LED and occupancy / daylight sensors are few. The switch to more distinctly modern lighting modes will also provide ease of maintenance and installation in terms of construction management.

Additionally, the implementation of skylights in the Daylighting depth will reduce heating loads in the winter and will provide an alternate method of lighting the space, resulting in less power consumption.

PSU AE - ABET 2.4

The redesigns offered in this thesis meet and exceed requirements of all applicable safety codes, ensuring public health, safety, and welfare. This is most pertinent in the Electrical depth, which requires the installation of new electrical items.

The conceptual intent of the design seeks to encourage students to learn and to invite everyone, regardless of who they are, into this public space of learning. This specific emphasis on inclusion may be especially pertinent to the current social climate in a divided America.

Finally, the investigation of more comprehensive daylighting applications and detailed controls is focused on energy conservation. That conservation has

been pursued with an eye to sustainability, as well as economic (in the form of energy savings) and environmental factors.

PSU AE - ABET 7.2

In the Lighting depth, an analysis of the light levels of potential designs has been conducted in AGI32, and has been evaluated against the recommendations set forth in the 2010 IES Handbook. Renderings were completed in software including AGI32, Sketchup, and Photoshop.

In the Electrical depth, a detailed understanding of the fixtures and control devices was required, information which was acquired from the manufacturers' provided technical documents. National Electric Code (NFPA 70) was specifically followed.

The MAE Daylighting and Computer Optimization depth

The Structural breadth required calculation of loads by hand. Information about building members and materials were gleaned from the architect's drawings, and the software ETABS was used to assist in new member sizing. ASCE 710 was also referenced.

The Acoustical breadth required additional research into articles regarding small-theater acoustics, as well as independent reading on sound and voice transmission.

Acknowledgements

I must first thank my family. Lucy, my little sister, who was always up for a phone call while I was in the thick of a long simulation or tricky calculation; Joy, my mother, who worked so tirelessly and selflessly to bring me little bits of joy while I was working in my sometimes cave-like apartment; and Roland, my father, who helped me put out so many little fires throughout the process that he should consider changing careers to a fire protection specialist. Thanks for listening to me ramble about footcandles and daylighting simulations, guys.

To my extended family both near and far, thank you for your unwavering support both in this thesis and throughout my degree. I have felt the love from all corners and it's helped bolster me to finish this thing as best as I possibly can. Also, due to a hard drive corruption two weeks from the finish line, I wouldn't have had a computer to finish with at all if it wasn't for the help of my amazing extended family. You're all the very best.

To my friends... gosh, what to say? Thanks for making a global lockdown the most socially-fulfilling year of my life. My dear friends at home who have known me from my 8th-grade days, you are always there to lend an ear and offer truly unconditional support. It's rare that you find a group you can count on with such utter regularity, but I'd say 10+ years is pretty good proof of concept. My AE friends who've sat with me for hours upon hours in classes and thesis, thank you for providing such a fun, wonderfully sarcastic atmosphere in which to work — and play sometimes, too, when we have the time to breathe. Thanks also for encouraging my creative hobbies; the best feeling in the world is bringing others joy with what I make.

Thank you to all those professionals who have helped me on my journey. To my mentors at Lam Partners and AE Works (to name a few: Steve Iski, Olivia Eckard, Tori Roberts, and Beth Kassahun), I have learned more from you than I could have ever hoped to. Your breadth of knowledge, passion for your work, and encouragement of my curiosity helped bring me here.

And finally, to the AE faculty — the professors, instructors, advisors, and everyone else who worked alongside us to help us set out into the AE world — many, many thanks.

I'd like to particularly acknowledge:

Dr. Richard Mistrick	MAE and Lighting / Electrical Advisor
Mr. David Stabler	Professor and Electrical Advisor
Mr. Shawn Good	Instructor and Lighting Advisor

Thank you for being present and understanding during the ups and downs of this strange and difficult remote semester.

And if you read this thesis, a thank-you for you, too!

APPENDICES ATTACHED BELOW

Appendix I Lighting

Page 1

Lighting fixture schedule, LPD calculations, cutsheets, tagged lighting plans, and AGI output

Appendix II Electrical & Daylight

Page 120

Controls matrices, sequence of operations legend, controls cutsheets, circuit load calculations, skylight cutsheet

Appendix III Structural Breadth

Page 204

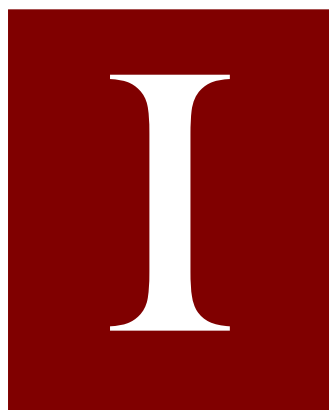
ETABS load applications, hand load calculations

Appendix IV Citations

Page 213

Citations for Grasshopper optimization tools, references for images

APPENDIX

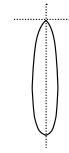


LIGHTING FIXTURE SCHEDULE

FIXTURE TYPE	DESCRIPTION	MANUFACTURER	CATALOG NUMBER	LIGHT SOURCE	INPUT (W)	OUTPUT (LM)	CCT (K)	COUNT	NOTES
RR1	LARGE CIRCULAR PENDANT IN CUPOLA	FLOS	F0408030	LED	54	2751	3000	1	TYPE F0418030 MOUNTING
RR2	SMALL CIRCULAR PENDANT IN CUPOLA	FLOS	F0407030	LED	35	1770	3000	1	TYPE F0418030 MOUNTING
RR3	LARGE GLOBE PENDANT	FLOS	F3176059	LED	17	2000	3000	18	
RR4	SMALL GLOBE PENDANT	FLOS	F3175059	LED	10	900	3000	12	
RR5	GLOBE WALL SCONCE MOUNTED AT 7'	FLOS	F3179059	LED	17	2000	3000	12	
RR6	6" RECESSED LINEAR WITH FLUSH LENS	FOCAL POINT	FSM6L-FL-625LF-30K-1C-UNV-LD1	LED	31	625 LF	3000	28	
RR7	WALL WASH SLOT	FOCAL POINT	FWSL-FL-250LF-30K-1C-UNV-LD1	LED	3.75 LF	450 LF	3000	394'	
RR8	4' 30X60 ACCENT LINEAR	LUMENPULSE	LOGN-4W-48V-48-DWH-30X60-CL-X	LED	16	938	3000	20	ALSO USED IN FAÇADE DESIGN.
RR9	GLOBE TABLE LAMP (FOR TASK)	PABLO	BOLA-SPH-TBL-12BRA	LED BULB (DIMMABLE)	9.5	800	3000	24	
L1	2" ADJUSTABLE DOWNLIGHT, 20 DEG	GOTHAM	ICO2ADJ-30/02-WR-FL-TFC-LD-20D-120	LED	3	249	3000	16	
L2	BRASS PENDANT OVER DESK	TECH LIGHTING	700MDP3-C-R-R	LED	44	1430	3000	2	
L3	1" RECESSED LINEAR WITH FLUSH LENS	FOCAL POINT	FSM1-FL-125LF-30K-1C-UNV-LD1	LED	1.5 LF	125 LF	3000	208'	ALSO USED IN SPECIAL COLLECTIONS DESIGN.
L4	FIBER OPTIC STAR CEILING KIT (SINGLE DIODES)	UNLIMITED LIGHT	XLS336	LED	75 (TOTAL)	50 (APPROX.)	3000	64 (1 KIT)	
T1	1" RECESSED COLOR CHANGE LINEAR	ALCON	12100-10-R-RGBW-4-RGBW30K-RTL-WH-DMX	LED	2 LF	77.5 LF (WHITE), 46.25 LF (RGBW)	3000	384'	
T2	8X8 COLOR CHANGING LINEAR	LUMENPULSE	LOGNH-4W-48V-48-RGBW-8X8-HFR-WH	LED	4 LF	181 LF	3000	40'	
T3	WALL WASH COLOR CHANGING LINEAR	LUMENPULSE	LOGN-4W-48V-48-RGBW-WW-FR-WH	LED	4 LF	181 LF	3000	84'	
C1	60" QUARTER RING DIRECT/INDIRECT PENDANT	ALW	MR1.5-RQ60-SS-MIN-80-3500K	LED	58	1875/2100	3500	3	
C2	36" QUARTER RING DIRECT/INDIRECT PENDANT	ALW	MR1.5-RQ36-SS-MIN-80-3500K	LED	34	1125/1275	3500	9	
C3	30" QUARTER RING DIRECT/INDIRECT PENDANT	ALW	MR1.5-RQ30-SS-MIN-80-3500K	LED	28	950/1050	3500	3	
C4	25" QUARTER RING DIRECT/INDIRECT PENDANT	ALW	MR1.5-RQ24-SS-MIN-80-3500K	LED	22	750/850	3500	3	
C5	SURFACE-MOUNTED 48" QUARTER RING	ALW	LP1/MR1SMB-Q48-3500K	LED	23	1150	3500	23	
C6	SURFACE-MOUNTED 36" QUARTER RING	ALW	LP1/MR1SMB-Q36-3500K	LED	17	860	3500	14	
C7	SURFACE-MOUNTED 25" QUARTER RING	ALW	LP1/MR1SMB-Q25-3500K	LED	11	600	3500	33	
S1	LARGE DIRECT / INDIRECT CHANDELIER	TECH LIGHTING	700ARL-55-B-LED930	LED	47	2999	3000	6	
S2	WOOD PENDANT LAMP	NORMAN COPENHAGEN	N/A	LED BULB (DIMMABLE)	9	800	3000	4	

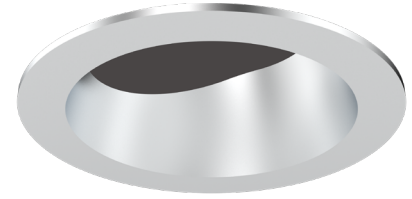
LIGHTING POWER DENSITY CALCULATIONS

SPACE	FLOOR AREA	TOTAL WATTS	LPD	LPD Req	Met?	<i>Reading Room</i>	<i>Lobby</i>	<i>Theater</i>	<i>Commons</i>	<i>Special Collections</i>	<i>Façade (wall)</i>	<i>Façade (entry)</i>
READING ROOM	12563.76	3612.5	0.28753335	1.06	YES	54	48	768	174	282	64	96
LOBBY	1973.42	523	0.26502214	0.9	YES	35	88	160	306	36		
THEATER	1765.75	1264	0.71584313	0.73	YES	306	312	336	84	72		
COMMONS	3553.43	1760	0.49529609	0.98	YES	120	75		66			
SPECIAL COLLECTIONS	1095.02	390	0.35615788	1.05	YES	204			529			
FAÇADE (WALL)	801.08	64	0.07989215	0.15	YES	868			238			
FAÇADE (ENTRY)	1130.43	96	0.08492344	0.4	YES	1477.5			363			
						320						
						228						
						3612.5	523	1264	1760	390	64	96



High Center Beam Round Adjustable Downlight

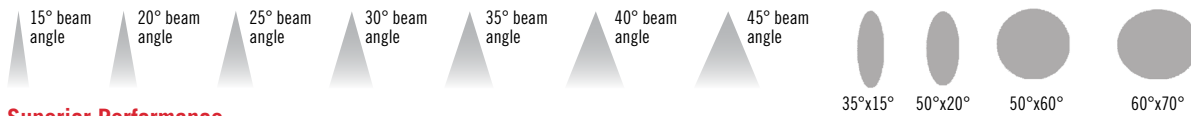
2"



Feature Set

- Eleven optimized distribution patterns allow designers to achieve tailored objectives
- Vertical tilt is self-locking from 0° - 40°; 365° of horizontal rotation. Can be hot aimed from below ceiling.
- Field interchangeable optic
- Driver and LED light engine fully serviceable from below ceiling
- 70% lumen maintenance at 60,000 hours
- 2.5 SDCM; 85 CRI typical, 90+ CRI optional
- Fixtures are wet location, covered ceiling
- ENERGY STAR® Certified product

Distribution



Superior Performance

Nominal lumens	250	500	750	1000	1500	2000
Delivered	249	530	812	1113	1668	2106
Wattage	3.1	5.6	8.6	12.0	19.7	28.4
Efficacy	80	95	94	93	85	74

*Based on 3500K 80CRI 15D AR LSS TFC @0 Degrees

Coordinated Apertures | Multiple Layers of Light



General Illumination Layer | EVO



High Center Beam Layer | Incito



EVO + Incito — Multiple Layers of Light

Core



Downlight



Adjustable



Open Wallwash



Lensed Wallwash



Cylinder



Pinhole



Bevel



Hyperbolic

Healthcare



MRI



Surgical Suite



Patient Room

Special Applications



Dynamic



Food Service



Vandal/Tamper



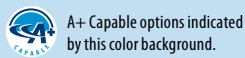
Clean Room



Shower



Steam Room



Design2Ship Quick Ship Program: Options in green text qualify for Design2Ship — 5 business days from order entry to ship. Refer to Design2Ship Brochure for complete program details. **Maximum Order Quantity: 50 units.**

Luminaire Type:

Catalog Number:

EXAMPLE: IC02ADJ 35/10 AR T20 LSS 20D MVOLT UGZ

Series	Color Temperature	Lumens	Reflector Color	Flange Type
IC02ADJ Incito 2in Round Adjustable Downlight	27/ 2700 K	02 250 lumens	AR Clear	(blank) Self-flanged
	30/ 3000 K	05 500 lumens	PR Pewter	FL Flangeless
	35/ 3500 K	07 750 lumens	WTR Wheat	
	40/ 4000 K	10 1000 lumens	GR Gold	
	50/ 5000 K	15 1500 lumens	WR ² White painted	
		20 2000 lumens	BR ² Black	
			BZR ² Dark Bronze painted	

Type	Reflector Finish	Lensing	Beam	Voltage
TFC Flat Cut Trim to allow tilting 0°-40°	LSS Semi-specular	(blank) Open	15D 15° beam angle	MVOLT 120V - 277V
T20³ Angle Cut Trim to allow tilting 0°-23°	LD Matte diffuse	SOL³ Solite pattern lens	20D 20° beam angle	120 120V
T40³ Angle Cut Trim to allow tilting 20°-40°			25D 25° beam angle	277 277V
			30D 30° beam angle	
			35D 35° beam angle	
			40D 40° beam angle	
			45D 45° beam angle	
			3515D Elliptical 35° x 15° beam angle	
			5020D Elliptical 50° x 20° beam angle	
			5060D Elliptical 50° x 60° beam angle	
			6070D Elliptical 60° x 70° beam angle	

Driver	Control Interface ⁶	Options
UGZ⁴ Universal dimming to 1% (0-10V, 120V TRIAC or ELV)	(blank)	90CRI¹ High CRI (90+)
EC00⁵ Lutron® EcoSystem® digital Hi-Lume <1% soft-on, fade to black. Min: 500LM; Max: 1500LM	NLT nLight® dimming pack.	NCH⁸ Structural reinforcement pan
	NLTER⁷ nLight® dimming pack for fixtures on emergency circuit	ICAT⁹ IC/Airtight housing construction
	NLTAIR2 nLight® AIR dimming pack.	CP⁹ Chicago Plenum
	NLTAIRER2⁷ nLight® AIR dimming pack for fixtures on emergency circuit	HAQ¹⁰ High ambient (40°C)
	NLTAIREM2 nLight® AIR dimming pack for fixtures on emergency circuit	N80¹³ nLight Lumen Compensation
		TRW¹¹ White painted flange
		TRBL¹² Black painted flange
		WL¹⁴ Wet Location

ACCESSORIES — order as separate catalog numbers (shipped separately)

IC020PTC XXD	Additional optics for field installation. Replace "XX" with beam angle.
IC020PTC KIT	Kit including a field interchangeable optic for each of the 13 preset beam distribution patterns
HS258	2-5/8" Hole saw
HS234FL	Hole saw for flangeless trim option
SDT 347/120 75VA	347V/120V, 75VA step down transformer. Must be remote mounted.
AW50	Allen wrench (.050") for adjusting tilt

ORDERING NOTES

- 5000K CCT not available with 90CRI.
- Not available with Reflector Finish.
- SOL lens requires TFC trim.
- Refer to [Tech 240](#) for compatible dimmers.
- Not available with Control Interfaces (nLight). Not compatible with spray foam with 1000LM, 1500LM, or 2000LM options.
- Field installed. Access required to location of remote mounted device.
- ER for use with generator supply power. Will require an emergency hot feed and normal hot feed.
- NCH is required for T-grid ceilings or where code requires.
- Not available with 1500lm or 2000lm.
- Not available with 2000lm.
- For use with different reflector finish only (i.e. AR, PR, WTR, GR options). Not available with WR (White Reflector). Not available with FL.
- For use with different reflector finish only (i.e. AR, PR, WTR, GR options). Not available with BR (Black Reflector). Not available with FL.
- Requires NLT or NLTER.
- WL requires a lens (e.g. SOL).

Optical and Trim Assembly

Fully serviceable and upgradeable lensed LED light engine suitable for field maintenance or service from above or below the ceiling.

Flangeless trim option includes proprietary Gotham mud ring enabling seamless integration into drywall applications. Mud ring ships separately. Superior 100% Virgin-silicone refractive optic, enables maximum dimensional stability and optical transmission with no discoloration over life. Field inter-changeable optics.

Electrical

The luminaire shall operate from a 50 or 60 Hz ± 3 Hz AC line over a voltage ranging from 120 VAC to 277 VAC. Support 347V via remote-mounted stepdown transformer. The fluctuations of line voltage shall have no visible effect on the luminous output.

The luminaire shall have a power factor of 90% or greater at all standard operating voltages and full luminaire output.

Sound Rated A+. Driver shall be >80% efficient at full load across all input voltages.

Controls

Luminaire shall be equipped with interface for nLight wired or nLight AIR networks with integral power supply as per specification.

Dimming

The luminaire shall be capable of continuous dimming without perceivable stroboscopic flicker as measured by flicker index (ANSI/IES RP-16-10) over a range of 100 – 1.0% of rated lumen output with a smooth shut off function to step to 0%.

Driver is inaudible in 24dB environment, and stable when input voltage conditions fluctuate over what is typically experienced in a commercial environment.

Construction

Light engine and driver are accessible from below ceiling.

Several additional mounting options available including a structural reinforcement pan, Chicago plenum, and Type IC.

Anodized extruded aluminum wiring compartment with hinged access. With two 1/2" trade-sized knockouts rated for 90°C.

Accommodates between 1/2" to 3/4"-thick ceilings.

Listings

Fixtures are UL Certified to meet US and Canadian Standards: All fixtures manufactured in strict accordance with the appropriate and current requirements of the "Standards for Safety" to UL, wet location covered ceiling. ENERGY STAR® Certified product.

IC rated with ICAT option. Fixtures with ICAT option are compatible with spray foam insulation with an R-value of 4.3 per inch or less.

Luminaire configurations are Energy Star certified through testing in EPA-recognized laboratories, with the results reviewed by an independent, accredited certification organization. Visit www.energystar.gov for specific configurations listed

Photometrics

LEDs tested to LM-80 standards. Measured by IESNA Standard LM-79-08 in an accredited lab. Lumen output shall not decrease by more than 30% over the minimum operational life of 60,000 hours.

Color appearance from luminaire to luminaire of the same type and in all configurations, shall be consistent both initially and at 6,000 hours and operate within a tolerance of <2.5 MacAdam ellipse as defined by the center of the quadrangles defined in ANSI C78.377-2015.

Warranty

5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/support/customer-support/terms-and-conditions

Note:

Actual performance may differ as a result of end user environment and application.

All values are design or typical values, measured under laboratory conditions at 25 °C.

A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and out-of-the-box control compatibility with simple commissioning.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is part of an A+ Certified solution for nLight® control networks when ordered with drivers marked by a shaded background*
- This luminaire is part of an A+ Certified solution for nLight® control networks, providing advanced control functionality at the luminaire level, when selection includes driver and control options marked by a shaded background*

To learn more about A+, visit www.acuitybrands.com/aplus.

*See ordering tree for details

Lumen Output Multiplier		
CRI	CCT	Multiplier
80	2700K	0.910
	3000K	0.946
	3500K	1.000
	4000K	1.027
	5000K	1.054
90	2700K	0.784
	3000K	0.847
	3500K	0.874
	4000K	0.946

Reflector Finish Multiplier	
Reflector Finish	Multiplier
LSS - Semi Specular	1.00
LD - Matte Diffuse	1.06
Reflector Color	Multiplier
WR - White	1.05
BR - Black	0.65
BZR - Bronze	0.61
AR - Clear	1.00
GR - Gold	0.93
PR - Pewter	0.98
WTR - Wheat	0.99

Driver		Control Provided				
Nomenclature	Description	NLT	NLTER	NLTAIR2	NLTAIREM2	NLTAIRER2
UGZ	0-10V driver dims to 1%	nPP16 D EFP	nPP16 D ER EFP	RPP20 D 24V G2	RPP20 D 24V EM G2	RPP20 D 24V ER G2

Marked Spacing in Inches 25°C Ambient			
Lumen Package	Fixed Center to Center MIN	Fixture Center to Building Member MIN	Space Above Fixture
2000	18	9	3
1500 (HAQ)	18	9	3

*Dimensions in inches [centimeters]

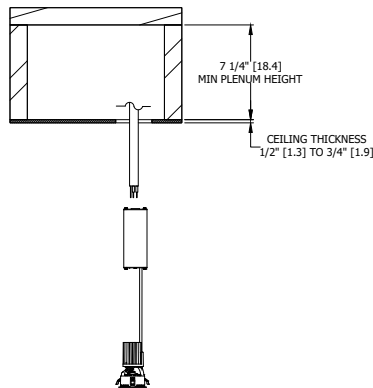
Aperture: 2-1/4" [5.7]

Ceiling Opening: 2-5/8" [6.7] self-flanged

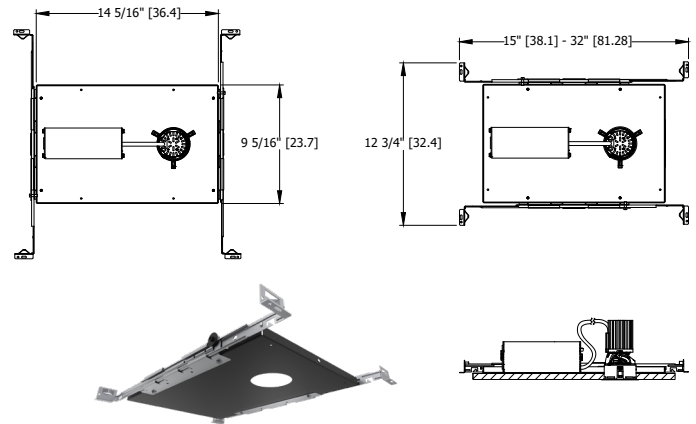
Overlap Trim: 3" [7.6]

2-3/4" [7] flangeless

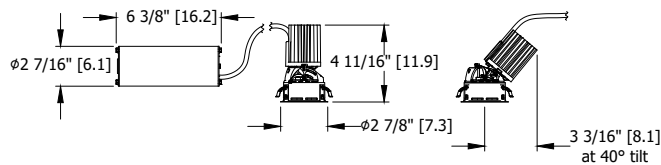
Recessed Application - Minimum Clearance Requirements



Structural Reinforcement Pan



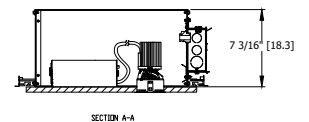
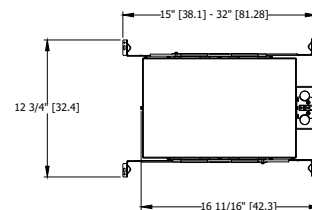
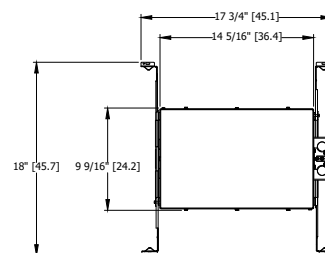
1500 Lumen and Below Install-from-Below Construction



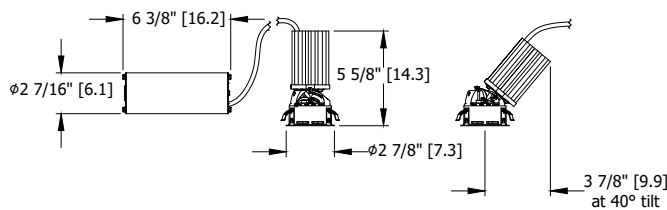
Ceiling cutout: ϕ 2 5/8" [6.7]
Flex conduit length: 16" [40.6]
Ceiling thickness range: 1/2" [1.3] to 3/4" [1.9]



IC / Airtight Housing / Chicago Plenum Construction



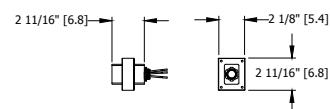
2000 Lumen or High Ambient Option Install-from-Below Construction



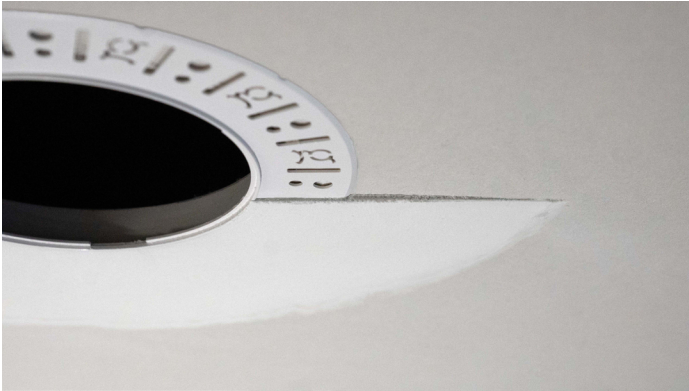
Ceiling cutout: ϕ 2 5/8" [6.7]
Flex conduit length: 16" [40.6]
Ceiling thickness range: 1/2" [1.3] to 3/4" [1.9]



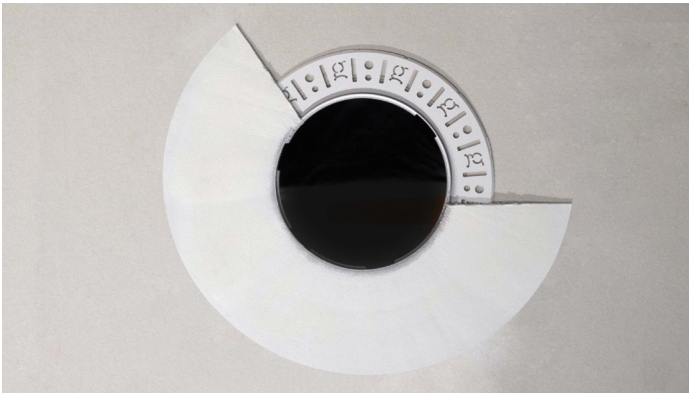
347V Transformer



347 Transformer:
Install to accessible
junction box by others



Partially finished mud ring, showing cross-section detail.



An ICO downlight requires only approximately 3" of plaster to finish.



ICO with flangeless trim

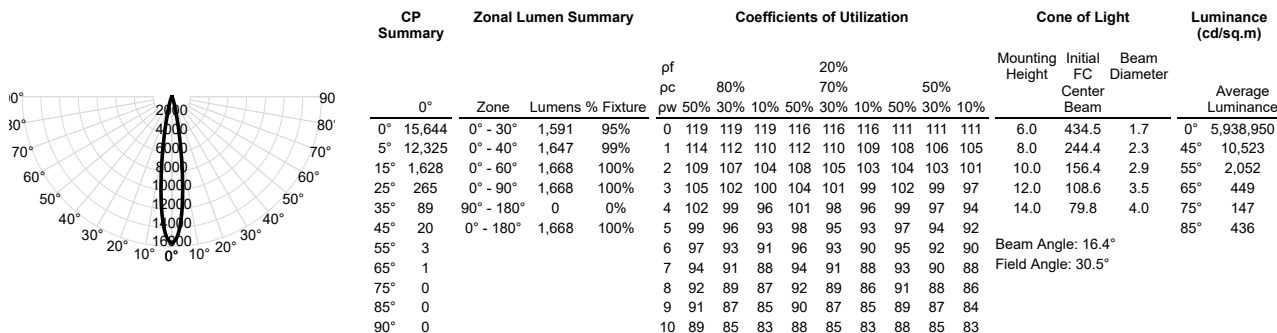
Flangeless Installation

Gotham's flangeless option utilizes a micro-thin polymer mud ring that minimizes the amount of drywall compound required to finish the ceiling. The end result is a virtually undetectable flangeless downlight installation.

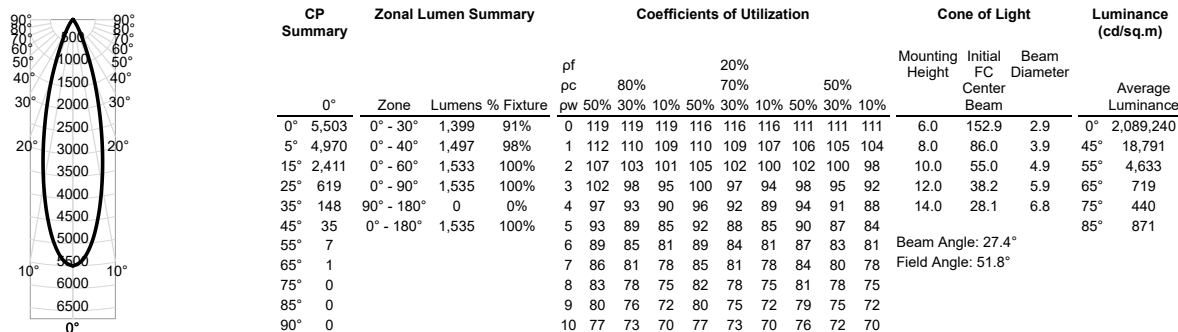
The polymer mud ring is installed independent of the of the recessed frame, therefore floating with the ceiling. This innovation minimizes any surface cracks during reflector installation, ceiling movement and any future service to the recessed frame, wiring, electronics, etc.

CONSULT WWW.GOTHAMLIGHTING.COM FOR ADDITIONAL PHOTOMETRY

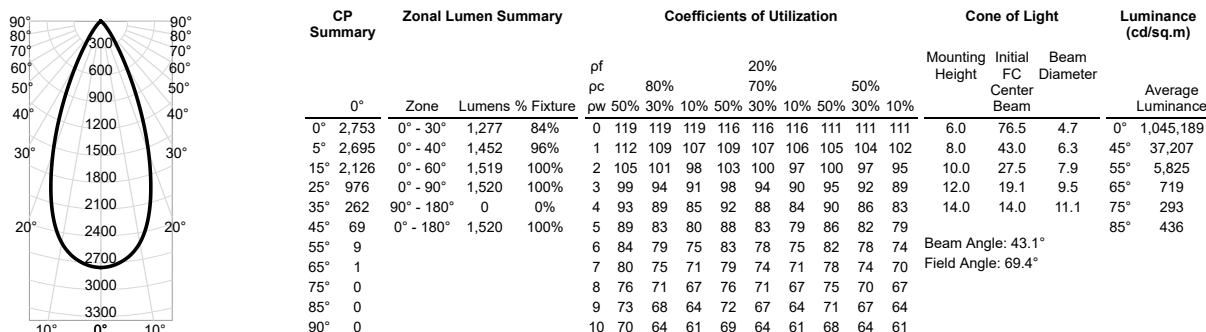
ICO2ADJ 35/15 AR TFC LSS 15D @ 0DEG TILT Input Watts: 19.7, Delivered Lumens: 1668, LPW: 84.7, S/MH: 0.28, Test No: 19-450-01P129



ICO2ADJ 35/15 AR TFC LSS 30D @ 0DEG TILT Input Watts: 19.7, Delivered Lumens: 1535, LPW: 77.9, S/MH: 0.45, Test No: 19-450-04P129



ICO2ADJ 35/15 AR TFC LSS 45D @ 0DEG TILT Input Watts: 19.7, Delivered Lumens: 1520, LPW: 77.2, S/MH: 0.70, Test No: 19-450-07P129



nLight® AIR is the ideal solution for retrofit or new construction spaces where adding communication wiring is cost prohibitive. The integrated nLight AIR rPP20 Power Pack is part of each EVO Luminaire ordered with the NLTAIR option. These individually addressable controls offer the ultimate in flexibility during initial setup and for space repurposing.

nLight® AIR Control Accessories

Order as separate catalog number. Visit [nLight AIR](#).

Wall Switches

Model Number	
On/Off single pole	rPODB (color) G2
On/Off two pole	rPODB 2P (color) G2
On/Off & raise/lower single pole	rPODB DX (color) G2
On/Off & raise/lower two pole	rPODB 2P DX (color) G2

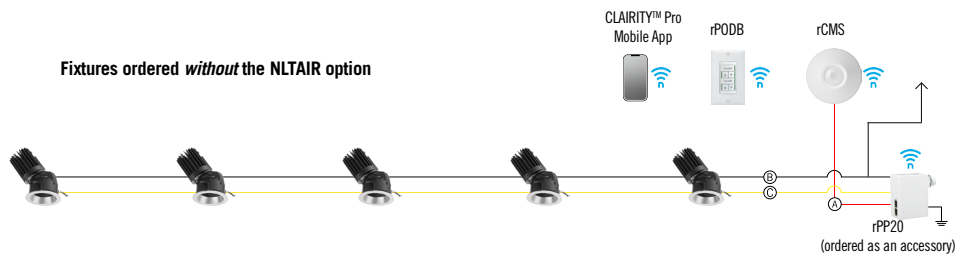
nLight® AIR Control Accessories (cont.)

Occupancy Sensors (PIR/dual tech)

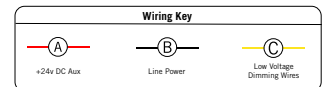
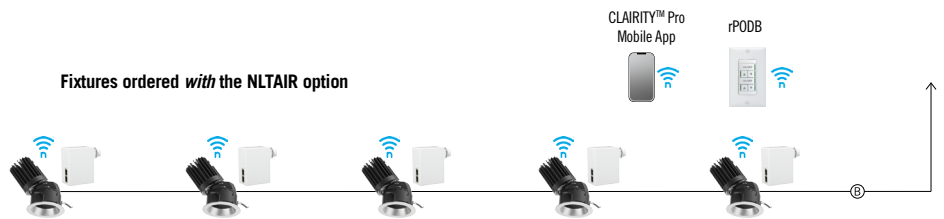
Model Number	
Small motion 360°, ceiling	rCMS 9 / rCMS PDT 9
Large motion 360°, ceiling	rCMS 10 / rCMS PDT 10

Possibilities for nLight® AIR

Fixtures ordered *without* the NLTAIR option



Fixtures ordered *with* the NLTAIR option



nLight® Wired The nLight® solution is a digital networked lighting control system that provides both energy savings and increased user configurability by cost effectively integrating time-based, daylight-based, sensor-based and manual lighting control schemes.

nLight® Wired Control Accessories

Order as separate catalog number. Visit [nLight](#).

Wall Switches

Model Number	
On/Off single pole	nPODM (XX)
On/Off two pole	nPODM 2P (XX)
On/Off & raise/lower single pole	nPOD DX (XX)
On/Off & raise/lower two pole	nPODM 2P DX (XX)
Graphic touchscreen	nPOD GFX (XX)

Photocell Controls

Dimming	nCM ADCX
---------	----------

nLight® Wired Control Accessories (cont.)

Occupancy Sensors (PIR/dual tech)

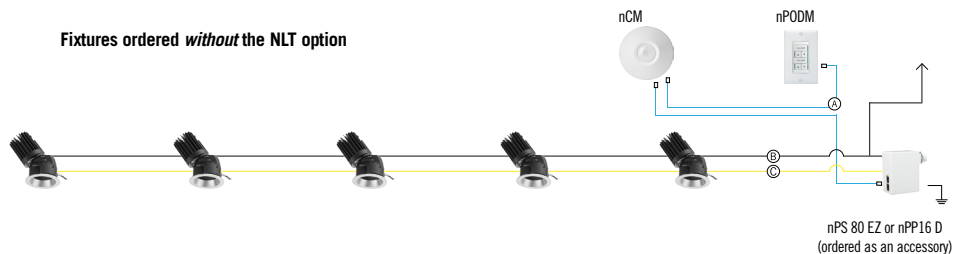
Model Number	
Small motion 360°, ceiling	nCM 9 / nCM PDT 9
Large motion 360°, ceiling	nCM 10 / nCM PDT 10
Wide View	nWV 16 / nWV PDT 16
Wall switch with raise/lower	nWSX LV DX / nWSX PDT LV DX

Cat-5 Cables (plenum rated)

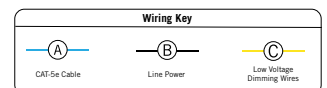
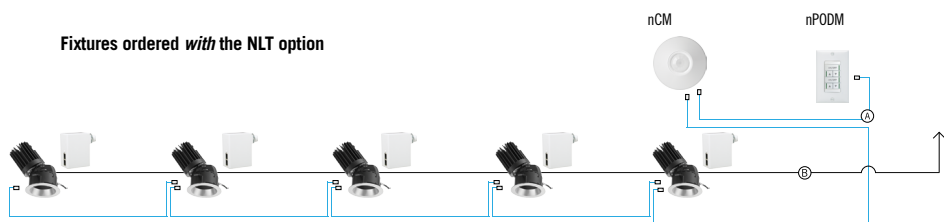
10', CAT5	CAT5 10FT J1
15', CAT5	CAT5 15FT J1

Possibilities for nLight® wired

Fixtures ordered *without* the NLT option



Fixtures ordered *with* the NLT option



AERIAL 55 CHANDELIER

PRODUCT FEATURES

- Arched rods support cylindrical LED heads which produce up and down light
- Available in matte black and aged brass finishes in two sizes, 40" and 55" diameter
- Larger 60" diameter Aerial chandelier available
- Can be installed on a sloped ceiling up to 45°
- Lamping options are compatible with most dimmers
- Protected by a 5-year warranty. please visit the "About Us" Page on techlighting.com for more for warranty details

LAMPING

Includes 120 volt 47.19 watts, 2999 total delivered lumens, 3000K LED modules. Dimmable with most LED compatible ELV and TRIAC dimmers. Ships with (4) 12in and (2) 6in rigid stems in coordinating finish. Can be installed on a sloped ceiling up to 35°.



Matte Black



Aged Brass

Matte Black

ORDERING INFORMATION

700ARL	LENGTH (A)	FINISH	LAMP
	55 55"	R AGED BRASS B MATTE BLACK	-LED930 INTEGRATED LED 90 CRI 3000K 120V (T20/T24)

700ARL _____

JOB NAME _____

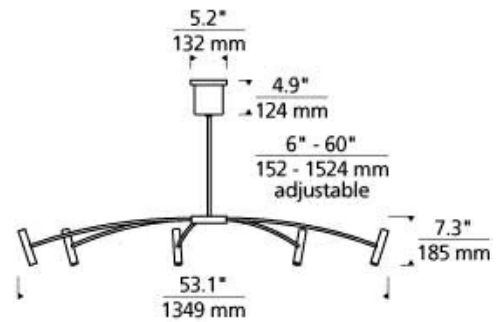
NOTES _____



AERIAL 55 CHANDELIER

SPECIFICATIONS

HARDWARE MATERIAL	Metal
SHADE MATERIAL	Aluminum
NET WEIGHT	10 lbs
HEIGHT	7in
WIDTH	53.1in
LENGTH	53.1in
UP LIGHT / DOWN LIGHT / BOTH?	
WET LISTED	
DAMP LISTED	Yes
DRY LISTED	
MIN. HANGING HEIGHT	17.9in
MAX HANGING HEIGHT	71.9in
TOTAL CORD LENGTH	
TOTAL STEM LENGTH	Up to 60in
STEM QTY	6
SLOPED CEILING ADAPTABLE?	Yes 35° Max
GENERAL LISTING	ETL Listed
INCLUDES	



LAMPING SPECIFICATIONS

	LED LAMP	INTEGRATED LED	NON LED	NO LAMP
DELIVERED LUMENS		2999		
WATTS		2.4		
MAX WATTAGE PER BULB		47.19W		
INPUT VOLTAGE		120V		
DIMMING TYPE*		ELV, TRIAC		
CCT		3000K		
CRI		90 CRI		
LED LIFETIME				
L70		>50000		
AVERAGE BULB HOURS				
FIELD SERVICEABLE LED				
LAMP BASE		Integrated LED		
LAMP SHAPE		Integrated LED		
LAMP INCLUDED?		Y		
WARRANTY**		5 Years		

* Dimming information available at www.techlighting.com/Downloads#dimming

** Visit techlighting.com for specific warranty limitations and details.

T20 / T24 INFORMATION

	Integrated LED	Replacement LED Lamp	No Lamp *
This product can be used to comply with California Building Energy Efficiency Standards 2016 Title 24 Part 6.	Yes		
This product can be used to comply with California Appliance Efficiency Standards 2016 Title 20 and may be shipped to and sold in California.	N/A		

* If a light fixture or component does not include a lamp or light source, it is the responsibility of the customer to select a lamp that meets the T24 and T20 requirements.



PRODUCT FEATURES

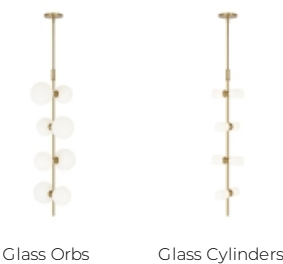
- Elegant ModernRail style in a convenient pendant size
- Classic Aged Brass finish adds charm and style
- Customizable using frosted opal glass globes or cylinders
- Ideal for both residential and commercial application
- Fully dimmable integrated LED light source
- 1-year warranty with no lamping option. 5-year warranty with LED lamping option

LAMPING

Ships with (8) 24 volt, 3 watt, 44.2 total watts, 1430.3 total delivered lumens) 3000K, integrated LED modules. Dimmable with most LED compatible ELV and TRIAC dimmers. Ships with (2) 6" stems and (4) 12" stems in coordinating finish. Remote Power Supply version T24.



Glass Cylinders



ORDERING INFORMATION

700MDP3	COLOR	FINISH	LAMP
	C GLASS CYLINDERS	R AGED BRASS	R 24V REMOTE CANOPY (T24)
	G GLASS ORBS		S 24V SURFACE CANOPY

700MDP3

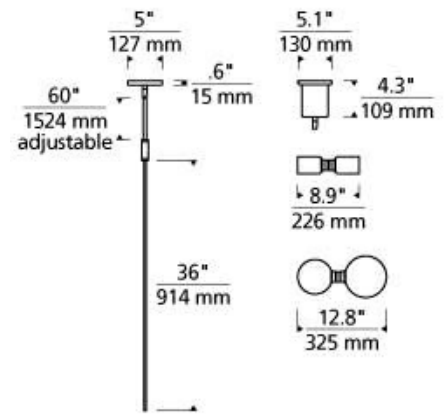
JOB NAME

NOTES

MODERNRAIL PENDANT

SPECIFICATIONS

HARDWARE MATERIAL	Metal
SHADE MATERIAL	Glass
NET WEIGHT	5.5 lbs
HEIGHT	36in
WIDTH	8.9in
LENGTH	8.9in
UP LIGHT / DOWN LIGHT / BOTH?	
WET LISTED	
DAMP LISTED	Yes
DRY LISTED	
MIN. HANGING HEIGHT	42in
MAX HANGING HEIGHT	96in
TOTAL CORD LENGTH	
TOTAL STEM LENGTH	Up to 60in
STEM QTY	6
SLOPED CEILING ADAPTABLE?	Yes 35° Max
GENERAL LISTING	ETL Listed
INCLUDES	



LAMPING SPECIFICATIONS

	LED LAMP	INTEGRATED LED	NON LED	NO LAMP
DELIVERED LUMENS		1430.3		
WATTS		44.2		
MAX WATTAGE PER BULB		44.2W		
INPUT VOLTAGE		120V		
DIMMING TYPE*		ELV, TRIAC		
CCT		3000K		
CRI		90 CRI		
LED LIFETIME				
L70		>50000		
AVERAGE BULB HOURS				
FIELD SERVICEABLE LED				
LAMP BASE		Integrated LED		
LAMP SHAPE		Integrated LED		
LAMP INCLUDED?		Y		
WARRANTY**		5 Years		

* Dimming information available at www.techlighting.com/Downloads#dimming

** Visit techlighting.com for specific warranty limitations and details.

T20 / T24 INFORMATION

	Integrated LED	Replacement LED Lamp	No Lamp *
This product can be used to comply with California Building Energy Efficiency Standards 2016 Title 24 Part 6.	Yes		
This product can be used to comply with California Appliance Efficiency Standards 2016 Title 20 and may be shipped to and sold in California.	N/A		

* If a light fixture or component does not include a lamp or light source, it is the responsibility of the customer to select a lamp that meets the T24 and T20 requirements.



Seem® 1

LED RECESSED



L3



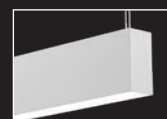
flush lens



pop-down lens



wall to ceiling
companion



suspended
companion

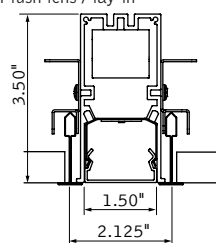


wall mount
companion

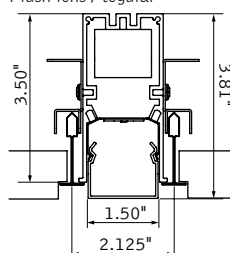
DIMENSIONAL DATA

9/16" Grid

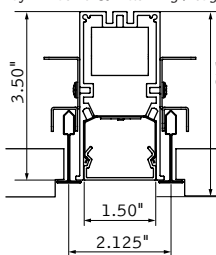
Flush lens / lay-in



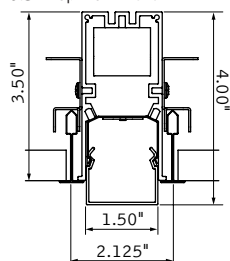
Flush lens / tegular



Asymmetric & Batwing / tegular



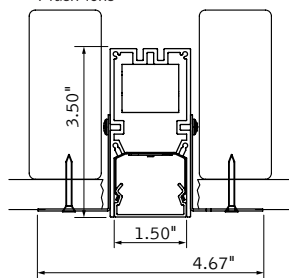
0.5" Pop-Down lens



Note: 15/16" tee spacing 2.50" on center

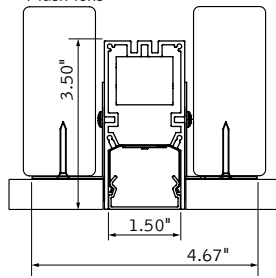
Trimless mud-in

Flush lens



Hard surface/wood

Flush lens



Note: 0.375" min-1.625" max ceiling thickness
Consult factory for thicker ceilings.

FEATURES

Narrow extruded aluminum 1.5" recessed linear slot LED with Asymmetric, Batwing and Pop-Down lens options.

Individual units and continuous runs in 1" increments.

Frosted acrylic lens provides uninterrupted illumination, without pixels or shadows.

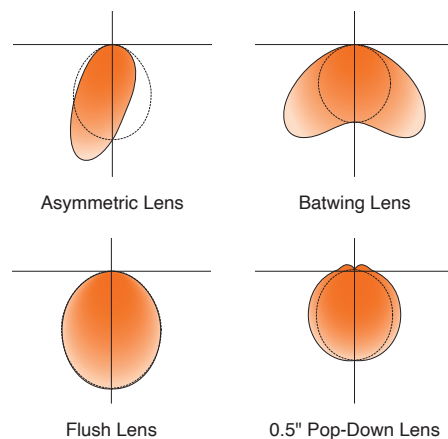
LED position and lens material optimized to provide the perfect blend of high performance and visual comfort.

Choice of output levels to meet a wide variety of application needs.

Preferred Light: Lighting for better color rendition and human preference.

PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires.

DISTRIBUTIONS

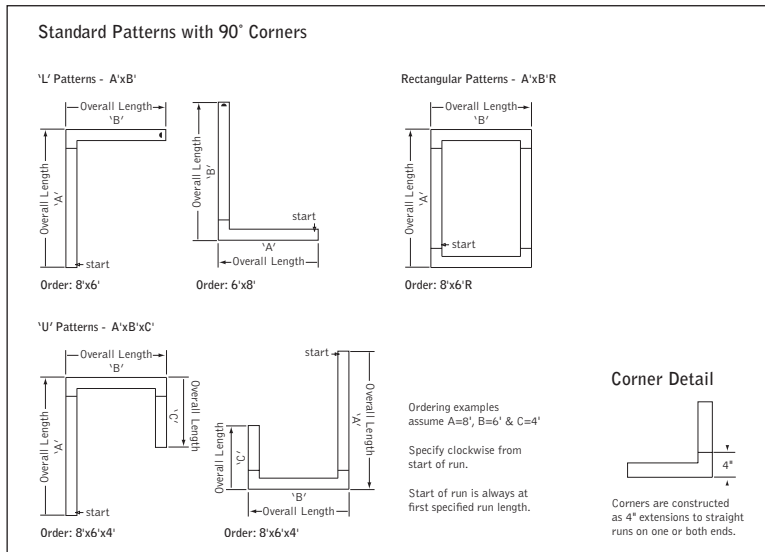


Photometric performance is measured in accordance with IESNA LM-79.
Visit focalpointlights.com for complete photometric data.

fixture:

project:

DETAILS



SPECIFICATIONS

LED System

Proprietary linear LED module incorporates premium LEDs on a robust platform to achieve excellent thermal management. LEDs are placed to promote a uniform appearance. Available in 3000K, 3500K or 4000K with both 80 and 90 CRI options. 3500K and 4000K with CRI>90 have a cyanosis observation index (COI) of 3.3 or less. LED modules and drivers are replaceable from below. Color accuracy <3 SDCM.

Construction

One piece extruded aluminum housing. 20 Ga. steel end caps. Housing for new construction applications. XFW acceptable for use with wood, consult factory for Type IC availability. 8' unit weight: 15lbs.

Optic

Reflectors fabricated of 22 Ga. steel finished in High Reflectance White powder coat. Extruded acrylic lens .07" thick with frosted finish, up to 8' continuous. 15-30" recommended distance from wall for Asymmetric Lens (AS).

Electrical

Luminaires are pre-wired with factory installed branch circuit wiring and over-molded quick connects. Standard 120-277V constant current driver includes 0-10V analog dimming. Power factor > .9. PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires. PoE runs require an independent PoE node and power feed for each luminaire section.

Emergency Battery

Emergency output - 10 watts for 90 minutes. See EM/EC Guide for default locations and ordering details.

Labels

UL and cUL listed. Suitable for Dry or Damp Locations, indoor use only.

Finish

Polyster powder coat applied over a multi-stage pre-treatment.

Lumen Maintenance

Reported: L70 at >61,000 hours Calculated: L70 at 470,000 hours
L90 at >61,000 hours L90 at 115,000 hours
Derived from EPA TM-21 calculator. Based on typical conditions, consult factory for additional data.

Reliability

At Focal Point, our products are designed to stand the test of time. Each luminaire is engineered using superior components, manufactured with the utmost care and rigorously tested. Contact us for reliability data.

Warranty

LED system rated for operation in ambient environments up to 25°C. 5-year limited warranty.

4' PERFORMANCE CHART

See page 3.

ORDERING

Luminaire Series

Seem 1 LED FSM1

Shielding

Asymmetric Lens AS

Batwing Lens BW

Flush Lens FL

0.5" Pop-Down Lens PD05
(Not available with Tegal ceiling configurations)

Lumen Output

125 Lumens per foot 125LF
(4' minimum length. Consult factory for Lutron, DALI)

250 Lumens per foot 250LF
(3' minimum length)

375 Lumens per foot 375LF

500 Lumens per foot 500LF

625 Lumens per foot 625LF

Color Temperature

3000K, 80+ CRI or 90+ CRI 30K or 930K

3500K, 80+ CRI or 90+ CRI 35K or 935K

4000K, 80+ CRI or 90+ CRI 40K or 940K

3500K, Preferred Light P35K

Circuit

Single Circuit 1C

Voltage

120/277 UNV Volt UNV

347 Volt 347

(LD1 driver only)

Low Voltage LV

Control System & Dimming Level

0-10V - 10% Dimming LD1

0-10V - 1% Dimming L11

Low Voltage, PoE compatible LVN

(No driver. Not available with EM or EC. LV Voltage only.)

Lutron Hi-Lume EcoSystem (LDE1) -

1% Dimming LH1

Lutron 5-Series EcoSystem (LDE5) -

5% Dimming LU5

DALI 1% Dimming D11

Ceiling Configuration

Std. 15/16" Lay-in G1

Std. 15/16" Tegal T1

Std. 9/16" Lay-in G2

Std. 9/16" Tegal T2

9/16" Slot-tee Tegal G3

Tall 15/16" Lay-in G4

Tall 15/16" Tegal T4

Tall 9/16" Lay-in G5

Tall 9/16" Tegal T5

Node 9/16" Tegal T6

Mud-in Trimless XFF

Non-Drywall Hard Surface XFN

Hard Surface, Wood XFW

Factory Options

Chicago Plenum CP

Emergency Circuit _EC

Emergency Battery Pack _EM

(4' minimum length. See EM/EC Guide for default locations and ordering details.)

6' New York City Flex Whip (120V) FNY1

6' New York City Flex Whip (277V) FNY2

6' Flex Whip FW

Finish

Matte White Housing WH

Luminaire Length

Specify luminaire/row length _ft _in
in 1" increments

(2' minimum, lengths are nominal 1" increments based on T-centers. Housing length is 1" shorter than specified. Leave blank for patterns. Smaller increments available, consult factory.)

Pattern Options

(3' minimum length)

'L' pattern A' x B'

'U' pattern A' x B' x C'

Rectangular pattern A' x B' R

(Consult factory for other pattern options)



10 DAY*

Options in orange qualify for the Quickship program. 1000' total, 48' maximum per pattern section. Refer to Quickship Guide for complete details including EM/EC options.

L3

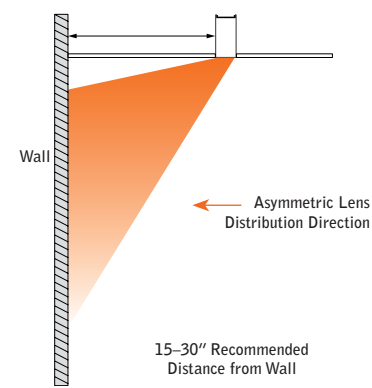
FSM

4' PERFORMANCE CHART

			Lumens Per Watt (LPW)			
Lumen Output	Delivered Lumens	Tested System Watts				
			AS	BW	FL	PD05
125LF	500	6	82	81	75	76
250LF	1000	10	105	98	98	99
375LF	1500	15	110	103	104	105
500LF	2000	19	114	106	106	107
625LF	2500	24	110	103	103	100

Based on 3500K, 4' length. Lumen multipliers: Preferred Light = 0.65, 90 CRI = 0.87.
Delivered lumens may vary +/- 5%. Actual wattage may vary +/- 5%.

DIRECT ASYMMETRIC
Standard Application Example





Create a luxurious starry night almost anywhere

Create a starry night on your bedroom, bathroom or any room in the house by using our fiber optic star ceiling kit on your ceiling.

Consisting of mixed diameter fiber for a 'near + far' effect, each fiber optic star kit comes with small acrylic fittings for a neat finish in the ceiling or chosen material. Unlike other systems on the market, these fittings allow for the fiber to pass all the way through, maintaining the preferred intense star effect achieved when the fiber end is exposed while covering up any ragged edges from the drill hole. Alternatively, drill 1mm holes in the ceiling and just use the fibers on their own for an intense point of light.

These fiber optic kits are usually installed in:

- Ceilings – access is required from above, or fibers can be installed into a section of
- MDF or plasterboard in a new ceiling prior to it being elevated and lifted into place;
- Drapes – pierce the material and apply silicone to the back;
- Tiling – tails can be installed in grout between tiles.

Our Standard Kit contains:-

Harness

Illuminator

End Fittings

Full installation guide



Unlimited Light offer 3 standard tungsten halogen illuminators in these kits - 35W, 50W, 75W. Alternatively, upgrade to one of our new MicroLED illuminators. These tiny but powerful boxes combine the efficiency of LED with amazing color changing effects. The MicroLED 4000 also offer full remote control with fingertip access to any static color or color cycle effect.



35W, 50W or 75W tungsten halogen unit with 1 plug. As standard these illuminators output continuously changing colours. The colorwheel can be removed to allow for static white light output.



The MicroLED range, available as an optional upgrade. MicroLED 1000, with built in controls to control color selection and effects. Dimensions: 5.2" (L) x 3.8" (W) x 2.6" (H) MicroLED 4000, with full remote control over colors and effects. Dimensions: 5.4" (L) x 4.5" (W) x 2.9" (H)



Fiber optic harness - This will be supplied with tail lengths from 1.25m to 7.5m depending upon the kit you choose. The harness is made of mixed diameter fiber - 0.75mm and 1.0mm - to give a near and far effect.



Star bullet lenses are supplied with these kit. These can be fitted on the fiber ends for decorative effect or to hide unevenly drilled holes

Name	Standard Illuminator	Number of Tails	Length	Power Supply	Tungsten Halogen Illuminator Dimensions
SS112	35W	112 tails	4.1' - 6.56' (1.25m - 2.0m)	One 110v power supply	(L)7.1" x (W)3.9" x (H)4.1"
SS112+1	35W	112 tails	7.4' - 9.8' (2.25m - 3.0m)	One 110v power supply	(L)7.1" x (W)3.9" x (H)4.1"
MS168	50W	168 tails	6.6' - 9.8' (2.0m - 3.0m)	One 110v power supply	(L)11.3" x (W)6.1" x (H)4.7"
LS224	75W	224 tails	3.28' - 14.8' (1.0m - 4.5m)	One 110v power supply	(L)11.3" x (W)6.1" x (H)4.7"
XLS336	75W	336 tails	6.56' - 24.6' (2.0m - 7.5m)	One 110v power supply	(L)11.3" x (W)6.1" x (H)4.7"



Arrangements Round Large

by Michael Anastassiades , 2018

Diffuse light suspended lighting device. Body in extruded, curved NC-machined and black powder-coated aluminium, diffuser in platinum optical silicone.

Each component can be connected to the power pack by means of an electrical and mechanical connection system designed for customisable product set-up.

Roses available with two powers: lamp with power under 70W and lamp with power under 190W. Class III roses also available for installations with remote power supply: "surface" version for installations on cement, "recessed" version for plasterboard ceilings.

The electronics integrated in the rose enables use of dimming systems: push, 1-10, potentiometer, DALI. In the absence of these systems, the light flow can be set with the push system included in the rose.

Cable length 2.4m

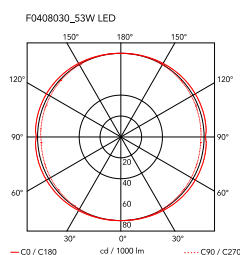
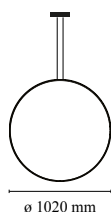


Mounting	Pendant
Environment	Indoor
Weight	1.3 Kg
Light sources available	1 x FLEX STRIP LED 54W 2751lm 2700K CRI90 [i]
Emergency	Without
Voltage	48V
Power	54W
Battery	No
Supply included	No

Cord Length 2400 mm

Materials Aluminum

Colors ● F0408030 - Black



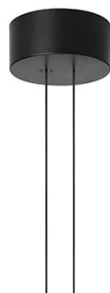
Arrangements Round Large

by Michael Anastassiades , 2018

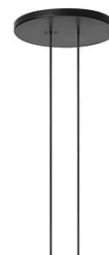
RR1/2



F0415030
Big Rose-MAX190W



F0416030
Small Rose-MAX70



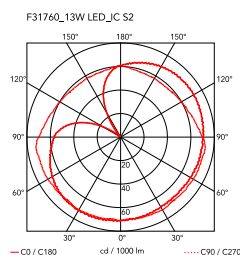
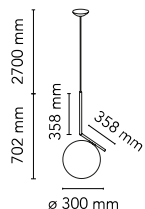
F0418030
Recessed Rose-MAX190W

IC Lights Suspension 2

by Michael Anastassiades , 2014



Suspension lamp providing diffused light. Frame in brass, brushed and transparent varnished or chrome steel. Blown glass opal diffuser.



Mounting	Pendant
Environment	Indoor
Weight	3.9 Kg
Light sources available	1 x RF26259 LED 18W E27 2700K [e] 1900lm Dimmable 1 x RF26258 LED 18W E27 3000K [e] 2000lm Dimmable 1 x RF28665 LED 15W E27 2700K [e] 2000lm Dimmable 1 x RF28666 LED 15W E27 3000K [e] 2000lm Dimmable

Emergency	Without
Voltage	220-250V
Power	MAX 205W
Battery	No
Supply included	No

Cord Length 2700 mm

Materials Blown glass, Brass, Steel

Colors	F3176035 - Red burgundy F3176030 - Black F3176057 - Chrome F3176059 - Brushed Brass
---------------	---

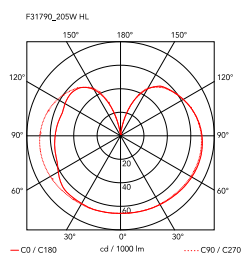
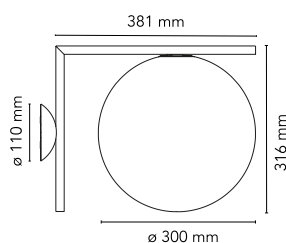


IC Lights Ceiling/Wall 2

by Michael Anastassiades , 2014



Wall-ceiling lamp providing diffused light. Frame in brass, brushed and transparent varnished or chrome steel. Blown glass opal diffuser.



Mounting	Ceiling and wall
Environment	Indoor
Weight	3.7 Kg
Light sources available	1 x RF26259 LED 17W E27 2700K [e] 1900lm Dimmable 1 x RF26258 LED 17W E27 3000K [e] 2000lm Dimmable 1 x RF28665 LED 15W E27 2700K [e] 2000lm Dimmable 1 x RF28666 LED 15W E27 3000K [e] 2000lm Dimmable

Emergency	Without
Voltage	220-250V
Power	MAX 205W
Battery	No
Supply included	No

Materials	Blown glass, Brass, Steel
------------------	---------------------------

Colors	F3179035 - Red burgundy F3179030 - Black F3179057 - Chrome F3179059 - Brushed Brass
---------------	--

Certificate	
--------------------	--

FIXTURE SPECIFICATIONS

INTENDED USE

The integrated color-changing LED lightstrip has a 1-inch lens aperture width and is available in standard lengths of 2-foot, 4-foot, 6-foot, 8-foot and custom cuts. Our commercial-grade product with dimmable light via Android or iOS application or optional controls can be joined in seamless runs of any length. This 24-voltage lightstrip offers direct downlight secured in a military-grade, field-cutable aluminum channel.

PRODUCT FAMILY

12100-10-P | Pendant

12100-10-S | Surface

12100-10-R | Recessed

12100-10-LR | Low-Profile Recessed

12100-10-PR | Perimeter Recessed

12100-10-PR-RGBW | Perimeter Recessed RGBW

FEATURES

Construction: Durable military grade aluminum, field cuttable can be installed in any drywall thickness

LED Driver: Remote non-dimming transformer is provided home run required at every 16'

Beam Angle: 120°

Lens: Glare-free snap-in frosted acrylic for even distribution

Shape Design: Fixture profile can be miter cut—in the field—to achieve desired shape design

Finish: Matte White

Voltage: 24V DC Constant Voltage

Lumens: 310 lms (White) | 185 lms (RGB)

Dimming: Light is Dimmable via iOS/Android Application or Optional Controls

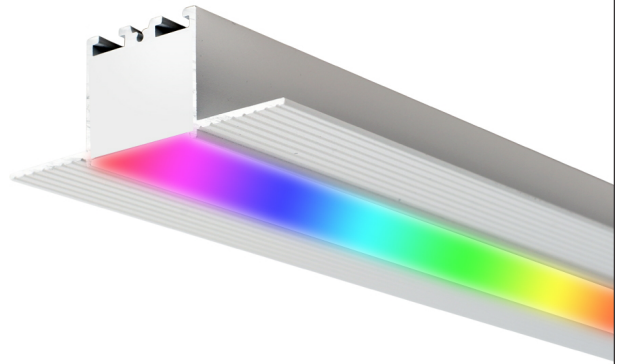
WiFi Controls: RF-WiFi: IOS or Android Lightpad App;

DMX-WiFi: IOS or Android WiFi 104 App available

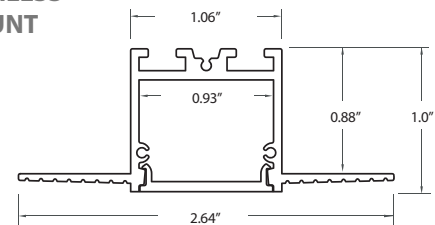
Life: 50,000 Hours

Warranty: 5 Years Carefree for Parts & Components (Labor Not Included)

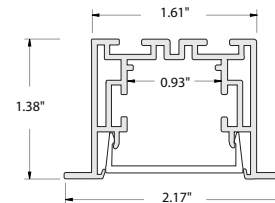
Listings: cUL Listed, Title 24 Certified, Wet Location (LED Component Only)



TRIMLESS MOUNT



T-BAR & FLANGE MOUNT



ORDERING INFORMATION Example: (12100-10-R-RGBW-2-RGBW27K-RTL-RF)

Model	Length Wattage	Color Temp	Mount Type	Flange Finish ¹	Options
12100-10-R-RGBW Recessed RGBW	2 2 Foot 10 Watts	RGBW27K RGB + 2700K	RTL Trimless	WH White	WL Wet Location IP65
	4 4 Foot 20 Watts	RGBW30K RGB + 3000K	RT T-Bar	BK Black	RF RF White Remote Control
	6 6 Foot 30 Watts	RGBW40K RGB + 4000K	RF Flanged	SL Silver	RF-WiFi RF with WiFi White Remote Control
	8 8 Foot 40 Watts	RGBW50K RGB + 5000K			DMX White Wall Control
	XX Custom Length Replace XX with Length in Feet				DMX-W-WiFi DMX with WiFi White Wall Control
					DMX-B-WiFi DMX with WiFi Black Wall Control

¹ Not required for Trimless

RGBW CONTROLS



RF Remote Control

Size: L x W x H (5.7" x 2.2" x 0.8")



RF Remote Control + WiFi

Size: L x W x H (5" x 2.9" x 1.7")

Lightpad App



iOS + Android



DMX Wall Control

Size: L x W x H (5.20" x 7.09" x 1.38")



DMX Wall Control + WiFi

Size: L x W x H (5.75" x 4.17" x 0.43")

WiFi-104



iOS + Android

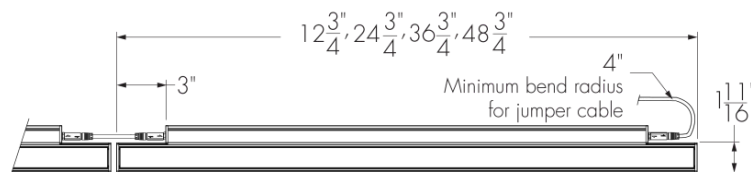
COLOR TEMPERATURE

COLOR TEMPERATURE GUIDE

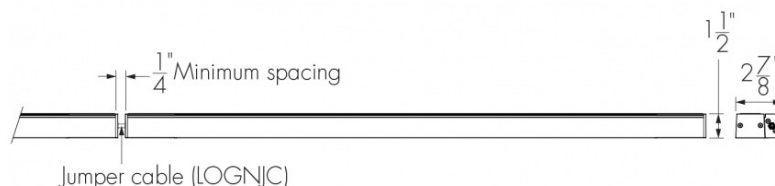


Project Name _____ Qty _____

Type _____ Catalog / Part Number _____



Top view



Front and side views

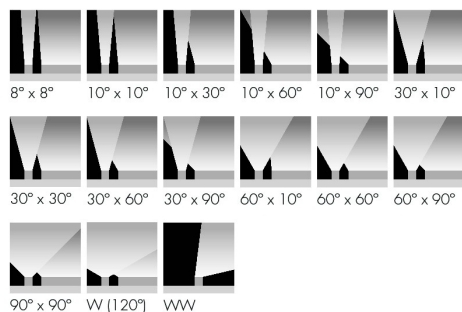
Photometric Summary

4ft, RGBW full output, DMX/RDM	Delivered output (lm)*	Intensity (peak cd)*
8°x8°	868	23,462
10°x10°	826	18,305
10°x30°	814	5,178
10°x60°	810	2,761
10°x90°	808	1,447
30°x10°	816	5,162
30°x30°	802	1,851
30°x60°	778	1,172
30°x90°	783	847
60°x10°	809	3,204
60°x60°	785	581
60°x90°	780	699
90°x90°	767	474
W (120°)	490	N/A
WW	865	4,195

Photometric performance is measured in compliance with IESNA LM 79-08.

*Estimated. Consult website for the latest IES and LDT files.

Optics



Description

The Lumenfacade Nano Horizontal Color Changing is a high-efficiency linear LED luminaire with a slim profile that makes it easy to conceal and integrate into architectural facades. Available in 12 in, 24 in, 36 in or 48 in sections, the Lumenfacade Nano Horizontal Color Changing can be configured with a wide number of options, including: optics for grazing, floodlighting, or wall washing; RGB, RGBW or RGBA color mixing; various mounting options, finishes and controls. The Lumenfacade Nano Horizontal Color Changing is also available with a unique asymmetric distribution, providing exceptional uniformity and brightness for walls and signage.

Features

Color and Color Temperature	Additive RGB, Additive RGB + white 4000K, Additive RGB + amber
Optics	8° x 8°, 10° x 10°, 10° x 30°, 10° x 60°, 10° x 90°, 30° x 10°, 30° x 30°, 30° x 60°, 30° x 90°, 60° x 10°, 60° x 60°, 60° x 90°, 90° x 90°, Wide 120°, Asymmetric Wallwash
Options	Corrosion-resistant coating for hostile environments
Power Consumption	4 W/ft
Warranty	5-year limited warranty

Performance

Delivered Output	724 lm (48 in fixture, RGB full output, 8° x 8°, UCTL), 868 lm (48 in fixture, RGBW full output, 8° x 8°, UCTL), 748 lm (48 in fixture, RGBA full output, 8° x 8°, UCTL)
Delivered Intensity	19,566 cd at nadir (48 in fixture, RGB full output, 8° x 8°, UCTL), 23,462 cd at nadir (48 in fixture, RGBW full output, 8° x 8°, UCTL), 20,211 cd at nadir (48 in fixture, RGBA full output, 8° x 8°, UCTL)
Illuminance at Distance	Minimum 1 fc at 153 ft (48 in fixture, RGB full output, 8° x 8°, UCTL), Minimum 1 fc at 168 ft (48 in fixture, RGBW full output, 8° x 8°, UCTL), Minimum 1 fc at 156 ft (48 in fixture, RGBA full output, 8° x 8°, UCTL)

Colors and Color Temperatures**Controls**

UCTL

Ratings

IP66 IK08

Certifications

Lumen Maintenance	L70 >90,000 hrs
--------------------------	-----------------

Physical

Housing Material	Low copper content extruded aluminum
-------------------------	--------------------------------------

Lens Material	Clear tempered glass
----------------------	----------------------

Hardware Material	Stainless steel
--------------------------	-----------------

End Cap Material	Machined aluminum
-------------------------	-------------------

Gasket Material	Silicone
------------------------	----------

Surface Finish	Electrostatically applied polyester powder coat
-----------------------	---

Weight	1.5 lbs (12 in), 3.2 lbs (24 in), 4.8 lbs (36 in), 6.5 lbs (48 in)
---------------	--

Electrical and control

Voltage	48 VDC
----------------	--------

Resolution (DMX/RDM)	Per foot or per fixture (configured with LumenID V3 software), 8-bit or 16-bit, 3 channels (RGB) or 4 channels (RGBW, RGBA)
-----------------------------	---

RGB Color Mixing	12 LEDs per 12 in (4x Red, 4x Green, 4x Blue)
-------------------------	---

RGBW Color Mixing	12 LEDs per 12 in (3x Red, 3x Green, 3x Blue, 3x White)
--------------------------	---

RGBA Color Mixing	12 LEDs per 12 in (3x Red, 3x Green, 3x Blue, 3x Amber)
--------------------------	---

Control	Universal control (compatible with DMX/RDM or DALI-2 Type 8 systems)
----------------	--

Environmental

Storage Temperature	-40 °F to 185 °F (device must reach start-up temperature value before operating)
----------------------------	--

Start-up Temperature	-13 °F to 122 °F
-----------------------------	------------------

Operating Temperature	-40 °F to 122 °F
------------------------------	------------------

Ingress Protection Rating	IP66
----------------------------------	------

Impact Resistance Rating	IK08 (IK09 for 48 in fixtures)
---------------------------------	--------------------------------

Accessories (order separately)

Cables	Lumenfacade Nano Jumper Cable, Trunk Power Cable, Trunk Data Cable, Lumenfacade Nano Jumper Cable Joiner
---------------	--

Control Boxes	Low-Voltage Control Box, Low-Voltage Splitter Box
----------------------	---

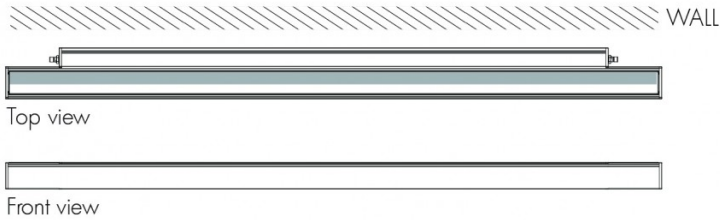
Optical Accessories	Lumenfacade Nano Visor
----------------------------	------------------------

Control Systems	Lumentone™ 2, Pharos® kit
------------------------	---------------------------

Diagnostic and Addressing Tools	LumenID
--	---------

Optical option installation details

HFR - Half-frosted lens



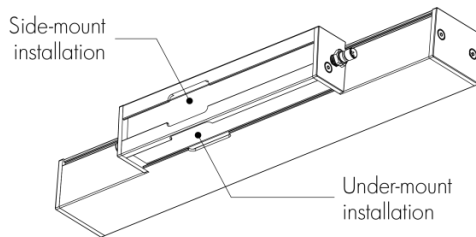
- Always position frosted side toward the wall.
- Applicable for 8° x 8°, 10° x 10° or asymmetric wallwash optics only.

WW - Asymmetric wallwash

Recommended setback from wall is 1/10 of the wall height.

Example: 2 ft setback for a 20 ft wall.

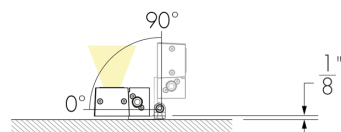
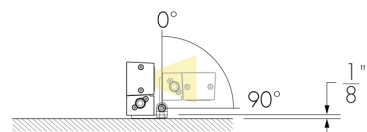
Mounting points



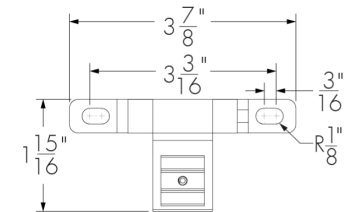
Mounting options

One mounting bracket provided for 12 in fixtures. Two mounting brackets provided for 24 in, 36 in and 48 in fixtures. See installation instructions for details.

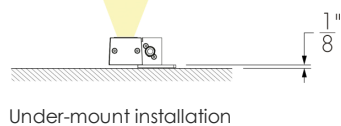
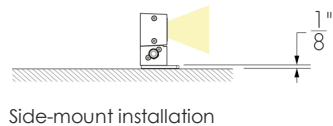
SAMNH - Slim Adjustable Mounting Nano Horizontal



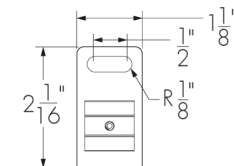
SAMNH - Mounting hole pattern



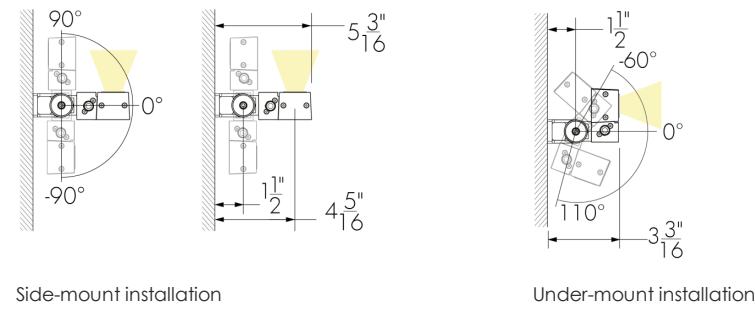
UMPNH - Fixed Mounting Nano Horizontal



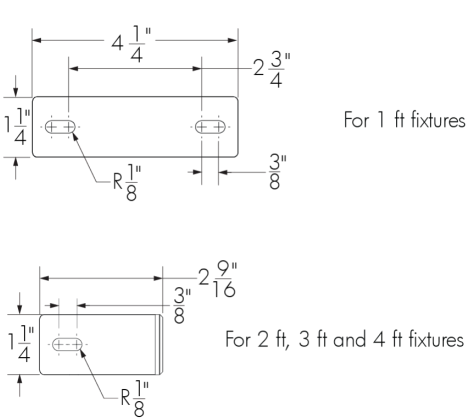
UMPNH - Mounting hole pattern



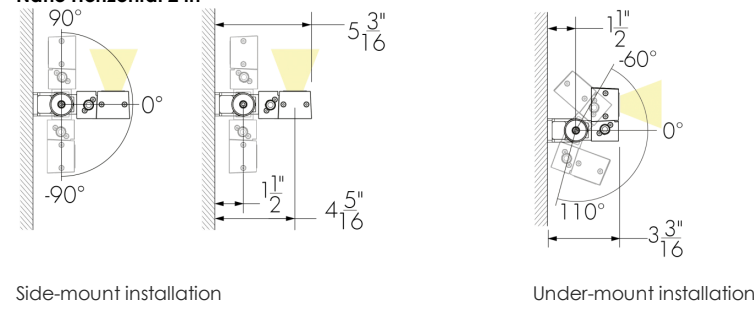
UMASNH - Universal Adjustable Mounting Nano



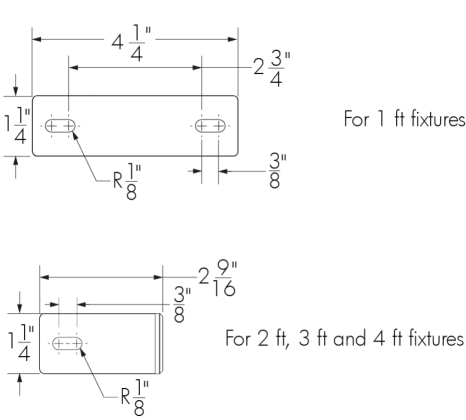
UMASNH - Mounting hole pattern



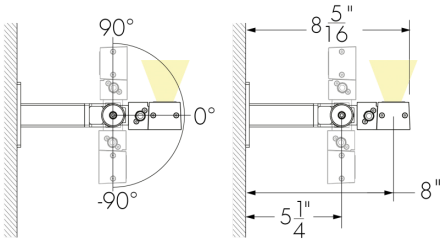
WAMNH2 - Adjustable Extended Arm Mounting Nano Horizontal 2 in



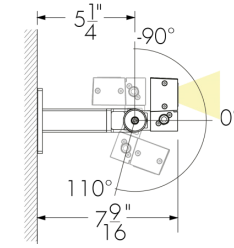
WAMNH2 - Mounting hole pattern



WAMNH6 - Adjustable Extended Arm Mounting Nano Horizontal 6 in

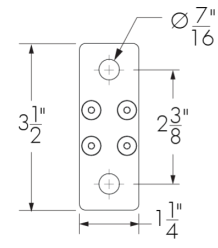


Side-mount installation

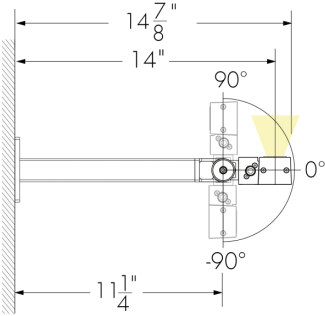


Under-mount installation

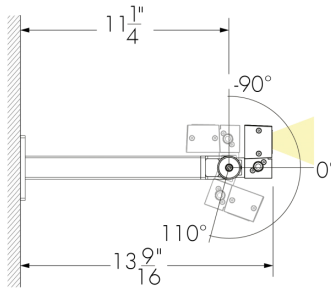
WAMNH6 - Mounting hole pattern



WAMNH12 - Adjustable Extended Arm Mounting Nano Horizontal 12 in

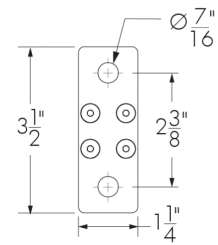


Side-mount installation

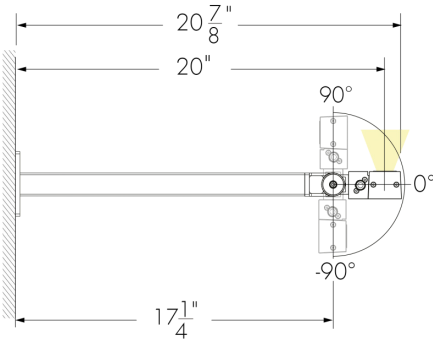


Under-mount installation

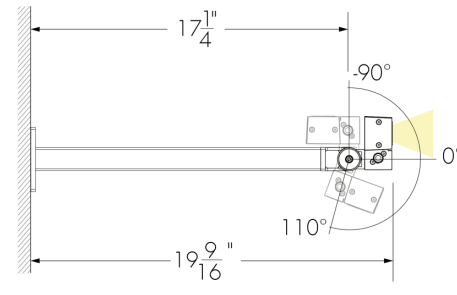
WAMNH12 - Mounting hole pattern



WAMNH18 - Adjustable Extended Arm Mounting Nano Horizontal 18 in

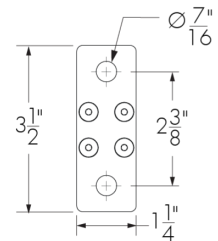


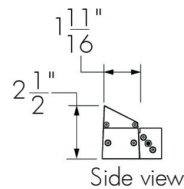
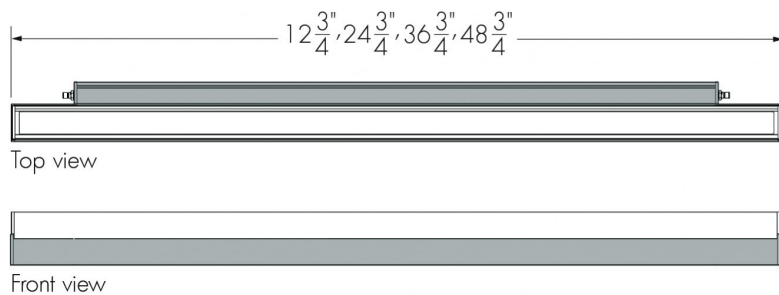
Side-mount installation



Under-mount installation

WAMNH18 - Mounting hole pattern

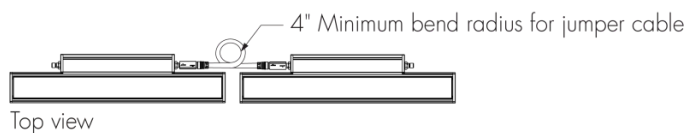


Optical accessories (order separately)**LOGNVS - Visor for Lumenfacade Nano****LOGNVS-LENGTH-FINISH-OPTIONS**

Please specify:

LENGTH: 12 in, 24 in, 36 in or 48 in; **FINISH:** BK - Black Sandtex®, BRZ - Bronze Sandtex®, SI - Silver Sandtex®, WH - Smooth white or CC - custom color and finish (please specify RAL color); **OPTIONS:** CRC - Corrosion-resistant coating for hostile environments

- The addition of a visor will affect beam distribution. Consult factory for application support.
- Not suitable for wide 120° optic.
- Maximum one accessory per fixture. Visors are field installable.

Cables (order separately)**LOGNJC - Jumper cable for Lumenfacade Nano**

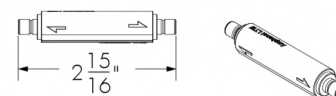
For minimal spacing between fixtures, use a 1 ft jumper cable.

LOGNJC-CERTIFICATION-LENGTH-CABLE COLOR

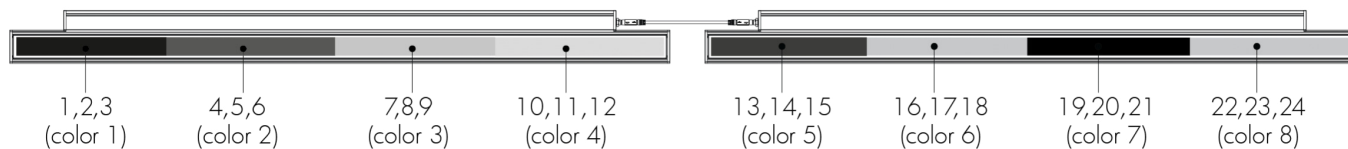
Please specify:

CERTIFICATION: UL or CE; **LENGTH:** 1 ft to 30 ft (available in 1 ft increments) or 50 ft; **CABLE COLOR:** black or white (connectors are the same color as the specified cable color).

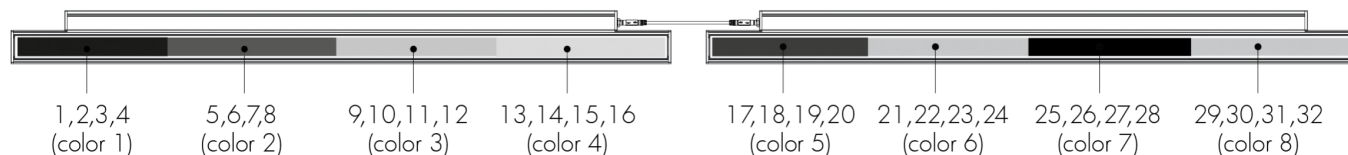
- Suitable for dimming/data and non-dimming applications.
- Consult Lumenfacade Nano jumper cable specification sheet for all available cable lengths and additional information.

Joiner (order separately)**LOGNJC-JOINER - Joiner for Lumenfacade Nano Jumper Cable**

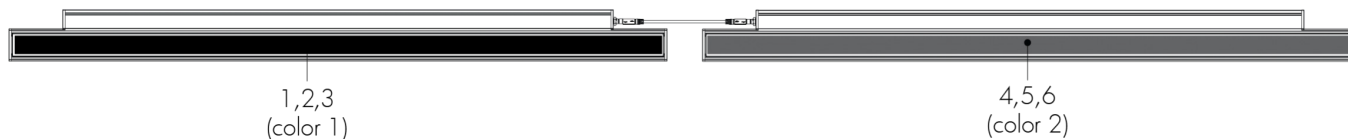
- Use joiners to connect and lengthen jumper cables.
- Joiners add voltage drops. Consult factory to confirm impact on run length.
- Available in black.

Resolution details**DMX/RDM control, resolution per foot: each 12 in section is addressed independently****DMX addresses:**

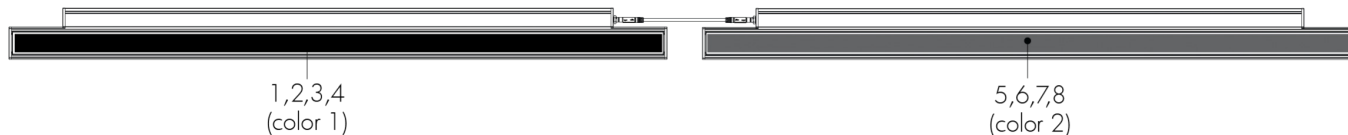
UCTL control option, RGB color mixing option.



UCTL control option, RGBW and RGBA color mixing options.

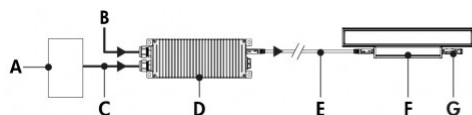
DMX/RDM control, resolution per fixture: each fixture is addressed independently**DMX addresses:**

UCTL control option, RGB color mixing option.

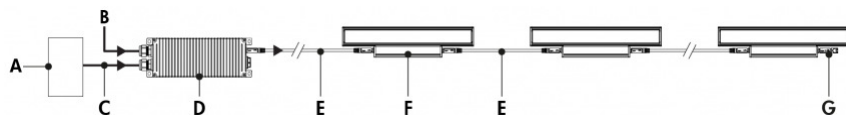


UCTL control option, RGBW, RGBA color mixing options.

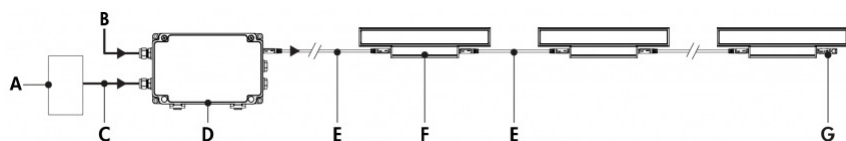
- 48 in fixtures shown.
- Fixture resolution can be configured on-site within the LumenID V3 software. A DMX/RDM enabled LCBX or DMX/RDM LSBX is required for DMX/RDM control.

Typical wiring diagrams**UCTL - Universal control****Single unit - LCBX 60W**

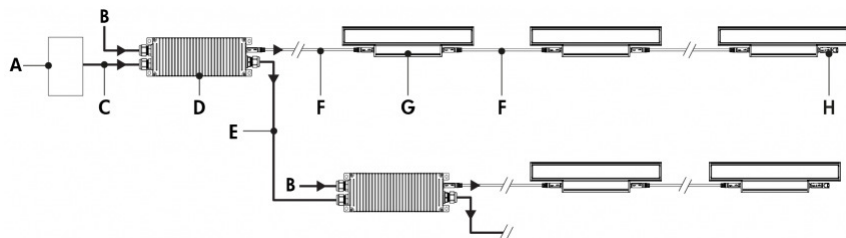
- A** - Controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (60W)
- E** - Jumper cable (LOGNJC)
- F** - Lumenfacade Nano Horizontal
- G** - Terminator cap

Continuous run - LCBX 60W or 120W

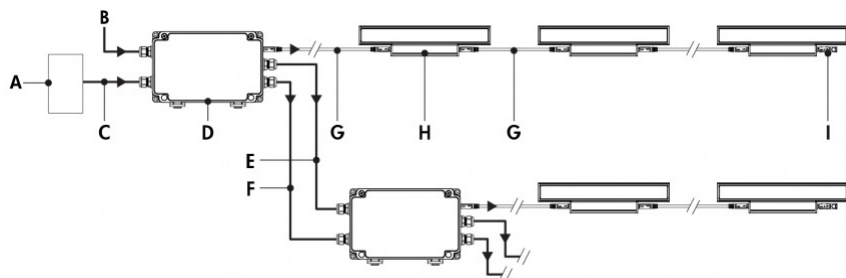
- A** - Controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (60W or 120W)
- E** - Jumper cable (LOGNJC)
- F** - Lumenfacade Nano Horizontal
- G** - Terminator cap

Continuous run - LCBX 200W

- A** - Controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (200W)
- E** - Jumper cable (LOGNJC)
- F** - Lumenfacade Nano Horizontal
- G** - Terminator cap

**Continuous run - Daisy chain
LCBX 60W or 120W**

- A** - Controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (60W or 120W)
- E** - Data output to next LCBX (wiring by others)
- F** - Jumper cable (LOGNJC)
- G** - Lumenfacade Nano Horizontal
- H** - Terminator cap

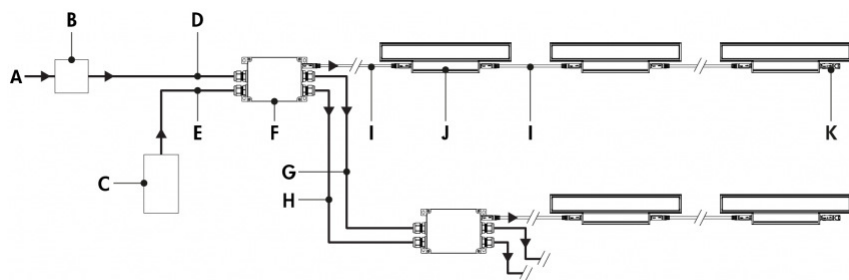
**Continuous run - Daisy chain
LCBX 200W**

- A** - Controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (200W)
- E** - Power output to next LCBX (120-277V, wiring by others)
- F** - Data output to next LCBX (wiring by others)
- G** - Jumper cable (LOGNJC)
- H** - Lumenfacade Nano Horizontal
- I** - Terminator cap

Maximum run length per LCBX (Based on a 50 ft master jumper cable)	
Configuration	4 W/ft
LCBX 60W	12 ft
LCBX 120W	24 ft
LCBX 200W	40 ft

- Consult factory for specific applications and maximum fixture count/run length recommendations.
- For installations of 600W or more, consult factory to select the optimal system: either a daisy chain continuous run system with LCBXs or a trunk system with LSBXs.
- A maximum of 128 UCTL devices on the output port of the LCBX.
- Maximum of 1 output to fixture, or fixture run, per LCBX.
- Consult the LCBX specification sheet for more information.
- RGB color mixture option requires 3 DMX channels. RGBW color mixture option requires 4 DMX channels. RGBA color mixture option requires 4 DMX channels.
- Fixtures can be controlled via a DMX/RDM or DALI controller.
- For DALI-2 Type 8 applications:
 - The LCBX responds to RGBWAF control.
- 4 W/ft.

Trunk system - LSBX

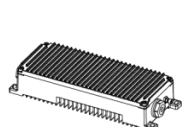


- A** - Power input (120-277V, wiring by others)
- B** - Power supply (48V, by others)
- C** - Controller (order separately from Lumenpulse, or by others)
- D** - Power input (48V, order separately from Lumenpulse - Trunk Power Cable (TKPWR), or equivalent by others)
- E** - Data input (order separately from Lumenpulse - Trunk Data Cable (TKDMX), or equivalent by others)
- F** - LSBX
- G** - Power output to next LSBX (48V, order separately from Lumenpulse - Trunk Power Cable (TKPWR), or equivalent by others)
- H** - Data output to next LSBX (order separately from Lumenpulse - Trunk Data Cable (TKDMX), or equivalent by others)
- I** - Jumper cable (LOGNJC)
- J** - Lumenfacade Nano Horizontal
- K** - Terminator cap

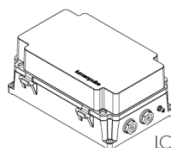
- Consult factory for specific applications and maximum fixture count/run length recommendations.
- For installations of 600W or more, consult factory to select the optimal system: either a daisy chain continuous run system with LCBXs or a trunk system with LSBXs.
- A maximum of 128 UCTL devices on the output port of the LSBX.
- Maximum of 1 output to fixture run per LSBX.
- Consult the LSBX specification sheet for more information.
- Consult factory for power supply recommendations.
- RGB color mixture option requires 3 DMX channels. RGBW color mixture option requires 4 DMX channels. RGBA color mixture option requires 4 DMX channels.
- 4 W/ft.

Control boxes (order separately)

LCBX - Low-Voltage Control Box



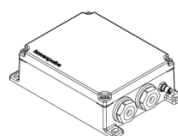
LCBX 60W & 120W



LCBX 200W

Low-voltage control and power box. One power and data output to fixture, or fixture run. Refer to LCBX specification sheet for details.

LSBX - Low-Voltage Splitter Box



Low-voltage control and power splitter box. One power and data output to fixture run. Refer to LSBX specification sheet for details.

Control systems (order separately)

LTN2 - Lumentone™ 2



Lumentone 2 is a simple pre-programmed DMX 512 controller with a push button rotary dial and live feedback.

PHAROS - Pharos® kit



The Pharos kit, available for 1 or 2 DMX universes, allows for complete control of large lighting installations. 2 DMX universes kit shown.

Diagnostic and addressing tools (order separately)

LID - LumenID



LumenID is a diagnostic and addressing DMX/RDM tool. It must be specified on all DMX applications. Consult LID specification sheet for details.

How to order

Housing	Wattage	Voltage	Length	Color and Color Temperature	Optics
LOGNH Lumenfacade™ Nano Horizontal	4W 4 W/ft	48V 48 VDC	12 12 3/4 in (1.4 lbs) 24 24 3/4 in (2.9 lbs) 36 36 3/4 in (4.4 lbs) 48 48 3/4 in (6 lbs)	RGB Additive RGB RGBW Additive RGB + white 4000K standard. 2700K, 3000K and 3500K available, consult factory. ⁽¹⁾ RGBA Additive RGB + amber	8x8 8° x 8° 10x10 10° x 10° 10x30 10° x 30° 10x60 10° x 60° 10x90 10° x 90° 30x10 30° x 10° 30x30 30° x 30° 30x60 30° x 60° 30x90 30° x 90° 60x10 60° x 10° 60x60 60° x 60° 60x90 60° x 90° 90x90 90° x 90° W Wide 120° ⁽²⁾ WW Asymmetric Wallwash

Notes:

1. Longer lead times apply for Royal Blue, 2700K, 3000K and 3500K white color temperature mixes.

2. Not compatible with visor optical accessory.

How to order

Lens	Mounting Options ⁽⁴⁾	Finish	Control ⁽¹⁰⁾	Options	Certification
CL Clear lens ⁽³⁾ FR Frosted lens ⁽⁴⁾ HFR Half-frosted lens ⁽⁵⁾	SAMNH Slim Adjustable Mounting Nano Horizontal UMPNH Fixed Mounting Nano Horizontal UMASNH Universal Adjustable Mounting Nano Horizontal WAMNH2 Adjustable Wall Mounting Nano Horizontal 2 in WAMNH6 Adjustable Extended Arm Mounting Nano Horizontal 6 in WAMNH12 Adjustable Extended Arm Mounting Nano Horizontal 12 in WAMNH18 Adjustable Extended Arm Mounting Nano Horizontal 18 in	BK Black Sandtex® BRZ Bronze Sandtex® SI Silver Sandtex® WH Smooth white CC Custom color and finish (please specify RAL color) ⁽⁷⁾ ⁽⁸⁾ ⁽⁹⁾	UCTL Universal control (compatible with DMX/RDM or DALI-2 Type 8 systems)	CRC Corrosion-resistant coating for hostile environments ⁽¹¹⁾ ⁽¹²⁾	UL UL compliant CE CE compliant

- Notes:**

3. Not available for 8x8, 10x10, W or WW optics.

4. Not available for WW optic.

5. Available for 8x8, 10x10 or WW optics only.

6. One mounting bracket provided for 12 in fixtures. Two mounting brackets provided for 24 in, 36 in and 48 in fixtures.

7. Lumenpulse offers a wide selection of RAL CLASSIC (K7) colors with a smooth texture and high-gloss finish. Please consult factory for a list of available K7 colors, other RAL textures and glosses, or to match alternate color charts. Final color matching results may vary.
8. Setup charges apply for RAL colors. Consult factory for details.

9. Longer lead times can be expected for custom RAL color finishes.

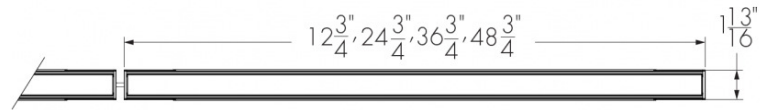
10. A Low-Voltage Control Box (LCBX) or Low-Voltage Splitter Box (LSBX) and LumenID (LID) must be specified.

11. Use only when exposed to salt spray and harsh chemicals. This option is not required for normal outdoor exposure.

12. Setup charges apply. Consult factory for details.

Project Name _____ Qty _____

Type _____ Catalog / Part Number _____



Top view



Front and side views

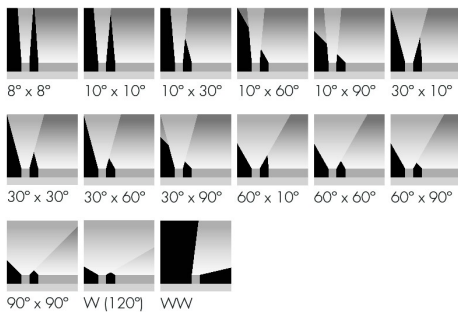
Photometric Summary

4ft, RGBW full output, DMX/RDM	Delivered output (lm)*	Intensity (peak cd)*
8°x8°	868	23,462
10°x10°	826	18,305
10°x30°	814	5,178
10°x60°	810	2,761
10°x90°	808	1,447
30°x10°	816	5,162
30°x30°	802	1,851
30°x60°	778	1,172
30°x90°	783	847
60°x10°	809	3,204
60°x60°	785	581
60°x90°	780	699
90°x90°	767	474
W (120°)	490	N/A
WW	865	4,195

Photometric performance is measured in compliance with IESNA LM 79-08.

*Estimated. Consult website for the latest IES and LDT files.

Optics



Description

The Lumenfacade Nano Color Changing is a high-efficiency linear LED luminaire that goes where no facade lighting has gone before. Available in 12 in, 24 in, 36 in or 48 in sections, the Lumenfacade Nano Color Changing packs all the bells and whistles of the larger members of the Lumenfacade family and can be configured with a wide number of options, including: optics for grazing, floodlighting, or wall washing; RGB, RGBW or RGBA color mixing; various mounting options, finishes and controls. The Lumenfacade Nano Color Changing is also available with a unique asymmetric distribution, providing exceptional uniformity and brightness for walls and signage.

Features

Color and Color Temperature	Additive RGB, Additive RGB + white 4000K, Additive RGB + amber
Optics	8° x 8°, 10° x 10°, 10° x 30°, 10° x 60°, 10° x 90°, 30° x 10°, 30° x 30°, 30° x 60°, 30° x 90°, 60° x 10°, 60° x 60°, 60° x 90°, 90° x 90°, Wide 120°, Asymmetric Wallwash
Options	Corrosion-resistant coating for hostile environments
Power Consumption	4 W/ft
Warranty	5-year limited warranty

Performance

Delivered Output	724 lm (48 in fixture, RGB full output, 8° x 8°, UCTL), 868 lm (48 in fixture, RGBW full output, 8° x 8°, UCTL), 748 lm (48 in fixture, RGBA full output, 8° x 8°, UCTL)
Delivered Intensity	19,566 cd at nadir (48 in fixture, RGB full output, 8° x 8°, UCTL), 23,462 cd at nadir (48 in fixture, RGBW full output, 8° x 8°, UCTL), 20,211 cd at nadir (48 in fixture, RGBA full output, 8° x 8°, UCTL)
Illuminance at Distance	Minimum 1 fc at 153 ft (48 in fixture, RGB full output, 8° x 8°, UCTL), Minimum 1 fc at 168 ft (48 in fixture, RGBW full output, 8° x 8°, UCTL), Minimum 1 fc at 156 ft (48 in fixture, RGBA full output, 8° x 8°, UCTL)

Colors and Color Temperatures**Controls**

UCTL

Ratings

IP66 IK08

Certifications

Lumen Maintenance L70 >90,000 hrs

Physical

Housing Material Low copper content extruded aluminum

Lens Material Clear tempered glass

Hardware Material Stainless steel

End Cap Material Machined aluminum

Gasket Material Silicone

Surface Finish Electrostatically applied polyester powder coat

Weight 1.4 lbs (12 in), 2.9 lbs (24 in), 4.4 lbs (36 in), 6 lbs (48 in)

Electrical and control

Voltage 48 VDC

Resolution (DMX/RDM) Per foot or per fixture (configured with LumenID V3 software), 8-bit or 16-bit, 3 channels (RGB) or 4 channels (RGBW, RGBA)

RGB Color Mixing 12 LEDs per 12 in (4x Red, 4x Green, 4x Blue)

RGBW Color Mixing 12 LEDs per 12 in (3x Red, 3x Green, 3x Blue, 3x White)

RGBA Color Mixing 12 LEDs per 12 in (3x Red, 3x Green, 3x Blue, 3x Amber)

Control Universal control (compatible with DMX/RDM or DALI-2 Type 8 systems)

Environmental

Storage Temperature -40 °F to 185 °F (device must reach start-up temperature value before operating)

Start-up Temperature -13 °F to 122 °F

Operating Temperature -40 °F to 122 °F

Ingress Protection Rating IP66

Impact Resistance Rating IK08 (IK09 for 48 in fixtures)

Accessories (order separately)

Cables Lumenfacade Nano Jumper Cable, Trunk Power Cable, Trunk Data Cable, Lumenfacade Nano Jumper Cable Joiner

Control Boxes Low-Voltage Control Box, Low-Voltage Splitter Box

Optical Accessories Lumenfacade Nano Visor

Control Systems Lumentone™ 2, Pharos® kit

Diagnostic and Addressing Tools LumenID

Optical option installation details

HFR - Half-frosted lens



- Always position frosted side toward the wall.
- Applicable for 8° x 8°, 10° x 10° or asymmetric wallwash optics only.

WW - Asymmetric wallwash

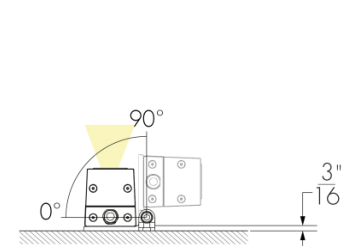
Recommended setback from wall is 1/10 of the wall height.

Example: 2 ft setback for a 20 ft wall.

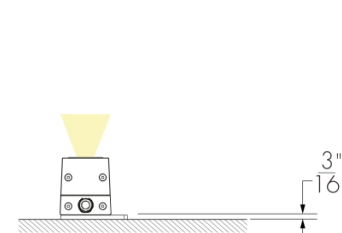
Mounting options

One mounting bracket provided for 12 in fixtures. Two mounting brackets provided for 24 in, 36 in and 48 in fixtures. See installation instructions for details.

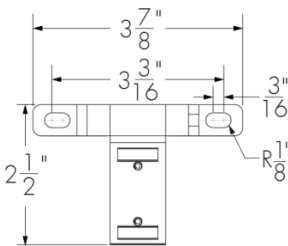
SAMN - Slim Adjustable Mounting Nano



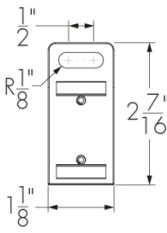
UMPN - Fixed Mounting Nano



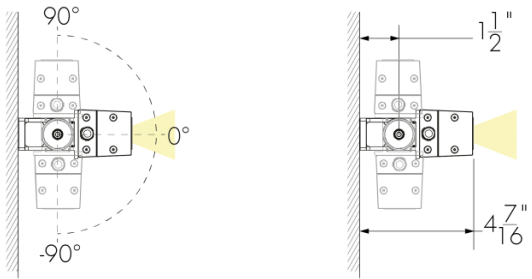
SAMN - Mounting hole pattern



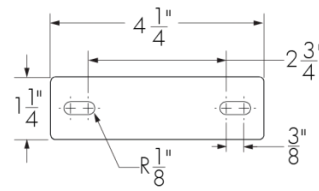
UMPN - Mounting hole pattern



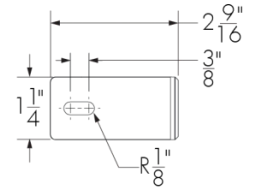
UMASN - Universal Adjustable Mounting Nano



UMASN - Mounting hole pattern

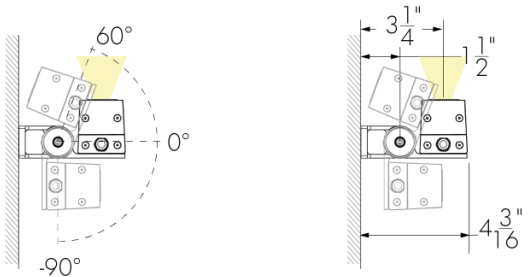


For 1 ft fixtures

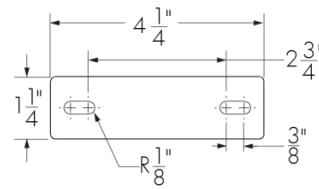


For 2 ft, 3 ft and 4 ft fixtures

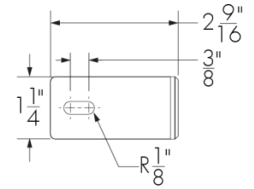
WAMN2 - Adjustable Extended Arm Mounting Nano 2 in



WAMN2 - Mounting hole pattern

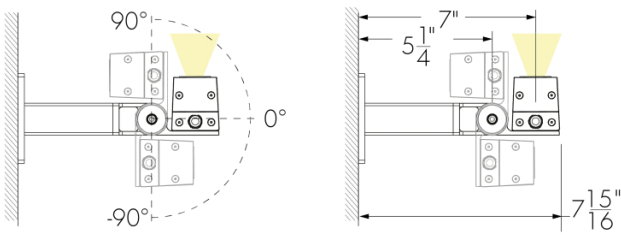


For 1 ft fixtures

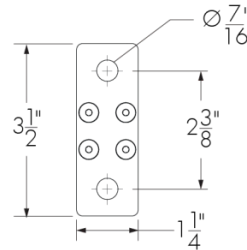


For 2 ft, 3 ft and 4 ft fixtures

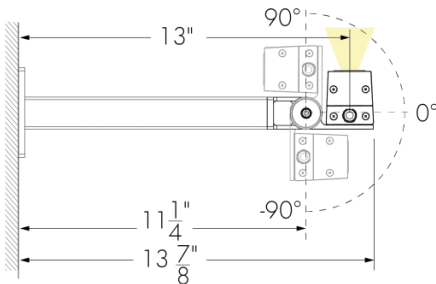
WAMN6 - Adjustable Extended Arm Mounting Nano 6 in



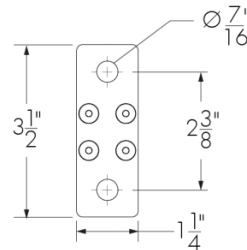
WAMN6 - Mounting hole pattern



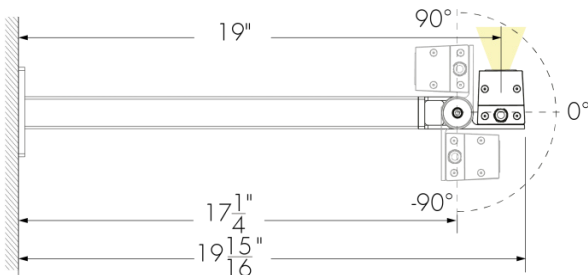
WAMN12 - Adjustable Extended Arm Mounting Nano 12 in



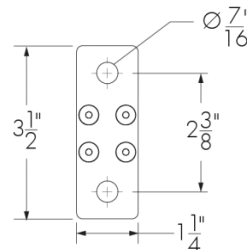
WAMN12 - Mounting hole pattern



WAMN18 - Adjustable Extended Arm Mounting Nano 18 in

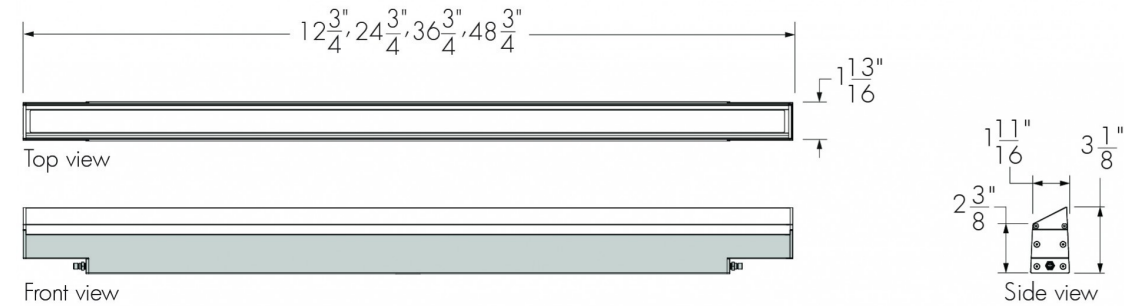


WAMN18 - Mounting hole pattern



Optical accessories (order separately)

LOGNVS - Visor for Lumenfacade Nano



LOGNVS-LENGTH-FINISH-OPTIONS

- Please specify:
- LENGTH:** 12 in, 24 in, 36 in or 48 in; **FINISH:** BK - Black Sandtex®, BRZ - Bronze Sandtex®, SI - Silver Sandtex®, WH - Smooth white or CC - custom color and finish (please specify RAL color); **OPTIONS:** CRC - Corrosion-resistant coating for hostile environments
- The addition of a visor will affect beam distribution. Consult factory for application support.
 - Not suitable for wide 120° optic.
 - Maximum one accessory per fixture. Visors are field installable.

Cables (order separately)

LOGNJC - Jumper cable for Lumenfacade Nano



Front view 4" Minimum bend radius for jumper cable

For minimal spacing between fixtures, use a 1 ft jumper cable.

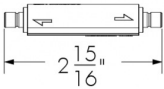
LOGNJC-CERTIFICATION-LENGTH-CABLE COLOR

Please specify:
CERTIFICATION: UL or CE; **LENGTH:** 1 ft to 30 ft (available in 1 ft increments) or 50 ft; **CABLE COLOR:** black or white (connectors are the same color as the specified cable color).

- Suitable for dimming/data and non-dimming applications.
- Consult Lumenfacade Nano jumper cable specification sheet for all available cable lengths and additional information.

Joiner (order separately)

LOGNJC-JOINER - Joiner for Lumenfacade Nano Jumper Cable

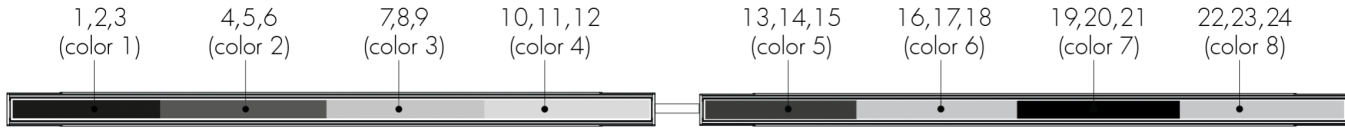


- Use joiners to connect and lengthen jumper cables.
- Joiners add voltage drops. Consult factory to confirm impact on run length.
- Available in black.

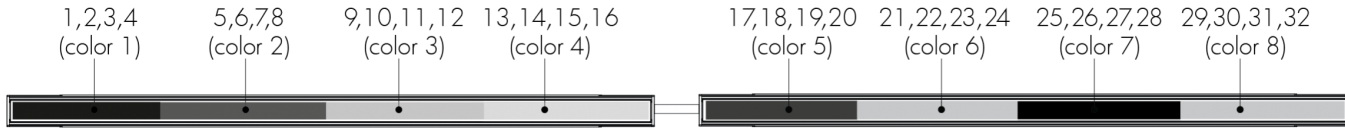
Resolution details

DMX/RDM control, resolution per foot: each 12 in section is addressed independently

DMX addresses:



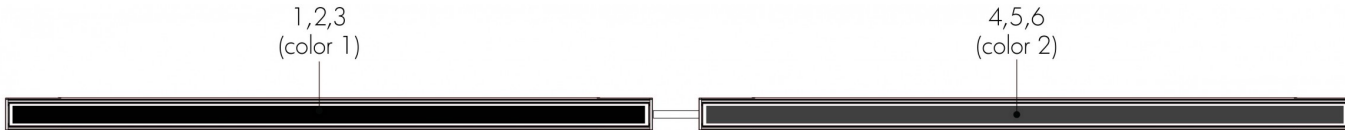
UCTL control option, RGB color mixing option.



UCTL control option, RGBW and RGBA color mixing options.

DMX/RDM control, resolution per fixture: each fixture is addressed independently

DMX addresses:



UCTL control option, RGB color mixing option.



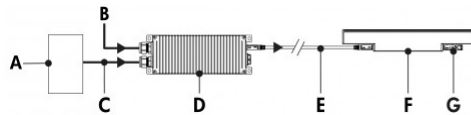
UCTL control option, RGBW, RGBA color mixing options.

- 48 in fixtures shown.
- Fixture resolution can be configured on-site within the LumenID V3 software. A DMX/RDM enabled LCBX or DMX/RDM LSBX is required for DMX/RDM control.

Typical wiring diagrams

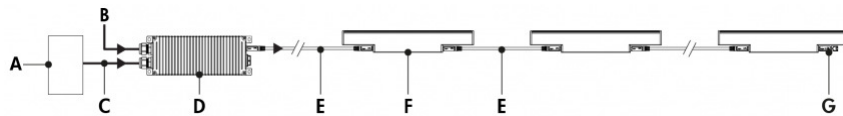
UCTL - Universal control

Single unit - LCBX 60W



- A** - Controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (60W)
- E** - Jumper cable (LOGNJC)
- F** - Lumenfacade Nano
- G** - Terminator cap

Continuous run - LCBX 60W or 120W



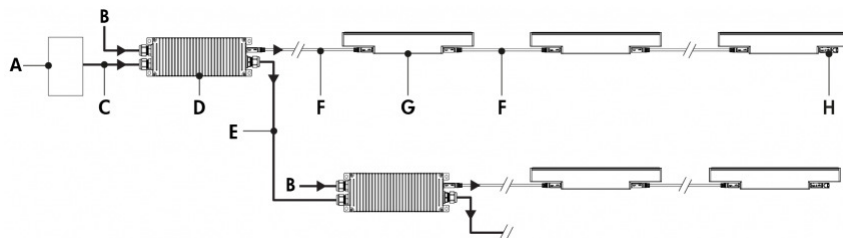
- A** - Controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (60W or 120W)
- E** - Jumper cable (LOGNJC)
- F** - Lumenfacade Nano
- G** - Terminator cap

Continuous run - LCBX 200W



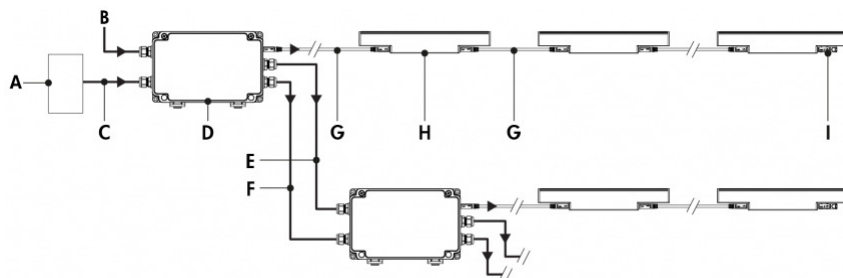
- A** - Controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (200W)
- E** - Jumper cable (LOGNJC)
- F** - Lumenfacade Nano
- G** - Terminator cap

Continuous run - Daisy chain LCBX 60W or 120W



- A** - Controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (60W or 120W)
- E** - Data output to next LCBX (wiring by others)
- F** - Jumper cable (LOGNJC)
- G** - Lumenfacade Nano
- H** - Terminator cap

Continuous run - Daisy chain LCBX 200W

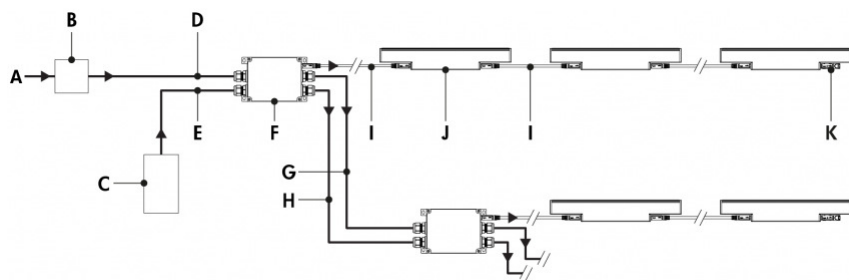


- A** - Controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (200W)
- E** - Power output to next LCBX (120-277V, wiring by others)
- F** - Data output to next LCBX (wiring by others)
- G** - Jumper cable (LOGNJC)
- H** - Lumenfacade Nano
- I** - Terminator cap

Maximum run length per LCBX (Based on a 50 ft master jumper cable)	
Configuration	4 W/ft
LCBX 60W	12 ft
LCBX 120W	24 ft
LCBX 200W	40 ft

- Consult factory for specific applications and maximum fixture count/run length recommendations.
- For installations of 600W or more, consult factory to select the optimal system: either a daisy chain continuous run system with LCBXs or a trunk system with LSBXs.
- A maximum of 128 UCTL devices on the output port of the LCBX.
- Maximum of 1 output to fixture, or fixture run, per LCBX.
- Consult the LCBX specification sheet for more information.
- RGB color mixture option requires 3 DMX channels. RGBW color mixture option requires 4 DMX channels. RGBA color mixture option requires 4 DMX channels.
- Fixtures can be controlled via a DMX/RDM or DALI controller.
- For DALI-2 Type 8 applications:
 - The LCBX responds to RGBWAF control.
- 4 W/ft.

Trunk system - LSBX

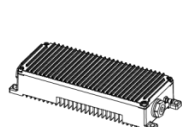


- A** - Power input (120-277V, wiring by others)
- B** - Power supply (48V, by others)
- C** - Controller (order separately from Lumenpulse, or by others)
- D** - Power input (48V, order separately from Lumenpulse - Trunk Power Cable (TKPWR), or equivalent by others)
- E** - Data input (order separately from Lumenpulse - Trunk Data Cable (TKDMX), or equivalent by others)
- F** - LSBX
- G** - Power output to next LSBX (48V, order separately from Lumenpulse - Trunk Power Cable (TKPWR), or equivalent by others)
- H** - Data output to next LSBX (order separately from Lumenpulse - Trunk Data Cable (TKDMX), or equivalent by others)
- I** - Jumper cable (LOGNJC)
- J** - Lumenfacade Nano
- K** - Terminator cap

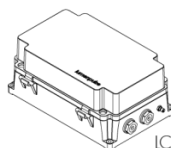
- Consult factory for specific applications and maximum fixture count/run length recommendations.
- For installations of 600W or more, consult factory to select the optimal system: either a daisy chain continuous run system with LCBXs or a trunk system with LSBXs.
- A maximum of 128 UCTL devices on the output port of the LSBX.
- Maximum of 1 output to fixture run per LSBX.
- Consult the LSBX specification sheet for more information.
- Consult factory for power supply recommendations.
- RGB color mixture option requires 3 DMX channels. RGBW color mixture option requires 4 DMX channels. RGBA color mixture option requires 4 DMX channels.
- 4 W/ft.

Control boxes (order separately)

LCBX - Low-Voltage Control Box



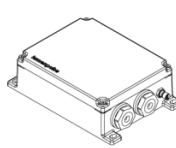
LCBX 60W & 120W



LCBX 200W

Low-voltage control and power box. One power and data output to fixture, or fixture run. Refer to LCBX specification sheet for details.

LSBX - Low-Voltage Splitter Box



Low-voltage control and power splitter box. One power and data output to fixture run. Refer to LSBX specification sheet for details.

Control systems (order separately)

LTN2 - Lumentone™ 2



Lumentone 2 is a simple pre-programmed DMX 512 controller with a push button rotary dial and live feedback.

PHAROS - Pharos® kit



The Pharos kit, available for 1 or 2 DMX universes, allows for complete control of large lighting installations. 2 DMX universes kit shown.

Diagnostic and addressing tools (order separately)

LID - LumenID



LumenID is a diagnostic and addressing DMX/RDM tool. It must be specified on all DMX applications. Consult LID specification sheet for details.

How to order

Housing	Wattage	Voltage	Length	Color and Color Temperature	Optics
LOGN Lumenfacade™ Nano	4W 4 W/ft	48V 48 VDC	12 12 3/4 in (1.4 lbs) 24 24 3/4 in (2.9 lbs) 36 36 3/4 in (4.4 lbs) 48 48 3/4 in (6 lbs)	RGB Additive RGB RGBW Additive RGB + white 4000K standard. 2700K, 3000K and 3500K available, consult factory. ⁽¹⁾ RGBA Additive RGB + amber	8x8 8° x 8° 10x10 10° x 10° 10x30 10° x 30° 10x60 10° x 60° 10x90 10° x 90° 30x10 30° x 10° 30x30 30° x 30° 30x60 30° x 60° 30x90 30° x 90° 60x10 60° x 10° 60x60 60° x 60° 60x90 60° x 90° 90x90 90° x 90° W Wide 120° ⁽²⁾ WW Asymmetric Wallwash

Notes:

1. Longer lead times apply for Royal Blue, 2700K, 3000K and 3500K white color temperature mixes.

2. Not compatible with visor optical accessory.

How to order

Lens	Mounting Options ⁽⁴⁾	Finish	Control ⁽¹⁰⁾	Options	Certification
CL Clear lens ⁽³⁾ FR Frosted lens ⁽⁴⁾ HFR Half-frosted lens ⁽⁵⁾	SAMN Slim Adjustable Mounting Nano UMPN Fixed Mounting Nano UMASN Universal Adjustable Mounting Nano WAMN2 Adjustable Wall Mounting Nano 2 in WAMN6 Adjustable Extended Arm Mounting Nano 6 in WAMN12 Adjustable Extended Arm Mounting Nano 12 in WAMN18 Adjustable Extended Arm Mounting Nano 18 in	BK Black Sandtex® BRZ Bronze Sandtex® SI Silver Sandtex® WH Smooth white CC Custom color and finish (please specify RAL color) ⁽⁷⁾ ⁽⁸⁾ ⁽⁹⁾	UCTL Universal control (compatible with DMX/RDM or DALI-2 Type 8 systems)	CRC Corrosion-resistant coating for hostile environments ⁽¹¹⁾ ⁽¹²⁾	UL UL compliant CE CE compliant

- Notes:**

3. Not available for 8x8, 10x10, W or WW optics.

4. Not available for WW optic.

5. Available for 8x8, 10x10 or WW optics only.

6. One mounting bracket provided for 12 in fixtures. Two mounting brackets provided for 24 in, 36 in and 48 in fixtures.

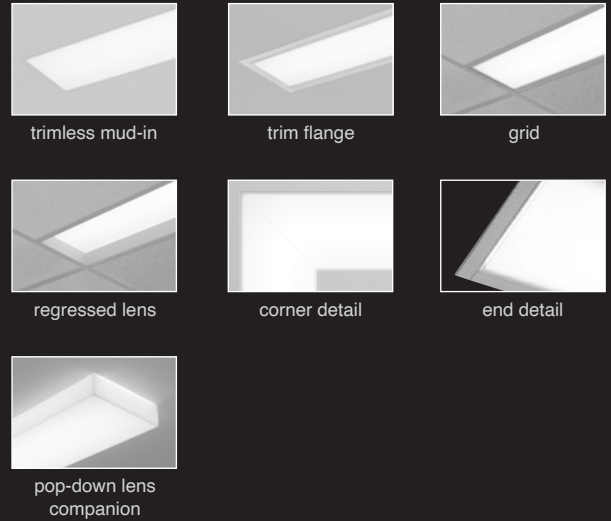
7. Lumenpulse offers a wide selection of RAL CLASSIC (K7) colors with a smooth texture and high-gloss finish. Please consult factory for a list of available K7 colors, other RAL textures and glosses, or to match alternate color charts. Final color matching results may vary.
8. Setup charges apply for RAL colors. Consult factory for details.

9. Longer lead times can be expected for custom RAL color finishes.

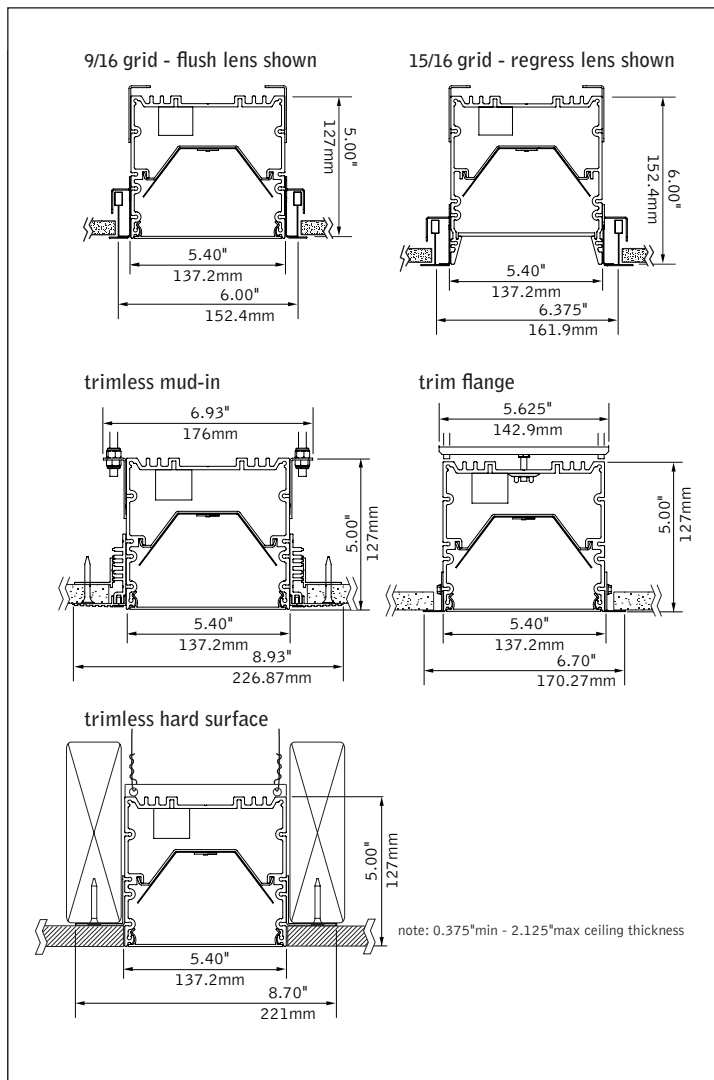
10. A Low-Voltage Control Box (LCBX) or Low-Voltage Splitter Box (LSBX) and LumenID (LID) must be specified.

11. Use only when exposed to salt spray and harsh chemicals. This option is not required for normal outdoor exposure.

12. Setup charges apply. Consult factory for details.



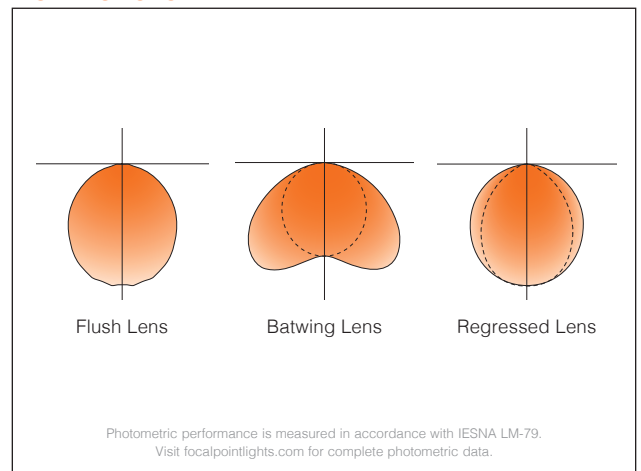
DIMENSIONAL DATA



FEATURES

- Narrow extruded aluminum 6" aperture recessed slot LED.
- Integrates with ceiling or wall in a variety of mounting styles for a clean, unobtrusive aesthetic.
- Compatible with common pre-engineered grid ceiling systems requiring luminaires fitting into a 6" slot.
- Individual units and continuous runs in 1" increments.
- Frosted acrylic lens provides uninterrupted illumination, without pixels or shadows.
- LED position and lens material optimized to provide the perfect blend of high performance and visual comfort.
- Connected Solutions: Integrates with wired and wireless building lighting control systems.
- Preferred Light: Lighting for better color rendition and human preference.
- PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires.

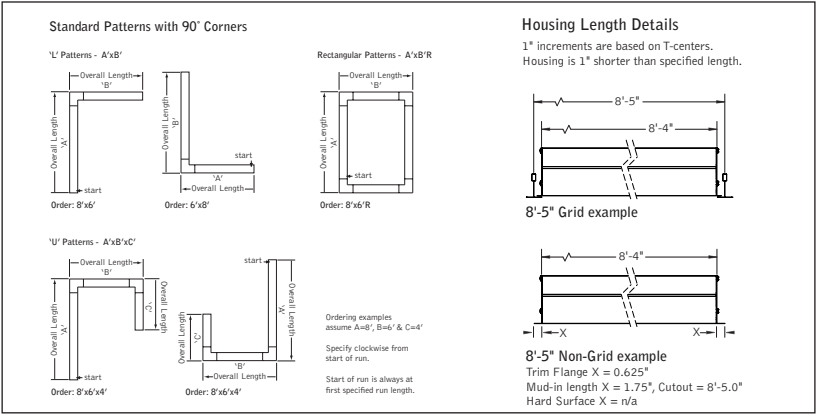
DISTRIBUTIONS



fixture:

project:

DETAILS



SPECIFICATIONS

LED System

Proprietary linear LED module incorporates premium LEDs on a robust platform to achieve excellent thermal management. LEDs are placed to promote a uniform appearance. Available in 2700K, 3000K, 3500K or 4000K with CRI>80 or CRI>90, 3 SDCM. 3500K and 4000K with CRI>90 have a cyanosis observation index (COI) of 3.3 or less. LED modules and drivers are replaceable from below.

Construction

One piece extruded aluminum housing. 20 Ga. steel end caps. Housing for new construction applications. XFW acceptable for use with wood, consult factory for Type IC availability. 2' unit weight: 18 lbs., 3' unit weight: 24 lbs., 4' unit weight: 30 lbs., 5' unit weight: 36 lbs.

Optic

Reflectors fabricated of 22 Ga. steel finished in High Reflectance White powder coat. Extruded acrylic lens .085" thick with satin finish, up to 8' continuous.

Electrical

Luminaires are pre-wired with factory installed branch circuit wiring and over-molded quick connects. Standard 120-277V constant current driver includes 0-10V analog dimming. Dimming range 100% to 10%. Power factor > .9. PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires. PoE runs require an independent PoE node and power feed for each luminaire section.

Emergency

Emergency Battery output - 10 watts for 90 minutes. Maximum mounting height: 18.8ft. Emergency Circuit with Connected Solutions (NLT1, ENL1, CLM1, CLMZ1, DLM1) shipped standard with leads to connect UL924 compliant device, by others. See EM/EC Guide for default locations and ordering details.

Labels

UL and cUL listed. Suitable for Dry or Damp Locations, indoor use only.

Finish

Polyester powder coat applied over a multi-stage pre-treatment.

Lumen Maintenance

Reported: L70 > 61,000 hours Calculated: L70 at > 350,000 hours
L90 > 61,000 hours L90 at > 90,000 hours
(Derived from EPA TM-21 calculator. Based on typical conditions, consult factory for additional data.)

Reliability

At Focal Point, our products are designed to stand the test of time. Each luminaire is engineered using superior components, manufactured with the utmost care and rigorously tested. Contact us for reliability data.

Warranty

LED system rated for operation in ambient environments up to 25°C. 5-year limited warranty.

4' PERFORMANCE CHART

Lumens Output	Delivered Lumens	Tested System Watts	LPW			
			FL	BW	SR	SRXP
375	1500	18	88	98	90	100
625	2500	31	87	98	90	100
875	3500	44	85	95	90	99
1000	4000	51	85	94	88	97
1125	4500	54	84	94	86	96
1250	5000	61	82	92	87	97

Based on 3500K, 80 CRI, 4' lengths. Lumen multipliers: Preferred Light = 0.65, 90+ CRI = 0.87.
Lumen output may vary +/- 5%. Actual wattage may vary +/- 5%.



10 DAY*

Options in orange qualify for the Quickship program. 1000' total, 48" maximum per pattern section. Refer to Quickship Guide for complete details including EM/EC options.

Focal Point LLC reserves the right to change specifications for product improvement without notification.

ORDERING

Luminaire Series

Seem 6 LED

Shielding

Batwing Lens

Flush Lens

Regressed Lens

(Ceiling applications only)

Regressed High Performance Lens

(Ceiling applications only)

Lumen Output

375 Lumens per foot

(Not available with LU5 & LH1 Drivers)

625 Lumens per foot

(4' minimum with LU5 & LH1 Drivers)

875 Lumens per foot

(3' minimum with LU5 & LH1 Drivers)

1000 Lumens per foot

1125 Lumens per foot

1250 Lumens per foot

Color Temperature

2700K, 80+ CRI or 90+ CRI

3000K, 80+ CRI or 90+ CRI

3500K, 80+ CRI or 90+ CRI

4000K, 80+ CRI or 90+ CRI

3500K, Preferred Light

(BW & FL Lens only. 6" increments. Patterns not available.)

Circuit

Single Circuit

Voltage

UNV 120/277 Volt

Low voltage

Control System & Dimming Level

0-10V - 10% Dimming

0-10V - 1% Dimming

Low-voltage, PoE compatible

(No driver. Not available with EM or EC. LV Voltage only.)

Lutron Hi-Lume EcoSystem (LDE1) - 1% Dimming

Lutron 5-Series EcoSystem (LDE5) - 5% Dimming

DALI 1% Dimming (1000LF max.)

Acuity nLight - 1% Dimming

(Not available with CP. Grid only. 3' minimum length.)

Enlighted Smart Sensor - 1% Dimming

(3' minimum length. Grid only.)

Osram Connected Lighting Module for ENCELIUM systems - 1% Dimming

(3' minimum length. Grid only. Compatible with Osram ENCELIUM and ENCELIUM EDGE systems only)

Osram Connected Lighting Module for ZigBee Wireless Networks - 1% Dimming

(3' minimum length. Grid only. Not compatible with Osram ENCELIUM systems)

Wattstopper® DLM - 1% Dimming

(3' minimum length. Grid only)

Ceiling Configurations

Std. 15/16" Lay-in

Std. 15/16" Tegular

Std. 9/16" Lay-in

Std. 9/16" Tegular

9/16" Slot-tee Tegular

Tall 15/16" Lay-in

Tall 15/16" Tegular

Tall 9/16" Lay-in

Tall 9/16" Tegular

Node 9/16" Tegular

Trim Flange Drywall

(3' minimum with Lutron Drivers)

Trim Flange Wood

(3' minimum with Lutron Drivers)

Mud-in Trimless, pre-set for 1/2" Drywall

Mud-in Trimless, pre-set for 5/8" Drywall

Mud-in Trimless, set thickness in field

(Mounting equipment assembled in field)

Non-Drywall Hard Surface

Hard Surface, Wood

Factory Options

Chicago Plenum

(Not available with Flex Whip)

Emergency Circuit

(4' minimum, 7' minimum with CLM1, CLMZ1, DLM1, ENL1 & NLT1.)

Emergency Battery Pack

(4' minimum, 7' minimum with CLM1, CLMZ1, DLM1, ENL1 & NLT1. See EM/EC Guide for default locations and ordering details.)

6' New York City Flex Whip (120V)

6' New York City Flex Whip (277V)

6' Flex Whip

Finish

Matte White Housing

Luminaire Length

Specify luminaire/row length in 1" increments

(2' minimum, lengths are nominal 1" increments based on T-centers. Housing length is 1" shorter than specified. Leave blank for patterns.)

(Smaller increments available, consult factory.)

Pattern Options

(3' minimum length)

'L' pattern

'U' pattern

Rectangular pattern

(Consult factory for other pattern options)

RR6

FSM6L

BW

FL

SR

SRXP

375LF

625LF

875LF

1000LF

1125LF

1250LF

27K or 927K

30K or 930K

35K or 935K

40K or 940K

P35K

1C

1C

UNV

LV

LD1

L11

LVN

LH1

LU5

D11

NLT1

ENL1

CLM1

CLMZ1

DLM1

G1

T1

G2

T2

G3

G4

T4

G5

T5

T6

TF

TFW

XF1

XF2

XFF

XFN

XFW

CP

_EC

_EM

FNY1

FNY2

FW

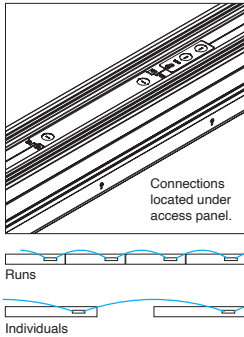
WH

ft

in

_ft _in

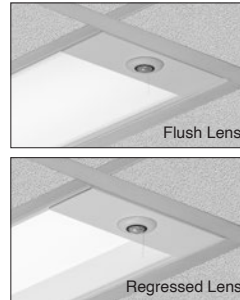
Focal Point provides flexibility in meeting the needs of each project by integrating with several building lighting control systems. A variety of sensors, drivers and other components can be specified that allow the luminaires to communicate with wired and wireless networks. All zoning can be digitally reconfigured through the application software. Daylight harvesting, occupancy sensing, integration with HVAC systems, and individual controls enable the monitoring and modulating of light levels and temperature in order to save energy, reduce costs and maximize occupants' comfort. All Connected Solutions luminaires require a compatible building control system.[†]



nLight[®] provides a two-way wired digital lighting system allowing for on/off and dimming functionality, occupancy sensing, and multi-zone daylight harvesting.

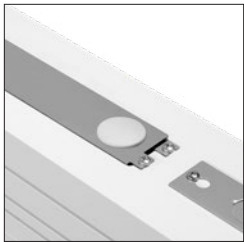
Acuity nLight - 1% Dimming (NLT1)
Acuity Model #nEPS-60-IO

CAT-5 Cable provided by others. Serial labels will be provided on outside of luminaires and control unit.



Enlighted smart sensor allows for occupancy sensing, daylight harvesting, energy usage, temperature and light level control. Communicates wirelessly with the Enlighted network.

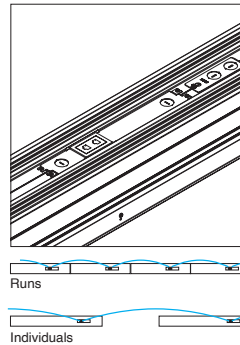
Enlighted Smart Sensor - 1% Dimming (ENL1)
Enlighted Model #SU-5E-IOT



Connected Lighting Module (CLM) enables each luminaire to be independently controlled and configured. Communicates wirelessly with Daintree Networks[®], Osram ENCELIUM[®], Osram ENCELIUM EDGE[™], and other networks using the ZigBee[®] HA communication protocol to allow for on/off and dimming functionality, occupancy sensing and multi-zone daylight harvesting.

Osram CLM - 1% Dimming (CLM1 & CLMZ1)
Osram Model #ZBHA-CLM DIM

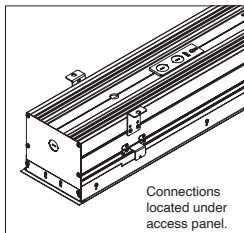
Serial labels will be provided on outside of luminaires and control unit.



A Digital Lighting Management (DLM) system that provides two-way wired communication between networked luminaires and control system to allow for on/off and dimming functionality, occupancy sensing and multi-zone daylight harvesting.

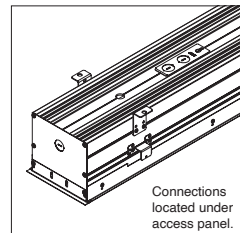
Wattstopper DLM - 1% Dimming (DLM1)
Wattstopper Model #LMFC-011

CAT-5 Cable provided by others. Serial labels will be provided on outside of luminaires and control unit.



A two-way digital network that enables on/off and dimming functionality, occupancy sensing, and multi-zone daylight harvesting working with Quantum[®], Energi Savr Node[™], and Energi TriPak[®] using EcoSystem[®] communication protocol.

Lutron Hi-Lume EcoSystem - 1% Dimming (LH1)
Lutron Model #LDE1
Lutron 5-Series EcoSystem - 5% Dimming (LU5)
Lutron Model #LDE5



A two-way digital network that enables on/off and dimming functionality, occupancy sensing, and multi-zone daylight harvesting. Communicates with Züm wireless and SpaceBuilder working with Züm hub scheduling or FUSION management.

DALI - 1% Dimming (D11)
0-10V - 1% Dimming (L11)

Note: 0-10V is not a digital network but is compatible with Crestron Züm[™] system.

CONNECTED SOLUTIONS DETAILS

Connected Solution	Model #	Protocol	Compatible Networks*	Occupancy	Daylight	Temperature Reporting	Communication to Luminaire	Drivers
Acuity nLight (NLT1)	nEPS-60-IO**	nLight	nLight	Enabled	Enabled	No	Wired	eldoLED ECODrive , eldoLED SOLOdrive
Crestron (D11, L11)	Specified Driver	DALI 0-10V	Crestron Züm Wireless & SpaceBuilder	Enabled	Enabled	No	Wired	eldoLED ECODrive (DALI) , Advance by Signify (0-10V)
Enlighted Smart Sensor (ENL1)	SU-5E-IOT**	Enlighted RF	Enlighted	Integrated	Integrated	Yes	Wireless	Advance by Signify , Osram Optotronic
Legrand Wattstopper DLM (DLM1)	LMFC-011**	DLM	DLM	Enabled	Enabled	No	Wired	Advance by Signify , Osram Optotronic
Lutron EcoSystem (LH1 & LU5)	LDE1**, LDE5**	EcoSystem	Quantum, Energi Savr Node, Energi TriPak	Enabled	Enabled	No	Wired	Lutron Hi-Lume Lutron 5-Series
Osram CLM for ENCELIUM systems (CLM1)	ZBHA-CLM**	ZigBee HA	Osram ENCELIUM & ENCELIUM EDGE	Enabled	Enabled	No	Wireless	Osram Optotronic
Osram CLM for ZigBee Wireless Networks (CLMZ1)	ZBHA-CLM**	ZigBee HA	Daintree Networks & open ZigBee Networks	Enabled	Enabled	No	Wireless	Osram Optotronic

*Not all compatible networks may be listed. **For performance data and additional control system details please visit the connected solutions manufacturer websites. Primary drivers are listed in **bold**. To specify a particular driver please consult factory. †Controls systems supplied by others.

[Back](#)[Shop](#) _____

Bau Lamp Large EU Nature

315.00 USD

Sorry - this product is out of stock.

Specifications

Maintenance

Light source

Materials:

Linden Wood Veneer

Size & Weight:

H: 51 x L: 57 cm

1,6 kg

Product Information:

Focus™ Wall Wash

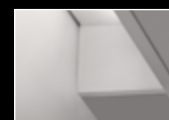
LED



inside corner

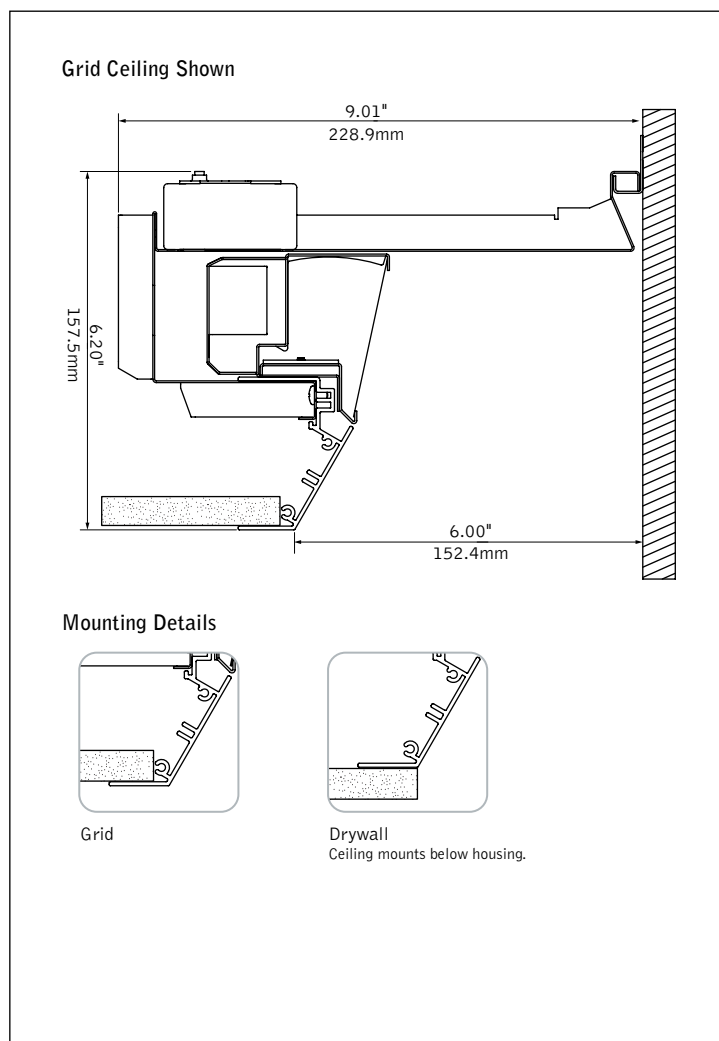


outside corner



optional flanged
end detail

DIMENSIONAL DATA



FEATURES

Low profile LED wall wash provides a glowing transition between wall and ceiling and shadow-free illumination.

Housing creates 6" architectural slot with extruded splay to conceal light source from view.

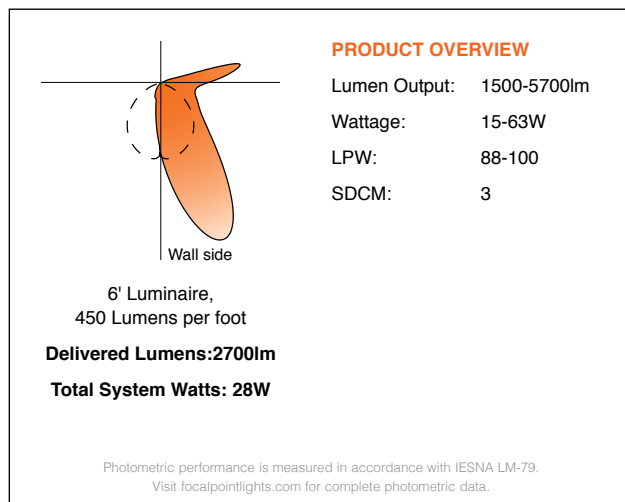
Infinite lengths with the ability for pattern creation with 90° inside and outside corners.

Ease of installation and maintenance with rough-in housing and separate snap and lock LED light module.

Integrated sliding sleeve extends to meet precise dimensions of a finished space with +/- 2" adjustment.

Preferred Light: Lighting for better color rendition and human preference.

PERFORMANCE

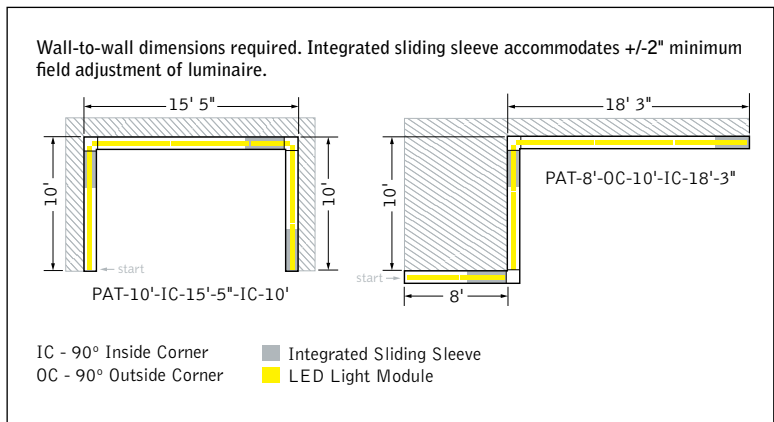


fixture:

project:

RR7

PATTERN CONFIGURATIONS (continued on page 3)



SPECIFICATIONS

LED System

Proprietary linear LED module incorporates premium LEDs on a robust platform to achieve excellent thermal management. Module is available in 2700K, 3000K, 3500K or 4000K with CRI > 80 or CRI>90. LED module and driver are replaceable from below.

Construction

One-piece, 22Ga. steel rough-in housing powder coated in matte satin white. Housing includes extruded splay in a matte satin white finish and steel alignment bracket. Light engine module constructed with 22Ga. steel and finished in matte satin white. Light engine must be installed after rough-in housing installation. Inside/outside corners and sliding sleeve fabricated with 22Ga. steel and include extruded aluminum splay.

Optic

Semi-specular aluminum optical reflector with .020" thick diffuser lens.

Electrical

Light engine module includes driver and wiring harness. Single power drop can power up to 40' or more in a single run. Galvanized feed box with access plate provided for every start of run luminaire and installed in the field. Emergency circuit feed locations are field located by positioning of feed box. Standard 120-277V driver includes 0-10V analog dimming. Power factor > .9.

Labels

UL and cUL listed. Suitable for Dry or Damp Locations, indoor use only. Suitable for wood ceiling applications.

Emergency Battery

Bodine BSL-310LP. Emergency output for 90 minutes. Maximum mounting height: 12ft.

Finish

Polyester powder coat applied over a multi-stage pre-treatment.

Lumen Maintenance

Reported: L70 > 60,000 hours Calculated: L70 at > 95,000 hours
(Derived from EPA TM-21 calculator. Based on typical conditions, consult factory for additional data.)

Reliability

At Focal Point, our products are designed to stand the test of time. Each luminaire is engineered using superior components, manufactured with the utmost care and rigorously tested. Contact us for reliability data.

Warranty

LED system rated for operation in ambient environments up to 25°C. 5 year limited warranty.

6' PERFORMANCE CHART

Lumens per Foot	Delivered Lumens	Tested System Watts	LPW
250LF	1500	15	100
450LF	2700	28	96
650LF	3900	42	92
800LF	4800	51	90
950LF	5700	63	88

Based on 3500K, 80 CRI, 6' lengths. Lumen Multipliers: Preferred Light = 0.65, 90+ CRI = 0.87.
Lumen output may vary +/- 5%. Actual wattage may vary +/- 5%.

Focal Point LLC reserves the right to change specifications for product improvement without notification.

ORDERING

Luminaire Series	FWSL	FWSL
Focus Wall Wash	FWSL	
Shielding		FL
Frosted Lens	FL	
Lumen Output		
250 Lumens per foot	250LF	
450 Lumens per foot	450LF	
650 Lumens per foot	650LF	
800 Lumens per foot	800LF	
(Not available with DALI)		
950 Lumens per foot	950LF	
(Not available with Lutron or DALI drivers)		
Color Temperature		
2700K, 80+ CRI or 90+ CRI	27K or 927K	
3000K, 80+ CRI or 90+ CRI	30K or 930K	
3500K, 80+ CRI or 90+ CRI	35K or 935K	
4000K, 80+ CRI or 90+ CRI	40K or 940K	
3500K, Preferred Light	P35K	
(6" increments only)		
Circuits		1C
Single Circuit	1C	
Voltage		
120/277 UNV	UNV	
347 Volt	347	
(650LF & LD1 driver only)		
Driver		
0-10V - 10% Dimming	LD1	
0-10V - 1% Dimming	L11	
Lutron H-Series - 1% Dimming	LH1	
Lutron 5-Series - 5% Dimming	LU5	
DALI - 1% Dimming	D11	
Mounting		U
Universal	U	
Factory Options		
Air Return	AR	
Chicago Plenum	CP	
Emergency Circuit	EC	
Emergency Battery Pack	EM	
Flanged Ends	FL	
Finish		WH
Matte White Housing	WH	
Luminaire Length		ft in
(2' minimum. Leave blank for pattern ordering.)		
Specify luminaire/row length in 1" increments	_ft _in	
Pattern Options		
Specify patterns based on wall-to-wall dimensions	PAT-	
(See Pattern Configurations for example)		

Pattern Example: FWSL-FL-650LF-35K-1C-UNV-LD1-U-WH-PAT-10'-IC-20'-5"-IC-10'



Options in orange qualify for the Quickship program. 10-day up to 400ft total. Refer to Quickship Guide for complete details.

For more information visit focalpointlights.com/reference or consult factory.

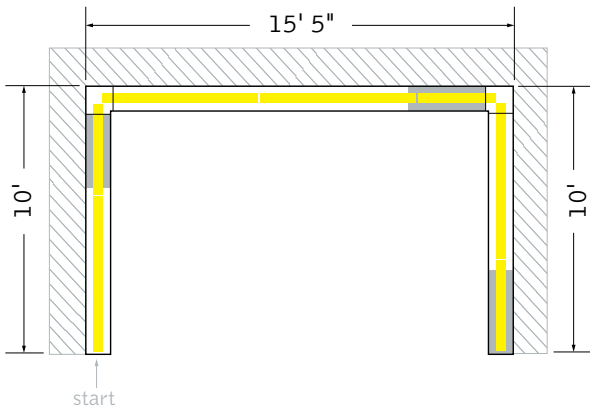
PATTERN CONFIGURATIONS

Specify wall-to-wall dimensions in feet and inches. Integrated sliding sleeve accommodates +/- 2" minimum field adjustment of luminaire at corners and end of run.

KEY

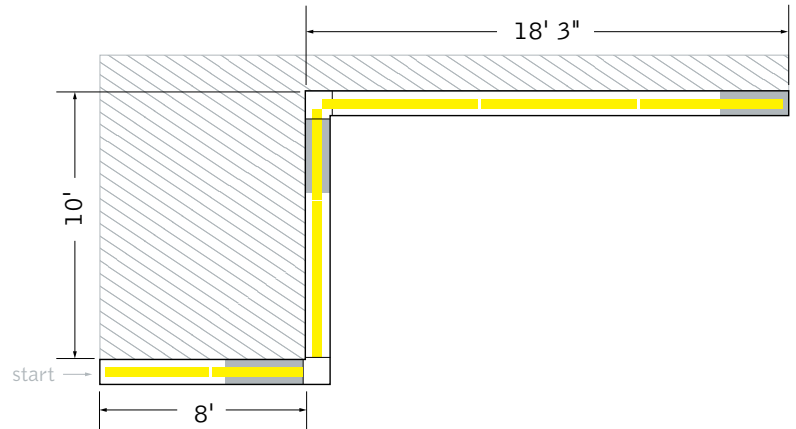
- IC - 90° Inside Corner
- OC - 90° Outside Corner
-  - Integrated Sliding Sleeve
-  - LED Light Module

U-Pattern



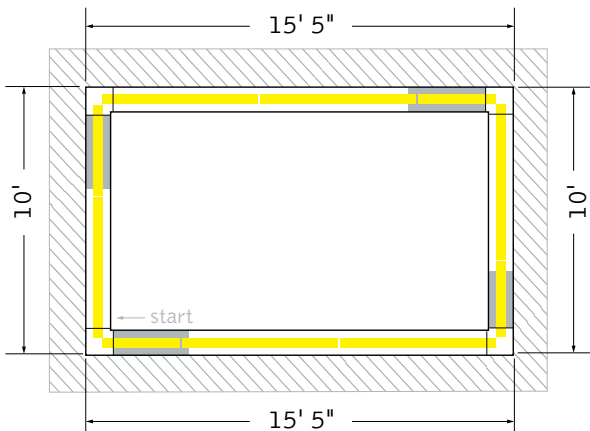
PAT-10'-IC-15'-5"-IC-10'

Z-Pattern



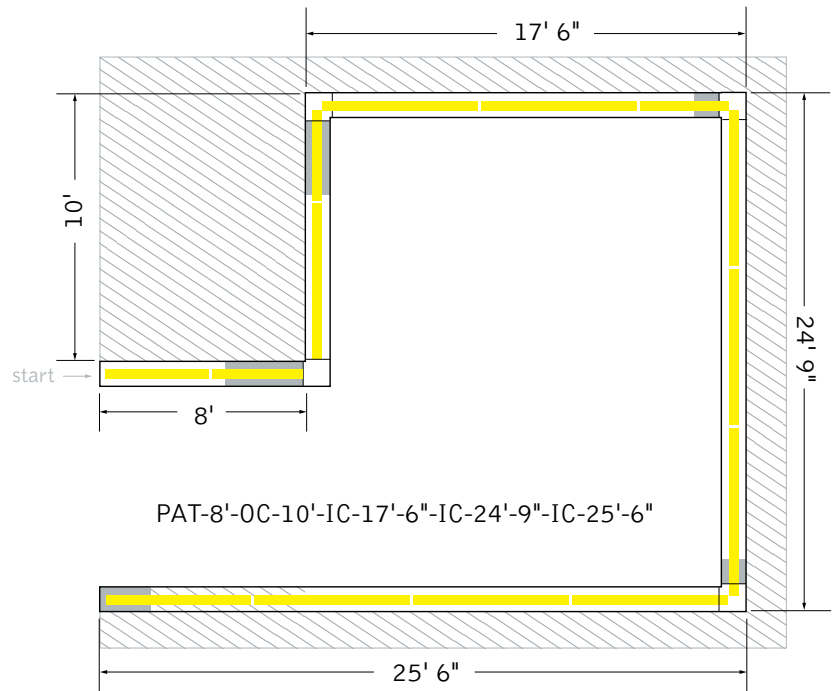
PAT-8'-OC-10'-IC-18'-3"

Square/Rectangular Pattern



PAT-10'-IC-15'-5"-IC-10'-IC-15'-5"-IC

Unique Pattern



PAT-8'-OC-10'-IC-17'-6"-IC-24'-9"-IC-25'-6"



MOONRING 1

RINGS, CRESCENTS, & CONTINUOUS/ROTATABLE SHAPES
LP1/MR1 | SUSPENDED, SURFACE

STANDARD SIZES

1" Aperture
 Configurable in circles, crescents, rotatable crescents, and serpentine shapes
 Radii of 25", 30", 36", and 48"
 Compatible with LP1 linear sections

LAMPING

LED - Direct or Indirect - 90+ CRI - 3000K/3500K/4000K
 Dimming down to 0%

FINISH

18 standard finishes available at no extra charge
 RAL classic colors, TCI / Tiger Drylac catalog colors, and custom color
 match also available

CONSTRUCTION

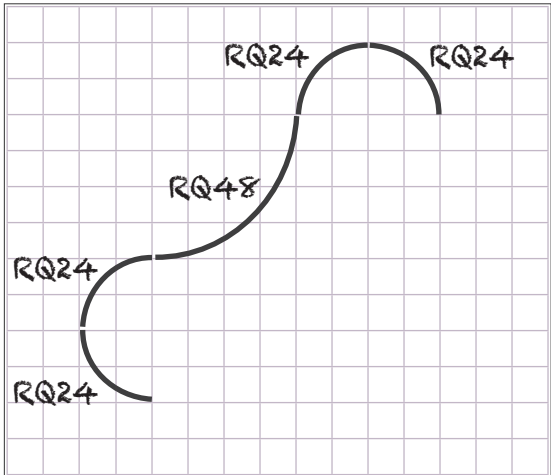
Industrial Strength Extruded 6061 Aluminum



HOW TO SUBMIT YOUR CRESCENT MOONRING CONFIGURATION (SKIP IF SPECIFYING RINGS OR STANDALONE CRESCENTS)

1. SKETCH YOUR DESIGN ON PAGE 3.

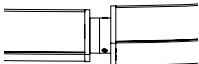
Alternatively, you can create your design using the CAD-ready STEP files provided on the CRESCENT MOONRING product page. Save your CAD assembly as a .STEP AP214 file and submit to ALW at quotes@alwusa.com.



2. TALLY UP EACH DESIRED CRESCENT SIZE & COMPLETE THE PRODUCT SUBMITTAL WORKSHEET (PGS. 6-7).

Count all of the Crescents sketched in step one, and indicate the quantity of each Crescent size in step 2 of the product submittal worksheet (pg. 4).

ROTATABLE CRESCENTS (SHAPES WITH ROTATABLE CONNECTORS)
INDICATE QUANTITY OF SECTIONS / LENGTH OF LINEAR

☒ RQ25/4	25" Radius (indicate quantity)	
☐ RQ30/___	30" Radius (indicate quantity)	
☐ RQ36/___	36" Radius (indicate quantity)	
☒ RQ48/1	48" Radius (indicate quantity)	
☐ S/___	Straight run LP1 section (indicate total length in ft.)	

*Can select multiple sizes for Crescent Configurations.

3. SUBMIT FORMS BELOW TO ALW FOR REVIEW.

1. CONFIGURATION GRAPH (PG. 3) or STEP AP214 FILE
2. PRODUCT SUBMITTAL WORKSHEET (PGS. 4-5)



C5/6/7

HOW TO SUBMIT YOUR CRESCENT MOONRING CONFIGURATION (CONT.)

DESIRED CONFIGURATION (LOOKING FROM CEILING DOWNWARDS)

SS060520-A.0



C5/6/7

PRODUCT SUBMITTAL WORKSHEET

SAMPLE PRODUCT CODE

LP1/MR1SD — D4 — DECOR/3500 — 0/10V/S — EXT/F — AL — UNV — EMB/1 — OS/2 — COMBO — SB
1 2 3 4 5 6 7 8A 8B 8C

1. BASE MODEL (CHOOSE ONE)

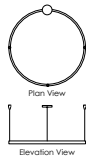
- ☐ **LP1/MR1SD** 1" Suspended, Direct
☐ **LP1/MR1SI** 1" Suspended, Indirect
☐ **LP1/MR1SMB** 1" Wall/Surface, Back-Mounted, Front-Facing

2. NOMINAL SHAPE/SIZE

FULL-CIRCLE RINGS

STANDARD SUSPENSION

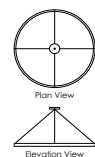
- ☐ **D4** 4' Diameter (Nominal)
☐ **D5** 5' Diameter
☐ **D6** 6' Diameter
☐ **D8** 8' Diameter



FULL-CIRCLE RINGS

CENTRAL AXIS SUSPENSION

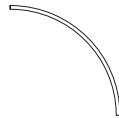
- ☐ **D4/CA** 4' Diameter (Nominal)
☐ **D5/CA** 5' Diameter
☐ **D6/CA** 6' Diameter
☐ **D8/CA** 8' Diameter



Note: See Performance Detail table on Page 11 for arc sections and mounting points.

STANDALONE CRESCENTS (SINGLE SECTIONS)

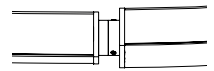
- ☐ **Q25** 25" Radius
☐ **Q30** 30" Radius
☐ **Q36** 36" Radius
☐ **Q48** 48" Radius



ROTATABLE CRESCENTS (ROTATABLE CONFIGURATIONS)

INDICATE QUANTITY OF SECTIONS / LENGTH OF LINEAR

- ☐ **RQ25/___** 25" Radius (indicate quantity)
☐ **RQ30/___** 30" Radius (indicate quantity)
☐ **RQ36/___** 36" Radius (indicate quantity)
☐ **RQ48/___** 48" Radius (indicate quantity)
☐ **S/___** Linear section (indicate total length in ft.)



*Can select multiple sizes for Crescent Configurations.

CONTINUOUS CRESCENTS (SHAPES WITH CONTINUOUS LIGHT)

INDICATE QTY OF SECTIONS / LENGTH OF LINEAR

- ☐ **CQ25/___** 25" Radius (indicate quantity)
☐ **CQ30/___** 30" Radius (indicate quantity)
☐ **CQ36/___** 36" Radius (indicate quantity)
☐ **CQ48/___** 48" Radius (indicate quantity)
☐ **S/___** Straight run LP1 section (indicate total length in ft.)



*Can select multiple sizes for Crescent Configurations.

3. LED LAMPING (CHOOSE ONE UNDER B)

A. OUTPUT

- ☒ **DECOR**
(90+ CRI)

B. CCT

- ☐ **3000K**
☐ **3500K**
☐ **4000K**

DELIVERED LUMENS (LM/FT)	WATTS (W/FT)
See page 11 for complete details.	

SS060520-A.0



4. REMOTE DRIVER^{1,2} (CHOOSE ONE)

- ☐ **0/10V/S** 0-10V dimming down to 10% (Standard Dimming)
- ☐ **0/10V/1%** 0-10V dimming down to 1%
- ☐ **0/10V/0%** 0-10V premium dimming down to 0%
- ☐ **DALI** DALI flicker-free dimming down to 0%
- ☐ **DMX** DMX flicker-free dimming down to 0%
- ☐ **ECOSYS1** Lutron Hi-lume 1% EcoSystem, constant voltage

¹Driver specifications provided upon request.

²See more information for compatible Driver under 'Sensor Options' for Lutron Vive Control Systems.

5. LENS

- ☒ **EXT/F** Extra diffuse, flush

6. FINISH (CHOOSE ONE. SEE PAGE 12 FOR LARGER SWATCHES AND ADDITIONAL INFORMATION)

STANDARD FINISHES

ALUMINUM

- ☐ **AL** ☒ Anodized Aluminum

BASIC POWDER COAT

- ☐ **GW** ☐ Gloss White
- ☐ **SW** ☐ Satin White
- ☐ **AW**  ☐ Antimicrobial Satin White
- ☐ **TW** ☐ Textured Matte White
- ☐ **TB** ☐ Textured Matte Black

METALLIC POWDER COAT

- ☐ **SG** ☐ Silver Gray
- ☐ **CG** ☐ Charcoal Gray
- ☐ **CU** ☐ Copper
- ☐ **BR** ☐ Brass

SATIN ANODIZED EFFECT POWDER COAT

- ☐ **CS** ☐ Clear Silver
- ☐ **OB** ☐ Oil-Rubbed Bronze
- ☐ **DB** ☐ Dark Bronze
- ☐ **SB** ☐ Satin Black

GLOSS POWDER COAT (80-95% GLOSS)

- ☐ **GO** ☐ Orange (RAL 2003)
- ☐ **GR** ☐ Red (RAL 3020)
- ☐ **GM** ☐ Magenta (RAL 4010)
- ☐ **GB** ☐ Blue (RAL 5015)

SPECIAL ORDER FINISHES

- ☐ **RAL_____**  Specify RAL Classic Color (Ex: RAL 3003) - Most RAL Colors are available for powder coat. See www.alwusa.com/finishes
- ☐ **CAT_____**  Specify Catalog Colors - Specify colors from the [Tiger Drylac](#) and [TCI](#) catalogs
- ☐ **CCM_____**  Custom Color Match - Specify a custom powder coat color match

7. VOLTAGE

- ☒ **UNV** Universal Voltage (120VAC-277VAC)



8. ADDITIONAL OPTIONS (OPTIONAL — CHOOSE ONE UNDER A & B, AND ANY UNDER C, IF DESIRED)

A. EMERGENCY OPTIONS

- ☐ **EMB/___**³ Emergency Battery (*indicate quantity — each battery powers 4 linear feet with a lumen output of 755lm*)
- ☐ **EMC/___**³ Emergency Circuit (*indicate quantity of 4 linear foot sections to be illuminated by emergency circuit*)

³Consult ALW for available options.

B. SENSOR OPTIONS (DEFAULT QUANTITY IS 1 SENSOR PER UNIT, INDICATE ALTERNATE QUANTITY IF DESIRED)

- ☐ **FCJS/___**⁴ Lutron® Vive remote RF wireless fixture control (Lutron Part: FCJS-ECO or FCJS-010)
- ☐ **FCJS/S/___**⁴ Lutron® Vive remote RF wireless fixture control + daylight/occ sensor (Lutron Part: FCJS-ECO or FCJS-010, & FC-Sensor)
- ☐ **ENLGH/___**⁵ Enlighted® remote connected lighting smart sensor (Enlighted Part: SU-5S-H) (*occupancy, daylight, networking, and more*)
- ☐ **OS/___** 0-10V remote occupancy sensor
- ☐ **PH/___** 0-10V remote photocell/daylight sensor

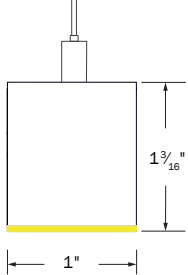
⁴Lutron® Vive remote sensors are compatible with the following drivers: 0/10V/S, 0/10V/1, 0/10V/0 driver or ECOSYS. Programming required by Lutron Commissioner.

⁵Enlighted® sensors are compatible with the following drivers: 0/10V/S, 0/10V/1, 0/10V/0. Programming required by Enlighted Commissioner. Additional Enlighted sensor families included IoT Sensors and Enlighted One Sensors are also available. Contact Customer Support for more information.

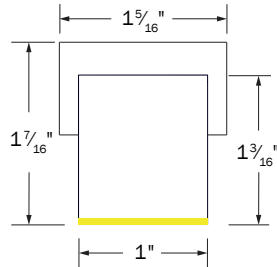
C. ADDITIONAL OPTIONS (COMPATIBLE ONLY WITH SUSPENDED MODELS)

- ☐ **COMBO** Combination 4.5" canopies at power feed locations to accommodate both power cord and suspension mount hardware.
- ☐ **SB** Seismic Bracing

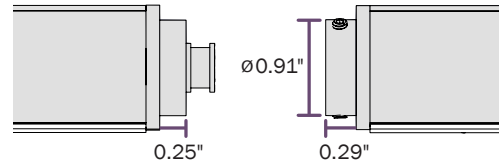
MECHANICAL DIAGRAMS – MOUNTING & DIMENSIONS



LP1/MR1SD



LP1/MR1SMB
W/ SURFACE-MOUNT BRACKET

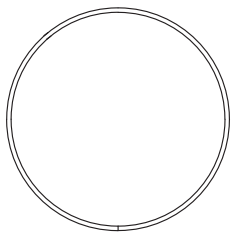


ROTATING CONNECTORS (RQ)

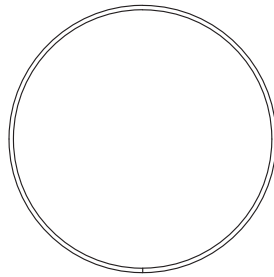
MECHANICAL DIAGRAMS – CONFIGURATIONS

MOONRINGS

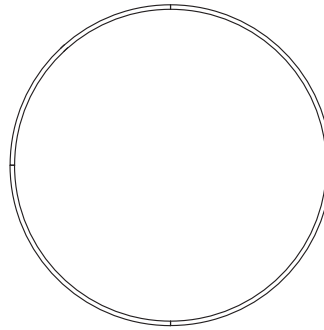
Shown with Full-Circle Diameters



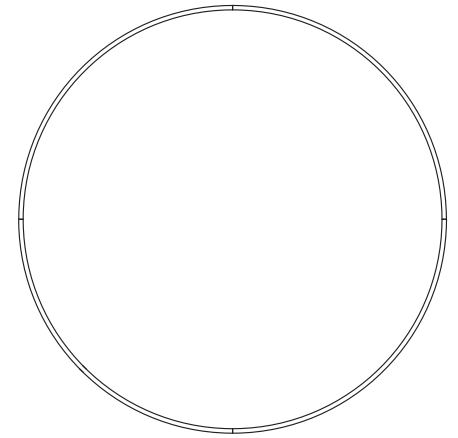
D4



D5



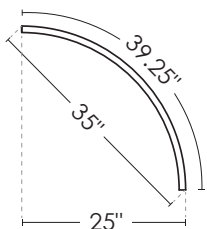
D6



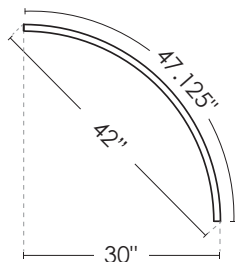
D8

QUADRANT ARCS

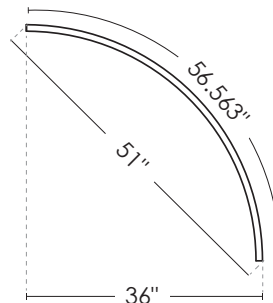
Shown with Radius and Arc Chord Lengths



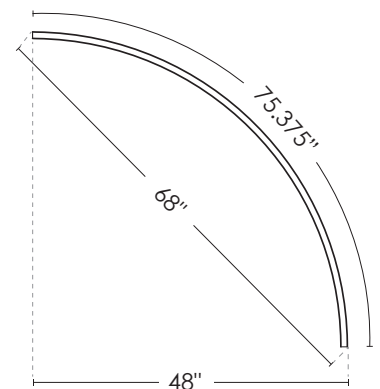
Q25



Q30



Q36

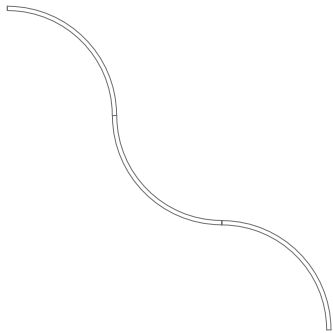


Q48

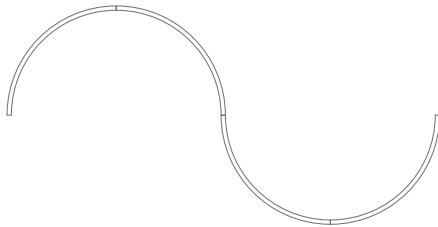
SS060520-A.0

SAMPLE CONFIGURATION DIAGRAMS

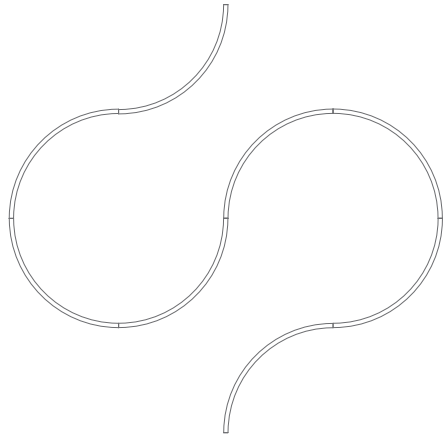
SERPENTINE SHAPES



Serpentine
 Depicted: CQ25/3
 3x 25" Arcs
 ■ **CQ25/3**

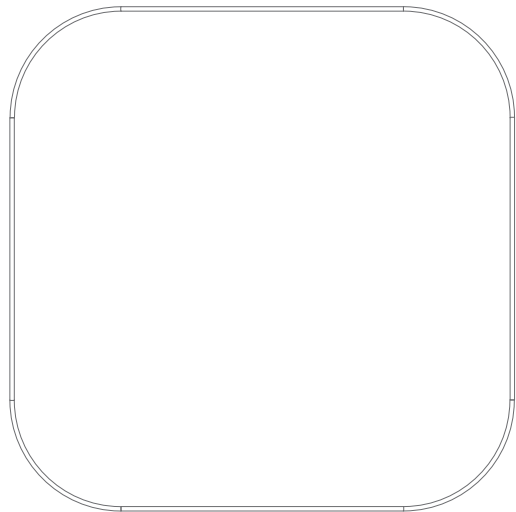
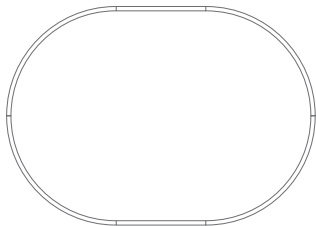


S-Shapes
 Depicted: CQ25/4
 4x 25" Arcs
 ■ **CQ25/4**



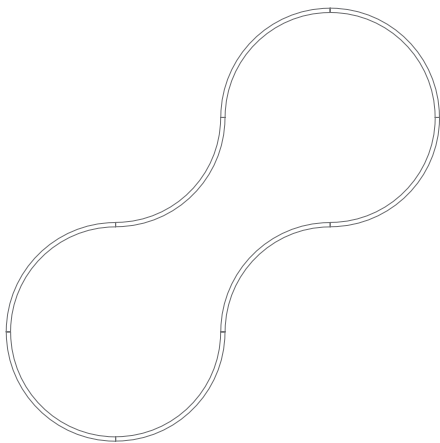
Curves
 Depicted: CQ25/8
 8x 25" Arcs
 ■ **CQ25/8**

STADIUM OVALS & ROUNDED RECTANGLES
 with compatible Lightplane 1 (LP1) linear sections

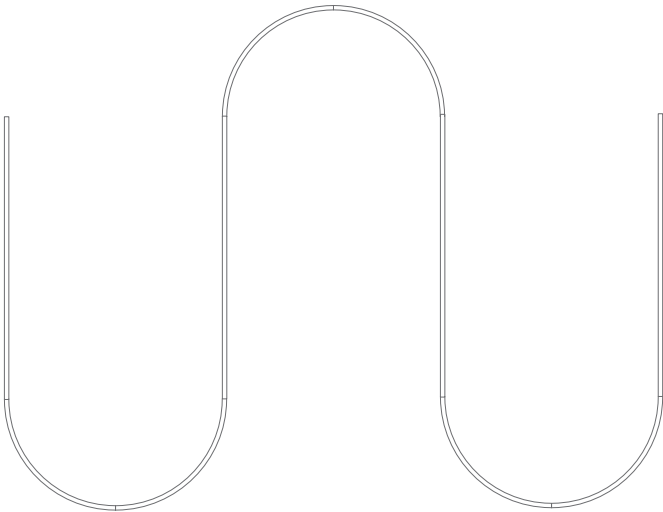


SAMPLE CONFIGURATION DIAGRAMS

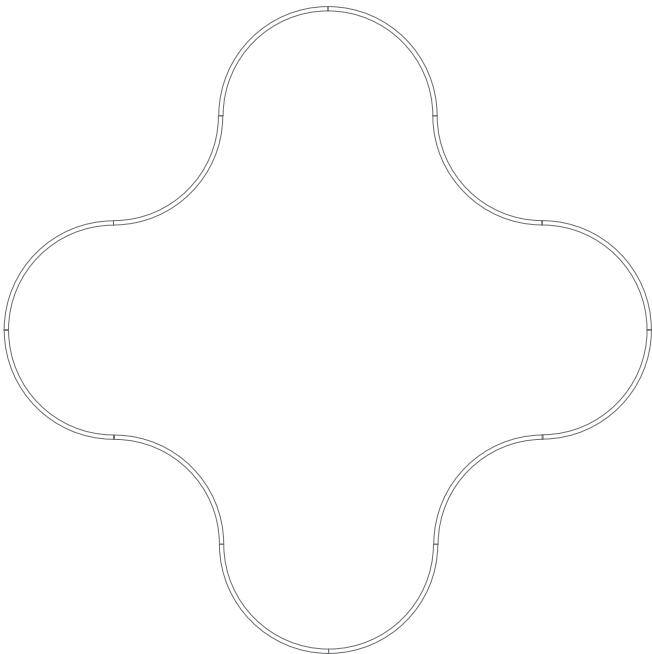
OTHER CONFIGURATIONS



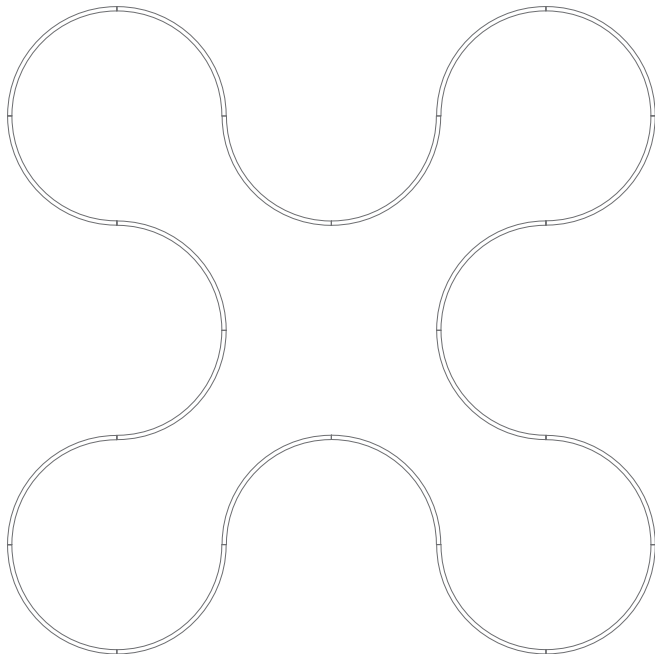
Depicted: CQ25/8
8x 25" Arcs
■ **CQ25/8**



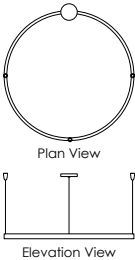
Depicted: CQ25/20
20x 25" Arcs
■ **CQ25/20**



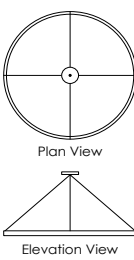
Depicted: CQ25/12
12x 25" Arcs
■ **CQ25/12**



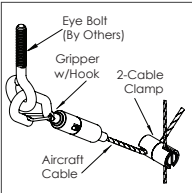
SUSPENSION OPTIONS



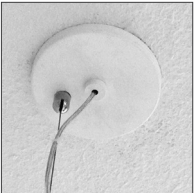
- Standard Suspension (SS)**
- (1) 4.5" white canopy per power feed location
 - (1) bullet mount
 - (1) 8' aircraft cable and
 - (1) 2" white canopy (for use with T-bar mounting) per suspension point



- Central Axis Suspension (CAS)**
- (1) 4.5"(D4 to D6) and 5"(D8) white central axis canopy per fixture that all aircraft cables/power feeds route into, as shown.



- Seismic Bracing (SB)**
- Add-on hardware includes cable gripper with hook, 2-cable clamp and specified length of aircraft cable per suspension point.



- Combo Canopy (COMBO)**
- Choose option COMBO to specify 4.5" canopies at feed locations with power feed and aircraft cable suspension mounting. Canopy finish is always white. Contact ALW for alternate colors.

REMOTE DRIVER VOLTAGE DROP INFORMATION (12VDC)

The below table should be used as a general guide to calculate the maximum run length between the canopy J-Box and the 0-10V remote driver. See alwusa.com/voltage-drop-calculator/ to calculate maximum recommended run length for specific wattages. Please note that the provided values are estimates only, and may vary depending on various factors such as temperature, wire/connector quality, etc. Also note that the wattages provided on the performance detail chart (pg. 8) are total watts for the fixture. The wattages for each remote driver should be indicated on the remote box, otherwise estimate watts by dividing total watts by the number of remote drivers provided.

WIRE GAUGE	20W 1.67A	30W 2.50A	40W 3.33A	50W 4.17A	60W 5.00A	70W 5.83A	80W 6.67A	90W 7.50A	100W 8.33A
18 AWG	8 ft.	3 ft.	Not recommended	Not recommended	Not recommended	Not recommended	Not recommended	Not recommended	Not recommended
16 AWG	18 ft.	9 ft.	5 ft.	2 ft.	Not recommended	Not recommended	Not recommended	Not recommended	Not recommended
14 AWG	34 ft.	20 ft.	13 ft.	9 ft.	6 ft.	4 ft.	2 ft.	Not recommended	Not recommended
12 AWG	60 ft.	37 ft.	26 ft.	19 ft.	14 ft.	11 ft.	9 ft.	7 ft.	5 ft.
10 AWG	100 ft.	64 ft.	46 ft.	35 ft.	28 ft.	22 ft.	19 ft.	16 ft.	13 ft.



PERFORMANCE DETAILS – LED LAMPING

FIXTURE TYPE	SIZE	DELIVERED LUMENS ³ (LM)	WATTS ⁶ (W)	MOUNTING OPTIONS	TOTAL FIXTURE SECTIONS	SUSPENSION POINTS	POWER DROPS ⁷		REMOTE DRIVER BOXES		APPROX. WEIGHT (LBS)
							0-10V, DALI, DMX	ECOSYS	0-10V, DALI, DMX	ECOSYS	
D4	4ft. Dia. (Nominal)	2390	57.5	Surface or Suspended	1x Joined Arc	4x Total	1	1	1	1	18
D5	5ft. Dia.	2870	69				1	1	1	1	22.5
D6	6ft. Dia.	3440	82.8		4x Joined Arcs	4x Total, 1x Per Arc	1	2	1	2	27
D8	8ft. Dia.	4590	110.4			6x Total, Across 4x Arcs	1	2	1	2	36
D4/CA	4ft. Dia. (Nominal)	2390	57.5	Suspended (With Central Axis Canopy)	4x Joined Arc	4x Total	1	1	1	1	18
D5/CA	5ft. Dia.	2870	69				1	1	1	1	22.5
D6/CA	6ft. Dia.	3440	82.8		4x Joined Arcs	4x Total, 1x Per Arc	1	1	1	2	27
D8/CA	8ft. Dia.	4590	110.4			6x Total, Across 4x Arcs	1	1	1	2	36
Q25	25in. Radius	600	14.4	Surface or Suspended	1x Arc	3x Total	1	1	1	1	4.5
Q30	30in. Radius	720	17.3								5.63
Q36	36in. Radius	860	20.7								6.75
Q48	48in. Radius	1150	27.6								9

⁶Performance calculations derived from actual IES test of D2 LED/3500K 0/10V driver

⁷Power Drop refers to the total quantity of canopies dropping low voltage power to the fixture. Each canopy may have one or multiple wire feeds supplying power to the fixture.

STANDARD FINISHES

Standard finishes are available at no additional charge.

ALUMINUM



Anodized
Aluminum

BASIC POWDER COAT



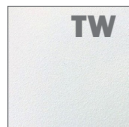
Gloss
White



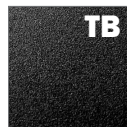
Satin
White



Antimicrobial
Satin
White



Textured
Matte
White



Textured
Matte
Black

METALLIC POWDER COAT



Silver
Gray



Charcoal
Gray



Copper

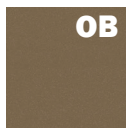


Brass

SATIN ANODIZED EFFECT POWDER COAT



Clear
Silver



Oil-Rubbed
Bronze



Dark
Bronze



Satin
Black

GLOSS POWDER COAT (80-95% GLOSS)



Orange
RAL 2003



Red
RAL 3020



Magenta
RAL 4010



Blue
RAL 5015

SPECIAL ORDER FINISHES*



RAL CLASSIC COLORS (80-95% GLOSS): RAL_ _ _ _

Most RAL Classic Colors are available for a minimum setup fee. On your specification submittal choose your RAL color by entering the 4-digit RAL code (Ex: RAL 3003). See www.alwusa.com/finishes



CUSTOM COLOR MATCH: CCM_ _ _ _

Custom powder coat color matching is available for a premium setup fee. Consult ALW for additional information.



CATALOG COLORS: CAT_ _ _ _

The complete range of powder coat colors from [Tiger Drylac](#) and [TCI](#) catalogs are available for a minimum setup fee. Consult ALW for a catalog color you would like to specify.

*An individual setup fee will apply to each unique Special Order Finish per purchase order.
(ex: RAL 5023 and RAL 2008 are specified for multiple line items on a purchase order. 2x setup fees will apply)

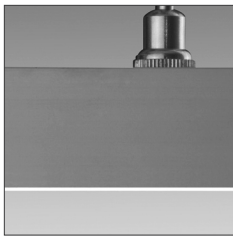
ADDITIONAL OPTIONS & SPECIFICATIONS

ELECTRICAL PERFORMANCE

Class 2 LED remote drivers are provided with 10' plenum-rated cable. 80+ CRI. Luminous flux +/- 5%.

LENS

Extruded, twin-layered, high-impact acrylic. EXT is white and extra diffuse with minimal- to no-source visibility.



FLUSH LENS – EXT/F

HOUSING

100% recyclable, extruded architectural grade 6061 aluminum with a 0.08" minimum wall thickness.

SAFETY & REGULATORY

ETL Listed (U.S. & Canada). Suitable for dry or damp locations. Conforms to UL std. 2108, Low Voltage Luminaires / Low Voltage Lighting Systems
Certified to CSA std. C22.2#250.0:2008 Ed. 3+G1;G2.

OPERATING CONDITIONS

Luminaire should be installed and operated ONLY in dry or damp locations where the ambient temperature ranges from -4 °F to 122 °F (-20 °C to 50 °C). Luminaire operation in environments outside the listed temperature range voids the warranty AND may damage the product or adversely impact lamp life, lumen output and color consistency.

WARRANTY

Limited 5-year warranty. Details: alwusa.com/warranty

POWER CABLES

Power cables come standard in a transparent sheathing to match steel aircraft suspension cables. Please contact customer support if custom cables are required for your application. Power cables cannot be swapped in the field as it will void the ETL Safety Listing and Product Warranty.



CONTROLS, SENSORS, & LED DRIVER

ALW lighting fixtures are intended for use with a wide range of sensors, lighting controls, LED drivers, and building management systems. Our component portfolio is continually expanding to adopt to the latest technologies and specification needs. We currently support integration with Lutron, Enlighted, EldoLED, nLight, Osram, Philips, and more. If there's a component or system needed that you don't see on the spec sheet please contact ALW customer support today so we can review your requirements.



C1/2/3/4



CRESCENT MOONRING

STANDALONE & CONTINUOUS/ROTATABLE SHAPES

MR1.5/MR3-Q | SUSPENDED, CEILING

STANDARD SIZES

1.5" or 3" Aperture

Crescents (quarter rings) with radii from 24in. to 96in

Standalone Crescents & Connectable via Rotatable Connectors

LAMPING

LED - Direct & Indirect - 80/90 CRI - 2700K/3000K/3500K/4000K

Output Options: MIN/LOW/MED/HI/Tunable White/RGB/RGB+W

Dimming down to 0%

FINISH

Two Tone Paint Options (Select Models):

18 standard finishes available at no extra charge

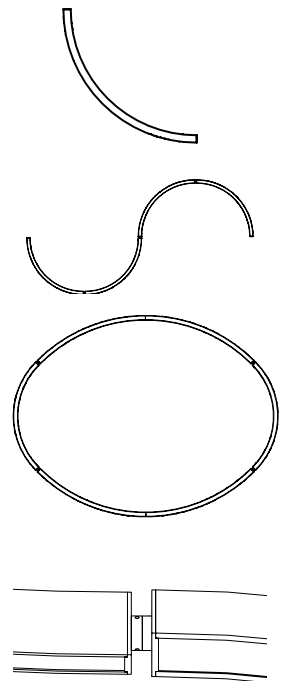
RAL classic colors, TCI / Tiger Drylac catalog colors, and custom color match also available

CONSTRUCTION

Industrial Strength Extruded & Welded 6061 Aluminum



enlighted **VIVE** by **LUTRON**



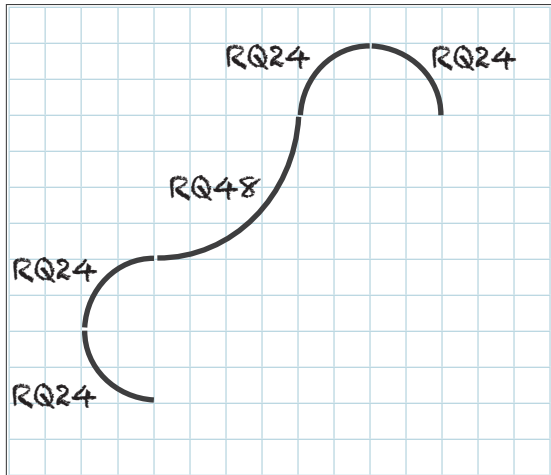
CRESCENT MR – SPECIFICATIONS
SUSPENDED, CEILING

ALWUSA.COM

HOW TO SUBMIT YOUR CRESCENT MOONRING CONFIGURATION (SKIP IF SPECIFYING STANDALONE CRESCENTS)

1. SKETCH YOUR DESIGN ON PAGE 3.

Alternatively, you can create your design using the [CAD-ready STEP files](#) provided on the [CRESCENT MOONRING product page](#). Save your CAD assembly as a .STEP AP214 file and submit to ALW at quotes@alwusa.com.

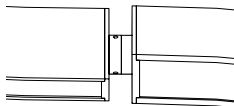


2. TALLY UP EACH DESIRED CRESCENT SIZE & COMPLETE THE PRODUCT SUBMITTAL WORKSHEET (PGS. 6-7).

Count all of the Crescents sketched in step one, and indicate the quantity of each Crescent size in step 2 of the product submittal worksheet (pg. 4).

CONFIGURATIONS (INDICATE QTY OF CRESCENTS, NOT AVAILABLE WITH TS OR ST BASE MODELS)
CRESCENTS WITH ROTATABLE CONNECTORS* (MAX 20° TILT FROM HORIZONTAL)

☒ RQ24/4	24" Radius <i>(indicate quantity)</i>
☐ RQ30/___	30" Radius <i>(indicate quantity)</i>
☐ RQ36/___	36" Radius <i>(indicate quantity)</i>
☐ RQ42/___	42" Radius <i>(indicate quantity)</i>
☒ RQ48/1	48" Radius <i>(indicate quantity)</i>
☐ RQ60/___	60" Radius <i>(indicate quantity)</i>
☐ RQ72/___	72" Radius <i>(indicate quantity)</i>
☐ RQ84/___	84" Radius <i>(indicate quantity)</i>
☐ RQ96/___	96" Radius <i>(indicate quantity)</i>



*Can select multiple sizes for Crescent Configurations.

3. SUBMIT FORMS BELOW TO ALW FOR REVIEW.

1. [CONFIGURATION GRAPH](#) (PG. 3) or [STEP AP214 FILE](#)
2. [PRODUCT SUBMITTAL WORKSHEET](#) (PGS. 4-7)



C1/2/3/4

HOW TO SUBMIT YOUR CRESCENT MOONRING ROTATABLE CONFIGURATION (CONT.)

DESIRED CONFIGURATION (LOOKING FROM CEILING DOWNWARDS)

PRODUCT SUBMITTAL WORKSHEET

SAMPLE PRODUCT CODE

MR1.5/TS — Q24 — SS — MED/90/3500 — 0/10V/0% — LENS — LOW/90/3500 — 0/10V/0% — HT — BK — RAL1001 — UNV — EMB/1 — OS/1 — SB
1 2 3 4 5 6 7 8 9 10 11 12 13a 13b 13c

1. BASE MODEL (CHOOSE ONE)

STANDALONE CRESCENT

- ☐ **MR1.5** 1.5", inside short wall, outside short wall
☐ **MR1.5/ST** 1.5", inside short wall, outside tall wall
☐ **MR1.5/TS** 1.5", inside tall wall, outside short wall
☐ **MR1.5/TT** 1.5", inside tall wall, outside tall wall
☐ **MR3** 3.0", equal wall

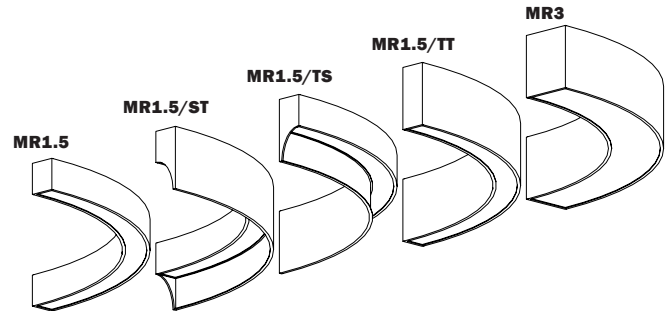
ROTATABLE CRESCENTS (DIRECT LAMPING ONLY)

- ☐ **MR1.5** 1.5", inside short wall, outside short wall
☐ **MR1.5/TT** 1.5", inside tall wall, outside tall wall
☐ **MR3** 3.0", equal wall

*See pages 7-8 for dimensions.

CONTINUOUS CRESCENTS

- ☐ **MR1.5** 1.5", inside short wall, outside short wall



2. NOMINAL SIZE

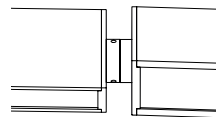
STANDALONE CRESCENTS (SINGLE SECTIONS)

- ☐ **Q24** 24" Radius (1/4 of D4 ring)
☐ **Q30** 30" Radius (1/4 of D5 ring)
☐ **Q36** 36" Radius (1/4 of D6 ring)
☐ **Q42** 42" Radius (1/4 of D7 ring)
☐ **Q48** 48" Radius (1/4 of D8 ring)
☐ **Q60** 60" Radius (1/4 of D10 ring)
☐ **Q72** 72" Radius (1/4 of D12 ring)
☐ **Q84** 84" Radius (1/4 of D14 ring)
☐ **Q96** 96" Radius (1/4 of D16 ring)

ROTATABLE CRESCENTS (ROTATABLE CONFIGURATIONS. MAX 20° TILT FROM HORIZONTAL)

INDICATE QTY OF SECTIONS / LENGTH OF LINEAR

- ☐ **RQ24/___** 24" Radius (indicate quantity)
☐ **RQ30/___** 30" Radius (indicate quantity)
☐ **RQ36/___** 36" Radius (indicate quantity)
☐ **RQ42/___** 42" Radius (indicate quantity)
☐ **RQ48/___** 48" Radius (indicate quantity)
☐ **RQ60/___** 60" Radius (indicate quantity)
☐ **RQ72/___** 72" Radius (indicate quantity)
☐ **RQ84/___** 84" Radius (indicate quantity)
☐ **RQ96/___** 96" Radius (indicate quantity)
☐ **S/___** Linear section (indicate total feet)

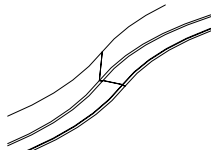


*Direct Lamping Only. Can select multiple sizes for Crescent Configurations.

CONTINUOUS CRESCENTS (SHAPES WITH CONTINUOUS LIGHT)

INDICATE QTY OF SECTIONS / LENGTH OF LINEAR

- ☐ **CQ24/___** 24" Radius (indicate quantity)
☐ **CQ30/___** 30" Radius (indicate quantity)
☐ **CQ36/___** 36" Radius (indicate quantity)
☐ **CQ42/___** 42" Radius (indicate quantity)
☐ **CQ48/___** 48" Radius (indicate quantity)
☐ **CQ60/___** 60" Radius (indicate quantity)
☐ **CQ72/___** 72" Radius (indicate quantity)
☐ **CQ84/___** 84" Radius (indicate quantity)
☐ **CQ96/___** 96" Radius (indicate quantity)
☐ **S/___** Linear section (indicate total feet)



*Can select multiple sizes for Crescent Configurations.

*Use chart on page # to calculate total linear length of section in feet

NOTE: 0.125 inch tolerance applies to "actual" measurements

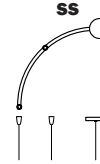
SS012720-C.0



C1/2/3/4

3. MOUNTING (CHOOSE ONE)

- ☐ **SS** Standard Suspension
- ☐ **CM** Ceiling Mounted (Not available with indirect lighting)



4. LED LAMPING — DIRECT (CHOOSE ONE UNDER A, B, & C)

A. OUTPUT¹

- ☐ **MIN**
- ☐ **LOW**
- ☐ **MED**
- ☐ **HI**
- ☐ **TUNE** (2700K-6500K, 80CRI)
- ☐ **RGB**
- ☐ **RGBW** (80CRI, 3500K White)

B. CRI²

- ☐ **80**
- ☐ **90**

C. CCT²

- ☐ **2700K**
- ☐ **3000K**
- ☐ **3500K**
- ☐ **4000K**

DELIVERED
LUMENS (LM)

WATTS (W)

See pages 6-7 for complete details.

¹Direct/Indirect lighting combinations are limited when specifying HI OUTPUT due to increased thermal temperatures and/or driver type limitations. See the 'Direct/Indirect LED Lighting Chart' on page 8 and LED driver footnotes.

²CRI/CCT options not applicable for TUNE, RGB, or RGBW lighting.

5. REMOTE DRIVER³ — DIRECT (CHOOSE ONE .STD, TUNE & RGB(W) TABLE INDICATES COMPATIBLE LED LAMPING)

	STD ⁴	TUNE	RGB(W)
☐ 0/10V/S	●	●	0-10V dimming down to 5% (Standard Dimming — Down to 10% for TUNE lighting)
☐ 0/10V/1%	●	●	0-10V dimming down to 1%
☐ 0/10V/0%	●	●	0-10V premium dimming down to 0%
☐ ECOSYS1	●	●	(LDE1) Lutron Hi-lume 1% EcoSystem LED driver with Soft-on, Fade-to-Black dimming technology
☐ ECOSYS5	●	●	(LDE5) Lutron 5-Series Ecosystem LED driver (Dims to 5%)
☐ LTEA	●	●	Lutron Hi-lume 1% 2-wire TRIAC dimming (120V forward-phase only).
☐ DALI	●	●	DALI flicker-free dimming down to 0%
☐ DMX	●	●	DMX flicker-free dimming down to 0%

³Driver specifications provided upon request.

⁴Lutron Vive Control Systems is compatible only with STD lighting. See more information for compatible Driver under 'Sensor Options'.

6. LENS — DIRECT

- ☒ **LENS** Extra diffuse lens

SS012720-C.0



C1/2/3/4

7. LED LAMPING — INDIRECT (CHOOSE NONE OR ONE UNDER A, B, & C)

☐ **N** None. Choose when specifying rotatable connectors or when indirect lamping is not desired.

A. OUTPUT⁵

- ☐ **MIN**
☐ **LOW**
☐ **MED**
☐ **HI**
☐ **TUNE** (2700K-6500K, 80CRI)
☐ **RGB**
☐ **RGBW** (80CRI, 3500K White)

B. CRI⁶

- ☐ **80**
☐ **90**

C. CCT⁶

- ☐ **2700K**
☐ **3000K**
☐ **3500K**
☐ **4000K**

DELIVERED LUMENS (LM)	WATTS (W)
See pages 6-7 for complete details.	

⁵Direct/Indirect lamping combinations are limited when specifying HI OUTPUT due to increased thermal temperatures and/or driver type limitations. See the 'Direct/Indirect LED Lamping Chart' on page 8 and LED driver footnotes.

⁶CRI/CCT options not applicable for TUNE, RGB, or RGBW lamping.

8. REMOTE DRIVER⁷ — INDIRECT (CHOOSE ONE .STD, TUNE & RGB(W) TABLE INDICATES COMPATIBLE LED LAMPING)

	STD ⁸	TUNE	RGB(W)	
☐ 0/10V/S	●	●		0-10V dimming down to 5% (Standard Dimming — Down to 10% for TUNE lamping)
☐ 0/10V/1%	●	●		0-10V dimming down to 1%
☐ 0/10V/0%	●	●		0-10V premium dimming down to 0%
☐ ECOSYS1	●			(LDE1) Lutron Hi-lume 1% EcoSystem LED driver with Soft-on, Fade-to-Black dimming technology
☐ ECOSYS5	●			(LDE5) Lutron 5-Series Ecosystem LED driver (Dims to 5%)
☐ LTEA	●			Lutron Hi-lume 1% 2-wire TRIAC dimming (120V forward-phase only).
☐ DALI	●			DALI flicker-free dimming down to 0%
☐ DMX	●	●	●	DMX flicker-free dimming down to 0%

⁷Driver specifications provided upon request.

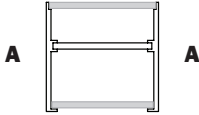
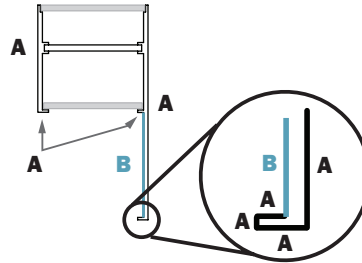
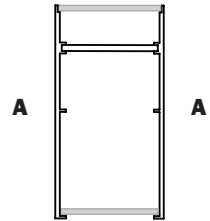
⁸Lutron Vive Control Systems is compatible only with STD lamping. See more information for compatible Driver under 'Sensor Options'.

9. LENS — INDIRECT (CHOOSE ONE)

- ☐ **N** None. Choose when specifying rotatable connectors or when indirect lamping is not desired. The lens will be substituted with an aluminum cover to match the exterior finish.
☐ **LENS** Extra diffuse lens
☐ **HT⁹** High transmission, near-clear lens

⁹High transmission lens increases lumen output by ~14%, but LED chip is visible. Recommended only when top-side of fixture is not directly visible.

SS012720-C.0

MR1.5 & MR3

MR1.5/ST & TS

MR1.5/TT


10. FINISH — SURFACE (A) (CHOOSE ONE. SEE PAGE 20 FOR LARGER SWATCHES AND ADDITIONAL INFORMATION)

STANDARD FINISHES

ALUMINUM

☐ **BA**  Brushed Aluminum

BASIC POWDER COAT

☐ GW	☐ Gloss White
☐ SW	☐ Satin White
☐ AW 	☐ Antimicrobial Satin White
☐ TW	☐ Textured Matte White
☐ TB	☐ Textured Matte Black

METALLIC POWDER COAT

☐ SG	☐ Silver Gray
☐ CG	☐ Charcoal Gray
☐ CU	☐ Copper
☐ BR	☐ Brass

SATIN ANODIZED EFFECT POWDER COAT

☐ CS	☐ Clear Silver
☐ OB	☐ Oil-Rubbed Bronze
☐ DB	☐ Dark Bronze
☐ SB	☐ Satin Black

GLOSS POWDER COAT (80-95% GLOSS)

☐ GO	☐ Orange (RAL 2003)
☐ GR	☐ Red (RAL 3020)
☐ GM	☐ Magenta (RAL 4010)
☐ GB	☐ Blue (RAL 5015)

SPECIAL ORDER FINISHES

☐ RAL_____ 	Specify RAL Classic Color (Ex: RAL 3003) - Most RAL Colors are available for powder coat. See www.alwusa.com/finishes
☐ CAT_____ 	Specify Catalog Colors - Specify colors from the Tiger Drylac and TCI catalogs
☐ CCM_____ 	Custom Color Match - Specify a custom powder coat color match

**11. FINISH — SURFACE (B)** (CHOOSE ONE. SEE PAGE 20 FOR LARGER SWATCHES AND ADDITIONAL INFORMATION)**STANDARD FINISHES****ALUMINUM**

- ☐ **BA**  Brushed Aluminum

BASIC POWDER COAT

- ☐ **GW**  Gloss White
☐ **SW**  Satin White
☐ **AW**  Antimicrobial Satin White
☐ **TW**  Textured Matte White
☐ **TB**  Textured Matte Black

METALLIC POWDER COAT

- ☐ **SG**  Silver Gray
☐ **CG**  Charcoal Gray
☐ **CU**  Copper
☐ **BR**  Brass

SATIN ANODIZED EFFECT POWDER COAT

- ☐ **CS**  Clear Silver
☐ **OB**  Oil-Rubbed Bronze
☐ **DB**  Dark Bronze
☐ **SB**  Satin Black

GLOSS POWDER COAT (80-95% GLOSS)

- ☐ **GO**  Orange (RAL 2003)
☐ **GR**  Red (RAL 3020)
☐ **GM**  Magenta (RAL 4010)
☐ **GB**  Blue (RAL 5015)

SPECIAL ORDER FINISHES

- ☐ **RAL**  Specify RAL Classic Color (Ex: RAL 3003) - Most RAL Colors are available for powder coat. See www.alwusa.com/finishes
☐ **CAT**  Specify Catalog Colors - Specify colors from the [Tiger Drylac](#) and [TCI](#) catalogs
☐ **CCM**  Custom Color Match - Specify a custom powder coat color match

12. VOLTAGE (CHOOSE ONE)

- ☐ **UNV** Universal Voltage (120VAC-277VAC)
☐ **347** 347 Volt (Driver options may be limited. Not available with EMB)

13. ADDITIONAL OPTIONS (OPTIONAL — CHOOSE ONE UNDER A, B, & C, IF DESIRED)**A. EMERGENCY OPTIONS** (INDICATE QUANTITY IF DESIRED, OTHERWISE IT WILL AUTOMATICALLY BE CALCULATED)

- ☐ **EMB/___¹⁰** Emergency Battery (indicate quantity — each battery powers 2 linear feet. Not available in 347V)
☐ **EMC/___¹⁰** Emergency Circuit (indicate quantity of 4 linear foot section to be illuminated by emergency circuit)

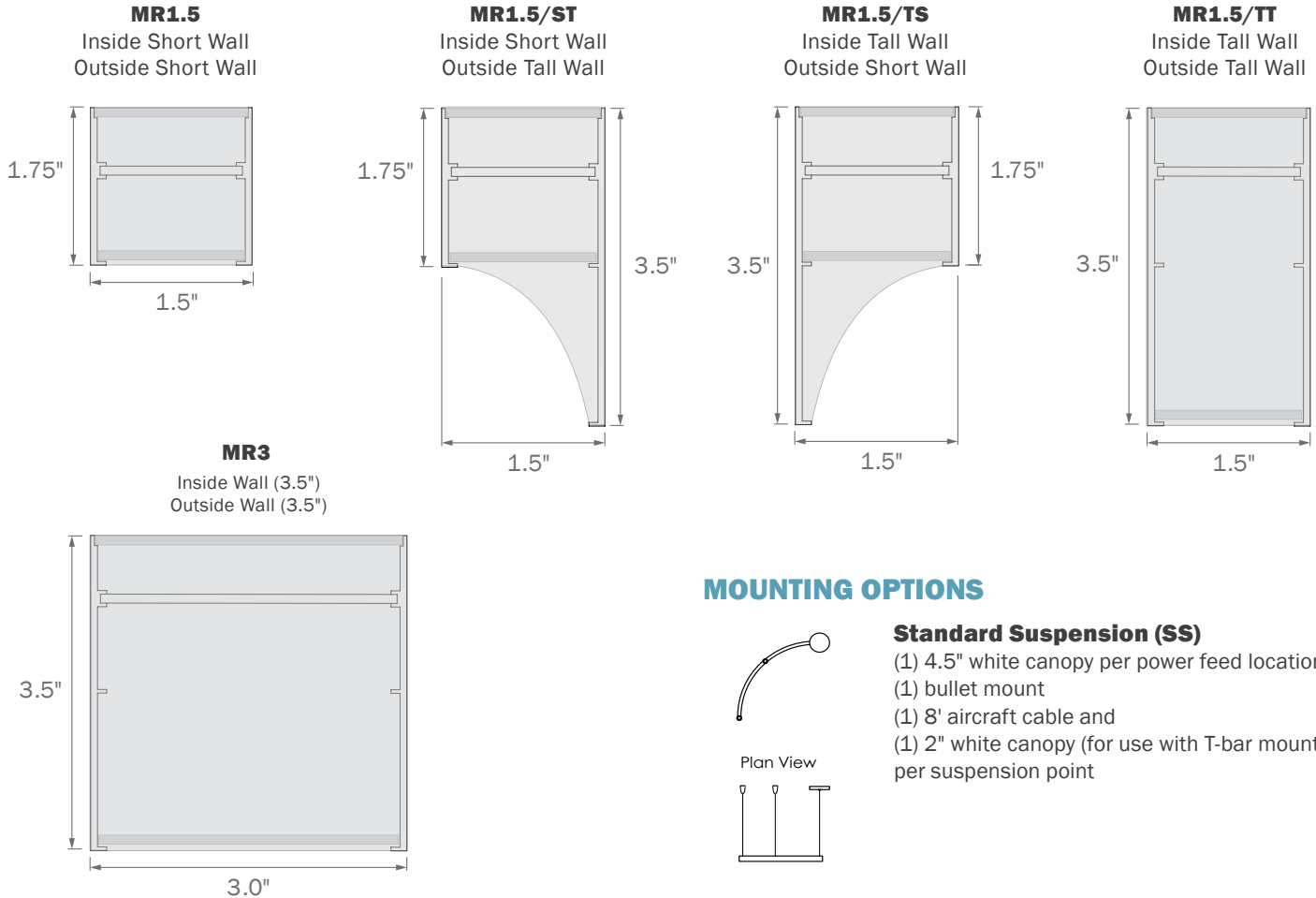
¹¹Consult ALW for more details.**B. SENSOR OPTIONS** (INDICATE QUANTITY IF DESIRED, OTHERWISE IT WILL AUTOMATICALLY BE CALCULATED)

- ☐ **FCJS/___¹¹** Lutron® Vive remote RF wireless fixture control (Lutron Part: FCJS-ECO or FCJS-010)
☐ **FCJS/S/___¹¹** Lutron® Vive remote RF wireless fixture control + daylight/occ sensor (Lutron Part: FCJS-ECO or FCJS-010, & FC-Sensor)
☐ **ENLGHT/___¹²** Enlighted® remote connected lighting smart sensor (Enlighted Part: SU-5S-H) (occupancy, daylight, networking, and more)
☐ **OS/___** 0-10V remote occupancy sensor
☐ **PH/___** 0-10V remote photocell/daylight sensor

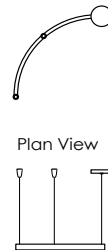
¹¹Lutron® Vive remote sensors are compatible with the following drivers: 0/10V/S, 0/10V/1, 0/10V/0 driver or ECOSYS. Programming required by Lutron Commissioner.¹²Enlighted® sensors are compatible with the following drivers: 0/10V/S, 0/10V/1, 0/10V/0. Programming required by Enlighted Commissioner. Additional Enlighted sensor families included IoT Sensors and Enlighted One Sensors are also available. Contact Customer Support for more information.**C. ADDITIONAL OPTIONS** (NOT APPLICABLE FOR CEILING MOUNT)

- ☐ **COMBO** Combination 4.5" canopy at power feed locations to accommodate both power cord & suspension mount hardware.
☐ **SB** Seismic Bracing

MECHANICAL DIAGRAMS

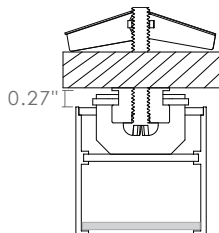


MOUNTING OPTIONS



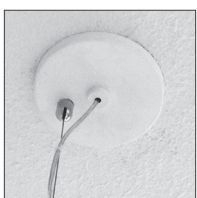
Standard Suspension (SS)

- (1) 4.5" white canopy per power feed location
- (1) bullet mount
- (1) 8' aircraft cable and
- (1) 2" white canopy (for use with T-bar mounting) per suspension point



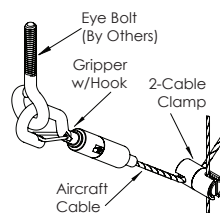
Ceiling Mount (CM)

Ceiling mount is for horizontal, ceiling mounting only. The fixture is not compatible with indirect lighting or vertical surface mounting (i.e. on a wall). Three ceiling-mount brackets per fixture. Surface Mount hardware adds 0.27" height to all options, as shown.



Combo Canopy (COMBO)

Choose option COMBO to specify 4.5" canopies at feed locations with power feed and aircraft cable suspension mounting. Canopy finish is always white. Contact ALW for alternate colors.



Seismic Bracing (SB)

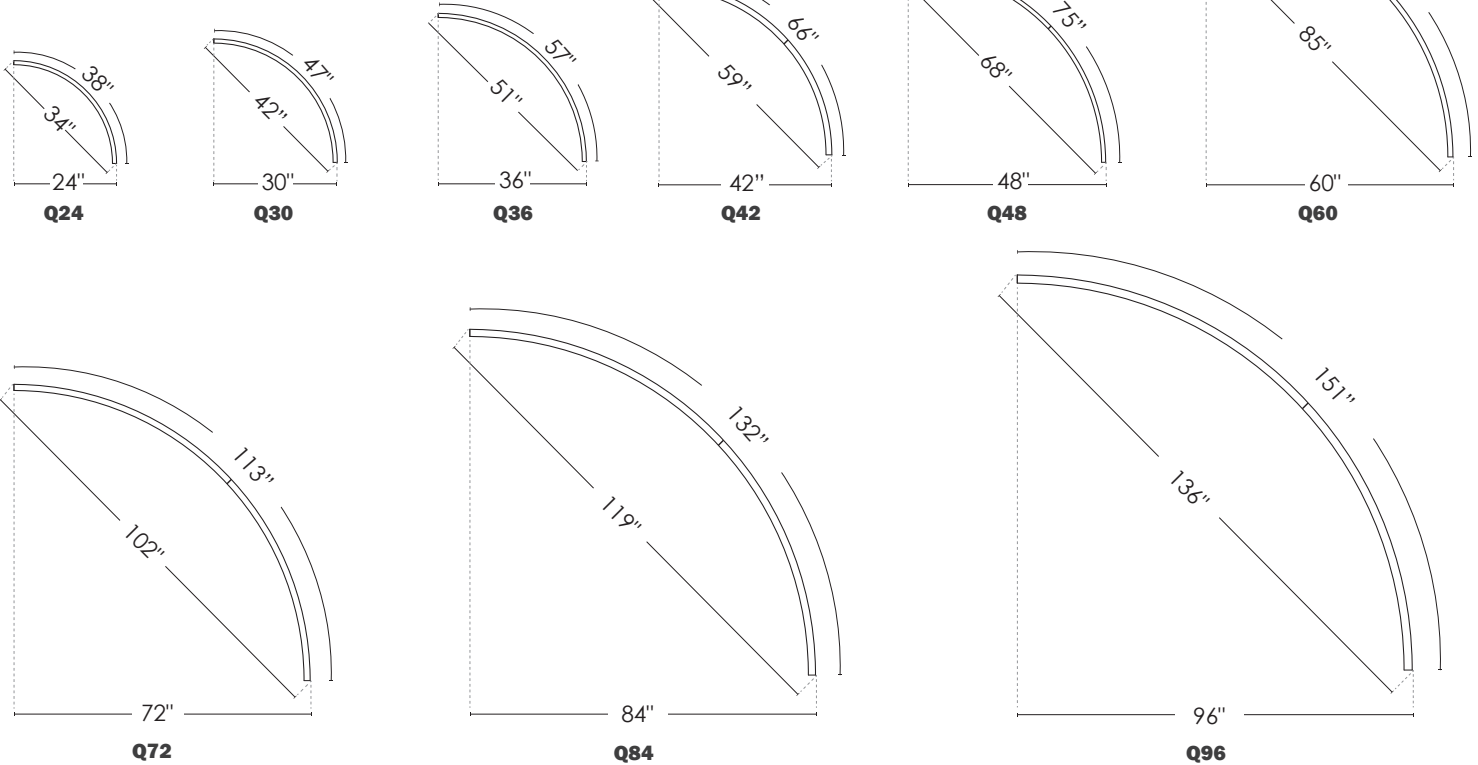
Add-on hardware includes cable gripper with hook, 2-cable clamp and specified length of aircraft cable per suspension point.

SS012720-C.0

DIMENSIONS

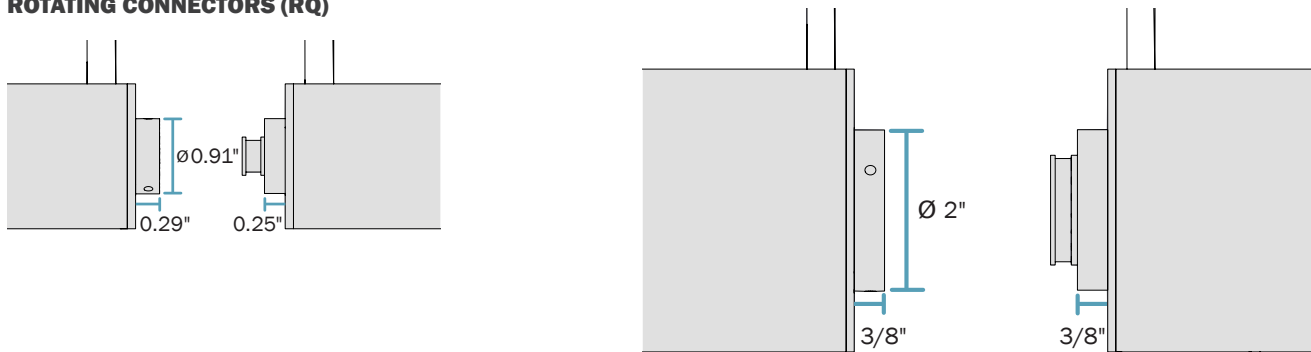
CRESCENT MOONRING

Shown with Radius and Arc Chord Lengths



Note: Each crescent is one welded aluminum section. Crescents Q42 - Q96 have two lenses installed in each single crescent. Lenses are designed to eliminate all light leak/gaps for a high-quality aesthetic appearance.

ROTATING CONNECTORS (RQ)

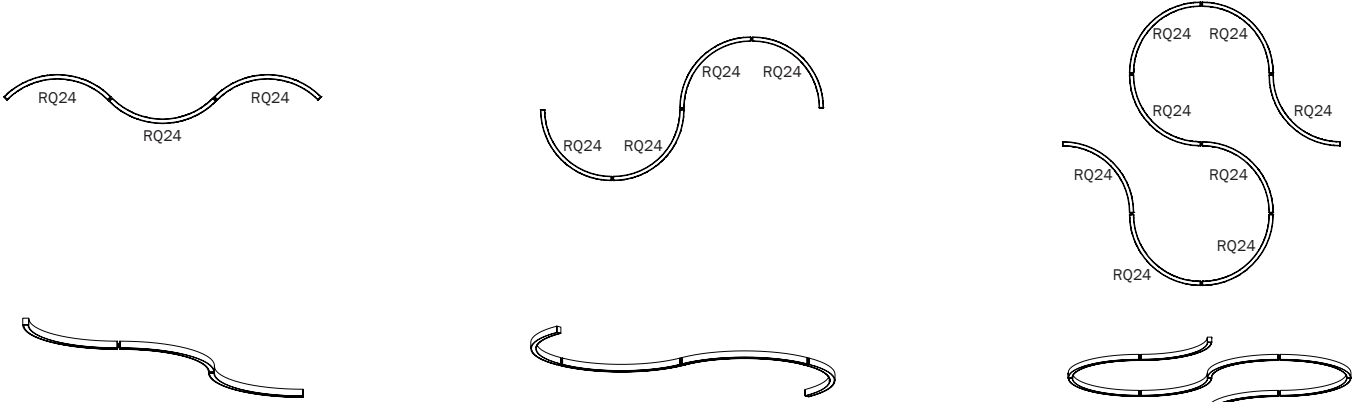


MR1.5

MR3

SS012720-C.0

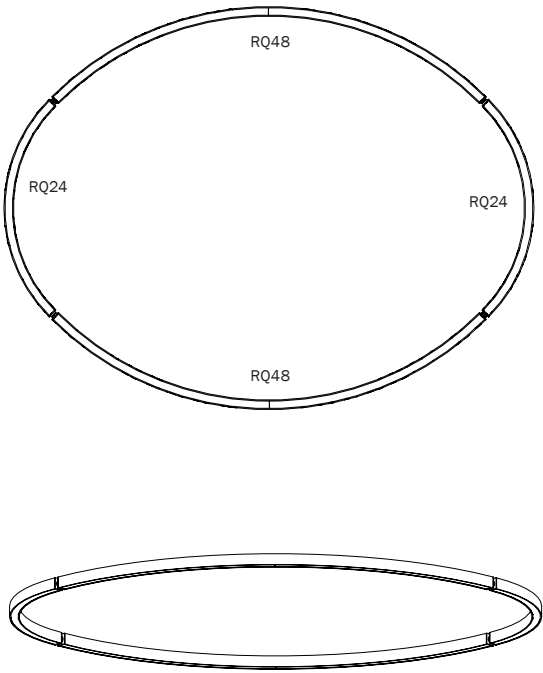
EXAMPLE CONFIGURATIONS (ILLUSTRATED WITH ROTATABL CONNECTORS)



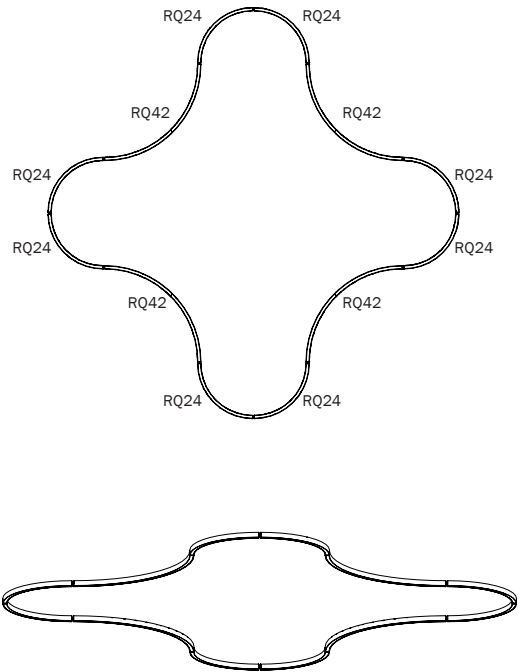
Serpentine
Depicted: RQ24/3
3x 24" Crescents
■ **RQ24/3**

S-Shapes
Depicted: RQ24/4
4x 24" Crescents
■ **RQ24/4**

Curves
Depicted: RQ24/8
8x 24" Crescents
■ **RQ24/8**



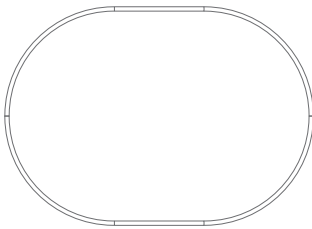
OVAL
Depicted: RQ24/2/RQ48/2
2x 24" and 2x 48" Crescents
■ **RQ24/2**
□ **RQ30/___**
□ **RQ36/___**
□ **RQ42/___**
■ **RQ48/2**



CLOVER
Depicted: RQ24/8/RQ42/4
8x 24" and 2x 42" Crescents
■ **RQ24/8**
□ **RQ30/___**
□ **RQ36/___**
■ **RQ42/2**

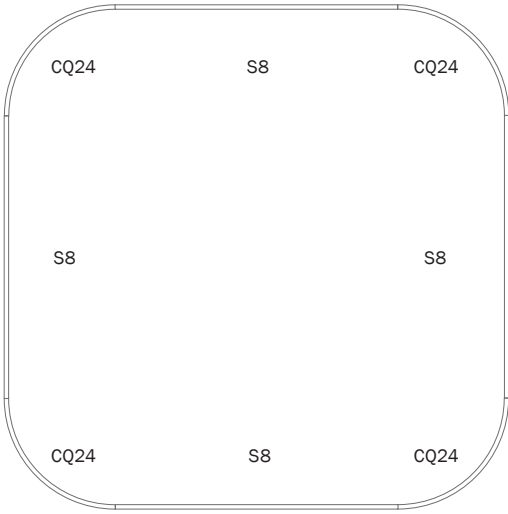
SAMPLE CONFIGURATION DIAGRAMS (ILLUSTRATED WITH ROTATABLE CONNECTORS)

STADIUM OVALS & ROUNDED RECTANGLES



Depicted: RQ24/4-S8
4x 24" Crescents and 2x 4ft. Straight Sections

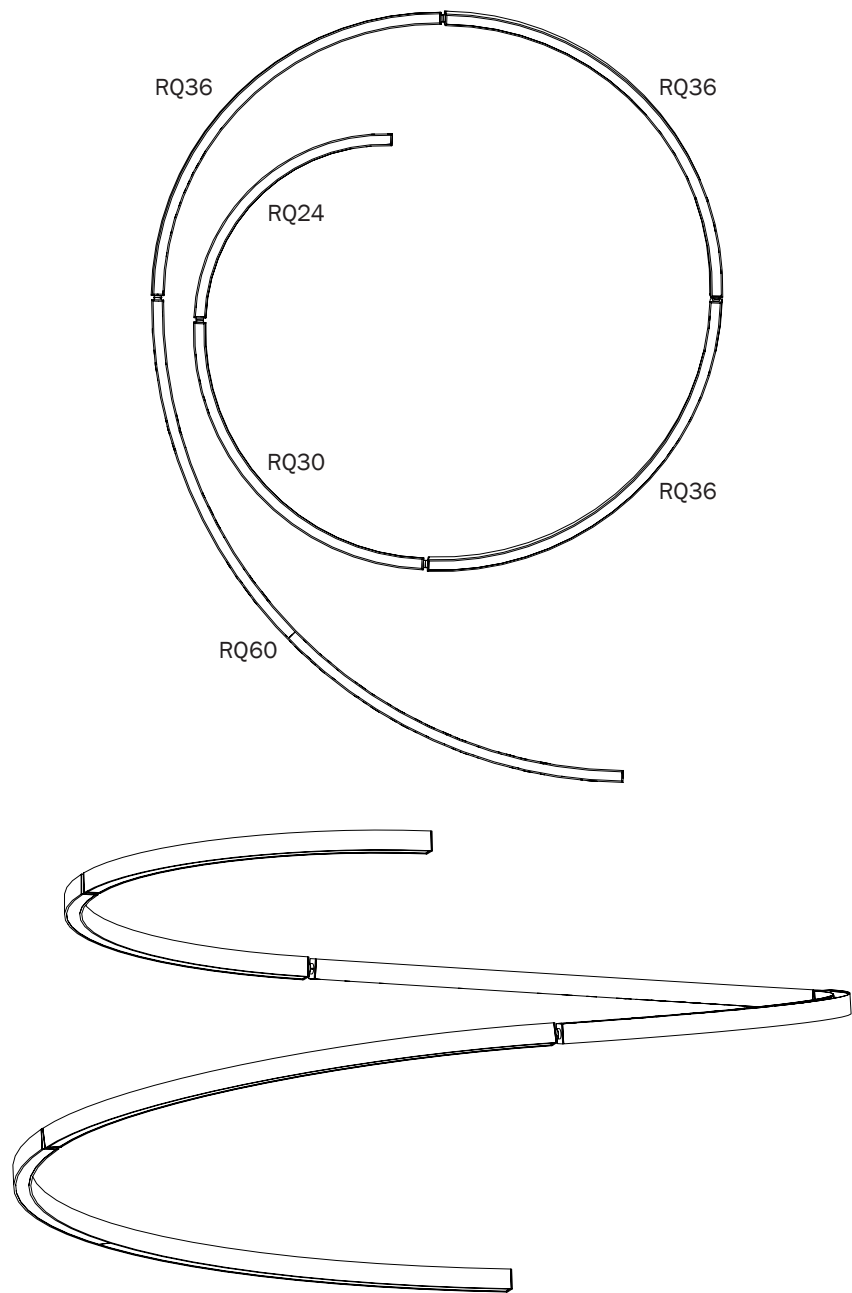
- **RQ24/4**
- **S8**



Depicted: RQ24/4-S32
4x 24" Crescents and 4x 8ft. Straight Sections

- **RQ24/4**
- **S32**

EXAMPLE CONFIGURATIONS (ILLUSTRATED WITH ROTATABL CONNECTORS)



SPIRAL/CORKSCREW

Depicted: RQ24/1/RQ30/1/RQ36/3/RQ60/1
1x 24", 1x 30", 3x 36", and 1x 60" Crescents

- ☒ RQ24/1
- ☒ RQ30/1
- ☒ RQ36/3
- ☐ RQ42/___
- ☐ RQ48/___
- ☒ RQ60/1



PERFORMANCE & MOUNTING DETAILS – MR1.5⁸

RING DIAMETER	OUTPUT TYPE	LUMENS (LM) <i>direct</i> <i>indirect</i>	WATTS (W) <i>direct OR indirect</i> <i>direct AND indirect</i>	POWER DROPS ⁹ <i>direct OR indirect</i> <i>direct AND indirect</i> <i>(Standard Driver)¹¹</i>	REMOTE DRIVER BOXES ¹⁰ <i>direct OR indirect</i> <i>direct AND indirect</i> <i>(Standard Driver)¹¹</i>	SUSPENSION POINTS	APPROX. WEIGHT (LBS)
Q24 (MR1.5)	MIN	750 850	11 22	1 1	1 1	3	6.25
	LOW	1125 1250	17 34	1 1	1 1		
	MED	1500 1700	23 46	1 1	1 1		
	HI	2250 N/A	34 N/A	1 N/A	1 N/A		
	RGB/RGBW	875/1600 975/1800	26/31 52/62	1 1	1 2		
	TUNABLE	2225 2475	18 36	1 1	1 2		
Q30 (MR1.5)	MIN	950 1050	14 28	1 1	1 1	3	8
	LOW	1400 1575	22 44	1 1	1 1		
	MED	1875 2100	28 56	1 1	1 1		
	HI	2825 N/A	43 N/A	1 1	1 N/A		
	RGB/RGBW	1100/2000 1225/2225	32/39 64/78	1 1	1 2		
	TUNABLE	2785 3100	22 44	1 1	1 2		
Q36 (MR1.5)	MIN	1125 1275	17 34	1 1	1 1	3	9.5
	LOW	1700 1900	26 52	1 1	1 1		
	MED	2250 2525	35 70	1 1	1 1		
	HI	3375 N/A	52 N/A	1 N/A	1 N/A		
	RGB/RGBW	1325/2400 1475/2675	40/48 80/96	1 1	1 2		
	TUNABLE	3325 3700	27 54	1 1	1 2		
Q42 (MR1.5)	MIN	1325 1475	20 40	1 1	1 1	3	10.5
	LOW	1975 2225	30 60	1 1	1 1		
	MED	2625 2950	40 80	1 1	1 1		
	HI	3950 N/A	61 N/A	1 N/A	1 N/A		
	RGB/RGBW	1525/2800 1700/3100	46/55 92/110	1 1	1 2		
	TUNABLE	3800 4325	31 62	1 1	1 2		

⁸Performance calculations are based on LM-T9 test of MAX output at 80 CRI and 4000K with a standard extra diffuse lens (LENS). HT Lenses provide approx. 14% more light output from these advertised values. MIN, LOW, MED and HIGH calculations are extrapolated values.

⁹Power Drop refers to the total quantity of canopies dropping low voltage power to the fixture. Each canopy may have one or multiple wire feeds supplying power to the fixture.

¹⁰One or more drivers may be enclosed in each Remote Driver Box. See your final drawing/submittal for details.

¹¹Applies to 0/10V/S drivers (DMX for RGB/RGBW). For additional info on other driver models see your final drawing/submittal.



PERFORMANCE & MOUNTING DETAILS – MR1.5 (CONT.)⁸

RING DIAMETER	OUTPUT TYPE	LUMENS (LM) direct indirect	WATTS (W) direct OR indirect direct AND indirect	POWER DROPS ⁹ direct OR indirect direct AND indirect (Standard Driver) ¹¹	REMOTE DRIVER BOXES ¹⁰ direct OR indirect direct AND indirect (Standard Driver) ¹¹	SUSPENSION POINTS	APPROX. WEIGHT (LBS)
Q48 (MR1.5)	MIN	1500 1675	23 46	1 1	1 1	3	12.5
	LOW	2250 2525	35 70	1 1	1 1		
	MED	3000 3375	46 92	1 1	1 1		
	HI	4500 N/A	70 N/A	1 N/A	1 N/A		
	RGB/RGBW	1750/3200 1925/3550	54/63 108/126	1 1	1 2		
	TUNABLE	4450 4950	36 72	1 1	1 2		
Q60 (MR1.5)	MIN	1875 2100	29 58	1 1	1 1	3	16
	LOW	2825 3150	44 88	1 1	1 1		
	MED	3750 4225	58 116	1 1	1 1		
	HI	5625 N/A	87 N/A	1 N/A	1 N/A		
	RGB/RGBW	2175/4000 2425/4450	66/80 132/160	1 1	1 2		
	TUNABLE	5550 6175	45 90	1 1	1 2		
Q72 (MR1.5)	MIN	2250 2525	35 70	1 1	1 1	3	19
	LOW	3375 3800	52 104	1 1	1 1		
	MED	4500 5050	70 140	1 1	1 2		
	HI	6750 N/A	105 N/A	1 N/A	1 N/A		
	RGB/RGBW	2625/4800 2900/5325	80/97 160/194	1 1	1 2		
	TUNABLE	6675 7425	54 108	1 1	1 2		
Q84 (MR1.5)	MIN	2625 2950	41 82	1 1	1 1	3	22
	LOW	3950 4425	61 122	1 1	1 1		
	MED	5250 5900	82 164	1 1	1 2		
	HI	7875 N/A	122 N/A	1 N/A	1 N/A		
	RGB/RGBW	3050/5575 3375/6225	94/112 188/224	1 1	1/2 N/A		
	TUNABLE	7775 8650	63 126	1 1	1 2		

⁸Performance calculations are based on LM-79 test of MAX output at 80 CRI and 4000K with a standard extra diffuse lens (LENS). HT Lenses provide approx. 14% more light output from these advertised values. MIN, LOW, MED and HIGH calculations are extrapolated values.

⁹Power Drop refers to the total quantity of canopies dropping low voltage power to the fixture. Each canopy may have one or multiple wire feeds supplying power to the fixture.

¹⁰One or more drivers may be enclosed in each Remote Driver Box. See your final drawing/submittal for details.

¹¹Applies to 0/10V/S drivers (DMX for RGB/RGBW). For additional info on other driver models see your final drawing/submittal.

SS012720-C.0



PERFORMANCE & MOUNTING DETAILS — MR1.5 (CONT.)⁸

RING DIAMETER	OUTPUT TYPE	LUMENS (LM) <i>direct indirect</i>	WATTS (W) <i>direct OR indirect direct AND indirect</i>	POWER DROPS ⁹ <i>direct OR indirect direct AND indirect (Standard Driver)¹¹</i>	REMOTE DRIVER BOXES ¹⁰ <i>direct OR indirect direct AND indirect (Standard Driver)¹¹</i>	SUSPENSION POINTS	APPROX. WEIGHT (LBS)
Q96 (MR1.5)	MIN	3000 3375	47 94	1 1	1 1	3	25
	LOW	4500 5050	70 140	1 1	1 2		
	MED	6000 6750	94 188	1 1	1 2		
	HI	9000 N/A	140 N/A	1 N/A	1 N/A		
	RGB/RGBW	3475/6400 3875/7100	108/129 216/258	1 N/A	1 N/A		
	TUNABLE	8900 9875	73 146	1 1	1 2		

PERFORMANCE & MOUNTING DETAILS — MR3⁸

RING DIAMETER	OUTPUT TYPE	LUMENS (LM) <i>direct indirect</i>	WATTS (W) <i>direct OR indirect direct AND indirect</i>	POWER DROPS ⁹ <i>direct OR indirect direct AND indirect (Standard Driver)¹¹</i>	REMOTE DRIVER BOXES ¹⁰ <i>direct OR indirect direct AND indirect (Standard Driver)¹¹</i>	SUSPENSION POINTS	APPROX. WEIGHT (LBS)
Q24 (MR3)	MIN	1175 1325	11 22	1 1	1 1	3	7
	LOW	1775 2000	17 34	1 1	1 1		
	MED	2375 2650	23 46	1 1	1 1		
	HI	3550 N/A	34 N/A	1 N/A	1 N/A		
	RGB/RGBW	925/1700 1050/1900	26/31 52/62	1 1	1 2		
	TUNABLE	2350 2650	18 36	1 1	1 2		
Q30 (MR3)	MIN	1475 1650	14 28	1 1	1 1	3	9
	LOW	2225 2500	22 44	1 1	1 1		
	MED	2950 3325	28 56	1 1	1 1		
	HI	4425 N/A	43 N/A	1 N/A	1 N/A		
	RGB/RGBW	1150/2125 1300/2375	32/39 64/78	1 1	1 2		
	TUNABLE	2950 3325	22 44	1 1	1 2		

⁸Performance calculations are based on LM-79 test of MAX output at 80 CRI and 4000K with a standard extra diffuse lens (LENS). HT Lenses provide approx. 14% more light output from these advertised values. MIN, LOW, MED and HIGH calculations are extrapolated values.

⁹Power Drop refers to the total quantity of canopies dropping low voltage power to the fixture. Each canopy may have one or multiple wire feeds supplying power to the fixture.

¹⁰One or more drivers may be enclosed in each Remote Driver Box. See your final drawing/submittal for details.

¹¹Applies to 0/10V/S drivers (DMX for RGB/RGBW). For additional info on other driver models see your final drawing/submittal.



PERFORMANCE & MOUNTING DETAILS – MR3 (CONT.)⁸

RING DIAMETER	OUTPUT TYPE	LUMENS (LM) <i>direct</i> <i>indirect</i>	WATTS (W) <i>direct OR indirect</i> <i>direct AND indirect</i>	POWER DROPS ⁹ <i>direct OR indirect</i> <i>direct AND indirect</i> <i>(Standard Driver)¹¹</i>	REMOTE DRIVER BOXES ¹⁰ <i>direct OR indirect</i> <i>direct AND indirect</i> <i>(Standard Driver)¹¹</i>	SUSPENSION POINTS	APPROX. WEIGHT (LBS)
Q36 (MR3)	MIN	1775 2000	17 34	1 1	1 1	3	10.5
	LOW	2650 2975	26 52	1 1	1 1		
	MED	3550 3975	35 70	1 1	1 1		
	HI	5325 N/A	52 N/A	1 N/A	1 N/A		
	RGB/RGBW	1375/2550 1550/2850	40/48 80/96	1 1	1 2		
	TUNABLE	3450 3975	27 54	1 1	1 2		
Q42 (MR3)	MIN	2075 2325	20 40	1 1	1 1	3	11.75
	LOW	3100 3475	30 60	1 1	1 1		
	MED	4150 4650	40 80	1 1	1 1		
	HI	6200 N/A	61 N/A	1 N/A	1 N/A		
	RGB/RGBW	1625/2975 1825/3350	46/55 92/110	1 1	1 2		
	TUNABLE	4125 4650	31 62	1 1	1 2		
Q48 (MR3)	MIN	2375 2650	23 46	1 1	1 1	3	14
	LOW	3550 3975	35 70	1 1	1 1		
	MED	4725 5300	46 92	1 1	1 1		
	HI	7100 N/A	70 N/A	1 N/A	1 N/A		
	RGB/RGBW	1850/3400 2075/3825	54/63 108/126	1 1	1 2		
	TUNABLE	4725 5300	36 72	1 1	1 2		
Q60 (MR3)	MIN	2950 3325	29 58	1 1	1 1	3	17.75
	LOW	4425 4975	44 88	1 1	1 1		
	MED	5900 6650	58 116	1 1	1 1		
	HI	8875 N/A	87 N/A	1 N/A	1 N/A		
	RGB/RGBW	2300/4250 2600/4775	66/80 132/160	1 1	1 2		
	TUNABLE	5900 6650	45 90	1 1	1 2		

⁸Performance calculations are based on LM-T9 test of MAX output at 80 CRI and 4000K with a standard extra diffuse lens (LENS). HT Lenses provide approx. 14% more light output from these advertised values. MIN, LOW, MED and HIGH calculations are extrapolated values.

⁹Power Drop refers to the total quantity of canopies dropping low voltage power to the fixture. Each canopy may have one or multiple wire feeds supplying power to the fixture.

¹⁰One or more drivers may be enclosed in each Remote Driver Box. See your final drawing/submittal for details.

¹¹Applies to 0/10V/S drivers (DMX for RGB/RGBW). For additional info on other driver models see your final drawing/submittal.

SS012720-C.0



PERFORMANCE & MOUNTING DETAILS – MR3 (CONT.)⁸

RING DIAMETER	OUTPUT TYPE	LUMENS (LM) <i>direct indirect</i>	WATTS (W) <i>direct OR indirect direct AND indirect</i>	POWER DROPS ⁹ <i>direct OR indirect direct AND indirect (Standard Driver)¹¹</i>	REMOTE DRIVER BOXES ¹⁰ <i>direct OR indirect direct AND indirect (Standard Driver)¹¹</i>	SUSPENSION POINTS	APPROX. WEIGHT (LBS)
Q72 (MR3)	MIN	3350 3975	35 70	1 1	1 1	3	21
	LOW	5325 5975	52 104	1 1	1 1		
	MED	7100 7975	70 140	1 1	1 2		
	HI	10625 N/A	105 N/A	1 N/A	1 N/A		
	RGB/RGBW	2775/5100 3125/5725	80/97 160/194	1 1	1 2		
	TUNABLE	7075 7975	54 108	1 1	1 2		
Q84 (MR3)	MIN	4150 4650	41 82	1 1	1 1	3	24.5
	LOW	6200 6975	61 122	1 1	1 1		
	MED	8275 9300	82 164	1 1	1 2		
	HI	12400 N/A	122 N/A	1 N/A	1 N/A		
	RGB/RGBW	3225/5925 3625/6675	94/112 188/224	1 1 / N/A	1/2 2 / N/A		
	TUNABLE	8275 9300	63 126	1 1	1 2		
Q96 (MR3)	MIN	4725 5300	47 94	1 1	1 1	3	27.75
	LOW	7100 7950	70 140	1 1	1 1		
	MED	9450 10625	94 188	1 1	1 2		
	HI	14175 N/A	140 N/A	1 N/A	1 N/A		
	RGB/RGBW	3700/6775 4150/7625	108/129 216/258	1 N/A	2 N/A		
	TUNABLE	9450 10625	73 146	1 1	1 2		

⁸Performance calculations are based on LM-79 test of MAX output at 80 CRI and 4000K with a standard extra diffuse lens (LENS). HT Lenses provide approx. 14% more light output from these advertised values. MIN, LOW, MED and HIGH calculations are extrapolated values.

⁹Power Drop refers to the total quantity of canopies dropping low voltage power to the fixture. Each canopy may have one or multiple wire feeds supplying power to the fixture.

¹⁰One or more drivers may be enclosed in each Remote Driver Box. See your final drawing/submittal for details.

¹¹Applies to 0/10V/S drivers (DMX for RGB/RGBW). For additional info on other driver models see your final drawing/submittal.



DIRECT/INDIRECT LED LAMPING CHART

Due to high thermal conditions, Direct & Indirect Lamping combinations are limited to the options below. Additional lamping combinations may be limited to the driver specified.

		INDIRECT LAMPING							
		NONE	MIN	LOW	MED	HI	RGB	RGBW	TUNE
DIRECT LAMPING	MIN	✓	✓	✓	✓	✓	✓	✓	✓
	LOW	✓	✓	✓	✓	✓	✓	✓	✓
	MED	✓	✓	✓	✓				
	HI	✓	✓	✓					
	RGB	✓	✓	✓			✓	✓	✓
	RGBW	✓	✓	✓			✓	✓	✓
	TUNE	✓	✓	✓			✓	✓	✓

HOW TO CALCULATE VOLTAGE DROP?

Your MOONRING may be powered with more than 1x Class 2 LED driver. Let's use the White LED, 33VDC chart below as an example.

1. Determine Load Size of Each Circuit

- Use the charts above to determine power consumption of the crescent in question, and refer to final/record drawings to determine number of remote drivers.
- Let's say the load is 160W, and there are two remote drivers. This is approximately 80W (we're using the White LED, 33VDC chart in this example).

2. Determine Distance from Driver to Load

Let's assume the distance is 60 ft.

3. Determine Wire Gauge

In this example, ALW recommends to install 14 AWG wire between the Driver and Canopy (where power drops to the ring).

MOONRING VOLTAGE DROP CHART FOR REMOTE DRIVERS - WHITE LED, 33VDC

For best performance, ensure proper wire gauge is installed between the remote LED driver and canopy that is dropping power to your fixture. *This chart only applies to MOONRING White LEDs at 33VDC. Do not use this chart to calculate voltage drop for other fixtures.*

WIRE GAUGE	20W 0.61A	30W 0.91A	40W 1.21A	50W 1.52A	60W 1.82A	70W 2.12A	80W 2.42A	90W 2.73A	100W 3.03A
18 AWG	119 ft.	77 ft.	55 ft.	43 ft.	34 ft.	28 ft.	23 ft.	20 ft.	17 ft.
16 AWG	195 ft.	127 ft.	93 ft.	73 ft.	59 ft.	50 ft.	42 ft.	37 ft.	32 ft.
14 AWG	315 ft.	207 ft.	153 ft.	121 ft.	99 ft.	84 ft.	72 ft.	63 ft.	56 ft.
12 AWG	506 ft.	334 ft.	249 ft.	197 ft.	163 ft.	138 ft.	120 ft.	106 ft.	94 ft.
10 AWG	809 ft.	537 ft.	400 ft.	319 ft.	264 ft.	225 ft.	196 ft.	173 ft.	155 ft.

MOONRING VOLTAGE DROP CHART FOR REMOTE DRIVERS - RGB LED, 24VDC

For best performance, ensure proper wire gauge is installed between the remote LED driver and canopy that is dropping power to your fixture. *This chart only applies to MOONRING RGB fixtures at 24VDC. Do not use this chart to calculate voltage drop for other fixtures.*

WIRE GAUGE	20W 0.83A	30W 1.25A	40W 1.67A	50W 2.08A	60W 2.50A	70W 2.92A	80W 3.33A	90W 3.75A	100W 4.20A
18 AWG	59 ft.	37 ft.	25 ft.	19 ft.	14 ft.	11 ft.	8 ft.	7 ft.	5 ft.
16 AWG	99 ft.	63 ft.	45 ft.	35 ft.	27 ft.	22 ft.	18 ft.	15 ft.	13 ft.
14 AWG	163 ft.	106 ft.	77 ft.	60 ft.	49 ft.	40 ft.	34 ft.	30 ft.	26 ft.
12 AWG	264 ft.	173 ft.	128 ft.	100 ft.	82 ft.	69 ft.	60 ft.	52 ft.	46 ft.
10 AWG	424 ft.	280 ft.	208 ft.	164 ft.	136 ft.	115 ft.	100 ft.	88 ft.	78 ft.

SS012720-C.0

STANDARD FINISHES

Standard finishes are available at no additional charge.

ALUMINUM



Brushed
Aluminum

BASIC POWDER COAT



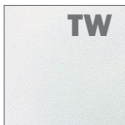
Gloss
White



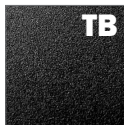
Satin
White



Antimicrobial
Satin
White



Textured
Matte
White



Textured
Matte
Black

METALLIC POWDER COAT



Silver
Gray



Charcoal
Gray



Copper



Brass

SATIN ANODIZED EFFECT POWDER COAT



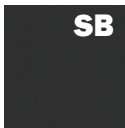
Clear
Silver



Oil-Rubbed
Bronze



Dark
Bronze



Satin
Black

GLOSS POWDER COAT (80-95% GLOSS)



Orange
RAL 2003



Red
RAL 3020



Magenta
RAL 4010



Blue
RAL 5015

SPECIAL ORDER FINISHES*



RAL CLASSIC COLORS (80-95% GLOSS): RAL_ _ _ _

Most RAL Classic Colors are available for a minimum setup fee. On your specification submittal choose your RAL color by entering the 4-digit RAL code (Ex: RAL 3003). See www.alwusa.com/finishes



CUSTOM COLOR MATCH: CCM_ _ _ _

Custom powder coat color matching is available for a premium setup fee. Consult ALW for additional information.



CATALOG COLORS: CAT_ _ _ _

The complete range of powder coat colors from [Tiger Drylac](#) and [TCI](#) catalogs are available for a minimum setup fee. Consult ALW for a catalog color you would like to specify.

*An individual setup fee will apply to each unique Special Order Finish per purchase order.
(ex: RAL 5023 and RAL 2008 are specified for multiple line items on a purchase order. 2x setup fees will apply)

ADDITIONAL OPTIONS & SPECIFICATIONS

LENS

Direct: Extra diffused opal acrylic lens (LENS).

Indirect: Extra diffused opal acrylic lens (LENS) OR clear high transmission lens (HT). HT lens increases lumen output by ~14%, but LED chips are visible. Recommended only when top-side of fixture is not directly visible.

HOUSING

100% recyclable, extruded architectural grade 6061 aluminum with a 0.075" minimum wall thickness.

SAFETY & REGULATORY

ETL Listed (U.S. & Canada). Suitable for dry locations only.
Conforms to UL std. 2108, Low Voltage Luminaires / Low Voltage Lighting Systems.
Certified to CSA std. C22.2#250.0:2008 Ed. 3+G1;G2.

OPERATING TEMPERATURE

Luminaire should be installed and operated ONLY in dry environments where the ambient temperature ranges from -4 °F to 122 °F (-20 °C to 50 °C). Luminaire operation in environments outside the listed temperature range voids the warranty AND may damage the product or adversely impact lamp life, lumen output and color consistency.

WARRANTY

Limited 5-year warranty. Details: alwusa.com/warranty

POWER CABLES

Power cables come standard in a transparent sheathing to match steel aircraft suspension cables. Please contact customer support if custom cables are required for your application. Power cables cannot be swapped in the field as it will void the ETL Safety Listing and Product Warranty.

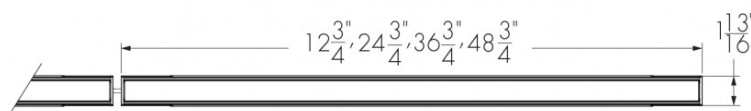


CONTROLS, SENSORS, & LED DRIVER

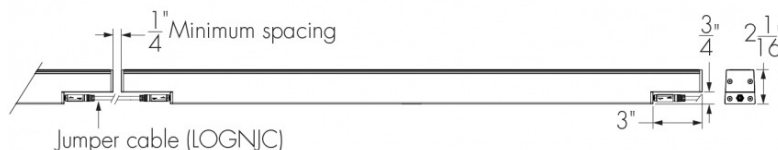
ALW lighting fixtures are intended for use with a wide range of sensors, lighting controls, LED drivers, and building management systems. Our component portfolio is continually expanding to adopt to the latest technologies and specification needs. We currently support integration with Lutron, Enlighted, EldoLED, nLight, Osram, Philips, and more. If there's a component or system needed that you don't see on the spec sheet please contact ALW customer support today so we can review your requirements.

Project Name _____ Qty _____

Type _____ Catalog / Part Number _____



Top view



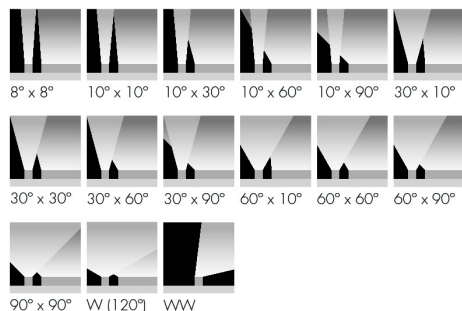
Front and side views

Photometric Summary

4ft, 4 W/ft, 4000K	Delivered output (lm)	Intensity (peak cd)
8°x8°	1,530	41,352
10°x10°	1,456	32,262
10°x30°	1,435	9,126
10°x60°	1,427	4,867
10°x90°	1,424	2,551
30°x10°	1,439	9,098
30°x30°	1,767	4,079
30°x60°	1,713	2,581
30°x90°	1,726	1,865
60°x10°	1,426	5,647
60°x60°	1,730	1,279
60°x90°	1,719	1,540
90°x90°	1,690	1,045
W (120°)	864	N/A
WW	1,524	7,393

Photometric performance is measured in compliance with IESNA LM 79-08.

Optics



Description

The Lumenfacade Nano White and Static Colors is a high-efficiency linear LED luminaire that goes where no facade lighting has gone before. Available in 12 in, 24 in, 36 in or 48 in sections, the Lumenfacade Nano is the right fit for general urban structures, historical buildings and those hardest to reach places. The Lumenfacade Nano packs all the bells and whistles of the larger members of the Lumenfacade family and can be configured with a wide number of options, including: optics for grazing, floodlighting or wall washing; a choice of outputs; various color temperatures or static colors; various mounting options, finishes, accessories and controls. The Lumenfacade Nano is also available with a unique asymmetric distribution, providing exceptional uniformity and brightness for walls and signage.

Features

Color and Color Temperature	2200K, 2700K, 3000K, 3500K, 4000K, Red, Green, Blue
Optics	8° x 8°, 10° x 10°, 10° x 30°, 10° x 60°, 10° x 90°, 30° x 10°, 30° x 30°, 30° x 60°, 30° x 90°, 60° x 10°, 60° x 60°, 60° x 90°, 90° x 90°, Wide 120°, Asymmetric Wallwash
Options	Corrosion-resistant coating for hostile environments
Power Consumption	2 W/ft, 4 W/ft
Warranty	5-year limited warranty

Performance

Delivered Output	884 lm (2 W/ft, 48 in fixture, 4000K, 30° x 30°, UCTL), 1,767 lm (4 W/ft, 48 in fixture, 4000K, 30° x 30°, UCTL)
Delivered Intensity	20,676 cd at nadir (2 W/ft, 48 in fixture, 4000K, 8° x 8°, UCTL), 41,352 cd at nadir (4 W/ft, 48 in fixture, 4000K, 8° x 8°, UCTL)
Illuminance at Distance	Minimum 1 fc at 144 ft (2 W/ft, 48 in fixture, 4000K, 8° x 8°, UCTL), Minimum 1 fc at 203 ft (4 W/ft, 48 in fixture, 4000K, 8° x 8°, UCTL)
Color Consistency	3 SDCM (2 SDCM for 8° x 8°, 10° x 10°, 10° x 30°, 10° x 60°, 10° x 90°, 30° x 10°, 60° x 10°, W and WW optics)

Colors and Color Temperatures**Controls**

ON/OFF UCTL

Ratings

IP66 IK08

Certifications

Color Rendering	CRI 80+
Lumen Maintenance	L70 >90,000 hrs

Physical

Housing Material	Low copper content extruded aluminum
Lens Material	Clear tempered glass
Hardware Material	Stainless steel
End Cap Material	Machined aluminum
Gasket Material	Silicone
Surface Finish	Electrostatically applied polyester powder coat
Weight	1.4 lbs (12 in), 2.9 lbs (24 in), 4.4 lbs (36 in), 6 lbs (48 in)

Electrical and control

Voltage	48 VDC
Resolution (DMX/RDM)	Per fixture, 8-bit or 16-bit
Control	On/Off control, Universal control (compatible with 0-10V, DALI or DMX/RDM systems)

Environmental

Storage Temperature	-40 °F to 185 °F (device must reach start-up temperature value before operating)
Start-up Temperature	-13 °F to 122 °F
Operating Temperature	-40 °F to 122 °F
Ingress Protection Rating	IP66
Impact Resistance Rating	IK08 (IK09 for 48 in fixtures)

Accessories (order separately)

Cables	Lumenfacade Nano Jumper Cable, Trunk Power Cable, Trunk Data Cable, Lumenfacade Nano Jumper Cable Joiner
Control Boxes	Low-Voltage Control Box, Low-Voltage Splitter Box
Optical Accessories	Lumenfacade Nano Radial Louver, Lumenfacade Nano Visor
Control Systems	Lumentone™ 2, Pharos® kit
Diagnostic and Addressing Tools	LumenID

Optical option installation details

HFR - Half-frosted lens



- Always position frosted side toward the wall.
- Applicable for 8° x 8°, 10° x 10° or asymmetric wallwash optics only.

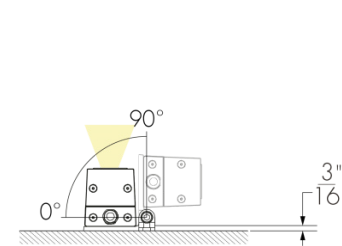
WW - Asymmetric wallwash

Recommended setback from wall is 1/10 of the wall height.
Example: 2 ft setback for a 20 ft wall.

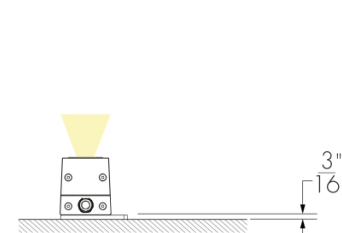
Mounting options

One mounting bracket provided for 12 in fixtures. Two mounting brackets provided for 24 in, 36 in and 48 in fixtures. See installation instructions for details.

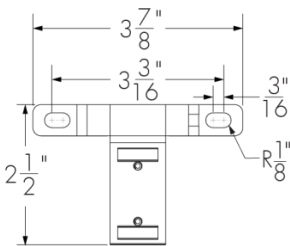
SAMN - Slim Adjustable Mounting Nano



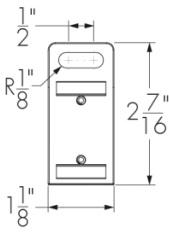
UMPN - Fixed Mounting Nano



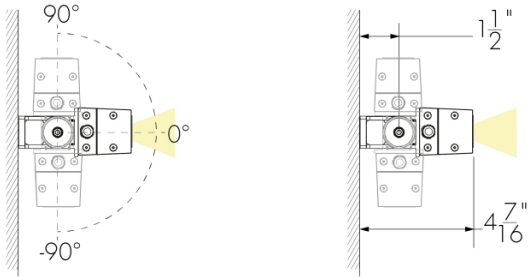
SAMN - Mounting hole pattern



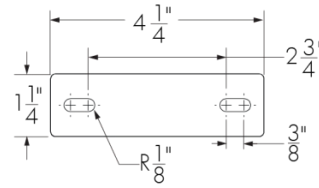
UMPN - Mounting hole pattern



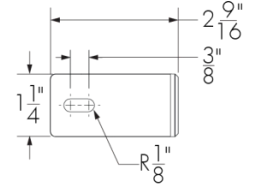
UMASN - Universal Adjustable Mounting Nano



UMASN - Mounting hole pattern

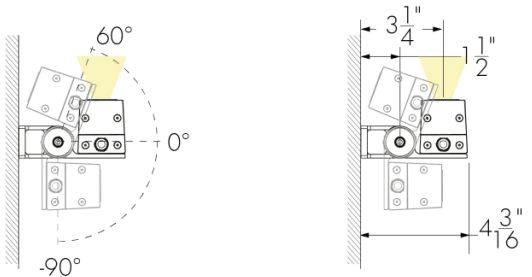


For 1 ft fixtures

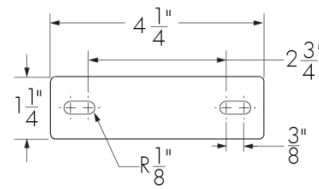


For 2 ft, 3 ft and 4 ft fixtures

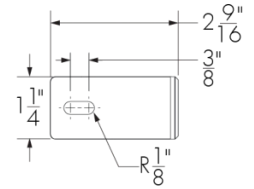
WAMN2 - Adjustable Extended Arm Mounting Nano 2 in



WAMN2 - Mounting hole pattern

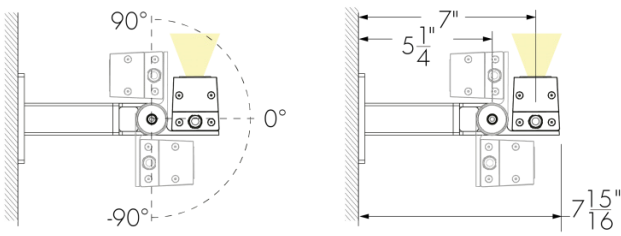


For 1 ft fixtures

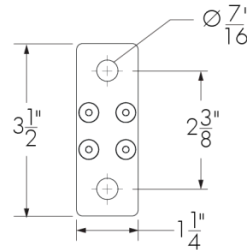


For 2 ft, 3 ft and 4 ft fixtures

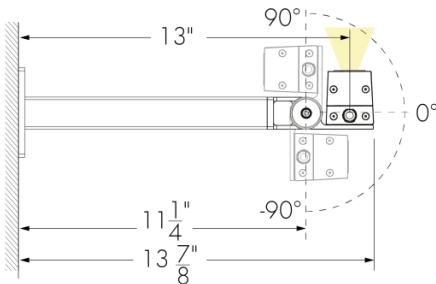
WAMN6 - Adjustable Extended Arm Mounting Nano 6 in



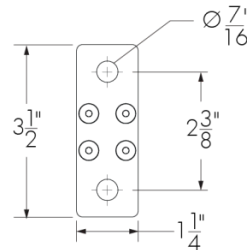
WAMN6 - Mounting hole pattern



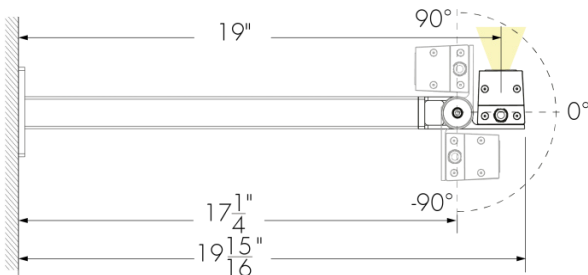
WAMN12 - Adjustable Extended Arm Mounting Nano 12 in



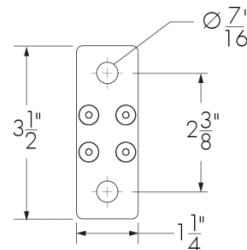
WAMN12 - Mounting hole pattern



WAMN18 - Adjustable Extended Arm Mounting Nano 18 in

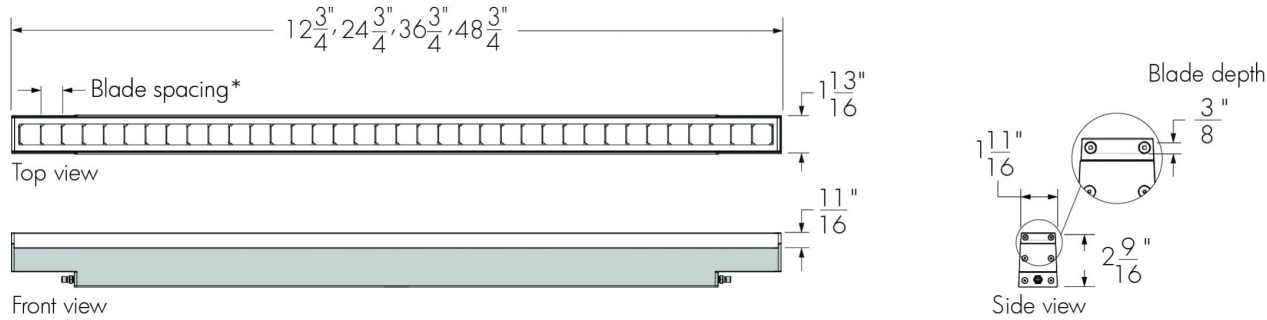


WAMN18 - Mounting hole pattern



Optical accessories (order separately)

LOGNRD - Radial louver for Lumenfacade Nano



*15/16 in blade spacing for 8° x 8°, 10° x 10°, 10° x 30°, 10° x 60°, 10° x 90°, 30° x 10° and 60° x 10° optics.

*1 15/16 in blade spacing for 30° x 30°, 30° x 60°, 30° x 90°, 60° x 60°, 60° x 90° and 90° x 90° optics.

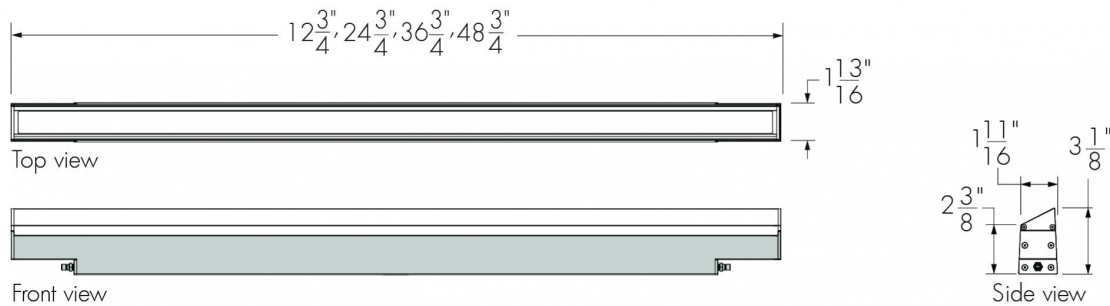
LOGNRD-LENGTH-FINISH-OPTIONS

Please specify:

LENGTH: 12 in, 24 in, 36 in or 48 in; **FINISH:** BK - Black Sandtex®, BRZ - Bronze Sandtex®, SI - Silver Sandtex®, WH - Smooth white or CC - custom color and finish (please specify RAL color); **OPTIONS:** CRC - Corrosion-resistant coating for hostile environments

- The addition of a louver will affect beam distribution. Consult factory for application support.
- Not suitable for wide 120° and asymmetric wallwash optics.
- Maximum one accessory per fixture. Louvers are field installable.

LOGNVS - Visor for Lumenfacade Nano



LOGNVS-LENGTH-FINISH-OPTIONS

Please specify:

LENGTH: 12 in, 24 in, 36 in or 48 in; **FINISH:** BK - Black Sandtex®, BRZ - Bronze Sandtex®, SI - Silver Sandtex®, WH - Smooth white or CC - custom color and finish (please specify RAL color); **OPTIONS:** CRC - Corrosion-resistant coating for hostile environments

- The addition of a visor will affect beam distribution. Consult factory for application support.
- Not suitable for wide 120° optic.
- Maximum one accessory per fixture. Visors are field installable.

Cables (order separately)

LOGNJC - Jumper cable for Lumenfacade Nano



Front view 4" Minimum bend radius for jumper cable

For minimal spacing between fixtures, use a 1 ft jumper cable.

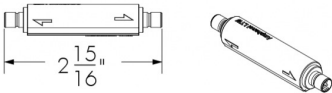
LOGNJC-CERTIFICATION-LENGTH-CABLE COLOR

Please specify: **CERTIFICATION:** UL or CE; **LENGTH:** 1 ft to 30 ft (available in 1 ft increments) or 50 ft; **CABLE COLOR:** black or white (connectors are the same color as the specified cable color).

- Suitable for dimming/data and non-dimming applications.
- Consult Lumenfacade Nano jumper cable specification sheet for all available cable lengths and additional information.

Joiner (order separately)

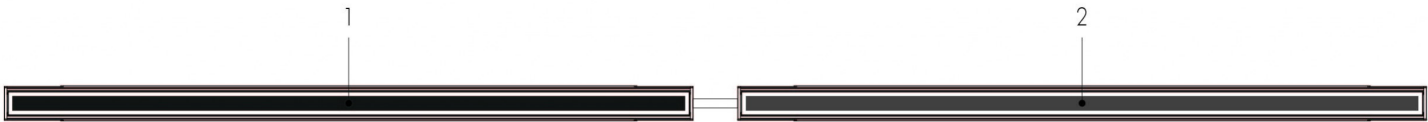
LOGNJC-JOINER - Joiner for Lumenfacade Nano Jumper Cable



- Use joiners to connect and lengthen jumper cables.
- Joiners add voltage drops. Consult factory to confirm impact on run length.
- Available in black.

Resolution details

DMX/RDM control, resolution per fixture: each fixture is addressed independently
DMX addresses:



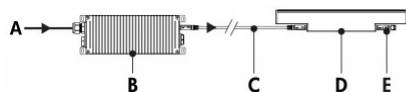
UCTL control option

- 48 in fixtures shown.
- Applicable for UCTL control only. A DMX/RDM enabled LCBX or LSBX is required for DMX/RDM control

Typical wiring diagrams

On/Off Control (NO)

Single unit - LCBX 60W



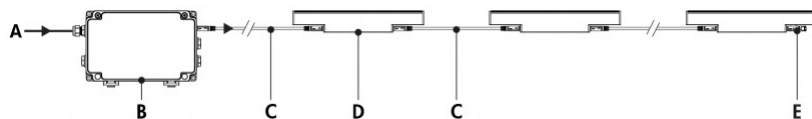
- A** - Power input (120-277V, wiring by others)
- B** - LCBX (60W)
- C** - Jumper cable (LOGNJC)
- D** - Lumenfacade Nano
- E** - Terminator cap

Continuous run - LCBX 60W or 120W



- A** - Power input (120-277V, wiring by others)
- B** - LCBX (60W or 120W)
- C** - Jumper cable (LOGNJC)
- D** - Lumenfacade Nano
- E** - Terminator cap

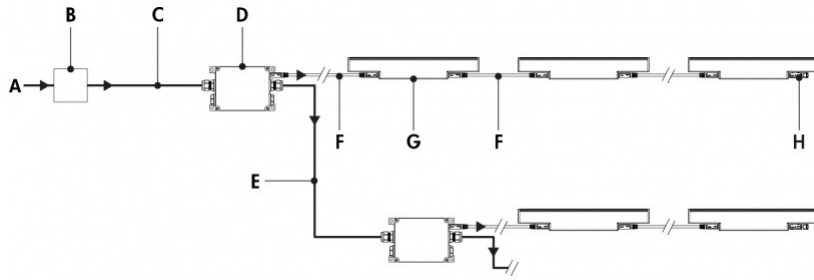
Continuous run - LCBX 200W



- A** - Power input (120-277V, wiring by others)
- B** - LCBX (200W)
- C** - Jumper cable (LOGNJC)
- D** - Lumenfacade Nano
- E** - Terminator cap

- Consult factory for specific applications and maximum fixture count/run length recommendations.
- For installations of 600W or more, consult factory to select the optimal system: either a daisy chain continuous run system with LCBXs or a trunk system with LSBXs.
- Maximum of 1 output to fixture, or fixture run, per LCBX.
- Consult the LCBX specification sheet for more information.
- 2W version: 2 W/ft; 4W version: 4 W/ft.

Trunk system - LSBX

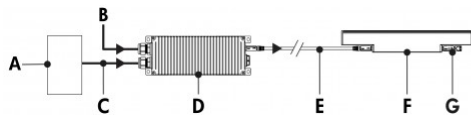


- A** - Power input (120-277V, wiring by others)
- B** - Power supply (48V, by others)
- C** - Power input (48V, order separately from Lumenpulse - Trunk Power Cable (TKPWR), or equivalent by others)
- D** - LSBX
- E** - Power output to next LSBX (48V, order separately from Lumenpulse - Trunk Power Cable (TKPWR), or equivalent by others)
- F** - Jumper cable (LOGNJC)
- G** - Lumenfacade Nano
- H** - Terminator cap

- Consult factory for specific applications and maximum fixture count/run length recommendations.
- For installations of 600W or more, consult factory to select the optimal system: either a daisy chain continuous run system with LCBXs or a trunk system with LSBXs.
- Maximum of 1 output to fixture run per LSBX.
- Consult the LSBX specification sheet for more information.
- Consult factory for power supply recommendations.
- 2W version: 2 W/ft; 4W version: 4 W/ft.

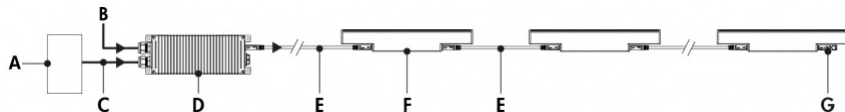
UCTL - Universal control

Single unit - LCBX 60W



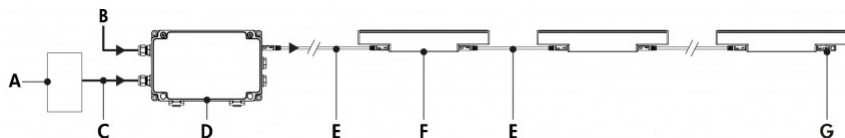
- A** - Dimmer/controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (60W)
- E** - Jumper cable (LOGNJC)
- F** - Lumenfacade Nano
- G** - Terminator cap

Continuous run - LCBX 60W or 120W



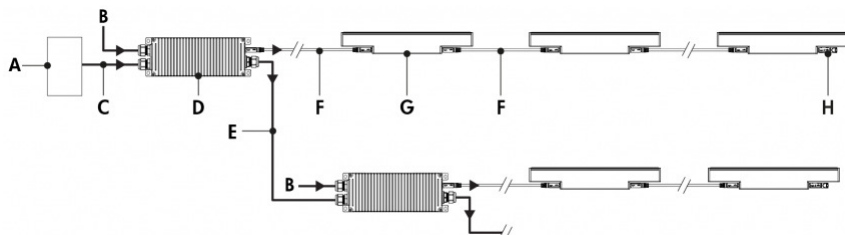
- A** - Dimmer/controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (60W or 120W)
- E** - Jumper cable (LOGNJC)
- F** - Lumenfacade Nano
- G** - Terminator cap

Continuous run - LCBX 200W



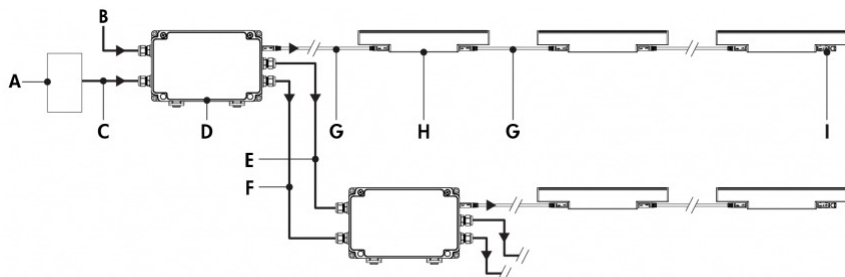
- A** - Dimmer/controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (200W)
- E** - Jumper cable (LOGNJC)
- F** - Lumenfacade Nano
- G** - Terminator cap

Continuous run - Daisy chain LCBX 60W or 120W



- A** - Dimmer/controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (60W or 120W)
- E** - Data output to next LCBX (wiring by others)
- F** - Jumper cable (LOGNJC)
- G** - Lumenfacade Nano
- H** - Terminator cap

Continuous run - Daisy chain LCBX 200W

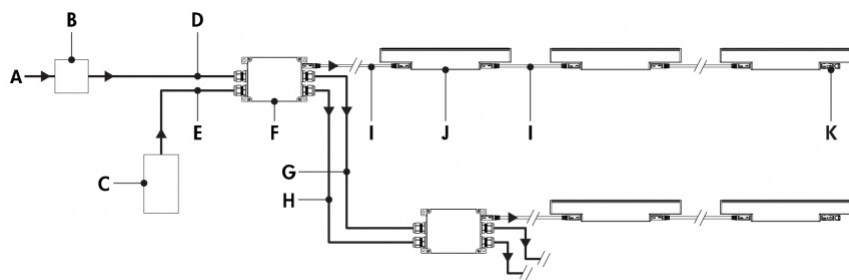


- A** - Dimmer/controller (order separately from Lumenpulse, or by others)
- B** - Power input (120-277V, wiring by others)
- C** - Data input (wiring by others)
- D** - LCBX (200W)
- E** - Power output to next LCBX (120-277V, wiring by others)
- F** - Data output to next LCBX (wiring by others)
- G** - Jumper cable (LOGNJC)
- H** - Lumenfacade Nano
- I** - Terminator cap

Maximum run length per LCBX (Based on a 50 ft master jumper cable)		
Configuration	2 W/ft	4 W/ft
LCBX 60W	28 ft	12 ft
LCBX 120W	52 ft	24 ft
LCBX 200W	76 ft	40 ft

- Consult factory for specific applications and maximum fixture count/run length recommendations.
- For installations of 600W or more, consult factory to select the optimal system: either a daisy chain continuous run system with LCBXs or a trunk system with LSBXs.
- Maximum of 1 output to fixture, or fixture run, per LCBX.
- Consult the LCBX specification sheet for more information.
- UCTL can be controlled via a 0-10V dimmer, DALI controller or DMX/RDM controller.
- For 0-10V dimming applications:
 - 0-10V mA ratings: Current Sink Mode: 25µA per LCBX; Current Source Mode: 2.5mA per LCBX.
- For DALI applications:
 - A maximum of 64 DALI fixtures per DALI loop.
- For DMX/RDM applications:
 - Each fixture requires 1 DMX channel.
 - A maximum of 128 UCTL devices on the output port of the LCBX.
- 1% minimum dimming value.
- 2W version: 2 W/ft; 4W version: 4 W/ft.

Trunk system - LSBX

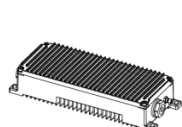


- A** - Power input (120-277V, wiring by others)
- B** - Power supply (48V, by others)
- C** - Controller (order separately from Lumenpulse, or by others)
- D** - Power input (48V, order separately from Lumenpulse - Trunk Power Cable (TKPWR), or equivalent by others)
- E** - Data input (order separately from Lumenpulse - Trunk Data Cable (TKDMX), or equivalent by others)
- F** - LSBX
- G** - Power output to next LSBX (48V, order separately from Lumenpulse - Trunk Power Cable (TKPWR), or equivalent by others)
- H** - Data output to next LSBX (order separately from Lumenpulse - Trunk Data Cable (TKDMX), or equivalent by others)
- I** - Jumper cable (LOGNJC)
- J** - Lumenfacade Nano
- K** - Terminator cap

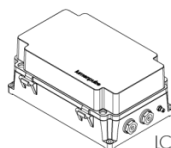
- Consult factory for specific applications and maximum fixture count/run length recommendations.
- For installations of 600W or more, consult factory to select the optimal system: either a daisy chain continuous run system with LCBXs or a trunk system with LSBXs.
- A maximum of 128 UCTL devices on the output port of the LSBX.
- Maximum of 1 output to fixture run per LSBX.
- Consult the LSBX specification sheet for more information.
- Consult factory for power supply recommendations.
- Each fixture requires 1 DMX channel.
- 1% minimum dimming value.
- 2W version: 2 W/ft; 4W version: 4 W/ft.

Control boxes (order separately)

LCBX - Low-Voltage Control Box



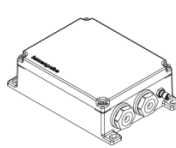
LCBX 60W & 120W



LCBX 200W

Low-voltage control and power box. One power and data output to fixture, or fixture run. Refer to LCBX specification sheet for details.

LSBX - Low-Voltage Splitter Box



Low-voltage control and power splitter box. One power and data output to fixture run. Refer to LSBX specification sheet for details.

Control systems (order separately)

LTN2 - Lumentone™ 2



Lumentone 2 is a simple pre-programmed DMX 512 controller with a push button rotary dial and live feedback.

PHAROS - Pharos® kit



The Pharos kit, available for 1 or 2 DMX universes, allows for complete control of large lighting installations. 2 DMX universes kit shown.

Diagnostic and addressing tools (order separately)

LID - LumenID



LumenID is a diagnostic and addressing DMX/RDM tool. It must be specified on all DMX applications. Consult LID specification sheet for details.

How to order

Housing	Wattage	Voltage	Length	Color and Color Temperature ⁽²⁾	Optics
LOGN Lumenfacade™ Nano	2W 2 W/ft ⁽¹⁾ 4W 4 W/ft	48V 48 VDC	12 12 3/4 in (1.4 lbs) 24 24 3/4 in (2.9 lbs) 36 36 3/4 in (4.4 lbs) 48 48 3/4 in (6 lbs)	22K 2200K 27K 2700K 30K 3000K 35K 3500K 40K 4000K RD Red ⁽³⁾ GR Green ⁽³⁾ BL Blue ⁽³⁾	8x8 8° x 8° 10x10 10° x 10° 10x30 10° x 30° 10x60 10° x 60° 10x90 10° x 90° 30x10 30° x 10° 30x30 30° x 30° 30x60 30° x 60° 30x90 30° x 90° 60x10 60° x 10° 60x60 60° x 60° 60x90 60° x 90° 90x90 90° x 90° W Wide 120° ⁽⁴⁾ WW Asymmetric Wallwash ⁽⁵⁾

- Notes:**

1. Not available for static red, green or blue color options.

2. Consult factory for availability of static Royal Blue, 6500K and 90+ CRI.

3. Static colors made to order 8-10 weeks.
4. Not compatible with louver or visor optical accessories.

5. Not compatible with louver optical accessory.



How to order

Lens	Mounting Options ⁽⁹⁾	Finish	Control ⁽¹³⁾	Options	Certification
CL Clear lens ⁽⁶⁾	SAMN Slim Adjustable Mounting Nano	BK Black Sandtex®	NO On/Off control	CRC Corrosion-resistant coating for hostile environments ⁽¹⁴⁾ ⁽¹⁵⁾	UL UL compliant
FR Frosted lens ⁽⁷⁾	UMPN Fixed Mounting Nano	BRZ Bronze Sandtex®	UCTL Universal control (compatible with 0-10V, DALI or DMX/RDM systems)		CE CE compliant
HFR Half-frosted lens ⁽⁸⁾	UMASN Universal Adjustable Mounting Nano	SI Silver Sandtex®			
	WAMN2 Adjustable Wall Mounting Nano 2 in	WH Smooth white			
	WAMN6 Adjustable Extended Arm Mounting Nano 6 in	CC Custom color and finish (please specify RAL color) ⁽¹⁰⁾ ⁽¹¹⁾ ⁽¹²⁾			
	WAMN12 Adjustable Extended Arm Mounting Nano 12 in				
	WAMN18 Adjustable Extended Arm Mounting Nano 18 in				

- Notes:**

6. Not available for 8x8, 10x10, W or WW optics.

7. Not available for WW optic.

8. Available for 8x8, 10x10 or WW optics only.

9. One mounting bracket provided for 12 in fixtures. Two mounting brackets provided for 24 in, 36 in and 48 in fixtures.

10. Lumenpulse offers a wide selection of RAL CLASSIC (K7) colors with a smooth texture and high-gloss finish. Please consult factory for a list of available K7 colors, other RAL textures and glosses, or to match alternate color charts. Final color matching results may vary.
11. Setup charges apply for RAL colors. Consult factory for details.

12. Longer lead times can be expected for custom RAL color finishes.

13. A Low-Voltage Control Box (LCBX) or Low-Voltage Splitter Box (LSBX) and LumenID (LID) must be specified.

14. Use only when exposed to salt spray and harsh chemicals. This option is not required for normal outdoor exposure.

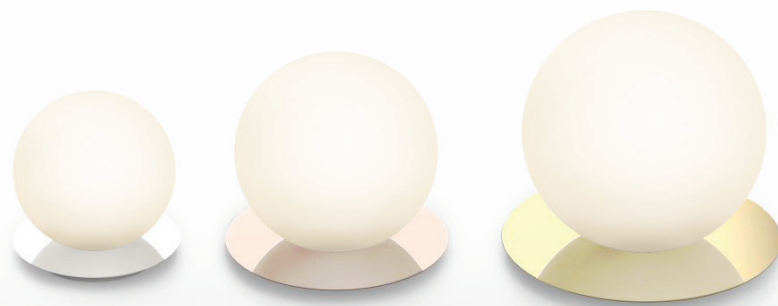
15. Setup charges apply. Consult factory for details.

BOLA SPHERE TABLE

RR9

DESCRIPTION

The Bola Sphere Table series fuses an elegant blown opal glass sphere with a mirrored disc base in polished stainless steel to give the illusion of a floating orb in space. Taking its cues from the Bola Family Collection, the new table version brings this magical combination to a table surface, allowing for full range dimming and is available in 3 distinct Globe sizes: 8" (20cm), 10" (25.5cm), and 12" (30.5cm). Its mating base is available in 3 corresponding diameters: 9.5" (24cm), 12" (30.5cm), and 14" (36cm) in 3 exquisit finishes: chrome, brass, and rose gold. Each finish provides a distinct personality for any residential, contract, or hospitality environment.



FIXTURE TYPE

Table

LIGHT SOURCE

A19 LED Bulb, Warm Dim

LIGHT CONTROL

In-line dimmer

MODELS

Bola Sphere Table 8
Bola Sphere Table 10
Bola Sphere Table 12

FEATURES

Fully dimmable

SPECIFICATIONS

Voltage: 120V or 240V, 50/60Hz
LED Warm Dim Bulb: 9.5W (60W equivalent)
Color Temperature: 2200-2700K
Luminosity: 800 Lumens
Luminaire Efficacy: 84 Lumens/Watt MAX
Cord Length: 6' (1.8m)

CERTIFICATIONS



PRODUCT CODES

Bola Sphere 8 (Chrome): BOLA SPH TBL 8 CRM
Bola Sphere 10(Chrome): BOLA SPH TBL 10 CRM
Bola Sphere 12 (Chrome): BOLA SPH TBL 12 CRM

Bola Sphere 8 (Brass) : BOLA SPH TBL 8 BRA
Bola Sphere 10(Brass) : BOLA SPH TBL 10 BRA
Bola Sphere 12 (Brass) : BOLA SPH TBL 12 BRA

Bola Sphere 8 (Rose Gold): BOLA SPH TBL 8 RGD
Bola Sphere 10(Rose Gold) : BOLA SPH TBL 10 RGD
Bola Sphere 12 (Rose Gold) : BOLA SPH TBL 12 RGD

FINISHES

BOLA SPHERE TABLE



CHROME



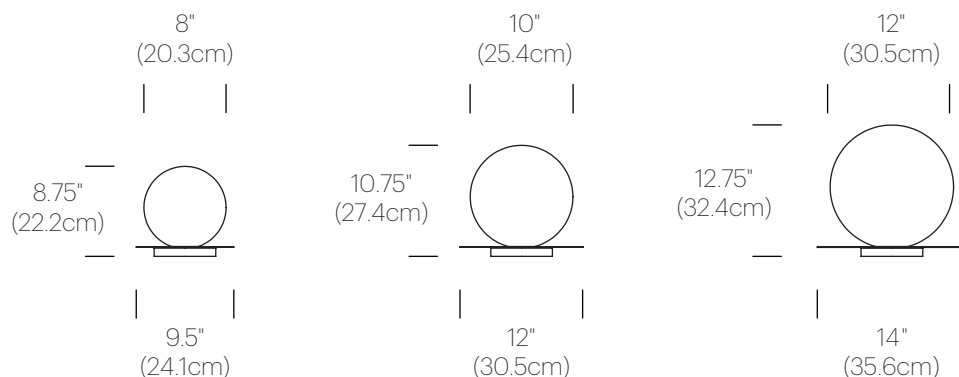
BRASS



ROSE GOLD

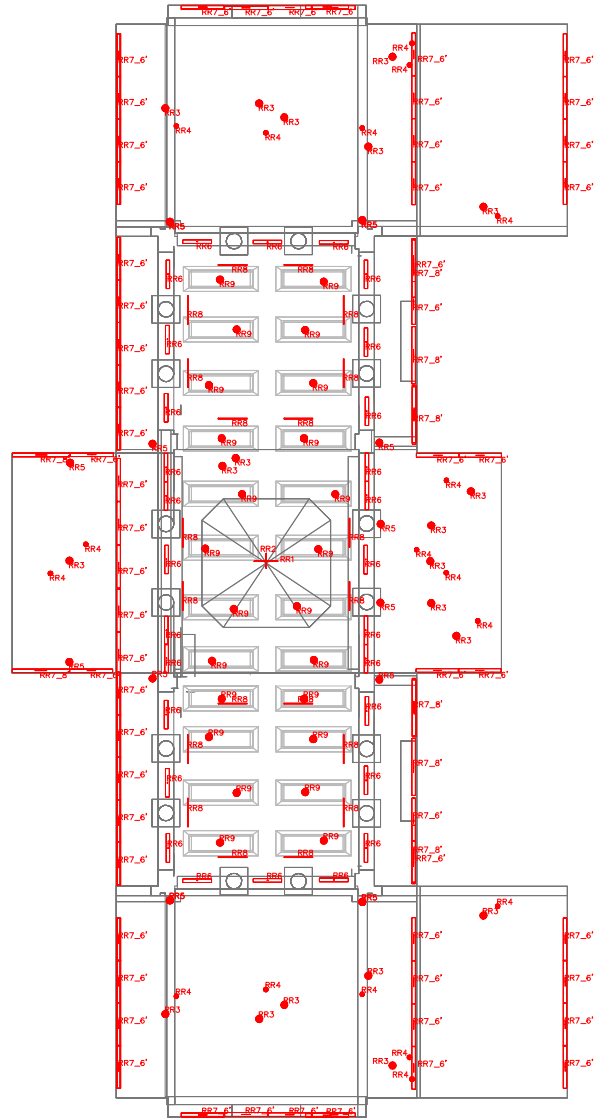
DIMENSIONS

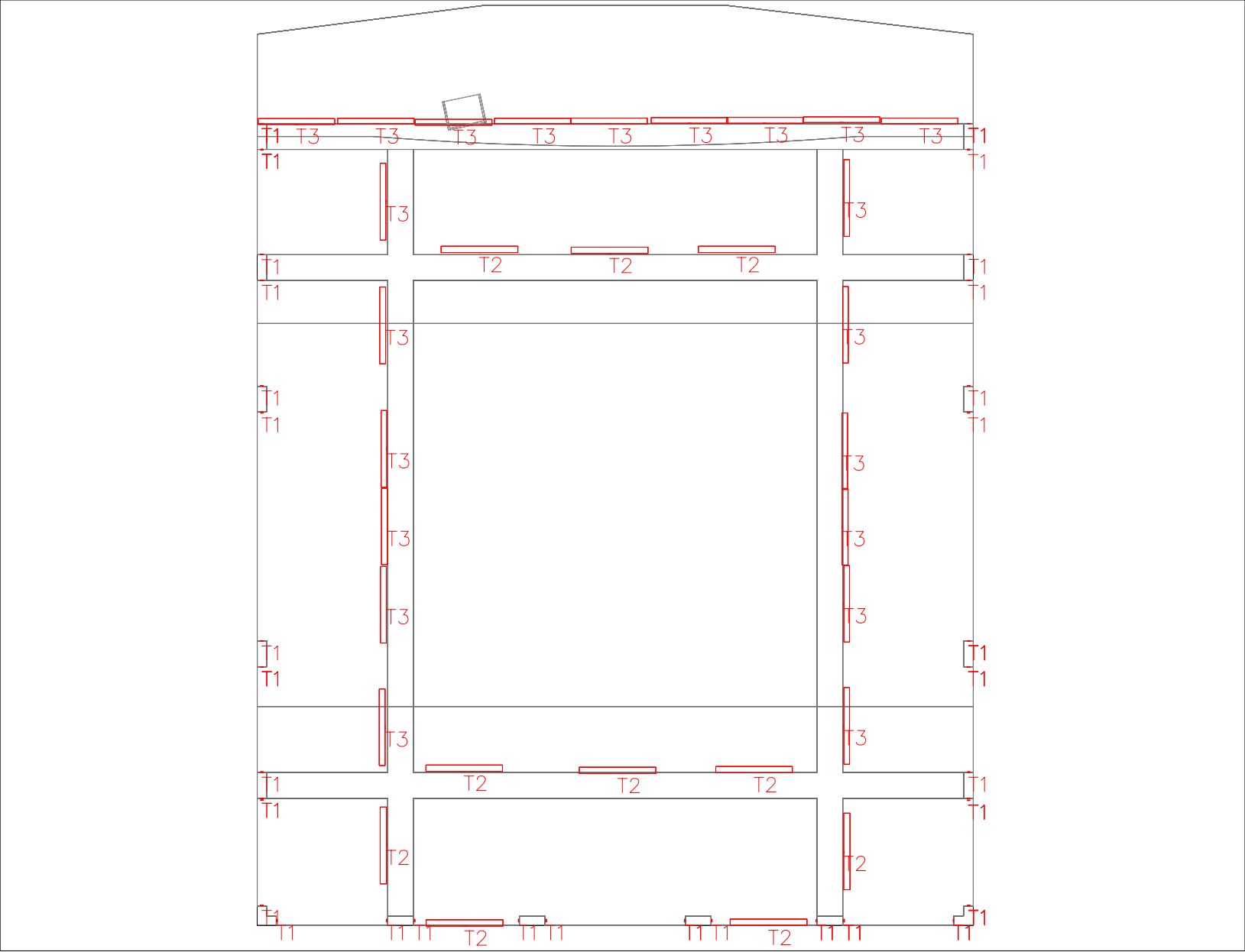
BOLA SPHERE 8, 10, 12

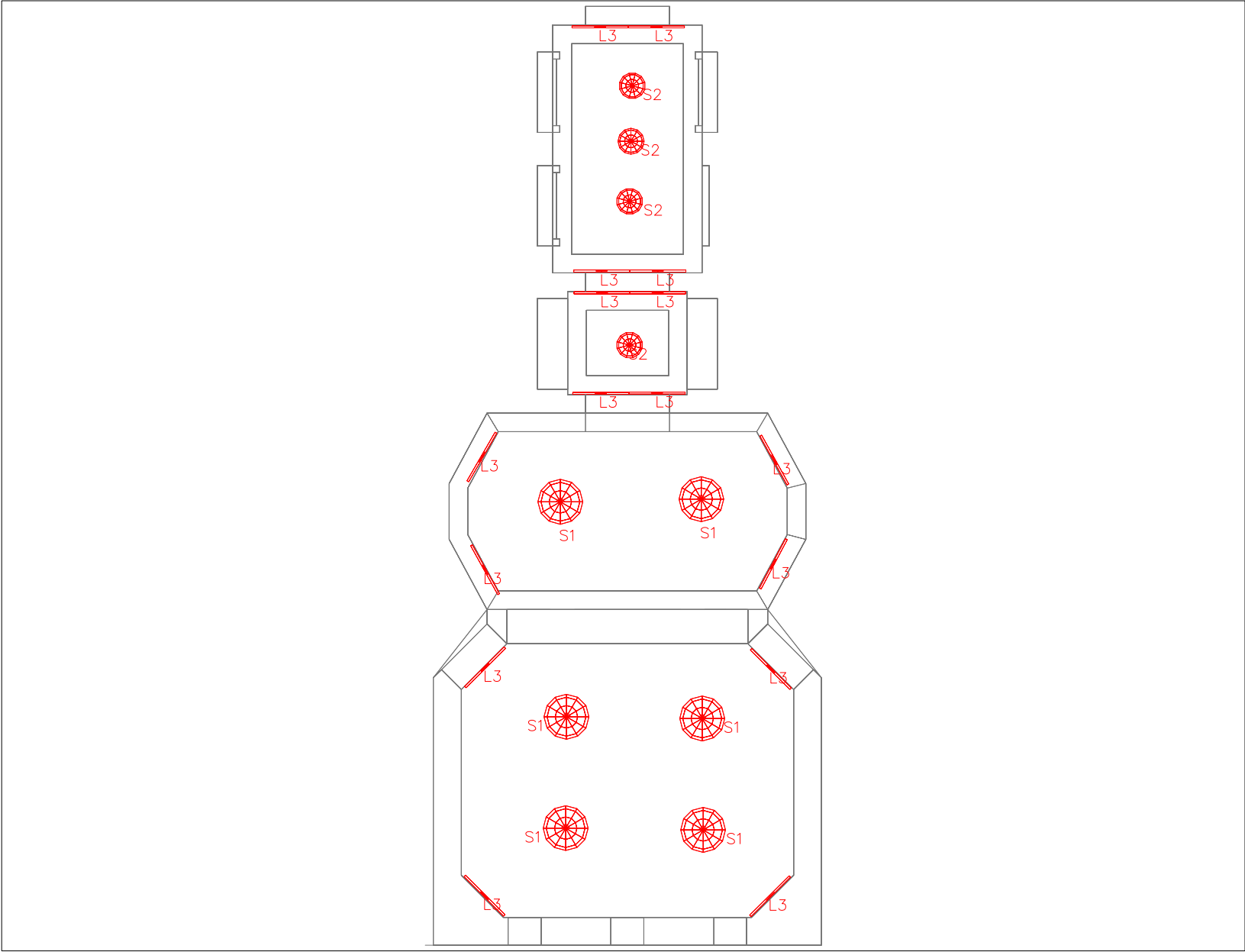


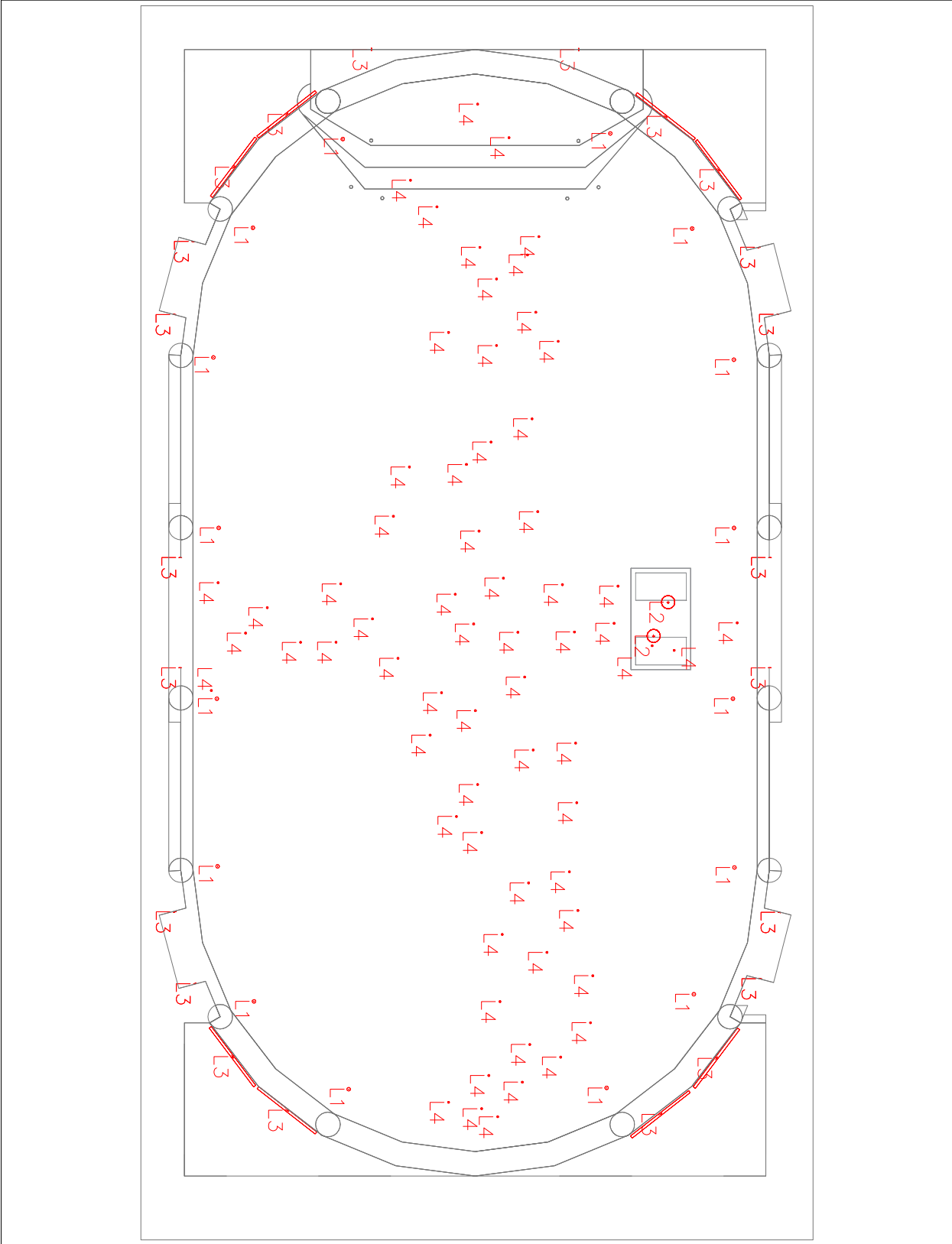
PACKAGING WEIGHT AND DIMENSIONS

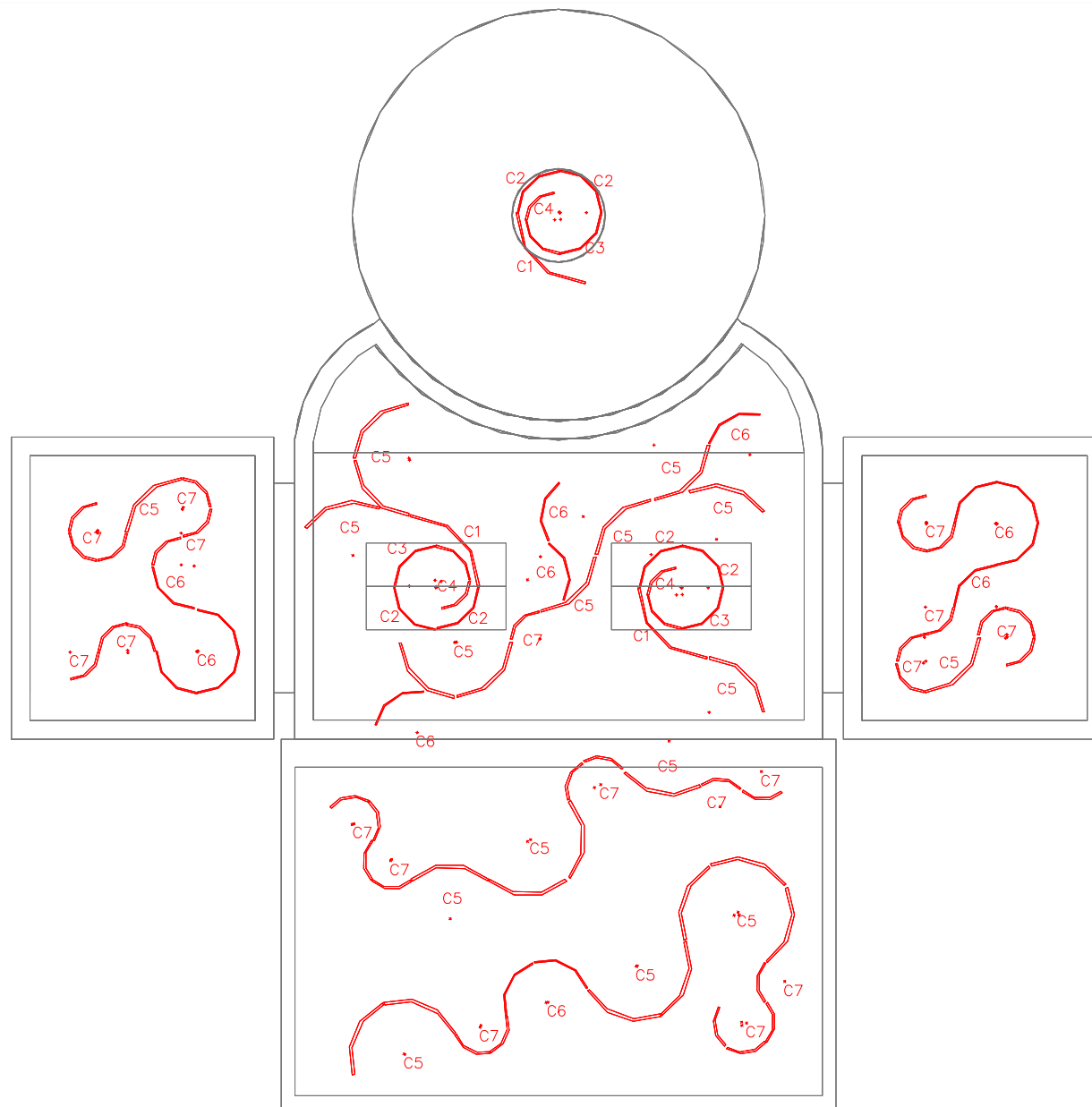
BOLA SPH 8	4LBS	10" X 10" X 14.5"
	1.8KG	25cm X 25cm X 37cm
BOLA SPH 10	4.2LBS	13" X 13" X 18"
	1.9KG	33cm X 33cm X 46cm
BOLA SPH 12	5.2LBS	16" X 16" X 21"
	2.4KG	40cm X 40cm X 53cm











READING ROOM CALCULATION REGIONS AND POINTS

If desired, contact msh5424@psu.edu for the full calculation grid. Because the space was modeled as two stacked floors, readability outside of AGI32 is low, so a summary has been included instead.

East Hall Floor 1

Illuminance (Fc)

Average=26.07 Maximum=38.6 Minimum=9.2 Avg/Min=2.83 Max/Min=4.20

East Hall Floor 2

Illuminance (Fc)

Average=14.18 Maximum=26.0 Minimum=6.7 Avg/Min=2.12 Max/Min=3.88

Entry Floor 1

Illuminance (Fc)

Average=18.72 Maximum=25.4 Minimum=13.4 Avg/Min=1.40 Max/Min=1.90

Forward Study Floor 2

Illuminance (Fc)

Average=12.24 Maximum=20.9 Minimum=7.4 Avg/Min=1.65 Max/Min=2.82

Main Cupola Floor 1

Illuminance (Fc)

Average=22.66 Maximum=47.0 Minimum=13.3 Avg/Min=1.70 Max/Min=3.53

Main Cupola Floor 1

Illuminance (Fc)

Average=22.66 Maximum=47.0 Minimum=13.3 Avg/Min=1.70 Max/Min=3.53

Rear Study Floor 2

Illuminance (Fc)

Average=18.52 Maximum=29.2 Minimum=13.5 Avg/Min=1.37 Max/Min=2.16

Skylight Floor 1

Illuminance (Fc)

Average=20.63 Maximum=37.7 Minimum=9.9 Avg/Min=2.08 Max/Min=3.81

West Hall Floor 1

Illuminance (Fc)

Average=38.43 Maximum=45.7 Minimum=18.6 Avg/Min=2.07 Max/Min=2.46

West Hall Floor 2

Illuminance (Fc)

Average=19.64 Maximum=29.8 Minimum=9.1 Avg/Min=2.16 Max/Min=3.27

Wing Floor 1

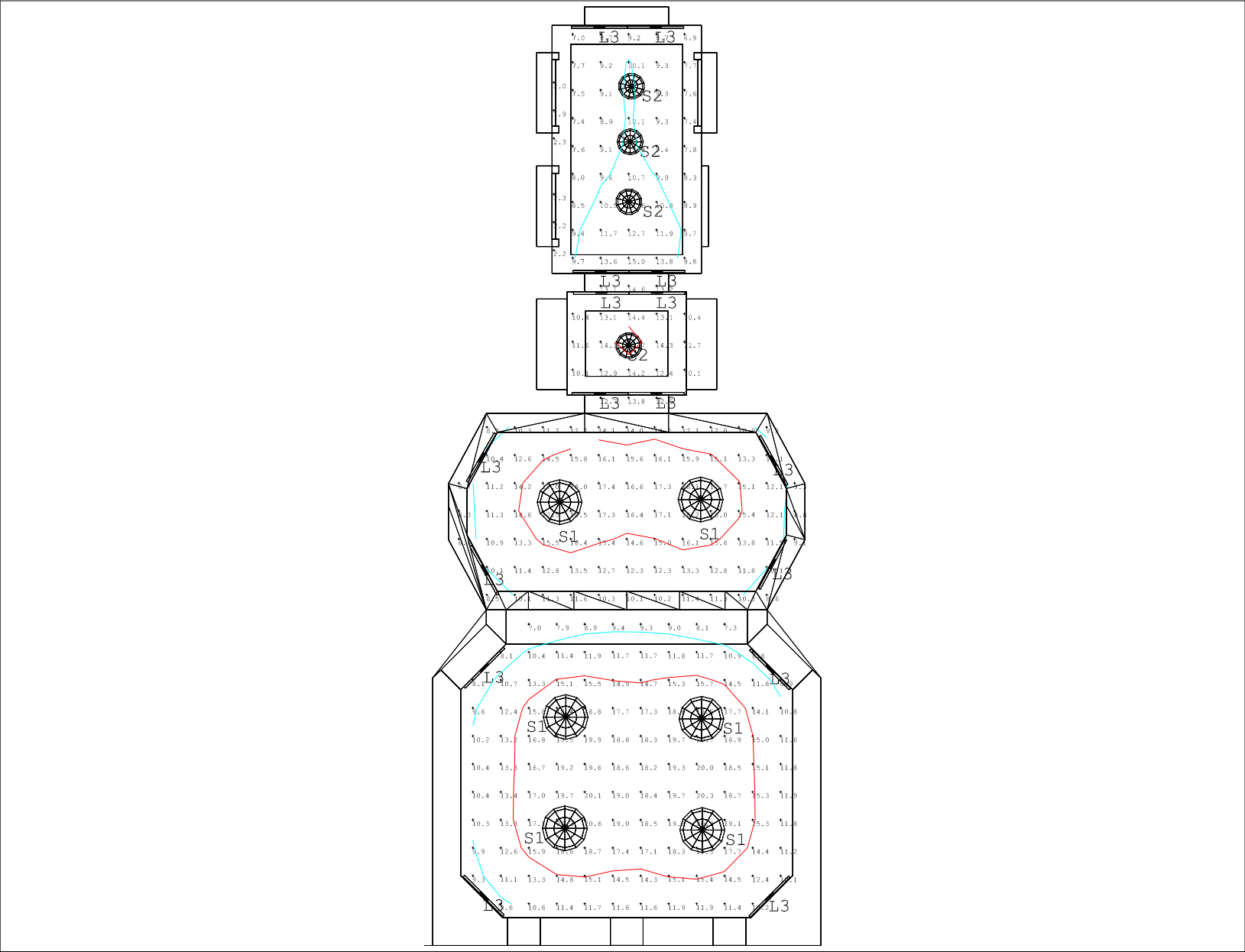
Illuminance (Fc)

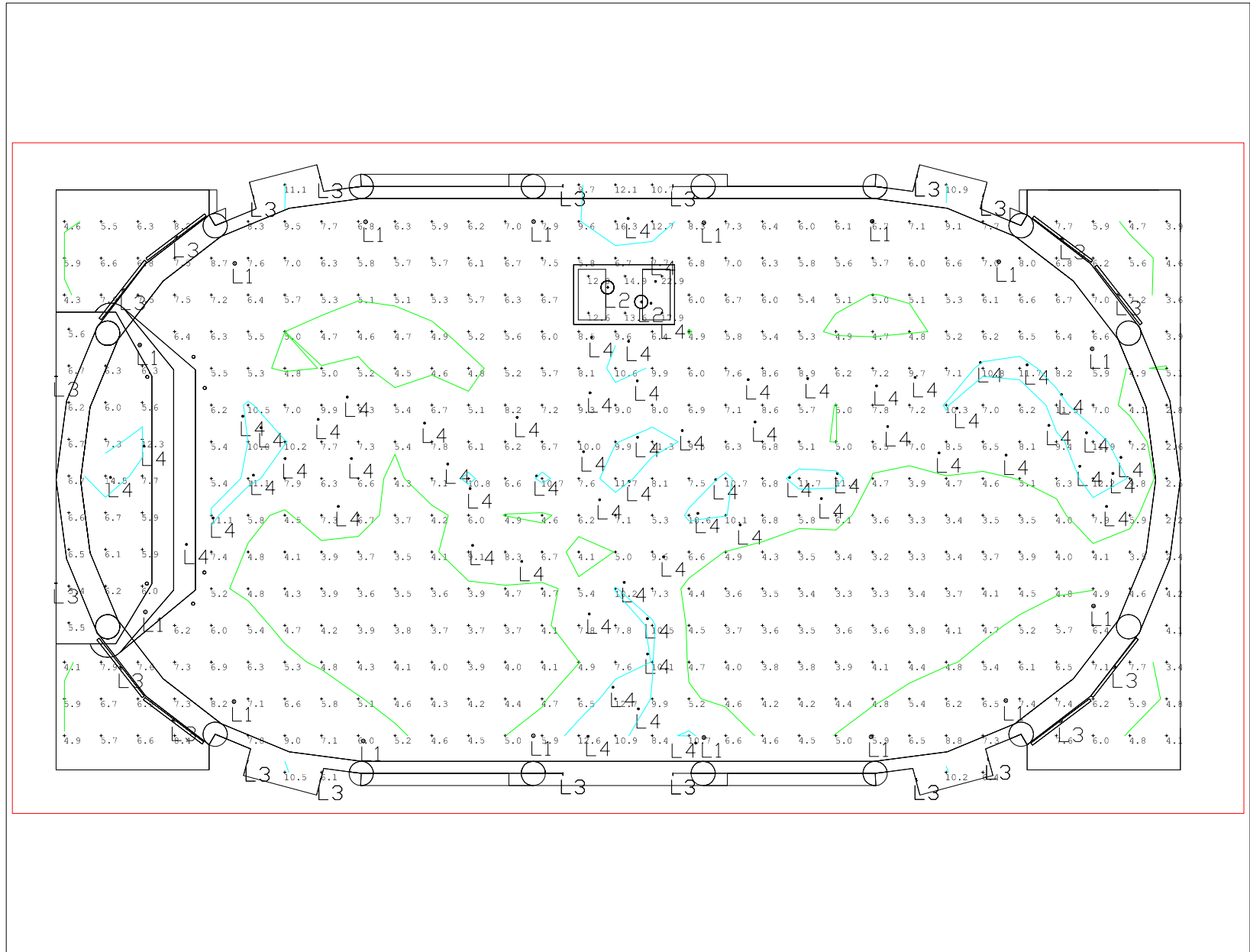
Average=13.91 Maximum=34.0 Minimum=6.6 Avg/Min=2.11 Max/Min=5.15

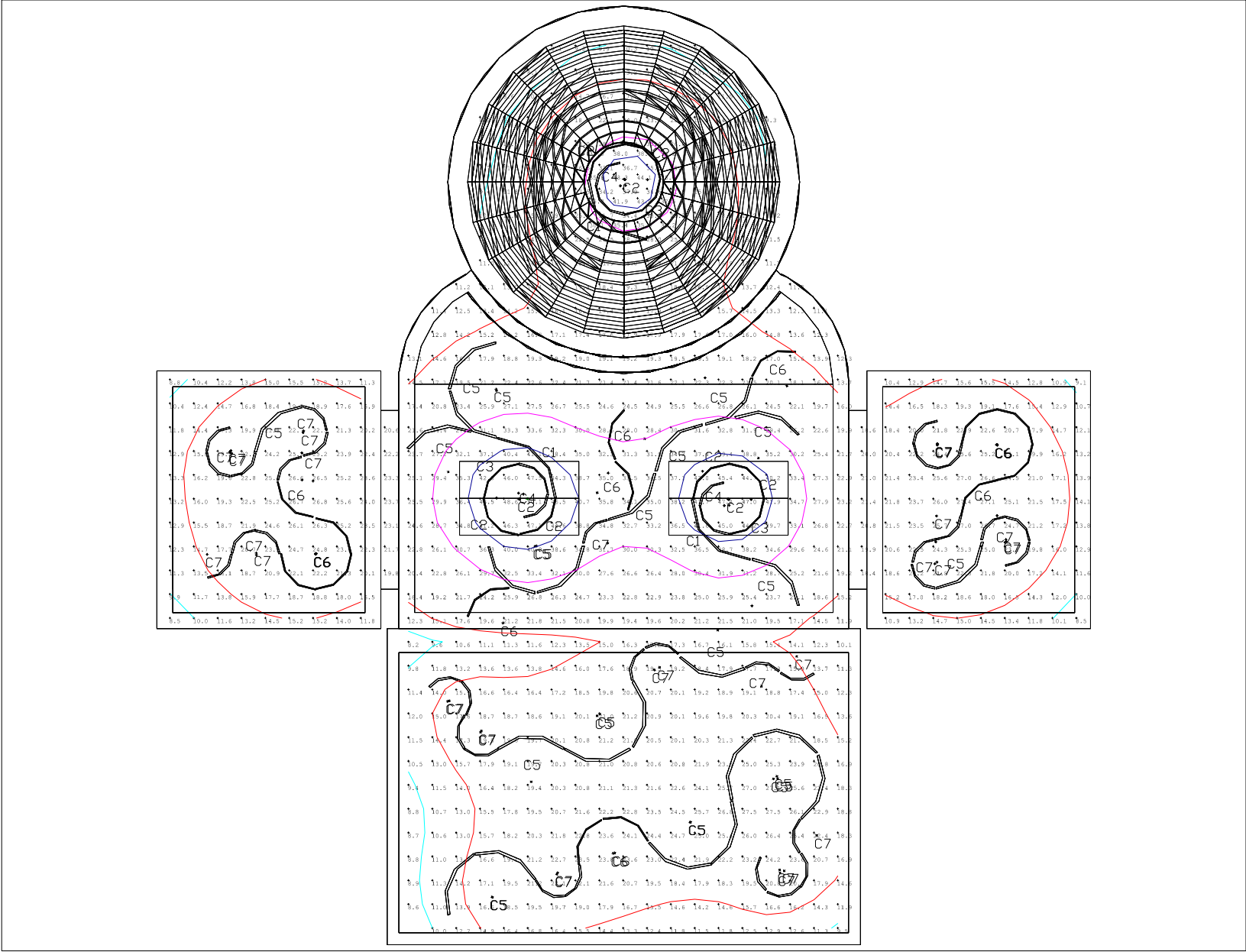
Wing Floor 2

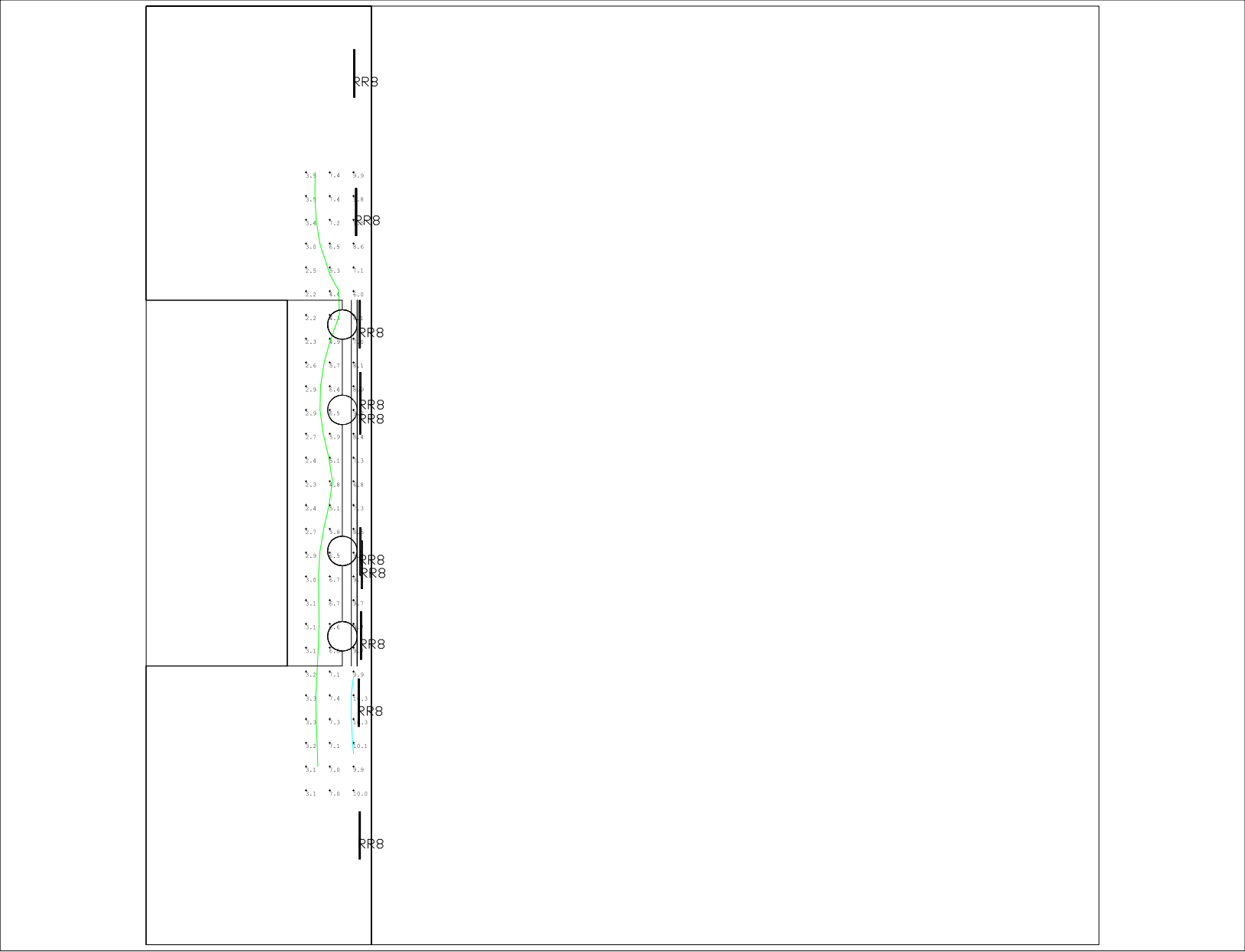
Illuminance (Fc)

Average=16.07 Maximum=35.5 Minimum=7.0 Avg/Min=2.30 Max/Min=5.07









APPENDIX



SPACE NAME	ROOM NUMBER	MANUAL ON	MANUAL OFF	DIMMING SWITCH	OVERRIDE SWITCH	TIMECLOCK ON/OFF	OCCUPANCY SENSOR	VACANCY SENSOR	PHOTOCONTROL DIMMING	EXTERIOR PHOTOCELL ON/OFF	FACILITY MANAGEMENT TOOL	4-BUTTON SCENE CONTROL	NETWORKED CONTROLS (DMX)	SEQUENCE OF OPERATIONS
Main Reading Room - F1 / F2	2318B	X	X		X	X	X		X	X	X			1
North Wing - F1	2318A	X	X		X	X	X		X	X	X			1
South Wing - F1	2318C	X	X		X	X	X		X	X	X			1
Entry - F1	2318B	X	X	X	X	X	X		X	X	X			2
North Wing - F2	3001A	X	X		X	X	X		X	X	X			1
South Wing - F2	3001D	X	X		X	X	X		X	X	X			1
Front Study Room - F2	3001C	X	X	X	X	X	X		X	X	X	X		3
Rear Study Room - F2	3001B	X	X	X	X	X	X		X	X	X	X		3

SPACE NAME	ROOM NUMBER	MANUAL ON	MANUAL OFF	DIMMING SWITCH	OVERRIDE SWITCH	TIMECLOCK ON/OFF	OCCUPANCY SENSOR	VACANCY SENSOR	PHOTOCONTROL DIMMING	EXTERIOR PHOTOCELL ON/OFF	FACILITY MANAGEMENT TOOL	4-BUTTON SCENE CONTROL	NETWORKED CONTROLS (DMX)	SEQUENCE OF OPERATIONS
Audience	2309	X	X		X	X					X		X	4
Stage	2313	X	X		X	X					X		X	4
Prefunction	L2-C-07	X	X		X	X					X	X		5
Prefunction Hall	2309A	X	X	X	X	X					X			6

SPACE NAME	ROOM NUMBER	MANUAL ON	MANUAL OFF	DIMMING SWITCH	OVERRIDE SWITCH	TIMECLOCK ON/OFF	OCCUPANCY SENSOR	VACANCY SENSOR	PHOTOCONTROL DIMMING	EXTERIOR PHOTOCELL ON/OFF	FACILITY MANAGEMENT TOOL	4-BUTTON SCENE CONTROL	NETWORKED CONTROLS (DMX)	SEQUENCE OF OPERATIONS
Display Gallery	L1-C-02	X	X	X	X	X	X			X	X	X		7
Display Gallery Hall	L1-C-03	X	X	X	X	X		X		X	X			9
Special Collections	1218	X	X	X	X	X		X	X	X	X	X		8

SPACE NAME	ROOM NUMBER	MANUAL ON	MANUAL OFF	DIMMING SWITCH	OVERRIDE SWITCH	TIMECLOCK ON/OFF	OCCUPANCY SENSOR	VACANCY SENSOR	PHOTOCONTROL DIMMING	EXTERIOR PHOTOCELL ON/OFF	FACILITY MANAGEMENT TOOL	4-BUTTON SCENE CONTROL	NETWORKED CONTROLS (DMX)	SEQUENCE OF OPERATIONS
Main Lobby	L1-C-01	X	X	X	X	X	X			X	X	X		✓

SPACE NAME	ROOM NUMBER	MANUAL ON	MANUAL OFF	DIMMING SWITCH	OVERRIDE SWITCH	TIMECLOCK ON/OFF	OCCUPANCY SENSOR	VACANCY SENSOR	PHOTOCONTROL DIMMING	EXTERIOR PHOTOCELL ON/OFF	FACILITY MANAGEMENT TOOL	4-BUTTON SCENE CONTROL	NETWORKED CONTROLS (DMX)	SEQUENCE OF OPERATIONS
Info Commons (Dome)	L2-C-13	X	X	X	X	X	X		X	X				10
Technology Commons	2314	X	X	X	X	X	X		X	X				10
Media Center	2317	X	X	X	X	X	X		X	X				10

SPACE NAME	ROOM NUMBER	MANUAL ON	MANUAL OFF	DIMMING SWITCH	OVERRIDE SWITCH	TIMECLOCK ON/OFF	OCCUPANCY SENSOR	VACANCY SENSOR	PHOTOCONTROL DIMMING	EXTERIOR PHOTOCELL ON/OFF	FACILITY MANAGEMENT TOOL	4-BUTTON SCENE CONTROL	NETWORKED CONTROLS (DMX)	SEQUENCE OF OPERATIONS
East Facade	N/A	X	X		X	X				X	X			11

SEQUENCE OF OPERATIONS LEGEND

1	At 7:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. Lights will DIM according to daylight sensors. At 10:00 PM the zone will turn OFF. Overrides include a user-operated manual ON/OFF.
2	At 7:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. Lights will DIM according to daylight sensors. At 10:00 PM the zone will turn OFF. Overrides include a user-operated manual ON/OFF and user-operated manual dimming.
3	At 7:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. Lights will DIM according to daylight sensors. At 10:00 PM the zone will turn OFF. Overrides include a user-operated manual ON/OFF, user-operated manual dimming, and user-operated 4-button scenes.
4	At 8:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. At 8:00 PM the zone will turn OFF. Overrides include DMX network controls and user-operated manual ON/OFF.
5	At 8:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. At 8:00 PM the zone will turn OFF. Overrides include user-operated manual ON/OFF and a user-operated 4-button scene switch.
6	At 8:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. At 8:00 PM the zone will turn OFF. Overrides include user-operated manual ON/OFF and a user-operated dimming switch.
7	At 7:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. At 10:00 PM the zone will turn OFF. Overrides include a 4-button scene switch, a dimming switch, and user-operated manual ON/OFF.
8	At 7:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the vacancy sensor detects no movement. At 10:00 PM the zone will turn OFF. Overrides include a 4-button scene switch, a dimming switch, and user-operated manual ON/OFF.
9	At 7:00 AM the timeclock of the facility management system will switch the designated zone ON (if exterior photocell conditions are met); for the duration, the lights may turn OFF if the vacancy sensor detects no movement. At 10:00 PM the zone will turn OFF. Overrides include a dimming switch and a user-operated manual ON/OFF.
10	Upon entrance to the space, the occupancy sensor will turn the zone ON. The lights may turn OFF if the occupancy sensor detects no movement, turning back ON upon detection. Lights will DIM according to daylight sensors. Overrides include a user-operated manual ON/OFF and user-operated dimming.
11	At 5:00 PM the timeclock of the facility management system will switch the designated zones ON (if exterior photocell conditions are met); at 7:00 AM, the system will switch them OFF (again, if photocell conditions are met). Override is a manual ON/OFF switch.

PANELBOARD EH1 SCHEDULE

RATED FOR 100 A (REFERENCED FROM RISER DIAGRAM)

LOAD SERVED		LOAD (AMPS)			BKR TRIP	CKT NO.	PHASE A B C	CKT NO.	BKR TRIP	LOAD (AMPS)			LOAD SERVED
		A	B	C						A	B	C	
	LTG 143D	8.5			20/1P	1	A	2	20/1P				LTG EXTERIOR
	LTG 143D		8.0		20/1P	3	B	4	20/1P				SPARE
	LTG 142,3,154-6			9.0	20/1P	5	C	6	20/1P				SPARE
	LTG 1202, 1211-3, L1-C-01, 9	12.2			20/1P	7	A	8	20/1P				SPARE
	LTG 1211, 2, 4, 6, 8, 20, L1-C-02		8.2		20/1P	9	B	10	20/1P				SPARE
	LTG 2302, L2-C-02, 3			8.6	20/1P	11	C	12	20/1P				SPARE
	LTG 2308-10, L2-C-05-09	6.3			20/1P	13	A	14	20/1P				SPARE
	LTG ST-G		1.2		20/1P	15	B	16	20/1P				SPARE
	LTG 2309			4.2	20/1P	17	C	18	20/1P				SPARE
	LTG 2314, 2317	6.3			20/1P	19	A	20	20/1P				SPARE
LTG 2316, L2-C-13, 12, 3, 6, 7, 8, 4			10.3		20/1P	21	B	22	20/1P				SPARE
	LTG ST-H			1.9	20/1P	23	C	24	20/1P				SPARE
	LTG 2319, ST-J	3.1			20/1P	25	A	26	20/1P				SPARE
	LTG ST-L, K		3.2		20/1P	27	B	28	20/1P				SPARE
	LTG 3001			3.8	20/1P	29	C	30	20/1P				SPARE
	LTG 3001	11.1			20/1P	31	A	32	20/1P				SPARE
	LTG 2318B		9.9		20/1P	33	B	34	20/1P				SPARE
	LTG ATTIC			6.0	20/1P	35	C	36	20/1P			4.0	GAS SHUT-OFF
	SPARE				20/1P	37	A	38	20/1P	26			PANEL EP1 VIA XFMR
	SPARE				20/1P	39	B	40	20/1P		14.2		
	SPARE				20/1P	41	C	42	20/1P			11.8	
TOTAL		47.5	40.8	33.5						26	14.2	15.8	TOTAL
TOTAL CONNECTED AMPS A: 73.5 B: 55.0 C: 49.3													

RATED FOR 100 A (REFERENCED FROM RISER DIAGRAM)

TOTAL CONNECTED AMPS A: 68.2 B: 55.3 C: 54.3



UPC Code : 078477239261

Country Of Origin : United States

Available Colors :



1223-SW

20 Amp, 120/277 Volt, Toggle 3-Way AC Quiet Switch, Heavy Duty Spec Grade, Grounding, Back & Side Wired - WHITE

Leviton's Industrial Grade AC toggle switches for extra heavy-duty applications represent top-of-the-line quality and peak performance. Leviton uses the finest materials available and the highest production standards to produce industrial switches of unmatched versatility and reliability.

Technical Information

AC Horsepower Ratings

HP Rating : 1HP-120V 2HP-240V-277V

Electrical Specifications

Amperage : 20 A

Dielectric Voltage : Withstands 1500V for 1 minute

Grounding : Self-Grounding

Max. Amperage : 16 Amp

Temperature Rise : Maximum 30 degrees C rise

Voltage : 120/277 VAC

Environmental Specifications

Flammability : Rated V-2 per UL 94

Operating Temperature : -40°C to 65°C

Material Specifications

Actuator Material : Thermoplastic

Base Material : PBT

Body Material : Thermoplastic

Color : White

Contacts : Silver-Cadmium .031 Thick

Cover Material : Nylon

Strap Material : Steel

Terminal Screws : Steel 8-32

Toggle : Polycarbonate

Mechanical Specifications

Product ID : Stamped on Strap

Terminal Accom. : 14-#10 AWG back wired; #14-#12 AWG side wired

Terminal ID : Brass-Hot, Green-Ground, Silver-Neutral

Termination : Back or Side Wire

Torque Range : 12-14 inch pounds

Product Features

Actuator Material : Thermoplastic

Color : White

Device Type : Toggle Switch

Function : 3-Way

Grade : Heavy-Duty Industrial Specification Grade

Voltage : 120/277 VAC

Warranty : 10-Year Limited

Standards and Certifications

ANSI : C-73

CSA C22.2 No. 111 : File #152105

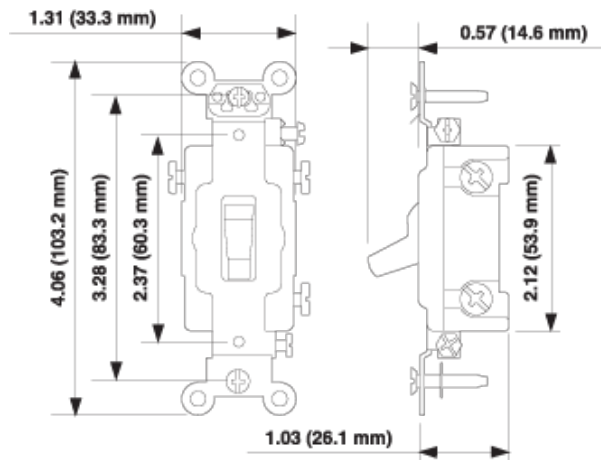
NEMA : WD-1 & WD-6

NOM : 057

UL Fed Spec WS896F : File #E7458

UL Standard : UL 20

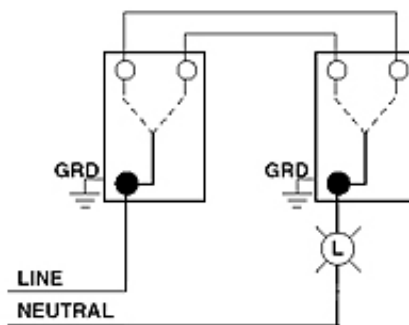
Warranty : 10-Year Limited



3-WAY

Wiring Diagram

3-Way to 3-Way



SPECIFICATION SUBMITTAL

JOB NAME:	CATALOG NUMBERS:	
JOB NUMBER:		

Leviton Manufacturing Co., Inc.

201 North Service Road, Melville, NY 11747

Telephone: +1-800-323-8920 · FAX: +1-800-832-9538 · Tech Line (8:30AM-7:30PM E.S.T. Monday-Friday): +1-800-824-3005

Leviton Manufacturing of Canada, Ltd.

165 Hymus Boulevard, Pointe Claire, Quebec H9R 1E9 · Telephone: +1-800-469-7890 ·

FAX: +1-800-824-3005 · www.leviton.com/canada

Leviton S. de R.L. de C.V.

Lago Tana 43, Mexico DF, Mexico CP 11290 · Tel.: (+52)55-5082-1040 · FAX: (+52)5386-1797 · www.leviton.com.mx

Visit our Website at: www.leviton.com

© 2018 Leviton Manufacturing Co., Inc. All Rights Reserved. Subject to change without notice.

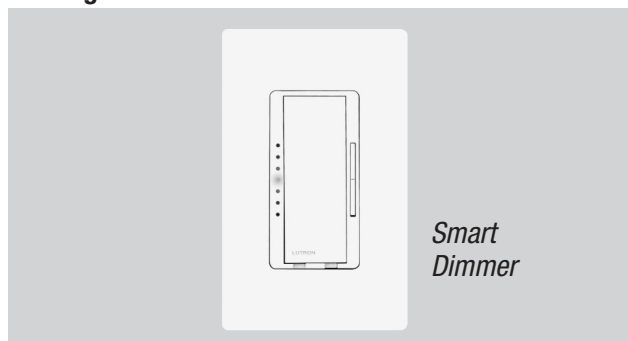
Leviton has a global presence.

If you would like to know where your local Leviton office is located please go to:

www.leviton.com/international/contacts/



The High-Tech Multi-Location Dimmer



PRODUCT FAMILY FEATURES

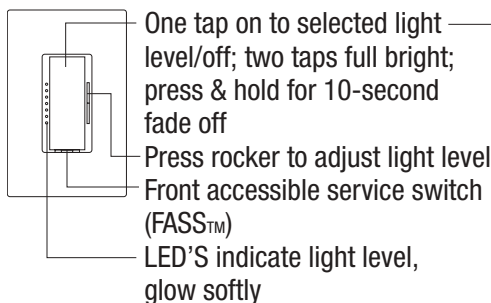
- High-tech "Smart Dimmer" with microprocessor technology for a standard designer wallplate opening
- Features a clean, flush, stylish appearance
- Special Features! Two taps on the switch brings lights on to full brightness; press and hold the switch to slowly fade lights to off over 10 seconds
- LED's indicate light level and glow softly as a locator light in the dark
- Multi-location dimming from up to 10 locations
- Uses standard single-pole and 3-way wiring for easy installation in any home
- Raise from off

SPECIFICATION FEATURES

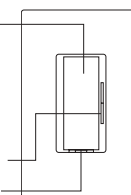
- Power- failure memory
- Frequency compensation
- Includes Radio Frequency Interference suppression
- Front accessible service switch (FASS™) to disconnect load power
- Electrostatic discharge tested
- Precise color matching across all controls

MAESTRO CONTROLS

Smart Dimmers



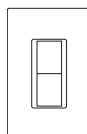
Smart Remotes



Note: For multi-location dimming only-use one Smart Dimmer (left) with up to nine Smart Remotes

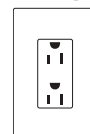
CLARO ACCESSORIES

Rocker Switch

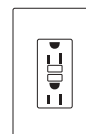


Switch

Receptacles

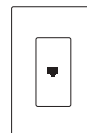


15A
Receptacle

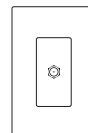


15A GFCI
Receptacle

Jacks

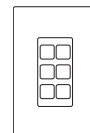


Single
Telephone
Jack



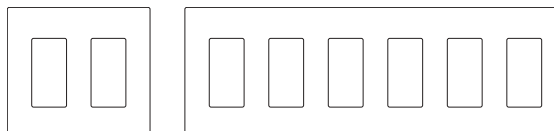
Cable
TV
Jack

Ports



6-Port
Frame

Custom Multigang Wallplates



2-gang to 6-gang wallplates

STANDARDS



JOB NAME	AREA CONTROLLED
LOCATION	JOB NUMBER
TITLE	PAGE NO.

Description	Model #
-------------	---------

SMART DIMMERS

Incandescent

Preset Smart Dimmers

Single Pole/Multi-Location	600W	MA-600-□
Single Pole/Multi-Location	1000W	MA-1000-□

Products above: For multi-location dimming, use one Maestro Smart Dimmer with up to nine Maestro Smart Remotes, MA-R-. Not for use with mechanical 3-way or 4-way switches. Minimum load on dimmer is 40W. Derating required if ganged, see page 5.

Electronic Low Voltage

Preset Smart Dimmers

Single Pole/Multi-location	600W	MAELV-600-□
----------------------------	------	-------------

Products above: For multi-location dimming, use one Maestro Smart Dimmer with up to nine Maestro Smart Remotes, MA-R-. Requires neutral wire connection. Not for use with mechanical 3-way or 4-way switches. Minimum load on dimmer is 5W. Derating required if ganged, see page 5.

Magnetic Low Voltage

Preset Smart Dimmers

Single Pole/Multi-Location	600VA (450W ¹)	MALV-600-□
Single Pole/Multi-Location	1000VA (800W ¹)	MALV-1000-□

Products Above: For Multi-location dimming, use one Maestro Smart Dimmer with up to nine Maestro Smart Remotes, MA-R-. Not for use with mechanical 3-way or 4-way switches. Minimum load on dimmer is 40W. Derating required if ganged, see page 5.

Fluorescent

For control of fluorescent loads, use Lutron Hi-lume®, Eco 10™ line voltage, or Tu-Wire® electronic dimming ballasts with MA-600- and Hi-Power 2•4•6 dimming module. For a coordinated look, consider using Spacer System dimmers for controlling fluorescent loads.

HI-POWER 2•4•6™ DIMMING MODULES

To increase load capacity up to 30,000W/VA in most popular sources, use one MA-600- and add up to five dimming modules.

SMART REMOTES

Provide Multi-Location Dimming from up to Nine Additional Locations.

Smart Remotes

Smart Remotes	MA-R-□
---------------	--------

For multi-location dimming, use up to nine Smart Remotes with only one of the following Maestro multi-location dimmers: MA-600-, MA-1000-, MAELV-600-, MALV-600-, or MALV-1000-. No derating required if ganged. Maximum traveler wiring run for multi-location applications is 250' (76.2m).

1. Actual lamp wattages.

Description	Rating	Model #
-------------	--------	---------

SWITCHES

General Purpose Switching of all Lighting Sources and Motor Loads

Single Pole, 120/277V	15A	CA-1PSH- ☐
3-way, 120/277V	15A	CA-3PSH- ☐
4-way, 120/277V	15A	CA-4PSH- ☐

Products above: No derating required if ganged.

ACCESSORIES

Receptacles

Receptacle	15A, 125V	CAR-15H- ☐
GFCI Receptacle	15A, 125V	CAR-15-GFCIH- ☐

Products above: No derating required if ganged.

Single Jacks

A physical barrier (partition) must exist when gangling with line-voltage products

Single Telephone Jack	6-conductor, RJ11	CA-PJH- ☐
-----------------------	-------------------	----------------------------------

Note: Also accepts most 4-conductor plugs

Single Cable Jack ¹	F-style 75-Ohm, coaxial cable	CA-CJH- ☐
--------------------------------	-------------------------------	----------------------------------

No derating required if ganged.

Field Customizable Multi-Port Frame

6-Port Frame	Shipped with 6 blanks <i>Shown with blanks</i>	CA-6PF- ☐
--------------	---	----------------------------------

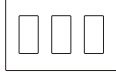
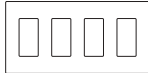
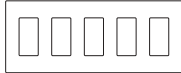
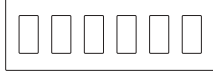
Product above: For use with Lutron connectors shown below. Also compatible with Hubble Xcelerator™ and snap-fit connectors.

Connectors

For use with 6-port frame (CA-6PF-). Each connector fills one port.

	Phone Jack	6-conductor, RJ11, Category 3	CON-1P-C3-WH
	Phone Jack	8-conductor, RJ45, Category 5e	CON-1P-C5E-WH
	Phone Jack	8-conductor, RJ45, Category 6	CON-1P-C6-WH
	Fiber Jack	MT-RJ Feed-Through	CON-1F-MTRJ-WH
	Fiber Jack	SC Simplex	CON-1F-SC-WH
	Fiber Jack	LC Non-Flush Mount	CON-1F-LC-WH
	Fiber Jack	ST Style	CON-1F-ST-WH
	Cable Jack	F-Style, 75-Ohm Coaxial cable	CON-1C-WH
	BNC Jack	BNC connector	CON-1B-WH

Connectors available in white (WH) only. For information about additional colors contact Lutron Customer Service.

	Description	Model #
	STANDARD WALLPLATES	
	<i>1-Gang</i> W: 2.94" (75mm) x H: 4.69" (119mm) x D: 0.30" (7.6mm)	CW-1- 
	<i>2-Gang</i> W: 4.75" (121mm) x H: 4.69" (119mm) x D: 0.30" (7.6mm)	CW-2- 
	<i>3-Gang</i> W: 6.56" (167mm) x H: 4.69" (119mm) x D: 0.30" (7.6mm)	CW-3- 
	<i>4-Gang</i> W: 8.37" (213mm) x H: 4.69" (119mm) x D: 0.30" (7.6mm)	CW-4- 
	<i>5-Gang</i> W: 10.18" (259mm) x H: 4.69" (119mm) x D: 0.30" (7.6mm)	CW-5- 
	<i>6-Gang</i> W: 12.00" (305mm) x H: 4.69" (119mm) x D: 0.30" (7.6mm)	CW-6- 

STANDARD COLORS/FINISHES

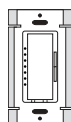
Gloss Finishes (Ships in 48 hours)

Add color/finish suffix to model number to order.

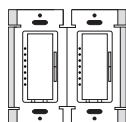
Example: MA-600P-**WH**

WH	White
IV	Ivory
AL	Almond
LA	Light Almond
GR	Gray
BR	Brown
BL	Black

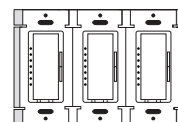
DERATING/MAXIMUM CAPACITY



No side sections removed
(Full Capacity)



One side section removed
(End Units)



Two side sections removed
(End Units)

Incandescent Dimmers ¹

600W
1000W

500W
800W

400W
650W

Electronic Low Voltage ²

600W

500W

400W

Magnetic Low Voltage ¹

600VA
(450W ²)

500VA
(400W ³)

400VA
(300W ²)

1000VA
(800W ²)

800VA
(650W ³)

650VA
(500W ²)

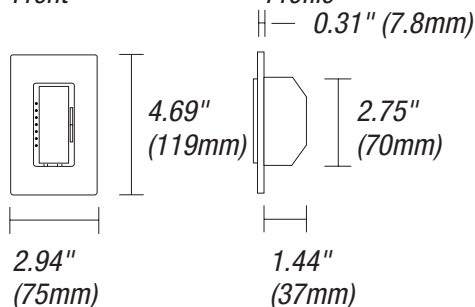
DIMENSIONS

Including Claro® wallplates – Wallplates sold separately.

Dimmer

Front

Profile



¹ Requires 40W minimum load.

² Requires 5W minimum load.

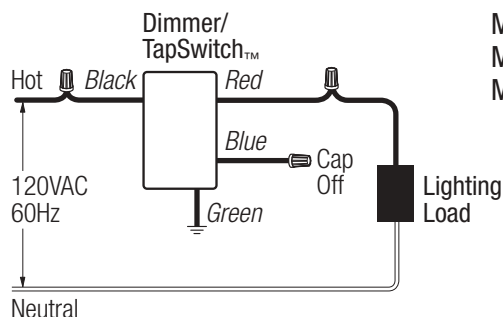
³ Actual lamp wattage.

WIRING DIAGRAMS

Wiring Diagram 1 Single-Location Wiring

Model

MA-600-
MA-1000-
MALV-600-
MALV-1000-



Ground



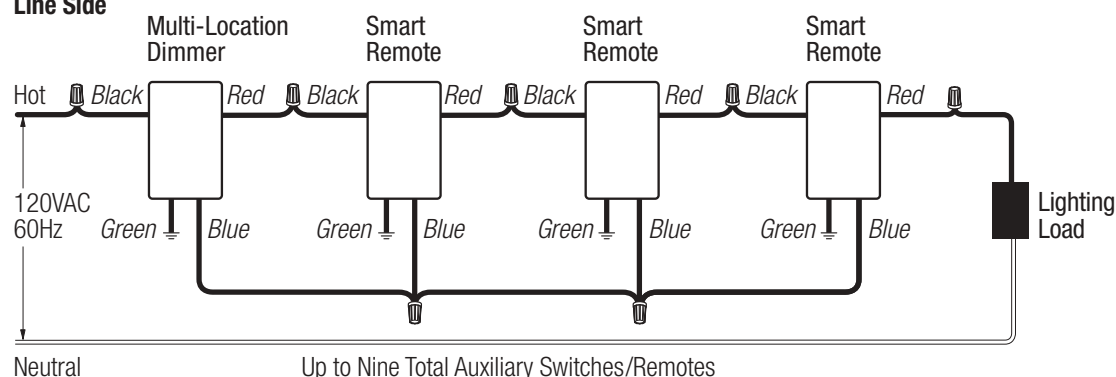
Wire Connectors

Wiring Diagram 2 Multi-Location Wiring

Model

MA-R-
MA-600-
MA-1000-
MALV-600-
MALV-1000-

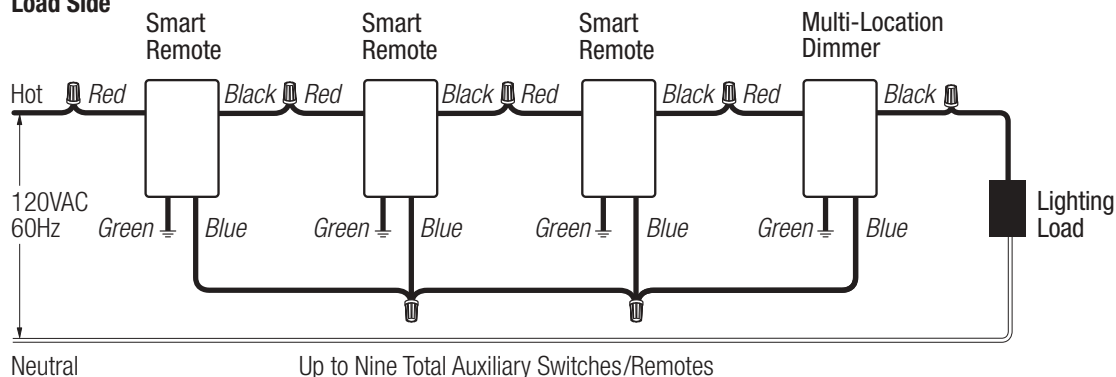
Control Line Side



Up to Nine Total Auxiliary Switches/Remotes

OR

Control Load Side



Up to Nine Total Auxiliary Switches/Remotes



Ground

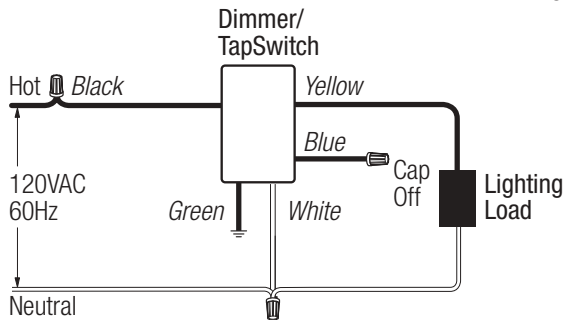


Wire Connectors

WIRING DIAGRAMS

Wiring Diagram 4
Multi-Location Control with Neutral
Used for Single-Location Wiring

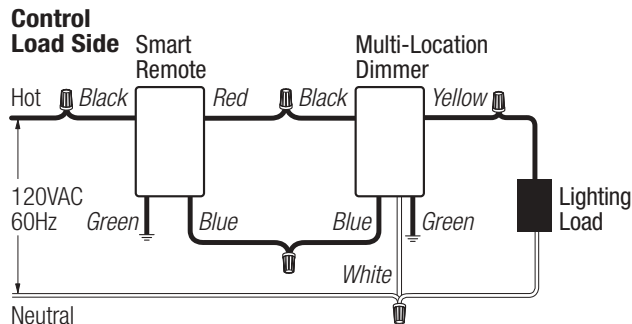
Model #
MAELV-600-



Wire Connectors

Wiring Diagram 5
Multi-Location Wiring

Model #
MAELV-600-
MA-R-

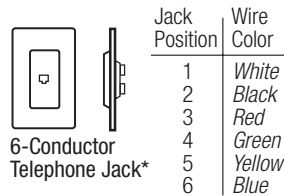


Wire Connectors

Up to Nine Total MA-R Units

Wiring Diagram 6
Telephone Jack Wiring

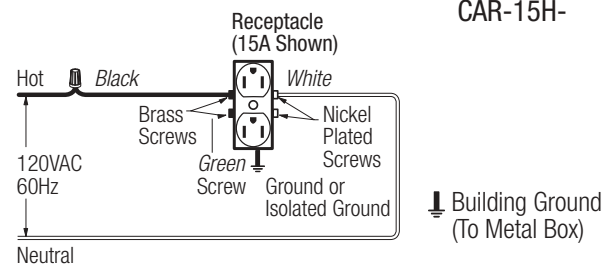
Model #
CA-PJH-



*accepts most 4-conductor jacks

Wiring Diagram 7
Receptacle Wiring

Model #
CAR-15H-

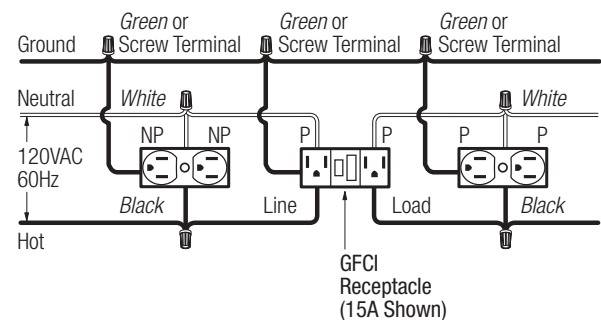


Wire Connectors

Building Ground
(To Metal Box)

Wiring Diagram 8
GFCI Receptacle Wiring

Model #
CAR-15-GFCIH-



P-Protected
NP-Not Protected

Wire Connectors

MAESTRO CONTROLS AND ACCESSORIES

PART 1 – GENERAL

1.01 SUMMARY

- A. Scope: Provide, install and test all switches, dimmers and related devices as specified herein for the areas indicated on the drawings, specifications, and load schedules.
- B. Related Sections: Section 16580 (Ballasts), Section 16570 (Dimming Systems).

1.02 REFERENCES

- A. UL 1472, CSA, NOM, ISO 9001

1.03 SYSTEM DESCRIPTION AND OPERATION

- A. Permanently installed, wallbox mounted switches and dimmers
- B. Permanently installed, wallbox mounted receptacles
- C. Permanently installed, wallbox mounted data, voice and cable jacks
- D. Screwless, seamless wallplates

1.04 SUBMITTALS

- A. Submit manufacturer's standard catalog data giving all application, wiring, and installation information on basic components and wallplate kits.
- B. Provide test data and/or samples as required to demonstrate conformance with PART 2 of this specification.

1.05 QUALITY ASSURANCE

- A. Manufacturer shall have a minimum of 10 years continuous experience in manufacturing wallbox dimming products.
- B. Dimmers shall be UL listed, CSA and NOM approved specifically for each required load (i.e., tungsten, electronic low voltage transformer, and magnetic low voltage transformer). Manufacturer shall provide file card or certificate upon request. Universal load-type dimmers shall not be acceptable.
- C. Manufacturer shall maintain ISO 9001 certification and provide a copy of the certificate upon request.

1.06 WARRANTY

- A. All devices shall be covered by a minimum one-year warranty.

PART 2 – EQUIPMENT

2.01 ACCEPTABLE MANUFACTURERS

- A. Lutron Electronics Co., Inc.
- B. Unless otherwise noted, all basic components (dimmer, switch, receptacle, telephone jack and cable jack) and wallplate kits shall be provided by one manufacturer.

2.02 EQUIPMENT

A. Controls Lutron Maestro Style

1. Performance

- a. Dimmers shall provide full-range, smooth and continuously variable control of light intensity.
- b. All dimmers shall be designed to minimize effects of changing line frequency.
- c. An actuator, accessible from the front of the unit, with the wallplate attached, shall activate a mechanical air-gap switch disconnecting power from the load during "safety off" condition; no leakage current shall be present at the fixture(s). This front accessible safety switch (FASS™) shall be separate from the tapswitch and raise/lower rocker.
- d. Dimmer shall be capable of on/off, raise/lower and mechanical air-gap "safety off" from up to 9 additional locations using aesthetically coordinated remotes.
- e. Controls shall meet ANSI/IEEE Std. C62.41-1980, tested to withstand voltage surges of up to 4000V and current surges of up to 200A without damage.
- f. Controls shall not be susceptible to damage or loss of memory due to static discharge.
- g. Controls shall be capable of operating at the rated capacity; this includes modified capacities for ganging configurations which require the removal of fins. Operation at rated capacity shall be possible across the full ambient temperature range, without shortening design lifetime.
- h. Controls shall operate in an ambient temperature range of 0°C (32°F) to 40°C (104°F).
- i. Controls shall incorporate power-failure memory. Should power be interrupted and subsequently returned, the lights will come back on to the same levels set prior to the power interruption. Restoration to some other default level is not acceptable.
- j. Dimmers shall be designed to reduce interference with radio, audio, and video equipment.
- k. To ensure a precise color match between all plastic parts, color variation of any gloss part shall not exceed a just noticeable level, delta E of 1, as defined in ASTM E 308-99.
- l. Visible parts of dimmers, switches, standard receptacles, cable jacks or any wallplate shall exhibit ultraviolet stability when tested as defined in ASTM D4674-89.
- m. All actuators shall be captured internally to the control.

- n. Remotes shall wire using conventional 3-way and 4-way wire runs.
 - o. Multi-location dimmers without neutral shall be capable of operating in either 3-way switch location.
 - p. Wall controls shall fit a decorator wallplate opening with a flush tapswitch. Dimmers and remotes shall have a small, raised rocker to the right of the tapswitch. Dimmers shall have seven discrete LEDs to the left of the tapswitch. Tapswitches shall remain flush in both the on and off state. Wall controls shall have a gloss finish.
 - q. A single tap of the tapswitch shall raise lights from off to the preset light level, or fade light to off. The raise/fade rate shall travel the dimming range in 3 seconds. A rapid double tap of the tapswitch shall raise lights to full-on in 1.5 seconds. Pressing and holding the tapswitch shall activate a delay fade-to-off function. Lights shall fade to off over 10 seconds.
 - r. The LEDs on the left side of the tapswitch shall indicate light level when the dimmer is on. When the dimmer is off, the LEDs shall glow softly as a night light with the preset level slightly brighter than any of the other LEDs.
 - s. The rocker on dimmers and remotes shall raise and lower the light level; this new light level becomes the preset. The rocker shall be able to raise the lights from off to low end and up, and shall lower the lights to low-end, not to off.
2. Incandescent Dimmers
 - a. Provide incandescent dimmers for direct control of up to 1000 watts.
 - b. Dimmers shall have a high-end of no less than 90% of line voltage.
 3. Electronic (Solid-State) Low Voltage (ELV) Transformer Dimmers
 - a. Provide ELV dimmers for direct control of up to 600 watts of electronic low voltage load.
 - b. Dimmers shall contain circuitry specifically designed to control the input of electronic (solid state) low voltage transformers. Dimmers using standard phase control shall not be acceptable.
 - c. Dimmers shall have a resettable overload protection that automatically shuts off when dimmer capacity is exceeded. Protection methods that are non-resettable or require the device to be removed from the wall to reset shall not be acceptable.
 - d. Dimmers shall be designed to withstand a short, per UL 1472 section 5.10, between load hot and either neutral or ground without damage to the dimmer.
 - e. Dimmers shall have a high-end of no less than 90% of line voltage.
 4. Magnetic Low Voltage (MLV) Transformer Dimmers
 - a. Provide MLV dimmers for direct control of up to 1000VA of magnetic low voltage load.
 - b. Dimmers shall contain circuitry specifically designed to control and provide a symmetrical AC waveform to the input of magnetic low voltage transformers per UL1472 section 5.11.
 - c. Dimmers shall not cause a magnetic low voltage transformer to operate above the transformers rated operating current or temperature.
 - d. Dimmers shall have a high-end of no less than 90% of line voltage.
 5. Remote dimming modules for high power loads
 - a. Where lighting loads exceed the full rated capacity of single dimmers, provide a Maestro incandescent dimmer driving high power modules. High power module and dimmer shall be from the same manufacturer to ensure compatibility.
 - b. High power modules shall be remotely mounted.
 - c. High power module shall be rated and UL listed for control of incandescent, electronic low voltage, magnetic low voltage, neon/cold cathode, and fluorescent loads in increments of 2,000 Watts up to 30,000 Watts.
 6. Remotes for multi-location control
 - a. Remotes shall provide multi-location control and mechanical air-gap switch. All tapswitch and rocker functions shall operate from each remote. Up to 9 remotes may be used with a Maestro dimmer.
 - b. Remotes shall not have any LEDs.
- B. Accessories Lutron Claro Style
 1. Switch Components Lutron Claro Style
 - a. Switches shall provide on/off control of any 120/277 VAC load up to 15A. Switches shall be UL Listed as general-use AC switches, Lutron Claro style.
 - b. Switches shall be available in single-pole, 3-way and 4-way configurations.
 2. Receptacle Components Lutron Claro Style
 - a. All receptacles shall be UL Listed, CSA and NOM approved.

- b. Receptacles shall be two pole, three wire ground and rated for 15A at 125VAC. All receptacles shall be NEMA configuration type 5-15R.
 - c. Ground-fault interrupter receptacles shall be Lutron Claro style with two-pole, three-wire ground and rated 15A at 125VAC Configuration shall be of the duplex type with rectangular NEMA WD-6 design. Receptacles shall have a 5 milliampere ground-fault trip level with "test" and "reset" buttons.
3. Telephone, Cable, Fiber and BNC Jacks Lutron Claro Style
- a. Contractor shall provide an appropriate barrier (partition) to isolate jacks from high-voltage wiring when ganged together. This complies with NEC Articles 800-3 and 820-13.
 - b. Telephone jack shall be designed to mate with standard 4- or 6-conductor modular jacks, and be compatible with 2, 4, or 6 conductor lines. Telephone jacks shall meet FCC Part 68, paragraph F standards to ensure compatibility with U.S. telephone systems.
 - c. Cable jacks shall be the coaxial type, designed for use with standard 75-Ohm cables.
 - d. Fiber jacks shall meet EIA/TIA-568-B.3 specifications for optical, mechanical and environmental performance.
 - e. BNC connectors shall be F/F couplers.
- C. Wallplates Lutron Claro Style
- 1. Wallplates shall be manufactured from durable polycarbonate plastic with gloss finish, and shall attach to the basic components without using exposed hardware or screws.
 - 2. Multigang wallplates shall provide a continuous, seamless cover for up to six-ganged decorator-style control and accessory combinations with no exposed hardware or screws.
 - 3. Multigang wallplates shall include an adapter plate for proper device alignment and wallplate attachment.
 - 4. Control, accessory and wallplate profiles shall not exceed .30 inches from wall surface to faceplate front surface.
 - 5. To ensure a precise color match between all plastic parts, color variation of any gloss part shall not exceed a just noticeable level, delta E of 1, as defined in ASTM E 308-99.
 - 6. Visible parts of dimmers, switches, standard receptacles, cable jacks or any wallplate shall exhibit ultraviolet stability when tested as defined in ASTM D4674-89.

2.03 SOURCE QUALITY CONTROL

- A. All dimming controls shall be 100% function tested at the time of manufacture. Statistical sampling plan shall not be acceptable.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Contractor shall furnish all devices (dimmers, accessories, & wallplate kits), labor and other services necessary for the proper installation of the devices as indicated on the drawings and specified herein.
- B. Contractor shall be responsible for derating dimmer capacity if side sections are removed.
- C. Contractor shall run separate neutral wires in 120/208 VAC installations.
- D. Contractors shall install all backboxes with a minimum wallbox depth of 2.5 inches.
- E. Devices shall be installed utilizing manufacturer's recommended application, wiring and installation instructions.
- F. Contractor to provide seamless wallplate covers per specification 2.02 for all devices ganged in a common box. Contractor shall provide barriers within the box where required by code.

3.02 FIELD QUALITY CONTROL

- A. Twenty-four hours a day, seven days a week, global customer service and technical hotline available.
- B. Supplemental information shall be provided by manufacturer's Internet site.

Lutron Electronics Co., Inc.
7200 Suter Road • Coopersburg, PA 18036 U.S.A.
Made and printed in U.S.A. 2/03

©2003

HomeWorks® QS Wired seeTouch® Architectural Keypads

HomeWorks® QS seeTouch® keypads provide homeowners with a simple and elegant way to operate lights, shades/draperies, motorized screens, thermostats, and many other devices.

HomeWorks® QS seeTouch® keypads feature large, easy-to-use buttons, plus a unique backlit engraving option that makes the keypads readable any time of the day or night. seeTouch® buttons are rounded, allowing engraving to be displayed at an upward angle, increasing readability.

Replacement Kits are available in a variety of colors and with custom engraving to clearly identify each button's function. The flexible design of the keypads allows the color, number of buttons, and button configuration to be changed by installing a new engraved Replacement Kit.

All HomeWorks® QS wired seeTouch® models have two contact closure inputs on the back of the unit which provide independent functions from the front buttons. Other options include configurations with infrared receiver and raise/lower buttons.

Use Lutron® Nova T★® wallplates. Wallplates are included with the keypad. Lutron® Nova T★® wallplates snap on with no visible means of attachment.



HomeWorks® QS wired seeTouch® architectural keypads are available in many button configurations, shown on the following two pages. They are also available in insert (*above left*) and non-insert (*above right*) styles. The insert style allows decorator-style controls to be easily ganged using Lutron® Nova T★® wallplates.

HomeWorks® QS Wired seeTouch® Architectural Keypads

Non-Insert Style Architectural Keypads

Model Numbers

HQWA-W1BN-XX*	1 Button Keypad
RKA-W1BN-XX*-E	Engraved Replacement Kit
HQWA-W2BSN-XX*	2 Button Keypad
RKA-W2BSN-XX*-E	Engraved Replacement Kit
HQWA-W3BSN-XX*	3 Button Keypad
RKA-W3BSN-XX*-E	Engraved Replacement Kit
HQWA-W3BSRLN-XX*	3 Button with Raise/Lower Keypad
RKA-W3BSRLN-XX*-E	Engraved Replacement Kit
HQWA-W3SN-XX*	3 Scene with Raise/Lower Keypad
RKA-W3SN-XX*-E	Engraved Replacement Kit
HQWA-W4BSN-XX*	4 Button Keypad
RKA-W4BSN-XX*-E	Engraved Replacement Kit
HQWA-W4SN-XX*	4 Scene with Raise/Lower Keypad
RKA-W4SN-XX*-E	Engraved Replacement Kit
HQWA-W5BN-XX*	5 Button Keypad
RKA-W5BN-XX*-E	Engraved Replacement Kit
HQWA-W5BRLN-XX*	5 Button with Raise/Lower Keypad
RKA-W5BRLN-XX*-E	Engraved Replacement Kit
HQWA-W5BIRN-XX*	5 Button with Raise/Lower Keypad and Infrared Receiver
RKA-W5BIRNXX*-E	Engraved Replacement Kit
HQWA-W6BN-XX*	6 Button Keypad
RKA-W6BN-XX*-E	Engraved Replacement Kit
HQWA-W6BRLN-XX*	6 Button with Raise/Lower Keypad
RKA-W6BRLN-XX*-E	Engraved Replacement Kit
HQWA-W7BN-XX*	7 Button Keypad
RKA-W7BN-XX*-E	Engraved Replacement Kit
HQWA-W1RLDN-XX*-E	Engraved Replacement Kit
RKA-W1RLDN-XX*	Dual Group with Raise/Lower Keypad
HQWA-W2RLDN-XX*	Dual Group with Dual Raise/Lower Keypad
RKA-W2RLDN-XX*-E	Engraved Replacement Kit
HQWA-W3BDN-XX*	Dual Group Keypad
RKA-W3BDN-XX*-E	Engraved Replacement Kit



HQWA-W1BN



HQWA-W2BSN



HQWA-W3BSN



HQWA-W3BSRLN



HQWA-W3SN



HQWA-W4BSN



HQWA-W4SN



HQWA-W5BN



HQWA-W5BRLN



HQWA-W5BIRN



HQWA-W6BN



HQWA-W6BRLN



HQWA-W7BN



HQWA-W1RLDN



HQWA-W2RLDN



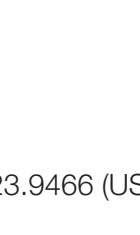
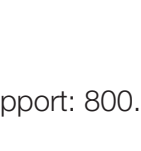
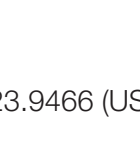
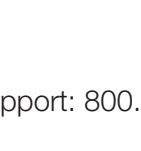
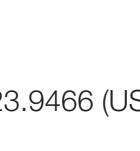
HQWA-W3BDN

*"XX" in the model number represents color/finish code. See **Colors and Finishes** at end of document.

HomeWorks® QS Wired seeTouch® Architectural Keypads

Insert Style Architectural Keypads

Model Numbers

HQWA-W1BI-XX*	1 Button Keypad				
RKA-W1BI-XX*-E	Engraved Replacement Kit				
HQWA-W2BSI-XX*	2 Button Keypad				
RKA-W2BSI-XX*-E	Engraved Replacement Kit				
HQWA-W3BSI-XX*	3 Button Keypad				
RKA-W3BSI-XX*-E	Engraved Replacement Kit				
HQWA-W3BSRLI-XX*	3 Button with Raise/Lower Keypad				
RKA-W3BSRLI-XX*-E	Engraved Replacement Kit				
HQWA-W3SI-XX*	3 Scene with Raise/Lower Keypad				
RKA-W3SI-XX*-E	Engraved Replacement Kit				
HQWA-W4BSI-XX*	4 Button Keypad				
RKA-W4BSI-XX*-E	Engraved Replacement Kit				
HQWA-W4SI-XX*	4 Scene with Raise/Lower Keypad				
RKA-W4SI-XX*-E	Engraved Replacement Kit				
HQWA-W5BI-XX*	5 Button Keypad				
RKA-W5BI-XX*-E	Engraved Replacement Kit				
HQWA-W5BRLI-XX*	5 Button with Raise/Lower Keypad				
RKA-W5BRLI-XX*-E	Engraved Replacement Kit				
HQWA-W5BIRI-XX*	5 Button with Raise/Lower Keypad and Infrared Receiver				
RKA-W5BIRI-XX*-E	Engraved Replacement Kit				
HQWA-W6BI-XX*	6 Button Keypad				
RKA-W6BI-XX*-E	Engraved Replacement Kit				
HQWA-W6BRLI-XX*	6 Button with Raise/Lower Keypad				
RKA-W6BRLI-XX*-E	Engraved Replacement Kit				
HQWA-W7BI-XX*	7 Button Keypad				
RKA-W7BI-XX*-E	Engraved Replacement Kit				
HQWA-W1RLDI-XX*-E	Engraved Replacement Kit				
RKA-W1RLDI-XX*	Dual Group with Raise/Lower Keypad				
HQWA-W2RLDI-XX*	Dual Group with Dual Raise/Lower Keypad				
RKA-W2RLDI-XX*-E	Engraved Replacement Kit				
HQWA-W3BDI-XX*	Dual Group Keypad				
RKA-W3BDI-XX*-E	Engraved Replacement Kit				

*"XX" in the model number represents color/finish code. See **Colors and Finishes** at end of document.

HomeWorks® QS Wired seeTouch® Architectural Keypads

Specifications

Model Numbers	See pages 2 and 3 for complete lists of model numbers.
Power	24–36 V $\overline{=}$ 30 mA SELV/PELV/NEC® Class 2
Typical Power Consumption	0.6 W; 1 Power Draw Unit (PDU) Test conditions: all backlights on medium intensity, two LEDs on (two presets active), keypad powered at 24 V $\overline{=}$
Regulatory Approvals	UL, cUL, NOM
Environment	Ambient operating temperature: 32 °F to 104 °F (0 °C to 40 °C), 0% to 90% humidity, non-condensing. Indoor use only.
Communications	Connects to QS wired device link on Homeworks® QS processor.
ESD Protection	Tested to withstand electrostatic discharge without damage or memory loss, in accordance with IEC 61000-4-2.
Surge Protection	Tested to withstand surge voltages without damage or loss of operation, in accordance with IEEE C62.41-1991 Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
Power Failure	Power failure memory: should power be interrupted, the keypad will return to its previous state when power is restored.
Mounting	U.S. wallbox 3 1/2 in (89 mm) deep, 2 1/4 in (57 mm) deep minimum, or low-voltage mounting bracket
Wiring	Control wire must be 1 pair 18 AWG (1.0 mm ²) SELV/PELV/NEC® Class 2 for power and 1 pair 22 to 18 AWG (0.5 to 1.0 mm ²) SELV/PELV/NEC® Class 2 twisted/shielded for data (see Wiring).
Warranty	www.lutron.com/TechnicalDocumentLibrary/Warranty.pdf

Design Features

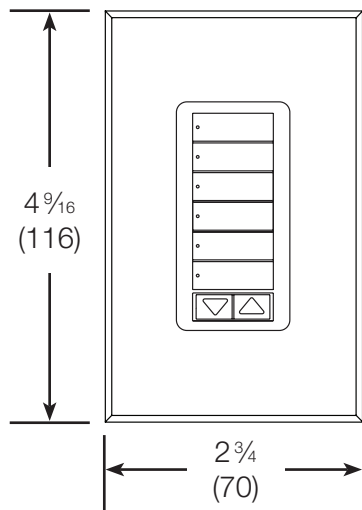
- Green status LEDs.
- Backlit button/engraving.
- Field-changeable Replacement Kits make for easy customization.
- All terminal block inputs are over-voltage and miswire-protected against wire reversals and shorts.
- Use Lutron® Nova T★® wallplates. Wallplates are included with the keypad.
- Lutron® Nova T★® wallplates snap on with no visible means of attachment.
- Use Replacement Kits to change color, button configuration, or engraving.

HomeWorks® QS Wired seeTouch® Architectural Keypads

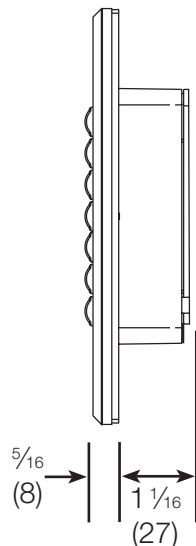
Dimensions

All dimensions are shown as $\frac{\text{in}}{(\text{mm})}$

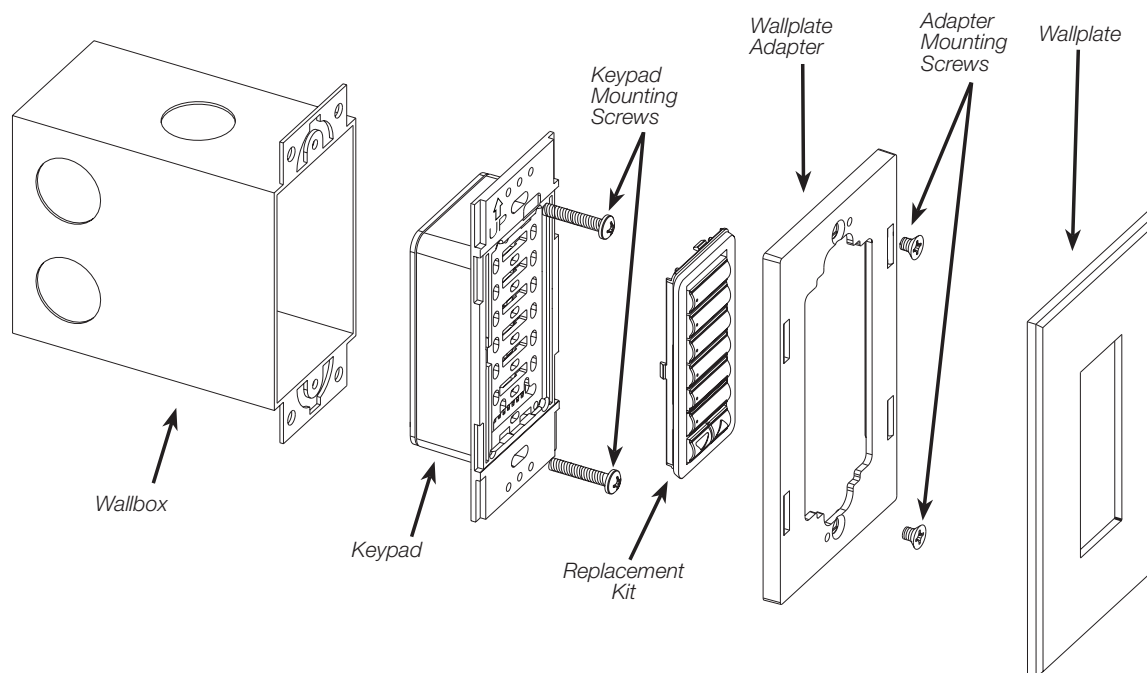
Front View



Side View

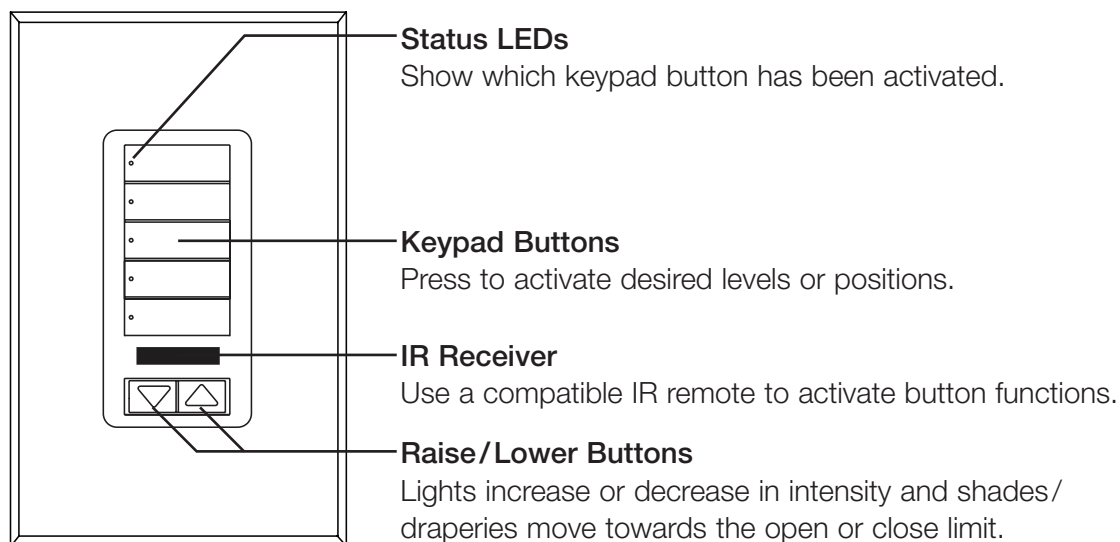


Mounting and Parts Identification



HomeWorks® QS Wired seeTouch® Architectural Keypads

Operation



HomeWorks[®] QS Wired seeTouch[®] Architectural Keypads

Wiring

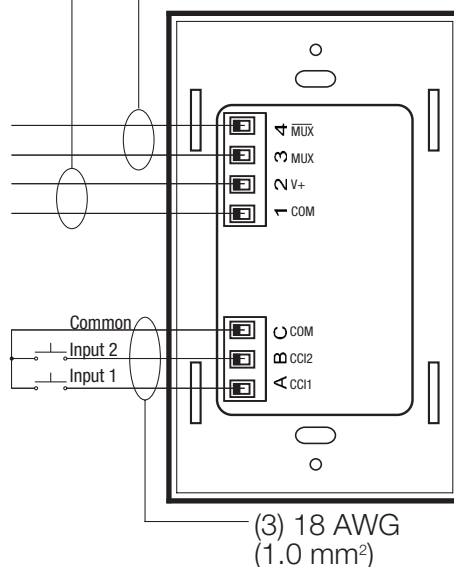
Wiring Notes

- Keypad wiring may be in a daisy-chain, star or T-tap configuration.
- The total length of wire on a QS wired link is not to exceed 2000 ft (610 m).
- Up to 100 devices can be connected to the QS wired link. This can include seeTouch[®] keypads along with other devices as defined in the HomeWorks[®] QS software.
- An external power supply may be required depending on the total current draw of all wired devices on the processor link.

SELV/PELV/NEC[®] Class 2 control wiring:

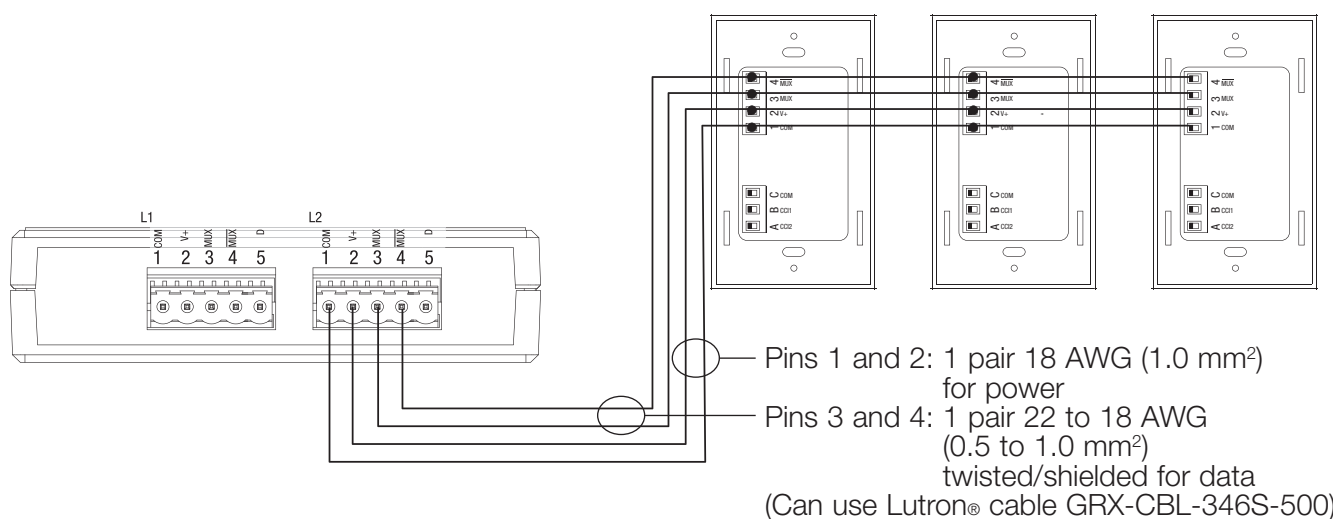
18 AWG (1.0 mm²)

Data link: twisted, shielded pair 22 to 18 AWG
(0.5 to 1.0 mm²)



Contact Closure Input

- Inputs must be dry contact closure, solid-state, open collector, or active-low (NPN) / active-high (PNP) output.
 - Open collector NPN or active-low on-state voltage must be less than 2 V_{DC} and sink 3.0 mA
 - Open collector PNP or active-high on-state voltage must be greater than 12 V_{DC} and source 3.0 mA
- Keypad is miswire protected up to 36 V_{DC}.
- Outputs must stay in the closed or open states for at least 40 msec in order to be recognized by the keypad.



HomeWorks® QS Wired seeTouch® Architectural Keypads

Colors and Finishes

Architectural Matte Finishes



White
WH



Ivory
IV



Almond
AL



Light
Almond
LA



Gray
GR



Brown
BR



Black
BL



Taupe
TP



Sienna
SI



Beige
BE

Architectural Metal Finishes (wallplates only)



Satin Brass
SB



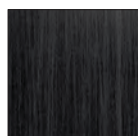
Bright Brass
BB



Bright Chrome
BC



Clear Anodized
Aluminum
CLA



Black Anodized
Aluminum
BLA



Brass Anodized
Aluminum
BRA



Antique Brass
QB



Antique Bronze
QZ



Satin Chrome
SC



Satin Nickel
SN



Bright Nickel
BN



Gold
AU

When ordering metal wallplates, it is recommended to order the keypad in Black (BL).

- Due to printing limitations, colors and finishes shown cannot be guaranteed to perfectly match actual product colors.
- Color chip keychains are available for more precise color matching:
Architectural Matte Finishes: AM-CK-1;
Architectural Metal Finishes: AMTL-CK-1

WIRELESS RGBW MULTI-ZONE LED WALL CONTROLLER

MODEL: AL-CTLR-RGBW-3ZRF-WMT



Description

This permanently mounted in-wall controller allows you to control your RGBW LED fixtures, providing full color and brightness control. Simply connect this unit to its receiver (or control box), your RGBW LED fixtures and a power supply, mount your wall plate, and start controlling your fixture. Choose any color output using the touch wheel and easily turn your dedicated white chips on and off.

This RGBW LED controller is compatible with all of aspectLEDs RGBW LED fixtures. Please note, this remote controller requires a Wireless RGBW 4 Channel LED Controller (AL-CTLR-RGBW-4CP) base unit. This in-wall controller communicates with its receiver wirelessly, but must be hardwired with low voltage wire to your power supply. To pair this controller with its base unit, turn the in-wall unit on, then the desired zone number on the remote (1-3). Press the learning key on the base unit, then touch the color wheel. Your lights should blink, and your controller should be paired.



Learn more

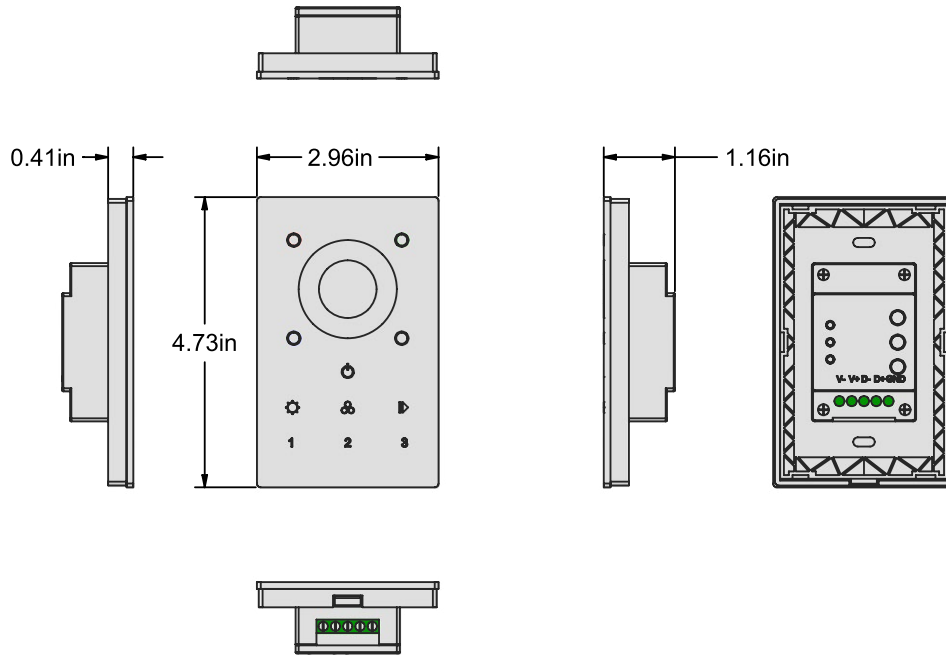
[Specifications >](#)

[Dimensions >](#)

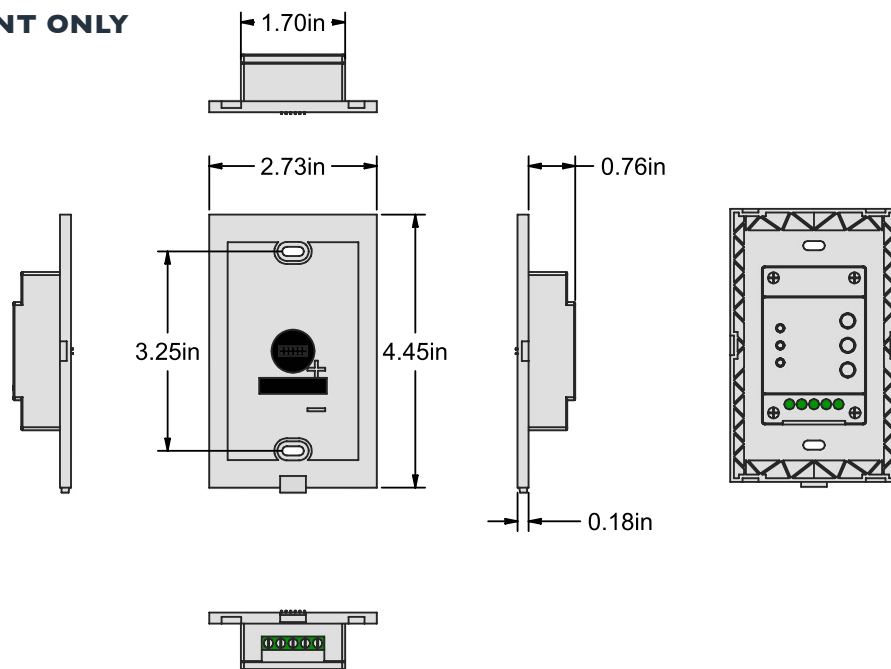
AL-CTLR-RGBW-3ZRF-WMT	
In-Wall Remote Dimensions	4.73" (120.1mm) long 2.96" (75.2mm) wide 1.16" (29.5mm) thick
RF Receiver/Control Box	Wireless RGBW 4 Channel LED Controller with Channel Pairing
Input Voltage	12VDC or 24VDC
Power Source	12VDC or 24VDC power supply
Output Signal	Wireless (RF) Remote Control, DMX
Compatible Power Supplies	Non-dimmable power supplies
Weight	0.9 lbs
Warranty	1 Year

Dimensions

FACEPLATE & BOX MOUNT



BOX MOUNT ONLY



Infrared Ceiling Mount Sensor

The LOS-CIR Series passive infrared ceiling-mount sensors can integrate into Lutron® systems or function as stand-alone controls using a Lutron® power pack. The sensor uses a small semiconductor heat detector that resides behind a multi-zone optical lens. The detector is sensitive to the heat emitted by the human body. In order to trigger the sensor, the source of heat must move from one range of detection to another. Non-moving hot objects will not cause the lights to turn on.

Features

- Intelligent, continually adapting Passive Infrared (PIR) sensor
- Passive Infrared (PIR) sensing
- Reliable motion detection with high error immunity
- Snap-locks to ceiling-mounted cover plate
- Non-Volatile Memory: settings saved in protected memory are not lost during power outages
- 450 ft² to 1500 ft² (42 m² to 140 m²) coverage when mounted on an 8 ft to 12 ft (2.4 m to 3.7 m) ceiling
- Affords choice of turning lights off or dimming to a preset level in the unoccupied state when integrated with a Lutron® system.



Models Available

Model	Color	Coverage	Field of View
LOS-CIR-450-WH	White	450 ft² (42 m²)	360°
LOS-CIR-1500-WH	White	1500 ft² (140 m²)	360°

Self-Adaptive Feature

The LOS-CIR Series sensors provide reliable detection with high error immunity. The internal microprocessor analyzes the information from the PIR technology and determines the optimum setting to use in order to properly cover the space.

Specifications

Regulatory Approvals

- UL® and cUL® listed

Power

- Operating voltage: 20 – 24 V_{AC}, IEC PELV/NEC® Class 2
- Operating current: 33 mA nominal
- Control output: 20 – 24 V_{AC} active high logic control signal with short-circuit protection, open collector when unoccupied

Environment

- Temperature: 32 °F to 104 °F (0 °C to 40 °C)
- Relative humidity: less than 95%, non-condensing
- For indoor use only

Timer Adjustment

- Automatic mode: Continually adapting sensor automatically adjusts settings to the space
- Manual mode: 8 to 30 minutes
- Test mode: 8 seconds

LED Lamp

- Red: infrared motion detected

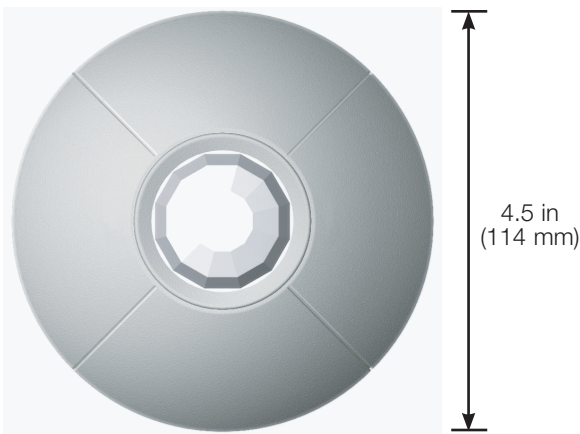
Housing

- Rugged, high-impact, injection-molded plastic
- Color-coded leads 6 in (15 cm)

Adaptive Functions

- Installation: 60 minutes
- Learning: 4 weeks for response to error conditions, air current adaptation, and timer optimization
- Post-learning occupancy periods
 - 24 hour circadian occupancy periods learned
 - Weekly occupancy periods learned
- Adjustments in post-learning period
 - Generally occupied periods (threshold = high-sensitivity mode)
 - Generally unoccupied periods (threshold = miser mode)

Dimensions



Front View



Side View

Job Name:	Model Numbers:	
Job Number:		

Wiring: System Control

Power packs may be required when interfaced to Lutron® lighting control systems. If more than 1 occupancy sensor is connected to the same input, a power pack is required. A maximum of 3 occupancy sensors can be connected to the same input. If more than 3 sensors are required per input, use one of the following models: LOS-CDT-500R-WH, LOS-CDT-1000R-WH, or LOS-CDT-2000R-WH.

Power Supply Options

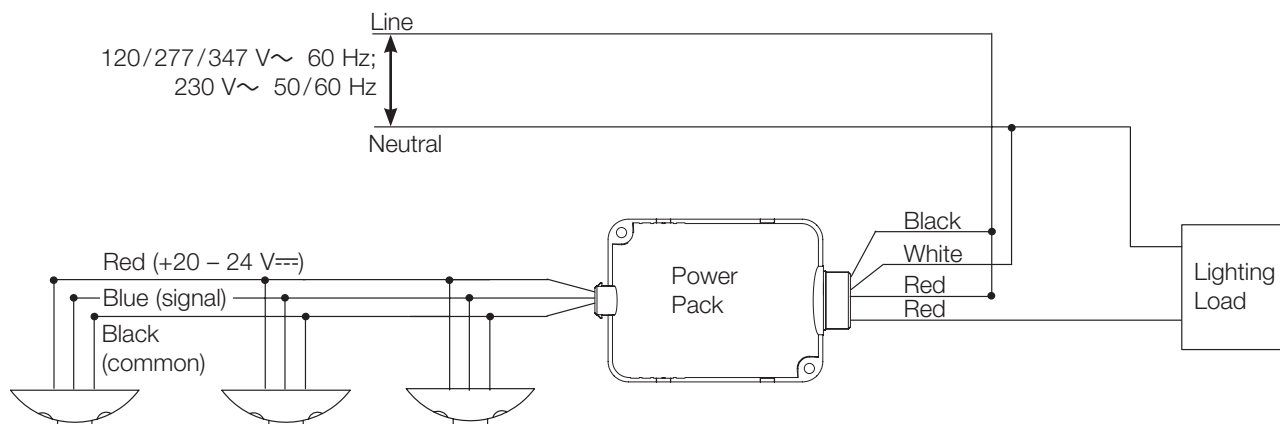
Lutron® Lighting Control System	Power Pack Required?
Digital microWATT™	No
EcoSystem®	No
Energi Savr Node™	No*
GRAFIK 5000™/6000®/7000™	No, when used with seeTouch® wallstations with occupancy sensor connections.
GRAFIK Eye® 3000/4000	Yes
GRAFIK Eye® QS	No*
HomeWorks®	Yes
HomeWorks® QS	No*
LCP128™	No, when used with seeTouch® wallstations with occupancy sensor connections.
microWATT®	No
Quantum®	No*
RadioRA®	Yes
RadioRA® 2	Yes
Softswitch128®	No, when used with seeTouch® wallstations with occupancy sensor connections.

* Some system components do not supply external power for occupancy sensors. Refer to individual product specifications for more information.

Job Name:	Model Numbers:	
Job Number:		

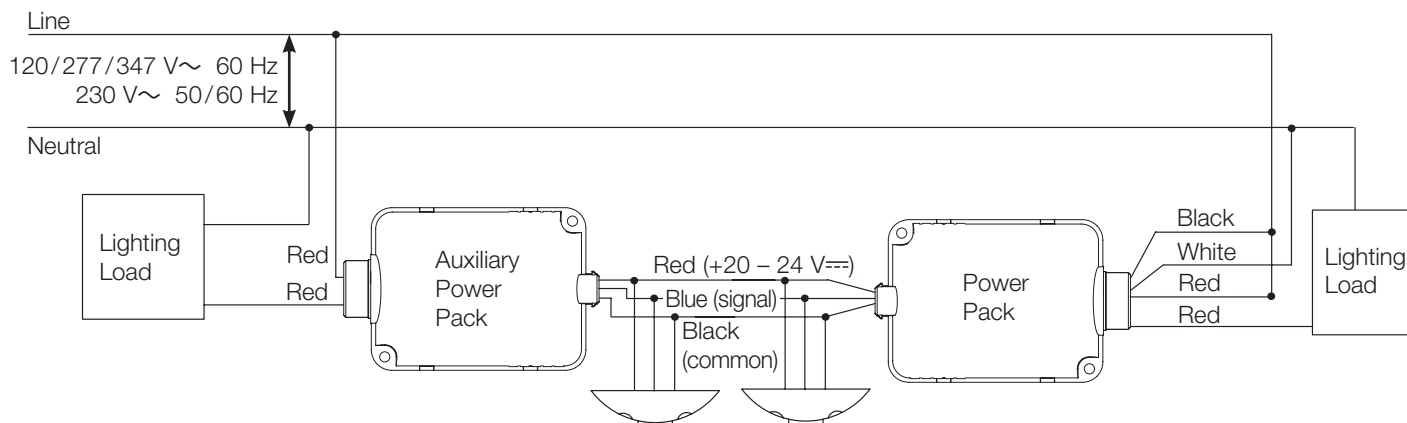
Wiring: Stand-Alone Control

1 to 3 Sensors with Power Pack



NOTE: Maximum 3 occupancy sensors.

Switching Multiple Loads with Auxiliary Power Packs



NOTE: Maximum of 3 devices total (occupancy sensors and auxiliary power packs) can be connected to a power pack.

Job Name:

Model Numbers:

Job Number:

Installation

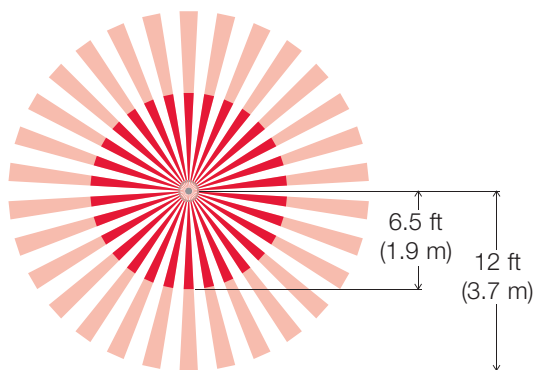
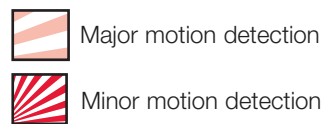
Sensor Setup

- Sensor setup is available as a service by Lutron. For more information see the **Sensor Layout and Tuning** service document (Lutron® P/N 3601235).

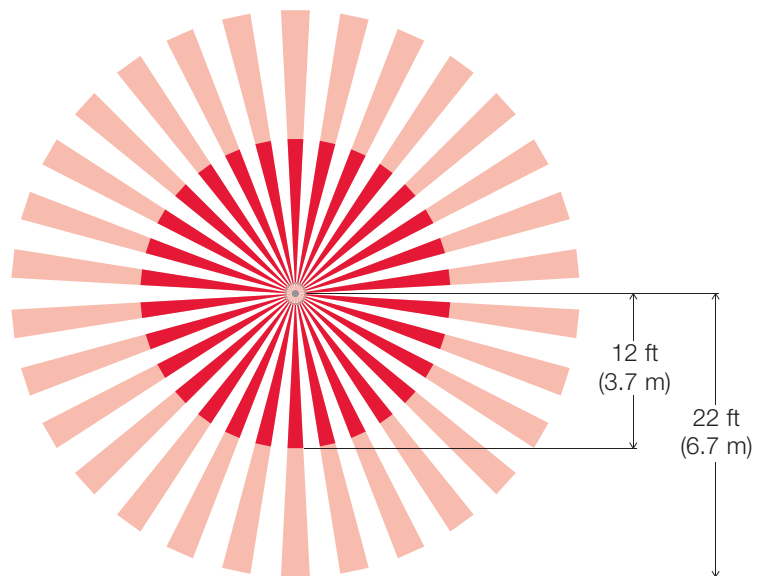
Sensor Placement

- The occupancy sensor must have an unobstructed view of the room. Do not mount behind or near tall cabinets, shelves, indirect hanging fixtures, etc.
- Do not place sensor within 4 ft (1.2 m) of air vents, air handlers, windows, fans, etc., as this may cause false triggering.
- Closely follow the diagrams shown concerning major and minor motion coverage. The sensor can detect major motion (e.g. person taking a half-step) at a greater distance than it can detect minor motion (e.g. writing at a desk or reading a book).
- May not detect occupancy with no significant difference between ambient and body temperatures.

Range Diagrams



LOS-CIR-450



LOS-CIR-1500

Job Name:

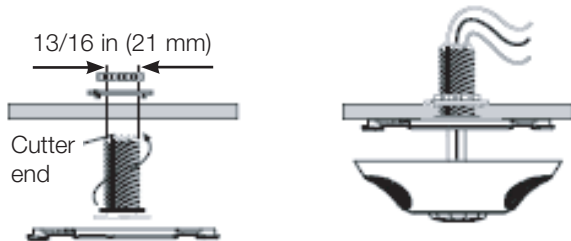
Model Numbers:

Job Number:

Mounting

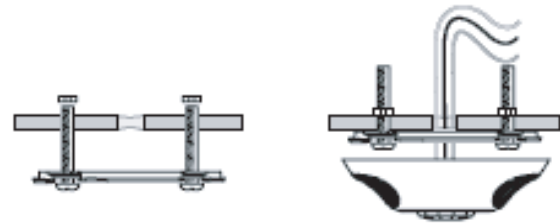
Normal Mounting

Twist and lock threaded mounting post onto cover plate. Drill through ceiling tile with assembly, using cutter end of the threaded mounting post. Secure with washer and nut.

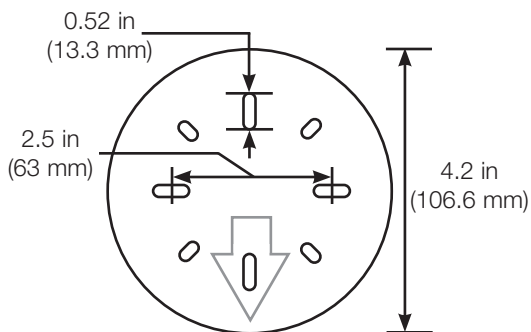


Mounting to Non-Standard Ceiling or Fixture

Mount twist-lock cover plate using mounting screws, nuts, and washers (included). Drill/punch wire routing hole through ceiling tile at center of cover plate.



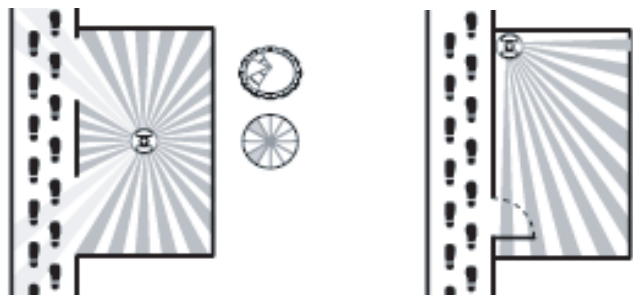
Mounting Plate Dimensions



Wire Lengths

Number of Sensors	1	2	3	1	2	1
Number of Auxiliary Power Packs	0	0	0	1	1	2
22 AWG	750 ft	375 ft	250 ft	375 ft	250 ft	250 ft
0.5 mm ²	365 m	180 m	120 m	90 m	120 m	120 m
20 AWG	1200 ft	600 ft	400 ft	600 ft	400 ft	400 ft
0.75 mm ²	730 m	365 m	240 m	365 m	240 m	365 m
18 AWG	2400 ft	1200 ft	800 ft	1200 ft	800 ft	800 ft

Using the Infrared Mask



Center Ceiling Mount
(Mask blocks sensor seeing out doorway into hall)

Corner Ceiling Mount
(No mask needed)

Typical Mask Patterns



Conference Room Mask



180° Mask



Full Mask



Rectangular Areas



Over the Door



Specific Areas You Wish to Mask

Job Name:

Model Numbers:

Job Number:

Sensor Adjustments

Override Settings

Auto/Manual

Threshold

LED Motion Indicator

Reset Learned Settings

OFF

ON

A

	Off (Default)	On
1	Automatic (Normal)	Manual on/off (Override)
2	Auto Threshold Adjustment	High Sensitivity (Low turn-on threshold)
3	Lights indicate motion	Disable LED Indicator
4	Retain Settings (Normal)	Erase all learned settings; Restart Learning (Toggle On)

Strong Airflow Compensation

Over Doorway Installation

Timer Adjust

Auto Sensitivity

OFF

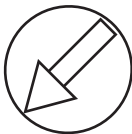
ON

B

	Off (Default)	On
1	Disable Compensation (Normal)	Enable Compensation
2	No (Normal)	Yes (Use increased turn-on threshold)
3	Adjust Timer Automatically	Use Manual Setting (No adjustment)
4	Adjust Sensitivity Automatically	Adjust Sensitivity Manually

Timer Test Mode

1. Remove the retainer cover.
2. Rotate the black timer adjustment knob to about midway (12 o'clock).
3. Return setting to minimum setting (full CCW).



Factory Settings



12 o'clock



Full CCW

NOTE: The timer will remain in the 8 second test mode for 1 hour, then automatically reset to 8 minutes.

4. To manually take the timer out of the 8 second test mode, turn the timer adjustment approximately 1/16 in (1.5 mm) clockwise to make the setting slightly above minimum (just above the 8 minute setting).

Factory Settings

Red:
Infrared
sensitivity
75% default

A

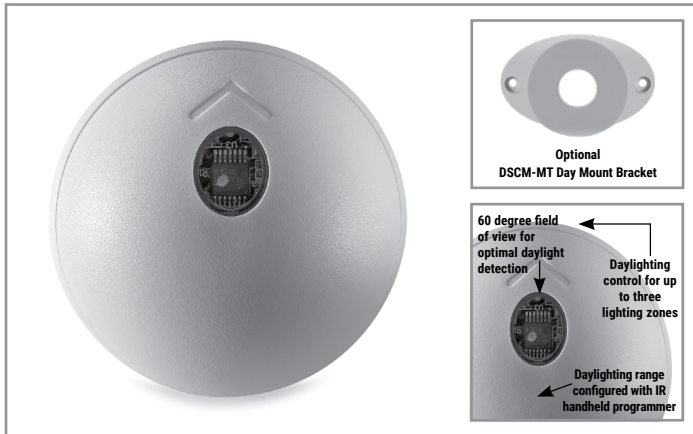
ON

B

ON

Black:
Timer
8 min

Project		Catalog #		Type	
Prepared by		Notes		Date	



Greengate

Open Loop

Daylight Sensor/IR Receiver

Interactive Menu

- Order Information page 2
- Additional Resources page 2
- Wiring Diagrams page 3
- Connected Systems page 5
- Product Warranty

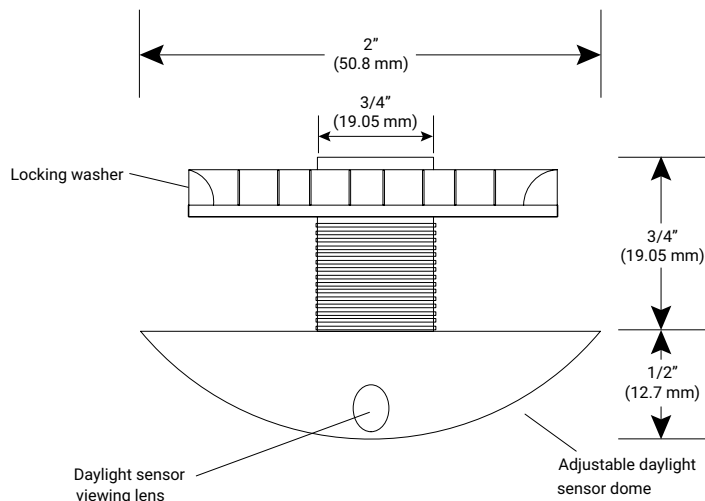
Product Certification



Top Product Features

- RJ45 connection
- Easily installed in suspended fixture or drop ceiling
- Three light sensor ranges (3-300 lux, 30-3000 lux, 300-30000 lux)
- Feedback LED
- Mounting bracket for installation in light well or hard ceiling

Dimensional and Mounting Details



additional product diagrams

Order Information

SAMPLE ORDER NUMBER: **DSRC-FMOIR, DSCM-MT**

Catalog Number	Description	Connection	Range
DSRC-FMOIR	Open Loop Daylight Sensor/IR Receiver (GGRC-COUPLER included)	RJ45	Low (3-300 lux) High (30-3000 lux) Direct Sun (300-30000 lux)
DSCM-MT	Daylight Sensor Mounting Bracket		

Optional Accessories

Room Controller	Description
HHPRG-RC	Handheld daylight zone remote programmer
HHPR-RC	Room Controller Personal Remote

DLVP	Description
LVHH-01	DLVP Programming Remote
LVHH-02	DLVP Personal Remote

Product Specifications

Electrical

- Class 2, LPS

Mechanical

Size: Sensor Head: 2" W x 1/2" H (50.8 mm x 12.7 mm)

Mounting Stem: 3/4" H x 3/4" W (19.05 mm x 19.05 mm)

Environment:

- **Operating temperature:** 32°F to 104°F (0°C to 40°C)
- **Relative humidity operating:** Less than 95%, non-condensing
- For indoor use only

Mounting: Height and position changes depending on application.

Voltage

Voltage:

- 24 VDC supplied controller

Connection:

- RJ45

Light Sensor Range

- Low: (3-300 lux)
- High: (30-3000 lux)
- Direct Sun: (300-30000 lux)

Status Indicator

- Multi-function Red and Green LEDs
- Selectable 5, 15, 30 minutes

Standards/Ratings

- cULus Listed - Energy Management Equipment (UL916)
- UL 508 Listed

Warranty

Five year warranty standard

Overview

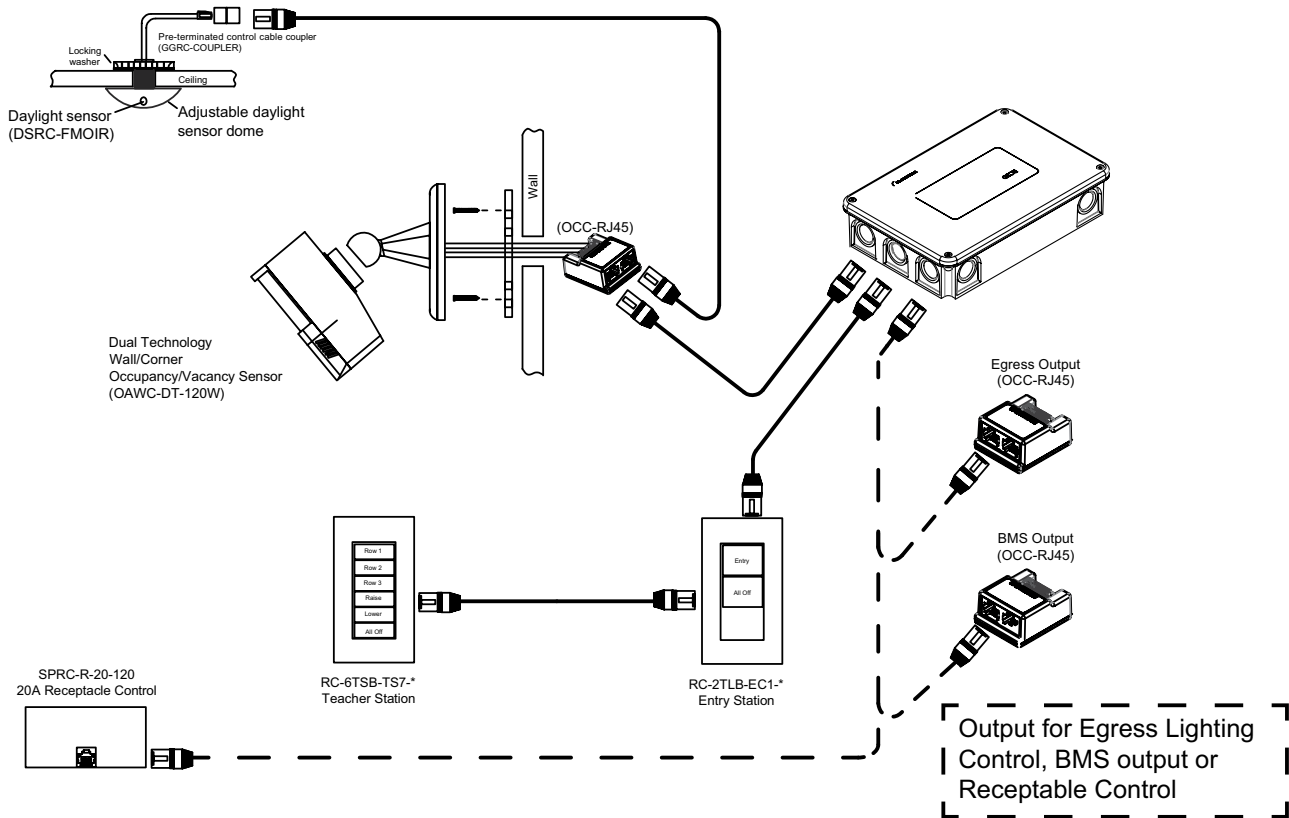
The DSRC-FMOIR is an open loop daylight sensor that measures the natural light contribution in order to automatically adjust lighting zones. It is part of the Room Controller and DLVP system and provides three easily distinguished light levels, Low (3-300 lux), High (30-3000 lux) and Direct Sun (300-30000 lux). The sensor range can be adjusted using the IR handheld programmer.

The DSRC-FMOIR is powered by the Room Controller or DLVP power module Class 2 power supply and is pre-configured to automatically adjust the dimming zones based on the natural light contribution. The DSCM-MT mounting bracket allows the daylight sensor to be mounted to a hard ceiling or a light well. The handheld remote programmer simplifies light sensor range setting by using simple language to describe the ranges (Low, High, Direct Sun) in addition to standard foot candle values. Individual zone control buttons allow the lighting levels and dimming curves to be adjusted in the Room Controller unit via the Daylight Sensor using the HHPRG-RC personal remote. Additional information on preset dimming curves and adjustments can be found in the installation instructions for Room Controller.

Low-voltage devices are connected using pre-terminated control cables (ordered separately).

Wiring Diagrams

Room Controller System Architecture Topology

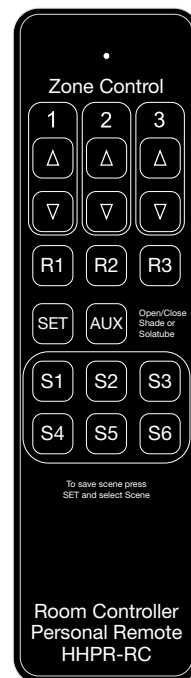


Handheld Remote Programmer HHPRG-RC

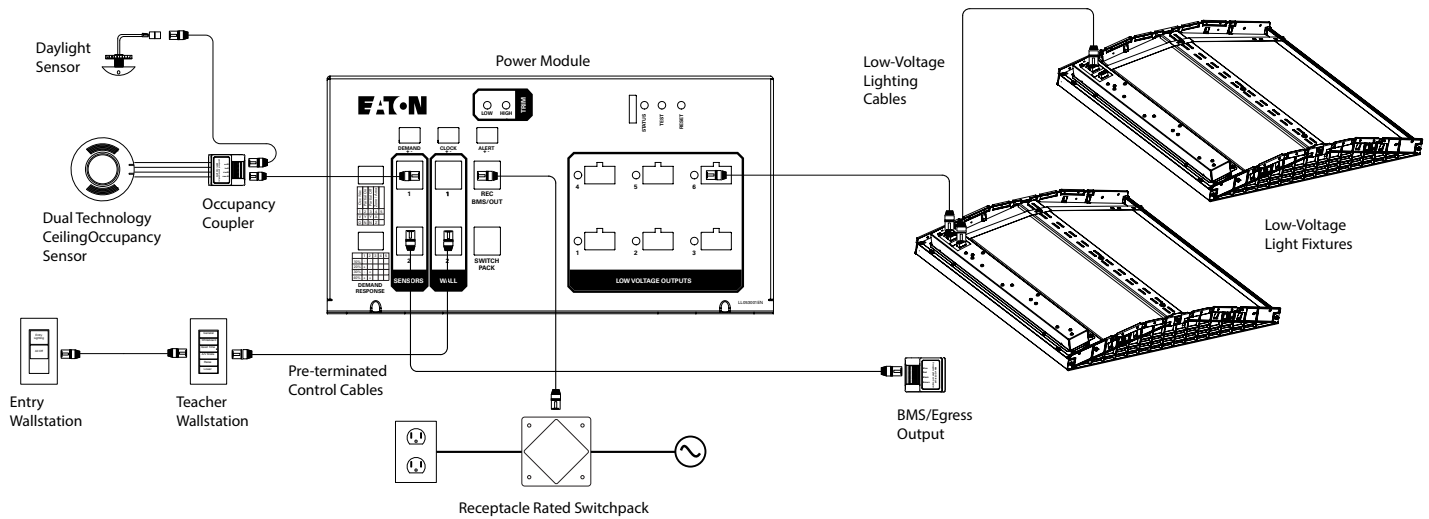
Daylight Settings



Personal Remote HHPR-RC



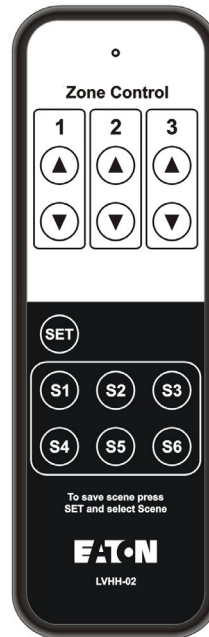
DLVP System Topology



Programming Remote (LVHH-01)

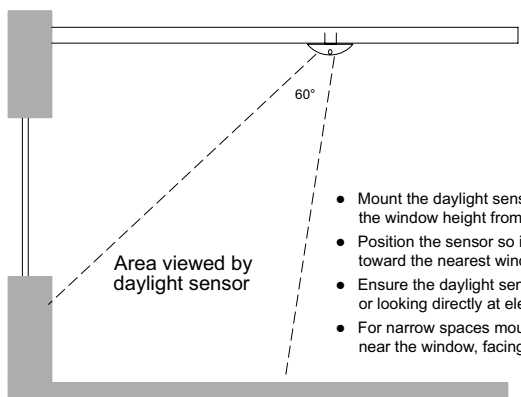


Personal Remote (LVHH-02)



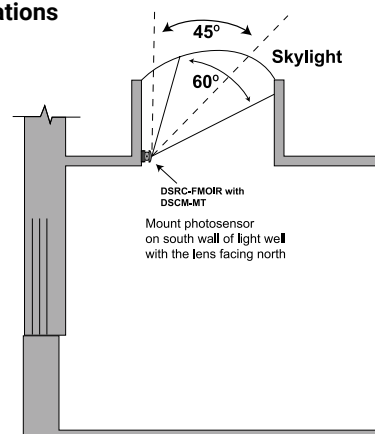
Application

Sidelight Applications



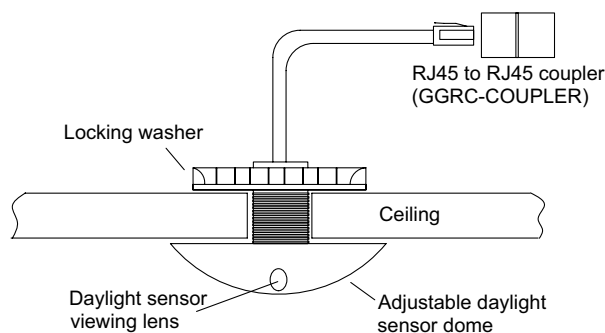
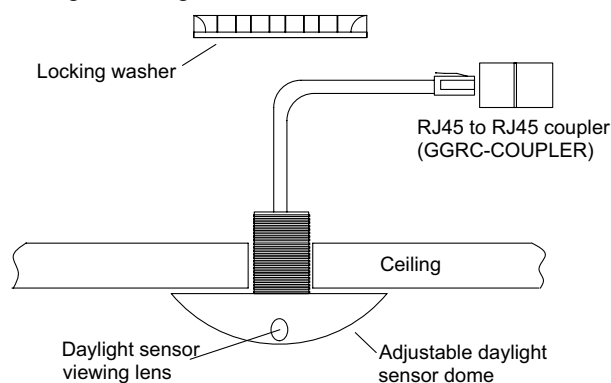
- Mount the daylight sensor one to two times the window height from the window wall.
- Position the sensor so its arrow is pointed toward the nearest window.
- Ensure the daylight sensor is not obstructed or looking directly at electric light.
- For narrow spaces mount the daylight sensor near the window, facing into the space.

Skylight Applications

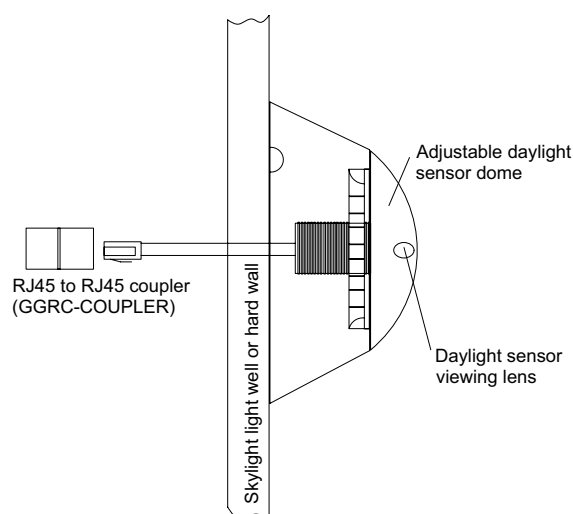
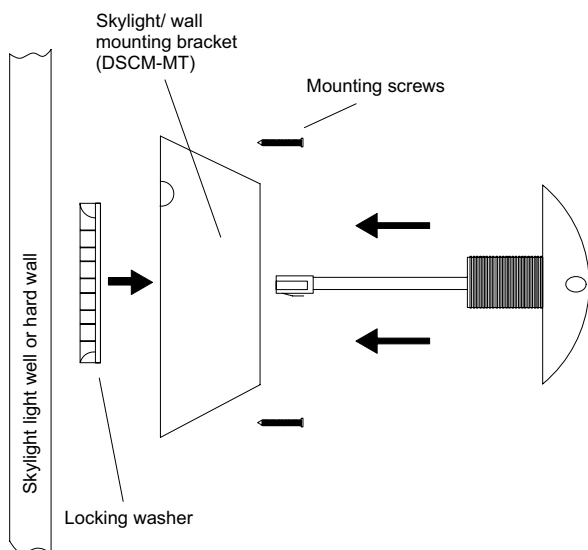


Mounting

Ceiling Mounting



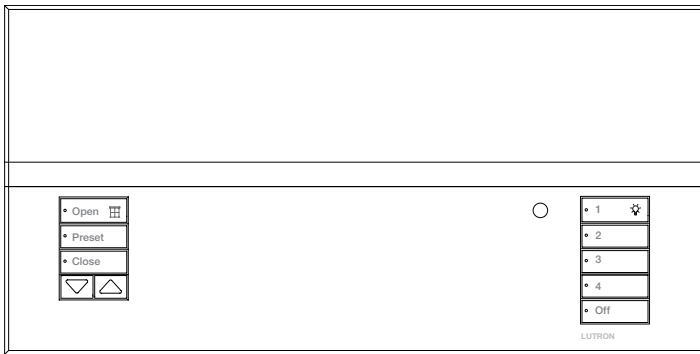
Light Well Mounting with DSCM-MT



Control Systems

- Greengate

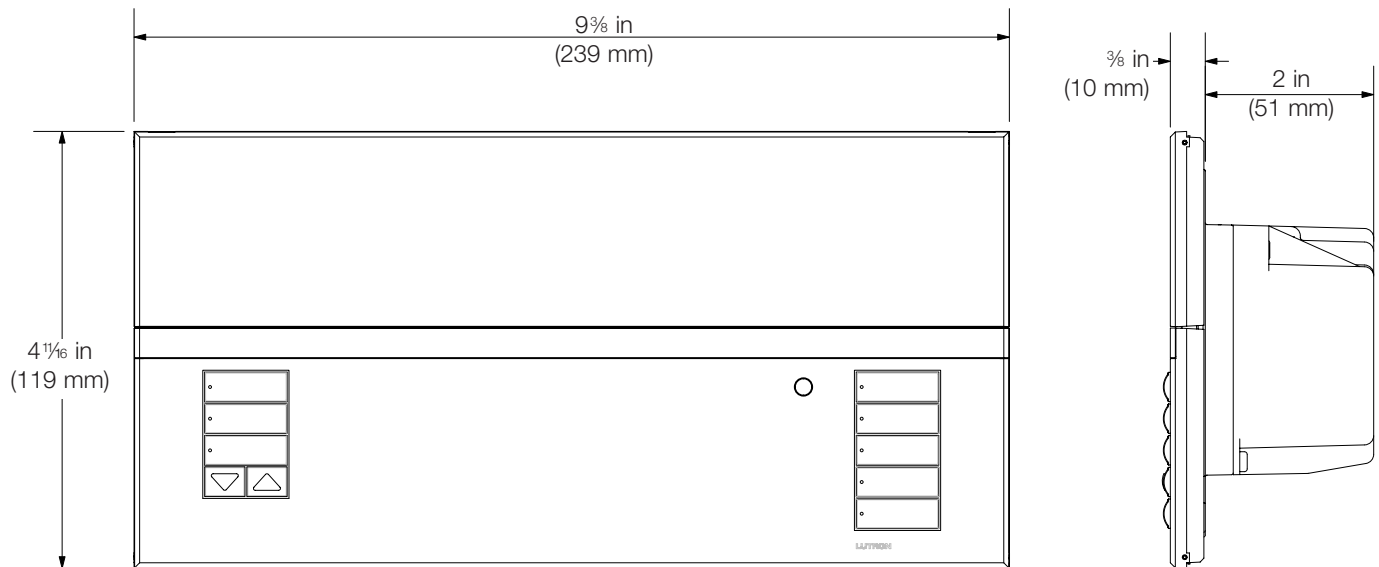
GRAFIK Eye QS Control Unit



Description

GRAFIK Eye QS is the premier energy-saving light and shade control. The GRAFIK Eye QS control unit includes an astronomic timeclock, intuitive lighting presets, and direct shade control. Additionally, the GRAFIK Eye QS control unit is compatible with all Lutron wired QS products and systems, including Quantum systems.

Mechanical Dimensions



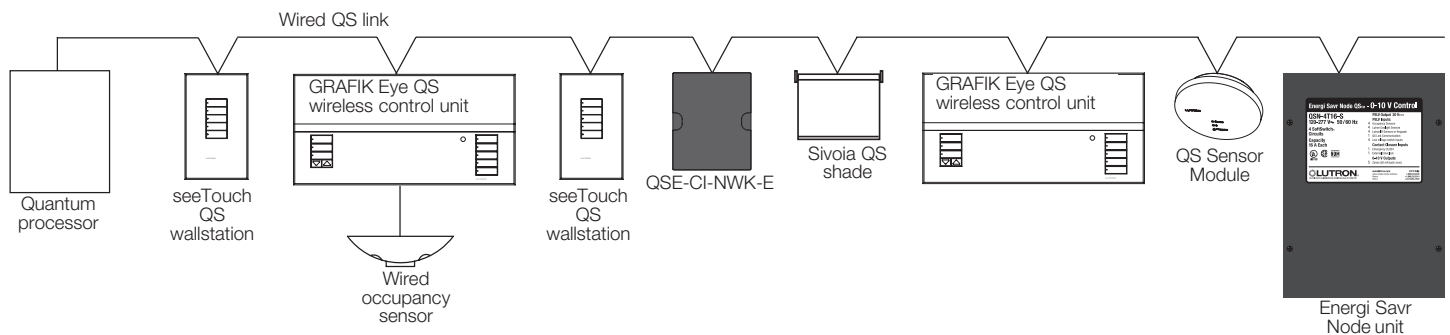
Front View

Side View

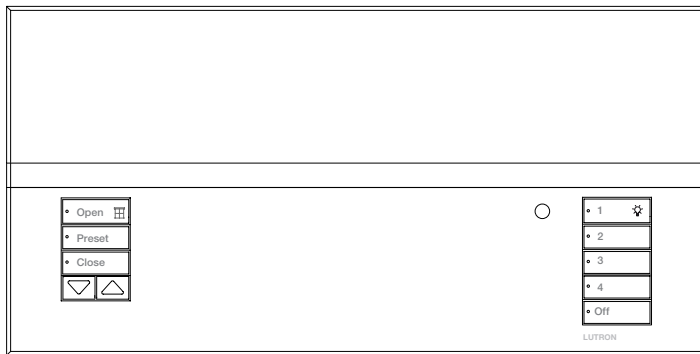
Fits into a 4-gang U.S. backbox, 3 1/2 in (90.4 mm) deep (Lutron P/N 245-254) or 3 in (76.2 mm) deep (Lutron P/N 241-400)

System Topology

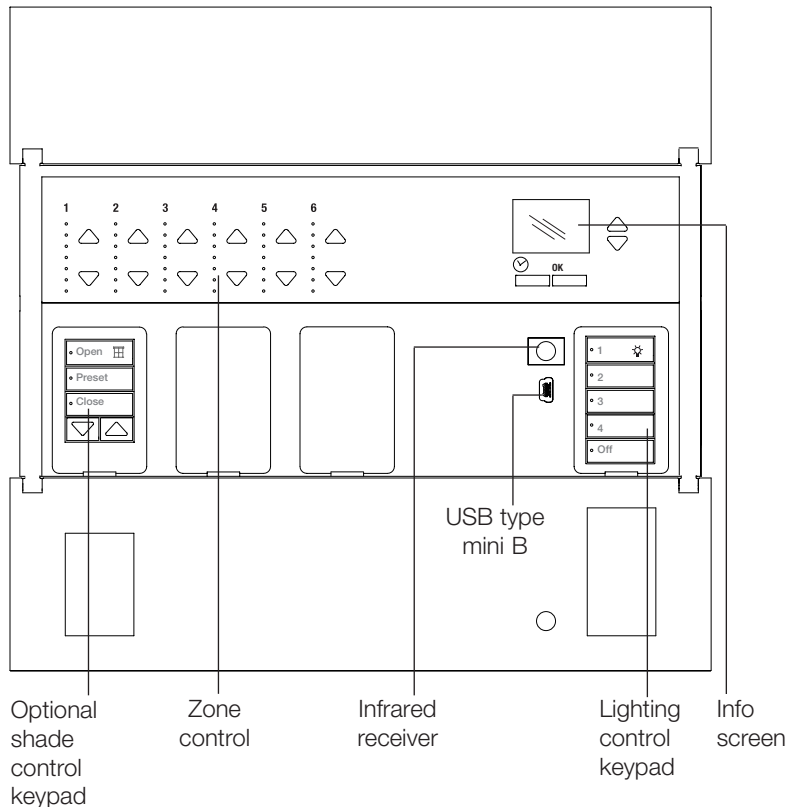
Example of Wired System



Job Name:	Model Numbers:	
Job Number:		



Note: General Engraving (-EGN) shown.



Features

- Pushbutton recall of four preset lighting scenes, plus Off.
- Sixteen (16) total available scenes, plus Off scene.
- Zones can control many light source types directly or through power modules.
- Optional integrated shade control buttons, which can also be added to the unit after installation.
- Master override buttons to raise and lower all lights.
- Allows setup of lighting scenes and shade presets using buttons on the control unit.
- Built-in infrared (IR) receiver.
- External IR connection.
- Built-in astronomic timeclock.
- Info screen shows zone light level percentage, energy savings, zone labeling, and programming.
- Lockout option prevents accidental changes.
- Occupancy sensor input and 24 V_{AC} power for one occupancy sensor.
- QS communication link for seamless integration of lights, motorized window treatments, occupancy sensors, wallstations, and integration interfaces.
- Compatible with all Lutron QS system components.
- Backlit buttons with engraving make unit easy to locate and operate.
- Available in a variety of colors and finishes.

Job Name:	Model Numbers:	
Job Number:		

Specifications

Input Power

- 120–127 V~ 50/60 Hz
- 220–240 V~ 50/60 Hz

Listings (120–127 V~)

- cULus
- CEC (Title 24)
- NOM

Environment

- 32 to 104 °F (0 to 40 °C).
- Relative humidity less than 90% non-condensing.

Lighting Sources/Load Types

- Zones on Energi Savr Node products wired to the same QS link
 - Zones on Energi Savr Node with Softswitch
 - Zones on Energi Savr Node for 0–10 V
 - Zones on Energi Savr Node with EcoSystem
 Please refer to “Remote Zone Mapping” for important information.
- DMX channel(s) through DMX output interface (QSE-CI-DMX). Please refer to “Accessory Controls: DMX Output Interface”

Controls the following lighting sources with a smooth, continuous square law dimming curve or on a full conduction non-dim basis:

- Incandescent
 - Halogen
 - Magnetic low-voltage transformer
 - Lutron Tu-Wire electronic fluorescent dimming ballast
 - Lutron Hi-lume 2-wire LTE LED driver
 - Advance Mark 10[®] electronic dimming ballast
 - Neon and cold cathode
 - Non-dim (incandescent, magnetic low-voltage, Tu-Wire, or neon/cold cathode)
 - Cree LR4/6, 120 V~ fixtures (for loading capacities, please refer to the LED report card located at www.lutron.com/LEDtool)
- Please refer to “Capacities” for more information.

Controls the following lighting sources with a smooth, continuous square law dimming curve or on a full conduction non-dim basis through separate Lutron power interfaces:

- Electronic low-voltage transformers (use ELV or Phase-Adaptive power module: PHPM-PA-DV-WH/ PHPM-PA-120-WH)
- Lutron 3-wire controlled electronic fluorescent dimming ballasts (use fluorescent 3-wire power module: PHPM-3F-DV-WH/ PHPM-3F-120-WH)
- Lutron 3-wire controlled LED drivers (use fluorescent 3-wire power module: PHPM-3F-DV-WH/ PHPM-3F-120-WH)
- Non-dim (use switching module: PHPM-SW-DV-WH)
- 0–10 V (use TVI)

Note: A zone may be programmed to control only one load type at a time.

Key Design Features

- Lightning strike protection meets ANSI/IEEE standard 62.41-1980. Can withstand voltage surges of up to 6000 V~ and current surges of up to 3000 A.
- Tested to withstand 16 kV electrostatic discharge without damage or memory loss.
- RTISS-equipped: Compensates in real time for incoming line voltage variations (no visible flicker with +/-2% change in RMS voltage per cycle, and +/-2% Hz change in frequency per second).
- Power failure memory retains programming and light level settings for up to 10 years in the event of a power loss.
- The GRAFIK Eye QS control unit supplies 3 Power Draw Units (PDUs) on the QS link. For complete information, see the **Power Draw Units on the QS Link Spec** (369405) on www.lutron.com.
- Faceplate is hinged at the top and bottom, and stays open at 180° for ease of access.

Scene and Shade Buttons

- Large, rounded buttons are easy to use.
- Backlit buttons with optional engraving make it easy to find and to operate the control unit in low light conditions (backlight can be disabled).
- Optional button engraving is angled up to the eye for easy reading.
- Predefined label stickers are included for field labeling.
- 4 preset lighting scenes, plus Off, are accessible from the front of the control unit.
- 12 additional scenes are stored in the control unit and are accessible from the integral timeclock, seeTouch QS wallstations, and QS interfaces.
- Light levels fade smoothly between scenes. Fade time can be set differently for each scene: 0 to 59 seconds, or 1 to 60 minutes. Maximum fade time from Scene Off is 3 seconds.

Job Name:	Model Numbers:	
Job Number:		

Specifications

Shade Control

- The GRAFIK Eye QS control unit can include up to 3 shade button columns. Each column has backlit open, preset, close, and raise/lower buttons.
- Each shade button column can be programmed to operate one shade or a group of shades. (Shades may be assigned to more than one shade button column).
- Faceplates are available with 1, 2 and 3 shade button columns.

Zone Control

- Each zone has a dedicated raise and lower button to adjust the zone.
- Each zone has a dedicated 7 LED bar graph for level status. Percentage of light level and energy saved is displayed on the info screen.
- All zone information has blue backlit LEDs. Backlight turns off when idle for 30 seconds.
- High-end and low-end trim settings are adjustable per zone (high end from 99 to 55%; low end from 45 to 1%).
Note: Trim for remote zones must be adjusted locally on the Energi Savr Node unit.
- Each zone is programmable to only one load type at a time.

Info Screen

- OLED (organic LED) screen is viewable from all angles.
- Screen turns off when idle for 30 seconds.
- Programmable zone labels.
- Programmable scene labels.
- Status of real-time zone percentage and energy savings.
- Programmable timeclock schedules.
- Programmable shade labels.
- Selectable display languages:
 - English – Spanish – French
 - Italian – German – Portuguese

Astronomic Timeclock

- Integral to all units.
- 7 daily schedules available.
- One available holiday schedule is programmable by date up to one year in advance.
- 25 events per day maximum.
- Timeclock events are programmable to control scenes that affect any Energi Savr Node unit connected on the QS link without changing the local scene on the GRAFIK Eye QS control unit.
- Astronomic times are programmable by integral city database or by entering latitude and longitude. Sunrise/Sunset times automatically adjust throughout the year based on location.
- Automatically adjusts for Daylight Saving Time (DST); DST is programmable.
- Local timeclock events can activate any of the following features:
 - Scenes 1 to 16 and Off
 - Any available shade presets
 - Start and End afterhours mode
 - Enable and Disable daylighting for all zones/groups
 - Enable and Disable occupancy for occupancy/vacancy sensors
 - Enable and Disable occupied events for all occupancy sensors

System Communications and Capacities

- Low-voltage type IEC PELV/NEC® Class 2 wiring connects control units, wallstations, motorized shades, and control interfaces.
- A QS system can have up to 100 devices and 100 zones.

Infrared

- Infrared (IR) receiver allows infrared transmitters to select 8 scenes, raise/lower lighting zones, or raise/lower shades.
- Transmitter buttons imitate buttons on faceplate.
- 50 ft (15 m) line of sight range.
- Terminal block infrared input for connection to a wired IR input from third-party equipment.
- IR can be disabled via programming.
- Works with Lutron GRX-IT and GRX-8IT infrared remote controls.

Job Name:	Model Numbers:	
Job Number:		

Specifications

Accessory Controls: seeTouch QS Wallstations (QSW2)

- Wired seeTouch QS wallstations provide the following features:
 - Access to one or more of the 16 scenes on the GRAFIK Eye QS control unit
 - Zone toggle, partitioning, sequencing, fine tune, panic mode, and timeclock enable/disable
 - Contact closure inputs
 - Certain functions are only available on specific wallstation configurations. Refer to the seeTouch QS specification submittal.

Accessory Controls: QS Sensor Module (QSM2)

- The QS Sensor Module provides a means to link wired or wireless occupancy sensors or daylight sensors, Pico controls, and wired infrared sensors to a GRAFIK Eye QS control unit via the wired QS link.
 - Occupancy sensors wired (or wirelessly linked) to a QS Sensor Module can be used by one or more GRAFIK Eye QS control units on the wired link.
 - Daylight sensors wired (or wirelessly linked) to a QS Sensor Module can be used by one or more GRAFIK Eye QS control units on the wired link.
 - Infrared sensors can control either one or more zones or scenes on the GRAFIK Eye QS control unit. Functionality varies; refer to the documentation for the QS Sensor Module for details.
 - Pico wireless controls wirelessly linked to a QS Sensor Module can be used to control one or more zones or scenes on the GRAFIK Eye QS control unit.
 - Pico wired controls can be used, when connected to a QS Sensor Module, to control one or more zones or scenes on the GRAFIK Eye QS control unit.

Accessory Controls: Contact Closure Input/Output Interface (QSE-IO)

- Recalls preset light levels for the following set of scenes on the GRAFIK Eye QS control unit:
 - Scenes 1-4 and Off
 - Scenes 9-12 and Off
 - Scenes 5-8 and Off
 - Scenes 13-16 and Off
- Sequence scenes 5-16, Enable/Disable Zone Lockout, Enable/Disable Scene Lockout, Enable/Disable Panic Mode, Enable/Disable Timeclock.
- Occupancy Sensors. An individual input counts as 1 occupancy sensor for the GRAFIK Eye QS control unit. Each input can be assigned to either Scene Control or Zone Control (please refer to the Occupancy Sensor(s) section of this guide).
- Zone Toggle. Allows an input to toggle one or more zones between programmable preset level(s) and off.
- Shade Output mode. A Shade Column on the GRAFIK Eye QS control unit can be linked to control outputs 1-3 and/or outputs 4-5 on the QSE-IO.

Accessory Controls:

DMX Output Interface (QSE-CI-DMX)

- Any zone on the GRAFIK Eye QS control unit can be mapped to any single DMX512 Channel.
- Any zone on the GRAFIK Eye QS control unit can be simultaneously mapped to any three DMX512 channels (providing RGB/CMY control).
- DMX loads cannot be used with daylighting.

Accessory Controls: Ethernet and RS232 Interface (QSE-CI-NWK-E)

- Allows for monitoring and control of the outputs and local scenes of the GRAFIK Eye QS control unit.

Accessory Controls: QS Keyswitch Wallstations (QSW2-KS)

- Recalls preset light levels for any two scenes including Off.
- Allows fine-tuning (raise/lower level) of a zone or group of zones.
- Starts/Stops scene sequencings (Scenes 1-4 or Scenes 5-16)
- Enables/Disables Timeclock
- Enables/Disables occupancy sensors
- Enables/Disables daylight sensors
- Allows toggle of Zone(s) to a preset level and off.
- Enables/Disables panic mode.
- Starts/Stops afterhours mode.

Other Accessory Controls and Devices

- Energi Savr Node QS (ESN). See the specification submittal for complete details.

Job Name:	Model Numbers:	
Job Number:		

Specifications

Occupancy Sensor(s)

- The GRAFIK Eye QS control unit works with occupancy sensors through either:
 - Scene Control: Up to 16 sensors activate user-selected occupancy and vacancy scenes.*
 - Zone Control: up to four sensors per zone activate user-selected occupancy and vacancy zone levels.
- Occupancy sensors may include:
 - Contact closure sensors wired to CCI input on back of GRAFIK Eye QS control unit
 - Wired or wireless sensors connected QS sensor module (QSM)
- If any sensor in a group detects occupancy, then the GRAFIK Eye QS control unit will go to the designated occupancy scene or zone level.
- If all sensors in a group detect vacancy, then the GRAFIK Eye QS control unit will go to the designated vacancy scene or zone level.
- Low battery: the Diagnostics screen will display a low battery symbol when applicable.
- If the GRAFIK Eye QS control unit does not receive a signal from an occupancy sensor on the link (usually due to a dead battery), the lights associated with that sensor will go to the occupied level.

Daylight Sensor(s)

- The GRAFIK Eye QS control unit allows daylight sensors to control one or more lighting zones to adjust electric light levels based on measured daylight levels.
- Daylight sensors may include:
 - Wired or wireless sensors connected to a QS sensor module (QSM)
- A daylight sensor can control one or more GRAFIK Eye QS control unit zones:
 - Each zone can be calibrated to target light levels
 - A zone can be controlled by no more than one daylight sensor
- Daylight control can be enabled or disabled on a scene-by-scene basis
 - By default, daylight control is enabled in all scenes

Note: Daylight control through the GRAFIK Eye QS control unit only affects select lighting loads. Shade groups cannot be controlled by daylight sensors. Daylighting does not affect DMX or RGB/CMY DMX loads. Daylighting of Remote Zones linked to Energi Savr Node zones must be configured at the Energi Savr Node unit or through the Energi Savr Node app for *iPod*.

Contact Closure Input (CCI) with Power Supply Output

- Each GRAFIK Eye QS control unit has one contact closure input (Terminal A).
 - The attached device must provide a dry contact closure or solid-state output.
 - Input is miswire-protected up to 36 V $\overline{=}$.
- The contact closure is capable of accepting the following types of inputs:
 - Maintained (default): The GRAFIK Eye QS control unit will act on both a contact closure and a contact open/release event.
 - Momentary: The GRAFIK Eye QS control unit will act on only contact closure events.
- Each GRAFIK Eye QS control unit can supply 50 mA maximum at 24 V $\overline{=}$.
 - Useful for powering occupancy sensors.
 - An auxiliary power supply must be used if the device requires more than 50 mA.
- The CCI is capable of operating in the following modes
 - Occupancy: If an occupancy sensor is wired directly to the GRAFIK Eye QS control unit.
 - Emergency: This setting allows the GRAFIK Eye QS control unit to work with a LUT-ELI. When an emergency situation is detected, all lights will go to full on, and no operations will be allowed until the emergency signal is cleared.
 - Afterhours: Allows the CCI to start and end the afterhours mode.
 - Timeclock: Allows the CCI to enable and disable the timeclock.
 - Scene Lockout: Prevents the user from making any changes to the control unit. The current scene will stay on until the CCI enables normal operation.
 - Save Never: Prevents any changes from being saved while the CCI is being used.
 - Disable CCI: The CCI will have no effect on the system and will not appear on the list of available sensors.

Security Lockout Password

- A 4-character password (using characters A to Z and 0 to 9) can be enabled/disabled to lock out access to the Programming Menu.
- By default there is no password enabled on the GRAFIK Eye QS control unit.
- If case the 4-digit password is forgotten, contact Lutron Customer Assistance to regain access.

* Applicable only to units that ship with firmware version 9.002 and higher. Previous versions support up to 4 sensors.

Job Name:	Model Numbers:	
Job Number:		

Specifications

Remote Zone Mapping

- Map a GRAFIK Eye QS zone directly to an Energi Savr Node output so that programmed scenes in the GRAFIK Eye QS control unit will directly control the output levels of the Energi Savr Node.
- Adjust high-end and low-end trim for remote zones through the Energi Savr Node or Energi Savr app software.
- Change load types of remote zones through the Energi Savr Node or Energi Savr app software.
- Configure daylighting for remote zones through the Energi Savr Node or Energi Savr app software.
- Required:
 - GRAFIK Eye QS control unit with firmware version 7.000 or higher
 - Energi Savr Node unit with firmware version 6.000 or higher
 - Energi Savr app version 6.0.0 or higher (required only if the Energi Savr Node unit has been configured using the app)

Partitioning

- When partition is open, creating one large space, automatically combines lighting preset functions for multiple GRAFIK Eye QS control units.
- When partition is closed, creating two or more smaller spaces, lighting preset functions become independent.
- Requires one wallstation (either a QSW2, QSW2-2B or a QSE-IO), a GRX-IRPS infrared transmitter/receiver pair, and a GRX-12VDC power supply for operation.
- If occupancy sensors are required in a partitioned space, note that each room's occupancy sensor(s) will operate independent of the partition status.

Job Name: 	Model Numbers: 	
Job Number:		

Capacities

	220–240 V~ 50/60 Hz	120–127 V~ 50/60 Hz	
Unit Capacity (watts)	3000	2000	
MLV	3000 VA / 2400 W	2000 VA / 1600 W	
Zone Capacity (watts)	40–1200	25–800	
MLV	40–1200 VA / 40–960 W	25–800 VA / 25–600 W	

Load Type Notes (Zones 1, 2 and 3)

- All electronic low-voltage (ELV) lighting used with an interface must be rated for reverse phase control dimming. Before installing an ELV light source, verify with the manufacturer that their transformer can be dimmed. When dimming, an ELV interface (such as the PHPM-PA-DV-WH) must be used with the control unit.
- Not all zones must be connected; however, connected zones must have a minimum load as specified above.
- Maximum total lighting load for a magnetic low-voltage (MLV) varies by input voltage:
 - 120–127 V~: 800 VA / 600 W
 - 220–240 V~: 1200 VA / 960 W
- Maximum total lighting load for Lutron Tu-Wire and Advance Mark 10® electronic dimming ballasts (120 to 127 V~ only) must not exceed 6 A per zone or 16 A per unit.
- No zone may be loaded with more than the capacity specified above. For higher wattage applications, or for 277 V~ applications, use Lutron power module PHPM-PA, PHPM-WBX, PHPM-PA-DV, PHPM-SW, or PHPM-WBX-DV.
- For controlling low-wattage loads (CFL, LED) in a non-dim application, contact Lutron Customer Assistance for the appropriate solution.

System Limits

- The QS wired communication link is limited to 100 devices or 100 zones.

Job Name:	Model Numbers:	
Job Number:		

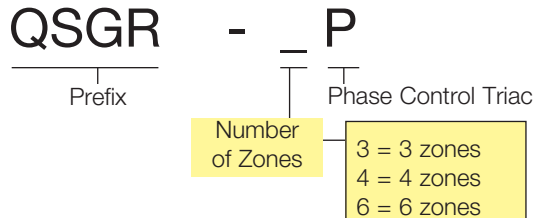
GRAFIK Eye QS Control Unit

Standard and Custom Color Options and Model Numbers

You must order a Base Unit and a Faceplate Kit

See Standard Color Combinations page for faceplate, stripe, and button colors

Base Unit



Example:

QSGR-6P

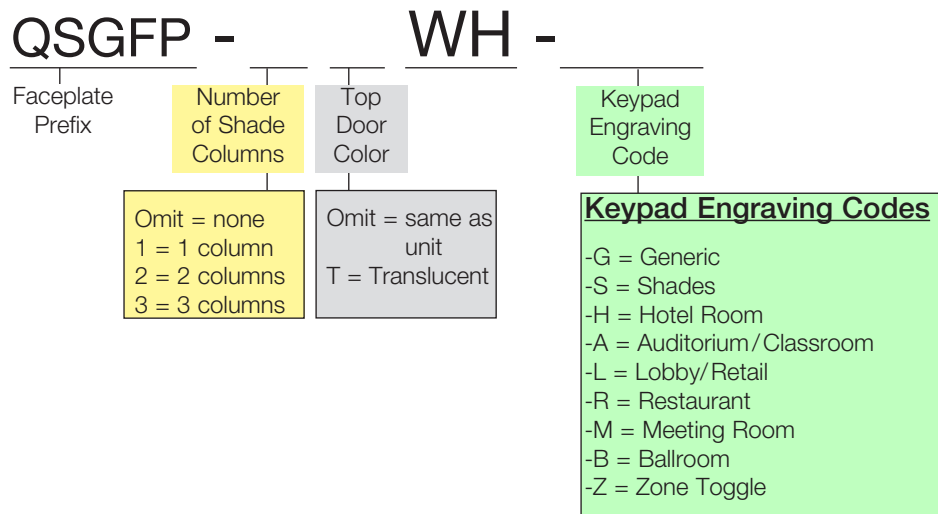
6-zone base unit
and

QSGFP-2WH-G

Ivory faceplate kit with two
shade columns and general
engraving

Standard Engraved Faceplate Kit (WH only)

(includes coordinating stripe and buttons)



Job Name:	Model Numbers:	
Job Number:		

GRAFIK Eye QS Control Unit *(continued)*

Standard and Custom Color Options and Model Numbers *(continued)*

Standard Engraved Faceplate Kit (WH only) *(continued)*

Generic (-G)

1	☀
2	
3	
4	
Off	☾

Meeting Room (-M)

All On	☀
Meeting	
A/V	
Cleaning	
All Off	☾

Shades (-S)

Open	☰
Preset 1	
Preset 2	
Preset 3	
Close	☷

Ballroom (-B)

All On	☀
Event 1	
Event 2	
Event 3	
All Off	☾

Hotel Room (-H)

High	☀
Medium	
Low	
Nightlight	
Off	☾

Zone Toggle (-Z)

Zone 1	
Zone 2	
Zone 3	
Zone 4	
Zone 5	

Auditorium/Classroom (-A)

All On	☀
Present	
Lecture	
Exam	
All Off	☾

Lobby/Retail (-L)

All On	☀
Morning	
Afternoon	
Evening	
All Off	☾

Restaurant (-R)

All On	☀
Breakfast	
Lunch	
Dinner	
All Off	☾

* Standard engraving text does not automatically assign or re-assign system programming to the QS keypad buttons. Project-specific customer input and programming by a Lutron service team member is still required to achieve a desired sequence of operation/system functionality per control.

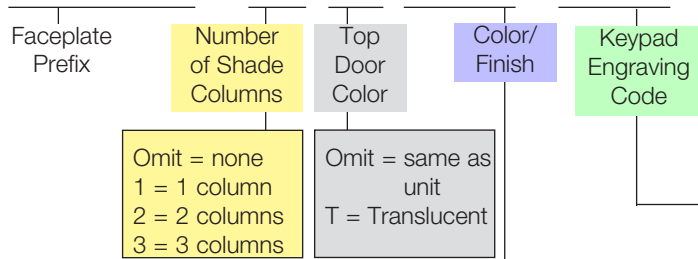
Job Name:	Model Numbers:	
Job Number:		

GRAFIK Eye QS Control Unit *(continued)*

Standard and Custom Color Options and Model Numbers *(continued)*

Custom (non-standard) Faceplate Kit (includes coordinating stripe and buttons)

QSGFP -



Faceplate Custom Color/Finish Codes

Architectural Matte Finishes

Standard (ship in 48 hours)	
White	WH
Ivory	IV
Beige	BE
Gray	GR
Brown	BR
Black	BL
Almond	AL
Light Almond	LA

Architectural Metal Finishes

Bright Brass	BB
Bright Chrome	BC
Bright Nickel	BN
Satin Brass	SB
Satin Chrome	SC
Satin Nickel	SN
Antique Brass	QB
Antique Bronze	QZ

Anodized Aluminum Finishes

Clear	CLA
Black	BLA
Brass	BRA

Satin Color Matte Finishes

Snow	SW
Midnight	MN
Taupe	TP
Biscuit	BI
Eggshell	ES
Palladium	PD
Hot	HT
Merlot	MR
Plum	PL
Sienna	SI
Terracotta	TC
Bluestone	BG
Greenbriar	GB
Goldstone	GS
Mocha Stone	MS
Stone	ST
Desert Stone	DS
Limestone	LS

For the latest color offerings please see our website:
<http://www.lutron.com/satincolors>

Keypad Engraving Codes

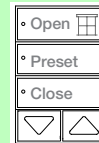
Omit = Unengraved

Ships with engraving certificate that customer can redeem at no charge

EGN = General Engraving



Lighting keypad



Shade column

NST = Non-Standard Text Engraving

Please visit the GRAFIK Eye QS website at www.lutron.com/grafikeyeqs for custom engraving forms. Submit completed form with order, and unit will ship engraved as specified by customer.

Job Name:	Model Numbers:	
Job Number:		

GRAFIK Eye QS Control Unit *(continued)*

Standard and Custom Color Options and Model Numbers *(continued)*

See previous page for Other Custom Model Numbers

See Standard Color Combinations page for faceplate, stripe, and button colors

Custom Button Kit

QSGB - 5B - WH -

Custom Button
Kit Prefix

Button
Configuration

Button
Color/
Finish

Keypad
Engraving
Code

3BRL = 3-button with
raise/lower
(shade column)
5B = 5-button
(lighting keypad)

Button Kit Custom Color/Finish Codes

Architectural Matte Finishes

White	WH
Ivory	IV
Beige	BE
Gray	GR
Brown	BR
Black	BL
Almond	AL
Light Almond	LA

Satin Color Matte Finishes

Snow	SW
Biscuit	BI
Eggshell	ES
Taupe	TP

Keypad Engraving Codes

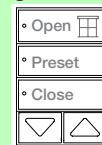
Omit = Unengraved

Ships with engraving certificate that
customer can redeem at no charge

EGN = General Engraving



Lighting
keypad



Shade
column

NST = Non-Standard Text Engraving

Please visit the GRAFIK Eye QS website
at **www.lutron.com/grafikeyeqs**
for custom engraving forms. Submit
completed form with order, and unit will
ship engraved as specified by customer.

Custom Stripe Kit

QSGS - WH

Stripe
Kit
Prefix

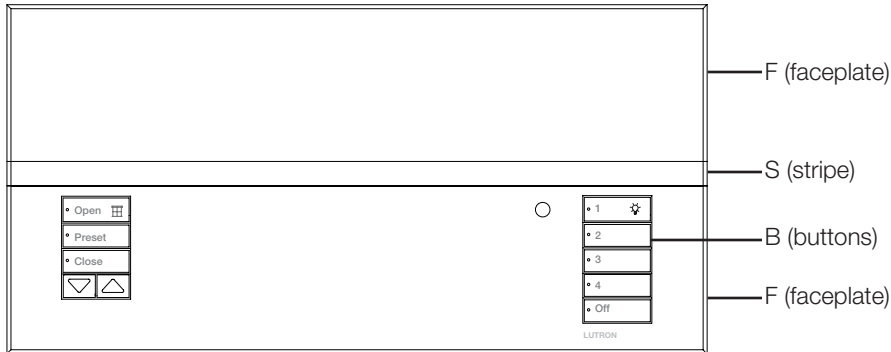
Stripe Color/
Finish

Stripe Custom Color/Finish Codes

Same as Faceplate colors on previous page

Job Name:	Model Numbers:	
Job Number:		

GRAFIK Eye QS Control Unit Standard Color Combinations See previous pages for Custom Model Numbers



Faceplate is comprised of a top and bottom. The bottom will always be the color indicated under "faceplate." The top may be the same color or translucent. Use the chart for faceplates that have the same color top and bottom. If a translucent lid is chosen, the stripe will automatically be the same color as the bottom lid.

Example:

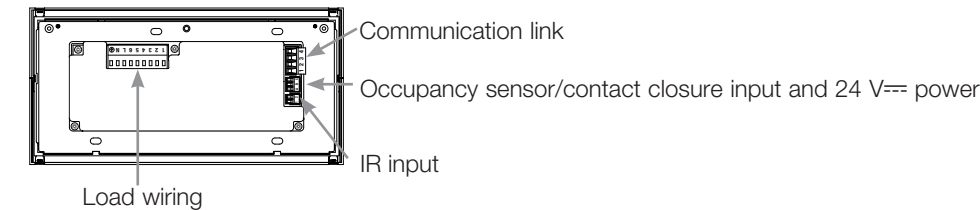
If you order QSGR-4P-1WH, your GRAFIK Eye QS control unit with 4 lighting zones and 1 shade zone will come with a white faceplate (both top and bottom), gray stripe, and white buttons.

Suffix	Faceplate (F)	Stripe (S)	Button (B)	Suffix	Faceplate (F)	Stripe (S)	Button (B)
Architectural Matte				Satin Matte			
WH	White	Gray	White	SW	Snow	Gray	Snow
IV	Ivory	Beige	Ivory	MN	Midnight	Gray	Black
BE	Beige	Ivory	Beige	TP	Taupe	Gray	Taupe
GR	Gray	Black	Gray	BI	Biscuit	Eggshell	Biscuit
BR	Brown	Black	Brown	ES	Eggshell	Beige	Eggshell
BL	Black	Gray	Black	PD	Palladium	Gray	Gray
AL	Almond	Light Almond	Almond	HT	Hot	Taupe	Taupe
LA	Light Almond	Almond	Light Almond	MR	Merlot	Taupe	Taupe
Architectural Metal				PL	Plum	Taupe	Taupe
BB	Bright Brass	Black	Black	SI	Sienna	Brown	Brown
BC	Bright Chrome	Black	Black	TC	Terracotta	Taupe	Taupe
BN	Bright Nickel	Black	Black	BG	Bluestone	Gray	Gray
SB	Satin Brass	Black	Black	GB	Greenbriar	Gray	Gray
SC	Satin Chrome	Black	Black	GS	Goldstone	Ivory	Ivory
SN	Satin Nickel	Black	Black	MS	Mocha Stone	Taupe	Taupe
QB	Antique Brass	Black	Black	ST	Stone	Gray	Gray
QZ	Antique Bronze	Black	Black	DS	Desert Stone	Taupe	Taupe
Anodized				LS	Limestone	Gray	Gray
CLA		Black	Black	For the latest color offerings please see our website: http://www.lutron.com/satincolors			
BLA	Black	Black	Black				
BRA	Brass	Black	Black				

Job Name:	Model Numbers:	
Job Number:		

Wiring Diagrams

Terminations

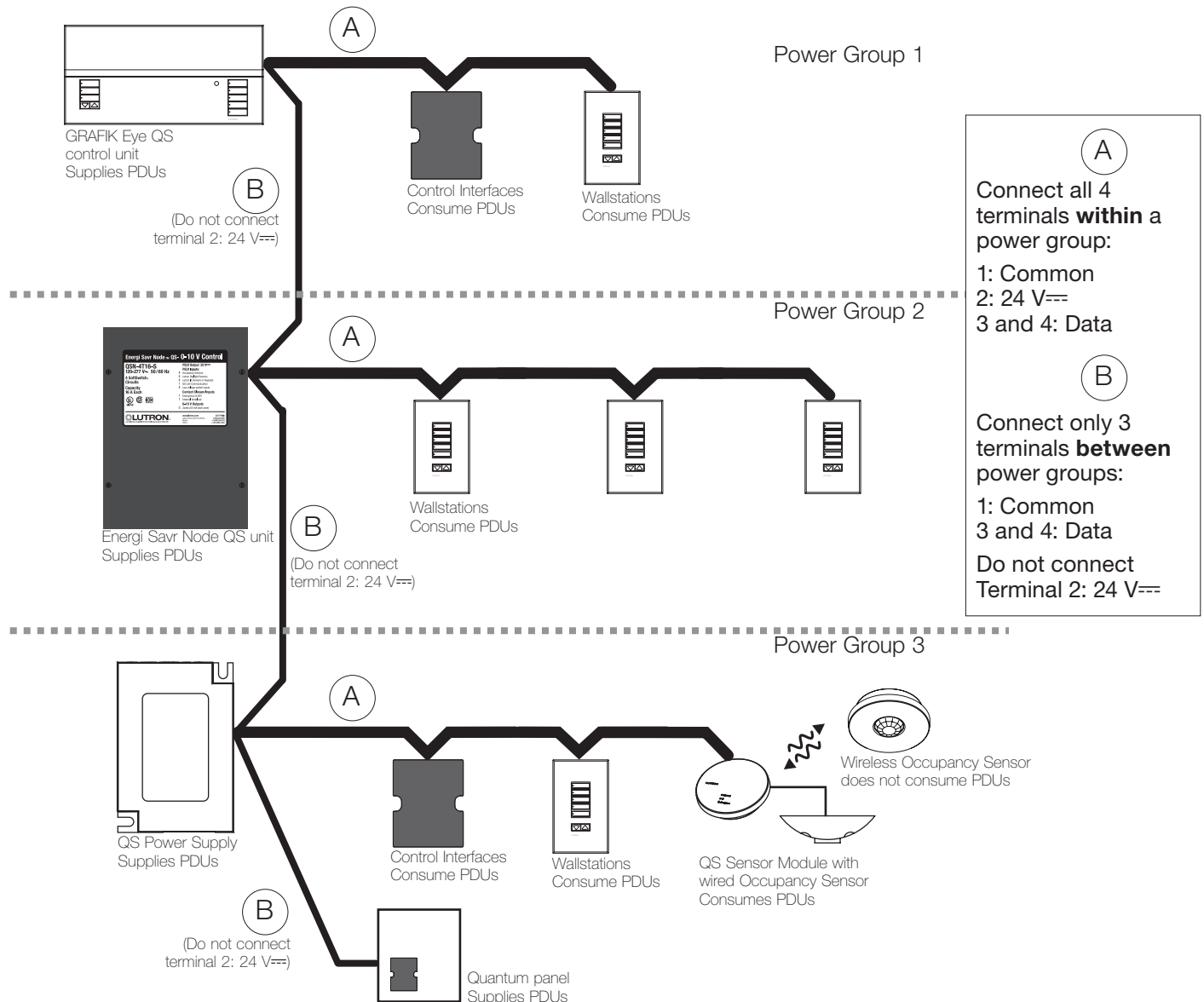


Power Group Wiring Example

On the QS link, there are devices that supply power and devices that consume power. Each device has a specific number of Power Draw Units (PDUs) it either supplies or consumes. A Power Group consists of one device that supplies power and one or more devices that consume power; each Power Group may have only one power-supplying device. Refer to the **Power Draw Units on the QS Link Spec** (369405) on www.lutron.com for more information concerning PDUs.

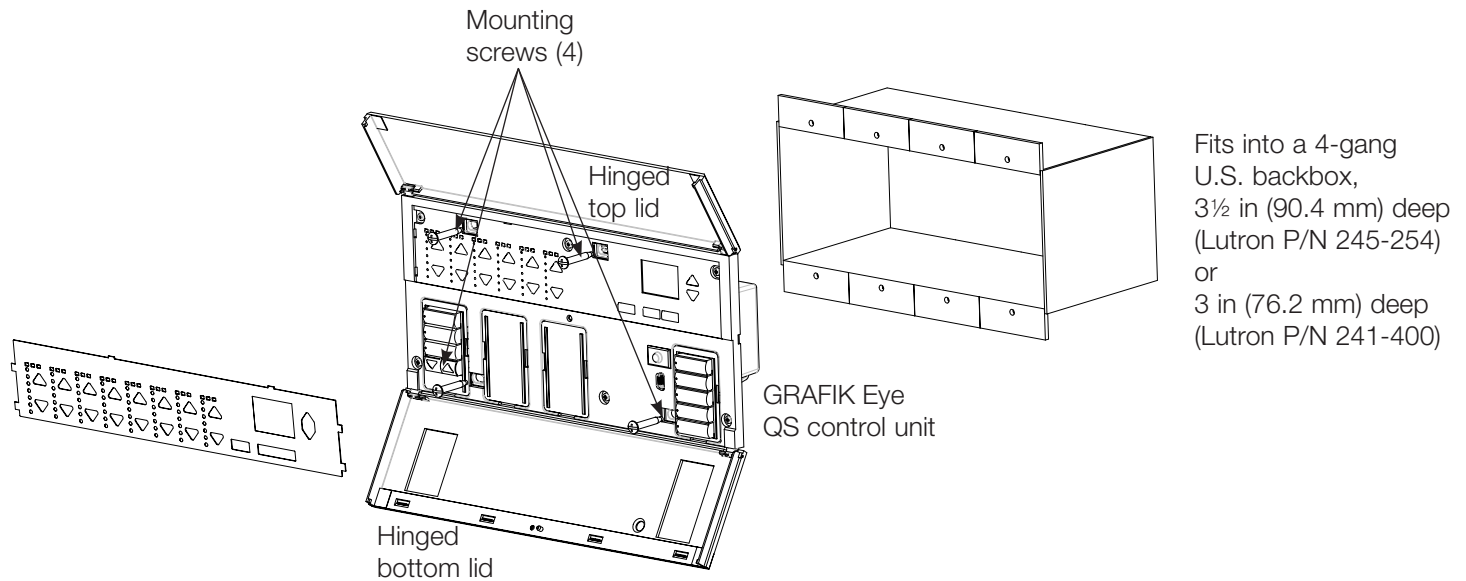
Within Power Groups on the QS link, connect all 4 terminals (1, 2, 3, and 4), shown by the letter A in the diagram. Between devices on the QS link that supply power, connect only terminals 1, 3, and 4 (NOT terminal 2), shown by the letter B on the diagram.

Wiring can be T-tapped or daisy-chained.

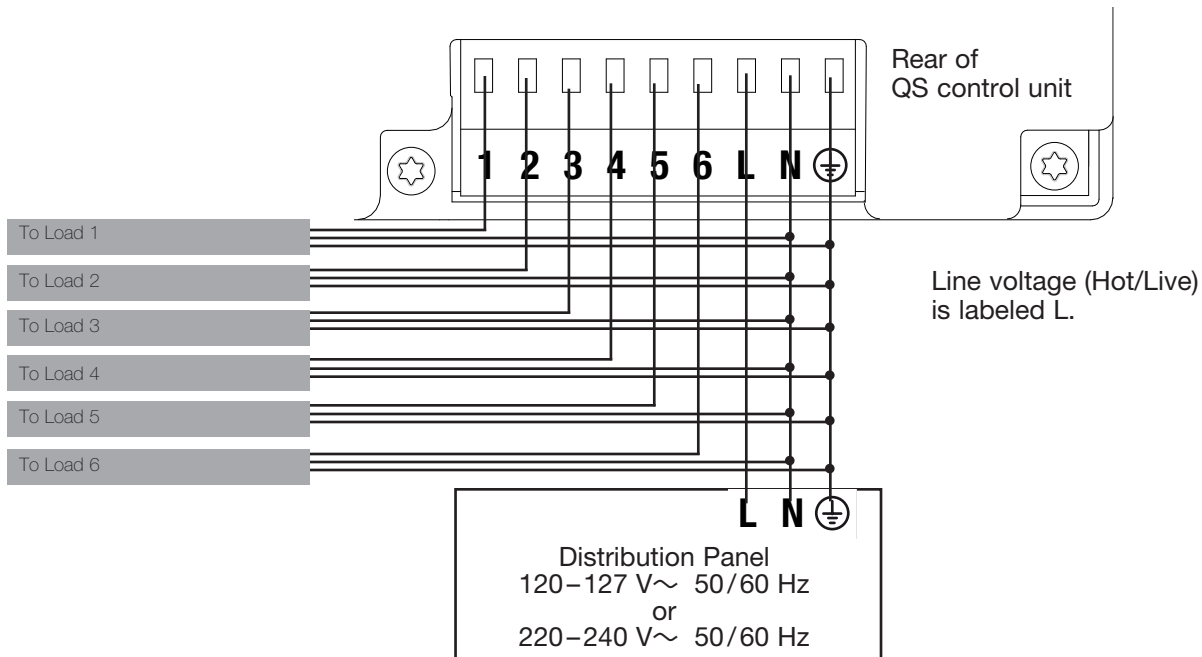


Job Name:	Model Numbers:	
Job Number:		

Mounting



Line Voltage Wiring



- Pull power wiring from distribution panel and to light fixtures.
- Each line voltage terminal can accept one 12 AWG (4.0 mm²) wire.
- Consult Lutron for non-dim relay wiring and/or load side emergency transfer wiring.

Job Name:	Model Numbers:	
Job Number:		

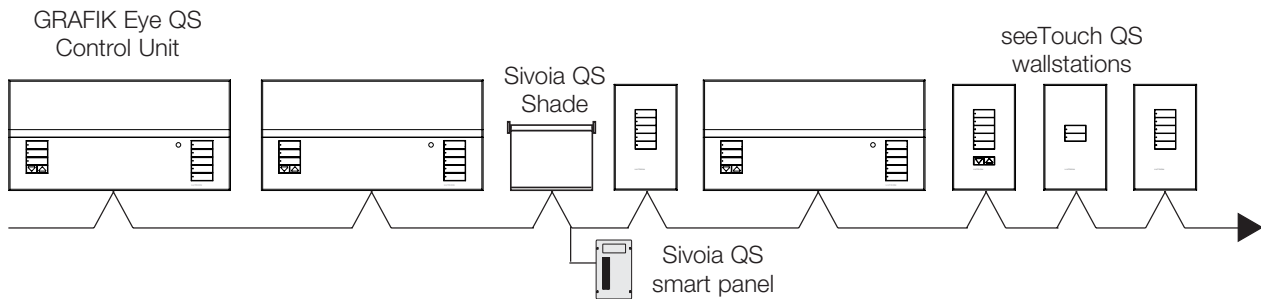
IEC PELV/NEC® Class 2 QS System Wiring

- Wiring can be daisy-chained or T-tapped.
- Wiring must be run separately from line/mains voltage.
- Total length of control link must not exceed 2000 ft (610 m).

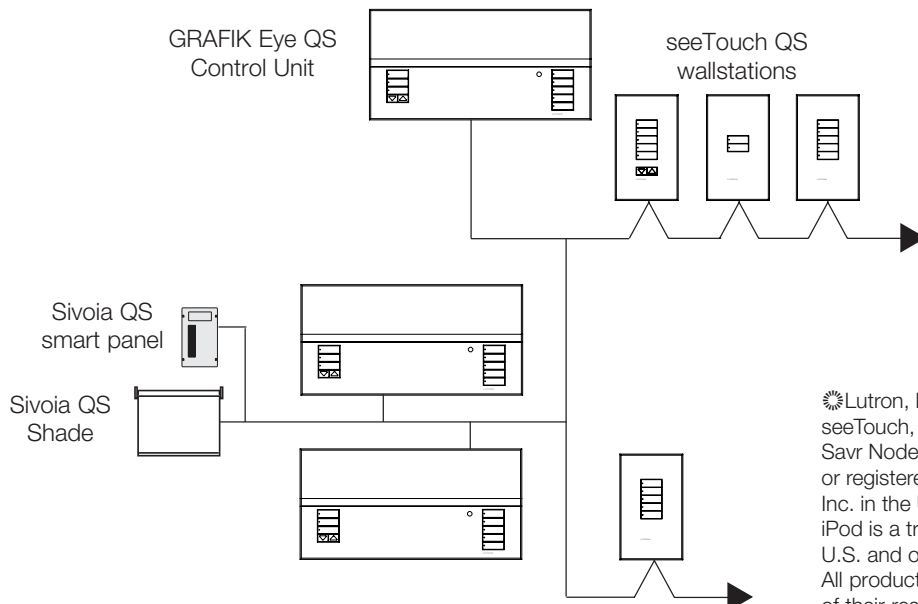
Wire Sizes (check compatibility in your area)

QS Link Wiring Length	Wire Gauge	Lutron Cable Part Number
Less than 500 ft (153 m)	Power (terminals 1 and 2) 1 pair 18 AWG (1.0 mm ²)	GRX-CBL-346S (non-plenum)
	Data (terminals 3 and 4) 1 twisted, shielded pair 22 AWG (0.5 mm ²)	GRX-PCBL-346S (plenum)
500 to 2000 ft (153 to 610 m)	Power (terminals 1 and 2) 1 pair 12 AWG (4.0 mm ²)	GRX-CBL-46L (non-plenum)
	Data (terminals 3 and 4) 1 twisted, shielded pair 22 AWG (0.5 mm ²)	GRX-PCBL-46L (plenum)

Daisy-Chain Wiring Example



T-Tap Wiring Example



Lutron, Lutron, GRAFIK Eye, Hi-lume, Quantum, seeTouch, Sivoia, Softswitch, Tu-Wire, Pico, Energi Savr Node, RTISS, and EcoSystem are trademarks or registered trademarks of Lutron Electronics Co., Inc. in the US and/or other countries. iPod is a trademark of Apple Inc. registered in the U.S. and other countries. All product names, logos, and brands are property of their respective owners.

Job Name:	Model Numbers:	
Job Number:		

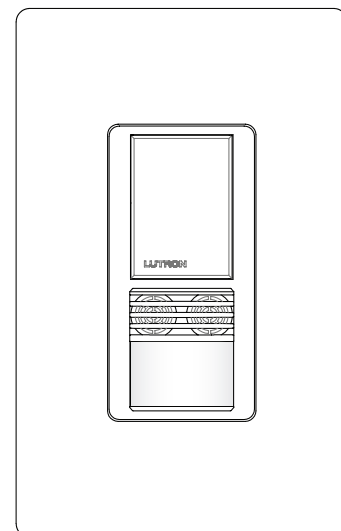
Maestro Dual Technology Sensor Switch

The Maestro dual technology (dual tech) occupancy sensor switch applies our exclusive XCT Technology to the ultrasonic as well as the passive infrared technology in this sensor to create a product that can detect very fine motion, such as typing. This product also includes all of the great features found in the rest of the Maestro sensor family, including: adaptive relay switching, smart ambient light detection, and simple button presses for changing settings. The Maestro dual tech occupancy sensor switch is available in single-circuit and dual-circuit versions.

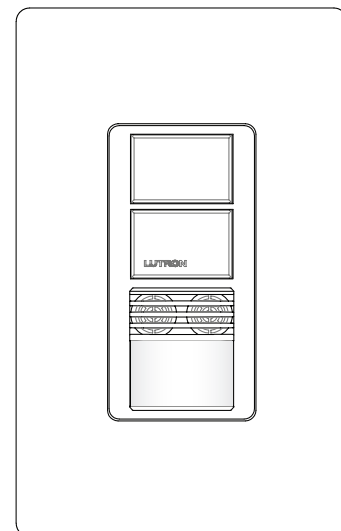
The single-circuit versions (MS-A102, MS-B102) can be used to meet many of the Title 20/24, ASHRAE 90.1, and IECC code requirements such as “automatic shutoff”. The dual-circuit versions (MS-A202, MS-B202) can be used to meet many of the Title 20/24, ASHRAE 90.1, and IECC code requirements such as “automatic shutoff” and “multi-level lighting control”. To find some examples of code-specific applications, visit www.lutron.com/energycodes

Features

- XCT Technology for major, minor, fine, and very fine motion detection
- 180° sensor field-of-view
- Tamper-resistant PIR lens
- Up to 900 ft² (81 m²) major motion coverage and 400 ft² (36 m²) minor motion coverage
- Two Ambient Light Detect (ALD) options:
 - Learning ALD Mode:
 - Uses adaptive algorithm.
 - Sensor learns user's preferred light level over time.
 - Fixed ALD mode:
 - Four selectable light level thresholds: Hi, Med, Low, Min
- Occupancy models (MS-A102-XX, MS-B102-XX, MS-A202-XX, MS-B202-XX) can be set to Auto-ON/Auto-OFF or Manual-ON/Auto-OFF per circuit
- Dual-circuit model (MS-A202) meet Title 24 requirements for multi-level lighting control.
- Single-circuit “Vacancy” model (MS-A102-V-XX, MS-B102-V-XX) available to meet Title 24/Title 20 requirements for vacancy sensors.
- Adjustable timeout for each circuit (1, 5, 15, or 30 minutes)
- Sensitivity adjustment
 - PIR (Hi, Med, Low, Min)
 - Ultrasonic (Hi, Med, Low, Off)
- Switches all lighting loads: incandescent, halogen, ELV, MLV, CFL, LED, magnetic fluorescent, electronic fluorescent
- Switches fan loads at 120 V~
- MS-B102, MS-B102-V work with Maestro accessory switches in multi-location applications
- MS-A models DO NOT require neutral wiring, while the MS-B models DO require neutral wiring.



MS-A102-XX (Occupancy model)
MS-A102-V-XX (Vacancy model)
MS-B102-XX (Occupancy model)
MS-B102-V-XX (Vacancy model)



MS-A202-XX (Occupancy model)
MS-B202-XX (Occupancy model)

Notes:

- “XX” in the model number represents color/finish code. See **Colors and Finishes** at end of document.
- Wallplate not included.
- For TAA compliant models, add “W” before “MS” when ordering. Available in gloss colors only. For other BAA/TAA compliant products, please visit our website at www.lutron.com/BAA and select “download BAA product list”.

Job Name:	Model Numbers:	
Job Number:		

Specifications

Regulatory Approvals

- UL® Listed to U.S. and Canadian safety requirements
- NOM certified
- Title 20/24 certified lighting control device
 - Complies with Title 20 and Title 24 section 110.9

Power/Load Control

- 120–277 V~ 50/60 Hz

Key Design Features

- Dual Sensing Technology
- Switches all lighting loads
- 6 A of lighting load per circuit at 120–277 V~
- 4.4 A (1/6 HP) of fan load per circuit at 120 V~
- Crush/tamper resistant lens
- Smart Ambient Light Detection (ALD)
- Fixed Ambient Light Detection
- Adaptive zero-cross switching algorithm for extended relay life (patent pending)
- XCT Technology for major, minor, fine, and very fine motion detection
- Programmable circuit swapping eliminates need for rewiring to reassign circuits after installation of a dual-circuit product. (patent pending)
- Product ground current does not exceed 0.5 mA

Environment

- Ambient operating temperature:
32 °F to 104 °F (0 °C to 40 °C), 0%–90% humidity,
non-condensing. Indoor use only.

Warranty

- 5-Year Limited Warranty. For additional Warranty information, please visit
www.lutron.com/TechnicalDocumentLibrary/Sensor_Warranty.pdf

Sensor Detection

Lutron dual tech sensors operate by triggering initial occupancy using PIR technology, and maintain occupancy using both ultrasonic and PIR technology.

Advanced Features

Switching

- Adaptive zero-cross switching—maximizes relay life by switching at the point of minimum energy on the AC power curve (patent pending). Actively adapts to variations in relay timing.

Additional Information on Sensors

- For single-circuit PIR Maestro occupancy sensor switch models, please see Lutron P/N 369666
- For Maestro occupancy sensor C•L dimmer models, please see Lutron P/N 369748
- For dual-circuit PIR Maestro occupancy sensor switch, please see Lutron P/N 369758
- For more information, please see www.lutron.com/occvacsensors
- Lutron Customer Support: 1.844.LUTRON1

Job Name:	Model Numbers:	
Job Number:		

Custom Settings

Default settings shown in bold

- Timeout

- 30 min
- **15 min**
- 5 min
- 1 min

Mode - Sensor Modes

Lights automatically turn off in all sensor modes

- **Occ - Occupancy mode (No ALD)**^{1,2,3}
- Lrn - Occupancy with learning ALD mode
- Fixd - Occupancy with fixed ALD mode
- Vac - Vacancy mode (No ALD)^{2,3}

¹ MS-A102-XX, MS-B102-XX default is Occ

² MS-A102-V-XX, MS-B102-V-XX is locked as Vac

³ MS-A202-XX, MS-B202-XX defaults are: Circuit 1 - Occ, Circuit 2 - Vac

- Ultrasonic Sensitivity

- High
- **Med**
- Low
- Off

PIR - Passive Infrared Sensitivity

- **High**
- Med
- Low
- Min

Additional Settings

Fixed ALD Light Level

- Hi
- Med
- **Low***
- Min

* "Low" is the default setting for any sensor that is set by the user to: Occupancy with fixed ALD mode

Off-While-Occupied

- **Enabled**
- Disabled

Walk-Thru Mode

- Enabled
- **Disabled**

Custom Settings - Details

Ambient Light Detection (ALD) mode

Lights turn on only when natural light in the room is below the set threshold.

- **Learning:** The ambient light threshold adjusts to the user's preference via manual interaction with the sensor switch.
- **Fixed:** Choose a fixed ALD light level from four pre-set options:
High, Medium, Low, and Minimum

Manual Off-While-Occupied Options

ENABLED (default setting)

- When the sensor switch is manually turned off, the sensor switch will not turn the lights back on automatically while the room is occupied.
- Once the room is vacated, the Auto-On feature returns to normal operation after the timeout period has expired.
- This may be the preference in conference rooms or classrooms while viewing presentations. This feature requires motions to keep the lights off.

DISABLED

- When the sensor switch is manually turned off, the Auto-On feature will return to normal operation after 25 seconds.
- This may be the preference in a restroom if the user always wants the lights to turn on upon entering and the lights to turn off when the room is vacant.

Walk-Thru Mode

ENABLED¹

- If motion is not detected within 3 minutes after initial occupancy, the lights will turn off after 3 minutes, instead of the current timeout.
- This setting may be the preference in commercial applications where personnel may briefly trigger sensors during non-working hours.

DISABLED (default setting)

- When motion is detected, the lights will ALWAYS remain on for the entire timeout duration, regardless of the duration of occupancy detection.

¹ 1 minute timeout would be overridden if walk-thru mode is also ENABLED

Job Name:	Model Numbers:		
Job Number:			

Load Type and Capacity

Control	Neutral Connection Required	Vacancy Only	Number of Circuits	TAA Compliant	Voltage/Load Type/Maximum Load (Anywhere in Gang) ¹	Minimum Load	3-Way with Mechanical Switch	Multi-Location with Accessory Switch
MS-A102			1		120 – 277 V~ Lighting 6 A ² 120 V~ Fan 4.4 A (1/6 HP) ³	0 A		
MS-A102-V		✓	1			0 A		
MS-A202			2			0 A		
MS-B102	✓		1			0 A	✓	✓
MS-B102-V	✓	✓	1			0 A	✓	✓
MS-B202	✓		2			0 A	✓	
WMS-A102			1	✓		0 A		
WMS-A102-V		✓	1	✓		0 A		
WMS-A202			2	✓		0 A		
WMS-B102	✓		1	✓		0 A	✓	✓
WMS-B102-V	✓	✓	1	✓		0 A	✓	✓
WMS-B202	✓		2	✓		0 A	✓	

¹ Ratings shown are per circuit.

² Sensor switch load type: Designed for use with permanently installed incandescent, halogen, MLV, ELV, CFL, LED, magnetic fluorescent, and electronic fluorescent lighting loads.

³ When controlling light and fan loads simultaneously on a single-circuit, maximum load capacity per circuit is 4.4 A at 120 V~.

- Ground or neutral is required for product to function. If neither wire is present, consult a licensed electrician.
- For models MS-A102 and MS-A202, connect green-sleeved wire to ground only in retrofit and replacement applications. When neutral connection is available, remove green sleeve and connect the white wire to neutral.

Sensor switch placement

- The sensor switch performs better with an unobstructed view of room occupants.
- Hot objects and moving air currents can affect the performance of the sensor switch. The sensor switch performs best when located 6 ft (1.8 m) or more away from hot objects or moving air currents.
- The PIR performance depends on a temperature differential between the ambient room temperature and that of room occupants. Warmer rooms may reduce the ability of the sensor switch to detect occupants.
- The ultrasonic performance can be affected by air currents and moving objects. Consider the effects of fans, HVAC vents, open windows, or moving objects when installing the sensor switch.
- If the sensor sees a specific area that is not desired (e.g., hallway), Lutron offers a lens mask kit (Lutron P/N 50013614) that can be ordered through Customer Support (1.844.LUTRON1). Alternatively, selectively placing opaque tape (e.g., painter's tape, electrical tape, masking tape) over certain parts of the lens can limit its field of vision to block undesired detection areas. Masking the lens may effect ALD performance, but DOES NOT block ultrasonic frequencies.

Definitions

Major motion: movement of a person entering or passing through an area.

Minor motion: movement of a person occupying an area and engaging in small activities (e.g., reaching for a telephone, turning the pages of a book, opening a file folder, picking up a coffee cup).

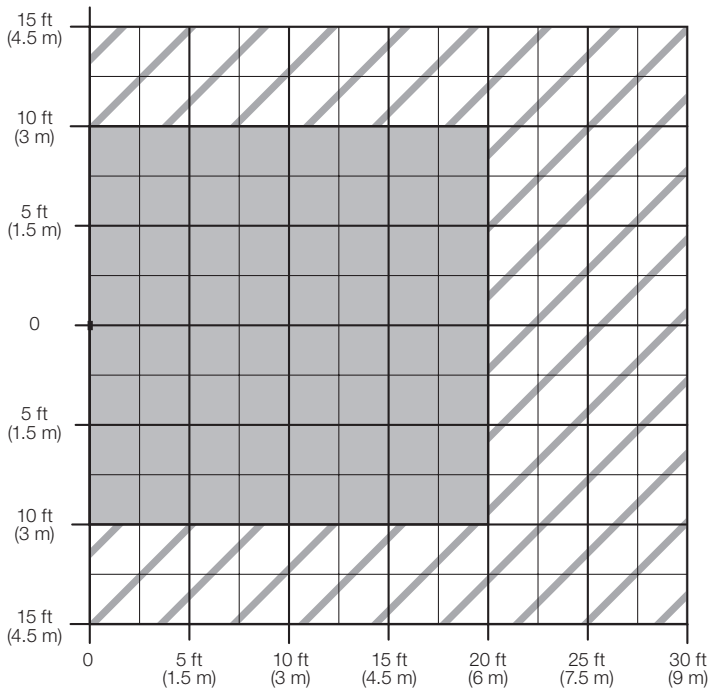
Fine Motion: movement of a person occupying an area and engaging in very small activities (e.g., reading a magazine).

Very Fine Motion: movement of a person occupying an area and engaging in very small activities (e.g., typing on a keyboard).

Job Name:	Model Numbers:	
Job Number:		

Sensor switch placement *(continued)*

NEMA WD7 Coverage

Major motion coverage: 900 ft² (81 m²)Minor motion coverage: 400 ft² (36 m²)

Test Room Dimensions: 37 ft x 38 ft (11.28 m x 11.6 m)

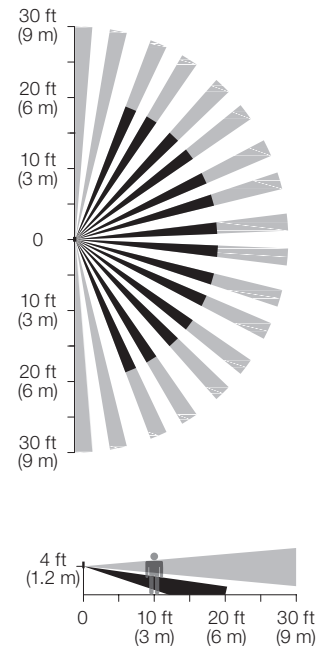
Test Floor Surface Material: Carpet

Sensor Coverage Angle: 180 °

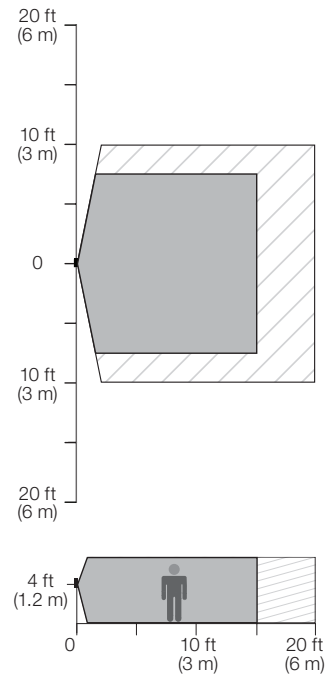
Major motion coverage: Initial trigger motion detection

Minor motion coverage: Maintained motion detection

Passive Infrared Beam Diagram (For Reference Only)



Ultrasonic Coverage (For Reference Only)



Ultrasonic Frequency: 40 kHz

Job Name:

Model Numbers:

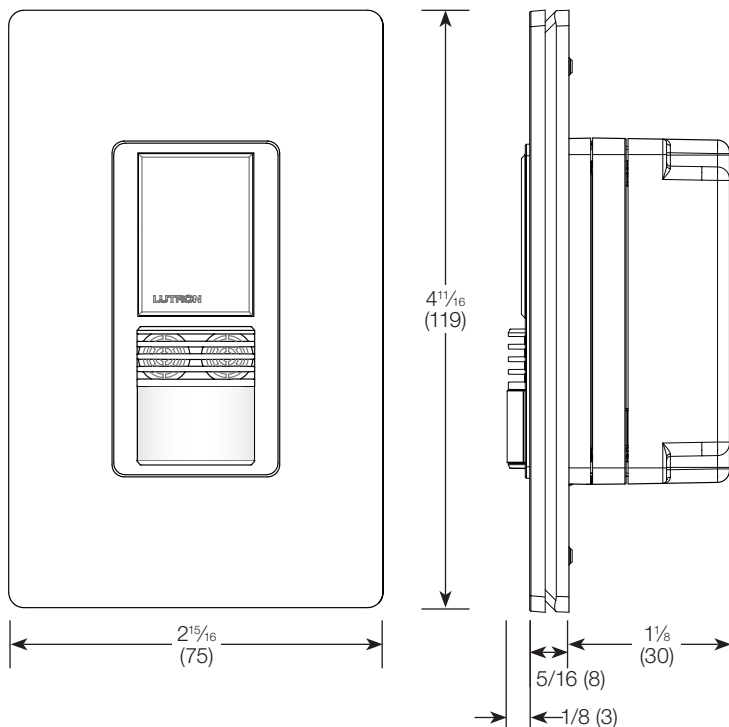
Job Number:

Dimensions - single-circuit MS-A102, MS-A102-V, MS-B102, MS-B102-V

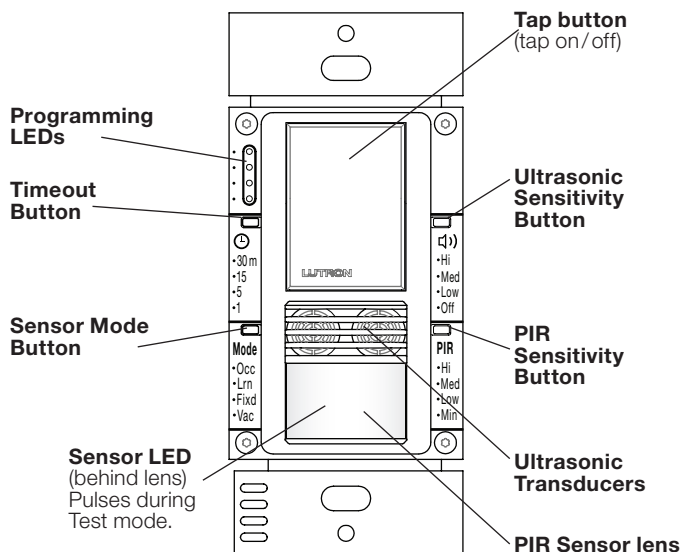
Measurements shown as: in (mm).

Front View

Side View



Operation

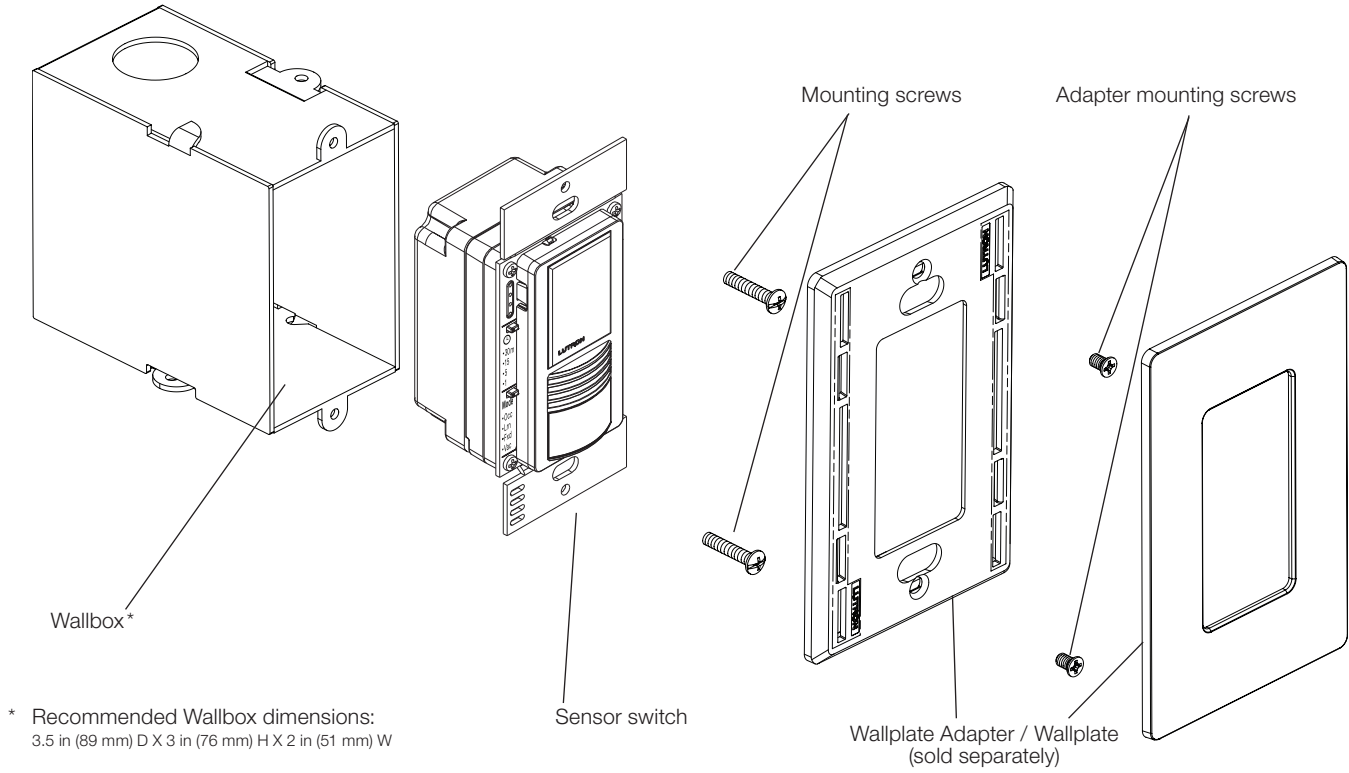


Job Name:

Model Numbers:

Job Number:

Mounting



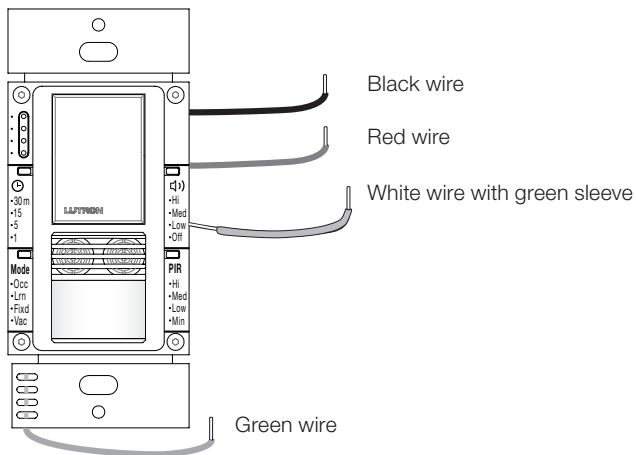
Job Name:

Model Numbers:

Job Number:

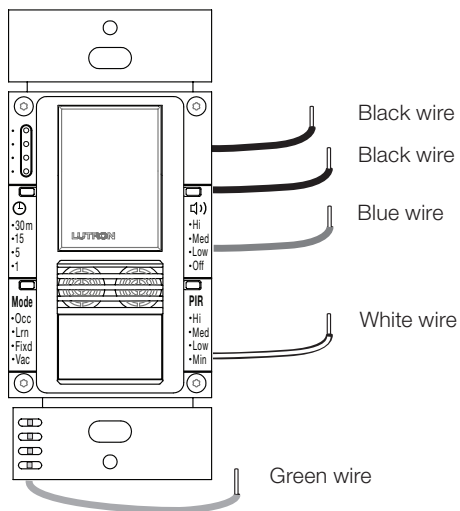
Wiring Installations with the Maestro Dual Technology Sensor Switch A102

In order to function, the dual technology sensor switch must have a ground or neutral wire connected. Connect green-sleeved wire to ground only in retrofit and replacement applications. When a neutral connection is available, remove green sleeve and connect white wire to neutral. Before installing wallplate, program all desired settings.



Wiring Installations with the Maestro Dual Technology Sensor Switch B102

Before installing wallplate, program all desired settings.



Job Name:

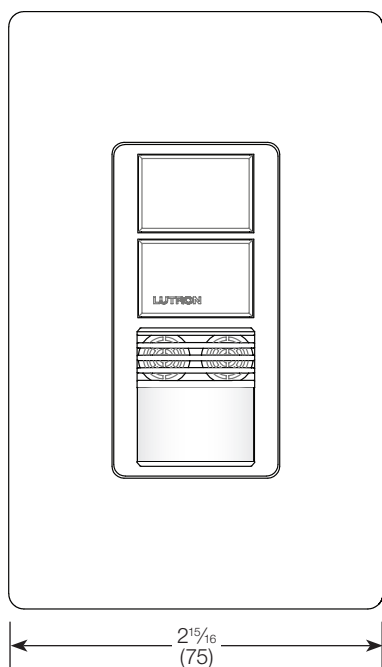
Model Numbers:

Job Number:

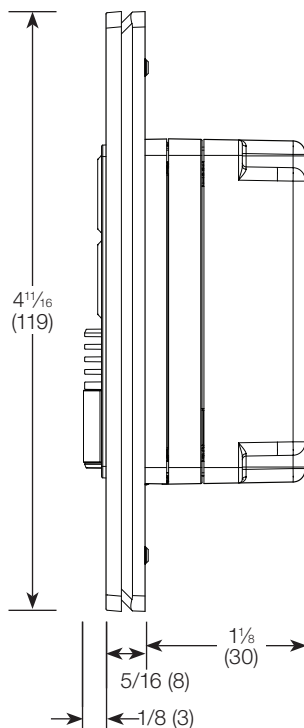
Dimensions - dual-circuit MS-A202, MS-B202

Measurements shown as: in (mm).

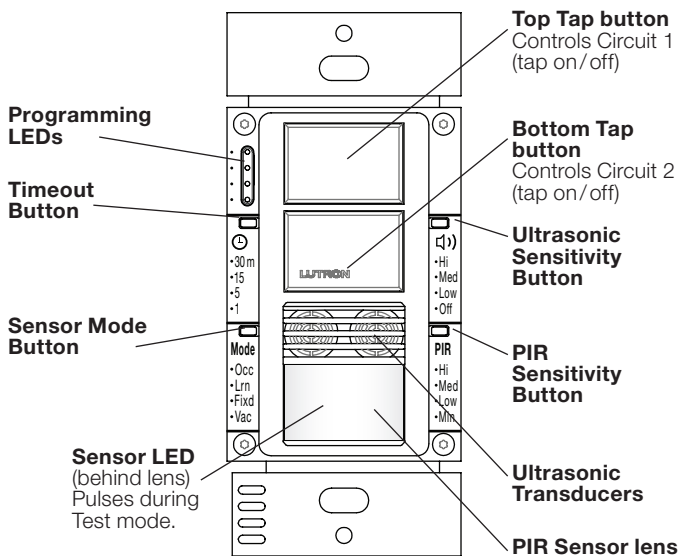
Front View



Side View



Operation

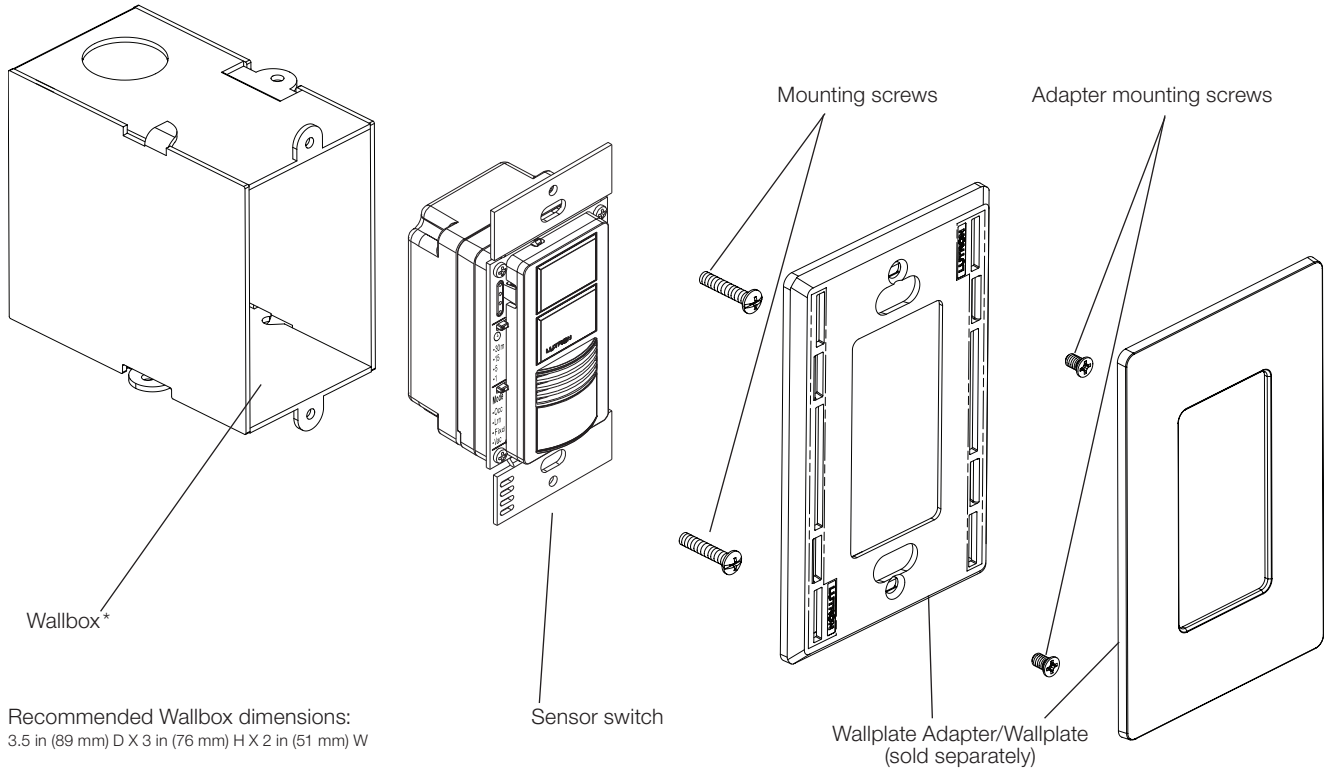


Job Name:

Model Numbers:

Job Number:

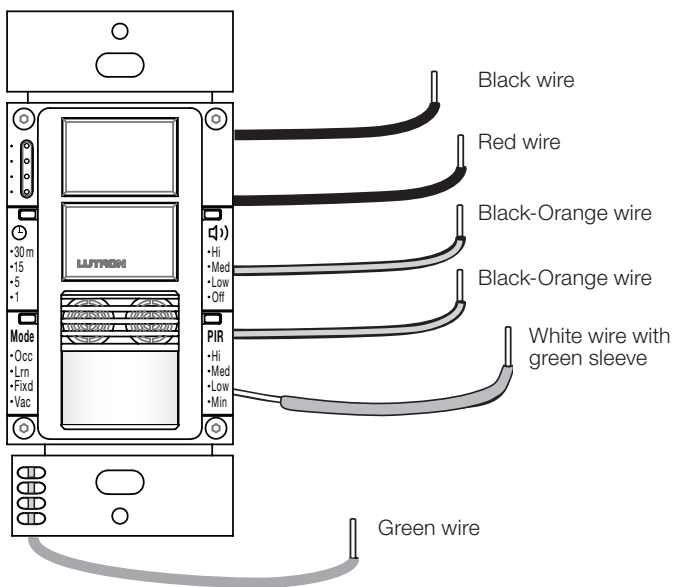
Mounting



Job Name:	Model Numbers:		
Job Number:			

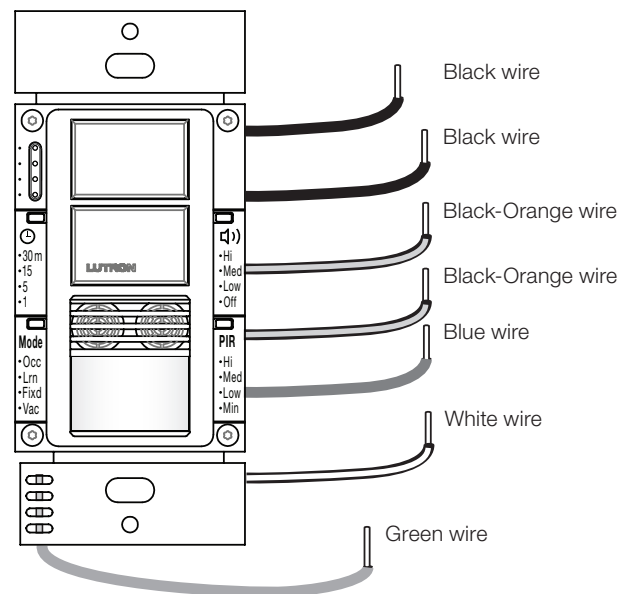
Wiring Installations with the Maestro Dual Technology Sensor Switch A202

In order to function, the dual technology sensor switch must have a ground or neutral wire connected. Connect green-sleeved wire to ground only in retrofit and replacement applications. When a neutral connection is available, remove green sleeve and connect white wire to neutral. Before installing wallplate, program all desired settings.



Wiring Installations with the Maestro Dual Technology Sensor Switch B202

Before installing wallplate, program all desired settings.

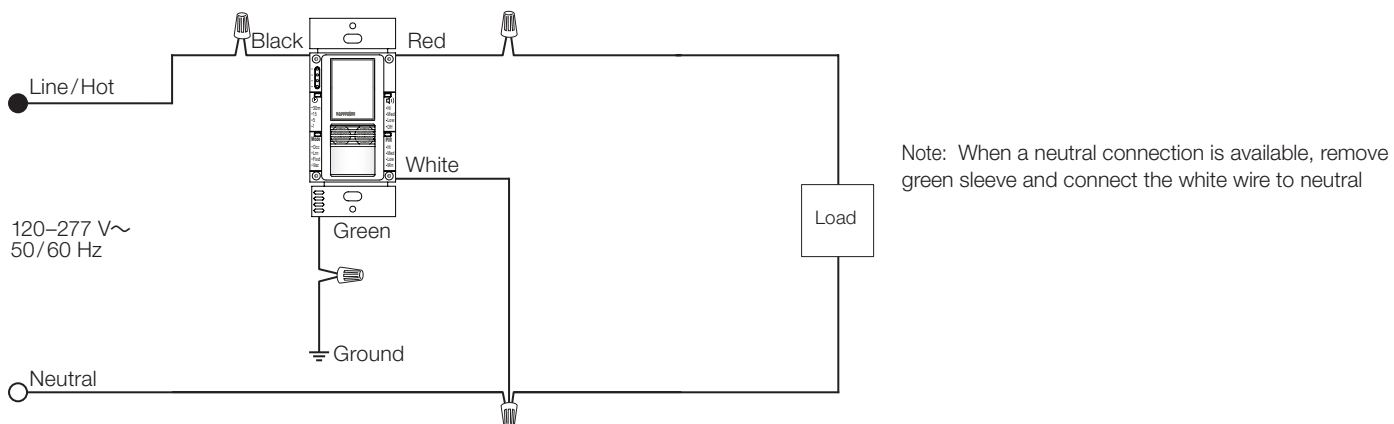


Job Name:	Model Numbers:	
Job Number:		

Wiring Diagrams - Single-Circuit

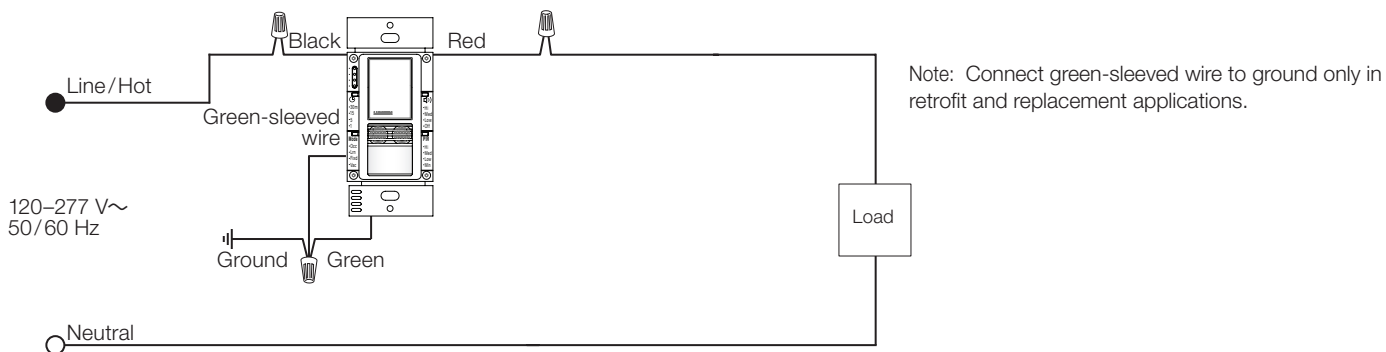
Wiring Diagram 1

Single pole wiring - single-circuit (MS-A102, MS-A102-V) with neutral



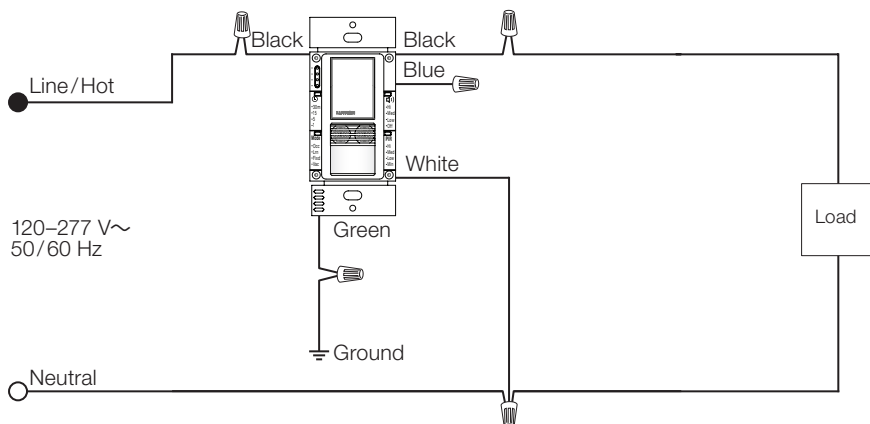
Wiring Diagram 2

Single pole wiring - single-circuit (MS-A102, MS-A102-V) without neutral



Wiring Diagram 3

Single pole wiring - single-circuit (MS-B102, MS-B102-V)



continued on next page...

Job Name:

Model Numbers:

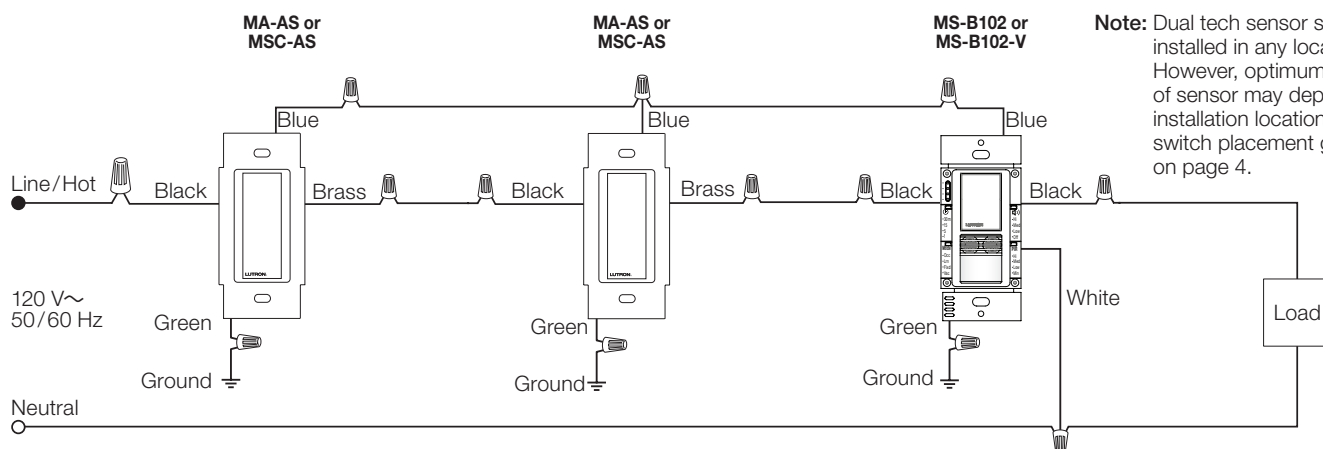
Job Number:

Wiring Diagrams - Single-Circuit *(continued)*

369773h 13 02.12.21

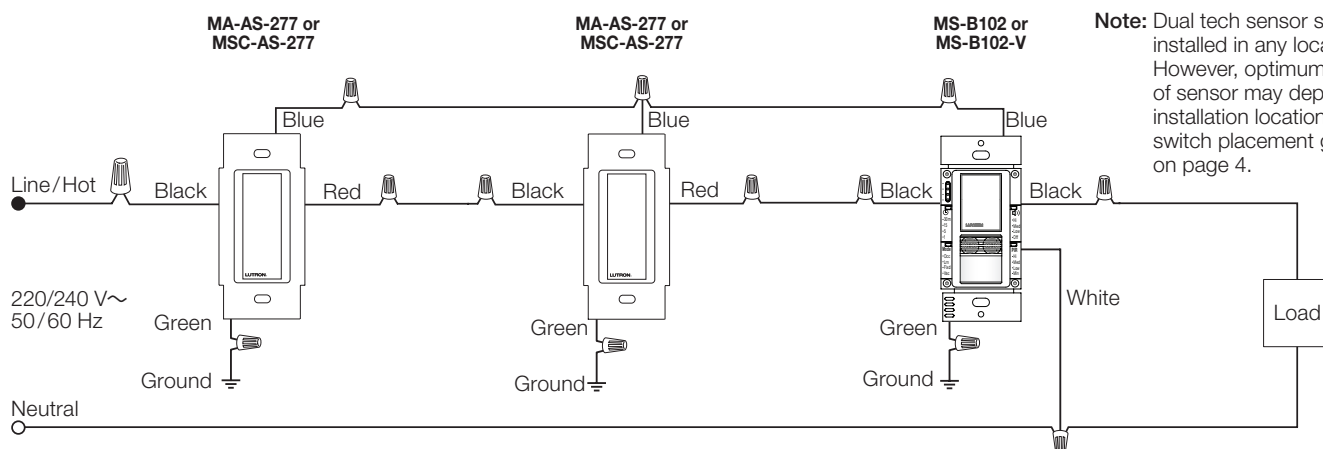
Wiring Diagram 4

120 V~ Multi-location installation with Maestro accessory switches (MS-B102, MS-B102-V)



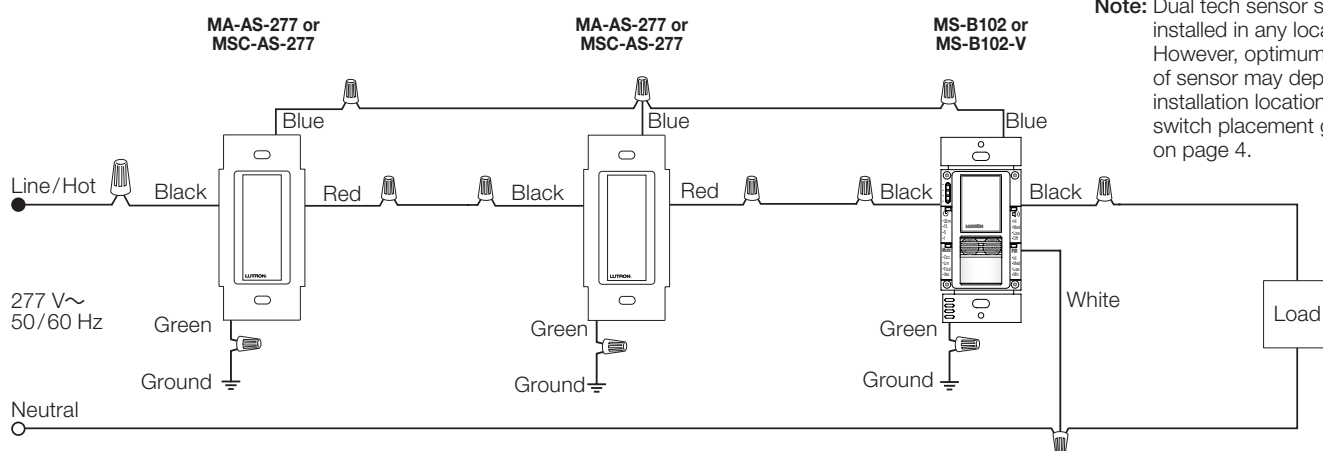
Wiring Diagram 5

220/240 V~ Multi-location installation with Maestro accessory switches (MS-B102, MS-B102-V)



Wiring Diagram 6

277 V~ Multi-location installation with Maestro accessory switches (MS-B102, MS-B102-V)



Job Name:

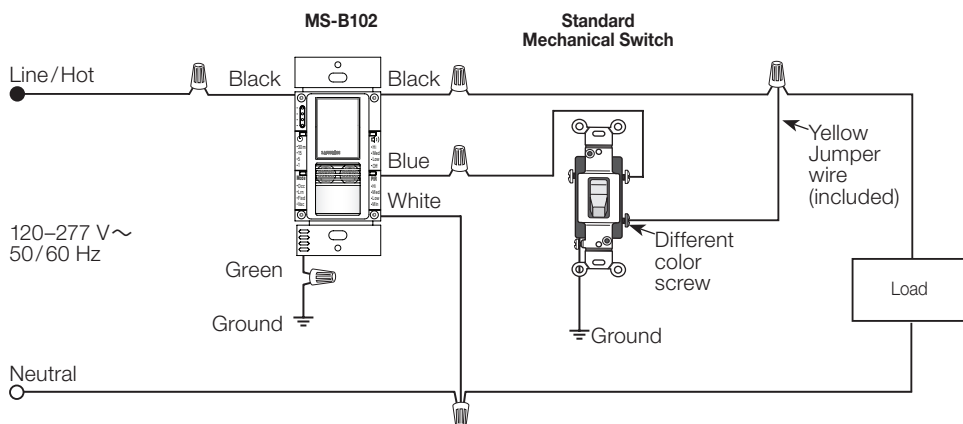
Model Numbers:

Job Number:

Wiring Diagrams - Single-Circuit *(continued)*

Wiring Diagram 7

3-way installation - single-circuit (MS-B102, MS-B102-V)

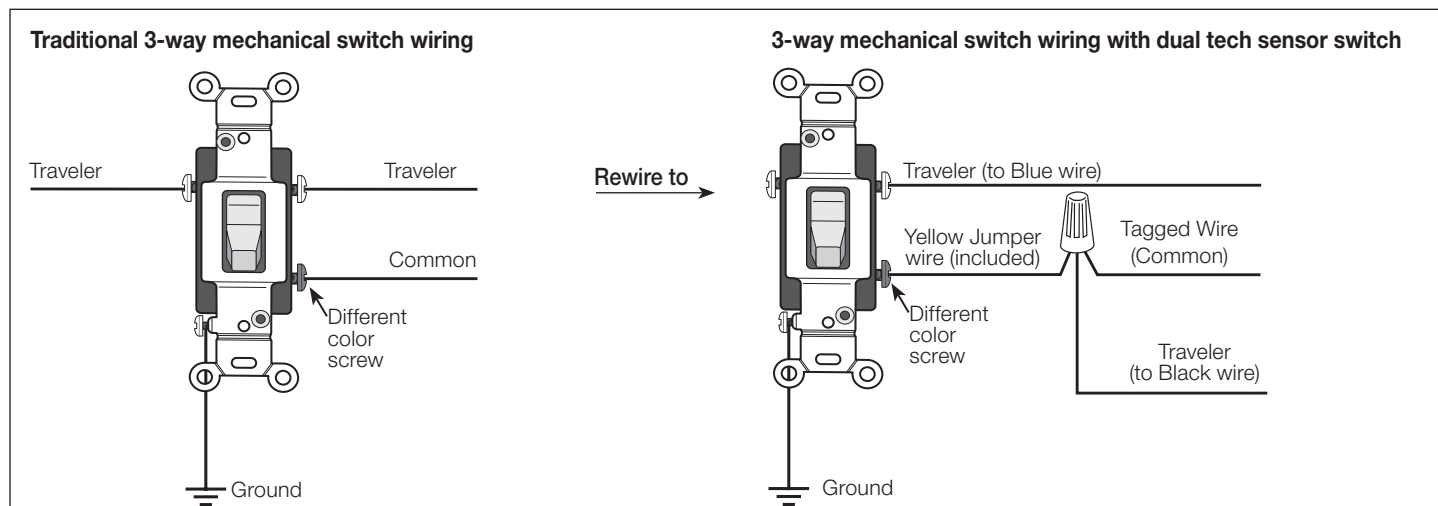


Note: Dual tech sensor switch can be installed in any location. However, optimum performance of sensor may depend upon installation location, see sensor switch placement guidelines on page 4.

3-way installation

For retrofit 3-way installations the mechanical switch needs to be rewired as shown in the diagram below after wiring the dual tech sensor switch. Otherwise the 3-way installation will not work as expected. Single pole mechanical switches may also be used in a 3-way installation with MS-B102, MS-B102-V and MS-B202 models.

1. Connect Ground: Ensure the bare copper or green ground wire from the wallbox is connected to the green ground screw of the mechanical switch.
2. Tag circuit Common: Your 3-way mechanical switch should have three screw terminals, two of the same color, and one of a different color. Tag the wire that is connected to the screw terminal of a different color.
3. Identify the wire that matches the color of the wire you connected to the blue wire of the Maestro dual technology occupancy sensor switch. Connect this wire to one of the two terminals of the same color.
4. Combine the tagged wire, the remaining wire and yellow jumper wire (included) using a wire connector. Connect the other end of jumper wire to the different color screw.



Job Name:

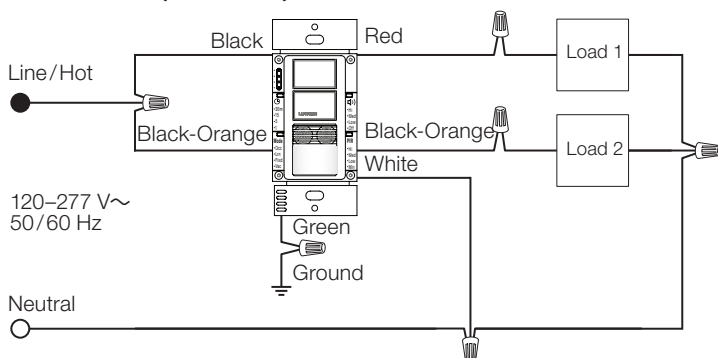
Model Numbers:

Job Number:

Wiring Diagrams - Dual-Circuit

Wiring Diagram 1

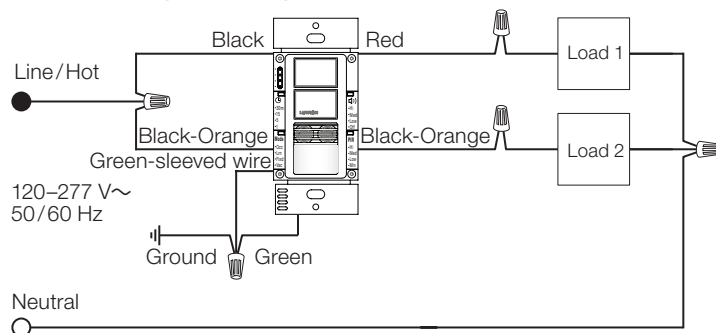
Single pole, single breaker feed wiring - dual-circuit (MS-A202) with neutral



Note: When a neutral connection is available, remove green sleeve and connect the white wire to neutral.

Wiring Diagram 2

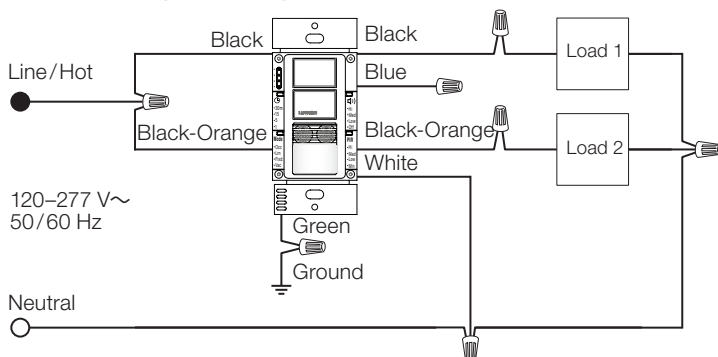
Single pole, single breaker feed wiring - dual-circuit (MS-A202) without neutral



Note: Connect green-sleeved wire to ground only in retrofit and replacement applications.

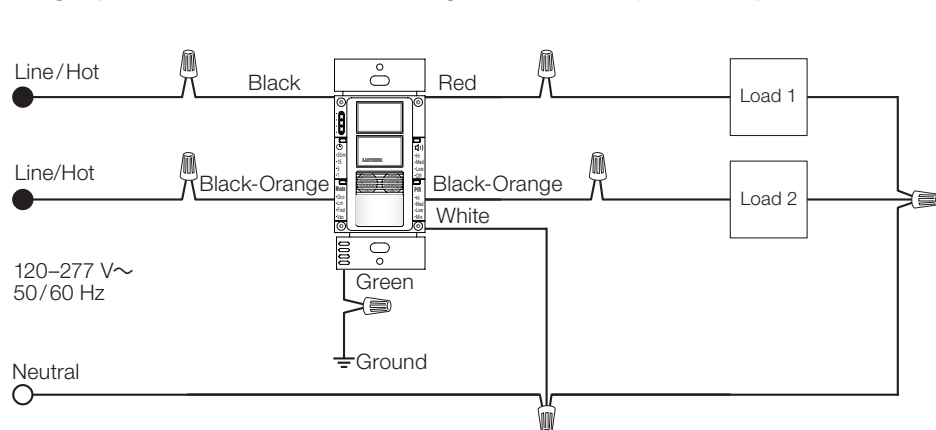
Wiring Diagram 3

Single pole, single breaker feed wiring - dual-circuit (MS-B202)



Wiring Diagram 4

Single pole, two breaker feed wiring - dual-circuit (MS-A202) with neutral



Note: When a neutral connection is available, remove green sleeve and connect the white wire to neutral.

Wiring must comply with NEC® code for wiring multiple branch circuits. Where two or more branch circuits supply devices or equipment on the same yoke, a means to simultaneously disconnect the ungrounded conductors supplying those devices shall be provided at the point at which the branch circuits originate.

continued on next page...

Job Name:

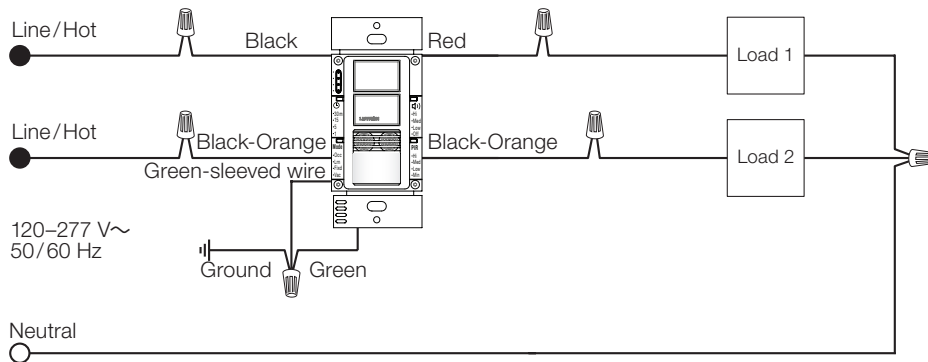
Model Numbers:

Job Number:

Wiring Diagrams - Dual-Circuit *(continued)*

Wiring Diagram 5

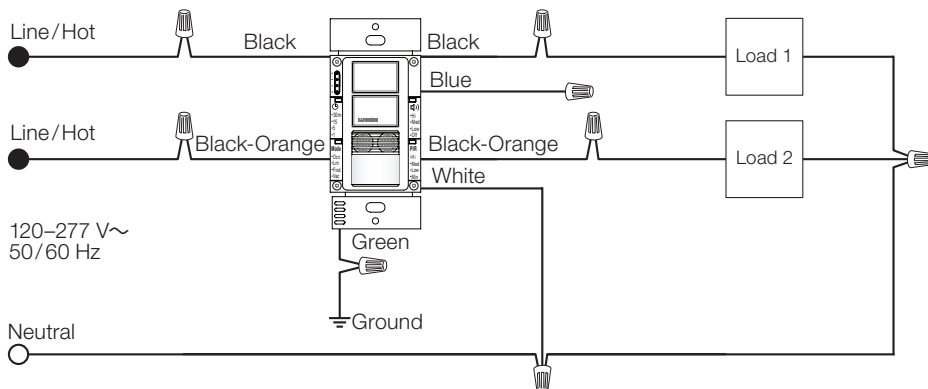
Single pole, two breaker feed wiring - dual-circuit (MS-A202) without neutral



Note: Connect green-sleeved wire to ground only in retrofit and replacement applications.

Wiring Diagram 6

Single pole, two breaker feed wiring - dual-circuit (MS-B202)



Wiring must comply with NEC® code for wiring multiple branch circuits. Where two or more branch circuits supply devices or equipment on the same yoke, a means to simultaneously disconnect the ungrounded conductors supplying those devices shall be provided at the point at which the branch circuits originate.

Job Name:

Model Numbers:

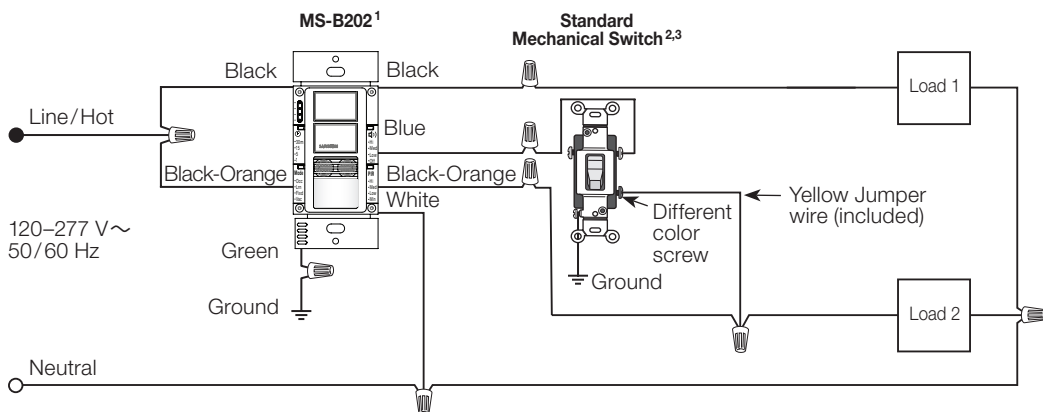
Job Number:

Wiring Diagrams - Dual-Circuit (continued)

Wiring Diagram 7

3-way installation, single breaker feed wiring: dual-circuit (MS-B202)

NOTE: Do not use Maestro accessory switches with MS-B202.

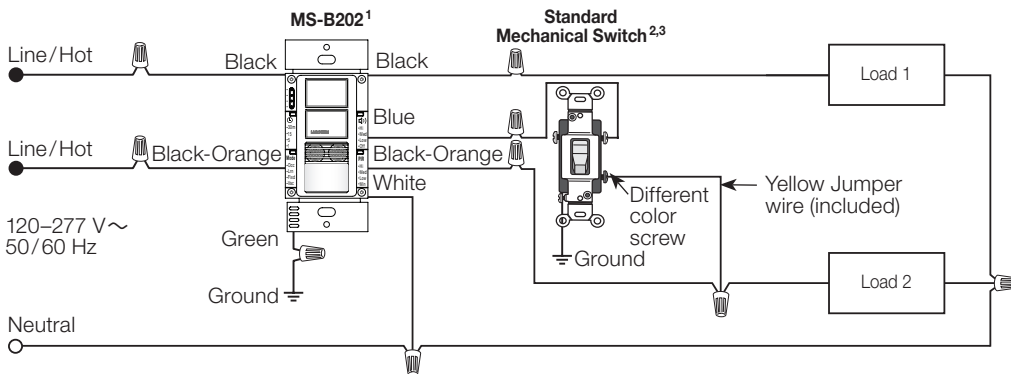


Note: Optimum performance of sensor may depend upon installation location, see sensor switch placement guidelines on page 4.

Wiring Diagram 8

3-way installation, two breaker feed wiring: dual-circuit (MS-B202)

Wiring must comply with NEC® code for wiring multiple branch circuits. Where two or more branch circuits supply devices or equipment on the same yoke, a means to simultaneously disconnect the ungrounded conductors supplying those devices shall be provided at the point at which the branch circuits originate.



Note: Do not use Maestro accessory switches with MS-B202.

Note: Optimum performance of sensor may depend upon installation location, see sensor switch placement guidelines on page 4.

¹ Dual tech sensor switch can be installed in any location.

² Mechanical switch may be wired to **either** circuit, and will control both. **Do NOT** wire mechanical switch to **both** circuits.

³ You may use no more than one mechanical switch with a dual-circuit dual tech sensor switch.

Job Name:

Model Numbers:

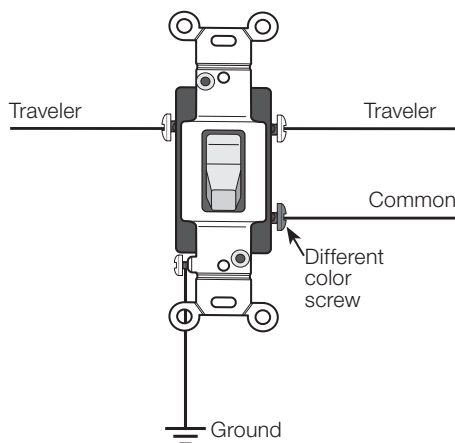
Job Number:

3-way installation

For retrofit 3-way installations the mechanical switch needs to be rewired as shown in the diagram below after wiring the dual tech sensor switch. Otherwise the 3-way installation will not work as expected. Single-pole mechanical switches may also be used in a 3-way with MS-B102, MS-B102-V and MS-B202 models.

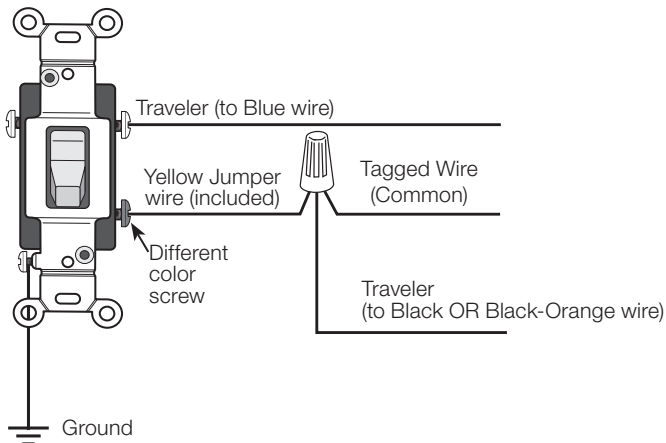
1. Connect Ground: Ensure the bare copper or green ground wire from the wallbox is connected to the green ground screw of the mechanical switch.
2. Tag circuit Common: Your 3-way mechanical switch should have three screw terminals, two of the same color, and one of a different color. Tag the wire that is connected to the screw terminal of a different color.
3. Identify the wire that matches the color of the wire you connected to the blue wire of the Maestro dual technology occupancy sensor switch. Connect this wire to one of the two terminals of the same color.
4. Combine the tagged wire, the remaining wire and yellow jumper wire (included) using a wire connector. Connect the other end of jumper wire to the different color screw.

Traditional 3-way mechanical switch wiring



Rewire to

3-way mechanical switch wiring with dual tech sensor switch



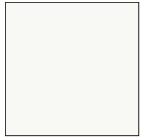
How loads operate in 3-way with dual-circuit sensor switch (MS-B202)

	Initial Load State		After flipping 3-way mechanical switch	
	Circuit 1	Circuit 2	Circuit 1	Circuit 2
When All Lights are OFF	Off	Off	On	On
When All Lights are ON	On	On	Off	Off
When One Circuit is ON	On	Off	Off	Off
	Off	On	Off	Off

Job Name:	Model Numbers:	
Job Number:		

Colors and Finishes

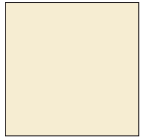
Gloss Finishes



White
WH



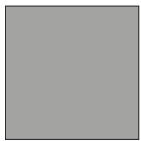
Ivory
IV



Almond
AL



Light Almond
LA



Gray
GR

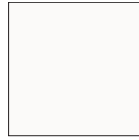


Brown
BR



Black
BL

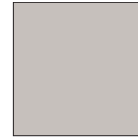
Satin Finishes



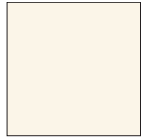
Snow
SW



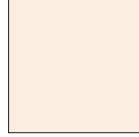
Midnight
MN



Taupe
TP



Biscuit
BI



Eggshell
ES



Palladium
PD



Hot
HT



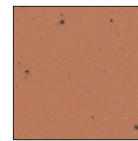
Merlot
MR



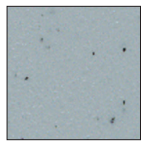
Plum
PL



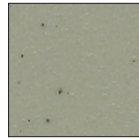
Sienna
SI



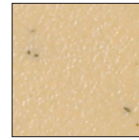
Terracotta
TC



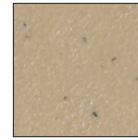
Bluestone
BG



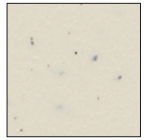
Greenbriar
GB



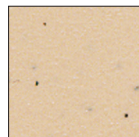
Goldstone
GS



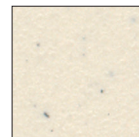
Mocha Stone
MS



Stone
ST



Desert Stone
DS



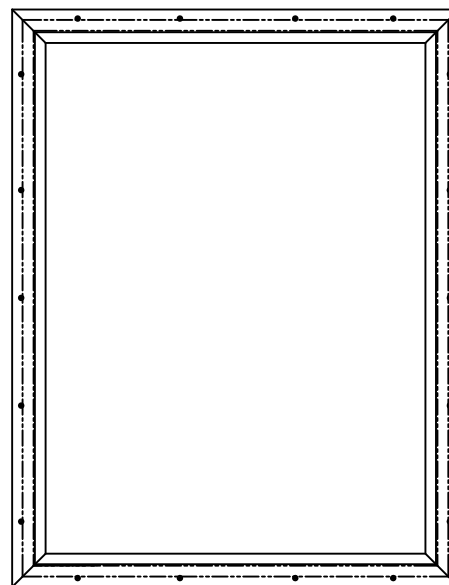
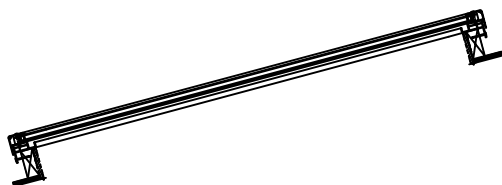
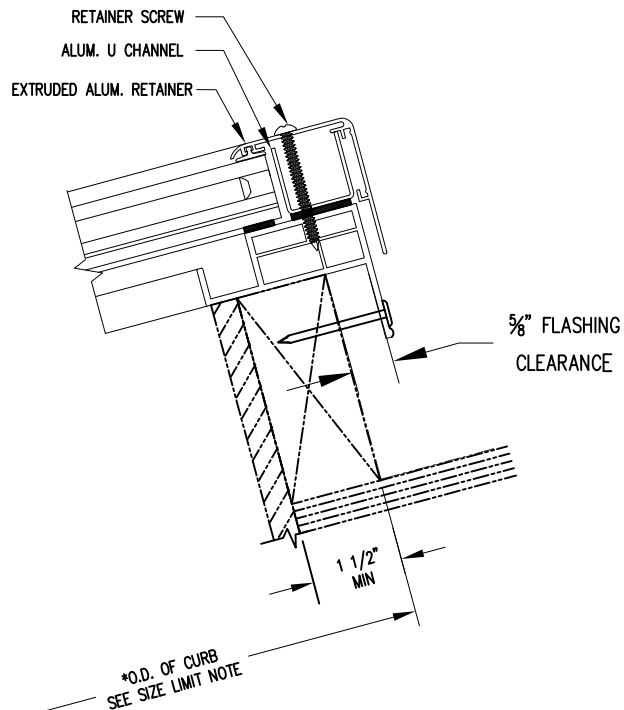
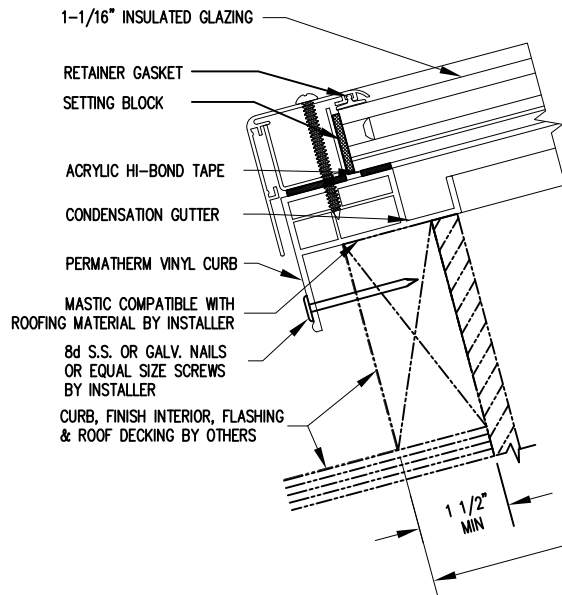
Limestone
LS

- Due to printing limitations, colors and finishes shown cannot be guaranteed to match actual product colors perfectly.
- Color chip keychains are available for more precise color matching:
Gloss Finishes: DG-CK-1
Satin Finishes: SC-CK-1

For the latest color offerings please see our website:
<http://www.lutron.com/satincolors>

The Lutron logo, Lutron, Maestro, XCT, and C•L are trademarks or registered trademarks of Lutron Electronics Co., Inc. in the US and/or other countries.
All other product names, logos, and brands are property of their respective owners.

Job Name: 	Model Numbers: 	
Job Number: 		



ORDER #: _____ DATE: _____

PROJECT: _____

LOCATION: _____

CUSTOMER: _____

APPROVED: _____ DATE: _____

MODEL	O.D.CURB	QUANTITY
GSM 5252	49 1/4" X 49 1/4"	
GSM 5276	49 1/4" X 72 1/2"	
GSM 5296	49 1/4" X 92 1/2"	
GSM 6060	58" X 58"	
CUSTOM		
CUSTOM		

SIZE LIMITS:
 LIMITED TO RECTANGULAR UNITS ONLY
 UNIT NOT TO EXCEED 32SF BASED ON THE OUTSIDE CURB DIMENSIONS.
 MAX. OCD. = 10'0" / MIN. OCD. = 25"
 PITCH OF GLASS ON SKYLIGHT: 1/4"/FT MIN

CURB FINISH: PVC: WHITE INTERIOR/BRONZE EXTERIOR
 RETAINER FINISH: BRONZE PAINT (STANDARD)

☐ OTHER _____

1 1/16" INSULATING GLASS SPECIFICATION
 STANDARD MAKEUP:
 SOLARBAN 70XL (#2)/3/8" ARGON/7/16" CLEAR HS LAMIMATED

CUSTOM

1/4" OUTER LAYER _____

3/8" SPACE FILL ☐ AIR ☐ ARGON

7/16" INNER LAYER _____

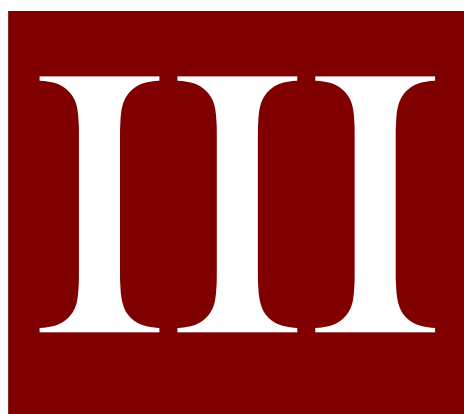
SKYMAX CURB MOUNT GLASS UNIT

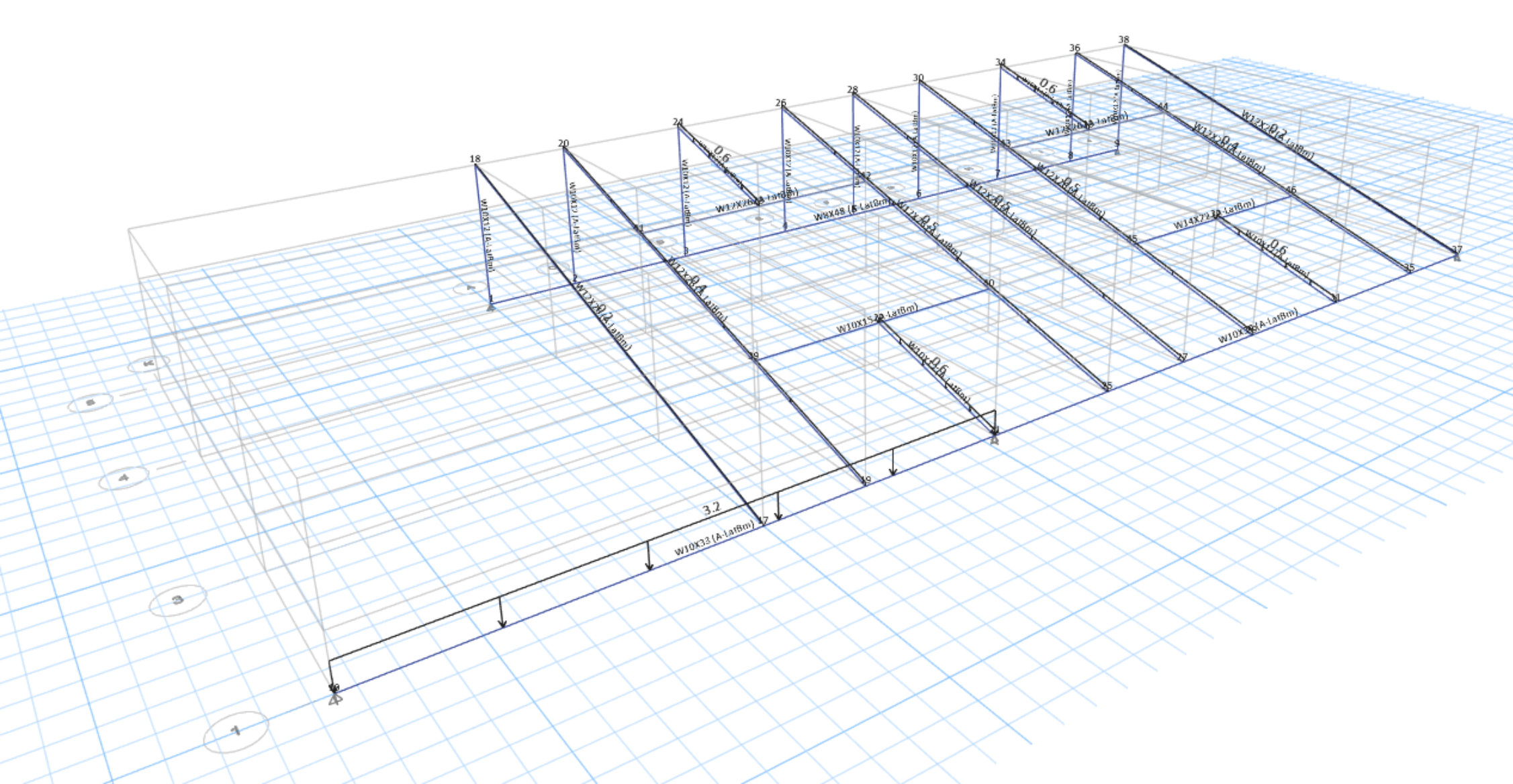


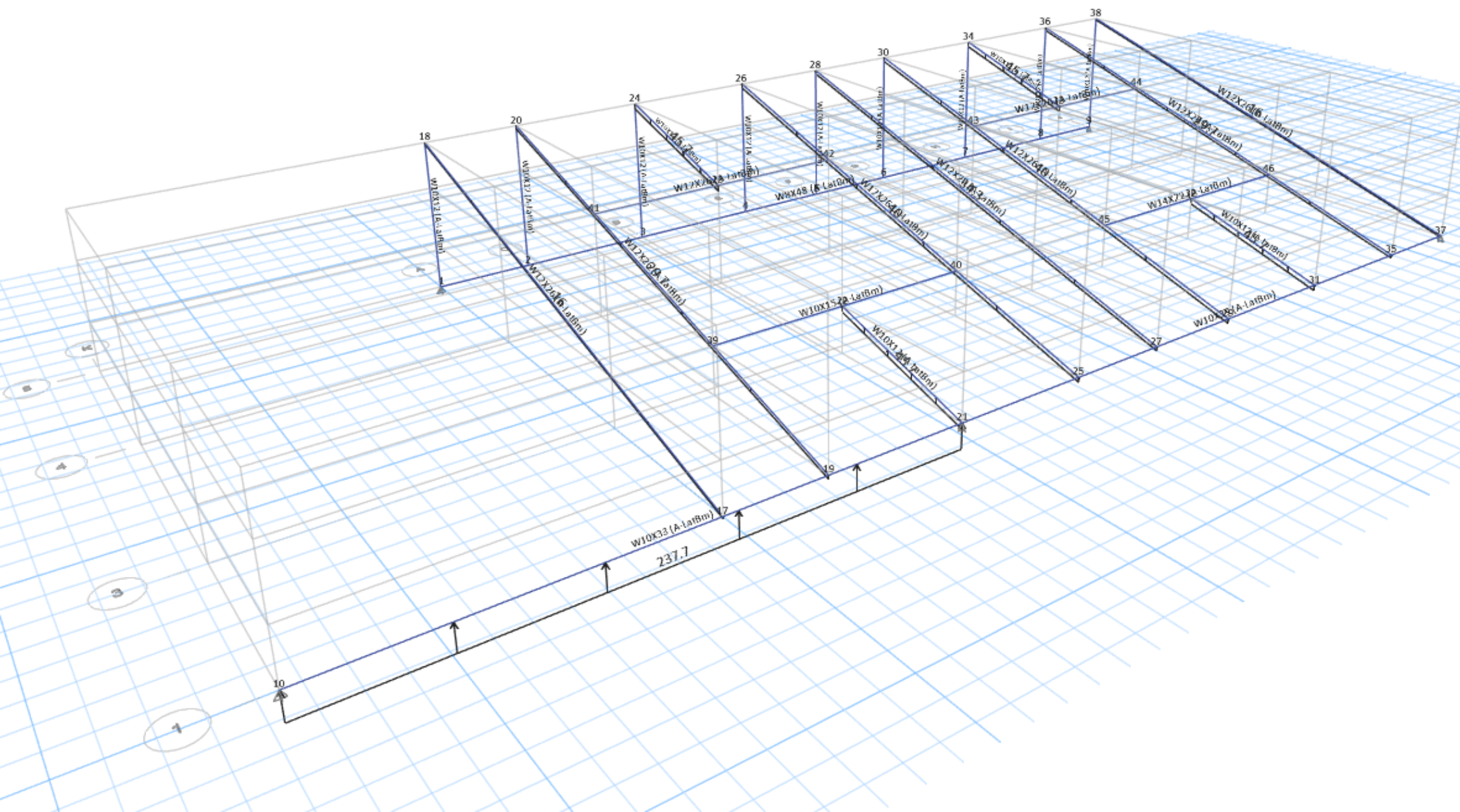
85 Spencer Drive, Unit A
 Wells, ME 04090
 1-800-88-VELUX
 veluxusa.com

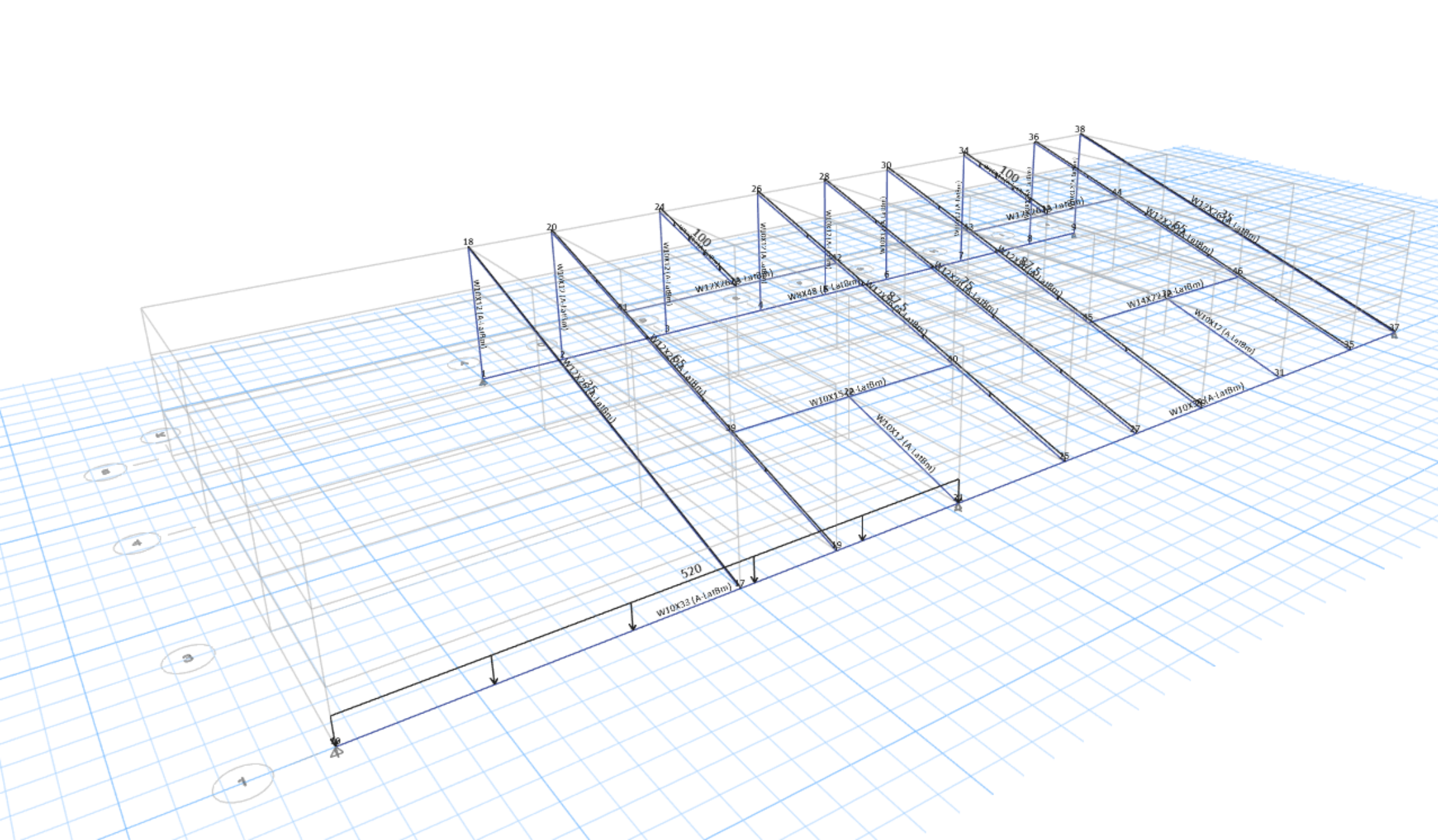
LOAD (W)	PF	LOAD (A)	CIRCUIT	ZONE	FIXTURE COUNTS	CIRCUIT WATTS	CIRCUIT AMPS
174	0.9	0.930175434					
306	0.9	1.635825763	C1 (2317)	Z11a, Z11b	14 C7, 11 C5, 2 C6	441	2.357513599
84	0.9	0.449050209	C2 (2314)	Z11c	9 C7, 1 C5, 4 C6	190	1.015708807
66	0.9	0.352825165	C3 (2314)	Z11d	9 C7, 1 C5, 4 C6	190	1.015708807
529	0.9	2.827947152	C4 (2314, L2-C-13)	Z11e, Z11f	3 C1, 9 C2, 3 C3, 3 C4, 10 C5, 4 C6	928	4.960935646
238	0.9	1.272308927				CHECK	9.349866859
363	0.9	1.940538405					
1760		9.408671053					

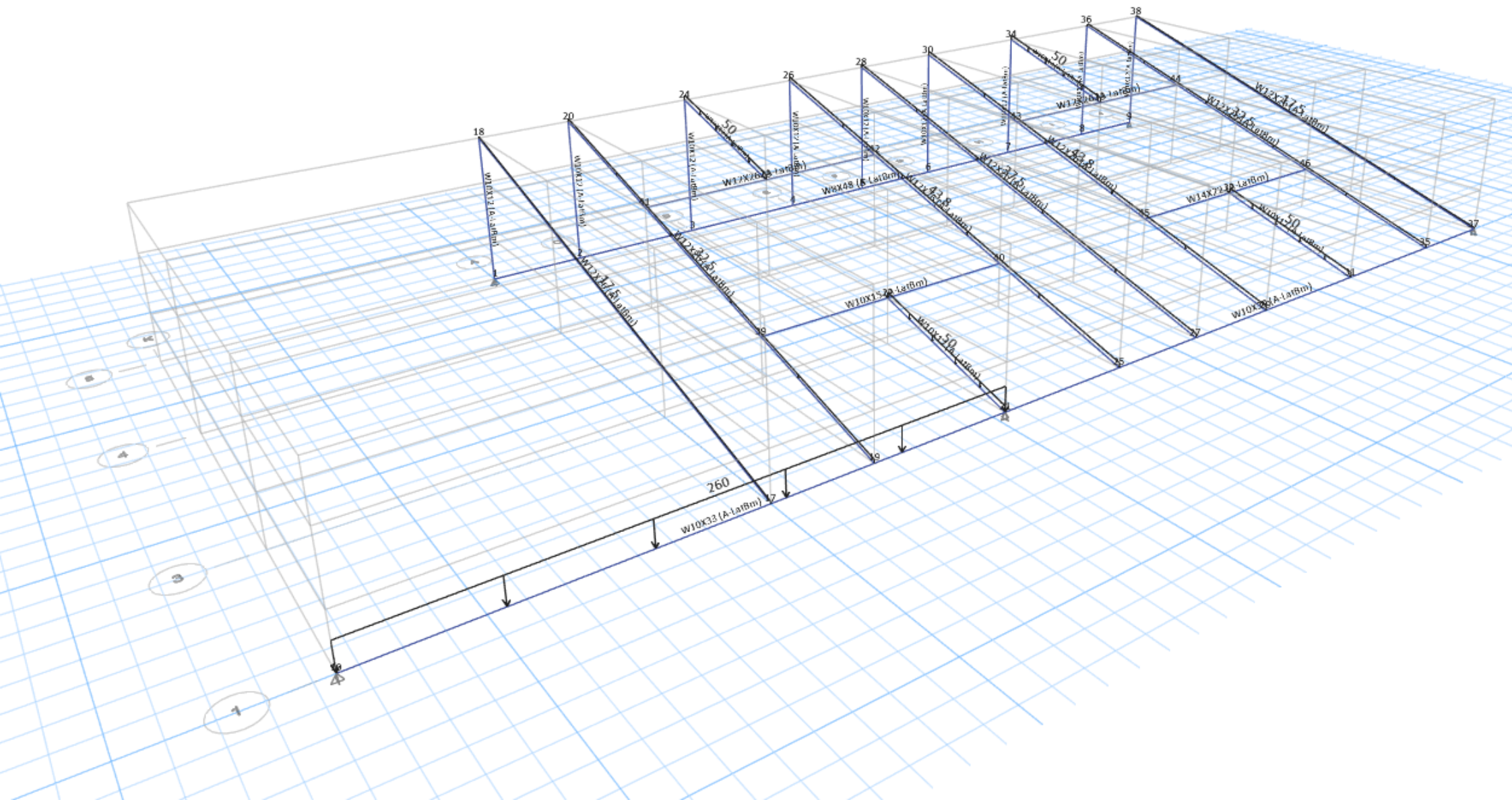
APPENDIX

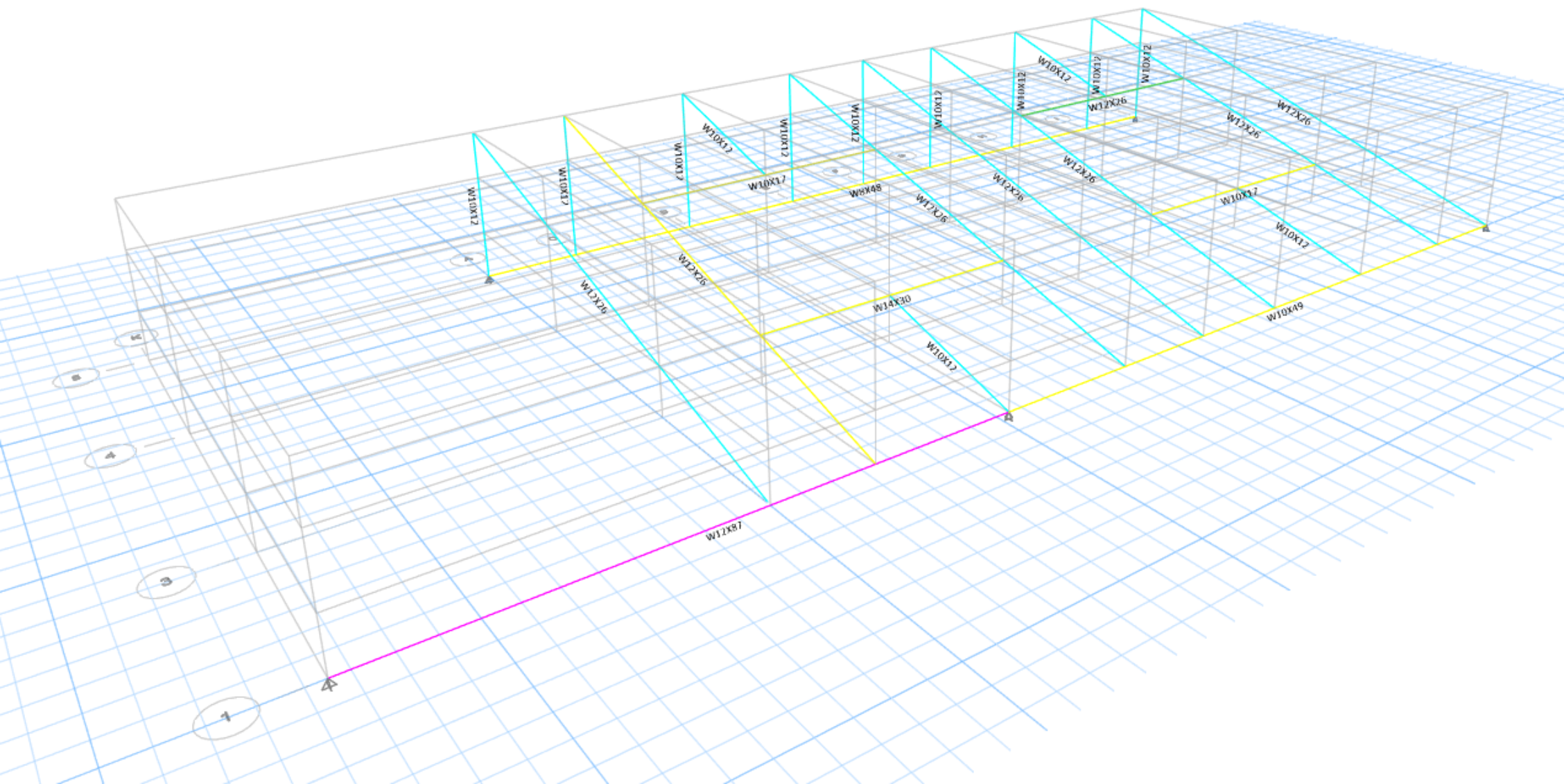












$$q_z = 0.00256 K_z K_{zt} K_d V^2$$

$$= 10.69 \text{ PSF (wind pressure)}$$

$$\frac{15.8}{19.5} = \frac{h}{L} = 0.81$$

Figure 27.4-1

Normal
to
ridge
for $\theta \leq 10^\circ$

(standard)
0.85

$$P = q G C_p - q_i (G C_{pi}) \text{ lb/ft}^2$$

$$= \frac{10.69 (0.85)}{0.18} (C_p - C_{pi})$$

$$\begin{aligned} & (-0.826 - 0.18) \uparrow \\ & (-0.16632 + 0.18) \downarrow \end{aligned}$$

Uplift
Downlift

$$9.0865 \cdot (-1.006) = 9.141 (-) \text{ uplift}$$

$$9.0865 \cdot (0.01368) = 0.1243 \text{ downlift}$$

$$3 - 1.2D + 1.6S + 0.5W_D$$

$$(x2) 4 - 1.2D + 1.0W_{u,D} + 0.5S$$

$$\text{combo } 6 - \text{uplift only } (0.9D + 1.0W_u)$$

26'

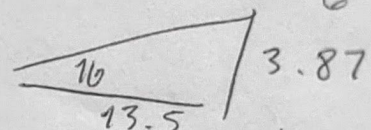
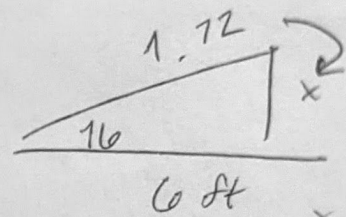
for trib width

C_p 's

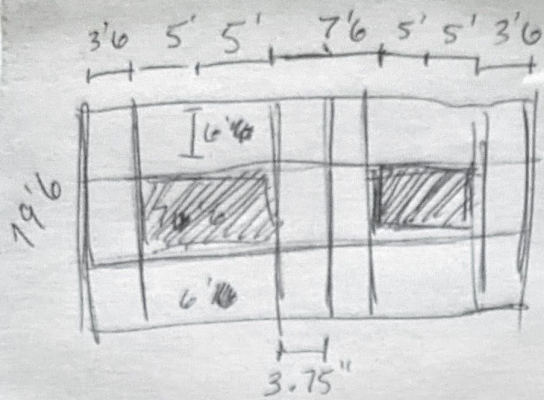
$$-0.826$$

$$-0.16632$$

0.417



2 load
cases



20 LI
LIVE

ROOF - 20 PSF

$$K_z = 2.01$$

$$(Z/Z_g)^{2/\alpha}$$

$$15.8' \uparrow 7.0$$

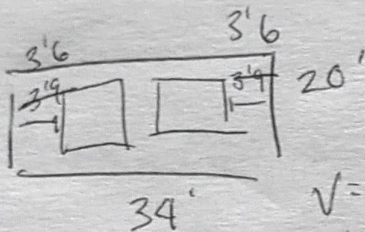
$$1200$$

SNOW
FLAT ROOF - 16.5 PSF

WIND
120 MPH
exposure cat: B

internal pressure
Coeff:
±0.18 A

14UCS3 ASCE 710 (IBC 2012)



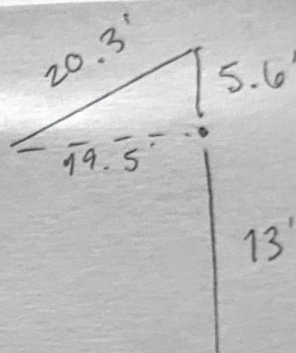
$$g_z = 0.00256 K_z K_{zt} K_d V^2$$

$$K_d = 0.5$$

$$K_z = 0.58$$

$$K_{zt} = 1 \text{ (flat roof)}$$

$$V = 120 \text{ mph}$$



mean = 15.8
roof height

APPENDIX



Citations / references

Tool authors for MAE Daylighting / Computer Optimization Depth

Design Space Exploration / Radical: Digital Structures at MIT

Check it out here: <https://www.food4rhino.com/app/design-space-exploration>

Galapagos: David Rutten, architecture & urbanism graduate from TU Delft

Read his paper here:

https://www.researchgate.net/publication/264299633_Galapagos_On_the_Logics_and_Limitations_of_Generic_Solvers

Drawings, specifications, and photographs

Lam Partners, Inc.

Glave and Holmes Architecture

Christopher Newport University

All other images used in renderings and report were either created by the student or within the public domain / available for non-commercial use.