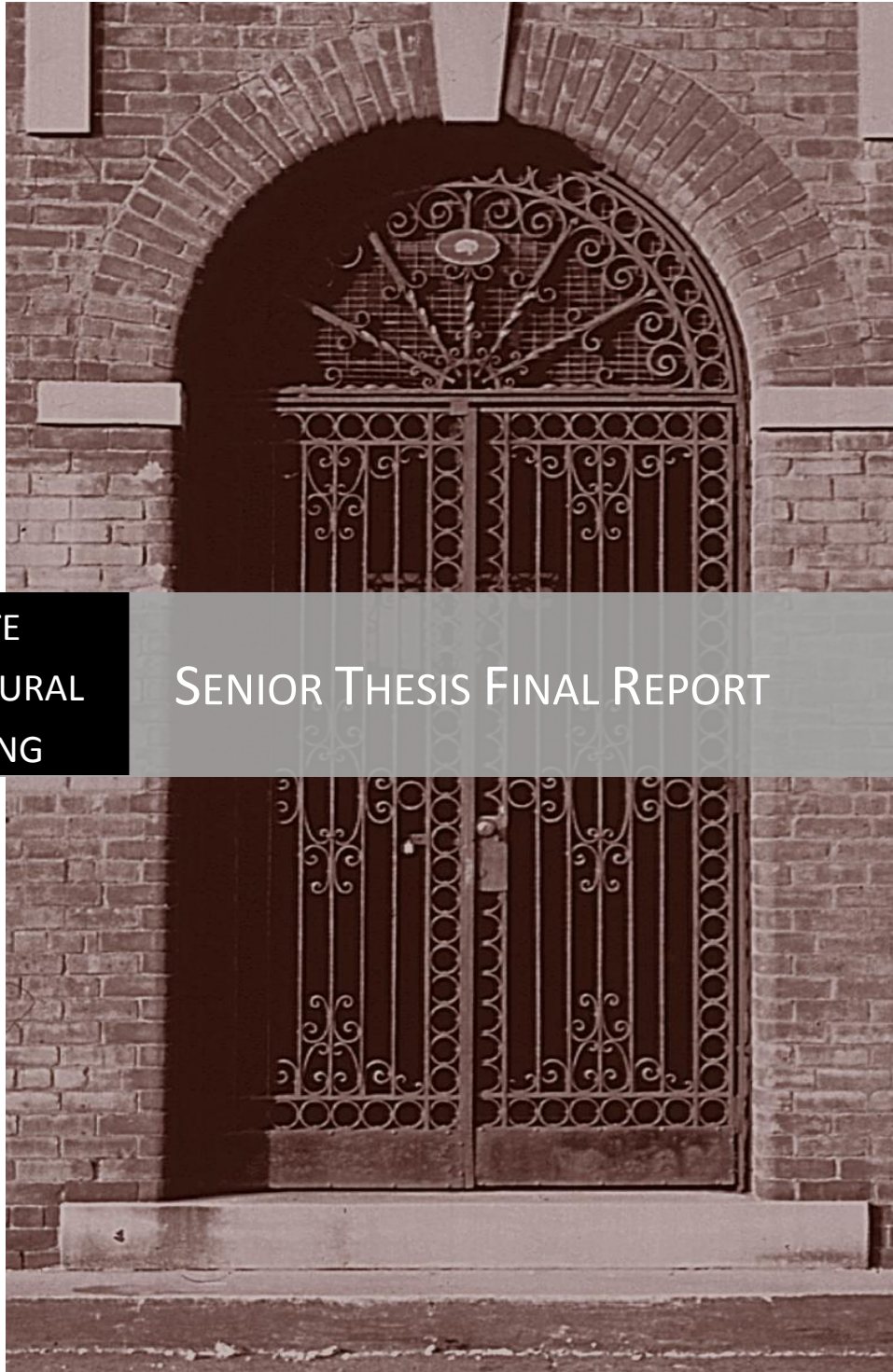


4/7/2011



PENN STATE
ARCHITECTURAL
ENGINEERING

SENIOR THESIS FINAL REPORT

The Web Shop - Elliptipar Headquarters

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West Haven, CT

Electrical System

- One 4160 V feeder
- 480/277, 3 phase, 4 wire system
- 208/120, 3 phase, 4 wire system
- 1,200,000 kWhr annually
- Fluorescent and metal halide lamps

Mechanical System

- **Heating:** Consists of a 9.8 million BTU gas fired steam boiler, operating at 15 psi. Steam condensate is collected in a 1000 gallon tank.
- **Cooling:** Consists of a well water pumping system, which supplies 150 gpm of chilled water through 7 AHUs

Structural System

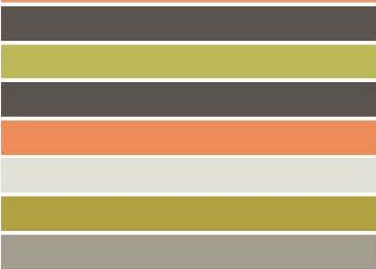
- The entire building is primarily wood framing. The interior spaces showcase the exposed columns and joists.

Project Overview

- The project consists of a series of renovations dating back to 1981, in an effort to update the historic building so that it makes the best use of the expanding company's needs.

Architectural Features

- The restored exterior of the complex exemplifies early 20th century industrial architecture in the Italianate style. It retains most of the original features including corbeled cornices, blue stone sills, brick piers, and segmented arch fenestrations



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Executive Summary:

The Web Shop is the main headquarters of the worldwide lighting manufacturer The Lighting Quotient. The building, originally a factory, has been renovated to meet the needs of the company. The building houses all areas of the company, including research and development, customer service, sales, applications, and product production.

The following document contains reports centered on the lighting and the electrical systems of the building. Four spaces were studied and redesigned as part of the lighting analysis. The four spaces studied include the main entrance, the main lobby, a conference room, and an open office. For these four spaces, an analysis of code compliance, as well as the impact to the existing electrical system was calculated. Hand calculations of the short circuit currents through the path to a panel board are included.

Two electrical depths included in this document are the addition of a photovoltaic array, and the consolidation of the existing transformers. Two breadth topics include an architectural breath and an acoustical analysis of the conference room.

The contents of this report are for the purposes of studying building systems pertaining to subjects studied in the Architectural Engineering program. Conclusions are merely suggestions for improvement, and are not meant to imply that the systems are designed improperly.

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BUILDING INFORMATION AND STATISTICS

Building Name:

The Lighting Quotient Headquarters, also known as “The Web Shop,” as a salute to the building’s history.

Location and Site:

114 Boston Post Road, West Haven, CT

Building Occupant Name:

The Lighting Quotient: a parent company to Elliptipar, Tambient, and Fraqtir

Building Function:

The building consists of two large offices for engineering, research and development, applications, marketing, and sales. Manufacturing, including painting, assembly, testing, and shipping, takes place in the attached factory.

Size:

100,000 SF. The factory floor is roughly 75,000 SF and the offices and circulation space makes up about 25,000 SF. The factory is one story, and the office is three stories.

Design and Functionality:

The building was designed in the early 1900’s in an Industrial Italianate style. The blue stone sills, corbled cornices, and archtop fenestrations exemplify this style. The factory space presents itself with much in the way of daylight, including an expansive array of sawtooth fenestrations. The office space is embellished with restored woodwork, including beautiful floors in the lobby, and formidable columns and beams in the open office.

Building Enclosure:

The facade of The Web Shop is almost exclusively brick, laid in a running bond fashion. The only exception is the blue stone sills. The roof is coated with a tar and gravel built up roof system. This also coats the exterior of the sawtooth monitors. Insulation is scarce, as the building is over a hundred years old. Much of the perimeter walls are solid brick through to the interior.

Electrical System:

The Web Shop receives its power via overhead utility lines provided by The United Illuminating Company, or UI for short. The voltage comes onsite at 4160V, where it splits into two sets of transformers, providing two service entrances. It would seem ideal in this circumstance for once service entrance to power the factory, and the other to power the offices. However, this is not the case, as the electrical system has had to change with the evolution of the company’s needs over the years. The first service entrance feeds a set of 480V transformers located on an overhead rack outside of the Utility Room. The second service entrance enters the Brick Vault Room, where it feeds 3-phase 240V and 1-phase 120/240V switchgear. A third service entrance exists but is no longer in use. It consists of 240V overhead service from UI. The service entrance was used to more accurately bill a previous subtenant for their electrical usage. However, The Lighting Quotient now utilizes the space using power from the 4160V service.

Mechanical System:**Air Conditioning Description:**

The existing system is comprised of (7) horizontal air handling units mounted within the space of the roof structure. Each unit consists of a return intake/filter section, steam coil, chilled water coil, supply fan and supply air duct work generally extends from the east side of the plant to the west. Operating airflow, and heating and cooling output is not known. The (2) most southern AHUs do not have steam control valves. The remaining (5) AHUs have control valves interlocked with associated temperature sensor attached to the condensate return line. All (7) AHUs do not have chilled water control valves. Each AHU is controlled by a local, non-programmable thermostat. The fan cycles as required based on the temperature set point.

Heating Plant:

The heating plant consists of a 9,800,000 BTU gas fired steam boiler. The boiler nameplate indicates a manufactured date of 1958. However, the gas burner is relatively new. The boiler operating pressure is 15 psi. The boiler operates through a local boiler control panel. Steam condensate is collected in a 1000 gallon steam condensate duplex pump receiver set. The pumps are electrically driven. The steam condensate duplex receiver operates through a float switch control system. The steam system serves the factory heating load through steam coil per AHU as well as the heating load associated with the office building through steam to hot water heat exchangers. Steam and steam condensate piping runs adjacent to the cast exterior wall in the factory. Branch piping extends to each of the (7) AHUs. It is suggested that the steam piping is chemically treated.

Cooling Plant:

The cooling plant serving the factory consists of a well water pumping system. A vertical turbine pump supplies approximately 150 gpm of chilled water to (7) AHU chilled water coils throughout the factory. Return water discharges to the storm sewer. Chilled water supply piping and chilled water return piping is mounted to the east exterior wall in the factory. Branch piping extends to each of the (7) AHUs.

Structural:

The exterior wall structure consists of load bearing brick. The interior is supported by 8" wood columns. Other than retrofitted transfer girders where columns were removed for large equipment, the entirety of the roof structure is wood framing.

ARCHITECTURAL BREADTH

Description:

The Web Shop has experienced a number of tenants in its 100 year history, all of whom have had different need. The building's current owner, The Lighting Quotient restored and remodeled much of the interior spaces to best suit their needs. One of these changes was the relocation of the main entrance. The original main entrance was located on the Boston Post Road side of the building, along the sidewalk. This entrance is a strong architectural statement, and depicts prominence over all other entrances. Since the original main entrance is no longer in use, one of the side entrances has established itself as the most prominent entrance. It is located at the intersection of the factory and office wings. This entrance leads to the main lobby and reception area from the parking lot. It is one of the most highly trafficked entrances in the building for employees. And for a guest arriving at The Web Shop, this entrance is the more appropriate of the two guest accessible entrances.

Design Issue:

The entrance does not express an importance over other side entrances. To the uninformed guest, it is very difficult to locate the main entrance. One of the adjacent entrances is an employee-only entrance to the factory. It has an awning over it, which actually looks more prominent than the actual current main entrance. This is certainly not the desired effect.

Design Considerations:

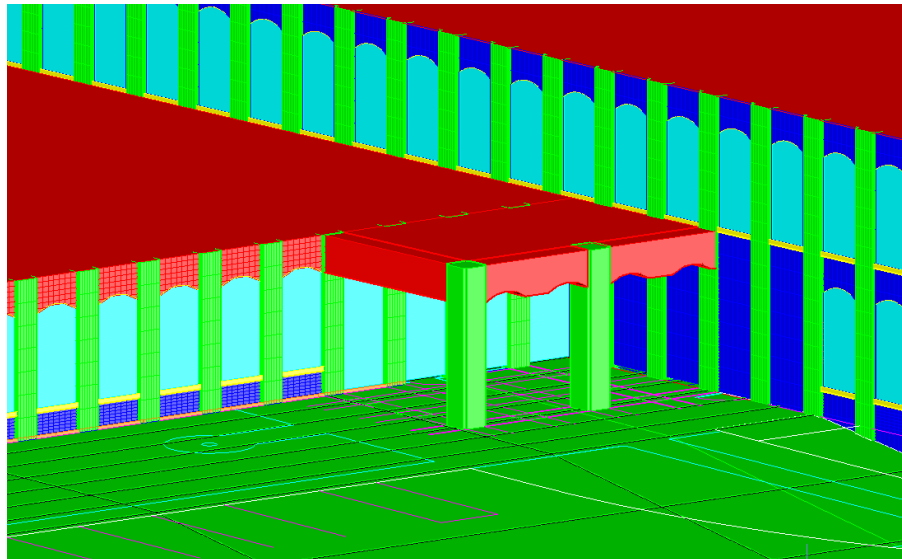
The objective of the design is not to overshadow the original main entrance, but to acquire architectural dominance over the other entrances adjacent to the parking lot. Once a guest enters the parking lot, it should be clear where he or she needs to go. It is important to note that the heritage of the building is a major consideration. The entrance should complement the architecture of the building, and use similar materials.

Below are two photographs of the main entrance, taken from the parking lot.



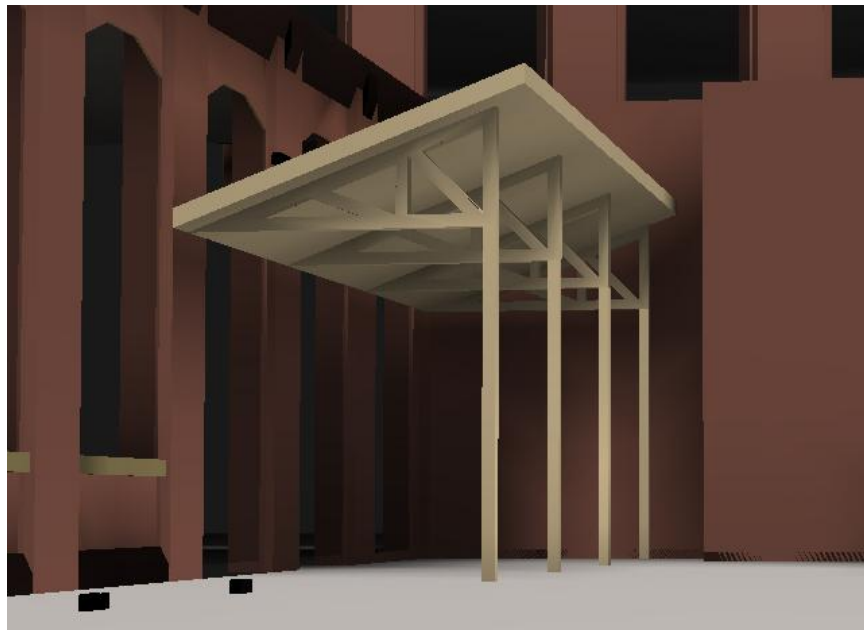
Discarded Solutions:

Several previous designs were considered before the final design was conceived. In this example, the brick columns of the main building were repeated outward into the courtyard. But the largest issue with this design is that it blocks out much of the daylight that would otherwise be present in the lobby. This goes completely against what the building stands for. Daylight was carefully considered when this building was designed over a hundred years ago. It would be a shame to dishonor the heritage in this way. Other options needed to be explored. Below is a Cad model showing this discarded design.



Final Solution:

The final design is a simple angled overhang. It is supported by four wood columns, reminiscent of the wood columns inside the lobby. Both the overhang columns and the lobby columns line up perfectly. The overhang is further supported by wood trusses. These trusses were inspired by the wood trusses supporting the sawtooth fenestrations in the factory. The underside of the overhang is finished in wood planks, similar to the floor in the lobby and hallway. The sides of the overhang are to be finished in a similar metal flashing as the rest of the building. The top of the overhang is to be finished in a standing seam interlocking metal roof. The roof should be finished in an attractive material since it will be viewable from the interior of the space.



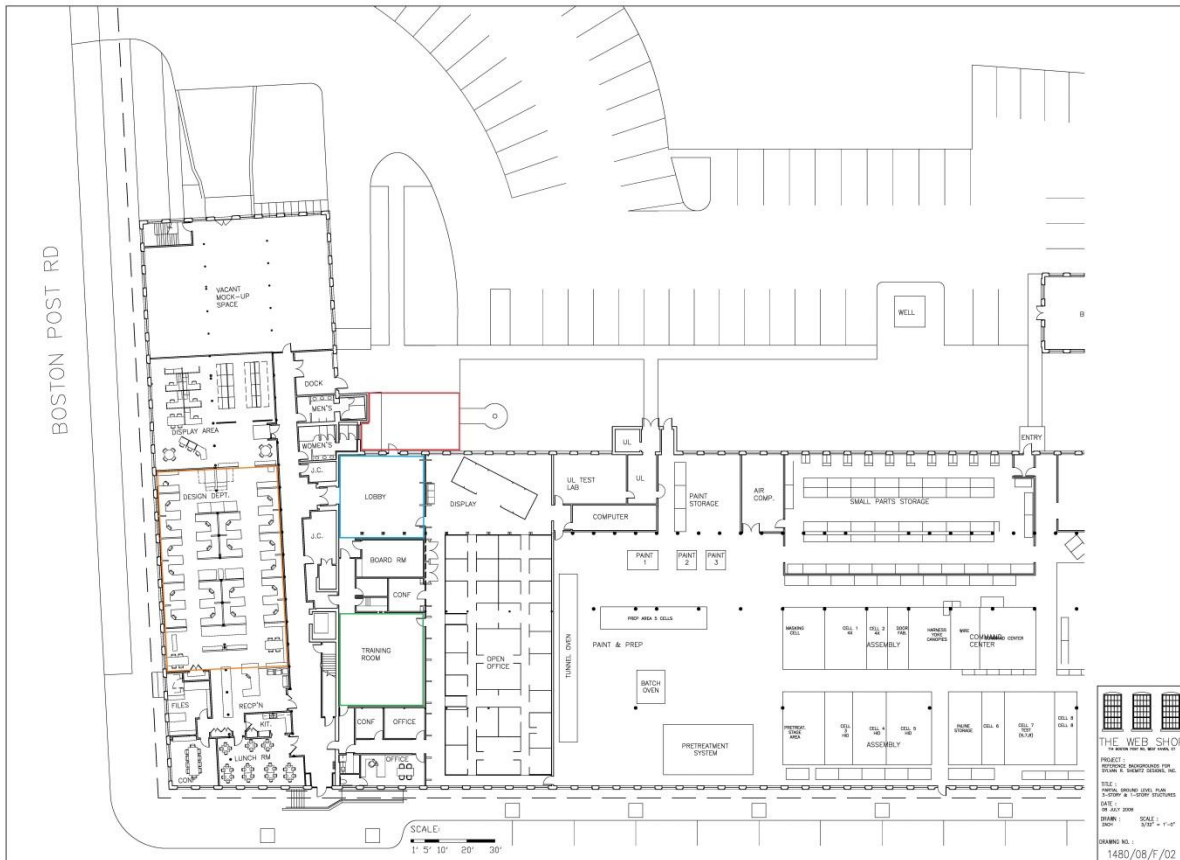
Above is a rendering of the overhang. Below are photos, taken throughout the building, that were inspiration to the design. First is the restored floor, and second are the trusses in the factory.



LIGHTING REDESIGN

For the lighting portion of the report, students are required to redesign the lighting in four spaces. The restrictions state that the spaces must be selected based on four different types of spaces: an outdoor space, a circulation space, a work space, and a special purpose space. In addition, students must produce a variety of analyses to convey the performance of each space. To aid in visualization of the spaces, the models were built in Autodesk's AutoCAD 2011 and rendered in Lighting Analysts' AGi32 Version 2.1. Additional image editing was done with the aid of Adobe Photoshop CS5.

The spaces that were analyzed are listed below, and are outlined in a plan-view.



Outdoor Space: Main Entrance and Façade, shown in red

Circulation Space: Main Lobby, shown in blue

Work Space: Open Office, shown in orange

Special Purpose Space: Training and Meeting Room, shown in green

Description:

Employees and guests will enter through the main entrance from the parking lot to get to the lobby and reception area. The main entrance, as described previously in the Architectural Breadth, has been redesigned with an overhang. The overhang consists primarily of wood, and the façade is primarily red brick. The palette of materials used in this building is very minimal. However, a small selection of materials reveals subtle architectural features more clearly. Take for example the brick detail at the column pediments. This is a subtle, yet defining feature representing the strength of a brick exterior.

Design Criteria: As interpreted from the IESNA Handbook

Building Exteriors – Entrances – Active (pedestrian/ conveyance)

Illuminance Values

- Horizontal – 5 fc
- Vertical – 3 fc

Appearance of Space and Luminaires

- The appearance of the luminaires should implement the exterior architecture by being simple and not interrupting the task in the space. In the case of the building façade and sidewalk, the fixtures should not be obvious.

Color Appearance

- Color rendering in dimly lit situations becomes increasingly more difficult. A lamp with a high CRI value and low CCT value should be chosen.

Direct Glare

- Use of cut off optics or semi-cutoff optics can control glare. Avoid using luminaires where the bare lamp can be seen.

Light Pollution/Trespass

- Avoid using luminaires that emit light above the horizontal plane. Minimize direct light onto nearby windows and illumination onto adjacent properties.

Modeling of Faces or Objects

- If it is important to identify faces, provide adequate vertical and horizontal illuminance. Diffuse illumination from luminaires and from surface reflection is helpful.

Points of Interest

- Make sure signs, special landscaping, and other points of interest are clearly visible to attract attention.

Power Allowances and Control Requirements:

According to ASHRAE 90.1, power densities for plaza areas shall not exceed 0.2 W/ft².

Walkways less than 10 ft wide shall not exceed a power density of 1.0 W/linear foot. Walkways greater than 10 ft wide shall not have a power density exceeding 0.2 W/ft². Lighting for all exterior applications shall have automatic controls capable of turning off exterior lighting when sufficient daylight is available or when the lighting is not required during nighttime hours.

Lighting Plans:

For a complete list of lighting plans, see Appendix A

Luminaires:

All luminaire schedules are listed in Appendix B

Cut Sheets:

Cut Sheets are located in Appendix C

Controls:

The entrance and walkway will be controlled by a Lutron Grafik Eye System. This system optimizes efficiency by monitoring surrounding light levels and only turning the circuit on when it is needed.

Materials and Reflectance:**Walls:**

Red Brick
Reflectance: 0.3

Windows:

Double Pane Glass
Reflectance: 0.15
Transmittance: 0.85

Sidewalk:

Concrete:
Reflectance: 0.3

Overhang:

Wood:
Reflectance: 0.5

Lighting Design:

The design of the main entrance can be broken up into three categories: the overhang, the façade, and the walkway. The first to be addressed will be the façade. The façade consists of strong brick columns between large arch top windows. By washing the columns with light with a point source at ground level, not only does the strength of the columns become evident, but the pattern that the columns create is enriched. Another benefit to washing the brick is its texture becomes more pronounced. A shadow is formed over the concave mortar joint from the brick below. The combination of repeating columns and the texture within them creates the basis for a wonderful scene. The next component of the main entrance is the overhang designed in the Architectural Breadth. By asymmetrically lighting the underside of the overhang, several effects occur. The underside is filled with light in a soft gradient, which not only catches the eye from a distance, but also reflects the light back down, indirectly illuminating the walkway in front of the door. The mounting location of these fixtures is just above the door, and though the fixtures don't necessarily make a large architectural impact, the fact that they are visible does not detract from what they accomplish. This is a great way to showcase the performance of one of Elliptipar's own products. The walkways are an important feature to the entrance. In a literal sense, they physically lead the guest to the door. But at night, they must guide the guest subconsciously. At night, light becomes the guiding force, when it is no longer the sole responsibility of individual materials to suggest a path. The lights mark a path from both directions, which terminates at the destination. When all of these individual elements come together, a clear and purposeful scene is created.

Psychological Impression:

When the guest approaches the main entrance, they will experience a visual compression under the overhang. When they enter the door, the above boundary will be lifted, and they will be released into the lobby. This compression and release phenomenon momentarily expresses the full extent of the 13 foot ceilings throughout the first floor.

Renderings:



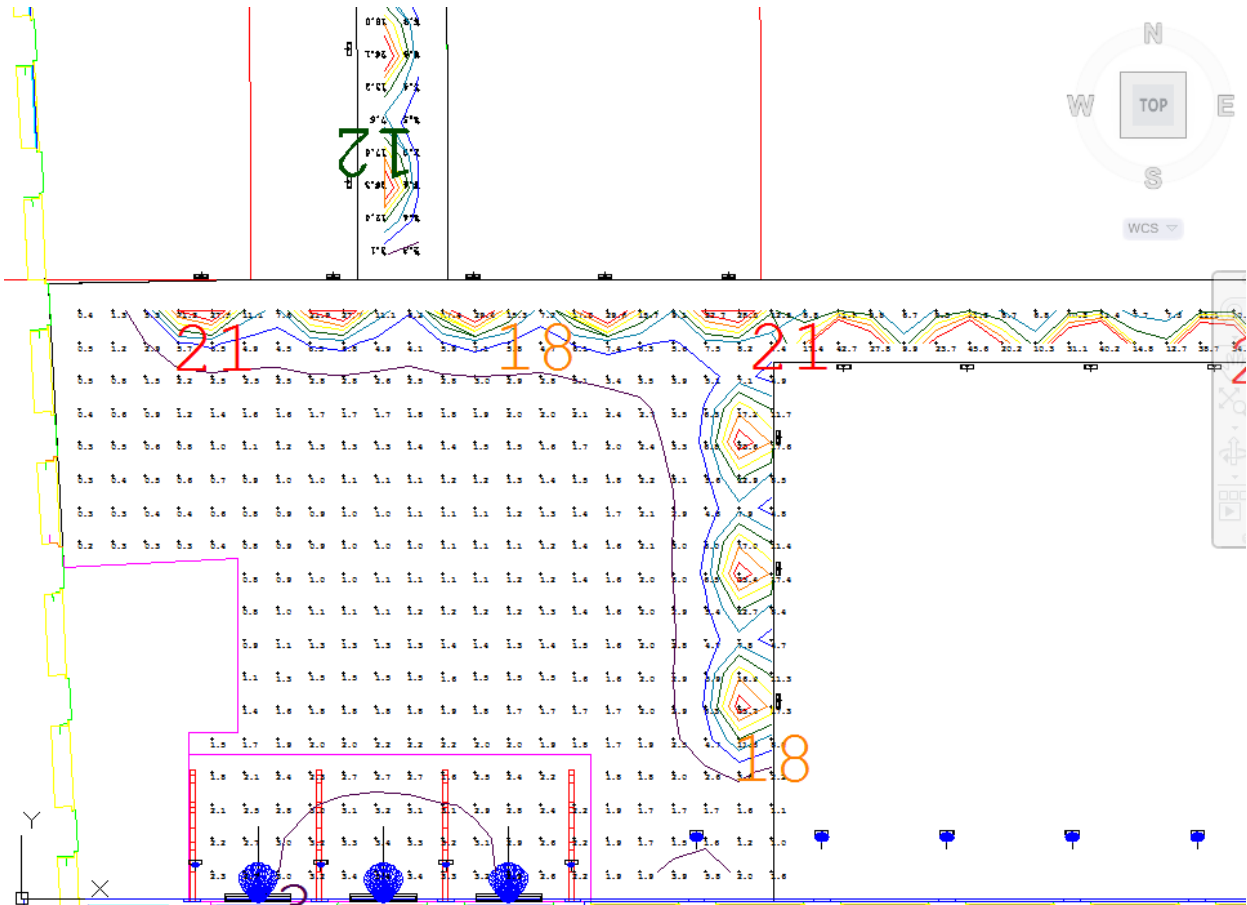


Design Performance:

The target illuminance on the walkways is 5 fc. The achieved average illuminance level is 6.48 fc.

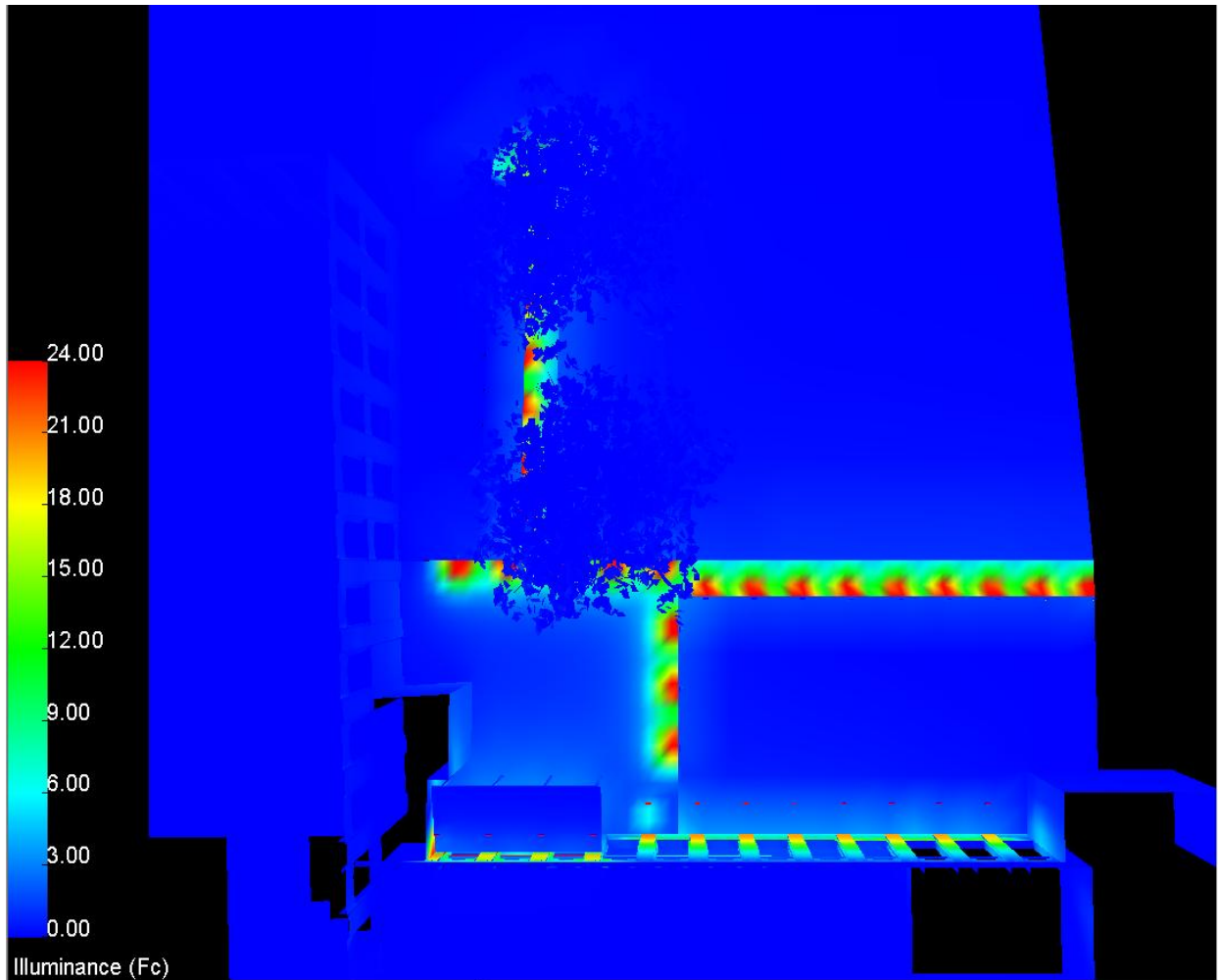
Isoline Drawing:

Each isoline is 3 footcandles from the next. The purple isoline represents 3 fc, and the red isoline represents 21 fc.



Pseudo Color Rendering:

The pseudo color rendering graphically displays the illuminances from an overhead view.



Energy Code Compliance:

ASHRAE 90.1 Lighting Power Density				
Area	Allowable Power	Size	Allowable Wattage	Designed Wattage
Walkways over 10' wide	0.2 W/sq ft	1431 sq ft	286 W	160 W
Walkways under 10' wide	1.0 W/ft	122 ft	122 W	360 W
Canopies	1.25 W/sq ft	231 sq ft	289 W	282 W
Façade	5 W/ft	97 ft	485 W	340 W
Total			1182 W	1142 W

Description:

As guests enter the lobby, they will be greeted by a cheerful exhibition of natural wood tones. The restored wood floor and columns hint at the heritage of the building. Though light in color, they enrich the environment. The columns also help to further express the height of the room. Between the columns, and also on the wall to the right are large black and white photographs that were taken early in the building's history. These photographs are the center piece of the lobby.

The lobby acts as the main junction between the two building halves. Immediately to the left is a glass curtain wall. Beyond the glass, the expansiveness of the converted factory is evident. In this space is one of the two large open offices. Past the lobby to the front is the main conference room. To the right lies a corridor that runs the length of the office wing.

Design Criteria: As interpreted from the IESNA Handbook

Offices – Lobbies, lounges, and reception areas

Illuminance Values

- Horizontal – 10 fc
- Vertical – 3 fc

Appearance of Space and Luminaires

- IESNA puts great importance on this topic. The interior architecture should speak for itself, yet coincide with the overall theme of the building. The appearance of the luminaires should implement the interior architecture by being simple and not interrupting the task in the space. The lobby is usually the first impression a person will get of the building. It is important that the first impression is a good one. Also, luminaires giving direction to the guests is helpful.

Color Appearance (and Color Contrast)

- Though not of the highest importance, IESNA still sees color appearance to be moderately important. Color appearance of this space should be welcoming and warm. Proper color rendering is important for complementing skin tones.

Daylight Integration and Control

- Daylight integration and control is only somewhat important to IESNA in a lobby space. However, since lobbies are generally adjacent to an outdoor space, daylight integration is usually not an issue. The issue of daylight control may not be necessary, as the curtain wall does not suffer from direct sunlight penetration.

Direct Glare

- Direct glare can cause visual discomfort to a guest. In order to reduce direct glare, luminaires should be placed accordingly so that they minimize direct line of sight. As a compromise, a glare shield can be specified.

Light Distribution on Surfaces

- The beam distribution on the walls is important. The correct fixtures should be chosen and aimed properly to minimize undesirable beam spread. This is key in the proper illumination of the black and white photographs on the north wall.

Luminance of Room Surfaces

- Luminance is important in creating a visual hierarchy in the space. Although the large photographs on the north wall are major focal points of the room, the other wall surfaces must not be left out. Luminance on the walls acts as a defining border, but can also give the sense of spaciousness.

Modeling of Faces or Objects

- It is likely that while walking through the lobby, an employee or guest will pass another person. A high percentage of communication is nonverbal. It is important that the pattern of light on faces enables clear recognition and interpretation of expression by enhancing contrast in certain areas around the mouth and eyes.

Surface Characteristics

- Dark surfaces, saturated colors, and glossy finishes can maintain visual interest and stimulation, but they should be used to a limited degree. In the lobby the floor is polyurethaned wood, which has a distinct shine to it

Psychological Reinforcement

- A psychological impression, or Flynn impression, that would be most fitting to a lobby space is that of spaciousness. This would be achieved by brightly illuminating the walls and ceiling.

Power Allowances and Control Requirements (ASHRAE 90.1):

For convenience, this space will be considered as a lobby while referencing ASHRAE 90.1. ASHRAE 90.1 states that the maximum lighting power density for a lobby, if using the Space-by-Space Method, is 1.3 W/ft². As for lighting controls, because the building is over 5000 ft² “all interior lighting shall be controlled with an automatic control device to shut off building lighting in all spaces.”

Lighting Plans:

For a complete list of lighting plans, see Appendix A

Luminaires:

All luminaire schedules are listed in Appendix B

Cut Sheets:

Cut Sheets diagrams are located in Appendix C

Controls:

The lobby lighting is broken up into zones that are easily dimmable to accommodate for the abundant amount of daylight that is received.

Materials and Reflectance:**Floor:**

Polyurethaned wood
Reflectance: 0.4 (assumed)

Ceiling:

White acoustical tile.
Reflectance: 0.8 (assumed)

Woodwork:

Wood columns.
Reflectance: 0.5 (assumed)

Walls:

White paint on brick.
Reflectance: 0.5 (assumed)

Partition:

Glass curtain wall.
Reflectance: 0.15 (assumed)
Transmittance: 0.85 (assumed)

Wall Hangings:

Pictures.
Reflectance: 0.5 (assumed)

Lighting Design:

A majority of the ambient light comes from fixtures hidden above the platform in the partition. These linear fluorescent fixtures wash the ceiling. The distribution is a soft gradient from left to right. The second layer of light in the room comes from the accented photographs. The fixtures that were used to accent the photographs are cantilevered asymmetrical wall washers, which utilize a halogen source. Halogen was chosen over other types of lamps due in part to its high CRI and consistency of CCT. Most importantly, though, is the fact that lamps requiring a ballast in a similar product can cause the luminaire to be nearly twice the size. A larger luminaire may detract from the artwork being accented.

Psychological Impressions:

The first time entering a building can be unnerving, especially if there is no indication of a correct path. However, there are alternatives to typical arrows pointing the way. The light on the ceiling plane in the main lobby of The Web Shop is used to guide the guest to his or her destination. The majority of the light on the ceiling is a soft gradient that starts from the left. This brightness creates a subconscious lure toward this side of the room, where beyond the curtain wall is the reception area. Another subtle but effective guide is the light emanating from the far corner of the room. In this nook is the entrance to the conference room, where guests are likely to go to.

Renderings:

The first image is positioned just inside the door of the main entrance.



The second image is located from beyond the curtain wall, looking into the lobby.

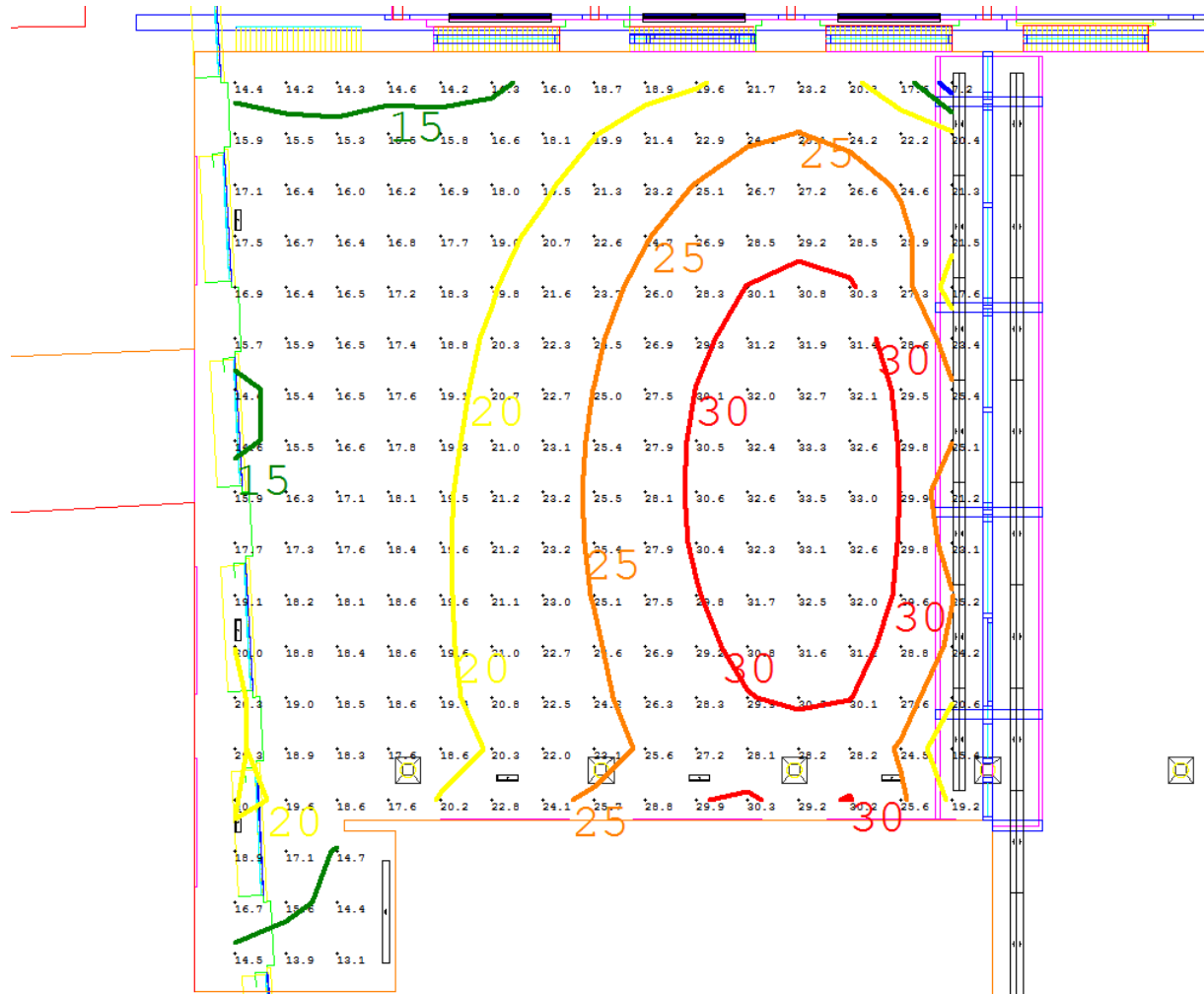


Design Performance:

The target illuminance in the lobby is only 10 fc. However, since the lobby is a transitional area between spaces of varying brightness, the illuminance was increased. However, even at full brightness when the design is capable of over 20 fc, it still remains 20% under the 1.3 W/sq ft maximum, as required by ASHRAE 90.1.

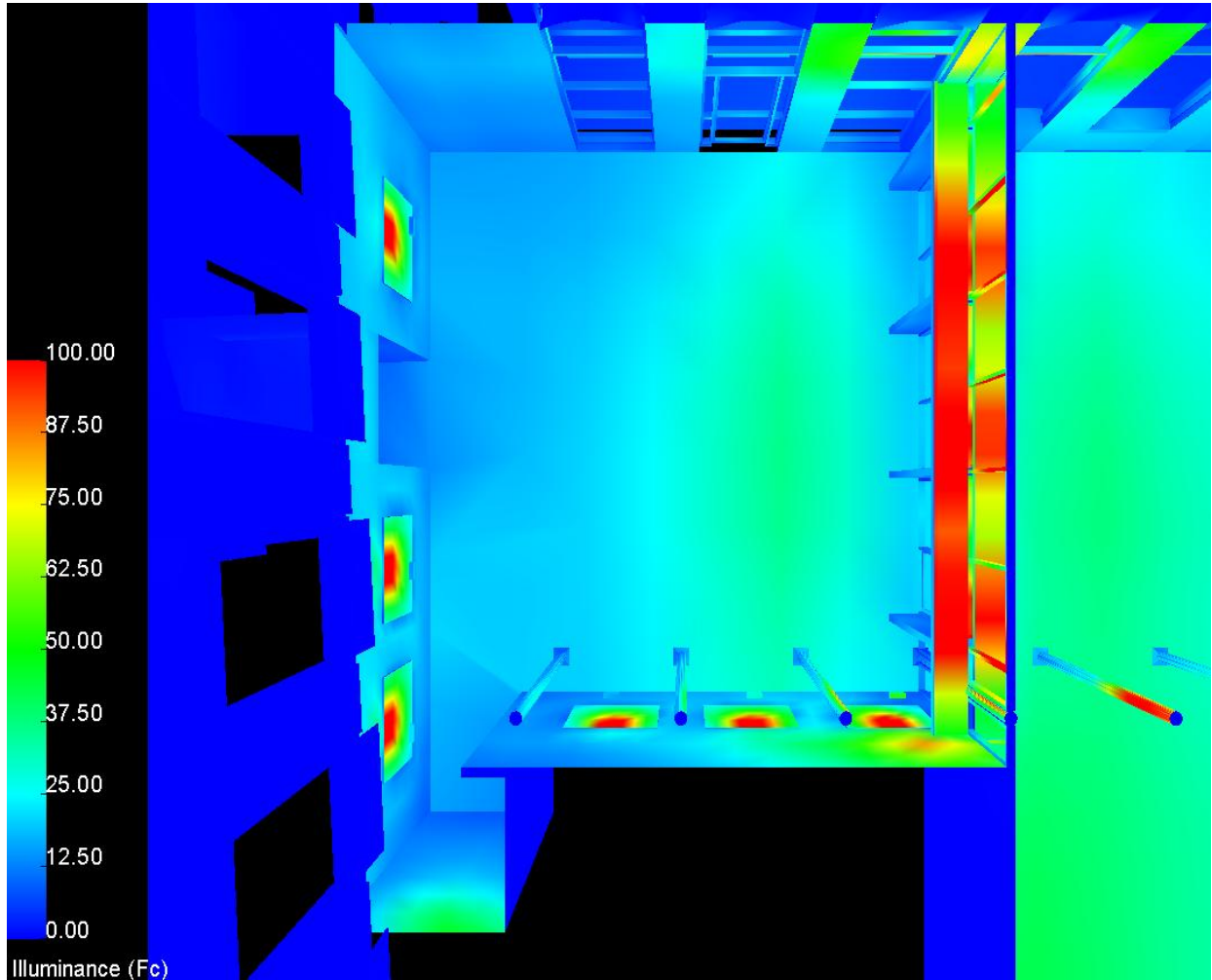
Isoline Drawing:

The isolines in the following drawing are in 5 fc increments starting with blue at 10 fc and ending with 30 fc in red.



Pseudo Color Rendering:

The pseudo color rendering graphically displays the illuminances from an overhead view with the ceiling surface set as single sided. The lack of visual ceiling does not change the performance of the space in any regard.



Energy Code Compliance:

ASHRAE 90.1 Lighting Power Density				
Area	Allowable Power	Size	Allowable Wattage	Designed Wattage
Walkways over 10' wide	1.3 W/sq ft	974	1265	1020

Description:

This 3100ft² office seats 20 employees, and houses hundreds of documents. There is also large office equipment, such as the full size plotter and scanner. The open office shares the same 13' ceiling as the rest of the first floor. The room is well proportioned. Its large square footage is balanced with its high ceiling height and large windows. The red accents add a splash of interest to the space.

Design Criteria:

Open plan office - Intensive VDT use, Hand written tasks, Printed tasks

Illuminance Values

- Horizontal - 30 fc
- Vertical - 5 fc

Direct Glare- Very Important

- Direct glare can cause visual discomfort and interfere with visibility of the occupants. Its main causes are from luminaire placement and natural light coming in through windows. Because reading and writing will be two tasks being performed by the occupants, it is crucial to control this problem in order for work to be done properly. Considerations to prevent this lie in use of indirect instead of direct light sources, luminaire placement, and placement of seating around fenestrations.

Reflected Glare- Very Important

- Reflected glare can be caused by light refracting off of shiny or glossy surfaces such as magazines. Veiling reflections from such surfaces can cause visual discomfort and reduce contrast on the surface. It is very likely that the occupants will be reading text glossy paper so reflected glare should not be ignored. This problem can be solved in much the same way direct glare can.

Luminances of Surfaces- Very Important

- Luminance values should be uniform on all surfaces; including floor, wall, ceiling, and work plane in order to reduce visual clutter and distractions. However, a slightly higher luminance value may be desired on work surfaces in order to direct focus to the work of the occupants.

Light Distribution on Task Plane (Uniformity) - Very Important

- Uniformity on the task plane is important for visual clarity while performing tasks such as reading and writing. Any type of patterns is undesirable for they will be distracting to the occupants.

Source/ Task/ Eye Geometry- Very Important

- Luminaires should be kept away from the offending zone to reduce reflections. Indirect lighting and luminaires placed to the sides of the desks will help avoid these problems.

Appearance of Space and Luminaires- Important

- It is important that the space be bright and uniformly illuminated to avoid visual distractions and clutter. Areas of circulation should stand out in order to guide foot traffic.

Color Appearance (and Color Contrast) - Important

- Color appearance can affect visibility and aesthetics. Proper color rendering is crucial for producing a pleasant looking space and complementing the appearance of the occupants. Contrast is required for distinguishing text in reading applications.

Daylighting Integration and Controls- Important

- Daylighting integration is important for reduction of lighting load and to provide high quality light or light with exceptional color rendering. The space receives an ample amount of natural light due to the fact that about 50 percent of its walls are exterior glazing. However, measures need to be taken to control the amount of daylighting such as shading in order to reduce glare or excessive solar heat gain.

Modeling of Faces and or Objects- Important

- Within the work environment, it is often important for people to converse with one another and share ideas. Therefore, it is necessary that the occupants' faces are rendered in a pleasant manner in order to optimize social interaction.

Power Allowances and Control Requirements (ASHRAE 90.1):

ASHRAE 90.1 states that the maximum power density for an office space, using the Space-by-Space Method, is 1.1W/ft². As for lighting controls, because the building is over 5000 ft² "all interior lighting shall be controlled with an automatic control device to shut off building lighting in all spaces."

Lighting Plans:

For a complete list of lighting plans, see Appendix A

Luminaires:

All luminaire schedules are listed in Appendix B

Cut Sheets:

Cut Sheets are located in Appendix C

Controls:

The task-ambient fixtures are integrated with wireless dimming control. The wall washers along the north wall are also to be controllable

Materials and Reflectance:**Floor:**

Dark blue carpet on raised floor.

Reflectance: 0.2 (assumed)

Ceiling:

White acoustical tile.

Reflectance: 0.8 (assumed)

Accents:

Red paint. Semi-gloss.

Reflectance: 0.25 (assumed)

Walls:

White paint on gypsum wall board.

Reflectance: 0.5 (assumed)

Woodwork:

Beams and columns.

Reflectance: 0.5 (assumed)

Furniture:

Cubicles.

Reflectance: 0.5 (assumed)

Wall Hangings:

Paintings and white boards.

Reflectance: 0.5 (assumed)

Glass:

Windows.

Reflectance: 0.15

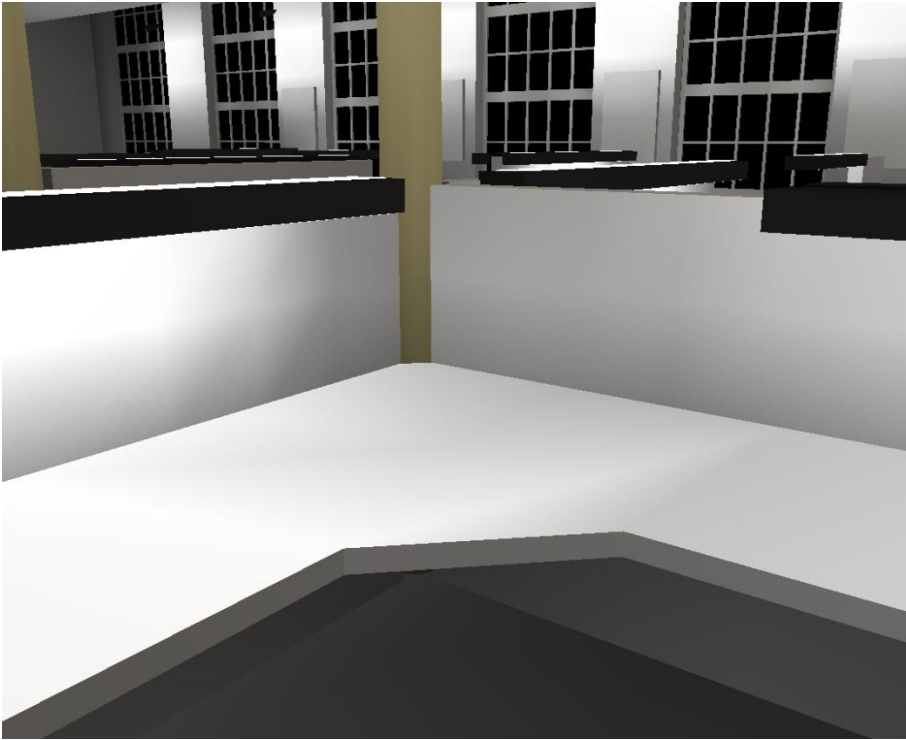
Transmittance: 0.85

Lighting Design:

The lighting design can be broken into layers to describe the behavior of each type of luminaire individually. The first layer is the task-ambient system. These luminaires provide the majority of the light in the space. The design consists of a combination of task-only, ambient-only, and task-ambient fixtures. It was necessary in some places to separate the two components to maintain uniformity, whether on the ceiling or on the work plane. The next layer consists of several types of wall washers. Each of the four walls is unique. The south wall is nearly continuous, with the only interruptions being the exposed wood columns. To wash this wall, luminaires were placed in the center of the wall section between the columns. In contrast, the north wall is much the opposite. The north wall has large brick columns rather than the round wood columns, and instead of a wall surface, there are 10' tall windows. So the resulting surface to wash is the columns, not the walls. The fixtures do not need to be as large as the south wall, since the target surface is much narrower. The east wall is the red accent wall. On this wall are four whiteboards that are grazed with linear fluorescents. The west wall is a small partition that does not connect to the ceiling. Both sides of the partition are illuminated with cantilevered wall washers. As a whole, the wall washers do not add a significant amount of reflected ambient light to the space, but the desks on the bordering wall do see some benefit.

Renderings:





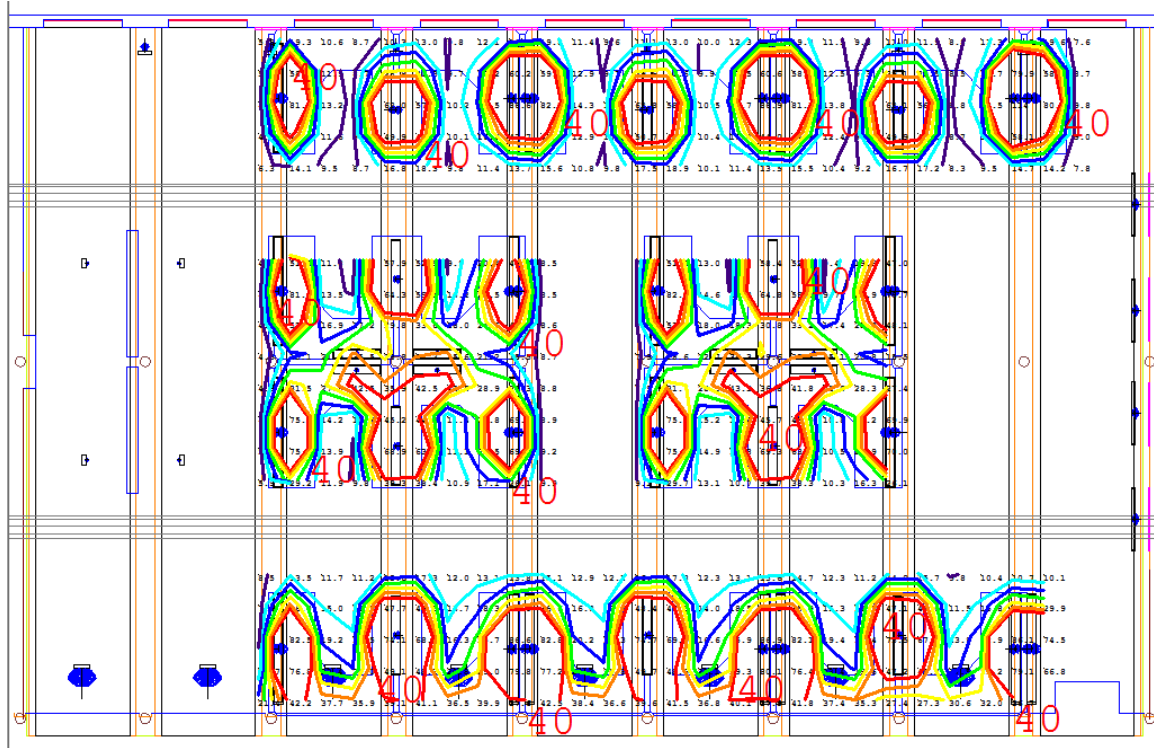
Design Performance:

The target illuminance on the work plane is required to be 30fc. As designed, the average illuminance on the workplane within the cubicle area is 29.25fc. This difference is only 2.5%, and is within the tolerance allowable by IESNA.

Isoline Drawings:

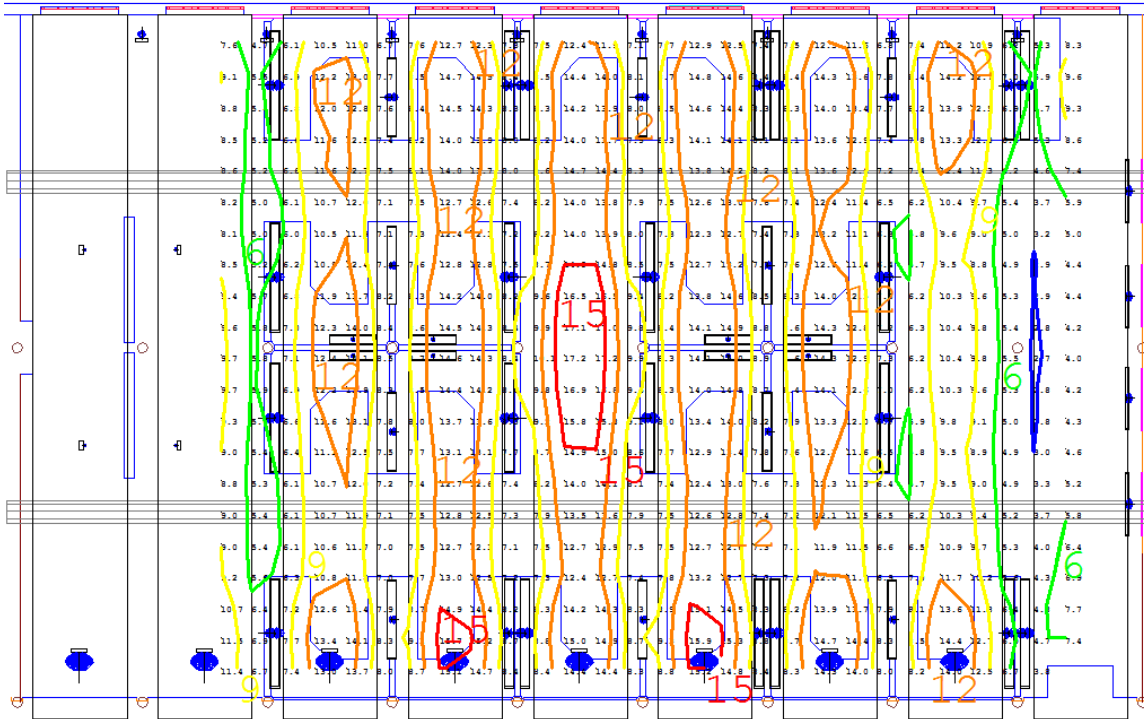
For the work plane, each isoline is 5 footcandles from the next. The purple isoline represents 10 fc, and the red isoline represents 40 fc.

Work Plane Isolines



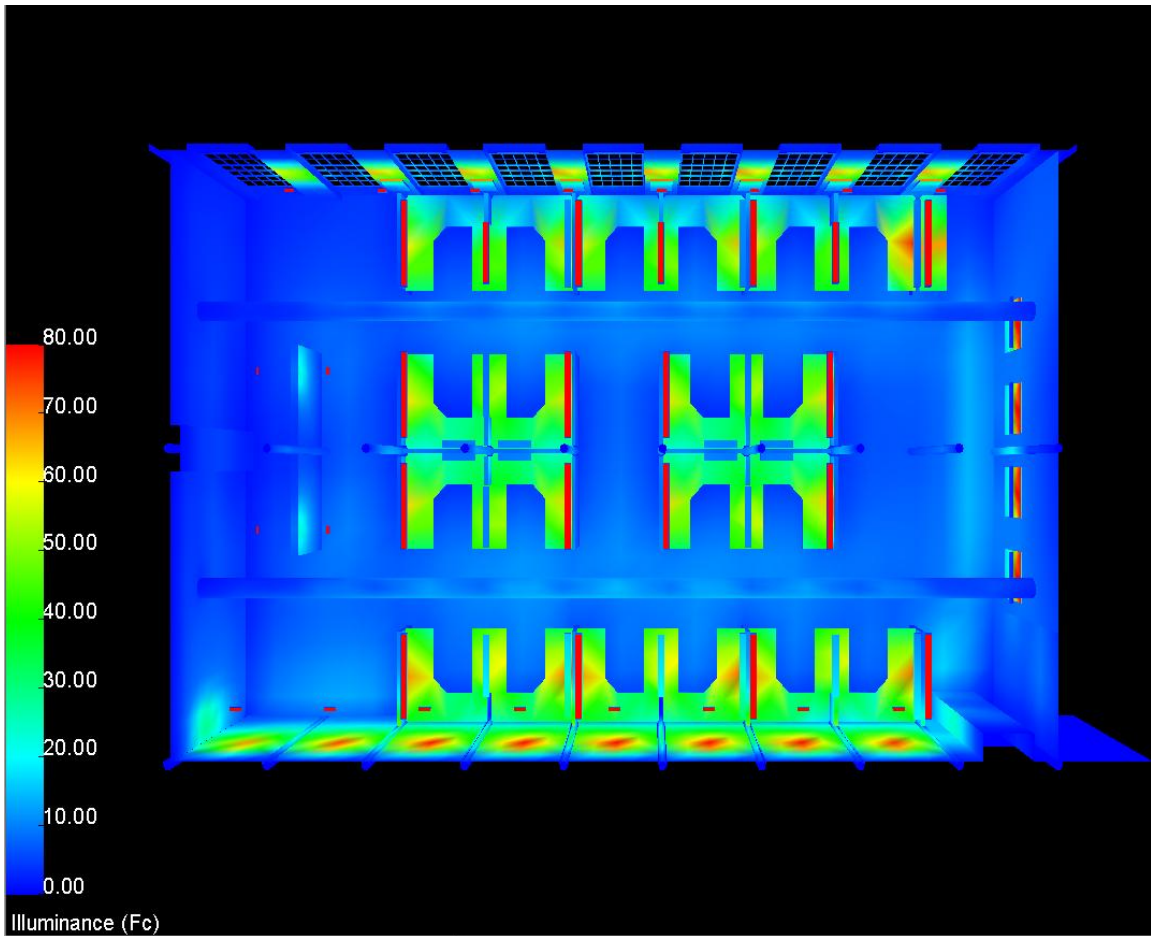
For the ceiling plane, each isoline is 3 footcandles from the next. The blue isoline represents 3 fc, and the red isoline represents 15 fc.

Ceiling Plane Isoline



Pseudo Color Rendering:

The pseudo color rendering graphically displays the illuminances from an overhead view.



Energy Code Compliance:

ASHRAE 90.1 Lighting Power Density					
Area	Allowable Power	Size	Allowable Wattage	Original Wattage	Designed Wattage
Open Office	1.1 W/sq ft	3100 sq ft	3400 W	8580 W	3478 W

Description:

The conference room at The Web Shop caters to a variety of uses. There are frequent staff meetings, product demonstrations, and guest lectures. The room is a simple rectangular shape with no windows. The room must be configurable to accommodate for a variety of points of attention. Often when there is a small department meeting, the tables are configured so that the attendees are facing each other toward the center of the room. When there is an occasion like a product demonstration, the speaker at the front of the room is the center of attention. And often when there is a guest lecturer, the projector screen is the center of attention. All of these assemblies require a different lighting solution, but all of the luminaires must coexist at the same time. The solution to creating different scenes lies in the application of a control system.

Design Criteria: As interpreted from the IESNA Handbook
Conference Rooms – Meeting

Illuminance Values

- Horizontal - 30 fc
- Vertical - 5 fc

Appearance of Space and Luminaires

- IESNA puts great importance on this topic. The interior architecture should speak for itself, yet coincide with the overall theme of the building. The appearance of the luminaires should implement the interior architecture by being simple and not interrupting the task in the space.

Color Appearance (and Color Contrast)

- Though not of the highest importance, IESNA still sees color appearance to be moderately important. Color appearance of this space should be welcoming and warm. Proper color rendering is important for complementing skin tones. As in most meeting spaces, there is a projector screen. Contrast is necessary to distinguish text in reading applications.

Daylight Integration and Control

- Daylight control is only somewhat important in a meeting space. As is the case, many meeting spaces are in the center of a building with no windows. This is generally preferred because there is no extra ambient light from sunlight to take care of when the room has been dimmed.

Direct Glare

- Direct glare is very important. It can result in severe visual discomfort. To avoid direct glare, in a meeting room there is usually a circumstance where the occupants must direct their attention to a particular source for extended periods of time.

Light Distribution on Surfaces

- The beam distribution on the walls is important. The correct fixtures should be chosen and aimed properly to minimize undesirable beam spread.

Light Distribution on Task Surfaces

- Light distribution on the tables should be as uniform as possible. This is important in completing visual tasks such as reading text on a paper.

Modeling of Faces or Objects

- Facial modeling is very important with giving speeches or presentations. Seeing the presenter well aids in the clarity of the presentation. This requires a good combination of direct and indirect light.

Shadows

- The speaker's face, for instance, should not be in shadow. Nor should any other visual task. This can be overcome by the proper placement and aiming of fixtures in the space. If a spotlight on a speaker is directly overhead or behind them, they will be in shadow.

Surface Characteristics

- Surface characteristics are important. If a bright room is desired, the surfaces in a room must convey the goal. All wall surfaces in the room are gypsum wall board, painted white. High luminance can easily be achieved.

Power Allowances and Control Requirements (ASHRAE 90.1):

ASHRAE 90.1 states that the maximum power density for an office space, using the Space-by-Space Method, is $2.6\text{W}/\text{ft}^2$. As for lighting controls, because the building is over 5000ft^2 "all interior lighting shall be controlled with an automatic control device to shut off building lighting in all spaces."

Lighting Plans:

For a complete list of lighting plans, see Appendix A

Luminaires:

All luminaire schedules are listed in Appendix B

Cut Sheets:

Cut Sheets are located in Appendix C

Controls:

The controls will be a system with programmable scenes. Since the room has no windows, dynamic daylight control is not necessary.

Materials and Reflectance:**Floor:**

Dark blue carpet.

Reflectance: 0.2 (assumed)

Ceiling:

White acoustical tile.

Reflectance: 0.8 (assumed)

Walls:

White paint on gypsum wall board.

Reflectance: 0.5 (assumed)

Furniture:

Tables.

Reflectance: 0.5 (assumed)

Elevator doors:

Silver paint over metal doors.

Reflectance: 0.4 (assumed)

Lighting Design: Speech Scene

The design for this scene is very simple. It consists entirely of recessed downlights. The ambient light is achieved by recessed flood lights dimmed to 5%, and the highlighted podium is lighted by aimed recessed spot lights at full brightness.



Lighting Design: Video Conference Scene

This scene relies on perimeter lighting in the form of wall washing to light the room. By selectively removing light from the center and the front of the room, the audience can feel relaxed as they watch the projection screen.



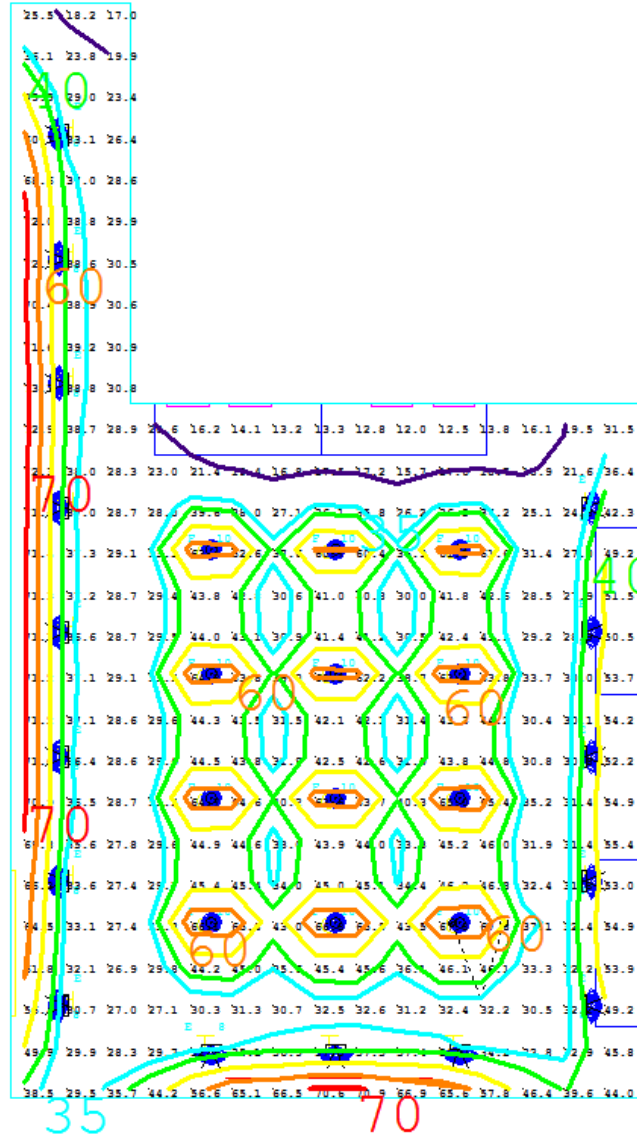
Lighting Design: Group Discussion Scene

During a group meeting when coworkers sit across the table from one another, facial recognition is important. The recessed downlights in the center of the room provide sufficient light to faces and the table surface. To avoid overly high contrast in surface brightness, the perimeter walls are washed at 50% brightness. This also removes a sense of tension associated with dark surroundings. If only the center of the room were lighted, the atmosphere would feel like an interrogation.



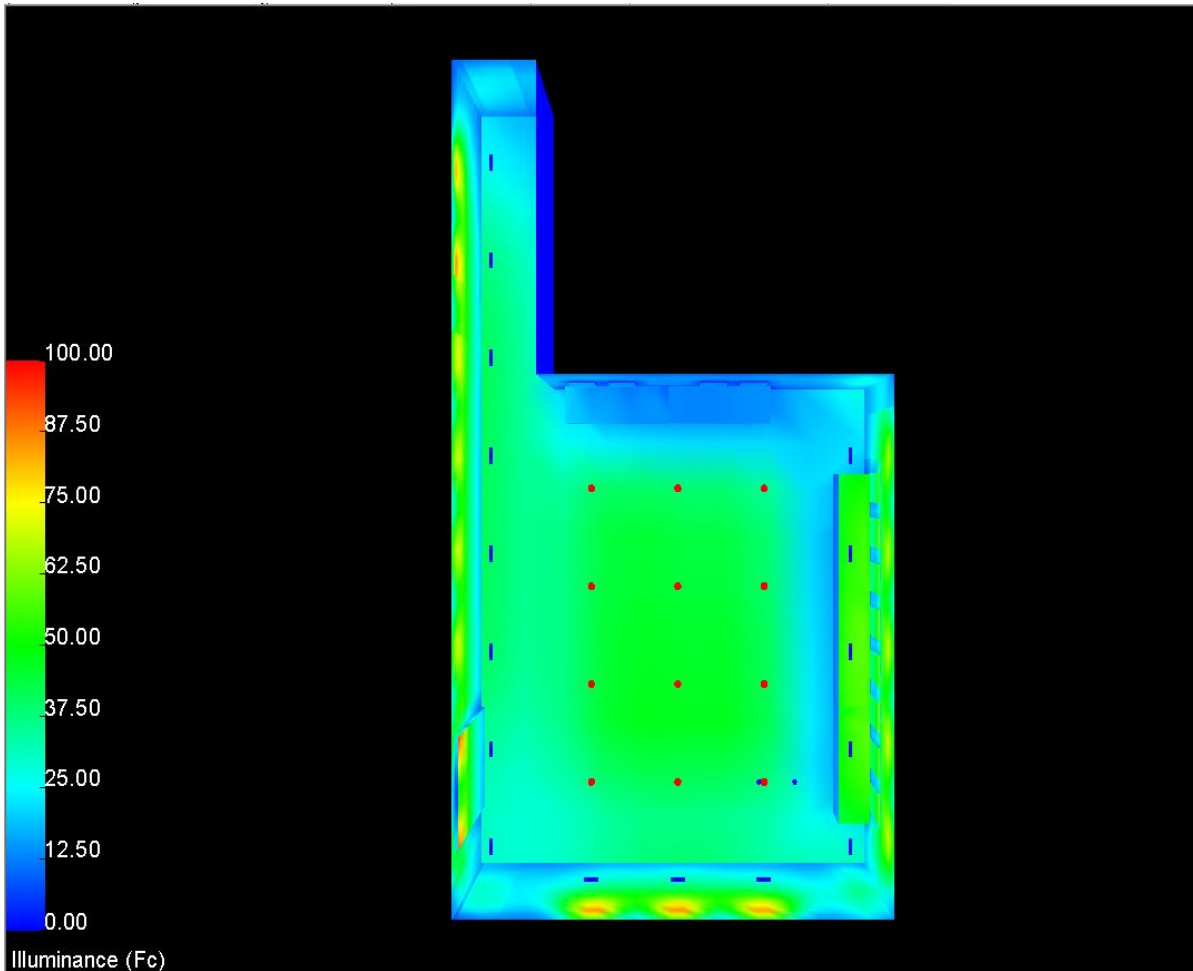
Isoline Drawing:

Each isoline is 10 footcandles from the next. The purple isoline represents 20 fc, and the red isoline represents 70 fc. Note that for this drawing, the lights are at full brightness. This is not part of any of the previous three scenes.



Pseudo Color Rendering:

The pseudo color rendering graphically displays the illuminances from an overhead view.



Energy Code Compliance:

ASHRAE 90.1 Lighting Power Density				
Area	Allowable Power	Size	Allowable Wattage	Designed Wattage
Conference Room	2.6 W/sq ft	1142 sq ft	2969 W	2800 W

ACOUSTICAL BREADTH

Introduction:

Room acoustics are an important quality of a space. In the case of the conference room at The Web Shop, speech intelligibility is a major design consideration. This breadth study contains strategies to develop an acoustically sound space. An analysis of reverberation time in the space shows a baseline of the room as well as suggested adjustments to fine tune the acoustics. In addition to reverberation time, HVAC noise will be taken into consideration in the analysis

HVAC Noise:

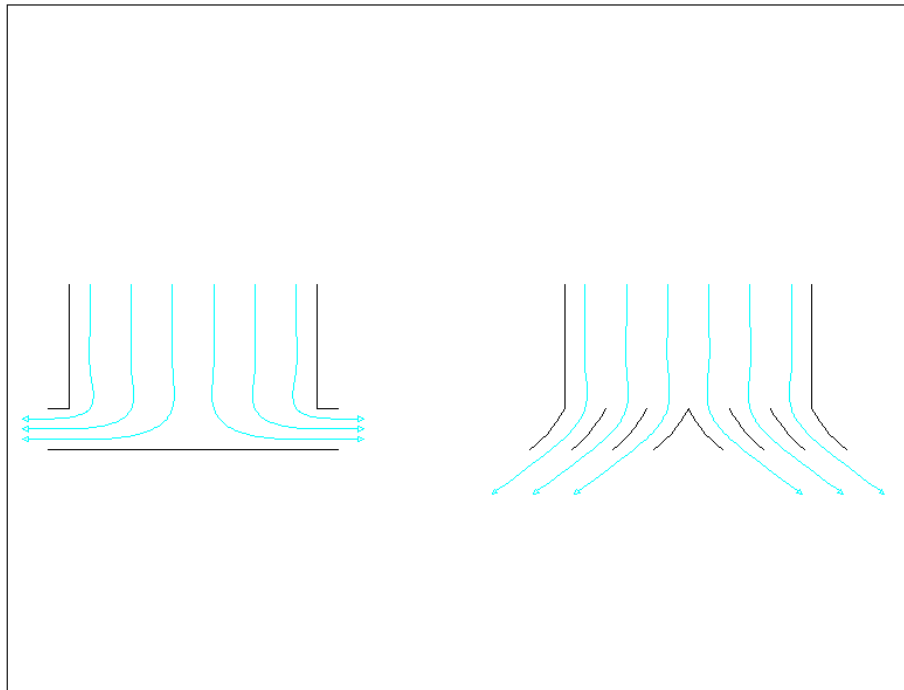
HVAC noise is an inevitable consequence of any building that is ventilated. However the noise it produces is not necessarily a bad thing. In moderation this background noise can provide a sense of normalcy and privacy. On the other hand, in excess it can be distracting to the occupants.

The standard created by ASHRAE to rate noise performance of an HVAC system is referred to as Room Criteria. Room Criteria is calculated by taking the arithmetic average of the 500, 1000, and 2000 Hz octave bands. For a conference room such as the one in The Web Shop, the suggested range is 25 to 30dB.

Unfortunately for the conference room in The Web Shop, the HVAC system suffers from a loud hissing noise. This noise, in the 2000 Hz range, would likely bring the Room Criteria rating above the 30dB maximum. A hissing noise in an HVAC system is most often caused by turbulence in the diffuser. Likely the diffuser is of poor quality or is undersized. In the conference room, the diffusers seem to be both of poor quality and undersized. The diffusers terminate at an abrupt 360 degree T-shape, but also the cross sectional area of the diffuser is reduced to 1/3 the size of the duct.



Above is a photograph of the conference room. Circled in red is a diffuser. Below is a sketch of diffusers. The left represents the existing design, and the right represents a suggested new design. The cyan arrows display the air flow of each method.



Sound Energy Decay:

The way sound decays in a room has a direct correlation with the quality of the acoustics. Within the room, sound energy is reflected off of every surface. Sound energy is also absorbed by these same surfaces.

T60 Reverberation Time:

The standard representation of room absorptivity is referred to as the T60 Time. This figure represents the amount of time it takes for a room to decrease by 60 decibels when the source is turned off. T60 Times can range from less than 0.1 seconds to 2.5 or more seconds. A recording studio, for instance, would fall at the bottom end of the scale, and a concert hall would fall towards the top. Reverberation Time directly impacts speech intelligibility. Lower T60 Time is best for speech quality. For a conference room, the T60 Time is recommended to be between 0.4 and 0.7 seconds. To calculate the T60 Time of the conference room, the Absorption Coefficient must first be determined. This figure represents how much the wall, ceiling, and floor surfaces are absorbing. The average absorption will always be between 0 and 1. 0 is perfectly absorptive, and 1 is completely reflective. Below are the calculations of the Absorption Coefficient and the T60 Time.

Calculating the Absorption Coefficient α :

Let the average room absorption = $\bar{\alpha}$. Let the individual surface absorption = α_n . Let the area of each surface = S_n .

$$\bar{\alpha} = (S_1\alpha_1 + S_2\alpha_2 + S_3\alpha_3 + \dots + S_n\alpha_n) / S_T$$

$$V = 14846 \text{ ft}^3$$

$$S_T = 4455$$

The assumed values of α , and the areas of each surface type are listed in the table below.

Description	Frequency (Hz)						Area (Sq Ft)
	125	250	500	1000	2000	4000	
	Sabine Absorptivity α						
Carpeted Floor	0.08	0.25	0.55	0.7	0.7	0.75	1142
Suspended Acoustic Tile	0.4	0.5	0.6	0.75	0.7	0.6	622
Plaster Ceiling	0.07	0.17	0.4	0.55	0.65	0.65	520
Gypsum on Studs	0.3	0.1	0.05	0.04	0.07	0.09	1338
Painted Brick	0.01	0.02	0.02	0.03	0.04	0.05	689
Wood Door	0.15	0.11	0.1	0.07	0.06	0.07	144
$\bar{\alpha}$ Per Octave Band	0.181	0.225	0.293	0.367	0.382	0.389	

Calculating the T60 Time:

$$T_{60} = 0.161V / -S_T \ln(1 - \bar{\alpha})$$

$$T_{60} = 0.161(14846) / -4455 \ln(1 - \bar{\alpha})$$

Frequency (Hz)	125	250	500	1000	2000	4000
$\bar{\alpha}$ Per Octave Band	0.181	0.225	0.293	0.367	0.382	0.389
T ₆₀	2.69	2.1	1.55	1.17	1.11	1.09

Analysis:

Reverberation time greater than 1 second generally is considered bad for intelligibility of speech. The target T₆₀ time for a conference room is somewhere between 0.5 and 0.9 seconds. Since speech lies around the 500-1000Hz range, the T₆₀ time for The Web Shop's conference room is between 1.1 and 1.6 seconds. To improve intelligibility for the space, it would be beneficial to get the T₆₀ below 0.9 seconds in both the 500 and 1000Hz octave bands. In order to improve the T₆₀ time of the conference room, the average absorptivity must increase. The best way to increase the absorptivity of an existing space is to hang highly absorptive materials on the walls. By this method, the reverberation time can be decreased to an appropriate level. This will vastly improve the acoustical quality of the room.

PHOTOVOLTAIC DEPTH

Introduction:

The following Electrical Depth is a study of photovoltaics. This report will present an overview of photovoltaic systems and their advantages. An analysis of the site will be conducted before the design of the system begins. Once design begins, detailed assumptions and calculations will be shown. The results will be analyzed to determine if the PV system was a worthwhile investment.

Why Photovoltaics?

In 2004 the global energy consumption was 130,000 terawatt hours. And in an age where fossil fuels are at a premium, the price of living is only going up. Changes must be made globally to be more efficient. Energy sources must shift to be renewable. The answer to all of the global needs is harnessing the power of the sun. Each year the earth receives about 350,000,000 terawatts of radiation. Even if the efficiency of the solar systems is terrible at first, there is still more than enough solar energy to make a difference.

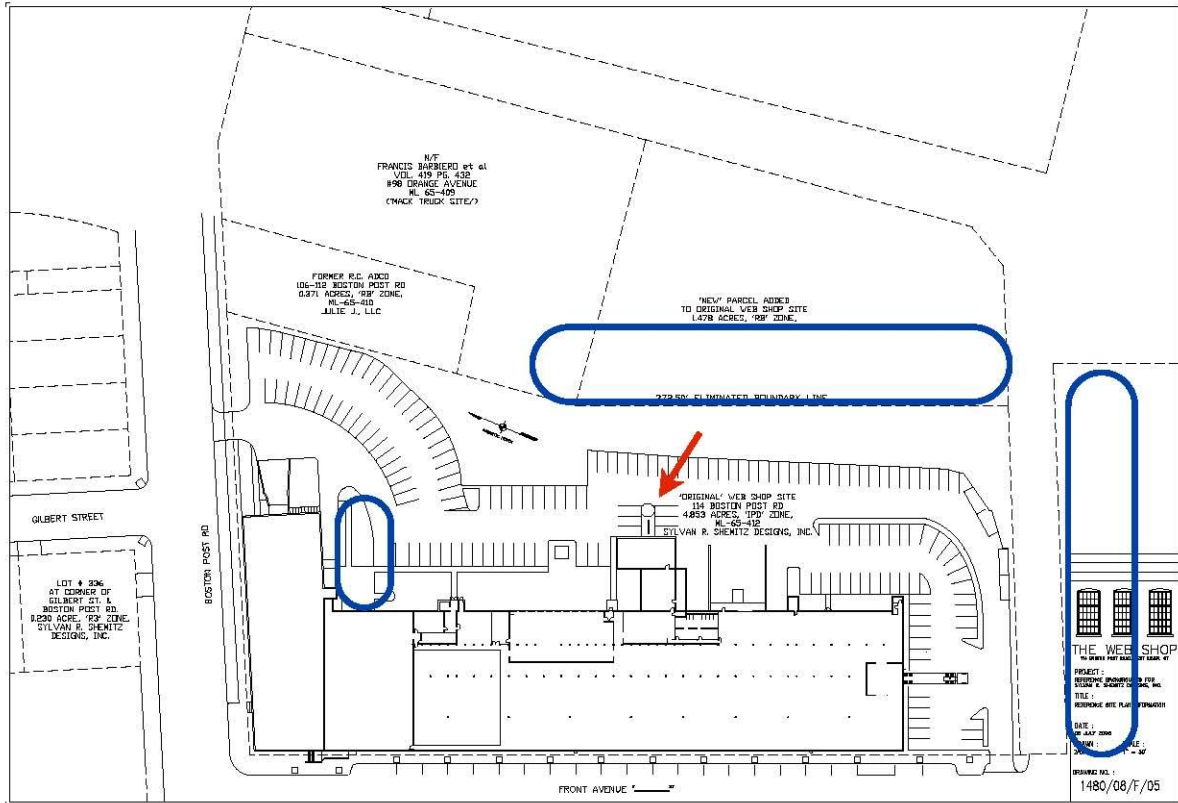
The advantage of photovoltaics over other renewable energy sources comes down to efficiency. Wind turbines, for instance, rely on temperature differences caused by the sun unequally heating the atmosphere. Photovoltaics, on the other hand, convert the sun's radiation directly to electricity.

Hypothesis:

The geographic location of the site may impact the solar gain. If it were nearer to the equator, the gain would be much higher. This, along with many other factors, will impact whether or not installing a PV system is cost effective. It will likely be very close to breaking even. Hopefully it will be more on the side of a positive investment. With every decision made in the design process, serious consideration will be made to cost effectiveness.

Survey of the Site:

Before the design of the PV system begins, the site must be deemed adequate. One of the major considerations determining the adequacy of the site is shading. Some of the key contributors of shading include, but are not limited to: vegetation such as large trees, surrounding structures, and PV self-shadowing. A shadow on even one of the panels can cripple the net gain, so everything must be thoroughly analyzed.



Upon analysis of the site, it has been determined that there are minimal obstructions, and none are of major concern. There are no adjacent buildings taller than The Web Shop. All foliage surrounding the building is sufficiently far away or is small enough to not be a concern. Foliage above 10 feet in height is outlined in blue. The factory cooling tower, as indicated with the red arrow above, may cast a shadow in the early morning. This will be taken into account, however it poses no major threat considering its shadows will generally lay in the parking lot. The only other major consideration is the array self-shadowing. This will be analyzed in detail when designing the array layout.

Determining the Basic Array Layout:

Now that the site has been deemed adequate, possible locations for the PV array can be determined. Since the entirety of the site excluding the building is utilized by parking, the only possibility is a rooftop array. Luckily, the roof of The Web Shop is very large, and should prove to be a viable location for a PV system. Shown below is a bird's eye view of the site. Outlined in purple is the taller office roof, and outlined in green is lower the factory roof.

As evident in the image above, the roofs are littered with mechanical equipment. Implementing the

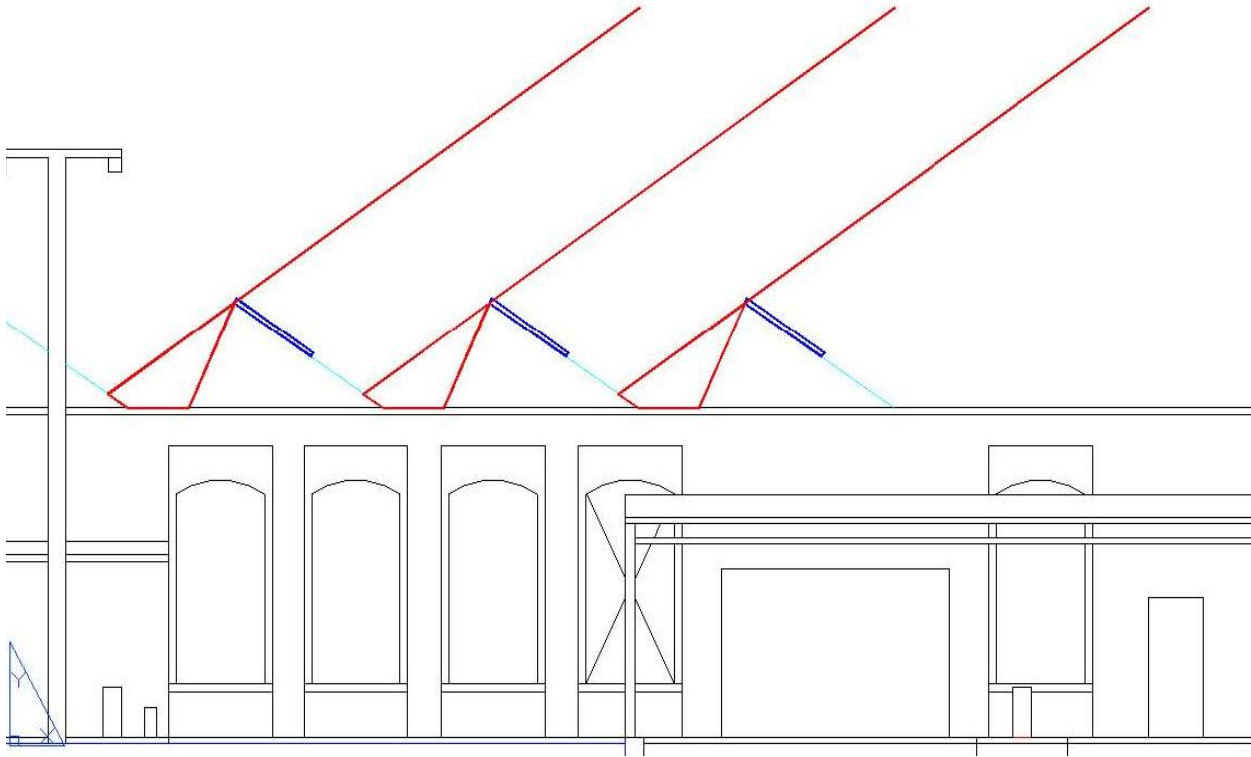


design around this equipment would be very difficult, and would also hinder the usability of said equipment. Also, it is necessary to consider a system that someone will be able to pay for. The most extravagant solutions may not be the most practical. By using this mentality, it seems necessary to limit the size of the array to only encompass the sawtooth fenestrations. This method restricts the flexibility of the design. However, the ease of mounting the array is greatly increased due to the convenient design of the fenestrations. In addition, by not stretching the array to the very edge of the roof, it will not be visible to passersby. Thus the building will retain a classic, understated appearance. Below is a plan and an elevation of the factory roof, showing the saw tooth fenestrations. Highlighted in red is the roof area encompassed by the fenestrations.

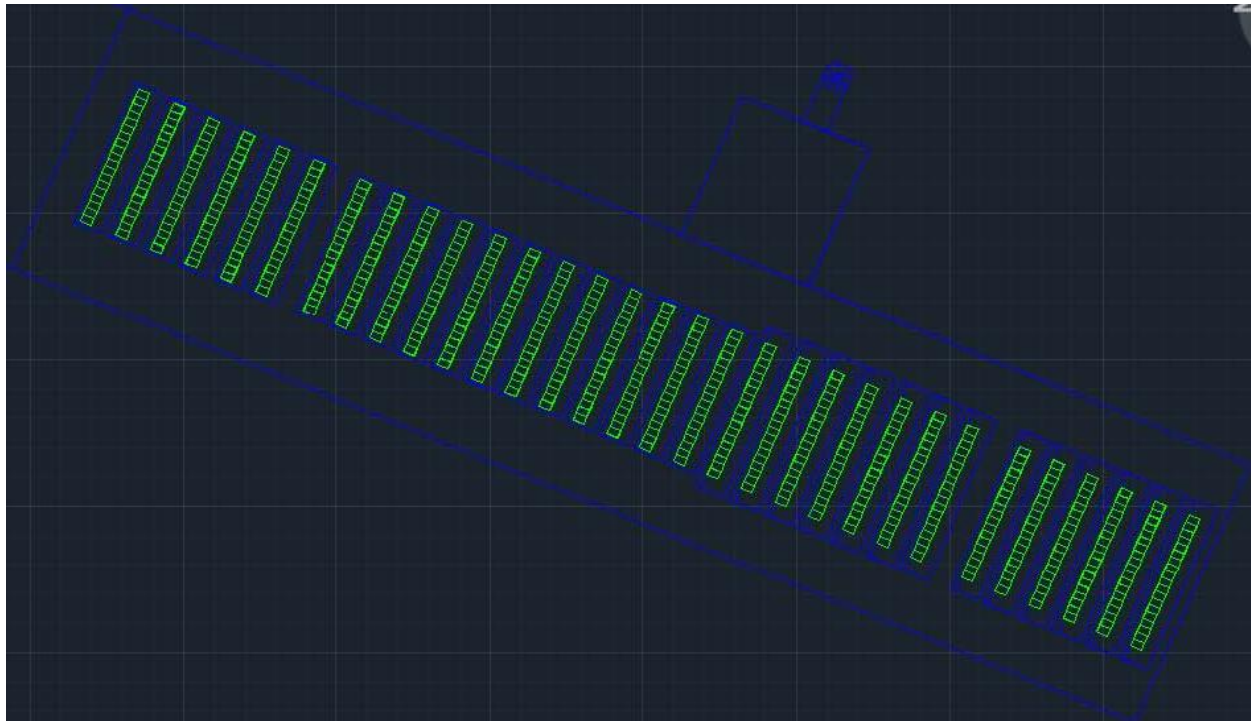
Preliminary Drawings:



There are so many brands of PV Panels and supporting equipment to choose from. For the purposes of this study, it is impractical to labor over deciding on which to use. Though care will be taken on specifications of products, the brands will be chosen arbitrarily. The first product decision to make is the PV Panels. Sharp Commercial Series Panels were chosen. This series of panels offers many choices of specifications of the same size panel. So for now, only the panel size will be chosen, and the specific model will be chosen later. The chosen panel measures 39.1" x 64.6" x 1.8". This size was chosen based on how well it fits on the back of the rooftop monitors. Filling the entire back slope of the monitors is impractical. Though it would be beneficial in the summer to maximize the size of the panels, in the winter months, the lower portion of the panels would be shaded by the next fenestration to the south. A compromise has to be made so that the panels can be effective all 12 months of the year. To accomplish this, only about half of the monitor is covered in modules. Below is a plan and elevation showing the layout. Please note that all strings contain 18 modules, though the larger monitors are able to fit more. This is done so that the voltage remains the same across all strings, and also so that the microinverters are not overloaded. In total, there are 558 modules.

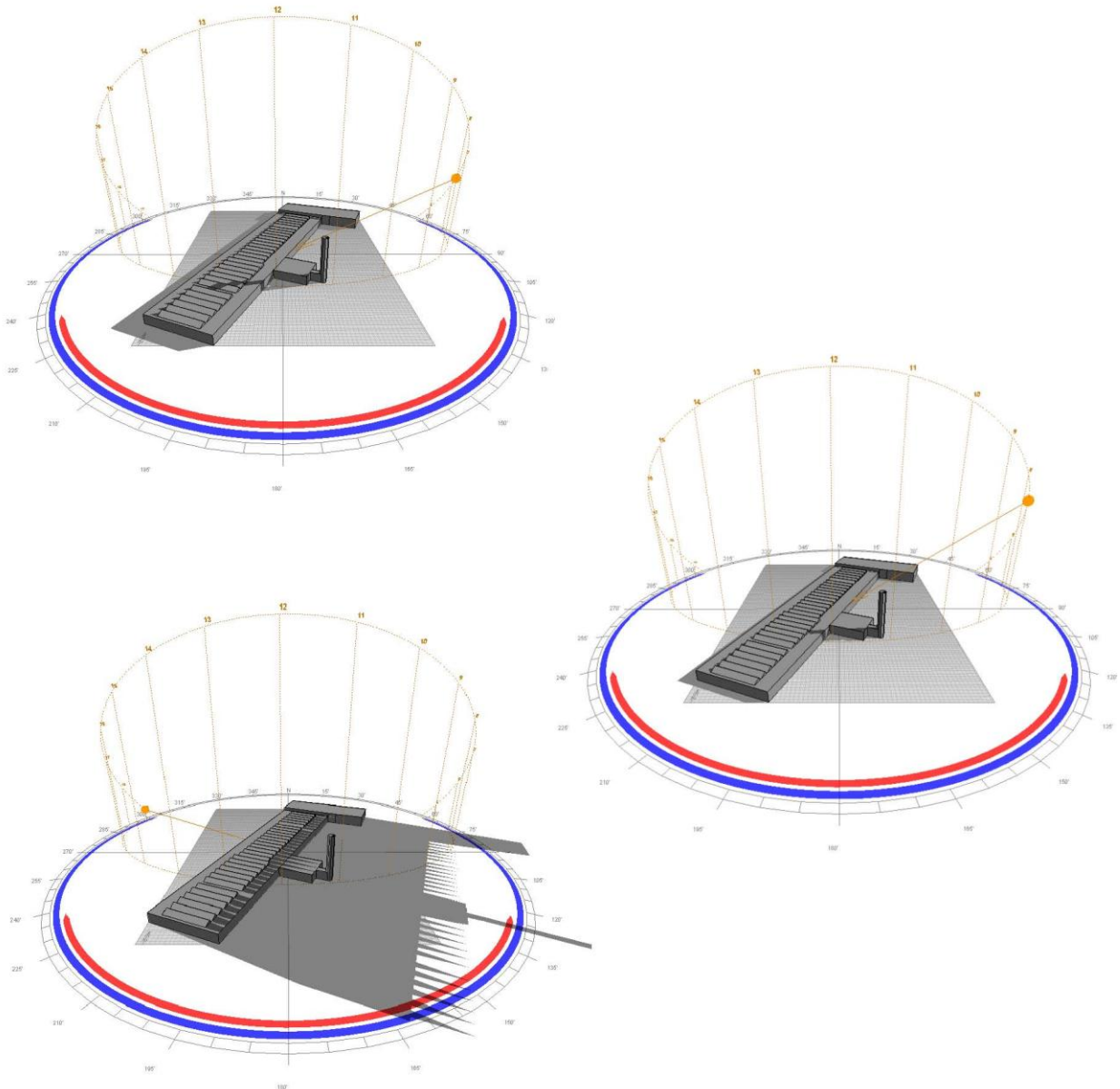


Shown above is a roof elevation with panels in blue on the backs of the monitors. In red shows how the sun angle affects shadowing. Note that the panels are out of the way of shadows caused by low sun angles. Below is a plan of the layout.



Shading, Revisited:

To take a closer look at the impact of shading, the building was analyzed in Autodesk Ecotect. It is necessary to analyze with this level of detail to calculate the precise times the building shadows itself. The shadows in consideration are the saw tooth fenestration shadows and the shadow caused from the cooling tower. The results show what hours of the day the panels are free of shade, and were analyzed quarterly on the equinoxes and solstices. Shown below is the Summer Solstice as an example. Note that the times do not take into consideration daylight savings, and are rounded to the nearest 15 minutes.



Results from Shading:

The result reveals what duration the PV panels will be free of shadows. In the summer, as shown above in the first image, the Panels are free from shadows caused by the monitors shortly after sunrise at 6:45 AM. However, the panels are not free from the shadow caused by the cooling tower until 7:15 AM. The panels do not see shadows until 7:00 PM when the monitors shade themselves. This yields 11 hours and 45 minutes of uninterrupted gain in the summer. Below is a table showing the summer example, as well as the remaining three quarters of the year. Usable Time 1 represents the total time of uninterrupted shading, and Usable Time 2 represents the total unshaded time, disregarding the cooling tower shadow.

QTR	Sunrise	Out of Shadow	Past Tower	Back In Shadow	Sunset	Usable Time 1	Usable Time 2
Spring	6:53 AM	6:45 AM	8:30 AM	5:30 PM	7:05 PM	9h 00m	10h 45m
Summer	5:19 AM	6:15 AM	7:15 AM	7:00 PM	8:28 PM	11h 45m	12h 45m
Autumn	6:38 AM	6:45 AM	8:30 AM	5:30 PM	6:53 PM	9h 00m	10h 45m
Winter	7:14 AM	7:45 AM	10:30 AM	3:15 PM	4:25 PM	4h 45m	7h 30m

Sizing Inverters:

To optimize solar radiation, it seems necessary to implement microinverters. By doing this, only the individual modules in shade will be affected. This will leave the rest of the system unaffected. The alternative to microinverters is one large inverter. But by using this system, the gain would be crippled in the time that any portion of a module is shaded.

The PV system will be using Sharp 230W modules and an Enphase D380 Twin Microinverter. This microinverter connects to two modules and has a single output. The rated maximum of the microinverter is matched at 230W. The calculations below show that the microinverters are a good match for the modules. First below are the PV module specs. Following is the microinverter specs.

ELECTRICAL CHARACTERISTICS	
Maximum Power (Pmax)*	230 W
Tolerance of Pmax	+10%/-5%
Type of Cell	Polycrystalline silicon
Cell Configuration	60 in series
Open Circuit Voltage (Voc)	37.1 V
Maximum Power Voltage (Vpm)	30.0 V
Short Circuit Current (Isc)	8.48 A
Maximum Power Current (Ipm)	7.67 A
Module Efficiency (%)	14.1%
Maximum System (DC) Voltage	600 V
Series Fuse Rating	15 A
NOCT	47.5°C
Temperature Coefficient (Pmax)	-0.485%/°C
Temperature Coefficient (Voc)	-0.36%/°C
Temperature Coefficient (Isc)	0.053%/°C

Input Data (DC)	D380-72-2LL-S12/3 and D380-72-2LL-S12/3-NA
Recommended input power (STC)	230W
Maximum input DC voltage	56V
Peak power tracking voltage	22V – 40V
Min./Max. start voltage	28V/54V
Max. DC short circuit current	12A
Max. input current	10A

Output Data (AC)	@208 Vac	@240 Vac
Maximum output power	380W	380W
Nominal output current	1.8A	1.6A
Nominal voltage/range	208V/183V-229V	240V/211V-264V
Extended voltage/range	208V/179V-232V	240V/206V-269V
Nominal frequency/range	60.0/59.3-60.5	60.0/59.3-60.5
Extended frequency/range	60.0/59.2-60.6	60.0/59.2-60.6
Power factor	>0.95	>0.95
Maximum units per 20A branch	15	10

Calculations:

The voltage increase due to temperature must be calculated. The open circuit voltage is calculated at a standard test condition of 25°C. However, the system will experience much lower temperatures. According to ASHRAE, the record low is -32°C.

$$37.1V + 37.1V*(-0.0036(/^{\circ}C))*(-26^{\circ}C-25^{\circ}C) = 43.91V$$

This is an increase of nearly 7V due to temperature. However it is still less than the 56V maximum input voltage of the inverter. The maximum power voltage of the modules is 30V. This is between the ranges that are required by the inverter of 22 to 40V. But it is necessary to check that under extreme operating conditions, the system will still work. The record high temperature for the area is 41°C. An additional 30°C is assumed. This represents the additional heat of the roof surface in the summer.

$$30.0V + 30.0V*(-0.0036(/^{\circ}C))*(61^{\circ}C-25^{\circ}C) = 26.11$$

This is a decrease of nearly 4V, however is still above the minimum of 22V.

The short circuit current of the module is 8.48A. The NEC requires a 1.25 multiplier.

$$8.48A * 1.25 = 10.6A$$

This is below the 12A maximum, as indicated on the microinverter spec sheet.

Also, the maximum number of microinverters per string is 10, as noted in the microinverter specs. Each of the strings in this layout contains 9 microinverters.

It can be concluded that the microinverter is sufficient to output the module.

Determining Array Orientation:

By using the building elevation, the tilt of the panels is 33.5° above horizontal. And by using the site plan, the azimuth is determined to be 20° west of due south.

Analyzing Solar Radiation:

To analyze the solar radiation for the site, a series of online calculators were used from a trusted provider. The PVWatts v.2 online calculator by the National Renewable Energy Laboratory was used for this calculation. By first imputing the zip code, PVWatts pulls data from National Solar Radiation Database.

STATION IDENTIFICATION		RESULTS			
Cell ID:	270369	MONTH	SOLAR RADIATION (kWh/m2/day)	AC ENERGY (kWh)	ENERGY VALUE (\$)
State:	Connecticut	January	2.79	8559	1143.74
Latitude:	41.2° N	February	3.62	9972	1332.56
Longitude:	73.2° W	March	4.72	13978	1867.88
PV SYSTEM SPECIFICATIONS		April	4.93	13855	1851.44
DC Rating	128.3kW	May	5.49	15291	2043.34
Derate Factor	0.75	June	5.58	14665	1959.68
AC Rating	96.3kW	July	5.48	14712	1965.96
Array Type	Fixed Tilt	August	5.38	14492	1936.57
Array Tilt	33.5°	September	4.91	12987	1735.45
Array Azimuth	200°	October	4.14	11809	1578.04
ENERGY SPECIFICATIONS		November	2.89	8081	1078.86
Cost of Electricity	\$0.134/kWh	December	2.66	7888	1054.07
		TOTAL	4.39	146290	19584.73

CALCULATION FOR OVERALL DC TO AC DERATE FACTOR		
COMPONENTS	VALUES	ACCEPTED RANGE
PV Module Nameplate DC Rating	0.95	0.80 - 1.05
Inverter and Transformer	0.92	0.88 - 0.98
Mismatch	0.98	0.97 - 0.995
Diodes and Connections	0.995	0.99 - 0.997
DC Wiring	0.98	0.97 - 0.99
AC Wiring	0.99	0.98 - 0.993
Soiling	0.95	0.30 - 0.995
System Availability	0.98	0.00 - 0.995
Shading	0.975	0.00 - 1.00
Sun-Tracking	1	0.95 - 1.00
Age	1	0.70 - 1.00
Overall DC to AC Derate Factor	0.75	

Payback:

Though saving nearly \$20,000 a year is considerable, it is not as impressive when compared to the monthly bill of the system of over \$16,000. The lifetime return is fair, considering the investment that was made; about 19.7%. This return walks the fine line between whether or not it is worth it. So the decision really comes down to what the benefit is. If the company wants no more than an investment to make money off of, then this may not be the safest choice. In the life expectancy, there is always the possibility that something may need to be replaced that isn't covered by the warranty. However, there is much more to energy savings than just money. This is an opportunity to conserve natural resources, reduce carbon emissions, and be a part of a growing technology. In a sense, it seems worth the risk, even though the potential monetary gains are low. In the future, if the price of electricity continues to increase, the return may be much higher. And if the price of PV equipment decreases as the technology improves before the system is implemented, the return would be higher still.

Price Assumptions	
PV Panels	\$450,000
Inverters	\$90,000
Electrical Systems	\$30,000
Labor	\$100,000
Shipping	\$10,000
Permits	\$20,000
TOTAL	\$700,000
30% Tax Incentive	(\$210,000)
TOTAL	\$490,000

Investment Payback	
System Cost	\$490,000
Annual Cost(over 30 years)	\$16,333
Annual Energy Savings	\$19,549
Annual Return	\$3,216
Total Return(over 30 years)	\$96,480
% Payback (over 30 years)	19.70%

TRANSFORMER CONSOLIDATION DEPTH

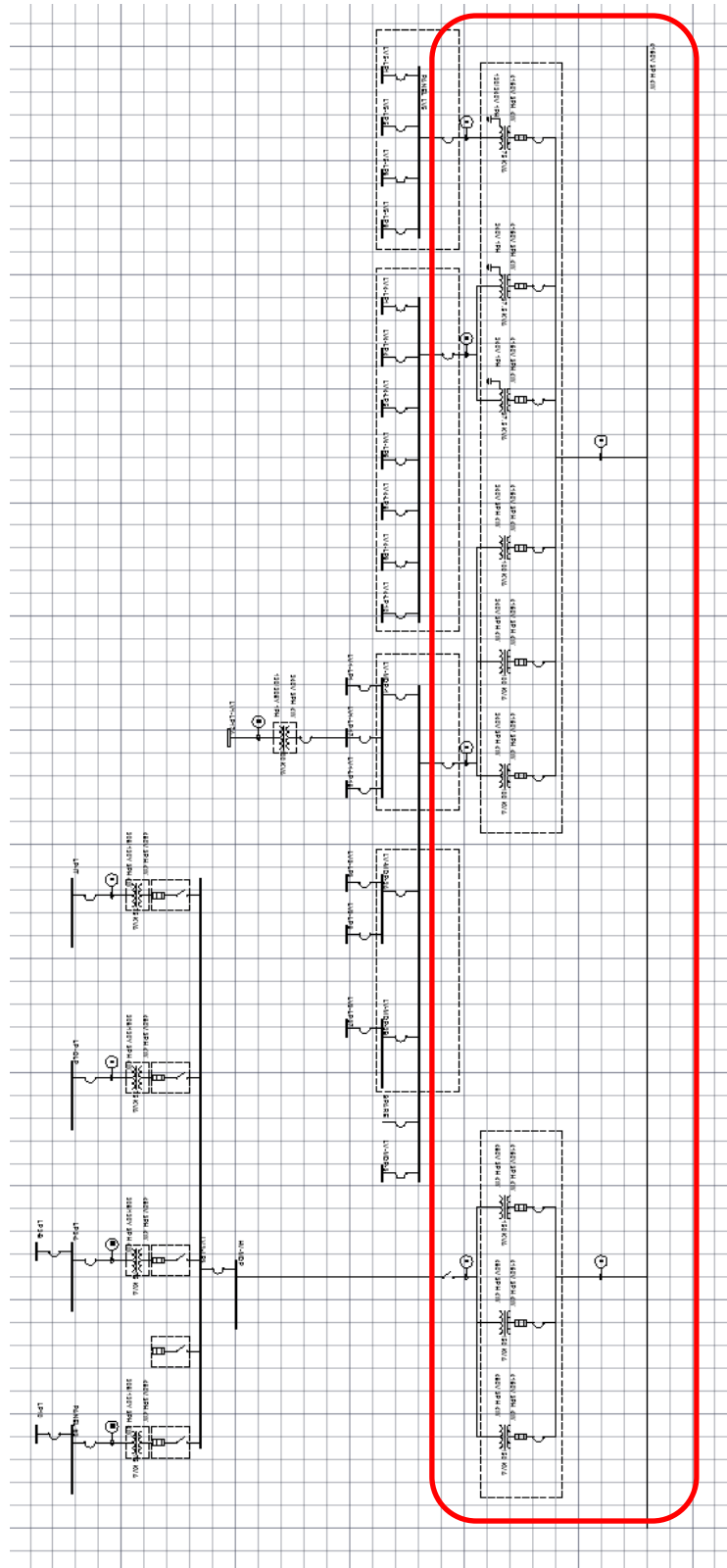
Introduction:

The electrical system at the Web Shop has changed as the needs of the tenants have changed. The Lighting Quotient did not renovate the electrical system when they moved in in the 1980s. They did however add and subtract some equipment as needed. For instance, a previous tenant utilized a bus duct that runs the length of the factory. The Lighting Quotient's manufacturing equipment is primarily pneumatic, with the exception of some large equipment like the powder coating oven. So they now use the bus duct to tie smaller transformers into the grid. This is not the most effective use of a bus. The current electrical system could certainly be redesigned to better meet the current needs of the company, as well as accommodate new equipment.

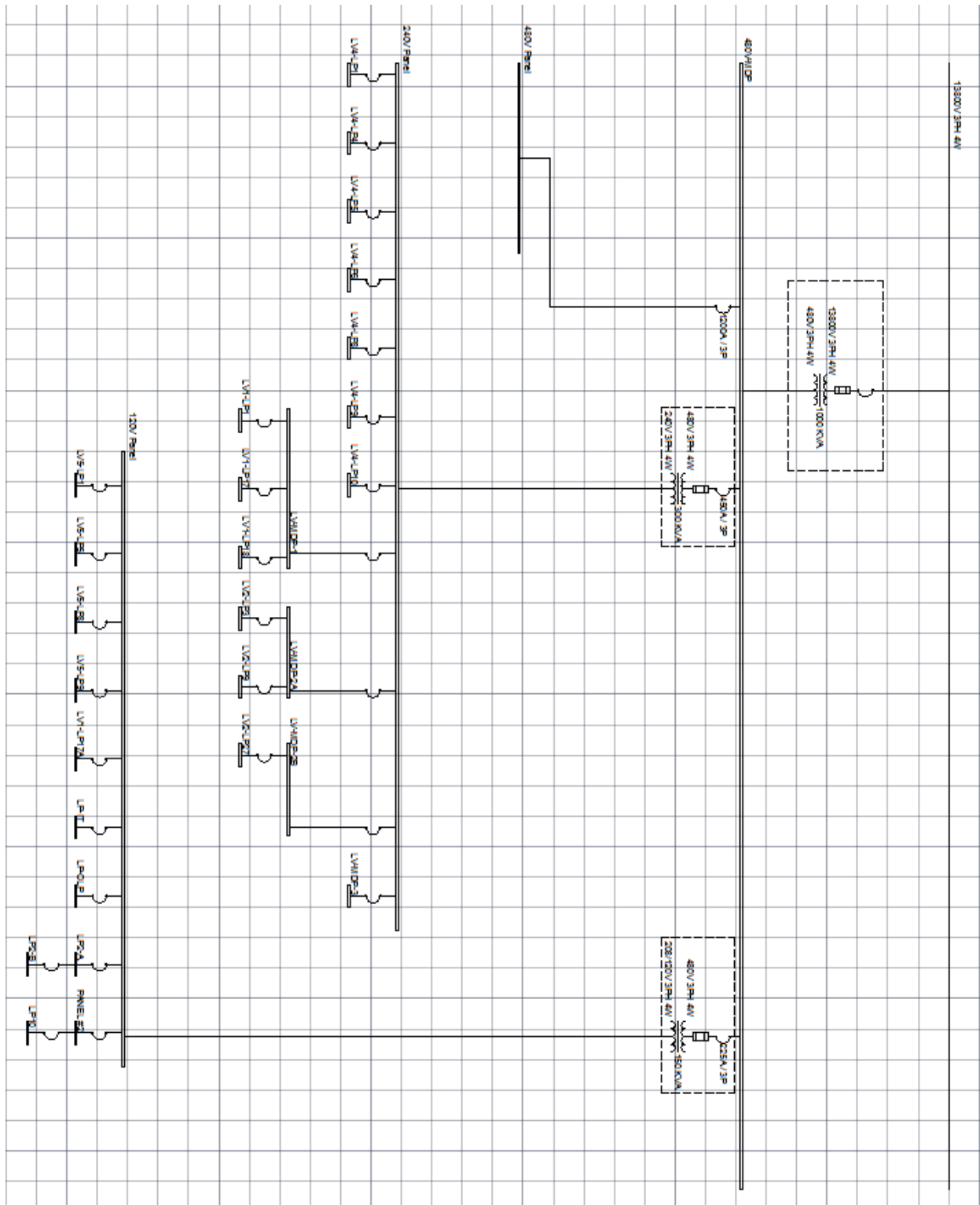
Project Overview:

The following analysis includes a redesign of all transformers and distribution panels. Though the individual panelboards could benefit being reworked, this would be out of the scope of the analysis. The sizing of all equipment and wires leading up to the existing individual panelboards will be documented below. The following drawing displays the scope of the analysis in the red outline.

Scope of Redesign:



Redesigned Transformers and Main Distribution Panels:



Design Overview:

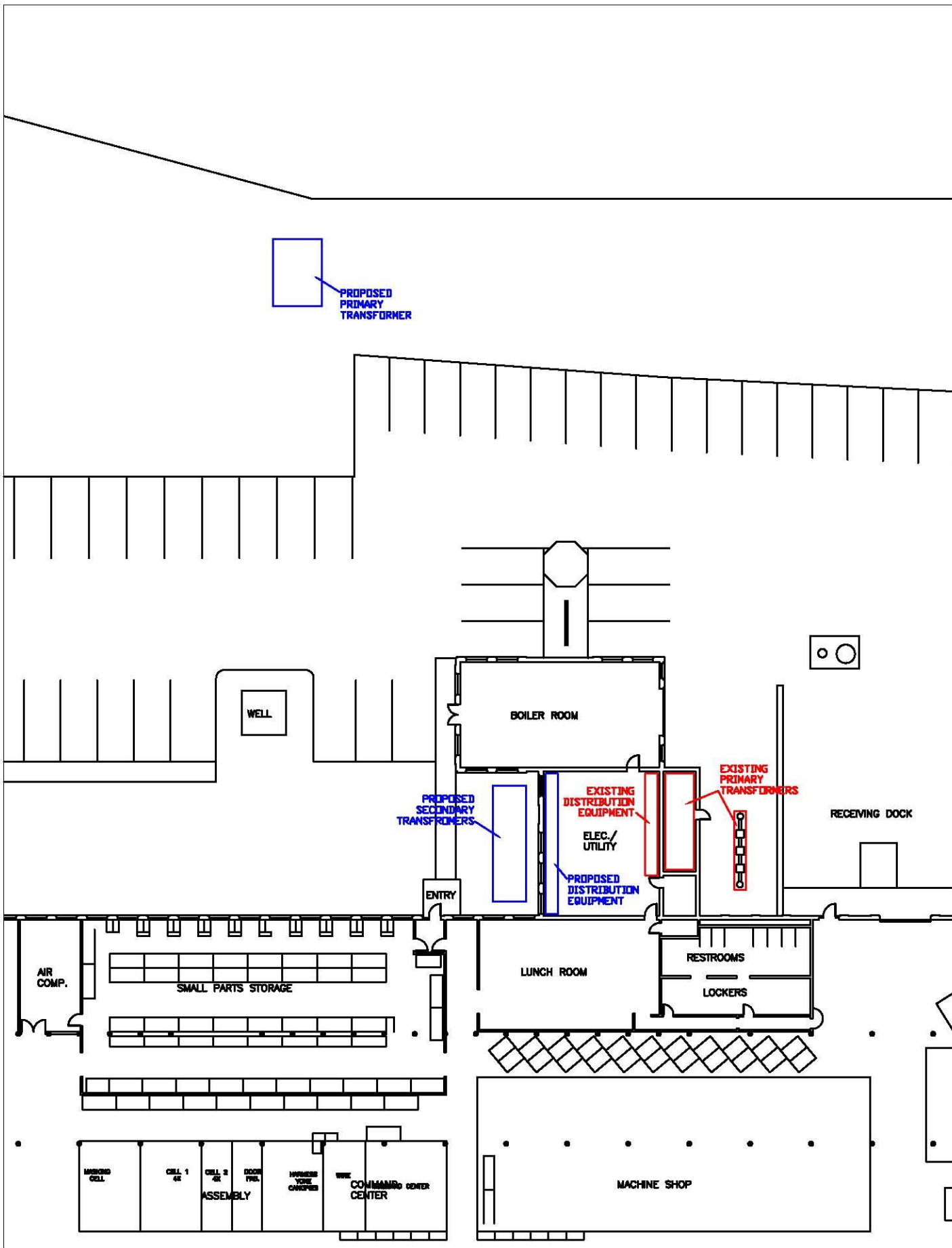
Whereas the existing design has 9 primary transformers and 5 secondary transformers, the new design utilizes just 1 primary and 2 secondary transformers. By doing so, each of the 3 voltage types in the building essentially has its own transformer. The primary transformer steps the incoming power down to 480V. This transformer feeds the 480V main distribution panel. The 480V main distribution panel serves the 480V loads, including the two secondary transformers. The first of the secondary transformers steps power down from 480V to 240V. The second secondary transformer steps power down from 480V to 120/208V. Each of the secondary transformers then feeds its respective main distribution panel.

There are 3 main distribution panels: one for each voltage type. The existing individual panel boards throughout the building were relocated on the new main distribution panels.

Coordination:

In order to minimize downtime while installing the new system, the building must continue to run on the existing system for as long as possible. It is possible to install the new main distribution panels adjacent to the existing equipment. By doing so, the building can continue to run until the installation is complete. In a short amount of time, the building can be de-energized, and the power can be transferred through the new system. Below is a plan showing the locations of the existing equipment, as well as the proposed locations of the new equipment.

Analysis:



SCALE:
 1' 5' 10' 20' 30'

ELECTRICAL DEPTH 2
 XFMR CONSOLIDATION
 COORDINATION PLAN
 SCALE: 1/32"=1'-0"

ADDITIONAL ELECTRICAL REQUIREMENTS

Introduction:

The following section addressed the impact of the new lighting designs on the existing electrical system. Though the individual panelboard schedules were obtained, the connected loads are not known. Therefore an accurate analysis of the existing panelboards is not possible. The compromise made to analyze the impact of the new lighting design is to create an all new panelboard and analyze its attributes. A voltage drop calculation will be conducted to double check that the new panel is sized correctly. Additional analyses consist of a short circuit analysis of one the path leading to one of the existing panels. Trip curves will also be included for this path.

Voltage Drop

The new panel uses a 225A bus.

Feeder:

152.7A → 175A

Use 2/0 AWG

Breaker:

152.7A → 175A

Use a 175A Breaker

Ground Wire:

152.7A → 200A

Use #6 AWG

Conduit:

$4 \times (2/0 \text{ AWG}) + 1 \times (\#6 \text{ AWG}) = 1.3455 \text{ in}^2$

Voltage Drop:

Assuming a magnetic conduit and 100% PF, the voltage drop is 0.064V / 1000A-ft

The panel has a 152.7A load and is 360ft from the main distribution panel.

$(0.064 \text{ V} / 1000 \text{ A-ft})(152.7 \text{ A})(360 \text{ ft}) = 3.52 \text{ V}$

$3.52 \text{ V} / 208 \text{ V} = 1.7\%$

Since the voltage drop is below 3%, the feeder does not need to be updated.

PANELBOARD SIZING WORKSHEET

Panel Tag----->	LP20	Panel Location:	Mechanical Room
Nominal Phase to Neutral Voltage----->	120	Phase:	3
Nominal Phase to Phase Voltage----->	208	Wires:	4

Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks
1	A	Ltg. Fluorescent	3	Lobby	420	w	0.90	420	467	Uplights
2	A	Ltg. Halogen	5	Lobby	600	w		600	750	Wall Wash
3	B	Ltg. Fluorescent	3	Office	112	w	0.90	112	124	F101 East Wall
4	B	Ltg. Metal Halide	4	Office	560	w		560	700	M101 South Wall
5	C	Ltg. Halogen	5	Office	1200	w		1200	1500	T099 North Wall
6	C	Ltg. Metal Halide	4	Conference	560	w		560	700	North/South Walls
7	A	Ltg. HID	4	Conference	1200	w		1200	1500	Downlights
8	A	Ltg. Metal Halide	4	Conference	210	w		210	263	West Wall
9	B	Ltg. Metal Halide	4	Entrance	520	w		520	650	Ground Lights
10	B	Ltg. Fluorescent	3	Entrance	282	w	0.90	282	313	Uplights
11	C	Ltg. Metal Halide	4	Entrance	360	w		360	450	Wall Wash
12	C	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
13	A	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
14	A	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
15	B	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
16	B	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
17	C	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
18	C	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
19	A	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
20	A	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
21	B	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
22	B	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
23	C	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
24	C	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
25	A	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
26	A	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
27	B	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
28	B	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
29	C	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
30	C	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
31	A	Receptacle	1	Office	1536	w		1536	1920	Tambient Fixtures
32	A				0	w		0	0	
33	B				0	w		0	0	
34	B				0	w		0	0	
35	C				0	w		0	0	
36	C				0	w		0	0	
37	A				0	w		0	0	
38	A				0	w		0	0	

39	B				0	w		0	0		
40	B				0	w		0	0		
41	C				0	w		0	0		
42	C				0	w		0	0		
PANEL TOTAL								36.7	45.8	Amps= 127.3	
PHASE LOADING											
PHASE TOTAL		A						kW	kVA	%	Amps
PHASE TOTAL		B						13.2	16.4	36%	136.8
PHASE TOTAL		C						10.7	13.3	29%	110.9
PHASE TOTAL								12.9	16.1	35%	134.1
LOAD CATAGORIES											
			Connected				Demand				
			kW	kVA	DF	kW	kVA	PF			
1	receptacles		30.7	38.4		30.7	38.4	0.80			
2	computers		0.0	0.0		0.0	0.0				
3	fluorescent lighting		0.8	0.9		0.8	0.9	0.90			
4	HID lighting		3.4	4.3		3.4	4.3	0.80			
5	incandescent lighting		1.8	2.3		1.8	2.3	0.80			
6	HVAC fans		0.0	0.0		0.0	0.0				
7	heating		0.0	0.0		0.0	0.0				
8	kitchen equipment		0.0	0.0		0.0	0.0				
9	unassigned		0.0	0.0		0.0	0.0				
Total Demand Loads						36.7	45.8				
Spare Capacity			20%			7.3	9.2				
Total Design Loads						44.1	55.0	0.80	Amps=	152.7	

Default Power Factor =	0.80
Default Demand Factor =	100 %

Note:
The receptacle loads were designed to carry two Tambient fixtures each. The total load from the Tambient fixtures is only demand 1816 Watts. However, since the receptacle loads are able to accommodate much larger loads, 1.92A per receptacle was assumed.

Short Circuit Analysis

$$I_{SC} = \text{Base kVA} / (\sqrt{3})(\text{kV})(Z_U)$$
$$Z_U = \sqrt{X^2 + R^2}$$
$$X_U = (X\%)(\text{Base kVA}) / 100(\text{XFMR kVA})$$
$$R_U = (R\%)(\text{Base kVA}) / 100(\text{XFMR kVA})$$

Utility:

$$X_U = 10000\text{kV} / 100000\text{kV} = 0.1$$
$$I_{SC} = 10000 / (\sqrt{3})(4.16)(0.1) = 138786\text{A}$$

XFMR 1: 450kVA

$$Z = 5.8\%$$
$$X/R = 4.33$$

$$R = 1.305\%$$
$$X = 5.65$$
$$X_U = (5.65)(10000) / (100)(0.48) = 1.26$$
$$X_{U-TOTAL} = 1.26 + 0.1$$
$$R_U = (1.205)(10000) / (100)(0.48) = 0.29$$
$$Z_U = \sqrt{X_U^2 + R_U^2} = 1.386$$
$$I_{SC} = 10000 / (\sqrt{3})(0.48)(1.386) = 8678\text{A}$$

Wire 1: 2 sets of 4/0

$$X = (50' / 1000)(0.0326)(1/2 \text{ sets}) = 0.000815$$
$$X_U = (0.000815)(10000) / (1000)(0.48)^2 = 0.035$$
$$X_{U-TOTAL} = 1.26 + 0.1 + 0.035 = 1.395$$
$$R = (50' / 1000)(0.0614)(1/2 \text{ sets}) = 0.001535$$
$$R_U = (0.001535)(10000) / (1000)(0.48)^2 = 0.067$$
$$R_{U-TOTAL} = 0.29 + 0.067 = 0.357$$
$$Z_U = \sqrt{X_U^2 + R_U^2} = 1.44$$
$$I_{SC} = 10000 / (\sqrt{3})(0.48)(1.44) = 8353\text{A}$$

Wire 2: #3 AWG

$$X = (200' / 1000)(.0367) = 0.00734$$
$$X_U = (0.00734)(10000) / (1000)(0.48)^2 = 0.319$$
$$X_{U-TOTAL} = 1.26 + 0.1 + 0.035 + 0.319 = 1.714$$
$$R = (200' / 1000)(0.247) = 0.0494$$
$$R_U = (0.0494)(10000) / (1000)(0.48)^2 = 2.144$$
$$R_{U-TOTAL} = 0.29 + 0.067 + 2.144 = 2.501$$
$$Z_U = \sqrt{X_U^2 + R_U^2} = 3.03$$
$$I_{SC} = 10000 / (\sqrt{3})(0.48)(3.03) = 3967\text{A}$$

XFMR 2: 75 kVA

$$Z = 3\%$$

$$X/R = 0.83$$

$$R = 2.308\%$$

$$X = 1.92$$

$$X_U = (1.92)(10000) / (100)(0.208) = 92.31$$

$$X_{U-TOTAL} = 1.26 + 0.1 + 0.035 + 0.319 + 92.31 = 94.02$$

$$R_U = (2.308)(10000) / (100)(0.208) = 110.96$$

$$R_{U-TOTAL} = 0.29 + 0.067 + 2.144 + 110.96 = 113.461$$

$$Z_U = \sqrt{X_U^2 + R_U^2} = 147.35$$

$$I_{SC} = 10000 / (\sqrt{3})(0.208)(147.35) = 188.38A$$

Wire 3:

$$X = (100' / 1000)(0.0371) = 0.00371$$

$$X_U = (0.00371)(10000) / (1000)(0.208)^2 = 0.857$$

$$X_{U-TOTAL} = 1.26 + 0.1 + 0.035 + 0.319 + 92.31 + 0.857 = 94.877$$

$$R = (100' / 1000)(0.1553) = 0.01553$$

$$R_U = (0.01553)(10000) / (1000)(0.208)^2 = 3.59$$

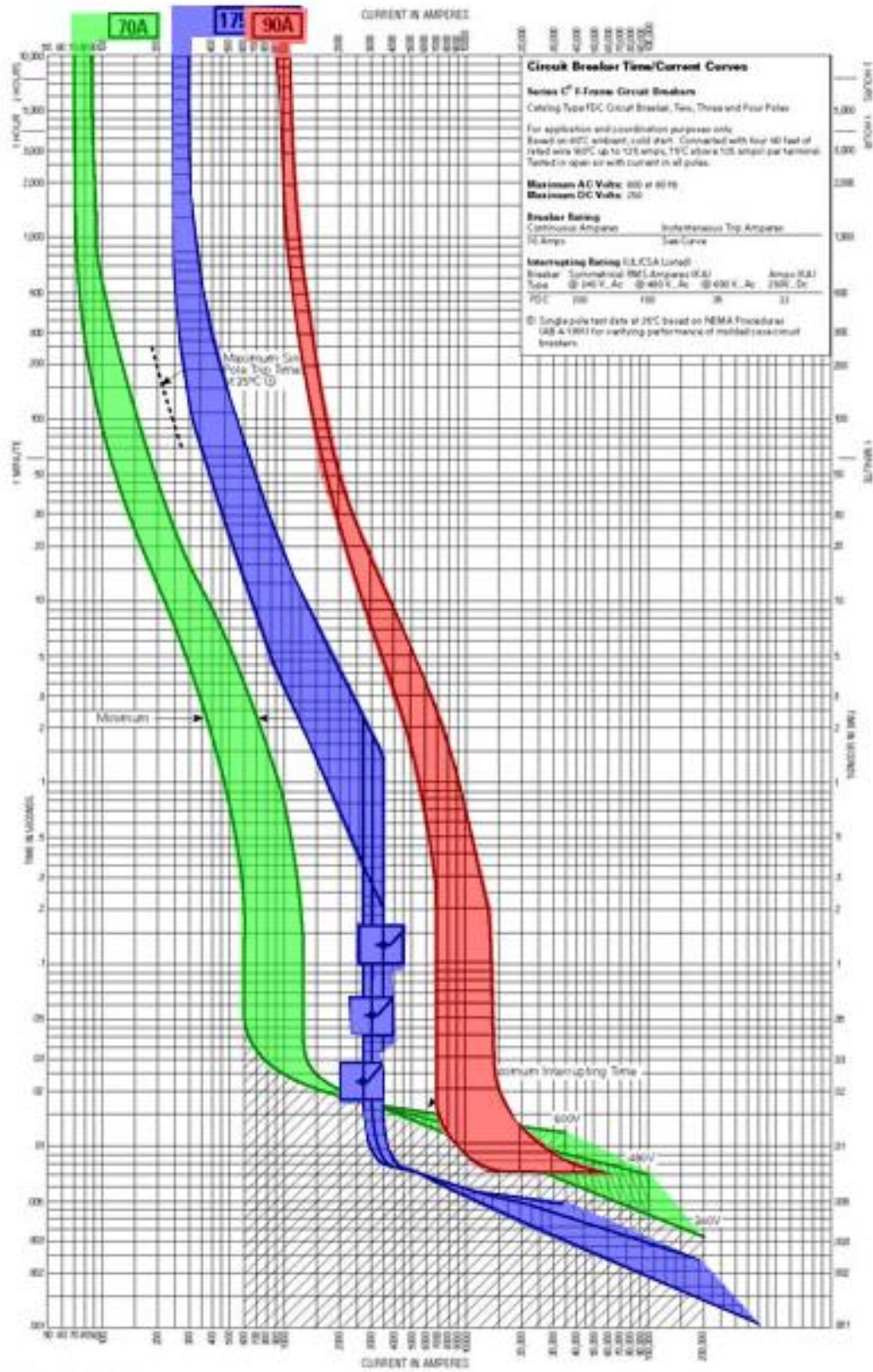
$$R_{U-TOTAL} = 0.29 + 0.067 + 2.144 + 110.96 + 3.59 = 117.051$$

$$Z_U = \sqrt{X_U^2 + R_U^2} = 150.67$$

$$I_{SC} = 10000 / (\sqrt{3})(0.208)(150.67) = 184A$$

Trip Curves

The following image is overlaid trip curves of the equipment analyzed in the previous section.



References and Acknowledgements

Software:

AGi32
Autodesk AutoCAD
Autodesk Ecotect
Adobe Photoshop
PVWatts v.2

Handbooks:

ASHRAE 90.1
IESNA Lighting Handbook

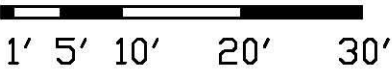
Acknowledgements:

I would like to personally thank all those who helped me. I could not have done this without all of the continued support from the faculty and friends who took time out of their busy day to lend a helping hand. You all made a difference.

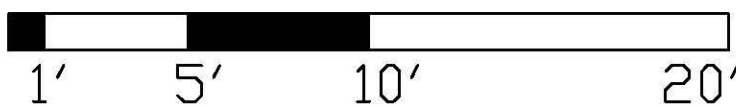
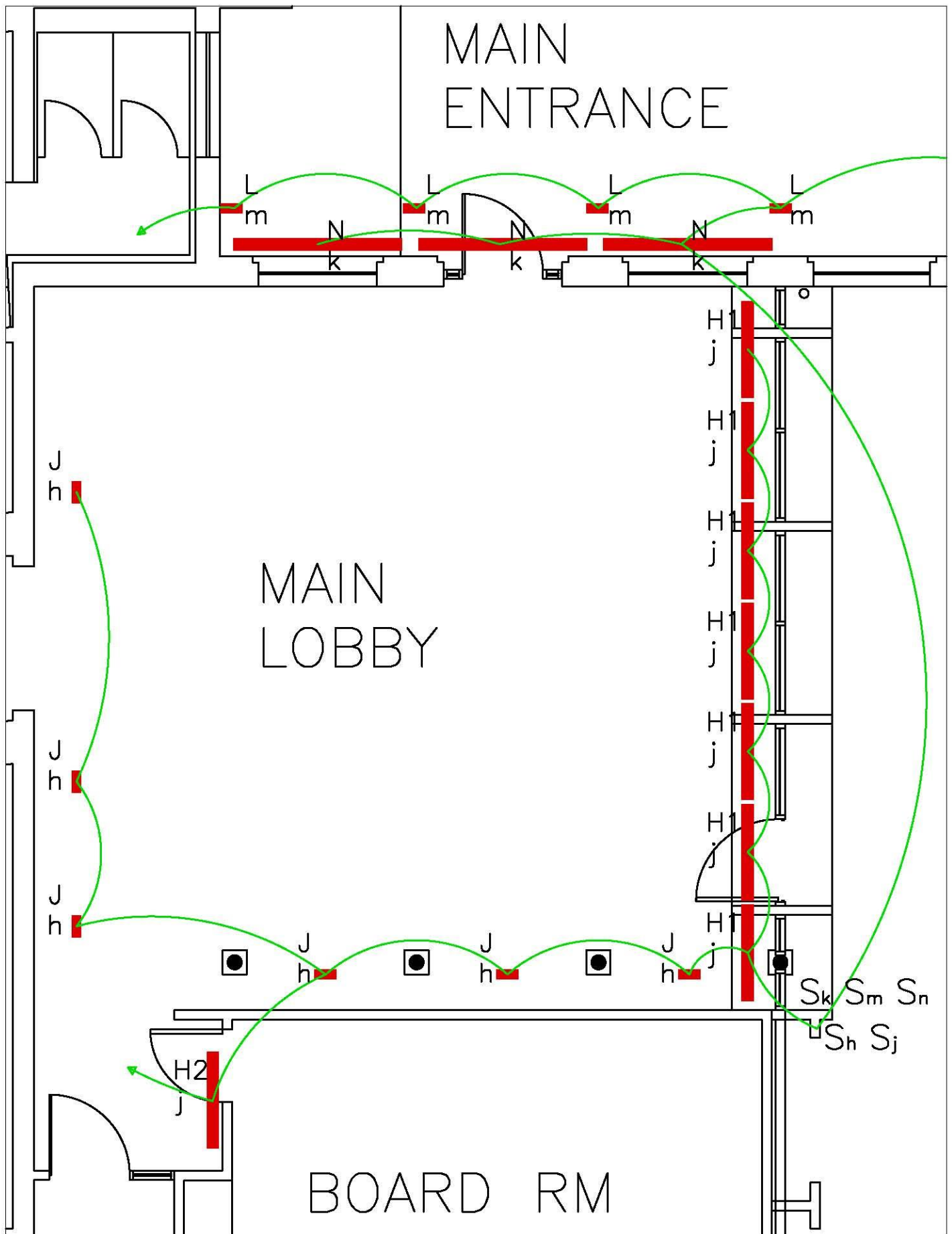
APPENDIX A

Lighting Plans:

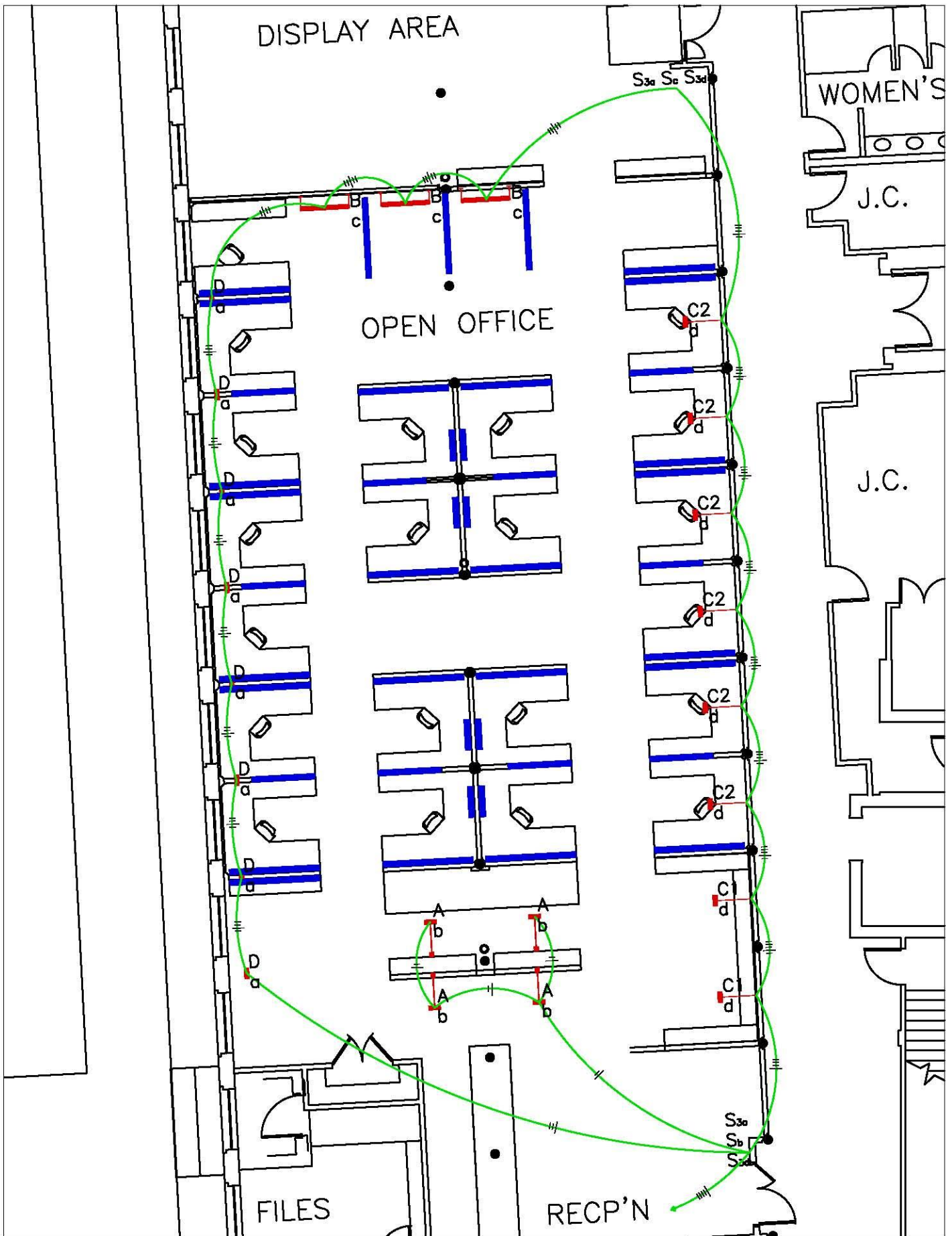
- Main Entrance
- Lobby
- Open Office
- Conference Room



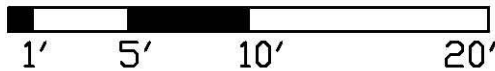
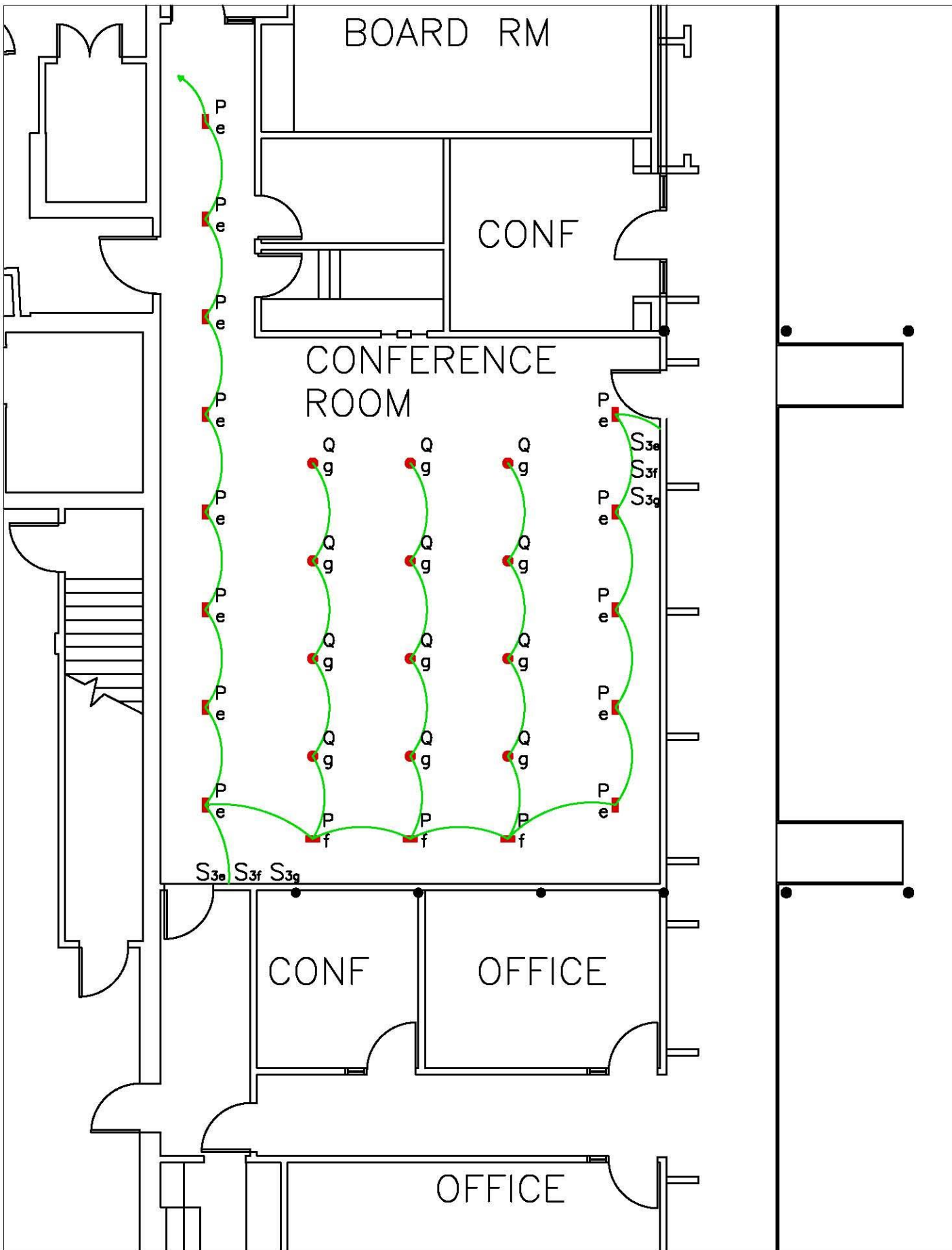
APPENDIX A
 LIGHTING PLAN
 MAIN ENTRANCE
 SCALE: 1/16"=1'-0"



APPENDIX A
 LIGHTING PLAN
 MAIN LOBBY
 SCALE: 3/16"=1'-0"







APPENDIX A
 LIGHTING PLAN
 OPEN OFFICE
 SCALE: 3/32"=1'-0"






APPENDIX A
 LIGHTING PLAN
 CONFERENCE ROOM
 SCALE: 1/8"=1'-0"

APPENDIX B






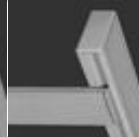
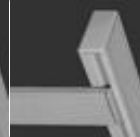
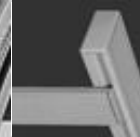
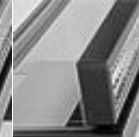
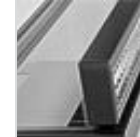
Luminaire Schedule: Main Entrance

Type	Image	Description	Manufacturer	Catalog No.	No. Lamps	Lamp Type	Watts	Ballast Type	BF	Voltage	Height
K		Asymmetrical Wall Washer	Elliptipar	M159	1	Metal Halide	35	Integral	> 0.85	120	0'0"
L		Asymmetrical Wall Washer	Elliptipar	M159	1	Metal Halide	20	Integral	> 0.85	120	11'5"
M		Asymmetrical Down Light	Elliptipar	M151	1	Metal Halide	20	Integral	> 0.85	120	3'0"
N		Asymmetrical Up Light	Elliptipar	F151	2	3' T5 HO 4' T5 HO	39 55	Integral	> 0.85	120	8'0"


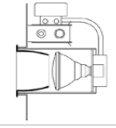
Luminaire Schedule: Lobby

Type	Image	Description	Manufacturer	Catalog No.	No. Lamps	Lamp Type	Watts	Ballast Type	BF	Voltage	Height
H1		Asymmetrical Ceiling Washer	Elliptipar	F307	2	4' T5	2x28	Integral	> 0.85	120	8' 7"
H2		Asymmetrical Ceiling Washer	Elliptipar	F305	1	4' T5	28	Integral	> 0.85	120	8' 7"
J		Asymmetrical Wall Washer	Elliptipar	T102	1	Tungsten Halogen	100	Remote	> 0.85	120	8' 0"

Luminaire Schedule: Open Office

Type	Image	Description	Manufacturer	Catalog No.	No. Lamps	Lamp Typ.	Watts	Ballast Type	BF	Voltage	Height
A		Asymmetrical Wall Washer	Elliptipar	M101	1	Metal Halide	20	Remote	> 0.85	120	8'0"
B		Asymmetrical Wall Washer	Elliptipar	F101	1	4' T5	28	Remote	> 0.85	120	7'6"
C1		Asymmetrical Wall Washer	Elliptipar	M101	1	Metal Halide	35	Remote	> 0.85	120	7'0"
C2		Asymmetrical Wall Washer	Elliptipar	M101	1	Metal Halide	70	Remote	> 0.85	120	11'6"
D		Asymmetrical Wall Washer	Elliptipar	T099	1	Tungsten Halogen	150	Remote	> 0.85	120	10'0"
F1		Task Light	Tambient	P201	1	5' T5	35	Integral	> 0.85	120	4'3"
F2		Task Light	Tambient	P201	1	3' T5 HO	24	Integral	> 0.85	120	4'3"
F3		Task Light	Tambient	P201	2	3' T5 4' T5	21 28	Integral	> 0.85	120	4'3"
G1		Task-Ambient Light	Tambient	L201	1	5' T5	35	Integral	> 0.85	120	4'3"
G2		Task-Ambient Light	Tambient	L201	2	3' T5 4' T5	21 28	Integral	> 0.85	120	4'3"

Luminaire Schedule: Conference Room

Type	Image	Description	Manufacturer	Catalog No.	No. Lamps	Lamp Type	Watts	Ballast Type	Bf	Voltage	Height
P		Semi-Recessed Wall Washer	Elliptipar	M203	1	Metal Halide	70	Integral	> 0.85	120	11' 0"
Q		Recessed Downlight	Edison Price	Arcdite 38/5	1	HID PAR	100	Integral	> 0.85	120	11' 0"

APPENDIX C

Luminaire Cut Sheets:

- Elliptipar F101
- Elliptipar F115
- Elliptipar F151
- Elliptipar F305
- Elliptipar F307
- Elliptipar M101
- Elliptipar M151
- Elliptipar M159
- Elliptipar M203
- Elliptipar T099
- Elliptipar T102
- Tambient L201
- Tambient P201
- Edison Price Arclite 38/5

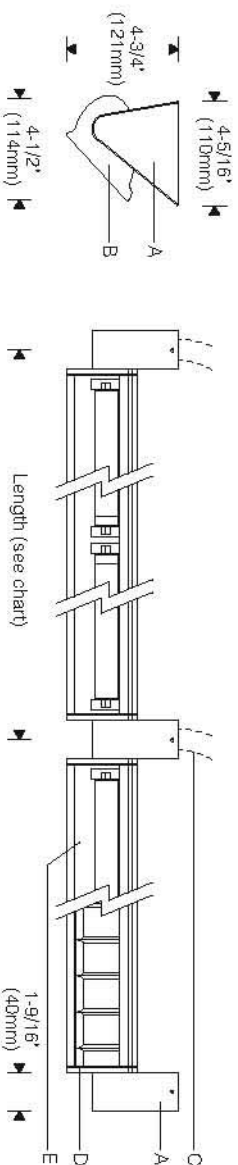
Lamp Information:

- The Lighting Quotient Lamp Information

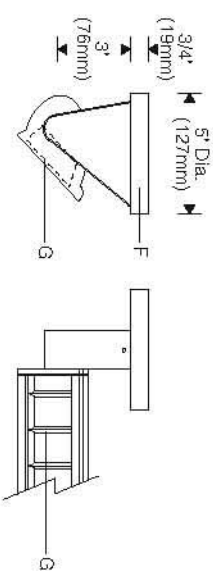
Ballast Information:

- The Lighting Quotient Indoor Ballast Information
- The Lighting Quotient Outdoor Ballast Information

Surface Mount: Conduit Feed 1:8 Scale



Surface Mount: Canopy 1:8 Scale



Nominal Lamp Length	Length (center to center of hangers)	
	T8	T5
1 x 2'	27-1/4" (692mm)	25-3/16" (640mm)
1 x 3'	39-1/4" (997mm)	37" (940mm)
1 x 4'	51-1/4" (1302mm)	48-1/316" (1240mm)
1 x 5'	63-1/16" (1602mm)	60-1/316" (1545mm)
2 x 3'	75-3/4" (1924mm)	72-1/316" (1849mm)
2 x 4'	99-3/4" (2534mm)	96-1/316" (2459mm)
2 x 5'	123-3/4" (3143mm)	120-1/316" (3069mm)

Specifications

- A** Aluminum hanger and splice cover
- B** Die-cast aluminum end plates
- C** Conduit feed (by others)
- D** Aluminum reveal plates (black)
- E** Specular extruded aluminum reflector
- F** Optional canopy for mounting to recessed outlet box (by others)
- G** Optional snap-in specular parabolic cross baffle

Finish:

Style 101 fluted – bright clear anodized aluminum housing. Painted end plates in choice of silver or semi-gloss black.
Style 102 smooth – semi-gloss white housing and end plates. Painted surfaces – 6 stage pretreatment and electrostatically applied thermoset powder coat for stable, long lasting and corrosion resistant finish.
 Reflector – extruded high purity aluminum with clear anodized specular finish. All luminaire hardware – stainless steel.
 All mounting hardware – zinc or cadmium plated.

Mounting:

Surface mounting hangers (ordered separately); specify end and intermediate hangers.
 Surface hanger mounts directly to ceiling. To mount on recessed outlet box, specify optional canopy.

Electrical:

Use 90°C wire for supply connections.
 Remote electronic HFP thermally protected class P ballast (with end-of-life protection for T5 lamps). Aluminum ballast enclosure includes four 7/8" diameter entries and a knockout for an accessory fuse.

Maximum wire length between electronic ballast and fixture is 7' for two-lamp reflectors and 12' for one-lamp reflectors.

For dimming, consult factory or see Styles 105/106 with integral dimming ballast.

For complete ballast specifications, see Accessories Section.

Standard:

UL listed or CSA certified for damp locations. Style 124 painted model with lens recommended for damp locations.

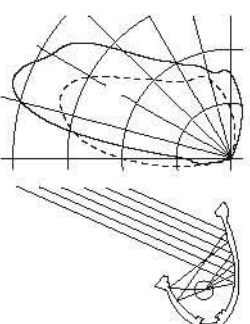


Features

- T5 and T8 lamps offer unequaled fluorescent wall lighting from close setbacks – electronic ballasts for low energy
- Adjustable reflector – tailor performance to wall height and setback distance
- Hanger allows direct conduit feed – optional canopy
- Optional parabolic cross baffle for lengthwise shielding

Performance

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



For complete photometrics, see www.elliptipar.com.



To Order

Style 101 / 102

To form a Catalog Number

F - - - - **S** - - - - - - -

1 Source

F = Linear fluorescent

2 Style

- 101 = Small fluted surface, remote ballast
- 102 = Small smooth surface, remote ballast

3 Lamp

= Lamp Code

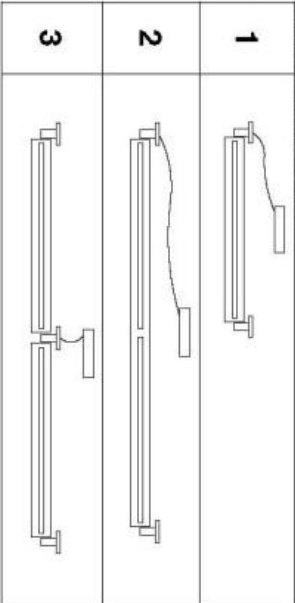
Lamp Wattage (see chart below)

Reflector Configuration, specify 1, 2 or 3 (see chart below)

- A = T8 Fluorescent
- T = T5 Fluorescent

Example: A325 = two nominal 3' reflectors, each for use with one 25W T8 lamp; one 2-lamp ballast

Reflector Configuration



Lamp Wattage

Lamp Length (nominal)	Lamp Wattage (Lamp Number)		
	T8	T5	T5 HO
2'	17 (F17T8)	14 (F14T5)	24 (F24T5/HO)
3'	25 (F25T8)	21 (F21T5)	39 (F39T5/HO)
4'	32 (F32T8)	28 (F28T5)	55 (F54T5/HO)
5'	40 (F40T8)	35 (F35T5)	80 (F80T5/HO)

For complete lamp and ballast information, see Accessories Section. Standard T5 lamp color is 3000K/80+ CRI. T8 lamps by others.

Project:

4 Mounting

S = For use with surface mounted end and intermediate hangers (order separately).

5 Finish

Style 101 Fluted

- 01 = Bright aluminum housing with silver end plates

Style 102 Smooth

- 02 = Semi-gloss white reflector and end plates

- 81 = Bright aluminum housing with semi-gloss black end plates

- 99 = Custom RAL or computer matched color to be specified, consult sales representative

6 Voltage/Ballast

Electronic

- 1 = 120V
- 2 = 277V
- 3 = 347V (Canada)

Dimming*

* For dimming, consult factory or see Styles 105/106 with integral dimming ballast.

7 Option (See Accessories Section for specifications)

- 00 = No options
- 0B = Snap-in parabolic cross baffle, specular finish, provides 35° lengthwise shielding
- 0E = Remote emergency battery pack
- XX = For modification not listed, include detailed description. Consult factory prior to specification.

8 Destination Requirement

- 0 = UL listed or CSA certified for U.S.
- J = UL listed or CSA certified for Canada

Example

F102 - A132 - S - 02 - 1 - 000

Small smooth surface model for use with one 32W T8 lamp in nominal 4 foot reflector. Semi-gloss white, Remote 1-lamp 120V electronic ballast. UL listed or CSA certified for U.S. Order surface mounting hangers separately.

Type:

Mounting Hangers

For individually mounted luminaires, order two end hangers for each reflector.

For a continuous row, order two end hangers. To determine the quantity of intermediate hangers, total the number of reflectors in the row and subtract one. Example: a row of five reflectors requires 2 end hangers and 4 intermediate hangers. Note: In determining hanger quantities, treat Reflector Configuration 3 as two reflectors.

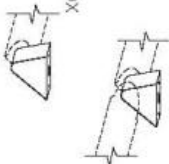
VS = Surface hanger

0 = U.S.

J = Canada

CF = Conduit feed

CA = Canopy for recessed outlet box



- 02 = semi-gloss white
- 07 = silver
- 08 = semi-gloss black

- A = Intermediate
- B = End

Accessories

Order separately. See Accessories Section for specifications.

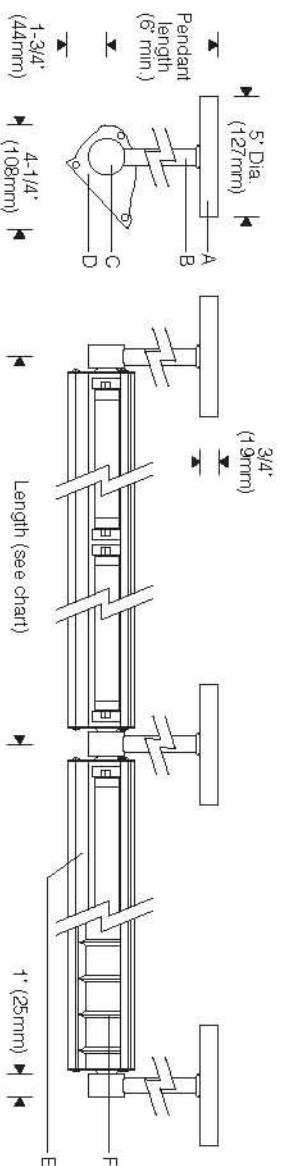
AFK000X = Ballast fuse kit

0 = U.S.

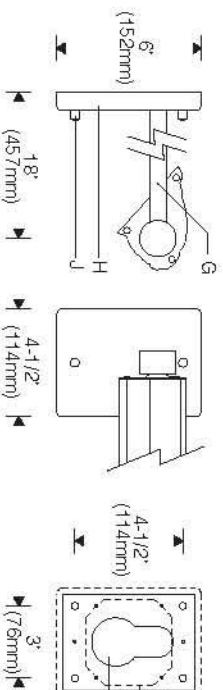
J = Canada



Pendant Mount 1:8 Scale



Cantilever Mount 1:8 scale



Mounting Plate

Nominal Lamp Length	Length (center to center of hangers)	
	T8	T5
1 X 2'	26-7/16" (672mm)	24-7/16" (621mm)
1 X 3'	38-7/16" (976mm)	36-1/4" (921mm)
1 X 4'	50-7/16" (1281mm)	48" (1219mm)
1 X 5'	62-5/16" (1583mm)	60" (1524mm)
2 X 3'	74-15/16" (1903mm)	72" (1829mm)
2 X 4'	98-15/16" (2513mm)	96" (2438mm)
2 X 5'	122-15/16" (3123mm)	120" (3048mm)

Specifications

- A** Round aluminum canopy (pendant mount)
- B** 11/16" O.D. aluminum pendant stem
- C** Machined aluminum mounting hub
- D** Contoured aluminum end plates
- E** Specular extruded aluminum reflector
- F** Optional snap-in specular parabolic cross baffle
- G** 11/16" O.D. cantilever arm
- H** Rectangular aluminum canopy (cantilever mount)
- J** Chrome cap nuts
- K** Cantilever mounting plate
- L** Outlet box (by others)
- M** Splice access opening

Finish:

Bright clear anodized aluminum housing with semi-gloss black end plates or all parts semi-gloss white. Hangers (ordered separately) in choice of semi-gloss white or black. Painted surfaces - 6 stage pretreatment and electrostatically applied thermoset powder coat for stable, long lasting and corrosion resistant finish.
 Reflector - extruded high purity aluminum with clear anodized specular finish. All luminaire hardware - stainless steel.
 All mounting hardware - zinc or cadmium plated.

Mounting:

Pendant or cantilever mounting hangers (ordered separately); specify end and intermediate hangers.
 Pendant assembly furnished with canopy for mounting on recessed outlet box. Optional hang-straight allows mounting on slopes up to 45° (in the plane perpendicular to wall).
 Cantilever wall plate mounts over recessed outlet box (suitable backing structure required). Adjustable interface plate (concealed under canopy) allows for leveling of arms.

REV. 7/07

Electrical:

Use 90°C wire for supply connections.
 Remote electronic HPF thermally protected class P ballast (with end-of-life protection for T5 lamps). Aluminum ballast enclosure includes four 7/8" diameter entries and a knock-out for an accessory fuse.

Maximum wire length between electronic ballast and fixture is 7' for two-lamp reflectors and 12' for one-lamp reflectors, less length of stem or arm.

For dimming, see Style 109 with integral dimming ballast. For complete ballast specifications, see Accessories Section.
Standard: UL listed or CSA certified for damp locations. (Style 124 painted model with lens recommended for damp locations.)

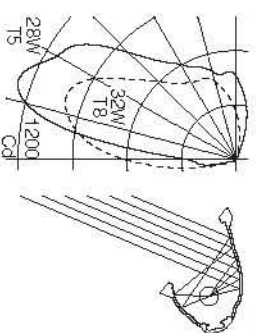


Features

- **KO Series** - unequaled linear fluorescent wall lighting for cost and energy conscious projects
- Machined aluminum mounting hub attaches to pendant stem or cantilever arm without exposed threads
- Extruded reflector - will not deform during maintenance
- Non-corrosive construction - aluminum and stainless steel

Performance

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



For complete photometrics, see www.elliptipar.com.



elliptipar

To form a Catalog Number

F | 1 | 1 | 5 | - X | - - - | | | | | |

1 Source

F = Linear fluorescent

2 Style

115 = Small KO Series contoured, remote ballast

3 Lamp

= Lamp Code

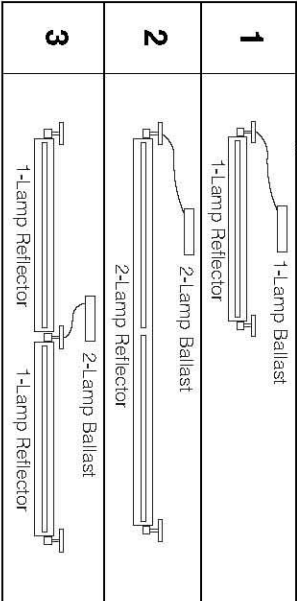
Lamp Wattage (see chart below)

Reflector Configuration, specify 1, 2 or 3 (see chart below)

A = T8 Fluorescent
T = T5 Fluorescent

Example: A325 = two nominal 3' reflectors, each for use with one 25W T8 lamp; one 2-lamp ballast

Reflector Configuration



Lamp Length (nominal)	Lamp Wattage (Lamp Number)		
	T8	T5	T5 HO
2'	17 (F-17T8)	14 (F-14T5)	24 (F-24T5/HO)
3'	25 (F-25T8)	21 (F-21T5)	39 (F-39T5/HO)
4'	32 (F-32T8)	28 (F-28T5)	55 (F-54T5/HO)
5'	40 (F-40T8)	35 (F-35T5)	80 (F-80T5/HO)

For complete lamp and ballast information, see Accessories Section. Standard T5 lamp color is 3000K / 80+ CRI. T8 lamps by others.



Project:

4 Mounting

X = For use with end and intermediate hangers. Available in pendant or cantilever (order separately).

5 Finish

- 81 = Bright clear anodized reflector with black end plates
 - 02 = Semi-gloss white
 - 99 = Custom RAL or computer matched color to be specified, consult sales representative
- Note: specify hanger finish separately.

6 Voltage/Ballast

- Electronic
- 1 = 120V
- 2 = 277V
- 3 = 347V (Canada)

Dimming*

* For dimming, see Style 109 with integral dimming ballast.

7 Option (See Accessories Section for specifications)

- 00 = No options
- 0B = Snap-in parabolic cross baffle, specular finish, provides 35° lengthwise shielding
- 0E = Remote emergency battery pack
- XX = For modification not listed, include detailed description. Consult factory prior to specification.

8 Standard

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

Example

F115 - A140 - X - 81 - 3 - 00J

Small KO Series contoured unit consisting of one nominal 5' reflector for use with one 40W T8 lamp. Bright anodized aluminum reflector with black end plates. Remote 1-lamp 347V electronic ballast. CSA. (Order pendant or cantilever mounting hangers separately.)

Mounting Hangers

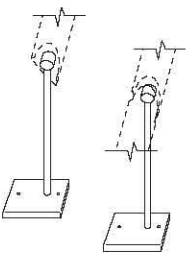
For individually mounted luminaires, order two end hangers for each reflector.

For a continuous row, order two end hangers. To determine the quantity of intermediate hangers, total the number of reflectors in the row and subtract one. Example: a row of five reflectors requires 2 end hangers and 4 intermediate hangers.

Note: In determining hanger quantities, treat Reflector Configuration 3 as two reflectors.

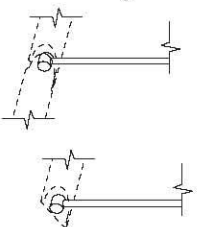
HS = Cantilever hanger with wall plate, 18" (457mm) setback

- 0 = UL
- J = CSA
- 02 = Semi-gloss white
- 08 = Semi-gloss black
- C = Intermediate
- D = End



HS = Pendant hanger with canopy

- 0 = UL
- J = CSA
- Length in inches, up to 60" (1.5m), 6" minimum
- 02 = Semi-gloss white
- 08 = Semi-gloss black
- F = Intermediate, straight
- G = End, straight
- J = Intermediate, swivel (up to 45°)
- K = End, swivel (up to 45°)



Accessories

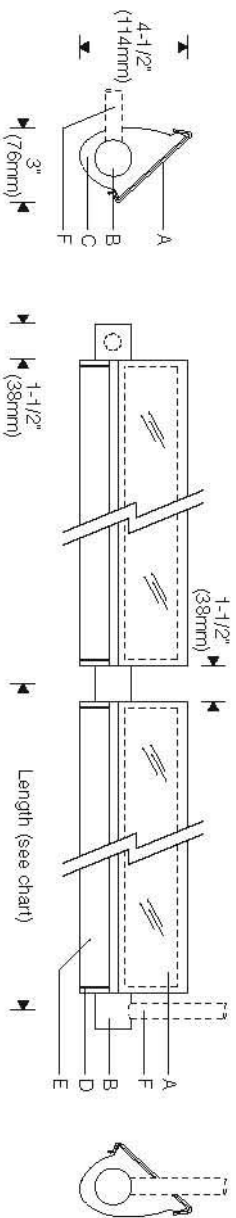
Order separately. See Accessories Section for specifications.

AFK000X = Ballast fuse kit
0 = UL
J = CSA

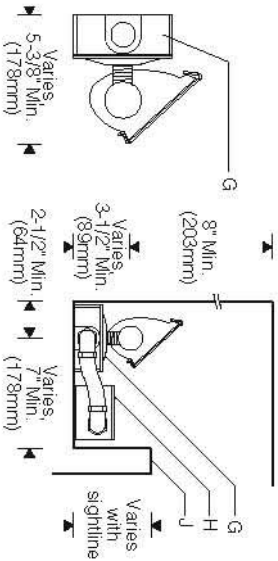


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Cantilever / Pendant 1:8 Scale



Surface 1:8 Scale



Cove 1:12 Scale

Lamps	Length (center to center of hangers)	
	T8	T5
1 x 2'	27-1/8" (689mm)	25-1/16" (636mm)
1 x 3'	39-1/8" (994mm)	36-7/8" (936mm)
1 x 4'	51-1/8" (1299mm)	48-5/8" (1235mm)
1 x 5'	62-15/16" (1598mm)	60-5/8" (1539mm)
2 x 3'	75-5/8" (1921mm)	72-5/8" (1884mm)
2 x 4'	99-5/8" (2530mm)	96-5/8" (2454mm)
2 x 5'	123-5/8" (3140mm)	120-5/8" (3063mm)

Specifications

- A** UV and impact resistant acrylic snap-on lens with EPDM gasket
- B** Machined aluminum mounting hubs with O-ring gaskets (ordered separately)
- C** Die-cast aluminum end plates
- D** Aluminum reveal plates (black)
- E** Specular extruded aluminum reflector

- F** 1/2" rigid conduit cantilever or pendant supports (by others)
- G** Outlet boxes, liquid tight flexible conduit and fittings (by others)
- H** Remote ballast in weatherproof aluminum enclosure
- J** Architectural cove (for design guidance, see Applications Section)

Finish:

Exterior surfaces – 6 stage pretreatment and electrostatically applied thermoset polyester powder coating for a durable abrasion, fade and corrosion resistant finish. Choice of semi-gloss colors (see ordering information).

Reflector – extruded high purity aluminum with clear anodized specular finish. All hardware and components – non-corrosive stainless steel or aluminum.

Snap-on lens – composite of impact resistant and UV stabilized acrylic. EPDM gasket for watertight operation when facing upward.

Mounting:

Machined aluminum mounting hubs (ordered separately) with internal 1/2" NPT threaded entry. 1/2" rigid conduit supports or fittings (by others). Allow 2.5 lbs/foot of reflector (example: 8' unit x 2.5 = 20 pounds).

Specify intermediate and end hubs. Reflector is adjustable about the hubs. Aiming is locked in position with set screws in the hubs.

Electrical:

Use 90°C wire for supply connections.

Remote electronic, HPF thermally protected class P ballast rated for 0°F/-18°C starting. Weatherproof aluminum enclosure includes three 7/8" diameter entries and one 3/8" liquidtight conduit connector.

7' (2.1m) wire leads exit end of reflector. **Maximum wire length between remote ballast and fixture is 7' for two-lamp reflectors and 12' for one-lamp reflectors.**

For complete ballast specifications, see Accessories Section.

Standard:

UL listed or CSA certified for wet locations when mounted horizontally. For positions other than horizontal, consult factory.

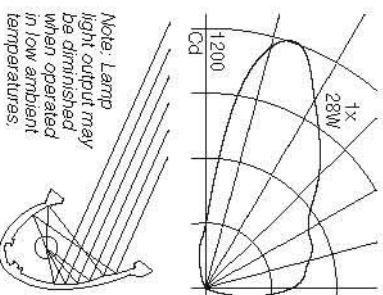


Features

- T5 for precise optical control – unequaled uniformity for uplighting soffits, vaults, canopies from minimal setbacks
- Snap-on impact and UV resistant acrylic lens with EPDM gasket – watertight for uplighting orientations
- Durable aluminum construction – extruded reflector, die-cast end plates, machined hubs; powder coat finish

Performance

Two parabolic reflector sections drive light across the overhead plane from one edge. An elliptical section redirects its light to a parabola and shields the lamp. Asymmetry is maximized resulting in high beam efficiency and superior surface uniformity. The fast "runback" minimizes wasted spill light.



For complete photometrics, visit www.elliptipar.com

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To form a Catalog Number

F 1 5 1 - - H - - - - - - - - -

1 Source

F = Linear fluorescent

2 Style

151 = Small outdoor, remote ballast

3 Lamp

= Lamp Code

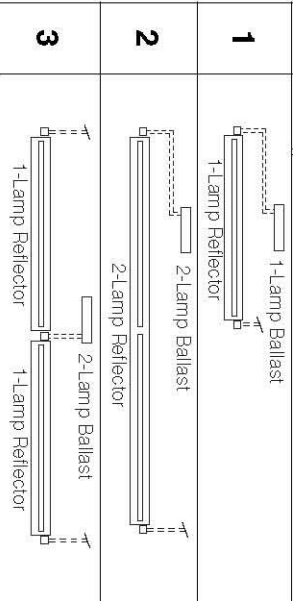
Lamp Wattage (see chart below)

Reflector Configuration, specify 1, 2 or 3 (see chart below)

A = T8 Fluorescent
T = T5 Fluorescent

Example: T328 = two nominal 4' reflectors, each for use with one 28W T5 lamp; one 2-lamp ballast

Reflector Configuration



Lamp Length (nominal)	Lamp Wattage (Lamp Number)		
	T8	T5	T5HO*
2'	17 (F17T8)	14 (F14T5)	24 (F24T5/HO)
3'	25 (F25T8)	21 (F21T5)	39 (F39T5/HO)
4'	32 (F32T8)	28 (F28T5)	55 (F54T5/HO)
5'	40 (F40T8)	35 (F35T5)	80 (F80T5/HO)

For complete lamp and ballast information, see Accessories Section. Standard T5 lamp color is 3000K/80+ CRI. T8 lamps by others. *NEW T5HO amalgam lamps are available that produce > 90% of full light output over a broader temperature range than standard lamps - see www.elliptipar.com or consult factory for specifications.

Project:

4 Mounting

H = For use with end and intermediate mounting hubs (order separately) with internal 1/2" NPT thread (1/2" rigid conduit supports or fittings by others).

Note: For positions other than horizontal, consult factory.

5 Finish

- 02 = Semi-gloss white
- 06 = Dark bronze
- 07 = Silver
- 08 = Semi-gloss black
- 12 = Green
- 99 = Custom RAL or computer matched color to be specified, consult sales representative.

6 Voltage/Ballast

- Electronic
- 1 = 120V
 - 2 = 277V
 - 3 = 347V

7 Option

- 00 = No options
- 0D = Remote electronic ballast for dry indoor location
- XX = For modification not listed, include detailed description. Consult factory prior to specification.

8 Destination Requirement

- 0 = UL listed or CSA certified for U.S.
- J = UL listed or CSA certified for Canada

Example

F151 - T128 - H - 08 - 1 - 000

Small outdoor fluorescent for use with one 28W T5 lamp in nominal 4 foot reflector. For use with mounting hubs (1/2" rigid conduit supports by others). Semi-gloss black powder coat finish. Remote 1-lamp 120V electronic ballast in weatherproof enclosure. UL listed or CSA certified for U.S.

Order end and intermediate mounting hubs separately.

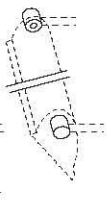
Type:

Hubs Only (order separately)

For use with 1/2" rigid conduit or fittings (supplied by others). Order one hub end kit for each individually mounted luminaire or each row. For a continuous row, order one Intermediate hub for each additional luminaire in the row. Example: a row of five reflectors requires 1 hub end kit and 4 intermediate hubs.

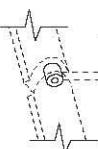
HOD 000 = End kit (includes 2 mounting hubs)

5 Finish



HOC 000 = Intermediate mounting hub

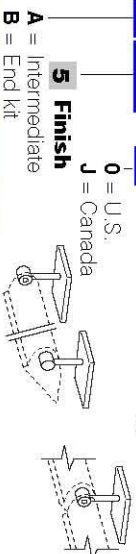
5 Finish



Hubs with Hangers (order separately)

Order one hanger end kit for each individually mounted luminaire or each row. For a continuous row, order one Intermediate hanger for each additional luminaire in the row. Example: two rows of four reflectors requires 2 end kits and 6 intermediate hangers. Note: Hubs Included. End kit includes one electrical feed hanger.

HB 00 = Outdoor surface hanger

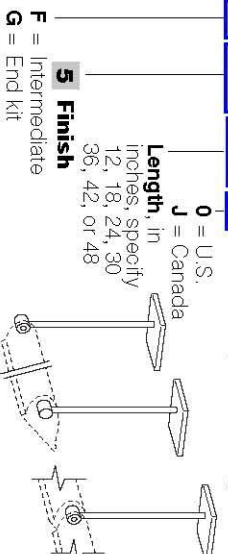


5 Finish

A = Intermediate

B = End kit

HB = Outdoor pendant hanger

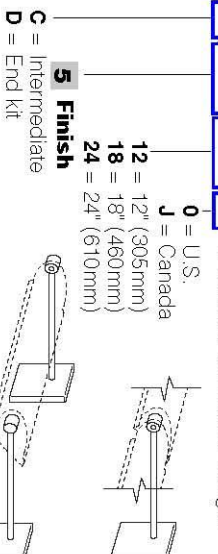


5 Finish

F = Intermediate

G = End kit

HB = Outdoor cantilever hanger



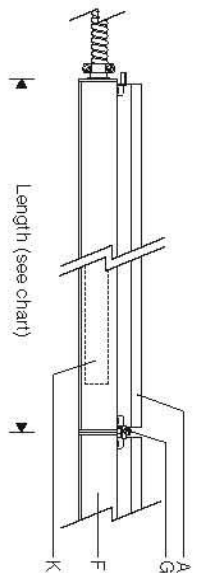
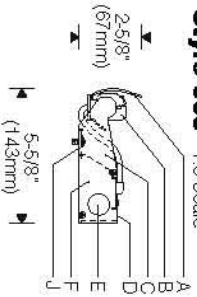
5 Finish

C = Intermediate

D = End kit

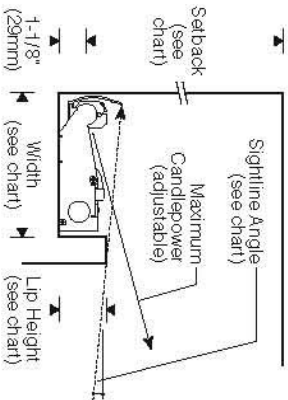


Style 305 1:8 Scale



Lamp Length	Luminaire Length
1 x 2'	23-1/16" (586mm)
1 x 3'	34-7/8" (886mm)
1 x 4'	46-1/16" (1186mm)
1 x 5'	58-1/2" (1486mm)
2 x 3'	69-1/2" (1765mm)
2 x 4'	93-1/8" (2365mm)
2 x 5'	116-5/8" (2963mm)

Cove



Cove Dimensions

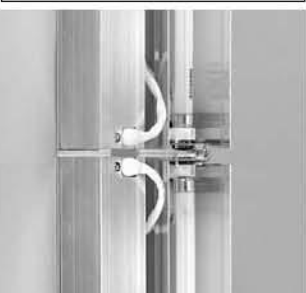
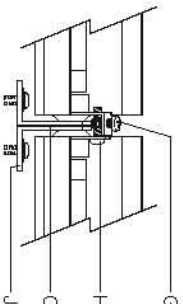
(max. candlepower aimed 15° above horiz.)

Sightline	0° (horiz. cutoff)	5°	10°
Width	6-1/2" (165mm)	5-7/8" (150mm)	5-7/8" (150mm)
Lip	2-5/8" (67mm)	2-1/8" (54mm)	1-5/8" (41mm)
Setback	Recommended minimum: 12" T5, 18" T5HO		

Note: Finish interior of cove matte white for best results.

Joint 1:4 Scale

(ballast compartment not shown for clarity)



Specifications

- A** Specular extruded aluminum reflector
- B** Stainless steel lamp-holder/support brackets
- C** Aluminum sidarm with mounting tab
- D** Extruded aluminum ballast/wireway channel cover
- E** Conduit entry (one each end, conduit and connector by others)
- F** Extruded aluminum ballast/wireway compartment
- G** Rotation locking screw
- H** Joiner/alignment screw
- J** Mounting tab (fastener by others)
- K** Integral electronic ballast

Finish:

Reflector – extruded high purity aluminum with clear anodized specular finish. Sidearms and ballast/wireway compartment – mill finish aluminum. All luminaire hardware – stainless steel.

Mounting:

Lay-in installation requires only one fastener per joint (by others). Sidearms with mounting tabs can be base or wall mounted. Luminaires can be mounted individually or joined together to form a continuous row.
Reflector aiming is adjustable and is fixed in position by rotation locking screws at each sidarm. When mounted in a continuous row, joiner screws lock reflectors together allowing all in the row to be aimed together.

Standard:

UL listed or CSA certified for damp locations (Style 124 painted model with lens recommended for damp locations).

Electrical:

Use 90°C wire for supply connections.

Integral electronic HPF, thermally protected class P ballast with end-of-life protection. Ballast/wireway compartment includes one conduit entry at each end. Channel cover removes for access to ballast and wiring. Luminaires may be butted end-to-end (connectors by others) for through wiring. Optional #12 AWG prewired modular through wiring with quick connectors. Master/satellite combination is available (Configuration 3, see Ordering Information). Master supplied with 2-lamp ballast (wiring, conduit and connectors between master and satellite units by others).

Optional electronic dimming ballast, compatible dimmer switch required (by others). Consult sales representative for compatibility and specifications.

Optional integral emergency battery operates one lamp. Separate unswitched supply is required.

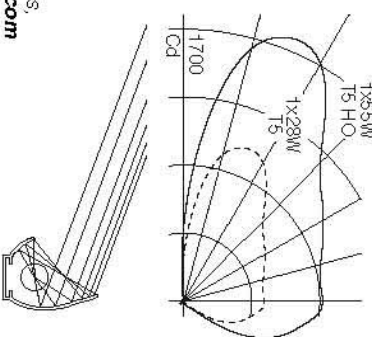
For complete ballast specifications, see Accessories Section.

Features

- T5 fluorescent – precise optical control for unequaled projection of light from perimeter coves
- Adjustable – all reflectors in a row join and aim together; rotation locking screws secure position*
- Only 2-5/8" high – fits in low profile coves
- Integral electronic ballast, thru wiring for easy installation

Performance

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



For complete photometrics, visit theLightingquotient.com



To Order

Style 305

To form a Catalog Number

F 3 0 5 - T - S - 0 0 - - - - - -

1 Source
F = Linear fluorescent

2 Style

305 = Xtra small concealed, Integral ballast

3 Lamp

Note: To order by overall row length, enter **ROW CODE** in place of Lamp Code below (see Row Charts on page C-19.2). Row Code specifies a row complete with all necessary reflectors and ballasts.

= Lamp Code (to specify individual units)

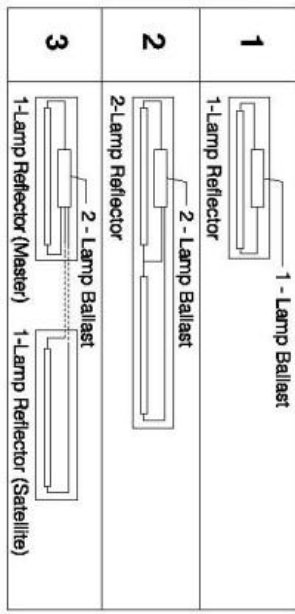
Lamp Wattage (see chart below)

Reflector Configuration, specify 1, 2 or 3

(see chart below)

Example: T228 = two 28W T5 lamps in nominal 8' reflector, one 2-lamp ballast

Reflector Configuration



Lamp Wattage	Lamp Length	Lamp Number
T5 Fluorescent		
14	2'	F14T5
21	3'	F21T5
28	4'	F28T5
35	5'	F35T5
T5 HO Fluorescent*		
24	2'	F24T5/HO
39	3'	F39T5/HO
55	4'	F54T5/HO
80	5'	F80T5/HO

For complete lamp and ballast information, see Accessories Section. Standard T5 and T5HO lamp color is 3000K/80+ CRI.

Project:

4 Mounting

S = Sidearms with mounting tabs

5 Finish

00 = Bright anodized reflector with mill finish ballast compartment

6 Voltage/Ballast

Electronic
1 = 120V
2 = 277V
3 = 347V (Canada)

*Dimming**
T = 120V
V = 277V

* Consult sales representative for dimming 5' lamps (lamp codes TX35, TX80) and for Reflector Configuration 3. Availability for wattages and voltages varies with ballast manufacturer and control type - see thelightingquotient.com for additional dimming specifications and limitations.

7 Option (see Accessories Section for specifications)

- 00 = No options
- 0E = Integral emergency battery pack with indicator lamp and test button. Operates one lamp. Available in nominal 4', 6' and 8' units only (lamp codes T128, T221, T228, T328, T155, T239, T255 and T355).
- 0K = Rewired modular #12 AWG through wiring with quick connectors
- EK = Combination of emergency battery pack and rewired modular through wiring as described above
- XX = For modification not listed, include detailed description. Consult factory prior to specification.

8 Destination Requirement

0 = UL listed or CSA certified for U.S.
J = UL listed or CSA certified for Canada

Example

F305 - T221 - S - 00 - 1 - 000

Xtra small concealed fluorescent unit consisting of one nominal 6' reflector with two 21W T5 lamps. Integral 120V electronic 2-lamp ballast. Sidearms with mounting tabs. UL listed or CSA certified for U.S.

Type:

Accessories

Order separately. See Accessories Section for specifications.

AFK000X = Ballast fuse kit

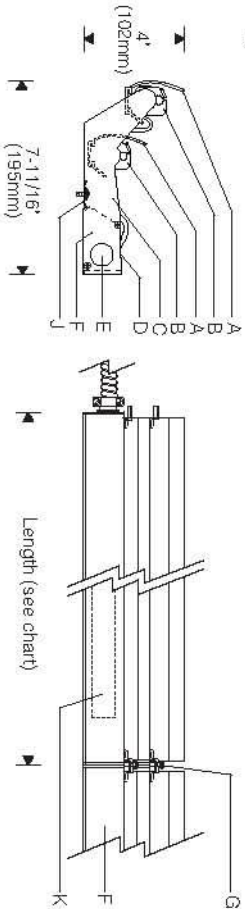
0 = U.S.
J = Canada



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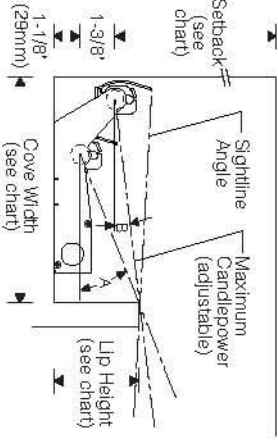
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Style 307 1:8 Scale



Lamp Length	Luminaire Length
1 x 2'	23-1/16" (586mm)
1 x 3'	34-7/8" (886mm)
1 x 4'	46-11/16" (1186mm)
1 x 5'	58-1/2" (1486mm)
2 x 3'	69-1/2" (1765mm)
2 x 4'	93-1/8" (2365mm)
2 x 5'	116-5/8" (2963mm)

Cove



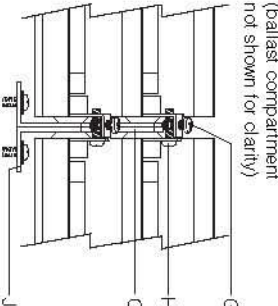
Note: Finish interior of cove matte white for best results.

Cove Dimensions

Sightline	0° (horiz. cutoff)	5°	10°
Width (inside)	1" (25mm)	9" (230mm)	8" (205mm)
Lip (inside)	4" (102mm)	3-1/4" (83mm)	2-5/8" (67mm)
Setback (varies)	Recommended minimum: 18" T5, 24" T5HO		
∠ A°	20°	20°	17°
∠ B°	8°	5°	5°

*Adjustable aiming, lowest angle listed.

Joint 1:4 Scale
(ballast compartment not shown for clarity)



Specifications

- A** Specular extruded aluminum reflector
- B** Stainless steel lamp-holder/support brackets
- C** Aluminum sidearm with mounting tab
- D** Extruded aluminum ballast/wireway channel cover
- E** Conduit entry (one each end, conduit and connector by others)
- F** Extruded aluminum ballast/wireway compartment
- G** Rotation locking screw
- H** Joiner/alignment screw
- J** Mounting tab (fastener by others)
- K** Integral electronic ballast

Finish:

Reflectors – extruded high purity aluminum with clear anodized specular finish. Sidearms and ballast/wireway compartment – mill finish aluminum. All luminaire hardware – stainless steel.

Mounting:

Lay-in installation requires only one fastener per joint (by others). Luminaires can be mounted individually or joined together to form a continuous row. Reflector aiming is adjustable and is fixed in position by rotation locking screws at each sidearm. When mounted in a continuous row, joiner screws lock each row of reflectors together allowing all in the row to be aimed together. Each row of reflectors is aimed independently.

Electrical:

Use 90°C wire for supply connections. Integral electronic HPF, thermally protected class P ballast with end-of-life protection. Ballast/wireway compartment includes one conduit entry at each end. Channel cover removes for access to ballast and wiring. Luminaires may be butted end-to-end (connectors by others) for through wiring. Optional #12 AWG prewired modular through wiring with quick connectors. Optional electronic dimming ballast, compatible dimmer switch required (by others). Consult sales representative for compatibility and specifications. Optional integral emergency battery operates one lamp. Separate ballast supply is required. For complete ballast specifications, see Accessories Section. **Standard:** UL listed or CSA certified for damp locations (Style 124 painted model with lens recommended for damp locations).

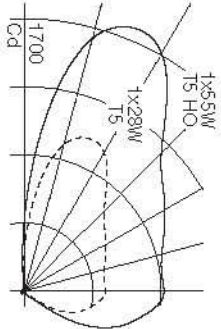
Features

- Two independently aimed reflectors – greater versatility
- T5 fluorescent – precise optical control for unequalled projection of light from perimeter coves
- Adjustable – each row of reflectors joins and aims together; rotation locking screws secure position
- Integral electronic ballast, thru wiring for easy installation



Performance

Each reflector consists of two parabolic reflector sections to drive light across the ceiling from one edge. An elliptical section shields the lamp from normal viewing angles and redirects its light to a parabola. Glare is minimized and asymmetry of the beam is maximized resulting in high beam efficiency and superior surface uniformity. Reflectors aim independently.



Note: Curve shown for single extra small reflector.



To Order

Style 307

To form a Catalog Number

F **3 0 7** - T - S **0 0 0** - - - - - -

1 Source
F = Linear fluorescent

2 Style

307 = Dual xtra small concealed, integral ballast

3 Lamp

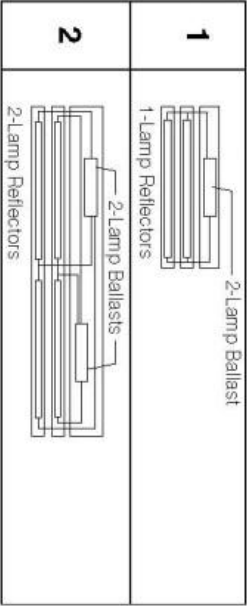
Note: To order by overall row length, enter **ROW CODE** in place of Lamp Code below (see Row Charts on page C-22.2). Row Code specifies a row complete with all necessary reflectors and ballasts.

T = Lamp Code (to specify individual units)

Lamp Wattage (see chart below)
Reflector Configuration, specify **1** or **2**
(see chart below)

Example: **T228** = four 28W T5 lamps in two nominal 8' reflectors, two 2-lamp ballasts

Reflector Configuration



Lamp Wattage	Lamp Length	Lamp Number
T5 Fluorescent		
14	2'	F-14T5
21	3'	F2-1T5
28	4'	F28T5
35	5'	F35T5
T5 HO Fluorescent*		
24	2'	F24T5/HO
39	3'	F39T5/HO
55	4'	F54T5/HO
80	5'	F80T5/HO

For complete lamp and ballast information, see Accessories Section. Standard T5 and T5HO lamp color is 3000K/80+ CRI.

Project:

4 Mounting

S = Sidelarms with mounting tabs for cove mounting

5 Finish

00 = Bright anodized reflectors with mill finish ballast compartment

6 Voltage/Ballast

Electronic *Dimming**
1 = 120V T = 120V
2 = 277V V = 277V
3 = 347V (Canada)

* Consult sales representative for dimming 5' lamps (lamp codes **Tx35, Tx80**). Availability for wattages and voltages varies with ballast manufacturer and control type - see thelightingquotient.com for additional dimming specifications and limitations.

7 Option (see Accessories Section for specifications)

- 00 = No options
- 0E = Integral emergency battery pack with indicator lamp and test button. Operates one lamp. Available in nominal 4', 6' and 8' units only (lamp codes **T128, T221, T228, T155, T239** and **T255**). Not for use with **0E** option (battery pack) or with **T, V** voltage (dimming); consult factory.
- EK = Combination of emergency battery pack and prewired modular through wiring as described above
- XX = For modification not listed. Include detailed description. Consult factory prior to specification.
- 0W = Two circuit wiring for switching front reflector separate from back reflector
- Available in nominal 4', 6' and 8' units only (lamp codes **T128, T221, T228, T155, T239** and **T255**). Not for use with **0E** option (battery pack) or with **T, V** voltage (dimming); consult factory.
- OK = Prewired modular #12 AWG through wiring with quick connectors

8 Destination Requirement

0 = UL listed or CSA certified for U.S.
J = UL listed or CSA certified for Canada

Example

F307 - T221 - S - 00 - 1 - 000

Dual xtra small concealed fluorescent unit consisting of two nominal 6' reflectors with four 21W T5 lamps. Two integral 120V electronic 2-lamp ballasts. Sidelarms with mounting tabs. UL listed or CSA certified for U.S.

Type:

Accessories

Order separately. See Accessories Section for specifications.

AFK000X = Ballast fuse kit
0 = U.S.
J = Canada

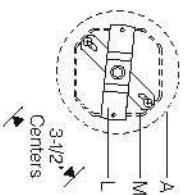
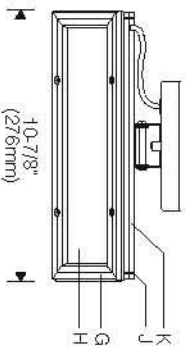
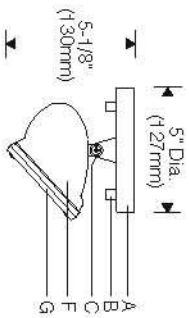


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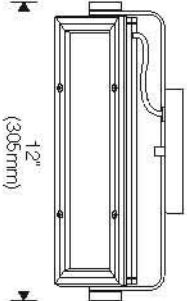
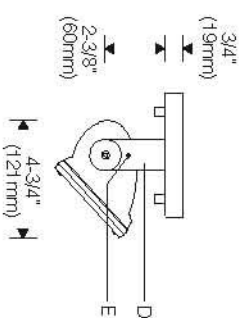
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C Mount 1:8 Scale



E Mount 1:8 Scale



Canopy

Specifications

- A** Aluminum canopy
- B** Chrome cap nuts
- C** Bright stainless steel adjustable bracket
- D** Aluminum yoke
- E** Locking set screw
- F** Die-cast end plates
- G** Milled extruded aluminum door frame with silicone gasket
- H** Micro-prismatic tempered glass lens
- J** Aluminum reveal plates (black)
- K** Specular extruded aluminum reflector
- L** Pivoting hanger bar
- M** Recessed outlet box (by others)

Finish:

Style 101 fluted – bright clear anodized aluminum housing and door frame. Painted end plates, yoke and canopy in choice of silver or semi-gloss black.

Style 102 smooth – semi-gloss white exterior, door frame, end plates, yoke and canopy.

Painted surfaces – 6 stage pretreatment and electrostatically applied thermoset powder coat for stable, long lasting and corrosion resistant finish.

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

All mounting hardware – zinc or cadmium plated.

Mounting:

Canopy mounts over recessed outlet box.

Pendant or cantilever ordered separately; specify **X** mount.

Track mounting available for tungsten halogen units; specify **K** mount. **Consult factory.**

Electrical:

Use 90°C wire for supply connections.

Tungsten halogen – recessed single contact (RSC) or DC bayonet lampholders retained with patented clamping supports for maximum heat dissipation.

Metal halide – G12 lampholder for use with single ended lamp. Remote encapsulated high reactance auto transformer ballast (35W and 70W) or electronic ballast. Electronic ballast provides improved voltage regulation, energy savings and automatic shut-off feature to eliminate end-of-life lamp cycling. For complete ballast specifications, see Accessories Section.

Standard:

UL listed or CSA certified for damp locations (Style 102 painted model recommended for damp locations). Where pendant or cantilever may be exposed to wind, consult factory.

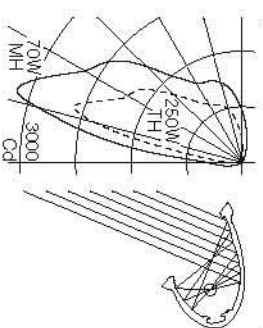


Features

- Die-cast end plates join at articulated black reveals; machined aluminum knobs – no exposed fasteners.
- All joints are gasketed – keep dirt and moisture out, prevent light leaks, maintain performance
- Non-corrosive aluminum or stainless steel construction
- Compact yet powerful – up to 250W halogen, 150W MH

Performance

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



For complete photometrics, see www.elliptipar.com.

To form a Catalog Number

1 2 3 4 5 6 7 8

Project: _____

Type: _____

Accessories

Order separately. See Accessories Section for specifications.

VCS 30 = Cantilever, 30" (760mm) setback

0 = U.S.
J = Canada

02 = semi-gloss white
07 = silver
08 = semi-gloss black

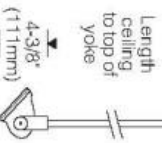


VP = Wallwash pendant

0 = U.S.
J = Canada

Length in inches
(54" (1.4m) max. for TH,
42" (1.0m) max. for MH)

02 = semi-gloss white
07 = silver
08 = semi-gloss black



L = straight
E = swivel (up to 45°)

AEBV 000 = External vertical blade baffle, black

2 = 25° shielding
4 = 45°



AUV00 0 = Ultraviolet (UV) filter lens

01 = Style 101
02 = Style 102



ACF = Stripped glass color filter, integral to door frame.



Note: Color filters limited to maximum 200W halogen, 70W CMH. Consult factory for complete specifications and ordering information.

AFK00X = Ballast fuse kit

0 = U.S.
J = Canada



5 Finish

Style 101 Fluted

01 = Bright aluminum housing and door frame with silver end plates, yoke and canopy

81 = Bright aluminum housing and door frame with semi-gloss black end plates, yoke and canopy

Style 102 Smooth

02 = Semi-gloss white housing, end plates, door frame, yoke and canopy

99 = Custom RAL or computer matched color to be specified, consult sales representative

6 Voltage/Ballast

Electronic

1 = 120V
2 = 277V

Magnetic*

A = 120V
B = 277V

*35W or 70W Metal Halide or Tungsten Halogen (120V)

7 Option (See Accessories Section for specifications)

00 = No options

0H = Long distance remote ballast (encapsulated magnetic ballast for 35 and 70W only), 35W: 15' min. up to 50' max. (4.5m - 15m), 70W: up to 50' max. (15m)

0M = MRI medical facility use (halogen E mount only)

0P = Natriotium (pool) use, tungsten halogen or metal halide unit with remote ballast located outside the pool environment (Style 102 smooth painted unit only)

0Q = Natriotium (pool) use, remote ballast suitable for use in pool environment (Style 102 smooth painted unit only)

0R = Halogen standby lamp with relay field connected at remote ballast. Lamp included (wattage varies).

XX = For modification not listed, include detailed description. Consult factory prior to specification.

8 Destination Requirement

0 = UL listed or CSA certified for U.S.

J = UL listed or CSA certified for Canada

Note: Not applicable to K mount.

Example

M102 - 070G - E - 02 - A - 0Q0

Small smooth surface model for use with 70 watt metal halide lamp. Mounted with external yoke on ceiling canopy. Semi-gloss white. Remote 120V magnetic ballast. Luminaire and ballast suitable for natriotium (pool) use. UL listed or CSA certified for U.S.

1 Source

M = Metal halide
T = Tungsten halogen

2 Style

101 = Small fluted surface, remote ballast
102 = Small smooth surface, remote ballast
Note: for damp locations, Style 102 is recommended.

3 Lamp

Lamp Code	Wattage	Lamp Number	Voltages	Remote Distance
035G	35	CDM35/T6/830	1, 2	15' (4.5m)
			A, B	10' (3m)
070G	70	CDM70/T6/830	1, 2	15' (4.5m)
			A, B	20' (6m)
150G	150	CDM150/T6/830	1, 2	15' (4.5m)
Tungsten Halogen				
0100	100	Q100DC	A	
0150	150	Q150DC	A	
0200	200	Q200T3	A	
0250	250	Q250DC	A	

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



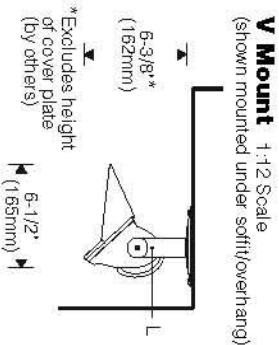
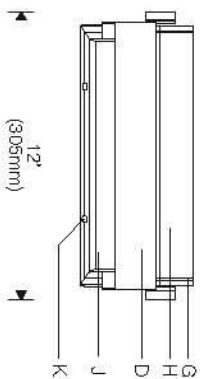
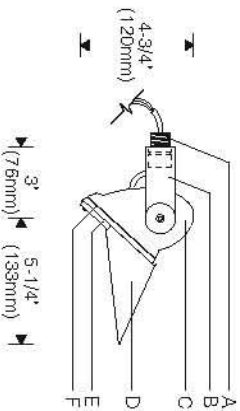
4 Mounting

C = Adjustable back bracket on ceiling canopy
E = External yoke on ceiling canopy

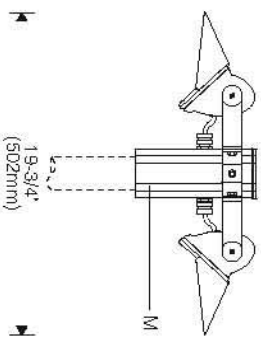
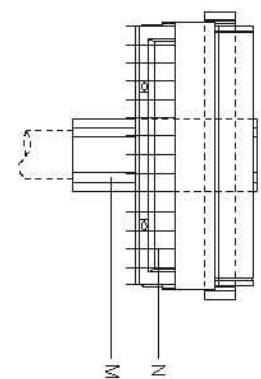
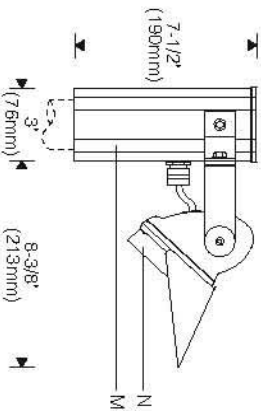
X = External yoke for use with accessory cantilever or pendant mounting assembly (order separately)

K = Track mounted (tungsten halogen only)
Note: Consult factory for available track manufacturers and types.

V Mount 1:8 Scale



Slipfitter: Single Unit 1:8 Scale (For use with X Mount)



Slipfitter: Double 1:12 Scale

Specifications

- | | | | |
|---|--|--|---|
| A 1/2" NPT nipple | E Milled extruded aluminum door frame | H Specular extruded aluminum reflector | L Locking set screw |
| B Aluminum yoke | F Pre-cured silicone door and lens gasket | J Micro-prismatic, thermal and impact resistant tempered glass lens | M Accessory extruded aluminum slipfitter for 2-3/8" O.D. tenon or pole |
| C Die-cast and aluminum plates | G Aluminum reveal plates (black) | K Tamper-resistant captive door screws | N Accessory vertical blade cross baffle (black) |
| D Aluminum cutoff visor (included) | | | |

Finish:

Exterior surfaces – 6 stage pretreatment and electrostatically applied thermoset polyester powder coating for a durable abrasion, fade and corrosion resistant finish. Choice of semi-gloss colors (see ordering information).

Reflector – extruded high purity aluminum with clear anodized specular finish. All hardware and components – non-corrosive stainless steel or aluminum. Door secured with captive tamper-resistant (#10 Torx) screws in stainless steel threaded reflector inserts to prevent seizing. Yoke attaches with recessed hex socket screws.

Mounting:

1/2" NPT nipple (wet location outlet box and outlet box cover or fitting by others).

Accessory slipfitter (ordered separately) for 2-3/8" O.D. pole, tenon or stanchion (by others). Side-mount for single or double (back-to-back) units, specify **X** mount.

Electrical:

Use 90°C wire for supply connections. Leads exit reflector through watertight flush cord entry and silicone coated fiber-glass sleeving with 8" (2m) exposed beyond nipple. 60" (1.5m) leads for **X** mount.

Tungsten halogen – recessed single contact (RSC) or DC bayonet lampholders retained with patented clamping supports for maximum heat dissipation.

Metal halide – G12 lampholder for use with single ended lamp. Remote high reactance autotransformer ballast (-20°F/-30°C starting) or electronic ballast (5°F/-15°C starting). Die-cast aluminum weatherproof ballast enclosure includes four 1/2" NPT threaded entries. Electronic ballast provides improved voltage regulation, energy savings and automatic shut-off feature to eliminate end-of-life lamp cycling. Optional remote ballast for dry indoor location.

For complete ballast specifications, see Accessories Section.

Standard:

UL listed or CSA certified for wet locations.

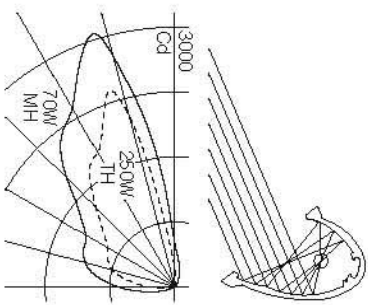
Features

- High performance asymmetric lighting for broad areas where pedestrian scale, controlled distribution are desired
- Compact yet powerful – up to 250W halogen, 150W MH
- Durable and secure – thermal and impact resistant lens, tamper-resistant fasteners, set screw in yoke locks aiming
- Non-corrosive – aluminum and stainless steel construction

Performance

Two parabolic reflector sections drive light across the ground plane from one edge. An elliptical section redirects its light to a parabola and shields the lamp. Asymmetry is maximized resulting in high beam efficiency and superior surface uniformity. Fast "runback" minimizes wasted spill and trespass light. Wide lateral distribution permits greater spacings.

For complete photometrics, visit theightingquotient.com



To Order

Style 151

To form a Catalog Number

1 5 1 - [] - [] - [] - V [] []
 1 2 3 4 5 6 7 8

1 Source

- M = Metal halide
- T = Tungsten halogen

2 Style

151 = Small outdoor, remote ballast

3 Lamp

Lamp Code	Wattage	Lamp Number	Voltages	Remote Distance
035G	35	CDM35/T6/830	1, 2	15' (4.5m)
			A, B	10' (3m)
070G	70	CDM70/T6/830	1, 2	15' (4.5m)
			A, B	20' (6m)
150G	150	CDM150/T6/830	1, 2	15' (4.5m)
			A, B	10' (3m)
Tungsten Halogen				
0100	100	Q100DC	A	
0150	150	Q150DC	A	
0200	200	Q200T3	A	
0250	250	Q250DC	A	

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

4 Mounting

- V = External yoke with 1/2" NPT nipple (wet location outlet box and outlet box cover or fitting by others)
- X = External yoke for use with accessory side-mount slipfitter (order separately)

5 Finish

- 02 = Semi-gloss white
- 06 = Dark bronze
- 07 = Silver
- 08 = Semi-gloss black
- 12 = Green

Project: []

6 Voltage/Ballast

- Electronic
- 1 = 120V
- 2 = 277V
- Magnetic
- A = 120V
- B = 277V

7 Option (see Accessories Section for specifications)

- V0 = Cutoff visor included, no other options
- VD = Remote ballast for dry indoor location (not for use with 150W magnetic)
- VH = Long distance remote metal halide ballast
 35W: 15' minimum up to 50' maximum (4.5m - 15m)
 70W: up to 50' maximum (15m)
 150W: up to 50' maximum (15m)
- VR = Halogen standby lamp with relay field connected at remote ballast. Lamp included (wattage varies).
- VX = For modification not listed, include detailed description. Consult factory prior to specification.

8 Destination Requirement

- 0 = UL listed or CSA certified for U.S.
- J = UL listed or CSA certified for Canada

Example

T151 - 0250 - V - 02 - A - V0J

Small outdoor model for use with 250 watt tungsten halogen lamp. External yoke with 1/2" NPT nipple. Semi-gloss white powder coat finish. 120V. UL listed or CSA certified for Canada. Cutoff visor included.

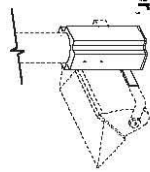
Type: []

Accessories

Order separately. See Accessories Section for specifications.

ASF [] S [] 0 = Side-mount slipfitter

for 2-3/8" O.D. pole, tenon or rigid conduit (for use with X mount units)



- 1 = single unit
- 2 = double unit (back to back)

5 Finish

AEBV [] 0D0 = External vertical blade **baffle**, black for lengthwise shielding



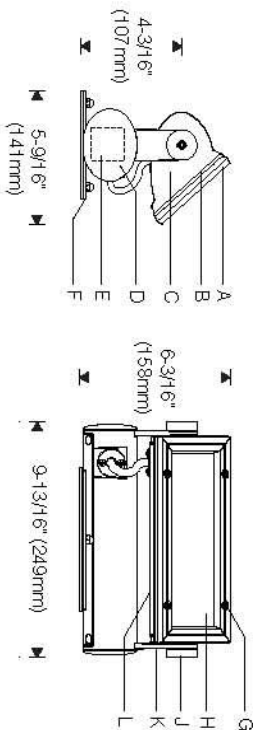
- 2 = 25° shielding
- 4 = 45°

AFK000X [] = Ballast fuse kit

- 0 = U.S.
- J = Canada

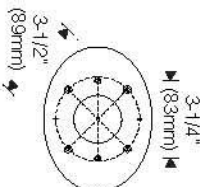


S Mount 1:8 Scale

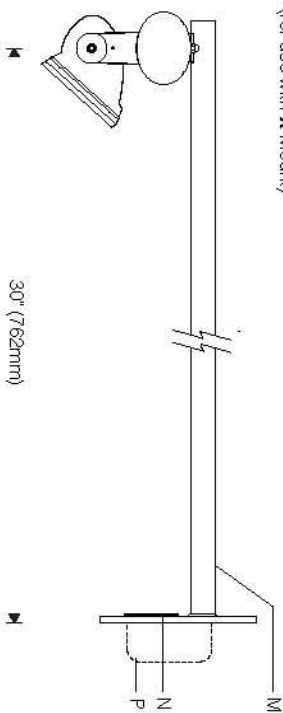


Mounting Plate
(S Mount)

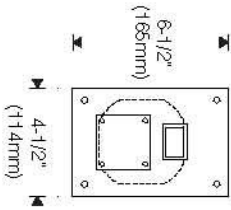
For use with surface, recessed, round, or rectangular outdoor outlet box by others



Cantilever: Lighting Downward
(for use with X Mount)



Cantilever Mounting Plate
(X Mount)



Specifications

- | | | | |
|---|---|--|--|
| A Milled extruded aluminum door frame | D Die-cast aluminum ballast housing and side arms | H Microprismatic tempered glass lens | M 1" x 1-1/2" aluminum arm |
| B Precured silicone door and lens gasket | E Integral electronic ballast | J Aluminum decorative knobs | N Welded aluminum mounting plate with splice access cover |
| C Die-cast aluminum end plates | F Stainless steel canopy, mounting plate, cap nuts | K Locking set screw | P Recessed outlet box (by others) |
| | G Tamper-resistant captive door screws | L Spectular extruded aluminum reflector | |

Finish:

Exterior surfaces – 6 stage pretreatment and electrostatically applied thermoset polyester powder coating for a durable abrasion, fade and corrosion resistant finish. Choice of semi-gloss colors (see ordering information).

Reflector – extruded high purity aluminum with clear anodized specular finish. All hardware and components – non-corrosive stainless steel or aluminum. Door secured with captive tamper-resistant (#10 Torx) screws in stainless steel threaded reflector inserts to prevent seizing. Yoke attaches with recessed hex socket screws.

Mounting:

Stainless steel mounting plate compatible with most recessed and surface mounted wet-location outlet boxes (4" round or single gang rectangular weatherproof outlet box by others). Stainless steel oval canopy attaches to mounting plate with stainless steel hardware.

Aluminum cantilever or slipfitter mounting assemblies ordered separately. specify X mount. Suitable backing structure required.

Electrical:

Use 90°C wire for supply connections. Leads exit reflector and enter ballast housing through watertight flush cord entry and silicone coated fiberglass sleeving.

S mount – provided with 8" (0.2m) leads exposed for supply connections at recessed or surface outlet box.

X mount – provided with 60" (1524mm) leads exposed for slipfitter mounting or cantilever mounting over recessed outlet box.

G-12 lampholder for use with single ended lamp.

Integral electronic HPF ballast (-4°F/-20°C starting) offers improved voltage regulation and color stability. Automatic shutoff feature eliminates end-of-life lamp cycling.

For complete ballast specifications, see Accessories Section.

Standard:

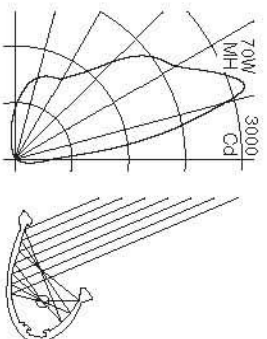
UL listed or CSA certified for wet locations.

Features

- Energy-efficient wall lighting – scaled for walls 8' to 12' high
- Compact yet powerful – up to 70W ceramic metal halide
- Ceramic metal halide – warm color, high CRI, long life
- Integral electronic ballast – precise lamp regulation
- Surface, cantilever, or slipfitter mounting options for up/down orientations

Performance

Two parabolic reflector sections drive light up (or down) the vertical plane from one edge. An elliptical section redirects its light to a parabola and shields the lamp. Asymmetry is maximized resulting in high beam efficiency and superior surface uniformity. The last "runback" minimizes glare and spill light. Wide lateral distribution permits greater spacings.



For complete photometrics, visit theLightingQuotient.com



To form a Catalog Number

M 1 5 9 - - - -

1 Source
M = Metal halide

2 Style
159 = Small outdoor, integral ballast **Ovalnear**

Lamp Code	Wattage	Lamp Number	Voltages	Ballast
Ceramic Metal Halide*				
020G	20	CDM20/T/6/8/90	1, 2	Electronic
035G	35	CDM35/T/6/8/90	1, 2	Electronic
070G	70	CDM70/T/6/8/90	1, 2	Electronic

For complete lamp and ballast information, see Accessories Section.
*Metal halide lamps using ceramic arc tubes yield higher light output than lamps with quartz arc tubes. They offer improved lamp-to-lamp color consistency and a more stable color temperature over their life (+200K). Standard lamp color is 3000K/80+ CRI.

4 Mounting

S = Surface mount with oval mounting plate and canopy (4" round or single gang rectangular weatherproof outlet box by others)
X = For use with cantilever mounting accessory (order separately)

Note: For slipfitter options, see Accessories Section.

5 Finish

02 = Semi-gloss white
06 = Dark bronze
07 = Silver
08 = Semi-gloss black
12 = Green
99 = Custom RAL or computer matched color to be specified, consult sales representative.

Project:

6 Voltage/Ballast

Electronic
1 = 120V
2 = 277V

7 Option (see Accessories Section for specifications)

00 = No options
XX = For modification not listed, include detailed description. Consult factory prior to specification.

8 Destination Requirement

0 = UL listed or CSA certified for U.S.
J = UL listed or CSA certified for Canada

Example

M159 - 070G - S - 06 - 2 - 000

Small outdoor **Ovalnear** for use with 70 watt ceramic arc tube pulse start metal halide lamp. Surface mounted with oval canopy over recessed or surface junction box. Dark bronze powder coat finish. Integral HPF 277V electronic ballast. UL listed or CSA certified for U.S.

Type:

Accessories

Order separately. See Accessories Section for specifications.

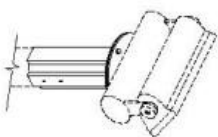
ACG 30 = Cantilever, 30" (760mm) setback (for use with X mount unit)



5 Finish

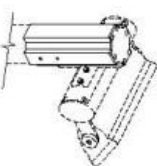
0 = U.S.
J = Canada

AST T10 = Top-mount slipfitter, for 2-3/8" O.D. pole, slanchion or tenon (for use with single S mount unit)



5 Finish

AST S10 = Side-mount slipfitter, for 2-3/8" O.D. pole, slanchion or tenon (for use with single X mount unit)

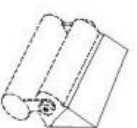


5 Finish

AEGV 0D0 = External vertical blade baffle, matte black for lengthwise shielding
2 = 25° shielding
4 = 45°



AVG 0D0 = Cutoff visor
5 Finish





Quad Tube Compact Fluorescent

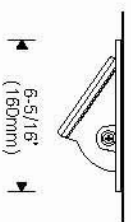
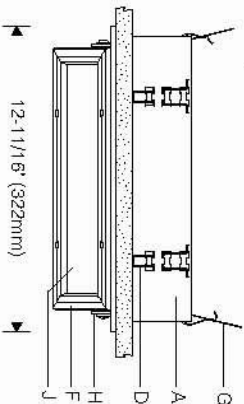
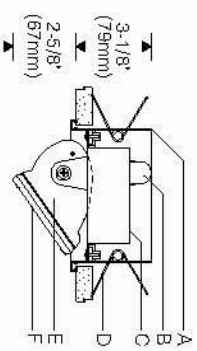


Ceramic Metal Halide



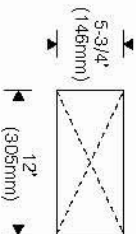
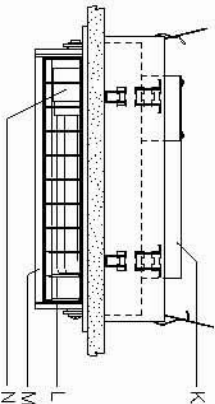
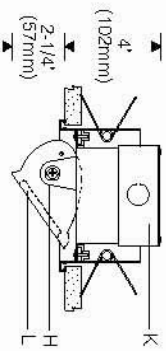
Tungsten Halogen

Style 203 1:8 Scale (Halogen, metal halide remote)



Profile (below ceiling)

Style 206 1:8 Scale (Quad tube fluorescent, metal halide integral)*



Ceiling Cutout

* Diagram shows Style 206 for quad tube fluorescent. Snap-in baffle provided for quad tube only. Style 206 for metal halide is provided with door and lens as shown in upper Style 203 diagram.

Specifications

A Extruded aluminum mounting/trim frame	E Die-cast end plates	H Aluminum yoke arms	L Snap-in polycarbonate baffle (matte gray), 15° shielding (quad tube)
B Conduit connector (Style 203)	F Mitered extruded aluminum door frame, silicone gasket (halogen and metal halide units)	J Tempered glass lens (halogen and metal halide units)	M Specular extruded aluminum reflector
C Aluminum back box	G Supplemental wire supports (by others)	K Integral ballast with splice compartment (Style 206)	N Twist and lock lampholder (quad tube)

Finish:

Semi-gloss white reflector, door, end plates, yoke arms and ceiling trim, with black back box.
 Painted surfaces – 6 stage pretreatment and electrostatically applied thermoset powder coat.
 Reflector – extruded high purity aluminum with clear anodized specular finish. All luminaire hardware – stainless steel.

Mounting:

Mounting/trim frame installs from below finished ceiling. Retrofits into existing non-accessible ceilings. Spring clips provided for ceilings up to 1-3/4" (44mm) thick. Supplemental support wires, bar hangers, etc. (by others) required for accessible ceilings. Where wire suspension is prohibited, order accessory universal mounting brackets for use with 1/2" EMT, 1-1/2" lathing or C channel (by others).

Standard:

UL listed or CSA certified for damp locations (TH and H units with lens recommended for damp location use). **Minimum spacings for 200W/250W Style 203, all Style 206: 2'** (0.6m) on center, **1'** (0.3m) fixture center to side wall, **3"** (76mm) to overhead building member.

Electrical:

Use 90°C wire for supply connections.
 Style 203 (halogen, metal halide remote) – 5' (1.5m) wire leads in flexible conduit exit back box for connection to accessible junction box (by others), or to remote ballast (installation prior to finished ceiling recommended).
 Style 206 (quad tube, 35W/70W metal halide integral) – splice compartment with two 7/8" diameter conduit entries.

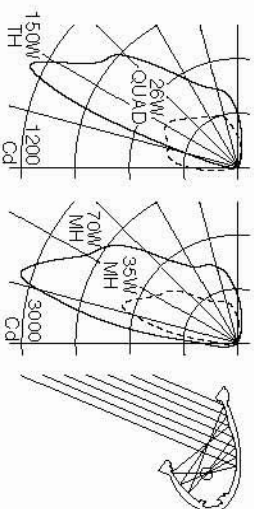
Tungsten halogen – DC bayonet or RSC lampholders in patented clamping supports for maximum heat dissipation. Fluorescent – integral HPF thermally protected electronic ballast with end-of-life protection. Optional dimming ballast, compatible dimmer switch required. Consult representative for compatibility. Twist & lock lampholder for easy relamping. Metal halide – Style 203 remote; encapsulated high reactance autotransformer ballast (35W and 70W) or electronic ballast. Style 206 integral (35W, 70W only); electronic ballast provides improved voltage regulation, energy savings and automatic shut-off feature to eliminate end-of-life lamp cycling. For complete ballast specifications, see Accessories Section.

Features

- Adjustable aiming – tailor distribution to the wall height and setback distance
- Shallow recessed depth – fits under ducts at core walls
- Precured silicone gaskets – keep dirt and moisture out, maintain performance (halogen and metal halide)
- Snap-in matte gray baffle – 15° shielding (quad tube)

Performance

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



elliptipar

There is no equal™



To Order

Style 203 / 206

To form a Catalog Number

- - - T - 0 2 - -

Project:

5 Finish

02 = Semi-gloss white

6 Voltage/Ballast

*Compact Fluorescent & Metal Halide Electronic**
 (Style 206)
 1 = 120V
 2 = 277V

Tungsten Halogen
 (Style 203)
 A = 120V
 Metal Halide
 (Style 203)
 A = 120V magnetic
 B = 277V magnetic
 1 = 120V electronic
 2 = 277V electronic

7 Option

* Electronic ballast for 35 and 70W available in Style M206 integral only, for 150W in Style M203 remote only.
 **Dimming varies with ballast manufacturer and control type — see thelightingquotient.com for specifications and limitations.

Type:

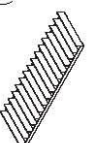
Accessories

Order separately. See Accessories Section for specifications.

AEBV 000

External vertical blade **baffle**, black (not for use with 250W tungsten halogen or quad tube fluorescent units)

2 = 25° shielding
4 = 45°



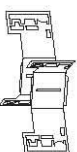
AUV00020 = Ultraviolet (UV) filter glass lens

(tungsten halogen and metal halide units only)



ASRBKT00 = Universal mounting brackets (set of two), accepts 1/2" EMT,

1-1/2" lathing, C channel or bar hangers (by others)



AFK000X = Ballast fuse kit

0 = U.S.
J = Canada



To Order

To form a Catalog Number

- - - T - 0 2 - -

5 Finish

02 = Semi-gloss white

6 Voltage/Ballast

*Compact Fluorescent & Metal Halide Electronic**
 (Style 206)
 1 = 120V
 2 = 277V

Tungsten Halogen
 (Style 203)
 A = 120V
 Metal Halide
 (Style 203)
 A = 120V magnetic
 B = 277V magnetic
 1 = 120V electronic
 2 = 277V electronic

7 Option

* Electronic ballast for 35 and 70W available in Style M206 integral only, for 150W in Style M203 remote only.
 **Dimming varies with ballast manufacturer and control type — see thelightingquotient.com for specifications and limitations.

To Order

To form a Catalog Number

- - - T - 0 2 - -

5 Finish

02 = Semi-gloss white

6 Voltage/Ballast

*Compact Fluorescent & Metal Halide Electronic**
 (Style 206)
 1 = 120V
 2 = 277V

Tungsten Halogen
 (Style 203)
 A = 120V
 Metal Halide
 (Style 203)
 A = 120V magnetic
 B = 277V magnetic
 1 = 120V electronic
 2 = 277V electronic

7 Option

* Electronic ballast for 35 and 70W available in Style M206 integral only, for 150W in Style M203 remote only.
 **Dimming varies with ballast manufacturer and control type — see thelightingquotient.com for specifications and limitations.

To Order

To form a Catalog Number

- - - T - 0 2 - -

5 Finish

02 = Semi-gloss white

6 Voltage/Ballast

*Compact Fluorescent & Metal Halide Electronic**
 (Style 206)
 1 = 120V
 2 = 277V

Tungsten Halogen
 (Style 203)
 A = 120V
 Metal Halide
 (Style 203)
 A = 120V magnetic
 B = 277V magnetic
 1 = 120V electronic
 2 = 277V electronic

7 Option

* Electronic ballast for 35 and 70W available in Style M206 integral only, for 150W in Style M203 remote only.
 **Dimming varies with ballast manufacturer and control type — see thelightingquotient.com for specifications and limitations.

3 Lamp

Lamp Code	Wattage	Lamp Number	Voltages	Remote Distance
Quad Tube Fluorescent				
P126	26 (4-pin)	CFQ26W/G24q	1, 2	Integral
			T, V	

Ceramic Arc Tube Pulse Start Metal Halide (80+ CRI)*

035G	35	CDM35/T6/830	1, 2	15' (4.5m)
			A, B	10' (3m)
070G	70	CDM70/T6/830	1, 2	15' (4.5m)
			A, B	20' (6m)
150G	150	CDM150/T6/830	1, 2	15' (4.5m)

Tungsten Halogen

0100	100	Q100DC	A	
0150	150	Q150DC	A	
0200	200	Q200T3	A	
0250	250	Q250DC	A	

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

4 Mounting

T = Overlapping trim

Type:

Accessories

Order separately. See Accessories Section for specifications.

AEBV 000

External vertical blade **baffle**, black (not for use with 250W tungsten halogen or quad tube fluorescent units)

2 = 25° shielding
4 = 45°



AUV00020 = Ultraviolet (UV) filter glass lens

(tungsten halogen and metal halide units only)



ASRBKT00 = Universal mounting brackets (set of two), accepts 1/2" EMT,

1-1/2" lathing, C channel or bar hangers (by others)

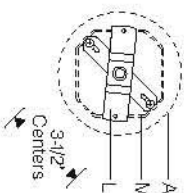
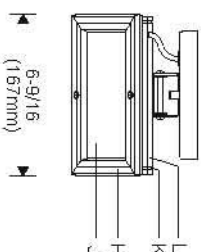
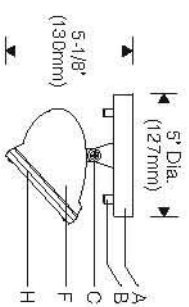


AFK000X = Ballast fuse kit

0 = U.S.
J = Canada

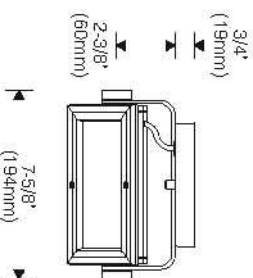
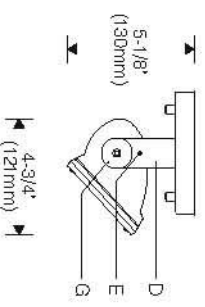


C Mount 1:8 Scale



Canopy

E Mount 1:8 Scale



Specifications	
A Aluminum canopy	E Locking set screw
B Chrome cap nuts	F Die-cast aluminum end plates
C Bright stainless steel adjustable bracket	G Machined aluminum knobs with hex head cap screws
D Aluminum yoke	H Milled extruded aluminum door frame with silicone gasket
	J Micro-prismatic tempered glass lens
	K Aluminum reveal plates (black)
	L Specular extruded aluminum reflector
	M Pivoting hanger bar
	N Recessed outlet box (by others)

Finish:

Style 099 fluted – bright clear anodized aluminum housing and door frame. Painted end plates, yoke and canopy in choice of silver or semi-gloss black.

Style 100 smooth – semi-gloss white exterior, door frame, end plates, yoke and canopy.

Painted surfaces – 6 stage pretreatment and electrostatically applied thermoset powder coat for stable, long lasting and corrosion resistant finish.

Reflector – extruded high purity aluminum with clear anodized specular finish. All luminaire hardware – stainless steel. All mounting hardware – zinc or cadmium plated.

Electrical:

Use 90°C wire for supply connections.

Tungsten halogen – DC bayonet lampholders retained with patented clamping supports for maximum heat dissipation.

Mounting:

Canopy mounts over recessed outlet box.

Pendant or cantilever ordered separately, specify **X** mount.

Pendant stem – 1 1/16" O.D. aluminum, internally threaded, 5" dia. x 1/2" aluminum canopy.

Cantilever – 1" x 2" steel arm. Interface plate (under canopy) allows +/- 5° leveling. **Suitable backing structure required.** Track mounting available, specify **K** mount. **Consult factory.**

Standard:

UL listed or CSA certified for damp locations (Style 100 painted model recommended for damp locations). Where pendant or cantilever may be exposed to wind, consult factory.

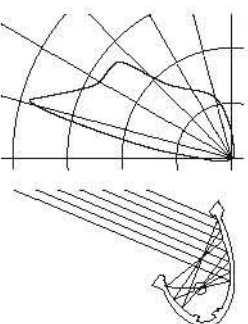


Features

- Scaled for residential interiors – 7' to 10' high walls
- Adjustable reflector – tailor performance to wall height and setback distance
- Versatile – canopy, pendant, cantilever, or track
- Die-cast end plates join at articulated black reveals; machined aluminum knobs – no exposed fasteners

Performance

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



For complete photometrics, see www.elliptipar.com.

To Order

Style 099 / 100

To form a Catalog Number

T - - - - **A** -

1 2 3 4 5 6 7 8

1 Source

T = Tungsten halogen

2 Style

099 = Small fluted surface
100 = Small smooth surface

Note: for damp locations, Style 100 is recommended.

3 Lamp

Lamp Code	Wattage	Lamp Number
0100	100	Q100DC
0150	150	Q150DC

4 Mounting

- Style 099 and 100 Surface**
- C = Adjustable back bracket on ceiling canopy
 - E = External yoke on ceiling canopy
 - X = External yoke for use with accessory cantilever or pendant mounting assembly (**order separately**)
 - K = Track mounted
- Note: Consult factory for available track manufacturers and types.**

5 Finish

- Style 099 Fluted**
- 01 = Bright aluminum housing and door frame with silver end plates, yoke and canopy
 - 81 = Bright aluminum housing and door frame with semi-gloss black end plates, yoke and canopy
- Style 100 Smooth**
- 02 = Semi-gloss white housing, end plates, door frame, yoke and canopy
 - 99 = Custom RAL or computer matched color to be specified, consult sales representative

Project:

6 Voltage

A = 120V

7 Option (See Accessories Section for specifications)

- 00 = No options
- V0 = Cutoff visor (recommended when wall mounted for uplighting)
- XX = For modification not listed, include detailed description. Consult factory prior to specification.

8 Destination Requirement

- 0 = UL listed or CSA certified for U.S.
 - J = UL listed or CSA certified for Canada
- Note:** Not applicable to K mount.

Example

T099 - 0100 - C - 01 - A - 000

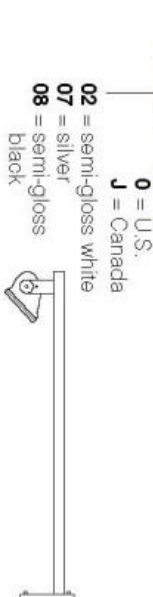
Small fluted surface model for use with 100 watt tungsten halogen lamp. Mounted with back bracket on ceiling canopy. Bright aluminum housing/reflector, silver end plates and canopy. 120V. UL listed or CSA certified for U.S.

Type:

Accessories

Order separately. See Accessories Section for specifications.

VCS = Cantilever, 30" (760mm) setback

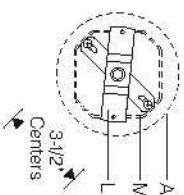
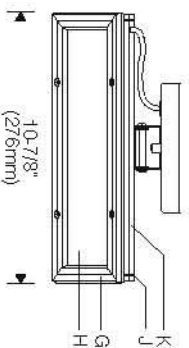
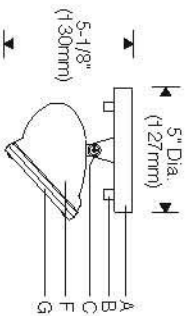


VP = Wallwash pendant



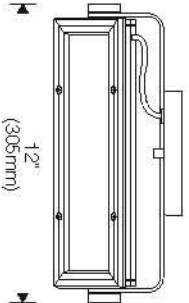
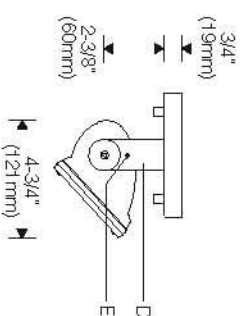


C Mount 1:8 Scale



Canopy

E Mount 1:8 Scale



Specifications

- A** Aluminum canopy
- B** Chrome cap nuts
- C** Bright stainless steel adjustable bracket
- D** Aluminum yoke
- E** Locking set screw
- F** Die-cast end plates
- G** Mitred extruded aluminum door frame with silicone gasket

- H** Micro-prismatic tempered glass lens
- J** Aluminum reveal plates (black)

- K** Specular extruded aluminum reflector
- L** Pivoting hanger bar
- M** Recessed outlet box (by others)

Finish:

Style 101 fluted – bright clear anodized aluminum housing and door frame. Painted end plates, yoke and canopy in choice of silver or semi-gloss black.

Style 102 smooth – semi-gloss white exterior, door frame, end plate, yoke and canopy.

Painted surfaces – 6 stage pretreatment and electrostatically applied thermoset powder coat for stable, long lasting and corrosion resistant finish.

Reflector – extruded high purity aluminum with clear anodized specular finish. All luminaire hardware – stainless steel. All mounting hardware – zinc or cadmium plated.

Mounting:

Canopy mounts over recessed outlet box.

Pendant or cantilever ordered separately; specify **X** mount.

Track mounting available for tungsten halogen units; specify **K** mount. **Consult factory.**

Electrical:

Use 90°C wire for supply connections.

Tungsten halogen – recessed single contact (RSC) or DC bayonet lampholders retained with patented clamping supports for maximum heat dissipation.

Metal halide – G12 lampholder for use with single ended lamp. Remote encapsulated high reactance autotransformer ballast (35W and 70W) or electronic ballast. Electronic ballast provides improved voltage regulation, energy savings and automatic shut-off feature to eliminate end-of-life lamp cycling. For complete ballast specifications, see Accessories Section.

Standard:

UL listed or CSA certified for damp locations (Style 102 painted model recommended for damp locations). Where pendant or cantilever may be exposed to wind, consult factory.

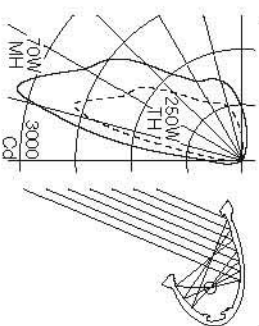


Features

- Die-cast end plates join at articulated black reveals; machined aluminum knobs – no exposed fasteners.
- All joints are gasketed – keep dirt and moisture out, prevent light leaks, maintain performance.
- Non-corrosive aluminum or stainless steel construction.
- Compact yet powerful – up to 250W halogen, 150W MH

Performance

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



To Order

Style 101 / 102

To form a Catalog Number

1 2 3 4 5 6 7 8

Project:

Type:

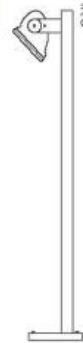
Accessories

Order separately. See Accessories Section for specifications.

VCS 30 = Cantilever, 30" (760mm) setback

0 = U.S.
J = Canada

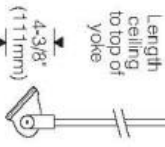
02 = semi-gloss white
07 = silver
08 = semi-gloss black



VP = Wallwash pendant

0 = U.S.
J = Canada

Length in inches
(54" (1.4m) max. for TH,
42" (1.0m) max. for MH)



4-3/8" (111mm)

L = straight
E = swivel (up to 45°)

AEBV 000 = External vertical blade baffle, black

2 = 25° shielding
4 = 45°



AUV00 0 = Ultraviolet (UV) filter lens

01 = Style 101
02 = Style 102



ACF = Stripped glass color filter, integral to door frame.



Note: Color filters limited to maximum 200W halogen, 70W CMH. Consult factory for complete specifications and ordering information.

AFK00X = Ballast fuse kit

0 = U.S.
J = Canada



5 Finish

Style 101 Fluted

01 = Bright aluminum housing and door frame with silver end plates, yoke and canopy

Style 102 Smooth

02 = Semi-gloss white housing, end plates, door frame, yoke and canopy

81 = Bright aluminum housing and door frame with semi-gloss black end plates, yoke and canopy

99 = Custom RAL or computer matched color to be specified, consult sales representative

6 Voltage/Ballast

Electronic
1 = 120V
2 = 277V

Magnetic*
A = 120V
B = 277V

*35W or 70W Metal Halide or Tungsten Halogen (120V)

7 Option (See Accessories Section for specifications)

00 = No options

0H = Long distance remote ballast (encapsulated magnetic ballast for 35 and 70W only), 35W: 15' min. up to 50' max. (4.5m - 15m), 70W: up to 50' max. (15m)

0M = MRI medical facility use (halogen E mount only)

0P = Natatorium (pool) use, tungsten halogen or metal halide unit with remote ballast located outside the pool environment (Style 102 smooth painted unit only)

0Q = Natatorium (pool) use, remote ballast suitable for use in pool environment (Style 102 smooth painted unit only)

0R = Halogen standby lamp with relay field connected at remote ballast. Lamp included (wattage varies).

XX = For modification not listed, include detailed description. Consult factory prior to specification.

8 Destination Requirement

0 = UL listed or CSA certified for U.S.

J = UL listed or CSA certified for Canada

Note: Not applicable to K mount.

Example

M102 - 070G - E - 02 - A - 0Q0

Small smooth surface model for use with 70 watt metal halide lamp. Mounted with external yoke on ceiling canopy. Semi-gloss white. Remote 120V magnetic ballast. Luminaire and ballast suitable for natatorium (pool) use. UL listed or CSA certified for U.S.

Lamp Code	Wattage	Lamp Number	Voltages	Remote Distance
035G	35	CDM35/T/6/830	1, 2	15' (4.5m)
			A, B	10' (3m)
070G	70	CDM70/T/6/830	1, 2	15' (4.5m)
			A, B	20' (6m)
150G	150	CDM150/T/6/830	1, 2	15' (4.5m)
Tungsten Halogen				
0100	100	Q100DC	A	
0150	150	Q150DC	A	
0200	200	Q200T3	A	
0250	250	Q250DC	A	

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



1 Source

M = Metal halide
T = Tungsten halogen

2 Style

101 = Small fluted surface, remote ballast
102 = Small smooth surface, remote ballast

Note: for damp locations, Style 102 is recommended.

3 Lamp

Lamp Code	Wattage	Lamp Number	Voltages	Remote Distance
035G	35	CDM35/T/6/830	1, 2	15' (4.5m)
			A, B	10' (3m)
070G	70	CDM70/T/6/830	1, 2	15' (4.5m)
			A, B	20' (6m)
150G	150	CDM150/T/6/830	1, 2	15' (4.5m)
Tungsten Halogen				
0100	100	Q100DC	A	
0150	150	Q150DC	A	
0200	200	Q200T3	A	
0250	250	Q250DC	A	

4 Mounting

C = Adjustable back bracket on ceiling canopy

E = External yoke on ceiling canopy

X = External yoke for use with accessory cantilever or pendant mounting assembly (order separately)

K = Track mounted (tungsten halogen only)

Note: Consult factory for available track manufacturers and types.

REV. 12/09

elliptipar

elliptipar

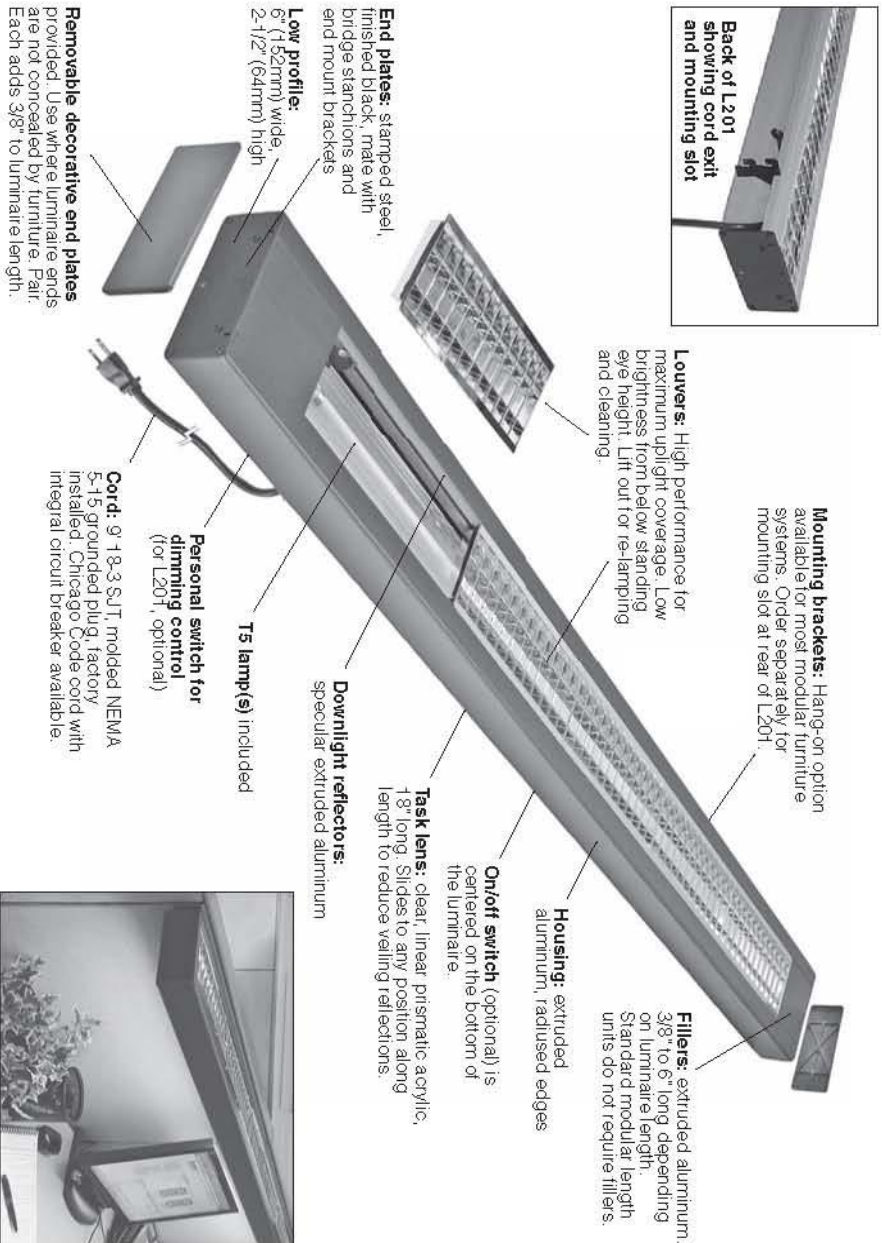
1114 Boston Post Road, West Haven, Connecticut 06516, USA
Voice 203.931.4455 • Fax 203.931.4464 • www.elliptipar.com

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Back of L201 showing cord exit and mounting slot



Mounting brackets: Hang-on option available for most modular furniture systems. Order separately for mounting slot at rear of L201.

Louvers: High performance for maximum uplight coverage. Low brightness from below standing eye height. Lift out for re-lamping and cleaning.

Fillers: extruded aluminum. 3/8" to 6" long depending on luminaire length. Standard modular length units do not require fillers.

Housing: extruded aluminum, radius edges

On/off switch (optional) is centered on the bottom of the luminaire.

Task lens: clear, linear prismatic acrylic, 1/8" long. Slides to any position along length to reduce veiling reflections.

Downlight reflectors: specular extruded aluminum

T5 lamp(s) included

Personal switch for dimming control (for L201, optional)

Cord: 9' 18-3 SUT, molded NEMA 5-15 grounded plug. Factory installed. Chicago Code cord with integral circuit breaker available.



Specifications

Finish:

Painted housing, fillers, decorative end plates, and mounting accessories (panel hooks, end mounts, stanchions).
 Painted surfaces – environmentally friendly 6-stage pretreatment and electrostatically applied thermoset powder coat provides a long lasting, scratch resistant finish. Choice of standard colors. RAL and computer matched colors available on request.
 Reflector – extruded aluminum, chemically brightened and clear anodized.
 Louver tiles – specular vacuum metallized polycarbonate with clear polymer topcoat for easy cleaning.
Mounting:
 L201 has a continuous mounting slot along the rear of the unit, and can be mounted to a wall, furniture panel, or desk clamp stanchion. L201 cords are routed along the mounting slot and can be specified for right- or left-hand exit.



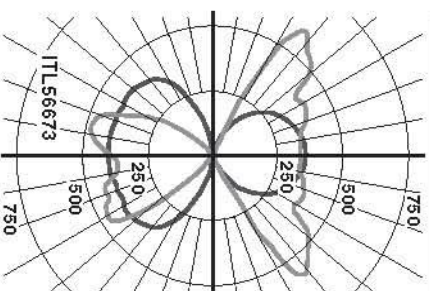
Features

- Task and ambient lighting from a single T5 lamp
- Typical energy consumption is 0.6 W/sf or less
- Integrates with embedded wireless controls (consult factory)
- Low profile, integrates with open plan office furniture systems
- Portable; may be reconfigured along with the furniture
- Reduces glare, eyestrain and visual distraction

Performance

Lighter curve at left shows 180° to 0°. Darker curve shows 90° to 270°. High lamp height position, see website for alternate positions. Illuminance based on a minimum of ten workstations. Light levels will be 5-10% greater in large rooms with more workstations. Ballast factor 0.98, input watts 52, maximum candlepower at 140° is 629 cd.

For complete photometrics see theightingquotient.com



Sample number: L201-71S6-M-EL15-1-1R-0S-3S

Project:

Type:

L20 - - - - - - - - - -

Style Length/Lamp(s) Optic Finish Electrical Cord Cord Exit Options Lamp Color

Style

- L201** Task ambient luminaire with integral hang-on mounting channel
- L202** Task ambient luminaire with smooth back panel

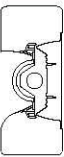
Length/Lamps

Code	Length (mm)	Lamp(s)	Input
24S2	24" (610)	1xF14T5	14W
36S3	35-3/4" (910)	1xF21T5	27W
48S4	47-1/2" (1205)	1xF28T5	33W
60S5	59" (1500)	1xF35T5	41W
71S6	70-3/4" (1800)	2xF21T5	49W
83S7	82-1/2" (2095)	1xF21T5 + 1xF28T5	60W
95S8	94-1/4" (2395)	2xF28T5	66W

Other lengths and lamping are available; consult factory.

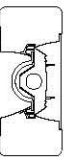
Optic

L Low-mount (L202 shown)



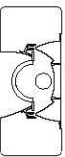
For low-mount IES information, consult factory.

M Mid-mount (L202 shown)



Download IES file.

H High-mount (L202 shown)



Download IES file.

To avoid glare, do not install below 48" or above 66"

Mounting Height	Worksurface Depth	
	24"	30"
48" – 50"	Low	Low
51" – 52"	Mid	Low
53" – 57"	Mid	Mid
58" – 61"	High	Mid
62" – 63"	High(1)	High
64" – 66"	(1)	High

(1) Consult factory. Notation for height: 62" – 63" is for L202.

Finish

- EL02** Eggshell white
- EL06** Dark bronze
- EL07** Silver
- EL08** Semi-gloss black
- EL12** British racing green
- EL15** Warm metallic
- TASL** Semi-gloss slate
- XXXX** Custom color (specify or submit sample)
- or 4-digit RAL color code** (color chart available)

Electrical

- 120 V only**
- 1** Electronic ballast
- T** Dimming ballast for personal dimming control option (L201 only, specify with option **OD**). For other dimming applications, consult factory.

Cord

- 90° SW rotation plug, 9 feet:**
- 1** Black
- 3** Gray
- 5** Beige
- 7** Chicago cord, integral circuit breaker, black
- 8** Chicago cord, integral circuit breaker, black
- Straight plug, 9 feet (L202 only):**
- 2** Black
- 4** Gray
- 6** Beige

Cord Exit

- R** Right rear (L201, L202)
- L** Left rear (L201, L202)
- E** Right bottom (L202 only)
- W** Left bottom (L202 only)
- For L202, **R** and **L** are on dual stanchion only; **E** and **W** exits (L202) are 1-1/2" from end of luminaire.

Options

- 00** None
- 0S** On/off switch
- 0D** Dimming switch (L201, for use with dimming ballast only)
- X0** Dual stanchion pre-drill (L202)
- XS** Dual stanchion pre-drill and integral on/off switch (L202)
- XX** Custom modification (specify)

Lamp Color

- 30** 3000K, 85 CRI
- 35** 3500K, 85 CRI
- 41** 4100K, 85 CRI

Mounting Accessories

TPH Panel Hooks, pair (L201)
TPR End Mount Rail Kit (L202)
TP - - -

System* Finish (at left)

TPH Panel Hooks mount to slotted panel frame. Stamped and formed CRS; pair.

TPR End Mount Rails (for 24" wide end panels) mount to slotted panel frames. Several models are available to interface with a variety of panel systems. Pair of rails, includes pair of black interface plates.

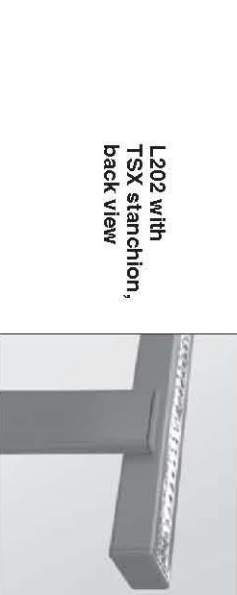
TPE End Mount Brackets, pair (P202)
 Support the ends of the luminaire, black, pair.

TMHDW Wall Brackets, pair (L201)
TMHDW - - -

TMHDW Wall Brackets mount to stud framed walls, millwork, and other solid surfaces. Stamped and formed CRS, black, pair.

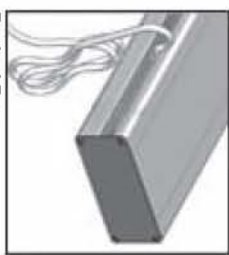
TSH Desk Clamp Stanchion (L201)
TSX Desk Clamp Stanchion (L202)
TS - - -

Desk Clamp Stanchions mount to edge of worksurface – 1/2" to 3-1/4" thick. Extruded aluminum post. Resilient pads resist slippage, protect surfaces. Integral cord management. **TSH19-7/TSX19-** places top of luminaire 19-1/2" above worksurface. Sold individually; some luminaires require two stanchions.



tambient from The Lighting Quotient
 114 Boston Post Road, West Haven, Connecticut 06516, USA
 Voice 203.931.4455 • Fax 203.931.4464 • thelightingquotient.com

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Back of P201 showing cord exit and mounting slot

Mounting brackets: Hang-on option available for most modular furniture systems. Order separately for mounting slot at rear of P201.

Housing: extruded aluminum, radius edges

Top panel lifts out for re-lamping and cleaning

Cord exits from integral mounting/cord management slot at rear of luminaire P201.

Low profile: 6" (152mm) wide, 2-1/2" (64mm) high

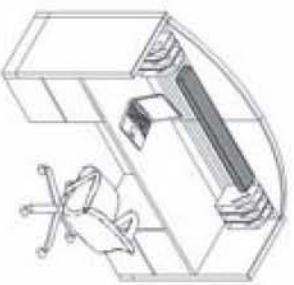
Cord: 9' 18-3 SJT, molded NEMA 5-15 grounded plug, factory installed. Chicago Code cord with integral circuit breaker available.

On/off switch (optional) is on the bottom of the luminaire, centered or on the end depending on its length.

Task lens: clear, linear prismatic acrylic, 1/8" long. Slides to any position along length to reduce veiling reflections.

Contoured bottom closure enhances task lighting effectiveness and controls undesirable reflections.

Removable decorative end plates provided. Use where luminaire ends are not concealed by furniture. Pair. Each adds 3/8" to luminaire length.



Specifications

Finish:

Painted housing, fillers, decorative end plates, and mounting accessories (panel hooks, end mounts/trails, stanchions).

Painted surfaces – environmentally friendly 6-stage pretreatment and electrostatically applied thermoset powder coat provides a long lasting, scratch resistant finish. Choice of standard colors. RAL and computer matched colors available on request.

Reflector – extruded aluminum, chemically brightened and clear anodized.

Mounting:

P201 has a continuous mounting slot along the rear of the unit, and can be mounted to a wall, furniture panel, or desk clamp stanchion. P201 cords are routed along the mounting slot and can be specified for right- or left-hand exit.

L202 has a smooth back surface for mounting with end mount trails (for 24" wide end panels) or with desk clamp stanchions.

P202 cord exits are specified left or right, rear or bottom of unit, depending on mounting method. Stanchions feature a cord management slot.

Electrical:

Integral electronic ballast is HPF thermally protected class P, 120 volt. BF > 0.98. Programmed start maximizes lamp life and minimizes energy use.

Cord – 9' 18-3 SJT, molded NEMA 5-15 grounded plug, factory installed. Chicago Code cord with integral circuit breaker available. Low profile grounded plug with 45° rotation is standard. Black is standard; gray and beige cords are available at additional cost.

Standard output T5 lamps are included. Choose from 3000K, 3500K and 4100K lamps.

Standard:

UL listed or CSA certified.

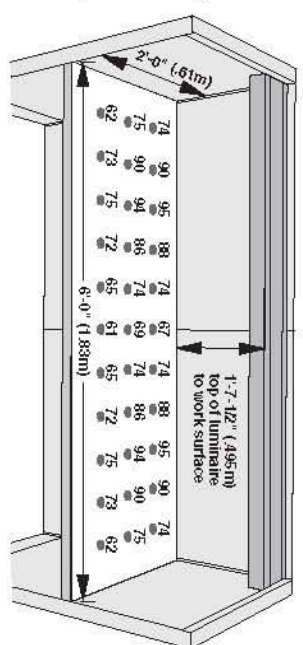


Features

- Low profile workstation task lighting from a single T5 lamp
- Provides balanced brightness on work surfaces and vertical panels
- Integrates with embedded wireless controls (consult factory)
- Available in lengths from 36" to 96"
- Choice of mounting options
- Portable – may be reconfigured along with the furniture

Performance

Illuminance levels for low lamp height position for P201 shown. Ballast factor 0.98, input watts 52. For complete photometrics, see thelightingquotient.com.



ARCLITE® 38/5

recessed PAR 38 metal halide downlight

Spec Sheet

HID
8-410

MADE-TO-ORDER • MAY NOT BE RETURNED FOR CREDIT • MADE-TO-ORDER • MAY NOT BE RETURNED FOR CREDIT

FEATURES

ArcLite 38/5 is an efficient 5" aperture downlight designed for use with 70-watt, 100-watt or 150-watt PAR-38 metal halide lamps, and is equipped with an electronic ballast. Precise reflector design minimizes aperture brightness, with a shielding angle of 40°.

PAR-38 metal halide lamps are available in a number of beam spreads from narrow spot to very wide flood. These lamps have color rendering indexes (CRI) of 70 to 93, and color temperatures ranging from 3000°K to 4000°K. The lamps have up to a 12,500-hour life.

The 5" aperture matches that of our 5" ArcLite accent lights, as well as our 5" PAR-38 incandescent downlights and accent lights.

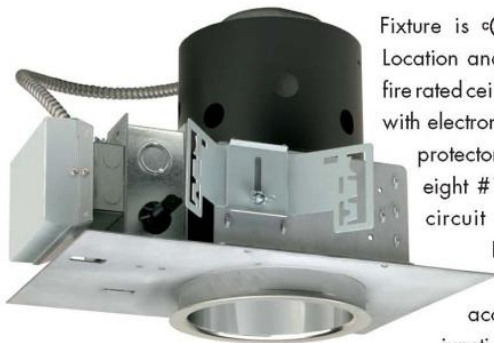
Reflector must be removed before relamping .

Reflectors are available in clear, natural aluminum in three finishes: **EvenTone**, our standard clear finish, partially diffuse, anti-iridescent and gently luminous in appearance; **OptiTone**, semi-specular and anti-iridescent, with minimum brightness and maximum efficiency; and **EasyTone**, diffuse and luminous. Additionally, reflectors are available in champagne gold, wheat, pewter, bronze and black.

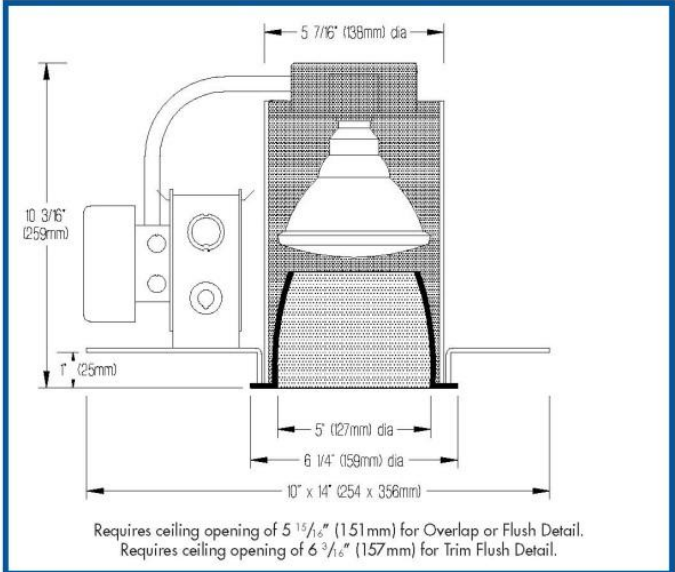
ArcLite 38/5 includes a pair of mounting bars (3/4" x 27" C channel). Specialty bars for wood joist and T-bar installations are also available.

APPLICATIONS

Fixture is recommended for downlighting in stores, malls, banks, hotels, schools, auditoriums, airports and sports facilities – especially in lobbies, atria and other public areas.



Fixture is listed for Damp Location and suitable for use in a fire rated ceiling. Fixture is prewired with electronic ballast and thermal protector, and is approved for eight #12 wire 75°C branch circuit pull-through wiring. Removal of the housing from below allows access to the ballast and junction box.



PRODUCT CODE

For complete product code, list basic unit and select one item from each following box.

Basic Unit	ARC38/5
Wattage	
70-watt ballast (no fixture spacing restrictions)	-70
100-watt ballast (see spacing restrictions *)	-100
150-watt ballast (see spacing restrictions *)	-150
Voltage	
120 volt service	120
277 volt service	277

Reflector Color and Detail	Overlap Flange	Flush	Trim Flush*
EvenTone Clear	VOL	VFL	VTF
OptiTone Clear	COL	CFL	CTF
EasyTone Clear	ECOL	ECFL	ECTF
Champagne Gold	GOL	GFL	GTF
Wheat	WHOL	WHFL	WHTF
Pewter	POL	PFL	PTF
Bronze	ZOL	ZFL	ZTF
Black	BOL	BFL	BTF

Other reflector finishes available on special order.
 Overlap Flange continues reflector finish. White painted flanges and custom painted flanges are available on special order. Add WF (white flange) or CCF (custom color flange).
 *Trim Flush reflector trim requires the use of a plaster ring Accessory (see below).

FIXTURE SPACING RESTRICTIONS
 Fixtures for use with 100-watt or 150-watt lamps must be spaced at least 36" apart and 18" from walls, and must have 1/2" clearance above housing.

MODIFICATIONS AVAILABLE
 Contact factory with quantity for pricing; orders may require shop drawing approval.

- CHP-**: 39-watt fixture suitable for **Chicago Plenum**; add CHP- as prefix to Product Code.
- CONC-**: 39-watt fixture suitable for poured-in-place **concrete**; add CONC- as prefix to Product Code.
- EXP-**: 'European-style' **install-from-below** fixture; add EXP- as prefix to Product Code.
- +2"CLG**: fixture suitable for installation in **2" thick ceiling** material; add +2"CLG to Product Code.
- +TR**: fixture prepared for **top re-lamping**; add +TR to Product Code.
- +OA MT**: fixture prepared to accept an **Optical Accessory holder**; add +OA MT to Product Code.

OPTIONS Specify by adding to the end of basic unit.

Emergency DC bayonet base socket for incandescent lamp (100 watt maximum)	- EMA
Auxiliary: same as above plus restrike relay	- AUX

ACCESSORIES Specify as a separate line item.

Plaster ring allows use of Trim Flush (-TF) reflector in sheetrock ceiling; 6 3/16" (157mm) dia hole is required.....	TF RING/5
--	-----------

► Decorative reflector rings are available on special order. Contact factory.



PHOTOMETRIC REPORT – FLOOD

Report No. 43160. Original Independent Testing Laboratories, Inc. (ITL) test report furnished upon request.

Luminaire recessed metal halide with spun aluminum reflector, specular finish
 Lamp MP100PAR38/U/FL35, 5500 lumens
 Efficiency 69.8%
 Spacing Criterion.... 0.6

ZONAL LUMEN SUMMARY

Zone	Lumens	% Lamp	% Fixture
0 – 30°	3682	66.9	95.9
0 – 40°	3821	69.5	99.5
0 – 60°	3840	69.8	100.0
0 – 90°	3840	69.8	100.0
90 – 180°	0	0.0	0.0
0 – 180°	3840	69.8	100.0

BALLAST INFORMATION

Voltage	120	277
Input Watts	110	110
Maximum Current (A)	.9	.41
Line Current (A)	.9	.41
Power Factor (%)	>90	>90
Min. Starting Temp (°F)	-22	-22

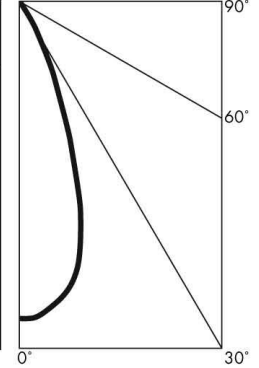
LUMINANCE DATA

Vertical Angle	Candela/m ²
45	2018
55	0
65	0
75	0
85	0

To convert cd/m² to footlamberts multiply by 0.2919.

CANDLEPOWER DISTRIBUTION

Vertical Angle	Candela
0	9726
5	9452
15	7033
25	1922
35	196
45	19
55	0
65	0
75	0
85	0
90	0



COEFFICIENTS OF UTILIZATION – ZONAL CAVITY METHOD (Effective Floor Cavity Reflectance 20%)

Ceiling Reflectance (%)	80				70				50				30				10				0
Wall Reflectance (%)	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
Room Cavity Ratio																					
0	83	83	83	83	81	81	81	81	78	78	78	74	74	74	71	71	71	70	70	70	
1	80	79	77	76	78	77	76	75	74	73	72	72	71	70	69	69	68	67	67	67	
2	77	75	72	71	76	73	71	70	71	70	68	69	68	67	67	66	65	64	64	64	
3	75	71	68	66	73	70	68	66	68	66	65	67	65	64	65	64	63	62	62	62	
4	72	68	65	63	71	67	64	62	66	63	62	64	63	61	63	62	60	59	59	59	
5	70	65	62	60	69	64	62	59	63	61	59	62	60	58	61	59	58	57	57	57	
6	67	62	59	57	66	62	59	57	61	58	56	60	58	56	59	57	56	55	55	55	
7	65	60	57	55	64	60	57	55	59	56	54	58	56	54	57	55	54	53	53	53	
8	63	58	55	53	62	57	54	52	57	54	52	56	54	52	56	53	52	51	51	51	
9	61	56	53	51	60	55	52	50	55	52	50	54	52	50	54	52	50	49	49	49	
10	59	54	51	49	58	54	51	49	53	50	49	53	50	48	52	50	48	48	48	48	

PHOTOMETRIC REPORT – SPOT

Report No. 43159. Original Independent Testing Laboratories, Inc. (ITL) test report furnished upon request.

Luminaire recessed metal halide with spun aluminum reflector, specular finish
 Lamp MP100PAR38/U/SP20, 5200 lumens
 Efficiency 73.7%
 Spacing Criterion.... 0.4

ZONAL LUMEN SUMMARY

Zone	Lumens	% Lamp	% Fixture
0 – 30°	3695	71.0	96.4
0 – 40°	3815	73.4	99.6
0 – 60°	3832	73.7	100.0
0 – 90°	3832	73.7	100.0
90 – 180°	0	0.0	0.0
0 – 180°	3832	73.7	100.0

BALLAST INFORMATION

Voltage	120	277
Input Watts	110	110
Maximum Current (A)	.9	.41
Line Current (A)	.9	.41
Power Factor (%)	>90	>90
Min. Starting Temp (°F)	-22	-22

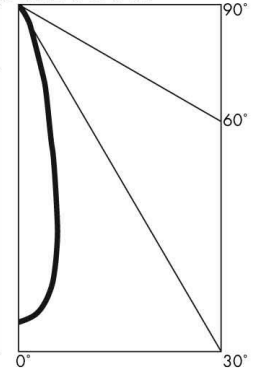
LUMINANCE DATA

Vertical Angle	Candela/m ²
45	2018
55	0
65	0
75	0
85	0

To convert cd/m² to footlamberts multiply by 0.2919.

CANDLEPOWER DISTRIBUTION

Vertical Angle	Candela
0	18397
5	17114
15	5368
25	1282
35	148
45	19
55	0
65	0
75	0
85	0
90	0



COEFFICIENTS OF UTILIZATION – ZONAL CAVITY METHOD (Effective Floor Cavity Reflectance 20%)

Ceiling Reflectance (%)	80				70				50				30				10				0
Wall Reflectance (%)	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
Room Cavity Ratio																					
0	88	88	88	88	86	86	86	86	82	82	82	78	78	78	75	75	75	74	74	74	
1	85	83	82	81	83	82	81	80	79	78	77	76	75	75	74	73	73	71	71	71	
2	82	80	78	76	81	78	77	75	76	75	73	74	73	72	72	71	70	69	69	69	
3	80	76	74	72	78	75	73	71	74	72	70	72	70	69	70	69	68	67	67	67	
4	77	74	71	69	76	73	70	68	71	69	68	70	68	67	69	67	66	65	65	65	
5	75	71	68	66	74	70	68	66	69	67	65	68	66	65	67	66	64	63	63	63	
6	73	69	66	64	72	68	66	64	67	65	63	66	64	63	66	64	62	62	62	62	
7	71	67	64	62	70	66	64	62	65	63	61	65	63	61	64	62	61	60	60	60	
8	69	65	62	60	69	64	62	60	64	61	60	63	61	59	63	61	59	58	58	58	
9	68	63	60	58	67	63	60	58	62	60	58	62	59	58	61	59	58	57	57	57	
10	66	61	59	57	66	61	58	57	61	58	57	60	58	56	60	58	56	56	56	56	

Watt-age	Lamp Number	Base	Bulb	Length (MCL)	Rated Lumens	Color Temperature(s)	CRI	Life ^① (hours)	Notes
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Quad Tube Compact Fluorescent

26	CFQ26W/G24q	G24q-3	T4	6-1/2"	1,800	2700/3000/3500/4100K	82	12,000	
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Hex Tube Compact Fluorescent

32	CFTR32W/GX24q	GX24q-3	T4	4-7/8"	2,400	2700/3000/3500/4100K	82	12,000	
42	CFTR42W/GX24q	GX24q-4	T4	5-5/8"	3,200	2700/3000/3500/4100K	82	12,000	

Long Twin Tube Compact Fluorescent

36/39	FT36-39W/2G11	2G11	T5	16-1/2"	2,900	3000/3500/4100K	82	20,000 (RS)	
40	FT40W/2G11	2G11	T5	22-1/2"	3,300	3000/3500/4100K	82	20,000 (RS)	
50	FT50W/2G11	2G11	T5	22-1/2"	4,300	3000/3500/4100K	82	20,000 (RS)	
55	FT55W/2G11	2G11	T5	21-1/8"	4,800	3000/3500/4100K	82	12,000 (IS)	
80	FT80W/2G11	2G11	T5	22-1/2"	6,000	3000/3500/4100K	82	20,000	

T5 Linear Fluorescent

14	F14T5	Miniature Bipin	T5	22-3/16"	1,350	3000/3500/4100K	85	20,000	
21	F21T5	Miniature Bipin	T5	34"	2,100	3000/3500/4100K	85	20,000	
28	F28T5	Miniature Bipin	T5	45-13/16"	2,900	3000/3500/4100K	85	20,000	
35	F35T5	Miniature Bipin	T5	57-5/8"	3,650	3000/3500/4100K	85	20,000	

T5 HO Linear Fluorescent

24	F24T5HO	Miniature Bipin	T5	22-3/16"	2,000	3000/3500/4100K	82	20,000	
39	F39T5HO	Miniature Bipin	T5	34"	3,500	3000/3500/4100K	82	20,000	
55 (54)	F54T5HO	Miniature Bipin	T5	45-13/16"	5,000	3000/3500/4100K	82	25,000	
80	F80T5HO	Miniature Bipin	T5	57-5/8"	7,500	3000/3500/4100K	82	20,000	

T8 Fluorescent

17	F17T8	Medium Bipin	T8	24"	1,400	3000/3500/4100K	75-95	24,000 (RS)	
25	F25T8	Medium Bipin	T8	36"	2,225	3000/3500/4100K	75-95	24,000 (RS)	
32	F32T8	Medium Bipin	T8	48"	2,950	3000/3500/4100K	75-95	30,000 (RS)	
40	F40T8	Medium Bipin	T8	60"	3,775	3000/3500/4100K	75-95	24,000 (RS)	

Notes:

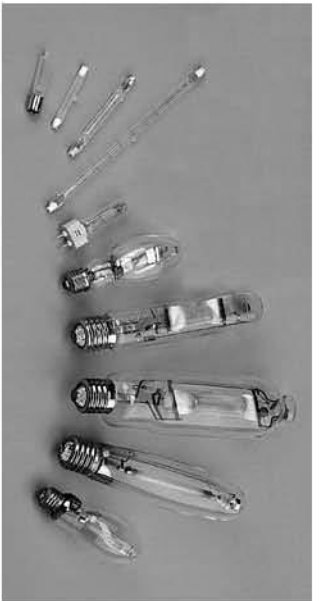
① Average rated life is the number of hours at which 50% of a large group of lamps are still operating. Fluorescent lamp life is based on 3 or more operating hours per start. Average life may increase or decrease as the period per start increases or decreases.



General:
 All **elliptipar** compact fluorescent, long twin tube and T5 fluorescent luminaires are furnished with lamp(s). **Furnished lamps are denoted by grey background.**
 Standard fluorescent lamp color temperature furnished is 3000K. Chart also lists alternative lamp color temperatures; consult your local sales representative for availability and lead times.

T8 lamps are supplied by others.
 Lamp ratings may vary with lamp manufacturer.





General:
All **elliptipar** metal halide, tungsten halogen and incandescent luminaires are furnished with lamp(s). Lamp ratings may vary with lamp manufacturer.

Metal Halide:
Use clear, compact envelope metal halide lamps.

Ceramic Arc Tube Pulse Start Metal Halide:
20-400W metal halide luminaires are furnished with single ended lamps using ceramic arc tubes that yield higher light output than lamps with quartz arc tubes. They offer improved lamp-to-lamp color consistency and a more stable color temperature over their rated life ($\pm 200K$). Standard lamp color temperature is 3000K, 80+ CRI.

Quartz Arc Tube Pulse Start Metal Halide:
250-400W pulse start (1000W probe start) metal halide luminaires are furnished with horizontal burning mogul base metal halide lamps. Standard lamp color temperature is 4000K, 68 CRI.

Tungsten Halogen:
Use frosted tungsten halogen lamps where available for 100-250W.



Wattage	Lamp Code	Lamp Number	Base	Envelope	Length (MOJ)	Initial Lumens	Color Temp.	CRI	Rate Life (hours)	Notes
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Ceramic Arc Tube Pulse Start Metal Halide Universal Burning (Small or Large Reflector)										
20	020G	CMH20/T4.5	G8.5	T4.5	3-3/8"	1,650	3000K	81	12,000	
35/39	035G	CDM35/T6/830	G12	T6	3-15/16"	3,300	3000K	81	12,000	
70	070G	CDM70/T6/830	G12	T6	3-15/16"	6,600	3000K	81	12,000	
150	150G	CDM150/T6/830	G12	T6	4-11/32"	14,000	3000K	85	12,000	
210	210C	CDM Elite MW 210/T9/930/J/E	PGZ18	T9	7-1/2"	24,200	3000K	90	20,000	②
250	250C	CMH250/J/830/R	Mogul	T15	9-3/4"	25,000	3000K	85	16,000	
315	315C	CDM Elite MW 315/T9/930/J/E	PGZ18	T9	7-1/2"	37,800	3000K	90	20,000	②
400	400C	CMH400/J/830/R	Mogul	ED18	9-3/4"	41,000	3000K	80	20,000	

Quartz Arc Tube Pulse Start Metal Halide Tubular Envelope Horizontal Burning (Large Reflector)										
250	250P	MS 250W/H/5/T15/PS/740	Mogul	T15	8-5/16"	22,000	4000K	68	15,000	
320	320P	MS 320W/H/5/T15/SP/740	Mogul	T15	8-5/16"	30,000	4000K	68	20,000	
350	350P	MS 320W/H/5/T15/PS/740	Mogul	T15	11-1/2"	33,000	4000K	68	20,000	

Quartz Arc Tube Pulse Start Metal Halide Standard Envelope Horizontal Burning (Xtra-Large Reflector)										
250	250P	MS 250W/H/5/PS/740	Mogul	ED28	8-5/16"	22,000	4000K	68	15,000	
320	320P	MS 320W/H/5/E/ED28/PS/740	Mogul	ED28	8-5/16"	30,000	4000K	68	20,000	
350	350P	MS 350W/H/5/E/ED28/PS/740	Mogul	ED28	8-5/16"	33,000	4000K	68	20,000	
400	400P	MS 400W/H/5/E/ED28/PS/740	Mogul	ED28	8-5/16"	40,000	4000K	68	20,000	

Quartz Arc Tube Probe Start Metal Halide Tubular Envelope Horizontal Burning (Xtra-Large Reflector)										
1000	1000	MS 1000W/H/OR/ET/3/K	Mogul	BT37	11-1/2"	115,000	3400K	70	12,000	

Tungsten Halogen										
100	0100	Q 100DDC	D.C. Bayonet	T4	2-7/16"	1,550	2800K	>95	2,000	
150	0150	Q 150DDC	D.C. Bayonet	T4	2-7/16"	2,700	2900K	>95	2,000	
200	0200	Q 200T3	RSC	T3	3-1/8"	3,400	2900K	>95	2,000	
250	0250	Q 250DC	D.C. Bayonet	T4	3"	4,800	3000K	>95	2,000	
300	0300	Q 300T3	RSC	T3	4-11/16"	5,770	2900K	>95	2,000	
350	0350	Q 350/CL/HR	RSC	T3	4-11/16"	10,000	3075K	>95	2,000	③
500	0500	Q 500T3	RSC	T3	4-11/16"	10,700	3000K	>95	2,000	
900	0900	Q 900/CL/HR	RSC	T3	10-1/16"	32,000	3160K	>95	2,000	③ ④
1000	1000	Q 1000T3/CL	RSC	T3	10-1/16"	21,500	3000K	>95	2,000	⑤

Incandescent										
25	025	25T6-1/2/F	Intermediate	T6-1/2	5-1/2"	240	2600K	>95	1,000	
40	040	40T6-1/2/2/F	Intermediate	T6-1/2	5-1/2"	420	2600K	>95	750	

- Notes:**
- Average rated life is the approximate hours at which 50% of a large group of lamps are still operating. Metal halide lamp life is based on 10 or more operating hours per start and may increase or decrease as the hours per start increases or decreases.
 - New Ceramic Arc Tube lamps with 90 CRI, 20,000 hours life and up to 120 lumens per watt.
 - 350 and 900W IR coated tungsten halogen lamps yield approximately the same light output as conventional 500 and 1500W lamps respectively.
 - 900W tungsten halogen lamp available in 240V and 277V only.
 - 1000W tungsten halogen lamp available in 120V, 220V, and 240V.

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Diagram 1

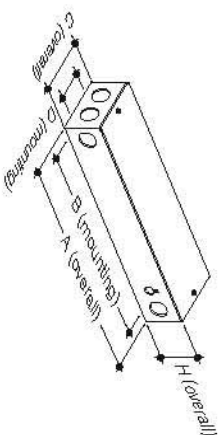
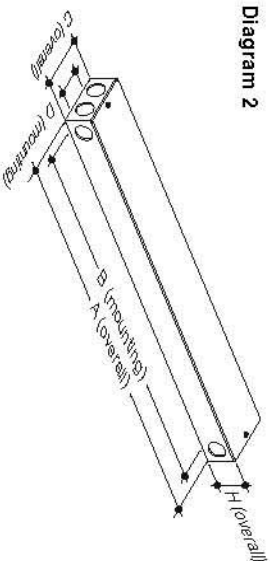


Diagram 2



Fluorescent Remote Ballast Dimensions

Lamp Type	Ballast Type	Lamp Watts	Max Wire Distance ^①	Overall Dimensions			Mounting Dim.		Dia-gram	Notes
				L (^o A ^o)	W (^o C ^o)	H (^o H ^o)	L (^o B ^o)	W (^o D ^o)		
Non-Dimming										
Quad Tube Compact	Electronic	26	9'	12"	3-3/8"	2"	10-3/8"	2"	1	②
Hex Tube Compact	Electronic	32, 42	9'	12"	3-3/8"	2"	10-3/8"	2"	1	②
Long Twin Tube	Electronic	36/39, 40, 50, 55	12'	12"	3-3/8"	2"	10-3/8"	2"	1	②
Long Twin Tube	Electronic	80 (only)	12'	21-5/8"	3-1/8"	1-5/8"	19-3/8"	1-3/4"	2	②
T8 Linear	Electronic	17, 25, 32, 40	18'	12"	3-3/8"	2"	10-3/8"	2"	1	②
T5 Linear	Electronic	14, 21, 28, 35	18'	21-5/8"	3-1/8"	1-5/8"	19-3/8"	1-3/4"	2	②
T5HO Linear	Electronic	24, 39, 55, 80	18'	21-5/8"	3-1/8"	1-5/8"	19-3/8"	1-3/4"	2	②
Dimming										
Hex Tube Compact	Electronic	32, 42	3'	12"	3-3/8"	2"	10-5/8"	2"	1	②
Long Twin Tube	Electronic	36/39, 40, 50	3'	12"	3-3/8"	2"	10-5/8"	2"	1	②
T8 Linear	Electronic	17, 25, 32, 40	7'	12"	3-3/8"	2"	10-5/8"	2"	1	②
T5 Linear	Electronic	14, 21, 28, 35	7'	21-1/2"	3-1/8"	1-5/8"	19-3/8"	1-3/4"	2	②
T5HO Linear	Electronic	24, 39, 55	7'	21-1/2"	3-1/8"	1-5/8"	19-3/8"	1-3/4"	2	②

Notes:

- ① Distance shown is for maximum one-way wire length from ballast to furthest lamp socket. Depending on the length of lamp/effector and exit location of the wire leads, the maximum distance from luminaire to ballast will be less. See individual luminaire data pages for maximum remote ballast mounting distance.
 - ② Manufacturer/model of furnished electronic ballast(s) shall be at **elliptipar's** discretion and shall meet or exceed the following criteria:
 - Total harmonic distortion (THD) < 20%
 - Power factor (PF) > 0.90
 - Ballast factor (BF) > 0.85
 - Current crest factor (CF) < 1.7
 - Sound rating A or better
 - ANSI, IEEE, and FCC compliant for electronic interference (EMI) and radio frequency interference (RFI)
 - UL listed or CSA certified depending upon destination
 - Minimum 3 year ballast manufacturer's limited warranty
- Remote Ballast Installation:**
- For a specifically named ballast manufacturer and/or model, consult your local sales representative for availability and lead time.
 - Use wire rated for at least 90°C for supply connections.
 - When installing more than one ballast in a common area, maintain minimum six-inch spacing between ballasts. Provide ventilation in area where ballasts are installed.



Indoor Ballast Information

Metal Halide

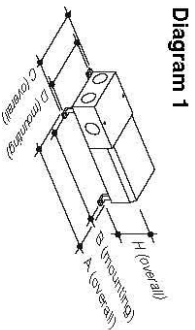


Diagram 1

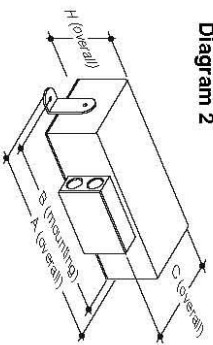


Diagram 2

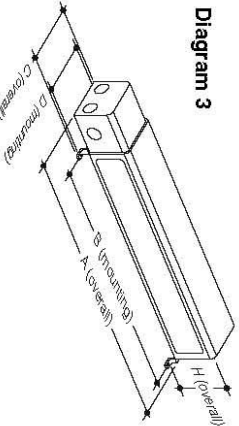


Diagram 3

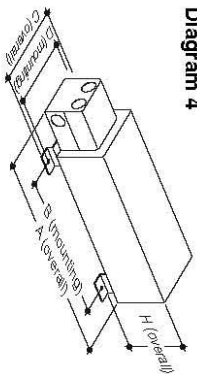


Diagram 4

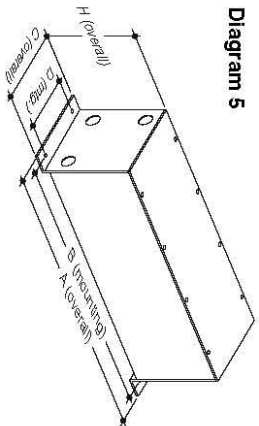


Diagram 5

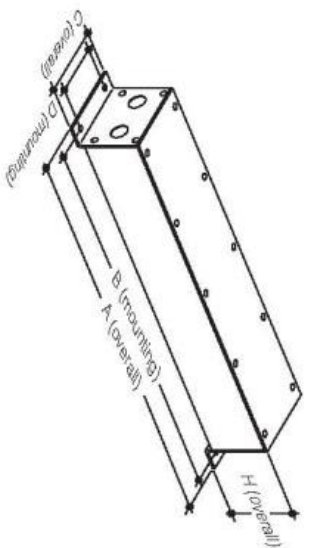
Lamp Watts	Lamp Code	Voltage Code	Input Voltages	Option ③	Ballast Type	Remote Distance	Sound Rating	Diagram	Overall Dimension			Mounting Dim.		Notes	
									L (A)	W (C)	H (H)	L (B)	W (D)		
35W	085G	A, B	1, 2	120-277V	00, V0	electronic	15' (4.5m)	A	1	9-5/16"	4-1/2"	2-1/4"	8-1/2"	4"	①
			1, 2	120-277V	00, VQ	electronic	15' (4.5m)	A	5	13-7/16"	6-3/8"	4"	12-3/16"	n/a	①
35W	085G	A, B	1, 2	120-277V	00, V0	HX-HPF, encapsulated	10' (3m)	B	3	14"	4-1/2"	3"	11-1/8"	4"	①②
			1, 2	120-277V	00, VH	HX-HPF, open core and coil	50' (15m)	n/a	4	13-13/16"	5-3/4"	3-9/16"	9-9/16"	5"	①
70W	070G	A, B	1, 2	120-277V	00, V0	electronic	15' (4.5m)	A	1	9-5/16"	4-1/2"	2-1/4"	8-1/2"	4"	①
			1, 2	120-277V	00, VQ	electronic	15' (4.5m)	A	5	13-7/16"	6-3/8"	4"	12-3/16"	n/a	①
70W	070G	A, B	1, 2	120-277V	00, V0	HX-HPF, encapsulated	20' (6m)	B	3	14"	4-1/2"	3"	11-1/8"	4"	①②
			1, 2	120-277V	00, VH	HX-HPF, encapsulated	50' (15m)	B	5	18-3/8"	4-3/16"	3-5/8"	17-3/8"	3"	①②
150W	150G	A, B	1, 2	120-277V	00, V0	electronic	15' (4.5m)	A	1	9-5/16"	4-1/2"	2-1/4"	8-1/2"	4"	①
			1, 2	120-277V	00, VQ	electronic	15' (4.5m)	A	5	16-1/4"	4-3/16"	3"	13-7/8"	2-1/4"	①
210W	210C	U	U	180-305V	00, V0	electronic dimming (100-50%)	30' (9m)	A	5	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	①
			U	180-305V	00, VQ	electronic dimming (100-50%)	30' (9m)	A	5	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	①
250W	250C	A, B	U	120/277V	00, VQ	CWA, potted core and coil	50' (15m)	B	5	18"	5-1/2"	6-1/4"	17"	4"	①
			U	120/208/240/277V	00, VQ	CWA, potted core and coil	50' (15m)	n/a	5	18"	5-1/2"	6-1/4"	17"	4"	①
250W	250P	A, B, E, G	U	180-305V	00, V0	electronic dimming (100-50%)	15' (4.5m)	A	5	16-1/8"	4"	2-3/4"	13-7/8"	2-1/4"	①
			U	180-305V	00, VQ	electronic dimming (100-50%)	15' (4.5m)	A	5	16-1/8"	4"	2-3/4"	13-7/8"	2-1/4"	①
315W	315C	U	U	180-305V	00, V0	electronic dimming (100-50%)	30' (9m)	A	5	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	①
			U	180-305V	00, VQ	electronic dimming (100-50%)	30' (9m)	A	5	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	①
320W	320P	A, B, E, G	U	120/208/240/277V	00, V0	CWA, potted core and coil	50' (15m)	B	5	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	①
			U	180-305V	00, V0	electronic dimming (100-50%)	15' (4.5m)	A	1	11-3/4"	5-1/4"	2-5/8"	8-7/8"	4-1/2"	①
350W	350P	A, B, E, G	U	180-305V	00, VQ	electronic dimming (100-50%)	15' (4.5m)	A	5	16-1/8"	4"	2-3/4"	13-7/8"	2-1/4"	①
			U	180-305V	00, V0	electronic dimming (100-50%)	15' (4.5m)	A	5	16-1/8"	4"	2-3/4"	13-7/8"	2-1/4"	①
400W	400C	A, B, E, G	U	120/208/240/277V	all	CWA, potted core and coil	50' (15m)	B	5	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	①
			U	180-305V	00, VQ	electronic dimming (100-50%)	15' (4.5m)	A	5	16-1/8"	4"	2-3/4"	13-7/8"	2-1/4"	①
400W	400P	A, B, E, G	U	120/208/240/277V	00, V0	CWA, potted core and coil	50' (15m)	B	5	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	①
			U	180-305V	00, VQ	electronic dimming (100-50%)	15' (4.5m)	A	1	11-3/4"	5-1/4"	2-5/8"	8-7/8"	4-1/2"	①
2 x 400W	240C	A, B, E, G	U	180-305V	00, VQ	electronic dimming (100-50%)	15' (4.5m)	A	5	16-1/8"	4"	2-3/4"	13-7/8"	2-1/4"	①
			U	180-305V	00, V0	electronic dimming (100-50%)	15' (4.5m)	A	5	16-1/8"	4"	2-3/4"	13-7/8"	2-1/4"	①
2 x 400W	240P	A, B, E, G	U	120/208/240/277V	all	CWA, potted core and coil	50' (15m)	B	5	25-3/16"	5-1/2"	6-1/4"	24-3/16"	4"	③
			U	180-305V	00, V0	electronic dimming (100-50%)	15' (4.5m)	A	5	25-3/16"	5-1/2"	6-1/4"	24-3/16"	4"	③
1000W	1000W	A, B	U	120-277V	00, V0	CWA, potted core and coil	200' (60m)	C	5	18-1/8"	6-1/2"	6"	17-1/8"	4"	③
			U	120-277V	00, VQ	CWA, potted core and coil	200' (60m)	C	5	18-1/8"	6-1/2"	6"	17-1/8"	4"	③

Notes: ① If luminaire to ballast distance is to be greater than lead length provided, limit the total wire length between lamp and ballast to the maximum marked on the ballast. Use UL listed/CSA certified 600V wire sized and enclosed in accordance with local and national electric codes. Do not run wires around sharp corners of grounded metal without an additional insulating sleeve over the "hot" wire. ② Maximum dimensions are shown for reference only. Exact dimensions vary with ballast manufacturer. ③ Luminaire supplied with two ballasts enclosed in a single housing. ④ See individual data page for complete explanation of option codes. ⑤ Based on #12 AWG wire.

Remote Ballast Installation: • Use wire/rated for at least 90°C for supply connections. • When installing more than one ballast in a common area, maintain minimum 6" spacing between ballasts (12" for pulse-start). • Provide installation in area where ballasts are installed.



Diagram 1



Fluorescent Remote Ballast Dimensions

Lamp Type	Ballast Type	Lamp Watts	Max. Wire Distance (1)	Overall Dimensions			Mounting Dimensions			Minimum Starting Temp.	Diagram	Notes
				Length (A)	Width (C)	Height (H)	Length (B)	Width (D)				
1 light Hex tube	Electronic	1x32, 1x42	9'	9"	4-3/16"	3-1/2"	8"	3"	0°F	1	(2)	
2 light Hex tube	Electronic	2x32, 2x42	9'	9"	4-3/16"	3-1/2"	8"	3"	0°F	1	(2)	
T5	Electronic	14, 21, 28, 35	18'	22"	3-3/8"	2-1/2"	21-3/16"	2"	0°F	1	(2)	
T5-HO	Electronic	24, 39, 55, 80	18'	22"	3-3/8"	2-1/2"	21-3/16"	2"	0°F	1	(2)	
T8	Electronic	17, 25, 32, 40	18'	13-7/8"	3-3/8"	2-1/2"	13"	2"	0°F	1	(2)	
T12HO	Magnetic	45, 60, 75, 85, 110	see below	18-3/8"	4-3/16"	3-1/2"	17-3/8"	3"	-20°F	1		
T12VHO	Magnetic	110, 160, 215	see below	21"	4-3/16"	3-1/2"	20"	3"	-20°F	1		

Notes:

- Distance shown is for maximum one-way wire length from ballast to furthest lamp socket. Depending on the length of lamp/reflector and exit location of the wire leads, the maximum distance from luminaire to ballast will be less. See individual luminaire data pages for maximum remote ballast mounting distance.
 - Manufacturer/model of furnished electronic ballast(s) shall be at **elliptipar**'s discretion and shall meet or exceed the following criteria:
 - Total harmonic distortion (THD) < 10%
 - Power factor (PF) > 0.90
 - Ballast factor (BF) > 0.85
 - Current crest factor (CF) < 1.7
 - Sound rating A or better
 - ANSI, IEEE, and FCC compliant for electronic interference (EMI) and radio frequency interference (RFI)
 - UL listed or CSA certified depending upon destination
 - Minimum 3 year ballast manufacturer's limited warranty
 For a specifically named ballast manufacturer and/or model, consult your local sales representative for availability and lead time.
- Remote Ballast Installation:**
- Use wire rated for at least 90°C for supply connections.
 - When installing more than one ballast in a common area, maintain minimum six-inch spacing between ballasts. Provide ventilation in area where ballasts are installed.



Outdoor Ballast Information

Diagram 1

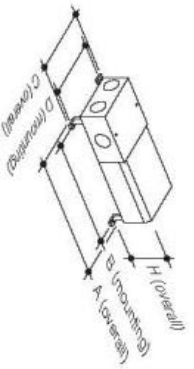


Diagram 2

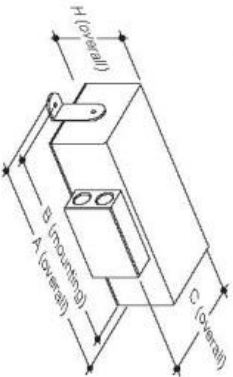


Diagram 3

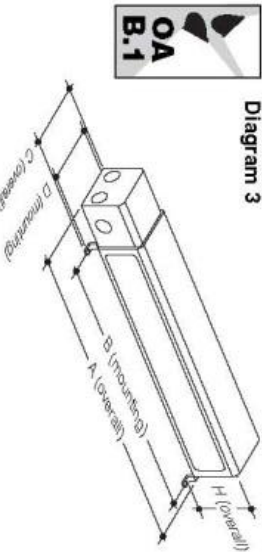
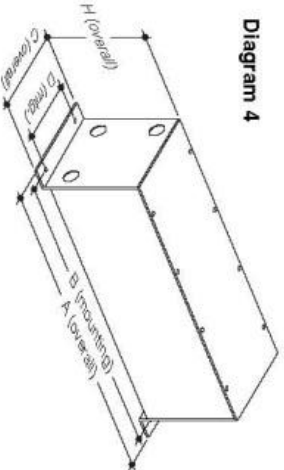


Diagram 4



Lamp Watts	Lamp Code	Voltage Code	Input Voltages	Option (4)	Ballast Type	Remote Distance	Sound Rating	Diagram	Overall Dimensions			Mounting Dim.	Notes	
									L (A)	W (C)	H (H)			L (B)
35W	035G	1, 2	120-277V	00, V0	electronic	15' (4.5m)	A	4	13-7/8"	3-3/8"	2-5/8"	13"	2"	(1)
		1, 2	120-277V	00, VD	electronic	15' (4.5m)	A	1	9-5/16"	4-1/2"	2-1/4"	8-1/2"	4"	(1)
35W	035G	A, B	120/277V	00, V0	HX-HPF, open core and coil	10' (3m)	n/a	2	11-3/4"	5-1/4"	2-5/8"	8-7/8"	4-1/2"	(1)
		A, B	120/277V	00, VH	HX-HPF, open core and coil	50' (15m)	n/a	2	11-3/4"	5-1/4"	2-5/8"	8-7/8"	4-1/2"	(1)
		A, B	120/277V	00, VD	HX-HPF, encapsulated	10' (3m)	B	3	14"	4-1/2"	3"	11-1/8"	4"	(1)(2)
		1, 2	120-277V	00, V0	electronic	15' (4.5m)	A	4	13-7/8"	3-3/8"	2-5/8"	13"	2"	(1)
70W	070G	1, 2	120-277V	00, VD	electronic	15' (4.5m)	A	1	9-5/16"	4-1/2"	2-1/4"	8-1/2"	4"	(1)
		A, B	120/277V	00, V0	HX-HPF, open core and coil	10' (3m)	n/a	2	11-3/4"	5-1/4"	2-5/8"	8-7/8"	4-1/2"	(1)
70W	070G	A, B	120/277V	00, VH	HX-HPF, open core and coil	50' (15m)	n/a	2	11-3/4"	5-1/4"	2-5/8"	8-7/8"	4-1/2"	(1)
		A, B	120/277V	00, VD	HX-HPF, encapsulated	10' (3m)	B	3	14"	4-1/2"	3"	11-1/8"	4"	(1)(2)
150W	150G	1, 2	120-277V	00, V0	electronic	15' (1.5m)	A	4	12-5/16"	4-3/16"	3-5/8"	11-5/16"	3"	(1)
		1, 2	120-277V	00, VD	electronic	15' (1.5m)	A	1	9-5/16"	4-1/2"	2-1/4"	8-1/2"	4"	(1)
210W	210C	U	180-305V	00, V0	electronic dimming (100-50%)	30' (9m)	A	4	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	(1)
		A, B	120/277V	00, V0	CWA, open core and coil	50' (15m)	B	4	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	(1)
250W	250C	A, B	120/277V	00, VD	CWA, open core and coil	50' (15m)	n/a	4	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	(1)
		A, B	120/277V	00, VD	CWA, open core and coil	50' (15m)	n/a	4	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	(1)
315W	315C	U	180-305V	00, V0	electronic dimming (100-50%)	15' (4.5m)	A	4	16-1/8"	4"	2-3/4"	13-7/8"	2-1/4"	(1)
		A, B	120/277V	00, V0	electronic dimming (100-50%)	30' (9m)	A	4	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	(1)
320W	320P	U	180-305V	00, VD	CWA, open core and coil	50' (15m)	B	4	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	(1)
		A, B	120/277V	00, VD	CWA, open core and coil	50' (15m)	B	4	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	(1)
350W	350P	U	180-305V	00, VD	electronic dimming (100-50%)	15' (4.5m)	A	1	11-3/4"	5-1/4"	2-5/8"	8-7/8"	4-1/2"	(1)
		A, B	120/277V	00, VD	CWA, open core and coil	50' (15m)	A	4	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	(1)
400W	400C	U	180-305V	00, V0	electronic dimming (100-50%)	15' (4.5m)	A	1	11-3/4"	5-1/4"	2-5/8"	8-7/8"	4-1/2"	(1)
		A, B	120/277V	00, VD	CWA, open core and coil	50' (15m)	B	4	18-3/8"	5-1/2"	6-1/4"	17-3/16"	4"	(1)
2 x 400W	240C	A, B	120/277V	00, V0, 00, VD	CWA, open core and coil	50' (15m)	B	4	25-3/16"	5-1/2"	6-1/4"	24-3/16"	4"	(3)

Notes:
 1) 35W, 70W and 150W metal halide luminaires with remote ballast are supplied with 5' leads. If luminaire-to-ballast distance is to be greater than 5', the following precautions must be followed:
 • Limit the total wire length between lamp and ballast to the maximum marked on the ballast (see chart below).
 • Use UL listed / CSA certified 600V wirenuts for splices.
 • Maintain a minimum 3/8" clearance between splices and grounded metal.
 • Use 600V wire sized and enclosed in accordance with local and national electric codes.
 • Do not run wires close to grounded metal or around sharp corners without an additional insulating sleeve over the "hot" wire (see wiring diagram on instruction sheet or ballast).
 2) Maximum dimensions are shown for reference only. Exact dimensions vary with ballast manufacturer.
 3) Luminaire supplied with two ballasts enclosed in a single housing.
 4) See individual data page for complete explanation of option codes.

Remote Ballast Installation:
 • Use wire rated for at least 90°C for supply connections.
 • When installing more than one ballast in a common area, maintain minimum six-inch spacing between ballasts. Provide ventilation in area where ballasts are installed.
 • When mounting to a vertical surface, mount with wire compartment down.

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