



Washington Metropolitan Area Transit Authority

**LIGHTING IMPROVEMENT PROGRAM
TRAINROOM LIGHTING DESIGNS**

**100% LIGHTING SPECIFICATION -
UNION STATION, SMITHSONIAN, AND L'ENFANT
PLAZA**

MAY 2017

TRACKBED & PYLON FIXTURES

1.00 DESIGN CRITERIA:

- A. Design the fixtures to provide the performance, quality, durability and maintainability described in this and the following sections and illustrated in the attached fixture drawings.
- B. Design and construct the fixtures in accordance with Underwriters' Laboratories Publication UL 57 Standard and Safety, Electric Lighting Fixtures or ETL.
- C. The descriptions included in the accompanying fitting specification and drawings are definitive. The electrical description and lighting performance must be conformed to. The general description and construction, where specified are indicative of the physical and aesthetic qualities desired in the fittings. They do not preclude consideration of fittings utilizing different types of construction or form factors which provide equivalent appearance and performance.
- D. The trackbed fixtures are:
 - a. Type L – 4ft, minimum-profile, linear LED uplight (30° x 30°) for mounting on the sides of parapet for lighting sides of train room vault.
 - b. Type L10 – 4ft, minimum-profile, linear LED uplight (10° x 30°) for mounting in the trackbed of the central platform track of a hub station for lighting sides of train room vault.
 - c. Type LW – 4ft, minimum-profile, linear LED uplight (60° x 60°) for mounting in the central trackbed trough of a split platform station for uplighting train room vault.
- E. The pylon fixtures are:
 - a. Type P – Nominal 1'-10" x 1'-10" square Type V-optic (120° x 120°) LED uplight that is mounted inside of the Type C or C3 Pylon for uplighting the train room vault in the central platform stations.
 - b. Type PH – Nominal 1'-10" x 1'-10" square Type IV-optic LED uplight that is mounted inside of the Type C or C3 Pylon for uplighting the train room vault in the upper platform levels of the hub stations.
- F. The train room, where these fixtures will be installed, is a harsh environment for fixtures with intense vibrations and pressure from passing trains, magnetic break dust and a difficult maintenance regimen due 24/7 operation and "track-right" access to certain areas.

1.01 DESCRIPTION:

- A. The fixtures shall consist of a factory-sealed, cast aluminum housing, driver housing, heatsink and mounting brackets (2 per fixture).
- B. Each housing shall consist of:
 - 1) For Trackbed Fixtures: Linear, flexible, toughened, protective glass as shown
For Pylon Fixtures: A square, flexible, toughened, protective glass window as shown
 - 2) For Trackbed Fixtures: LEDs mounted on a linear circuit board.
For Pylon Fixtures: LEDs mounted on a square circuit board.
The spacing and power of the LEDs shall be as required to produce the lighting effect herein after described.
 - 3) Collimating lenses with focal lengths as required to produce the specified lighting performance.
 - 4) A single power chord for plug connection to the LED power grid as shown. The fixtures are intended to be unplugged and removed to be returned to the factory for any maintenance, so there shall not be any through wiring.
 - 5) A shielded and flexible control cable for plug connection to the lighting control grid.
- C. For Trackbed Fixtures: The drivers shall be integral and be in a compartment below the housing which holds the LEDs. The housing and that compartment are a single extrusion. For Pylon Fixtures: The drivers shall be remotely located under the platform. The driver box or housing shall be UL-approved, IP66-rated, and easily accessible for maintenance.
- D. Each fixture shall have a mounting bracket to properly support and orient the housing that is configured and keyed so that it accepts only the appropriate Type L, Type L10, Type LW, Type P, or Type PH fixture in the proper orientation. How the receiving part of the mounting bracket is designed may vary with each station's condition.
- E. The fixtures shall be designed so that it can be removed and installed by one person.
- F. When returned to the factory, the fixtures shall be capable of being repaired or reconditioned rather than simply replaced or thrown out.
- G. All LED fixtures shall comply with FCC Rule Part 15 governing electromagnetic interference.
- H. Fixtures shall be free of light leaks.

1.02 CONSTRUCTION:

- A. Design and build the fixtures such that, when installed and mounted as described, they:

- 1) Maintain all seals and gasketed junctions.
 - 2) Maintain proper fixture seating in mounting brackets.
 - 3) Maintain all clearances required for described maintenance procedures.
- B. All fixtures shall be designed and constructed in accordance with the requirements of the Underwriter's Laboratories, and either bear the U.L. label or be approved by the applicable inspecting authority. Conformance labels shall be placed on the fixtures in a location not visible from the floor or the mezzanines above.
- C. Fixture Housing:
- 1) Trackbed Fixtures: The body of the fixtures shall be a one piece extrusion with die cast end caps and driving housing designed so that when assembled it forms a single rigid assembly that when supported at its ends its maximum sag is .0625"
Pylon Fixtures: The body of the fixture shall be a single die cast unit with a protective glass lens designed so that when assembled it forms a single rigid assembly and is rated IP66.
 - 2) Materials for Trackbed Fixtures:
 - a. Body – extruded aluminum.
 - b. Ends – Die cast aluminum.Materials for Pylon Fixtures:
 - a. Aluminum extrusion or casting
 1. .100 inch minimum wall thickness
 2. .067 inch minimum thickness for tabs, stops, etc
 - b. Sheet Aluminum
 1. .100 inch minimum thickness
 - 3) All joints shall be sealed or caulked such that it will withstand water-jet cleaning of 4000 psi.
 - 4) The section of the extrusion shall be configured to act as a heatsink.
 - 5) The cross section of the extrusion shall provide screw slots and guides for fastening and supporting all internal components. There shall be no visible fasteners on the assembled module. Screws or fasteners on the end caps shall be flush.
 - 6) For Trackbed Fixtures: The total weight of a nominal 4' fixture with an integral driver shall not be greater than 15lbs.
For Pylon Fixtures: The total weight of a fixture shall not be greater than 35lbs. The weight of the remote driver in its housing shall not exceed 25lbs.
 - 7) The fixtures shall have a minimum impact rating of IK08.

D. Pylon Fixture Driver Housing

- 1) The driver shall be remotely located underneath the platform. The driver box or housing shall be NEMA 4X or IP66.
- 2) The box shall be UL-approved for use with this fixture
- 3) The box shall be of a minimum profile so that it can fit underneath the platform and be easily accessible for maintenance.
- 4) The weight of the driver and its protective box shall not exceed 25 lbs.

E. Protective Glass or Lens:

- 1) For Trackbed Fixtures: The protective glass shall be clear and rectangular as shown.
For Pylon Fixtures: The protective glass shall be clear and curved as shown.
- 2) It shall sit firmly on a frame formed by the extrusion such that its exterior is flush with the exterior of the housing. The junction of the protective glass and the housing shall be factory sealed. This junction shall also meet the requirements of IP66 and able to withstand 4000 psi.
- 3) Materials:
 - a. Flexible Tempered glass ("Gorilla Glass")
 - b. 0.125 inch thick
 - c. Clear
- 4) The junction of the protective glass to the housing shall also be able to withstand the suction created by a passing train.

E. Component Board:

- 1) The component board slides through the end and sits guides provided by the extrusion and is factory removable for replacing or reconditioning. It may be modular.
- 2) It contains and supports the LEDs, the collimating lenses and necessary onboard electronics attached firmly in such a way to prevent disconnection caused by vibration from passing trains or reasonable handling.
- 3) There shall be a firm maintained continuity between the computer board and its heat sink in order to conduct the heat away from the LED. All junctions shall be configured so that the heat is conducted away from the LED. These junctions shall be designed to not be interrupted by the vibrations of passing trains nor the normal handling of a fixture being installed.

F. LEDs:

- 1) LEDS and LED modules shall be manufactured by a trusted manufacturer with a proven track record for performance and reliability, with at least 5 years' experience.
- 2) The perceived color and its consistency is of utmost importance. The nominal LED color temperature shall be 3000K as presented to WMATA in a mockup May 12, 2016. The sample fixture used for the mockup has been retained to be compared against any submitted samples.
- 3) The manufacturer of LEDs shall utilize an advanced production LED binning process to maintain color consistency. LEDs and LED modules shall have a color consistency between each other of no more than 2 MacAdam ellipses.
- 4) The LED color temperature shall be 3000K and verifiable per IESNA LM-79 test measurement for solid state luminaries. The CRI shall be 80.
- 5) LED fixtures shall be thermally protected using one or more of the following thermal management techniques: heat sink, metal core board, gap pad, and/or internal monitoring firmware.
- 6) Manufacturer must conduct a 48 hour "burn in" of the fixtures prior to shipment to minimize failure in the initial one thousand hours. In this 48 hour test, the fixtures must cycle through being on for a period of 4 hours and off for a period of 2 hours. This shall be repeated until the 48 hour period is over.
- 7) LED array shall be provided with protection mechanisms to prevent string failures like individual shorts or open.
- 8) LEDs shall have a minimum lifetime of L70 (not lose more than 30% of their initial brightness) of 100,000 hours per US DOE Caliper Test for solid state lighting. The Thermal resistance shall be less than 10 degrees C/Watt to allow heat transfer from LED junction to the LED board.
- 9) Where for optical or power performance a fixture manufacture needs to use a different LED module the manufacture must provide a sample.
- 10) LED modules shall employ remote phosphor or cold phosphor technology.
- 11) The efficiency of LED light engines or LEDs shall be no less than 80 lumens per Watt

G. Collimating Lenses

- 1) Type L is to have 30 degree X 30 degree optics
- 2) Type L10 is to have 10 degree X 30 degree optics

- 3) Type LW is to have 60 degree X 60 degree optics
- 4) Type P is to have 120 degree x 120 degree optics
- 5) Type PH is to have Type IV optics
- 6) Highest Quality, Optically-Clear Acrylic
- 3) Molded and polished to provide the specified optics
- 4) Wavelength range: 200-2000 nm
- 5) Operating temperature 150° C

H. LED Drivers:

- 1) Drivers shall be manufactured by a trusted manufacturer with a proven track record for performance and reliability, with at least 5 years experience.
- 2) All drivers shall be constant current; thereby, operating the LED at constant and carefully regulated current. LEDs shall not be overdriven beyond their specified junction temperature and nominal voltage and current.
- 3) LED drivers must be able to communicate with the central system in a "feedback" system reporting on its status and usage for maintenance and sustainability planning.
- 4) The drivers shall come with an NTC interface for robust thermal management. The electronics shall be self-protected.
- 5) The drivers shall have a startup of less than one second without any flickering.
- 6) The input voltage shall be 277V. The drivers shall provide Class 2 LED output.
- 7) The frequency shall be between 47-63Hz.
- 8) The Power factor shall be no less than 0.9 at full load.
- 9) All drivers shall be UL or ETL approved for use in damp and dry locations.
- 10) Their Ta range shall be between -20°C to +50°C. Their TC max shall be 75°C. Their TC lifetime shall be 75°C.
- 11) The system shall conform to all local and international codes and in particular IEC 62386 Digital Lighting Interface.
- 12) Surge protection: 4kV.
- 13) All drivers must come with a minimum 5-year warranty.

- 14) All drivers must have a sound rating of A.
 - 15) All drivers shall be guaranteed by manufacturer against defects in material and workmanship. Guarantee shall include on-site inspection, labor and material for replacement of defective drivers for a period of 3 years.
- I. Brackets and Miscellaneous Angles
 - 1) Cast or Formed Aluminum or Stainless Steel
 - a) .125 minimum thickness
 - J. Springs
 - 1) High temperature, tempered stainless steel.
 - 2) Spring characteristics shall not be reduced by welding or hot riveting to fixture components.
 - K. Nuts, Bolts, Rivets:
 - 1) Nuts, bolts, rivets and miscellaneous fasteners shall be sized in accordance with the technical standards of the Industrial Fasteners Institute.
 - 2) Nuts, bolts, rivets and miscellaneous fasteners shall be manufactured in accordance with the standards of the specifications of the Industrial Fasteners Institute.
 - F. Gaskets
 - 1) Physical characteristics:
 - a) Compliance- Gasket shall compress sufficiently to seal fixture along the entire perimeter.
 - b) Resiliency- Gasket shall have quick recovery to original shape after compression.
 - c) Temperature Flexibility -There shall be no noticeable stiffening of the gasket at temperatures down to 0°C. There shall be no change in modulus temperatures up to 100°C.
 - d) Permeability -Water and aqueous solutions shall neither swell, nor be absorbed by, the gasket.
 - e) Flame resistance -The gasket shall be self-extinguishing after a few seconds, and shall have flame resistant characteristics.
 - 2) Configuration
 - a) One piece and continuous along fixture perimeter.
 - b) Any joints shall be permanent with a glued diagonal overlap providing a seal equivalent to the continuous portions.

- 3) Attachment to Chassis: Glued to continuous seat. Seat shall not allow gasket to shift under compression.
- 4) Conformance with Labeling: Gasket supplied with fixtures shall be exactly the same as that used when U.L. label for "Enclosed and Gasketed" was secured.

1.03 LIGHTING PERFORMANCE:

- A. Each fixture shall produce a smooth, even field of light on the surface which it is designed to light. The field shall be free of hot spots, dark spots, or filament striations.
- B. Photometric performance shall be defined by any of the following:
 - 1) Photometric curves.
 - 2) Beam spread as specified by spacing to mounting height ratio or degrees.
 - 3) Zonal lumen distribution.
 - 4) Reference to a specific fixture by manufacturer and catalogue number.
 - 5) Delivered Lumens, that number of lumens that makes it out of the fixture and into the beam angle, not field angle.
- C. The beam spread of lights shall be defined by:
 - 1) Beam angle defined as the angle from nadir at which the beam intensity, in candelas, equals 50% of the center beam intensity.
 - 2) Field angle defined as the angle from nadir at which the beam intensity, in candelas, equals 10% of the center beam intensity.
- D. The efficiency of fixtures shall be expressed as a percentage representing:
 - 1) For general downlights, the percentage of lamp lumens which is directed into the useful light beam.
- E. It is the intent of this lighting specification to procure a train room lighting system that after a reduction to 70% of initial light output produces the illumination levels described in the *WMATA Manual of Design Criteria Section 4.5.2* under "Minimum Illumination Level-Maintained of 3fc. This means the initial light output of the fixture shall produce 6fc on the platform. The review of a mockup at Federal Triangle on May 2, 2016 indicated that this will be achieved by the installation of LED luminaires with the light output herein after described and installed as shown in the lighting plans. As a final step in the development of this system, the manufacturer will furnish sample

fixtures and install them in the station or stations for which this fixture is intended. The purpose of the mockup is to:

- 1) Verify the color of the LEDs
- 2) Compare the color between fixtures
- 3) Verify the beam angle of the fixtures

F. For Trackbed Fixtures: From that mockup we measured that the fixture should produce a minimum of 4.5fc 3' off the ground.

For Pylon Fixtures: From that mockup we measured that the fixture should produce a minimum of 10 foot Lamberts on the ceiling.

The manufacturer must submit a prototype indicative of the optical performance so that the Engineer can confirm that the optical performance is met.

G. For the Pylon Fixtures, fixture brightness maximum shall be expressed in foot Lamberts. This shall be measured at the stated angle by a calibrated spot brightness meter measure a circle of one-inch diameter.

Where average brightness is stated, the measured area may be as large as a six-inch diameter. Average to maximum ratio within that cycle shall not exceed 2:3.

H. Polar distribution curve shall give candlepower distribution stated in candelas at 15 degree intervals in the parallel, normal, and diagonal planes. Readings shall be factored to levels based on standard lamp producing rated lumen output.

I. Submit lighting performance data of the submitted fixtures. verified by an acceptable independent testing laboratory. These tests shall include distribution curve and lumen output data.

J. Type L and Type L10 shall produce a minimum of 1350 delivered lumens per linear foot within the beam angle.

K. Type LW shall produce a minimum of 1680 delivered lumens per linear foot within the beam angle.

L. Fixture Type P shall have a beam angle of $120^\circ \times 120^\circ$. The orientation of the pylons is rotated 45° , so the optics must truly be symmetrical in all directions (i.e. 120° in all directions).

M. Fixture Type PH shall have Type IV optics.

N. Type P and PH shall produce a minimum of 65,400 delivered lumens within the beam angle.

O. The lighting system must produce a minimum of 10fL on the ceiling and 6fc on the platform at floor level.

1.04 MOUNTING:

- A. For the linear fixtures that go in the trackbed and the parapet fixtures, there must be a nonferrous linear mounting rail or as shown on the drawings. This mounting rail shall be installed at the correct height so that the fixture when installed is exactly located as shown in the drawings, i.e. below and out of the line of sight of someone standing on the edge of the platform. The installation of the aluminium or stainless steel rail may vary from location type to location type, i.e. trackbed, side platform parapet and hub station mezzanine parapet. Please see drawings.
- B. Type P and Type PH shall have mounting brackets made of aluminum or stainless steel and configured as shown on the drawings. This mounting brackets shall be installed at the correct height so that the fixture when installed is exactly located as shown in the drawings, i.e. above and out of the line of sight of someone standing on the platform.
- C. All parts of the mounting bracket shall be non-ferrous, meaning either stainless steel or aluminum.
- D. Each Light fixture type shall have its own mounting bracket configuration as shown making it impossible for anyone to ever install the wrong linear fixture in that location.
- E. Each trackbed fixture shall come with two mounting brackets in order to be supported at two standard mounting points. Each pylon fixture shall come with four mounting brackets in order to be supported at four standard mounting points.
- F. It shall not be possible for anyone in the field to change the mounting bracket of a fixture for another mounting bracket type, thereby facilitating someone to install the wrong fixture in the wrong location.
- G. For Trackbed fixtures, the portion of the mounting bracket on the fixture and the mounting bracket mounted to the trough shall always be aligned so that the proper fixture easily slides into place and sits properly and firmly in the mounting bracket.
- H. For Pylon fixtures, the portion of the mounting bracket on the fixture and the mounting bracket mounted to the pylon shall always be aligned so that the proper fixture easily slides into place and sits properly and firmly in the mounting bracket.
- I. The mounting brackets shall have a minimum thickness of .125" in order to resist denting or bending and therefore preventing the fixture to slide in firmly into the bracket and its position.

1.05 FINISHES:

- A. Aluminum extrusions, castings or exposed housings.
 - 1) Dressed free of burrs or mold marks.

- 2) 9-step powder coat process, including marine epoxy undercoat and polyester top coat.
- 3) Paint color shall be "WMATA Brown", glossy. Color and Finish per Engineer's sample.
- 4) Color and Finish sample shall be submitted to Engineer for review and sign off prior to any fabrication.

1.06 DIMENSIONS:

- A. Dimensions shown are maximum or minimum as indicated. Where no dimensions are shown, dimensions are to be based on meeting the required performance and on common good industry practice.
- B. In the event of discrepancy on the drawings between written dimensions and scaled dimensions, the written dimensions shall govern.
- C. Any conflicts between the actual conditions and the Contract Documents shall be brought to the attention of the Engineer for resolution prior to any fabrication.

1.07 ELECTRICAL:

- A. Type L and Type L10 shall consume no more than 66W per fixture.
- B. Type LW shall consume no more than 70W per fixture.
- C. Type P and Type PH shall consume no more than 850W per fixture.
- D. Each fixture is to come with two different AMP-style connectors: one for power and one for control.
- E. Electrical design and construction to be in accordance with Underwriter's Laboratory Publication U.L.57-Standards for Safety Electric Lighting Fixtures.
- F. Conductor types, sizes and wiring methods shall conform to all applicable requirements of Underwriter's Laboratories.
- G. Fixtures to have an Underwriter's Laboratory Listing for the classes of service described in subsequent sections of the Specification.
- H. Fixtures to bear appropriate U.L. labels and to be marked in accordance with the requirements of Publication U.L.57. Labels to be in areas that are not visible from below.
- I. LEDs and LED modules: Wattages are shown to indicate the required electrical circuitry. The LEDs and LED modules actually to be used are the ones on the approved shop drawings.
- J. All hardwired connections to LED fixtures shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.

- K. The power and control connections to the fixture shall be with AMP-type connector that is keyed for correct connection for choice of type and polarity. The connector shall also have an overlap protector that provides IP66 protection. The connector shall have a spring-loaded stop to prevent interruption due to train vibration and to signal to the installer that the connection is complete.
- L. The AMP-type connector for the power shall be different from the AMP-type connector for the control cable so that there can never be any confusion as to which is which or what gets plugged into what.
- M. Wiring: 105°C U.L. approved fixture wire.
- N. The LED fixtures shall not be constructed or intended for through wiring.
- O. The electrical input to the LED fixtures shall be 277v AC.
- P. The control cable shall be shielded and flexible for plug connection to the lighting control grid.

1.08 MAINTENANCE:

Design fixtures to allow the following operations to be done by one man in one ladder position:

- A. To be able to reach the power and control cables to undo them before removing the fixture.
- B. Only be able to put the correct fixture in the correct place and not confuse a fixture with different optics for another fixture.
- C. Power wash the fixtures.
- D. To not be able to confuse the power cable and the control cables, nor plug one into the socket of the other.
- E. To install without tools the replacement fixture and that it rests firmly in the correct focus.

FIXTURE TYPE P

Type P is a nominal 1'-10" x 1'-10" square, minimum-profile, industrial, IP66, 120°x120° Type V-optic (as shown below) LED upright that is mounted in the top of Type C or C3 Pylon for uplighting the train room vault in the central platform stations. Type P's nominal dimensions are 1'-10" x 1'-10" wide x 5" high to the bottom of the heat sink. Type P is mounted in the top of the pylons as shown on the drawings.

Type P will have a mounting frame made of aluminum or stainless steel and configured as shown on the drawings. This mounting frame shall be installed at the correct height so that the fixture when installed is exactly located as shown in the drawings, i.e. above and out of the line of sight of someone standing on the platform. Each Light fixture type shall have its own mounting configuration as shown making it impossible for anyone to ever install the wrong pylon light in that location.

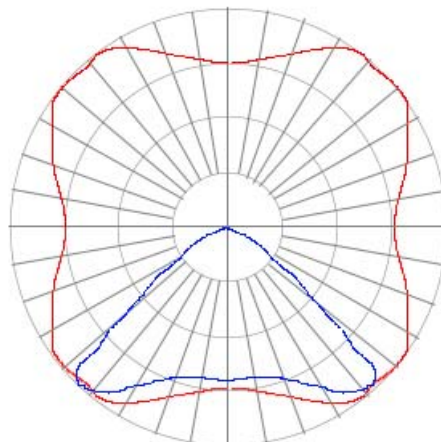
The LED light engine or module shall produce a consistent 3000K color of light with no apparent variation between fittings either upon installation or afterwards.

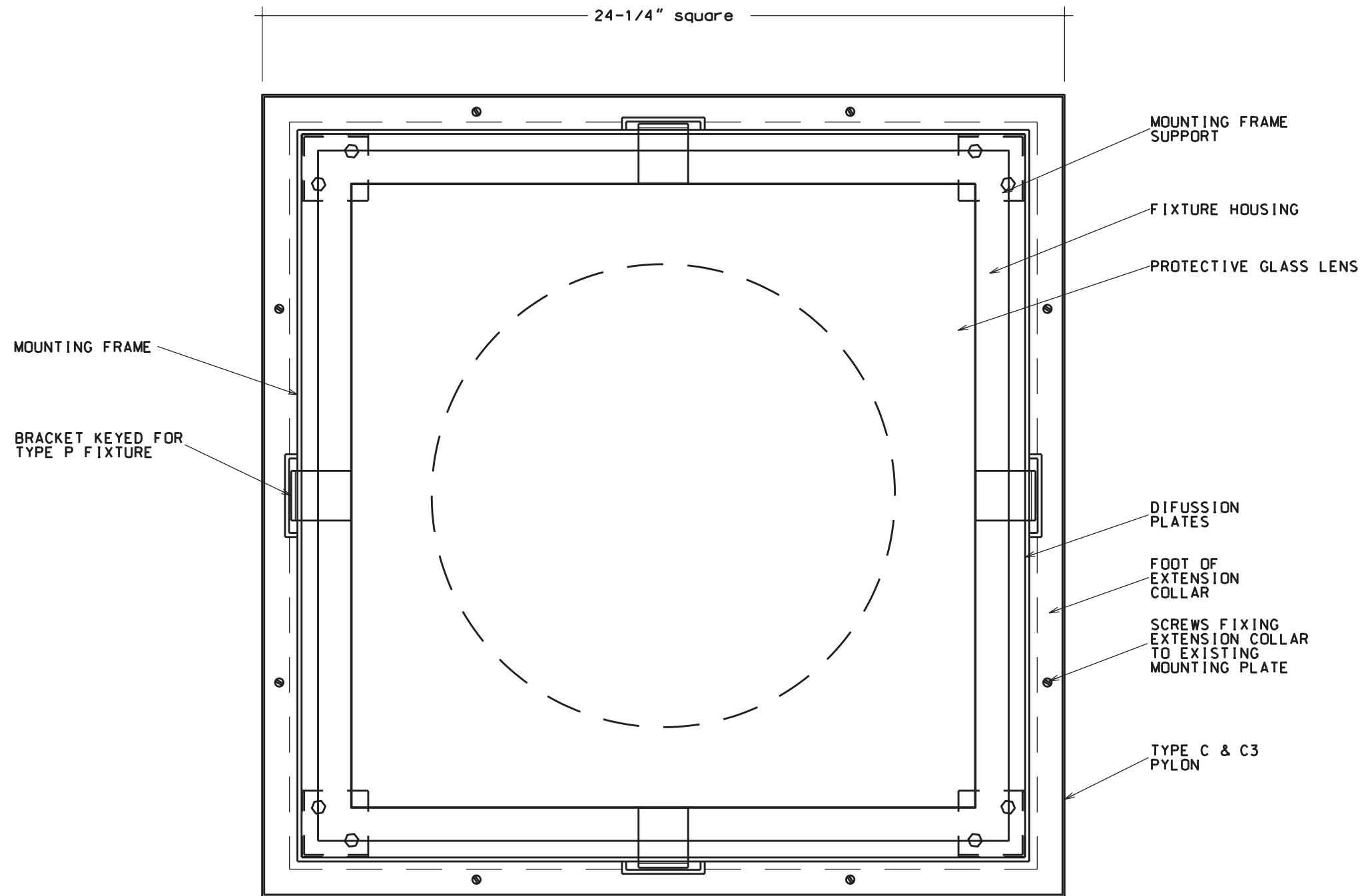
The drivers shall be remotely located under the platform. The driver box or housing shall be UL-approved, IP66-rated, and easily accessible for maintenance.

The heat sink shall work passively and maintain the LED connections and circuitry at the proper temperature to ensure their full life. The LEDs shall have a life of no less than 100,000 hours and not lose anymore than 70% of their lumen output after a period of 3 years.

Lamp:

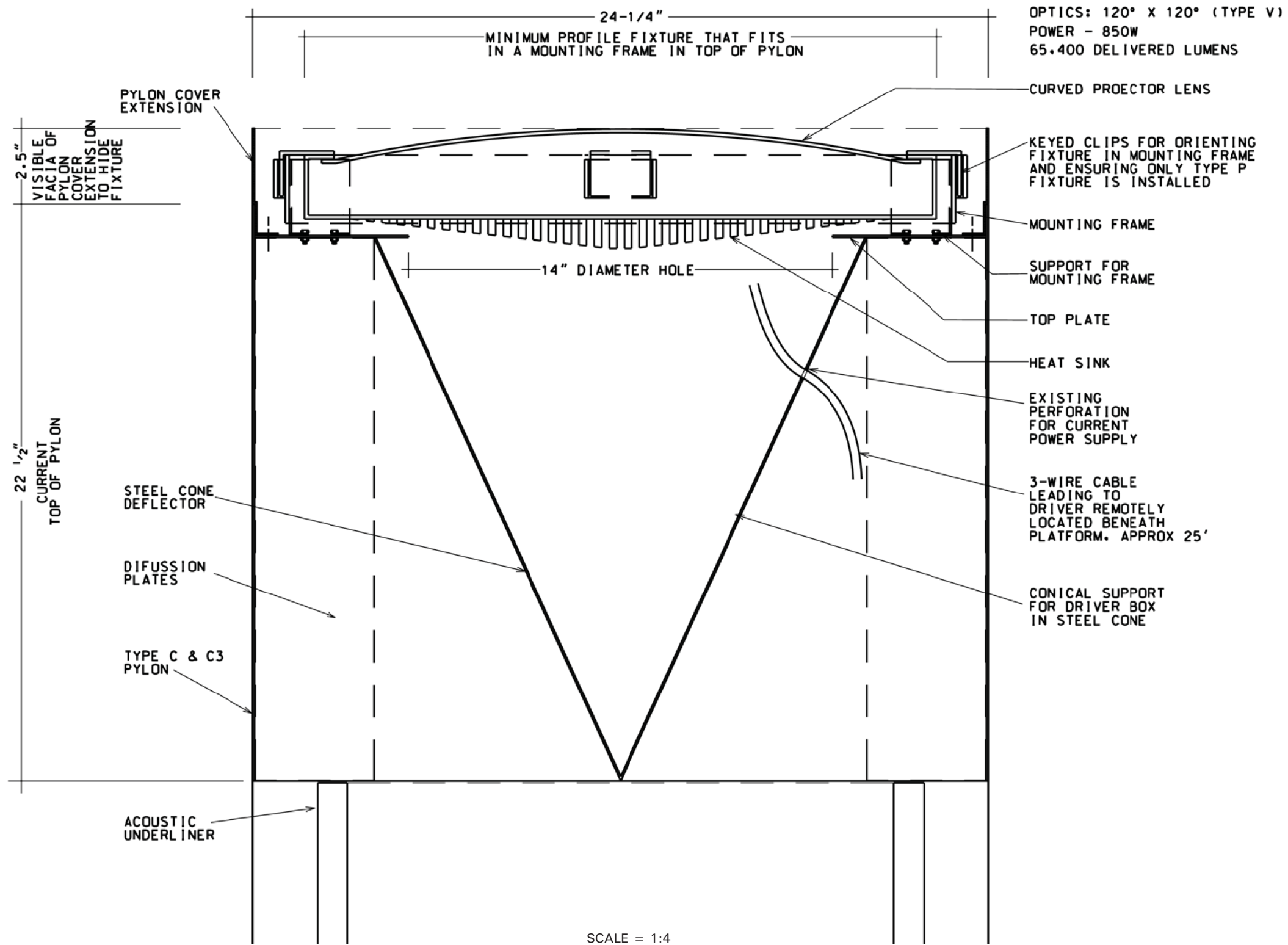
- 850W LED
- 65,400 delivered lumens
- 120° x 120° optics
- 3000K





SCALE = 1:4

P (plan)



P (section)

FIXTURE TYPE PH

Type PH is a nominal 1'-10" x 1'-10" square, minimum-profile, industrial, IP66, Type IV-optic (as shown below) LED uplight that is mounted in the top of Type C or C3 Pylon on the mezzanine in the hub stations for uplighting the train room vault. Type PH's nominal dimensions are 1'-10" x 1'-10" wide x 5" high to the bottom of the heat sink. Type PH is mounted in the top of the pylons as shown on the drawings.

Type PH will have a mounting frame made of aluminum or stainless steel and configured as shown on the drawings. This mounting frame shall be installed at the correct height so that the fixture when installed is exactly located as shown in the drawings, i.e. above and out of the line of sight of someone standing on the platform. Each Light fixture type shall have its own mounting configuration as shown making it impossible for anyone to ever install the wrong pylon light in that location.

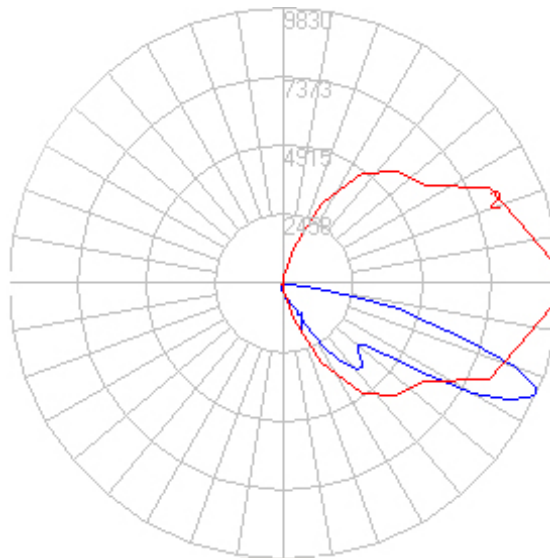
The LED light engine or module shall produce a consistent 3000K color of light with no apparent variation between fittings either upon installation or afterwards.

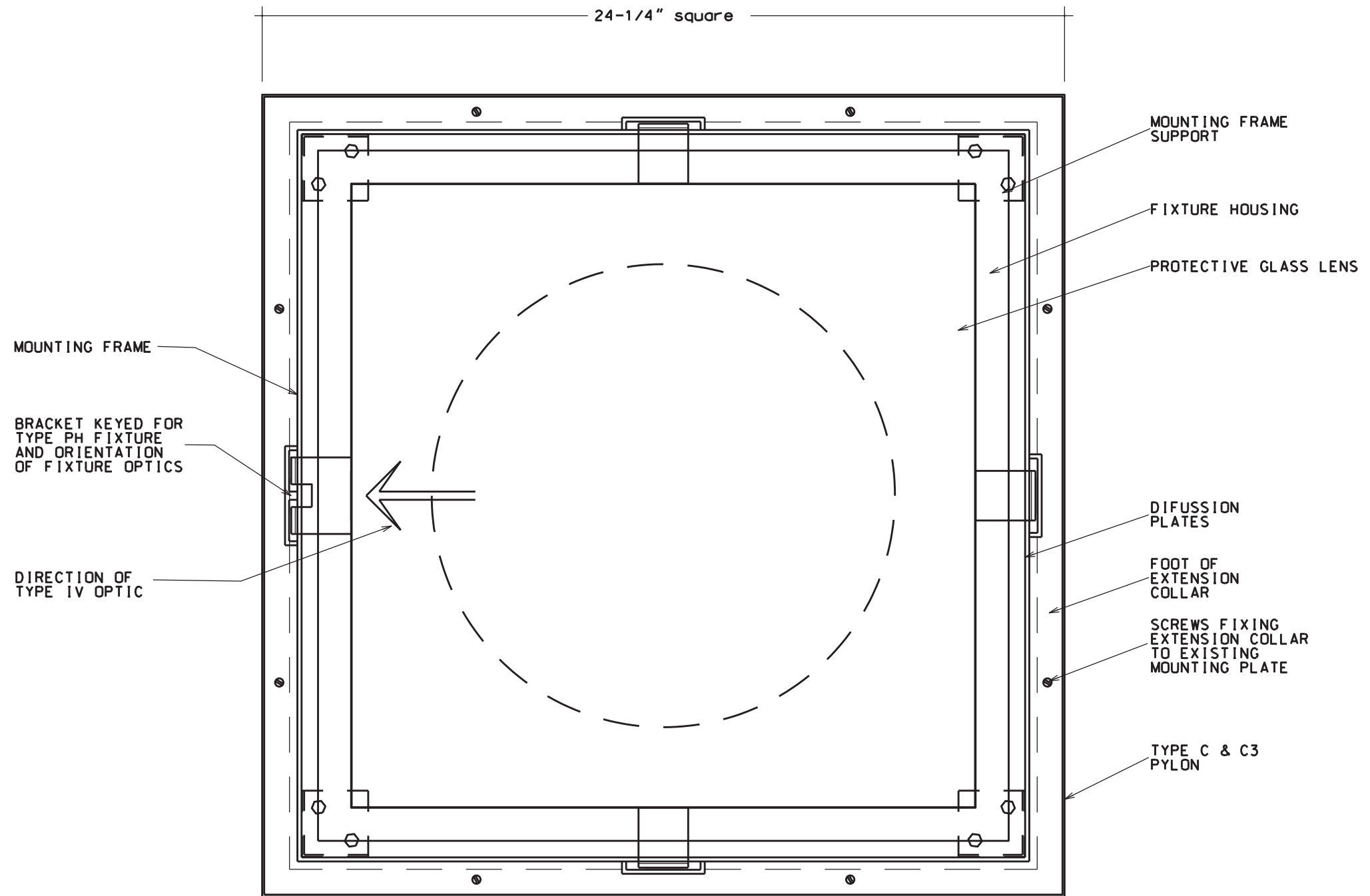
The drivers shall be remotely located under the platform. The driver box or housing shall be UL-approved, IP66-rated, and easily accessible for maintenance.

The heat sink shall work passively and maintain the LED connections and circuitry at the proper temperature to ensure their full life. The LEDs shall have a life of no less than 100,000 hours and not lose anymore than 70% of their lumen output after a period of 3 years.

Lamp:

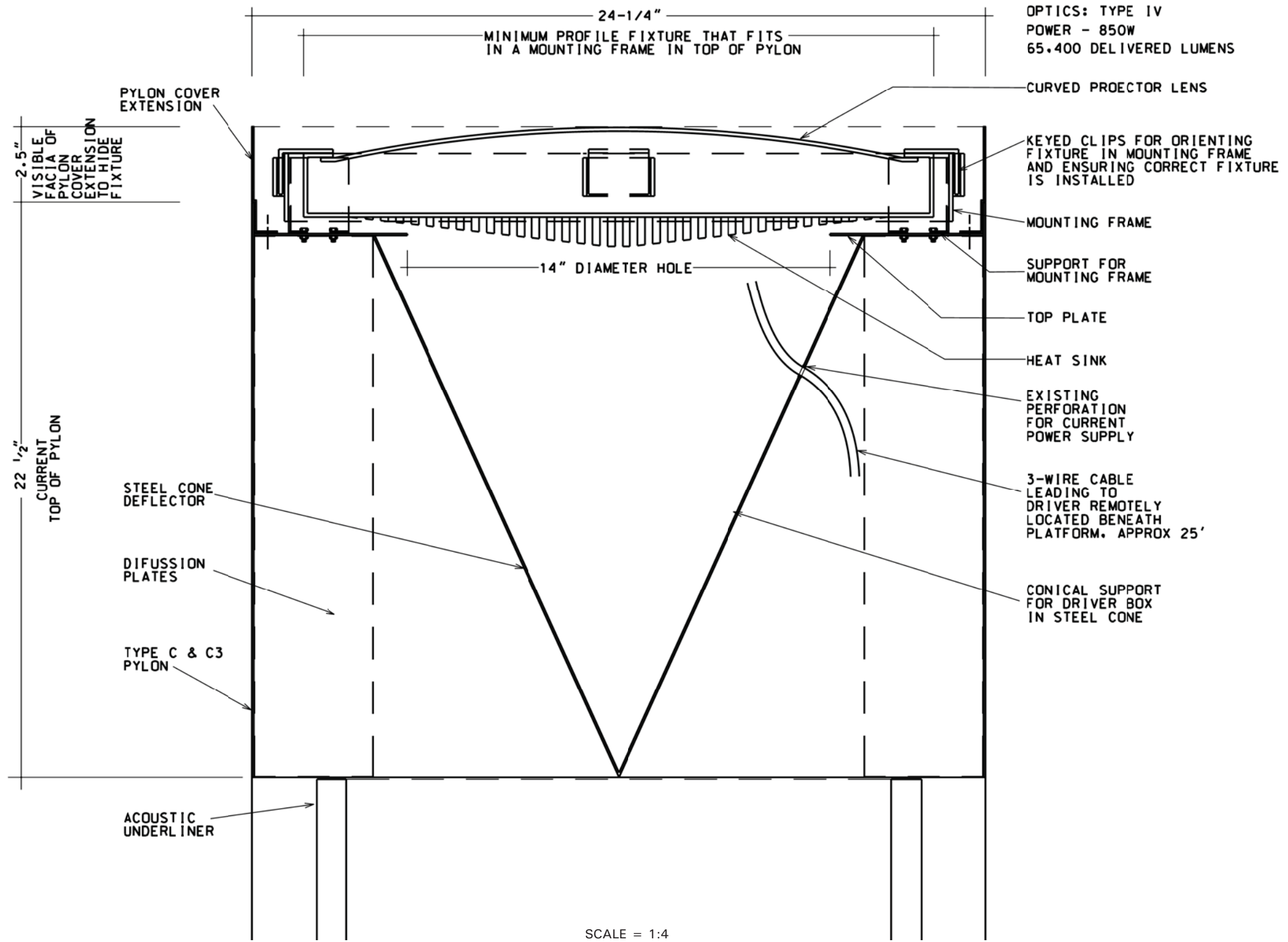
- 820W LED
- 65,400 delivered lumens
- Type IV optics (shown below)
- 3000K





SCALE = 1:4

PH (plan)



PH (section)

FIXTURE TYPE L

Type L is a nominal 4'-long, minimum-profile, industrial, IP66, linear LED uplight that is mounted on the sides of the parapet wall in a split platform station or in the trackbed trough of a central platform station for lighting the sides of the train room vault. Type L has a clean beam of 30° x 30°. It's nominal dimensions are 2.75" wide x 3.5" high x 4' long. Type L is mounted continuously, spaced evenly around the 8'-4" module of the stations as shown on the drawings.

For mounting details, please see architectural drawings.

Type L shall be rated IP66 and be suitable for wet locations. It shall be constructed of low-copper, die-cast, marine-grade extruded aluminum with isolated stainless steel fasteners. The fixture must be able to withstand 4000 psi, or approximately the pressure of a garden hose. The lens shall be made of clear, tempered glass (silicate) so as to repel brake dust.

The finish of the light fittings must be electro-statically applied polyester powder coat. The end caps must be machined aluminum and gasketed. All hardware for the fittings must be made from corrosion-proof stainless steel. There shall be no tools required for moving the fixtures. The fixture housing shall contain no visible bolts or screws.

The mounting system is such that it does not matter where the support brackets are. This is accomplished by installing support brackets and then installing a non-ferrous mounting rail to the brackets. The keyed mounting hardware is then put into the track and arranged so the fixtures can be located as shown in the plans.

The cable entry to the fitting must be fitted with a submersible cable gland. The fitting shall also allow thru wiring.

The light fittings shall have 30 x 30 degree optics and shall provide a continuous wash of light without any striations or dark spots on the fin either within a single beam angle or between fittings.

The LED used for this tube shall be of the highest quality and apparently consistent in color and brightness to the eye. The electronics shall be per the specification of the highest grade, maintaining the LEDs at their proper junction temperature. The final color for the LEDs shall be 3000K. Fixture is to be driven at lowest possible amperage to conserve in wattage consumption.

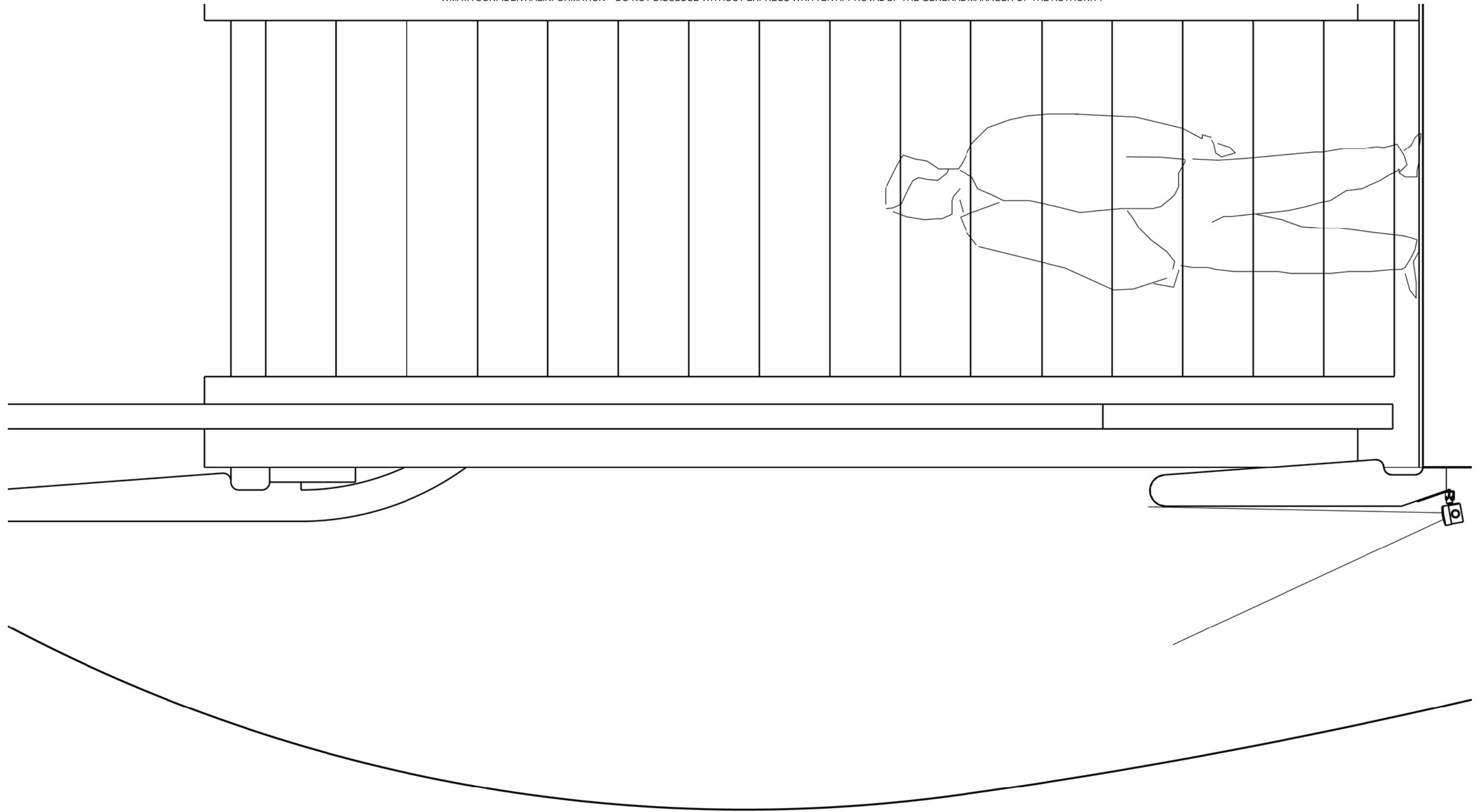
Fixture must be mocked up to verify optics, tilt and power of fixture.

The fixture should have a Center Beam Candle Power of 11,400. If the fixture is 10ft away from a wall, the brightness of the wall shall measure no less than 60fc 2ft away from the center of the fixture.

Type L shall produce a minimum of 1350 delivered lumens per foot within the beam angle.

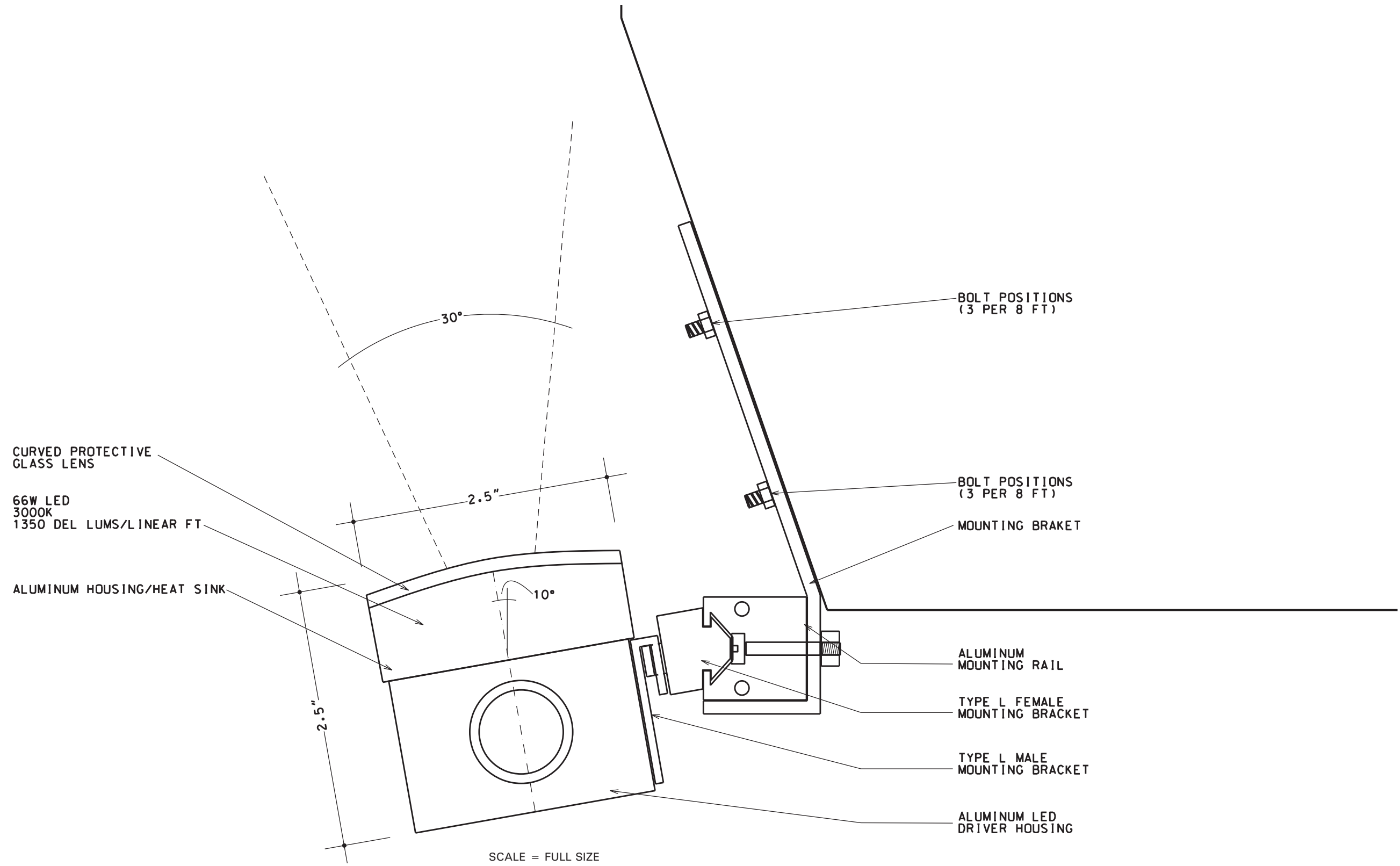
Lamp:

- 16.5W/ft LED
- 1350 delivered lumens/ft
- 30° x 30° optics

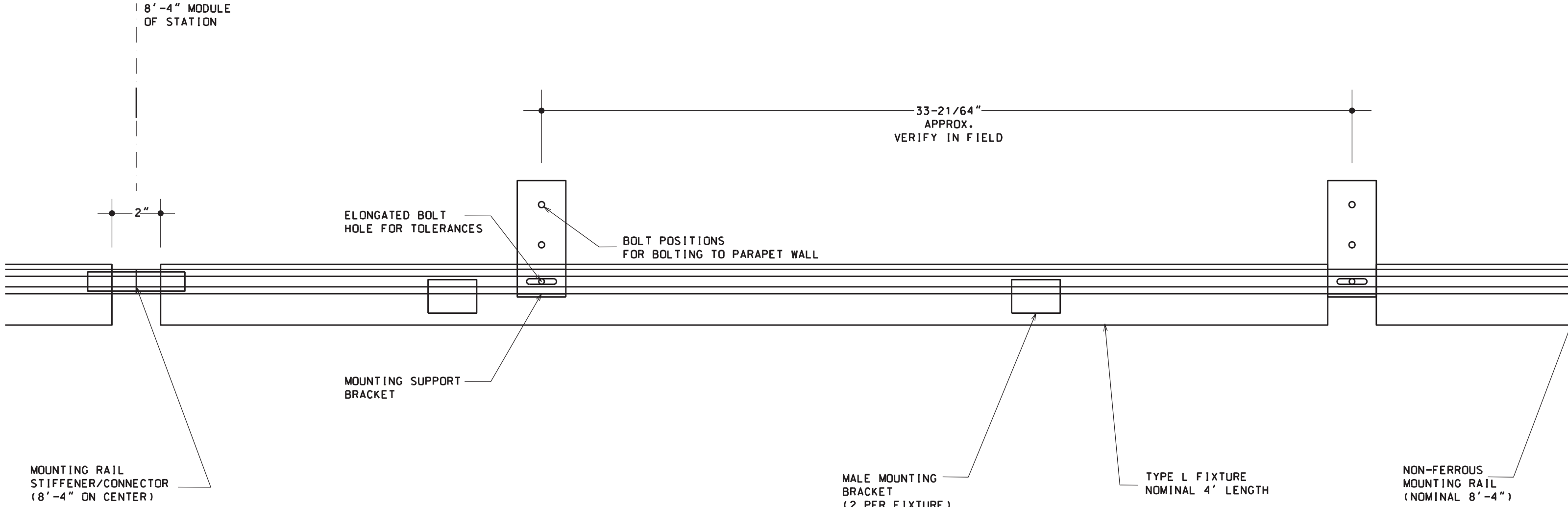


L (split platform)

SCALE = ONE TWELFTH FULL SIZE



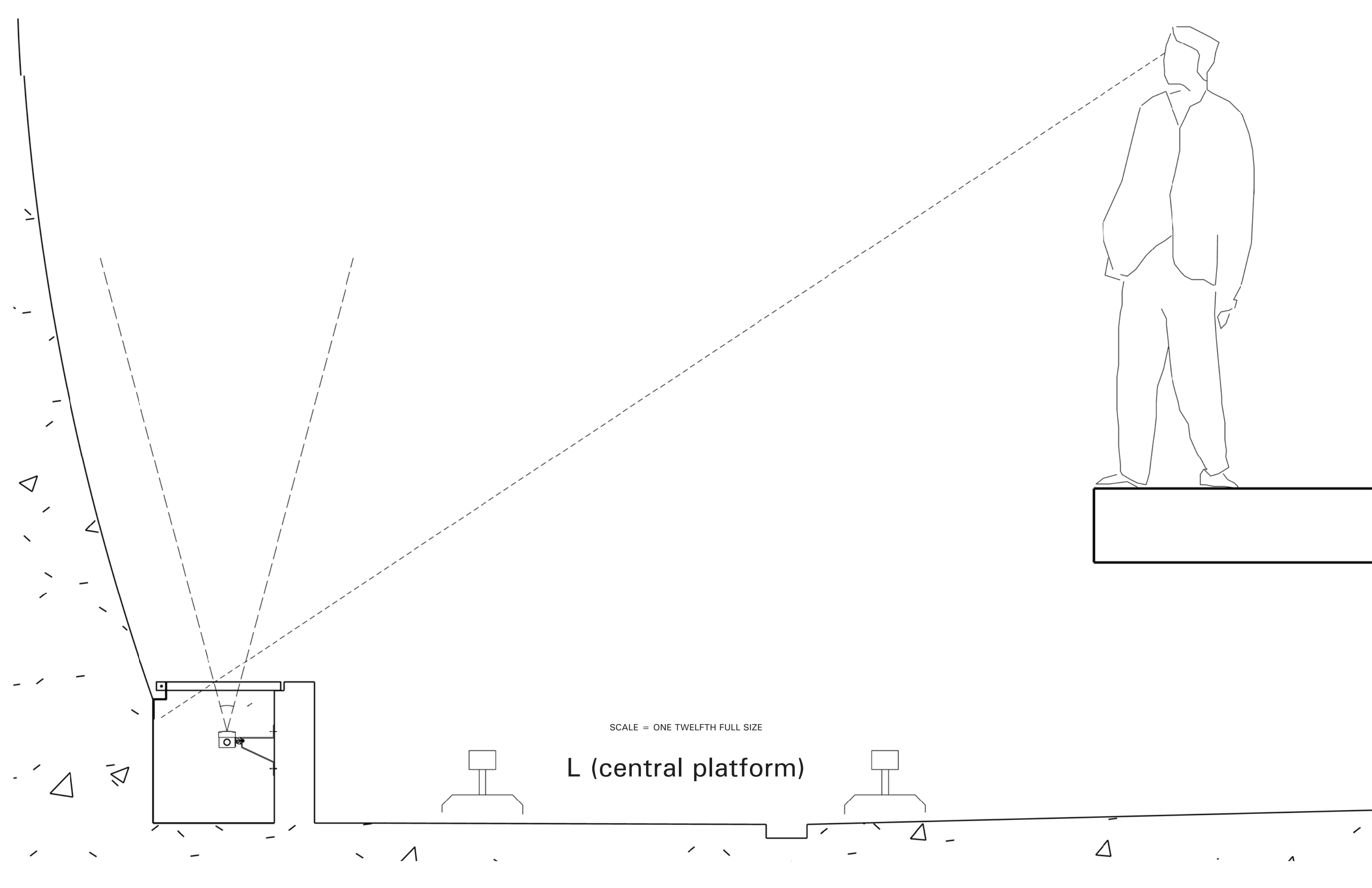
L (split platform section)



ALL MOUNTING ELEMENTS AND LIGHTING SYSTEM MUST FIT INTO EXISTING 8'-4" MODULE

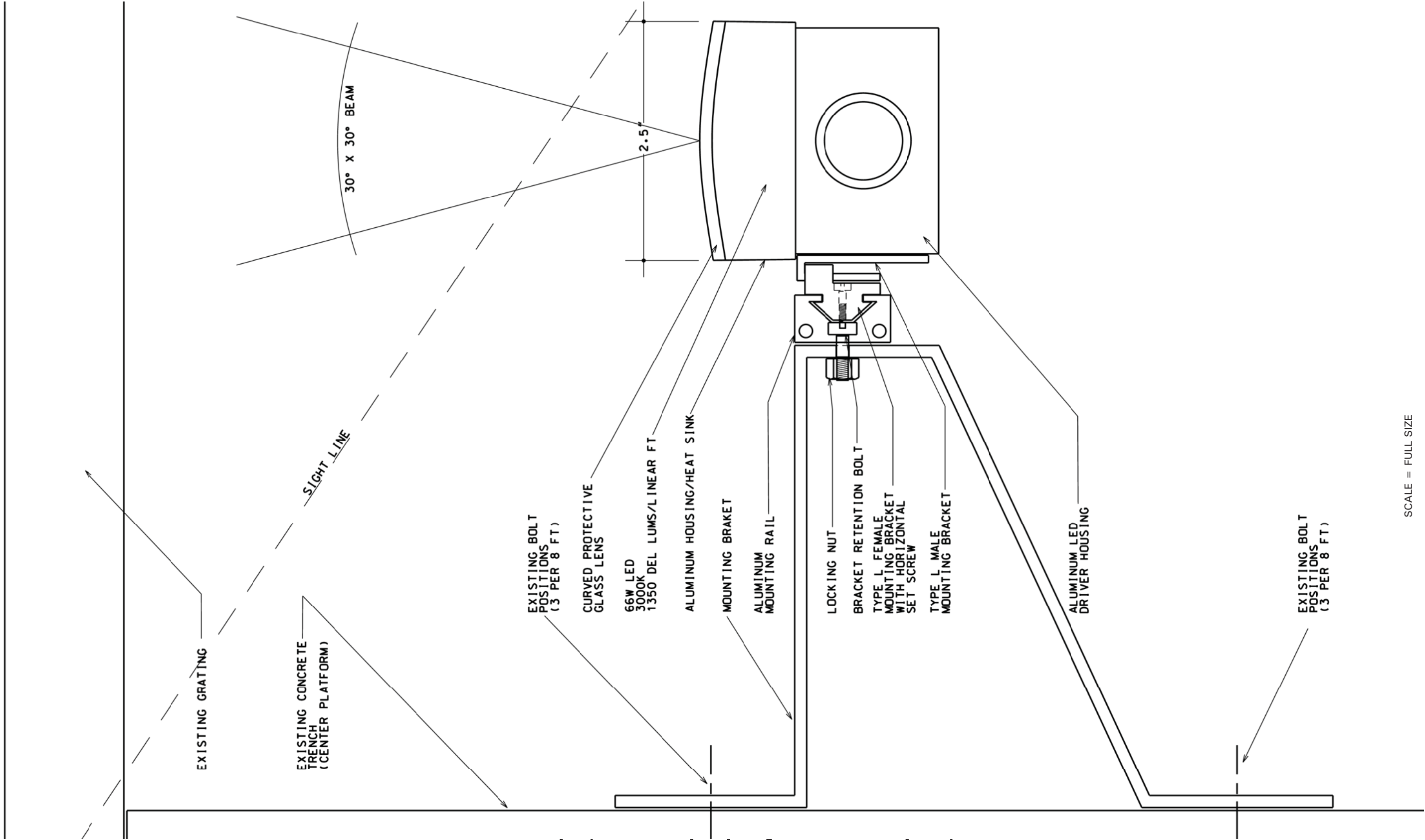
SCALE = ONE QUARTER FULL SIZE

L (split platform elevation)



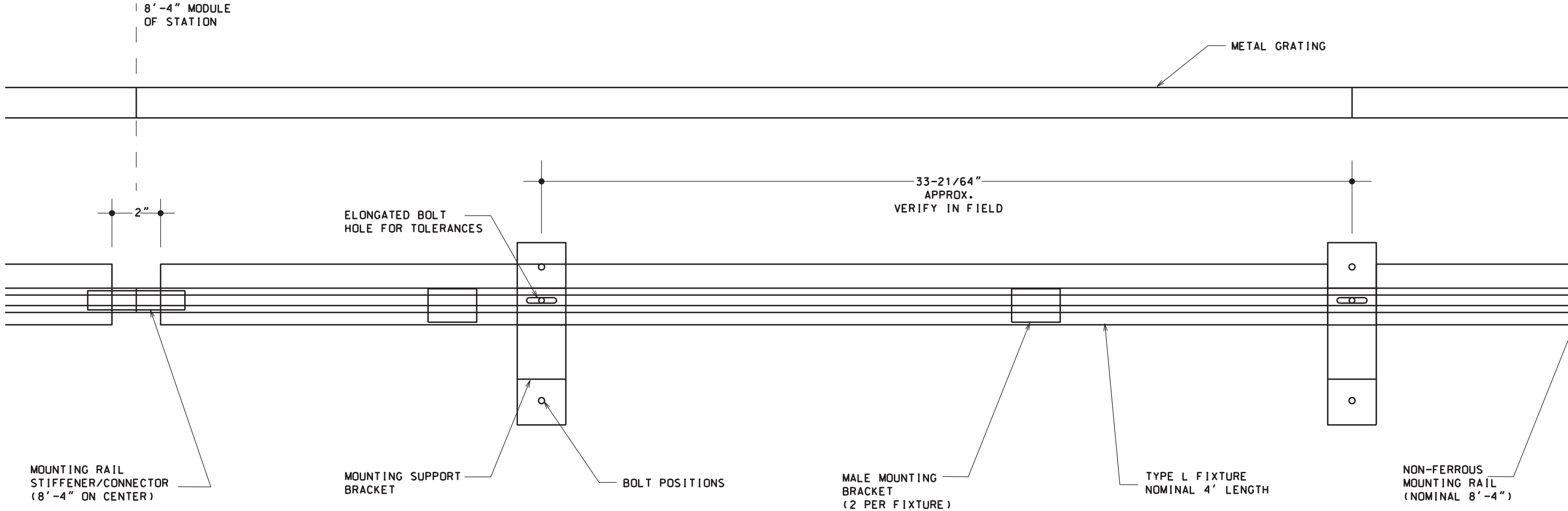
SCALE = ONE TWELFTH FULL SIZE

L (central platform)



L (central platform section)

SCALE = FULL SIZE



ALL MOUNTING ELEMENTS AND LIGHTING SYSTEM MUST FIT INTO EXISTING 8'-4" MODULE

SCALE = ONE QUARTER FULL SIZE

L (central platform elevation)

FIXTURE TYPE L10

Type L10 is a nominal 4'-long, minimum-profile, industrial, IP66, linear LED uplight that is mounted in the trackbed of a hub station for lighting the sides of the train room vault. Type L10 has a clean beam of 10° x 30°. It's nominal dimensions are 2.75" wide x 3.5" high x 4' long. Type L10 is mounted continuously, spaced evenly around the 8'-4" module of the stations as shown on the drawings.

For mounting details, please see architectural drawings.

Type L10 shall be rated IP66 and be suitable for wet locations. It shall be constructed of low-copper, die-cast, marine-grade extruded aluminum with isolated stainless steel fasteners. The fixture must be able to withstand 4000 psi, or approximately the pressure of a garden hose. The lens shall be made of clear, tempered glass (silicate) so as to repel brake dust.

The finish of the light fittings must be electro-statically applied polyester powder coat. The end caps must be machined aluminum and gasketed. All hardware for the fittings must be made from corrosion-proof stainless steel. There shall be no tools required for moving the fixtures. The fixture housing shall contain no visible bolts or screws.

The mounting system is such that it does not matter where the support brackets are. This is accomplished by installing support brackets and then installing a non-ferrous mounting rail to the brackets. The keyed mounting hardware is then put into the track and arranged so the fixtures can be located as shown in the plans.

The cable entry to the fitting must be fitted with a submersible cable gland. The fitting shall also allow thru wiring.

The light fittings shall have 10 x 30 degree optics and shall provide a continuous wash of light without any striations or dark spots on the fin either within a single beam angle or between fittings.

The LED used for this tube shall be of the highest quality and apparently consistent in color and brightness to the eye. The electronics shall be per the specification of the highest grade, maintaining the LEDs at their proper junction temperature. The final color for the LEDs shall be 3000K. Fixture is to be driven at lowest possible amperage to conserve in wattage consumption.

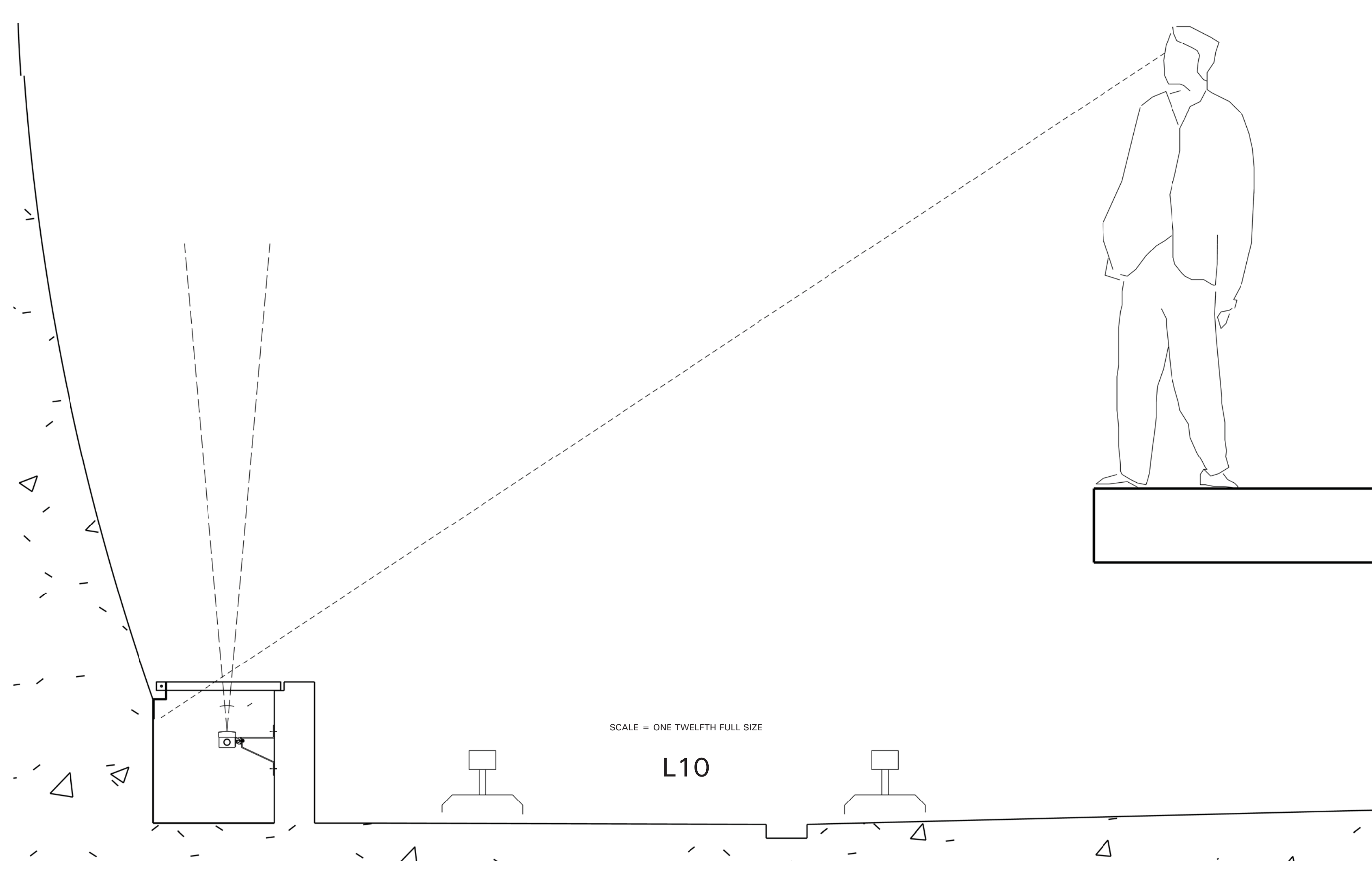
Fixture must be mocked up to verify optics, tilt and power of fixture.

The fixture should have a Center Beam Candle Power of 22,400. If the fixture is 10ft away from a wall, the brightness of the wall shall measure no less than 100fc 10in away from the center of the fixture.

Type L10 shall produce a minimum of 1350 delivered lumens per foot within the beam angle.

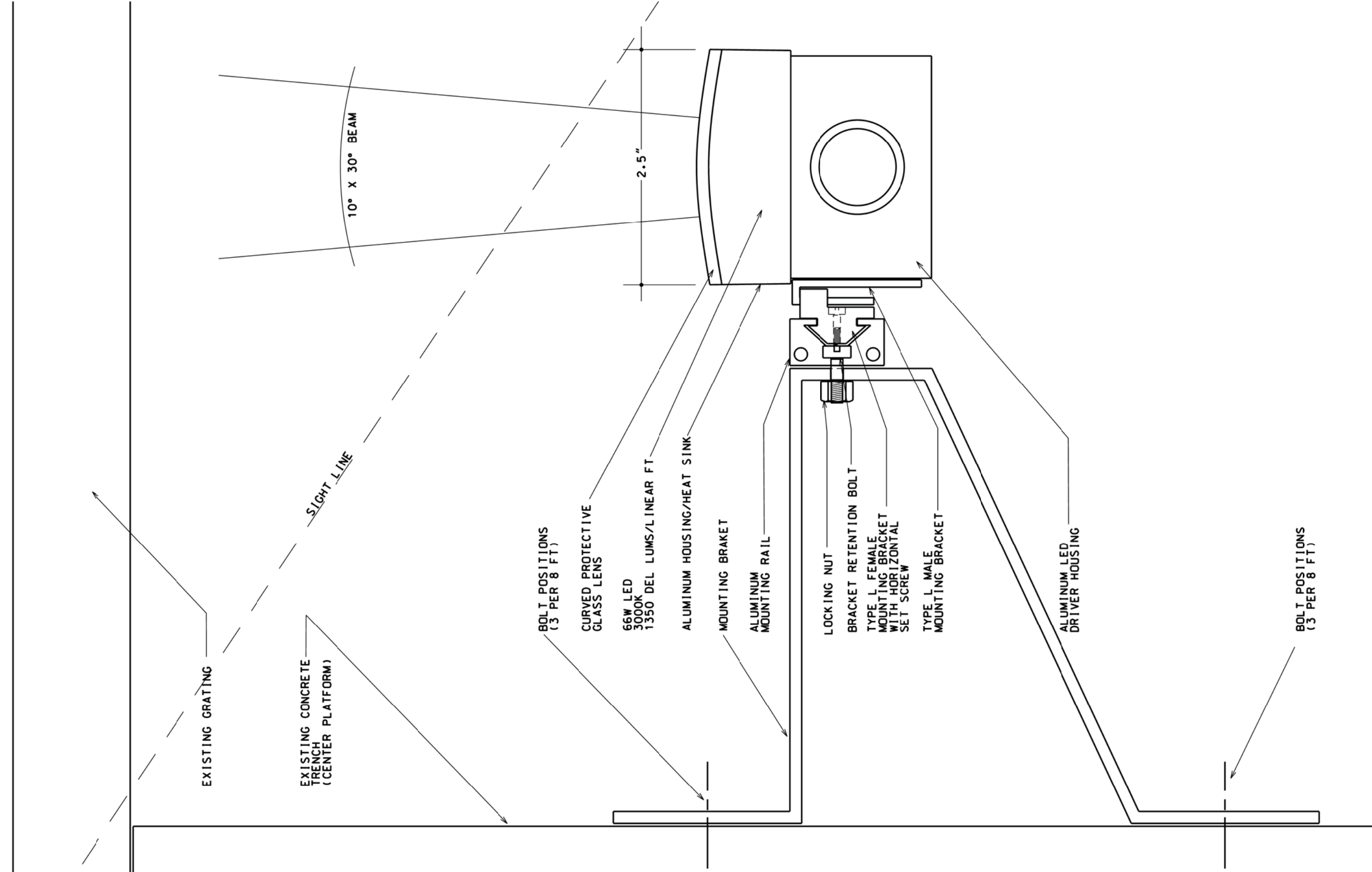
Lamp:

16.5W/ft LED
1350 delivered lumens/ft
10° x 30° optics



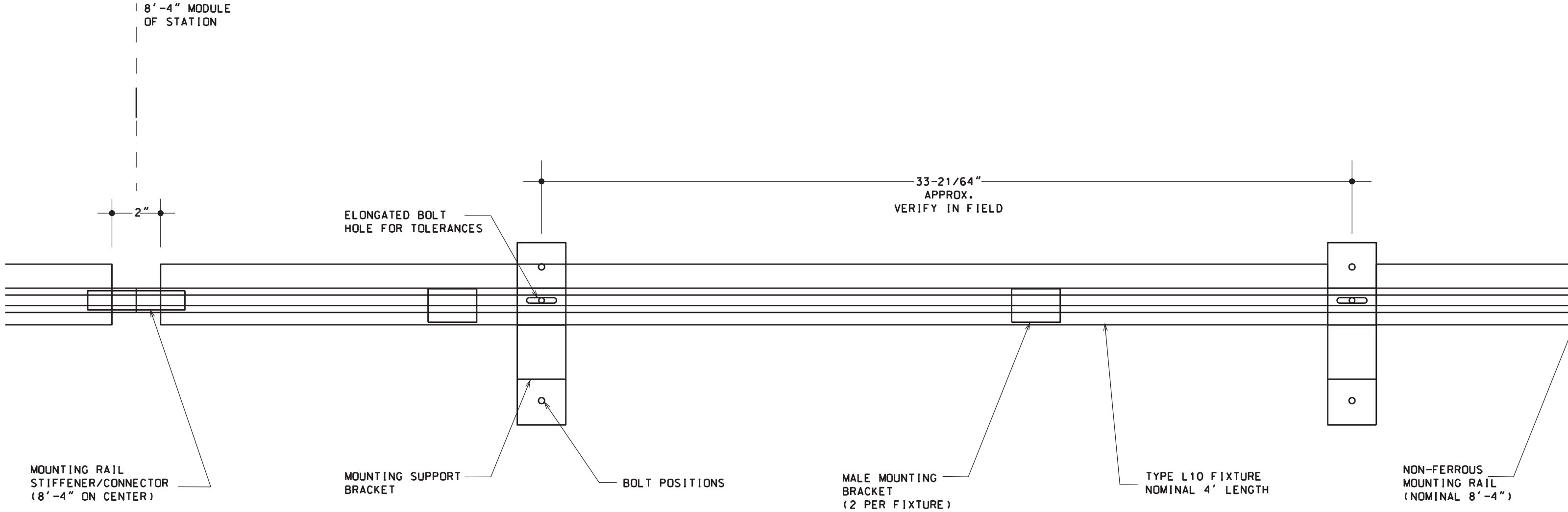
SCALE = ONE TWELFTH FULL SIZE

L10



SCALE = FULL SIZE

L10 (section)



ALL MOUNTING ELEMENTS
AND LIGHTING SYSTEM
MUST FIT INTO EXISTING
8'-4" MODULE

SCALE = ONE QUARTER FULL SIZE

L10 (elevation)

FIXTURE TYPE LW

Type LW is a nominal 4'-long, minimum-profile, industrial, IP66, linear LED upright that is mounted in split platform central trackbed trough for uplighting the train room vault. Type LW has a clean beam of 60° x 60°. It's nominal dimensions are 2.75" wide x 3.5" high x 4' long. Type LW is mounted continuously, spaced evenly around the 8'-4" module of the stations as shown on the drawings.

For mounting details, please see architectural drawings.

Type LW shall be rated IP66 and be suitable for wet locations. It shall be constructed of low-copper, die-cast, marine-grade extruded aluminum with isolated stainless steel fasteners. The fixture must be able to withstand 4000 psi, or approximately the pressure of a garden hose. The lens shall be made of clear, tempered glass (silicate) so as to repel brake dust.

The finish of the light fittings must be electro-statically applied polyester powder coat. The end caps must be machined aluminum and gasketed. All hardware for the fittings must be made from corrosion-proof stainless steel. There shall be no tools required for moving the fixtures. The fixture housing shall contain no visible bolts or screws.

The mounting system is such that it does not matter where the support brackets are. This is accomplished by installing support brackets and then installing a non-ferrous mounting rail to the brackets. The keyed mounting hardware is then put into the track and arranged so the fixtures can be located as shown in the plans.

The cable entry to the fitting must be fitted with a submersible cable gland. The fitting shall also allow thru wiring.

The light fittings shall have 60 x 60 degree optics and shall provide a continuous wash of light without any striations or dark spots on the fin either within a single beam angle or between fittings.

The LED used for this tube shall be of the highest quality and apparently consistent in color and brightness to the eye. The electronics shall be per the specification of the highest grade, maintaining the LEDs at their proper junction temperature. The final color for the LEDs shall be 3000K. Fixture is to be driven at lowest possible amperage to conserve in wattage consumption.

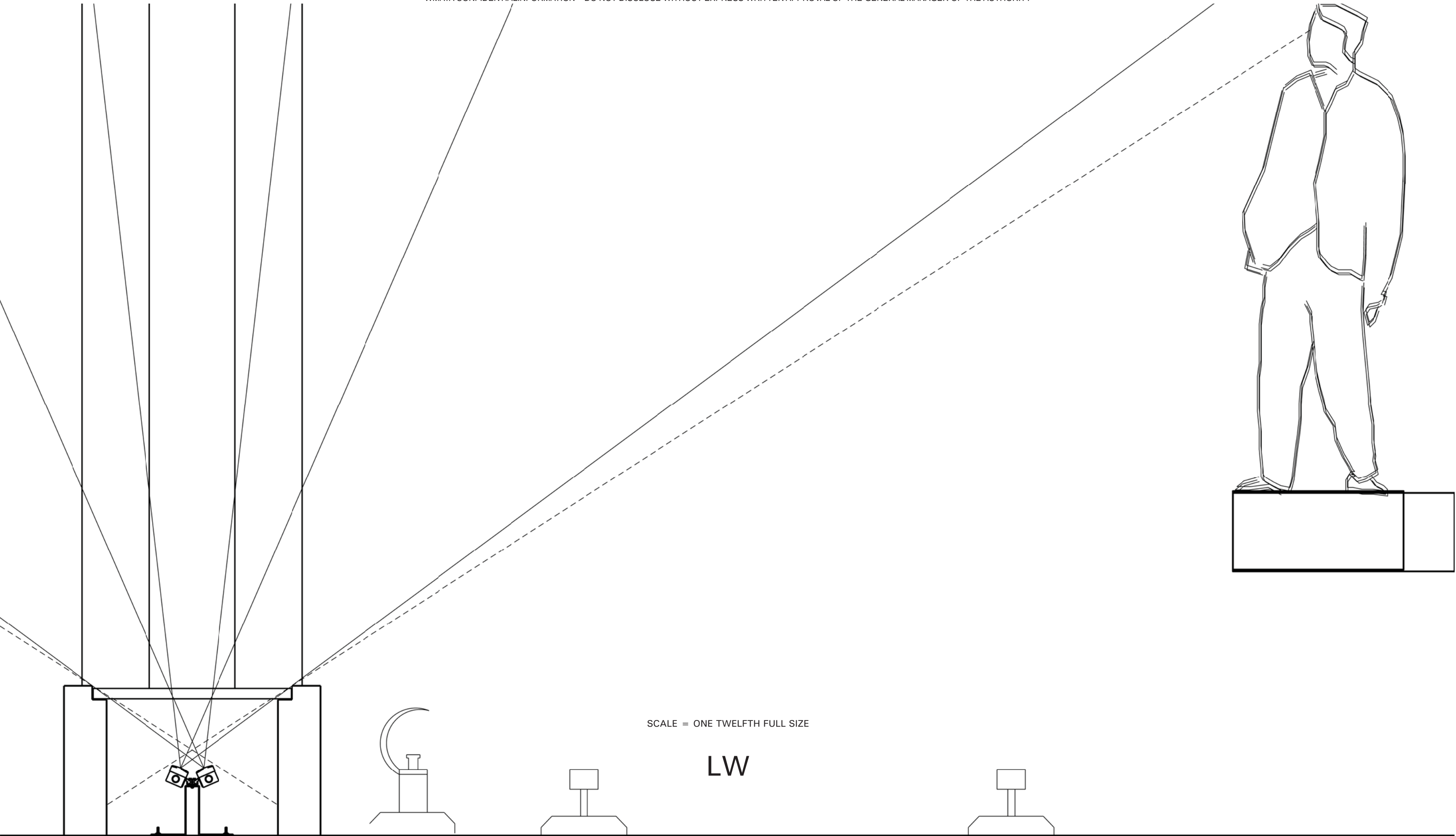
Fixture must be mocked up to verify optics, tilt and power of fixture.

The fixture should have a Center Beam Candle Power of 3,200. If the fixture is 10ft away from a wall, the brightness of the wall shall measure no less than 14fc 5ft away from the center of the fixture.

Type LW shall produce a minimum of 1680 delivered lumens per foot within the beam angle.

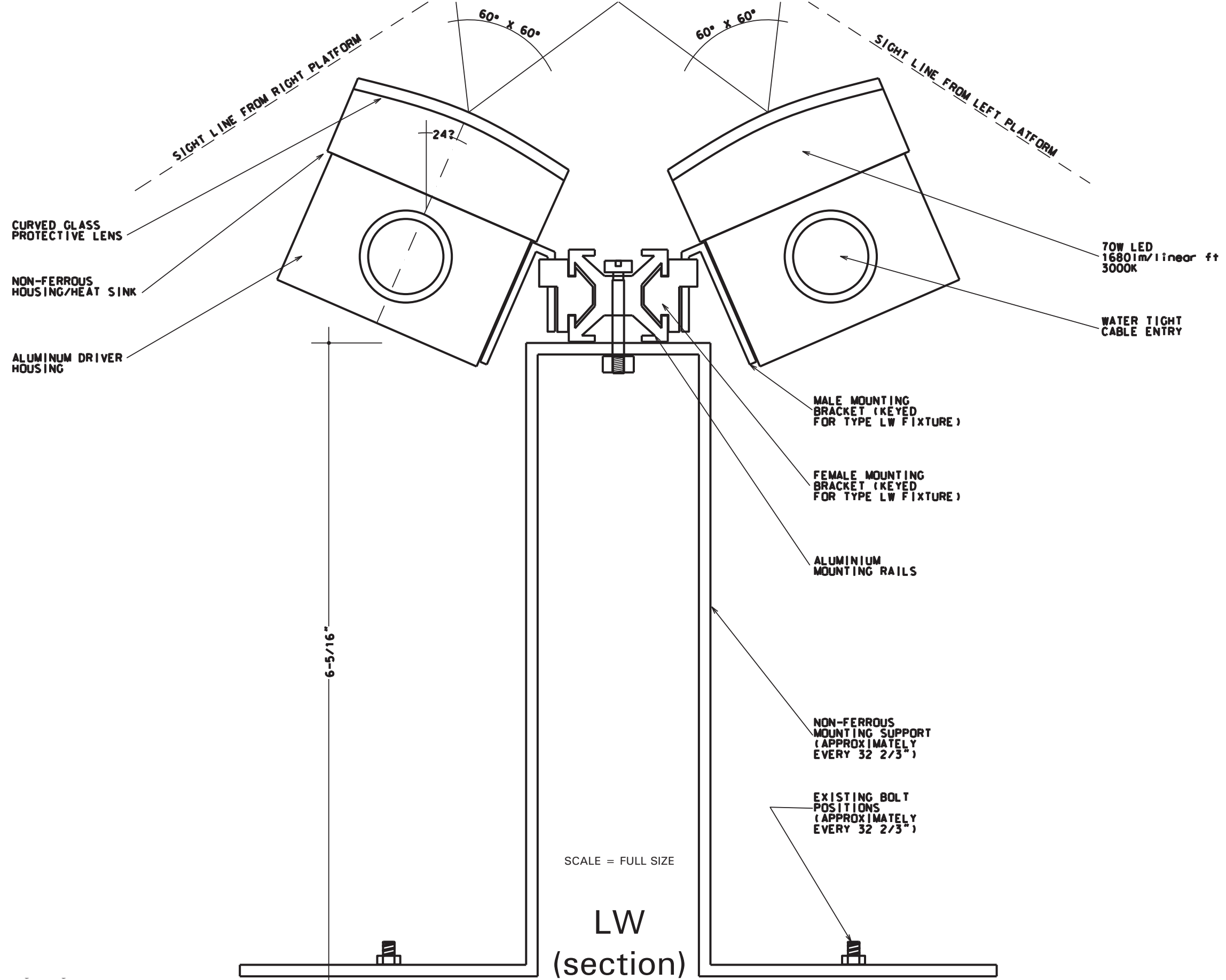
Lamp:

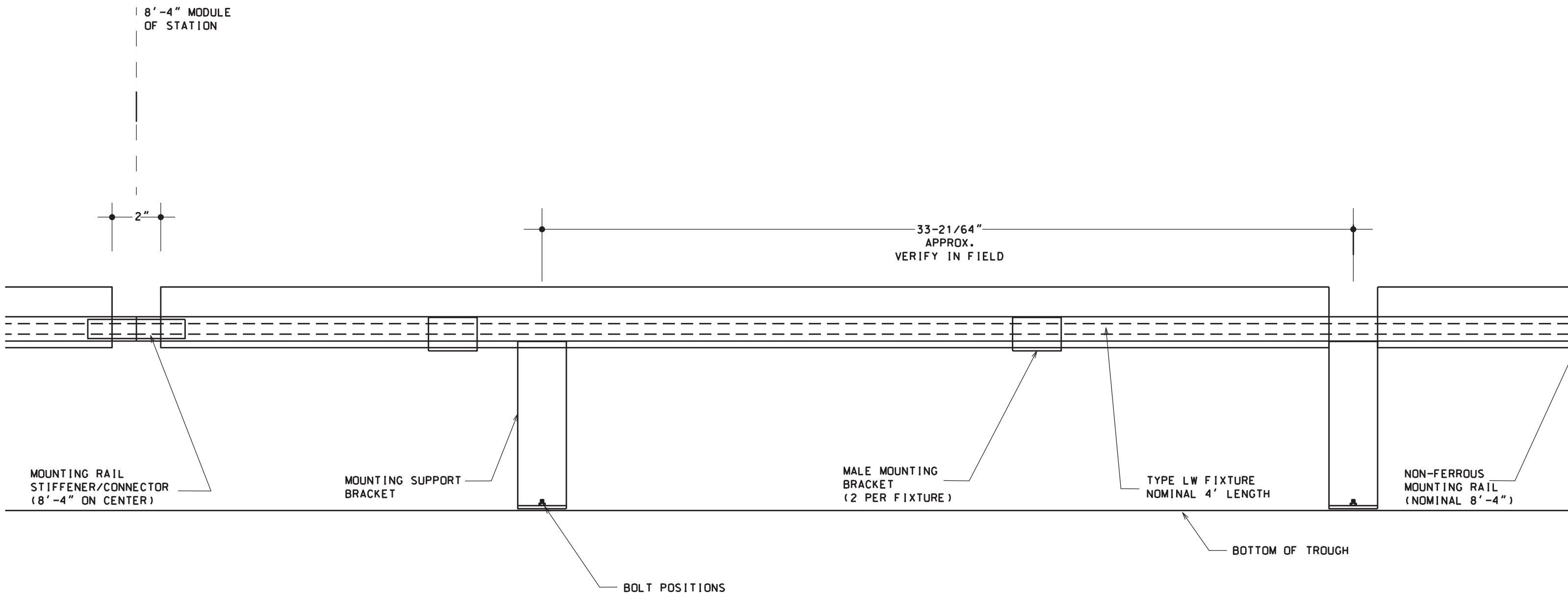
- 17.5W/ft LED
- 1680 delivered lumens/ft
- 60° x 60° optics



SCALE = ONE TWELFTH FULL SIZE

LW





MOUNTING RAIL
STIFFENER/CONNECTOR
(8'-4" ON CENTER)

MOUNTING SUPPORT
BRACKET

MALE MOUNTING
BRACKET
(2 PER FIXTURE)

TYPE LW FIXTURE
NOMINAL 4' LENGTH

NON-FERROUS
MOUNTING RAIL
(NOMINAL 8'-4")

BOTTOM OF TROUGH

BOLT POSITIONS

ALL MOUNTING ELEMENTS
AND LIGHTING SYSTEM
MUST FIT INTO EXISTING
8'-4" MODULE

SCALE = ONE QUARTER FULL SIZE

LW (elevation)