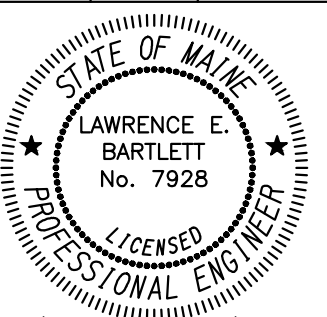


23. Lighting Compliance with City Ordinances, General Summary, Assessment, and Cut Sheets

Lighting Compliance

The lighting on this site has been analyzed previously. This project will make one change by moving a high-mast light from the Northern section of the lot to where the Maintenance Building is being removed. The attached photometrics plan has been updated to reflect this change, and the supporting information regarding technical details of the lights have been brought forward from the analysis completed for the previous project.

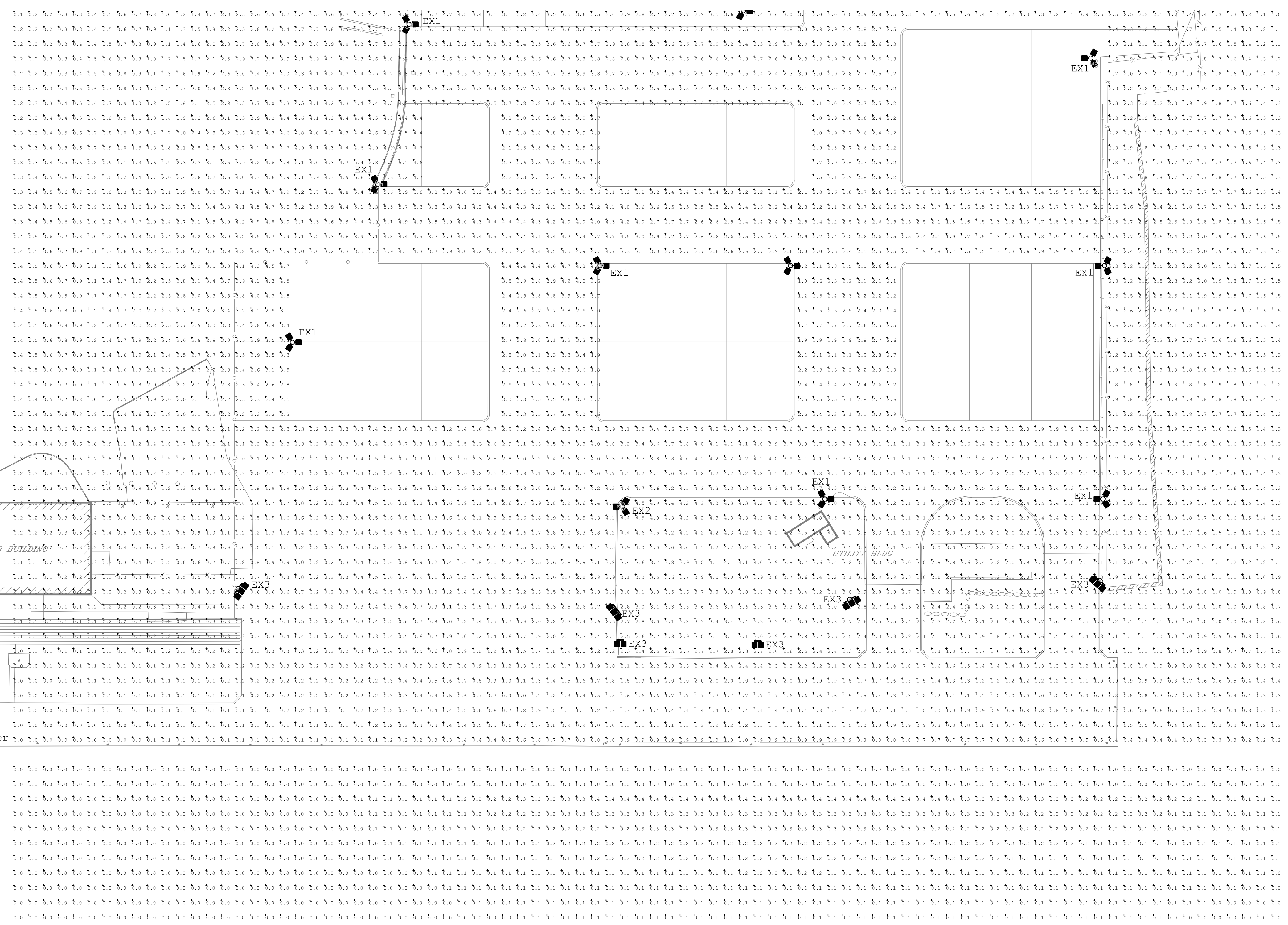


Lawrence E. Bartlett
 SIGNATURE
 P.E. NUMBER 7928
 DATE 1/10/2018

PROJ. MANAGER	DATE	BY	DESIGN-DETAILED	CHECKED-REVIEWED	DESIGN-DETAILED	DESIGN-DETAILED	REVISIONS 1	REVISIONS 2	REVISIONS 3	REVISIONS 4	FIELD CHANGES
CRAIG R. MORIN	1/10/18	LEB	-	-	-	-	-	-	-	-	-

PORTLAND INTERNATIONAL MARINE TERMINAL
 MARINE INTERMODAL PORT PRODUCTIVITY
 WHARF INFILL & BUILDING REMOVAL
 PORTLAND CUMBERLAND COUNTY
 SITE LIGHTING CALCULATION

SHEET NUMBER
E03
 OF



LIGHTING FIXTURES

- TYPE EX1 EXISTING 60-FOOT TALL HI-MAST LIGHT POLE TO REMAIN.
- TYPE EX2 EXISTING 60-FOOT TALL HI-MAST LIGHT POLE TO BE RELOCATED TO LOCATION AS SHOWN.
- TYPE EX3 EXISTING 35-FOOT TALL FLOODLIGHT POLE TO BE REMOVED.

SITE LIGHTING ILLUMINANCE CALCULATION PLAN

SCALE: 1" = 40'-0"

CALCULATED ILLUMINANCE IN FOOTCANDLES INDICATED AT GRADE
 ILLUMINANCE VALUES SHOWN BEYOND THE PIER ARE CALCULATED AT THE MEAN HIGH WATER ELEVATION 10 FEET BELOW THE PIER DECK.

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PIER LIGHTING

The existing pier is presently lit by means of floodlight luminaires that are mounted to the face of the existing terminal building, as well as floodlights that are pole mounted (see Fig. 1). There are eight building mounted floodlights that utilize 400 watt high pressure sodium lamps and are installed at a height of approximately 25 feet above the pier (see Fig. 2). Additionally, there are two lighting poles that are approximately 60 feet in height at the east end of the pier. These lighting poles each include four luminaires that are aimed at the pier and at the east pier ramps (see Fig. 3).

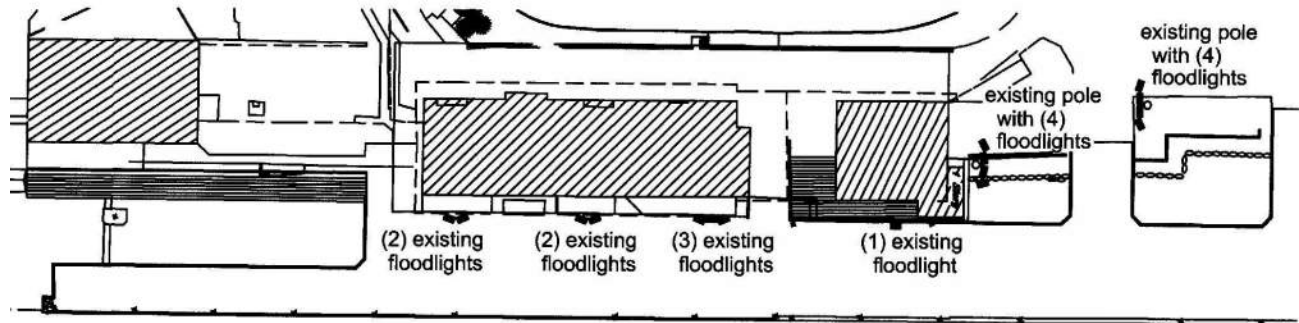


Fig. 1: Existing Pier Lighting Plan



Fig. 2: Existing Building Mounted Pier Floodlights

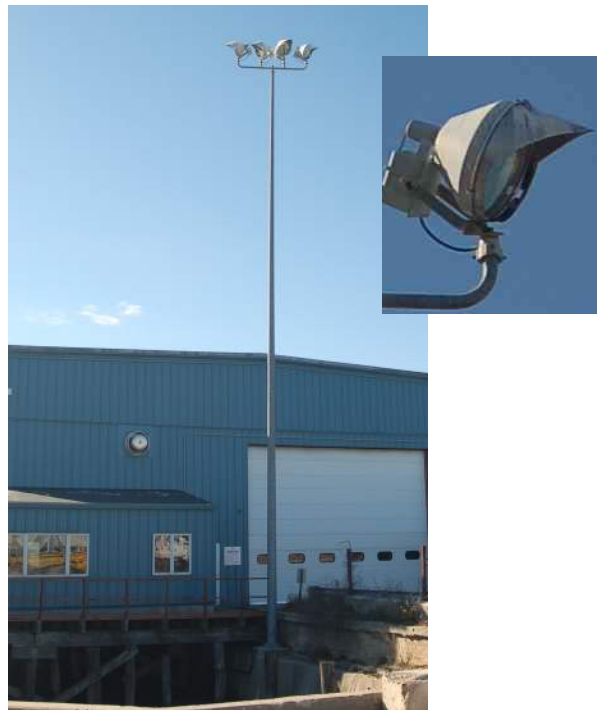


Fig. 3: Existing pole Mounted Pier Floodlights

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The proposed new pier lighting is intended to provide illumination to meet the task requirements across the length of the main area of the pier where loading and unloading tasks occur. An emphasis has been placed on providing proper lighting levels to promote nighttime safety for workers. An additional lighting design priority is that of control of astronomic light pollution and control of spill light beyond the pier surface.

To meet the design objectives, the following lighting system parameters have been established:

- Provide a maintained average illuminance at the pier deck of at least 3.0 footcandles.
- Provide a minimum illuminance level at the pier deck of at least 1.0 footcandles.
- Provide a white light source to best facilitate visual tasks.
- Limit the mounting heights of building mounted floodlights to that which presently exists (approximately 25 feet).
- Reduce the height of pole mounted floodlights from the existing 60 foot height to no more than 40 feet.
- Provide top and side shielding for all floodlights for brightness control.

The proposed floodlights have been selected to utilize 400 watt pulse start metal halide lamps. The floodlights will be equipped with top and side shielding visors to control luminaire brightness (see Fig. 4).



Fig. 4: Proposed Pier Floodlight

The floodlights that will be installed on the building will be mounted on the canopy face with stand-off wall brackets (see Fig. 5). The floodlights that will be installed on lighting poles will be mounted on multi-arm brackets (see Fig. 6). Floodlight poles will be 35-foot round tapered steel to be installed on concrete bases that project 36-inches above grade.

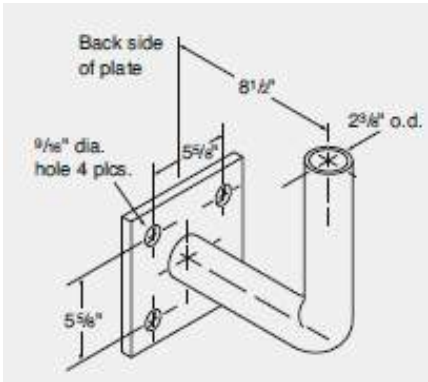


Fig. 5: Wall Mounted Floodlight Bracket

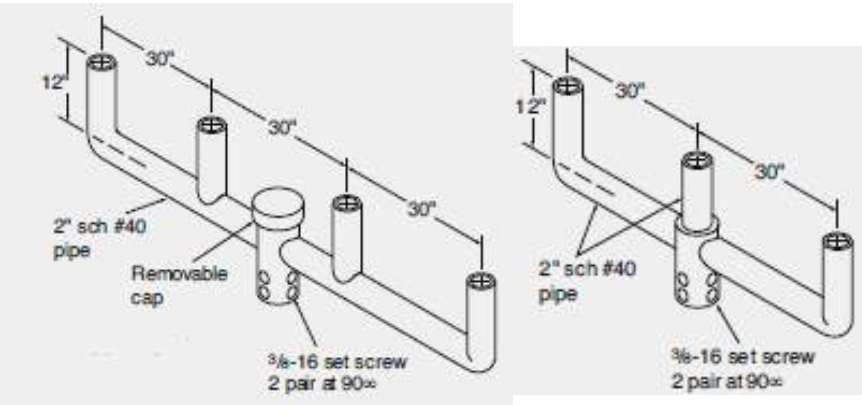


Fig. 6: Pole Mounted Floodlight Brackets

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The proposed pier lighting is shown on Lighting Calculation Plans E0A and E0B. The plan includes three new lighting poles, one to be installed at the west end of the pier, and the remaining two poles to be installed at the east end of the pier. Mounted on the building will be three arrays of floodlights with two locations having two floodlights each, and the third location having three floodlights. The pier lighting pole designation FL1 will include four (4) floodlights. The pier lighting pole designation FL4 will include three (3) floodlights. The pier lighting that will be installed on the building will consist of a group of three (3) floodlights (designation FL2), and a group of two (2) floodlights (designation FL3).

Type: Pier Floodlights

Description: Floodlight with wide horizontal optical distribution. Luminaire shall be rated for outdoor marine environments and shall be equipped with top and side shielding visors. Luminaire color shall be grey.

Lamp: (1) M400/PS/U

Manufacturers: *Holophane Lighting* # PF-40LPH-MT-L-N-1-G-A-D-

Type: Floodlight Wall Bracket

Description: Surface wall bracket with 2-inch slip fitter and 2-3/8" tenon. Height of Tenon shall be sufficient to install fixture at 25 feet above pier deck. Bracket shall be hot dipped galvanized.

Manufacturers: *Holophane Lighting* # BKT-1-P

Type: Floodlight Pole Bracket

Description: Multi-arm bracket assembly with 2-inch slip fitters and 2-3/8" tenon. Bracket shall be hot dipped galvanized.

Manufacturers: *Holophane Lighting* # BKT-24-P (4-arm bracket)
BKT-20-P (3-arm bracket)

Type: Floodlight Poles

Description: 35-foot round tapered steel pole with hot dipped galvanized finish. Pole shall be installed on a 24-inch diameter concrete foundation base with a raised section that extends 36-inches above grade.

Manufacturers: *Holophane Lighting* # RTS3595B-P6-ND-HG-2

SITE LIGHTING

The existing site is presently lighted by means of high mast lighting poles that are 100 feet tall, as well as poles with single post-top luminaires (see Fig. 7). One of the high mast poles (designation A) includes nine (9) high mast luminaires that utilize 1000-watt high pressure sodium lamps (see Fig. 8). The second high mast pole (designation B) includes eight floodlights that utilize 1000 watt high pressure sodium lamps (see Fig. 8). The post-top luminaires (designation C) also utilize high pressure sodium lamps and are mounted on poles that are approximately 30 feet in height (see Fig. 9).

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Fig. 7: Existing Site Lighting



Fig. 8: High Mast Pole



Fig. 9: High Mast Pole



Fig. 10: Pole-Top Light

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The *Illuminating Engineering Society of North America (IESNA)* publishes recommendations for illumination levels for active pier freight areas. The ninth edition of the *IESNA Lighting Handbook* includes a recommended maintained horizontal illuminance level of 5.0 footcandles at grade for such areas. Additionally, although not a governing standard, the *U.S. Army Corps of Engineers* publishes a recommended illuminance level of 5.0 maintained horizontal footcandles at grade for container storage depots in their *Engineering Manual 1110-1-150*.

While a vast majority of existing lighting fixtures at container storage yards utilize high pressure sodium lamps (which emit an orange-color light), it has been decided by the local port authority to provide a combination of light fixtures that will utilize both metal halide lamps (which emit a white color light) as well as high pressure sodium lamps. The proposed area lighting design therefore consist of lighting poles that each have three light fixtures, two of which will utilize 1000-watt metal halide lamps, and the third which will utilize a 400-watt high pressure sodium lamp.

The human eye is most sensitive to the portion of the electromagnetic spectrum that contains white light. This results in an increased ability to see under metal halide lamps than under high pressure sodium lamps. With a majority of the light being provided as white light, the design target illuminance for the Portland site has been established at 4.0 footcandles, which is 80% of that which is normally sought under high pressure sodium lighting. It is felt that the reduction in lighting level will be desirable in consideration of neighboring properties, while at the same time will still provide for personnel safety given the largely white light appearance.

The storage plan for containers on site is to accommodate stacked containers in three-high arrangement. This will result in an overall height of containers of about 30 feet. The general site lighting must be designed to deliver adequate illumination between container stacks, which sets a minimum acceptable pole height. The standard height for container yard lighting poles is 100 feet, which is the height of the existing site lighting poles. In deference to the neighbors, it has been decided that the pole height should be kept to an absolute minimum to assure proper lighting without creating unnecessary visual distraction off site. Accordingly, the proposed lighting design calls for site lighting poles that are 60 feet in height.

In a further attempt to limit luminaire brightness, the proposed site lighting fixtures are classified as having cut-off optical distribution (see Fig. 11). This means that, unlike the existing site lighting fixtures, the proposed lights will not emit light horizontally or at angle above the horizontal.



Fig. 11: Proposed Container Yard Site Light

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The proposed site lighting is shown on Lighting Calculation Plans E0A and E0B. The plan includes eight (8) new lighting poles (designation S1), each with three lighting fixtures. The proposed lighting also includes four (4) additional new lighting poles (designation S2) that are identical to the Type S1 poles except that the luminaires will have side shields to minimize spill light onto the adjacent property. The two luminaires on each pole that will utilize 1000-watt metal halide lamps will be normally off and will only be used during nighttime periods of container loading and unloading. The third luminaire on each pole that utilizes a 400-watt high pressure sodium lamp will operate each evening from dusk until dawn, serving as a means of security lighting.

In addition to the general site lighting poles, the proposed lighting plan also includes two shorter area lighting poles at the new office building (designation S3). These poles are 20-feet in height and they each have a single luminaire that utilizes a 150-watt high pressure sodium lamp (see Fig. 12). These luminaires are also classified as having a cut-off optical distribution.



Fig. 12: Proposed Office Building Site Light

Type: Type S1 Area Lights – Metal Halide

Description: High mast area light with symmetrical reflector and flat glass diffuser.

Lamp: (1) M1000/U/BT37

Manufacturers: *Holophane Lighting* # HMAOC10MP48S9

Type: Type S1 Area Lights – High Pressure Sodium

Description: High mast area light with symmetrical reflector and flat glass diffuser.

Lamp: (1) LU400/ECO

Manufacturers: *Holophane Lighting* # HMAO400HP48J7

Type: Type S2 Area Lights – Metal Halide

Description: Identical to Type S1 except with 180 degree shield.

Lamp: (1) M1000/U/BT37

Manufacturers: *Holophane Lighting* # HMAOC10MP48S9 sd-395-180

Type: Type S2 Area Lights – High Pressure Sodium

Description: Identical to Type S1 except with 180 degree shield.

Lamp: (1) LU400/ECO

Manufacturers: *Holophane Lighting* # HMAO400HP48J7 sd-395-180

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Type: **Type S1/S2 Lighting Pole**

Description: 60-foot steel high mast pole with lowering device.

Manufacturers: *Holophane Lighting # 10 2 4 HMR 1M K 060 NS 1 5 /
PLMS 60 100 HG AB-H060AH01*

Type: **Type S3 Area Lights**

Description: Area light with Type III reflector and flat glass diffuser.

Lamp: (1) LU150/100

Manufacturers: *Holophane Lighting # G250HP12LWF*

Submitted on Lighting Calculation sheets E0A and E0B are calculated maintained horizontal illuminance at grade in footcandles for the proposed lighting. Calculations have been prepared with the use of computer modeling as developed by AGi Ver 2.02.

The illuminance levels for the proposed lighting design are calculated to be as follows:

All Luminaires in Use – Container Yard

- Average – 3.96 footcandles
- Maximum – 7.6 footcandles
- Minimum – 0.8 footcandles

Security Luminaires only in Use – Container Yard

- Average – 0.86 footcandles
- Maximum – 2.9 footcandles
- Minimum – 0.2 footcandles

All Luminaires in Use – Pier

- Average – 3.10 footcandles
- Maximum – 7.9 footcandles
- Minimum – 1.0 footcandles