

Appendix 6

Lighting Report

**SEASPAN VANCOUVER DRYDOCK
WATERLOT EXPANSION**

LIGHTING DESIGN & REPORT

Issued: 6th April 2021

1.0 SUMMARY

Poorly designed shipyard lighting can provide an unsafe work environment for employee's and a source of irritation to adjacent property owners. This report identifies, within the scope of the proposed waterlot expansion, a design that meets recognized safe lighting practices in a location that eliminates light pollution to passing vessels and adjacent properties.

2.0 INTRODUCTION

RFT Engineering Ltd. have been retained by Seaspan ULC as part of the proposed waterlot expansion project team to design fixed position area lighting to support the movement of people and equipment on the new work pontoon, new floodlighting to support berthing and access to ships and barges on the north side of the pontoon, and produce a report identifying the implication of these on the site and surrounding properties.

3.0 PROJECT OVERVIEW

Seaspan is looking to consolidate ship repair activities at the Vancouver Drydock and is proposing to add new infrastructure to better accommodate and service smaller vessels.

The proposed waterlot expansion project involves the installation of a new work pontoon and two additional drydocks on the west side of the existing deep-water outfitting pier.

Currently a Panamax drydock is permanently moored to the east side of the pier, and a self-contained drydock, the Seaspan Careen is moored to the west side of the pier. The Seaspan Careen will be moved approximately 40m to the south to accommodate the new pontoon and drydocks.

The large Panamax, relocated Careen and the two new drydocks are shown on the plan below, together with the location of the proposed work pontoon.



4.0 SCOPE OF WORK

There will be no changes or additions to the existing floodlighting installation on shore.

The deep-water outfitting pier has an 85T crane which travels the full length of the pier, and as such there is no lighting mounted to the pier, and no new lighting proposed.

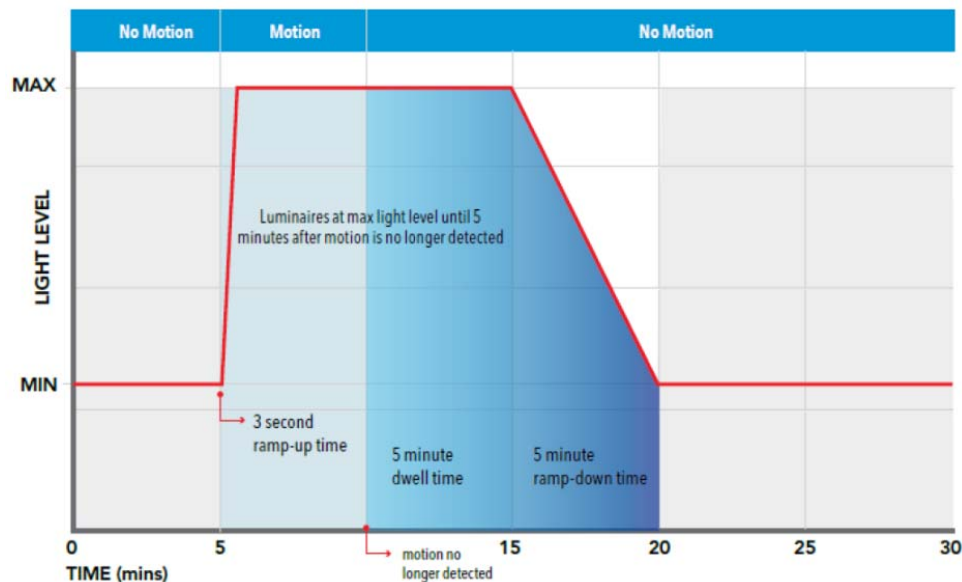
All existing and proposed new drydocks have lighting to support operation and work being carried out on vessels held in drydock. No additional lighting is being proposed for the drydocks.

Six 10.7m / 35ft square section light poles will be installed along the north side of the new work pontoon. At the top of each pole, facing south, will be mounted a fixed position dark sky friendly area light to illuminate the pontoon and the access ramps to the three drydocks. At the top of each pole facing north, will be mounted an identical light at a 30 deg. tilt, to provide floodlighting to support the berthing and installation of access walkways to vessels moored to the north side of the new work pontoon.

AREA LIGHTS

The area lights will be controlled by photocells for on/off control and will be fitted with a motion sensor on the underside to dim the lights when no motion is detected. See 'Motion Sensor Function' diagram below. The area lights will provide a minimum maintained average illuminance of 5 foot-candles on the work pontoon in accordance with Occupational Safety and Health Administration safe lighting practices and the IES recommended lighting level for shipyards and docks - general landside areas. See 'OSHA Fact Sheet Table' and 'Photometric plot' below.

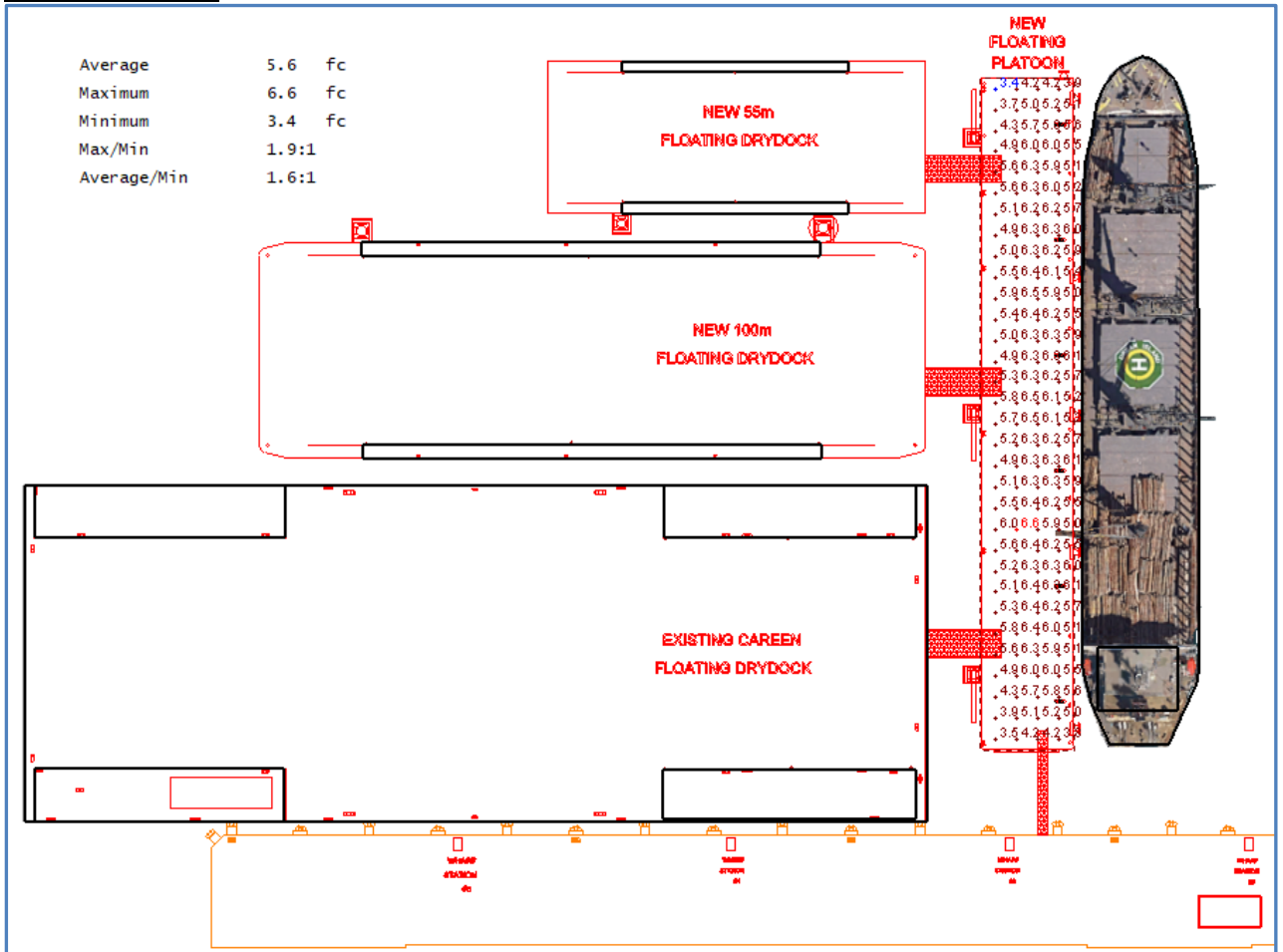
Motion Sensor Function



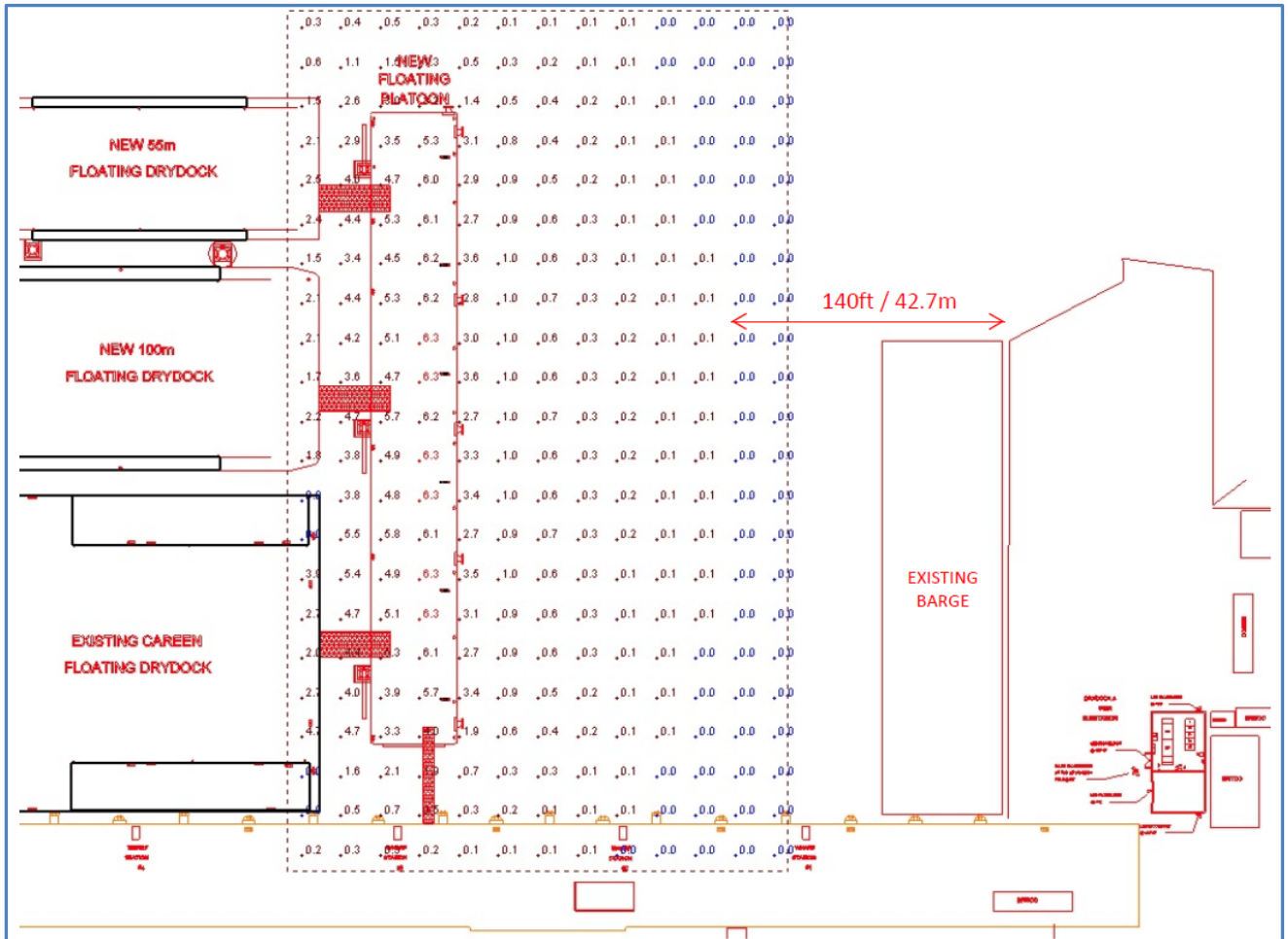
OSHA Fact Sheet Table

Lumens (foot-candles)	3	5	10	30
Areas of Operation	General areas on vessels and vessel sections such as: <ul style="list-style-type: none"> Accessways Exits Gangways Stairs Walkways 	General landside areas such as: <ul style="list-style-type: none"> Corridors Exits Stairs Walkways 	Landside work areas such as: <ul style="list-style-type: none"> Machine shops Electrical equipment rooms Carpenter shops Lofts Tool rooms Warehouses Outdoor work areas 	First-aid stations
		Landside tunnels, shafts, vaults, pumping stations, and underground work areas		Health and sanitation facilities such as: <ul style="list-style-type: none"> Changing rooms Showers Sewered toilets Eating or drinking areas Break areas
		All assigned work areas on any vessel or vessel section	Offices	

Photometric Plot



To see what effect the new area lights have on the existing site and surrounding properties, the photometric plot area can be expanded to determine where the lighting fall-off occurs, as shown by a 0.0 reading. Regarding glare, the lights are horizontal, full cut-off dark sky friendly style which produces no glare forward to passing vessels, and no glare backwards towards the site and surrounding properties. The expanded photometric plot is shown below and indicates that light fall-off occurs approximately 140 ft / 42.7m away from the existing wharf.

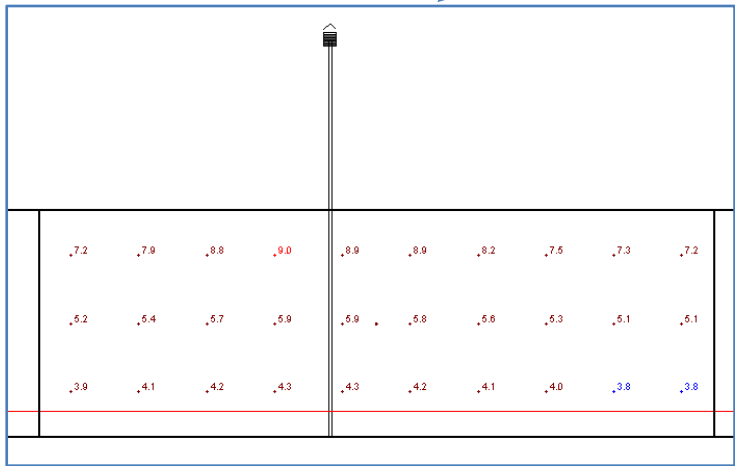
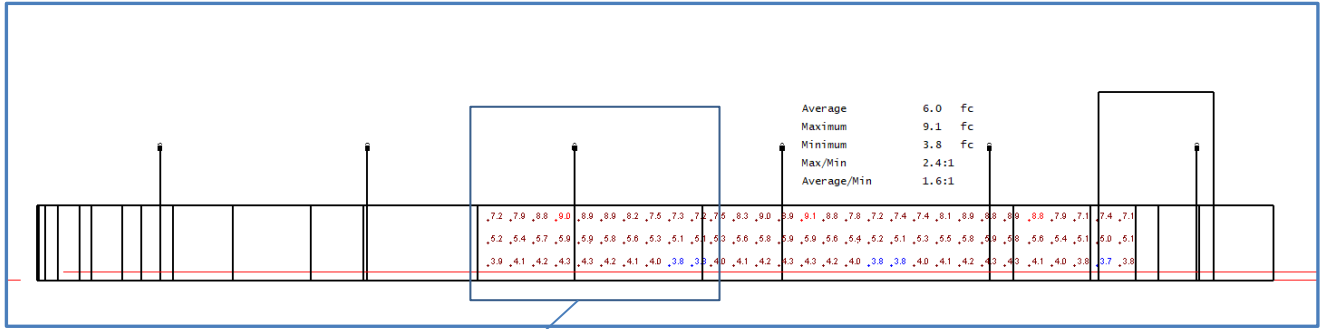


FLOODLIGHTING

The floodlights will only be used when a vessel can be repaired without entering a drydock. When this is the case the vessel will be moored to the north side of the new work pontoon.

The floodlights will be manually switched on/off at the base of each light pole. No photocell will be employed. Each light will be fitted with a motion sensor on the underside to dim the lights when no motion is detected. See 'Motion Sensor Function' diagram above.

A photometric plot, in plan, with all lights switched on, and a 326 ft. / 100m log transport vessel berthed, is shown below. The vessel acts as a shield to light pollution to the north towards the site and any other premises. A surface photometric plot on the side of the vessel is also shown to indicate the illumination levels which are an average of 5.5 foot-candles.

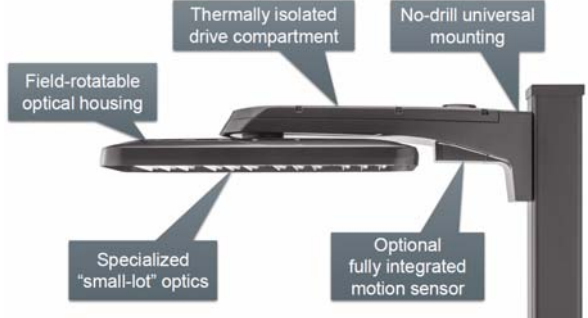


PROPOSED LIGHTS

Lithonia KAX LED Size 2



KAX2 LED Area



- Thermally isolated drive compartment
- No-drill universal mounting
- Field-rotatable optical housing
- Specialized "small-lot" optics
- Optional fully integrated motion sensor

The KAX LED area luminaires have an optional tilt arm that allows the light engine housing to tilt up to 80 degrees.





motion sensor

5.0 CONCLUSION

The lights proposed for the work pontoon will provide lighting levels to meet OSHA and IESNA requirements without affecting passing vessels in the inner harbour, without affecting existing lighting levels on-shore at the site, and without affecting adjacent properties.