

# LIGHTING

## Project & Environmental Review – Berth 2 Shiploader Replacement

### Neptune Bulk Terminals Ltd.

**PBX Engineering Ltd.**

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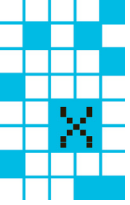
Permit to Practice Number: 1000208

Prepared by: PBX Engineering

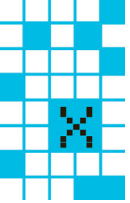
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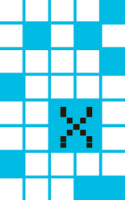


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# 1 Executive Summary

Neptune Bulk Terminals Canada Limited or “NBT”, is a bulk shipping terminal located on the north shore of the Burrard Inlet in the Port of Vancouver. From the terminal in North Vancouver (the Facility), NBT handles potash from Saskatchewan and steelmaking coal from B.C. and Alberta.

NBT is replacing the two existing 54-year-old potash ship loaders on Berth #2, as well as the associated conveying systems and the potash dumper #2 as the equipment is nearing their end of service life.

This report provides an overview of the requirements, conceptual design, and considerations for the exterior lighting design and installation proposed for the Berth 2 Shiploader Replacement project (the Project) at Neptune Bulk Terminals Ltd. (the Facility). The purpose of this report is to outline how the proposed lighting design will provide safety, security, and productivity through appropriate light levels as per applicable standards, guidelines, and facility-specific requirements.

In addition to providing sufficient illumination, light fixtures will be specified, installed, and located such that project areas are not over-lit, and to also minimize any negative impacts, such as glare and light spill, to any adjacent properties or areas outside of the project. All light fixtures will be energy-efficient LEDs to minimize energy consumption. Interior lighting of the Project is outside the scope of this report.

# 2 Criteria

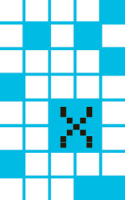
The site must be sufficiently illuminated to provide safe working conditions and security, and meet, as a minimum, the applicable requirements set out by the Canadian Occupational Health and Safety Regulations (SOR/86-304), with considerations of the requirements of WorkSafe BC (G4.65). Additionally, best practice design standards such as the Illuminating Engineering Society of North America provide industry-adopted guidelines. Further considerations for light fixture specifications and layouts include minimizing over-lighting and obtrusive light (refer to Section 2.5).

## 2.1 Standards

The following table outlines the applicable codes, standards, and guidelines used for the purposes of establishing the project lighting design criteria.

**Table 1: Relevant Codes/Standards/Guidelines**

Title	Section
Canadian Electrical Code (CEC)	CSA C22.1:18
Illuminating Engineering Society of North America	IES RP-7-17 Industrial Facilities
International Commission on Illumination	CIE 150:2003 Guide on the Limitation of Effects of Obstructive Light from Outdoor Lighting Installations
Occupational Health and Safety Regulations (COHSR)	SOR/86-304 Part VI Lighting: Schedule 2 Lighting Levels on Industrial Areas
Transportation Association of Canada (TAC) Guidelines	TAC Guide for the Design of Roadway Lighting
WorkSafeBC	Illumination Levels – Section 4.65



In review of Canadian Occupation Health and Safety Regulations compared to WorkSafe BC, it was determined that WorkSafe BC includes higher minimum illumination levels for several of the project areas listed in Table 2 in this report (Lighting Level Zones) compared to Canadian Occupation Health and Safety Regulations. This discrepancy is primarily due to Table 4-1: Illumination Levels for Task Categories from WorkSafe BC containing fewer “Task Categories” compared to the number of “Task Position or Areas” defined in Canadian Occupation Health and Safety Regulations.

The codes, standards, and guidelines noted above overlap in certain areas, and each have their own intended purpose. For this technical report and the site lighting design for the Project, the Canada Occupational Health and Safety Regulations will be used as the governing reference as it applies to the working areas of the terminal, is a federally mandated requirement document, and the Terminal falls under federal jurisdiction.

## 2.2 Design Considerations

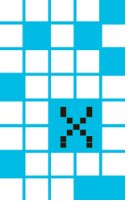
Sufficient outdoor lighting will be provided throughout construction and operation to ensure the facility is operated in a safe, secure, and efficient manner. The lighting will be designed such that it provides a light distribution that is appropriate to the context and environment without compromising safety and security and minimizing harsh contrasts in colour and lighting levels. The lighting will be comprised of LED fixtures with matching colour temperatures for all fixtures. The following are additional site-specific considerations for the Project:

- Conveyor and equipment walkways will be illuminated for safety of personnel. Fixtures located along handrails will direct light to the grated walking areas only.
- The end of the loader spout must be visible at night and will be illuminated by an array of fixtures on the end of the shiploader boom above the spout. These fixtures will only be turned on during shiploading operations.
- The shiploader travels on rails and will have illumination near its wheel areas for the safety of personnel. Shiploader lighting will be mounted to direct light downward and prevent light pollution. Fixtures will be mounted above the wheels to provide illumination at the wheels for worker safety.
- Drive and motor areas will have sufficient illumination to facilitate regular maintenance activities.

## 2.3 Lighting Levels

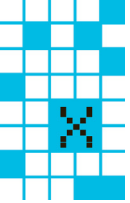
The proposed project area must be sufficiently illuminated to provide safe working conditions, security, and meet the minimum requirements of the Canadian Occupational Health and Safety Regulations. Additionally, the lighting characteristics set out in the IES standard will be referenced as a best-practice guideline for the lighting design.

In addition to the minimum light levels listed in Table 1, various areas within the Project include motors and moving equipment in locations accessible to workers. The minimum illuminance in those areas will be 100 lux as per Canada Occupational Health and Safety Regulations (SOR/86) PART VI Lighting: Schedule 2 item 5)(c)(i). Areas with motors or moving equipment have been identified in the Preliminary Lighting Plans in Appendix B. Note that not all of these areas have been shown yet as they will depend on the final equipment design and configuration.



**Table 2: Lighting Zone Levels**

Area	Ave. Illuminance at 1m (lux)	Min. Illuminance at 1m (lux)	COHSR Reference SOR/86-304
<b>Conveyor 8</b>			
Drive Motor and Surge Bin Platform	100	33.3	6.5, 5(c)(i)
Stairs along Conveyor	50	16.7	6.5, 6(a)(ii)
Walkways along Conveyor	30	10.0	6.5, 6(e)(ii)
<b>Conveyor 242</b>			
Drive Motor Platform	100	33.3	6.5, 5(c)(i)
Stairs along Conveyor	50	16.7	6.5, 6(a)(ii)
Walkways along Conveyor	30	10.0	6.5, 6(e)(ii)
Take-Up Area	100	33.3	6.5, 5(c)(i)
<b>Conveyor 243</b>			
Drive Motor Platform	100	33.3	6.5, 5(c)(i)
Walkways along Conveyor	30	10.0	6.5, 6(e)(ii)
Take-Up Area (at TT260)	50	16.7	6.5, 5(c)(ii)
<b>Surge Bin and Towers</b>			
Surge Bin Stairs	50	16.7	6.5, 6(a)(ii)
Surge Bin Platforms	30	10.0	6.5, 6(e)(ii)
Scrubber Tower 253, 254 Stairs	50	16.7	6.5, 6(a)(ii)
Scrubber Tower 253, 254 Platforms	30	10.0	6.5, 6(e)(ii)
Transfer Tower 260, 261 Stairs	50	16.7	6.5, 6(a)(i)
<b>Electrical Room</b>			
Outdoor Walkways	100	33.3	6.6, 1(a)(i)
Outdoor Platforms	30	10	6.5, 6(e)(ii)
Outdoor Stairs	50	16.7	6.5, 6(a)(ii)
<b>General</b>			
Spout Storage Tower Stairs	50	16.7	6.5, 6(a)(ii)
Spout Storage Tower Platform	50	16.7	6.5, 6(e)(ii)
Berth 2 Sump Areas	100	33.3	6.5, 5(c)(ii)
Mooring Dolphin Walkways	50	16.7	6.5, 6(e)(i)
Pedestrian Walkways	30	10.0	6.6, 1(b)(i)
Berth 2 Dock Loading Zones	150	50.0	6.5, 3(c)
Roadway	20	6.7	6.6, 1(c)(i)
Auxiliary Areas	50	16.7	6.5, 5(c)(ii)



## 2.4 Computer Simulation

Appropriate illumination will be confirmed with computer simulation via AGI32 software during the detailed design phase. Utilizing light fixture manufacturer provided IES files with models of various project areas, computer simulations will be prepared to ensure appropriate light levels are maintained throughout the project area. The software will also be used to calculate and review the impact of illumination outside the project area (obtrusive light) as well as light pollution.

## 2.5 Obtrusive Lighting

Obtrusive light is unwanted spill light, or light that falls onto the property of others, and because of quantitative, directional, or spectral attributes in a given context, gives rise to discomfort, distraction, or reduction in the ability to see essential information. Obtrusive light is measured in candelas and identifies intensity values of fixtures in a designated direction.

Table 2 identifies the maximum values for intensity of fixtures oriented towards adjacent properties.

Table 3: Obtrusive Lighting Levels

NO.	AREA	LIGHTING ENVIRONMENT	LUMINOUS INTENSITY EMITTED BY LUMINAIRES (POST-CURFEW HOURS) (CANDELAS)
1	Natural	Intrinsically Dark	0
2	Rural	Low District Brightness	500
3	Suburban	Medium District Brightness	1000
4	Urban	High District Brightness	2500

(†)The lighting simulation software AGI32 will be used to simulate the lighting results for the proposed project. This software calculates the Obtrusive Light according to the CIE 150:2003 standard. It should be noted that the CIE 150:2003 has been revised and updated with the CIE 150:2017 version. Since the latest version is not yet included in AGI32, the AGI32 software simulation results will also be compared against the revised CIE 150:2017 standard to confirm that the software simulations meet the requirements outlined in the latest standard.

The obtrusive light levels of the new flood lighting will be reviewed using AGI32 calculations which references the requirements of CIE 150: 2003 “Guide on the limitation of the effects of obtrusive lighting from outdoor lighting installations. The obtrusive light levels in candela will be considered based on requirements for “Medium District Brightness”, which is relevant for suburban industrial areas.

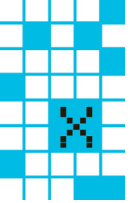
## 3 Design Summary

This section outlines the design considerations for each type of lighting installations used in the project.

### 3.1 Swivel Pole and Fixed Lighting

Excluding the Berth 2 roadway and dock face, all new lighting for the project will be comprised of an enclosed, gasketed, LED fixture suitable for the industrial environment, typically mounted at 2.25m height. The fixtures will be spaced apart to sufficiently meet the light level requirements described in Section 2.2 while minimizing over-lighting.

Some fixtures will be mounted on a swivel-pole, which allows for the light fixture to be easily raised or lowered for maintenance or replacement without the use of a ladder. Typically these fixtures will be mounted around drive areas. The orientation of the light fixture can also be adjusted with the swivel-pole so the light fixture properly illuminates



the intended area. With the swivel-pole assembly, the fixture is mounted facing down horizontally (even on sloped surfaces) so that up-light and light pollution is minimized.

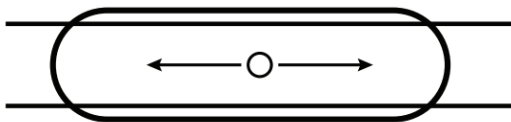
The fixed lighting will be mounted to platform railings, railings along conveyors, and to structural beams with custom mounting brackets. The fixtures will be mounted facing down horizontally (even on sloped conveyor walkways) so that up-light and light pollution is minimized.

The selected swivel pole light fixture, Hazardous Mercmaster LED GEN 3 Series by Appleton (see Appendix D for cutsheet), is available with several different light distributions. Type I distribution is used for walkways. Type I distribution (Figure 1) is a two-way lateral distribution with two principle light concentrations in opposite directions – this reduces both spillover light and the quantity of fixtures needed to achieve sufficient light levels.

The selected fixed fixture, RAB Lighting Design LFX4 LED (See Appendix D for Cutsheet), is available in 2 different wattages. This will allow for an optimized design to reduce both spillover light and quantities of fixture needed to achieve sufficient light levels

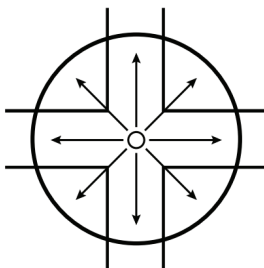
To ensure that light pollution is minimized, the Mercmaster fixture is Dark Sky approved by the International Dark Sky Association.

**Figure 1: Type I Light Distribution**



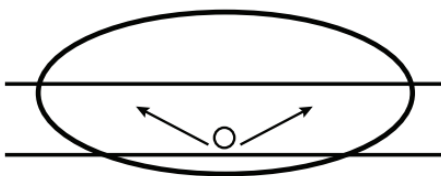
For larger areas, like tower platforms, Type V distribution (Figure 2) is used to evenly distribute light in all directions.

**Figure 2 – Type V distribution**

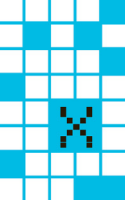


Type IV distribution (Figure 3) is ideal for fixture mounted on or near walls, or on the edge of project areas like platforms, so that light is evenly distributed from angles of 90 to 270 degrees, while minimizing spillover light to the rear.

**Figure 3 – Type IV distribution**







For the preliminary energy consumption calculations in this report swivel pole light fixtures consume 30 watts (W) for walkway installations (Type I distribution) and 100W for all other installations.

### 3.2 Flood and Roadway Lighting

Flood lighting and roadway lighting fixtures will be provided to illuminate the dock face and roadway behind Berth 2. The light fixture for illuminating these areas has not been selected yet since its specification will depend on available mounting locations, which will depend on the final arrangement of equipment.

The obtrusive light levels of the new flood lighting will be reviewed using AGI32 as outlined in Section 2.5 Obtrusive Lighting.

The following items will be considered in fixture specification and design of flood lighting to promote safety, security, and productivity while minimizing unwanted effects:

- Mounting heights and orientation to focus lighting on project area and minimize spill light
- Reduced spill-light via full cut-off optics and visors where full cut-off is not available
- Avoid up-lighting, or light spill above 90 degrees
- Dark Sky approved by the International Dark Sky Association

For the preliminary energy consumption calculations in this report, flood light fixture consumption is estimated to be 550W. This value may be revised based on the specification of the fixture.

### 3.3 Obtrusive Light Mitigation

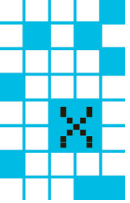
Obtrusive light is a concern and consideration for almost every project and, as such, best practice guidelines have been established for developing effective lighting designs that mitigate spill light as much as possible. Fortunately, newer LED fixtures have significantly improved cut-off optics reducing the spill light. It is important to note that even though spill light can be calculated to be negligible, public reaction may be based on their perception of the real-world lighting levels.

As part of the design methodology, the following considerations are applied to manage spill lighting outside the project area:

- Directional lighting to be utilized when possible/appropriate to minimize light trespass effects for people or wildlife. This is accomplished by directing fixtures inward toward the terminal
- Where possible, specifying “full cut-off” or “fully shielded” lighting fixtures that prevents spill-light above a 90-degree angle.
- Use of LED fixtures with high cut-off optics.
- Add lighting only where it is required for work, safety, or security and minimize over-lighting

Managing obtrusive lighting from flood lighting will be particularly important for this project since flood lighting is generally high output and broad-beamed. Flood lighting fixtures will be mounted at higher elevations than the Swivel Pole lighting installations as well, so those installations will be more prone to spill light.

The closest neighbouring facility is another marine bulk operations terminal approximately 180-metres East from the Facility. The closest publicly accessed land-side property is approximately 450-meters North of the Facility and at a higher elevation. With the implementation of the considerations previously noted, and through calculations as outlined in Section 2.5, assuring acceptable obtrusive light levels at neighboring properties should be achievable.



### 3.4 Lighting Plans

Refer to Appendices A for Preliminary Lighting Sketches – Land Side and Appendix B for shiploader Preliminary Lighting Plans. The lighting plans illustrate which project areas require illumination and indicate the classification of each area and minimal lighting level requirements as per Canadian Occupational Health and Safety Requirements.

Since the Project is in the preliminary phase, detailed fixture layouts are not yet prepared as they are highly dependent on equipment plans.

## 4 Energy Consumption

The total estimated energy consumption of new exterior lighting for the Project is 16.06kW. See Table 3 below for fixture counts per area (refer to Site Plan in Appendix A for locations). Note that fixture quantities and wattages are subject to change during detailed design.

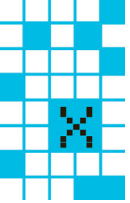
**Table 4: New Fixture Quantities and Wattages**

NO.	AREA	QUANTITY	FIXTURE TYPE	WATTAGE (W)	TOTAL (W)
1	B2 General	10	Flood / Roadway Light	550	5500
2	Scrubber Tower 253	3	Mercmaster/RAB LED	100	300
3	Scrubber Tower 254	3	Mercmaster /RAB LED	100	300
4	Scrubber Tower 255	3	Mercmaster / RAB LED	100	300
5	ER-211 (exterior)	8	Mercmaster (w)/ RAB LED	30	240
6	Surge Bin	6	Mercmaster / RAB LED	100	600
7	T243	15	Mercmaster / RAB LED	100	1500
8	Spout Storage Tower	8	Mercmaster / RAB LED	100	800
9	Mooring Dolphins	10	Mercmaster LED (w)	30	300
10	C242	4	Mercmaster (w) / RAB LED	30	120
11	C243	40	Mercmaster (w) / RAB LED	30	1200
12	Transfer Tower 261	25	Mercmaster / RAB LED	100	2500
14	Berth 2 Sump Ponds	6	Mercmaster LED	100	600
15	Shiploader	60	Mercmaster (w)	30	1800

(†) Lower wattage fixtures for walkways indicated by (w).

The total estimated energy consumption of removed exterior lighting for the Project is 9.4kW. See Table 3 below for fixture counts per area (refer to Site Plan in Appendix A for locations).

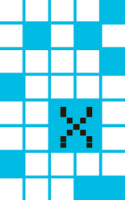
Note that multiple areas where existing lighting is being removed do not currently meet the applicable codes and standards and are under-lit or without lighting.



**Table 5: Removed Fixture Counts and Wattages**

NO.	AREA	QUANTITY	FIXTURE TYPE	WATTAGE (W)	TOTAL (W)
1	West Shiploader	6	Flood light	550	3300
2	East Shiploader	6	Flood light	550	3300
3	Scrubber Towers	9	Low bay	100	900
4	Scrubber Tower 255	3	Low bay	100	300
5	Pedestrian Overpass	7	Low bay	100	700
6	Surge Bin	6	Low bay	100	600
7	ER201	3	Low bay	100	300

(†) Lower wattage fixtures for walkways indicated by (w).



## 5 Conclusion

In summary, this report outlines the design criteria and approach for the Neptune Berth 2 Shiploader project at Neptune Bulk Terminals. This design criteria and approach provides a basis of design for the exterior lighting that will meet applicable code requirements, Neptune Bulk Terminals facility requirements (operational, safety, and security), and well as minimize unwanted light spill or other impacts on adjacent properties.

If you have any questions or require further information or clarification, please feel free to contact the undersigned.

Best regards,

Written By:

PBX Engineering Ltd.

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*Design Engineer*

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PBX Engineering Ltd.

**David Black P.Eng.**

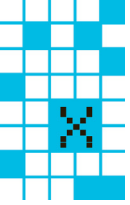
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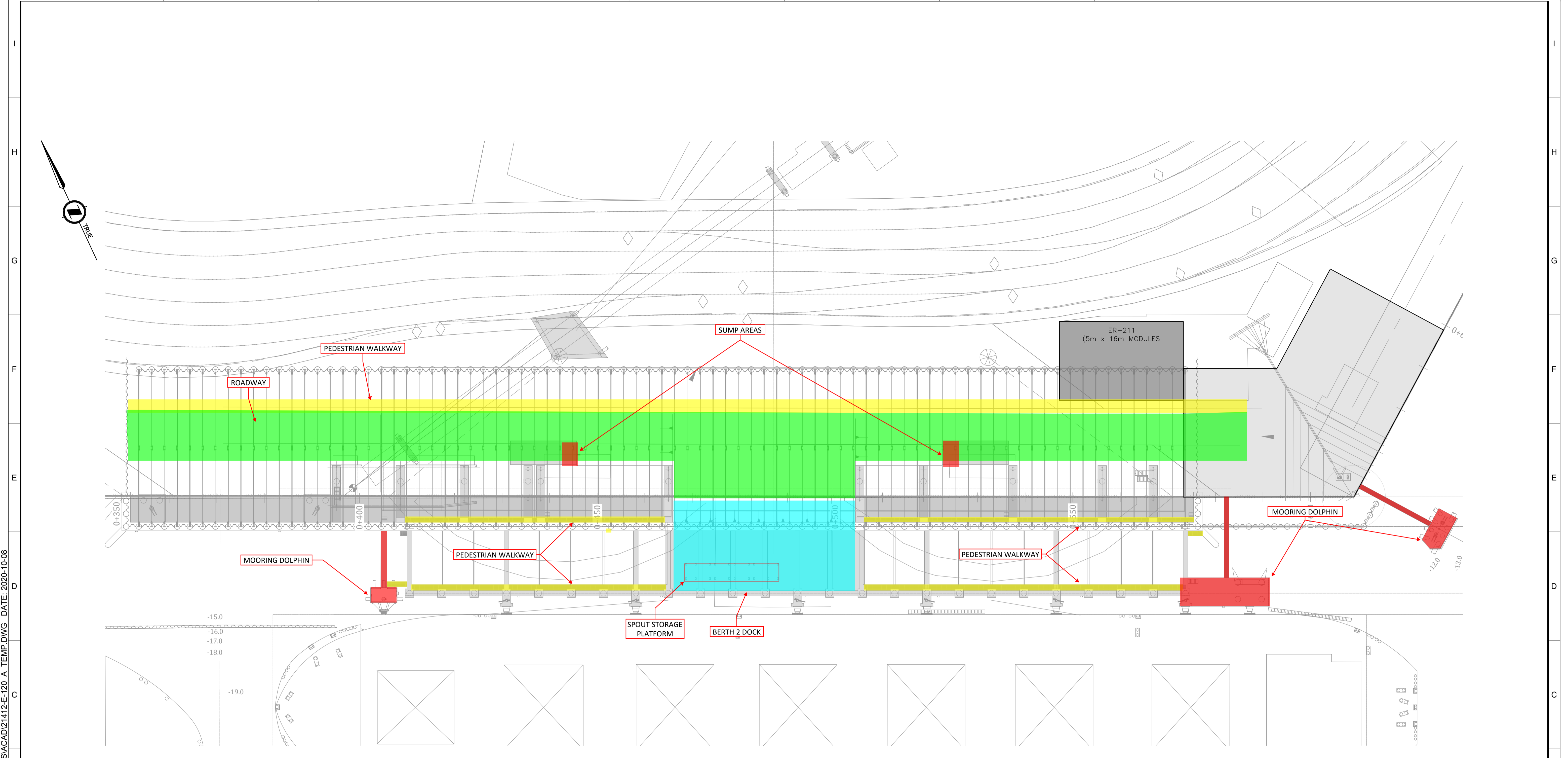
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## Appendix A      Lighting Sketches – Land Side

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**SITE PLAN**

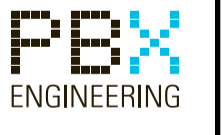


**LEGEND:**

- 100 LUX - MOVING EQUIPMENT/MOTOR PLATFORM (IMMEDIATE WORK AREA), STAIRS (FREQUENTLY USED), BUILDING ENTRANCE/EXIT
- 50 LUX - MOVING EQUIPMENT/MOTOR PLATFORM (SURROUNDING AREA), STAIRS (INFREQUENTLY USED), CORRIDOR/ISLE (FREQUENTLY USED), PEDESTRIAN WALKWAY
- 30 LUX - CORRIDOR/ISLE (USED INFREQUENTLY)
- 500 LUX - ROOM WITH DIAL DISPLAY
- 20 LUX - BUILDING PERIMETER, ROADWAY
- 150 LUX - BERTH DOCK

**LIGHTING MARKUP 21412-02-ESK002**  
**REV. P0 2022-03-07**

**NOTE:**  
 PLANS AND ARRANGEMENTS ARE PRELIMINARY  
 DESIGNS BY OTHERS AND ARE SUBJECT TO CHANGE



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 SYSTEM: POTASH  
 ASSET: 221  
 DISCIPLINE: ELECTRICAL

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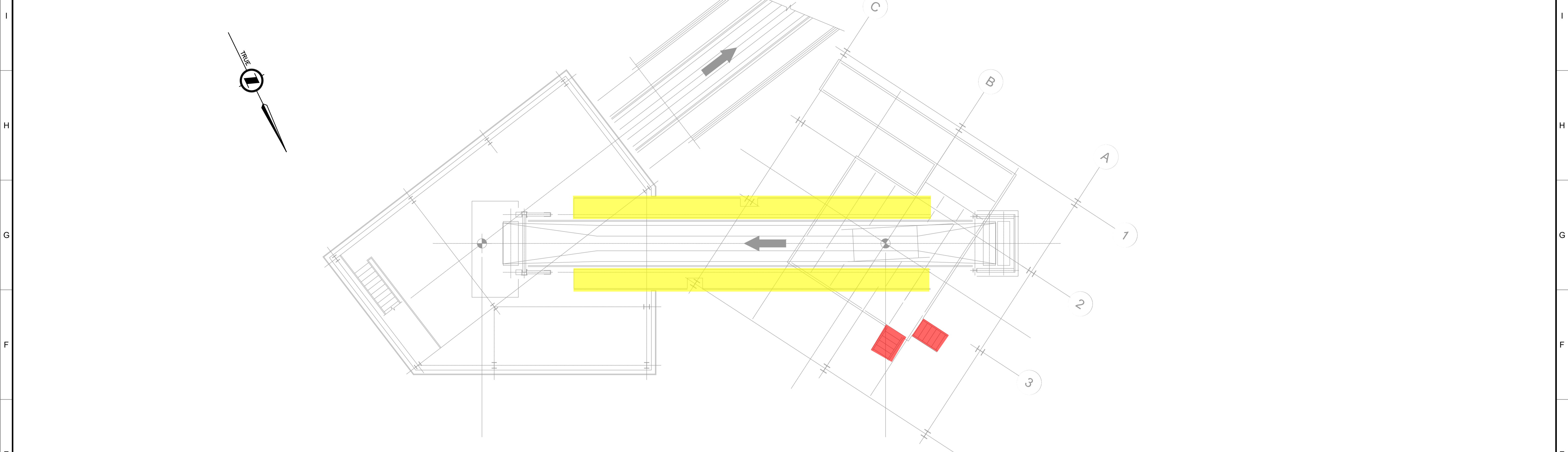
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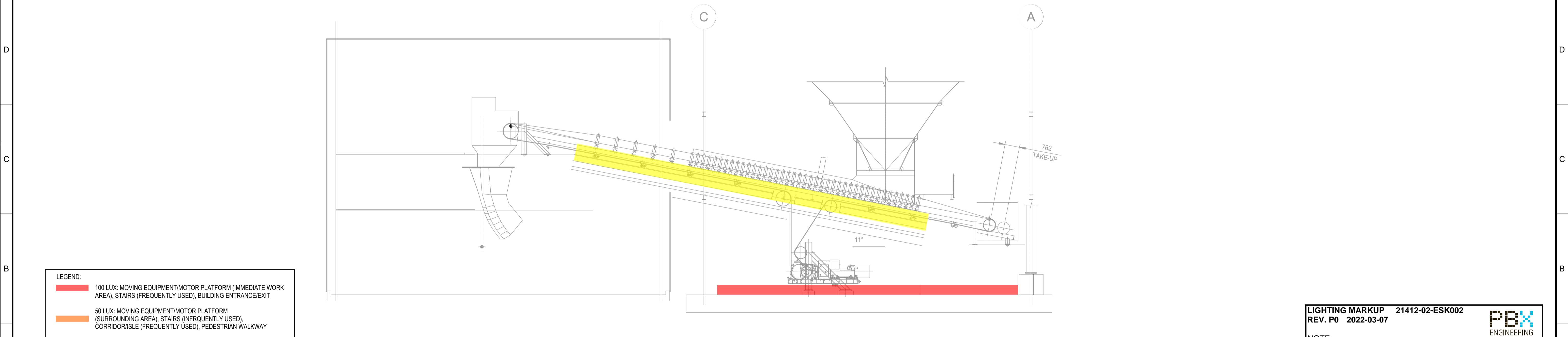
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SCALE:	SHEET OF	DRAWING NO. 21412-E-120	REV: A



**SITE PLAN**  
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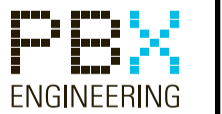
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DRAWING NO.	DRAWING DESCRIPTION / TITLE
REFERENCE DRAWINGS / DESIGN STANDARDS	

PROJECT / W.O.: \_\_\_\_\_

SYSTEM: POTASH

ASSET: 241

DISCIPLINE: ELECTRICAL

REV	YYYY-MM-DD	DESCRIPTION	DRAWN	APPROVED
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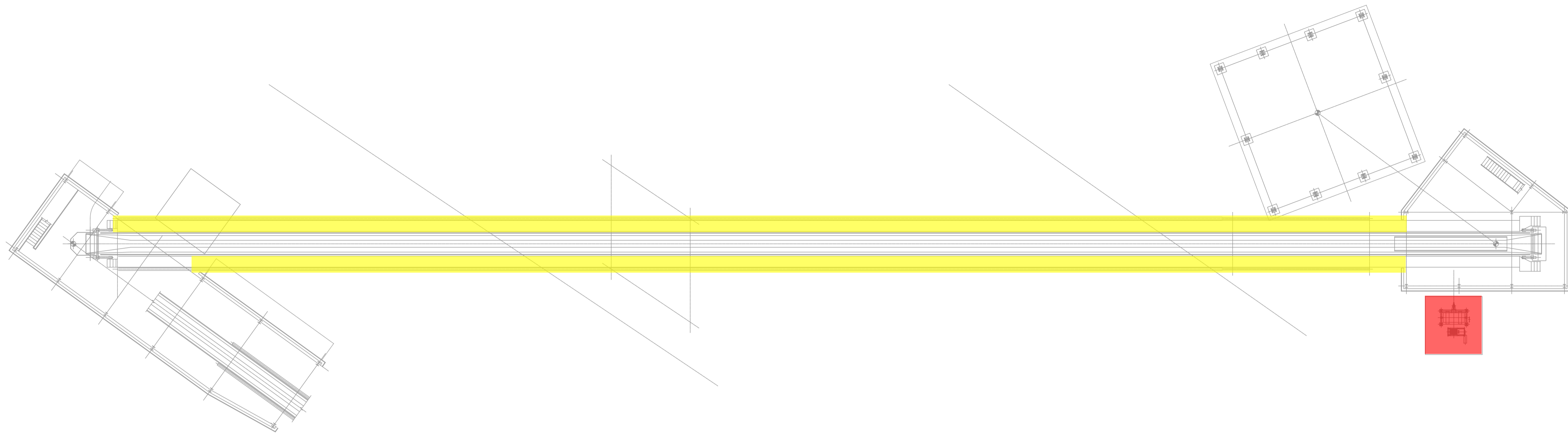
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ISSUED AS RECORD COPY? (YES/NO) NO

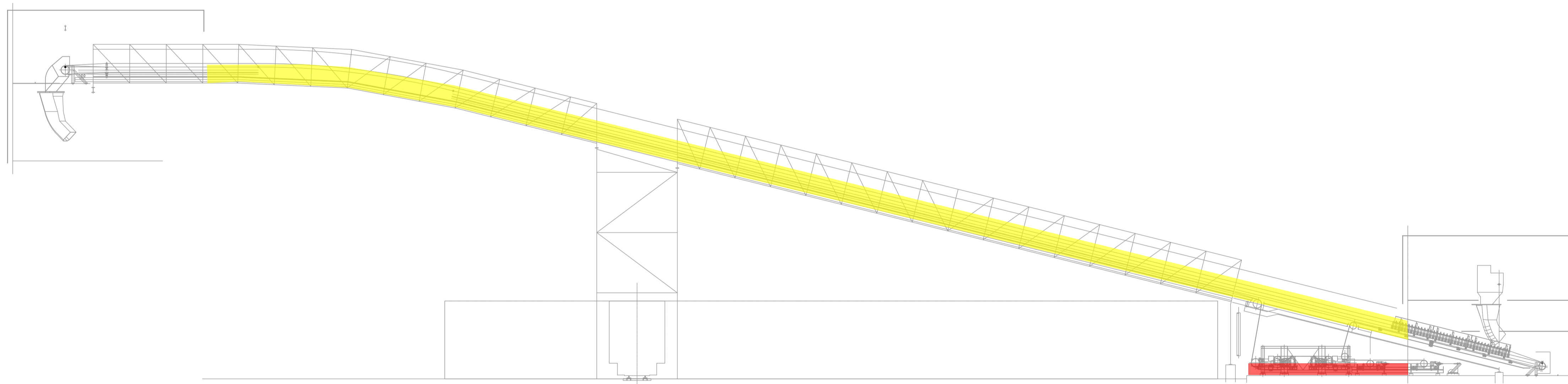
**Neptune**  
TERMINALS

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TITLE: <b>BERTH 2 SHIP LOADER REPLACEMENT CONVEYOR 242 GENERAL ARRANGEMENT - EQUIPMENT</b>			
SCALE:	SHEET OF	DRAWING NO. 21412-E-040	REV: A



**SITE PLAN**  
1:250



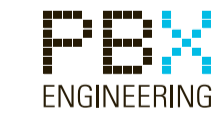
**ELEVATION**  
1:250

**LEGEND:**

- 100 LUX - MOVING EQUIPMENT/MOTOR PLATFORM (IMMEDIATE WORK AREA), STAIRS (FREQUENTLY USED), BUILDING ENTRANCE/EXIT
- 50 LUX - MOVING EQUIPMENT/MOTOR PLATFORM (SURROUNDING AREA), STAIRS (INFREQUENTLY USED), CORRIDOR/ISLE (FREQUENTLY USED), PEDESTRIAN WALKWAY
- 30 LUX - CORRIDOR/ISLE (USED INFREQUENTLY)
- 500 LUX - ROOM WITH DIAL DISPLAY
- 20 LUX - BUILDING PERIMETER, ROADWAY
- 150 LUX - BERTH DOCK

**LIGHTING MARKUP** 21412-02-ESK002  
**REV. P0** 2022-03-07

**NOTE:**  
 PLANS AND ARRANGEMENTS ARE PRELIMINARY  
 DESIGNS BY OTHERS AND ARE SUBJECT TO CHANGE



**PRELIMINARY**  
NOT FOR CONSTRUCTION

DRAWING NO.	DRAWING DESCRIPTION / TITLE
REFERENCE DRAWINGS / DESIGN STANDARDS	

PROJECT / W.O.: \_\_\_\_\_

SYSTEM: POTASH

ASSET: 242

DISCIPLINE: ELECTRICAL

REV	YYYY-MM-DD	DESCRIPTION	DRAWN	APPROVED
A				

ENGINEERING SEAL:

VENDOR:  
**PBX ENGINEERING**  
 PBX ENGINEERING Ltd.  
 Suite 300 - 131 Water St.  
 Vancouver BC, V6B 4M3 Tel 604.468.7222  
 www.pbxeng.com

OEM:

ISSUED AS RECORD COPY? (YES/NO) NO

**Neptune**  
TERMINALS

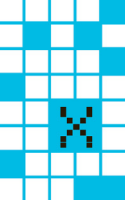
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TITLE:  
**BERTH 2 SHIP LOADER REPLACEMENT  
 CONVEYOR 243  
 GENERAL ARRANGEMENT - EQUIPMENT**

SCALE: SHEET OF DRAWING NO. 21412-E-060 REV: A

P:\21412\_NBT\_B2\_SL REPLACEMENT\03 INDUSTRIAL DETAILED DESIGN\DRAWINGS\CAD\21412-E-060\_A.DWG DATE: 2020-10-08



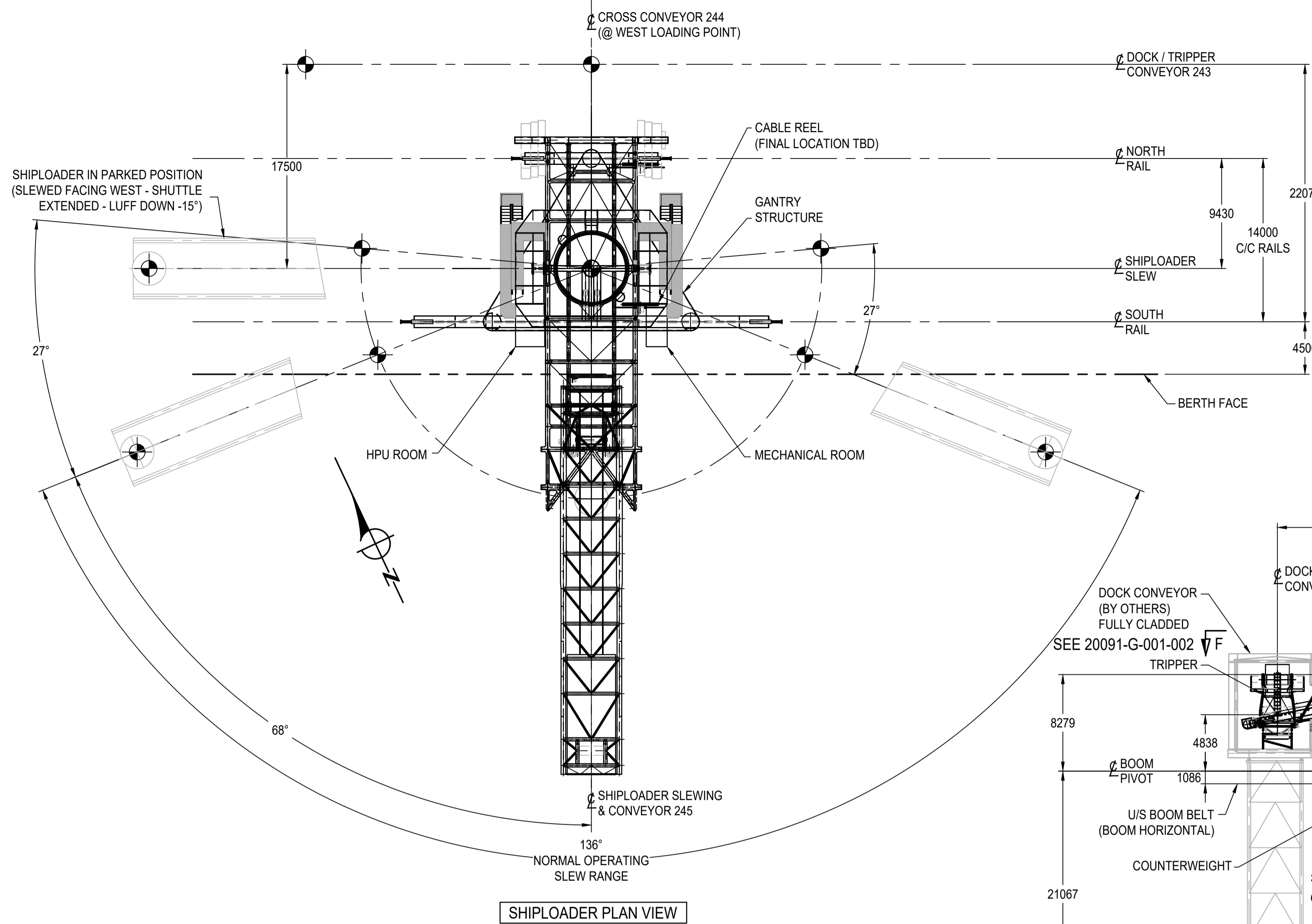


## **Appendix B      Lighting Plans – EMS SL250**

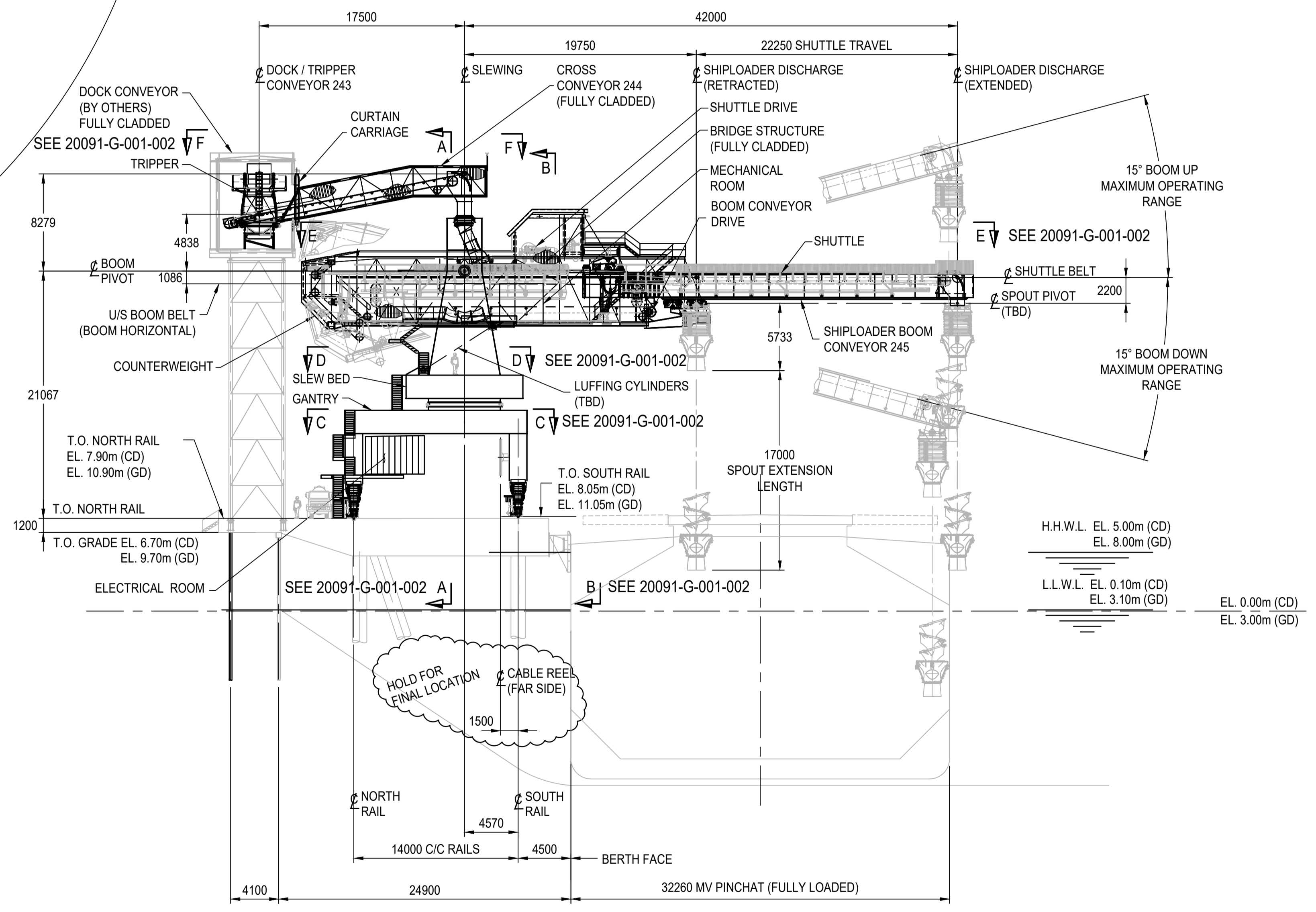
*THIS PAGE IS INTENTION*

GENERAL ARRANGEMENTS DRAWING LIST:

- 20091-G-001 OVERALL GENERAL ARRANGEMENT
- 20091-G-002 SITE PLAN AND ELEVATION ARRANGEMENTS
- 20091-G-003 CONVEYOR WORK POINTS
- 20091-G-004 DESIGN VESSEL PRIME DIMENSIONS
- 20091-G-005 ACCESS ARRANGEMENT
- 20091-G-006 SHIPLOADER IN PARKED POSITION GENERAL ARRANGEMENT
- 20091-G-007 HATCH COVERAGE AND TRAVEL LIMITS
- 20091-G-008 HATCH COVERAGE AND TRAVEL LIMITS
- 20091-G-009 OPERATING POSITIONS AND CLEARANCES
- 20091-G-010 GENERAL NOTES AND DETAILS
- 20091-G-011 GENERAL WELDING NOTES
- 20091-G-012 GENERAL LADDER, STAIRS AND HANDRAIL DETAILS
- 20091-G-013 GENERAL CHUTES AND SKIRT DETAILS



SHIPLOADER PLAN VIEW



CROSS SECTION thru SHIPLOADER 250

1. CD = CHART DATUM  
GD = GEODETIC DATUM
2. ELEVATIONS ARE REFERENCED TO HYDROGRAPHIC (TIDE AND CHART) DATUM. CHART DATUM IS 3.0m BELOW GEODETIC DATUM AS PROVIDED IN VANCOUVER FRASER PORT AUTHORITY (VFPA) "SOUNDINGS BOOK - BURRARD INLET". VFPA DRAWING "NEPTUNE TERMINALS", PLAN NO. H2017-006, SHEET 21 OF 32, DATED MARCH 2017.
3. EXISTING BENCHMARK LOCATIONS WERE TAKEN FROM ADVISIAN SITE PLAN DRAWING 04-MA-DGA-001 AND 04-MA-DGA-002.

**PRELIMINARY**

OWNER/OPERATOR:  
**Neptune**  
 TERMINALS

DRAWING TITLE:  
**B2 SHIPLOADER 250**  
 OVERALL GENERAL  
 ARRANGEMENT AND SECTIONS

DRAWING NUMBER	SHT.	CONT.	REV.
20091-G-001	1	2	B

DRAWING NO.	REFERENCE	REV.	REVISION DESCRIPTION	BY	CHKD	DATE
		B	GENERAL UPDATES / REVISED PER CLIENT COMMENTS	TJB	RDD	JUN. 30/21
		A	ISSUED FOR CLIENT REVIEW	TJB	RDD	MAY 31/21

THIRD ANGLE PROJECTION

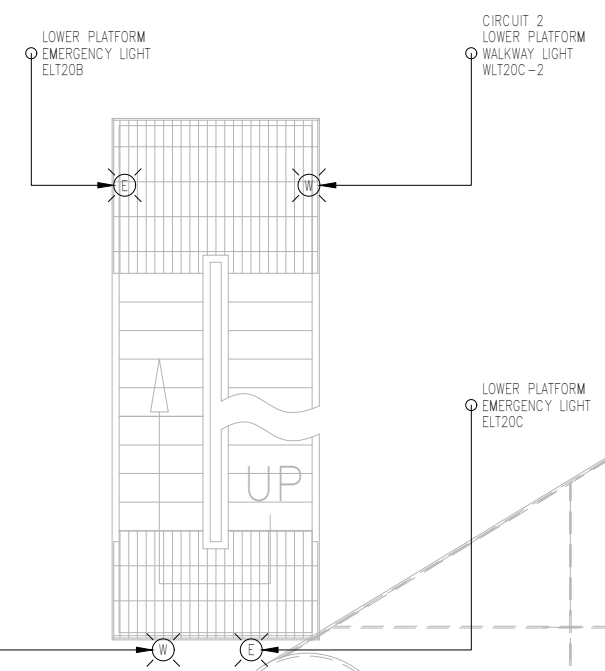
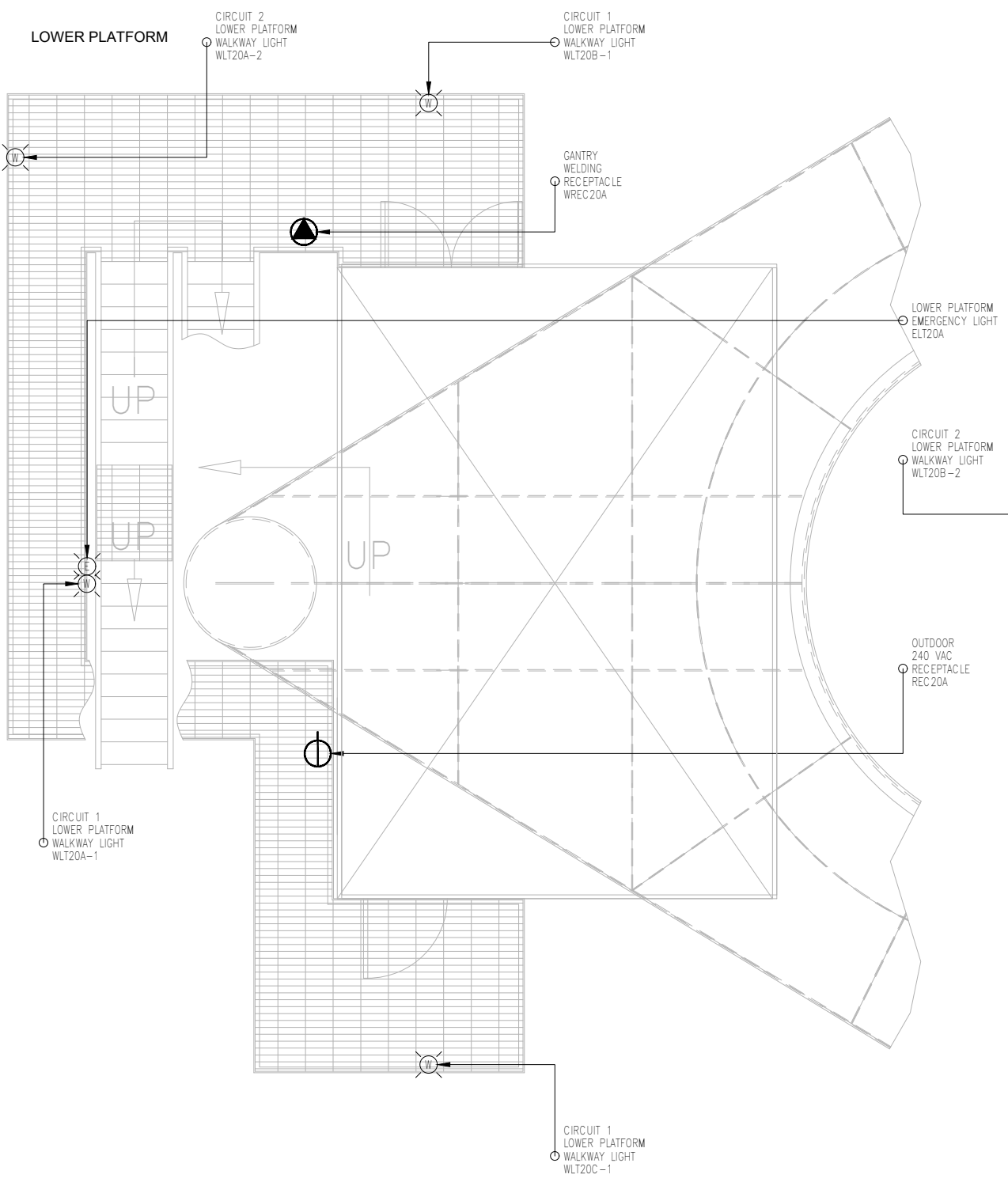
SCALE (A1 Sheet): 1:250  
 DATE: MAY 27, 2021  
 DRAWN BY: TJB  
 CHECKED BY: RDD

STATUS: **NOT FOR CONSTRUCTION**

PROJECT: NEPTUNE - BERTH 2 NEW SHIPLOADER

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EMS - TECH INC.  
 mobile equipment and bulk material handling systems  
 BELLEVILLE - ONTARIO - CANADA  
 PHONE 613-966-6611 FAX 613-966-6710



- LIGHTING NOTES:**
1. WALKWAY LIGHTS (WLT) = 6
  2. EMERGENCY LIGHTS (ELT) = 3

20091-G-013 SHEET 1 REV A - BACKGROUND IMAGE

DRAWING NO.	REFERENCE	REV.	REVISION DESCRIPTION	BY	CHKD	DATE

THIRD ANGLE PROJECTION

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SCALE (A1 Sheet):  
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DATE: MAY 18, 2021  
DRAWN BY: RNP  
CHECKED BY: SRH

STATUS: **NOT FOR CONSTRUCTION**  
PROJECT: NEPTUNE - BERTH 2 NEW SHIPLOADER

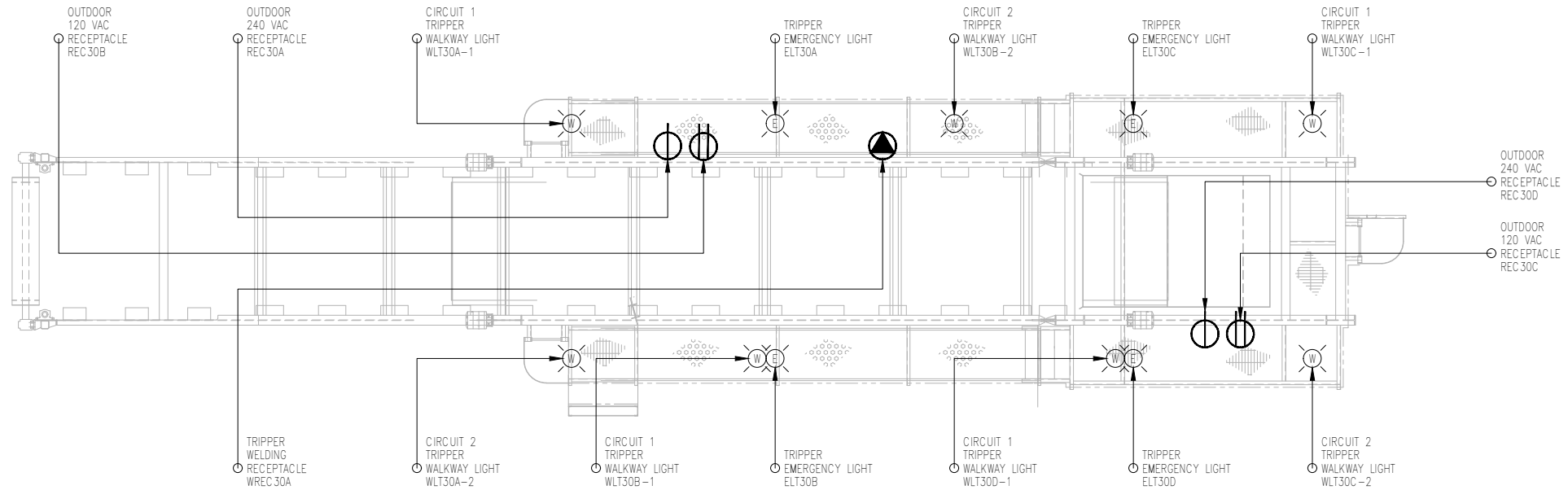
mobile equipment and bulk material handling systems  
BELLEVILLE - ONTARIO - CANADA  
PHONE 613-966-6611 FAX 613-966-6710

OWNER/OPERATOR:  
**Neptune TERMINALS**

DRAWING TITLE:  
ELECTRICAL ARRANGEMENT  
GANTRY / TRUCKS / TRAVEL  
WALKWAY LIGHTING / SERVICES

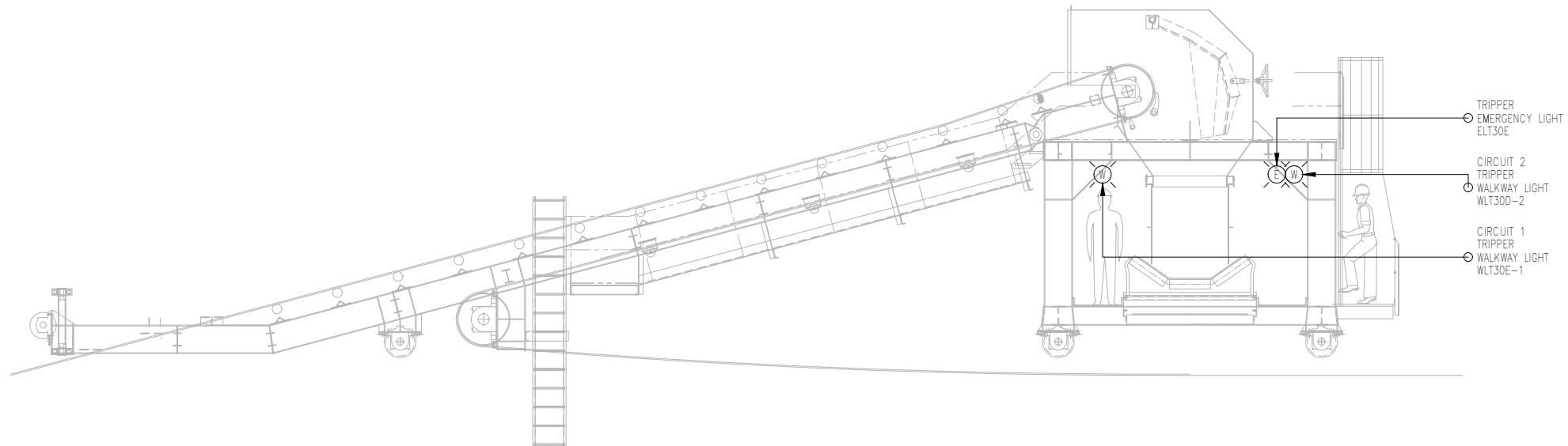
DRAWING NUMBER	SHT.	CONT.	REV.
20091-E-120	1	-	A

TRIPPER



LIGHTING NOTES:

1. WALKWAY LIGHTS (WLT) = 9
2. EMERGENCY LIGHTS (ELT) = 5



20091-G-600 SHEET 1 REV A - BACKGROUND IMAGE

THIRD ANGLE PROJECTION

SCALE (A1 Sheet):  
NTS  
DATE: MAY 18, 2021

STATUS: **NOT FOR CONSTRUCTION**



DRAWING TITLE:  
ELECTRICAL ARRANGEMENT  
TRIPPER  
WALKWAY LIGHTING / SERVICES

DRAWING NO.	REFERENCE	REV.	REVISION DESCRIPTION	BY	CHKD	DATE

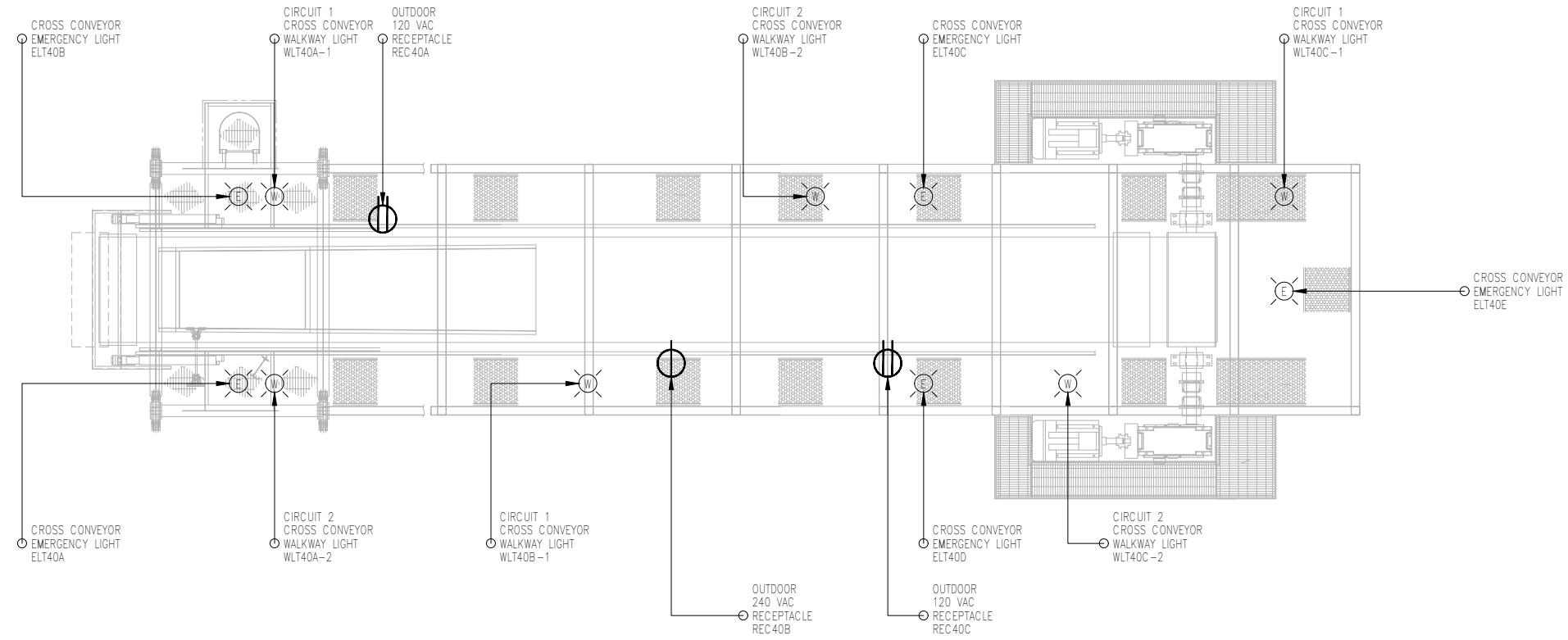
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CHECKED BY: SRH

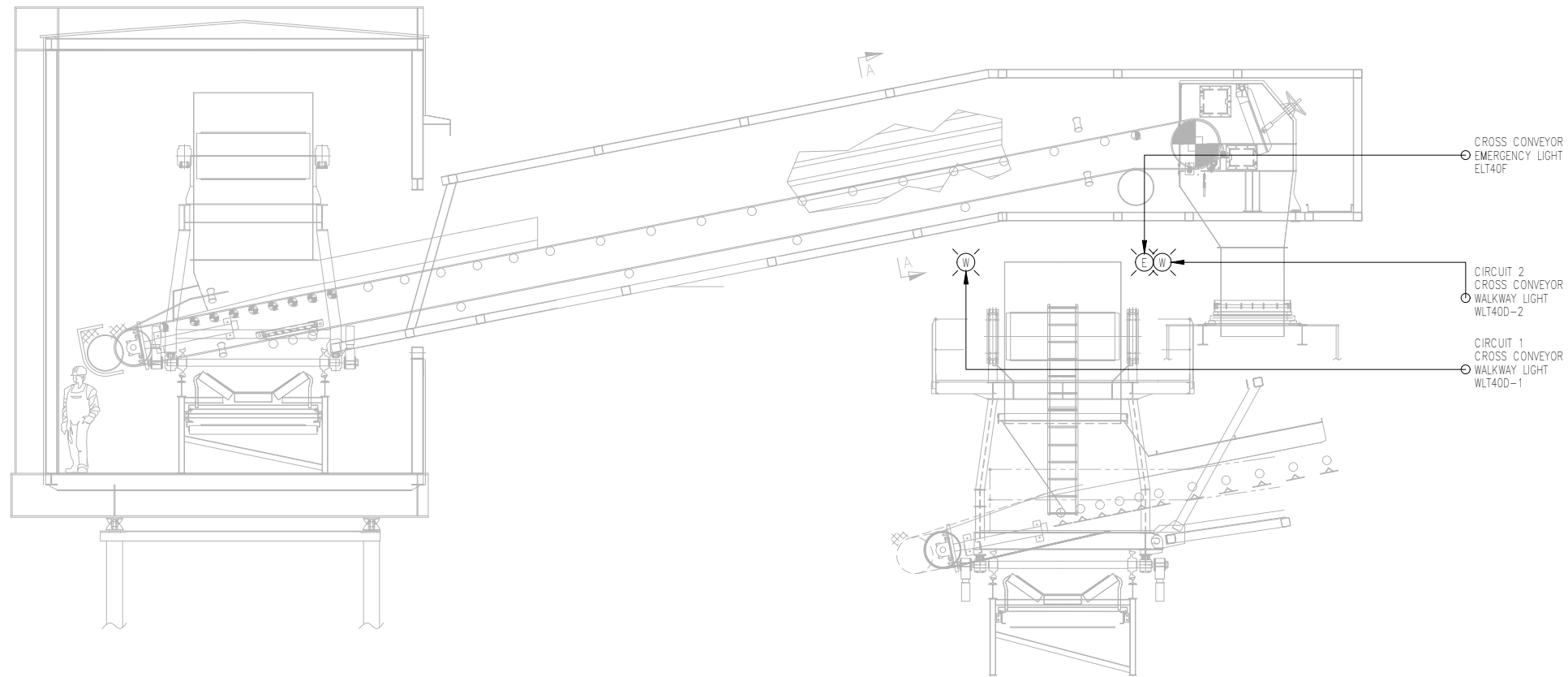
PROJECT:  
NEPTUNE - BERTH 2  
NEW SHIPLOADER

DRAWING NUMBER	SHT.	CONT.	REV.
20091-E-130	1	-	A

CROSS CONVEYOR



- LIGHTING NOTES:
1. WALKWAY LIGHTS (WLT) = 8
  2. EMERGENCY LIGHTS (ELT) = 6



20091-G-500 SHEET 1 REV A - BACKGROUND IMAGE

THIRD ANGLE PROJECTION

SCALE (A1 Sheet):  
NTS  
DATE: MAY 25, 2021

STATUS: **NOT FOR CONSTRUCTION**



OWNER/OPERATOR: **Neptune TERMINALS**

DRAWING TITLE: **ELECTRICAL ARRANGEMENT CROSS CONVEYOR WALKWAY LIGHTING / SERVICES**

DRAWING NO.	REFERENCE	REV.	REVISION DESCRIPTION	BY	CHKD	DATE	REV.	REVISION DESCRIPTION	BY	CHKD	DATE
							A	ISSUED FOR PERMIT	RNP	SRH	JULY 16 2021

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DRAWN BY: RNP  
CHECKED BY: SRH

PROJECT: **NEPTUNE - BERTH 2 NEW SHIPLOADER**

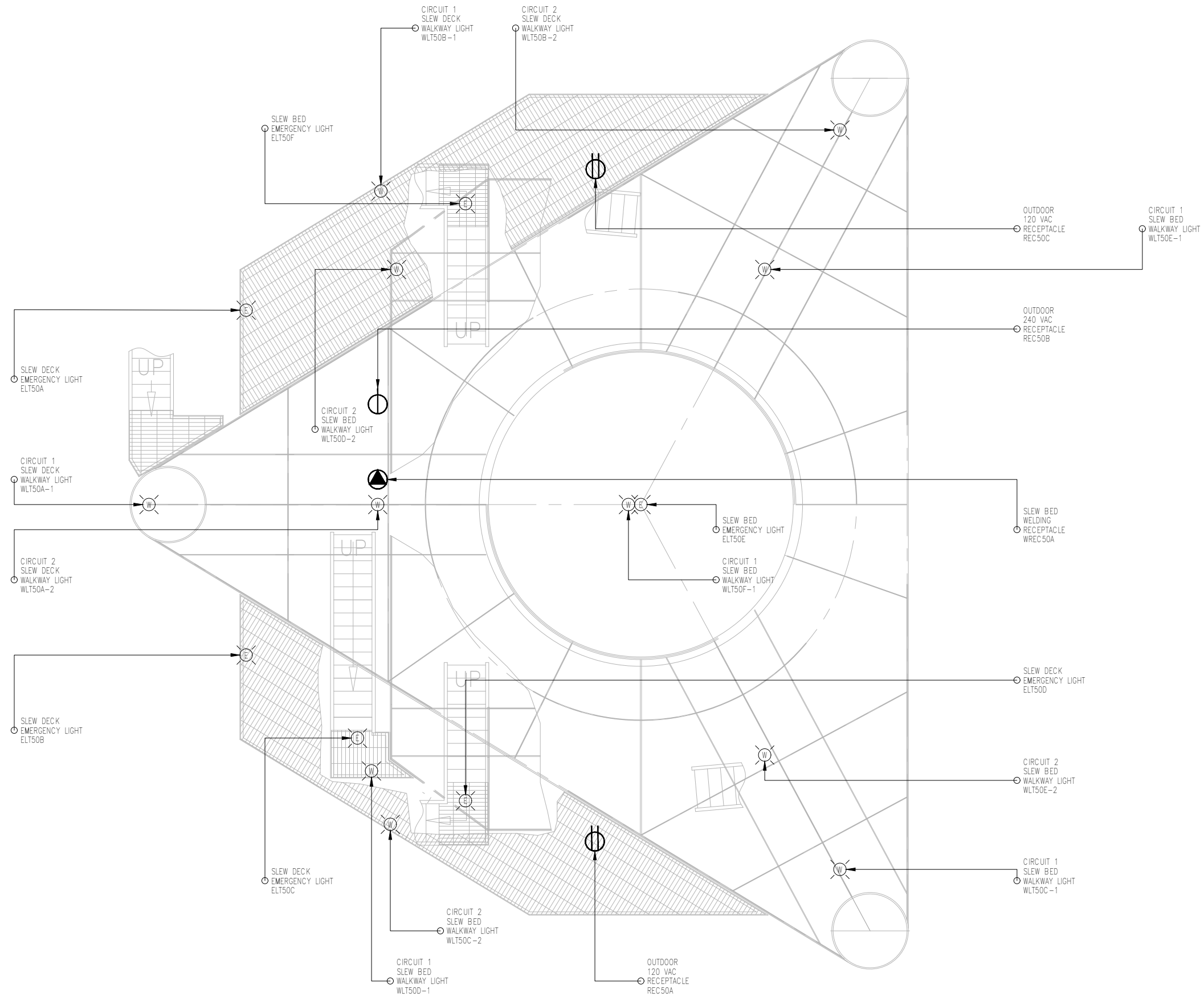
DRAWING NUMBER	SHT.	CONT.	REV.
20091-E-140	1	-	A

BELLEVILLE - ONTARIO - CANADA  
PHONE 613-966-6611 FAX 613-966-6710

SLEW BED

LIGHTING NOTES:

1. WALKWAY LIGHTS (WLT) = 11
2. EMERGENCY LIGHTS (ELT) = 6



20091-G-013 SHEET 1 REV A - BACKGROUND IMAGE

THIRD ANGLE PROJECTION

SCALE (A1 Sheet): NTS

STATUS:

**NOT FOR CONSTRUCTION**

DATE: MAY 25, 2021

DRAWN BY: RNP

CHECKED BY: SRH

PROJECT:

NEPTUNE - BERTH 2  
NEW SHIPLOADER



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PHONE 613-966-6611 FAX 613-966-6710

OWNER/OPERATOR:



DRAWING TITLE:

ELECTRICAL ARRANGEMENT  
SLEW / LUFF  
WALKWAY LIGHTING / SERVICES

DRAWING NUMBER	SHT.	CONT.	REV.
20091-E-150	1	-	A

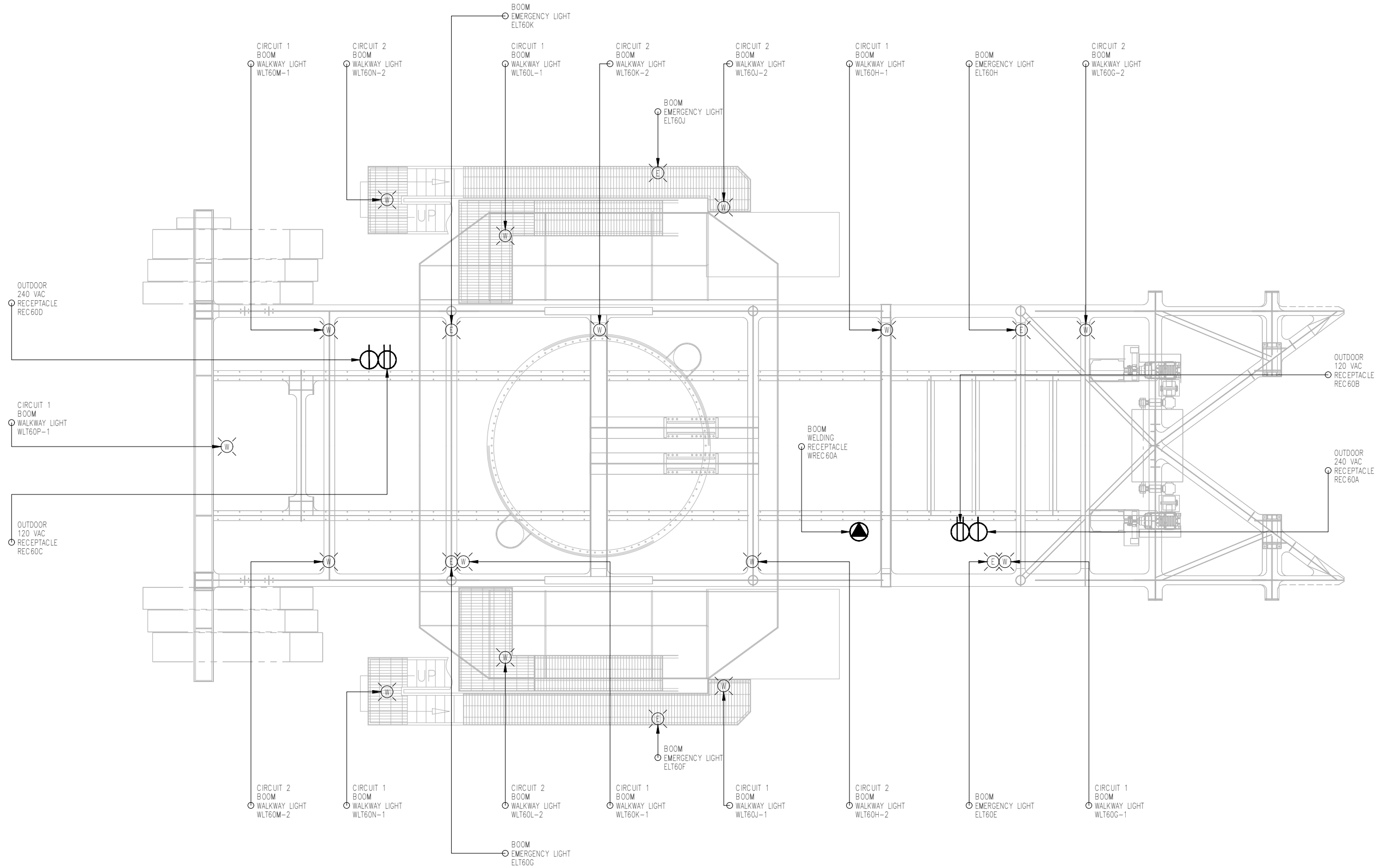
DRAWING NO.	REFERENCE	REV.	REVISION DESCRIPTION	BY	CHKD	DATE	REV.	REVISION DESCRIPTION	BY	CHKD	DATE
							A	ISSUED FOR PERMIT	RNP	SRH	JULY 16 2021

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BOOM WALKWAY

LIGHTING NOTES:

1. WALKWAY LIGHTS (WLT) = 15
2. EMERGENCY LIGHTS (ELT) = 6



OWNER/OPERATOR:



DRAWING TITLE:

ELECTRICAL ARRANGEMENT  
BOOM  
WALKWAY LIGHTING / SERVICES

DRAWING NUMBER	SHT.	CONT.	REV.
20091-E-160	1	2	A

DRAWING NO.	REFERENCE	REV.	REVISION DESCRIPTION	BY	CHKD	DATE
20091-G-001	SHEET 2 REV A - BACKGROUND IMAGE					

THIRD ANGLE PROJECTION

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CHECKED BY: SRH

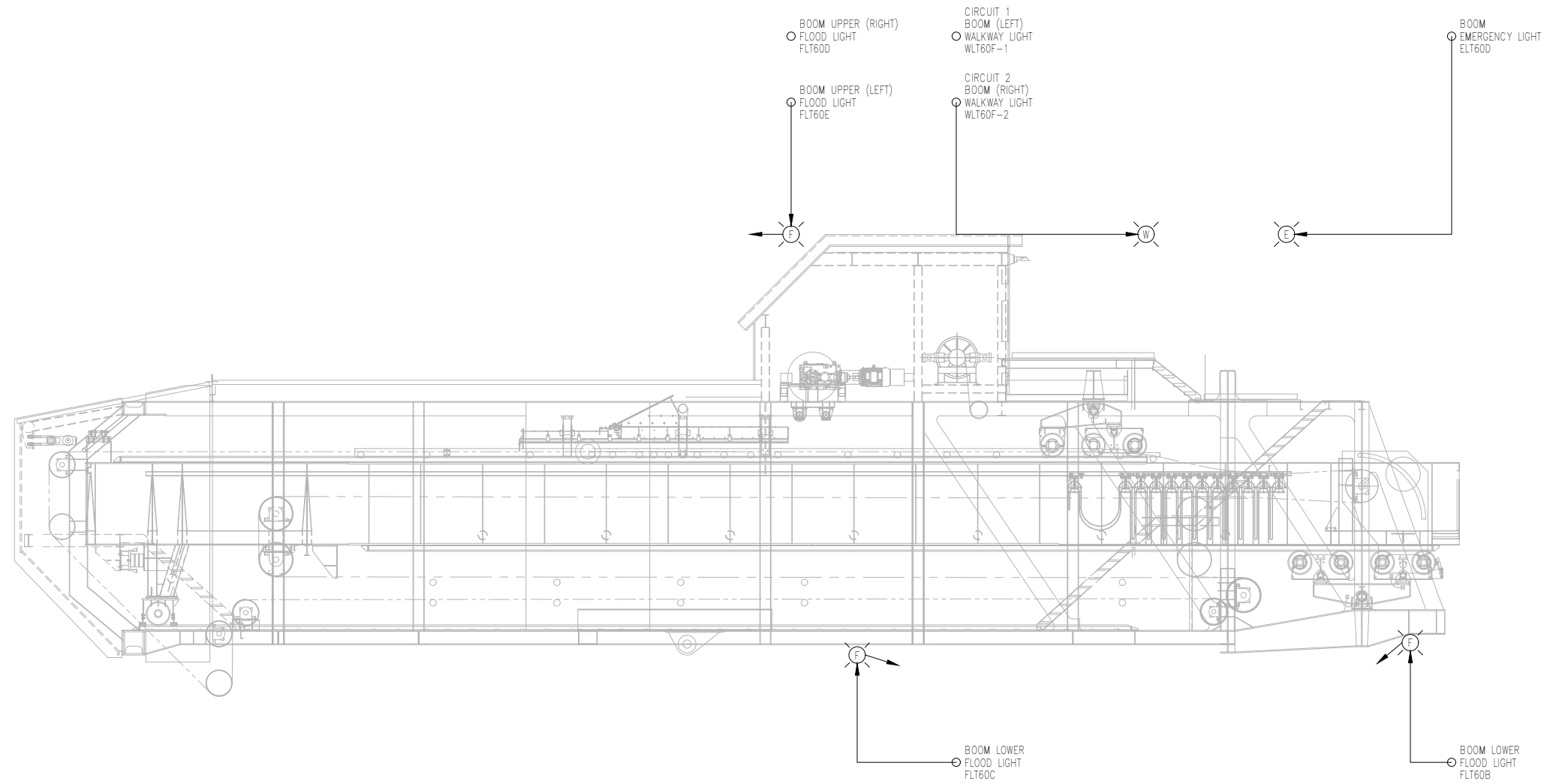
STATUS: **NOT FOR CONSTRUCTION**  
PROJECT: NEPTUNE - BERTH 2 NEW SHIPLOADER

mobile equipment and bulk material handling systems  
BELLEVILLE - ONTARIO - CANADA  
PHONE 613-966-6611 FAX 613-966-6710


SHUTTLE DRIVE WALKWAY

LIGHTING NOTES:

1. WALKWAY LIGHTS (WLT) = 2
2. EMERGENCY LIGHTS (ELT) = 1



20091-G-001	SHEET 1 REV A - BACKGROUND IMAGE																			
DRAWING NO.	REFERENCE	REV.	REVISION DESCRIPTION	BY	CHKD	DATE	REV.	REVISION DESCRIPTION	BY	CHKD	DATE									

THIRD ANGLE PROJECTION 

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SCALE (A1 Sheet):  
NTS  
DATE: MAY 26, 2021  
DRAWN BY: RNP  
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STATUS: **NOT FOR CONSTRUCTION**

PROJECT: NEPTUNE - BERTH 2 NEW SHIPLOADER

  
mobile equipment and bulk material handling systems  
BELLEVILLE - ONTARIO - CANADA  
PHONE 613-966-6611 FAX 613-966-6710

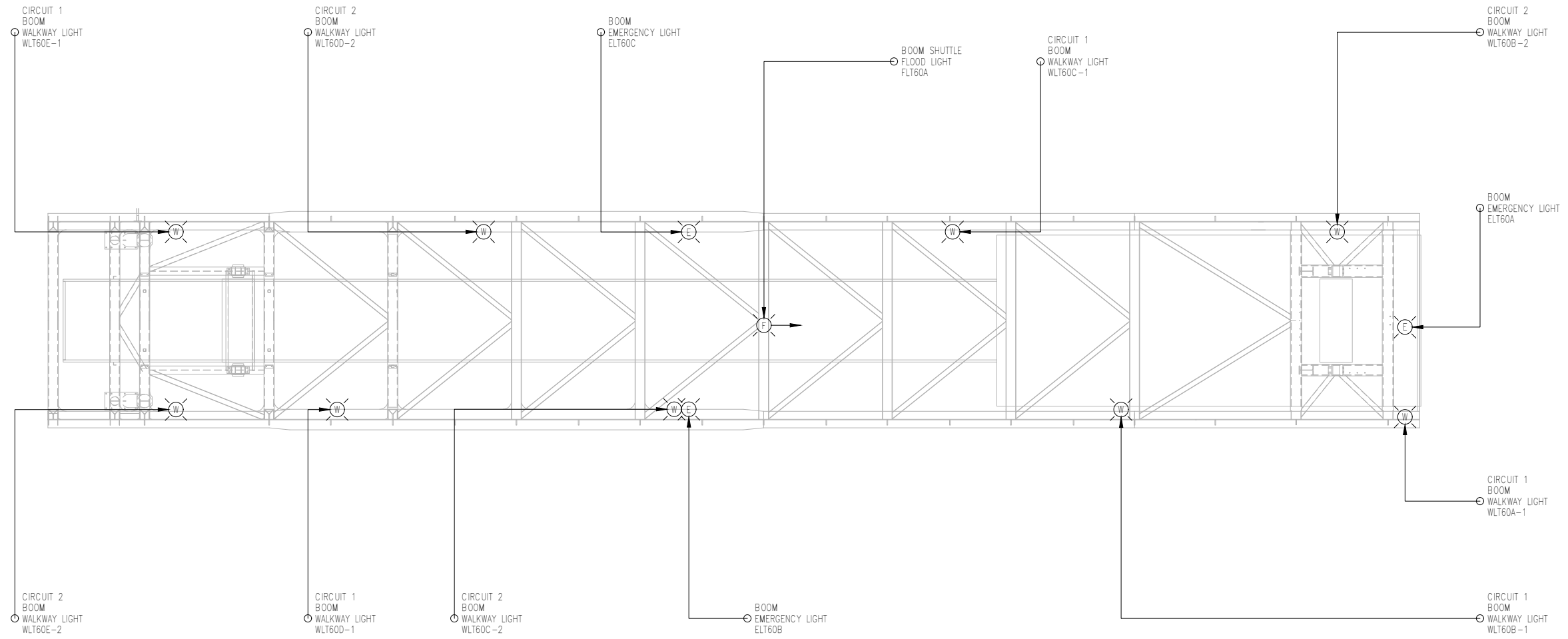
OWNER/OPERATOR: <b>Neptune TERMINALS</b>			
DRAWING TITLE: ELECTRICAL ARRANGEMENT BOOM WALKWAY LIGHTING / SERVICES			
DRAWING NUMBER	SHT.	CONT.	REV.
20091-E-160	2	3	A



SHUTTLE WALKWAY

LIGHTING NOTES:

1. WALKWAY LIGHTS (WLT) = 9
2. EMERGENCY LIGHTS (ELT) = 3



20091-G-101 SHEET 1 REV A - BACKGROUND IMAGE

DRAWING NO.	REFERENCE	REV.	REVISION DESCRIPTION	BY	CHKD	DATE
		A	ISSUED FOR PERMIT	RNP	SRH	JULY 16 2021

THIRD ANGLE PROJECTION

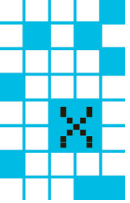
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SCALE (A1 Sheet):  
NTS  
DATE:  
MAY 26, 2021  
DRAWN BY:  
RNP  
CHECKED BY:  
SRH

STATUS:  
**NOT FOR CONSTRUCTION**  
PROJECT:  
NEPTUNE - BERTH 2  
NEW SHIPLOADER

mobile equipment and bulk material handling systems  
BELLEVILLE - ONTARIO - CANADA  
PHONE 613-966-6611 FAX 613-966-6710

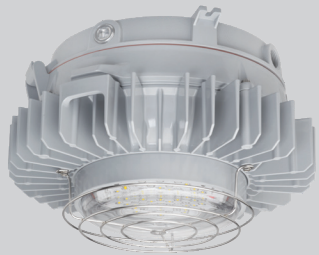
OWNER/OPERATOR:  
**Neptune TERMINALS**  
DRAWING TITLE:  
ELECTRICAL ARRANGEMENT  
BOOM  
WALKWAY LIGHTING / SERVICES  
DRAWING NUMBER: 20091-E-160  
SHT. CONT. REV.: 3 - A



## Appendix C

## Lighting Cut Sheet

*THIS PAGE IS INTENTION*



## HAZARDOUS MERCMASTER™ LED GENERATION 3 SERIES LUMINAIRES

### APPLICATIONS

- Enclosed and gasketed fixtures suitable for use in:
  - A wide range of industrial, chemical processing and other areas where flammable gases and vapors or combustible dusts may be present
  - Marine and wet locations
  - Suitability includes use where there may be simultaneous exposure to flammable gases and vapors or combustible dusts
- Typical applications include:
  - Power plants
  - Processing plants
  - Chemical plants
  - Oil refineries
  - Waste and sewage treatment
  - Other areas where dust, water, dirt and rough usage are a problem

### FEATURES

- Modular design provides thousands of combinations for maximum versatility.
- Design is suited for mounting heights ranging from 2 m (7 ft), up to 15 m (50 ft).
- Nine light outputs provide up to 26,000 lumens (5000K CCT, Type V light distribution, and clear glass globe).

Nominal Lumens ①	HID Equivalent	Model Number
3500	70-100W	MLGL3
5500	100-150W	MLGL5
7500	175-250W	MLGL7
9500	250-350W	MLGL9/MLGH9
11,500	350-400W	MLGH1
14,500	400W	MLGH3
17,500	400-600W	MLGH6
20,000	600-750W	MLGX1
24,000	1000W	MLGX5

① Nominal lumen value for 5000K, clear glass globe, Type V wide optic. Detailed lumen information is provided in catalog pages.

- Choice of optics for optimal light distribution in a variety of applications: Type I, Type III, Type V or Type V Wide.
- Choice of color temperature (CCT): 5000K cool white (70 CRI min), 4500K mid-neutral (80 CRI min), 4000K neutral white (80 CRI min), 3500K mid-warm (80 CRI min), or 3000K warm white (80 CRI min).

- Options for High Ambient luminaires (up to 75 °C [167 °F]). Add -A at end of eligible part numbers. See T-Code table in catalog pages for specifics.
- Customize to the application requirements with four different globe options: clear and diffused polycarbonate, clear glass, or prismatic glass refractor.
- Seven standard mounting hood designs allow for mounting in any location. Uses same mounting hoods as Mercmaster III.
- Retrofit adapters for Crouse-Hinds™ †, Mercmaster II, and Killark † hoods available. See Mercmaster LED Adapters.
- New Watertight Pendant Hood with IP 68 cord grip available to address water ingress into luminaire via conduit.
- Hinge has high lip for added safety during installation and servicing. Hinge and bolt construction assures 360° compression at all points on fixture housing gasket for positive sealing. Swing away design of captive bolt and nut simplifies installation.
- Rugged housing with superior thermal design translates to long luminaire life.
- Luminaire housing has wiring compartment with terminal block separate for easy wiring access.
- Standard screw-type terminal block can accept UL/CSA .14 to 6 mm<sup>2</sup> (26-10 AWG) wire.
- Standard 6 kV surge protection. Optional 10 kV available.
- Heavy duty, high temperature silicone gaskets.
- Photometric data and electronic drawings available upon request.
- Ambient Temperature (standard product): -40 °C to +65 °C (-40 °F to +149 °F). Higher ambient options available on select configurations. See T-Code table for details.
- Standard NPT threads with M20 option.
- LED L70 reported at 76,000 hours.
- Field replaceable globes and LED driver.
- 10 Year warranty standard for select part numbers (see ordering tree for details).

### STANDARD MATERIALS

- Mounting hoods and bodies: cast copperfree (4/10 of 1% max.) aluminum
- Gaskets: silicone
- All hardware and catch assemblies: stainless steel
- Globe: polycarbonate or glass
- Refractor: heat-resistant prismatic glass
- Glass globe guard and safety cable: stainless steel wire
- Glass refractor guard: die cast aluminum

### STANDARD FINISHES

- Mounting hoods, bodies and glass refractor guard: gray epoxy powder coat finish, electrostatically applied for complete uniform protection

### OPTIONS

- Globe and refractor guards available, purchase separately
- Safety cable available, purchase separately.
- All Mercmaster luminaires have provision for fusing; add suffix -F at the end of the catalog number.
- All Mercmaster LED Generation 3 luminaires have option for 10 kV surge protection. Add suffix -S at the end of the catalog number.
- Some lumen output luminaires offer High Ambient temperature option up to 70 °C or 75 °C (158 °F or 167 °F). See catalog logic tree for specifics.
- Photocontrols are available and are configured to your operating voltage. Add suffix -1 for 120V, -2 for 208V, -3 for 240V, -4 for 277V.
- Drain is available to divert water existing in the conduit system, *purchase separately*.

### DESIGN LIGHTS™ CONSORTIUM

- Check DLC QPL for current list of products.

### INTERNATIONAL DARK-SKY ASSOCIATION

- IDA Dark Sky Approved when ordering [I]MLG[A/B/C/D]/R/W]xxW[P/D/G]5Bxxx with MMVISOR accessory.

† Killark is a registered trademark of Hubbell Incorporated.  
 † Crouse-Hinds is a registered trademarks of Cooper Crouse-Hinds.

APPLETON™

For product information:  
[www.masteringled.com](http://www.masteringled.com)  
 1.800.621.1506



CONSIDER IT SOLVED™

# HAZARDOUS MERCMASTER™ LED GENERATION 3 SERIES LUMINAIRES

## NEC/CEC RATINGS

- Class I, Division 2, Groups A, B, C, D
- Class II, Division 1 and 2, Group E, F, G
- Class III
- Class I, Zone 2 AEx ec IIC
- Zone 21 AEx tb IIIC
- Class I, Zone 2 Ex ec II
- Zone 21 Ex tb IIIC
- Type 3R, 4, 4X
- IP66/IP67

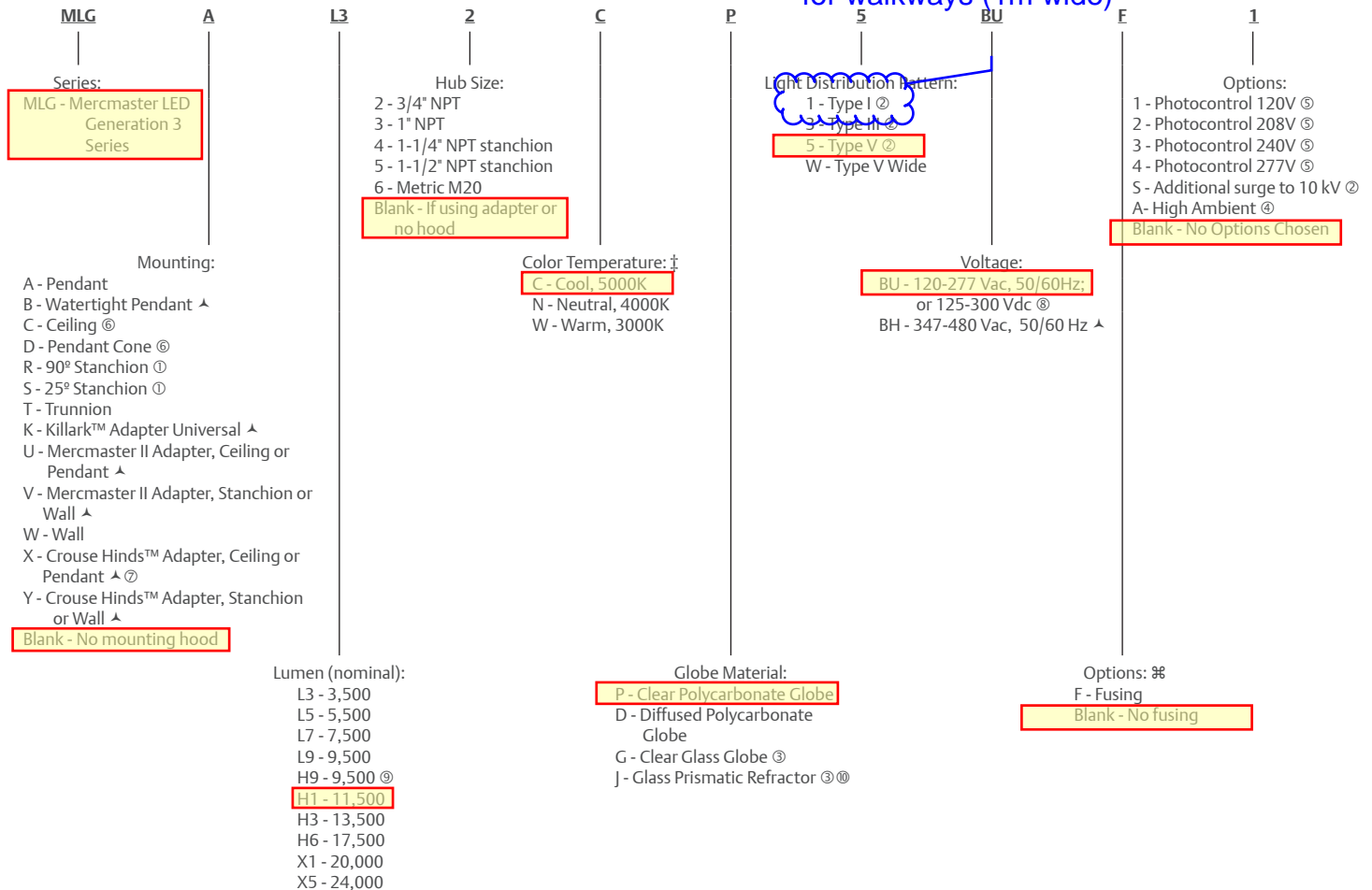
## NEC/CEC RATINGS

- Simultaneous Exposure
- Suitable for Use in Wet Locations
- Marine Outside Type (Salt Water)
- American Bureau of Shipping (ABS) Certified
- International Dark Sky (IDA) Approved

## NEC/CEC CERTIFICATIONS AND COMPLIANCES

- UL Standard: UL 844; UL 1598; UL 50E; UL 8750; UL 60079-0; UL 60079-7; UL 60079-31
- CSA Standard: C22.2 No. 0 - 10; C22.2 No. 94.2 - 15; C22.2 No. 137 - M1981; C22.2 No. 250.0 - 08; C22.2 No. 250.13 - 14; C22.2 No. 60529; C22.2 No. 60079-0:15; C22.2 No. 60079-7:16; C22.2 No. 60079-31:15; CSA E60598-1:16
- NEMA ANSI/IEC Standards: 60529
- cCSAus: 164460, Certificate Number: 70112879

## CATALOG NUMBERING GUIDE



- ① 3/4" NPT, 1" NPT and Metric M20 hub entries are not offered in this mounting option.
- ② 10 year warranty standard when ordered with light distribution pattern Type I, III or V Wide or additional (10 kV) surge protection (not available with high ambient options). 10 kV surge is not rated for ATEX/IECEx.
- ③ Guards for the glass refractors and globes are ordered separately. See the Accessories for more information.
- ④ See details in T-Codes tables for specific model numbers.
- ⑤ Luminaires with photocontrol are not rated IP66/67, Class II, 3R, 4, 4X, or Marine Outside Type (Salt Water). Photocontrol available for 120-277 Vac only. Factory installed in the mounting hood. Photocontrols only certified for cCSAus.
- ⑥ Ceiling-mount and pendant cone mounting hoods and adapters are not designed to use the in hood photocontrol. Ceiling and pendant cone mounts must use an FS/FD box with photocontrol.

- ⑦ Only allowed for Type V and Type V wide light distribution.
  - ⑧ For 125-170 Vdc, operating temperature range is -40°C to +55°C (-40 °F to +131 °F) (lower range applies to IECEx/ATEX only).
  - ⑨ H9 only available with High Ambient option (A).
  - ⑩ J - Glass prismatic refractor is only available in light distribution pattern Type V. Refractor is not rated for ATEX/IECEx.
- Ⓜ Fusing only permitted for NEC/CEC rating. Factory installed. Use of fuse voids Marine Outside Type (Salt Water) rating. Fusing is mounted in the driver housing.
- ‡ Other CCT options available upon request. Contact your local sales representative for more information.
  - ▲ Adapters, watertight pendant hood and BH Voltage only certified for NEC/CEC.

New improved IP66 linear vapourproof fixture that is rugged in design, with conduit entries on the back and the side for ease of installation.



### APPLICATIONS

**Ideal for parking lots, industrial applications, agricultural applications, food processing industries, poultry barns and other harsh environments.**

<b>Project</b>	
<b>Type</b>	
<b>Date</b>	
<b>Notes</b>	

### SPECIFICATIONS

#### Construction

Polycarbonate UV stabilized housing with opal lens. The lens attaches to the fixture using 6 stainless steel clips on either side. The LFX4-LED60 is ideal for mounting heights between 8' - 10' creating a wide even light distribution because of its rounded opal lens.

#### Lens

Fixture has a high grade polycarbonate lens that is UV stabilized.

#### LED information

The fixture contains a high efficiency LED strip that delivers a total output of 8,002 lumens at an efficacy of 130 lumens/watt. LEDs have a colour temperature of 4000K as standard, 5000K is available as an option.

#### Finish

Grey Polycarbonate Finish

#### Electrical

Total system wattage of the unit is 62W. The standard unit has a high efficiency driver that operates at 120 - 277V. 347V is available as an option.

#### Mounting

Fixture comes with 2 stainless steel mounting brackets that facilitate quick and easy mounting direct on the wall or ceiling. Additional mounting options include suspended chain mount.

There are 4 conduit entries on the bottom and one conduit entry on either side.

#### Options

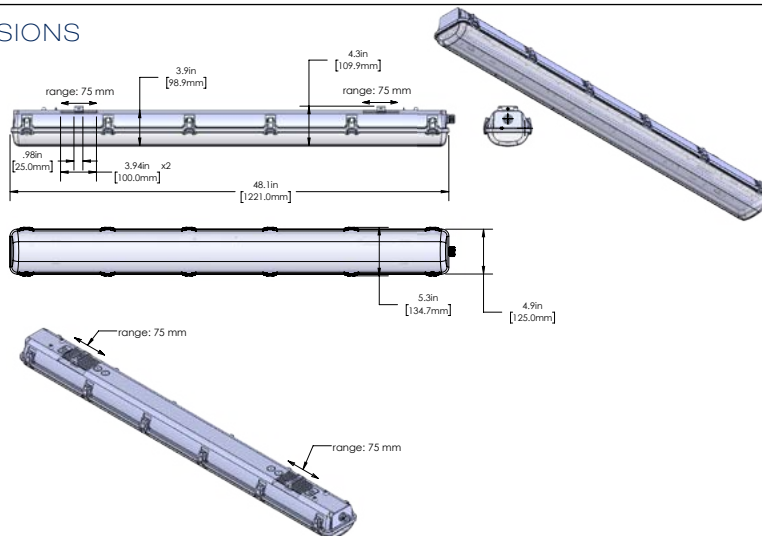
- Integrated High Frequency Sensor
- Battery backup

<b>Watts</b>	<b>62W</b>
<b>Equivalent to</b>	<b>&gt; 3 lamp T5 fluorescent fixture</b>
<b>Lumens</b>	<b>8,002</b>
<b>Efficacy</b>	<b>130 lumens per watt</b>

<b>Operating Temperature</b>	<b>-40°C to +40°C</b>
<b>Certification</b>	<b>cULus, IP66, DLC, NEMA 4X, NSF</b>
<b>LED Life</b>	<b>100,000 hours</b>
<b>Colour Temperature</b>	<b>4000K (standard) 5000K (option)</b>

<b>Warranty</b>	<b>5 years</b>
<b>CRI</b>	<b>&gt;80</b>
<b>Power Factor</b>	<b>0.9</b>
<b>Total Harmonic Distortion</b>	<b>14.85%</b>

### DIMENSIONS



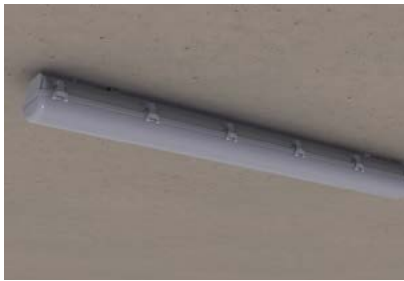
**NOTE:** Not for use in car wash facilities.



EASY INSTALLATION



1. Mount stainless steel clips on the surface



2. Mount fixture onto clips



3. Open up the lens by unhooking polycarbonate clips on one side



4. Remove LED tray using the pull tabs on either side of the fixture  
5. Both tray and lens hang while tethered to the fixture using a clip and lock system.  
6. Connect wires using quick connects



7. Reattach the tray to the fixture



8. Reattach the lens to the fixture

ORDERING GUIDE

<b>LFX4</b>	<b>LED60</b>								
		<b>VOLTAGE</b>	<b>COLOUR TEMP</b>	<b>FINISH</b>	<b>DIMMING</b>	<b>LIGHTING CONTROLS</b>	<b>NSF CERTIFICATION</b>	<b>NEMA 4X CERTIFICATION</b>	<b>BATTERY BACKUP</b>
		<b>B - 120</b> <b>277V*</b> <b>C - 347V</b>	<b>4K - 4000K*</b> <b>5K - 5000K</b>	<b>GRY - GREY*</b>	<b>DIM - 0 - 10V</b> <b>dimming*</b>	<b>Leave Blank - None*</b> <b>DHFS - Dimming High frequency motion sensor (can be set as ON/OFF)</b>	<b>FS-NSF Certified*</b>	<b>N4X-NEMA 4X*</b>	<b>Leave Blank - No Battery Backup</b> <b>BBK - Battery Backup</b>

Order separately: 089556 - LFX4-LED REPL SST CLIPS KIT - Replacement Stainless steel clips kit

\* Standard configuration

**NOTE: Not for use in car wash facilities.**