



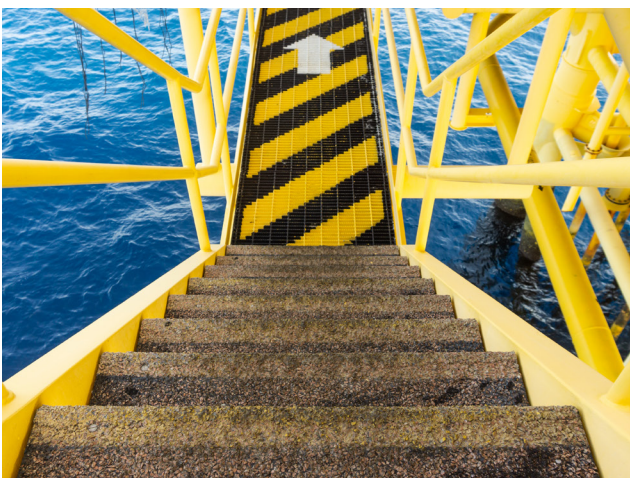
Chalmit

CASE STUDY

# Offshore Substations and Chalmit Lighting Design

Here in Chalmit Lighting Design, we are involved in varied project types and Off-Shore Substations are some of the most interesting. Having completed numerous sub-station lighting designs over the years, we see many repeated features.

In this document, we aim to look at various areas requiring lighting and how we would go about specifying lighting products designing the lighting layout to suit. These recommendations can be taken as a basis for upcoming structures.



## Standards

BS IEC 61892-2:2019 details the lighting requirements for Mobile and Fixed offshore units.

**Normal Mode Illumination** – in normal mode, the installed lighting should, as a minimum, achieve the average lux levels noted in 61892-2 Table G.1. These values are taken from the NORSOK S-002 standard where additional areas are included too.

The Standard tells us to measure our levels at a 1.0m high task plain. This is generally fine for internal areas with control equipment. However exterior walking areas contravene 1.0m task height requirement where the task height should be taken as the floor.

Average illuminance is not a stated requirement in the standard. However, we would endeavour to achieve a good degree of uniformity over all the spaces in line with similar activities.

**Table G.1 - General lighting illumination levels**

Area	Average illuminance (lux)
General outdoor areas	100
General indoor areas, corridors, accommodation etc	100
Stairways	150
Process areas	200
Drill floor	350
Control rooms	500
Engine rooms - Pump rooms	200
Auxiliary engine rooms	200
Workshops	500
Switchboard/transformer rooms	200
Offices	500
Laundry and mess area	300
Galley	500
Hospital	Min. 500
Radio rooms	500

**Emergency Mode Illumination** – in emergency mode there may be machinery that remains active and requires shutting down. For this case we need to achieve >30% of Normal average illumination target. Task plain heights in Emergency Mode the same as Normal Mode.

**Escape Mode Illumination** – all escape routes must achieve a minimum of 1.0 lux along centre line to place of safety. Task Plain taken as floor level throughout. We have found that customers intend to power the Emergency and Escape lighting from a site UPS system.

Off-shore substations are classed as Safe Area so all lighting will be Industrial & Marine rated, with the exception of battery rooms that will be Zone 2.

**Area Specifications**

Room description	Level of manning	Average illuminance level (lux)	Temperature min/max °c	Vibration limit	Noise total dB(A)	Noise HVAC dB (A)
External walkways and access ways		100	Outdoor		80	
Stairs, walkways and access ways in enclosed work areas		150			60-80	
Lay down area		200			75	
Muster Area	U	200	Outdoor	2	75	
Fire pump room	U	200	5-35	3	110	80
Emergency generator room	U	200	5-35	3	110	
Unmanned machinery room	U	200	5-35	3	110	80
General process and utility area	I	200	Outdoor/5-35	3	85/90	
HVAC room	U	200	5-35	3	90	
Switchboard and transformer room	I	200	5-35	2	85	70
Central control room	M	500 Adjustable	20-24	1	45	40
Local control room	I	400	19-26	2	60	50
Coffee bars outside LQ	M	150	19-26	2	60	50
Battery room	U	200	5-35	3	85	70
Main generator room	U	200	5-35	3	85/90	70
Inst/El. Workshop	M	500	19-26	2	65	50
Mechanical workshop/welding	M	500	16-26	2	65	50
Stores - Large parts		200	16-26	2	65	60
Stores - Small parts		300	16-26	2	65	60
Laboratory	I/M	500	19-26	2	60	50
Paint shop	I	500	16-26	2	65	55
Sandblasting room	I	300	16-26	2	65	55
Workshop office	M	500	19-26	2	55	50
Crane cabin	M	400	19-26	2	65	60
Driller's cabin	M	400 Adjustable	19-26	2	65	60
Drill floor	M	350	Outdoor	3	85	
Local instrument room	U	400	5-35	2	75	60
Coffee bars in LQ, television room etc.	I	150	20-24	1	45	40
Dining room	M	300	20-24	1	55	50
Galley	M	500	20-24	1	60	55
Serving area	M	400	20-24	1	55	50
Laundry- machinery area	M	300	20-24	2	75	60
Laundry- work area	M	300	20-24	2	65	60
Dish washing	M	min. 300	20-24	1	70	55
Gymnasium	I	min. 300	20-24	1	50	50
Cabins	M	150	20-24	1	40	35
Corridor in LQs	U	100	19-26	1	60	50
Corridor in work areas	U	100	5-35		60	
Hospital/ward	M	min. 500	20-24	1	40	35
Offices/meeting rooms	M	500 Adjustable	20-24	1	45	40
Radio room	M	500	20-24	1	50	45
Toilets/changing room	I	min. 200	20-24	1/2	60	50
Monkey board	M	200	Outdoor	3	85	
Pipe rack area	I	200	Outdoor	3	85	
Mud/well logging	I	500	16-26	2	60	50
Shale shaker	I	300	5-35	3	85/90	
Mud room, mixing area	I	200	Outdoor	3	85/90	
Mud room, test station	I	300	Outdoor	3	85/90	
Mud lab	I	300	16-26	2	60	55
Operator's cabin in drilling unit	I/M	400	16-26	2	60	55
Blowout preventer and well head	I	150	Outdoor	3	85/90	

## Maintenance Factor

A strict calculation of maintenance factor for lighting calculations, to maintain a minimum illuminance throughout the life of a lighting install, factors in not only output depreciation of the light source over time and lamp mortality but also environmental dirt build up on the lighting and on the surrounding surfaces.

Lighting Design is involved very early in the life of off-shore installations. As such we rarely

have information pertaining to the planned maintenance and cleaning regimes to be employed in the future.

As such we can only assume that the on-site planned maintenance team cleans and re-lamps regularly. In this way we can discount the unknowns and calculate using L70 end of life lumen maintenance of 70% or 0.70 only.

## Mounting

- Customers like to mount lighting to existing cable trays and exterior hand-rails.
- Customers like to mount lighting where it can be easily maintained.
- Customers do not like to use lighting columns or to add structures for lighting purposes.
- Where and how lighting is mounted is integral to the off-shore structure.
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- Where and how lighting is mounted is integral to the off-shore structure.

Ensuring compliance with the target illuminances and uniformities is essential while maintaining an economic, low glare and maintainable lighting layout poses significant challenges to a lighting designer.

## Lighting Products



**Protecta 3 LED Industrial – PR31**  
Interior and exterior marine rated Linear. GRP body, polycarbonate diffuser  
120,000hrs. 2ft – 2000 lumens, 4ft 7000 lumens (nominal)

[View Protecta III](#)



**Arran X LED Flood light – ARXI**  
Interior and Exterior marine rated floodlight, Marine grade aluminium, various beam optics, 100,000hrs, 7000 lumens, 20000 lumens (nominal), Medium and Narrow beams

[View Arran X](#)



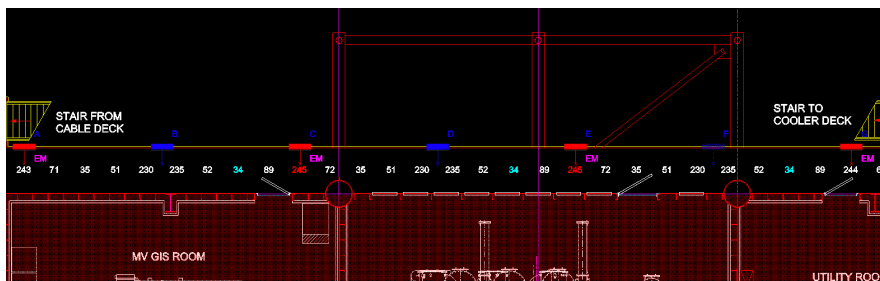
**NexLED III Bulkhead – NL31**  
Interior and Exterior marine rated bulkhead, Marine grade aluminium, EXIT legend, 100,000hrs  
1000 lumens (nominal)

[View NexLED III](#)

## Exterior Walkways

### Specifications. Option 1.

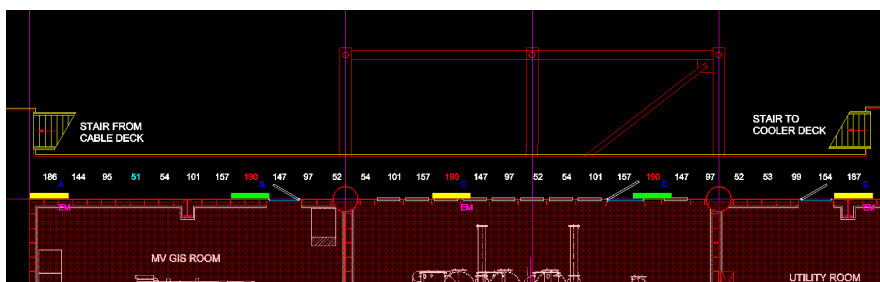
PR31/O2L/LE	
Mounting	Handrail. Attached under and parallel to upper rail at 1.0m AFFL with 30° rotation
Task Plain	Floor - 0.0m
Task Illuminance (Norm)	>100 lux average
Target illuminance (Em)	>30 lux average
Target illuminance (Esc)	>1.0 lux minimum
Additional	0.25 uniformity (Norm)
Spacing (Norm)	4.5m
Spacing (Em/Esc)	9.0m
Normal Mode	118 lux average, >0.28 uniformity
Emergency Mode	58 lux average onto floor
Escape Mode	2.8 lux minimum



## Exterior Walkways

### Specifications. Option 2.

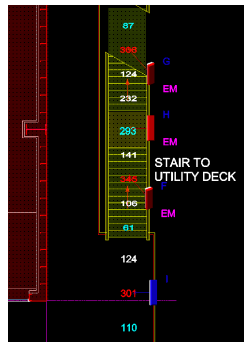
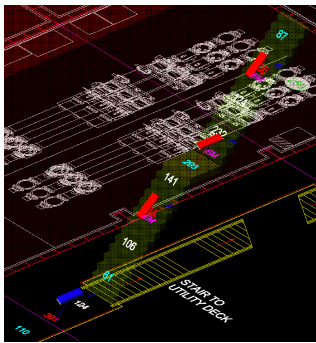
PR31/O2L/LE	
Mounting	Handrail. Attached under and parallel to upper rail at 2.6m AFFL
Task Plain	Floor - 0.0m
Task Illuminance (Norm)	>100 lux average
Target illuminance (Em)	>30 lux average
Target illuminance (Esc)	>1.0 lux minimum
Additional	0.25 uniformity (Norm)
Spacing (Norm)	5.0m
Spacing (Em/Esc)	10.0m
Normal Mode	115 lux average, >0.43 uniformity
Emergency Mode	61 lux average onto floor
Escape Mode	6.8 lux minimum



## Exterior Stairways

### Specifications

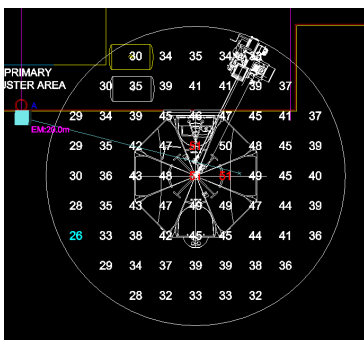
PR31/O2L/LE	
Mounting	Handrail. Attached under and parallel to upper rail at 1.0m AFFL with 30° rotation
Task Plain	Floor - 0.0m
Task Illuminance (Norm)	>150 lux average
Target illuminance (Em)	>45 lux average
Target illuminance (Esc)	>1.0 lux minimum
Additional	0.25 uniformity (Norm)
Spacing (Norm)	1 luminaire per landing or tread run
Normal Mode	160-290 lux average, >0.25 uniformity
Emergency Mode	150 lux average onto floor
Escape Mode	21 lux minimum



## Escape to Sea / Boat Launch

### Specifications

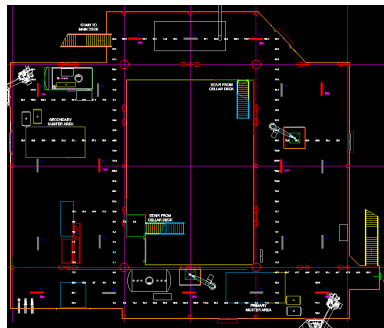
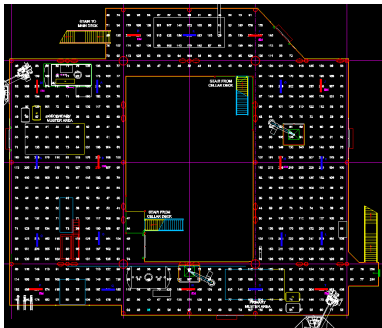
ARX1/20L/LE/N	
Mounting	Deck Edge aimed to centre of life raft landing, avoiding winching equipment and exit barriers
Task Plain	10m dia Sea Surface -20m below Cable deck level
Task Illuminance (Norm)	>30 lux average
Target illuminance (Em)	>15 lux average
Target illuminance (Esc)	>2.0 lux minimum
Additional	0.25 uniformity (Norm)
Normal Mode	39lux average, 0.67 uniformity
Emergency Mode	39 lux average onto sea surface
Escape Mode	26 lux minimum



## Covered Exterior Deck

### Specifications

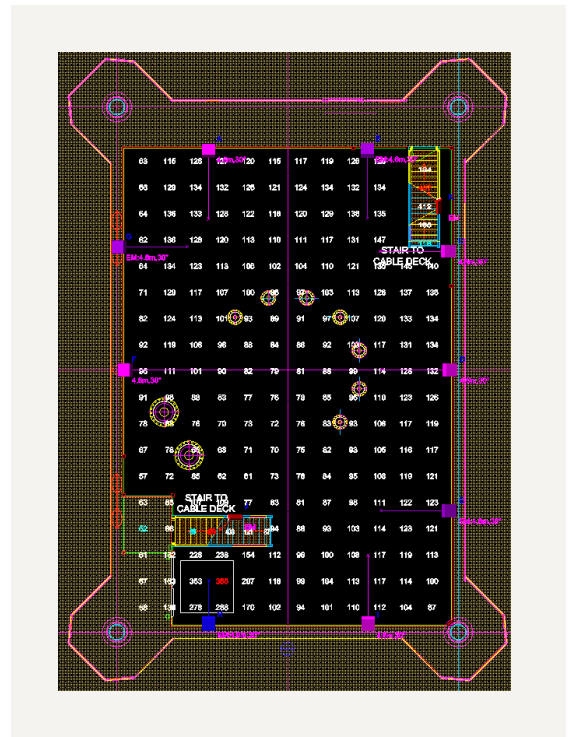
PR31/07L/LE	
Mounting	Cable Tray at 2.6m
Task Plain	Floor
Task Illuminance (Norm)	>100 lux average
Target illuminance (Em)	>30 lux average
Target illuminance (Esc)	>1.0 lux minimum
Additional	0.25 uniformity (Norm)
Normal Mode	110 lux average, 0.28 uniformity
Emergency Mode	48 lux average
Escape Mode	5.2 lux minimum along escape route



## Covered Cellar Deck

### Specifications

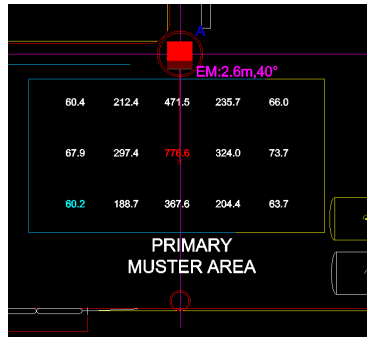
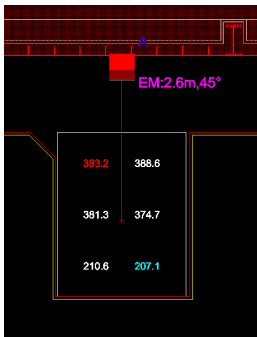
ARX1/07L/LE	
Mounting	Elevated Handrails surrounding Cellar Deck
Task Plain	Floor
Task Illuminance (Norm)	>100 lux average
Target illuminance (Em)	>30 lux average
Target illuminance (Esc)	>1.0 lux minimum
Additional	0.25 uniformity (Norm)
Normal Mode	110 lux average, 0.46 uniformity
Emergency Mode	50 lux average
Escape Mode	5.2 lux minimum



## Laydown and Muster Areas

### Specifications

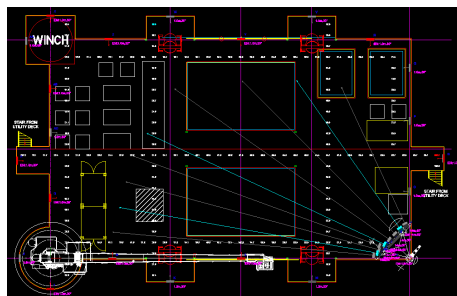
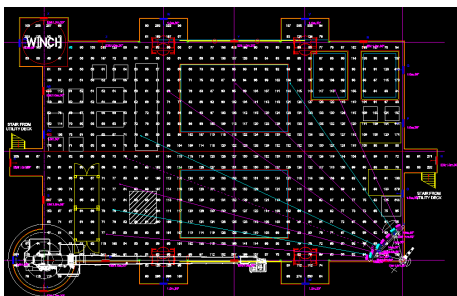
ARXI/07L/LE/N		
Mounting	Cable Tray at 2.6m mounted away from hoist machinery	
Task Plain	Floor - 0.0m	
Task Illuminance (Norm)	>200 lux average	
Target illuminance (Em)	>60 lux average	
Target illuminance (Esc)	>1.0 lux minimum	
Additional	0.25 uniformity (Norm)	
Normal Mode	325 lux average, >0.63 uniformity	231 lux average, 0.26 uniformity
Emergency Mode	325 lux average	231 lux average
Escape Mode	207 lux minimum	60 lux minimum



## Open Exterior Deck

### Specifications

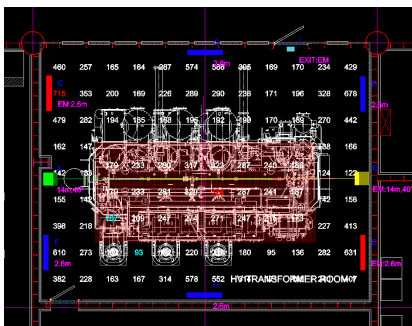
PR31/02L/LE & ARXI/07L/LE/N	
Mounting	Handrails at 1.0m and Communications Mast at 14.0m
Task Plain	Floor
Task Illuminance (Norm)	>100 lux average
Target illuminance (Em)	>30 lux average
Target illuminance (Esc)	>1.0 lux minimum
Additional	0.25 uniformity (Norm)
Normal Mode	104 lux average, 0.41 uniformity
Emergency Mode	40 lux average
Escape Mode	10.3 lux minimum



## Interior Transformer Spaces

### Specifications

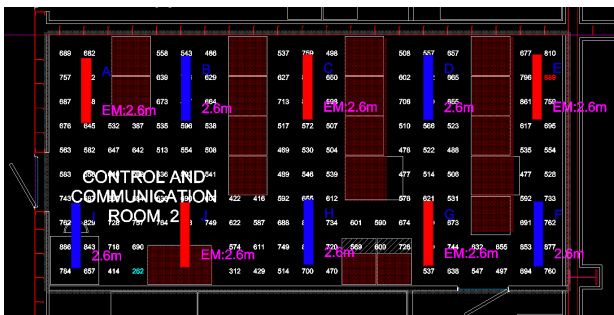
PRGI/07L/LE & ARXI/20L/LE/N	
Mounting	Cable Tray at 2.6m and Upper Access trays at 14.0m
Task Plain	1.0m AFFL
Task Illuminance (Norm)	>200 lux average
Target illuminance (Em)	>60 lux average
Target illuminance (Esc)	>1.0 lux minimum
Additional	0.25 uniformity (Norm)
Normal Mode	267 lux average, 0.35 uniformity Task / 245 lux average, 0.68 uniformity TX Top
Emergency Mode	74 lux average Task / 88 lux average TX Top
Escape Mode	12.6 lux minimum Floor / 43 lux min TX Top Floor



## Interior Control Rooms

### Specifications

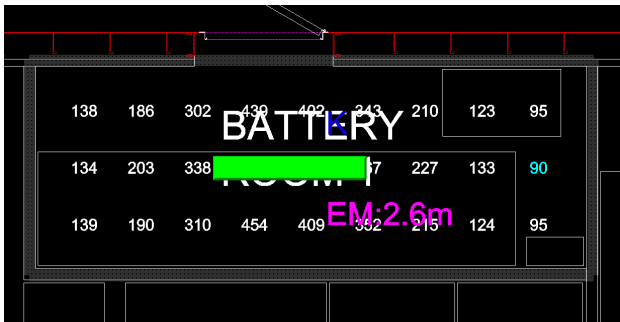
PRGI/07L/LE	
Mounting	Cable Tray at 2.6m
Task Plain	1.0m AFFL
Task Illuminance (Norm)	>500 lux average
Target illuminance (Em)	>250 lux average
Target illuminance (Esc)	>1.0 lux minimum
Additional	0.25 uniformity (Norm)
Normal Mode	635 lux average, 0.41 uniformity
Emergency Mode	260 lux average Task
Escape Mode	18 lux minimum



## Interior Battery Rooms (Z1/Z2)

### Specifications

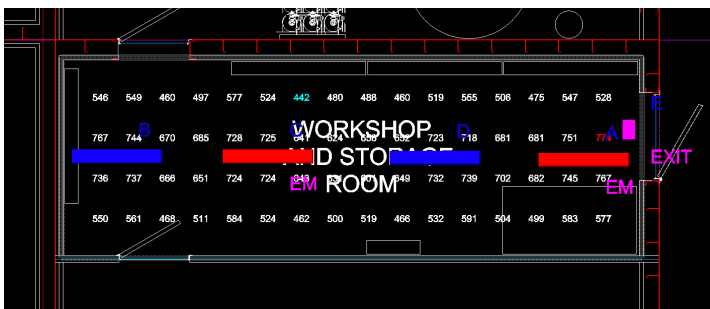
PRGE/05L/LE	
Mounting	Cable Tray at 2.6m
Task Plain	1.0m AFFL
Task Illuminance (Norm)	>200 lux average
Target illuminance (Em)	>60 lux average
Target illuminance (Esc)	>1.0 lux minimum
Additional	Zone 1 or Zone 2 environment, 0.25 uniformity (Norm)
Normal Mode	258 lux average, >0.35 uniformity
Emergency Mode	108 lux average Task
Escape Mode	52 lux minimum



## Interior Workshop

### Specifications

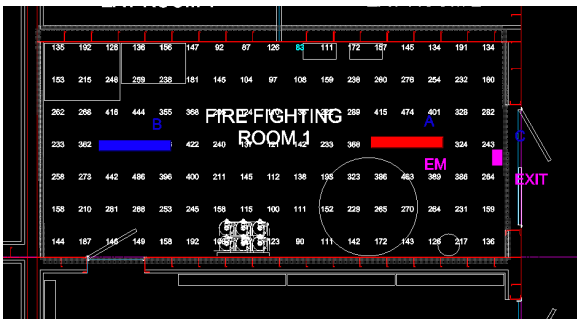
PRGI/07L/LE	
Mounting	Cable Tray at 2.6m
Task Plain	1.0m AFFL
Task Illuminance (Norm)	>500 lux average
Target illuminance (Em)	>50 lux average
Target illuminance (Esc)	>1.0 lux minimum
Additional	0.25 uniformity (Norm)
Normal Mode	608 lux average, >0.72 uniformity Task
Emergency Mode	1293 lux average Task
Escape Mode	59 lux minimum



## Interior Firefighting Room

### Specifications

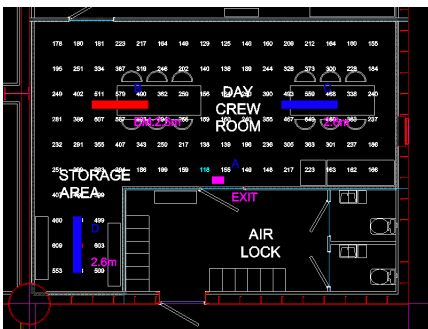
PRGI/07L/LE	
Mounting	Cable Tray at 2.6m
Task Plain	1.0m AFFL
Task Illuminance (Norm)	>200 lux average
Target illuminance (Em)	>60 lux average
Target illuminance (Esc)	>1.0 lux minimum
Additional	0.25 uniformity (Norm)
Normal Mode	236 lux average, >0.35 uniformity Task
Emergency Mode	109 lux average Task
Escape Mode	3.7 lux minimum



## Interior Day Crew Room

### Specifications

PRGI/07L/LE	
Mounting	Cable Tray at 2.6m
Task Plain	1.0m AFFL
Task Illuminance (Norm)	>200 lux average
Target illuminance (Em)	>60 lux average
Target illuminance (Esc)	>1.0 lux minimum
Additional	0.25 uniformity (Norm)
Normal Mode	299 lux average, >0.39 uniformity Task
Emergency Mode	114 lux average Task
Escape Mode	5.4 lux minimum



## Contact Us

Here at Chalmit we offer a free Lighting Design service as an aid to our Sales Team offering our huge experience and technical know-how to provide valued solutions to our customers lighting needs.

If you have any questions at all about Lighting Design or Off-Shore Wind Substations, please contact us using the details below. We will be happy to answer whatever questions you have and offer advice on products and lighting design.

**Email Lighting Design:** [hhlightingdesign@hubbell.com](mailto:hhlightingdesign@hubbell.com)

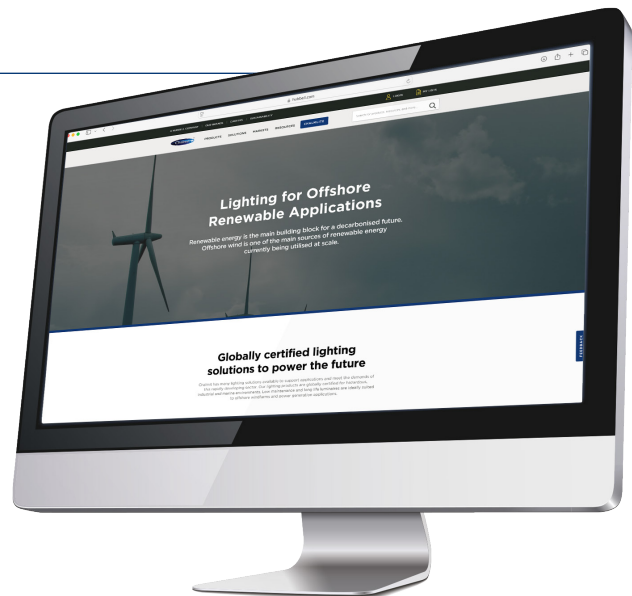
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Lighting Design*

## About the Author

Karl joined Chalmit in 2012, and has a total of 28 years experience within the lighting industry.

A developer of ChalmLite 6.0 lighting design calculation software, Karl is dedicated to all things lighting design.

To get in touch with Karl, email him via [kslingo@hubbell.com](mailto:kslingo@hubbell.com) or follow him on LinkedIn.

# Chalmit<sup>®</sup>

Founded in 1910 in Glasgow, Scotland, Chalmit is a trusted and leading manufacturer of lighting solutions to the Harsh, Hazardous and Industrial markets.

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