

Investitor:

**GRAD VUKOVAR**

Dr. Franje Tuđmana 1, Vukovar 32000  
OIB 50041264710

Građevina:

**IZGRADNJA SPORTSKO REKREACIJSKOG CENTRA NA NOGOMETNOM STADIONU U VUKOVARU**

Ulica 204. vukovarske brigade, novoformirana k.č.br. 1575, k.o. Vukovar

Projekt:

**IZVEDBENI PROJEKT – ELEKTROTEHNIČKI PROJEKT**

Broj:

**127/19**

## 9. SVJETLOTEHNIČKI PRORAČUNI

U Osijeku, travanj 2020. god.

PROJEKTANT:

Zlatko Galić, dipl. ing. el.



**ZLATKO GALIĆ**  
dipl.ing.el.

E 223

**OVLAŠTENI INŽENJER**  
**ELEKTROTEHNIKE**

# **Svjetlotehnički proračun stadionske rasvjete**

INVESTITOR:  
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Dr. Franje Tuđmana 1,  
31000 Vukovar

GRAĐEVINA:  
Rekonstrukcija stadiona

Date: 19.03.2020  
Operator: Nova-lux d.o.o., Osijek



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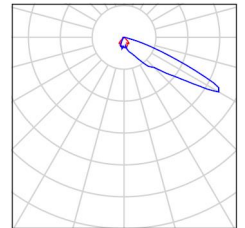
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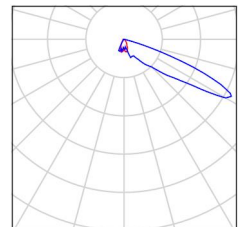
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### Svjetlotehnički proračun stadionske rasvjete / Luminaire parts list

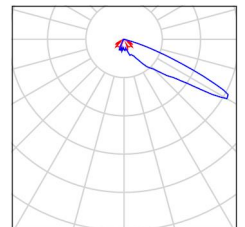
10 Pieces PHILIPS MVP507 1xMHN-FC1000W/230V/740  
 MB/60  
 Article No.:  
 Luminous flux (Luminaire): 82770 lm  
 Luminous flux (Lamps): 93000 lm  
 Luminaire Wattage: 1100.0 W  
 Luminaire classification according to CIE: 100  
 CIE flux code: 25 63 98 100 89  
 Fitting: 1 x MHN-FC1000W/230V/740 (Correction  
 Factor 1.000).



12 Pieces PHILIPS MVP507 1xMHN-FC1000W/230V/740  
 NB/62  
 Article No.:  
 Luminous flux (Luminaire): 83700 lm  
 Luminous flux (Lamps): 93000 lm  
 Luminaire Wattage: 1100.0 W  
 Luminaire classification according to CIE: 100  
 CIE flux code: 27 62 98 100 90  
 Fitting: 1 x MHN-FC1000W/230V/740 (Correction  
 Factor 1.000).



8 Pieces PHILIPS MVP507 1xMHN-FC1000W/230V/740  
 WB/60  
 Article No.:  
 Luminous flux (Luminaire): 84630 lm  
 Luminous flux (Lamps): 93000 lm  
 Luminaire Wattage: 1100.0 W  
 Luminaire classification according to CIE: 100  
 CIE flux code: 21 58 98 100 91  
 Fitting: 1 x MHN-FC1000W/230V/740 (Correction  
 Factor 1.000).

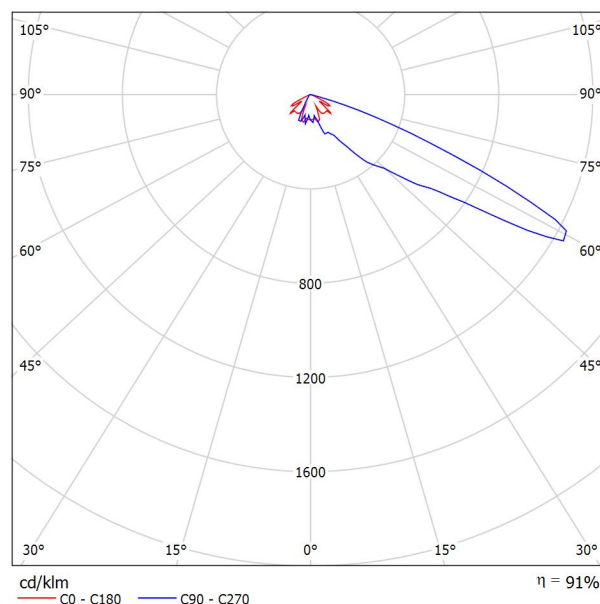




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## PHILIPS MVP507 1xMHN-FC1000W/230V/740 WB/60 / Luminaire Data Sheet

Luminous emittance 1:

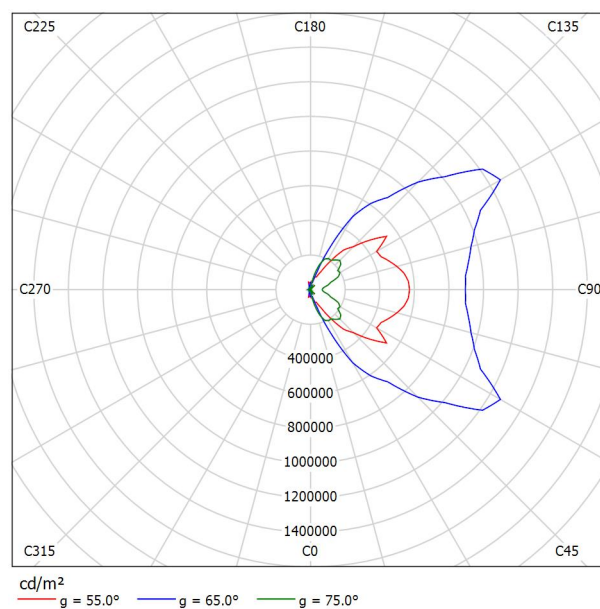


Luminaire classification according to CIE: 100  
 CIE flux code: 21 58 98 100 91

OptiVision – breakthrough downlight Optivision is an asymmetric downlighting luminaire that combines compact dimensions with very high efficiency. Available with narrow, medium and wide beams for flexibility in application, it provides excellent control of spill light and limitation of glare and upward leakage of light. Optivision can accommodate metal-halide lamps for good color rendering or high-pressure sodium lamps for economical operation.

Excellent spill-light control, limitation of glare and upward leakage of light is secured by asymmetric optics that achieve peak intensity at 60° and a sharp cut-off of light at 80°. The MHN-LA/FC lamps guarantee pleasant and natural color rendering and comfortable atmosphere.

Luminous emittance 1:



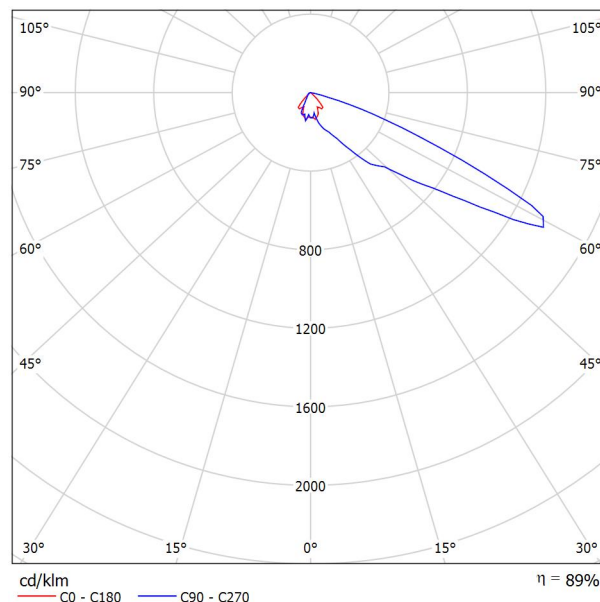
Components:

• 2 x

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## PHILIPS MVP507 1xMHN-FC1000W/230V/740 MB/60 / Luminaire Data Sheet

Luminous emittance 1:

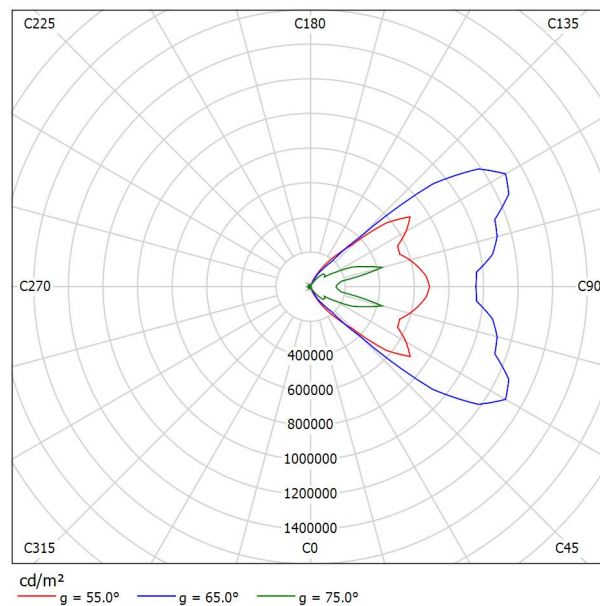


Luminaire classification according to CIE: 100  
 CIE flux code: 25 63 98 100 89

OptiVision – breakthrough downlight Optivision is an asymmetric downlighting luminaire that combines compact dimensions with very high efficiency. Available with narrow, medium and wide beams for flexibility in application, it provides excellent control of spill light and limitation of glare and upward leakage of light. Optivision can accommodate metal-halide lamps for good color rendering or high-pressure sodium lamps for economical operation.

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Luminous emittance 1:



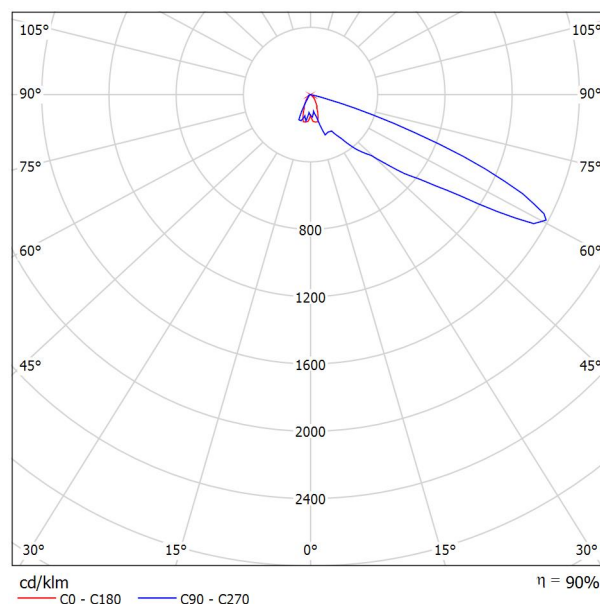
Components:

• 2 x

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## PHILIPS MVP507 1xMHN-FC1000W/230V/740 NB/62 / Luminaire Data Sheet

Luminous emittance 1:

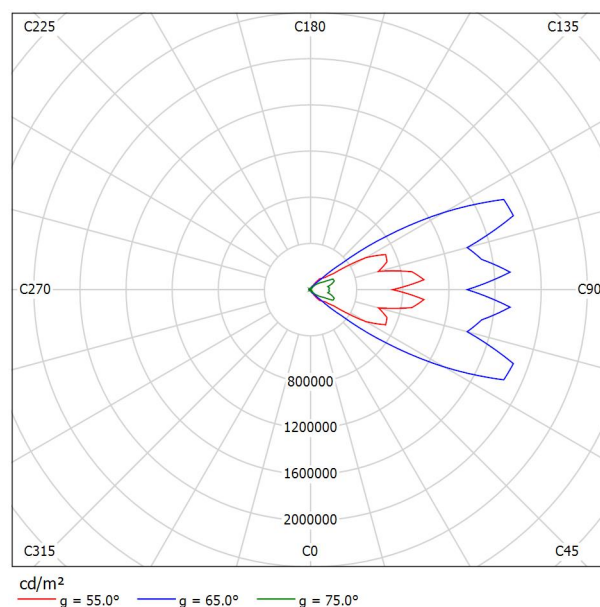


Luminaire classification according to CIE: 100  
 CIE flux code: 27 62 98 100 90

OptiVision – breakthrough downlight Optivision is an asymmetric downlighting luminaire that combines compact dimensions with very high efficiency. Available with narrow, medium and wide beams for flexibility in application, it provides excellent control of spill light and limitation of glare and upward leakage of light. Optivision can accommodate metal-halide lamps for good color rendering or high-pressure sodium lamps for economical operation.

Excellent spill-light control, limitation of glare and upward leakage of light is secured by asymmetric optics that achieve peak intensity at 60° and a sharp cut-off of light at 80°. The MHN-LA/FC lamps guarantee pleasant and natural color rendering and comfortable atmosphere.

Luminous emittance 1:



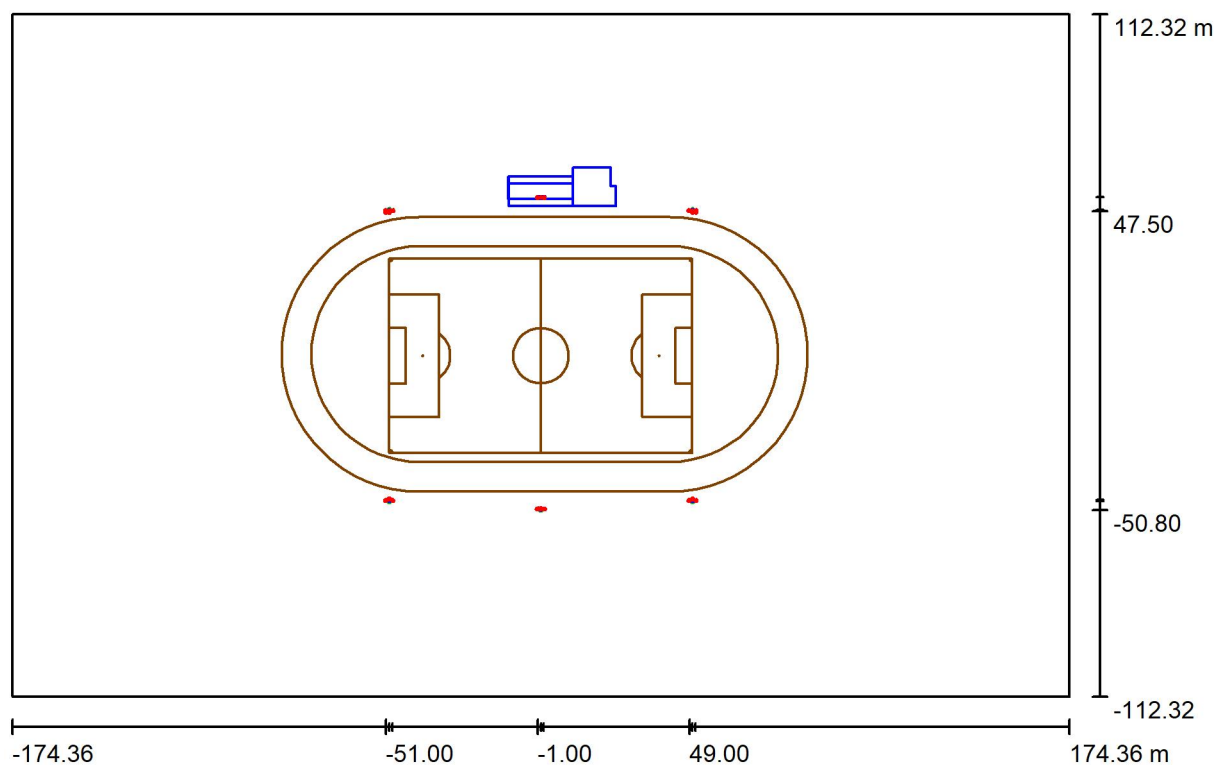
Components:

•2 x



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## Rasvjeta terena / Planning data



Maintenance factor: 0.80, ULR (Upward Light Ratio): 0.0%

Scale 1:2494

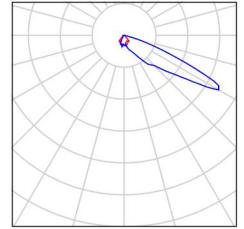
### Luminaire Parts List

No.	Pieces	Designation (Correction Factor)	Φ (Luminaire) [lm]	Φ (Lamps) [lm]	P [W]
1	10	PHILIPS MVP507 1xMHN-FC1000W/230V/740 MB/60 (1.000)	82770	93000	1100.0
2	12	PHILIPS MVP507 1xMHN-FC1000W/230V/740 NB/62 (1.000)	83700	93000	1100.0
3	8	PHILIPS MVP507 1xMHN-FC1000W/230V/740 WB/60 (1.000)	84630	93000	1100.0
Total:			2509140	2790000	33000.0

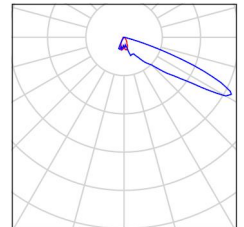
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## Rasvjeta terena / Luminaire parts list

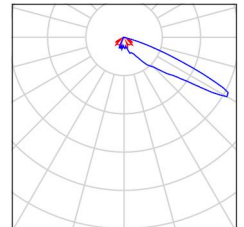
10 Pieces PHILIPS MVP507 1xMHN-FC1000W/230V/740 MB/60  
 Article No.:  
 Luminous flux (Luminaire): 82770 lm  
 Luminous flux (Lamps): 93000 lm  
 Luminaire Wattage: 1100.0 W  
 Luminaire classification according to CIE: 100  
 CIE flux code: 25 63 98 100 89  
 Fitting: 1 x MHN-FC1000W/230V/740 (Correction Factor 1.000).



12 Pieces PHILIPS MVP507 1xMHN-FC1000W/230V/740 NB/62  
 Article No.:  
 Luminous flux (Luminaire): 83700 lm  
 Luminous flux (Lamps): 93000 lm  
 Luminaire Wattage: 1100.0 W  
 Luminaire classification according to CIE: 100  
 CIE flux code: 27 62 98 100 90  
 Fitting: 1 x MHN-FC1000W/230V/740 (Correction Factor 1.000).



8 Pieces PHILIPS MVP507 1xMHN-FC1000W/230V/740 WB/60  
 Article No.:  
 Luminous flux (Luminaire): 84630 lm  
 Luminous flux (Lamps): 93000 lm  
 Luminaire Wattage: 1100.0 W  
 Luminaire classification according to CIE: 100  
 CIE flux code: 21 58 98 100 91  
 Fitting: 1 x MHN-FC1000W/230V/740 (Correction Factor 1.000).





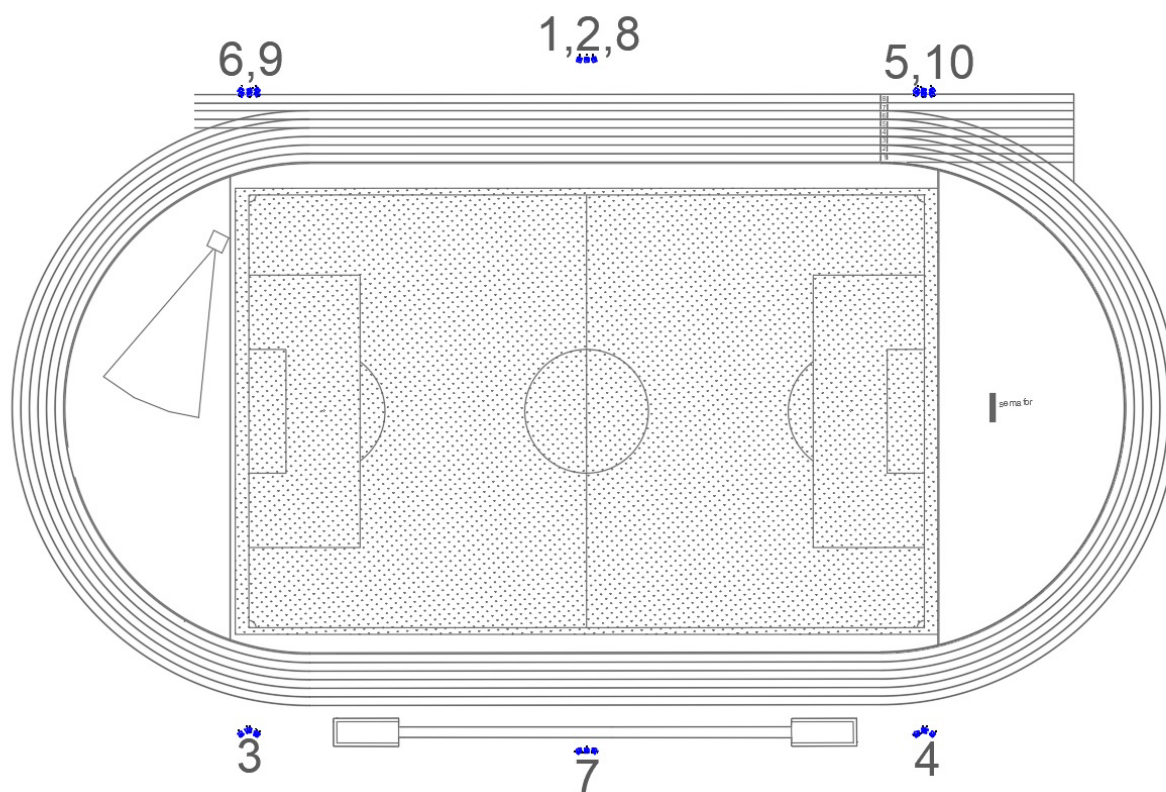


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## Rasvjeta terena / Luminaires (coordinates list)

### PHILIPS MVP507 1xMHN-FC1000W/230V/740 MB/60

82770 lm, 1100.0 W, 1 x 1 x MHN-FC1000W/230V/740 (Correction Factor 1.000).



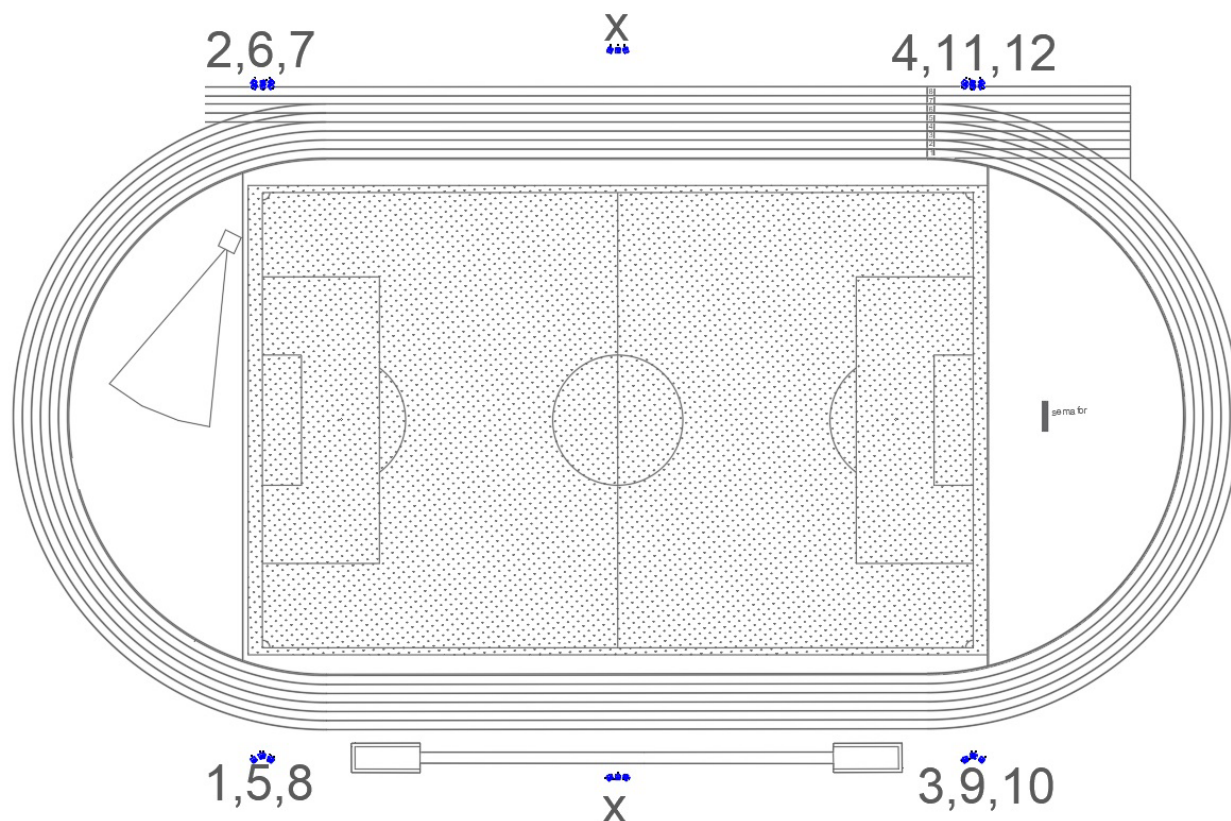
No.	Position [m]			Rotation [°]		
	X	Y	Z	X	Y	Z
1	1.000	52.307	10.804	15.0	0.0	-160.0
2	-1.000	52.307	10.804	15.0	0.0	160.0
3	-49.000	-48.000	15.000	10.0	0.0	-45.0
4	49.000	-48.000	15.000	10.0	0.0	45.0
5	49.000	48.000	15.000	10.0	0.0	135.0
6	-49.000	48.000	15.000	10.0	0.0	-135.0
7	0.000	-50.800	16.000	7.0	0.0	0.0
8	0.000	52.307	10.804	20.0	0.0	-180.0
9	-49.000	48.000	16.000	10.0	0.0	-145.0
10	49.000	48.000	16.000	10.0	0.0	145.0

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## Rasvjeta terena / Luminaires (coordinates list)

### PHILIPS MVP507 1xMHN-FC1000W/230V/740 NB/62

83700 lm, 1100.0 W, 1 x 1 x MHN-FC1000W/230V/740 (Correction Factor 1.000).



No.	Position [m]			Rotation [°]		
	X	Y	Z	X	Y	Z
1	-50.000	-47.500	16.000	8.0	0.0	30.0
2	-51.000	47.500	16.000	8.0	0.0	150.0
3	50.000	-47.500	16.000	8.0	0.0	-30.0
4	51.000	47.500	16.000	8.0	0.0	-150.0
5	-50.000	-47.500	15.000	7.0	0.0	-10.0
6	-50.000	47.500	15.000	7.0	0.0	-170.0
7	-51.000	48.000	15.000	5.0	0.0	140.0
8	-51.000	-48.000	15.000	5.0	0.0	40.0
9	51.000	-48.000	15.000	5.0	0.0	-40.0
10	50.000	-47.500	15.000	7.0	0.0	10.0
11	51.000	48.000	15.000	5.0	0.0	-140.0
12	50.000	47.500	15.000	7.0	0.0	170.0

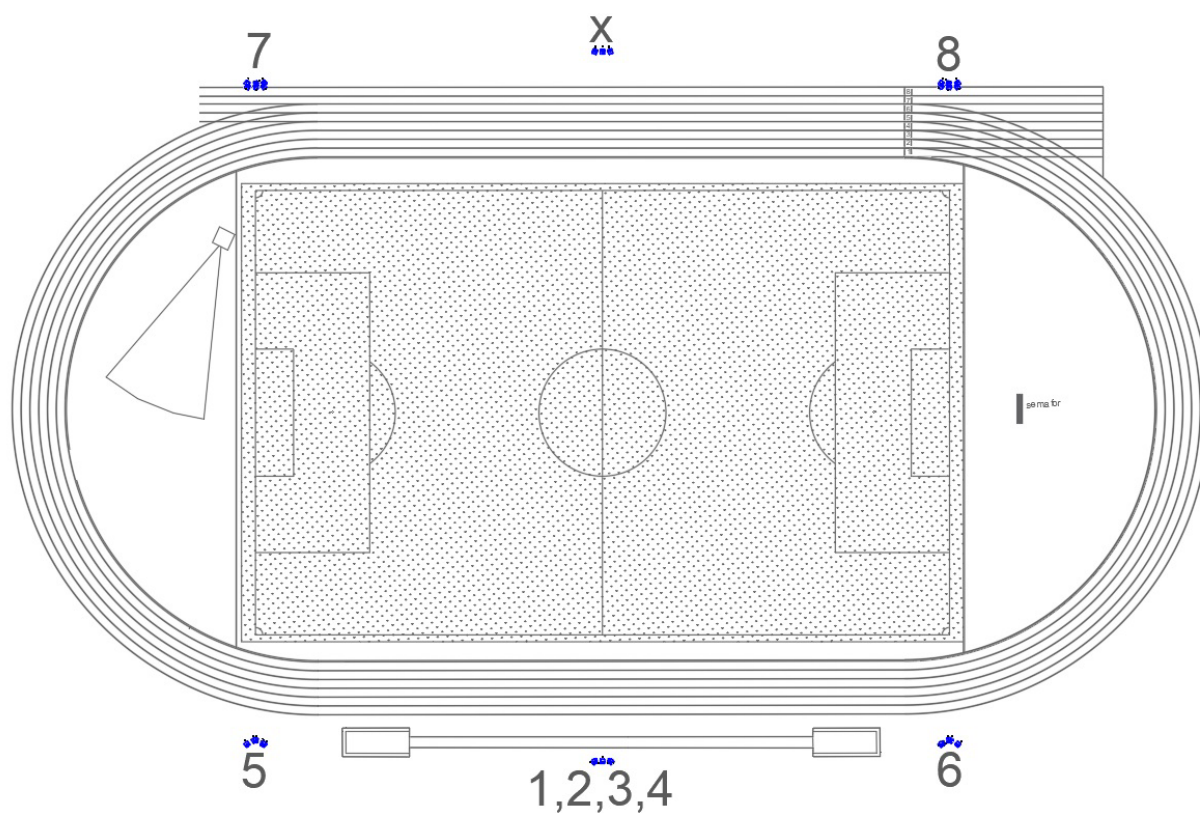


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## Rasvjeta terena / Luminaires (coordinates list)

### PHILIPS MVP507 1xMHN-FC1000W/230V/740 WB/60

84630 lm, 1100.0 W, 1 x 1 x MHN-FC1000W/230V/740 (Correction Factor 1.000).



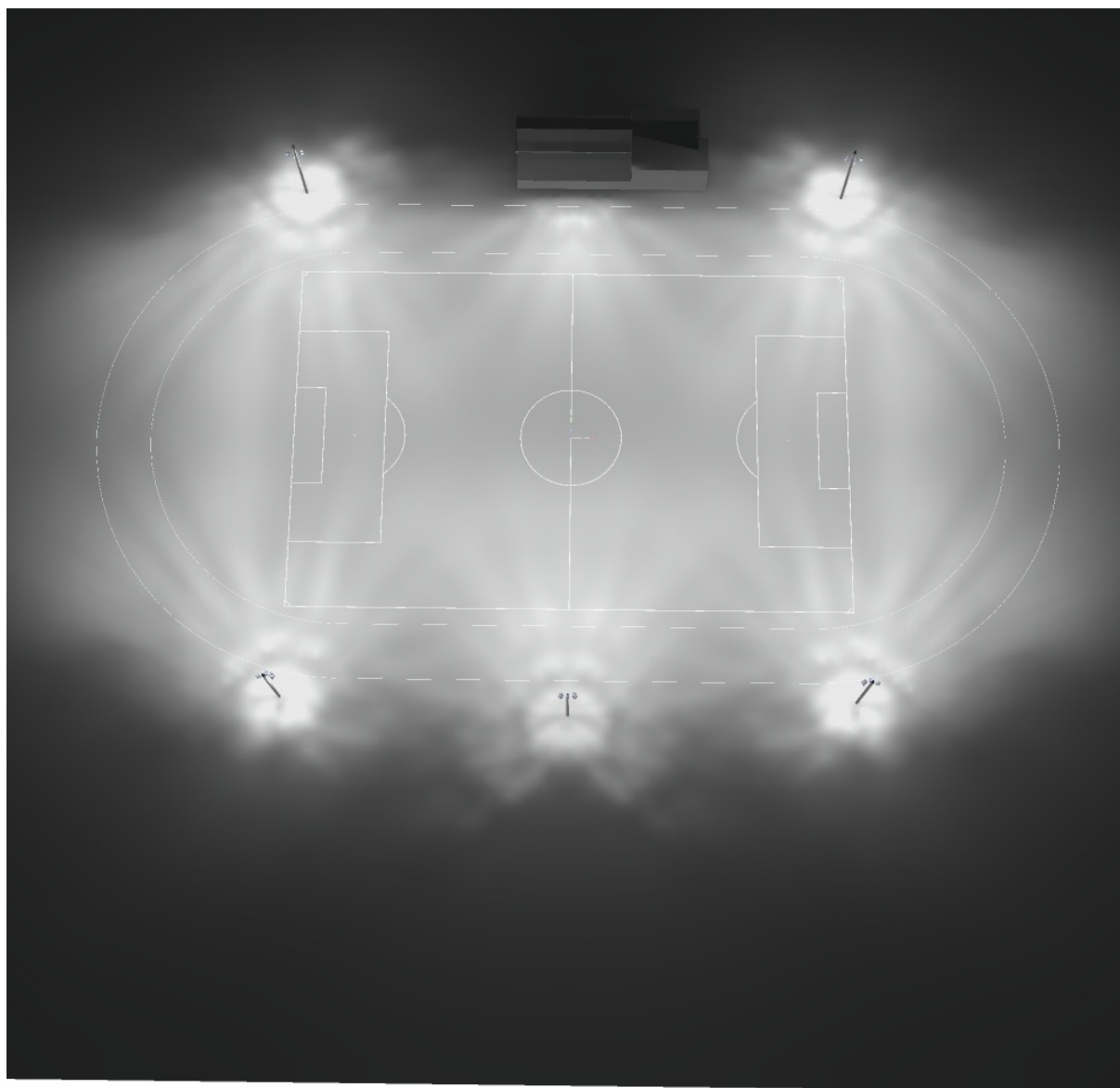
No.	Position [m]			Rotation [°]		
	X	Y	Z	X	Y	Z
1	-1.000	-50.800	16.000	7.0	0.0	15.0
2	1.000	-50.800	16.000	7.0	0.0	-15.0
3	-1.000	-50.800	15.000	7.0	0.0	45.0
4	1.000	-50.800	15.000	7.0	0.0	-45.0
5	-49.000	-48.000	16.000	10.0	0.0	-15.0
6	49.000	-48.000	16.000	10.0	0.0	15.0
7	-50.000	48.000	16.000	10.0	0.0	-165.0
8	50.000	48.000	16.000	10.0	0.0	165.0





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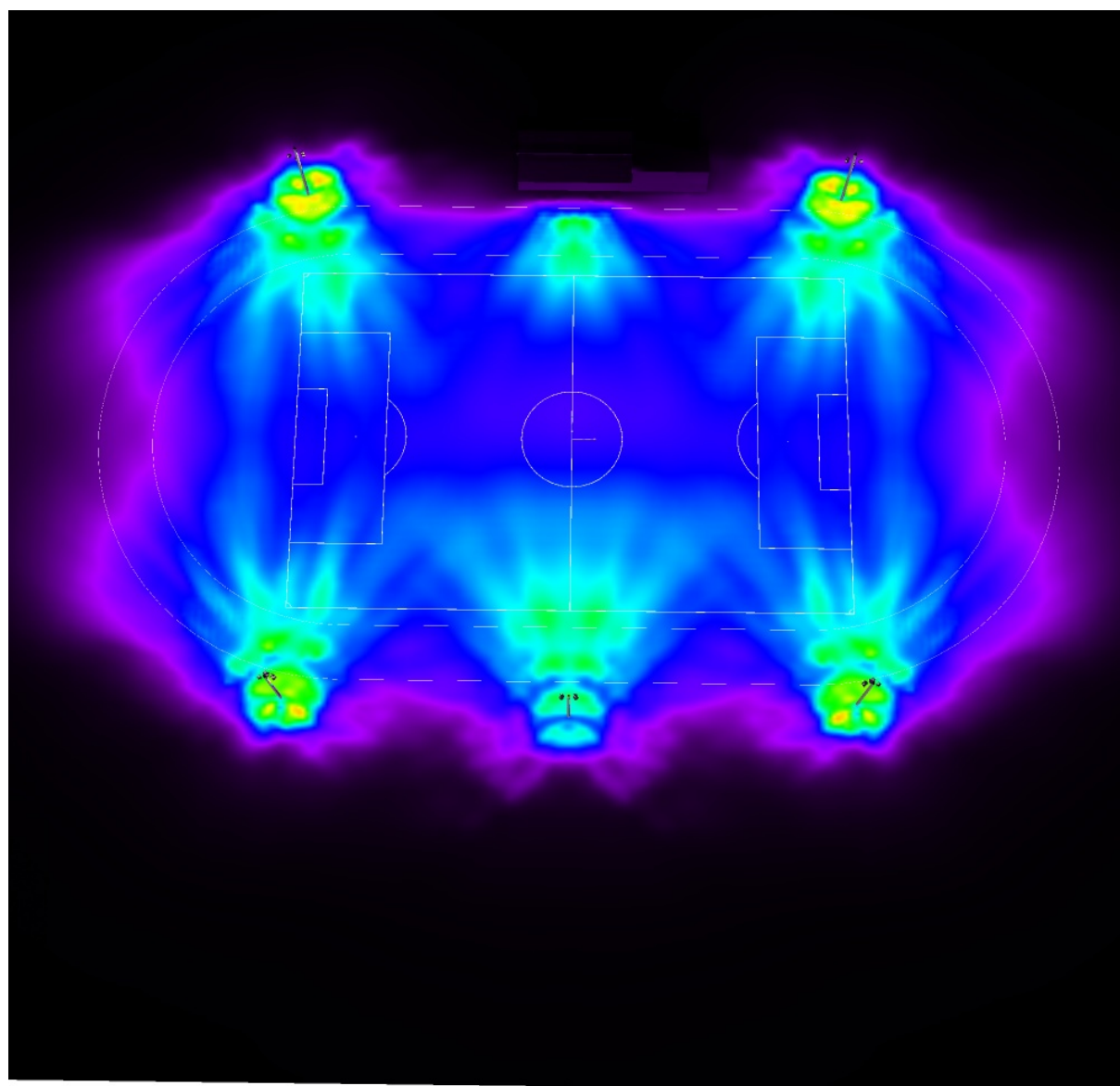
## Rasvjeta terena / 3D Rendering





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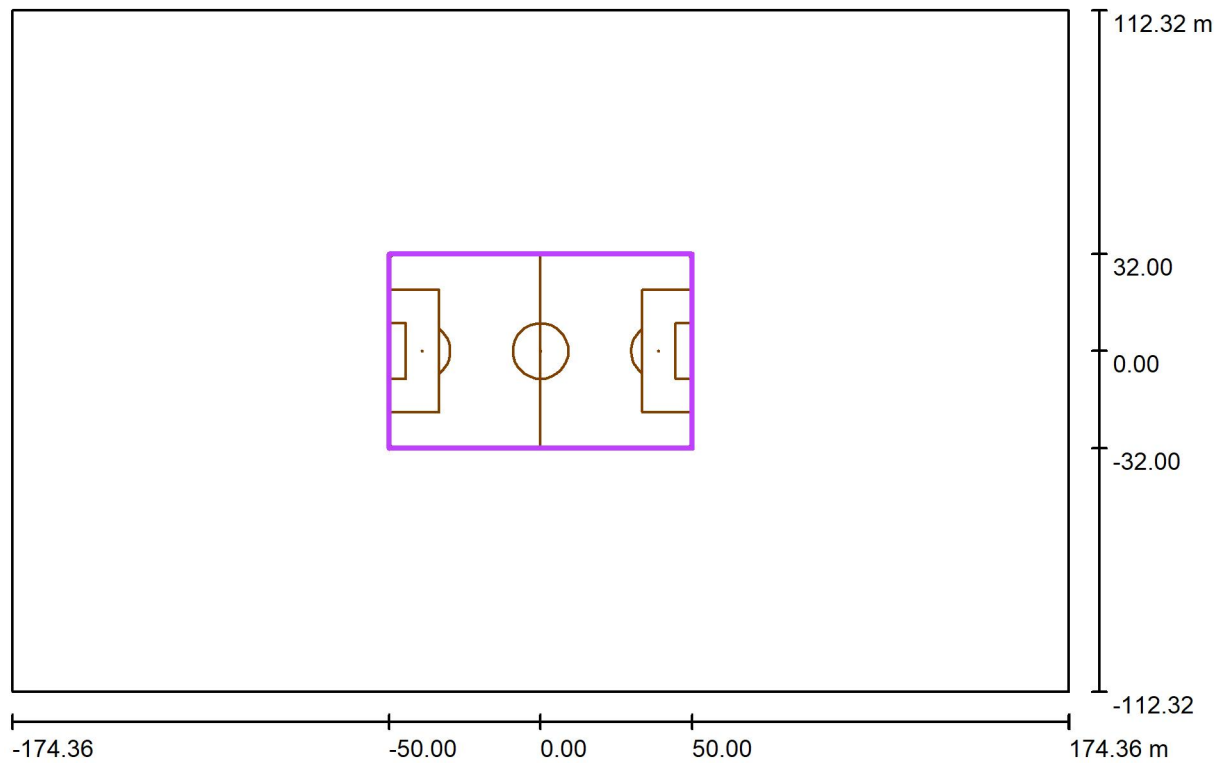
## Rasvjeta terena / False Colour Rendering





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## Rasvjeta terena / Soccer Field 1 Calculation Grid (PA) / Summary



Scale 1 : 2494

Position: (0.000 m, 0.000 m, 0.000 m)  
 Size: (100.000 m, 64.000 m)  
 Rotation: (0.0°, 0.0°, 0.0°)  
 Type: Normal, Grid: 19 x 13 Points  
 Belongs to the following sport arena: Soccer Field 1

### Results overview

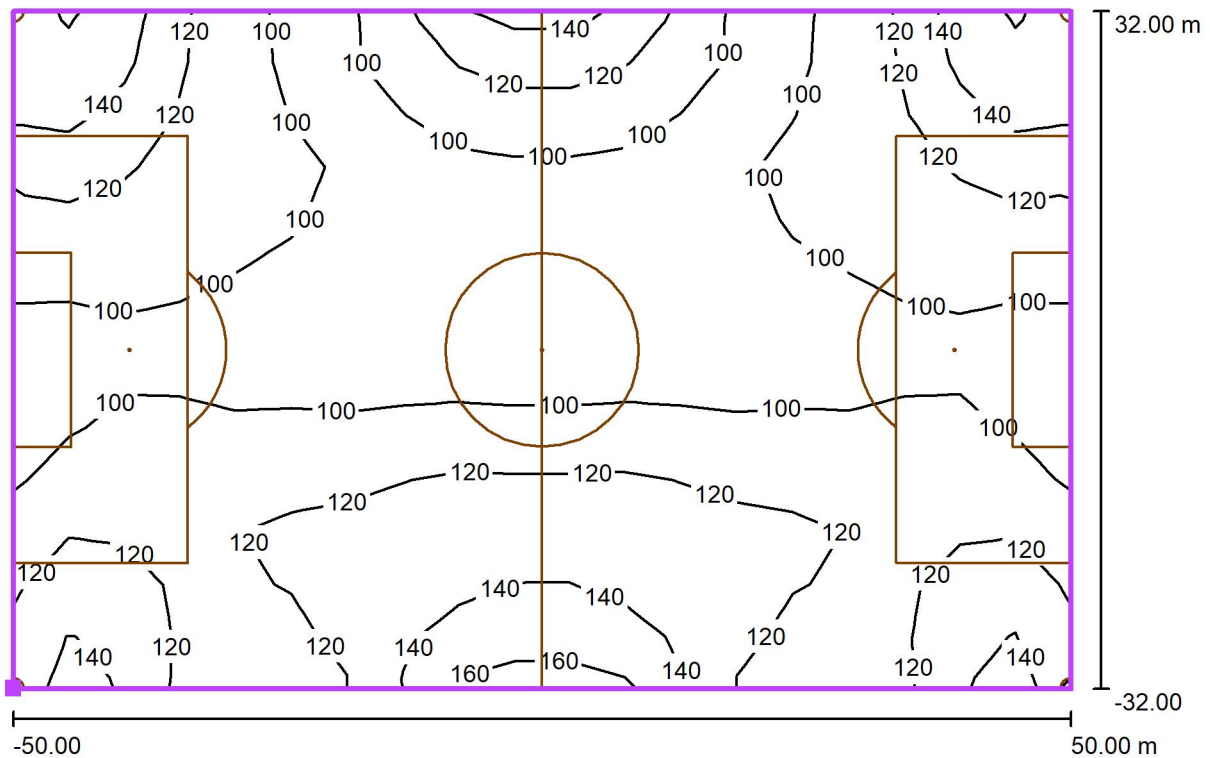
No.	Type	$E_{av}$ [lx]	$E_{min}$ [lx]	$E_{max}$ [lx]	$u0$	$E_{min} / E_{max}$	$E_{h\ m} / E_m$	H [m]	Camera
1	perpendicular	112	80	166	0.72	0.48	/	0.000	/
2	horizontal	112	80	166	0.72	0.48	/	0.000	/
3	vertical, 0.0°	87	26	150	0.30	0.18	1.29	1.000	/

$E_{h\ m} / E_m$  = Relationship between middle horizontal and vertical illuminance, H = Measuring Height



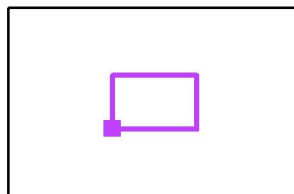
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## Rasvjeta terena / Soccer Field 1 Calculation Grid (PA) / Isolines (E, Perpendicular)



Values in Lux, Scale 1 : 715

Position of surface in external scene:  
 Marked point: (-50.000 m, -32.000 m,  
 0.000 m)



Grid: 19 x 13 Points

$E_{av}$  [lx]  
112

$E_{min}$  [lx]  
80

$E_{max}$  [lx]  
166

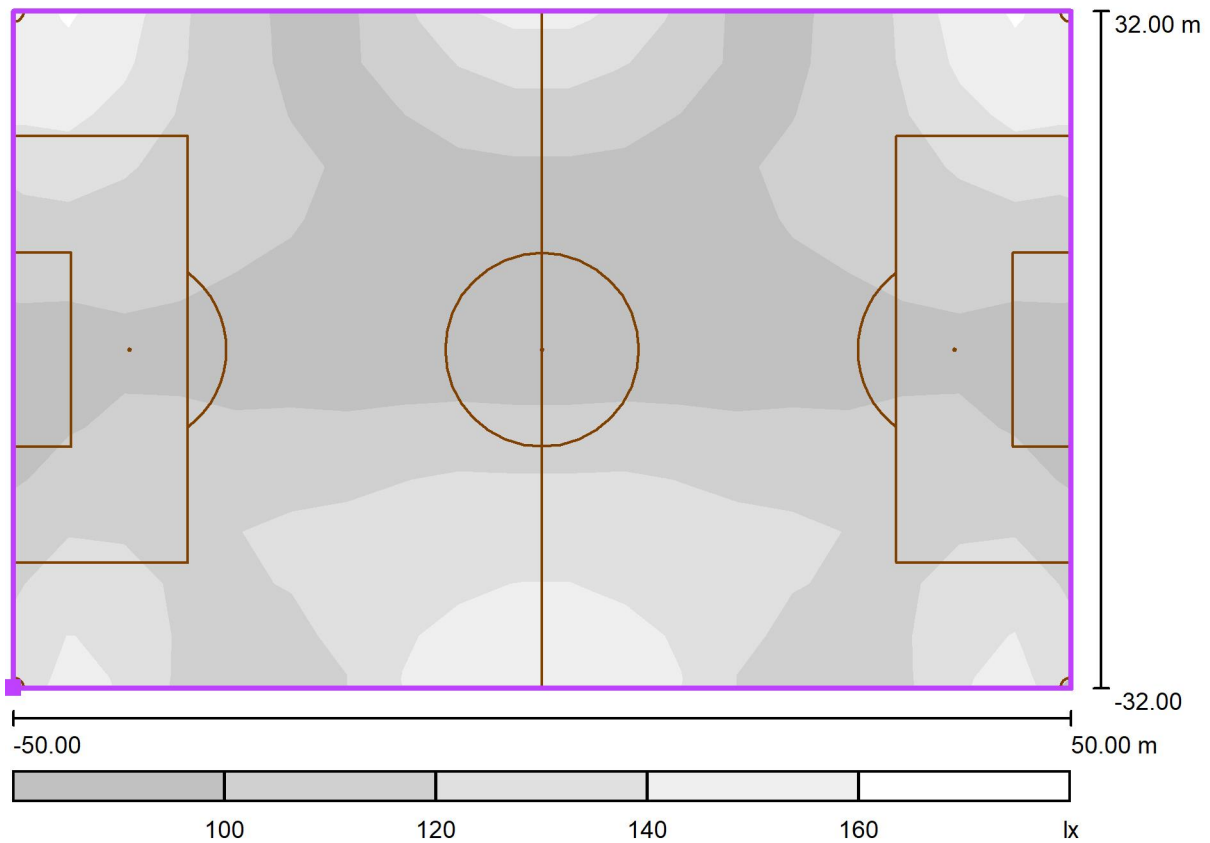
$u_0$   
0.72

$E_{min} / E_{max}$   
0.48



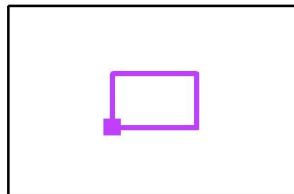
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 e-Mail uprava@nova-lux.hr

## Rasvjeta terena / Soccer Field 1 Calculation Grid (PA) / Greyscale (E, Perpendicular)



Scale 1 : 715

Position of surface in external scene:  
 Marked point: (-50.000 m, -32.000 m,  
 0.000 m)



Grid: 19 x 13 Points

$E_{av}$  [lx]  
112

$E_{min}$  [lx]  
80

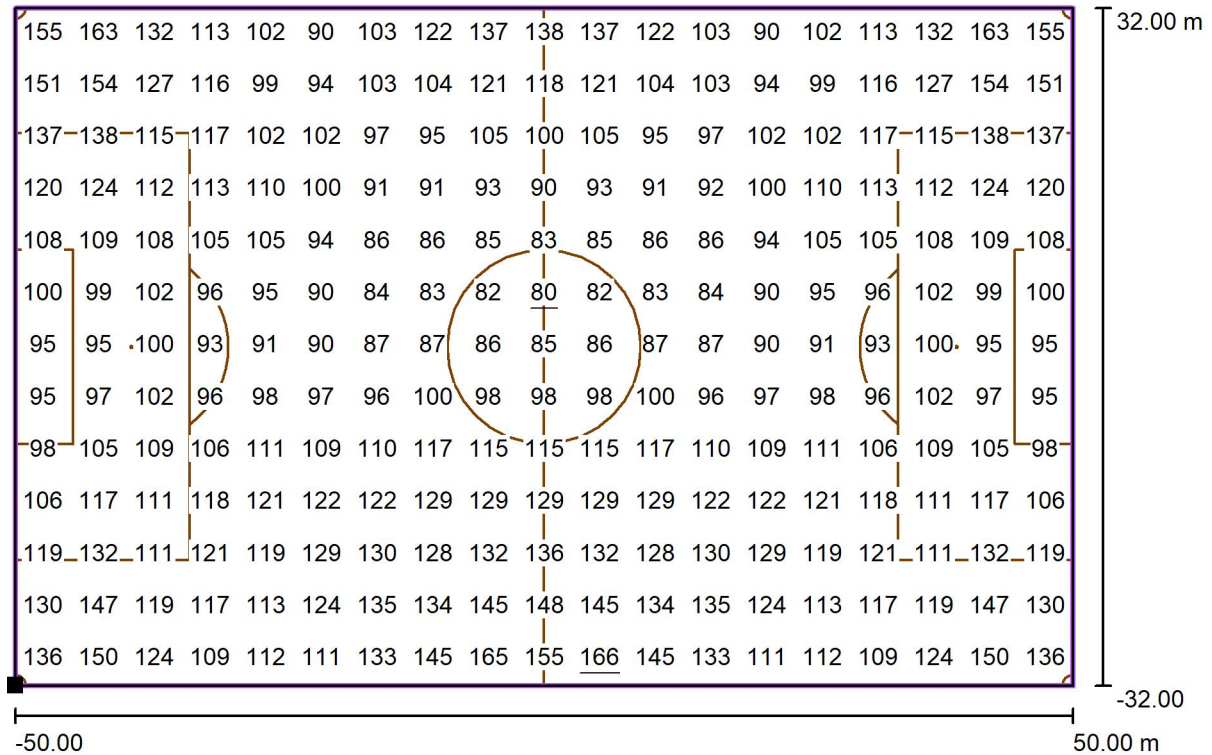
$E_{max}$  [lx]  
166

$u_0$   
0.72

$E_{min} / E_{max}$   
0.48

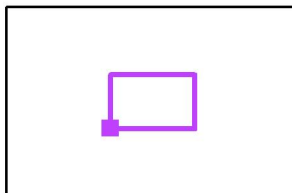
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## Rasvjeta terena / Soccer Field 1 Calculation Grid (PA) / Value Chart (E, Perpendicular)



Values in Lux, Scale 1 : 715

Position of surface in external scene:  
 Marked point: (-50.000 m, -32.000 m, 0.000 m)



Grid: 19 x 13 Points

$E_{av}$  [lx]  
112

$E_{min}$  [lx]  
80

$E_{max}$  [lx]  
166

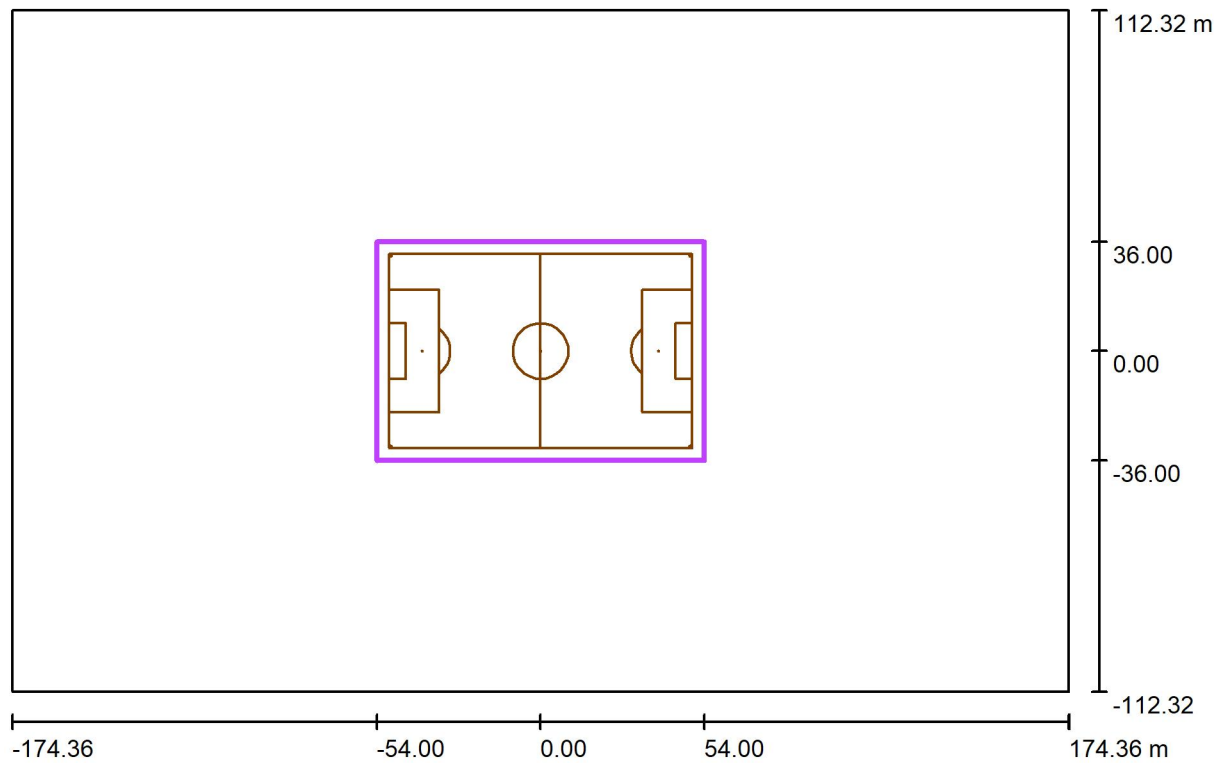
$u_0$   
0.72

$E_{min} / E_{max}$   
0.48



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## Rasvjeta terena / Soccer Field 1 Calculation Grid (TA) / Summary



Scale 1 : 2494

Position: (0.000 m, 0.000 m, 0.000 m)  
 Size: (108.000 m, 72.000 m)  
 Rotation: (0.0°, 0.0°, 0.0°)  
 Type: Normal, Grid: 21 x 13 Points  
 Belongs to the following sport arena: Soccer Field 1

### Results overview

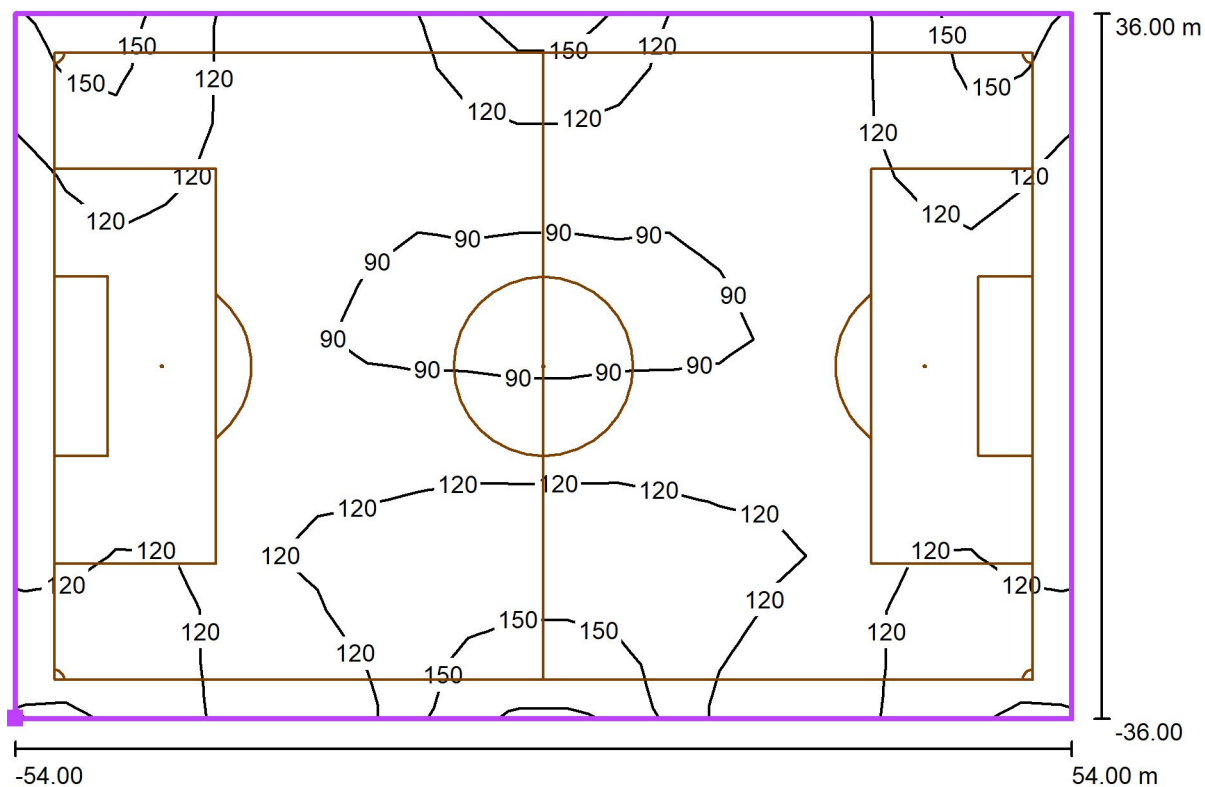
No.	Type	$E_{av}$ [lx]	$E_{min}$ [lx]	$E_{max}$ [lx]	u0	$E_{min} / E_{max}$	$E_{h\ m} / E_m$	H [m]	Camera
1	perpendicular	114	80	183	0.70	0.44	/	0.000	/
2	horizontal	114	80	183	0.70	0.44	/	0.000	/
3	vertical, 0.0°	84	14	151	0.17	0.09	1.36	1.000	/

$E_{h\ m} / E_m$  = Relationship between middle horizontal and vertical illuminance, H = Measuring Height



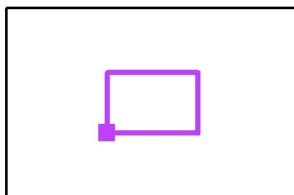
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## Rasvjeta terena / Soccer Field 1 Calculation Grid (TA) / Isolines (E, Perpendicular)



Values in Lux, Scale 1 : 773

Position of surface in external scene:  
 Marked point: (-54.000 m, -36.000 m,  
 0.000 m)



Grid: 21 x 13 Points

$E_{av}$  [lx]  
114

$E_{min}$  [lx]  
80

$E_{max}$  [lx]  
183

$u_0$   
0.70

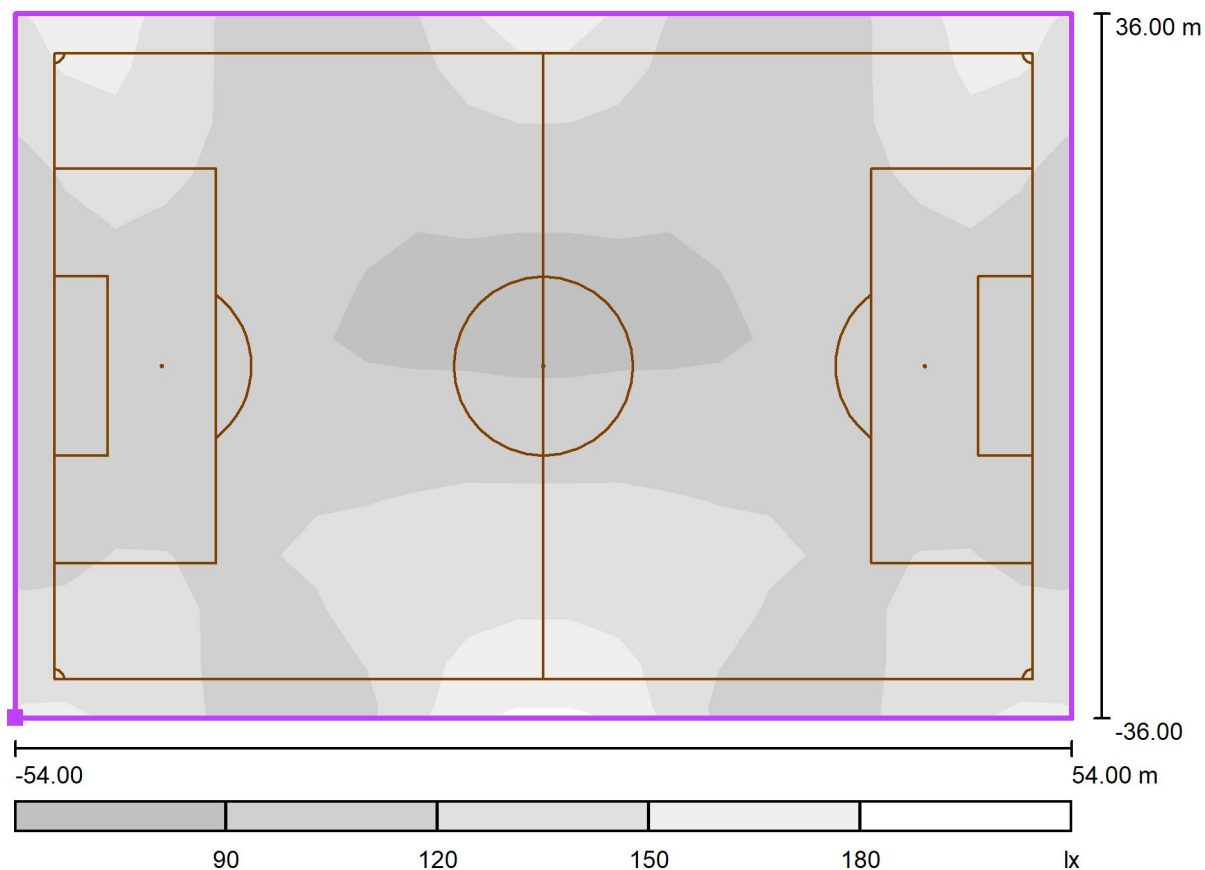
$E_{min} / E_{max}$   
0.44





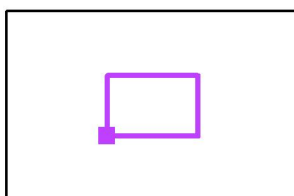
Operator Nova-lux d.o.o., Osijek  
 Telephone 031/284 686  
 Fax 031/284 685  
 e-Mail uprava@nova-lux.hr

## Rasvjeta terena / Soccer Field 1 Calculation Grid (TA) / Greyscale (E, Perpendicular)



Scale 1 : 773

Position of surface in external scene:  
 Marked point: (-54.000 m, -36.000 m, 0.000 m)



Grid: 21 x 13 Points

$E_{av}$  [lx]  
114

$E_{min}$  [lx]  
80

$E_{max}$  [lx]  
183

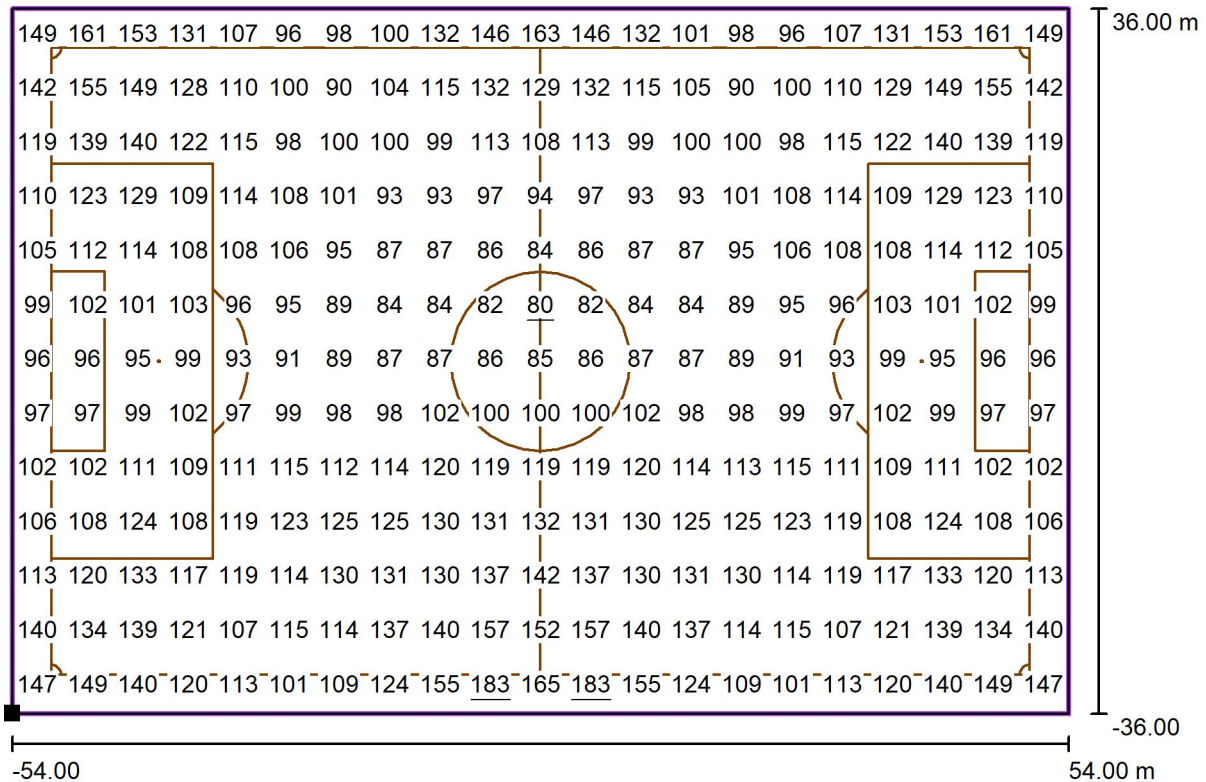
$u_0$   
0.70

$E_{min} / E_{max}$   
0.44

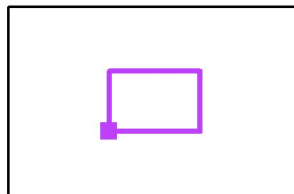


Operator Nova-lux d.o.o., Osijek  
 Telephone 031/284 686  
 Fax 031/284 685  
 e-Mail uprava@nova-lux.hr

## Rasvjeta terena / Soccer Field 1 Calculation Grid (TA) / Value Chart (E, Perpendicular)



Position of surface in external scene:  
 Marked point: (-54.000 m, -36.000 m, 0.000 m)



Grid: 21 x 13 Points

$E_{av}$  [lx]  
114

$E_{min}$  [lx]  
80

$E_{max}$  [lx]  
183

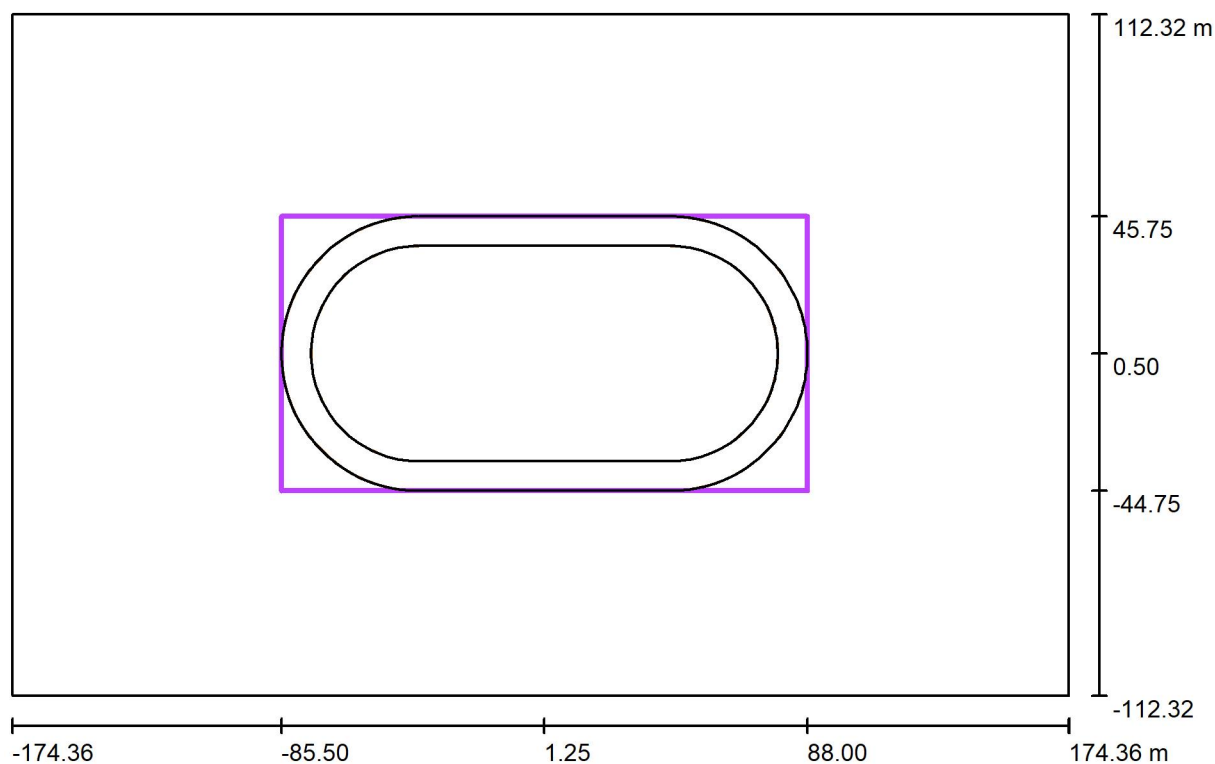
$u_0$   
0.70

$E_{min} / E_{max}$   
0.44



Operator Nova-lux d.o.o., Osijek  
 Telephone 031/284 686  
 Fax 031/284 685  
 e-Mail uprava@nova-lux.hr

## Rasvjeta terena / Track 1 Calculation Grid (PA) / Summary



Scale 1 : 2494

Position: (1.250 m, 0.500 m, 0.000 m)  
 Size: (173.500 m, 90.500 m)  
 Rotation: (0.0°, 0.0°, 0.0°)  
 Type: Radial, Grid: 19 x 1 Points  
 Belongs to the following sport arena: Track 1

### Results overview

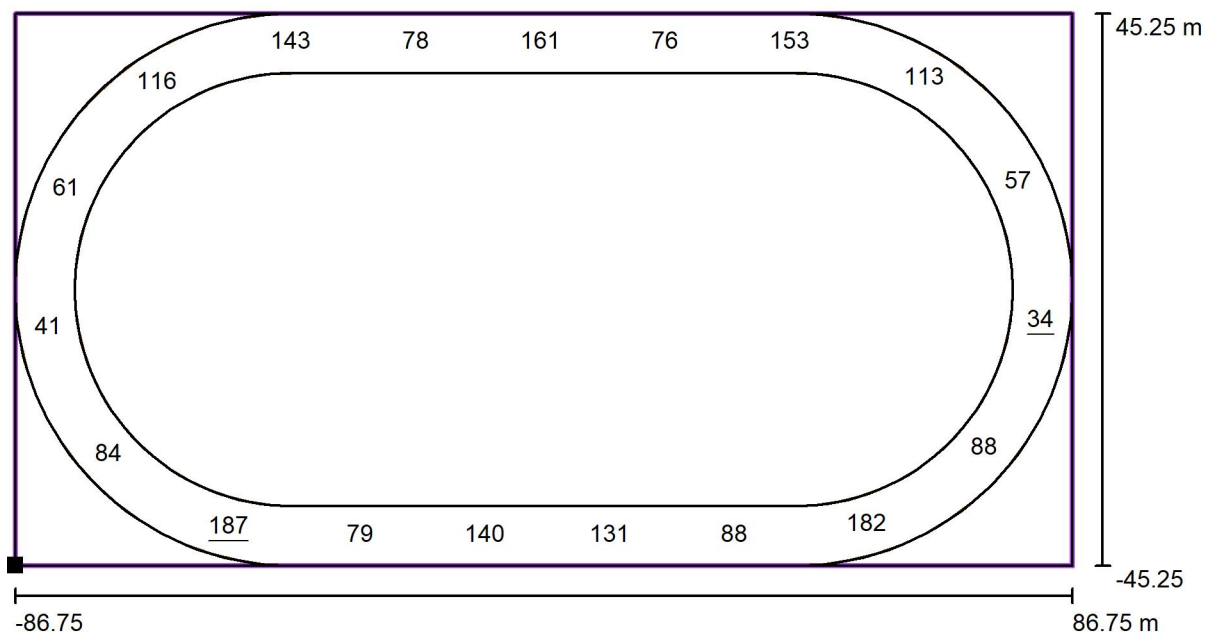
No.	Type	$E_{av}$ [lx]	$E_{min}$ [lx]	$E_{max}$ [lx]	$u0$	$E_{min} / E_{max}$	$E_{h\ m} / E_m$	H [m]	Camera
1	perpendicular	106	34	187	0.32	0.18	/	0.000	/

$E_{h\ m} / E_m$  = Relationship between middle horizontal and vertical illuminance, H = Measuring Height

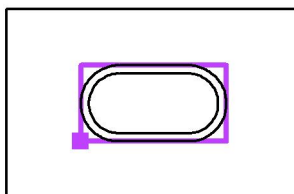


Operator Nova-lux d.o.o., Osijek  
 Telephone 031/284 686  
 Fax 031/284 685  
 e-Mail uprava@nova-lux.hr

## Rasvjeta terena / Track 1 Calculation Grid (PA) / Value Chart (E, Perpendicular)



Position of surface in external scene:  
 Marked point: (-85.500 m, -44.750 m,  
 0.000 m)



Grid: 19 x 1 Points

$E_{av}$  [lx]  
106

$E_{min}$  [lx]  
34

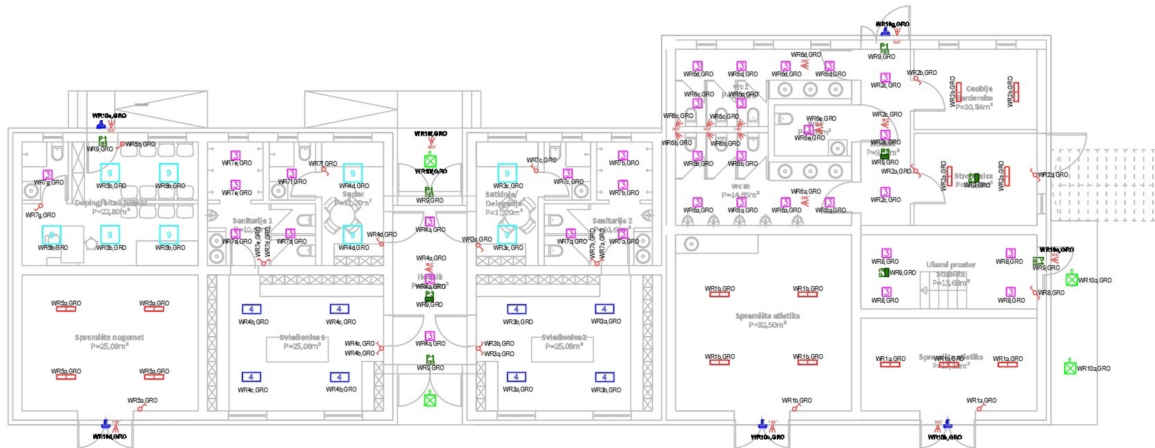
$E_{max}$  [lx]  
187

$u_0$   
0.32

$E_{min} / E_{max}$   
0.18

Date

20.03.2020.



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## 1. kat

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Građevina - 1. KAT - 1. kat

## Hodnik

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Građevina - 1. KAT - 1. kat

## Ured nogomet / kontrolna soba

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## Luminaire list

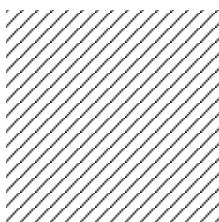
$\Phi_{\text{total}}$ 114477 lm	$P_{\text{total}}$ 1082.4 W	Luminous efficacy 105.8 lm/W
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pcs.	Manufacturer	Article No.	Article name	P	$\Phi$	Luminous efficacy
7	LUXIONA Troll	01AMAAS CBBPLX	AGAT LED SMOOTH 5400 PLX E 840 / 600X600	36.0 W	4062 lm	112.8 lm/W
4	LUXIONA Troll	01AMALS CACPLX	AGAT LED SMOOTH 3750 PLX E 840 / 600X300	29.0 W	2821 lm	97.3 lm/W
18	LUXIONA Troll	LOTOS_EL _SQ_XXXX	LOTOS ELEGANCE SQUARE PC LED COMPACT 1800LM E IP54 840	19.8 W	1698 lm	85.8 lm/W
6	LUXIONA Troll	RLOOKLE DXX_XXPL XE	RUBIN LOOK LED 5200LM PLX E IP40 840 / 600X600	34.0 W	4042 lm	118.9 lm/W
7	TREVOS	FUTURA 2.2ft PC Al 3200/840	LED,industrial,body PC with aluminium cooler,diffuser translucent PC	22.0 W	2849 lm	129.5 lm/W

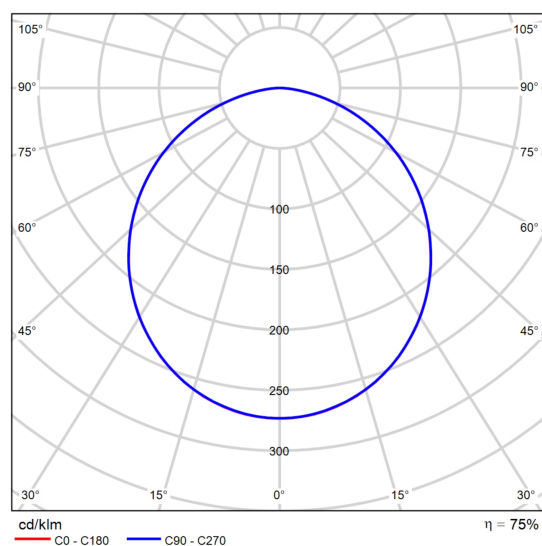


## Product data sheet

LUXIONA Troll AGAT LED SMOOTH 3750 PLX E 840 / 600X300



Article No.	01AMALSCACPLX
P	29.0 W
$\Phi_{\text{Lamp}}$	3750 lm
$\Phi_{\text{Luminaire}}$	2821 lm
$\eta$	75.23 %
Luminous efficacy	97.3 lm/W
CCT	4000 K
CRI	100



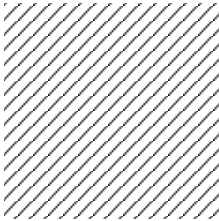
Polar LDC

Glare evaluation according to UGR												
p Ceiling		70	70	50	50	30	70	70	50	50	30	
p Walls		50	30	50	30	30	50	30	50	30	30	
p Floor		20	20	20	20	20	20	20	20	20	20	
Room size X Y		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis					
2H	2H	18.3	19.7	18.6	19.9	20.1	18.3	19.7	18.6	19.9	20.1	
	3H	19.8	21.1	20.2	21.3	21.6	19.8	21.1	20.1	21.3	21.6	
	4H	20.4	21.6	20.7	21.8	22.1	20.4	21.5	20.7	21.8	22.1	
	6H	20.8	21.9	21.1	22.2	22.5	20.8	21.8	21.1	22.1	22.5	
	8H	20.9	21.9	21.2	22.2	22.6	20.9	21.9	21.2	22.2	22.6	
	12H	20.9	21.9	21.3	22.2	22.6	20.9	21.9	21.3	22.2	22.6	
4H	2H	19.0	20.1	19.3	20.4	20.7	19.0	20.1	19.3	20.4	20.7	
	3H	20.7	21.7	21.1	22.0	22.3	20.7	21.7	21.1	22.0	22.3	
	4H	21.4	22.3	21.8	22.6	23.0	21.4	22.2	21.8	22.6	23.0	
	6H	21.9	22.6	22.3	23.0	23.4	21.8	22.6	22.3	23.0	23.4	
	8H	22.0	22.7	22.4	23.1	23.5	22.0	22.7	22.4	23.1	23.5	
	12H	22.1	22.7	22.5	23.1	23.6	22.0	22.7	22.5	23.1	23.6	
8H	4H	21.6	22.4	22.1	22.8	23.2	21.6	22.3	22.1	22.7	23.2	
	6H	22.2	22.8	22.7	23.3	23.7	22.2	22.8	22.7	23.2	23.7	
	8H	22.4	23.0	22.9	23.4	23.9	22.4	22.9	22.9	23.4	23.9	
	12H	22.6	23.0	23.1	23.5	24.0	22.6	23.0	23.1	23.5	24.0	
12H	4H	21.6	22.3	22.1	22.7	23.2	21.6	22.3	22.1	22.7	23.1	
	6H	22.3	22.8	22.8	23.3	23.7	22.3	22.8	22.7	23.2	23.7	
	8H	22.5	23.0	23.0	23.4	23.9	22.5	22.9	23.0	23.4	23.9	
Variation of the observer position for the luminaire distances S												
S = 1.0H		+0.1 / -0.1					+0.1 / -0.1					
S = 1.5H		+0.2 / -0.4					+0.2 / -0.4					
S = 2.0H		+0.4 / -0.7					+0.4 / -0.7					
Standard table		BK05					BK05					
Correction summand		3.9					3.9					
Corrected glare indices referring to 3750lm Total luminous flux												

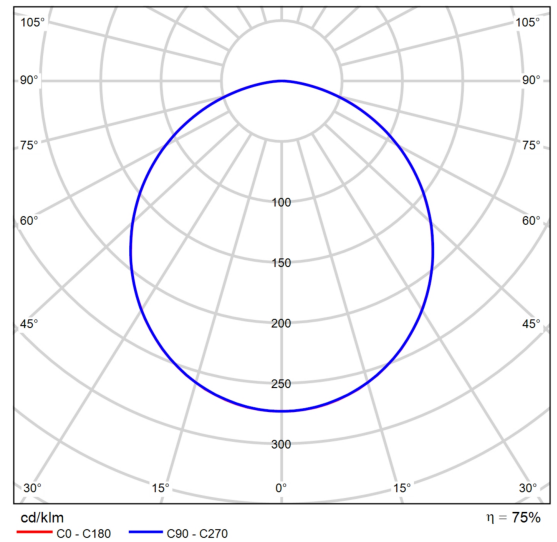
UGR diagram (SHR: 0.25)

## Product data sheet

LUXIONA Troll AGAT LED SMOOTH 5400 PLX E 840 / 600X600



Article No.	01AMAASCBPLX
P	36.0 W
$\Phi_{\text{Lamp}}$	5400 lm
$\Phi_{\text{Luminaire}}$	4062 lm
$\eta$	75.23 %
Luminous efficacy	112.8 lm/W
CCT	4000 K
CRI	100



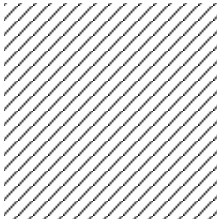
Polar LDC

Glare evaluation according to UGR												
p Ceiling		70	70	50	50	30	70	70	50	50	30	
p Walls		50	30	50	30	30	50	30	50	30	30	
p Floor		20	20	20	20	20	20	20	20	20	20	
Room size X Y		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis					
2H	2H	17.1	18.5	17.4	18.7	18.9	17.1	18.5	17.4	18.7	19.0	
	3H	18.6	19.9	19.0	20.1	20.4	18.6	19.9	19.0	20.1	20.4	
	4H	19.2	20.4	19.5	20.6	20.9	19.2	20.4	19.5	20.6	20.9	
	6H	19.6	20.7	19.9	21.0	21.3	19.6	20.6	19.9	20.9	21.3	
	8H	19.7	20.7	20.0	21.0	21.4	19.7	20.7	20.0	21.0	21.3	
	12H	19.7	20.7	20.1	21.0	21.4	19.7	20.7	20.1	21.0	21.4	
4H	2H	17.8	18.9	18.1	19.2	19.5	17.8	18.9	18.1	19.2	19.5	
	3H	19.5	20.5	19.9	20.8	21.1	19.5	20.5	19.9	20.8	21.1	
	4H	20.2	21.1	20.6	21.4	21.8	20.2	21.1	20.6	21.4	21.8	
	6H	20.7	21.4	21.1	21.8	22.2	20.6	21.4	21.1	21.8	22.2	
	8H	20.8	21.5	21.2	21.9	22.3	20.8	21.5	21.2	21.9	22.3	
	12H	20.9	21.5	21.3	21.9	22.4	20.9	21.5	21.3	21.9	22.4	
8H	4H	20.4	21.2	20.9	21.6	22.0	20.4	21.2	20.9	21.5	22.0	
	6H	21.0	21.6	21.5	22.1	22.5	21.0	21.6	21.5	22.1	22.5	
	8H	21.3	21.8	21.7	22.2	22.7	21.2	21.8	21.7	22.2	22.7	
	12H	21.4	21.8	21.9	22.3	22.8	21.4	21.8	21.9	22.3	22.8	
12H	4H	20.4	21.1	20.9	21.5	22.0	20.4	21.1	20.9	21.5	21.9	
	6H	21.1	21.6	21.6	22.1	22.5	21.1	21.6	21.6	22.0	22.5	
	8H	21.3	21.8	21.8	22.2	22.7	21.3	21.8	21.8	22.2	22.7	
Variation of the observer position for the luminaire distances S												
S = 1.0H		+0.1 / -0.1					+0.1 / -0.1					
S = 1.5H		+0.2 / -0.4					+0.2 / -0.4					
S = 2.0H		+0.4 / -0.7					+0.4 / -0.7					
Standard table		BK05					BK05					
Correction summand		2.7					2.7					
Corrected glare indices referring to 5400lm Total luminous flux												

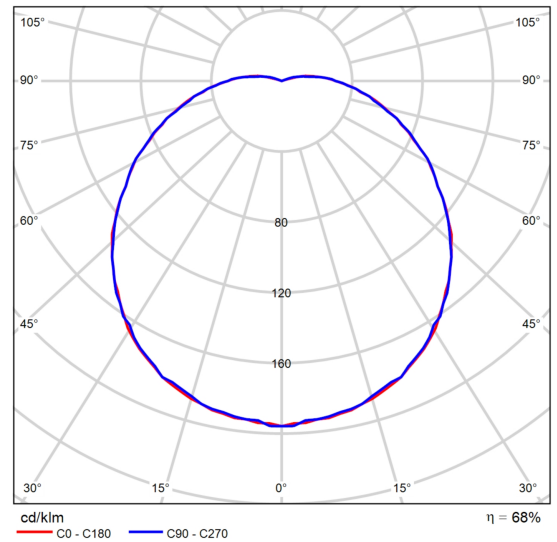
UGR diagram (SHR: 0.25)

## Product data sheet

### LUXIONA Troll LOTOS ELEGANCE SQUARE PC LED COMPACT 1800LM E IP54 840



Article No.	LOTOS_EL_SQ_XXXX
P	19.8 W
$\Phi_{\text{Lamp}}$	2500 lm
$\Phi_{\text{Luminaire}}$	1698 lm
$\eta$	67.93 %
Luminous efficacy	85.8 lm/W
CCT	4000 K
CRI	80



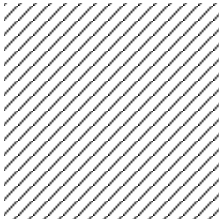
Polar LDC

Glare evaluation according to UGR												
p Ceiling		70	70	50	50	30	70	70	50	50	30	
p Walls		50	30	50	30	30	50	30	50	30	30	
p Floor		20	20	20	20	20	20	20	20	20	20	
Room size X      Y		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis					
2H	2H	18.2	19.6	18.5	19.9	20.2	18.1	19.5	18.5	19.9	20.2	
	3H	20.1	21.4	20.5	21.7	22.1	20.1	21.3	20.5	21.7	22.1	
	4H	21.0	22.3	21.5	22.6	23.0	21.0	22.2	21.4	22.6	23.0	
	6H	22.0	23.1	22.4	23.5	23.9	22.0	23.1	22.4	23.5	23.9	
	8H	22.5	23.6	22.9	24.0	24.4	22.4	23.5	22.9	23.9	24.4	
4H	12H	22.9	24.0	23.4	24.4	24.8	22.9	24.0	23.4	24.4	24.8	
	2H	18.9	20.1	19.3	20.5	20.9	18.9	20.1	19.3	20.4	20.8	
	3H	21.0	22.1	21.5	22.5	22.9	21.0	22.1	21.5	22.5	22.9	
	4H	22.2	23.1	22.6	23.5	24.0	22.1	23.1	22.6	23.5	24.0	
	6H	23.3	24.1	23.8	24.6	25.1	23.2	24.1	23.7	24.6	25.1	
8H	8H	23.8	24.6	24.3	25.1	25.6	23.8	24.6	24.3	25.1	25.6	
	12H	24.4	25.2	24.9	25.6	26.2	24.4	25.1	24.9	25.6	26.2	
	4H	22.6	23.4	23.1	23.9	24.4	22.6	23.4	23.1	23.8	24.4	
	6H	24.0	24.6	24.5	25.1	25.7	23.9	24.6	24.5	25.1	25.7	
	8H	24.7	25.3	25.2	25.8	26.4	24.6	25.2	25.2	25.8	26.3	
12H	12H	25.4	25.9	26.0	26.5	27.1	25.4	25.9	26.0	26.5	27.1	
	4H	22.7	23.4	23.2	23.9	24.4	22.7	23.4	23.2	23.9	24.4	
	6H	24.1	24.7	24.7	25.2	25.8	24.1	24.7	24.6	25.2	25.8	
	8H	24.9	25.4	25.5	26.0	26.6	24.9	25.4	25.4	25.9	26.5	
	Variation of the observer position for the luminaire distances S											
S = 1.0H		+0.1 / -0.1					+0.1 / -0.1					
S = 1.5H		+0.2 / -0.2					+0.2 / -0.2					
S = 2.0H		+0.3 / -0.5					+0.3 / -0.4					
Standard table		BK09					BK09					
Correction summand		7.1					7.1					
Corrected glare indices referring to 2500lm Total luminous flux												

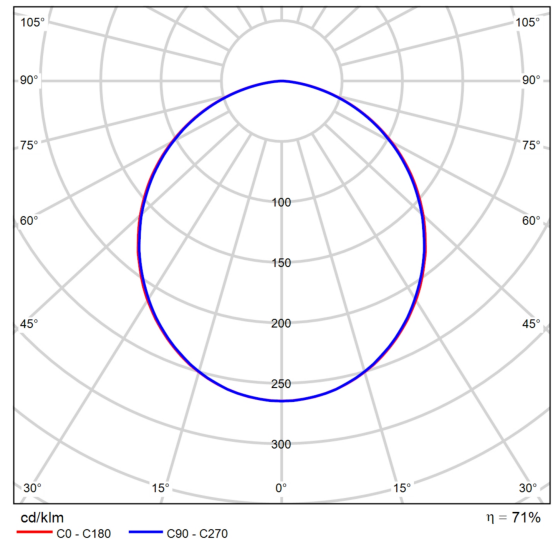
UGR diagram (SHR: 0.25)

## Product data sheet

LUXIONA Troll RUBIN LOOK LED 5200LM PLX E IP40 840 / 600X600



Article No.	RLOOKLEDXX_XXPLXE
P	34.0 W
$\Phi_{\text{Lamp}}$	5680 lm
$\Phi_{\text{Luminaire}}$	4042 lm
$\eta$	71.16 %
Luminous efficacy	118.9 lm/W
CCT	4000 K
CRI	80



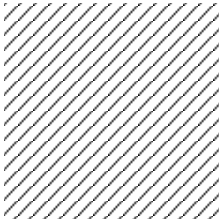
Polar LDC

Glare evaluation according to UGR												
p Ceiling		70	70	50	50	30	70	70	50	50	30	
p Walls		50	30	50	30	30	50	30	50	30	30	
p Floor		20	20	20	20	20	20	20	20	20	20	
Room size X Y		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis					
2H	2H	17.2	18.6	17.5	18.8	19.1	17.2	18.5	17.5	18.8	19.0	
	3H	18.7	20.0	19.1	20.2	20.5	18.7	19.9	19.0	20.1	20.4	
	4H	19.3	20.4	19.6	20.7	21.0	19.2	20.4	19.6	20.6	20.9	
	6H	19.7	20.7	20.0	21.0	21.3	19.6	20.6	19.9	20.9	21.2	
	8H	19.7	20.8	20.1	21.1	21.4	19.6	20.7	20.0	21.0	21.3	
	12H	19.8	20.8	20.1	21.1	21.4	19.7	20.6	20.0	21.0	21.3	
4H	2H	17.9	19.0	18.2	19.3	19.6	17.8	19.0	18.2	19.3	19.6	
	3H	19.6	20.6	20.0	20.9	21.2	19.5	20.5	19.9	20.8	21.2	
	4H	20.3	21.1	20.7	21.5	21.9	20.2	21.1	20.6	21.4	21.8	
	6H	20.7	21.5	21.1	21.9	22.3	20.6	21.4	21.1	21.8	22.2	
	8H	20.8	21.6	21.3	22.0	22.4	20.7	21.5	21.2	21.9	22.3	
	12H	20.9	21.5	21.3	22.0	22.4	20.8	21.4	21.2	21.9	22.3	
8H	4H	20.5	21.2	20.9	21.6	22.0	20.4	21.2	20.9	21.6	22.0	
	6H	21.1	21.7	21.6	22.1	22.6	21.0	21.6	21.5	22.0	22.5	
	8H	21.3	21.8	21.7	22.2	22.7	21.2	21.7	21.7	22.1	22.6	
	12H	21.4	21.8	21.9	22.3	22.8	21.3	21.7	21.8	22.2	22.7	
12H	4H	20.5	21.2	21.0	21.6	22.0	20.5	21.1	20.9	21.5	22.0	
	6H	21.1	21.6	21.6	22.1	22.6	21.1	21.6	21.5	22.0	22.5	
	8H	21.3	21.8	21.8	22.2	22.7	21.2	21.7	21.7	22.2	22.7	
Variation of the observer position for the luminaire distances S												
S = 1.0H		+0.1 / -0.1					+0.1 / -0.1					
S = 1.5H		+0.2 / -0.4					+0.2 / -0.4					
S = 2.0H		+0.4 / -0.7					+0.4 / -0.7					
Standard table		BK05					BK05					
Correction summand		2.6					2.6					
Corrected glare indices referring to 5680lm Total luminous flux												

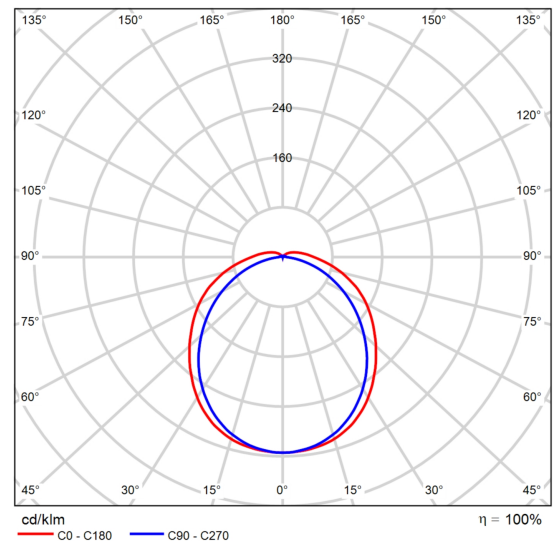
UGR diagram (SHR: 0.25)

## Product data sheet

TREVOS LED, industrial, body PC with aluminium cooler, diffuser translucent PC



Article No.	FUTURA 2.2ft PC AI 3200/840
P	22.0 W
$\Phi_{\text{Lamp}}$	2850 lm
$\Phi_{\text{Luminaire}}$	2849 lm
$\eta$	99.96 %
Luminous efficacy	129.5 lm/W
CCT	4000 K
CRI	85

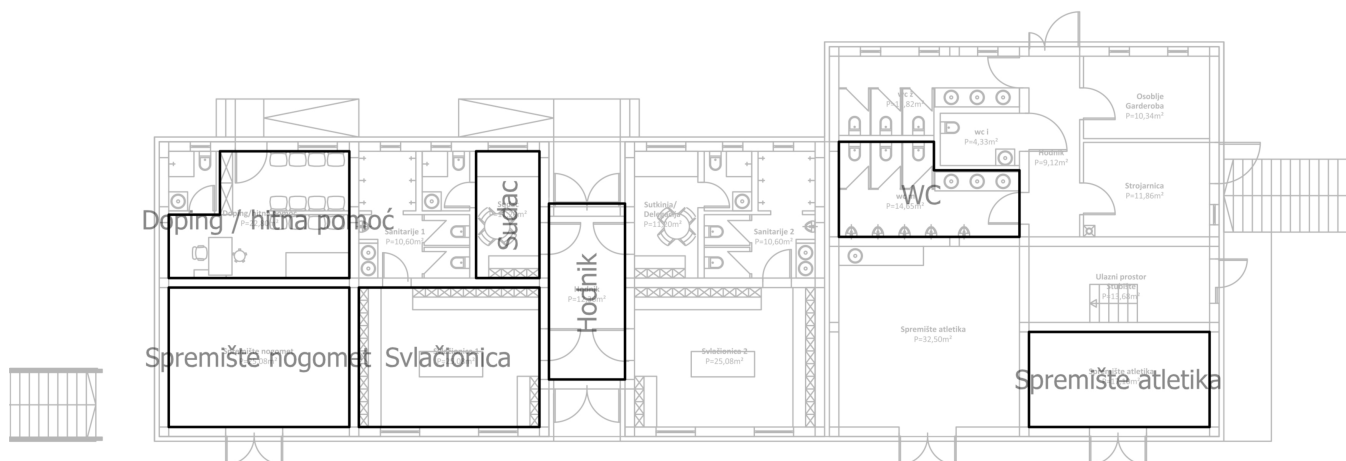


Polar LDC

Glare evaluation according to UGR												
p Ceiling		70	70	50	50	30	70	70	50	50	30	
p Walls		50	30	50	30	20	50	30	50	30	20	
p Floor		20	20	20	20	20	20	20	20	20	20	
Room size X Y		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis					
2H	2H	18.9	20.2	19.3	20.6	20.9	18.3	19.6	18.7	19.9	20.3	
	3H	20.7	21.9	21.1	22.3	22.7	19.6	20.8	20.0	21.2	21.6	
	4H	21.5	22.6	21.9	23.0	23.5	20.1	21.2	20.5	21.6	22.0	
	6H	22.2	23.3	22.7	23.7	24.2	20.4	21.5	20.9	21.9	22.3	
	8H	22.6	23.6	23.0	24.0	24.5	20.5	21.5	21.0	22.0	22.4	
	12H	22.9	23.8	23.3	24.3	24.8	20.6	21.5	21.0	22.0	22.5	
4H	2H	19.4	20.6	19.9	21.0	21.4	18.9	20.1	19.4	20.5	20.9	
	3H	21.4	22.4	21.9	22.9	23.3	20.4	21.4	20.9	21.9	22.3	
	4H	22.4	23.3	22.9	23.8	24.3	21.1	22.0	21.6	22.4	22.9	
	6H	23.3	24.1	23.9	24.6	25.1	21.5	22.3	22.1	22.8	23.4	
	8H	23.7	24.5	24.3	25.0	25.5	21.7	22.4	22.2	22.9	23.5	
	12H	24.1	24.8	24.7	25.3	25.9	21.8	22.5	22.3	23.0	23.6	
8H	4H	22.7	23.4	23.2	23.9	24.5	21.5	22.2	22.0	22.7	23.3	
	6H	23.8	24.4	24.4	24.9	25.5	22.2	22.8	22.7	23.3	23.9	
	8H	24.3	24.9	24.9	25.4	26.1	22.4	22.9	23.0	23.5	24.1	
	12H	24.9	25.3	25.5	25.9	26.6	22.6	23.1	23.2	23.6	24.3	
	4H	22.7	23.3	23.2	23.9	24.5	21.6	22.2	22.1	22.8	23.3	
	6H	23.9	24.4	24.4	25.0	25.6	22.3	22.9	22.9	23.4	24.0	
12H	8H	24.5	24.9	25.1	25.5	26.2	22.6	23.1	23.2	23.7	24.3	
Variation of the observer position for the luminaire distances S												
S = 1.0H		+0.1 / -0.1					+0.1 / -0.1					
S = 1.5H		+0.2 / -0.3					+0.2 / -0.4					
S = 2.0H		+0.3 / -0.5					+0.4 / -0.7					
Standard table		BK08					BK06					
Correction summand		8.0					5.6					
Corrected glare indices referring to 2850lm Total luminous flux												

UGR diagram (SHR: 0.25)

## Room List



PRIZEMLJE · Prizemlje

**Room List**

Doping / hitna pomoć

<b>P<sub>total</sub></b> 180.0 W	<b>A<sub>Room</sub></b> 19.57 m <sup>2</sup>	<b>Lighting power density</b> 9.20 W/m <sup>2</sup> = 1.44 W/m <sup>2</sup> /100 lx (Room)	<b>E<sub>horizontal (Workplane)</sub></b> 639 lx
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pcs.	Manufacturer	Article No.	Article name	P	Φ <sub>Luminaire</sub>
5	LUXIONA Troll	01AMAAS CBBPLX	AGAT LED SMOOTH 5400 PLX E 840 / 600X600	36.0 W	4062 lm

Hodnik

<b>P<sub>total</sub></b> 59.4 W	<b>A<sub>Room</sub></b> 13.32 m <sup>2</sup>	<b>Lighting power density</b> 4.46 W/m <sup>2</sup> = 3.05 W/m <sup>2</sup> /100 lx (Room)	<b>E<sub>horizontal (Workplane)</sub></b> 146 lx
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pcs.	Manufacturer	Article No.	Article name	P	Φ <sub>Luminaire</sub>
3	LUXIONA Troll	LOTOS_EL _SQ_XXXX	LOTOS ELEGANCE SQUARE PC LED COMPACT 1800LM E IP54 840	19.8 W	1698 lm

Spremište atletika

<b>P<sub>total</sub></b> 66.0 W	<b>A<sub>Room</sub></b> 17.10 m <sup>2</sup>	<b>Lighting power density</b> 3.86 W/m <sup>2</sup> = 1.86 W/m <sup>2</sup> /100 lx (Room)	<b>E<sub>horizontal (Workplane)</sub></b> 208 lx
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pcs.	Manufacturer	Article No.	Article name	P	Φ <sub>Luminaire</sub>
3	TREVOS	FUTURA 2.2ft PC Al 3200/840	LED,industrial,body PC with aluminium cooler,diffuser translucent PC	22.0 W	2849 lm

PRIZEMLJE · Prizemlje

**Room List**

Spremište nogomet

<b>P<sub>total</sub></b> 88.0 W	<b>A<sub>Room</sub></b> 25.08 m <sup>2</sup>	<b>Lighting power density</b> 3.51 W/m <sup>2</sup> = 1.24 W/m <sup>2</sup> /100 lx (Room)	<b>E<sub>horizontal</sub> (Workplane)</b> 283 lx
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pcs.	Manufacturer	Article No.	Article name	P	Φ <sub>Luminaire</sub>
4	TREVOS	FUTURA 2.2ft PC Al 3200/840	LED,industrial,body PC with aluminium cooler,diffuser translucent PC	22.0 W	2849 lm

Sudac

<b>P<sub>total</sub></b> 72.0 W	<b>A<sub>Room</sub></b> 8.00 m <sup>2</sup>	<b>Lighting power density</b> 9.00 W/m <sup>2</sup> = 1.74 W/m <sup>2</sup> /100 lx (Room)	<b>E<sub>horizontal</sub> (Workplane)</b> 517 lx
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pcs.	Manufacturer	Article No.	Article name	P	Φ <sub>Luminaire</sub>
2	LUXIONA Troll	01AMAAS CBBPLX	AGAT LED SMOOTH 5400 PLX E 840 / 600X600	36.0 W	4062 lm

Svlačionica

<b>P<sub>total</sub></b> 116.0 W	<b>A<sub>Room</sub></b> 25.08 m <sup>2</sup>	<b>Lighting power density</b> 4.63 W/m <sup>2</sup> = 1.51 W/m <sup>2</sup> /100 lx (Room)	<b>E<sub>horizontal</sub> (Workplane)</b> 306 lx
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pcs.	Manufacturer	Article No.	Article name	P	Φ <sub>Luminaire</sub>
4	LUXIONA Troll	01AMALS CACPLX	AGAT LED SMOOTH 3750 PLX E 840 / 600X300	29.0 W	2821 lm



PRIZEMLJE · Prizemlje

**Room List**

WC

 $P_{\text{total}}$ 

118.8 W

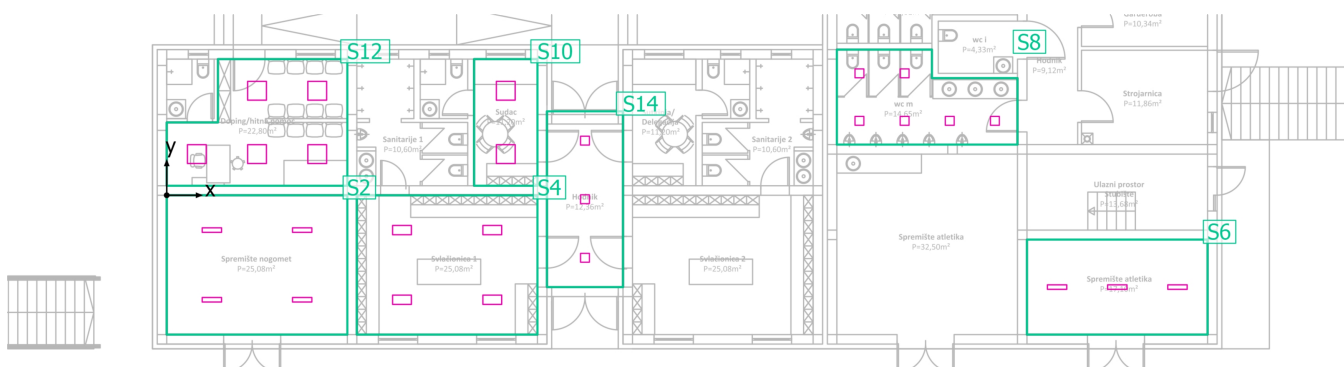
 $A_{\text{Room}}$ 14.67 m<sup>2</sup>**Lighting power density**8.10 W/m<sup>2</sup> = 3.37 W/m<sup>2</sup>/100 lx (Room) $\bar{E}_{\text{horizontal (Workplane)}}$ 

241 lx

pcs.	Manufacturer	Article No.	Article name	P	$\Phi_{\text{Luminaire}}$
6	LUXIONA Troll	LOTOS_EL _SQ_XXXX	LOTOS ELEGANCE SQUARE PC LED COMPACT 1800LM E IP54 840	19.8 W	1698 lm

PRIZEMLJE · Prizemlje

## Calculation objects



PRIZEMLJE · Prizemlje

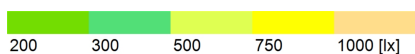
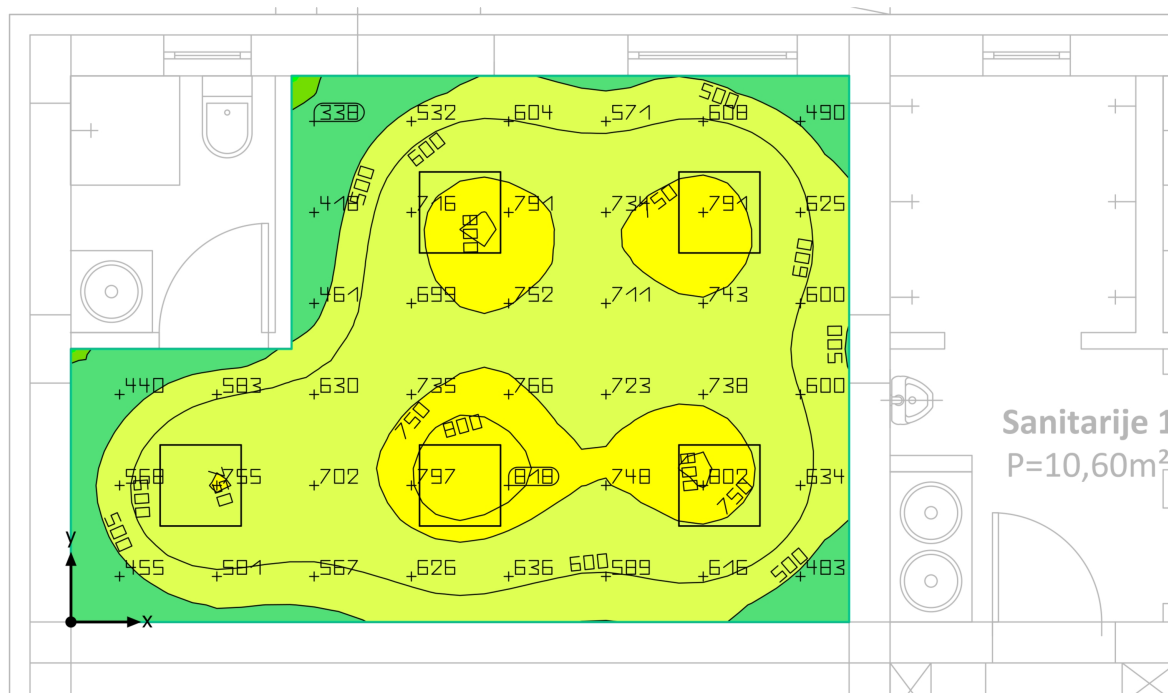
**Calculation objects**

## Work planes

Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$	$g_2$	Index
Workplane (Spremište nogomet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	283 lx ( $\geq 100$ lx) ✓	130 lx	418 lx	0.46	0.31	S2
Workplane (Svlačionica) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	306 lx ( $\geq 300$ lx) ✓	132 lx	470 lx	0.43	0.28	S4
Workplane (Spremište atletika) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	208 lx ( $\geq 100$ lx) ✓	123 lx	263 lx	0.59	0.47	S6
Workplane (WC) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	241 lx ( $\geq 200$ lx) ✓	133 lx	306 lx	0.55	0.43	S8
Workplane (Sudac) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	517 lx ( $\geq 500$ lx) ✓	297 lx	690 lx	0.57	0.43	S10
Workplane (Doping / hitna pomoć) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	639 lx ( $\geq 500$ lx) ✓	280 lx	841 lx	0.44	0.33	S12
Workplane (Hodnik) Perpendicular illuminance (adaptive) Height: 0.000 m, Wall zone: 0.000 m	146 lx ( $\geq 100$ lx) ✓	96.9 lx	179 lx	0.66	0.54	S14

PRIZEMLJE · Prizemlje · Doping / hitna pomoč

## Summary



Ground area: 19.57 m<sup>2</sup> | Reflection factors: Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 % | Maintenance factor: 0.80 (fixed) | Clearance height: 2.380 m | Mounting height: 2.380 m

PRIZEMLJE · Prizemlje · Doping / hitna pomoć

## Summary

### Results

	Symbol	Calculated	Target	Check
Workplane	$\bar{E}$	639 lx	$\geq 500$ lx	✓
	$g_1$	0.44	-	-
Consumption values	Consumption	650 kWh/a	max. 700 kWh/a	✓
Lighting power density	Room	9.20 W/m <sup>2</sup>	-	-
		1.44 W/m <sup>2</sup> /100 lx	-	-

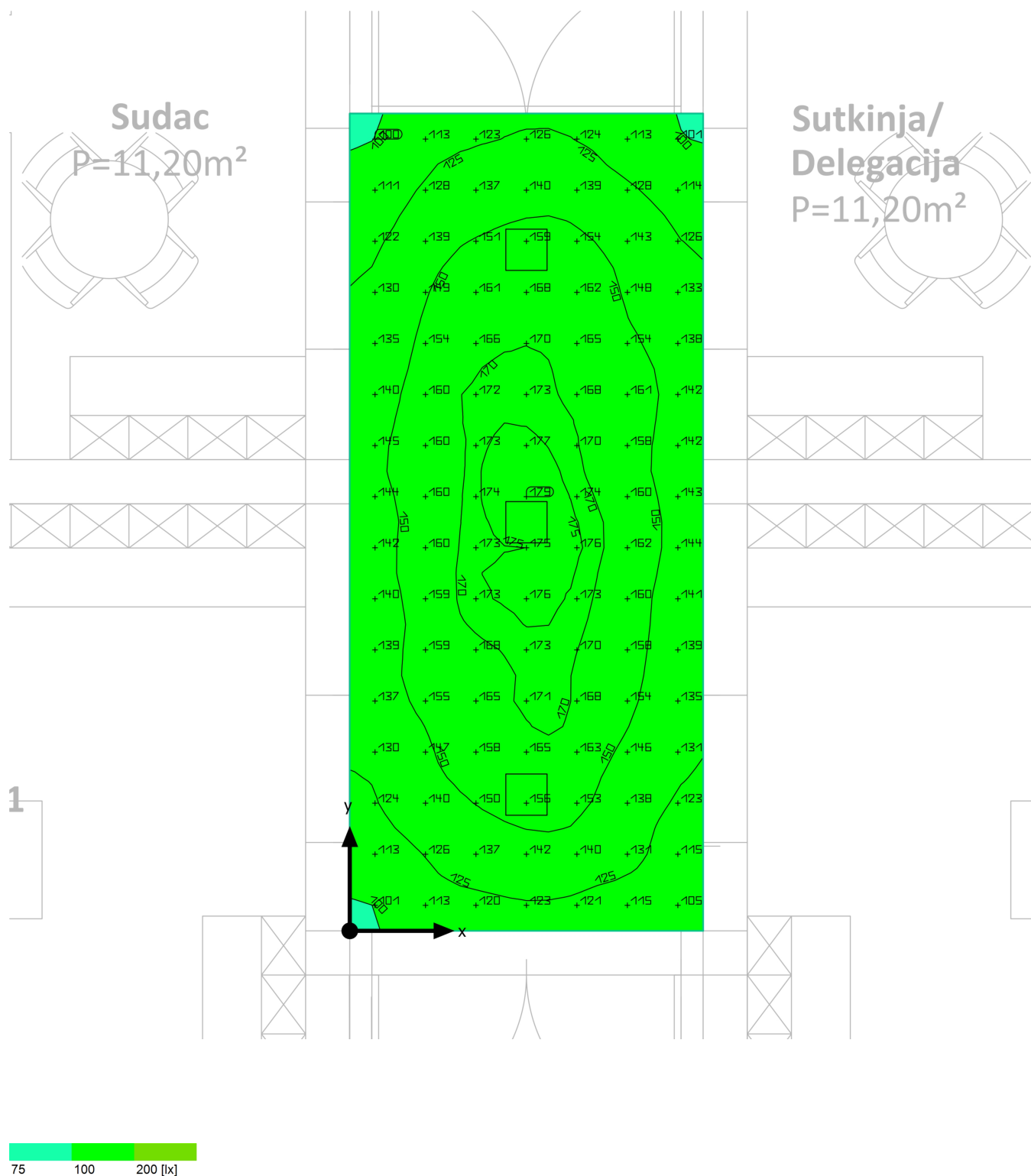
Utilisation profile: Healthcare premises - Examination rooms (general), General lighting

### Luminaire list

pcs.	Manufacturer	Article No.	Article name	P	$\Phi$	Luminous efficacy
5	LUXIONA Troll	01AMAAS CBBPLX	AGAT LED SMOOTH 5400 PLX E 840 / 600X600	36.0 W	4062 lm	112.8 lm/W

PRIZEMLJE · Prizemlje · Hodnik

## Summary



PRIZEMLJE · Prizemlje · Hodnik

## Summary

### Results

	Symbol	Calculated	Target	Check
Workplane	$\bar{E}$	146 lx	$\geq 100$ lx	✓
	$g_1$	0.66	-	-
Consumption values	Consumption	65 kWh/a	max. 500 kWh/a	✓
Lighting power density	Room	4.46 W/m <sup>2</sup>	-	-
		3.05 W/m <sup>2</sup> /100 lx	-	-

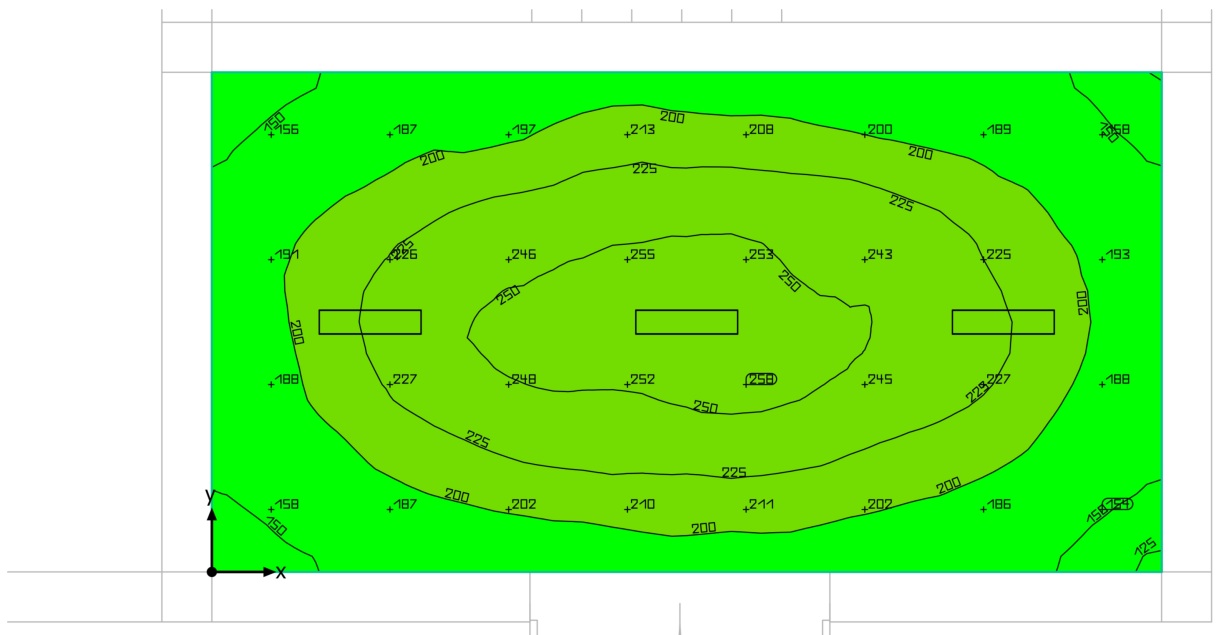
Utilisation profile: Traffic zones inside buildings, Circulation areas and corridors

### Luminaire list

pcs.	Manufacturer	Article No.	Article name	P	$\Phi$	Luminous efficacy
3	LUXIONA Troll	LOTOS_EL _SQ_XXXX	LOTOS ELEGANCE SQUARE PC LED COMPACT 1800LM E IP54 840	19.8 W	1698 lm	85.8 lm/W

PRIZEMLJE · Prizemlje · Spremište atletika

## Summary





PRIZEMLJE · Prizemlje · Spremište atletika

## Summary

### Results

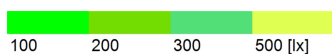
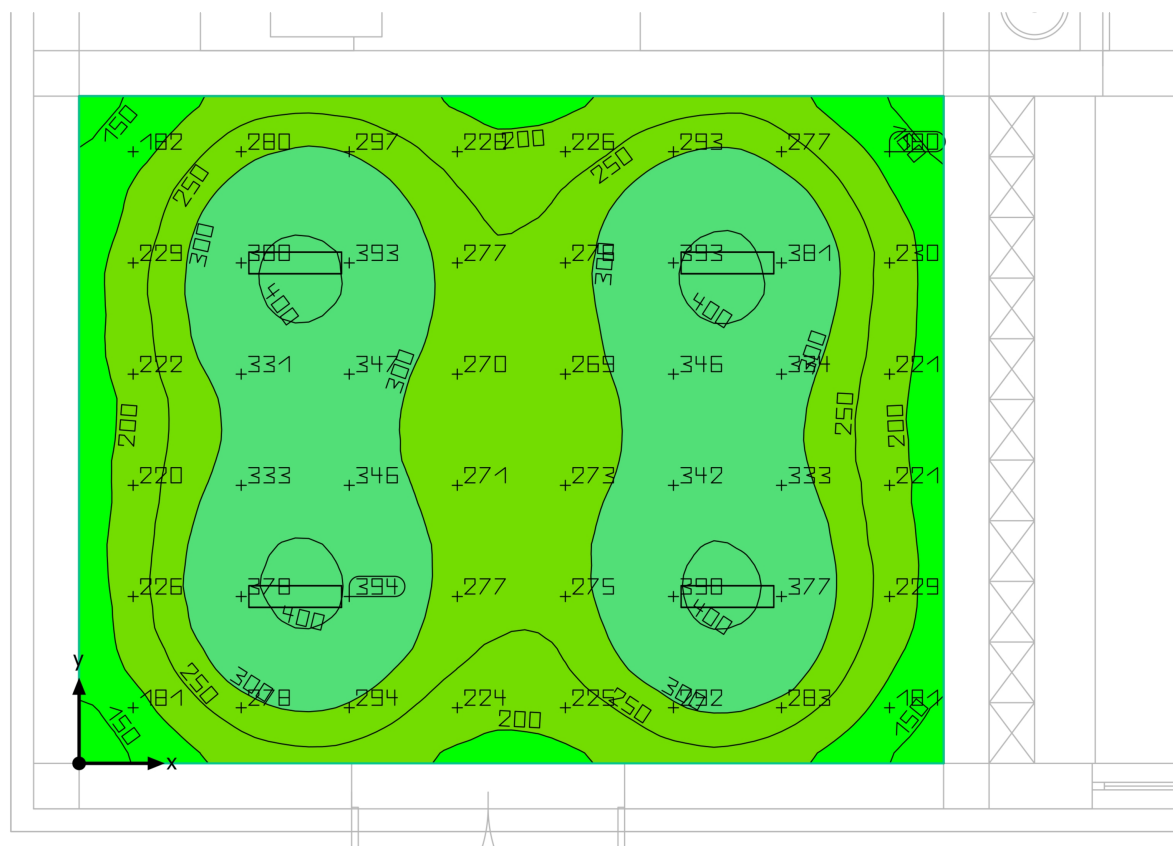
	Symbol	Calculated	Target	Check
Workplane	$\bar{E}$	208 lx	$\geq 100$ lx	✓
	$g_1$	0.59	-	-
Consumption values	Consumption	11 kWh/a	max. 600 kWh/a	✓
Lighting power density	Room	3.86 W/m <sup>2</sup>	-	-
		1.86 W/m <sup>2</sup> /100 lx	-	-

Utilisation profile: General areas inside buildings - Store rooms and cold stores, Store and stockrooms

### Luminaire list

pcs.	Manufacturer	Article No.	Article name	P	$\Phi$	Luminous efficacy
3	TREVOS	FUTURA 2.2ft PC Al 3200/840	LED,industrial,body PC with aluminium cooler,diffuser translucent PC	22.0 W	2849 lm	129.5 lm/W

PRIZEMLJE · Prizemlje · Spremište nogomet

**Summary**

Ground area: 25.08 m<sup>2</sup> | Reflection factors: Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 % | Maintenance factor: 0.80 (fixed) | Clearance height: 2.380 m | Mounting height: 2.380 m

PRIZEMLJE · Prizemlje · Spremište nogomet

## Summary

### Results

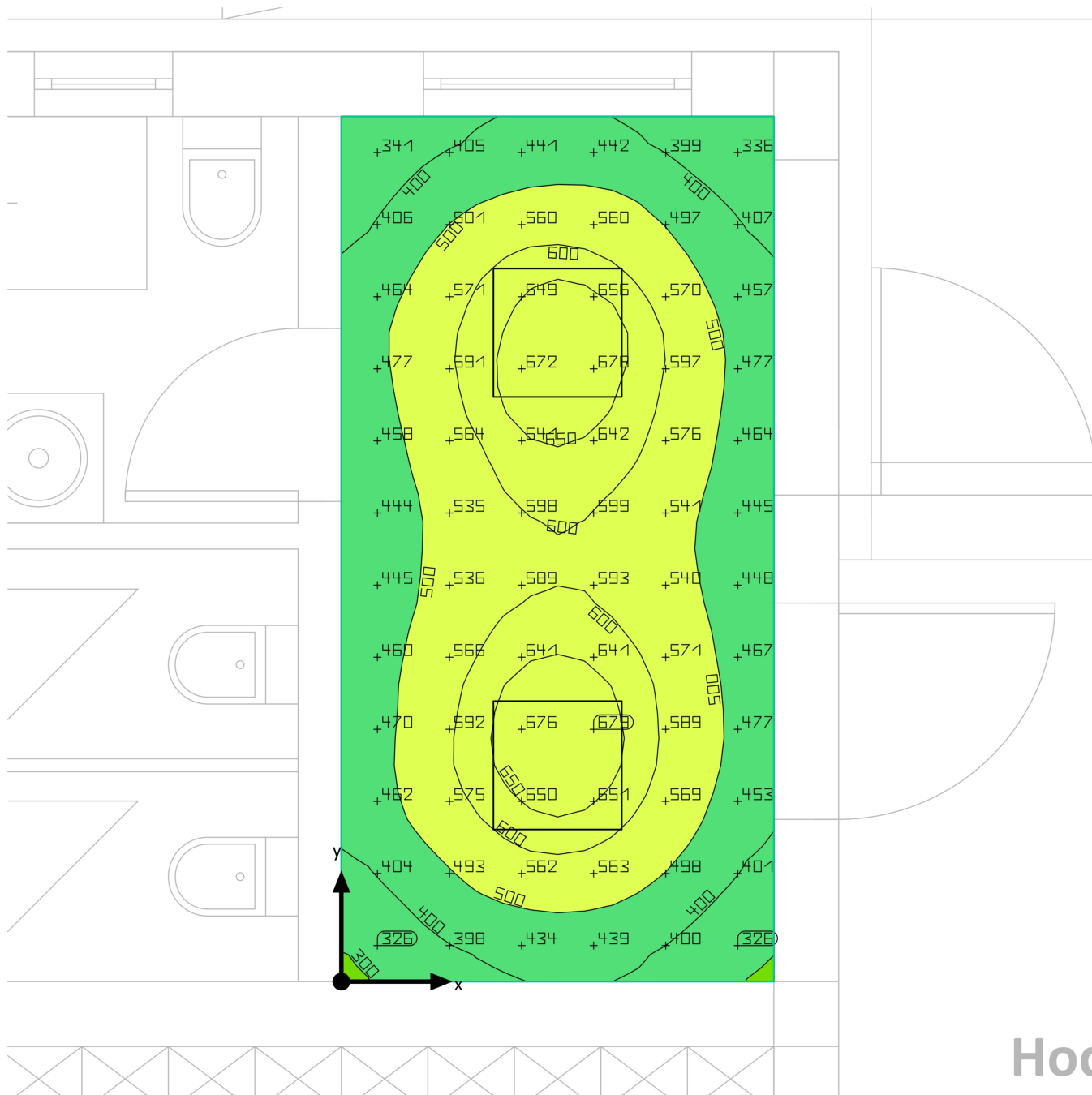
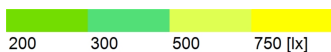
	Symbol	Calculated	Target	Check
Workplane	$\bar{E}$	283 lx	$\geq 100$ lx	✓
	$g_1$	0.46	-	-
Consumption values	Consumption	15 kWh/a	max. 900 kWh/a	✓
Lighting power density	Room	3.51 W/m <sup>2</sup>	-	-
		1.24 W/m <sup>2</sup> /100 lx	-	-

Utilisation profile: General areas inside buildings - Store rooms and cold stores, Store and stockrooms

### Luminaire list

pcs.	Manufacturer	Article No.	Article name	P	$\Phi$	Luminous efficacy
4	TREVOS	FUTURA 2.2ft PC Al 3200/840	LED,industrial,body PC with aluminium cooler,diffuser translucent PC	22.0 W	2849 lm	129.5 lm/W

PRIZEMLJE · Prizemlje · Sudac

**Summary****Hoc**

PRIZEMLJE · Prizemlje · Sudac

## Summary

### Results

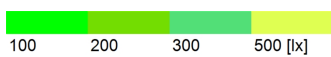
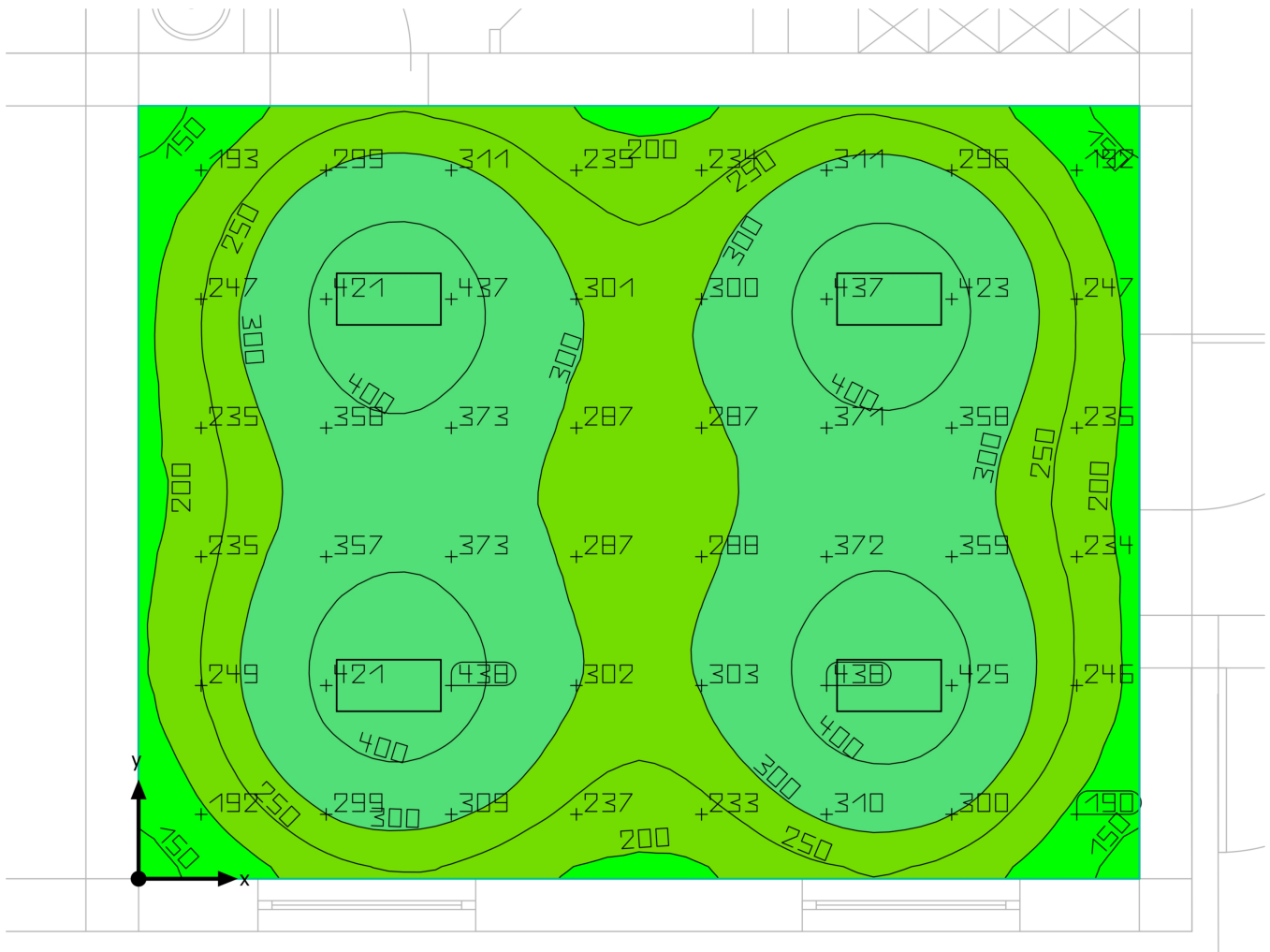
	Symbol	Calculated	Target	Check
Workplane	$\bar{E}$	517 lx	$\geq 500$ lx	✓
	$g_1$	0.57	-	-
Consumption values	Consumption	200 kWh/a	max. 300 kWh/a	✓
Lighting power density	Room	9.00 W/m <sup>2</sup>	-	-
		1.74 W/m <sup>2</sup> /100 lx	-	-

Utilisation profile: DIALux presetting, Standard (office)

### Luminaire list

pcs.	Manufacturer	Article No.	Article name	P	$\Phi$	Luminous efficacy
2	LUXIONA Troll	01AMAAS CBBPLX	AGAT LED SMOOTH 5400 PLX E 840 / 600X600	36.0 W	4062 lm	112.8 lm/W

PRIZEMLJE · Prizemlje · Svlačionica

**Summary**

Ground area: 25.08 m<sup>2</sup> | Reflection factors: Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 % | Maintenance factor: 0.80 (fixed) | Clearance height: 2.380 m | Mounting height: 2.380 m

PRIZEMLJE · Prizemlje · Svlačionica

## Summary

### Results

	Symbol	Calculated	Target	Check
Workplane	$\bar{E}$	306 lx	$\geq 300$ lx	✓
	$g_1$	0.43	-	-
Consumption values	Consumption	220 kWh/a	max. 900 kWh/a	✓
Lighting power density	Room	4.63 W/m <sup>2</sup>	-	-
		1.51 W/m <sup>2</sup> /100 lx	-	-

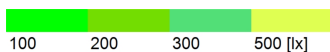
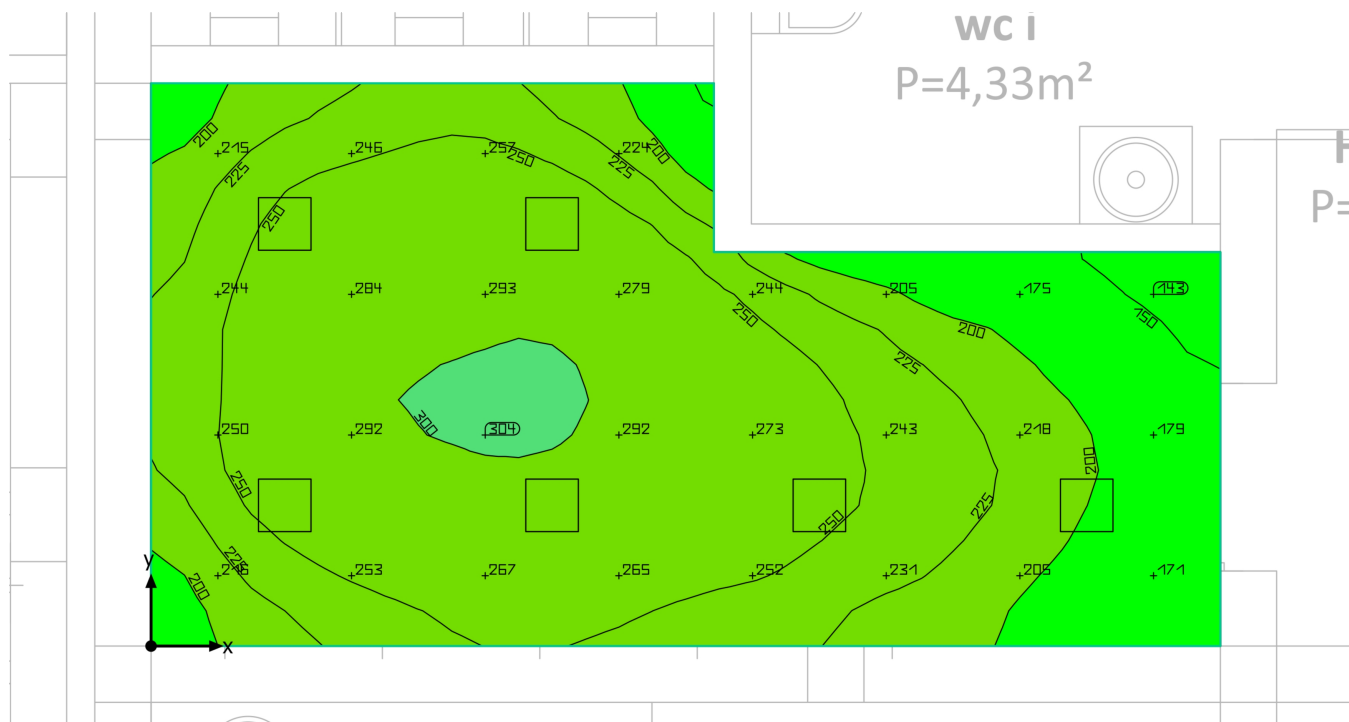
Utilisation profile: Places of public assembly - Theatres, concert halls, cinemas, entertainment venues, Dressing rooms

### Luminaire list

pcs.	Manufacturer	Article No.	Article name	P	$\Phi$	Luminous efficacy
4	LUXIONA Troll	01AMALS CACPLX	AGAT LED SMOOTH 3750 PLX E 840 / 600X300	29.0 W	2821 lm	97.3 lm/W

PRIZEMLJE · Prizemlje · WC

## Summary





PRIZEMLJE · Prizemlje · WC

## Summary

### Results

	Symbol	Calculated	Target	Check
Workplane	$\bar{E}$	241 lx	$\geq 200$ lx	✓
	$g_1$	0.55	-	-
Consumption values	Consumption	98 kWh/a	max. 550 kWh/a	✓
Lighting power density	Room	8.10 W/m <sup>2</sup>	-	-
		3.37 W/m <sup>2</sup> /100 lx	-	-

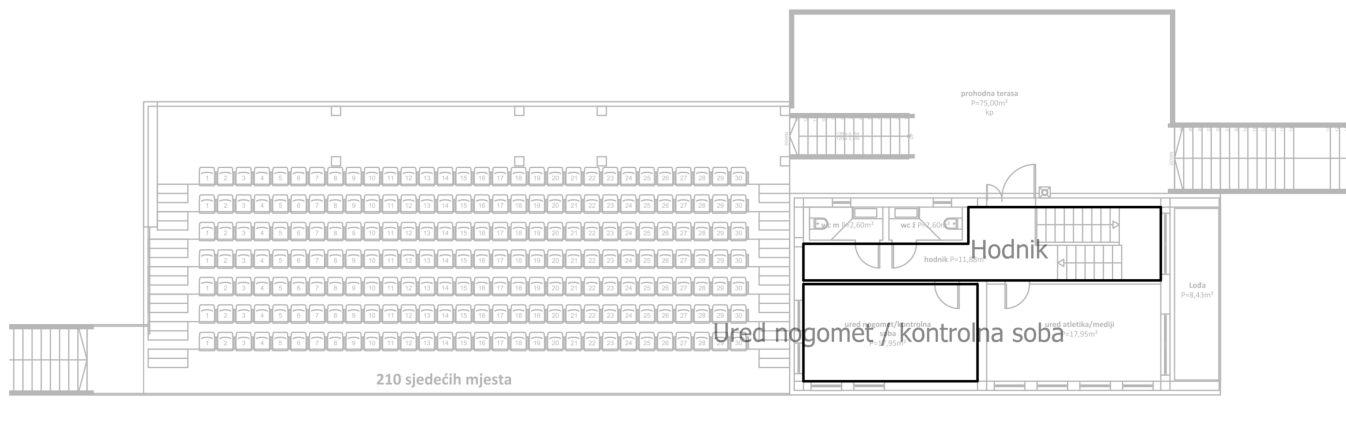
Utilisation profile: General areas inside buildings - Rest, sanitation and first aid rooms, Cloakrooms, washrooms, bathrooms, toilets

### Luminaire list

pcs.	Manufacturer	Article No.	Article name	P	$\Phi$	Luminous efficacy
6	LUXIONA Troll	LOTOS_EL _SQ_XXXX	LOTOS ELEGANCE SQUARE PC LED COMPACT 1800LM E IP54 840	19.8 W	1698 lm	85.8 lm/W

1. KAT · 1. kat

## Room List



1. KAT · 1. kat

**Room List**

Hodnik

 $P_{\text{total}}$   
178.2 W $A_{\text{Room}}$   
21.60 m<sup>2</sup>**Lighting power density**  
 $8.25 \text{ W/m}^2 = 4.16 \text{ W/m}^2/100 \text{ lx (Room)}$  $\bar{E}_{\text{horizontal (Workplane)}}$   
198 lx

pcs.	Manufacturer	Article No.	Article name	P	$\Phi_{\text{Luminaire}}$
9	LUXIONA Troll	LOTOS_EL _SQ_XXXX	LOTOS ELEGANCE SQUARE PC LED COMPACT 1800LM E IP54 840	19.8 W	1698 lm

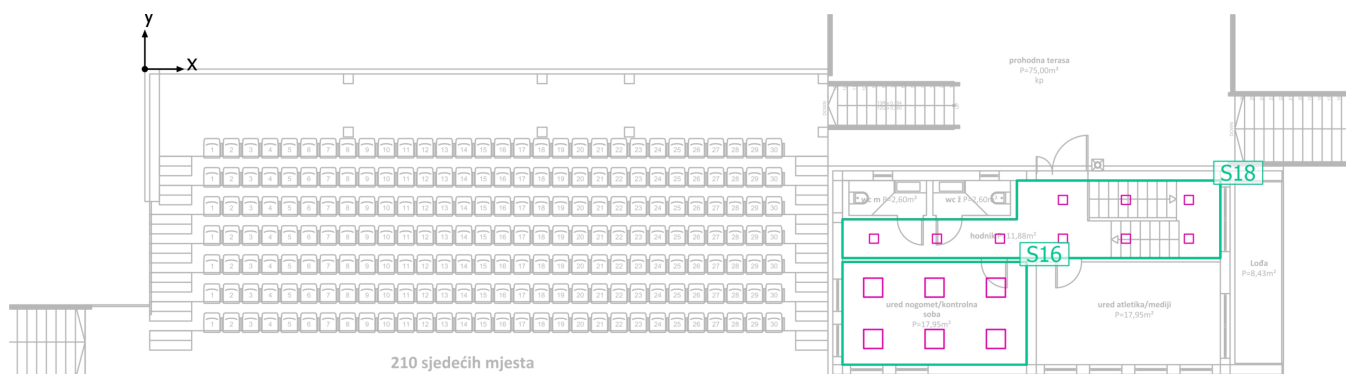
Ured nogomet / kontrolna soba

 $P_{\text{total}}$   
204.0 W $A_{\text{Room}}$   
18.13 m<sup>2</sup>**Lighting power density**  
 $11.25 \text{ W/m}^2 = 1.74 \text{ W/m}^2/100 \text{ lx (Room)}$  $\bar{E}_{\text{horizontal (Workplane)}}$   
648 lx

pcs.	Manufacturer	Article No.	Article name	P	$\Phi_{\text{Luminaire}}$
6	LUXIONA Troll	RLOOKLE DXX_XXPL XE	RUBIN LOOK LED 5200LM PLX E IP40 840 / 600X600	34.0 W	4042 lm

1. KAT · 1. kat

## Calculation objects



1. KAT · 1. kat

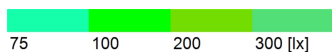
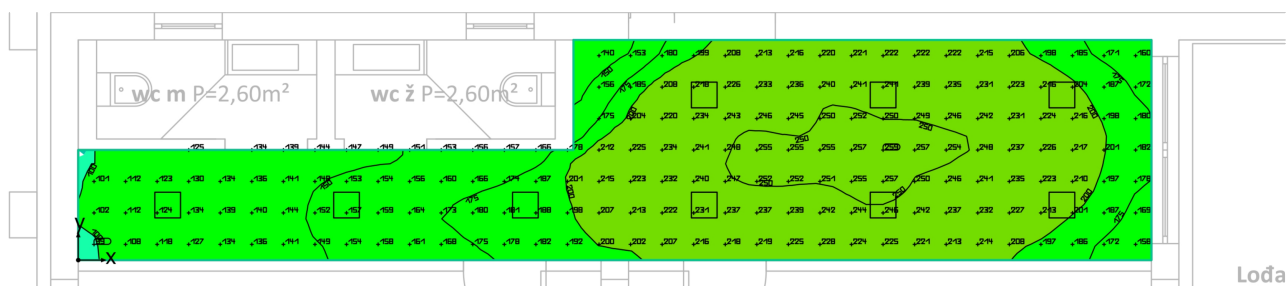
**Calculation objects**

## Work planes

Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$	$g_2$	Index
Workplane (Ured nogomet / kontrolna soba) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	648 lx (≥ 500 lx) ✓	407 lx	796 lx	0.63	0.51	S16
Workplane (Hodnik) Perpendicular illuminance (adaptive) Height: 0.000 m, Wall zone: 0.000 m	198 lx (≥ 100 lx) ✓	97.9 lx	259 lx	0.49	0.38	S18

1. KAT · 1. kat · Hodnik

## Summary



Ground area: 21.60 m<sup>2</sup> | Reflection factors: Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 % | Maintenance factor: 0.80 (fixed) | Clearance height: 3.070 m | Mounting height: 3.070 m

1. KAT · 1. kat · Hodnik

## Summary

### Results

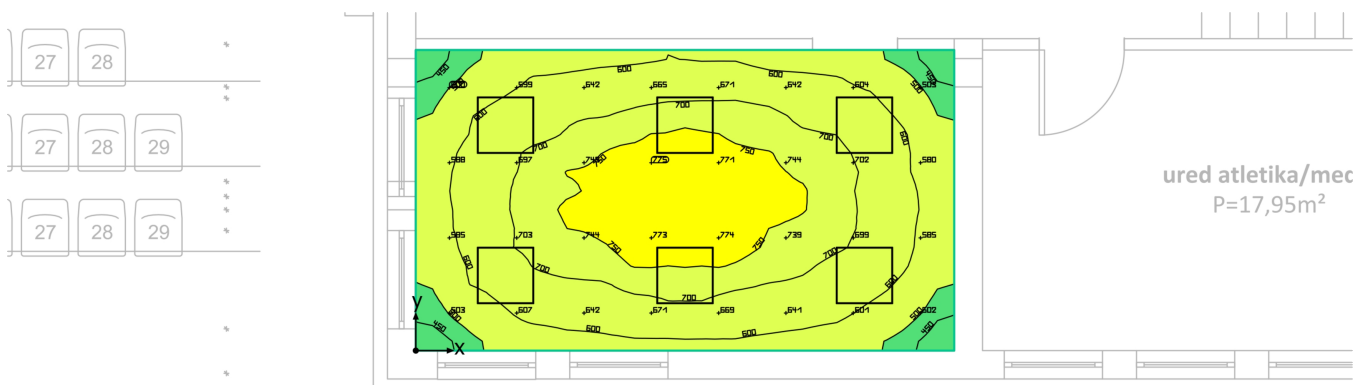
	Symbol	Calculated	Target	Check
Workplane	$\bar{E}$	198 lx	$\geq 100$ lx	✓
	$g_1$	0.49	-	-
Consumption values	Consumption	200 kWh/a	max. 800 kWh/a	✓
Lighting power density	Room	8.25 W/m <sup>2</sup>	-	-
		4.16 W/m <sup>2</sup> /100 lx	-	-

Utilisation profile: Traffic zones inside buildings, Circulation areas and corridors

### Luminaire list

pcs.	Manufacturer	Article No.	Article name	P	$\Phi$	Luminous efficacy
9	LUXIONA Troll	LOTOS_EL _SQ_XXXX	LOTOS ELEGANCE SQUARE PC LED COMPACT 1800LM E IP54 840	19.8 W	1698 lm	85.8 lm/W

1. KAT · 1. kat · Ured nogomet / kontrolna soba

**Summary**



1. KAT · 1. kat · Ured nogomet / kontrolna soba

## Summary

### Results

	Symbol	Calculated	Target	Check
Workplane	$\bar{E}$	648 lx	$\geq 500$ lx	✓
	$g_1$	0.63	-	-
Consumption values	Consumption	560 kWh/a	max. 650 kWh/a	✓
Lighting power density	Room	11.25 W/m <sup>2</sup>	-	-
		1.74 W/m <sup>2</sup> /100 lx	-	-

Utilisation profile: DIALux presetting, Standard (office)

### Luminaire list

pcs.	Manufacturer	Article No.	Article name	P	$\Phi$	Luminous efficacy
6	LUXIONA Troll	RLOOKLE DXX_XXPL XE	RUBIN LOOK LED 5200LM PLX E IP40 840 / 600X600	34.0 W	4042 lm	118.9 lm/W

Investitor:

**GRAD VUKOVAR**

Dr. Franje Tuđmana 1, Vukovar 32000  
OIB 50041264710

Građevina:

**IZGRADNJA SPORTSKO REKREACIJSKOG CENTRA NA NOGOMETNOM STADIONU U VUKOVARU**

Ulica 204. vukovarske brigade, novoformirana k.č.br. 1575, k.o. Vukovar

Projekt:

**IZVEDBENI PROJEKT – ELEKTROTEHNIČKI PROJEKT**

Broj:

**127/19**

## 10. STATIČKI PRORAČUNI

U Osijeku, travanj 2020. god.

PROJEKTANT:

Zlatko Galić, dipl. ing. el.



**ZLATKO GALIĆ**  
dipl.ing.el.

E 223

**OVLAŠTENI INŽENJER**  
**ELEKTROTEHNIKE**

CALCULATION NUMBER	0527/2019-0
FILE	20190527_003
FOR	Lipapromet

**BELIER P 16 SPEC + 2x CROSSBBAR 3,4m C80 at 16m and 15,1m**  
**Floodlight 4+4 angle max 20° (Weight-30kg, CxS-0,22m<sup>2</sup>/pcs)**  
**Wind: 25 m/s, II terrain category acc. to EN40**

#### Shaft list (The diameters written here under are external diameters)

Shaft	Material	Nr Side	Base Flat (mm)	Top Flat (mm)	Base Angl (mm)	Top Angl (mm)	Thk (mm)	Length (m)	Slip joint (m)	Cone (mm/m)	Nr shell	Base dev (mm)	Top dev (mm)	Black weight (kg)	Galvanized weight (kg)
BELIER P 16 SPEC	S235	16	430.00	270.10	438.42	275.39	4.0	8.00	0.60	20.380	1	1354.53	845.62	277	288
BELIER P 16 SPEC	S235	16	291.90	120.00	297.62	122.35	4.0	8.60	-	20.380	1	915.00	367.92	174	181
<b>Total</b>														450	468

#### BASEPLATE

CIRCULAR BASEPLATE		
Material	S355	-
External diameter	660.000	mm
Drilling diameter	540.000	mm
Thickness	25.0000	mm
Anchor bolts	8 Anchor bolts Right TOR M30/32 x 1090 FE E 500	
		-

- Black weight : 37 kg
- Galvanized weight : 37 kg

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Made by ad.maciejewski with Paul Standard version 3.5.0.0

CALCULATION NUMBER	0527/2019-0
FILE	20190527_003
FOR	Lipapromet

BELIER P 16 SPEC + 2x CROSSBBAR 3,4m C80 at 16m and 15,1m  
Floodlight 4+4 angle max 20° (Weight-30kg, CxS-0,22m²/pcs)  
Wind: 25 m/s, II terrain category acc. to EN40

## GENERAL INFORMATION

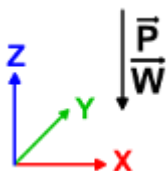
### STANDARD USED

- **EN40-3-1 - European standard**  
(C) Copyright 1995...2020 [Version 9 Release Sep 27 2018]
- **EN40-3-3 - European standard**  
(C) Copyright 1995...2020 [Version 8 Release Sep 27 2018]

### MATERIALS

Name	E (daN/mm²)	G (daN/mm²)	Re (daN/mm²)	Rm (daN/mm²)	Rt (daN/mm²)	Rc (daN/mm²)	Rs (daN/mm²)	Density (kg/dm³)	Poisson	Allon (%)
S235	21000	8070	23.5	34	0	0	0	7.85	0.3	23

### SYSTEM OF COORDINATES



## STRUCTURE DESCRIPTION

### SHAFTS LIST (Diameters are outside diameters)

Name	Material	Nb sides	Bot/Flat (mm)	Top/Flat (mm)	Bot/Pnt (mm)	Top/Pnt (mm)	Thick (mm)	Length (m)	Level (m)
BELIER P 16 SPEC	S235	16	430.0	270.1	438.4	275.4	4.00	8.000	8.000
	S235	16	291.9	120.0	297.6	122.4	4.00	8.600	16.000

- Pole elements weight : 450.215 kg

### HAND HOLES LIST

Description	Angle (deg)	GndLev (mm)	Length (mm)	Width (mm)
600x180	0.0	500.0	600.0	180.0

Description	Angle (deg)	GndLev (mm)	Length (mm)			Width (mm)		
	Reinforcements							
	Name	Parameters		Md	Angle (deg)	Tx (mm)	Ty (mm)	Sides
	V shape reinforcement	Dlugosc = 50 mm Grubosc = 10 mm Kat = 120 deg		4	0	12	0	Left,Right

LOADING

LOAD CASE COMBINATION LIST

Combination	Weight factor	Wind factor
Strength check	1.2	1.2
Deflection check	1	1

CALCULATION RESULTS

COMBINATION RESULTS Strength check :

Name	Pressure (daN/m2)	Speed (m/s)	Direction (X; Y; Z)	Additional parameters		
				Name	Value	Unit
Wind: 25 m/s, terrain category II.	35.9375	25	(0; 1; 0)	Vref altitude adjusted	25	m/s
				Terrain category	2	
				Altitude factor CALT	1	
				Mounting height	0	m
				Topography factor known	Yes	
				Topography factor f	1	
				Mountain height	0	m
				Length of the hillside	0	m
				Distance between hilltop and mast	0	m
				Coefficient Cs	0.959166	

Name	Number	Level (m)	Floodlights	Total weight (kg)	Total area (EPA) (m2)
Set of 1 crossbar(s) Cross bar 3,4m C80	1	16	4 PHILIPS BVP 500-I40°	149	1.33
Set of 1 crossbar(s) Cross bar 3,4m C80	1	15.1	4 PHILIPS BVP 500-I40°	149	1.33

NATURAL FREQUENCY

	Order 1	Unit
Natural period	1.247115	s
Natural frequency	0.801850	s-1
Natural pulsation	5.038175	rd/s

Level (m)	De/AgI (mm)	Inertia (cm4)		Moments (daN.m)			Loads (daN)			Coefficients					
		Ix	Iy	X	Y	Z	X	Y	Z	Global	Delta	Beta	F	CE	C
0.00	438.4	12465.5	12465.5	-8858.6	0.0	0.0	0.0	726.1	-888.3	1.40	0.84	1.57	1.00	1.80	0.59
0.50	428.2	12074.2	14601.0	-8498.1	0.0	0.0	0.0	713.3	-863.5	1.41	0.84	1.57	1.00	1.80	0.59
1.00	418.0	11125.7	13752.0	-8143.1	0.0	0.0	0.0	700.7	-833.6	1.41	0.84	1.57	1.00	1.80	0.59
1.10	416.0	10941.8	13586.9	-8072.9	0.0	0.0	0.0	698.2	-827.7	1.41	0.84	1.57	1.00	1.80	0.59
1.60	405.8	9863.7	9863.7	-7724.6	0.0	0.0	0.0	685.9	-804.2	1.42	0.84	1.57	1.00	1.80	0.60

Level (m)	De/Agf (mm)	Inertia (cm4)		Moments (daN.m)			Loads (daN)			Coefficients					
		Ix	Iy	X	Y	Z	X	Y	Z	Global	Delta	Beta	F	CE	C
2.10	395.6	9132.1	9132.1	-7381.7	0.0	0.0	0.0	673.9	-781.4	1.42	0.84	1.57	1.00	1.80	0.60
2.60	385.4	8437.5	8437.5	-7044.0	0.0	0.0	0.0	662.1	-759.1	1.43	0.84	1.57	1.00	1.80	0.60
3.10	375.2	7779.1	7779.1	-6711.6	0.0	0.0	0.0	650.7	-737.4	1.43	0.84	1.57	1.00	1.80	0.60
3.60	365.1	7155.9	7155.9	-6384.2	0.0	0.0	0.0	639.4	-716.3	1.44	0.84	1.57	1.00	1.80	0.60
4.10	354.9	6566.9	6566.9	-6061.7	0.0	0.0	0.0	628.5	-695.7	1.48	0.84	1.57	1.00	1.85	0.61
4.60	344.7	6011.2	6011.2	-5744.1	0.0	0.0	0.0	617.5	-675.8	1.54	0.84	1.57	1.00	1.91	0.61
5.10	334.5	5487.7	5487.7	-5431.4	0.0	0.0	0.0	606.5	-656.5	1.59	0.84	1.57	1.00	1.97	0.61
5.60	324.3	4995.5	4995.5	-5123.7	0.0	0.0	0.0	595.4	-637.7	1.64	0.84	1.57	1.00	2.02	0.61
6.10	314.1	4533.7	4533.7	-4820.9	0.0	0.0	0.0	584.4	-619.5	1.69	0.84	1.57	1.00	2.07	0.62
6.60	303.9	4101.2	4101.2	-4523.1	0.0	0.0	0.0	573.4	-601.9	1.73	0.84	1.57	1.00	2.12	0.62
7.10	293.7	3697.2	3697.2	-4230.3	0.0	0.0	0.0	562.4	-584.9	1.76	0.84	1.57	1.00	2.15	0.62
7.40	287.6	3468.0	3468.0	-4057.1	0.0	0.0	0.0	555.9	-575.0	1.79	0.84	1.57	1.00	2.19	0.62
8.00	285.4	3386.9	3386.9	-3716.5	0.0	0.0	0.0	542.7	-535.9	1.84	0.84	1.57	1.00	2.23	0.62
8.50	275.2	3032.1	3032.1	-3438.4	0.0	0.0	0.0	531.8	-520.0	1.88	0.84	1.57	1.00	2.27	0.63
9.00	265.0	2703.0	2703.0	-3165.4	0.0	0.0	0.0	521.1	-504.7	1.91	0.84	1.57	1.00	2.30	0.63
9.50	254.8	2398.6	2398.6	-2897.3	0.0	0.0	0.0	510.6	-489.9	1.95	0.84	1.57	1.00	2.34	0.63
10.00	244.6	2117.9	2117.9	-2634.1	0.0	0.0	0.0	500.3	-475.7	1.99	0.84	1.57	1.00	2.37	0.64
10.50	234.4	1860.0	1860.0	-2375.5	0.0	0.0	0.0	490.2	-462.2	2.02	0.84	1.57	1.00	2.40	0.64
11.00	224.2	1624.0	1624.0	-2121.6	0.0	0.0	0.0	480.4	-449.2	2.06	0.84	1.57	1.00	2.43	0.64
11.50	214.1	1408.9	1408.9	-1872.2	0.0	0.0	0.0	470.8	-436.8	2.09	0.84	1.57	1.00	2.46	0.65
12.00	203.9	1213.6	1213.6	-1627.2	0.0	0.0	0.0	461.6	-424.9	2.13	0.84	1.57	1.00	2.48	0.65
12.50	193.7	1037.3	1037.3	-1386.4	0.0	0.0	0.0	452.6	-413.7	2.17	0.84	1.57	1.00	2.51	0.65
13.00	183.5	878.9	878.9	-1149.8	0.0	0.0	0.0	444.0	-403.1	2.20	0.84	1.57	1.00	2.53	0.66
13.50	173.3	737.5	737.5	-917.1	0.0	0.0	0.0	435.7	-393.0	2.24	0.84	1.57	1.00	2.56	0.66
14.00	163.1	612.2	612.2	-688.3	0.0	0.0	0.0	427.7	-383.6	2.27	0.84	1.57	1.00	2.58	0.67
14.50	152.9	502.0	502.0	-463.3	0.0	0.0	0.0	420.1	-374.7	2.31	0.84	1.57	1.00	2.60	0.67
15.00	142.7	405.8	405.8	-242.0	0.0	0.0	0.0	412.9	-366.4	2.35	0.84	1.57	1.00	2.63	0.68
15.50	132.5	322.8	322.8	-92.6	0.0	0.0	0.0	207.7	-182.9	2.39	0.84	1.57	1.00	2.65	0.68
16.00	122.4	252.0	252.0	16.0	0.0	0.0	0.0	201.3	-175.8	2.39	0.84	1.57	1.00	2.65	0.68

Level (m)	Allowable stress			Effective stress			CSR	Deflec (mm)	Angle (deg)
	Bend/X (daN.m)	Bend/Y (daN.m)	Tor (daN.m)	Bend/X (daN.m)	Bend/Y (daN.m)	Tor (daN.m)			
0.00	12519.86	12519.86	12759.91	-8858.65	0.00	0.00	0.71	0.00	0.0984
0.50	12884.91	14638.97	7134.49	-8498.05	0.00	0.00	0.66	0.86	0.1963
1.00	11916.12	13714.95	6539.40	-8143.12	0.00	0.00	0.68	2.57	0.2164
1.10	11722.36	13528.56	6421.19	-8072.87	0.00	0.00	0.69	2.95	0.3216
1.60	11007.27	11007.27	10915.99	-7724.57	0.00	0.00	0.70	5.76	0.4301
2.10	10550.43	10550.43	10369.26	-7381.67	0.00	0.00	0.70	9.51	0.5422
2.60	10101.26	10101.26	9836.58	-7044.05	0.00	0.00	0.70	14.24	0.6580
3.10	9659.82	9659.82	9317.94	-6711.59	0.00	0.00	0.69	19.98	0.7777
3.60	9226.19	9226.19	8813.35	-6384.17	0.00	0.00	0.69	26.77	0.9015
4.10	8800.44	8800.44	8322.80	-6061.69	0.00	0.00	0.69	34.64	1.0297
4.60	8382.66	8382.66	7846.30	-5744.08	0.00	0.00	0.69	43.62	1.1624
5.10	7972.92	7972.92	7383.85	-5431.39	0.00	0.00	0.68	53.77	1.2998
5.60	7571.32	7571.32	6935.44	-5123.65	0.00	0.00	0.68	65.11	1.4423
6.10	7177.94	7177.94	6501.07	-4820.90	0.00	0.00	0.67	77.70	1.5901
6.60	6792.88	6792.88	6080.75	-4523.12	0.00	0.00	0.67	91.57	1.7433
7.10	6416.23	6416.23	5674.48	-4230.29	0.00	0.00	0.66	106.78	1.8380
7.40	6194.32	6194.32	5437.45	-4057.05	0.00	0.00	0.65	116.41	1.9308
8.00	6114.23	6114.23	5352.35	-3716.46	0.00	0.00	0.61	136.62	2.0830

Level (m)	Allowable stress			Effective stress			CSR	Deflec (mm)	Angle (deg)
	Bend/X (daN.m)	Bend/Y (daN.m)	Tor (daN.m)	Bend/X (daN.m)	Bend/Y (daN.m)	Tor (daN.m)			
8.50	5753.15	5753.15	4971.62	-3438.43	0.00	0.00	0.60	154.80	2.2402
9.00	5400.78	5400.78	4604.93	-3165.42	0.00	0.00	0.59	174.35	2.4025
9.50	5057.25	5057.25	4252.29	-2897.33	0.00	0.00	0.57	195.31	2.5697
10.00	4722.68	4722.68	3913.70	-2634.07	0.00	0.00	0.56	217.74	2.7417
10.50	4397.19	4397.19	3589.15	-2375.54	0.00	0.00	0.54	241.66	2.9179
11.00	4080.94	4080.94	3278.65	-2121.63	0.00	0.00	0.52	267.12	3.0976
11.50	3774.06	3774.06	2982.19	-1872.23	0.00	0.00	0.50	294.14	3.2797
12.00	3476.71	3476.71	2699.78	-1627.20	0.00	0.00	0.47	322.76	3.4624
12.50	3157.50	3157.50	2431.41	-1386.42	0.00	0.00	0.44	352.97	3.6428
13.00	2827.28	2827.28	2177.09	-1149.76	0.00	0.00	0.41	384.75	3.8168
13.50	2515.30	2515.30	1936.81	-917.10	0.00	0.00	0.36	418.05	3.9783
14.00	2221.55	2221.55	1710.58	-688.31	0.00	0.00	0.31	452.76	4.1180
14.50	1946.05	1946.05	1498.40	-463.31	0.00	0.00	0.24	488.68	4.2216
15.00	1688.78	1688.78	1300.26	-242.00	0.00	0.00	0.14	525.51	4.2819
15.50	1449.75	1449.75	1116.16	-92.63	0.00	0.00	0.06	562.87	4.2971
16.00	1228.95	1228.95	946.12	16.02	0.00	0.00	0.01	600.35	4.2971

CALCULATION RESULTS

COMBINATION RESULTS Deflection check :

Name	Pressure (daN/m2)	Speed (m/s)	Direction (X; Y; Z)	Additional parameters		
				Name	Value	Unit
Wind: 25 m/s, terrain category II.	35.9375	25	(0; 1; 0)	Vref altitude adjusted	25	m/s
				Terrain category	2	
				Altitude factor CALT	1	
				Mounting height	0	m
				Topography factor known	Yes	
				Topography factor f	1	
				Mountain height	0	m
				Length of the hillside	0	m
				Distance between hilltop and mast	0	m
				Coefficient Cs	0.959166	

Name	Number	Level (m)	Floodlights	Total weight (kg)	Total area (EPA) (m2)
Set of 1 crossbar(s) Cross bar 3,4m C80	1	16	4 PHILIPS BVP 500-I40°	149	1.33
Set of 1 crossbar(s) Cross bar 3,4m C80	1	15.1	4 PHILIPS BVP 500-I40°	149	1.33

NATURAL FREQUENCY

	Order 1	Unit
Natural period	1.247115	s
Natural frequency	0.801850	s-1
Natural pulsation	5.038175	rd/s

Level (m)	De/AgI (mm)	Inertia (cm4)		Moments (daN.m)			Loads (daN)			Coefficients					
		Ix	Iy	X	Y	Z	X	Y	Z	Global	Delta	Beta	F	CE	C
0.00	438.4	12465.5	12465.5	-7345.0	0.0	0.0	0.0	605.1	-740.2	1.40	0.84	1.57	1.00	1.80	0.59
0.50	428.2	12074.2	14601.0	-7044.6	0.0	0.0	0.0	594.4	-719.6	1.41	0.84	1.57	1.00	1.80	0.59
1.00	418.0	11125.7	13752.0	-6749.0	0.0	0.0	0.0	583.9	-694.7	1.41	0.84	1.57	1.00	1.80	0.59
1.10	416.0	10941.8	13586.9	-6690.5	0.0	0.0	0.0	581.8	-689.7	1.41	0.84	1.57	1.00	1.80	0.59

Level (m)	De/Agl (mm)	Inertia (cm4)		Moments (daN.m)			Loads (daN)			Coefficients					
		Ix	Iy	X	Y	Z	X	Y	Z	Global	Delta	Beta	F	CE	C
1.60	405.8	9863.7	9863.7	-6400.6	0.0	0.0	0.0	571.6	-670.2	1.42	0.84	1.57	1.00	1.80	0.60
2.10	395.6	9132.1	9132.1	-6115.3	0.0	0.0	0.0	561.6	-651.1	1.42	0.84	1.57	1.00	1.80	0.60
2.60	385.4	8437.5	8437.5	-5834.5	0.0	0.0	0.0	551.8	-632.6	1.43	0.84	1.57	1.00	1.80	0.60
3.10	375.2	7779.1	7779.1	-5558.0	0.0	0.0	0.0	542.2	-614.5	1.43	0.84	1.57	1.00	1.80	0.60
3.60	365.1	7155.9	7155.9	-5285.9	0.0	0.0	0.0	532.9	-596.9	1.44	0.84	1.57	1.00	1.80	0.60
4.10	354.9	6566.9	6566.9	-5017.9	0.0	0.0	0.0	523.7	-579.8	1.48	0.84	1.57	1.00	1.85	0.61
4.60	344.7	6011.2	6011.2	-4754.1	0.0	0.0	0.0	514.6	-563.2	1.54	0.84	1.57	1.00	1.91	0.61
5.10	334.5	5487.7	5487.7	-4494.5	0.0	0.0	0.0	505.4	-547.0	1.59	0.84	1.57	1.00	1.97	0.61
5.60	324.3	4995.5	4995.5	-4239.1	0.0	0.0	0.0	496.2	-531.4	1.64	0.84	1.57	1.00	2.02	0.61
6.10	314.1	4533.7	4533.7	-3987.9	0.0	0.0	0.0	487.0	-516.3	1.69	0.84	1.57	1.00	2.07	0.62
6.60	303.9	4101.2	4101.2	-3740.9	0.0	0.0	0.0	477.8	-501.6	1.73	0.84	1.57	1.00	2.12	0.62
7.10	293.7	3697.2	3697.2	-3498.2	0.0	0.0	0.0	468.7	-487.4	1.76	0.84	1.57	1.00	2.15	0.62
7.40	287.6	3468.0	3468.0	-3354.6	0.0	0.0	0.0	463.3	-479.2	1.79	0.84	1.57	1.00	2.19	0.62
8.00	285.4	3386.9	3386.9	-3072.3	0.0	0.0	0.0	452.2	-446.6	1.84	0.84	1.57	1.00	2.23	0.62
8.50	275.2	3032.1	3032.1	-2841.9	0.0	0.0	0.0	443.2	-433.3	1.88	0.84	1.57	1.00	2.27	0.63
9.00	265.0	2703.0	2703.0	-2615.8	0.0	0.0	0.0	434.2	-420.5	1.91	0.84	1.57	1.00	2.30	0.63
9.50	254.8	2398.6	2398.6	-2393.8	0.0	0.0	0.0	425.5	-408.2	1.95	0.84	1.57	1.00	2.34	0.63
10.00	244.6	2117.9	2117.9	-2175.9	0.0	0.0	0.0	416.9	-396.4	1.99	0.84	1.57	1.00	2.37	0.64
10.50	234.4	1860.0	1860.0	-1962.0	0.0	0.0	0.0	408.5	-385.1	2.02	0.84	1.57	1.00	2.40	0.64
11.00	224.2	1624.0	1624.0	-1752.0	0.0	0.0	0.0	400.3	-374.3	2.06	0.84	1.57	1.00	2.43	0.64
11.50	214.1	1408.9	1408.9	-1545.8	0.0	0.0	0.0	392.4	-364.0	2.09	0.84	1.57	1.00	2.46	0.65
12.00	203.9	1213.6	1213.6	-1343.3	0.0	0.0	0.0	384.7	-354.1	2.13	0.84	1.57	1.00	2.48	0.65
12.50	193.7	1037.3	1037.3	-1144.4	0.0	0.0	0.0	377.2	-344.8	2.17	0.84	1.57	1.00	2.51	0.65
13.00	183.5	878.9	878.9	-948.9	0.0	0.0	0.0	370.0	-335.9	2.20	0.84	1.57	1.00	2.53	0.66
13.50	173.3	737.5	737.5	-756.8	0.0	0.0	0.0	363.1	-327.5	2.24	0.84	1.57	1.00	2.56	0.66
14.00	163.1	612.2	612.2	-568.0	0.0	0.0	0.0	356.4	-319.6	2.27	0.84	1.57	1.00	2.58	0.67
14.50	152.9	502.0	502.0	-382.3	0.0	0.0	0.0	350.1	-312.2	2.31	0.84	1.57	1.00	2.60	0.67
15.00	142.7	405.8	405.8	-199.7	0.0	0.0	0.0	344.1	-305.3	2.35	0.84	1.57	1.00	2.63	0.68
15.50	132.5	322.8	322.8	-76.1	0.0	0.0	0.0	173.1	-152.4	2.39	0.84	1.57	1.00	2.65	0.68
16.00	122.4	252.0	252.0	13.6	0.0	0.0	0.0	167.7	-146.5	2.39	0.84	1.57	1.00	2.65	0.68

Level (m)	Allowable stress			Effective stress			CSR	Deflec (mm)	Angle (deg)
	Bend/X (daN.m)	Bend/Y (daN.m)	Tor (daN.m)	Bend/X (daN.m)	Bend/Y (daN.m)	Tor (daN.m)			
0.00	12519.86	12519.86	12759.91	-7345.00	0.00	0.00	0.59	0.00	0.0816
0.50	12884.91	14638.97	7134.49	-7044.61	0.00	0.00	0.55	0.71	0.1628
1.00	11916.12	13714.95	6539.40	-6749.04	0.00	0.00	0.57	2.13	0.1794
1.10	11722.36	13528.56	6421.19	-6690.54	0.00	0.00	0.57	2.45	0.2666
1.60	11007.27	11007.27	10915.99	-6400.62	0.00	0.00	0.58	4.77	0.3565
2.10	10550.43	10550.43	10369.26	-6115.29	0.00	0.00	0.58	7.88	0.4493
2.60	10101.26	10101.26	9836.58	-5834.45	0.00	0.00	0.58	11.80	0.5452
3.10	9659.82	9659.82	9317.94	-5558.01	0.00	0.00	0.58	16.56	0.6444
3.60	9226.19	9226.19	8813.35	-5285.86	0.00	0.00	0.57	22.18	0.7469
4.10	8800.44	8800.44	8322.80	-5017.91	0.00	0.00	0.57	28.70	0.8529
4.60	8382.66	8382.66	7846.30	-4754.10	0.00	0.00	0.57	36.15	0.9627
5.10	7972.92	7972.92	7383.85	-4494.48	0.00	0.00	0.56	44.55	1.0765
5.60	7571.32	7571.32	6935.44	-4239.06	0.00	0.00	0.56	53.94	1.1944
6.10	7177.94	7177.94	6501.07	-3987.88	0.00	0.00	0.56	64.36	1.3166
6.60	6792.88	6792.88	6080.75	-3740.91	0.00	0.00	0.55	75.85	1.4433
7.10	6416.23	6416.23	5674.48	-3498.15	0.00	0.00	0.55	88.45	1.5216
7.40	6194.32	6194.32	5437.45	-3354.56	0.00	0.00	0.54	96.41	1.5983



Level (m)	Allowable stress			Effective stress			CSR	Deflec (mm)	Angle (deg)
	Bend/X (daN.m)	Bend/Y (daN.m)	Tor (daN.m)	Bend/X (daN.m)	Bend/Y (daN.m)	Tor (daN.m)			
8.00	6114.23	6114.23	5352.35	-3072.29	0.00	0.00	0.50	113.15	1.7241
8.50	5753.15	5753.15	4971.62	-2841.94	0.00	0.00	0.49	128.19	1.8541
9.00	5400.78	5400.78	4604.93	-2615.81	0.00	0.00	0.48	144.37	1.9881
9.50	5057.25	5057.25	4252.29	-2393.84	0.00	0.00	0.47	161.72	2.1263
10.00	4722.68	4722.68	3913.70	-2175.94	0.00	0.00	0.46	180.28	2.2683
10.50	4397.19	4397.19	3589.15	-1962.04	0.00	0.00	0.45	200.07	2.4139
11.00	4080.94	4080.94	3278.65	-1752.04	0.00	0.00	0.43	221.13	2.5623
11.50	3774.06	3774.06	2982.19	-1545.83	0.00	0.00	0.41	243.49	2.7126
12.00	3476.71	3476.71	2699.78	-1343.31	0.00	0.00	0.39	267.16	2.8634
12.50	3157.50	3157.50	2431.41	-1144.38	0.00	0.00	0.36	292.14	3.0123
13.00	2827.28	2827.28	2177.09	-948.91	0.00	0.00	0.34	318.43	3.1559
13.50	2515.30	2515.30	1936.81	-756.81	0.00	0.00	0.30	345.96	3.2892
14.00	2221.55	2221.55	1710.58	-567.96	0.00	0.00	0.26	374.66	3.4044
14.50	1946.05	1946.05	1498.40	-382.27	0.00	0.00	0.20	404.36	3.4899
15.00	1688.78	1688.78	1300.26	-199.66	0.00	0.00	0.12	434.81	3.5396
15.50	1449.75	1449.75	1116.16	-76.07	0.00	0.00	0.05	465.69	3.5520
16.00	1228.95	1228.95	946.12	13.58	0.00	0.00	0.01	496.68	3.5520

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CALCULATION NUMBER	0527/2019-0
FILE	20190527_003
FOR	Lipapromet

BELIER P 16 SPEC + 2x CROSSBBAR 3,4m C80 at 16m and 15,1m  
 Floodlight 4+4 angle max 20° (Weight-30kg, CxS-0,22m²/pcs)  
 Wind: 25 m/s, II terrain category acc. to EN40

## STANDARD USED

EN40 - European standard (C) Copyright 1998...2020 Version12 Release Sep 27 2018

## MATERIAL

Name	E (daN/mm2)	G (daN/mm2)	Density (kg/dm3)	Poisson	Re (daN/mm2)	Rm (daN/mm2)	Elong %
S355	21000.00	8070.00	7.85	0.30	35.50	49.00	18.00
FE E 500	21000.00	8070.00	7.85	0.30	50.00	55.00	8.00

## MOMENTS AND LOADS AT THE BASE OF THE POLE

MOMENTS			FORCES		
Mx	-8858.6	daN.m	Fx	0.0	daN
My	0.0	daN.m	Fy	726.1	daN
Mz	0.0	daN.m	Fz	-888.3	daN

## CALCULATION HYPOTHESIS

Outside diameter of the shaft	438.3	mm
Thickness of the shaft	4.0	mm

## BASEPLATE

Material	S355	-
External diameter	660.0	mm
Internal diameter	443.3	mm
Thickness	25.0	mm

## BOLTS

Number of bolts	8	-
Bolts	Right TOR M30/32 x 1090 FE E 500	-
Bolts circle	540.0	mm
Distance between anchor bolts	206.6	mm

## CALCULATION RESULTS

Anchor bolts analysis		
Axial load on the most stressed bolt	8313.5	daN
Allowable tensile load on the bolt (with a partial safety coefficient=1.25)	18883.3	daN
Allowable pulling load on the bolt (with a partial safety coefficient=1.50)	21466.0	daN
Characteristic strength of concrete in compression (Fck)	2.0	daN/mm <sup>2</sup>
Shear load on the most stressed bolt	90.8	daN
Allowable shear load in the bolt (with a partial safety coefficient=1.25)	12342.0	daN
Stress ratio in anchor bolts (CSR)	0.440257	-
The anchor bolts are sufficient		
Baseplate bending analysis		
Bending moment due to the axial load	7.8	daN.m
Bending moment due to the bending moment MR	312.2	daN.m
Total bending moment	320.1	daN.m
Section modulus	12.0	cm <sup>3</sup>
Bending stress including $\Psi$ coefficient	22.6	daN/mm <sup>2</sup>
Allowable bending stress	32.9	daN/mm <sup>2</sup>
Baseplate twisting analysis		
Twisting moment	414.2	daN.m
Twisting modulus	21.2	cm <sup>3</sup>
Shear stress including $\Psi$ coefficient	16.5	daN/mm <sup>2</sup>
Factored shear stress including $\Psi$ coefficient	25.4	daN/mm <sup>2</sup>
Allowable shear stress	32.9	daN/mm <sup>2</sup>

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CALCULATION NUMBER	20190527-
FILE	20190527_002
FOR	Lipapromet

BELIER P 16 SPEC + 2xCROSSBBAR 3,4m C80 at 16m, 15,1m  
Floodlight 4+4 angle max 20° (Weight-30kg, CxS-0,22m<sup>2</sup>/pcs)  
Wind: 40m/s, II terrain category acc. to EN40

### Load case combination [Survival wind (ULS)]

#### MAST LOADS ON CONCRETE BLOCK

Axial load	1065.06	daN
Shearing stress	1821.51	daN
Bending moment	21696.6	daN.m

#### FEATURES OF THE BLOCK 'Concrete'

Height of the concrete block	2.5	m
Side of the concrete block	3 x 3	m
Specific gravity of concrete	2.25	kg/dm <sup>3</sup>
Weight of concrete block	50625	kg
Soil pressure	1.2	daN/cm <sup>2</sup>

#### CALCULATION RESULTS

Stability moment	33313.1	daN.m
Revolving moment	26250.4	daN.m
Stability coefficient	1.26905	-

**DIMENSIONS ARE GIVEN FOR A NON REINFORCED CONCRETE FOUNDATION BLOCK (ANDREE & NORSA'S formula). It is essential that these dimensions have to be confirmed by soil study and quotation reinforcement.**

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