

Preliminary remarks



Description

Luminaire list

 Φ_{total}

267189 lm

 P_{total}

1986.0 W

Luminous efficacy

134.5 lm/W

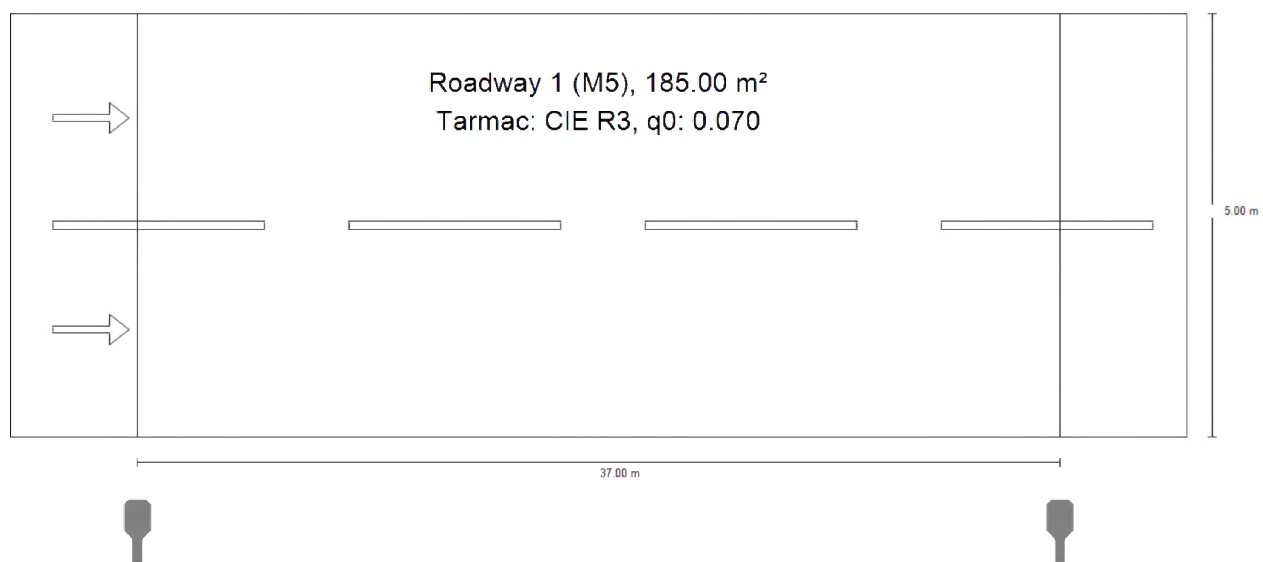
pcs.	Manufacturer	Article No.	Article name	P	Φ	Luminous efficacy
4	BUCK		LAHOR 12LED T2 0.7A	26.0 W	3515 lm	135.2 lm/W
4	BUCK		LAHOR 24LED T2 0.7A	53.0 W	7031 lm	132.7 lm/W
5	BUCK		STAR 48LED T2 0.7A	104.0 W	14063 lm	135.2 lm/W
5	BUCK		STAR 80LED DWC 0.7A	174.0 W	23438 lm	134.7 lm/W
4	BUCK		VIHOR 32LED T2 0.7A	70.0 W	9375 lm	133.9 lm/W



TIP 1

Description

TIP 1

Summary (according to EN 13201:2015)

TIP 1

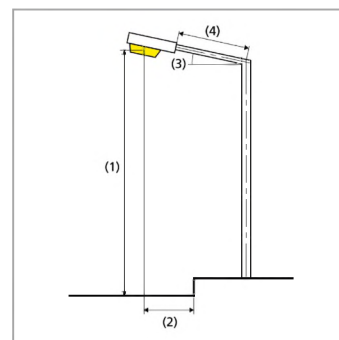
Summary (according to EN 13201:2015)



Manufacturer	BUCK	P	26.0 W
Article name	LAHOR 12LED T2 0.7A	Φ_{Lamp}	4136 lm
Fitting	1x QUICK FLUX XG 12LED LS 740 LS G8	$\Phi_{\text{Luminaire}}$	3515 lm
		η	85.00 %

LAHOR 12LED T2 0.7A (single side bottom)

Pole distance	37.000 m
(1) Light spot height	7.000 m
(2) Light point overhang	-1.000 m
(3) Boom inclination	10.0°
(4) Boom length	0.500 m
Annual operating hours	4000 h; 100.0 %, 26.0 W
Consumption	702.0 W/km
ULR / ULOR	0.01 / 0.00
Max. luminous intensities	≥ 70°: 1117 cd/klm
Any direction forming the specified angle from the downward vertical, with the luminaire installed for use.	≥ 80°: 707 cd/klm ≥ 90°: 39.6 cd/klm
Luminous intensity class	-
The luminous intensity values in [cd/klm] for calculation of the luminous intensity class refer to the luminaire luminous flux according to EN 13201:2015.	
Glare index class	D.1



TIP 1

Summary (according to EN 13201:2015)

Results for valuation fields

	Symbol	Calculated	Target	Check
Roadway 1 (M5)	L_{av}	0.51 cd/m ²	≥ 0.50 cd/m ²	✓
	U_o	0.57	≥ 0.35	✓
	U_l	0.64	≥ 0.40	✓
	TI	15 %	≤ 15 %	✓
	R_{EI}	0.31	≥ 0.30	✓

A maintenance factor of 0.80 was used for calculating for the installation.

Results for energy efficiency indicators

	Symbol	Calculated	Consumption
TIP 1	D_p	0.018 W/lx*m ²	-
LAHOR 12LED T2 0.7A (single side bottom)	D_e	0.6 kWh/m ² yr,	104.0 kWh/yr

TIP 1

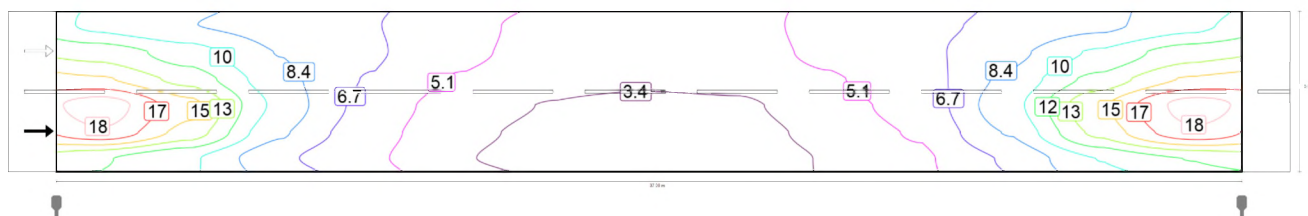
Roadway 1 (M5)

Results for valuation field

	Symbol	Calculated	Target	Check
Roadway 1 (M5)	L_{av}	0.51 cd/m ²	≥ 0.50 cd/m ²	✓
	U_o	0.57	≥ 0.35	✓
	U_l	0.64	≥ 0.40	✓
	TI	15 %	≤ 15 %	✓
	R_{EI}	0.31	≥ 0.30	✓

Results for observer

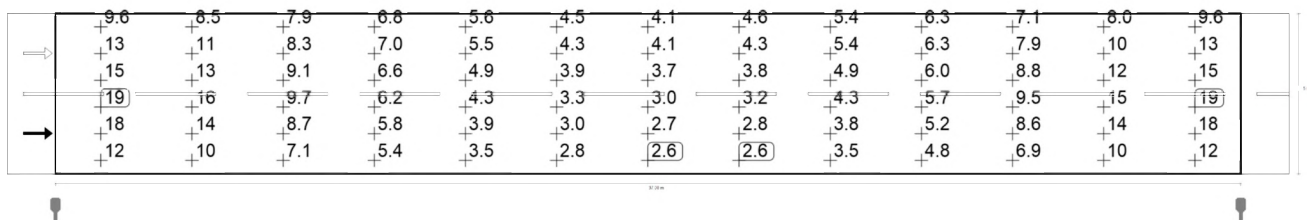
	Symbol	Calculated	Target	Check
Observer 1 Position: -60.000 m, 1.250 m, 1.500 m	L_{av}	0.51 cd/m ²	≥ 0.50 cd/m ²	✓
	U_o	0.61	≥ 0.35	✓
	U_l	0.64	≥ 0.40	✓
	TI	14 %	≤ 15 %	✓
Observer 2 Position: -60.000 m, 3.750 m, 1.500 m	L_{av}	0.56 cd/m ²	≥ 0.50 cd/m ²	✓
	U_o	0.57	≥ 0.35	✓
	U_l	0.75	≥ 0.40	✓
	TI	15 %	≤ 15 %	✓



Maintenance value, horizontal illuminance [lx] (Iso-illuminance curves)

TIP 1

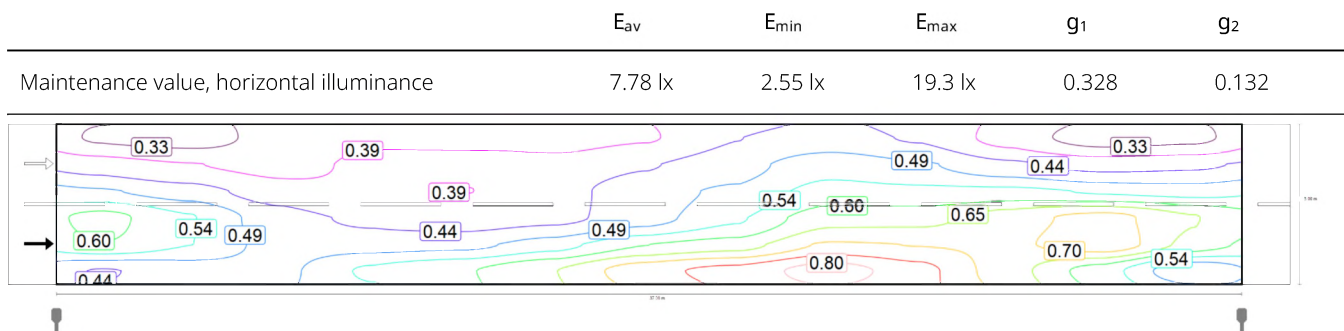
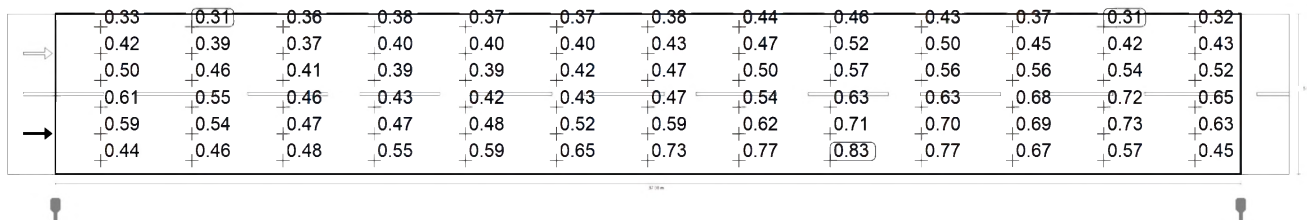
Roadway 1 (M5)



Maintenance value, horizontal illuminance [lx] (Value grid)

m	1.423	4.269	7.115	9.962	12.808	15.654	18.500	21.346	24.192	27.038	29.885	32.731	35.577
4.583	9.62	8.47	7.86	6.83	5.58	4.53	4.13	4.56	5.45	6.25	7.14	8.04	9.56
3.750	12.86	10.93	8.35	6.97	5.50	4.34	4.09	4.31	5.44	6.30	7.93	10.38	12.79
2.917	15.36	12.81	9.06	6.63	4.88	3.89	3.66	3.81	4.87	5.98	8.80	12.34	15.35
2.083	19.33	15.59	9.66	6.21	4.30	3.30	3.02	3.16	4.31	5.68	9.50	14.89	19.18
1.250	18.16	14.44	8.68	5.84	3.85	2.98	2.73	2.82	3.83	5.23	8.58	13.99	18.07
0.417	12.01	10.33	7.13	5.39	3.51	2.78	2.55	2.62	3.48	4.78	6.94	10.18	11.84

Maintenance value, horizontal illuminance [lx] (Value chart)

Observer 1: Maintenance value, luminance with dry roadway [cd/m^2] (Iso-illuminance curves)Observer 1: Maintenance value, luminance with dry roadway [cd/m^2] (Value grid)

m	1.423	4.269	7.115	9.962	12.808	15.654	18.500	21.346	24.192	27.038	29.885	32.731	35.577
4.583	0.33	0.31	0.36	0.38	0.37	0.37	0.38	0.44	0.46	0.43	0.37	0.31	0.32
3.750	0.42	0.39	0.37	0.40	0.40	0.40	0.43	0.47	0.52	0.50	0.45	0.42	0.43

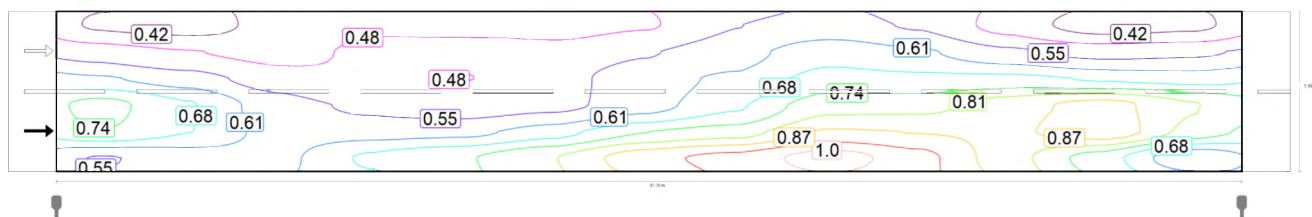
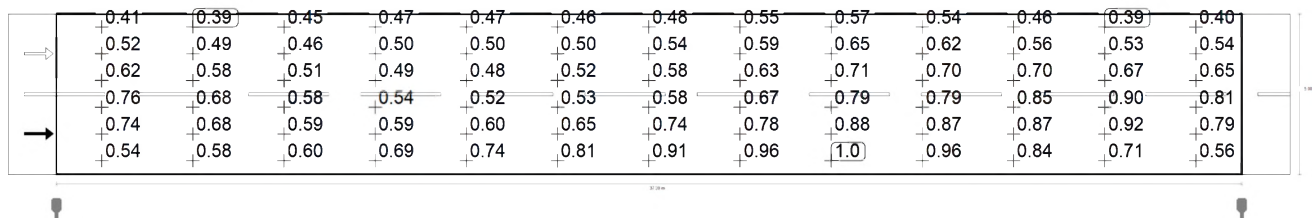
TIP 1

Roadway 1 (M5)

m	1.423	4.269	7.115	9.962	12.808	15.654	18.500	21.346	24.192	27.038	29.885	32.731	35.577
2.917	0.50	0.46	0.41	0.39	0.39	0.42	0.47	0.50	0.57	0.56	0.56	0.54	0.52
2.083	0.61	0.55	0.46	0.43	0.42	0.43	0.47	0.54	0.63	0.63	0.68	0.72	0.65
1.250	0.59	0.54	0.47	0.47	0.48	0.52	0.59	0.62	0.71	0.70	0.69	0.73	0.63
0.417	0.44	0.46	0.48	0.55	0.59	0.65	0.73	0.77	0.83	0.77	0.67	0.57	0.45

Observer 1: Maintenance value, luminance with dry roadway [cd/m^2] (Value chart)

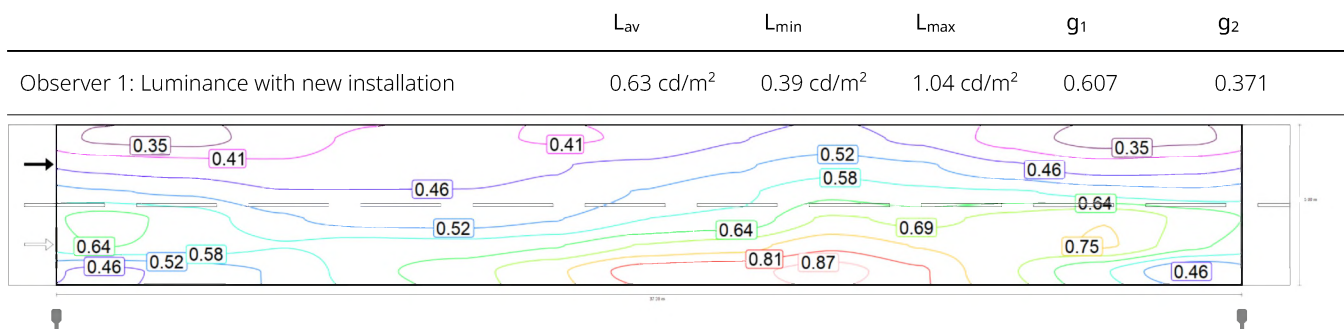
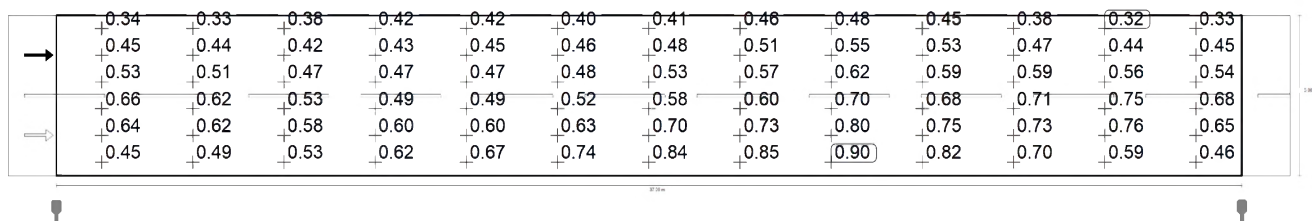
	L_{av}	L_{min}	L_{max}	g_1	g_2
Observer 1: Maintenance value, luminance with dry roadway	0.51 cd/m^2	0.31 cd/m^2	0.83 cd/m^2	0.607	0.371

Observer 1: Luminance with new installation [cd/m^2] (Iso-illuminance curves)Observer 1: Luminance with new installation [cd/m^2] (Value grid)

TIP 1

Roadway 1 (M5)

m	1.423	4.269	7.115	9.962	12.808	15.654	18.500	21.346	24.192	27.038	29.885	32.731	35.577
4.583	0.41	0.39	0.45	0.47	0.47	0.46	0.48	0.55	0.57	0.54	0.46	0.39	0.40
3.750	0.52	0.49	0.46	0.50	0.50	0.50	0.54	0.59	0.65	0.62	0.56	0.53	0.54
2.917	0.62	0.58	0.51	0.49	0.48	0.52	0.58	0.63	0.71	0.70	0.70	0.67	0.65
2.083	0.76	0.68	0.58	0.54	0.52	0.53	0.58	0.67	0.79	0.79	0.85	0.90	0.81
1.250	0.74	0.68	0.59	0.59	0.60	0.65	0.74	0.78	0.88	0.87	0.87	0.92	0.79
0.417	0.54	0.58	0.60	0.69	0.74	0.81	0.91	0.96	1.04	0.96	0.84	0.71	0.56

Observer 1: Luminance with new installation [cd/m^2] (Value chart)Observer 2: Maintenance value, luminance with dry roadway [cd/m^2] (Iso-illuminance curves)Observer 2: Maintenance value, luminance with dry roadway [cd/m^2] (Value grid)

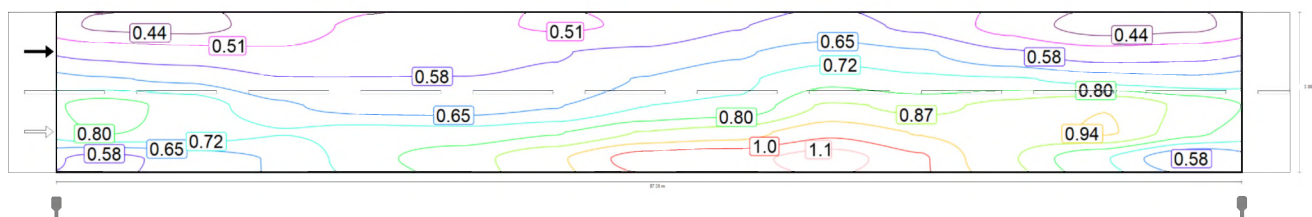
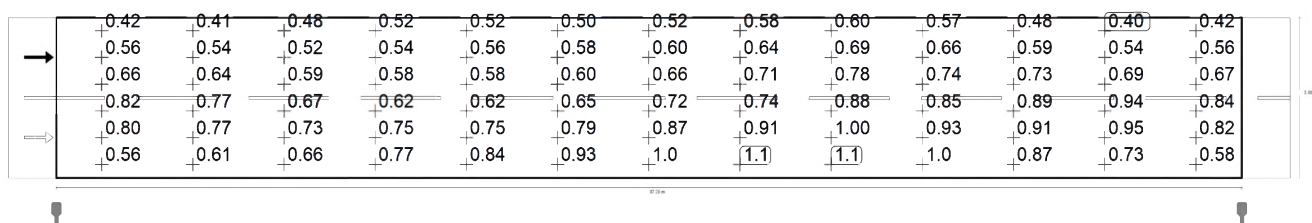
TIP 1

Roadway 1 (M5)

m	1.423	4.269	7.115	9.962	12.808	15.654	18.500	21.346	24.192	27.038	29.885	32.731	35.577
4.583	0.34	0.33	0.38	0.42	0.42	0.40	0.41	0.46	0.48	0.45	0.38	0.32	0.33
3.750	0.45	0.44	0.42	0.43	0.45	0.46	0.48	0.51	0.55	0.53	0.47	0.44	0.45
2.917	0.53	0.51	0.47	0.47	0.47	0.48	0.53	0.57	0.62	0.59	0.59	0.56	0.54
2.083	0.66	0.62	0.53	0.49	0.49	0.52	0.58	0.60	0.70	0.68	0.71	0.75	0.68
1.250	0.64	0.62	0.58	0.60	0.60	0.63	0.70	0.73	0.80	0.75	0.73	0.76	0.65
0.417	0.45	0.49	0.53	0.62	0.67	0.74	0.84	0.85	0.90	0.82	0.70	0.59	0.46

Observer 2: Maintenance value, luminance with dry roadway [cd/m^2] (Value chart)

	L_{av}	L_{min}	L_{max}	g_1	g_2
Observer 2: Maintenance value, luminance with dry roadway	0.56 cd/m^2	0.32 cd/m^2	0.90 cd/m^2	0.574	0.358

Observer 2: Luminance with new installation [cd/m^2] (Iso-illuminance curves)Observer 2: Luminance with new installation [cd/m^2] (Value grid)

m	1.423	4.269	7.115	9.962	12.808	15.654	18.500	21.346	24.192	27.038	29.885	32.731	35.577
4.583	0.42	0.41	0.48	0.52	0.52	0.50	0.52	0.58	0.60	0.57	0.48	0.40	0.42
3.750	0.56	0.54	0.52	0.54	0.56	0.58	0.60	0.64	0.69	0.66	0.59	0.54	0.56
2.917	0.66	0.64	0.59	0.58	0.58	0.60	0.66	0.71	0.78	0.74	0.73	0.69	0.67
2.083	0.82	0.77	0.67	0.62	0.62	0.65	0.72	0.74	0.88	0.85	0.89	0.94	0.84
1.250	0.80	0.77	0.73	0.75	0.75	0.79	0.87	0.91	1.00	0.93	0.91	0.95	0.82
0.417	0.56	0.61	0.66	0.77	0.84	0.93	1.05	1.06	1.12	1.02	0.87	0.73	0.58

TIP 1

Roadway 1 (M5)Observer 2: Luminance with new installation [cd/m²] (Value chart)

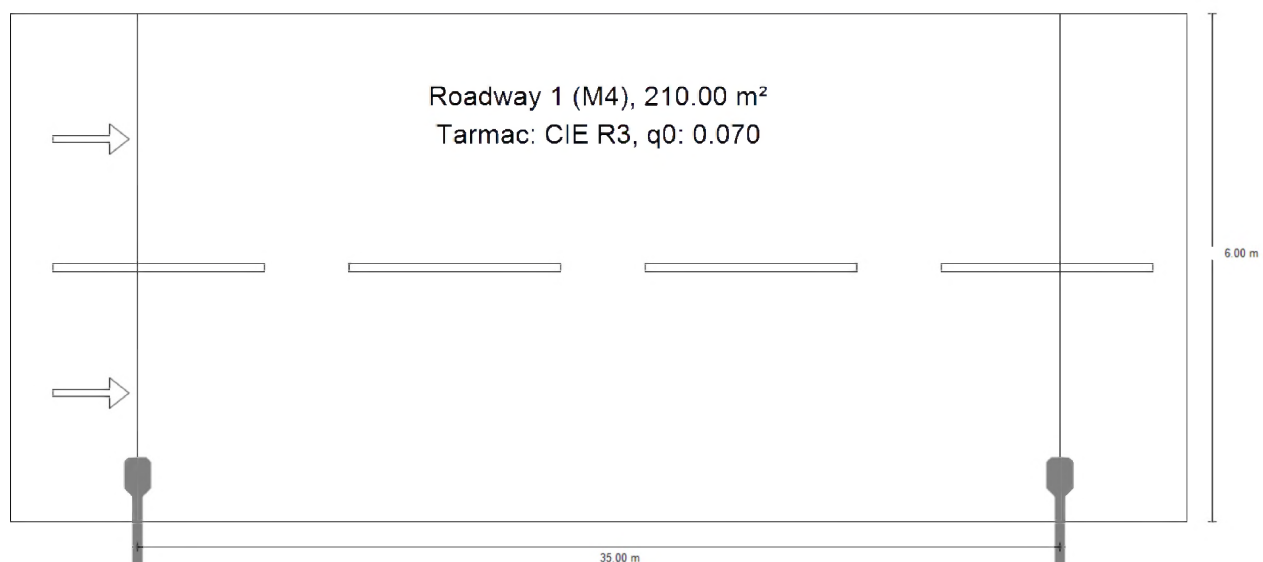
	L _{av}	L _{min}	L _{max}	g ₁	g ₂
Observer 2: Luminance with new installation	0.70 cd/m ²	0.40 cd/m ²	1.12 cd/m ²	0.574	0.358



TIP 2

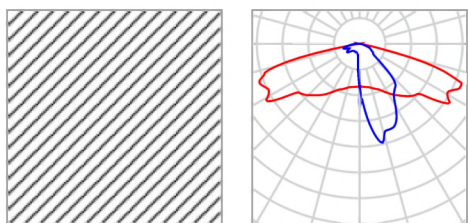
Description

TIP 2

Summary (according to EN 13201:2015)

TIP 2

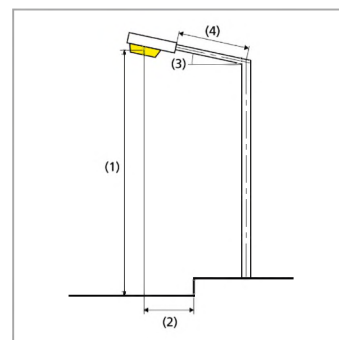
Summary (according to EN 13201:2015)



Manufacturer	BUCK	P	53.0 W
Article name	LAHOR 24LED T2 0.7A	Φ_{Lamp}	8272 lm
Fitting	1x QUICK FLUX XG 24LED LS 740 LS G8	$\Phi_{\text{Luminaire}}$	7031 lm
		η	85.00 %

LAHOR 24LED T2 0.7A (single side bottom)

Pole distance	35.000 m
(1) Light spot height	10.000 m
(2) Light point overhang	0.500 m
(3) Boom inclination	10.0°
(4) Boom length	1.000 m
Annual operating hours	4000 h: 100.0 %, 53.0 W
Consumption	1537.0 W/km
ULR / ULOR	0.01 / 0.00
Max. luminous intensities Any direction forming the specified angle from the downward vertical, with the luminaire installed for use.	$\geq 70^\circ$: 1117 cd/klm $\geq 80^\circ$: 707 cd/klm $\geq 90^\circ$: 39.6 cd/klm
Luminous intensity class The luminous intensity values in [cd/klm] for calculation of the luminous intensity class refer to the luminaire luminous flux according to EN 13201:2015.	-
Glare index class	D.0



TIP 2

Summary (according to EN 13201:2015)

Results for valuation fields

	Symbol	Calculated	Target	Check
Roadway 1 (M4)	L_{av}	0.75 cd/m ²	≥ 0.75 cd/m ²	✓
	U_o	0.48	≥ 0.40	✓
	U_l	0.62	≥ 0.60	✓
	TI	9 %	≤ 15 %	✓
	R_{EI}	0.31	≥ 0.30	✓

A maintenance factor of 0.80 was used for calculating for the installation.

Results for energy efficiency indicators

	Symbol	Calculated	Consumption
TIP 2	D_p	0.027 W/lx*m ²	-
LAHOR 24LED T2 0.7A (single side bottom)	D_e	1.0 kWh/m ² yr,	212.0 kWh/yr

TIP 2

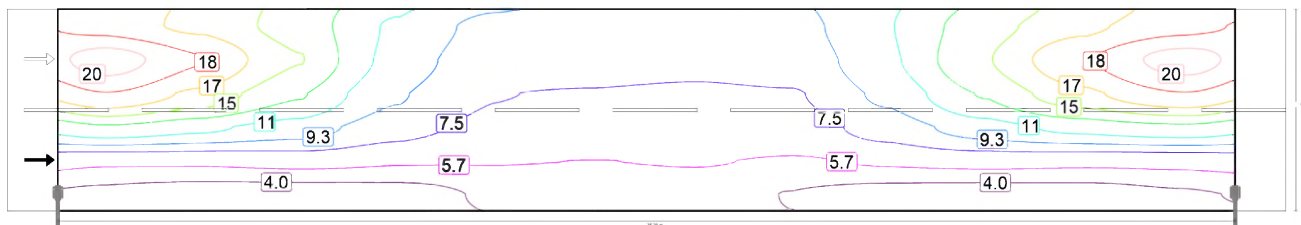
Roadway 1 (M4)

Results for valuation field

	Symbol	Calculated	Target	Check
Roadway 1 (M4)	L_{av}	0.75 cd/m ²	≥ 0.75 cd/m ²	✓
	U_o	0.48	≥ 0.40	✓
	U_l	0.62	≥ 0.60	✓
	TI	9 %	≤ 15 %	✓
	R_{EI}	0.31	≥ 0.30	✓

Results for observer

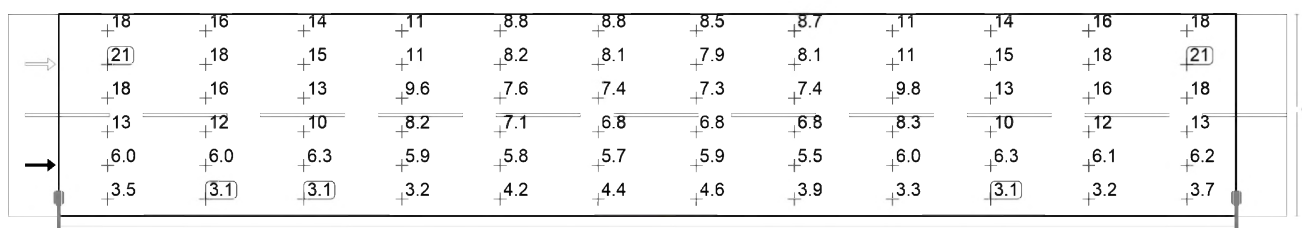
	Symbol	Calculated	Target	Check
Observer 1 Position: -60.000 m, 1.500 m, 1.500 m	L_{av}	0.75 cd/m ²	≥ 0.75 cd/m ²	✓
	U_o	0.59	≥ 0.40	✓
	U_l	0.62	≥ 0.60	✓
	TI	9 %	≤ 15 %	✓
Observer 2 Position: -60.000 m, 4.500 m, 1.500 m	L_{av}	0.81 cd/m ²	≥ 0.75 cd/m ²	✓
	U_o	0.48	≥ 0.40	✓
	U_l	0.75	≥ 0.60	✓
	TI	9 %	≤ 15 %	✓



Maintenance value, horizontal illuminance [lx] (Iso-illuminance curves)

TIP 2

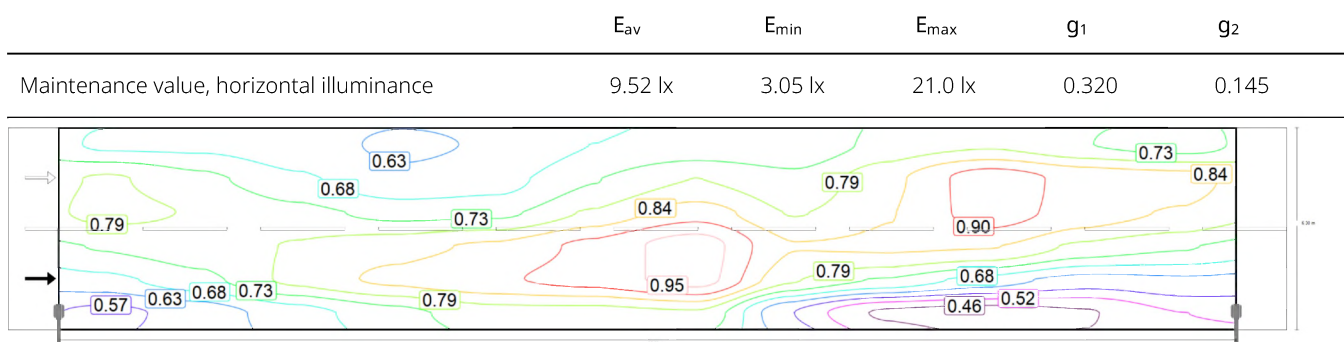
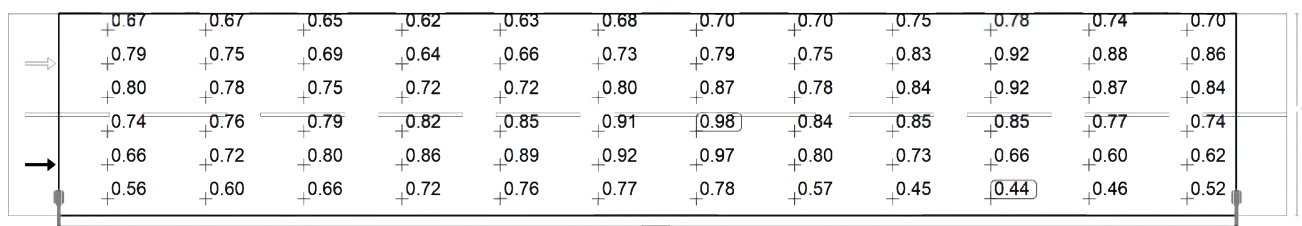
Roadway 1 (M4)



Maintenance value, horizontal illuminance [lx] (Value grid)

m	1.458	4.375	7.292	10.208	13.125	16.042	18.958	21.875	24.792	27.708	30.625	33.542
5.500	17.59	16.12	13.99	10.87	8.78	8.77	8.49	8.72	11.06	13.92	16.07	17.66
4.500	21.02	18.43	14.79	10.54	8.18	8.10	7.89	8.13	10.79	14.63	18.09	20.94
3.500	18.26	16.06	13.11	9.57	7.61	7.44	7.32	7.43	9.77	13.11	16.07	18.25
2.500	12.65	11.58	10.27	8.22	7.07	6.84	6.84	6.76	8.29	10.30	11.71	12.50
1.500	5.99	6.01	6.32	5.93	5.84	5.73	5.88	5.54	6.00	6.31	6.11	6.21
0.500	3.47	3.05	3.05	3.23	4.19	4.37	4.55	3.91	3.29	3.12	3.20	3.72

Maintenance value, horizontal illuminance [lx] (Value chart)

Observer 1: Maintenance value, luminance with dry roadway [cd/m^2] (Iso-illuminance curves)Observer 1: Maintenance value, luminance with dry roadway [cd/m^2] (Value grid)

m	1.458	4.375	7.292	10.208	13.125	16.042	18.958	21.875	24.792	27.708	30.625	33.542
5.500	0.67	0.67	0.65	0.62	0.63	0.68	0.70	0.70	0.75	0.78	0.74	0.70

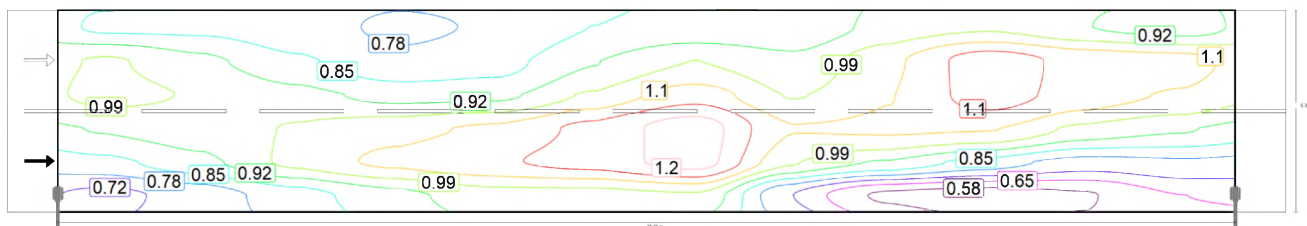
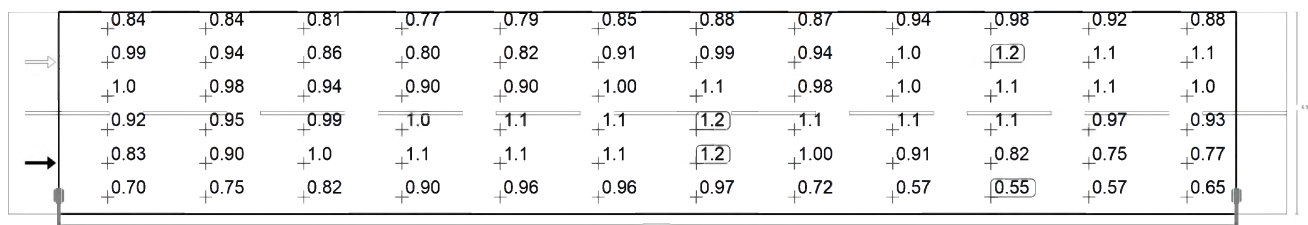
TIP 2

Roadway 1 (M4)

m	1.458	4.375	7.292	10.208	13.125	16.042	18.958	21.875	24.792	27.708	30.625	33.542
4.500	0.79	0.75	0.69	0.64	0.66	0.73	0.79	0.75	0.83	0.92	0.88	0.86
3.500	0.80	0.78	0.75	0.72	0.72	0.80	0.87	0.78	0.84	0.92	0.87	0.84
2.500	0.74	0.76	0.79	0.82	0.85	0.91	0.98	0.84	0.85	0.85	0.77	0.74
1.500	0.66	0.72	0.80	0.86	0.89	0.92	0.97	0.80	0.73	0.66	0.60	0.62
0.500	0.56	0.60	0.66	0.72	0.76	0.77	0.78	0.57	0.45	0.44	0.46	0.52

Observer 1: Maintenance value, luminance with dry roadway [cd/m^2] (Value chart)

	L_{av}	L_{min}	L_{max}	g_1	g_2
Observer 1: Maintenance value, luminance with dry roadway	0.75 cd/m^2	0.44 cd/m^2	0.98 cd/m^2	0.586	0.447

Observer 1: Luminance with new installation [cd/m^2] (Iso-illuminance curves)Observer 1: Luminance with new installation [cd/m^2] (Value grid)

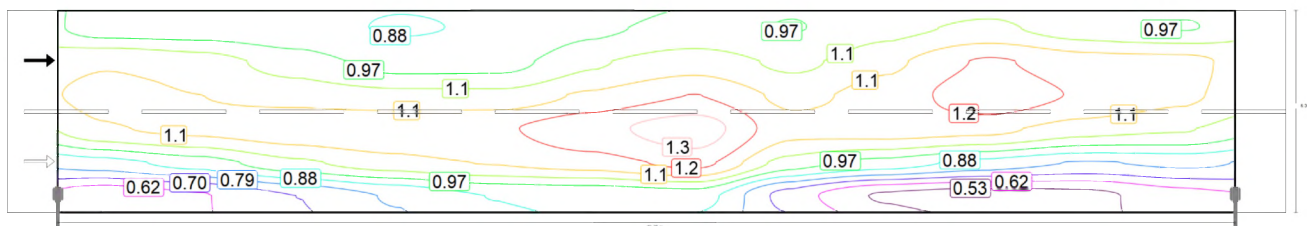
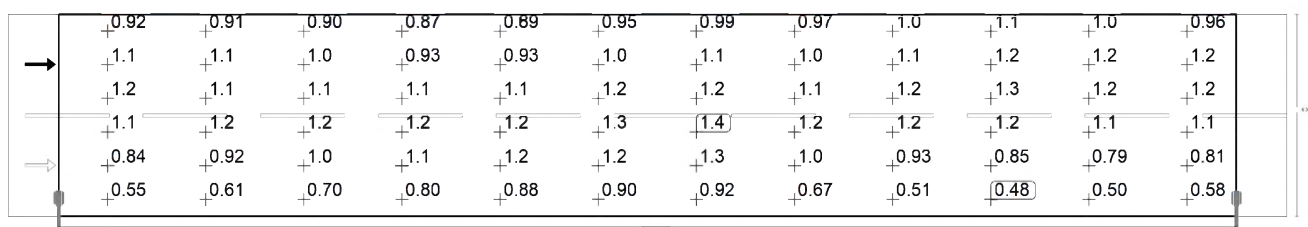
TIP 2

Roadway 1 (M4)

m	1.458	4.375	7.292	10.208	13.125	16.042	18.958	21.875	24.792	27.708	30.625	33.542
5.500	0.73	0.73	0.72	0.70	0.71	0.76	0.80	0.77	0.82	0.86	0.80	0.77
4.500	0.91	0.88	0.81	0.74	0.75	0.83	0.89	0.83	0.90	0.99	0.95	0.93
3.500	0.94	0.92	0.89	0.87	0.87	0.93	0.99	0.90	0.95	1.03	0.98	0.93
2.500	0.90	0.94	0.96	0.97	0.98	1.03	1.09	0.94	0.95	0.94	0.87	0.85
1.500	0.67	0.74	0.83	0.89	0.92	0.95	1.01	0.81	0.75	0.68	0.63	0.65
0.500	0.44	0.49	0.56	0.64	0.71	0.72	0.73	0.53	0.41	0.39	0.40	0.46

Observer 2: Maintenance value, luminance with dry roadway [cd/m^2] (Value chart)

	L_{av}	L_{min}	L_{max}	g_1	g_2
Observer 2: Maintenance value, luminance with dry roadway	0.81 cd/m^2	0.39 cd/m^2	1.09 cd/m^2	0.478	0.353

Observer 2: Luminance with new installation [cd/m^2] (Iso-illuminance curves)Observer 2: Luminance with new installation [cd/m^2] (Value grid)

m	1.458	4.375	7.292	10.208	13.125	16.042	18.958	21.875	24.792	27.708	30.625	33.542
5.500	0.92	0.91	0.90	0.87	0.89	0.95	0.99	0.97	1.03	1.07	1.00	0.96
4.500	1.14	1.10	1.01	0.93	0.93	1.04	1.11	1.04	1.12	1.24	1.18	1.16
3.500	1.17	1.14	1.12	1.09	1.08	1.16	1.23	1.12	1.18	1.28	1.22	1.16
2.500	1.13	1.17	1.20	1.21	1.22	1.29	1.37	1.17	1.19	1.17	1.09	1.06
1.500	0.84	0.92	1.04	1.11	1.15	1.19	1.26	1.02	0.93	0.85	0.79	0.81
0.500	0.55	0.61	0.70	0.80	0.88	0.90	0.92	0.67	0.51	0.48	0.50	0.58

TIP 2

Roadway 1 (M4)Observer 2: Luminance with new installation [cd/m²] (Value chart)

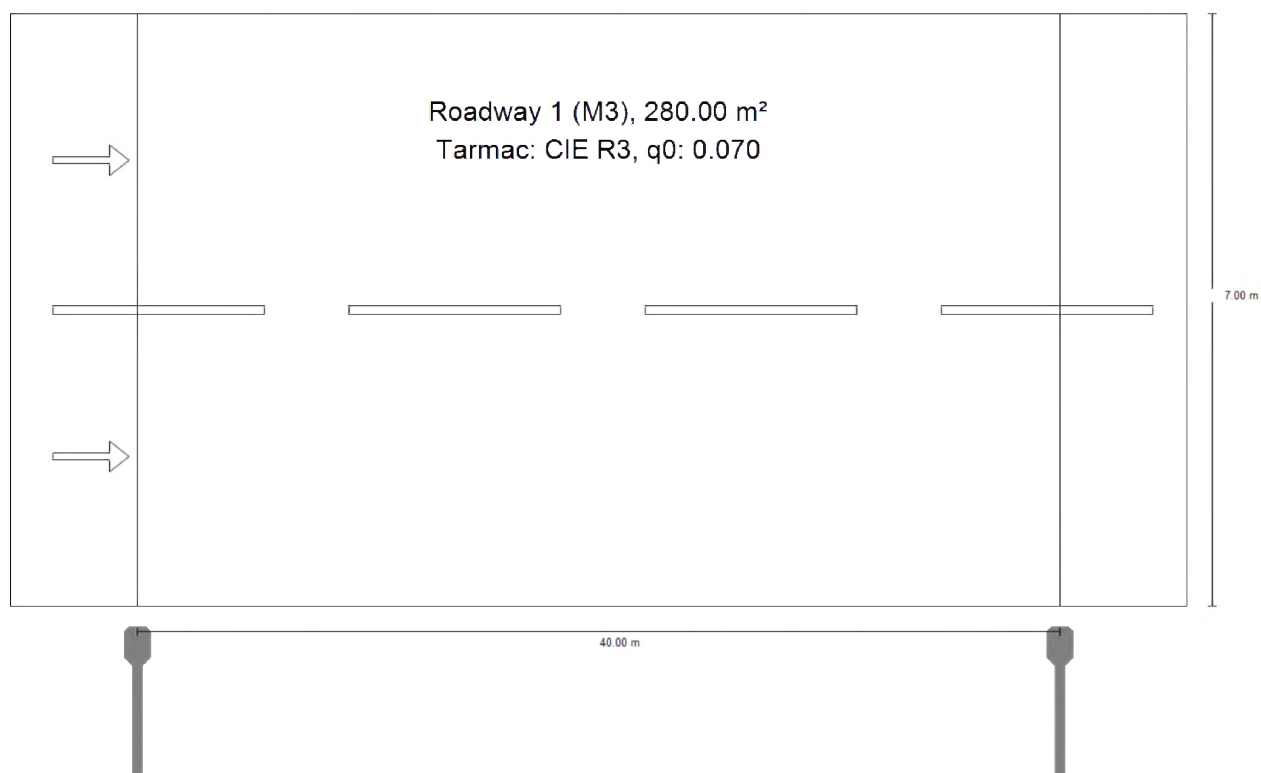
	L _{av}	L _{min}	L _{max}	g ₁	g ₂
Observer 2: Luminance with new installation	1.01 cd/m ²	0.48 cd/m ²	1.37 cd/m ²	0.478	0.353



TIP 3

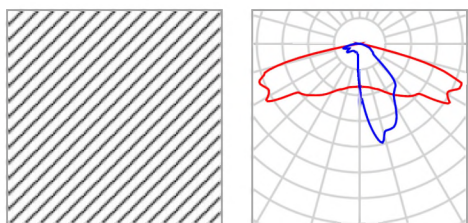
Description

TIP 3

Summary (according to EN 13201:2015)

TIP 3

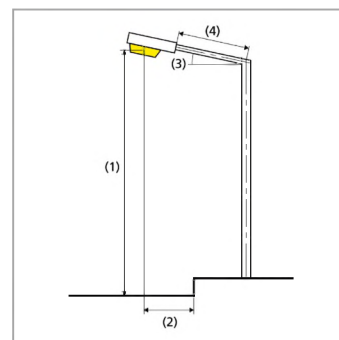
Summary (according to EN 13201:2015)



Manufacturer	BUCK	P	70.0 W
Article name	VIHOR 32LED T2 0.7A	Φ_{Lamp}	11030 lm
Fitting	1x QUICK FLUX XG 32LED LS 740 LS G8	$\Phi_{\text{Luminaire}}$	9375 lm
		η	85.00 %

VIHOR 32LED T2 0.7A (single side bottom)

Pole distance	40.000 m
(1) Light spot height	10.000 m
(2) Light point overhang	-0.500 m
(3) Boom inclination	0.0°
(4) Boom length	1.500 m
Annual operating hours	4000 h: 100.0 %, 70.0 W
Consumption	1750.0 W/km
ULR / ULOR	0.00 / 0.00
Max. luminous intensities	≥ 70°: 1124 cd/klm
Any direction forming the specified angle from the downward vertical, with the luminaire installed for use.	≥ 80°: 154 cd/klm ≥ 90°: 25.4 cd/klm
Luminous intensity class	G*1
The luminous intensity values in [cd/klm] for calculation of the luminous intensity class refer to the luminaire luminous flux according to EN 13201:2015.	
Glare index class	D.0



TIP 3

Summary (according to EN 13201:2015)

Results for valuation fields

	Symbol	Calculated	Target	Check
Roadway 1 (M3)	L_{av}	1.06 cd/m ²	≥ 1.00 cd/m ²	✓
	U_o	0.49	≥ 0.40	✓
	U_l	0.71	≥ 0.60	✓
	TI	12 %	≤ 15 %	✓
	R_{EI}	0.38	≥ 0.30	✓

A maintenance factor of 0.80 was used for calculating for the installation.

Results for energy efficiency indicators

	Symbol	Calculated	Consumption
TIP 3	D_p	0.016 W/lx*m ²	-
VIHOR 32LED T2 0.7A (single side bottom)	D_e	1.0 kWh/m ² yr,	280.0 kWh/yr

TIP 3

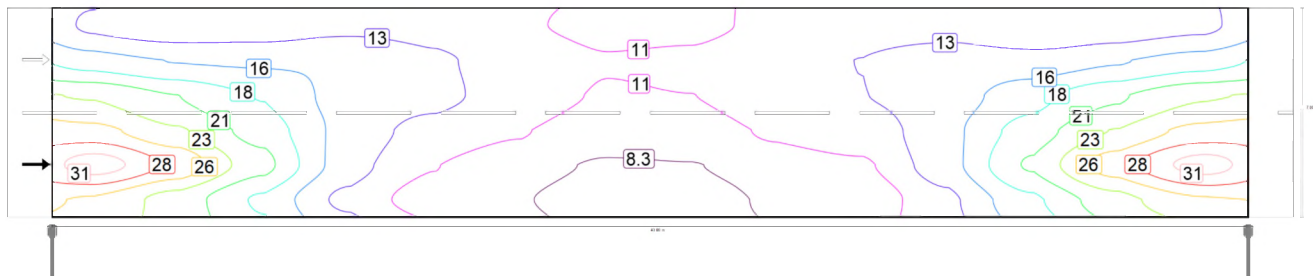
Roadway 1 (M3)

Results for valuation field

	Symbol	Calculated	Target	Check
Roadway 1 (M3)	L_{av}	1.06 cd/m ²	≥ 1.00 cd/m ²	✓
	U_o	0.49	≥ 0.40	✓
	U_l	0.71	≥ 0.60	✓
	TI	12 %	≤ 15 %	✓
	R_{EI}	0.38	≥ 0.30	✓

Results for observer

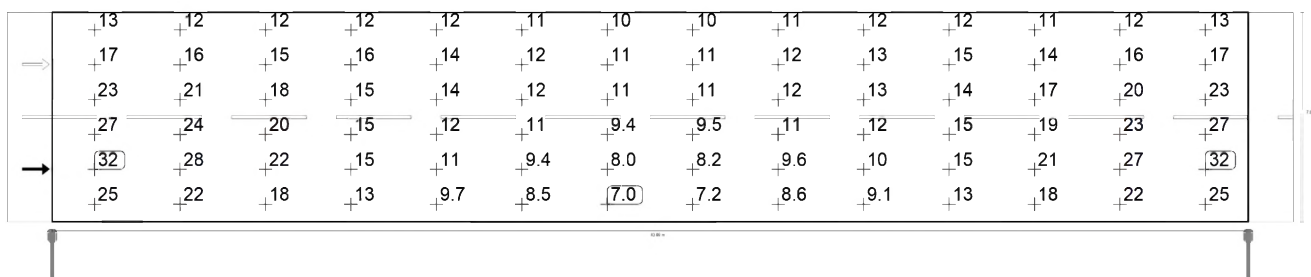
	Symbol	Calculated	Target	Check
Observer 1 Position: -60.000 m, 1.750 m, 1.500 m	L_{av}	1.06 cd/m ²	≥ 1.00 cd/m ²	✓
	U_o	0.50	≥ 0.40	✓
	U_l	0.75	≥ 0.60	✓
	TI	10 %	≤ 15 %	✓
Observer 2 Position: -60.000 m, 5.250 m, 1.500 m	L_{av}	1.18 cd/m ²	≥ 1.00 cd/m ²	✓
	U_o	0.49	≥ 0.40	✓
	U_l	0.71	≥ 0.60	✓
	TI	12 %	≤ 15 %	✓



TIP 3

Roadway 1 (M3)

Maintenance value, horizontal illuminance [lx] (Iso-illuminance curves)

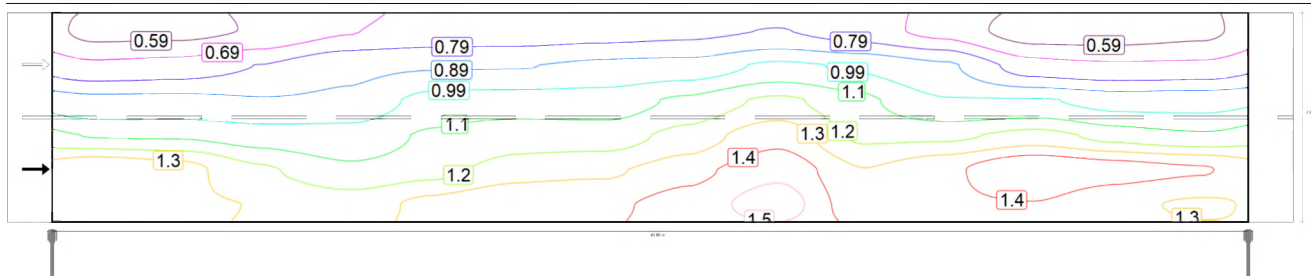


Maintenance value, horizontal illuminance [lx] (Value grid)

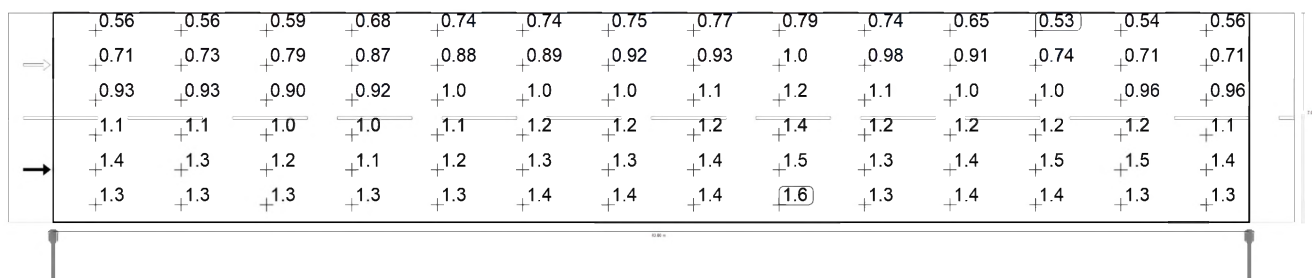
m	1.429	4.286	7.143	10.000	12.857	15.714	18.571	21.429	24.286	27.143	30.000	32.857	35.714	38.571
6.417	12.81	11.89	11.94	12.44	11.97	11.10	10.13	10.26	11.22	11.59	11.73	11.27	11.87	12.72
5.250	17.14	15.65	15.43	15.67	13.74	12.21	10.85	11.04	12.31	13.27	14.71	14.37	15.52	17.10
4.083	23.11	20.74	18.13	14.77	13.89	12.15	10.55	10.73	12.24	13.18	14.41	17.35	20.40	23.02
2.917	26.61	23.61	19.76	15.00	12.37	10.95	9.37	9.55	11.09	11.68	14.92	19.35	23.38	26.63
1.750	32.01	27.76	21.59	14.61	10.86	9.42	7.95	8.15	9.59	10.39	14.69	21.07	27.03	31.80
0.583	25.40	22.28	17.90	12.60	9.68	8.47	7.00	7.20	8.58	9.10	12.60	17.67	22.22	25.36

Maintenance value, horizontal illuminance [lx] (Value chart)

	E_{av}	E_{min}	E_{max}	g_1	g_2
Maintenance value, horizontal illuminance	15.2 lx	7.00 lx	32.0 lx	0.462	0.219

Observer 1: Maintenance value, luminance with dry roadway [cd/m^2] (Iso-illuminance curves)

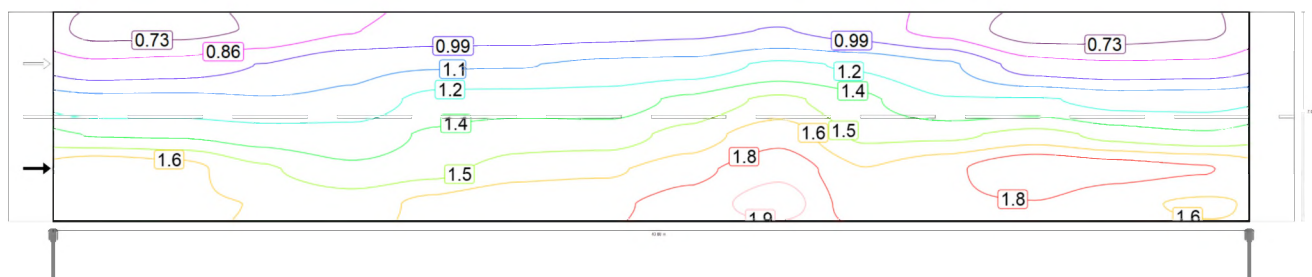
TIP 3

Roadway 1 (M3)Observer 1: Maintenance value, luminance with dry roadway [cd/m^2] (Value grid)

m	1.429	4.286	7.143	10.000	12.857	15.714	18.571	21.429	24.286	27.143	30.000	32.857	35.714	38.571
6.417	0.56	0.56	0.59	0.68	0.74	0.74	0.75	0.77	0.79	0.74	0.65	0.53	0.54	0.56
5.250	0.71	0.73	0.79	0.87	0.88	0.89	0.92	0.93	1.02	0.98	0.91	0.74	0.71	0.71
4.083	0.93	0.93	0.90	0.92	1.03	1.04	1.05	1.12	1.22	1.12	1.00	1.00	0.96	0.96
2.917	1.09	1.08	1.05	1.04	1.11	1.16	1.15	1.24	1.37	1.18	1.18	1.24	1.16	1.11
1.750	1.39	1.34	1.22	1.12	1.16	1.25	1.28	1.36	1.48	1.30	1.38	1.50	1.45	1.41
0.583	1.31	1.31	1.30	1.26	1.33	1.40	1.39	1.45	1.55	1.33	1.38	1.40	1.32	1.29

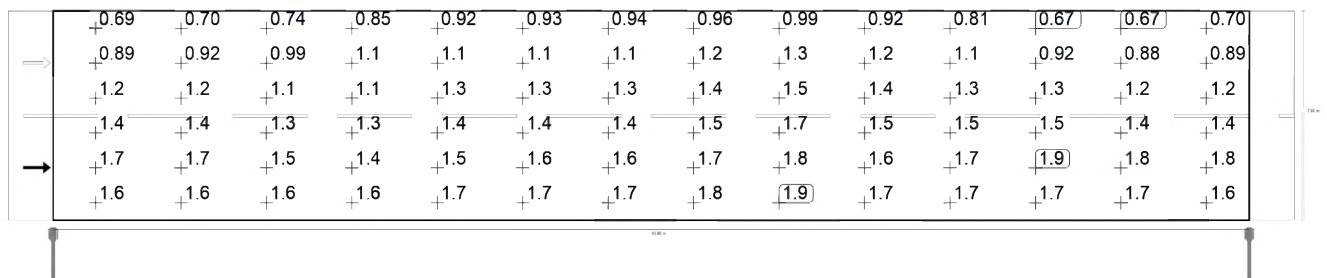
Observer 1: Maintenance value, luminance with dry roadway [cd/m^2] (Value chart)

	L_{av}	L_{min}	L_{max}	g_1	g_2
Observer 1: Maintenance value, luminance with dry roadway	1.06 cd/m^2	0.53 cd/m^2	1.55 cd/m^2	0.505	0.344

Observer 1: Luminance with new installation [cd/m^2] (Iso-illuminance curves)

TIP 3

Roadway 1 (M3)

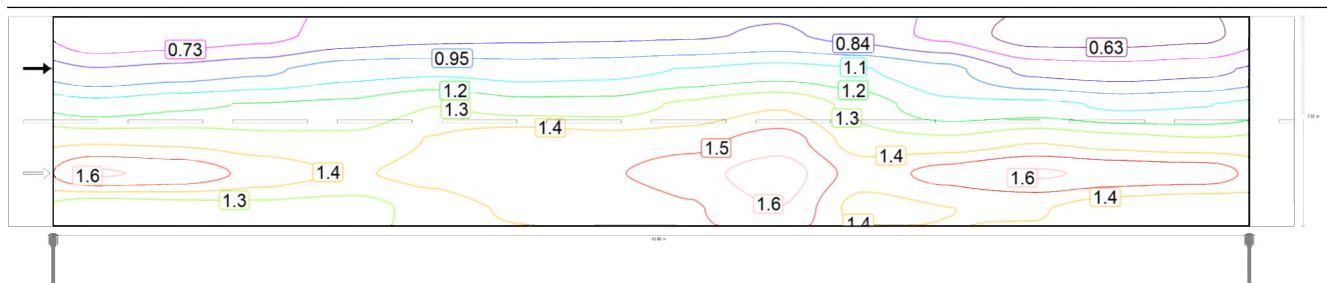


Observer 1: Luminance with new installation [cd/m²] (Value grid)

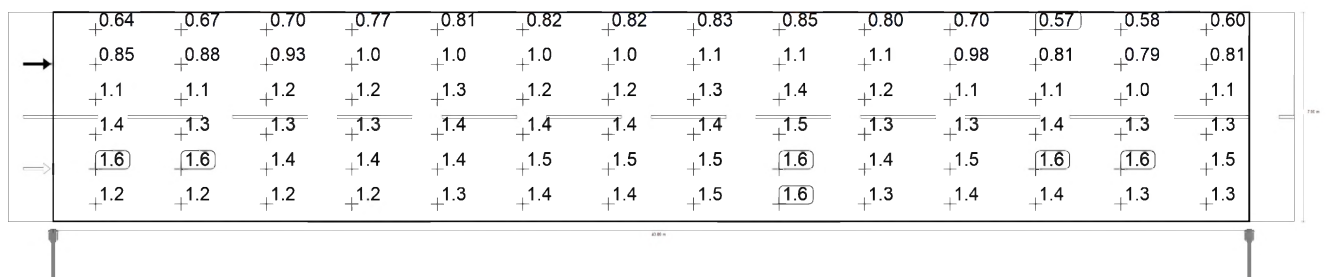
m	1.429	4.286	7.143	10.000	12.857	15.714	18.571	21.429	24.286	27.143	30.000	32.857	35.714	38.571
6.417	0.69	0.70	0.74	0.85	0.92	0.93	0.94	0.96	0.99	0.92	0.81	0.67	0.67	0.70
5.250	0.89	0.92	0.99	1.09	1.10	1.11	1.15	1.17	1.27	1.22	1.13	0.92	0.88	0.89
4.083	1.16	1.16	1.13	1.15	1.29	1.30	1.31	1.40	1.53	1.40	1.25	1.25	1.20	1.20
2.917	1.36	1.35	1.31	1.30	1.39	1.45	1.44	1.55	1.71	1.47	1.47	1.55	1.45	1.39
1.750	1.74	1.68	1.52	1.40	1.45	1.57	1.60	1.71	1.85	1.63	1.72	1.87	1.81	1.76
0.583	1.64	1.64	1.62	1.57	1.66	1.75	1.73	1.81	1.94	1.66	1.73	1.74	1.65	1.61

Observer 1: Luminance with new installation [cd/m²] (Value chart)

	L _{av}	L _{min}	L _{max}	g ₁	g ₂
Observer 1: Luminance with new installation	1.32 cd/m²	0.67 cd/m²	1.94 cd/m²	0.505	0.344



Observer 2: Maintenance value, luminance with dry roadway [cd/m²] (Iso-illuminance curves)



TIP 3

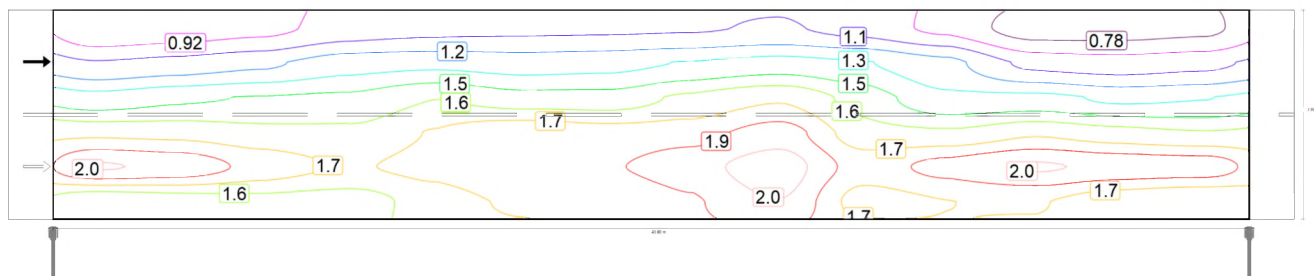
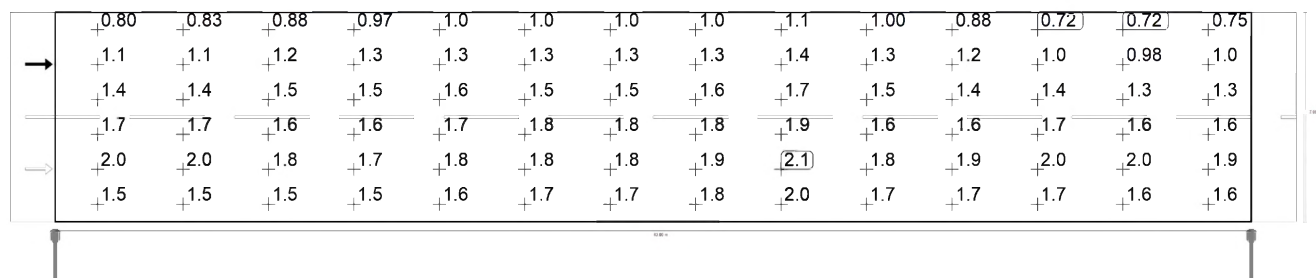
Roadway 1 (M3)

Observer 2: Maintenance value, luminance with dry roadway [cd/m^2] (Value grid)

m	1.429	4.286	7.143	10.000	12.857	15.714	18.571	21.429	24.286	27.143	30.000	32.857	35.714	38.571
6.417	0.64	0.67	0.70	0.77	0.81	0.82	0.82	0.83	0.85	0.80	0.70	0.57	0.58	0.60
5.250	0.85	0.88	0.93	1.01	1.03	1.01	1.02	1.06	1.10	1.06	0.98	0.81	0.79	0.81
4.083	1.10	1.14	1.17	1.18	1.27	1.21	1.21	1.29	1.36	1.23	1.08	1.09	1.03	1.05
2.917	1.36	1.35	1.31	1.30	1.38	1.44	1.42	1.44	1.54	1.32	1.29	1.36	1.31	1.28
1.750	1.60	1.56	1.45	1.37	1.41	1.47	1.47	1.55	1.64	1.43	1.52	1.60	1.56	1.54
0.583	1.19	1.22	1.24	1.22	1.31	1.39	1.39	1.47	1.58	1.33	1.38	1.38	1.31	1.27

Observer 2: Maintenance value, luminance with dry roadway [cd/m^2] (Value chart)

	L_{av}	L_{min}	L_{max}	g_1	g_2
Observer 2: Maintenance value, luminance with dry roadway	1.18 cd/m^2	0.57 cd/m^2	1.64 cd/m^2	0.486	0.348

Observer 2: Luminance with new installation [cd/m^2] (Iso-illuminance curves)Observer 2: Luminance with new installation [cd/m^2] (Value grid)

m	1.429	4.286	7.143	10.000	12.857	15.714	18.571	21.429	24.286	27.143	30.000	32.857	35.714	38.571
6.417	0.80	0.83	0.88	0.97	1.01	1.02	1.03	1.04	1.06	1.00	0.88	0.72	0.72	0.75
5.250	1.06	1.10	1.16	1.26	1.29	1.26	1.28	1.32	1.38	1.33	1.22	1.02	0.98	1.01

TIP 3

Roadway 1 (M3)

m	1.429	4.286	7.143	10.000	12.857	15.714	18.571	21.429	24.286	27.143	30.000	32.857	35.714	38.571
4.083	1.38	1.43	1.46	1.48	1.58	1.51	1.51	1.61	1.71	1.54	1.35	1.36	1.29	1.31
2.917	1.70	1.68	1.63	1.62	1.73	1.80	1.77	1.80	1.92	1.64	1.61	1.70	1.64	1.60
1.750	2.00	1.95	1.81	1.71	1.77	1.84	1.84	1.93	2.05	1.79	1.90	2.00	1.95	1.93
0.583	1.48	1.52	1.54	1.53	1.64	1.74	1.74	1.84	1.98	1.66	1.72	1.73	1.64	1.59

Observer 2: Luminance with new installation [cd/m²] (Value chart)

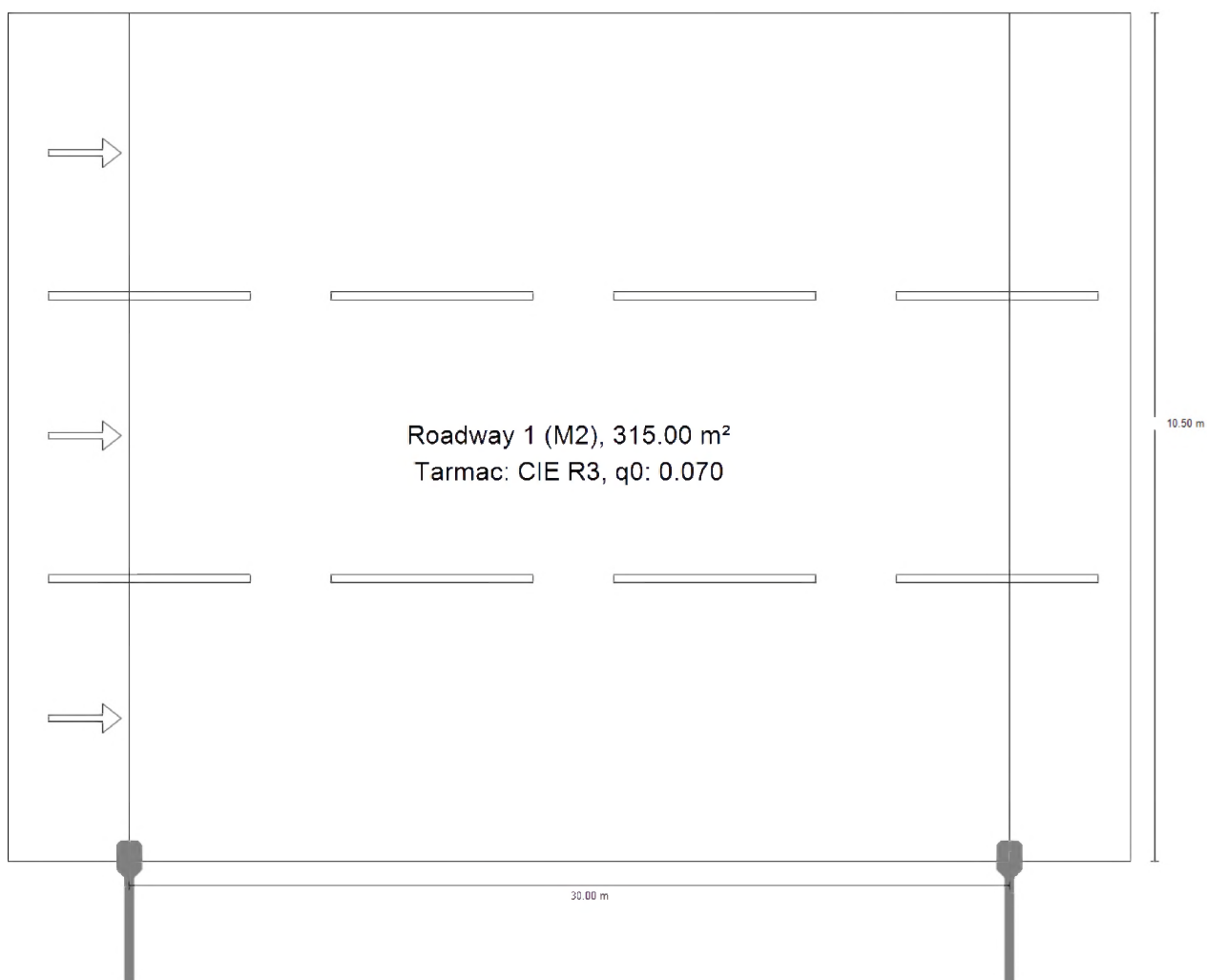
	L _{av}	L _{min}	L _{max}	g ₁	g ₂
Observer 2: Luminance with new installation	1.47 cd/m ²	0.72 cd/m ²	2.05 cd/m ²	0.486	0.348



TIP 4

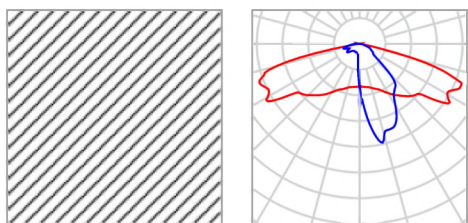
Description

TIP 4

Summary (according to EN 13201:2015)

TIP 4

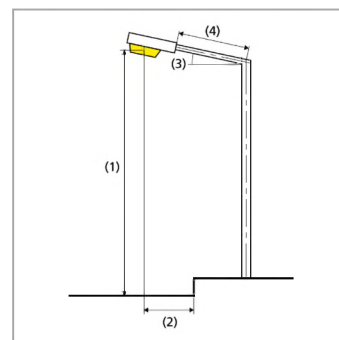
Summary (according to EN 13201:2015)



Manufacturer	BUCK	P	104.0 W
Article name	STAR 48LED T2 0.7A	Φ_{Lamp}	16545 lm
Fitting	1x QUICK FLUX XG 48LED LS 740 LS G8	$\Phi_{\text{Luminaire}}$	14063 lm
		η	85.00 %

STAR 48LED T2 0.7A (single side bottom)

Pole distance	30.000 m
(1) Light spot height	12.000 m
(2) Light point overhang	0.000 m
(3) Boom inclination	0.0°
(4) Boom length	1.500 m
Annual operating hours	4000 h: 100.0 %, 104.0 W
Consumption	3432.0 W/km
ULR / ULOR	0.00 / 0.00
Max. luminous intensities	≥ 70°: 1124 cd/klm
Any direction forming the specified angle from the downward vertical, with the luminaire installed for use.	≥ 80°: 154 cd/klm ≥ 90°: 25.4 cd/klm
Luminous intensity class	G*1
The luminous intensity values in [cd/klm] for calculation of the luminous intensity class refer to the luminaire luminous flux according to EN 13201:2015.	
Glare index class	D.0



TIP 4

Summary (according to EN 13201:2015)

Results for valuation fields

	Symbol	Calculated	Target	Check
Roadway 1 (M2)	L_{av}	1.58 cd/m ²	≥ 1.50 cd/m ²	✓
	U_o	0.44	≥ 0.40	✓
	U_l	0.88	≥ 0.70	✓
	TI	10 %	≤ 10 %	✓
	R_{EI}	0.35	≥ 0.35	✓

A maintenance factor of 0.80 was used for calculating for the installation.

Results for energy efficiency indicators

	Symbol	Calculated	Consumption
TIP 4	D_p	0.014 W/lx*m ²	-
STAR 48LED T2 0.7A (single side bottom)	D_e	1.3 kWh/m ² yr,	416.0 kWh/yr

TIP 4

Roadway 1 (M2)

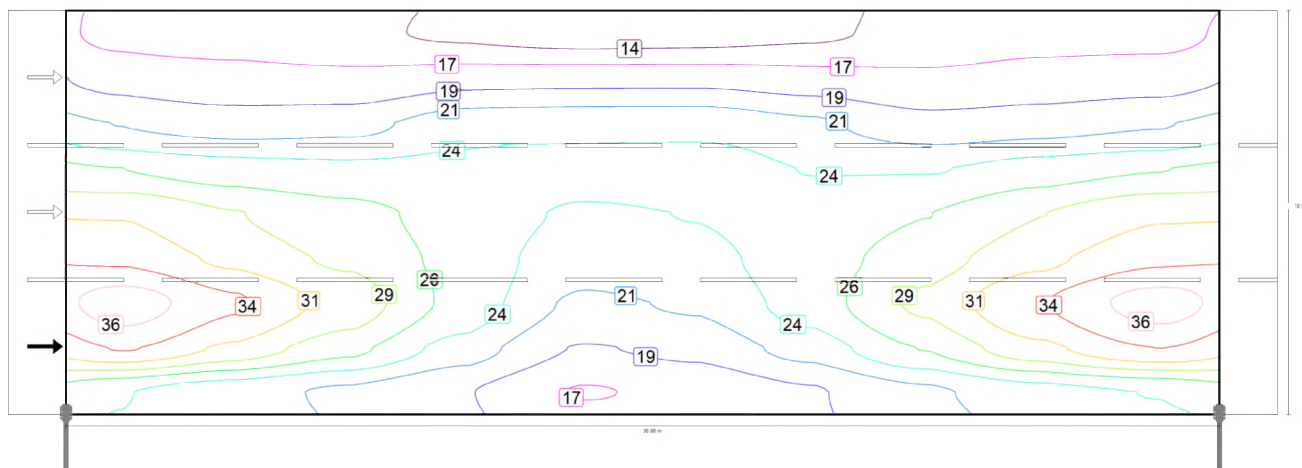
Results for valuation field

	Symbol	Calculated	Target	Check
Roadway 1 (M2)	L_{av}	1.58 cd/m ²	≥ 1.50 cd/m ²	✓
	U_o	0.44	≥ 0.40	✓
	U_l	0.88	≥ 0.70	✓
	TI	10 %	≤ 10 %	✓
	R_{EI}	0.35	≥ 0.35	✓

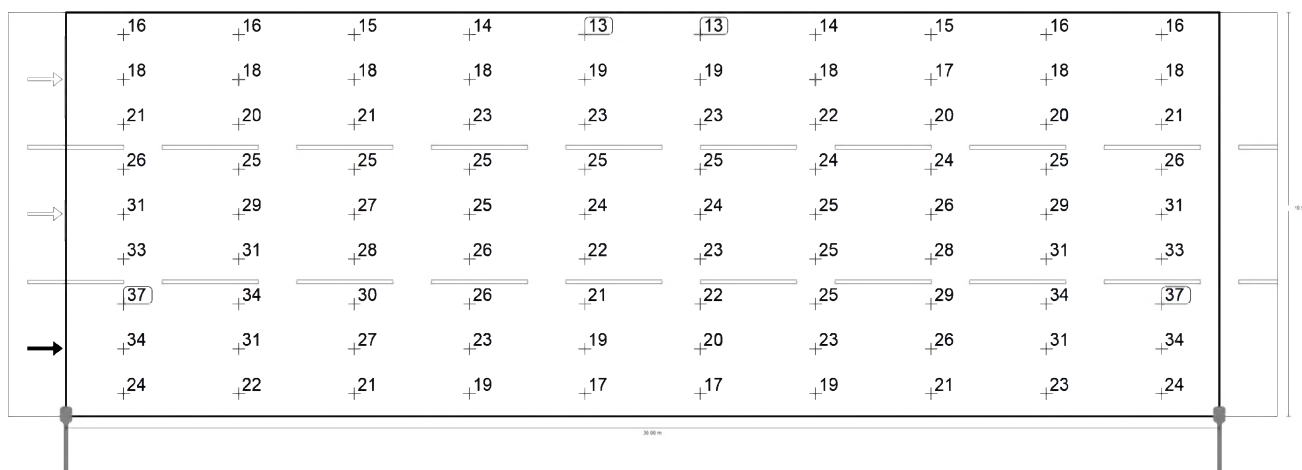
Results for observer

	Symbol	Calculated	Target	Check
Observer 1 Position: -60.000 m, 1.750 m, 1.500 m	L_{av}	1.58 cd/m ²	≥ 1.50 cd/m ²	✓
	U_o	0.45	≥ 0.40	✓
	U_l	0.92	≥ 0.70	✓
	TI	8 %	≤ 10 %	✓
Observer 2 Position: -60.000 m, 5.250 m, 1.500 m	L_{av}	1.73 cd/m ²	≥ 1.50 cd/m ²	✓
	U_o	0.44	≥ 0.40	✓
	U_l	0.91	≥ 0.70	✓
	TI	10 %	≤ 10 %	✓
Observer 3 Position: -60.000 m, 8.750 m, 1.500 m	L_{av}	1.87 cd/m ²	≥ 1.50 cd/m ²	✓
	U_o	0.45	≥ 0.40	✓
	U_l	0.88	≥ 0.70	✓
	TI	8 %	≤ 10 %	✓

TIP 4

Roadway 1 (M2)

Maintenance value, horizontal illuminance [lx] (Iso-illuminance curves)



Maintenance value, horizontal illuminance [lx] (Value grid)

m	1.500	4.500	7.500	10.500	13.500	16.500	19.500	22.500	25.500	28.500
9.917	16.02	15.51	14.76	13.83	13.04	13.25	13.87	14.87	15.68	15.91
8.750	18.42	17.82	17.53	18.34	18.52	18.54	17.87	17.34	17.97	18.25
7.583	21.42	20.41	20.79	22.97	23.16	23.22	21.96	20.06	20.48	21.30
6.417	26.33	25.09	24.57	24.70	24.85	24.96	23.82	23.79	25.12	26.21
5.250	31.06	28.86	27.14	25.48	23.56	23.99	24.91	26.30	28.73	30.94
4.083	33.12	30.55	28.25	25.60	22.37	23.19	25.09	27.56	30.52	33.07
2.917	37.21	33.94	30.23	25.55	21.03	21.82	25.07	29.25	33.51	37.04
1.750	33.80	30.60	27.10	22.83	18.92	19.77	22.53	26.49	30.51	33.63

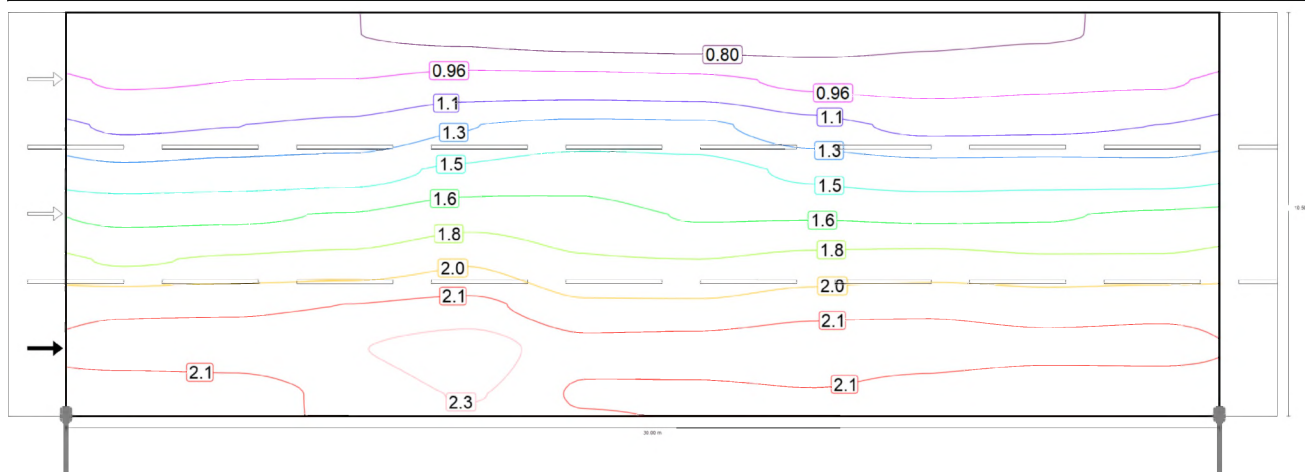
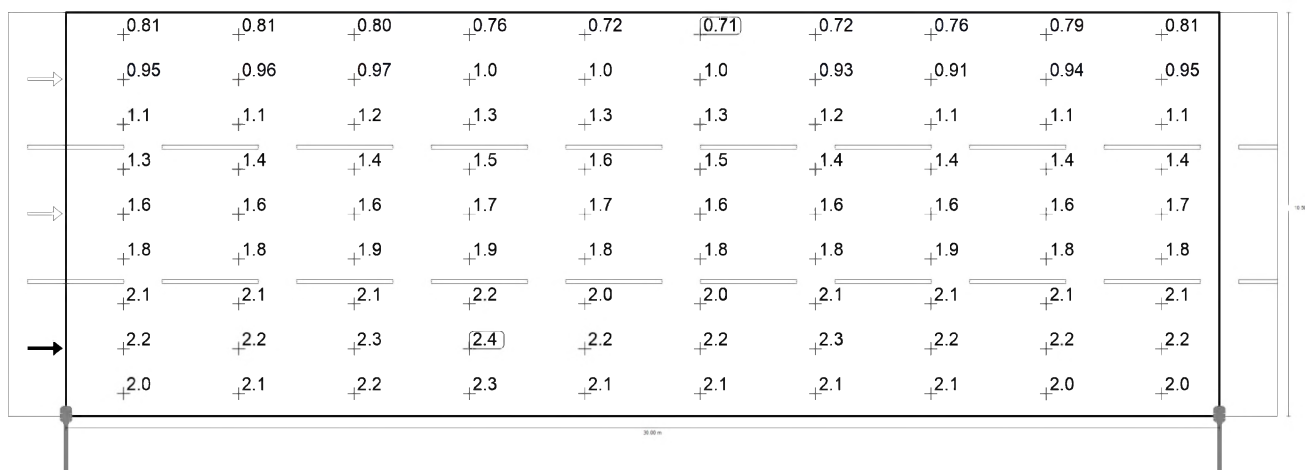
TIP 4

Roadway 1 (M2)

m	1.500	4.500	7.500	10.500	13.500	16.500	19.500	22.500	25.500	28.500
0.583	24.09	22.50	21.12	19.20	16.52	17.27	18.84	21.01	22.94	23.99

Maintenance value, horizontal illuminance [lx] (Value chart)

	E_{av}	E_{min}	E_{max}	g_1	g_2
Maintenance value, horizontal illuminance	23.5 lx	13.0 lx	37.2 lx	0.556	0.351

Observer 1: Maintenance value, luminance with dry roadway [cd/m^2] (Iso-illuminance curves)Observer 1: Maintenance value, luminance with dry roadway [cd/m^2] (Value grid)

m	1.500	4.500	7.500	10.500	13.500	16.500	19.500	22.500	25.500	28.500
9.917	0.81	0.81	0.80	0.76	0.72	0.71	0.72	0.76	0.79	0.81
8.750	0.95	0.96	0.97	1.03	1.02	1.00	0.93	0.91	0.94	0.95

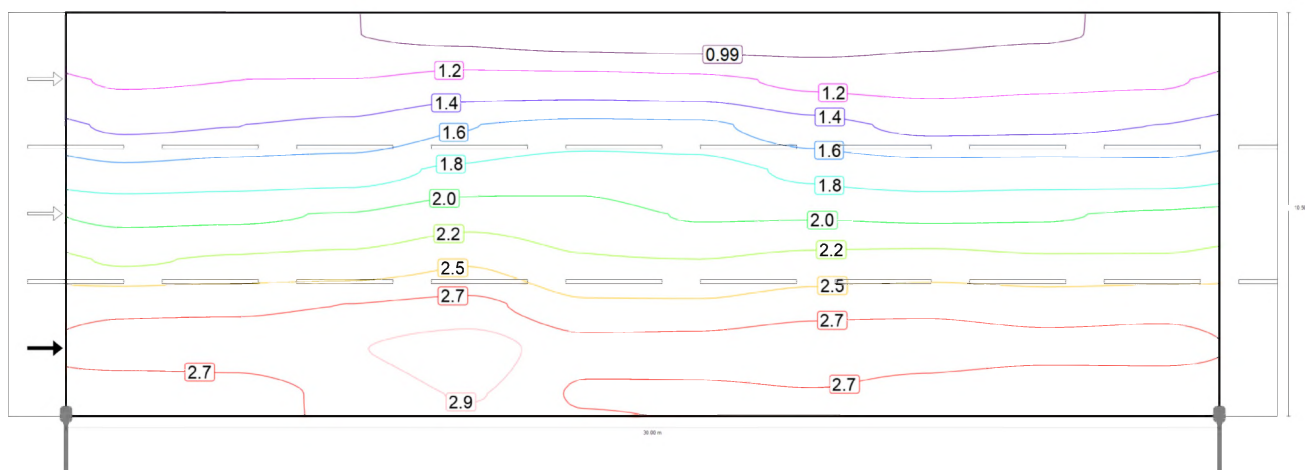
TIP 4

Roadway 1 (M2)

m	1.500	4.500	7.500	10.500	13.500	16.500	19.500	22.500	25.500	28.500
7.583	1.11	1.13	1.17	1.29	1.33	1.32	1.19	1.09	1.10	1.13
6.417	1.34	1.37	1.40	1.50	1.57	1.53	1.43	1.38	1.38	1.37
5.250	1.61	1.61	1.64	1.74	1.69	1.62	1.62	1.61	1.62	1.65
4.083	1.78	1.82	1.85	1.95	1.81	1.80	1.85	1.86	1.82	1.82
2.917	2.09	2.11	2.13	2.17	1.99	1.99	2.06	2.09	2.06	2.08
1.750	2.22	2.22	2.28	2.38	2.18	2.20	2.26	2.23	2.18	2.19
0.583	2.03	2.06	2.17	2.31	2.11	2.11	2.12	2.05	2.00	2.00

Observer 1: Maintenance value, luminance with dry roadway [cd/m^2] (Value chart)

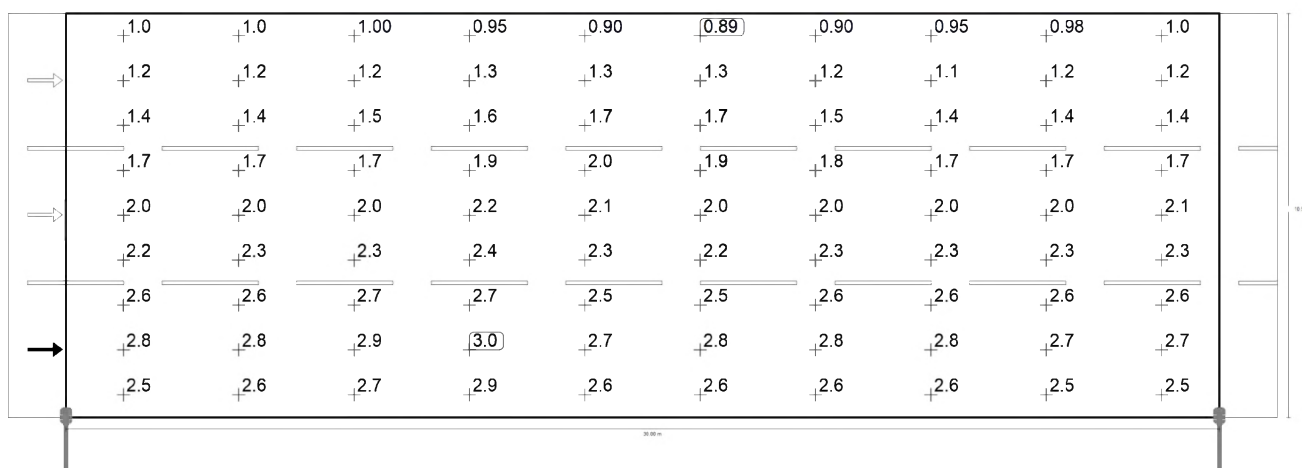
	L_{av}	L_{min}	L_{max}	g_1	g_2
Observer 1: Maintenance value, luminance with dry roadway	1.58 cd/m^2	0.71 cd/m^2	2.38 cd/m^2	0.450	0.300



Observer 1: Luminance with new installation [cd/m^2] (Iso-illuminance curves)

TIP 4

Roadway 1 (M2)



Observer 1: Luminance with new installation [cd/m²] (Value grid)

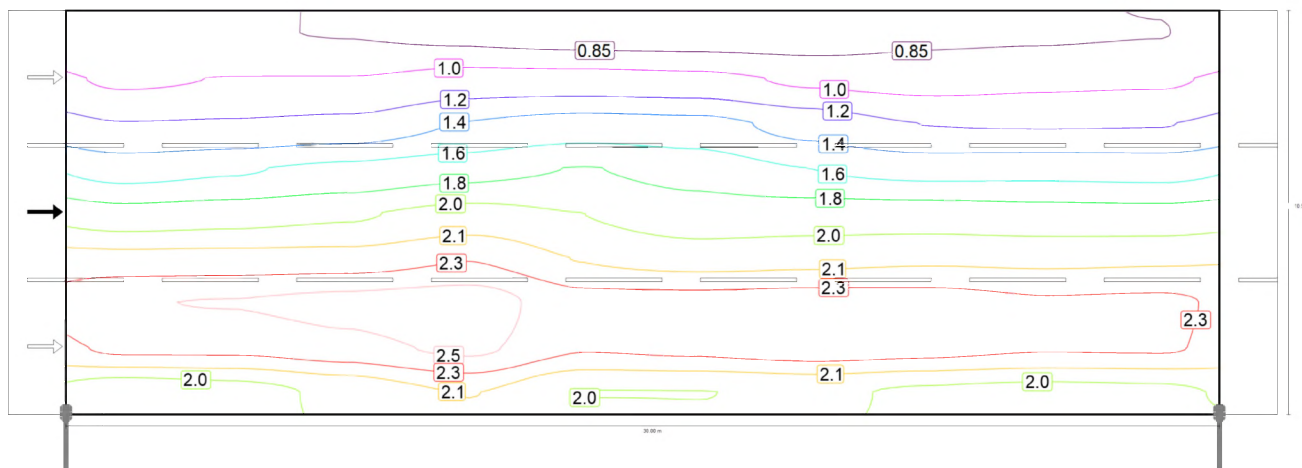
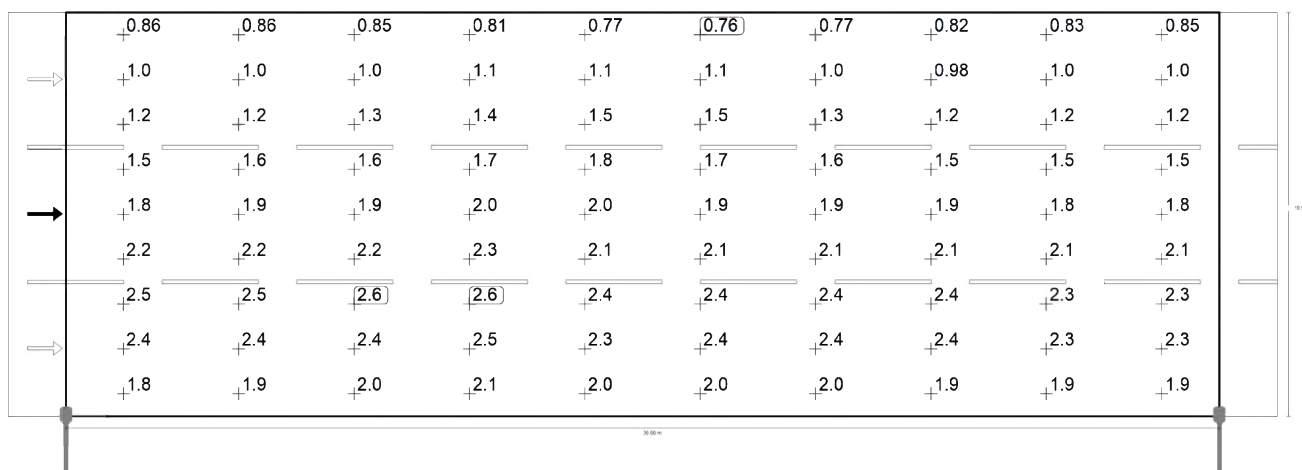
m	1.500	4.500	7.500	10.500	13.500	16.500	19.500	22.500	25.500	28.500
9.917	1.01	1.01	1.00	0.95	0.90	0.89	0.90	0.95	0.98	1.02
8.750	1.19	1.20	1.21	1.28	1.28	1.25	1.16	1.14	1.17	1.18
7.583	1.39	1.41	1.46	1.61	1.67	1.66	1.49	1.37	1.38	1.41
6.417	1.67	1.72	1.75	1.87	1.96	1.91	1.79	1.72	1.73	1.71
5.250	2.01	2.01	2.05	2.18	2.11	2.02	2.03	2.01	2.02	2.06
4.083	2.22	2.27	2.31	2.44	2.27	2.24	2.31	2.33	2.28	2.28
2.917	2.62	2.63	2.66	2.72	2.49	2.48	2.58	2.62	2.58	2.60
1.750	2.77	2.77	2.85	2.97	2.73	2.75	2.83	2.79	2.73	2.74
0.583	2.54	2.57	2.71	2.88	2.64	2.63	2.65	2.56	2.50	2.50

Observer 1: Luminance with new installation [cd/m²] (Value chart)

	L _{av}	L _{min}	L _{max}	g ₁	g ₂
Observer 1: Luminance with new installation	1.98 cd/m²	0.89 cd/m²	2.97 cd/m²	0.450	0.300

TIP 4

Roadway 1 (M2)

Observer 2: Maintenance value, luminance with dry roadway [cd/m^2] (Iso-illuminance curves)Observer 2: Maintenance value, luminance with dry roadway [cd/m^2] (Value grid)

m	1.500	4.500	7.500	10.500	13.500	16.500	19.500	22.500	25.500	28.500
9.917	0.86	0.86	0.85	0.81	0.77	0.76	0.77	0.82	0.83	0.85
8.750	1.01	1.04	1.05	1.12	1.12	1.09	1.00	0.98	1.00	1.02
7.583	1.23	1.24	1.28	1.41	1.49	1.46	1.34	1.22	1.21	1.21
6.417	1.52	1.57	1.64	1.71	1.77	1.71	1.58	1.53	1.54	1.53
5.250	1.85	1.88	1.93	2.03	1.95	1.87	1.88	1.87	1.85	1.84
4.083	2.20	2.21	2.22	2.31	2.13	2.06	2.08	2.11	2.10	2.11
2.917	2.49	2.51	2.55	2.59	2.38	2.38	2.40	2.39	2.33	2.35
1.750	2.36	2.36	2.44	2.54	2.33	2.37	2.43	2.39	2.34	2.34

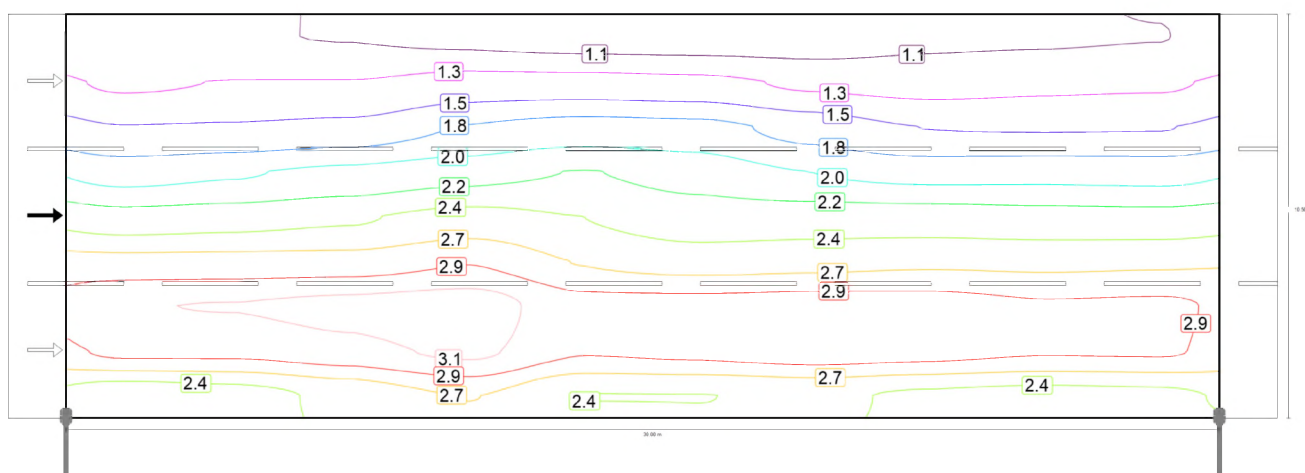
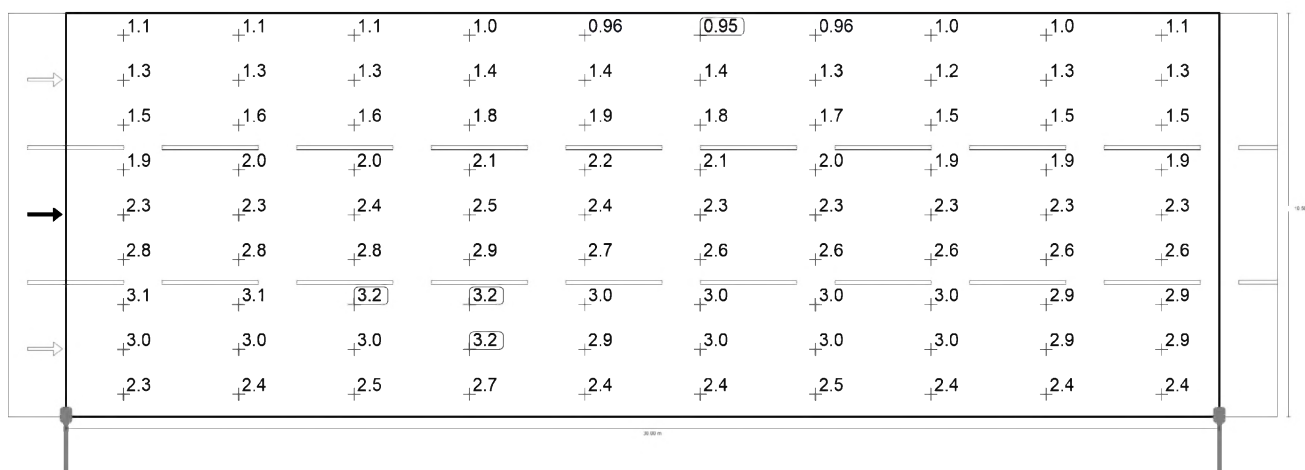
TIP 4

Roadway 1 (M2)

m	1.500	4.500	7.500	10.500	13.500	16.500	19.500	22.500	25.500	28.500
0.583	1.83	1.88	2.00	2.14	1.95	1.95	1.98	1.93	1.90	1.91

Observer 2: Maintenance value, luminance with dry roadway [cd/m^2] (Value chart)

	L_{av}	L_{min}	L_{max}	g_1	g_2
Observer 2: Maintenance value, luminance with dry roadway	1.73 cd/m^2	0.76 cd/m^2	2.59 cd/m^2	0.440	0.294

Observer 2: Luminance with new installation [cd/m^2] (Iso-illuminance curves)Observer 2: Luminance with new installation [cd/m^2] (Value grid)

m	1.500	4.500	7.500	10.500	13.500	16.500	19.500	22.500	25.500	28.500
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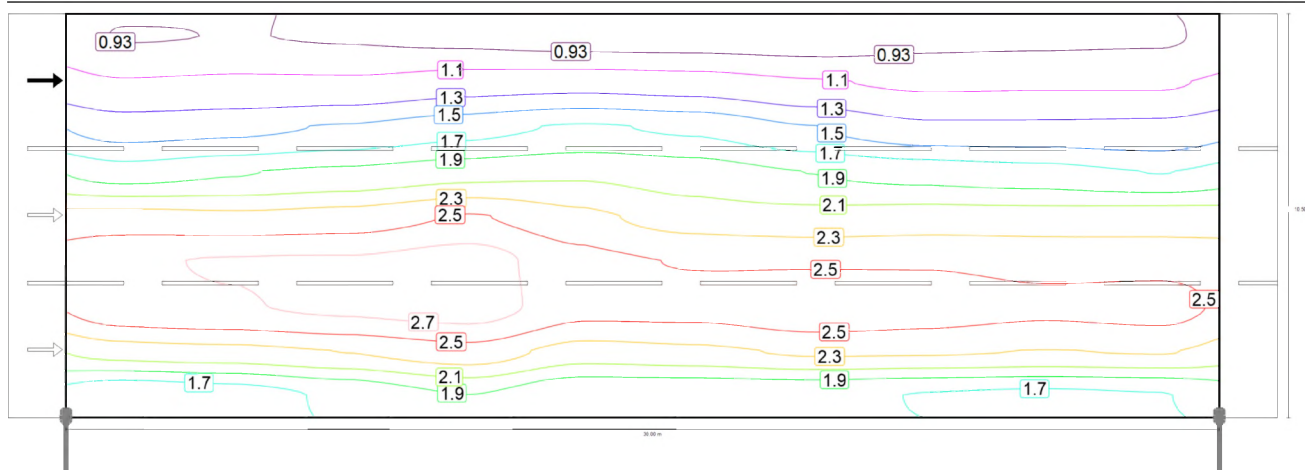
TIP 4

Roadway 1 (M2)

m	1.500	4.500	7.500	10.500	13.500	16.500	19.500	22.500	25.500	28.500
9.917	1.08	1.08	1.06	1.01	0.96	0.95	0.96	1.02	1.04	1.06
8.750	1.27	1.30	1.31	1.40	1.40	1.37	1.26	1.22	1.25	1.27
7.583	1.53	1.55	1.60	1.77	1.86	1.83	1.68	1.52	1.51	1.52
6.417	1.90	1.96	2.04	2.13	2.22	2.13	1.98	1.91	1.92	1.91
5.250	2.31	2.35	2.41	2.53	2.44	2.34	2.35	2.34	2.31	2.30
4.083	2.75	2.77	2.78	2.89	2.66	2.57	2.60	2.63	2.62	2.64
2.917	3.11	3.13	3.19	3.24	2.97	2.97	3.01	2.99	2.92	2.93
1.750	2.96	2.96	3.05	3.18	2.92	2.96	3.03	2.99	2.92	2.93
0.583	2.28	2.35	2.50	2.68	2.44	2.44	2.47	2.41	2.37	2.39

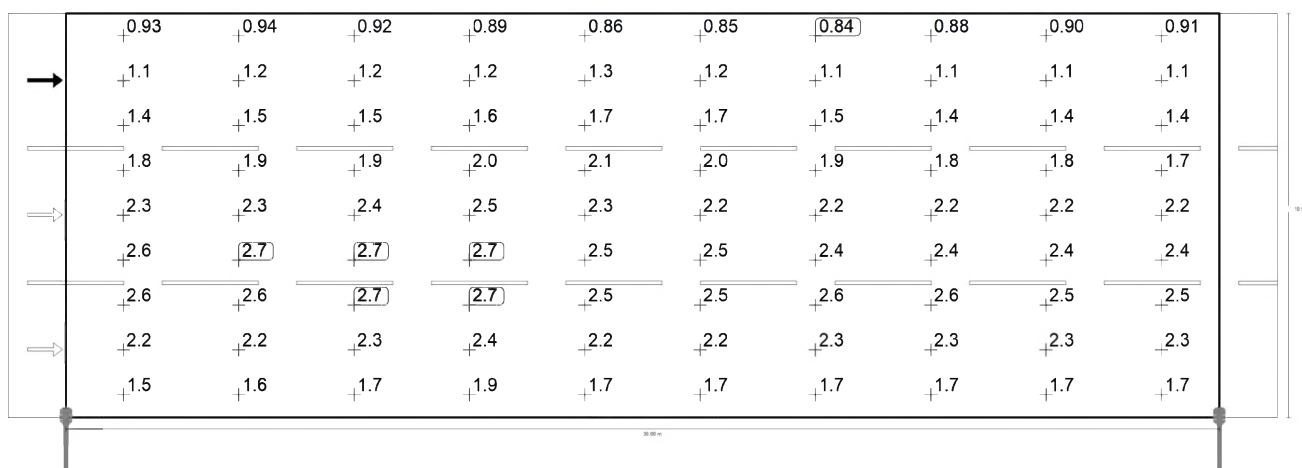
Observer 2: Luminance with new installation [cd/m²] (Value chart)

	L _{av}	L _{min}	L _{max}	g ₁	g ₂
Observer 2: Luminance with new installation	2.17 cd/m ²	0.95 cd/m ²	3.24 cd/m ²	0.440	0.294

Observer 3: Maintenance value, luminance with dry roadway [cd/m²] (Iso-illuminance curves)

TIP 4

Roadway 1 (M2)

Observer 3: Maintenance value, luminance with dry roadway [cd/m^2] (Value grid)

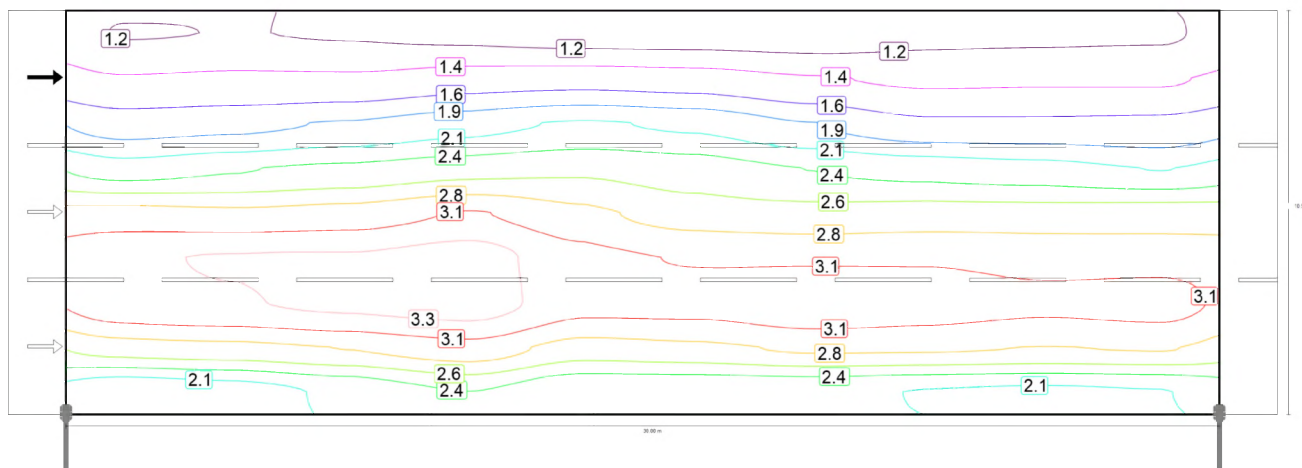
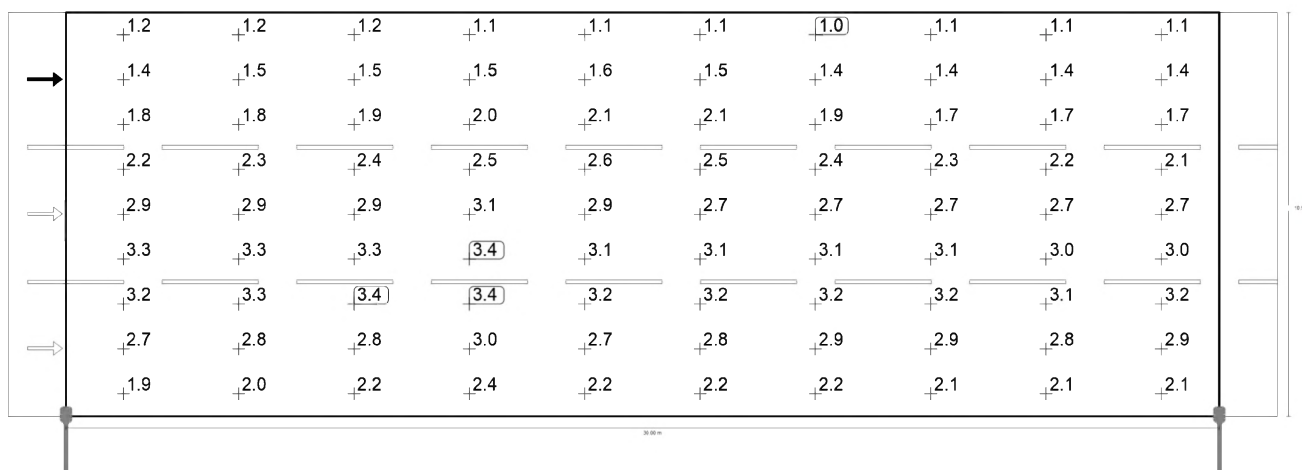
m	1.500	4.500	7.500	10.500	13.500	16.500	19.500	22.500	25.500	28.500
9.917	0.93	0.94	0.92	0.89	0.86	0.85	0.84	0.88	0.90	0.91
8.750	1.14	1.17	1.17	1.23	1.25	1.22	1.14	1.10	1.11	1.11
7.583	1.43	1.46	1.53	1.63	1.72	1.66	1.51	1.36	1.36	1.37
6.417	1.80	1.87	1.93	2.01	2.05	1.99	1.88	1.82	1.78	1.69
5.250	2.35	2.32	2.36	2.47	2.32	2.19	2.16	2.18	2.17	2.18
4.083	2.63	2.66	2.67	2.74	2.52	2.45	2.45	2.45	2.42	2.41
2.917	2.60	2.64	2.70	2.75	2.53	2.53	2.60	2.55	2.50	2.53
1.750	2.16	2.21	2.28	2.38	2.18	2.22	2.30	2.30	2.27	2.29
0.583	1.54	1.61	1.74	1.88	1.72	1.73	1.74	1.69	1.67	1.69

Observer 3: Maintenance value, luminance with dry roadway [cd/m^2] (Value chart)

	L_{av}	L_{min}	L_{max}	g_1	g_2
Observer 3: Maintenance value, luminance with dry roadway	1.87 cd/m^2	0.84 cd/m^2	2.75 cd/m^2	0.449	0.305

TIP 4

Roadway 1 (M2)

Observer 3: Luminance with new installation [cd/m^2] (Iso-illuminance curves)Observer 3: Luminance with new installation [cd/m^2] (Value grid)

m	1.500	4.500	7.500	10.500	13.500	16.500	19.500	22.500	25.500	28.500
9.917	1.16	1.17	1.15	1.11	1.07	1.06	1.05	1.10	1.12	1.14
8.750	1.43	1.46	1.46	1.54	1.56	1.53	1.43	1.38	1.38	1.38
7.583	1.78	1.82	1.91	2.04	2.15	2.08	1.89	1.70	1.70	1.71
6.417	2.24	2.34	2.42	2.52	2.57	2.49	2.36	2.28	2.22	2.11
5.250	2.93	2.90	2.95	3.09	2.90	2.73	2.70	2.72	2.71	2.73
4.083	3.29	3.32	3.34	3.42	3.15	3.06	3.06	3.06	3.03	3.01
2.917	3.25	3.30	3.37	3.43	3.16	3.16	3.25	3.19	3.12	3.16
1.750	2.71	2.76	2.85	2.98	2.73	2.78	2.88	2.87	2.83	2.86

TIP 4

Roadway 1 (M2)

m	1.500	4.500	7.500	10.500	13.500	16.500	19.500	22.500	25.500	28.500
0.583	1.92	2.01	2.17	2.36	2.15	2.16	2.17	2.11	2.08	2.11

Observer 3: Luminance with new installation [cd/m²] (Value chart)

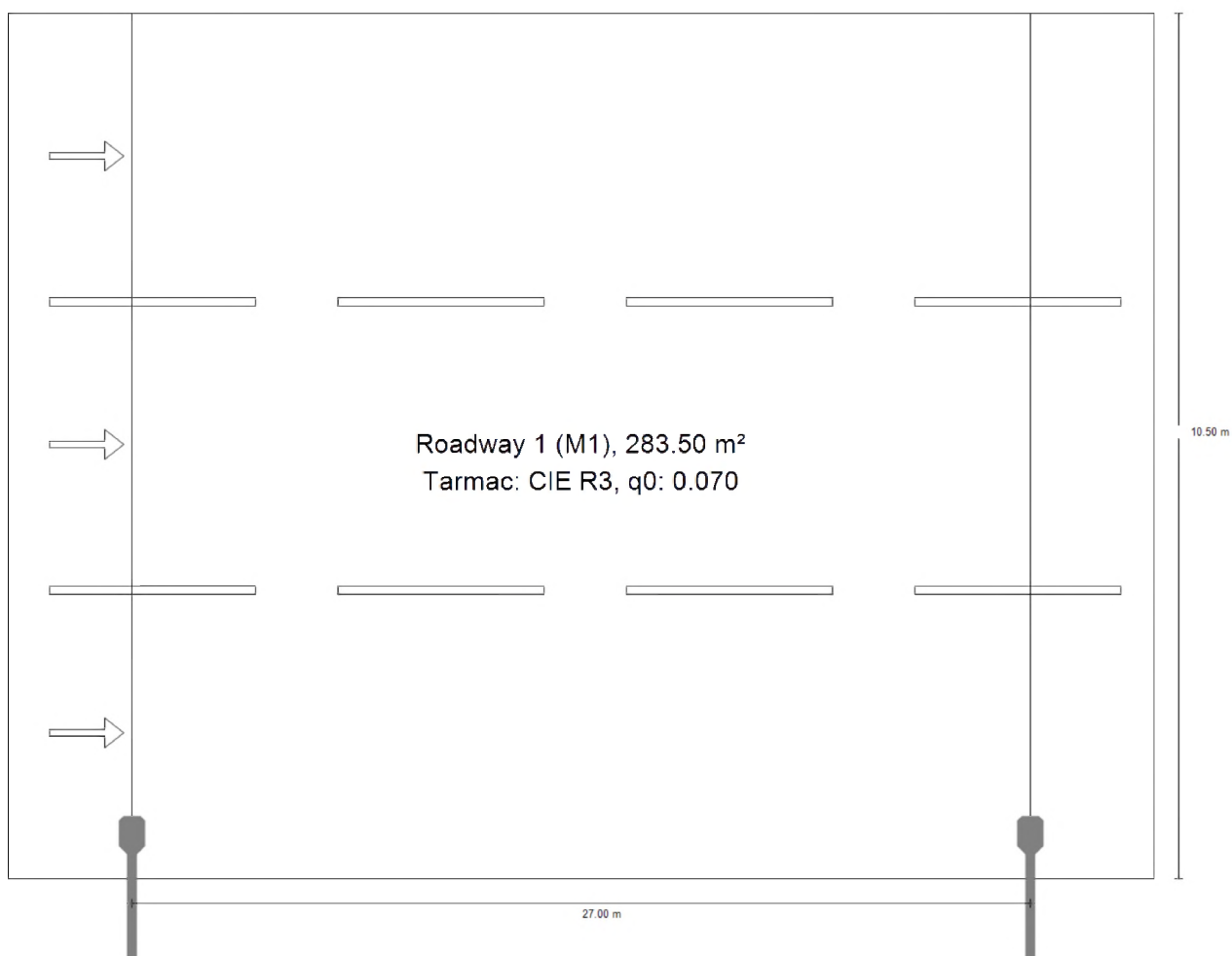
	L _{av}	L _{min}	L _{max}	g ₁	g ₂
Observer 3: Luminance with new installation	2.33 cd/m ²	1.05 cd/m ²	3.43 cd/m ²	0.449	0.305



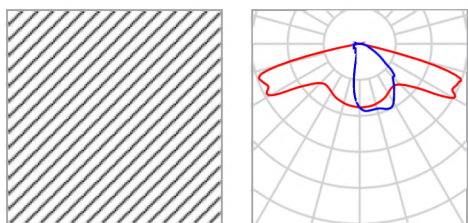
TIP 5

Description

TIP 5

Summary (according to EN 13201:2015)

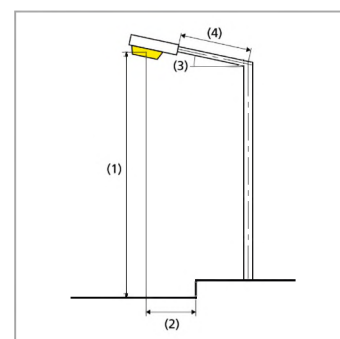
TIP 5

Summary (according to EN 13201:2015)

Manufacturer	BUCK	P	174.0 W
Article name	STAR 80LED DWC 0.7A	Φ_{Lamp}	27575 lm
Fitting	1x QUICK FLUX XG 80LED LS 740 LS G8	$\Phi_{\text{Luminaire}}$	23438 lm
		η	85.00 %

STAR 80LED DWC 0.7A (single side bottom)

Pole distance	27.000 m
(1) Light spot height	13.000 m
(2) Light point overhang	0.500 m
(3) Boom inclination	15.0°
(4) Boom length	1.500 m
Annual operating hours	4000 h: 100.0 %, 174.0 W
Consumption	6438.0 W/km
ULR / ULOR	0.01 / 0.00
Max. luminous intensities	≥ 70°: 678 cd/klm
Any direction forming the specified angle from the downward vertical, with the luminaire installed for use.	≥ 80°: 511 cd/klm ≥ 90°: 92.1 cd/klm
Luminous intensity class	-
The luminous intensity values in [cd/klm] for calculation of the luminous intensity class refer to the luminaire luminous flux according to EN 13201:2015.	
Glare index class	D.0



TIP 5

Summary (according to EN 13201:2015)

Results for valuation fields

	Symbol	Calculated	Target	Check
Roadway 1 (M1)	L_{av}	2.06 cd/m ²	≥ 2.00 cd/m ²	✓
	U_o	0.50	≥ 0.40	✓
	U_l	0.78	≥ 0.70	✓
	TI	10 %	≤ 10 %	✓
	R_{EI}	0.38	≥ 0.35	✓

A maintenance factor of 0.80 was used for calculating for the installation.

Results for energy efficiency indicators

	Symbol	Calculated	Consumption
TIP 5	D_p	0.022 W/lx*m ²	-
STAR 80LED DWC 0.7A (single side bottom)	D_e	2.5 kWh/m ² yr,	696.0 kWh/yr

TIP 5

Roadway 1 (M1)

Results for valuation field

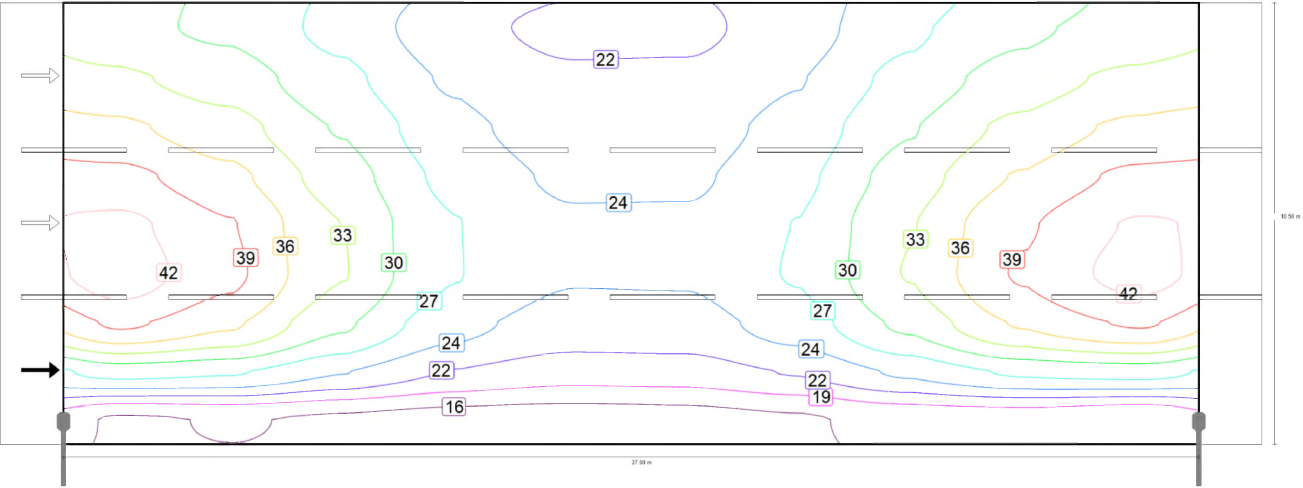
	Symbol	Calculated	Target	Check
Roadway 1 (M1)	L_{av}	2.06 cd/m ²	≥ 2.00 cd/m ²	✓
	U_o	0.50	≥ 0.40	✓
	U_l	0.78	≥ 0.70	✓
	TI	10 %	≤ 10 %	✓
	R_{EI}	0.38	≥ 0.35	✓

Results for observer

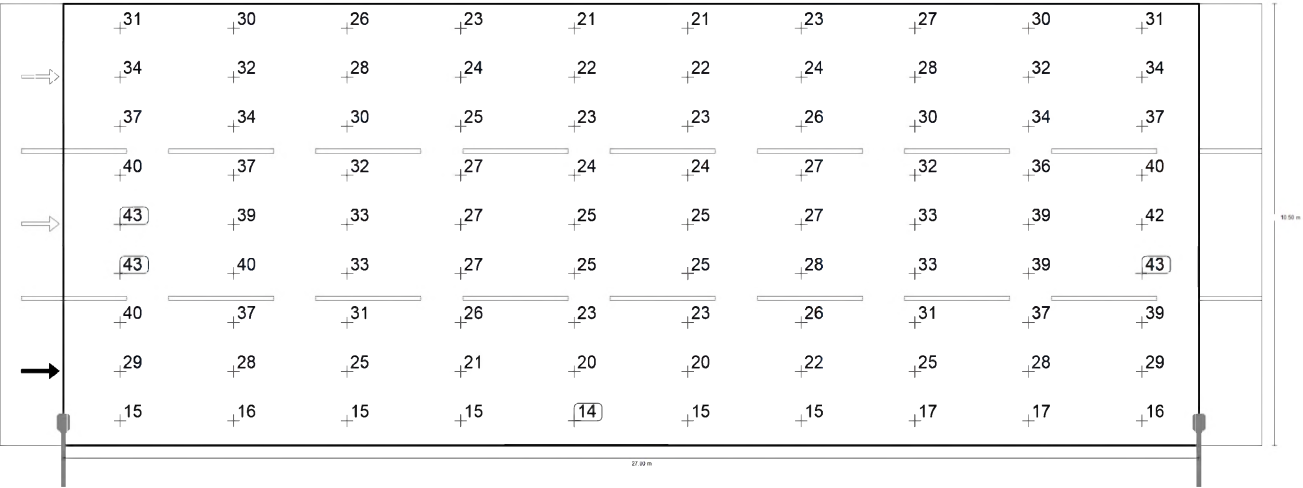
	Symbol	Calculated	Target	Check
Observer 1 Position: -60.000 m, 1.750 m, 1.500 m	L_{av}	2.06 cd/m ²	≥ 2.00 cd/m ²	✓
	U_o	0.51	≥ 0.40	✓
	U_l	0.85	≥ 0.70	✓
	TI	10 %	≤ 10 %	✓
Observer 2 Position: -60.000 m, 5.250 m, 1.500 m	L_{av}	2.25 cd/m ²	≥ 2.00 cd/m ²	✓
	U_o	0.50	≥ 0.40	✓
	U_l	0.79	≥ 0.70	✓
	TI	9 %	≤ 10 %	✓
Observer 3 Position: -60.000 m, 8.750 m, 1.500 m	L_{av}	2.39 cd/m ²	≥ 2.00 cd/m ²	✓
	U_o	0.53	≥ 0.40	✓
	U_l	0.78	≥ 0.70	✓
	TI	7 %	≤ 10 %	✓

TIP 5

Roadway 1 (M1)



Maintenance value, horizontal illuminance [lx] (Iso-illuminance curves)



Maintenance value, horizontal illuminance [lx] (Value grid)

m	1.350	4.050	6.750	9.450	12.150	14.850	17.550	20.250	22.950	25.650
9.917	31.29	29.77	26.47	22.68	20.86	20.96	23.08	26.81	29.74	31.37
8.750	33.78	31.88	28.19	24.02	22.03	22.11	24.31	28.38	31.67	33.91
7.583	36.71	34.36	30.03	25.35	23.05	23.13	25.51	30.09	33.99	36.76
6.417	39.84	36.90	31.73	26.54	24.02	24.06	26.61	31.68	36.38	39.68
5.250	42.59	39.18	33.15	27.43	24.74	24.77	27.46	33.08	38.59	42.19
4.083	43.38	39.74	33.31	27.50	24.72	24.78	27.64	33.40	39.38	42.84
2.917	39.55	36.63	30.80	25.57	23.17	23.30	25.90	31.04	36.51	39.41

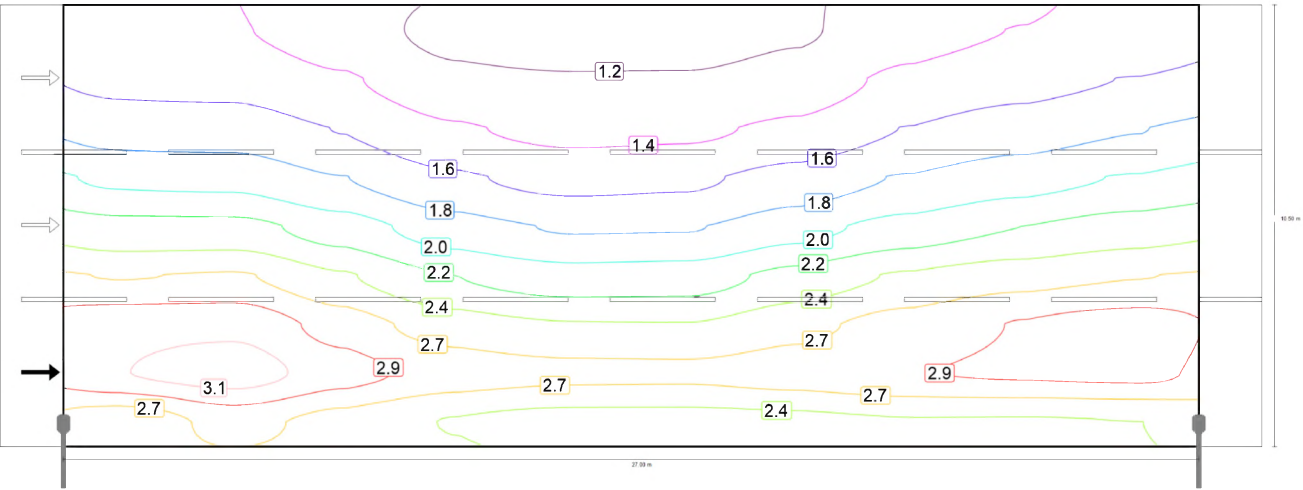
TIP 5

Roadway 1 (M1)

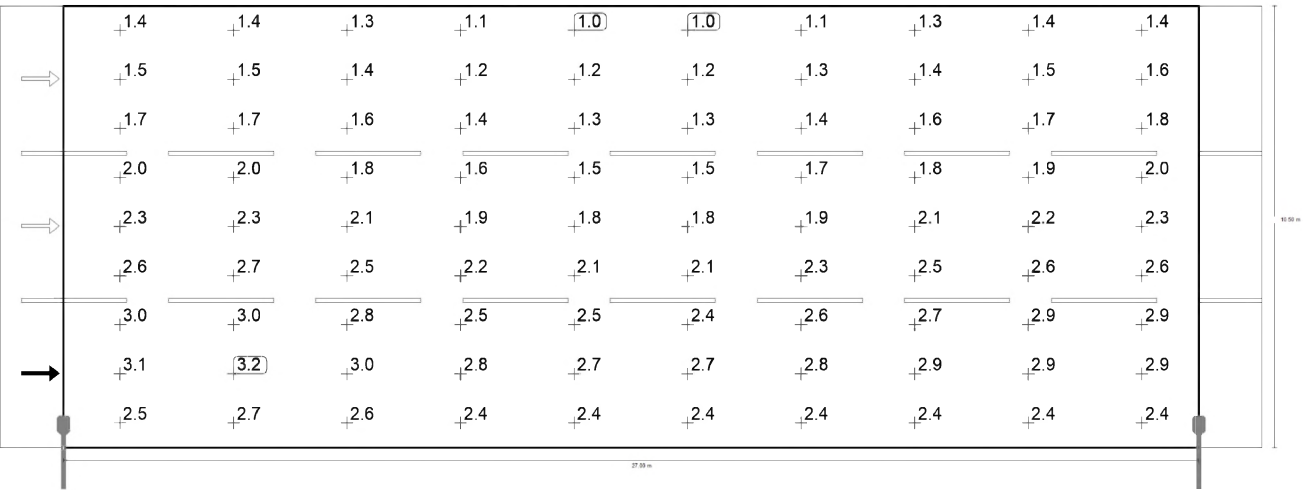
m	1.350	4.050	6.750	9.450	12.150	14.850	17.550	20.250	22.950	25.650
1.750	28.51	27.74	24.63	21.39	19.98	20.14	21.81	25.10	27.94	28.55
0.583	15.44	15.91	15.33	14.58	14.30	14.61	15.43	16.60	16.80	15.84

Maintenance value, horizontal illuminance [lx] (Value chart)

	E _{av}	E _{min}	E _{max}	g ₁	g ₂
Maintenance value, horizontal illuminance	28.2 lx	14.3 lx	43.4 lx	0.506	0.330



Observer 1: Maintenance value, luminance with dry roadway [cd/m²] (Iso-illuminance curves)



Observer 1: Maintenance value, luminance with dry roadway [cd/m²] (Value grid)

m	1.350	4.050	6.750	9.450	12.150	14.850	17.550	20.250	22.950	25.650
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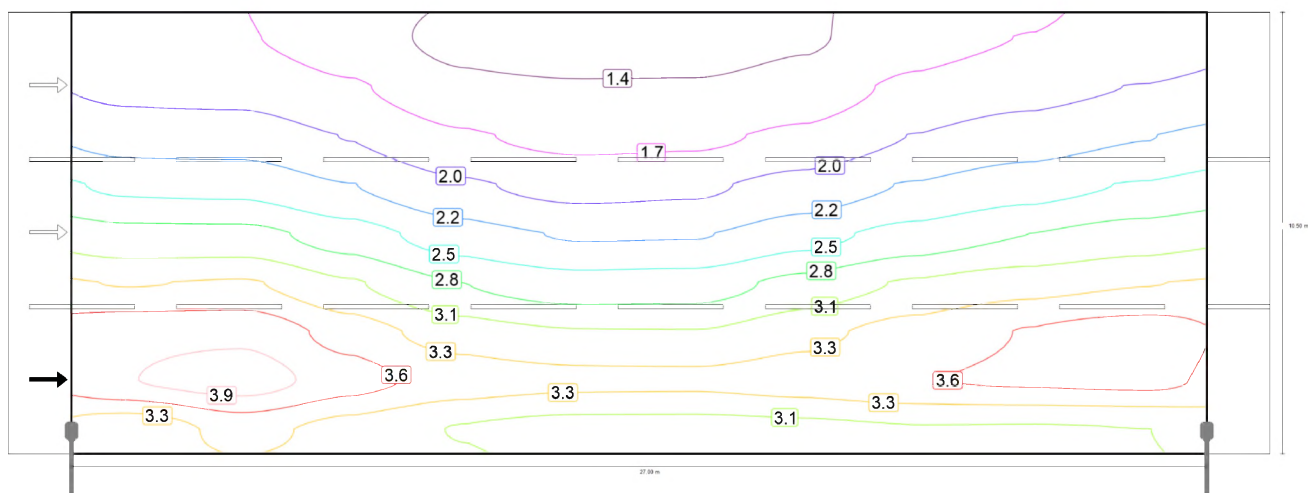
TIP 5

Roadway 1 (M1)

m	1.350	4.050	6.750	9.450	12.150	14.850	17.550	20.250	22.950	25.650
9.917	1.40	1.38	1.26	1.09	1.05	1.05	1.13	1.28	1.37	1.43
8.750	1.53	1.51	1.39	1.21	1.17	1.18	1.25	1.42	1.51	1.59
7.583	1.71	1.71	1.57	1.39	1.31	1.33	1.42	1.59	1.70	1.79
6.417	1.97	1.95	1.80	1.61	1.52	1.54	1.67	1.81	1.93	2.03
5.250	2.30	2.30	2.12	1.89	1.78	1.78	1.93	2.10	2.23	2.34
4.083	2.64	2.68	2.46	2.22	2.11	2.12	2.30	2.47	2.57	2.65
2.917	3.01	3.04	2.78	2.55	2.46	2.45	2.59	2.75	2.88	2.94
1.750	3.07	3.19	2.96	2.78	2.71	2.70	2.76	2.86	2.90	2.93
0.583	2.52	2.72	2.58	2.43	2.37	2.37	2.39	2.43	2.43	2.44

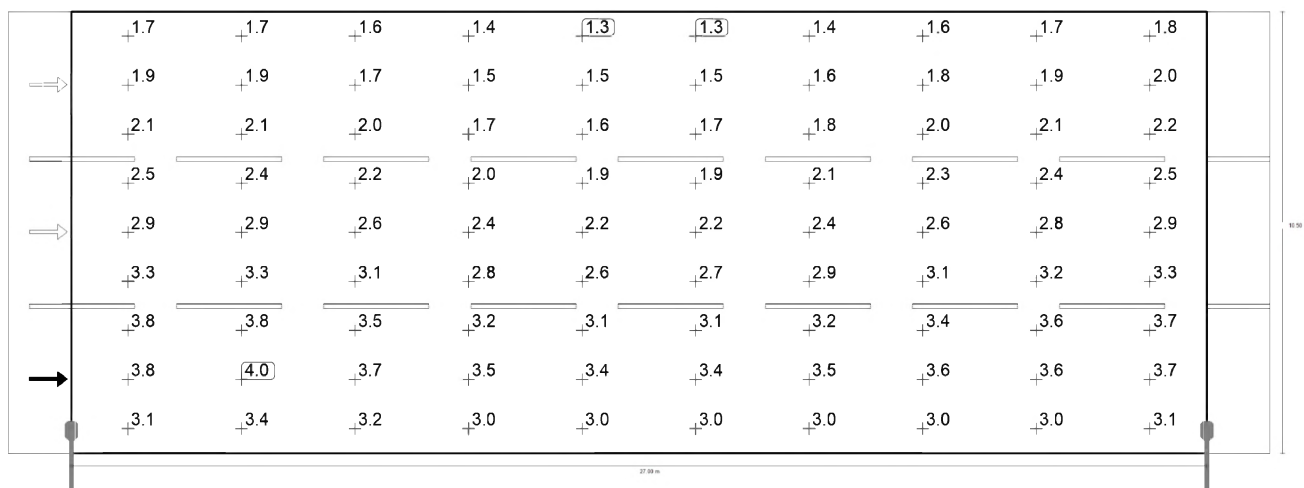
Observer 1: Maintenance value, luminance with dry roadway [cd/m^2] (Value chart)

	L_{av}	L_{min}	L_{max}	g_1	g_2
Observer 1: Maintenance value, luminance with dry roadway	2.06 cd/m^2	1.05 cd/m^2	3.19 cd/m^2	0.508	0.328

Observer 1: Luminance with new installation [cd/m^2] (Iso-illuminance curves)

TIP 5

Roadway 1 (M1)



Observer 1: Luminance with new installation [cd/m²] (Value grid)

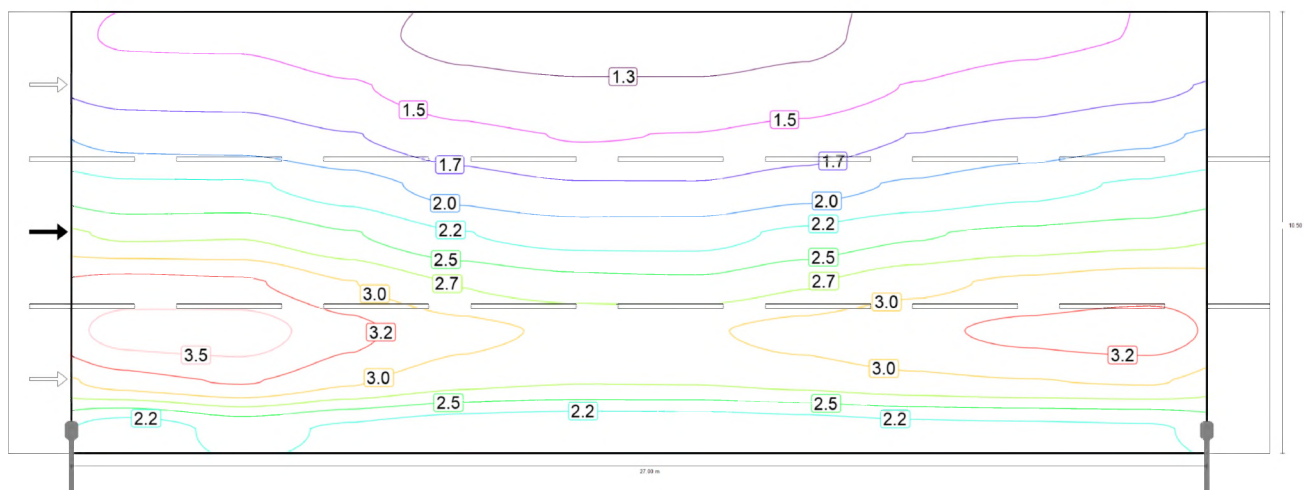
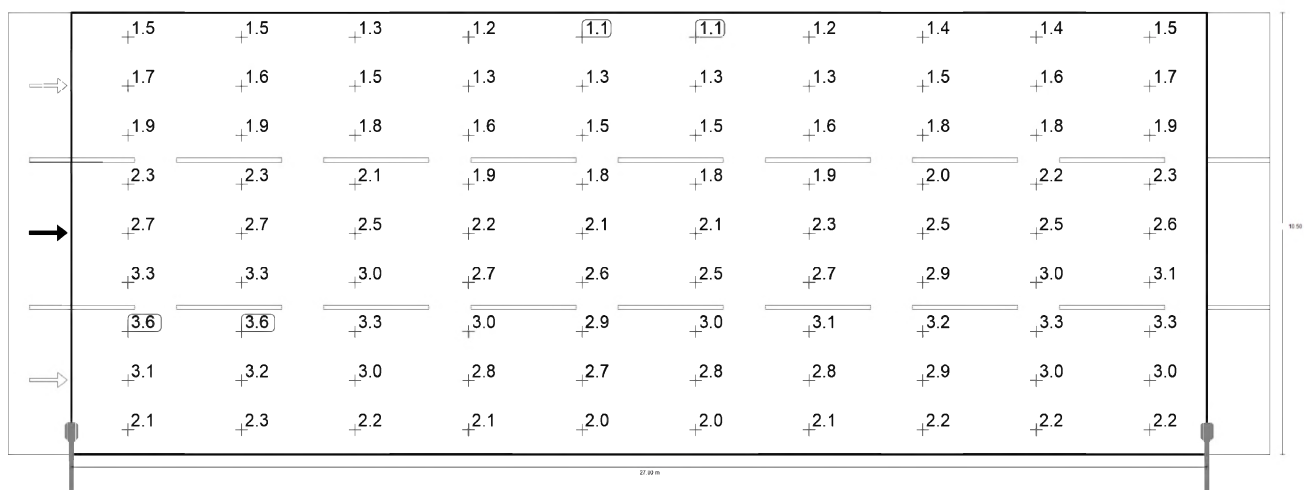
m	1.350	4.050	6.750	9.450	12.150	14.850	17.550	20.250	22.950	25.650
9.917	1.75	1.73	1.57	1.36	1.31	1.31	1.41	1.60	1.72	1.79
8.750	1.92	1.89	1.74	1.51	1.47	1.47	1.56	1.78	1.89	1.99
7.583	2.14	2.13	1.97	1.74	1.64	1.66	1.77	1.99	2.12	2.24
6.417	2.46	2.44	2.25	2.02	1.90	1.93	2.09	2.27	2.41	2.53
5.250	2.88	2.87	2.65	2.36	2.22	2.23	2.41	2.62	2.78	2.92
4.083	3.31	3.35	3.08	2.78	2.63	2.65	2.87	3.08	3.21	3.31
2.917	3.76	3.80	3.47	3.18	3.07	3.06	3.23	3.44	3.60	3.68
1.750	3.84	3.99	3.71	3.47	3.39	3.38	3.46	3.57	3.62	3.66
0.583	3.15	3.40	3.22	3.04	2.96	2.96	2.99	3.04	3.03	3.05

Observer 1: Luminance with new installation [cd/m²] (Value chart)

	L _{av}	L _{min}	L _{max}	g ₁	g ₂
Observer 1: Luminance with new installation	2.58 cd/m²	1.31 cd/m²	3.99 cd/m²	0.508	0.328

TIP 5

Roadway 1 (M1)

Observer 2: Maintenance value, luminance with dry roadway [cd/m^2] (Iso-illuminance curves)Observer 2: Maintenance value, luminance with dry roadway [cd/m^2] (Value grid)

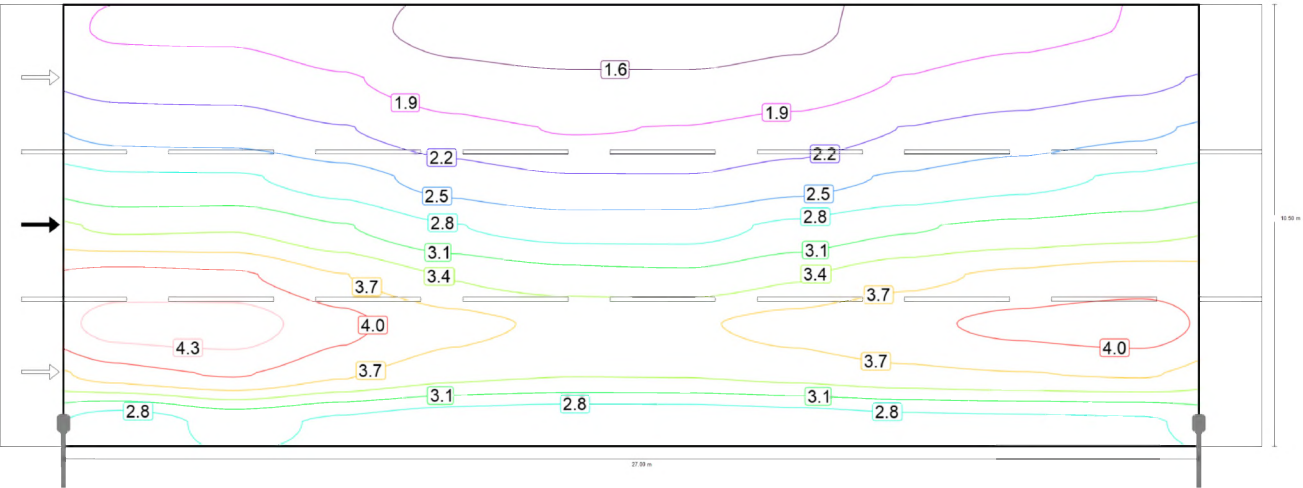
m	1.350	4.050	6.750	9.450	12.150	14.850	17.550	20.250	22.950	25.650
9.917	1.47	1.46	1.33	1.17	1.13	1.13	1.20	1.35	1.44	1.51
8.750	1.66	1.65	1.53	1.35	1.29	1.29	1.34	1.52	1.61	1.70
7.583	1.90	1.88	1.76	1.58	1.49	1.51	1.60	1.75	1.85	1.94
6.417	2.27	2.27	2.10	1.88	1.76	1.76	1.87	2.03	2.15	2.27
5.250	2.68	2.70	2.50	2.24	2.14	2.14	2.30	2.46	2.54	2.61
4.083	3.30	3.26	2.98	2.71	2.57	2.54	2.70	2.90	3.03	3.11
2.917	3.57	3.59	3.29	3.04	2.94	2.95	3.05	3.17	3.28	3.33

TIP 5
Roadway 1 (M1)

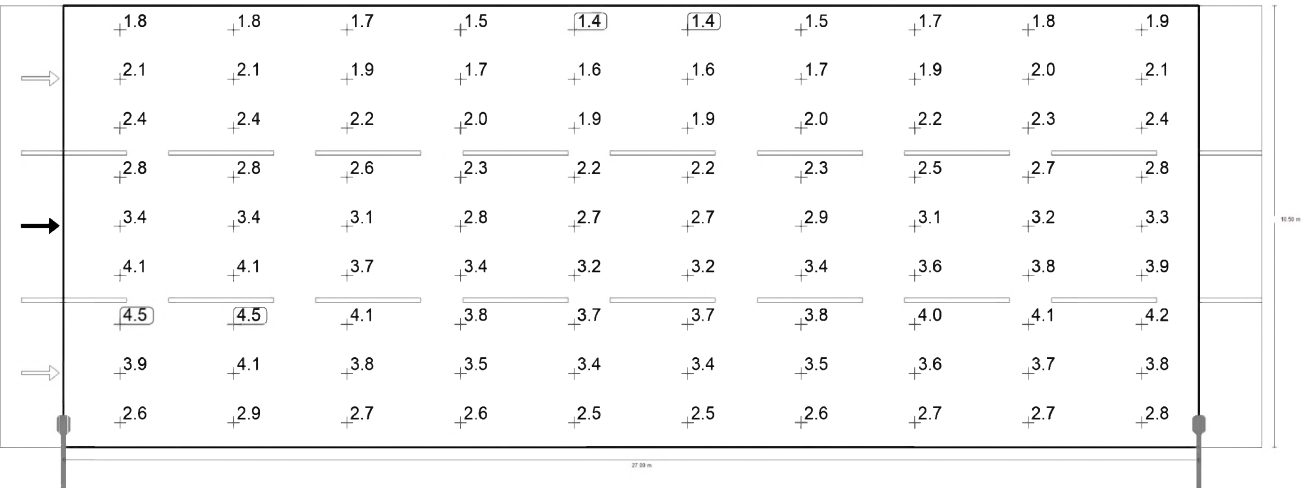
m	1.350	4.050	6.750	9.450	12.150	14.850	17.550	20.250	22.950	25.650
1.750	3.10	3.25	3.01	2.81	2.75	2.75	2.82	2.91	2.97	3.00
0.583	2.11	2.31	2.20	2.08	2.03	2.04	2.09	2.16	2.19	2.21

Observer 2: Maintenance value, luminance with dry roadway [cd/m²] (Value chart)

	L _{av}	L _{min}	L _{max}	g ₁	g ₂
Observer 2: Maintenance value, luminance with dry roadway	2.25 cd/m²	1.13 cd/m²	3.59 cd/m²	0.503	0.315



Observer 2: Luminance with new installation [cd/m²] (Iso-illuminance curves)



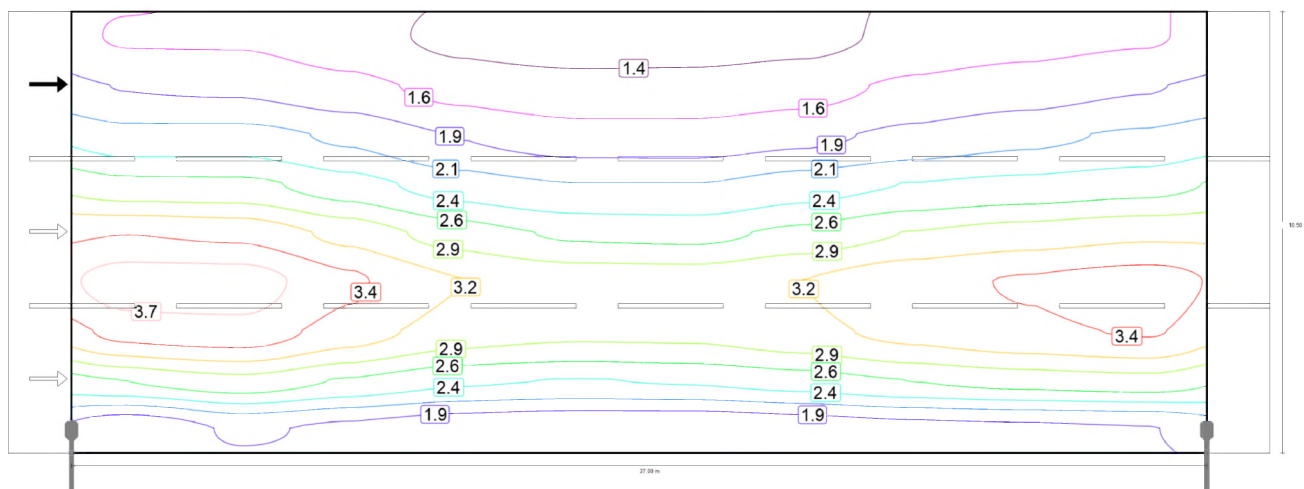
TIP 5

Roadway 1 (M1)Observer 2: Luminance with new installation [cd/m^2] (Value grid)

m	1.350	4.050	6.750	9.450	12.150	14.850	17.550	20.250	22.950	25.650
9.917	1.84	1.82	1.67	1.46	1.41	1.42	1.50	1.69	1.80	1.88
8.750	2.07	2.06	1.91	1.68	1.61	1.61	1.68	1.89	2.02	2.12
7.583	2.38	2.35	2.20	1.97	1.86	1.88	2.00	2.19	2.31	2.43
6.417	2.84	2.83	2.63	2.35	2.20	2.20	2.34	2.53	2.69	2.84
5.250	3.35	3.38	3.12	2.81	2.67	2.68	2.87	3.07	3.18	3.26
4.083	4.13	4.08	3.72	3.39	3.21	3.18	3.38	3.63	3.79	3.89
2.917	4.46	4.49	4.11	3.80	3.68	3.69	3.81	3.97	4.09	4.17
1.750	3.88	4.06	3.77	3.51	3.44	3.44	3.52	3.64	3.71	3.76
0.583	2.63	2.89	2.75	2.60	2.54	2.55	2.62	2.70	2.73	2.76

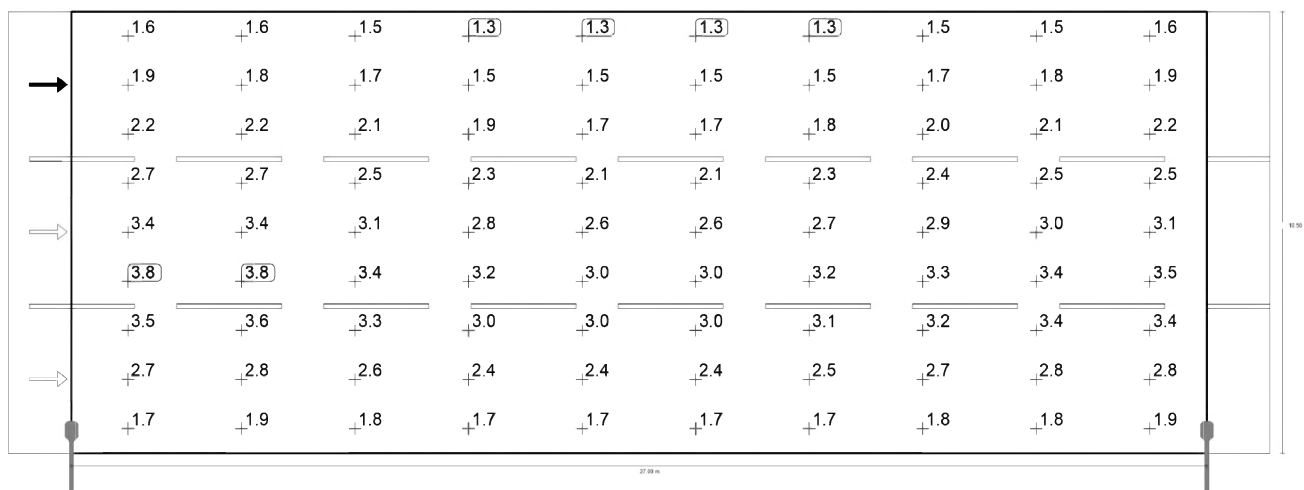
Observer 2: Luminance with new installation [cd/m^2] (Value chart)

	L_{av}	L_{min}	L_{max}	g_1	g_2
Observer 2: Luminance with new installation	2.81 cd/m^2	1.41 cd/m^2	4.49 cd/m^2	0.503	0.315

Observer 3: Maintenance value, luminance with dry roadway [cd/m^2] (Iso-illuminance curves)

TIP 5

Roadway 1 (M1)



Observer 3: Maintenance value, luminance with dry roadway [cd/m²] (Value grid)

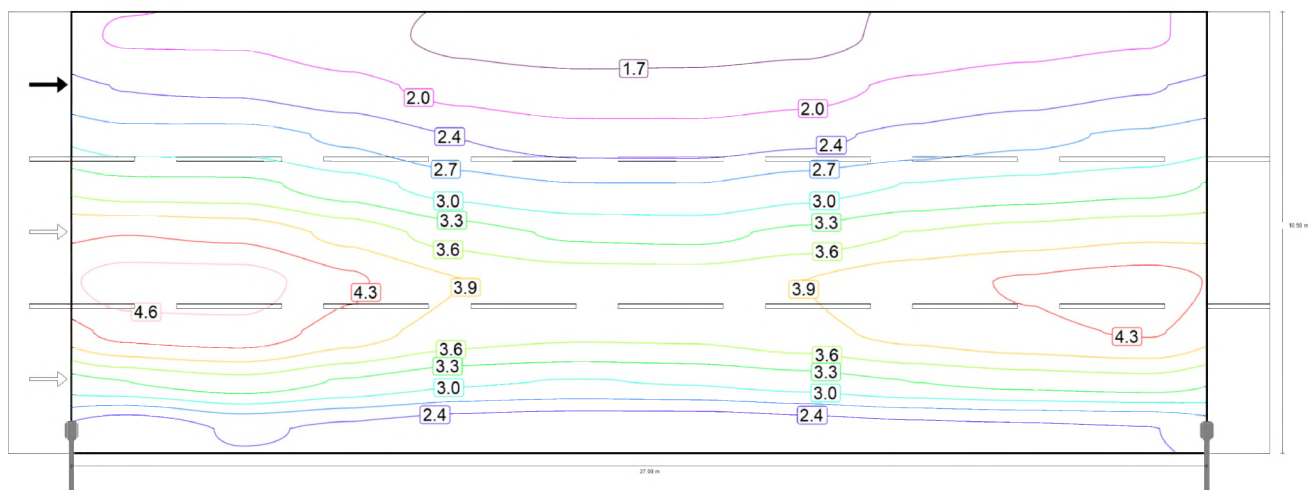
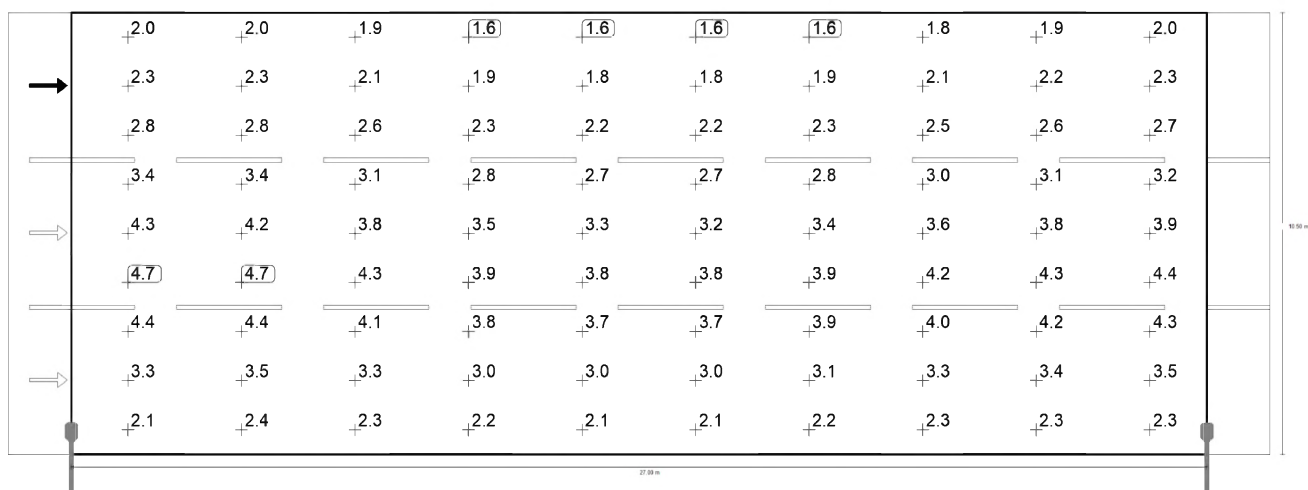
m	1.350	4.050	6.750	9.450	12.150	14.850	17.550	20.250	22.950	25.650
9.917	1.60	1.60	1.48	1.31	1.26	1.25	1.30	1.46	1.54	1.60
8.750	1.87	1.84	1.71	1.54	1.46	1.48	1.54	1.69	1.77	1.86
7.583	2.24	2.24	2.09	1.87	1.75	1.74	1.82	1.96	2.08	2.18
6.417	2.73	2.71	2.50	2.26	2.14	2.14	2.27	2.40	2.48	2.55
5.250	3.40	3.35	3.07	2.77	2.60	2.58	2.72	2.91	3.02	3.11
4.083	3.79	3.78	3.45	3.15	3.03	3.02	3.16	3.32	3.43	3.51
2.917	3.50	3.56	3.28	3.03	2.95	2.97	3.08	3.24	3.35	3.43
1.750	2.65	2.82	2.62	2.44	2.39	2.42	2.52	2.66	2.75	2.81
0.583	1.71	1.92	1.84	1.73	1.67	1.67	1.74	1.81	1.85	1.88

Observer 3: Maintenance value, luminance with dry roadway [cd/m²] (Value chart)

	L _{av}	L _{min}	L _{max}	g ₁	g ₂
Observer 3: Maintenance value, luminance with dry roadway	2.39 cd/m²	1.25 cd/m²	3.79 cd/m²	0.525	0.331

TIP 5

Roadway 1 (M1)

Observer 3: Luminance with new installation [cd/m^2] (Iso-illuminance curves)Observer 3: Luminance with new installation [cd/m^2] (Value grid)

m	1.350	4.050	6.750	9.450	12.150	14.850	17.550	20.250	22.950	25.650
9.917	2.00	2.00	1.85	1.63	1.58	1.57	1.62	1.82	1.93	2.00
8.750	2.34	2.30	2.14	1.92	1.83	1.85	1.93	2.11	2.21	2.33
7.583	2.80	2.80	2.61	2.34	2.18	2.17	2.27	2.45	2.59	2.73
6.417	3.41	3.39	3.13	2.83	2.68	2.68	2.84	3.00	3.09	3.19
5.250	4.25	4.19	3.84	3.46	3.25	3.22	3.40	3.64	3.78	3.89
4.083	4.73	4.72	4.31	3.94	3.79	3.78	3.95	4.16	4.29	4.38
2.917	4.37	4.45	4.10	3.79	3.69	3.71	3.85	4.05	4.19	4.29

TIP 5

Roadway 1 (M1)

m	1.350	4.050	6.750	9.450	12.150	14.850	17.550	20.250	22.950	25.650
1.750	3.32	3.52	3.28	3.05	2.98	3.03	3.15	3.32	3.44	3.51
0.583	2.13	2.40	2.30	2.16	2.09	2.09	2.17	2.26	2.31	2.35

Observer 3: Luminance with new installation [cd/m²] (Value chart)

	L _{av}	L _{min}	L _{max}	g ₁	g ₂
Observer 3: Luminance with new installation	2.98 cd/m ²	1.57 cd/m ²	4.73 cd/m ²	0.525	0.331

Glossary

A

A

Formula symbol for a surface in the geometry

B

Background area

The background area borders the direct ambient area according to DIN EN 12464-1 and reaches up to the borders of the room. In larger rooms, the background area is at least 3 m wide. It is located horizontally at floor level.

C

CCT

(Engl. correlated colour temperature) Body temperature of a thermal radiator which serves to describe its light colour. Unit: Kelvin [K]. The lesser the numerical value the redder; the greater the numerical value the bluer the light colour. The colour temperature of gas-discharge lamps and semi-conductors are termed "correlated colour temperature" in contrast to the colour temperature of thermal radiators. Allocation of the light colours to the colour temperature ranges acc. to EN 12464-1: Light colour - colour temperature [K] warm white (ww) 5.300 K

Clearance height

The designation for the distance between upper edge of the floor and bottom edge of the ceiling (in the completely furnished status of room).

CRI

(Engl. colour rendering index) Designation for the colour rendering index of a luminaire or a lamp acc. to DIN 6169: 1976 or CIE 13.3: 1995. The general colour rendering index Ra (or CRI) is a dimensionless figure that describes the quality of a white light source in regards to its similarity with the remission spectra of defined 8 test colours (see DIN 6169 or CIE 1974) to a reference light source.

D

Daylight factor

Ratio of the illuminance achieved solely by daylight incidence at a point in the inside to the horizontal illuminance in the outer area under an unobstructed sky. Formula symbol: D (Engl. daylight factor) Unit: %

Daylight quotient effective area

A calculation surface within which the daylight quotient is calculated.

Glossary

E

Eta (η)	(light output ratio) The light output ratio describes what percentage of the luminous flux of a free radiating lamp (or LED module) is emitted by the luminaire when installed. Unit: %
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G

g_1	Often also U_o (Engl. overall uniformity) Designates the overall uniformity of the illuminance on a surface. It is the quotient from E_{min} to \bar{E} and is required, for instance, in standards for illumination of workstations.
g_2	Actually it designates the "non-uniformity" of the illuminance on a surface. It is the quotient of E_{min} to E_{max} and is generally only relevant for certifying the emergency lighting acc. to EN 1838.

I

Illuminance	Describes the ratio of the luminous flux that strikes a certain surface to the size of this surface ($lm/m^2 = lx$). The illuminance is not tied to an object surface. It can be determined anywhere in space (inside or outside). The illuminance is not a product feature because it is a recipient value. Luxometers are used for measuring. Unit: Lux Abbreviation: lx Formula symbol: E
Illuminance, adaptive	For the determining of the middle adaptive illuminance on a surface, this is rastered "adaptively". In the area of large illuminance differences within the surface, the raster is subdivided finer; within lesser differences, a rougher classification is made.
Illuminance, horizontal	Illuminance that is calculated or measured on a horizontal (level) surface (this can be for example a table top or the floor). The horizontal illuminance is usually identified by the formula letter E_h .
Illuminance, perpendicular	Illuminance that is calculated or measured plumb-vertical to a surface. This needs to be taken into account for tilted surfaces. If the surface is horizontal or vertical, then there is no difference between the perpendicular and the horizontal or vertical illuminance.
Illuminance, vertical	Illuminance that is calculated or measured on a vertical surface (this can be for example the front of some shelves). The vertical illuminance is usually identified by the formula letter E_v .

L

LENI	(Engl. lighting energy numeric indicator) Lighting energy numeric indicator acc. to EN 15193 Unit: kWh/m ² year
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Glossary

LLMF	(Engl. lamp lumen maintenance factor)/acc. to CIE 97: 2005 Lamp flux maintenance factor that takes the luminous flux reduction into account of a luminaire or an LED module in the course of the operating time. The lamp flux maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no luminous flux reduction existing).
LMF	(Engl. luminaire maintenance factor)/acc. to CIE 97: 2005 Luminaire maintenance factor that takes the soiling into account of the luminaire in the course of the operating time. The luminaire maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no soiling existing).
LSF	(Engl. lamp survival factor)/acc. to CIE 97: 2005 Lamp survival factor that takes the total failure into account of a luminaire in the course of the operating time. The lamp survival factor is specified as a decimal digit and can have a maximum value of 1 (no failures existing within the time concerned or prompt replacement after the failure).
Luminance	Dimension for the "brightness impression" that the human eye has of a surface. The surface itself can emit light thereby or light striking it can be reflected (emitter value). It is the only photometric value that the human eye can perceive. Unit: Candela per square metre Abbreviation: cd/m^2 Formula symbol: L
Luminous efficacy	Ratio of the emitted luminous flux Φ [lm] to the absorbed electrical power P [W] Unit: lm/W . This ratio can be formed for the lamp or LED module (lamp or module light output), the lamp or module with control gear (system light output) and the complete luminaire (luminaire light output).
Luminous flux	Dimension for the total light output that is emitted from one light source in all directions. It is thus an "emitter value" that specifies the entire emitting output. The luminous flux of a light source can only be determined in a laboratory. A difference is made between the lamp or LED module luminous flux and the luminaire luminous flux. Unit: Lumen Abbreviation: lm Formula symbol: Φ
Luminous intensity	Describes the intensity of the light in a certain direction (emitter value). The luminous intensity is a matter of the luminous flux Φ that is emitted in a certain spherical angle Ω . The radiation characteristics of a light source are presented graphically in a light distribution curve (LDC). The luminous intensity is an SI base unit. Unit: Candela Abbreviation: cd Formula symbol: I
M	
Maintenance factor	See MF

Glossary

MF	(Engl. maintenance factor)/acc. to CIE 97: 2005 Maintenance factor as decimal number between 0 and 1 that describes the ratio of the new value of a photometric planning parameter (e.g. of the illuminance) to a maintenance value after a certain time. The maintenance factor takes into account the soiling of luminaires and rooms as well as the luminous flux reduction and the failure of light sources. The maintenance factor is taken into account either overall or determined in detail acc. to CIE 97: 2005 by the formula $RMF \times LMF \times LLMF \times LSF$.
P	
P	(Engl. power) Electric power consumption Unit: watt Abbreviation: W
R	
Reflection factor	The reflection factor of a surface describes how much of the striking light is reflected back. The reflection factor is defined by the colour of the surface.
RMF	(Engl. room maintenance factor)/acc. to CIE 97: 2005 Room maintenance factor that takes the soiling into account of the space encompassing surfaces in the course of the operating time. The room maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no soiling existing).
S	
Surrounding area	The ambient area directly borders the area of the visual task and should be planned with a width of at least 0.5 m according to DIN EN 12464-1. It is at the same height as the area of the visual task.
U	
UGR (max)	(unified glare rating) Measure for the psychological glare effect in interiors. In addition to luminaire luminance, the UGR value also depends on the position of the observer, the viewing direction and the ambient luminance. Among other things, EN 12464-1 specifies maximum permissible UGR values for various indoor workplaces.
UGR observer	Calculation point in the room, for the DIALux the UGR value is determined. The location and height of the calculation point should correspond to the typical observer position (position and eye level of the user).

Glossary

V

Visual task area	The area that is needed for carrying out the visual task in accordance with DIN EN 12464 -1. The height corresponds with the height at which the visual task is executed.
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W

Wall zone	Circumferential area between working plane and walls which is not taken into account for the calculation.
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Workplane	Virtual measuring or calculation surface at the height of the visual task that generally follows the room geometry. The working plane may also feature a wall zone.
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С. ГРАФИЧКА ДОКУМЕНТАЦИЈА



Пројекат: ИДЕЈНИ ПРОЈЕКАТ ЕЕ ИНСТАЛАЦИЈА РЕКОНСТРУКЦИЈА ИНСТАЛАЦИЈЕ ОСВЕТЉЕЊА	Одговорни пројектант: С. Стојаковић д.и.е.	Прилог/Лист: 1	Размера :	Пројектна организација: SLADJANA STOJAKOVIC PR AGENCIJA ZA INZENJERSKE DELATNOSTI I TEHNIČKO SAVETOVANJE ELEKTROKOPRING ЈБ
Објект: ЈАВНА РАСВЕТА ЖАГУБИЦА	Цртеж: Ситуација		Датум: 12.2022.	