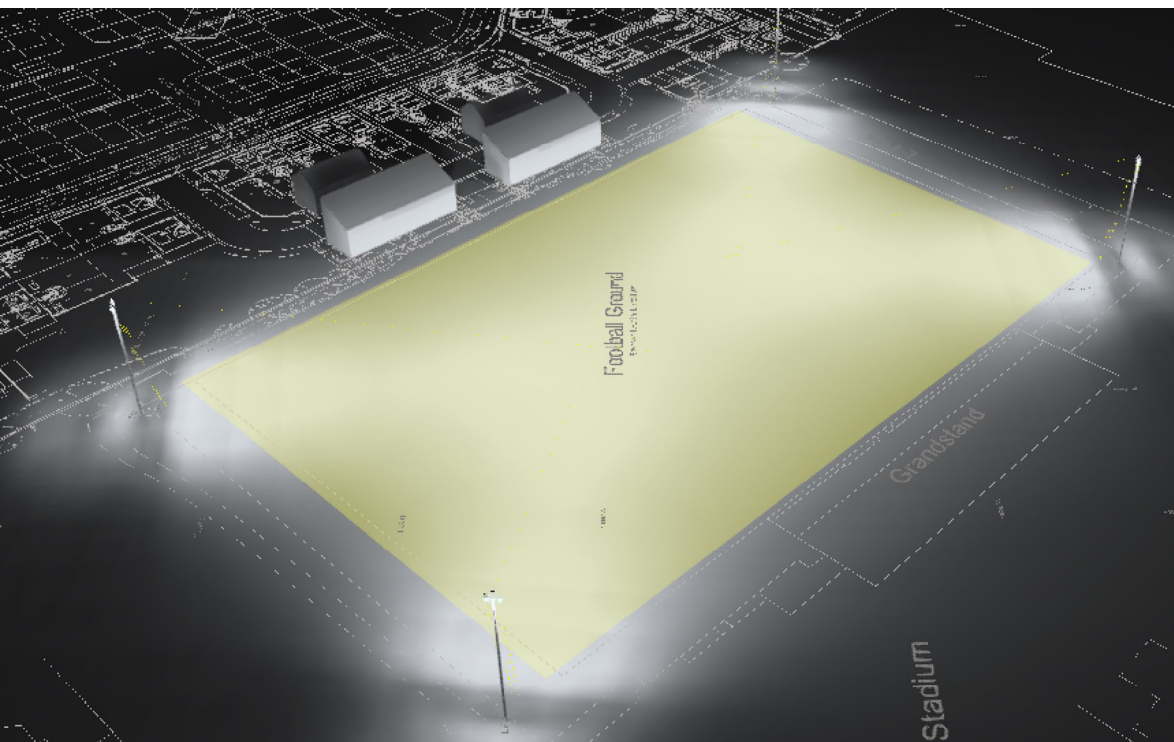




SHD969-SHD-HLG-SALI-CA-EO-Lighting Calculation-R3

Table of Contents

Cover	1
Table of Contents	2
Luminaire list	3

Product data sheets

Thorn Lighting - ALTIS 2KW R5 HQITS-S CL1 WI (1x HIT-DE OSS 2000W)	4
Thorn Lighting - Champion 2KW Osram HQI-TS long arc. V1 (1x 1 x 2000W MHN-TD, MHW-TD, MHD-TD, MHD)	5
Thorn Lighting - Champion 2KW Osram HQI-TS long arc. V2 (1x 1 x 2000W MHN-TD, MHW-TD, MHD-TD, MHD)	6

Site 1

Luminaire layout plan	7
Luminaire list	13
Calculation objects / Light scene 1	14
Football Pitch Surface / Light scene 1 / Horizontal illuminance	16

Site 1 - Plot 15

Storey 1

Calculation objects / Light scene 1	17
Plot 15 vertical calculation / Light scene 1 / Perpendicular illuminance (adaptive)	19
Plot 15 vertical calculation / Light scene 1 / Luminance	20

Site 1 - Plot 16

Storey 1

Calculation objects / Light scene 1	21
Plot 16 vertical calculation / Light scene 1 / Perpendicular illuminance (adaptive)	23
Plot 16 vertical calculation / Light scene 1 / Luminance	24

Glossary	25
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Luminaire list

Φ_{total} 4111952 lm	P_{total} 58436.0 W	Luminous efficacy 70.4 lm/W
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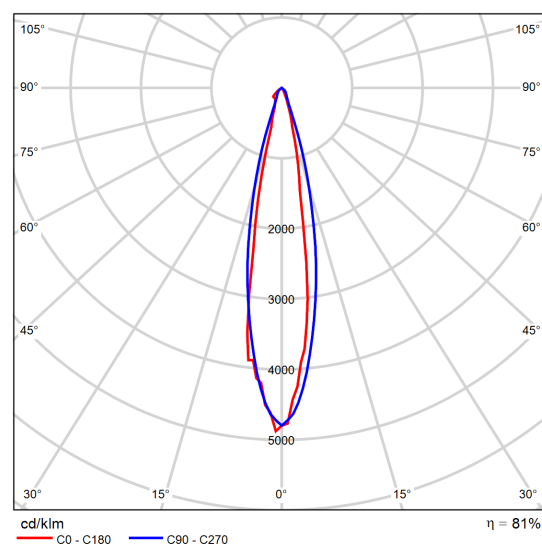
pcs.	Manufacturer	Article No.	Article name	P	Φ	Luminous efficacy
4	Thorn Lighting	96263374 (STD - standard)	ALTIS 2KW R5 HQITS-S CL1 WI	2075.0 W	162620 lm	78.4 lm/W
12	Thorn Lighting	CHAMP2SL A(V1)	Champion 2KW Osram HQI-TS long arc. V1	2089.0 W	140333 lm	67.2 lm/W
12	Thorn Lighting	CHAMP2SL A(V2)	Champion 2KW Osram HQI-TS long arc. V2	2089.0 W	148123 lm	70.9 lm/W

Product data sheet

Thorn Lighting - ALTIS 2KW R5 HQITS-S CL1 WI



Article No.	96263374 (STD - standard)
P	2075.0 W
Φ_{Lamp}	200000 lm
$\Phi_{\text{Luminaire}}$	162620 lm
η	81.31 %
Luminous efficacy	78.4 lm/W
CCT	3000 K
CRI	100



Polar LDC

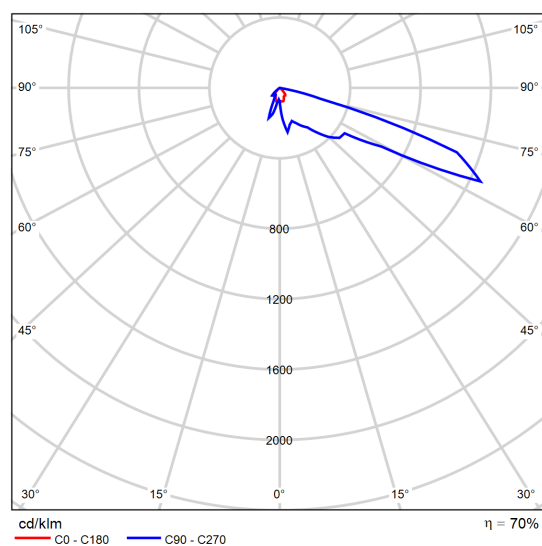
Cone diagram

Product data sheet

Thorn Lighting - Champion 2KW Osram HQI-TS long arc. V1



Article No.	CHAMP2SLA(V1)
P	2089.0 W
Φ_{Lamp}	200000 lm
$\Phi_{\text{Luminaire}}$	140333 lm
η	70.17 %
Luminous efficacy	67.2 lm/W
CCT	4000 K
CRI	100



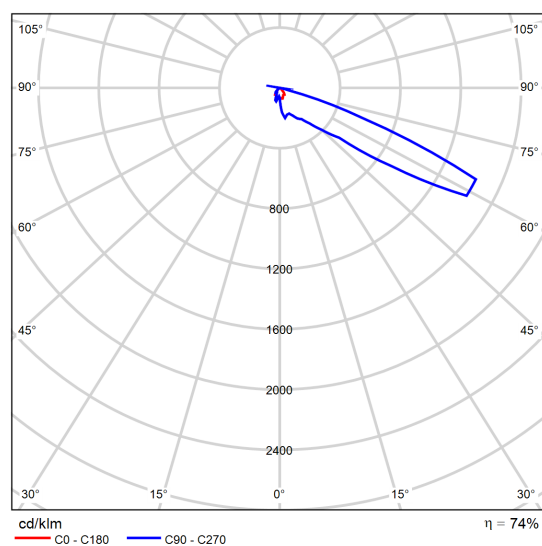
Polar LDC

Product data sheet

Thorn Lighting - Champion 2KW Osram HQI-TS long arc. V2



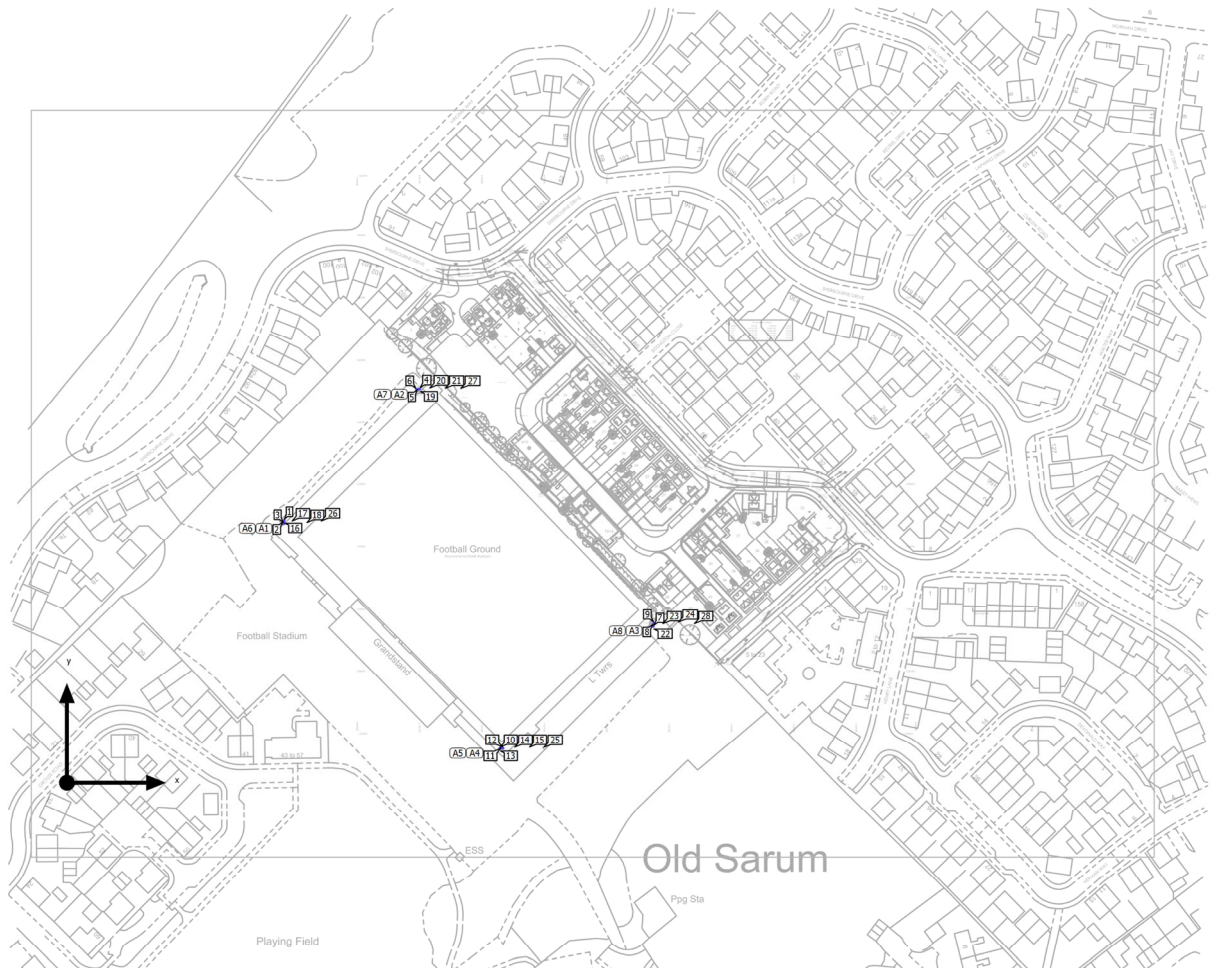
Article No.	CHAMP2SLA(V2)
P	2089.0 W
Φ_{Lamp}	200000 lm
$\Phi_{\text{Luminaire}}$	148123 lm
η	74.06 %
Luminous efficacy	70.9 lm/W
CCT	4000 K
CRI	100



Polar LDC

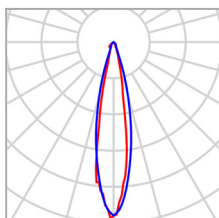
Site 1

Luminaire layout plan



Site 1

Luminaire layout plan



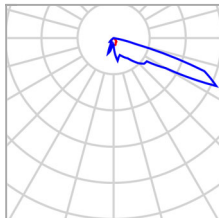
Manufacturer	Thorn Lighting	P	2075.0 W
Article No.	96263374 (STD - standard)	$\Phi_{\text{Luminaire}}$	162620 lm
Article name	ALTIS 2KW R5 HQITS-S CL1 WI		
Fitting	1x HIT-DE OSS 2000W		

Individual luminaires

X	Y	Mounting height	Luminaire
174.119 m	13.639 m	19.000 m	25
87.003 m	104.577 m	19.000 m	26
140.724 m	158.057 m	19.000 m	27
235.105 m	63.331 m	19.000 m	28

Site 1

Luminaire layout plan



Manufacturer	Thorn Lighting	P	2089.0 W
Article No.	CHAMP2SLA(V1)	$\Phi_{\text{Luminaire}}$	140333 lm
Article name	Champion 2KW Osram HQI-TS long arc. V1		
Fitting	1x 1 x 2000W MHN- TD, MHW-TD, MHD- TD, MHD		

3 x Thorn Lighting Champion 2KW Osram HQI-TS long arc. V1

Type	Line arrangement	X	Y	Mounting height	Luminaire
1st luminaire (X/Y/Z)	87.084 m / 105.246 m / 18.000 m	87.084 m	105.246 m	18.000 m	1
X-direction	3 pcs., Centre - centre, 0.667 m	86.981 m	104.588 m	18.000 m	2
		86.878 m	103.929 m	18.000 m	3
Arrangement	A1				

3 x Thorn Lighting Champion 2KW Osram HQI-TS long arc. V1

Type	Line arrangement	X	Y	Mounting height	Luminaire
1st luminaire (X/Y/Z)	141.374 m / 158.198 m / 18.000 m	141.374 m	158.198 m	18.000 m	4
X-direction	3 pcs., Centre - centre, 0.667 m	140.718 m	158.082 m	18.000 m	5
		140.061 m	157.966 m	18.000 m	6
Arrangement	A2				

3 x Thorn Lighting Champion 2KW Osram HQI-TS long arc. V1

Site 1

Luminaire layout plan

Type	Line arrangement	X	Y	Mounting height	Luminaire
1st luminaire (X/Y/Z)	234.989 m / 62.700 m / 18.000 m	234.989 m	62.700 m	18.000 m	7
X-direction	3 pcs., Centre - centre, 0.667 m	235.105 m	63.356 m	18.000 m	8
		235.221 m	64.013 m	18.000 m	9
Arrangement	A3				

3 x Thorn Lighting Champion 2KW Osram HQI-TS long arc. V1

Type	Line arrangement	X	Y	Mounting height	Luminaire
1st luminaire (X/Y/Z)	173.453 m / 13.621 m / 18.000 m	173.453 m	13.621 m	18.000 m	10
X-direction	3 pcs., Centre - centre, 0.667 m	174.119 m	13.621 m	18.000 m	11
		174.786 m	13.621 m	18.000 m	12
Arrangement	A4				

Site 1

Luminaire layout plan



Manufacturer	Thorn Lighting	P	2089.0 W
Article No.	CHAMP2SLA(V2)	$\Phi_{\text{Luminaire}}$	148123 lm
Article name	Champion 2KW Osram HQI-TS long arc. V2		
Fitting	1x 1 x 2000W MHN- TD, MHW-TD, MHD- TD, MHD		

3 x Thorn Lighting Champion 2KW Osram HQI-TS long arc. V2

Type	Line arrangement	X	Y	Mounting height	Luminaire
1st luminaire (X/Y/Z)	173.453 m / 13.621 m / 18.500 m	173.453 m	13.621 m	18.500 m	13
X-direction	3 pcs., Centre - centre, 0.667 m	174.119 m	13.621 m	18.500 m	14
		174.786 m	13.621 m	18.500 m	15
Arrangement	A5				

3 x Thorn Lighting Champion 2KW Osram HQI-TS long arc. V2

Type	Line arrangement	X	Y	Mounting height	Luminaire
1st luminaire (X/Y/Z)	87.084 m / 105.246 m / 18.500 m	87.084 m	105.246 m	18.500 m	16
X-direction	3 pcs., Centre - centre, 0.667 m	86.981 m	104.588 m	18.500 m	17
		86.878 m	103.929 m	18.500 m	18
Arrangement	A6				

3 x Thorn Lighting Champion 2KW Osram HQI-TS long arc. V2

Site 1

Luminaire layout plan

Type	Line arrangement	X	Y	Mounting height	Luminaire
1st luminaire (X/Y/Z)	141.376 m / 158.178 m / 18.500 m	141.376 m	158.178 m	18.500 m	19
X-direction	3 pcs., Centre - centre, 0.667 m	140.720 m	158.062 m	18.500 m	20
		140.063 m	157.946 m	18.500 m	21
Arrangement	A7				

3 x Thorn Lighting Champion 2KW Osram HQI-TS long arc. V2

Type	Line arrangement	X	Y	Mounting height	Luminaire
1st luminaire (X/Y/Z)	234.970 m / 62.696 m / 18.500 m	234.970 m	62.696 m	18.500 m	22
X-direction	3 pcs., Centre - centre, 0.667 m	235.084 m	63.353 m	18.500 m	23
		235.198 m	64.010 m	18.500 m	24
Arrangement	A8				

Site 1

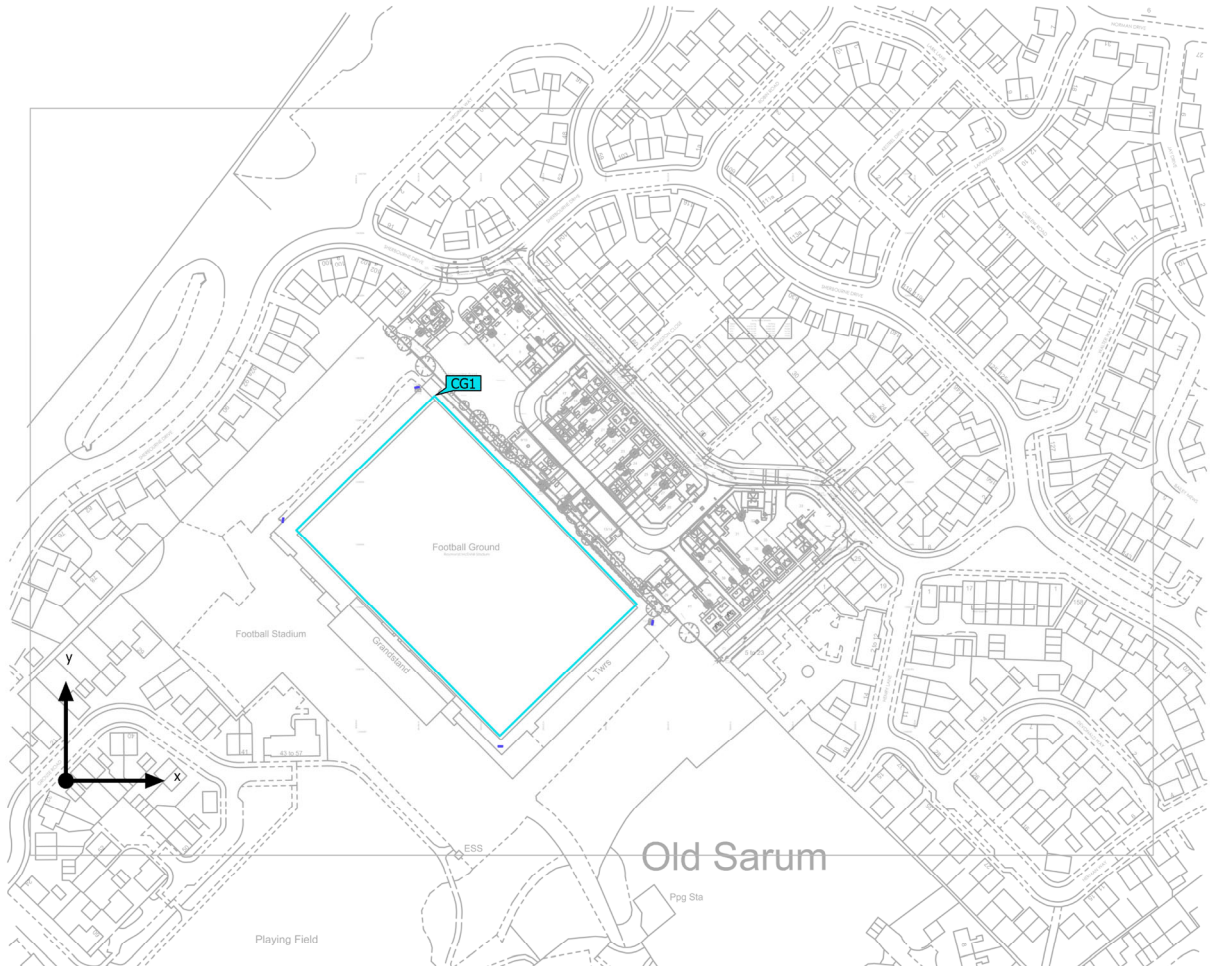
Luminaire list

Φ_{total} 4111952 lm	P_{total} 58436.0 W	Luminous efficacy 70.4 lm/W
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pcs.	Manufacturer	Article No.	Article name	P	Φ	Luminous efficacy
4	Thorn Lighting	96263374 (STD - standard)	ALTIS 2KW R5 HQITS-S CL1 WI	2075.0 W	162620 lm	78.4 lm/W
12	Thorn Lighting	CHAMP2SL A(V1)	Champion 2KW Osram HQI-TS long arc. V1	2089.0 W	140333 lm	67.2 lm/W
12	Thorn Lighting	CHAMP2SL A(V2)	Champion 2KW Osram HQI-TS long arc. V2	2089.0 W	148123 lm	70.9 lm/W

Site 1 (Light scene 1)

Calculation objects



Site 1 (Light scene 1)

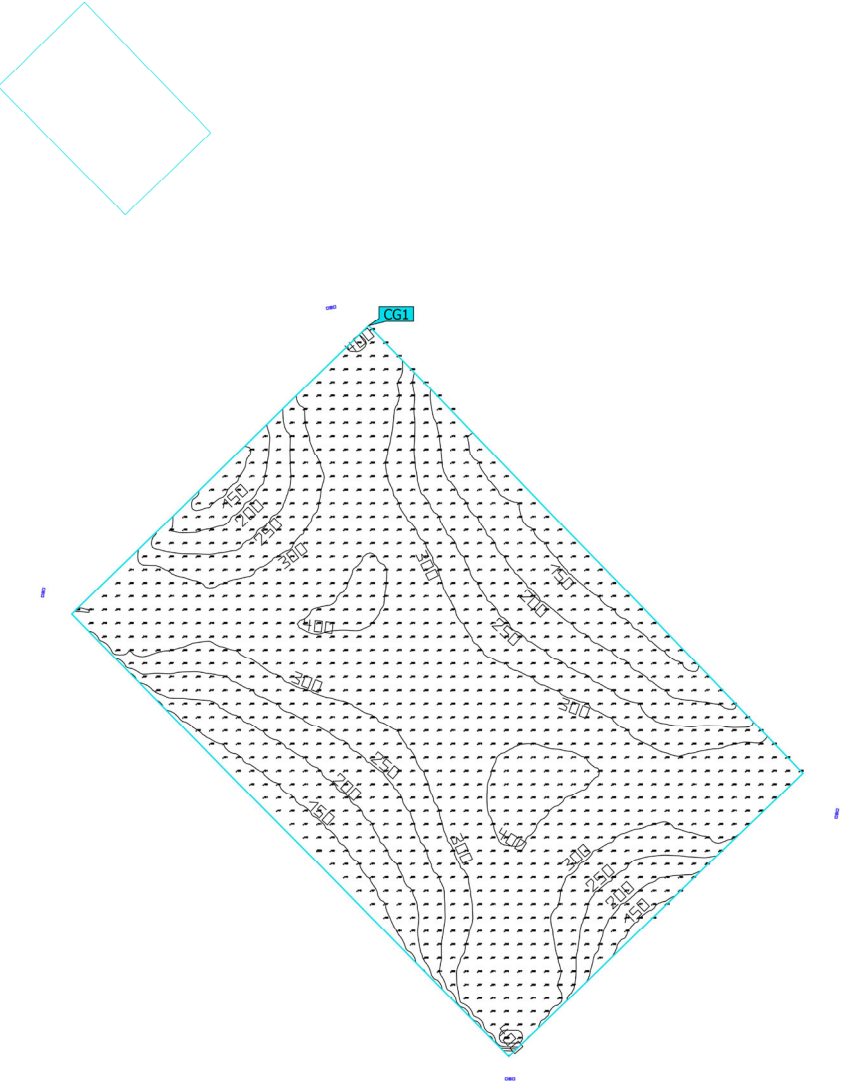
Calculation objects

Calculation surfaces

Properties	$\bar{E}$	$E_{\min}$	$E_{\max}$	$U_o (g_1)$	g_2	Index
Football Pitch Surface Horizontal illuminance Height: 0.000 m	284 lx	111 lx	464 lx	0.39	0.24	CG1

Utilisation profile: General circulation areas at outdoor workplaces (5.1.3 Regular vehicle traffic (max. 40km/h))

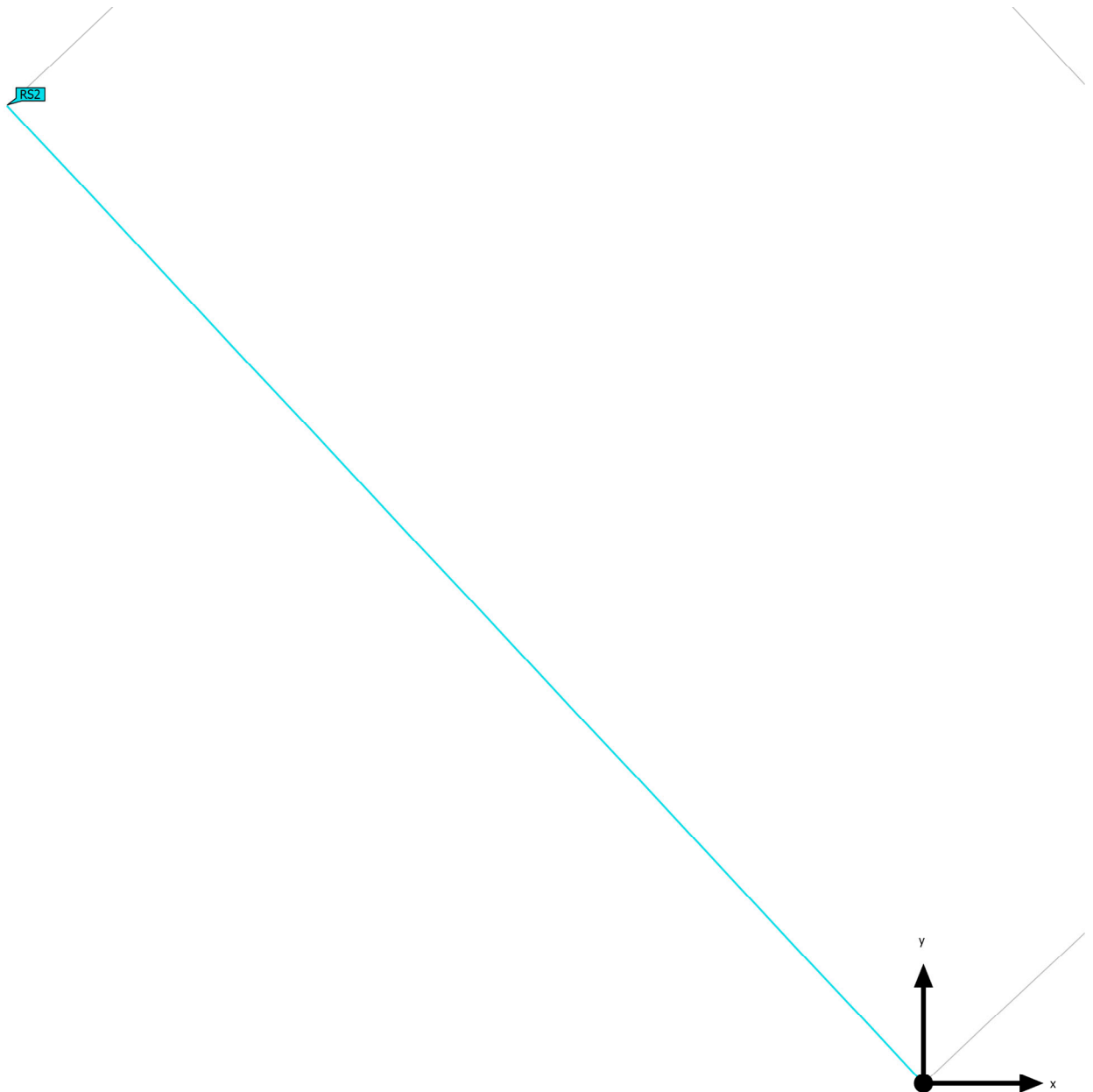
Site 1 (Light scene 1)
Football Pitch Surface



Properties	$\bar{E}$	E_{min}	E_{max}	$U_o (g_1)$	g_2	Index
Football Pitch Surface Horizontal illuminance Height: 0.000 m	284 lx	111 lx	464 lx	0.39	0.24	CG1

Utilisation profile: General circulation areas at outdoor workplaces (5.1.3 Regular vehicle traffic (max. 40km/h))

Plot 15 · Storey 1 (Light scene 1)

Calculation objects

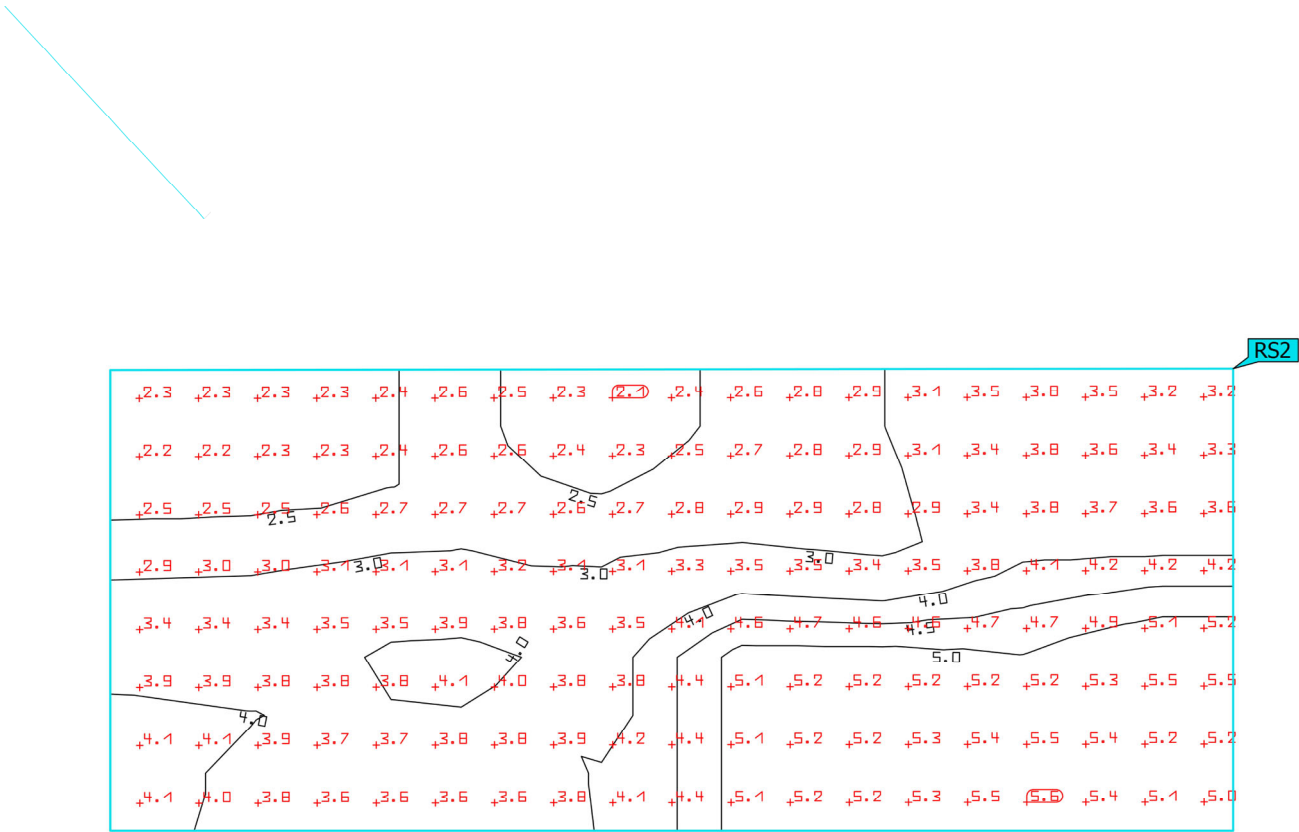
Plot 15 · Storey 1 (Light scene 1)

Calculation objects

Surface result objects

Properties	Ø	min	max	U _o (g ₁)	g ₂	Index
Plot 15 vertical calculation Perpendicular illuminance (adaptive) Height: 2.358 m	3.70 lx	2.21 lx	5.50 lx	0.60	0.40	RS2
Plot 15 vertical calculation Luminance Height: 2.358 m	0.59 cd/m ²	0.35 cd/m ²	0.87 cd/m ²	0.59	0.40	RS2

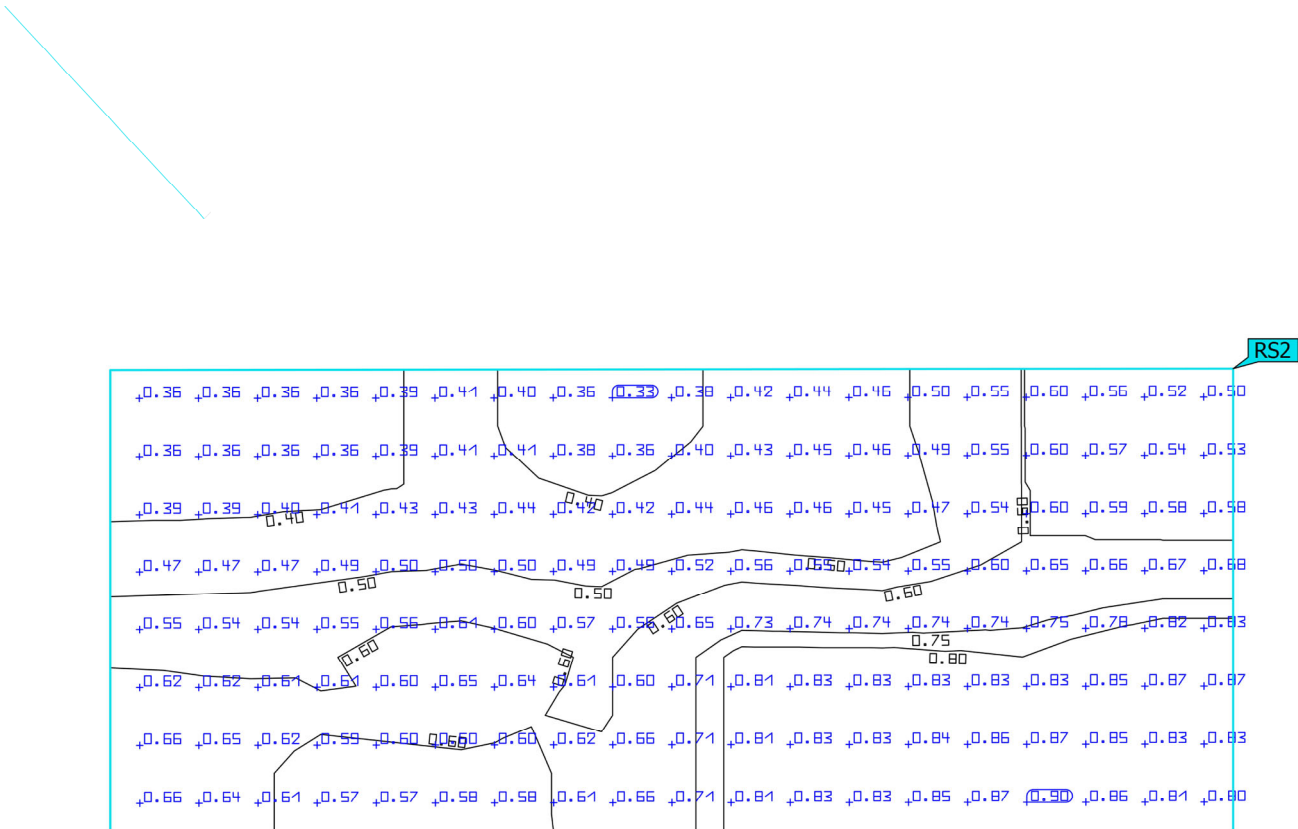
Plot 15 · Storey 1 (Light scene 1)
Plot 15 vertical calculation



Properties	$\bar{E}$	E_{min}	E_{max}	$U_o (g_1)$	g_2	Index
Plot 15 vertical calculation	3.70 lx	2.21 lx	5.50 lx	0.60	0.40	RS2
Perpendicular illuminance (adaptive)						
Height: 2.358 m						

Plot 15 · Storey 1 (Light scene 1)

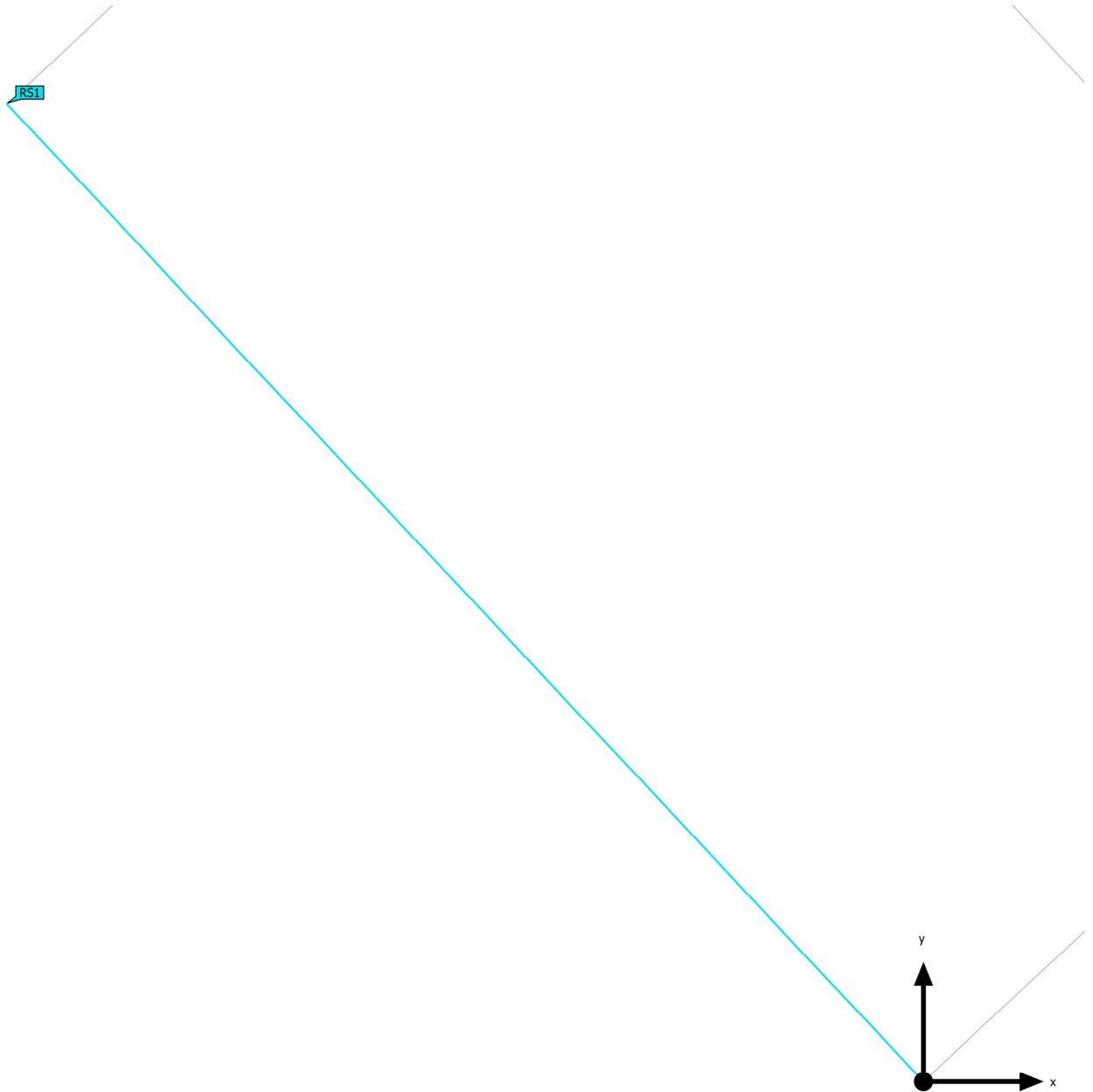
Plot 15 vertical calculation



Properties	Ø	min	max	U _o (g ₁)	g ₂	Index
Plot 15 vertical calculation Luminance Height: 2.358 m	0.59 cd/m ²	0.35 cd/m ²	0.87 cd/m ²	0.59	0.40	RS2

Plot 16 · Storey 1 (Light scene 1)

Calculation objects



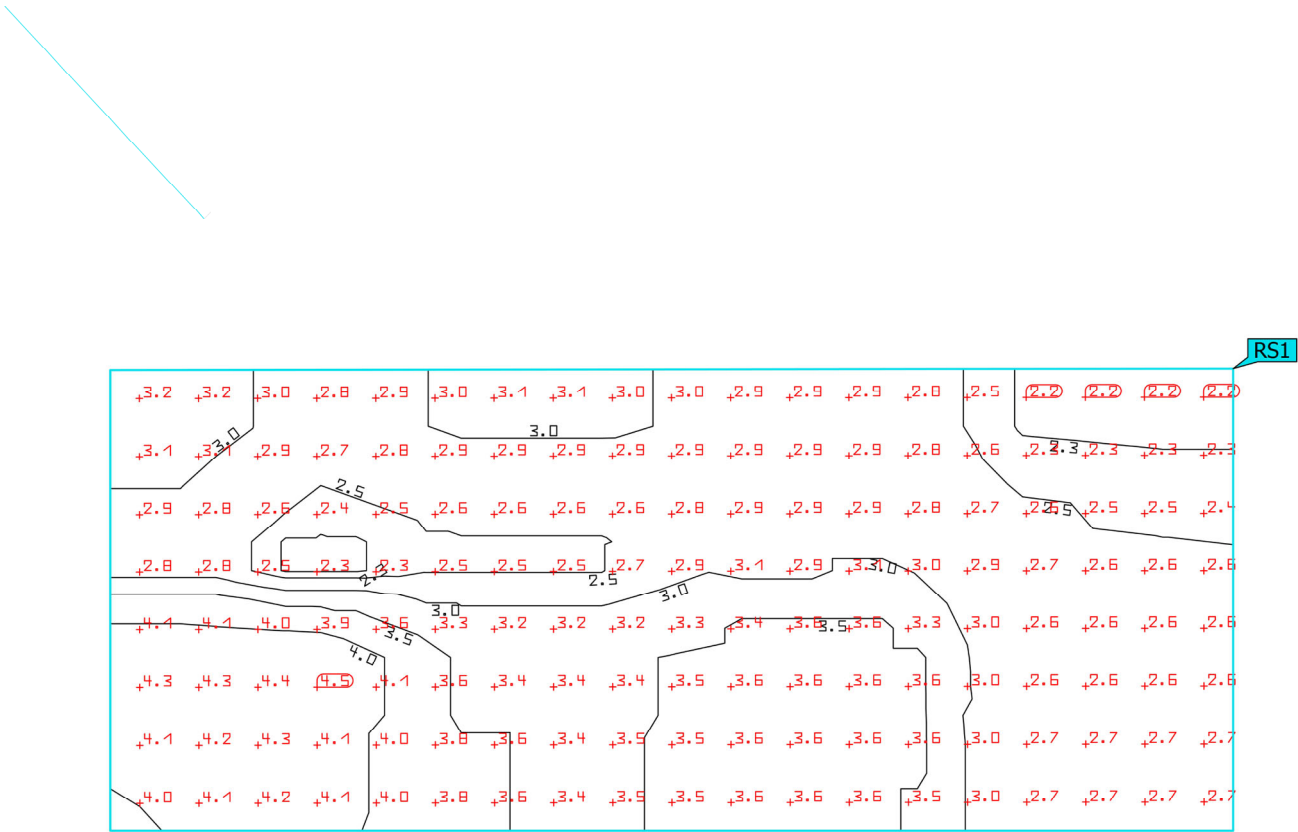
Plot 16 · Storey 1 (Light scene 1)

Calculation objects

Surface result objects

Properties	Ø	min	max	U _o (g ₁)	g ₂	Index
Plot 16 vertical calculation Perpendicular illuminance (adaptive) Height: 2.358 m	3.11 lx	2.17 lx	4.34 lx	0.70	0.50	RS1
Plot 16 vertical calculation Luminance Height: 2.358 m	0.50 cd/m ²	0.35 cd/m ²	0.69 cd/m ²	0.70	0.51	RS1

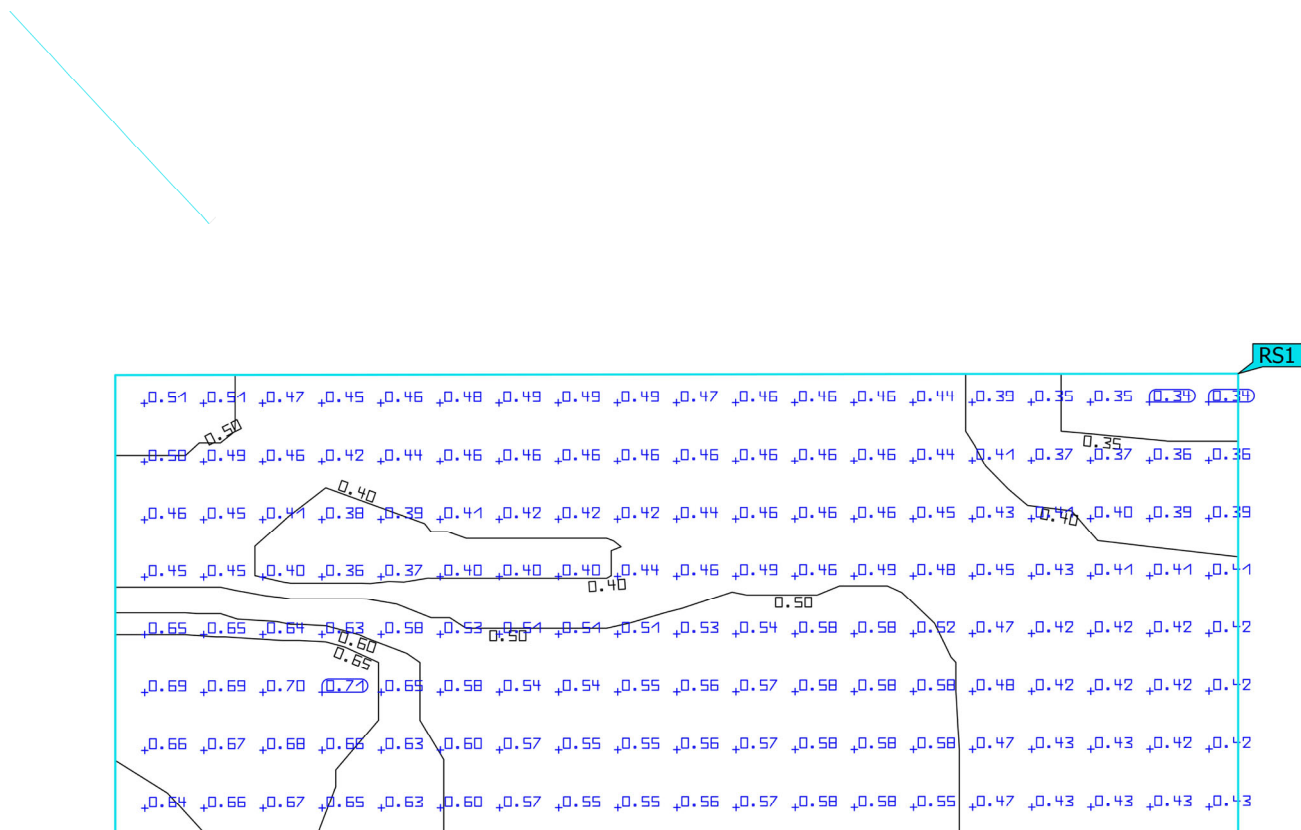
Plot 16 · Storey 1 (Light scene 1)
Plot 16 vertical calculation



Properties	$\bar{E}$	E_{min}	E_{max}	$U_o (g_1)$	g_2	Index
Plot 16 vertical calculation	3.11 lx	2.17 lx	4.34 lx	0.70	0.50	RS1
Perpendicular illuminance (adaptive)						
Height: 2.358 m						

Plot 16 · Storey 1 (Light scene 1)

Plot 16 vertical calculation



Properties	Ø	min	max	U _o (g ₁)	g ₂	Index
Plot 16 vertical calculation Luminance Height: 2.358 m	0.50 cd/m ²	0.35 cd/m ²	0.69 cd/m ²	0.70	0.51	RS1

Glossary

A

A	Formula symbol for a surface in the geometry
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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.
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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) < 3,300 K neutral white (nw) ≥ 3,300 – 5,300 K daylight white (dw) > 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).
Control group	A group of luminaires that are dimmed and controlled together. For each lighting scene, a control group provides its own dimming value. All luminaires within a control group share this dimming value. The control groups with their luminaires are automatically determined by DIALux on the basis of the created light scenes and their luminaire groups.
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.

Glossary

D

Daylight autonomy	Describes what percentage of the daily working time the required illuminance is met by daylight. The nominal illuminance is used from the room profile, unlike described in EN 17037. The calculation is not done in the centre of the room but at the placed sensor measuring point. A room is considered sufficiently supplied with daylight if it achieves at least 50% daylight autonomy.
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.

E

Energy evaluation	Based on an hourly calculation procedure for daylight in indoor spaces, considering the project geometry and any existing daylight control systems. Orientation and location of the project are also considered. The calculation uses the specified system power of the luminaires to determine the energy demand. A linear relationship between power and luminous flux in the dimmed state is assumed for daylight-controlled luminaires. Times of use and nominal illuminance are determined from the usage profiles of the spaces. Switched-on luminaires that are explicitly excluded from control also consider the specified times-of-use. The daylight control systems use a simplified control logic that closes them at an outdoor horizontal illuminance of 27,500lx. The calendar year 2022 is used as a reference only. It is not a simulation of this year. The reference year is only used to assign the days of the week to the calculated results. The changeover to summer time is not considered. The reference sky type used is the average sky described in CIE 110 without direct sunlight. The method was developed together with the Fraunhofer Institute for Building Physics and is available for review by the Joint Working Group 1 ISO TC 274 as an extension of the previous annual regression-based method.
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: %

Glossary

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: $kWh/(m^2 \cdot a)$
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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

Glossary

M

Maintenance factor	See MF
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
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R

$R_{(UG)} \max$	Measure of the psychological glare in indoor spaces. In addition to the luminance of luminaires, the level of the $R_{(UG)}$ value also depends on the observer position, the viewing direction and the ambient luminance. The calculation is made according to the table method, see CIE 117. Among other things, EN 12464-1:2021 specifies maximum permissible $R_{(UG)}$-values $R_{(UGL)}$ for various indoor workplaces.
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.
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Glossary

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).

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.
------------------	---

W

Wall zone	Circumferential area between working plane and walls which is not taken into account for the calculation.
Working plane	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.