PENGENALAN REKABENTUK LAMPU JALAN

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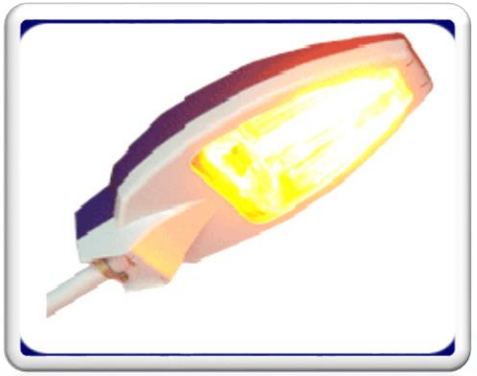
JENIS LAMPU JALAN

- High Pressure Sodium Vapour (HPSV)



- Metal Halide

- Induction

- Solid State Lighting (LED)

JENIS TIANG LAMPU JALAN

- ❖Hot Dipped Galvanised
- ❖Fibreglass Reinforced
- ❖Pre-Stressed Spun Concrete

SISTEM LAMPU JALAN

1) **Luminous flux, ϕ (lm) –** The amount of light radiated from a light source.
2) **Luminous Intencity, I (cd)** – Amount of light leaving the source propagated in an element or solid angle containing the given direction and the element of the solid angle.
3) **Illuminance, E (lux)** - Luminous flux incident on an element of the surface
4) **Luminance, L (cd/m2) –** luminous intensity unit area of travelling light in a given direction

LUMINOUS FLUX (LUMEN)

1

2

LIGHT INTENSITY (cd)

LUMINANCE (cd/m^2)

4

ROAD SURFACE

3

ILLUMINANCE (LUX)

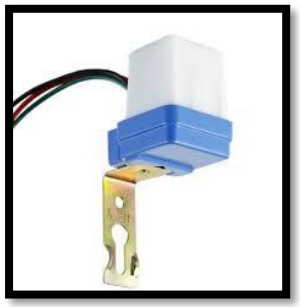
1 & 2 = **FROM LIGHT SOURCE**

3 & 4 = **RESULTS OF LIGHT SOURCE**

SERVICE DOOR

TERMINAL BLOCK / MODULAR TERMINATION BOX

PHOTOCELL



Photocells act as light sensors

HIGH-MAST LIGHTING

High-mast lighting is a tall pole with lighting attached to the top pointing towards the ground

PLANTED TYPE POLE

FLANGED TYPE POLE

CONCRETE BASE/FOUNDATION

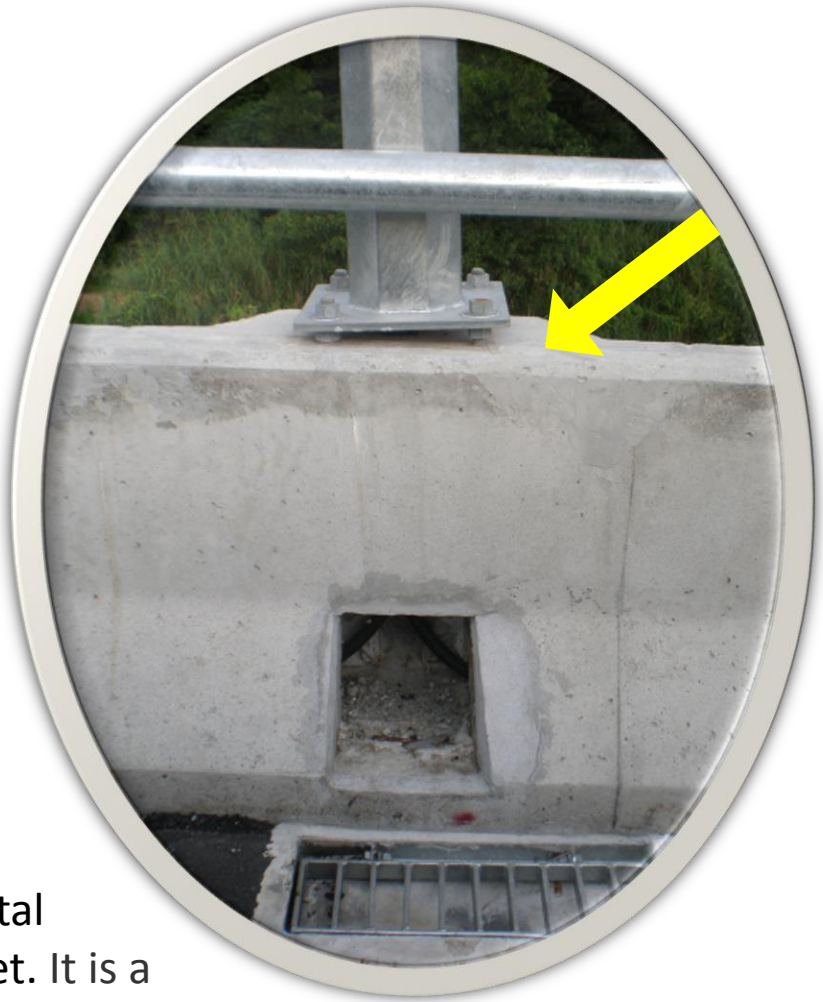
DECORATIVE POLE

FEEDER PILLAR

PARAPET WALL

A parapet wall is a low wall, usually enclosing a roof, or a protective barrier at the edge of a terrace or on the side of a bridge. In modern use, one is constructed to provide a barrier to prevent people or objects from falling from the edge of the structure

CORBEL

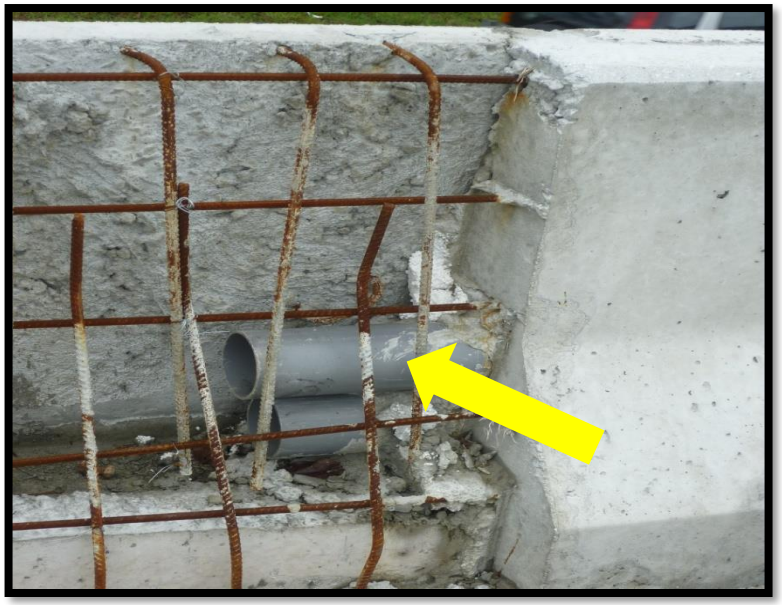


A **corbel** is a structural piece of stone, wood or metal jutting from a wall to carry weight, a type of bracket. It is a bracket or support attached to and protruding from a wall. Corbels are laid in brickwork, built from wood for millwork, and made from metal for structural support of an offset load, such as on a column.

NEW JERSEY BARRIER (NJB)

Jersey Barriers are designed to redirect a crash, using the car's momentum to absorb the impact and slide the vehicle up parallel along the side of the barrier to prevent a rollover.

CABLE DUCTS



- Galvanised steel pipe
- uPVC pipe
- HDPE corrugated pipe

GUARDRAIL

A strong fence at the side of a road or in the middle of an expressway, intended to reduce the risk of serious accidents; a crash barrier

ROAD KERB

The edge where a raised sidewalk/pavement or road median/central reservation meets a street or other roadway.

MEDIAN

The strip of land between the carriageways of a motorway or other major road; a central reservation.

PAVEMENT

ASPHALT

CONCRETE

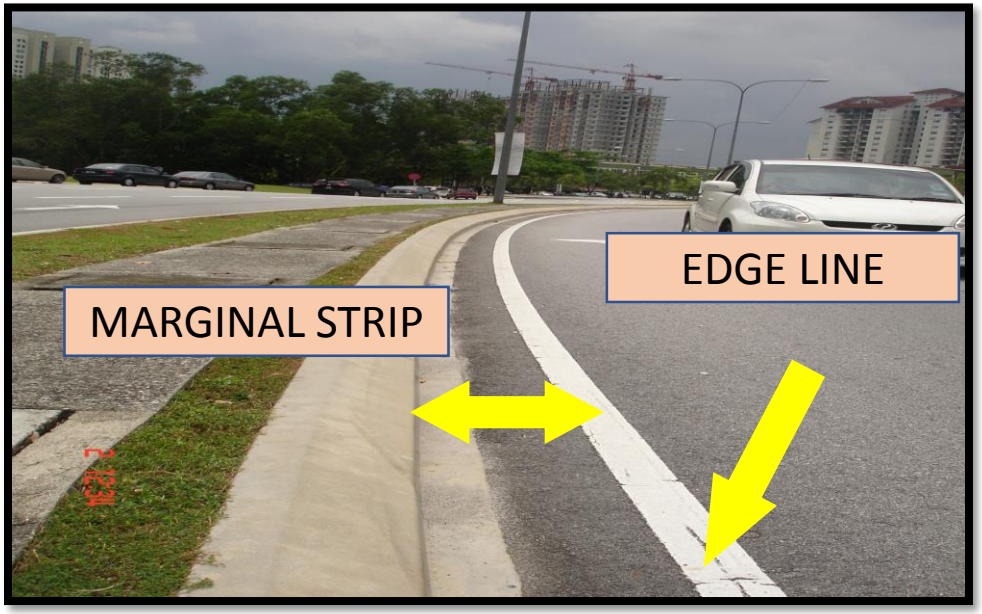
The hard surface of a road or street

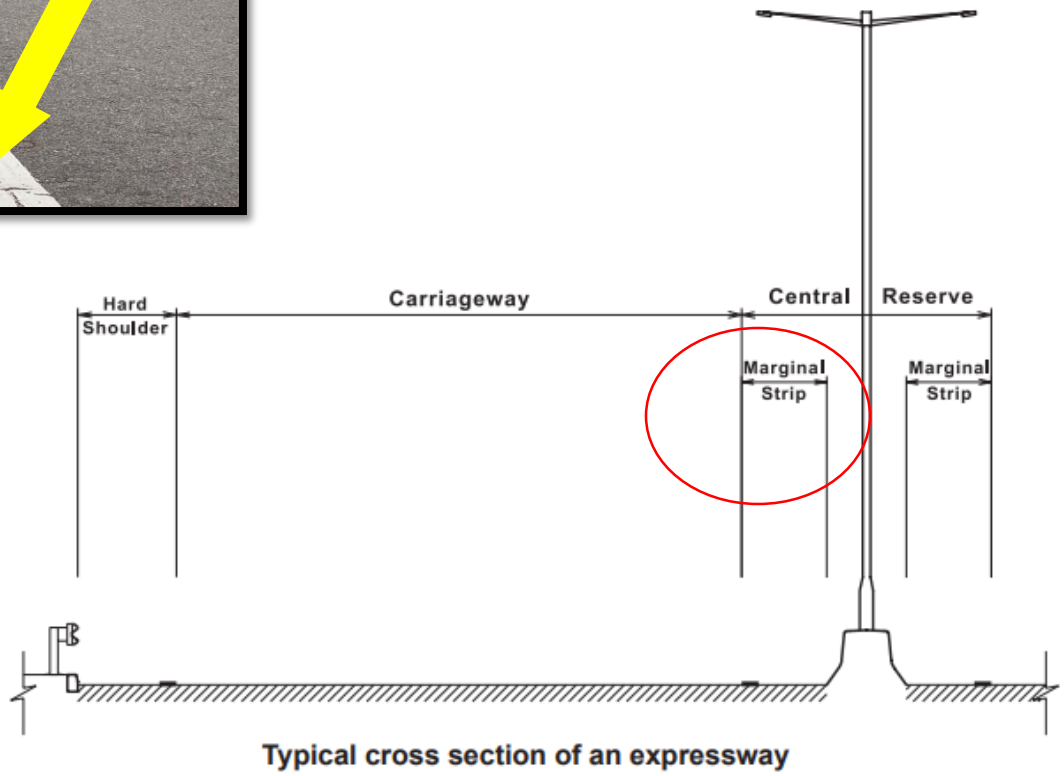
PAVED SHOULDER

TRAFFIC ISLAND

GHOST ISLAND

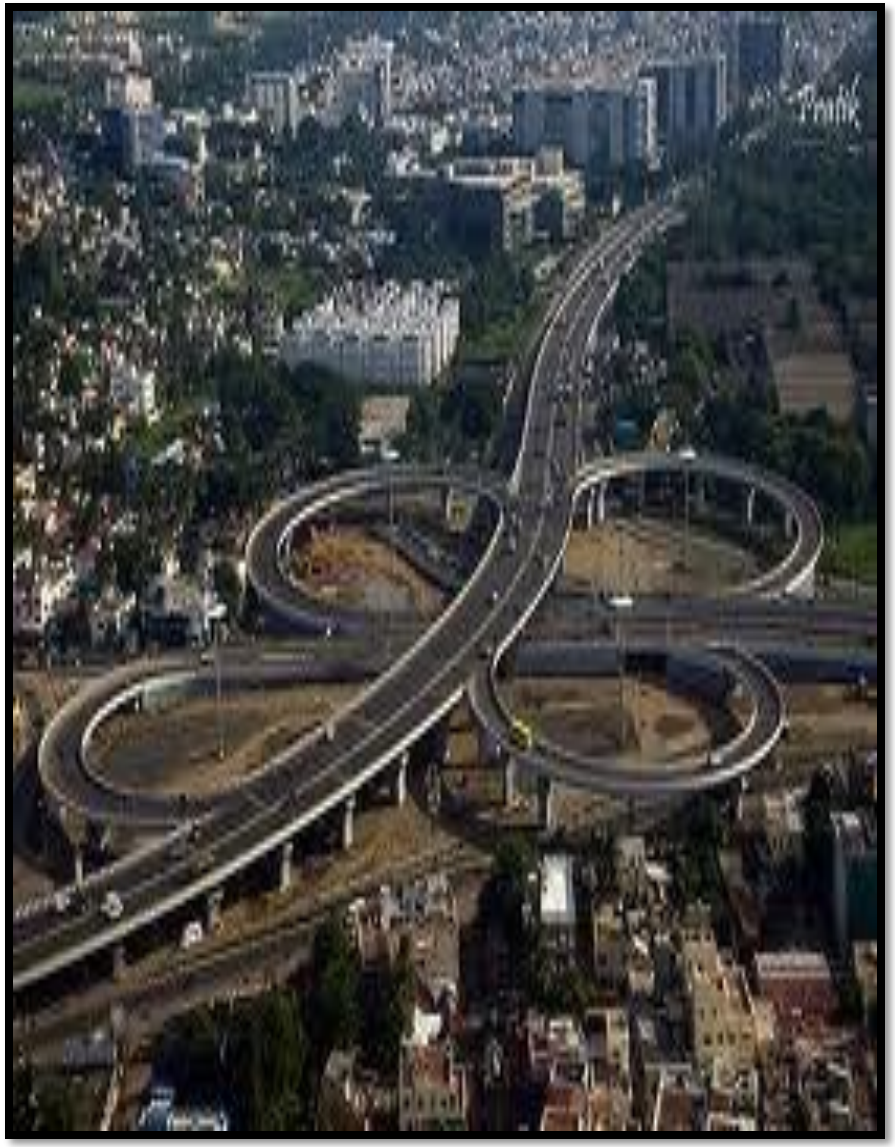
MARGINAL STRIP & EDGE LINE



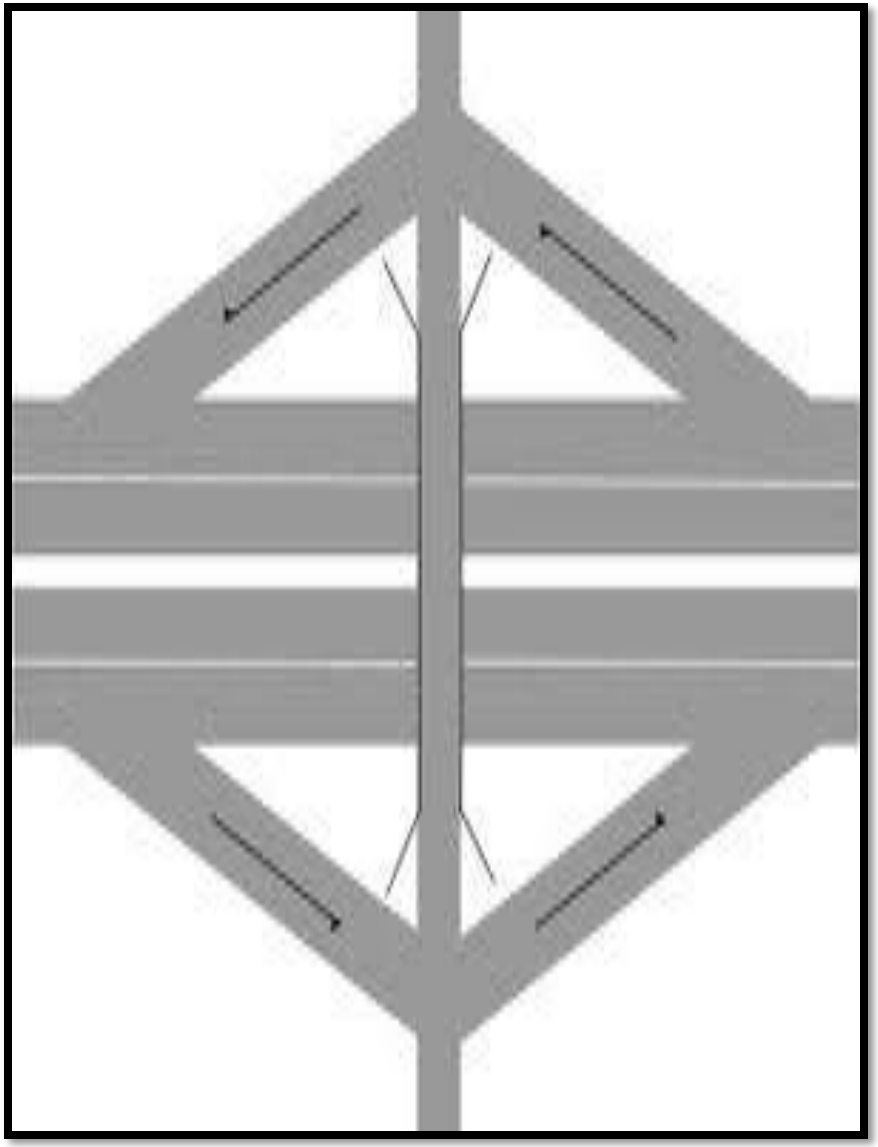


Typical cross section of an expressway

CLOVERLEAF INTERCHANGE



DIAMOND INTERCHANGE

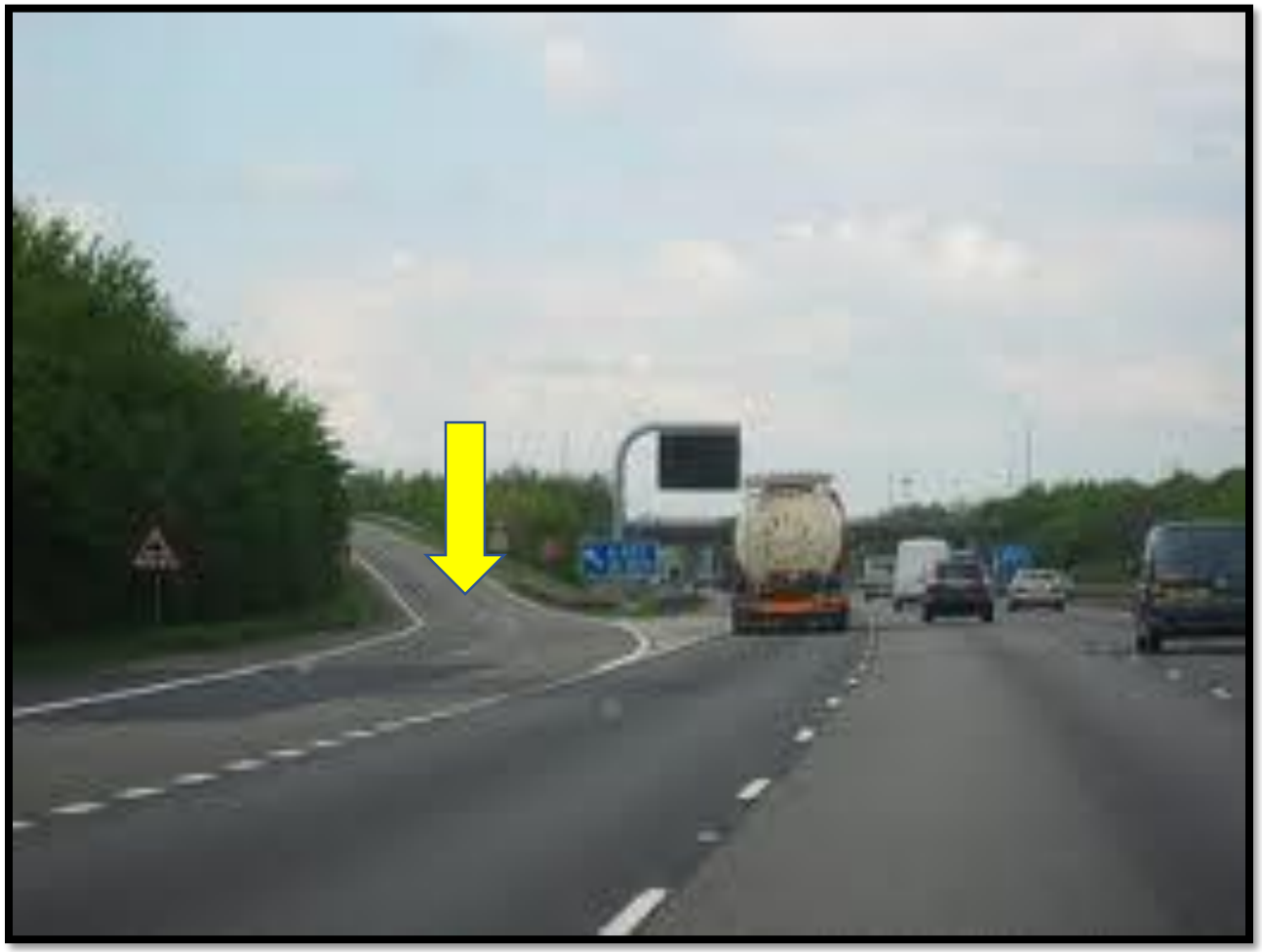


TRUMPET INTERCHANGE

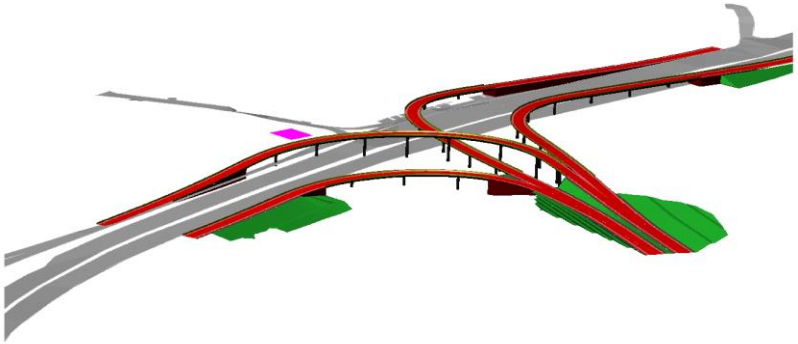
UNDERPASS

a road or pedestrian tunnel passing under a road or railway

SLIP ROAD



a road entering or leaving a motorway or dual carriageway



ROAD CATEGORY AND APPLICATIONS

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KURSUS REKABENTUK LAMPU JALAN

RURAL

Standard	Max design speed limit (km/h)	Minimum lane width (m)	Access control	Application
JKR R6	120	3.5	Full	Expressways under the administration of Malaysian Highway Authority (MHA)
JKR R5	100	3.5	Partial	Primary roads and partial access highways for the Federal JKR
JKR R4	90	3.25	Partial	Main / secondary roads
JKR R3	70	3.0	Partial	Secondary roads
JKR R2	60	2.75	None	Minor roads ***Note:*** *JKR R2 is the minimum geometrical standard for 2-lane roads*
JKR R1	40	(5.0)*	None	Single-lane minor roads (village roads)
JKR R1a	40	(4.5)*	None	Single-lane roads (roads to restricted areas such as quarries)

URBAN

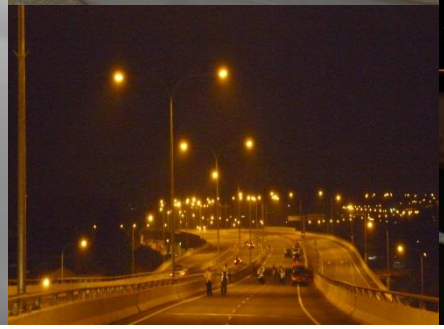
Standard	Max design speed limit (km/h)	Minimum lane width (m)	Access control	Application
JKR U6	100	3.5	Full	Expressways under the administration of Malaysian Highway Authority
JKR U5	80	3.5	Partial	Arterial roads and partial access municipal highways
JKR U4	70	3.25	Partial	Arterial / collector roads
JKR U3	60	3.0	Partial	Collector roads / Local streets
JKR U2	50	2.75	None	Local streets ***Note:*** *JKR R2 is the minimum geometrical standard for 2-lane roads*
JKR U1	40	(5.0)*	None	Single-lane street (in towns)
JKR U1a	40	(4.5)*	None	Single-lane street (as in low-cost housing areas)

Type of federal roads and route number categories

Examples	Information	Number digits
	Main federal route numbers	001 - 249
	Institutional facilities federal roads	250 - 479
	Federal road exit numbers	EXIT 201 - EXIT 299
	Main federal route numbers **(Sarawak)**	1-1 - 1-59 3-1 - 3-99
	Main federal route numbers **(Sabah; old numbering system)**	A01 - A99
	Main federal route numbers **(Labuan)**	700 - 799
	FELDA/FELCRA federal route numbers	1000 - 1999 2000 - 2999
	Industrial federal route numbers	3000 - 3999





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STANDARD
&
SPESIFIKASI
LAMPU JALAN

ANA SALMI AHMAD SALMAN

Standard

- **MS 825 : *Code of Practice for the Design of Road Lighting***
  - Part 1 : 2007 – Lighting of Roads & Public Amenity Area
  - Part 2 : 2008 –Lighting of Tunnels
  - Part 4 : 2012 – Performance Requirements
  - Part 5 : 2012 – Calculation of Performance
  - Part 6 : 2012 – Methods of Measuring Lighting Performance

Class	Luminance of the road surface of the carriageway for the dry road surface condition			Disability glare	Lighting of surroundings
	L in cd/m (minimum maintained)	Overall Uniformity Uo (minimum)	Longitudinal Uniformity Ul (minimum)	TI in % a (maximum)	SR (minimum) b
ME1	2,0	0,4	0,7	10	0,5
ME2	1,5	0,4	0,7	10	0,5
ME3a	1,0	0,4	0,7	15	0,5
ME3b	1,0	0,4	0,6	15	0,5
ME3c	1,0	0,4	0,5	15	0,5
ME4a	0,75	0,4	0,6	15	0,5
ME4b	0,75	0,4	0,5	15	0,5
ME5	0,5	0,35	0,4	15	0,5
ME6	0,3	0,35	0,4	15	0,5

a- An increase of 5 percentage points in TI can be permitted where low luminance light sources are used (see note 6)

b- This criterion can be applied only where there are no traffic areas with their own requirements adjacent to the carriageway

Table 1a. - ME - Series of lighting classes

Class	Horizontal Illuminance	
	E in lux (minimum maintained)	U (minimum)
CE0	50	0,4
CE1	30	0,4
CE2	20	0,4
CE3	15	0,4
CE4	10	0,4
CE5	7,5	0,4

Table 2 - CE - Series of lighting classes

Cleaning Interval Month	Luminaire maintenance factor								
	IP2X minimum			IP5X minimum			IP6X minimum		
	High pollution	medium pollution	low pollution	High pollution	Medium pollution	Low pollution	High pollution	Medium pollution	Low pollution
12	0.53	0.62	0.82	0.89	0.9	0.92	0.91	0.92	0.93
18	0.48	0.58	0.8	0.88	0.88	0.91	0.9	0.91	0.92
24	0.45	0.56	0.79	0.86	0.86	0.9	0.88	0.89	0.91
36	0.42	0.53	0.78	0.82	0.82	0.88	0.83	0.87	0.9

>Ingress protection code number of lamp housing;see MS IEC 60529

>High pollution generally occurs in the centre of large urban area and heavy industrial areas

>Medium pollution generally occurs in semi-urban,residential and light industrial areas

>Low pollution generally occurs in rural areas

MS 825: Part 1 : 2007
Table D1 : Luminaire Maintenance Factor

TYPE	DAY		NIGHT	
	E	Emin	E	Emin
Subways -open -enclosed	 - 350	 - 150	 50 100	 25 50
Pedestrian bridges -open -enclosed	 - 350	 - 150	 30 100	 15 50
Stairways/ramps -open -enclosed	 - 350	 - 150	 30 100	 15 50
open'equates to major daylight penetration For 'enclosed'areas emergency lighting should be considered.it is essential that it is installed if the area forms part of an escape route from a shopping centre, car park or transport interchange.				

MS 825: Part 1 : 2007

Table 4 : Lighting levels for subways, pedestrian bridges, stairways and ramp

Spesifikasi Cawangan Kejuruteraan Elektrik

- ✓ *L-S20 : Specification for Road Lighting Installation*
- ✓ *L-S20 : Adendum No. 1 and 2 to L-S20*
- ✓ *L-S1 : Specification for Low Voltage Internal Electrical Installation*
- ✓ *L-S3 : Specification for Low Voltage Underground Cables*

Lain- lain Rujukan

- ✓ JKR/SPJ/2011-S7 - *Standard Specifications for Road Works*
- ✓ Panduan Teknik Edisi ke-4 2008 Cawangan Kejuruteraan Elektrik – *Chapter 16 : Guidelines for External/Road Lighting*
- ✓ Arahan Teknik Jalan
- ✓ *A Guide on Geometric Design of Roads – Chapter 2 : Road Classifications and Design Standards*

L-S20 : *Specification for Road Lighting Installation*

- 1.0 General
- 2.0 Road Lighting Luminaires
- 3.0 Photometric Data
- 4.0 Sample of Luminaires
- 5.0 Schedule & Technical Information of Luminaires
- 6.0 Projects Based on the Turnkey, D&B or BOT Approach
- 7.0 Outdoor Weatherproof Feeder Pillars
- 8.0 Columns and Brackets
- 9.0 Cables & Ducts
- 10.0 Shop Drawings
- 11.0 Construction Requirements
- 12.0 Testing & Test Certificates
- 13.0 Service & Maintenance
- 14.0 As Installed Drawings, Manual & Tools

Section 2.0 : Luminaires

- HPSV : 100/150/250/400W : 240V
- IP55 : Optical Compartment
- IP43 : housing and control gear
- Lumen output specifications

Lamp	Colour Correlated Temperature (CCT)	Lumen Output (lm)	
		Initial at 100hrs.	After 2000hrs
100W	2000K - 2100K	9500	9200
150W	2000K - 2100K	14500	13500
250W	2000K - 2100K	28000	26500
400W	2000K - 2100K	48000	46000

Section 3.0 Columns & Brackets

- Wind Speed : 35m/s
- HDG, Fiberglass, Pre-stressed spun concrete
- Terminal Block – Modular Termination Box
- Cable glands for all armoured cable termination

Addendum 1 : LED Luminaires

- CCT : 2500K to 3500K
- The lumen output of LED luminaires (system efficacy) shall be **minimum 90 lm/W**. The usable lifetime of LED (lumen maintenance) at 36,000 hours shall not be less than 80% (L80 @ 36,000 hours)
- **Surge Protective Device (SPD)**

a) Internal/Built-In SPD

The driver shall be protected against lightning surge with an internal surge protector devices (SPD) of not less than 15kA with a let-through voltage of less than 350V test at 2kV, 1.2/50µSec open circuit and 1kA, 8/20µSec short circuit.

- **Luminaire Cover (Secondary Optics)**

Luminaire cover shall be provided to protect the optical lens from accumulation of dust and for easy cleaning of the luminaire. It shall be made UV resistant material suitable for outdoor used (in accordance with standard UL746C or equivalent).

For covers that is designed as light diffuser/disperser, it shall be made of clear tampered glass.

- The manufacturer / distributor shall provide a **5 years** warranty certificate for the complete luminaire system

Addendum 2

- **APPENDIX D1-1.1A : DESIGN CRITERIA**
- **APPENDIX D1-1.2A : DESCRIPTION OF THE LAYOUT**
- **APPENDIX D1-2A : ILLUMINANCE MEASUREMENT GRID**
- **APPENDIX D1-3A :LUMINANCE MEASUREMENT GRID**
- **APPENDIX D1-4A : LONGITUDINAL UNIFORMITY FOR EACH LANE**

The Electrical Contractors are required to submit computer plots of road sections as stated in Appendix D2-1

The Electrical Contractors shall also fill up the Appendix below:-

1) APPENDIX D1-1.1A, 1.2A - Design Criteria

2) APPENDIX D1- (2A to 4A) - Computer Calculation Format for Road Lighting

Installation (To be submitted for various layout and sections as stated in Appendix D2-1)

3) APPENDIX D2 - (1 to 2) - Tabulated Summary of Lighting Level Calculation/Data For Road Lighting Installation

The computer plots shall also be attached. **In addition, the photometric data of item3.0 shall be submitted.**

All the above plots and data shall be certified by the respective manufacturer/supplier.

L-S3 : Specification for Low Voltage Underground Cables

- Cable : PVC/SWA/PVC, XLPE/SWA/PVC
- At road crossings : Cable in galvanised ducts at 900mm depth
- Cable buried underground
- uPVC protective cover

REKABENTUK AWALAN

Data Fotometri
(Photometric Data)

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PROSES REKABENTUK AWALAN

1) Pemilihan *Lighting Class* utk *Traffic Route*

2) Pemilihan *Lighting Class* utk *Conflict Area* : Table B3 MS 825 Part 1

3) Penentuan - tinggi tiang, jenis lantera, jenis lampu, luminous flux, rating IP, jadual pembersihan lantera, kategori pencemaran, *maintenance factor*

(Table D1: MS 825 Part 1), lebar *carriageway*, lebar lane, susunan luminaire, jenis permukaan jalan (r-table)

Terms and Definition

1) Average road surface luminance (of a carriageway of a road) – (L)

- luminance of the road surface averaged over the carriageway

2) Longitudinal uniformity (of road surface luminance of a driving lane) – (U_{gl}) = Lmin/Lmax (each lane)

- ratio of the lowest to the highest road surface luminance found in a line in the centre along a driving lane

3) Longitudinal uniformity (of road surface luminance of a carriageway) – (U_l) = Lmin/Lmax

-lowest of the longitudinal uniformities of the driving lanes of the carriageway

4) Threshold increment *(TI)*

- measure of the loss of visibility caused by the disability glare of the luminaires of a road lighting installation

5) Surround ratio (of illumination of a carriageway of a road) *(SR)*

- average illuminance on strips just outside the edges of the carriageway in proportion to the average illuminance on strips just inside the edges

6) Overall uniformity (of road surface luminance,illuminance on a road area or hermispherical illuminance) - *(U_o) =* Lmin/Lave

-ratio of the lowest to the average value

Class	Luminance of the road surface of the carriageway for the dry road surface condition			Disability glare	Lighting of surroundings
	L in cd/m (minimum maintained)	Overall Uniformity Uo (minimum)	Longitudinal Uniformity Ul (minimum)	TI in % [a] (maximum)	SR (minimum) [b]
ME1	2,0	0,4	0,7	10	0,5
ME2	1,5	0,4	0,7	10	0,5
ME3a	1,0	0,4	0,7	15	0,5
ME3b	1,0	0,4	0,6	15	0,5
ME3c	1,0	0,4	0,5	15	0,5
ME4a	0,75	0,4	0,6	15	0,5
ME4b	0,75	0,4	0,5	15	0,5
ME5	0,5	0,35	0,4	15	0,5
ME6	0,3	0,35	0,4	15	No requirement

a- An increase of 5 percentage points in TI can be permitted where low luminance light sources are used (see note 6)

b- This criterion can be applied only where there are no traffic areas with their own requirements adjacent to the carriageway

ME - Series of lighting classes

Class	Horizontal Illuminance	
	E in lux (minimum maintained)	Uo (minimum)
CE0	50	0,4
CE1	30	0,4
CE2	20	0,4
CE3	15	0,4
CE4	10	0,4
CE5	7,5	0,4

CE - Series of lighting classes

- Arrangement :

  - Single-sided, twin central, staggered, opposite, combined twin central and opposite

- Road Surface Classifications – Table C3 & C4 MS 825

  i) R3 : Q_o = 0.07 Asphalt road surface with dark aggregate

  ii) R1 : Q_o = 0.1 Cement concrete road surface

To be filled by designer and attached in tender document

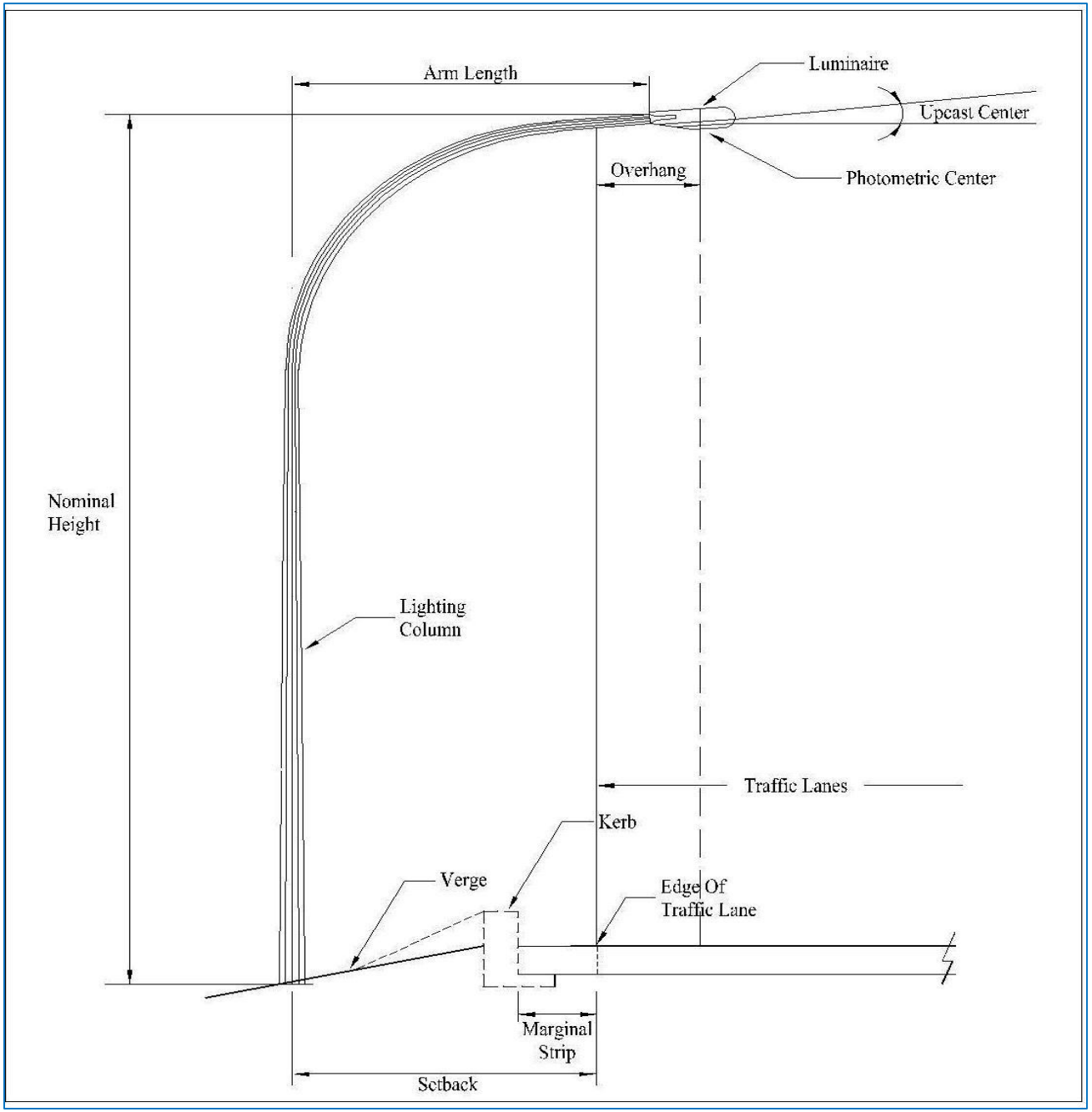
APPENDIX D1 – 1.1A
DESIGN CRITERIA

*Road Lighting Class	: ME_____/ CE_____		
*Road Surface Type	: Asphalt / Concrete		
Luminance Coefficient, Q_o	=	_	
Average Luminance, L_{ave}	≥	_____	
Overall Uniformity, U_o	≥	_____	
Longitudinal Uniformity, U_l	≥	_____	
Threshold Increment, TI	≤	_____	
Surround Ratio, SR	≥	_____	
*Maintenance Factor , MF	:	_	
*Column Height , H	:	_	m
* Column spacing (m)	:	_	m
*Lamp Type	:	_	
*Lamp Wattage	:	_	W
Flux (klm)	:	_	klm
Lamp Tilting Angle	:	_	
*Arm Length	:	_	
*Overhang	:	_	
*Setback	:	_	

Note :

* Data to be filled by Designer

Maintenance Factor , MF = Luminaire MF X Lamp Lumen MF


Arm Length
Luminaire
Upcast Center
Overhang
Photometric Center
Nominal Height
Lighting Column
Traffic Lanes
Kerb
Verge
Edge Of Traffic Lane
Marginal Strip
Setback

DESIGN CRITERIA OF ROAD LIGHTING & TRAFFIC SIGNAL LIGHT

DESIGN STANDARDS

THE FOLLOWING DESIGN STANDARDS ARE USED IN DESIGNING ROAD LIGHTING.

- MS 825 : - CODE OF PRACTICE FOR THE DESIGN OF ROAD LIGHTING
- CIE 115 : RECOMMENDATIONS FOR THE LIGHTING OF ROADS FOR MOTOR AND PEDESTRIAN TRAFFIC
- L-S20 : SPECIFICATION FOR ROAD LIGHTING INSTALLATION
- JKR/SPJ/2008-S8 : STANDARD SPECIFICATION FOR ROAD WORKS (SECTION 8 : TRAFFIC SIGNAL SYSTEM)

DESIGN CRITERIA

CLASS OF ROAD : R5
ROAD PROFILE : 4 LANE DUAL CARRIAGEWAY
SPEED LIMIT : 90km/hr

ITEM	TYPICAL CONFLICT AREA (JUNCTION)	MAIN LINE
LIGHTING CLASS	CE0	ME1
MINIMUM MAINTAINED AVERAGE ILLUMINANCE (LUX) / LUMINANCE (cd/m^2)	50 LUX	2.00 cd/m^2
ILLUMINANCE / LUMINANCE (INITIAL) REQUIRED	57.47 LUX	2.30 cd/m^2
OVERALL UNIFORMITY (E Min/ E Ave)	≥0.4	≥0.4
LONGITUDINAL UNIFORMITY (Emin / Emax)	-	≥0.7
DISABILITY GLARE (TI)	-	10
MAINTENANCE FACTOR	0.87 (ASSUMPTION : CLEANING INTERVAL = 36 MONTH, MEDIUM POLUTION, IP 6X MIN)	0.87 (ASSUMPTION : CLEANING INTERVAL = 36 MONTH, MEDIUM POLUTION, IP 6X MIN)
LIGHTING ARRANGEMENT	MEDIAN & ROAD SIDE	MEDIAN & ROAD SIDE
AVERAGE SPAN	AT GRADE 25m AT BRIDGE (PARAPET) 25m	AT GRADE 35m
ROAD SURFACE TYPE	ASPHALT, Q_o = 0.07	ASPHALT, Q_o = 0.07

ROAD LIGHTING COLUMNS

> ALL COLUMNS USED ARE OCTAGONAL HOT-DIPPED GALVANISED IRON (2 SECTIONS)

> LIGHTING COLUMNS ARE DESIGNED TO WITHSTAND A WIND SPEED OF 35m/s

TYPE OF LUMINAIRES :-

> TYPE OF LUMINAIRES USED SHALL BE AS FOLLOWS :

AREA	TYPE OF FITTING	LAMP LUMEN	ARM LENGTH	TILTING ANGLE
MEDIAN	2 X 250W HPSV LUMINAIRE MOUNTED ON 10m POLE	28000 lm	(WITH ARM)	5°
ROAD SIDE	1 X 250W HPSV LUMINAIRE MOUNTED ON 10m POLE AT BRIDGE PARAPET	28000 lm	(WITH ARM)	5°
CORBEL @ PARAPET	1 X 250W HPSV LUMINAIRE MOUNTED ON 9m POLE AT BRIDGE PARAPET	28000 lm	(WITH ARM)	5°

> ALL LIGHT LUMINAIRES WILL MEET THE MINIMUM REQUIREMENT OF IP66 FOR OPTICAL COMPARTMENT AND MINIMUM IP43 FOR CONTROL GEAR COMPARTMENT.

> ACCESS TO THE INTERIOR OF THE LUMINAIRE SHALL BE FROM THE TOP. BOTTOM ACCESS IS NOT ACCEPTABLE

TRAFFIC SIGNAL LIGHTING

> SIGNAL HEAD SHALL BE OF 300mm HIGH-POWER LED LAMP
> TRAFFIC SIGNAL CONTROL SYSTEM SHALL BE SIMILAR TO EXISTING CONTROL MONITORING SYSTEM (CMS)

PROJECT 2

DESIGN REQUIREMENT ME 2

LUMINAIRE - ALF12040 - 120W

MEDIAN (2 LANE)
SINGLE SIDED (2 LANE)

Partner for Contact:
Order No.:
Company:
Customer No.:

Date: 23.08.2019
Operator: NURUL ASHIKIN BINTI MOHD RODZI

GRUPPE LIGHTING SOLUTION SDN BHD

NO 9, JALAN ANGGERIK MOKARA 31/60,KOTA KEMUNING,
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GRUPPE LIGHTING SOLUTION SDN BHD

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23.08.2019

GRUPPE LIGHTING SOLUTION SDN BHD

NO 9, JALAN ANGGERIK MOKARA 31/60,KOTA KEMUNING, SEKSYEN 31,
40460 SHAH ALAM, SELANGOR DARUL EHSAN

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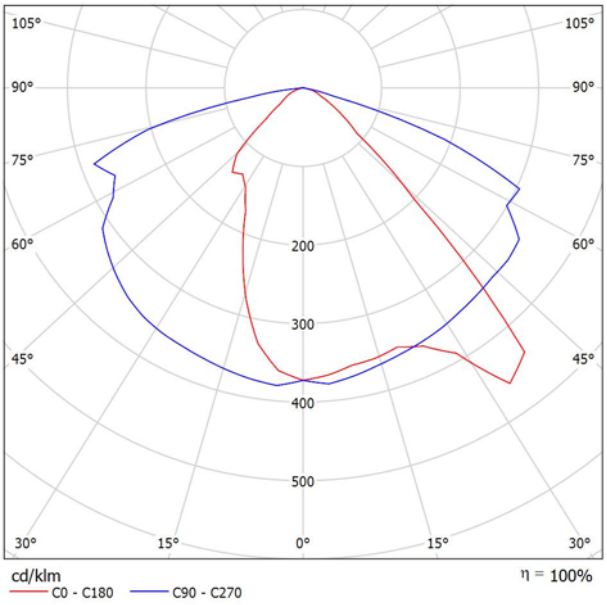
ALF12040-120W/ Luminaire Data Sheet

See our luminaire catalog for an image of the luminaire.

Luminous emittance 1:



Luminaire classification according to CIE: 100
CIE flux code: 49 85 99 100 100

Due to missing symmetry properties, no UGR table can be displayed for this luminaire.

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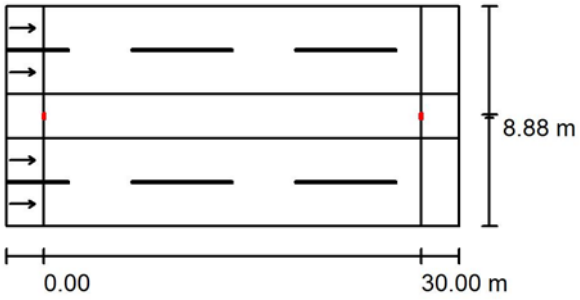
MEDIAN (2 LANE) / Planning data

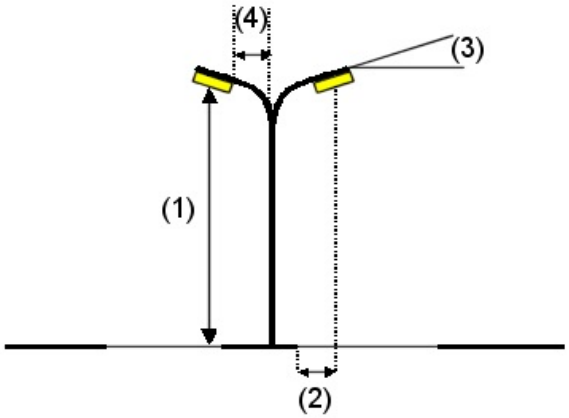
Street Profile

Roadway 2	(Width: 7.000 m, Number of lanes: 2, tarmac: R3, q0: 0.070)
Median 1	(Width: 3.500 m, Height: 0.000 m)
Roadway 1	(Width: 7.000 m, Number of lanes: 2, tarmac: R3, q0: 0.070)

Light loss factor: 0.80

Luminaire Arrangements





Luminaire: ALF12040 - 120W

Luminous flux (Luminaire):	15324 lm
Luminous flux (Lamps):	15327 lm
Luminaire Wattage:	120.0 W
Arrangement:	on Median
Pole Distance:	30.000 m
Mounting Height (1):	10.000 m
Height:	10.000 m
Overhang (2):	-1.375 m
Boom Angle (3):	5.0 °
Boom Length (4):	0.125 m

Maximum luminous intensities

at 70°:	337 cd/klm
at 80°:	72 cd/klm
at 90°:	2.60 cd/klm

Any direction forming the specified angle from the downward vertical, with the luminaire installed for use.

Arrangement complies with luminous intensity class G3.
Arrangement complies with glare index class D.4.

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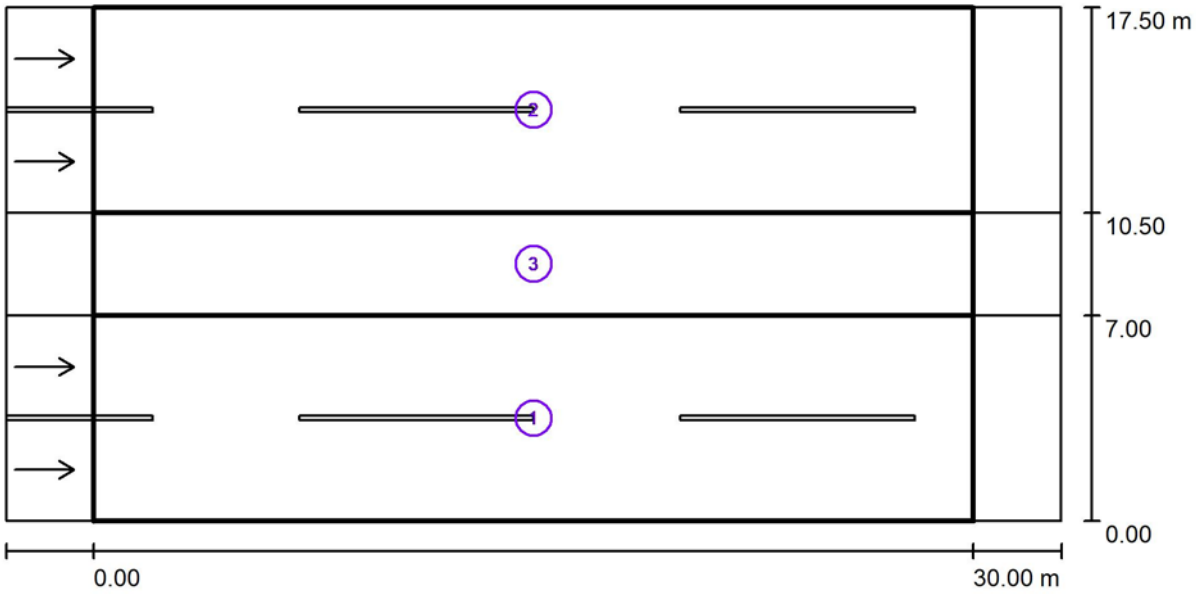
MEDIAN (2 LANE) / Photometric Results



Light loss factor: 0.80

Scale 1:258

Calculation Field List

1 Valuation Field Roadway 1
Length: 30.000 m, Width: 7.000 m
Grid: 10 x 6 Points
Accompanying Street Elements: Roadway 1.
tarmac: R3, q0: 0.070
Selected Lighting Class: ME2 (All lighting performance requirements are met.)

	L_{av} [cd/m²]	U0	Ul	TI [%]	SR
Calculated values:	1.75	0.44	0.81	8	1.03
Required values according to class:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10	≥ 0.50
Fulfilled/Not fulfilled:	✓	✓	✓	✓	✓

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MEDIAN (2 LANE) / Photometric Results

Calculation Field List

2 Valuation Field Roadway 2
Length: 30.000 m, Width: 7.000 m
Grid: 10 x 6 Points
Accompanying Street Elements: Roadway 2.
tarmac: R3, q0: 0.070
Selected Lighting Class: ME2 (All lighting performance requirements are met.)

	L_{av} [cd/m²]	U0	UI	TI [%]	SR
Calculated values:	1.63	0.43	0.72	5	1.03
Required values according to class:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10	≥ 0.50
Fulfilled/Not fulfilled:	✓	✓	✓	✓	✓

3 Valuation Field Median 1
Length: 30.000 m, Width: 3.500 m
Grid: 10 x 3 Points
Accompanying Street Elements: Median 1.
Selected Lighting Class: CE5 (All lighting performance requirements are met.)

	E_{av} [lx]	U0
Calculated values:	50.95	0.49
Required values according to class:	≥ 7.50	≥ 0.40
Fulfilled/Not fulfilled:	✓	✓

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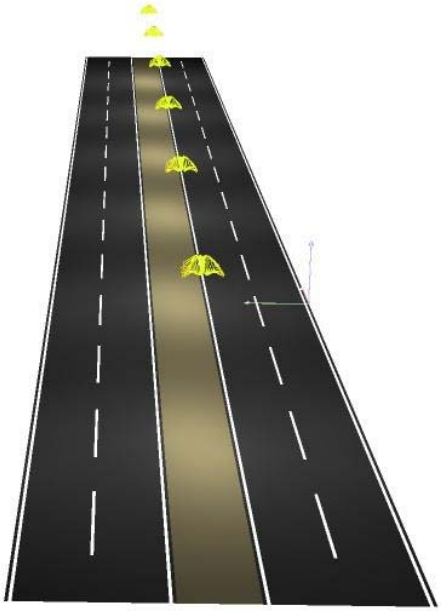
MEDIAN (2 LANE) / 3D Rendering



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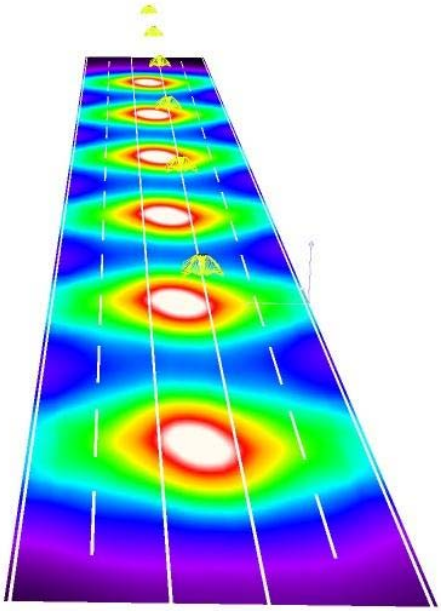
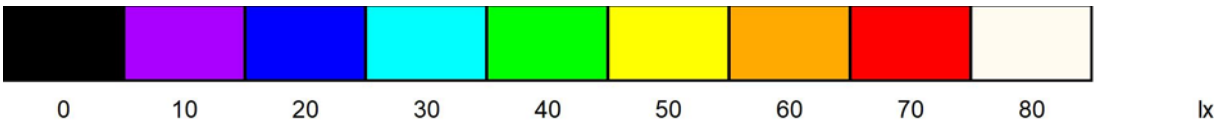
MEDIAN (2 LANE) / False Color Rendering





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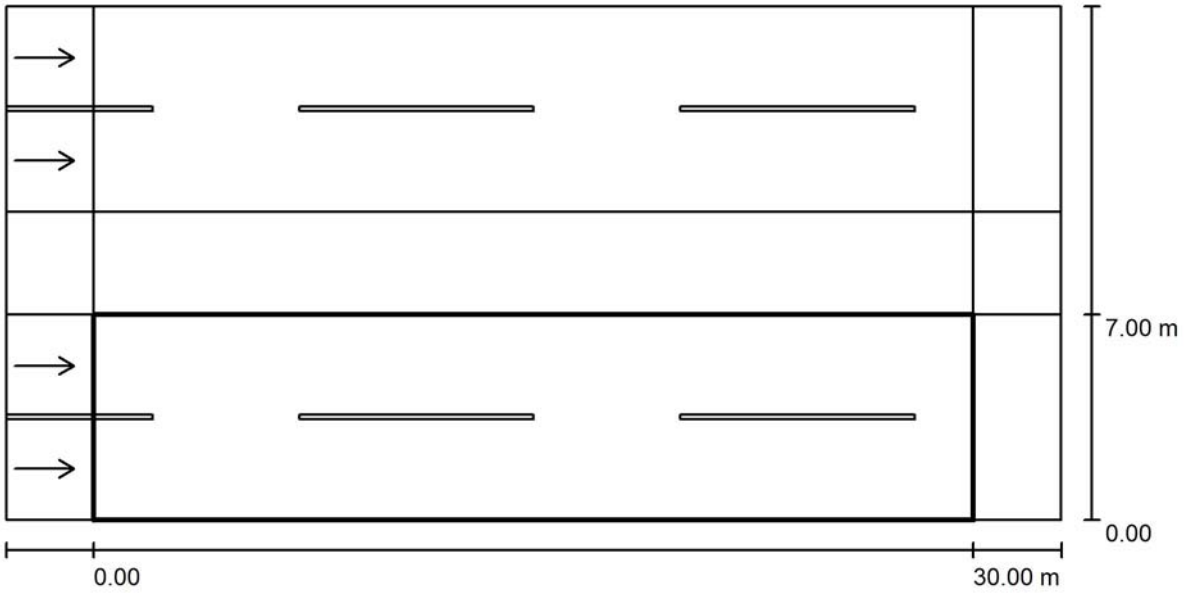
MEDIAN (2 LANE) / Valuation Field Roadway 1 / Results overview



Light loss factor: 0.80

Scale 1:258

Grid: 10 x 6 Points
Accompanying Street Elements: Roadway 1.
tarmac: R3, q0: 0.070
Selected Lighting Class: ME2 (All lighting performance requirements are met.)

	L_{av} [cd/m²]	U0	Ul	TI [%]	SR
Calculated values:	1.75	0.44	0.81	8	1.03
Required values according to class:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10	≥ 0.50
Fulfilled/Not fulfilled:	✓	✓	✓	✓	✓

Assigned observer (2 Pieces):

No.	Observer	Position [m]	L_{av} [cd/m²]	U0	Ul	TI [%]
1	Observer 1	(-60.000, 1.750, 1.500)	1.94	0.44	0.81	4
2	Observer 2	(-60.000, 5.250, 1.500)	1.75	0.46	0.84	8

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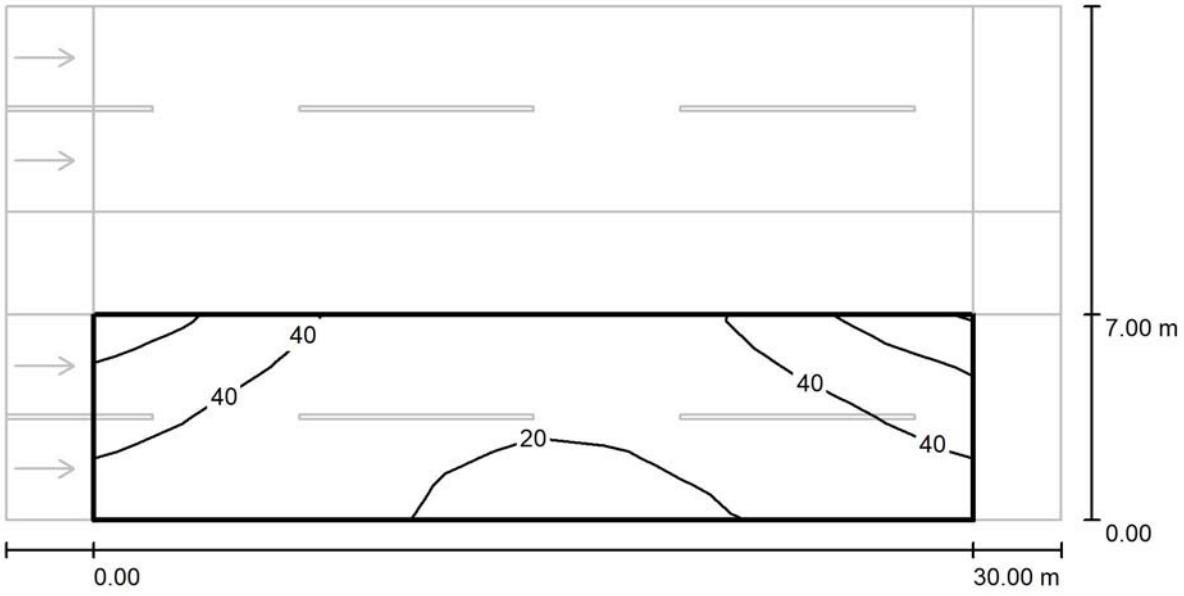
MEDIAN (2 LANE) / Valuation Field Roadway 1 / Isolines (E)



Values in Lux, Scale 1 : 258

Grid: 10 x 6 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
33	15	70	0.463	0.215

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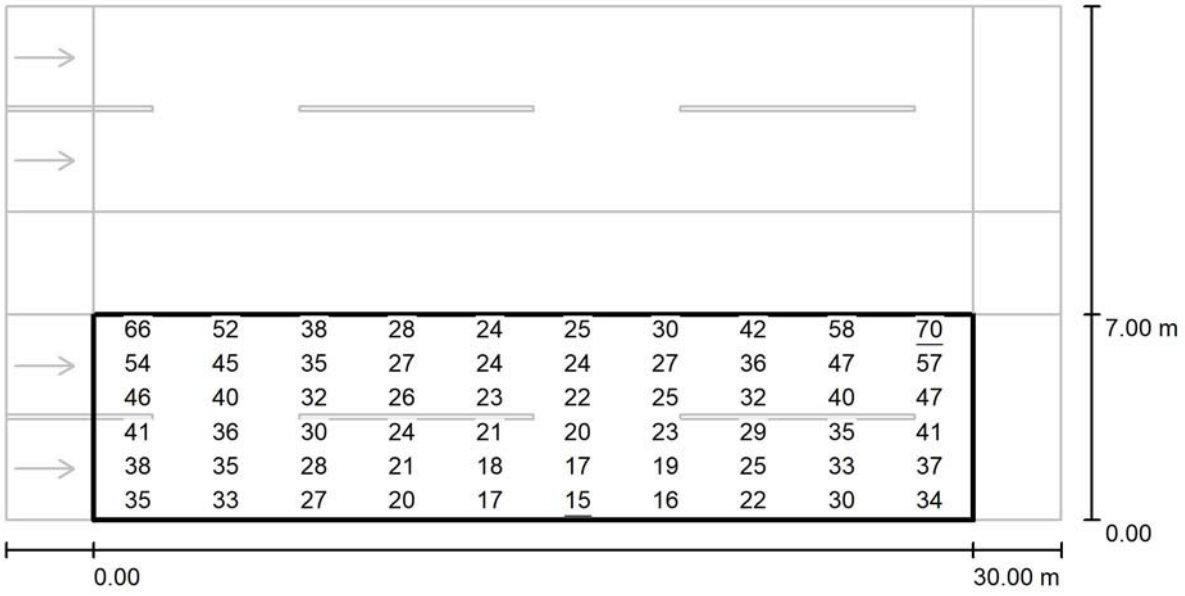
MEDIAN (2 LANE) / Valuation Field Roadway 1 / Value Chart (E)



Values in Lux, Scale 1 : 258

Grid: 10 x 6 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
33	15	70	0.463	0.215

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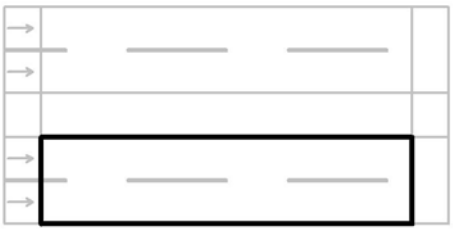
MEDIAN (2 LANE) / Valuation Field Roadway 1 / Table (E)



6.417	66	52	38	28	24	25	30	42	58	70
5.250	54	45	35	27	24	24	27	36	47	57
4.083	46	40	32	26	23	22	25	32	40	47
2.917	41	36	30	24	21	20	23	29	35	41
1.750	38	35	28	21	18	17	19	25	33	37
0.583	35	33	27	20	17	15	16	22	30	34
m	**1.500**	**4.500**	**7.500**	**10.500**	**13.500**	**16.500**	**19.500**	**22.500**	**25.500**	**28.500**

Attention: The coordinates refer to the image above. Values in Lux.

Grid: 10 x 6 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
33	15	70	0.463	0.215

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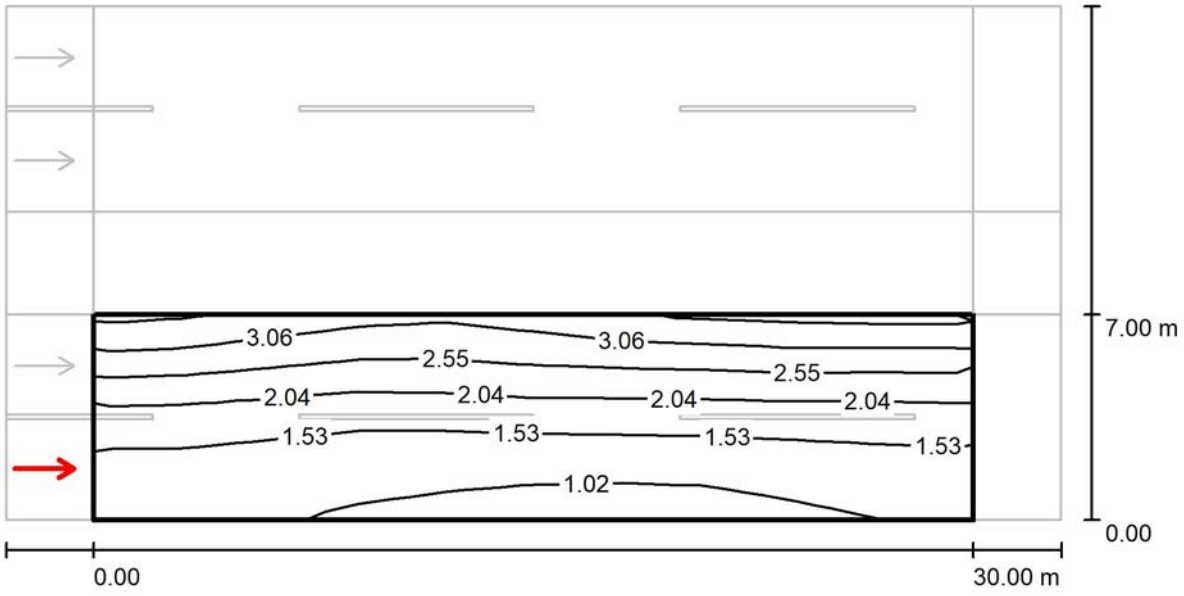
MEDIAN (2 LANE) / Valuation Field Roadway 1 / Observer 1 / Isolines (L)



Values in Candela/m², Scale 1 : 258

Grid: 10 x 6 Points
Observer Position: (-60.000 m, 1.750 m, 1.500 m)
tarmac: R3, q0: 0.070

	L_{av} [cd/m²]	U0	UI	TI [%]
Calculated values:	1.94	0.44	0.81	4
Required values according to class ME2:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10
Fulfilled/Not fulfilled:	✓	✓	✓	✓

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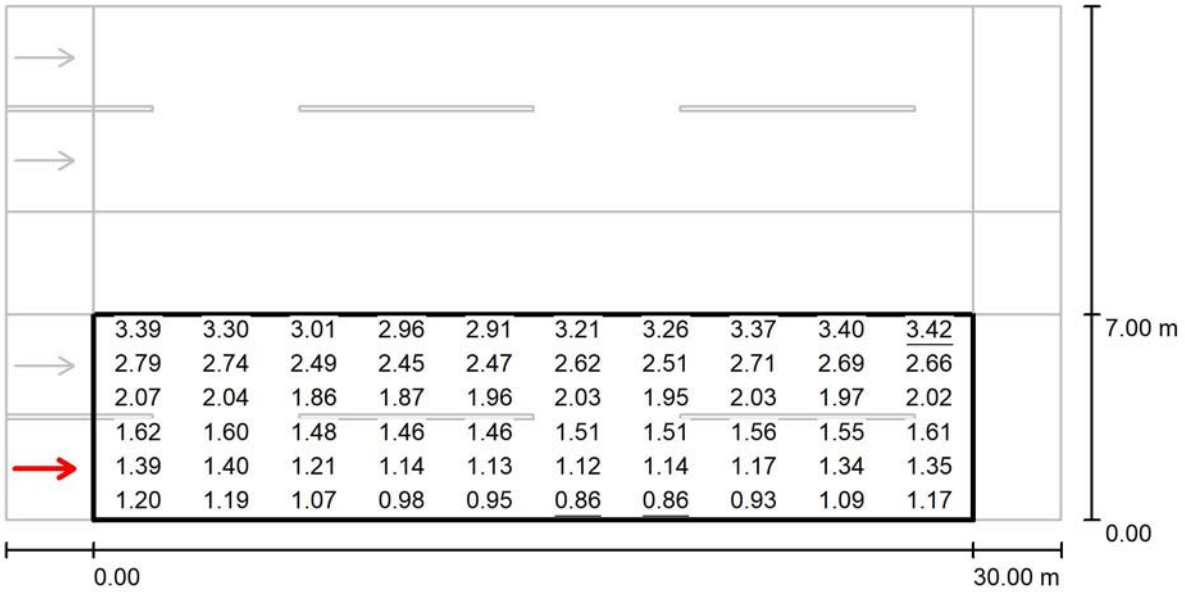
MEDIAN (2 LANE) / Valuation Field Roadway 1 / Observer 1 / Value Chart (L)



Values in Candela/m², Scale 1 : 258

Grid: 10 x 6 Points
Observer Position: (-60.000 m, 1.750 m, 1.500 m)
tarmac: R3, q0: 0.070

	L_{av} [cd/m²]	U0	Ul	TI [%]
Calculated values:	1.94	0.44	0.81	4
Required values according to class ME2:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10
Fulfilled/Not fulfilled:	✓	✓	✓	✓

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MEDIAN (2 LANE) / Valuation Field Roadway 1 / Observer 1 / Table (L)

6.417	3.39	3.30	3.01	2.96	2.91	3.21	3.26	3.37	3.40	3.42
5.250	2.79	2.74	2.49	2.45	2.47	2.62	2.51	2.71	2.69	2.66
4.083	2.07	2.04	1.86	1.87	1.96	2.03	1.95	2.03	1.97	2.02
2.917	1.62	1.60	1.48	1.46	1.46	1.51	1.51	1.56	1.55	1.61
1.750	1.39	1.40	1.21	1.14	1.13	1.12	1.14	1.17	1.34	1.35
0.583	1.20	1.19	1.07	0.98	0.95	0.86	0.86	0.93	1.09	1.17
m	**1.500**	**4.500**	**7.500**	**10.500**	**13.500**	**16.500**	**19.500**	**22.500**	**25.500**	**28.500**

Attention: The coordinates refer to the image above. Values in Candela/m².

Grid: 10 x 6 Points
Observer Position: (-60.000 m, 1.750 m, 1.500 m)
tarmac: R3, q0: 0.070

	L_{av} [cd/m²]	U0	UI	TI [%]
Calculated values:	1.94	0.44	0.81	4
Required values according to class ME2:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10
Fulfilled/Not fulfilled:	✓	✓	✓	✓

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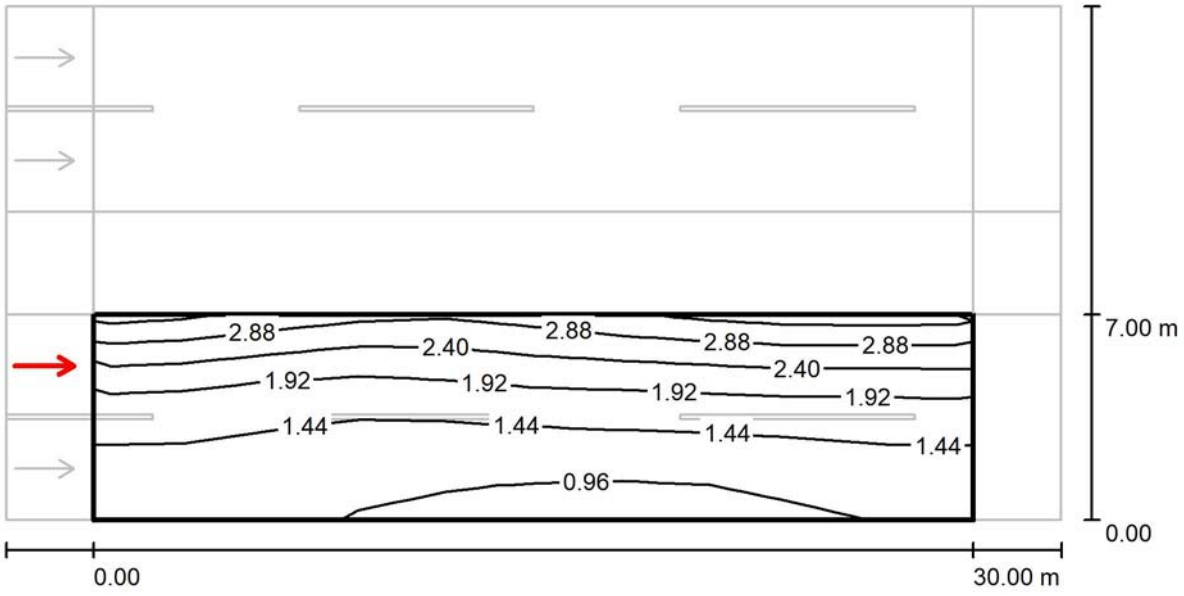
MEDIAN (2 LANE) / Valuation Field Roadway 1 / Observer 2 / Isolines (L)



Values in Candela/m², Scale 1 : 258

Grid: 10 x 6 Points
Observer Position: (-60.000 m, 5.250 m, 1.500 m)
tarmac: R3, q0: 0.070

	L_{av} [cd/m²]	U0	UI	TI [%]
Calculated values:	1.75	0.46	0.84	8
Required values according to class ME2:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10
Fulfilled/Not fulfilled:	✓	✓	✓	✓

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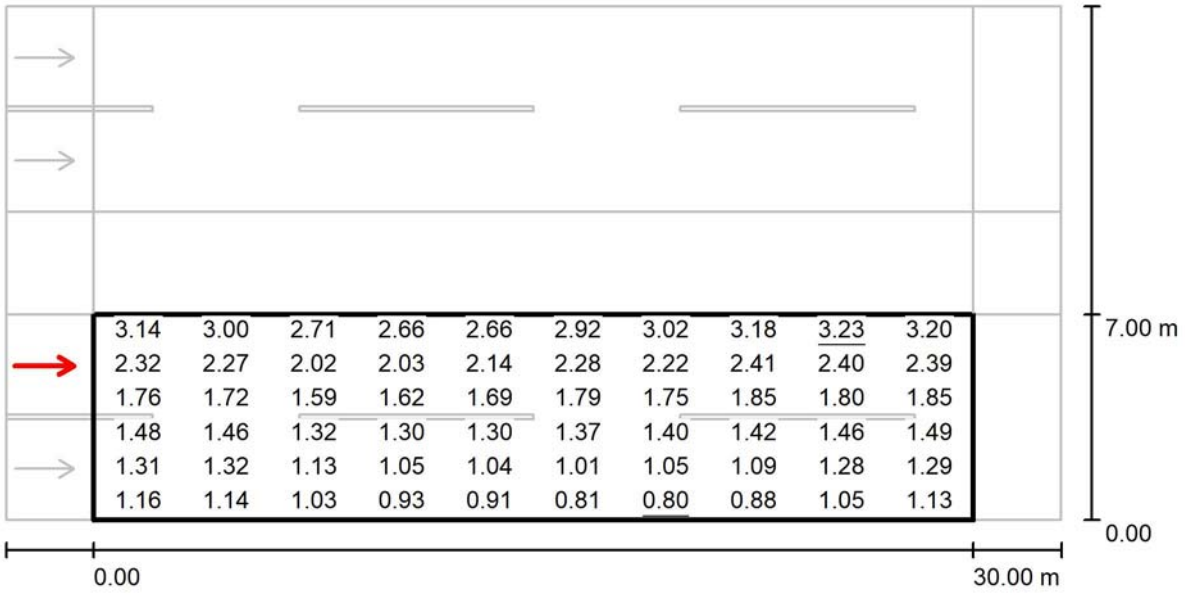
MEDIAN (2 LANE) / Valuation Field Roadway 1 / Observer 2 / Value Chart (L)



Values in Candela/m², Scale 1 : 258

Grid: 10 x 6 Points
Observer Position: (-60.000 m, 5.250 m, 1.500 m)
tarmac: R3, q0: 0.070

	L_{av} [cd/m²]	U0	UI	TI [%]
Calculated values:	1.75	0.46	0.84	8
Required values according to class ME2:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10
Fulfilled/Not fulfilled:	✓	✓	✓	✓

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MEDIAN (2 LANE) / Valuation Field Roadway 1 / Observer 2 / Table (L)

6.417	3.14	3.00	2.71	2.66	2.66	2.92	3.02	3.18	3.23	3.20
5.250	2.32	2.27	2.02	2.03	2.14	2.28	2.22	2.41	2.40	2.39
4.083	1.76	1.72	1.59	1.62	1.69	1.79	1.75	1.85	1.80	1.85
2.917	1.48	1.46	1.32	1.30	1.30	1.37	1.40	1.42	1.46	1.49
1.750	1.31	1.32	1.13	1.05	1.04	1.01	1.05	1.09	1.28	1.29
0.583	1.16	1.14	1.03	0.93	0.91	0.81	0.80	0.88	1.05	1.13
m	**1.500**	**4.500**	**7.500**	**10.500**	**13.500**	**16.500**	**19.500**	**22.500**	**25.500**	**28.500**

Attention: The coordinates refer to the image above. Values in Candela/m².

Grid: 10 x 6 Points
Observer Position: (-60.000 m, 5.250 m, 1.500 m)
tarmac: R3, q0: 0.070

	L_{av} [cd/m²]	U0	UI	TI [%]
Calculated values:	1.75	0.46	0.84	8
Required values according to class ME2:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10
Fulfilled/Not fulfilled:	✓	✓	✓	✓

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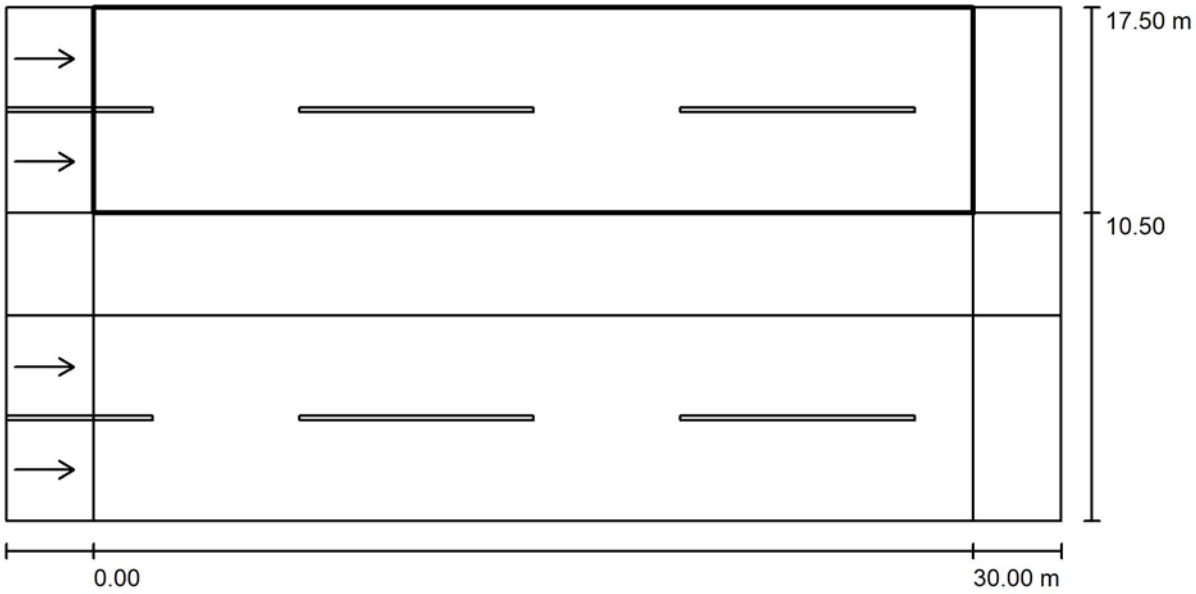
MEDIAN (2 LANE) / Valuation Field Roadway 2 / Results overview



Light loss factor: 0.80

Scale 1:258

Grid: 10 x 6 Points
Accompanying Street Elements: Roadway 2.
tarmac: R3, q0: 0.070
Selected Lighting Class: ME2 (All lighting performance requirements are met.)

	L_{av} [cd/m²]	U0	Ul	TI [%]	SR
Calculated values:	1.63	0.43	0.72	5	1.03
Required values according to class:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10	≥ 0.50
Fulfilled/Not fulfilled:	✓	✓	✓	✓	✓

Assigned observer (2 Pieces):

No.	Observer	Position [m]	L_{av} [cd/m²]	U0	Ul	TI [%]
1	Observer 3	(-60.000, 12.250, 1.500)	1.63	0.45	0.86	5
2	Observer 4	(-60.000, 15.750, 1.500)	1.77	0.43	0.72	2

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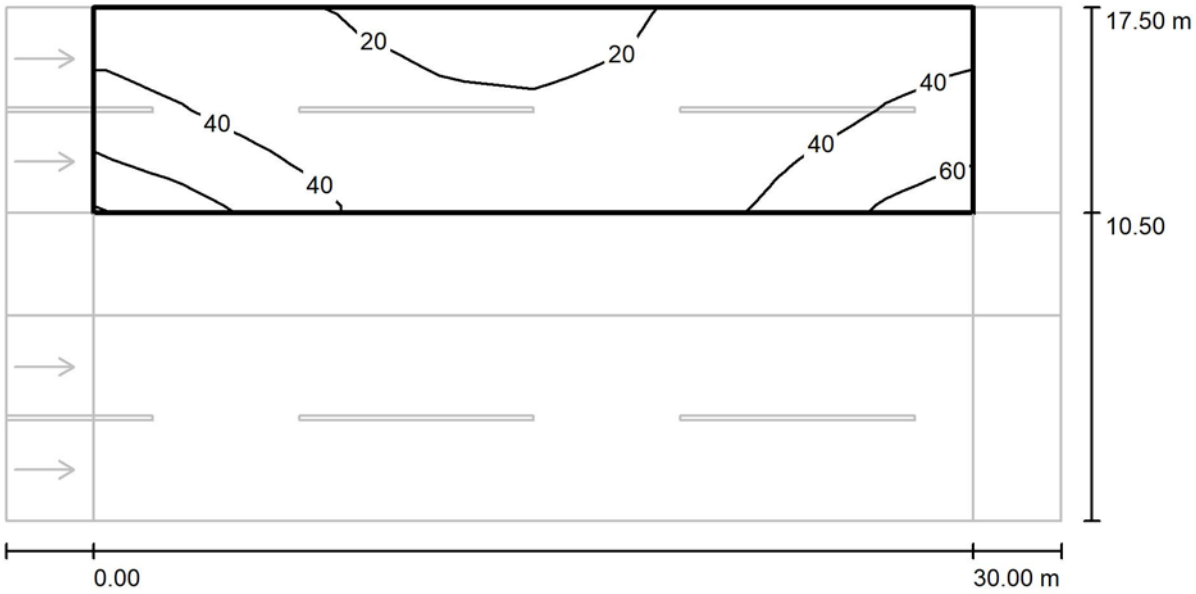
MEDIAN (2 LANE) / Valuation Field Roadway 2 / Isolines (E)



Values in Lux, Scale 1 : 258

Grid: 10 x 6 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
33	15	70	0.463	0.215

23.08.2019

GRUPPE LIGHTING SOLUTION SDN BHD

NO 9, JALAN ANGGERIK MOKARA 31/60,KOTA KEMUNING,
SEKSYEN 31,
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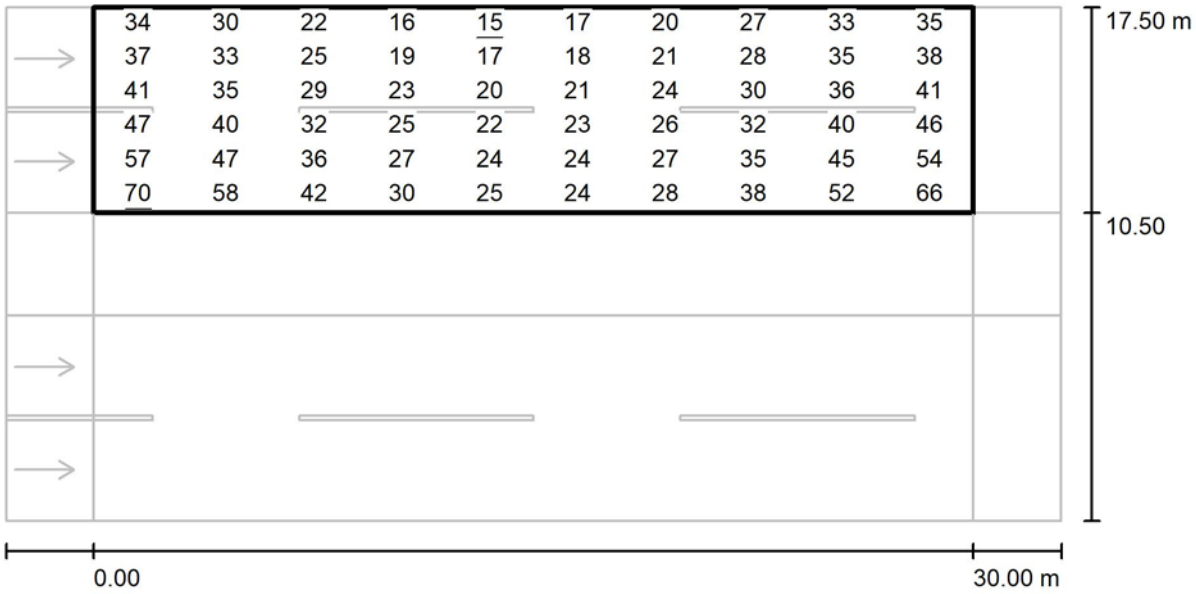
MEDIAN (2 LANE) / Valuation Field Roadway 2 / Value Chart (E)



Values in Lux, Scale 1 : 258

Grid: 10 x 6 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
33	15	70	0.463	0.215

GRUPPE LIGHTING SOLUTION SDN BHD

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MEDIAN (2 LANE) / Valuation Field Roadway 2 / Table (E)

6.417	34	30	22	16	15	17	20	27	33	35
5.250	37	33	25	19	17	18	21	28	35	38
4.083	41	35	29	23	20	21	24	30	36	41
2.917	47	40	32	25	22	23	26	32	40	46
1.750	57	47	36	27	24	24	27	35	45	54
0.583	70	58	42	30	25	24	28	38	52	66
m	**1.500**	**4.500**	**7.500**	**10.500**	**13.500**	**16.500**	**19.500**	**22.500**	**25.500**	**28.500**

Attention: The coordinates refer to the image above. Values in Lux.

Grid: 10 x 6 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
33	15	70	0.463	0.215

23.08.2019

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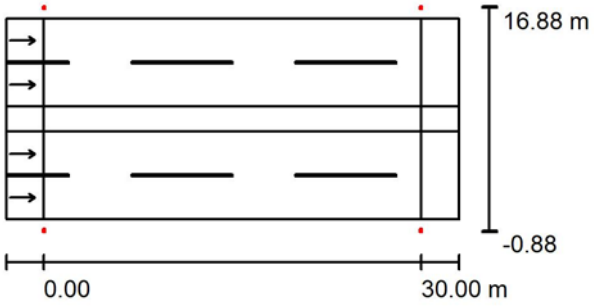
SINGLE SIDED (2 LANE) / Planning data

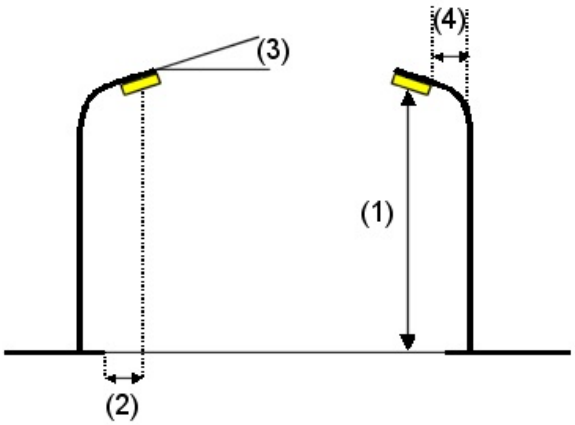
Street Profile

Roadway 2	(Width: 7.000 m, Number of lanes: 2, tarmac: R3, q0: 0.070)
Median 1	(Width: 2.000 m, Height: 0.000 m)
Roadway 1	(Width: 7.000 m, Number of lanes: 2, tarmac: R3, q0: 0.070)

Light loss factor: 0.80

Luminaire Arrangements





Luminaire:ALF12040-120W

Luminous flux (Luminaire):	15324 lm
Luminous flux (Lamps):	15327 lm
Luminaire Wattage:	120.0 W
Arrangement:	Double row, opposing
Pole Distance:	30.000 m
Mounting Height (1):	10.000 m
Height:	10.000 m
Overhang (2):	-0.875 m
Boom Angle (3):	5.0 °
Boom Length (4):	0.125 m

Maximum luminous intensities

at 70°:	337 cd/klm
at 80°:	72 cd/klm
at 90°:	2.60 cd/klm

Any direction forming the specified angle from the downward vertical, with the luminaire installed for use.

Arrangement complies with luminous intensity class G3.

Arrangement complies with glare index class D.4.

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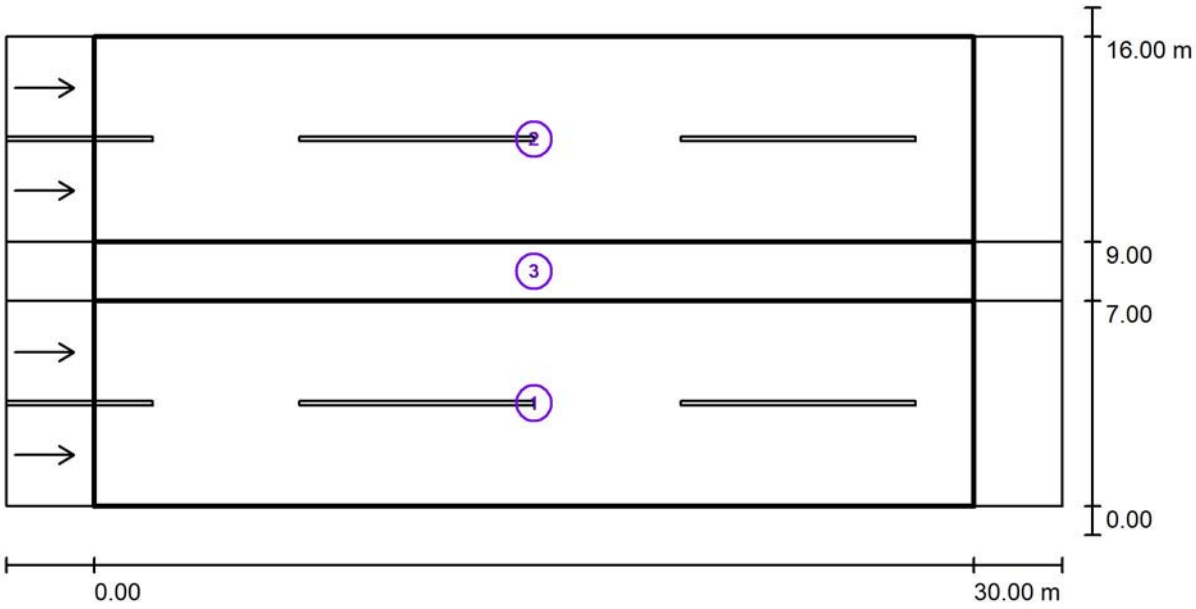
SINGLE SIDED (2 LANE) / Photometric Results



Light loss factor: 0.80

Scale 1:258

Calculation Field List

1 Valuation Field Roadway 1
Length: 30.000 m, Width: 7.000 m
Grid: 10 x 6 Points
Accompanying Street Elements: Roadway 1.
tarmac: R3, q0: 0.070
Selected Lighting Class: ME2 (All lighting performance requirements are met.)

	L_{av} [cd/m²]	U0	Ul	TI [%]	SR
Calculated values:	1.52	0.76	0.72	4	1.04
Required values according to class:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10	≥ 0.50
Fulfilled/Not fulfilled:	✓	✓	✓	✓	✓

GRUPPE LIGHTING SOLUTION SDN BHD

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SINGLE SIDED (2 LANE) / Photometric Results

Calculation Field List

2 Valuation Field Roadway 2
Length: 30.000 m, Width: 7.000 m
Grid: 10 x 6 Points
Accompanying Street Elements: Roadway 2.
tarmac: R3, q0: 0.070
Selected Lighting Class: ME2 (All lighting performance requirements are met.)

	L_{av} [cd/m²]	U0	UI	TI [%]	SR
Calculated values:	1.62	0.80	0.80	7	1.04
Required values according to class:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10	≥ 0.50
Fulfilled/Not fulfilled:	✓	✓	✓	✓	✓

3 Valuation Field Median 1
Length: 30.000 m, Width: 2.000 m
Grid: 10 x 3 Points
Accompanying Street Elements: Median 1.
Selected Lighting Class: CE5 (All lighting performance requirements are met.)

	E_{av} [lx]	U0
Calculated values:	40.55	0.72
Required values according to class:	≥ 7.50	≥ 0.40
Fulfilled/Not fulfilled:	✓	✓

GRUPPE LIGHTING SOLUTION SDN BHD

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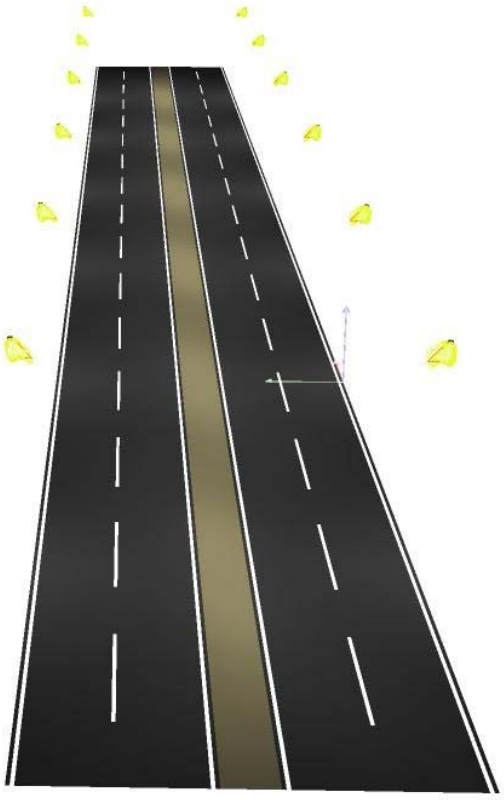
SINGLE SIDED (2 LANE) / 3D Rendering



GRUPPE LIGHTING SOLUTION SDN BHD

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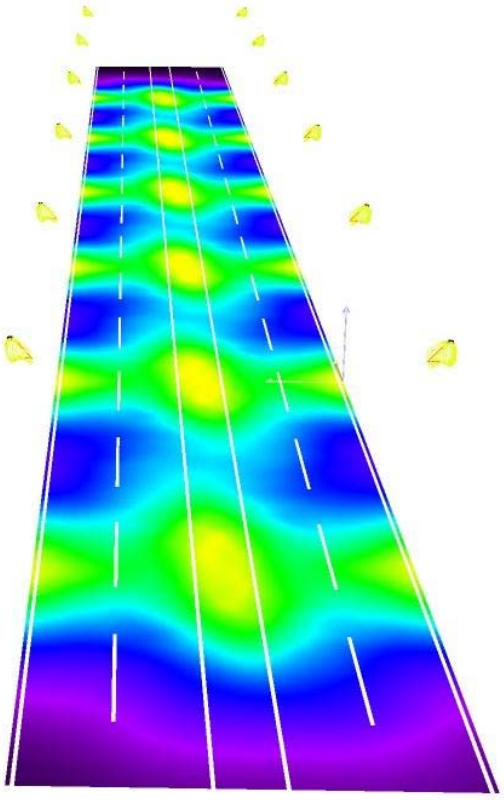
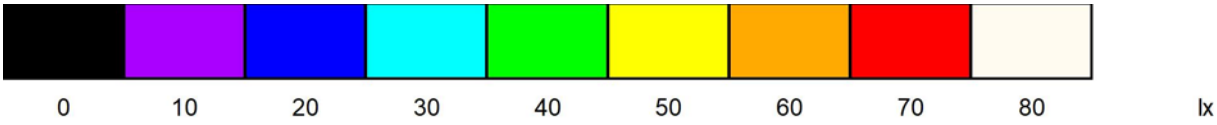
SINGLE SIDED (2 LANE) / False Color Rendering





GRUPPE LIGHTING SOLUTION SDN BHD

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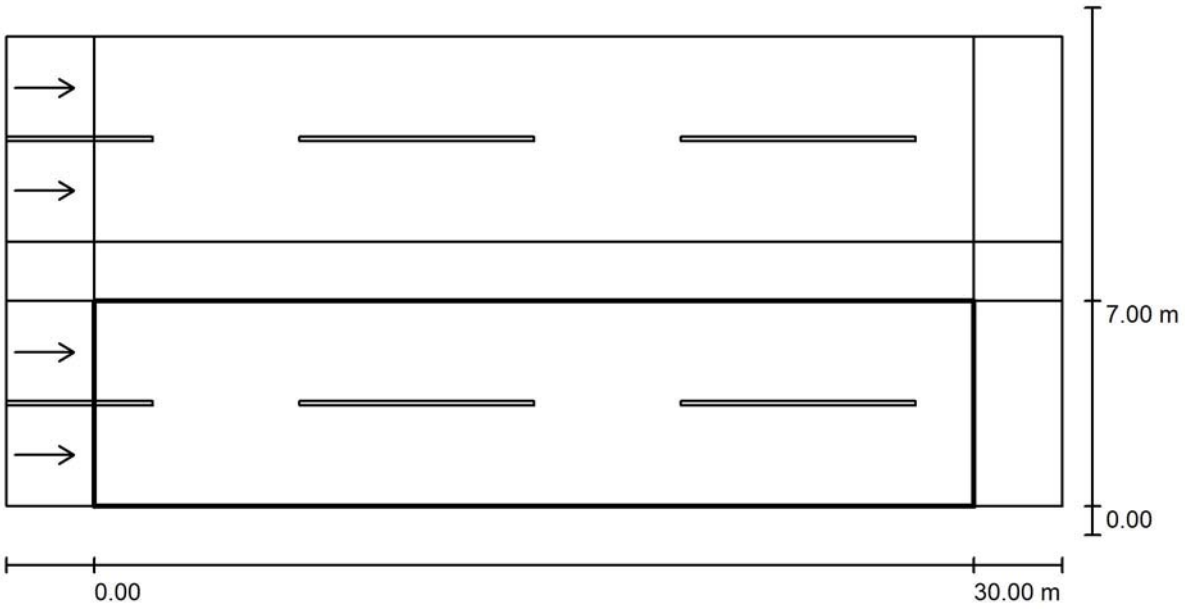
SINGLE SIDED (2 LANE) / Valuation Field Roadway 1 / Results overview



Light loss factor: 0.80

Scale 1:258

Grid: 10 x 6 Points
Accompanying Street Elements: Roadway 1.
tarmac: R3, q0: 0.070
Selected Lighting Class: ME2 (All lighting performance requirements are met.)

	L_{av} [cd/m²]	U0	Ul	TI [%]	SR
Calculated values:	1.52	0.76	0.72	4	1.04
Required values according to class:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10	≥ 0.50
Fulfilled/Not fulfilled:	✓	✓	✓	✓	✓

Assigned observer (2 Pieces):

No.	Observer	Position [m]	L_{av} [cd/m²]	U0	Ul	TI [%]
1	Observer 1	(-60.000, 1.750, 1.500)	1.52	0.76	0.89	4
2	Observer 2	(-60.000, 5.250, 1.500)	1.57	0.76	0.72	3

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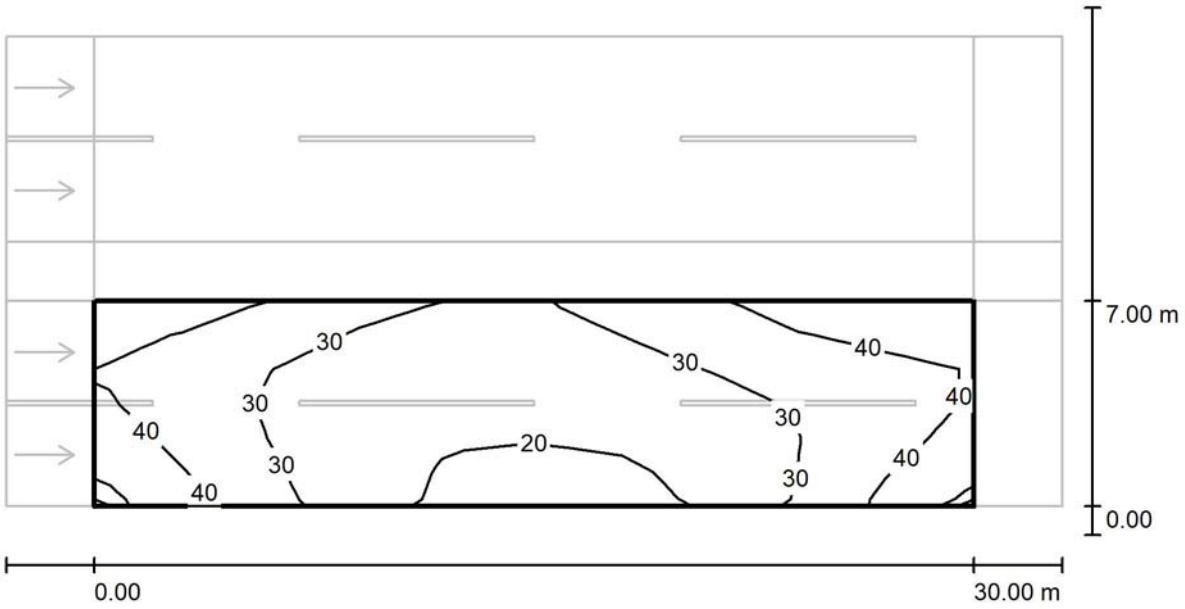
SINGLE SIDED (2 LANE) / Valuation Field Roadway 1 / Isolines (E)



Values in Lux, Scale 1 : 258

Grid: 10 x 6 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
31	16	48	0.530	0.344

23.08.2019

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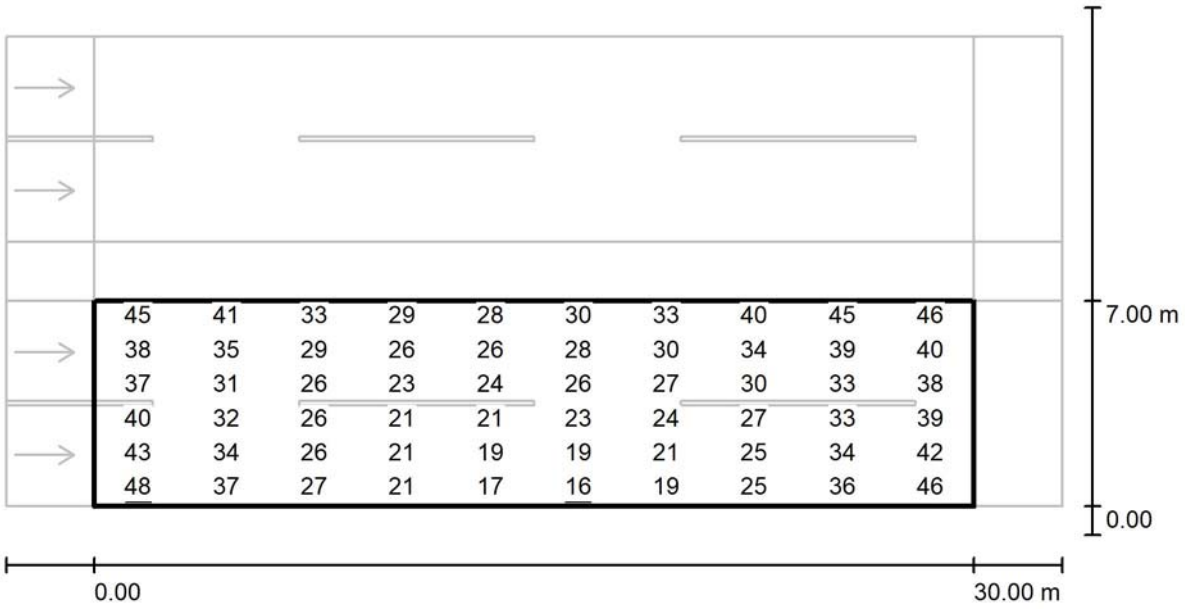
SINGLE SIDED (2 LANE) / Valuation Field Roadway 1 / Value Chart (E)



Values in Lux, Scale 1 : 258

Grid: 10 x 6 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
31	16	48	0.530	0.344

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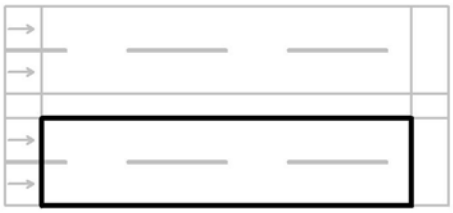
SINGLE SIDED (2 LANE) / Valuation Field Roadway 1 / Table (E)



6.417	45	41	33	29	28	30	33	40	45	46
5.250	38	35	29	26	26	28	30	34	39	40
4.083	37	31	26	23	24	26	27	30	33	38
2.917	40	32	26	21	21	23	24	27	33	39
1.750	43	34	26	21	19	19	21	25	34	42
0.583	48	37	27	21	17	16	19	25	36	46
m	**1.500**	**4.500**	**7.500**	**10.500**	**13.500**	**16.500**	**19.500**	**22.500**	**25.500**	**28.500**

Attention: The coordinates refer to the image above. Values in Lux.

Grid: 10 x 6 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
31	16	48	0.530	0.344

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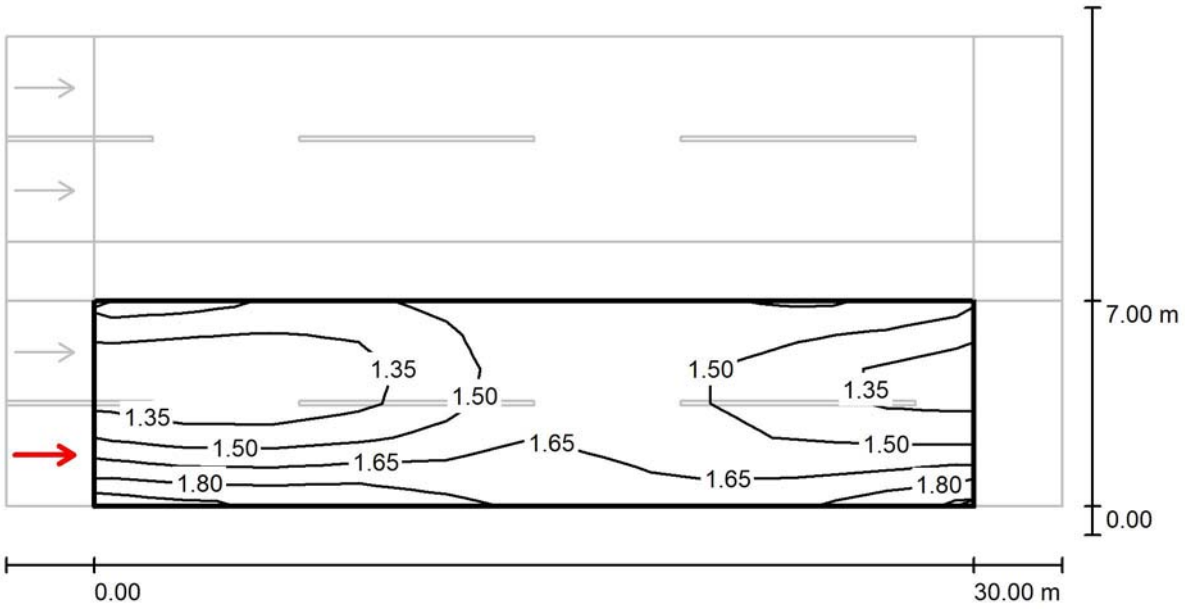
SINGLE SIDED (2 LANE) / Valuation Field Roadway 1 / Observer 1 / Isolines (L)



Values in Candela/m², Scale 1 : 258

Grid: 10 x 6 Points
Observer Position: (-60.000 m, 1.750 m, 1.500 m)
tarmac: R3, q0: 0.070

	L_{av} [cd/m²]	U0	UI	TI [%]
Calculated values:	1.52	0.76	0.89	4
Required values according to class ME2:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10
Fulfilled/Not fulfilled:	✓	✓	✓	✓

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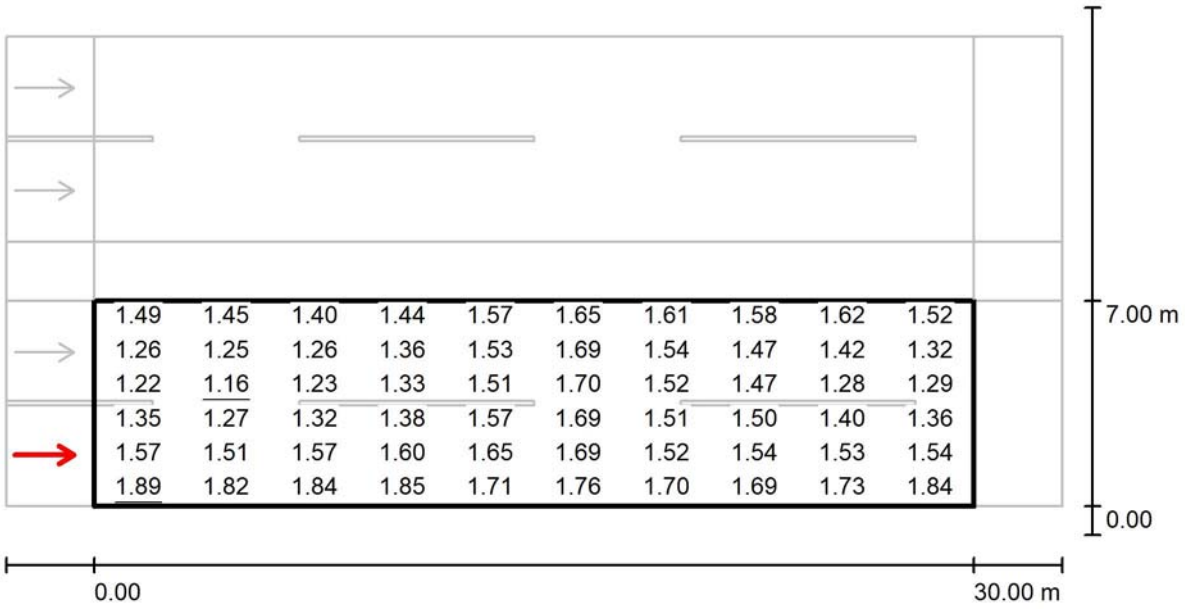
SINGLE SIDED (2 LANE) / Valuation Field Roadway 1 / Observer 1 / Value Chart (L)



Values in Candela/m², Scale 1 : 258

Grid: 10 x 6 Points
Observer Position: (-60.000 m, 1.750 m, 1.500 m)
tarmac: R3, q0: 0.070

	L_{av} [cd/m²]	U0	UI	TI [%]
Calculated values:	1.52	0.76	0.89	4
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Fulfilled/Not fulfilled:	✓	✓	✓	✓

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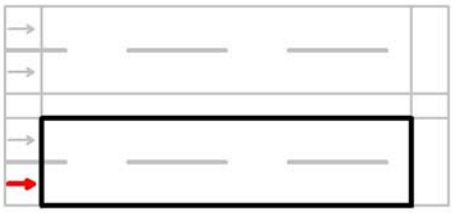
SINGLE SIDED (2 LANE) / Valuation Field Roadway 1 / Observer 1 / Table (L)



6.417	1.49	1.45	1.40	1.44	1.57	1.65	1.61	1.58	1.62	1.52
5.250	1.26	1.25	1.26	1.36	1.53	1.69	1.54	1.47	1.42	1.32
4.083	1.22	1.16	1.23	1.33	1.51	1.70	1.52	1.47	1.28	1.29
2.917	1.35	1.27	1.32	1.38	1.57	1.69	1.51	1.50	1.40	1.36
1.750	1.57	1.51	1.57	1.60	1.65	1.69	1.52	1.54	1.53	1.54
0.583	1.89	1.82	1.84	1.85	1.71	1.76	1.70	1.69	1.73	1.84
m	**1.500**	**4.500**	**7.500**	**10.500**	**13.500**	**16.500**	**19.500**	**22.500**	**25.500**	**28.500**

Attention: The coordinates refer to the image above. Values in Candela/m².

Grid: 10 x 6 Points
Observer Position: (-60.000 m, 1.750 m, 1.500 m)
tarmac: R3, q0: 0.070

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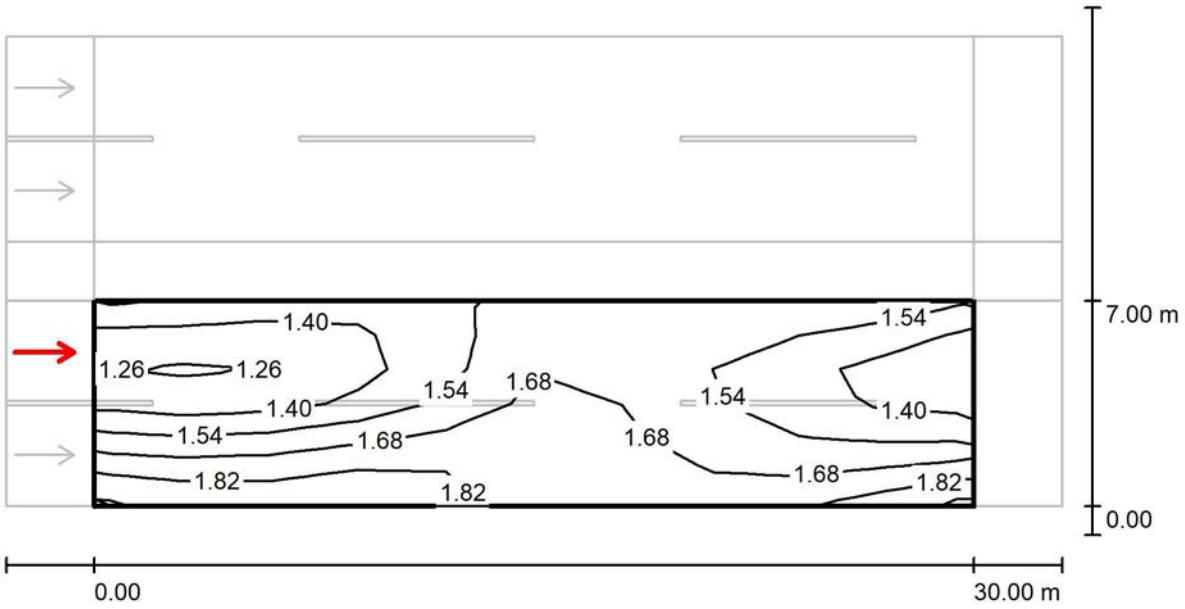
SINGLE SIDED (2 LANE) / Valuation Field Roadway 1 / Observer 2 / Isolines (L)



Values in Candela/m², Scale 1 : 258

Grid: 10 x 6 Points
Observer Position: (-60.000 m, 5.250 m, 1.500 m)
tarmac: R3, q0: 0.070

	L_{av} [cd/m²]	U0	UI	TI [%]
Calculated values:	1.57	0.76	0.72	3
Required values according to class ME2:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10
Fulfilled/Not fulfilled:	✓	✓	✓	✓

23.08.2019

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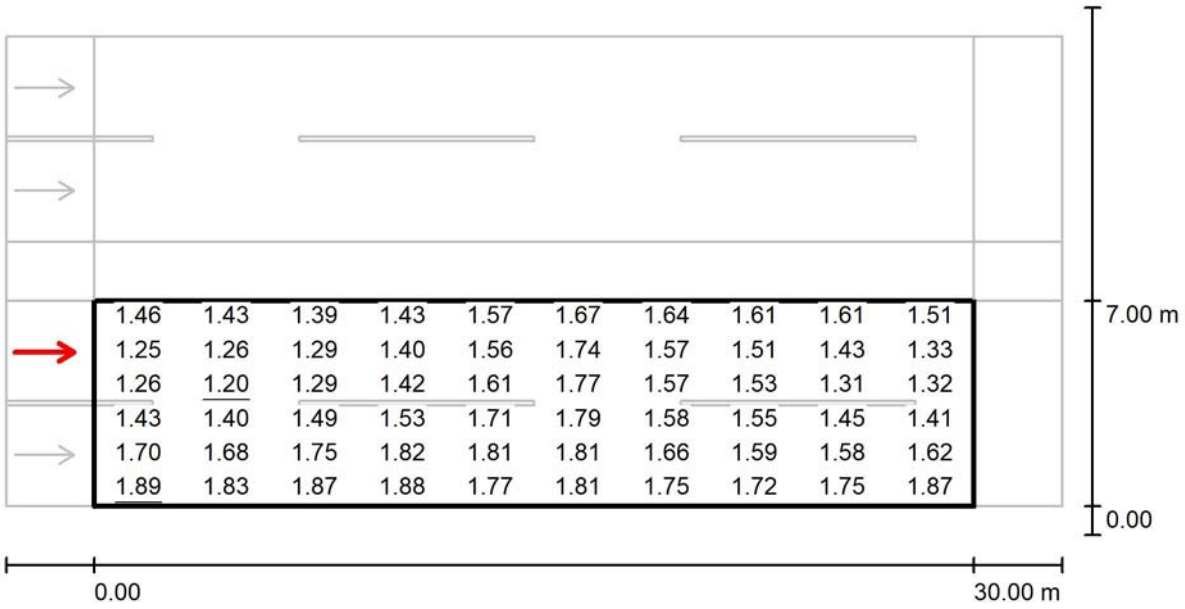
SINGLE SIDED (2 LANE) / Valuation Field Roadway 1 / Observer 2 / Value Chart (L)



Values in Candela/m², Scale 1 : 258

Grid: 10 x 6 Points
Observer Position: (-60.000 m, 5.250 m, 1.500 m)
tarmac: R3, q0: 0.070

	L_{av} [cd/m²]	U0	UI	TI [%]
Calculated values:	1.57	0.76	0.72	3
Required values according to class ME2:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10
Fulfilled/Not fulfilled:	✓	✓	✓	✓

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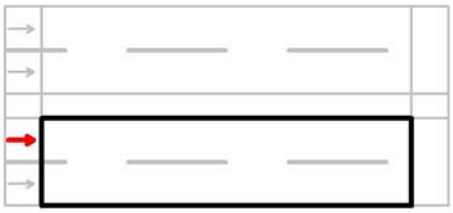
SINGLE SIDED (2 LANE) / Valuation Field Roadway 1 / Observer 2 / Table (L)



6.417	1.46	1.43	1.39	1.43	1.57	1.67	1.64	1.61	1.61	1.51
5.250	1.25	1.26	1.29	1.40	1.56	1.74	1.57	1.51	1.43	1.33
4.083	1.26	1.20	1.29	1.42	1.61	1.77	1.57	1.53	1.31	1.32
2.917	1.43	1.40	1.49	1.53	1.71	1.79	1.58	1.55	1.45	1.41
1.750	1.70	1.68	1.75	1.82	1.81	1.81	1.66	1.59	1.58	1.62
0.583	1.89	1.83	1.87	1.88	1.77	1.81	1.75	1.72	1.75	1.87
m	**1.500**	**4.500**	**7.500**	**10.500**	**13.500**	**16.500**	**19.500**	**22.500**	**25.500**	**28.500**

Attention: The coordinates refer to the image above. Values in Candela/m².

Grid: 10 x 6 Points
Observer Position: (-60.000 m, 5.250 m, 1.500 m)
tarmac: R3, q0: 0.070

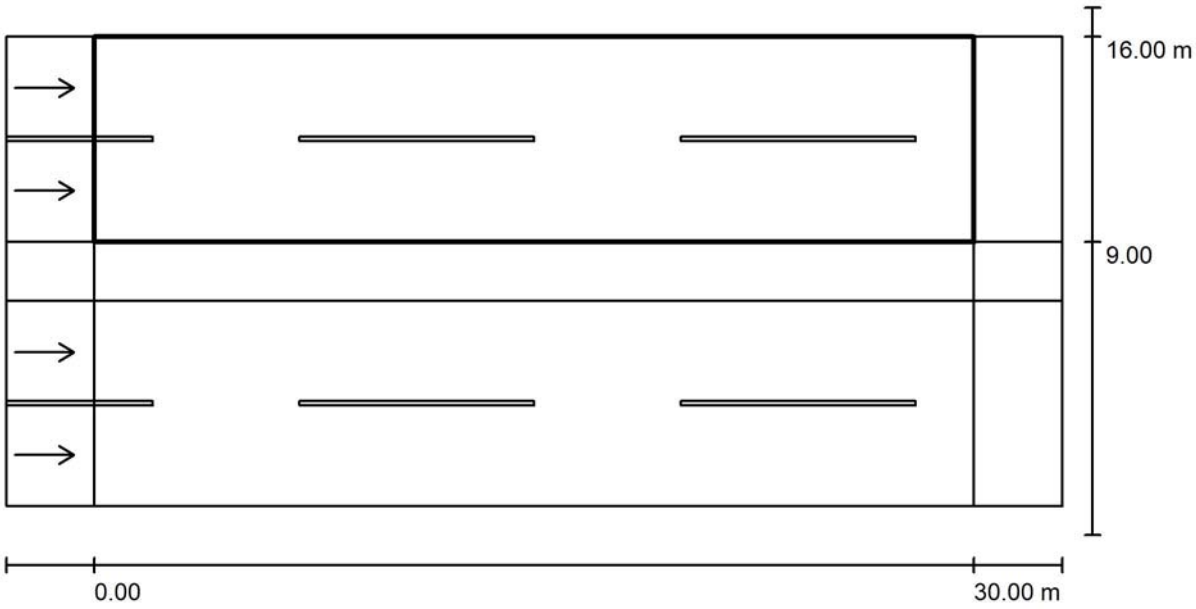
	L_{av} [cd/m²]	U0	UI	TI [%]
Calculated values:	1.57	0.76	0.72	3
Required values according to class ME2:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10
Fulfilled/Not fulfilled:	✓	✓	✓	✓

GRUPPE LIGHTING SOLUTION SDN BHD

NO 9, JALAN ANGGERIK MOKARA 31/60,KOTA KEMUNING,
SEKSYEN 31,
40460 SHAH ALAM, SELANGOR DARUL EHSAN

Operator NURUL ASHIKIN BINTI MOHD RODZI
Telephone 03-55254133
Fax 03-55254122
e-Mail ashikin@gruppelighting.com

SINGLE SIDED (2 LANE) / Valuation Field Roadway 2 / Results overview



Light loss factor: 0.80

Scale 1:258

Grid: 10 x 6 Points
Accompanying Street Elements: Roadway 2.
tarmac: R3, q0: 0.070
Selected Lighting Class: ME2 (All lighting performance requirements are met.)

	L_{av} [cd/m²]	U0	Ul	TI [%]	SR
Calculated values:	1.62	0.80	0.80	7	1.04
Required values according to class:	≥ 1.50	≥ 0.40	≥ 0.70	≤ 10	≥ 0.50
Fulfilled/Not fulfilled:	✓	✓	✓	✓	✓

Assigned observer (2 Pieces):

No.	Observer	Position [m]	L_{av} [cd/m²]	U0	Ul	TI [%]
1	Observer 3	(-60.000, 10.750, 1.500)	1.73	0.80	0.84	5
2	Observer 4	(-60.000, 14.250, 1.500)	1.62	0.80	0.80	7

23.08.2019

GRUPPE LIGHTING SOLUTION SDN BHD

NO 9, JALAN ANGGERIK MOKARA 31/60,KOTA KEMUNING,
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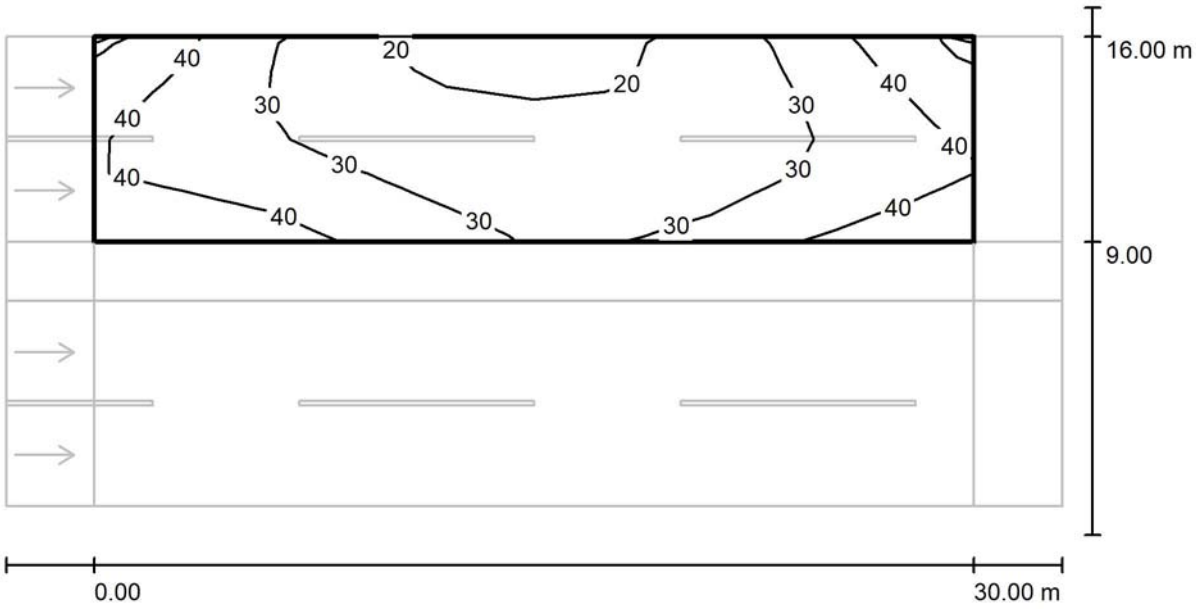
Telephone 03-55254133
Fax 03-55254122
e-Mail ashikin@gruppelighting.com

SINGLE SIDED (2 LANE) / Valuation Field Roadway 2 / Isolines (E)



Values in Lux, Scale 1 : 258

Grid: 10 x 6 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
31	16	48	0.530	0.344

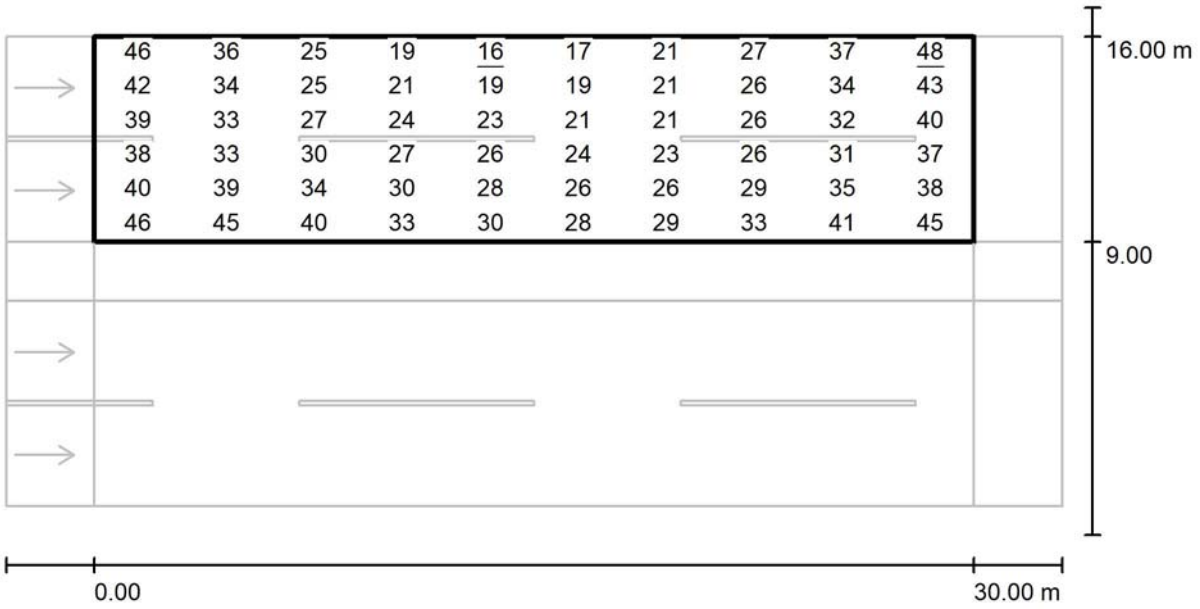
23.08.2019

GRUPPE LIGHTING SOLUTION SDN BHD

NO 9, JALAN ANGGERIK MOKARA 31/60,KOTA KEMUNING,
SEKSYEN 31,
40460 SHAH ALAM, SELANGOR DARUL EHSAN

Operator NURUL ASHIKIN BINTI MOHD RODZI
Telephone 03-55254133
Fax 03-55254122
e-Mail ashikin@gruppelighting.com

SINGLE SIDED (2 LANE) / Valuation Field Roadway 2 / Value Chart (E)



Values in Lux, Scale 1 : 258

Grid: 10 x 6 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
31	16	48	0.530	0.344

GRUPPE LIGHTING SOLUTION SDN BHD

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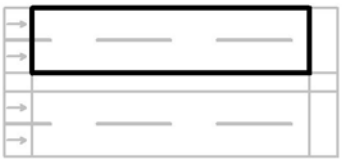
e-Mail ashikin@gruppelighting.com

SINGLE SIDED (2 LANE) / Valuation Field Roadway 2 / Table (E)



6.417	46	36	25	19	16	17	21	27	37	48
5.250	42	34	25	21	19	19	21	26	34	43
4.083	39	33	27	24	23	21	21	26	32	40
2.917	38	33	30	27	26	24	23	26	31	37
1.750	40	39	34	30	28	26	26	29	35	38
0.583	46	45	40	33	30	28	29	33	41	45
m	**1.500**	**4.500**	**7.500**	**10.500**	**13.500**	**16.500**	**19.500**	**22.500**	**25.500**	**28.500**

Attention: The coordinates refer to the image above. Values in Lux.

Grid: 10 x 6 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
31	16	48	0.530	0.344

PENGUJIAN SISTEM LAMPU JALAN

ANA SALMI BINTI AHMAD SALMAN

JENIS PENGUJIAN

1) Luminance – Luminance meter
   Jalan lurus (cd/m2) –
   sight distance 60m

2) Illuminance – Illuminance meter
   Conflict area (lux)

PERKARA PENTING

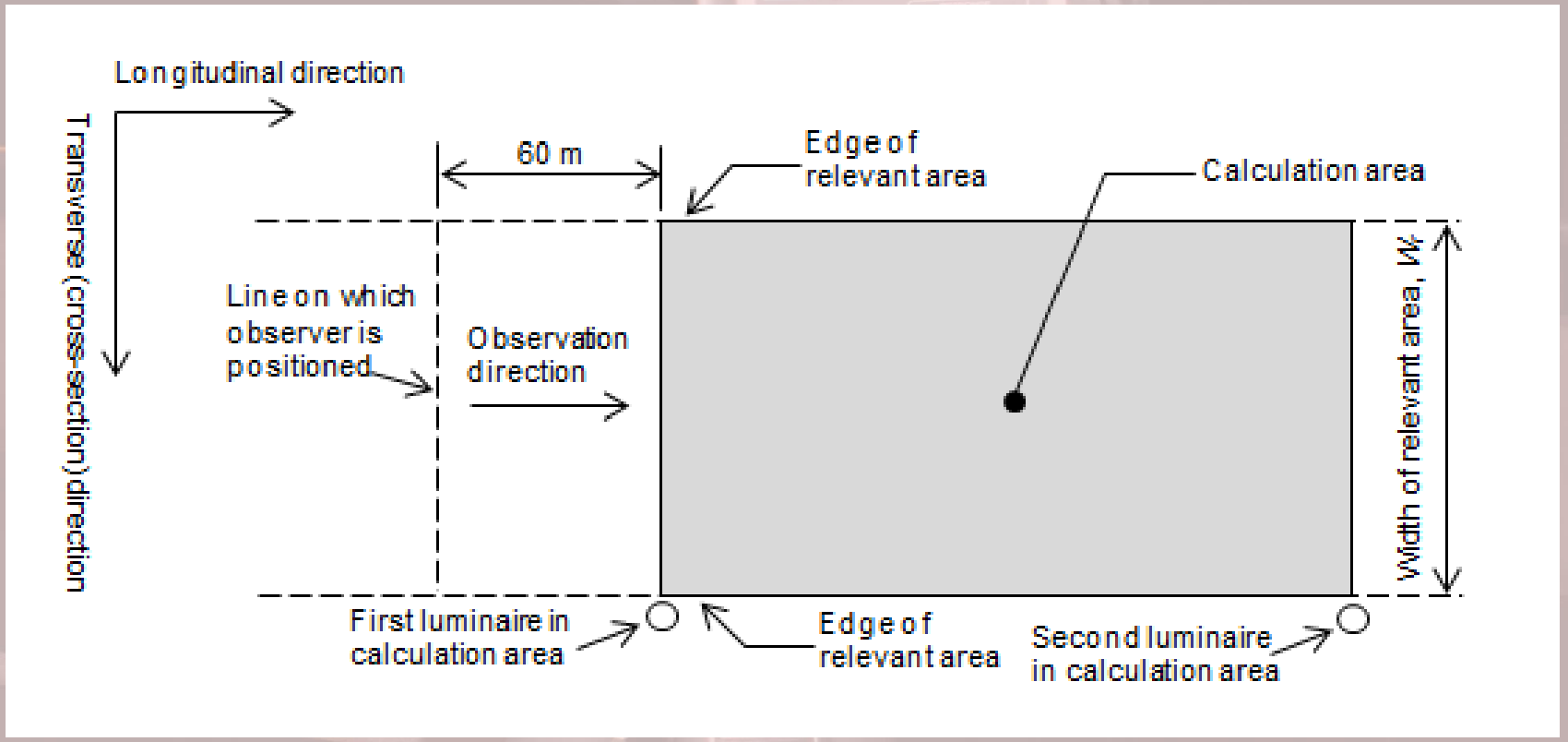
Perkara yang perlu diambil perhatian semasa pengujian :-

1) Keselamatan : traffic management plan (TMP), baju keselamatan
2) Cuaca – malam gelap, tidak hujan
3) Kestabilan lampu jalan – *discharge lamp* ambil masa utk stabil
4) Keadaan persekitaran – lampu luar, halangan pokok
5) Peralatan pengujian - perlu dikalibrasi
6) Lokasi yang sesuai – rujuk BS EN 13201-3 :2003
7) Laporan pengujian – direkod dgn tepat

Lighting Classes

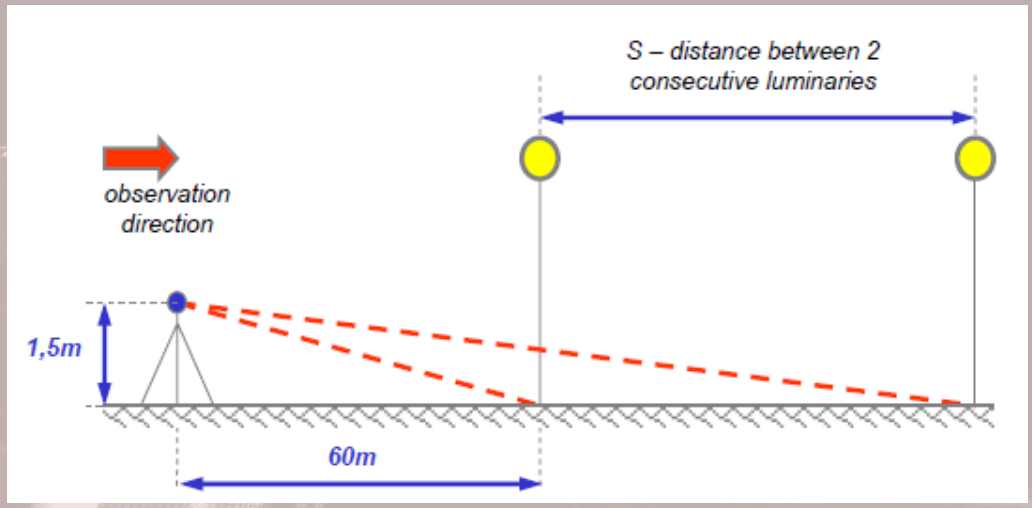
ME	This class is intended for users of motorised vehicles on traffic routes
CE	This class is intended for users of motorised vehicles in conflict areas such as road intersections, roundabouts, viewing distances are less than 60 m. etc.

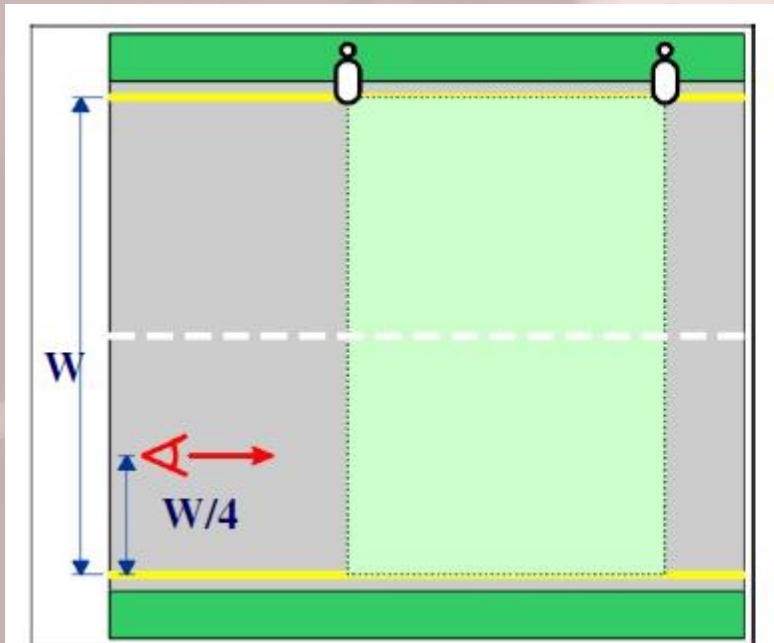
Measurement Area for Luminance

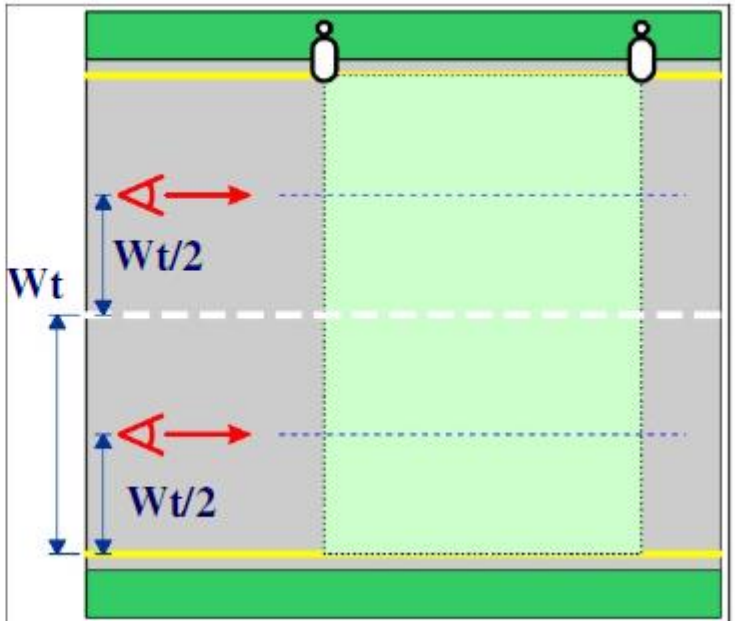


Position of observer for luminance measurement

- The observer's eye is at the height of 1.5 m above the road level.
- The observer is positioned in the middle of each lane in turn. For each position of the observer, the luminance is measured over the whole width of the carriageway

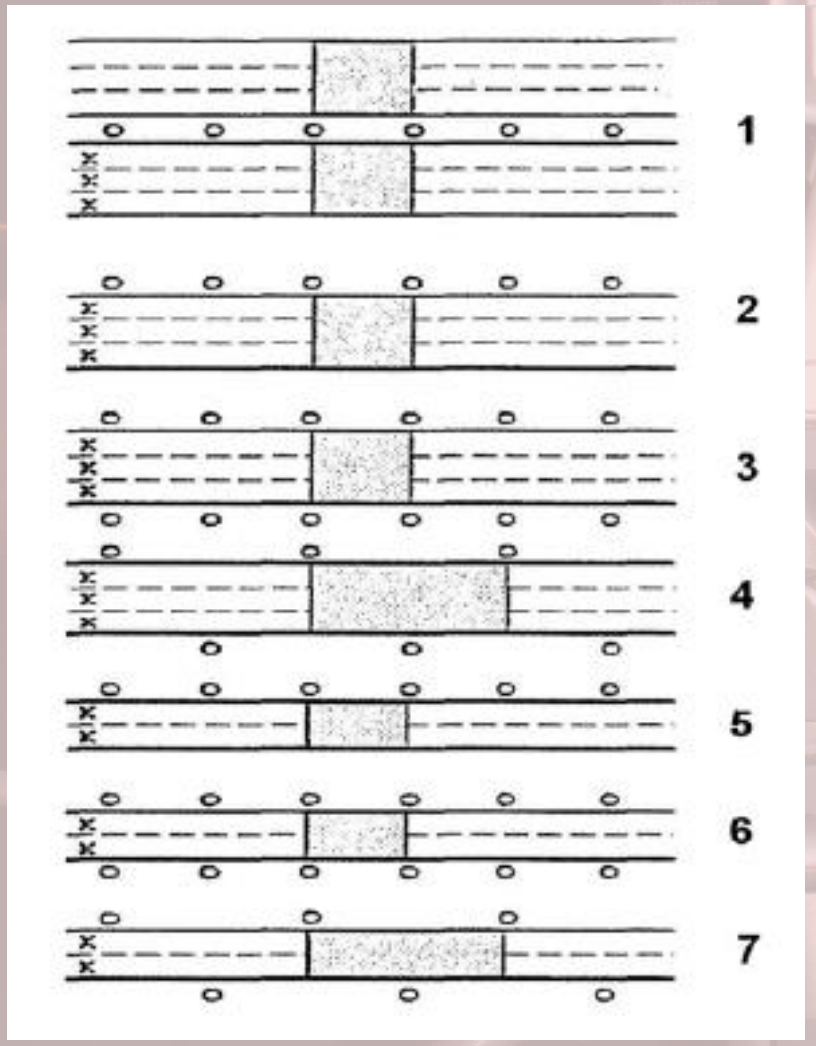






Position of observer for luminance

For each position of the observer, the luminance is measured over the whole width of the carriageway.



1 six lane road with central reservation

2 three lane road, single side luminaire arrangement

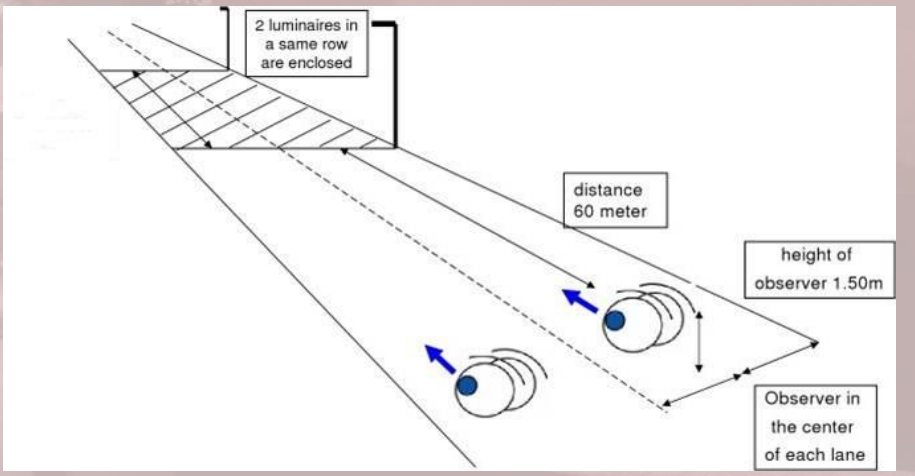
3 three lane road. Double side luminaire arrangement

4 three lane road. Staggered luminaire arrangement

5 two lane road. Single side luminaire arrangement

6 two lane road. Double side luminaire arrangement

7 two lane road. Staggered luminaire arrangement



LUMINANCE TEST

1) Jarak observer dari lampu jalan = **60m**

2) Jarak longitudinal **D=S/N**

D : jarak di antara titik (longitudinal) , m

S : jarak antara lampu jalan

N : bilangan titik longitudinal (S<30m, N=10)

(S>30m, N= integer terkecil yang memberi D<3m)

Baris pertama titik-titik ialah pada jarak D/2 dari lampu

3) Jarak Tranverse **d = WL/3**

d : jarak antara titik (tranverse), m

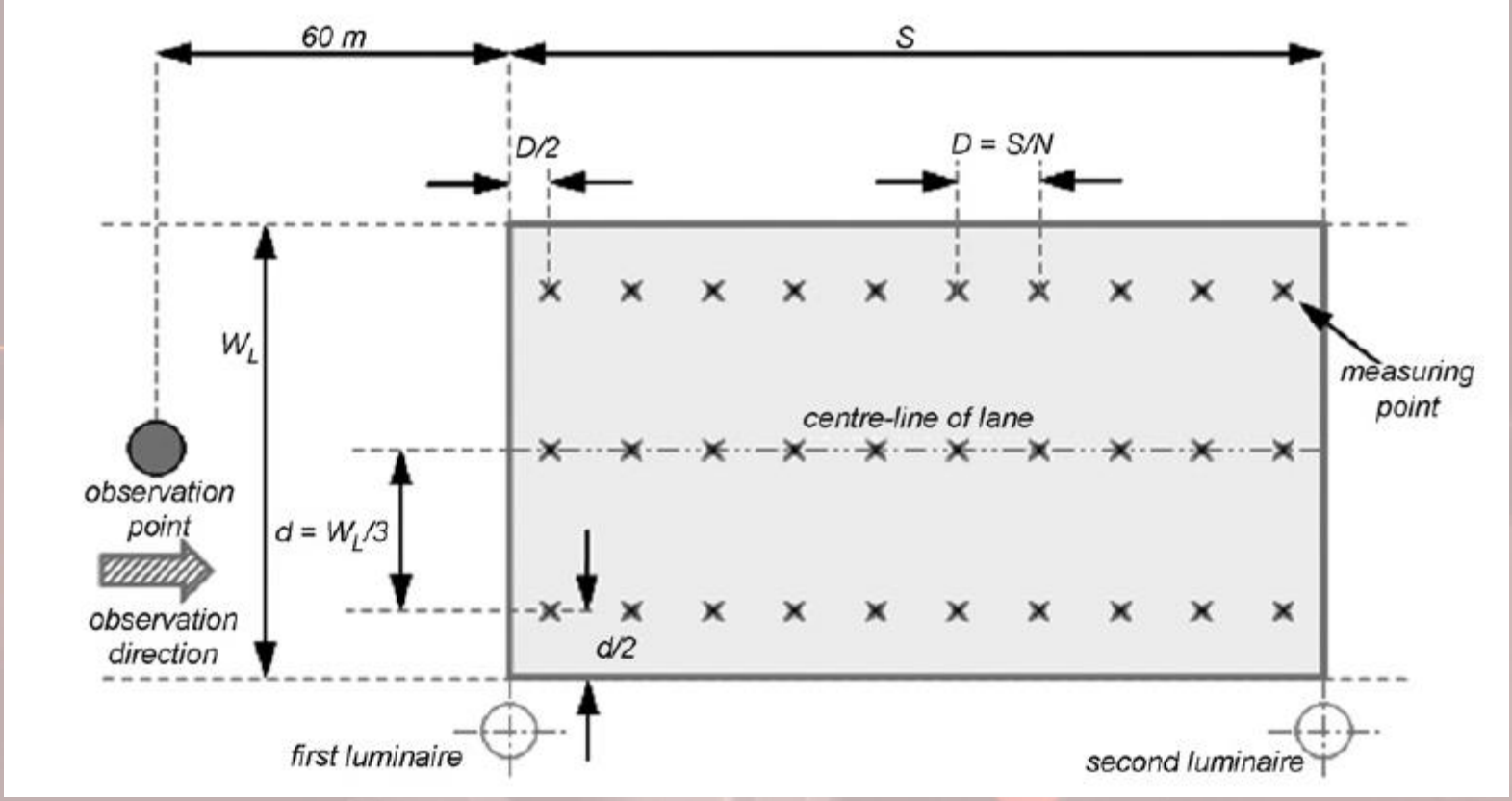
WL : Lebar lane, m

Jarak titik pertama dari edge line = d/2

4) Tinggi mata pemerhati = **1.5m** dari road level

Position of measurement points for luminance

(Refer MS 825, BS EN 13201)



W_L : width of the lane (m)
D : spacing between points in the longitudinal direction (m)
S : spacing between luminaires (m)
N : number of calculation points in the longitudinal direction,
for $S \leq 30$ m, $N = 10$
for $S > 30$ m, **the smallest integer** giving $D \leq 3$ m.
d : spacing between points in the transverse direction.

Average luminance and overall uniformity

Average luminance (L_{ave})and overall uniformity of luminance (U_O) should be calculated **for the entire carriageway and for each position of the observer.**

The U_O is calculated from the formula:

$$U_O = \frac{L_{min}}{L_{ave}}$$

where,

L_{min} : lowest luminance, **occurring at any grid point** in the field of measurement

Longitudinal uniformity

Longitudinal uniformity of luminance (U_L)should be measured for each centre line of each lane. The U_L is calculated from the formula:

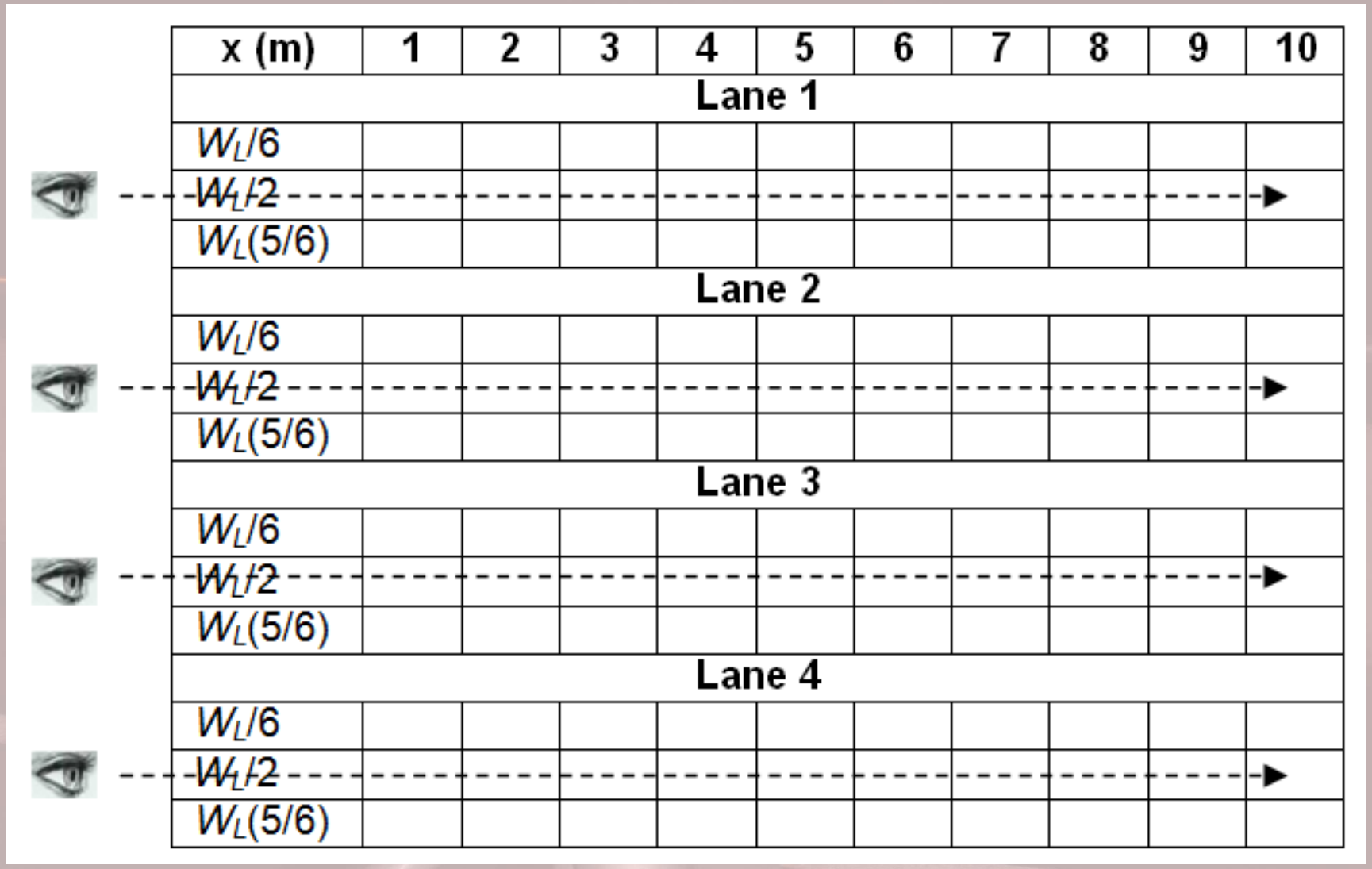
$$U_L = \frac{L_{min}}{L_{max}}$$

where,

L_{min} : lowest luminance in the longitudinal direction **along the centre line of each lane.**

L_{max} : highest luminance in the longitudinal direction **along the centre line of each lane.**

Measurement of longitudinal uniformity



x (m)	1	2	3	4	5	6	7	8	9	10
Lane 1										
$W_L/6$										
$W_L/2$										
$W_L(5/6)$										
Lane 2										
$W_L/6$										
$W_L/2$										
$W_L(5/6)$										
Lane 3										
$W_L/6$										
$W_L/2$										
$W_L(5/6)$										
Lane 4										
$W_L/6$										
$W_L/2$										
$W_L(5/6)$										

Measurement of luminance

Result

Average luminance (L_{ave})

L_{ave} = _____ cd/m^2 (take the lowest value between four observers)

Overall uniformity of luminance (U_o)

U_o = _____ (take the lowest value between four observers)

Longitudinal uniformity of luminance (U_L)

U_L = _____ (take the lowest value between four lane)

LUMINANCE TEST

ILLUMINANCE TEST

Measurement of illuminance

For conflict areas or viewing distances are less than 60 m, illuminance measurements should comply with CE lighting classes.

For luminance measurements are practicable (traffic routes), the illuminance measurements should also be taken to check the compliance between the design and installation.

ILLUMINANCE TEST

1) Jarak longitudinal **D=S/N**

D : jarak di antara titik (longitudinal) , m

S : jarak antara lampu jalan

N : bilangan titik longitudinal (S<30m, N=10)

(S>30m, N= integer terkecil yang memberi D<3m)

Baris pertama titik-titik ialah pada jarak D/2(m) dari lampu

3) Jarak Transverse **d = Wr/n**

d : jarak antara titik (tranverse), m

Wr : Lebar kawasan, m

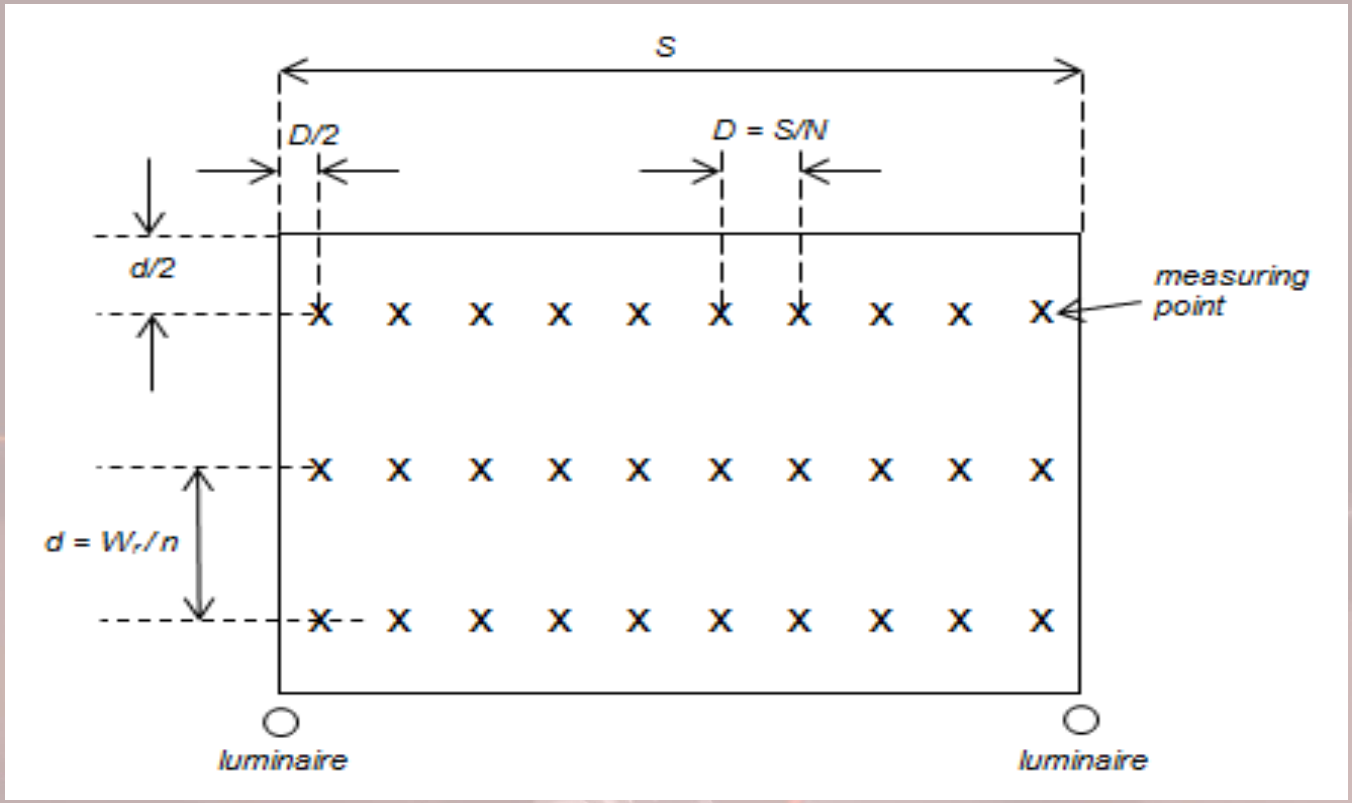
n: bil titik di lokasi tranverse mesti >3 dan integer terkecil yang memberi d <1.5m

Jarak titik pertama dari edge line = d/2(m)

4) Illuminance meter : Atas jalan raya

Measurement points for illuminance

(Based on MS 825, BS EN 13201)



D : spacing between points in the longitudinal direction (m)
S : spacing between luminaires (m)
N : number of calculation points in the longitudinal direction,
for $S \leq 30$ m, $N = 10$
for $S > 30$ m, **the smallest integer** giving $D \leq 3$ m
d : spacing between points in the transverse direction (m).
W_r : width of the carriageway or relevant area (m).
n : the number of points in the transverse direction with a value $n \geq 3$ and is **the smallest integer** giving $d \leq 1.5$ m.

Average illuminance and uniformity of illuminance

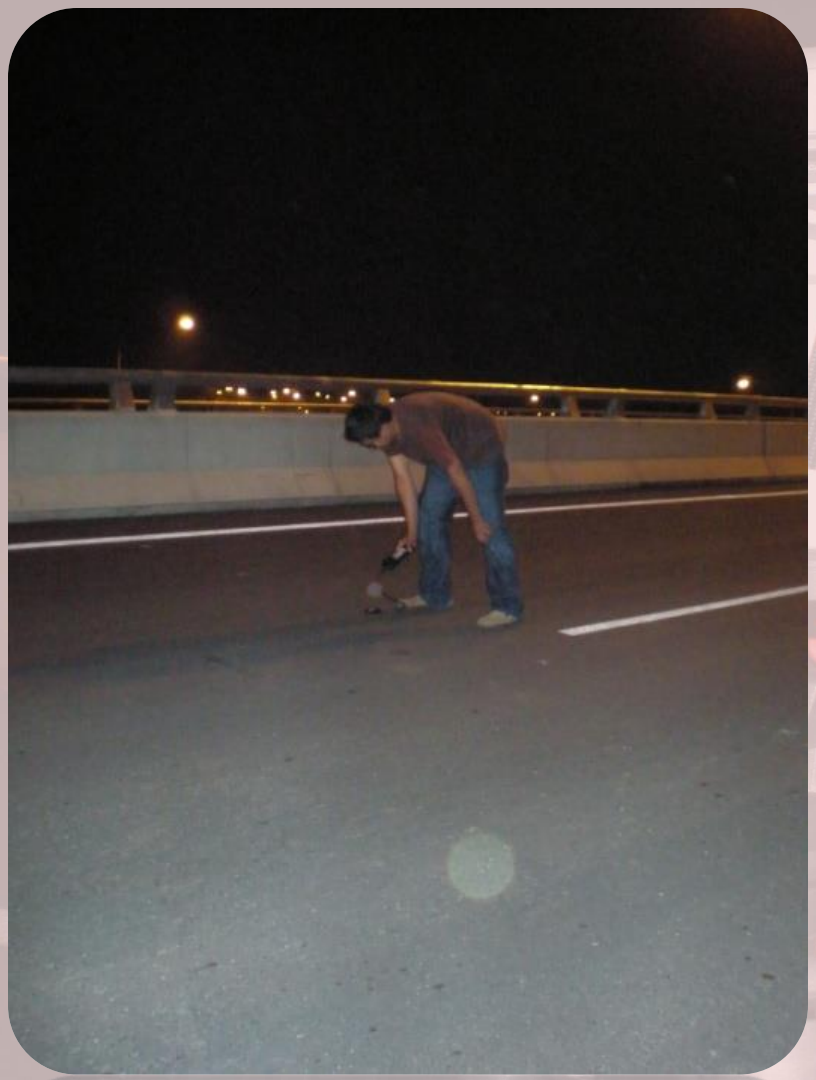
Average illuminance($\bar{E}$)and uniformity of illuminance (U_o)should be calculated for the entire relevant area. The U_o is calculated from the formula:

$$U_O = \frac{E_{min}}{\bar{E}}$$

where,

E_{min} : lowest illuminance, occurring at any grid point in the field of measurement.

ILLUMINANCE TEST



Credit isi kandungan slide : Ir. Hamzah Ismail, UPRBA2 CKE

APPENDIX D1 – 1.1A
DESIGN CRITERIA

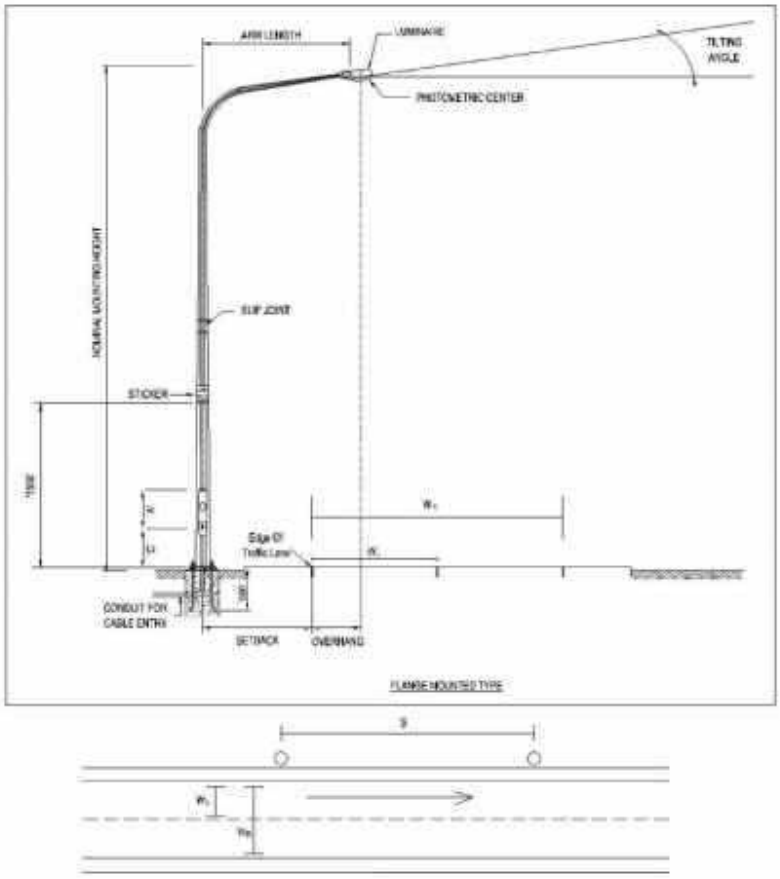
*Road Lighting Class	: ME_____/ CE_____	
*Road Surface Type	: Asphalt / Concrete	
Luminance Coefficient, Q_o	=	
Average Luminance, L_{ave}	≥	_____
Overall Uniformity, U_o	≥	_____
Longitudinal Uniformity, U_l	≥	_____
Threshold Increment, TI	≤	_____
Surround Ratio, SR	≥	_____
*Maintenance Factor , MF	:	
*Column Height , H	:	m
* Column spacing (m)	:	m
*Lamp Type	:	
*Lamp Wattage	:	W
Flux (klm)	:	klm
Lamp Tilting Angle	:	
*Arm Length	:	
*Overhang	:	
*Setback	:	

Note :

* Data to be filled by Designer

Maintenance Factor , MF = Luminaire MF X Lamp Lumen MF

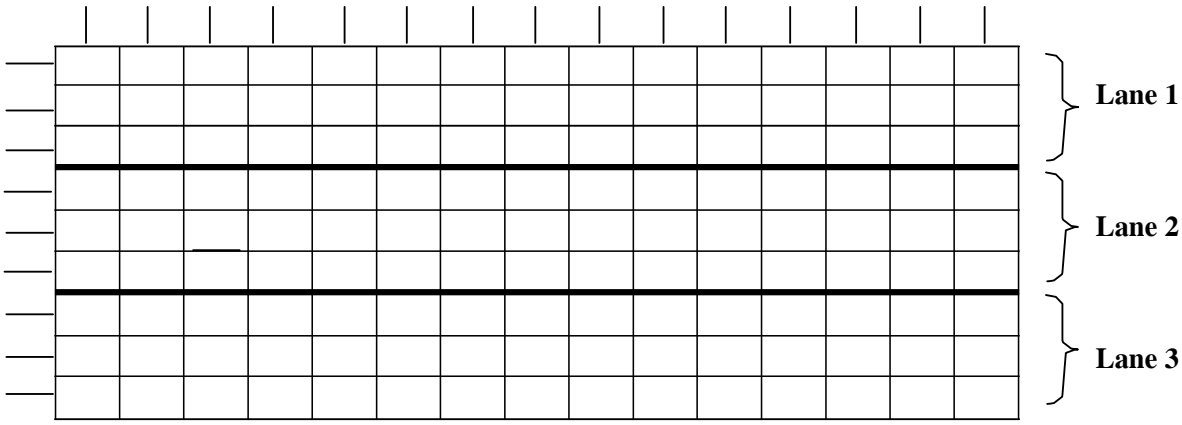
APPENDIX D1 – 1.2A
DESCRIPTION OF THE LAYOUT



LEGEND

S = Column Spacing (m)
W_L = Lane Width (m)
W_R = Carriageway Width (m)

APPENDIX D1-2A
ILLUMINANCE MEASUREMENT GRID



E_{ave} = _____lux E_{max} = _____lux

E_{min} = _____lux $U_o = E_{min}/E_{ave}$ = _____%

_____ _____

Tandatangan Pengilang/Pengedar Tandatangan Kontraktor Elektrik

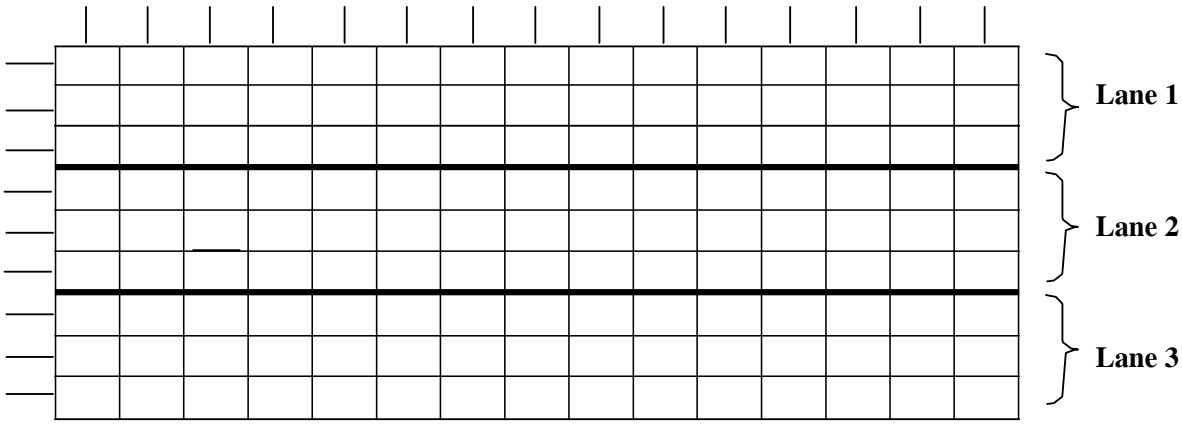
_____ _____

Cop Pengilang/Pengedar Cop Kontraktor Elektrik

Nama : _____ Nama : _____

Jawatan : _____ Jawatan : _____

APPENDIX D1-3A
LUMINANCE MEASUREMENT GRID



L_{ave} = _____ cd/m^2 $U_o = L_{min}/L_{ave}$ = _____ %

L_{min} = _____ cd/m^2 $U_l = L_{min}/L_{max}$ = _____ %

L_{max} = _____ cd/m^2 SR = _____

_____ _____

Tandatangan Pengilang/Pengedar Tandatangan Kontraktor Elektrik

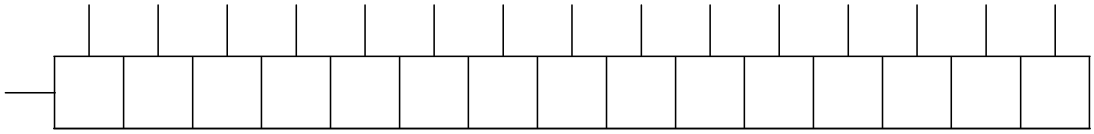
_____ _____

Cop Pengilang/Pengedar Cop Kontraktor Elektrik

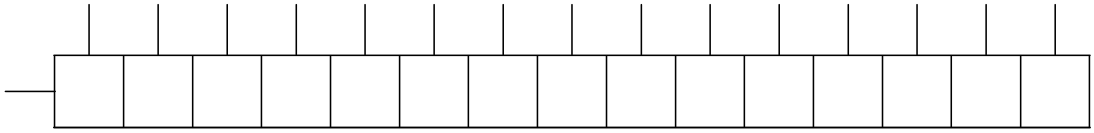
Nama : _____ Nama : _____

Jawatan : _____ Jawatan: _____

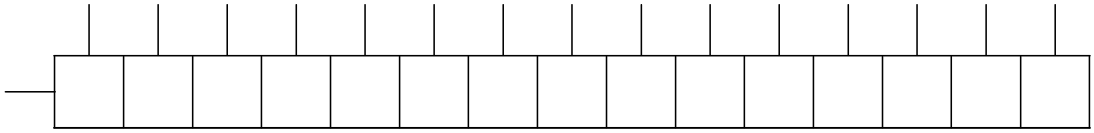
APPENDIX D1-4A
LONGITUDINAL UNIFORMITY FOR EACH LANE



$U_{l1} = L_{min} / L_{max} =$ _____ %



$U_{l2} = L_{min} / L_{max} =$ _____ %

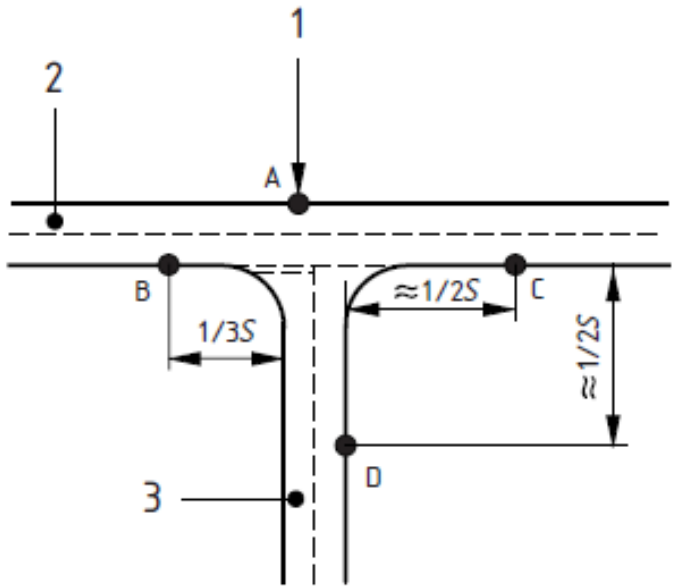


$U_{l3} = L_{min} / L_{max} =$ _____ %

_____	_____
Tandatangan Pengilang/Pengedar	Tandatangan Kontraktor Elektrik
_____	_____
Cop Pengilang/Pengedar	Cop Kontraktor Elektrik
Nama : _____	Nama : _____
Jawatan : _____	Jawatan: _____

Voltage Drop Calculation for Road Lighting

Contoh kedudukan lampu.



Key

1 Luminaire positions

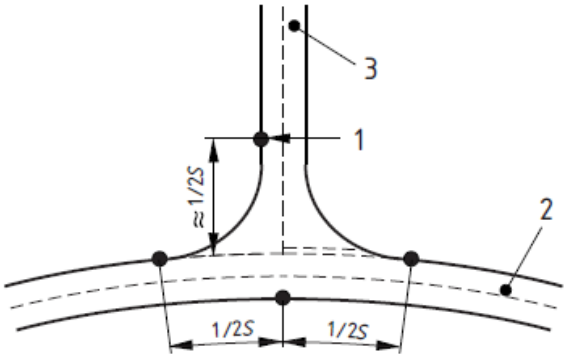
2 Major road

3 Minor road

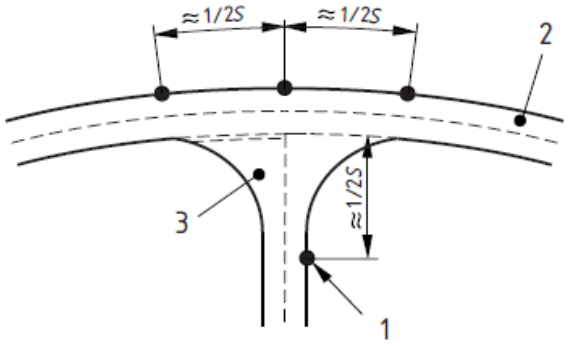
NOTE The design spacing S relates to the major road.

Figure J.1 — T-junctions on straight roads

Contoh kedudukan lampu.



a) T-junction with minor road on outside of bend



b) T-junction with minor road on inside of bend

Key

1 Luminaire positions

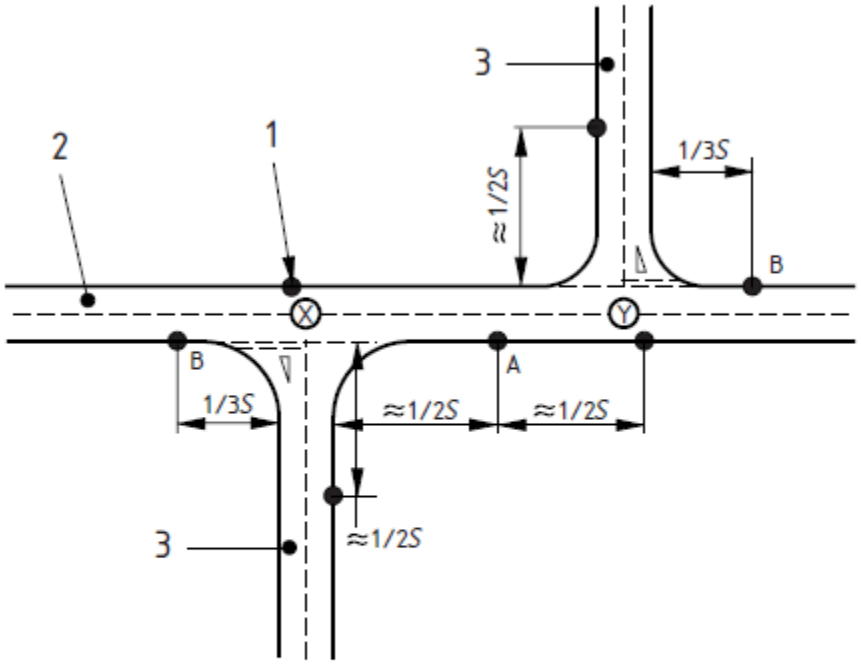
2 Major road

3 Minor road

NOTE The design spacing *S* relates to the major road.

Figure J.2 — T-junctions on bends

Contoh kedudukan lampu.



Key

1 Luminaire positions

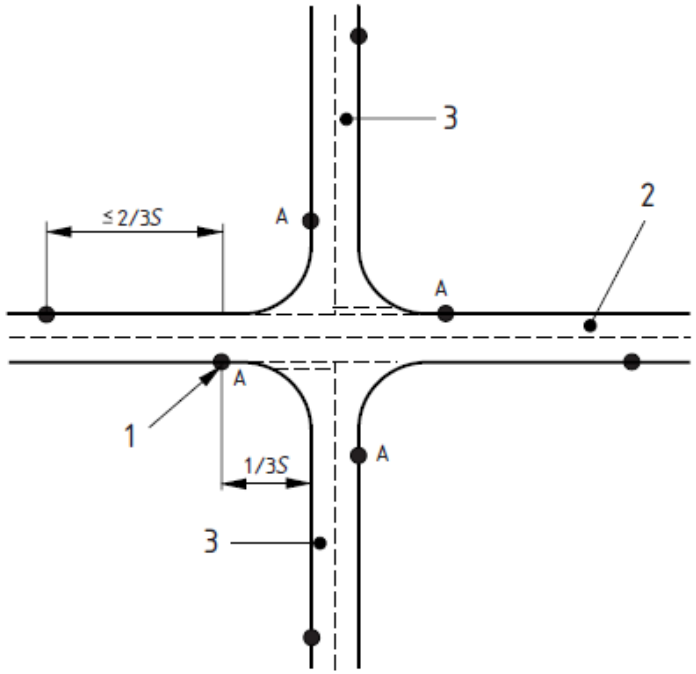
2 Major road

3 Minor road

NOTE The design spacing *S* relates to the major road.

Figure J.3 — Staggered junctions

Contoh kedudukan lampu.



Key

1 Luminaire positions

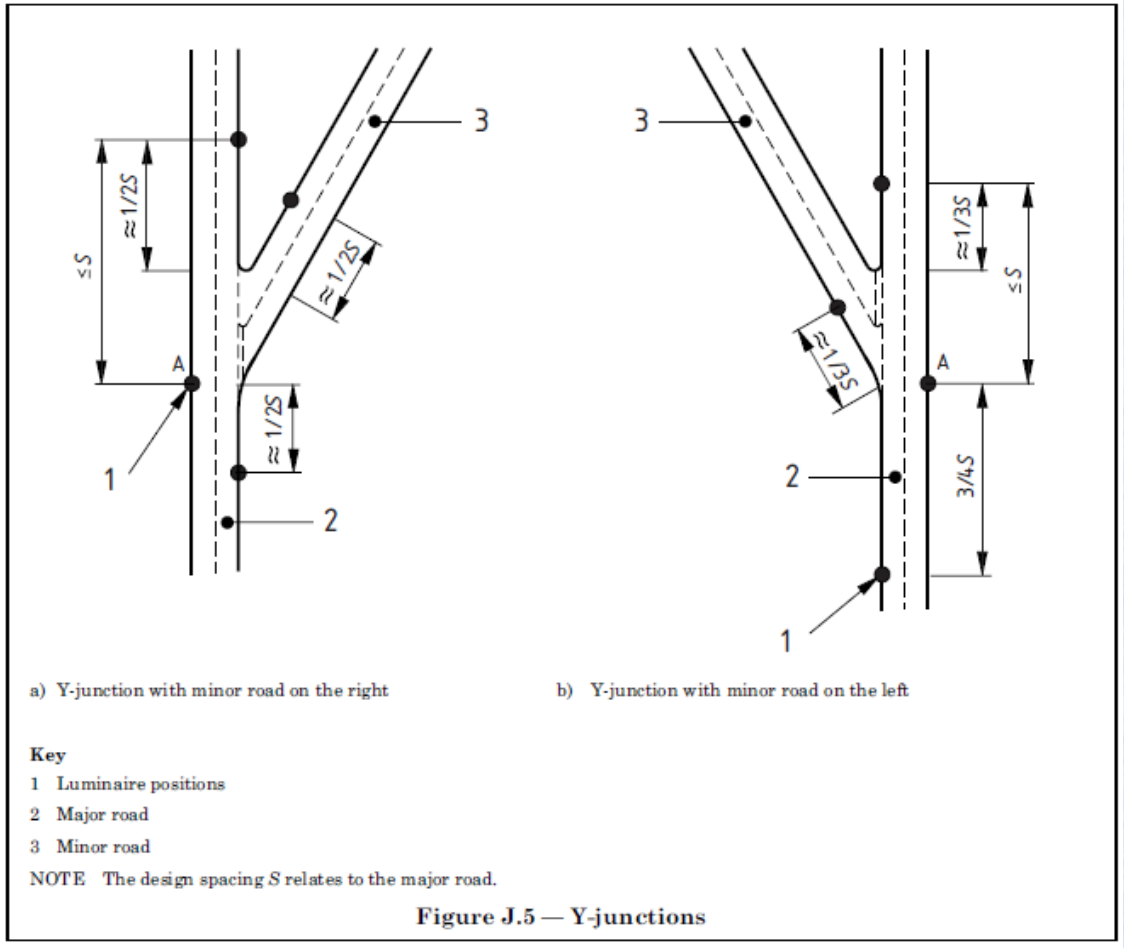
2 Major road

3 Minor road

NOTE The design spacing S relates to the major road.

Figure J.4 — Crossroads

Contoh kedudukan lampu.



a) Y-junction with minor road on the right

b) Y-junction with minor road on the left

Key

1 Luminaire positions

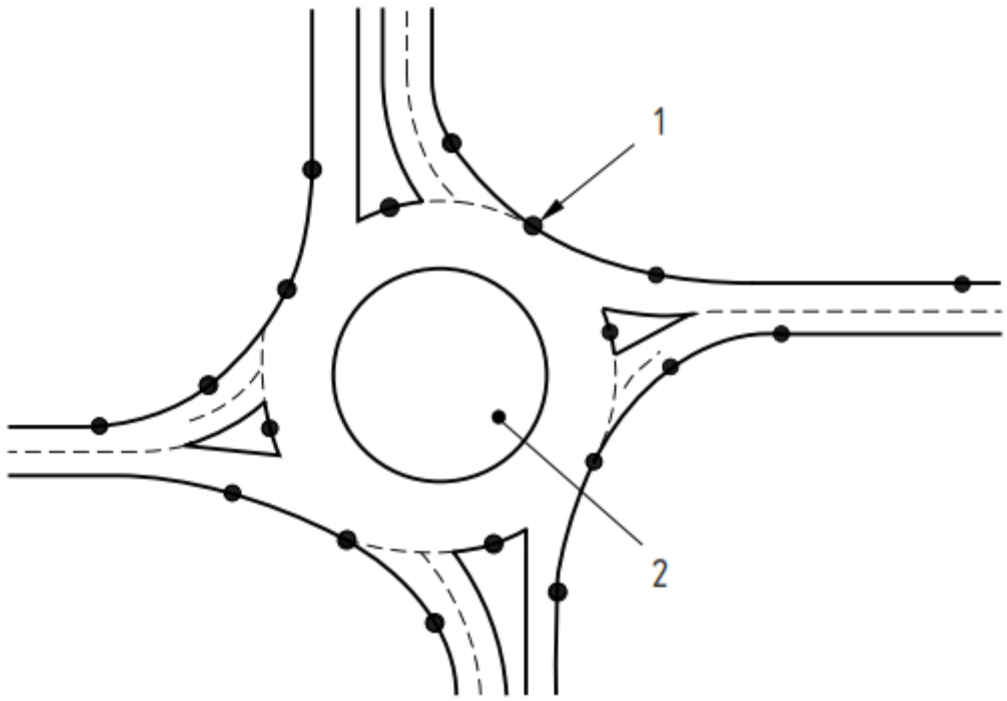
2 Major road

3 Minor road

NOTE The design spacing *S* relates to the major road.

Figure J.5 — Y-junctions

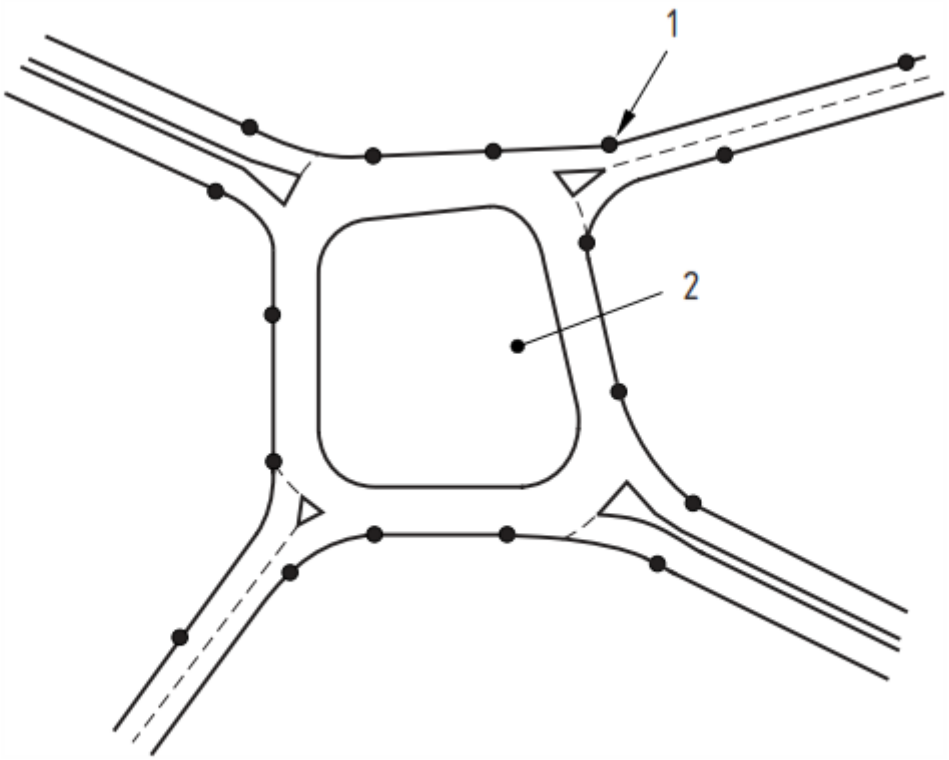
Contoh kedudukan lampu.



Key
1 Luminaire positions
2 Central island

Figure J.11 — Roundabouts at four-way junctions

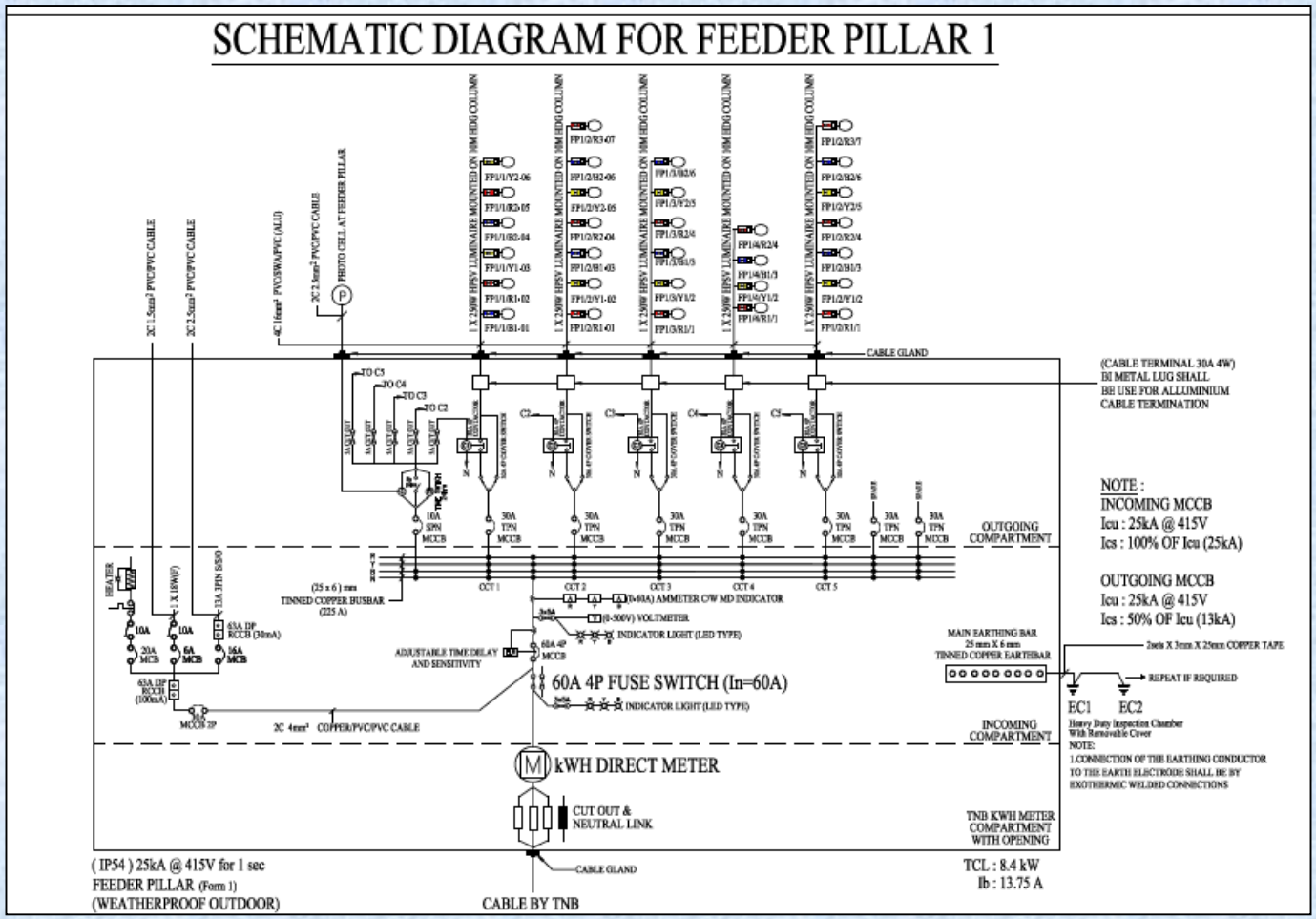
Contoh kedudukan lampu.



Key
1 Luminaire positions
2 Central island

Figure J.11 — Roundabouts at four-way junctions

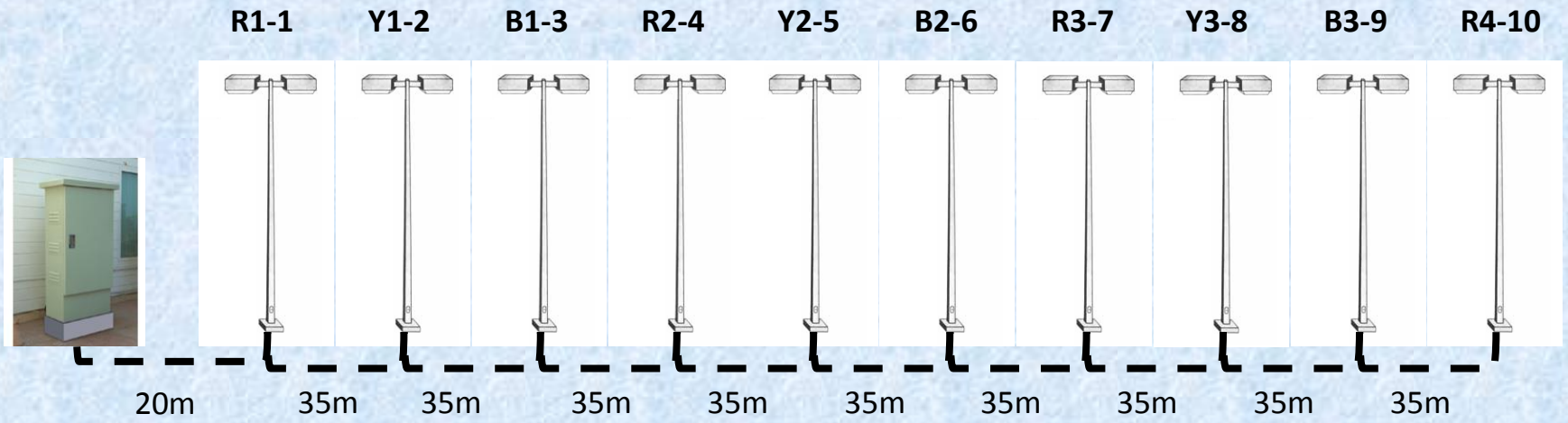
Contoh Skematik Feeder Pillar

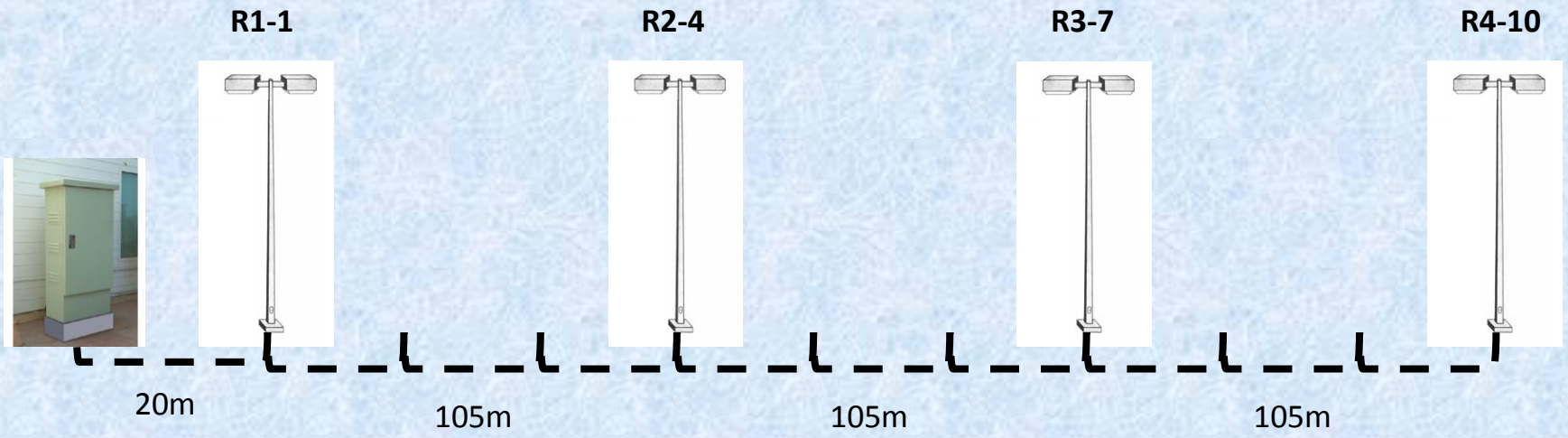


Voltage Drop Formula

$$Vd = \frac{L \times I \times \frac{\frac{mV}{A}}{m}}{1000}$$

$$Ib = \frac{P}{V} = \frac{Ptotal}{V \times p.f.}$$


R1-1
Y1-2
B1-3
R2-4
Y2-5
B2-6
R3-7
Y3-8
B3-9
R4-10
20m
35m
35m
35m
35m
35m
35m
35m
35m
35m



Luminaires = 250W

Cables = 1 x 4C 25mm² (Alu)

- Vd at Pole no. 1

$$In = \frac{Ptotal}{V \times p.f.} = \frac{4 \times 2 \times (250w + 30w)}{240 \times 0.85}$$

$$= \frac{2240}{204} = 10.98\text{A}$$

$$Vd1 = \frac{25 \times 10.98 \times 2.7}{1000} = 0.74V$$

- Vd at Pole no. 4

$$In = \frac{Ptotal}{V \times p.f.} = \frac{3 \times 2 \times (250w + 30w)}{239.26 \times 0.85}$$

$$= \frac{1680}{203.37} = 8.26\text{A}$$

$$Vd2 = \frac{111 \times 8.26 \times 2.7}{1000} = 2.48V$$

- Vd at Pole no. 7

$$In = \frac{Ptotal}{V \times p.f.} = \frac{2 \times 2 \times (250w + 30w)}{236.78 \times 0.85}$$

$$= \frac{1120}{201.26} = 5.56\text{A}$$

$$Vd3 = \frac{111 \times 5.56 \times 2.7}{1000} = 1.67V$$

- Vd at Pole no. 10

$$In = \frac{Ptotal}{V \times p.f.} = \frac{1 \times 2 \times (250w + 30w)}{235.11 \times 0.85}$$

$$= \frac{560}{199.84} = 2.80\text{A}$$

$$Vd4 = \frac{111 \times 2.80 \times 2.7}{1000} = 0.84V$$

- Total Voltage Drop

- $Vd = Vd1 + Vd2 + Vd3 + Vd4$
- $Vd = 0.74V + 2.48V + 1.67V + 0.84V$
- $Vd = 5.73V$

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