Yerevan Municipality (Armenia)

One-pager on Street Lighting Projects

(Identification form for municipal project proposals on EE modernization of street lighting[1])

1. Information about municipality	
Name of municipality:	Yerevan
Region / Oblast:	
Country:	Armenia
Number of citizens:	1077600
City budget (most recent year)	152866219 EURO 80,18 billion AMD[2]
Website of municipality:	www.yerevan.am
Member of CoM since:	09.09.2014
Date of SECAP approval:	24.06.2016
Name of contact:	Ararat Khachikyan
Position:	Head of Communal Department
Email:	
Phone:	+(374 11) 514-243

2. SEAP/SECAP Sector	Public Lighting / Street Lighting

3. Description of object	
Parameter	**Street N1**
Street name	Tbilisi Highway
Classification /category of street[3]	U2
Length of street, m	4000
Width of street, m	24
Sidewalks[4]	On both sides (1.5-2m length)
Number of lighting poles, pcs	260
Distance between lighting poles, m	35
Mounting height of a luminaire, m	9.5
Position of luminaries	On both sides of the street (opposite)
Number of luminaries, psc.	513
Type of installed lamps	HPS
Capacity of installed lamps, W	285
Total installed capacity of street lighting system, kW	146,2
Annual hours of operation of the system, hours	2920
Average illuminance level, lux	
Control system (Yes/No)	Yes
Type of control system (e.g. time relay/lighting sensor)	Via ground phone lines
Underground cable wiring (Yes/No)	Overhead
Power metering system (Yes/No)	Yes
Type of power metering system (e.g. two-tariff)	Two-tariff
Short description (conditions of infrastructure, number of non-operated lamps, metering system e.g. individual or combined with other consumers, other information)	Not operational lamps: 30 Metering system is not individual (other consumers are connected).

[1] The information provided with this form is for information purposes only. No rights can be exerted because of information provided with this form, nor can the municipality be held accountable for any mistakes or incorrect information provided within.

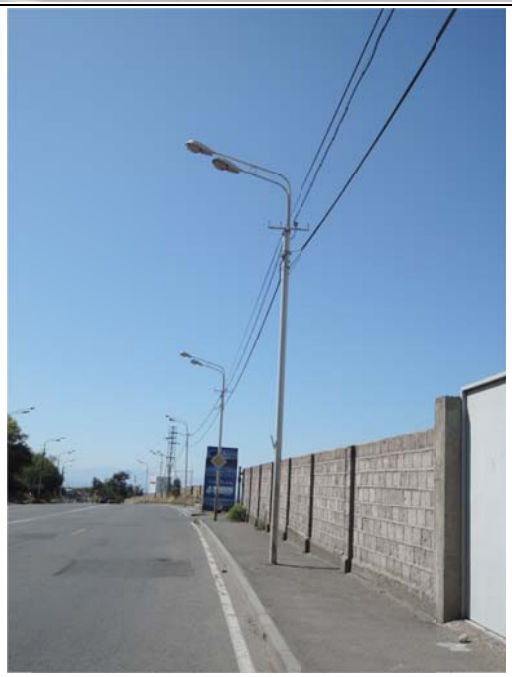
[2] Use the exchange rate of your national bank on the moment of filling in the form.

[3] Please refer to relevant laws/norms.

[4] For example: on both sides (1.5-2 m width), or on one side (1.5-2 m width, on the side of lighting poles), or on one side (1.5-2 m width, in front of the lighting poles).

4. Annual energy consumption (MWh/year) and costs over the past 3 years							
Year	Energy consumption (MWh/year)	Energy consumption costs		O&M costs		Total costs per year	
		EUR	AMD	EUR	AMD	EUR	AMD
2017	347	26524,6	13909480			26524,6	13909480
2018	339	25950,3	13608334			25950,3	13608334
2019	338	25808,2	13533778			25808,2	13533778

5. Photos showing pre-project situation (daylight and night time)



6. Available supporting documents (If necessary, provide links or attach copies of documents)
Reference to any available supporting documents like energy audits, feasibility studies, etc. Document / Source N1: Technical passport of the lighting system (8.3 km) and (1.2 km) Document / Source N2: DIALux Lighting Calculation (see attached)

7. Energy efficiency measures and modernizations to be implemented at Street N1					
Energy efficiency measure & modernizations	**Number of units**	**Indicative costs per unit (with VAT)[5]**		**Subtotal costs**	
		EUR	**AMD**	**EUR**	**AMD**
Procurement of street luminaires, pcs.	257	290	152250	74530	39128250
Installation of street luminaires, pcs.	257	10	5250	2570	1349250
Repairmen or replacement of poles, pcs.	65	255	133700	16575	8690500
Installation of underground cable, m	5700	5,8	3045	33060	17356500
Installation of control boxes, pcs.	6	381	200000	2286	1200000
Installation of metering system, pcs.	6	202	106000	1212	636000
Introduction of dimming system, pcs.	No				
Complimentary equipment, pcs.					
- brackets	257	7.8	4100	2004	1053700
- fixing elements	257	10.1	5300	2595.6	1362100
- procurement of poles and brackets	343	1.7	910	594.5	312130
Other works (welding)	Replacement of defective cables				
TOTAL				**135427.1**	**71088430**

8. Other costs		
Description	**Indicative costs (EUR)**	**Indicative costs (AMD)**
Human resources/PIU		
Structural study		
Energy Audit		
Technical design		
State expertise		
Site supervision		
Installation works (labor)		
Other (please specify)		
TOTAL		

[5] These are indicative costs based on the data from real implemented projects under the Covenant of Mayors – Demonstration Projects (CoM-DeP programme). However, municipalities are advised to contact suppliers / service providers to obtain more accurate information for their specific case / country.

9. Grad total costs	Tigran Mets Avenue
EURO	**135427.1**
AMD	**71088430**

10. Description of system after implementation		
Parameter	**Street N1**	
Street name	Tbilisi Highway	
Number of lighting points, pcs	257	
Type of new luminaires (e.g. HPS, LED, PV integrated LED)	LED	
Individual capacity of new luminaires, W	137	
Total installed capacity of new street lighting system, kW	35.21	
Average illuminance level, lux	1,7 candela/m^2 27 lux	
Annual hours of operation of the system, hours	2920	
Annual energy consumption of the system, MWh[6]	102.8	
Annual energy consumption costs, Euro / AMD	8302	4358720
Annual O&M costs, Euro / AMD	830	435000
Annual energy consumption and O&M costs, Euro / AMD	**9132**	**4793720**

11. Expected results		
Annual energy savings, MWh[7]	**235.2**	
Annual monetary savings, EUR/local currency	**16676.2**	**8740058**
Annual CO_2 emission reduction[8], tCO_2	**52.21**	

12. Timetable of the project	
Description of step	**Indicative time needed (days)**
Organization of procurement	30
Procurement and shipment	100
Works/site supervision	30
Final acceptance (incl. correction of defects)	5
Calculation of real savings (measurement &verification)	5
TOTAL	**170**

13. Other information

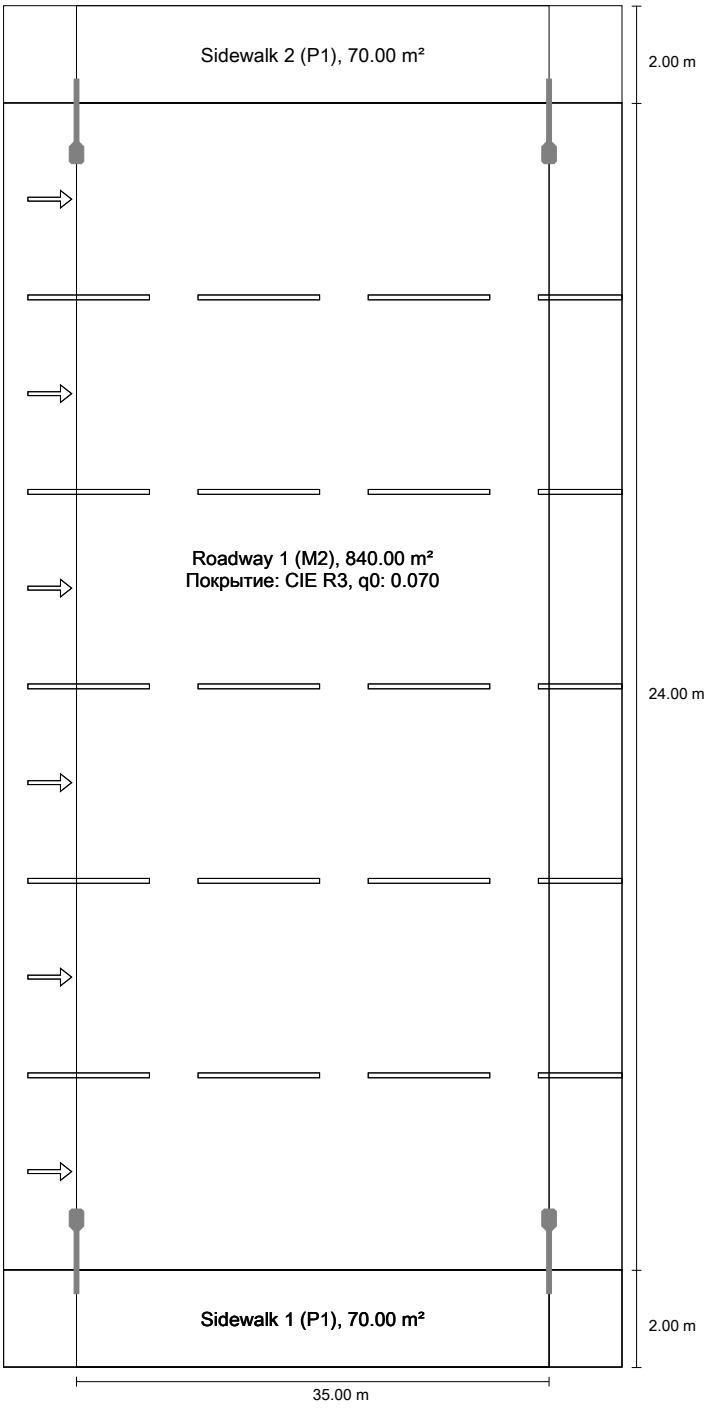
[6] In case of PV integrated solar LED street lights that generate electricity to be accumulated in batteries in the daytime and consumed by the lighting system in the nighttime, or to be supplied to a national grid via a net-metering system (bidirectional electricity meters) in the daytime and consumed by the lighting system in the nighttime, only electricity supplied to the lighting system by a national grid or other sources shall be counted.
[7] It is important that you fill in reasonable estimates of energy savings. Too optimistic energy savings will raise questions about your trustworthiness as partner.
[8] For calculation of CO_2 emission reduction, please refer to national GHG emission factors (SECAP Guide).

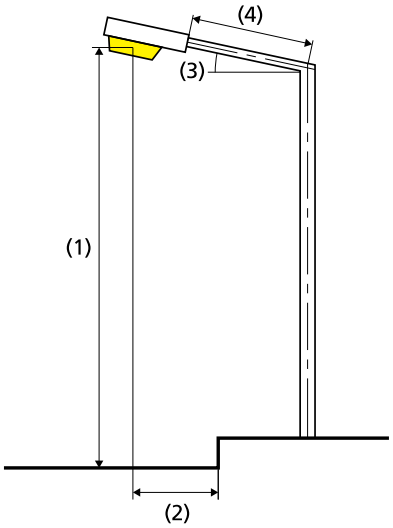
Дата:
19.09.2019

Yerevan light calculation Tbilisyan road-24road-9.5poles-35 distance

Street 1 по EN 13201:2015

DIALux 137 W L02





Лампа:	1x64 LEDs bin N4
Световой поток (светильник):	17784.12 lm
Световой поток (лампа):	17784.00 lm
Рабочие часы	
4000 h:	100.0 %, 137.0 W
W/km:	7946.0
Расположение:	двухсторонне напротив
Расстояние между мачтами:	35.000 m
Наклон консоли (3):	10.0°
Длина консоли (4):	1.500 m
Высота световых точек (1):	9.500 m
Свес световой точки (2):	1.000 m

ULR:	0.00
ULOR:	0.00
Наибольшие значения силы света	
при 70° и выше:	490 cd/klm *
при 80° и выше:	176 cd/klm *
при 90° и выше:	16.6 cd/klm *
Класс интенсивности света:	G*1

В во всех направлениях, которые образуют указанный угол с нижней вертикалью в инсталлированных и готовых к работе светильниках.

* Значения интенсивности света в [свечей/килолюмен] для расчета класса интенсивности света относятся в соответствии с EN 13201:2015 к световому потоку.

Компоновка отвечает классу индекса ослепления D.0

Результаты для полей оценки

Коэффициент эксплуатации: 0.80

Sidewalk 2 (P1)

Ecp [lx]	Emin [lx]
* 11.44	* 7.42

Roadway 1 (M2)

Lcp [cd/m²] ≥ 1.60	Uo ≥ 0.40	Ul ≥ 0.70	TI [%] ≤ 10	EIR
✓ 1.72	✓ 0.46	✓ 0.70	✓ 9	* 0.34

Sidewalk 1 (P1)

Ecp [lx]	Emin [lx]
* 11.44	* 7.42

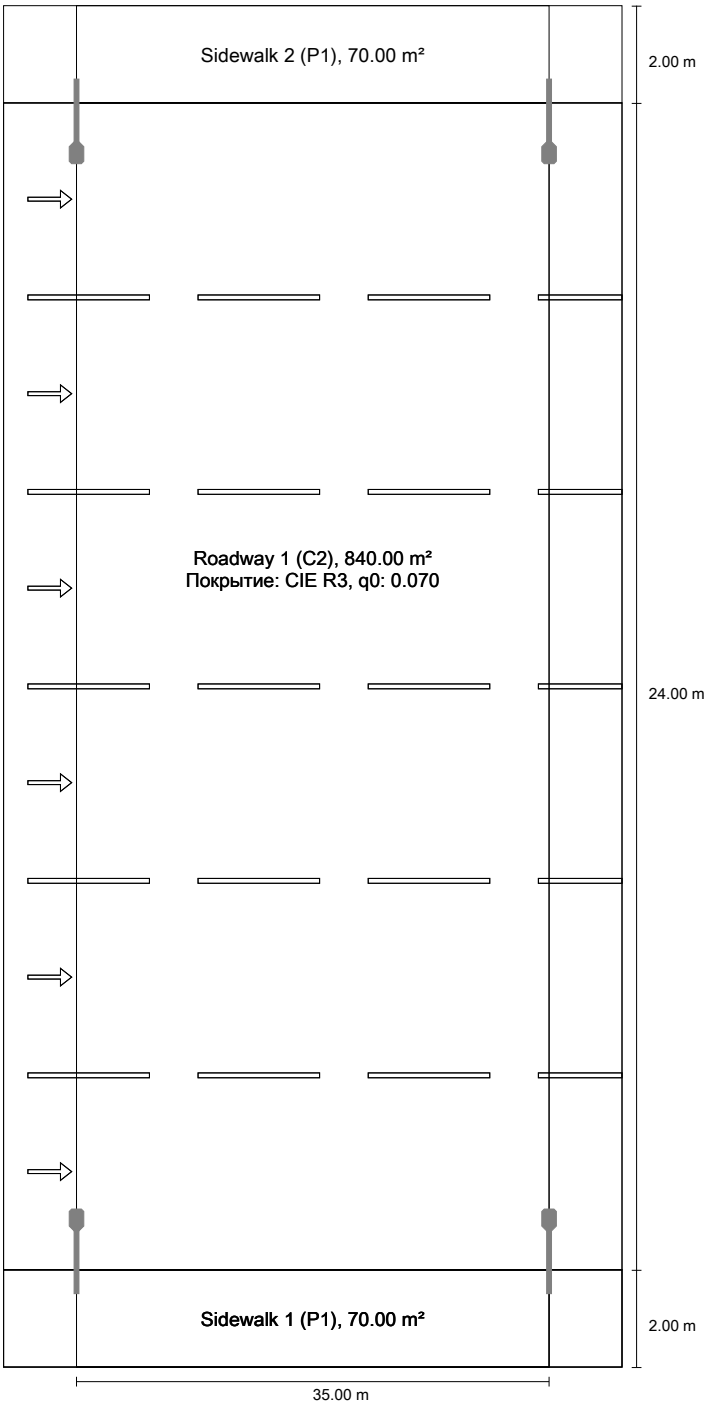
* Для сведения; не входит в оценку

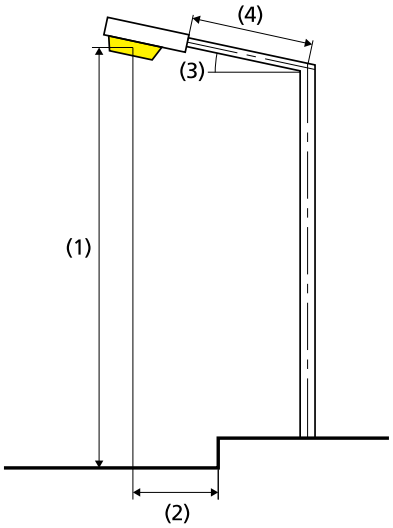
Результаты для показателей энергоэффективности

Индикатор плотности мощности (Dp)	0.011 W/lxm²
Интенсивность потребления энергии	
Расположение: 137 (1096.0 кВт-ч/год)	1.1 кВт-ч/m² год

Street 2 по EN 13201:2015

DIALux 137 W L02





Лампа:	1x64 LEDs bin N4
Световой поток (светильник):	17784.12 lm
Световой поток (лампа):	17784.00 lm
Рабочие часы	
4000 h:	100.0 %, 137.0 W
W/km:	7946.0
Расположение:	двухсторонне напротив
Расстояние между мачтами:	35.000 m
Наклон консоли (3):	10.0°
Длина консоли (4):	1.500 m
Высота световых точек (1):	9.500 m
Свес световой точки (2):	1.000 m

ULR:	0.00
ULOR:	0.00
Наибольшие значения силы света	
при 70° и выше:	490 cd/klm *
при 80° и выше:	176 cd/klm *
при 90° и выше:	16.6 cd/klm *
Класс интенсивности света:	G*1

В во всех направлениях, которые образуют указанный угол с нижней вертикалью в инсталлированных и готовых к работе светильниках.

* Значения интенсивности света в [свечей/килолюмен] для расчета класса интенсивности света относятся в соответствии с EN 13201:2015 к световому потоку.

Компоновка отвечает классу индекса ослепления D.0

Результаты для полей оценки

Коэффициент эксплуатации: 0.80

Sidewalk 2 (P1)

Ecp [lx]	Emin [lx]
* 11.44	* 7.42

Roadway 1 (C2)

Ecp [lx] ≥ 20.00	Uo ≥ 0.35
✔ 27.40	✔ 0.59

Sidewalk 1 (P1)

Ecp [lx]	Emin [lx]
* 11.44	* 7.42

* Для сведения; не входит в оценку

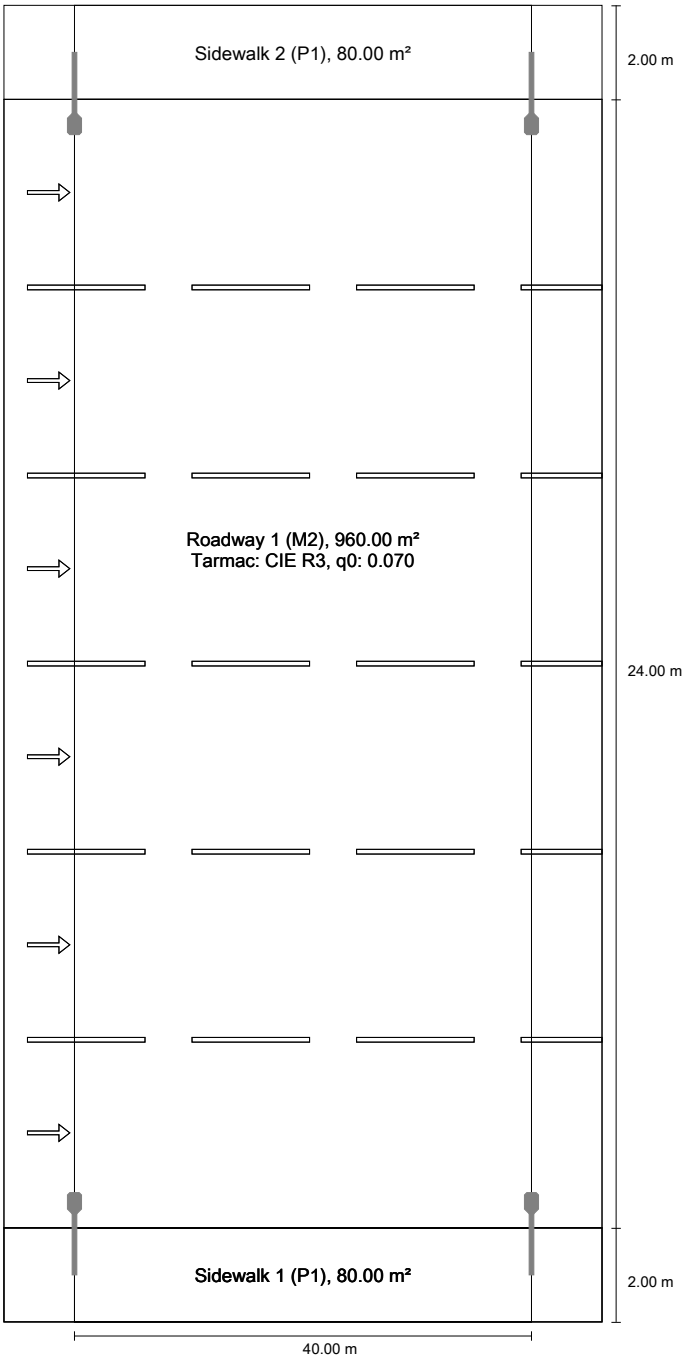
Результаты для показателей энергоэффективности

Индикатор плотности мощности (Dp)	0.011 W/lxm²
Интенсивность потребления энергии	
Расположение: 137 L02 (1096.0 кВт-ч/год)	1.1 кВт-ч/m² год

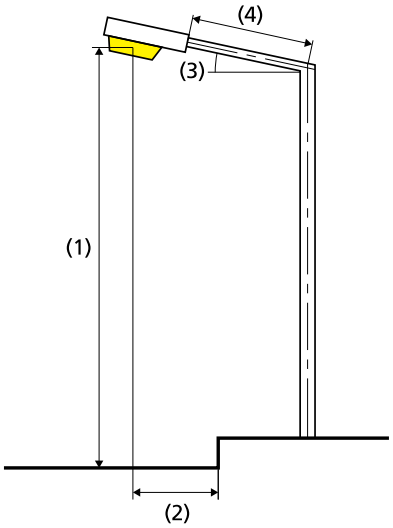
Date:
03.09.2019

Yerevan light calculation Tbilisyan road-24road-10.5poles-40 distance

Street 1 according to EN 13201:2015



DIALux 174 W 84 LEDs L02



Lamp:	1x84 LEDs bin N4
Luminous flux (luminaire):	22441.51 lm
Luminous flux (lamp):	22441.00 lm
Operating Hours	
4000 h:	100.0 %, 174.0 W
W/km:	8700.0
Arrangement:	both sides opposite
Pole distance:	40.000 m
Boom inclination (3):	5.0°
Boom length (4):	1.500 m
Light centre height (1):	10.500 m
Light overhang (2):	0.500 m

ULR:	0.00
ULOR:	0.00
Maximum luminous intensities	
at 70° and above	405 cd/klm *
at 80° and above	79.5 cd/klm *
at 90° and above	3.82 cd/klm *
Luminous intensity class:	G*4

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

* Luminous intensity values in [cd/klm] for calculating luminous intensity class refer to the output flux of the luminaire, according EN 13201:2015.

Arrangement complies with glare index class D.0

Results for valuation fields

Light loss factor: 0.80

Sidewalk 2 (P1)

Em [lx] ≥ 15.00 ≤ 22.50	Emin [lx] ≥ 3.00
✔ 17.32	✔ 10.91

Roadway 1 (M2)

Lm [cd/m²] ≥ 1.60	Uo ≥ 0.40	Ul ≥ 0.70	TI [%] ≤ 10	EIR
✔ 1.62	✔ 0.49	✔ 0.70	✔ 8	* 0.47

Sidewalk 1 (P1)

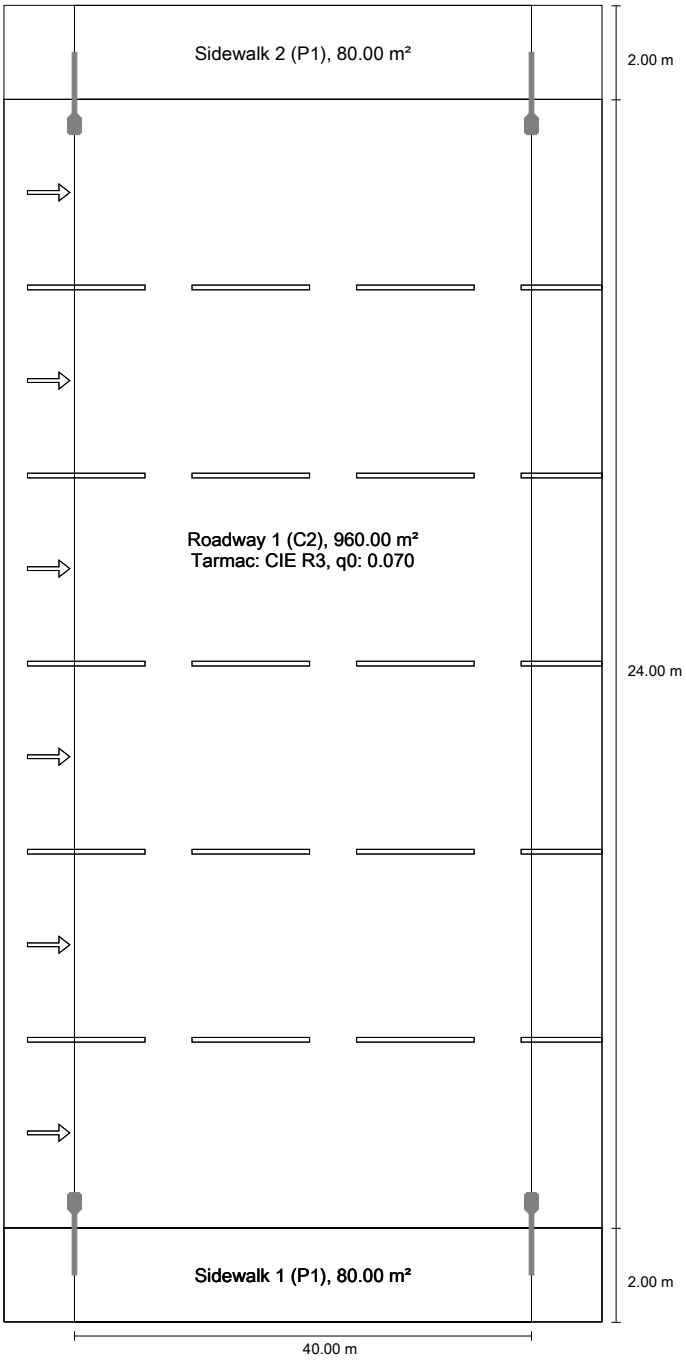
Em [lx] ≥ 15.00 ≤ 22.50	Emin [lx] ≥ 3.00
✔ 17.32	✔ 10.91

* Informative, not part of the valuation

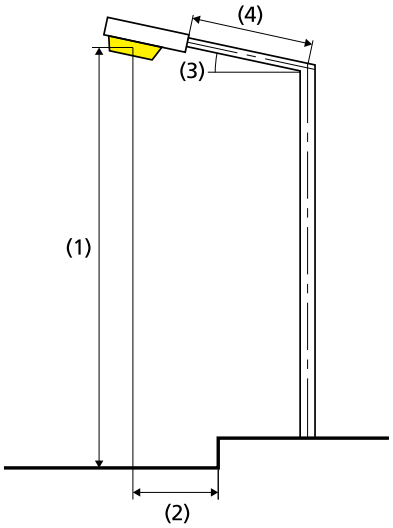
Results for energy efficiency indicators

Power density indicator (Dp)	0.012 W/lxm²
Energy consumption density	
Arrangement: 174 L02 (1392.0 kWh/yr)	1.2 kWh/m² yr

Street 2 according to EN 13201:2015



DIALux 174 W 84 LEDs L02



Lamp:	1x84 LEDs bin N4
Luminous flux (luminaire):	22441.51 lm
Luminous flux (lamp):	22441.00 lm
Operating Hours	
4000 h:	100.0 %, 174.0 W
W/km:	8700.0
Arrangement:	both sides opposite
Pole distance:	40.000 m
Boom inclination (3):	5.0°
Boom length (4):	1.500 m
Light centre height (1):	10.500 m
Light overhang (2):	0.500 m

ULR:	0.00
ULOR:	0.00
Maximum luminous intensities	
at 70° and above	405 cd/klm *
at 80° and above	79.5 cd/klm *
at 90° and above	3.82 cd/klm *
Luminous intensity class:	G*4

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

* Luminous intensity values in [cd/klm] for calculating luminous intensity class refer to the output flux of the luminaire, according EN 13201:2015.

Arrangement complies with glare index class D.0

Results for valuation fields

Light loss factor: 0.80

Sidewalk 2 (P1)

Em [lx] ≥ 15.00 ≤ 22.50	Emin [lx] ≥ 3.00
✔ 17.32	✔ 10.91

Roadway 1 (C2)

Em [lx] ≥ 20.00	Uo ≥ 0.35
✔ 27.99	✔ 0.44

Sidewalk 1 (P1)

Em [lx] ≥ 15.00 ≤ 22.50	Emin [lx] ≥ 3.00
✔ 17.32	✔ 10.91

Results for energy efficiency indicators

Power density indicator (Dp)	0.012 W/lxm²
Energy consumption density	
Arrangement: 174 L02 (1392.0 kWh/yr)	1.2 kWh/m² yr