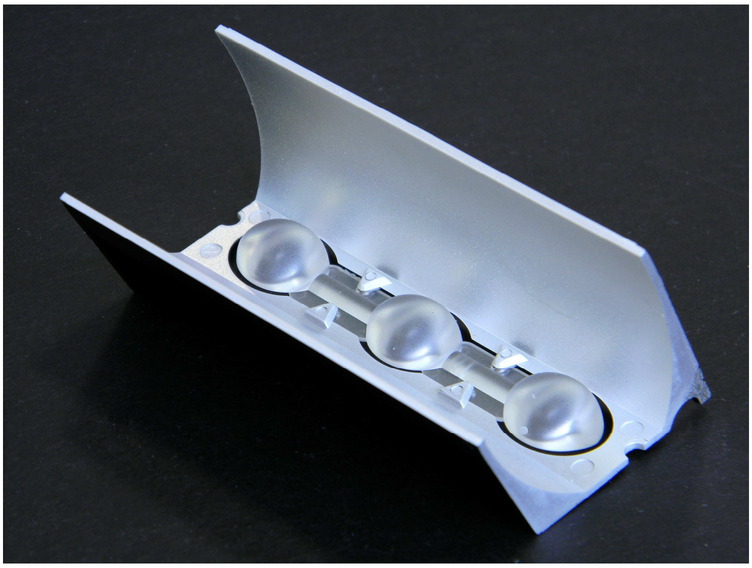
F2L3-1-RE

Fraen Optical Solutions

Designed to meet European illumination specifications

Street Lights for Philips™ Luxeon Rebel ES LEDs

- **High efficiency**
- **Scalable solution**
- **European illumination**
- **Excellent uniformity**

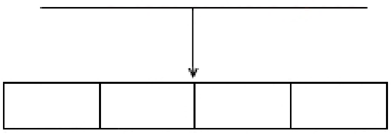


This 3-up optical solution was developed specifically for LED streetlights to produce the illumination patterns required to meet the demanding EN 13201-2:2003 requirements. The design features are specifically tuned for Philips Luxeon Rebel ES.
The F2L3-1-RE 3-up optical solution meets the Class: ME3a, ME3b, ME3c, ME4a, ME4b, ME5 and ME6 requirements.

Application example:

- Distance between poles: 32m
- High of the pole 8m
- Width of the street 8m

To achieve a proper Illumination patterns, these optics must be arranged in Rows of four or more optics.



Please see examples on pages 13-15.

PHILIPS LUMILEDS

Philips® Luxeon Rebel ES is a trademark of Philips, Inc. For technical information about these LEDs please refer to the Philips® Rebel datasheet or visit: http://www.philipslumileds.com/

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General Characteristics

Lens Material	PMMA
Reflector Material	Black PC
Metallization Coating	3 layers vacuum metalized aluminum; protective topcoat with >85% reflectivity.
Coating durability test	10 days at 98% humidity at 37°C
Operating Temperature range	-15deg C / + 85 deg C
Storage Temperature range	-15deg C / + 85 deg C

IMPORTANT NOTE – Lenses handling and cleaning*:*

- *Handling: Always use gloves to handle the reflector and/or handle the reflector only by the external body. Never touch the inside surfaces of the reflector with fingers; finger oils and contamination will absorb or refract light.*
- *Cleaning: Don't clean the reflector; only the lens could be cleaned with soap and water. Never expose the reflector and the lens to solvents such as alcohol, as it will damage the coating.*

Optical Characteristics

- Highly efficient optical system
- Excellent uniformity on street
- Meets dark-sky requirements with properly designed enclosure and flat cover window

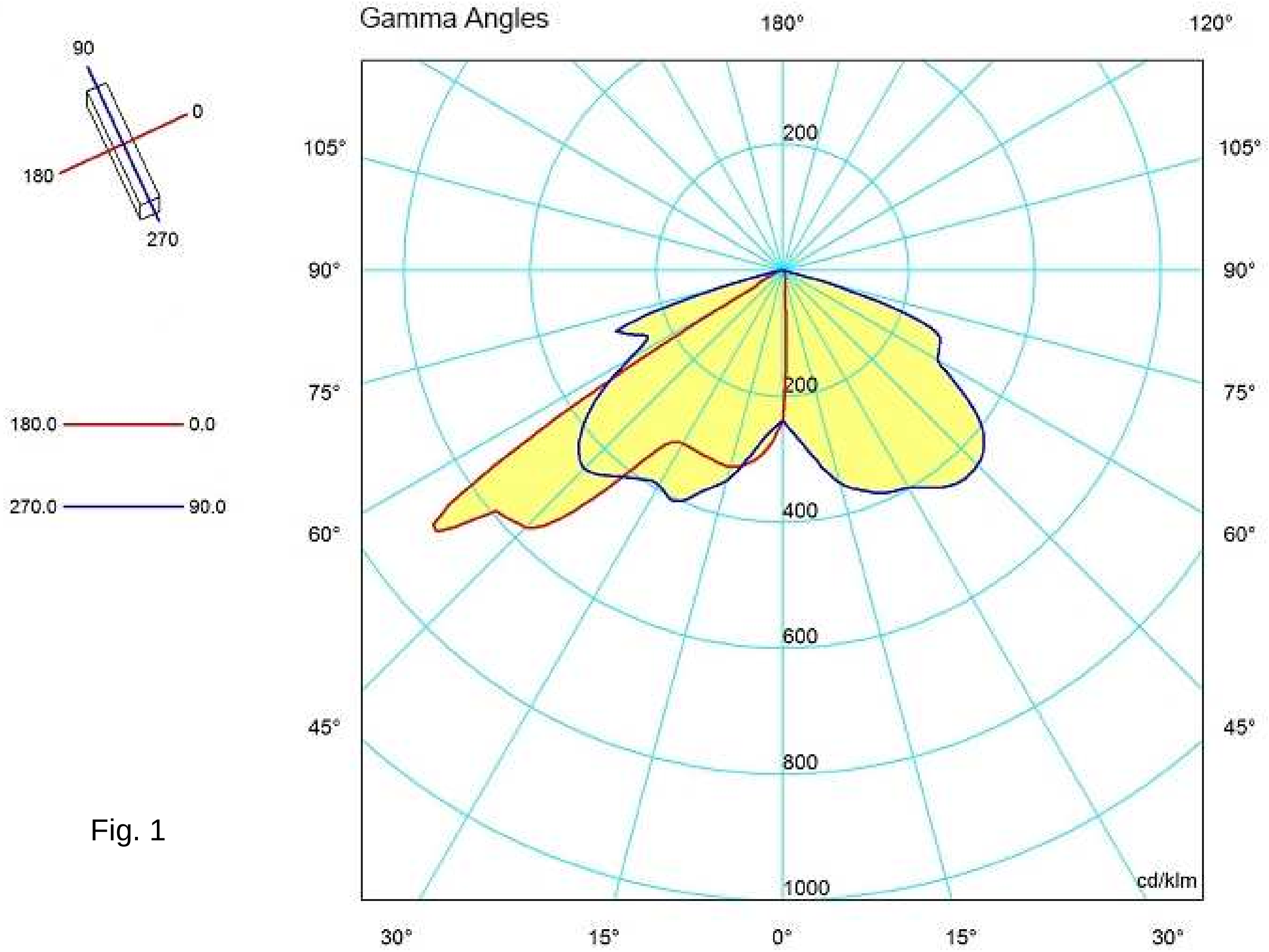


Fig. 1

Figure 1. The intensity pattern produced by the optics in a 4 x 6 array (see Fig.6 in the Case Study).

Mechanical Characteristics and Layout Information

- General view of the optic:

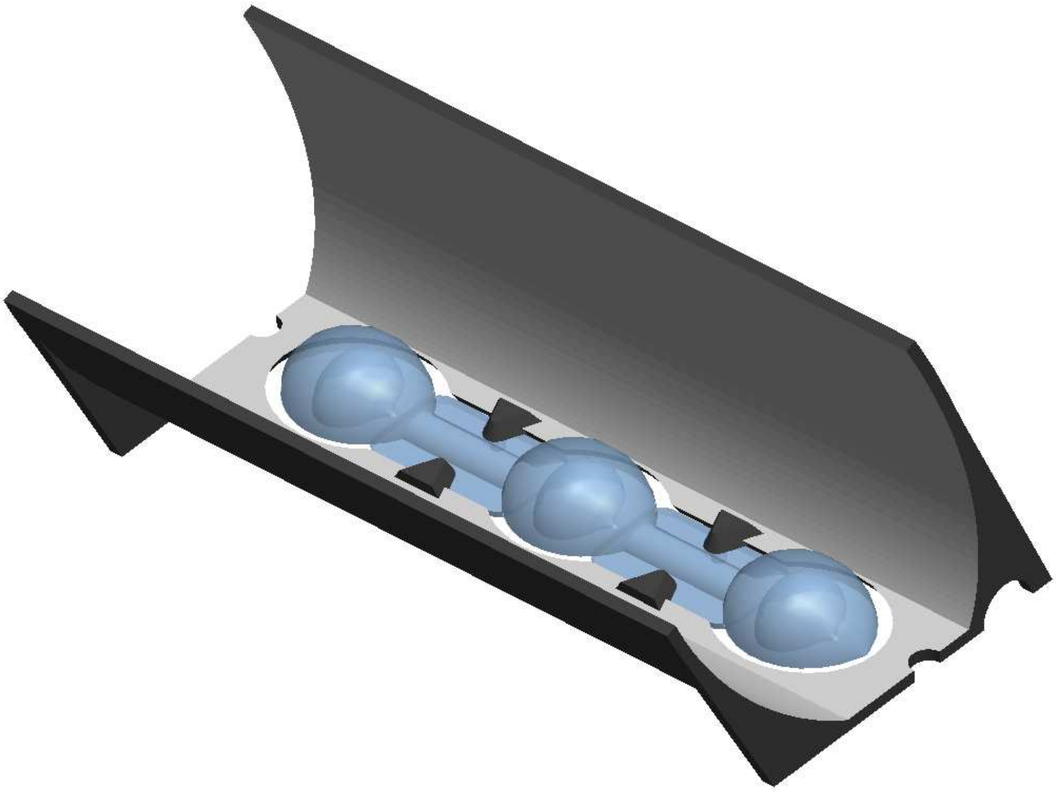


Fig. 2

Fig. 2 General view of the optic.

- Drawings of the 3-up optic:

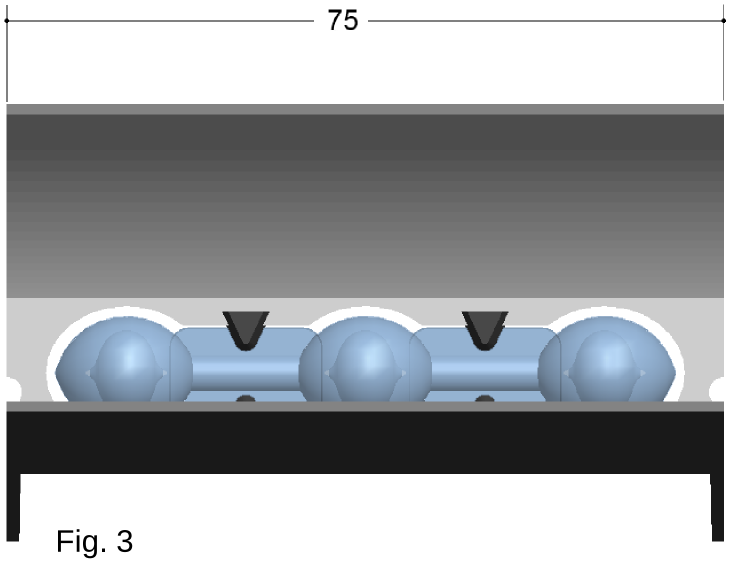


Fig. 3

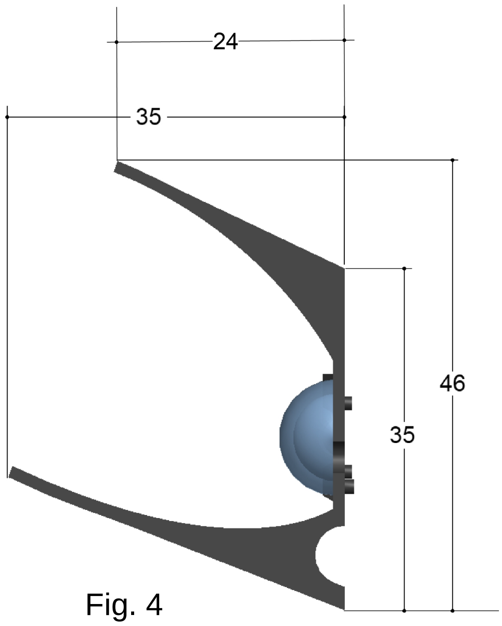


Fig. 4

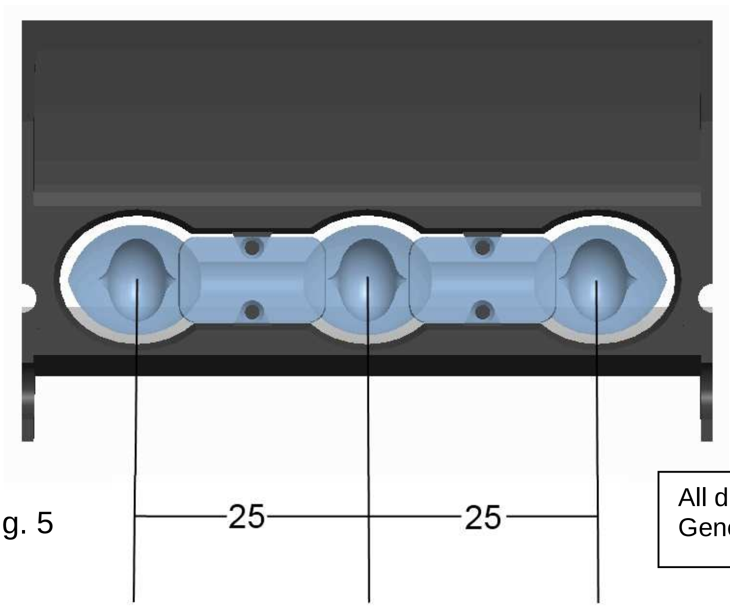


Fig. 5

All dimension in millimeters.
General tolerance +/- 0.2mm.

Fig. 3 Front view of the optic.
Fig. 4 Side view.
Fig. 5 Back view.

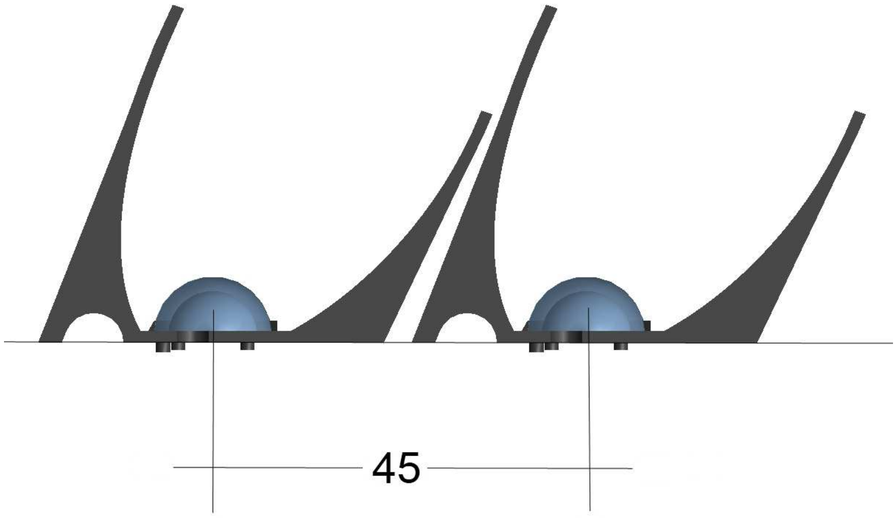


Fig. 6

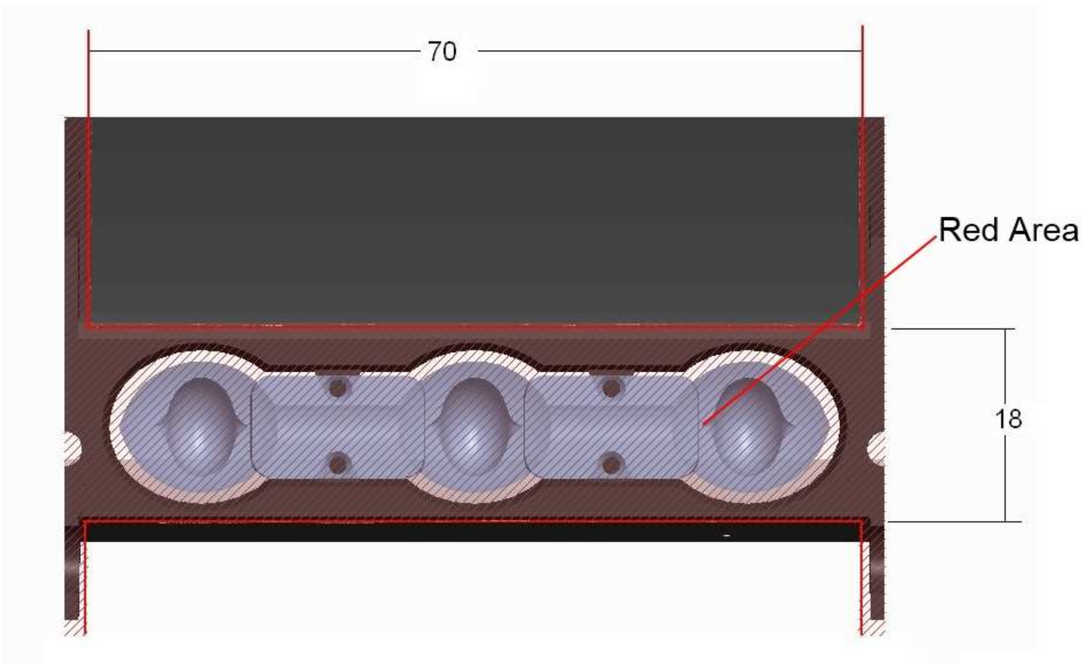


Fig. 7

Fig. 6 Showing the minimum allowable distance between optics
Fig. 7 Showing the area (Red) required for the optic. Electrical components or other obstructions cannot be in this area.

- Mechanical attachment:

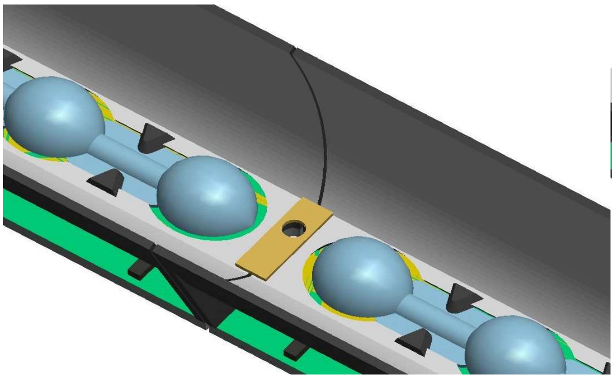


Fig. 8

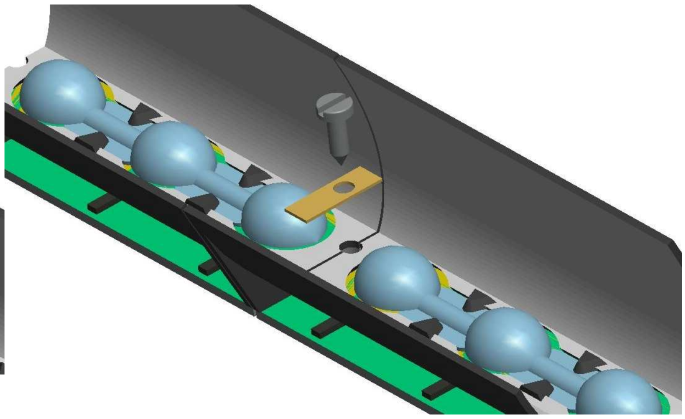


Fig. 9

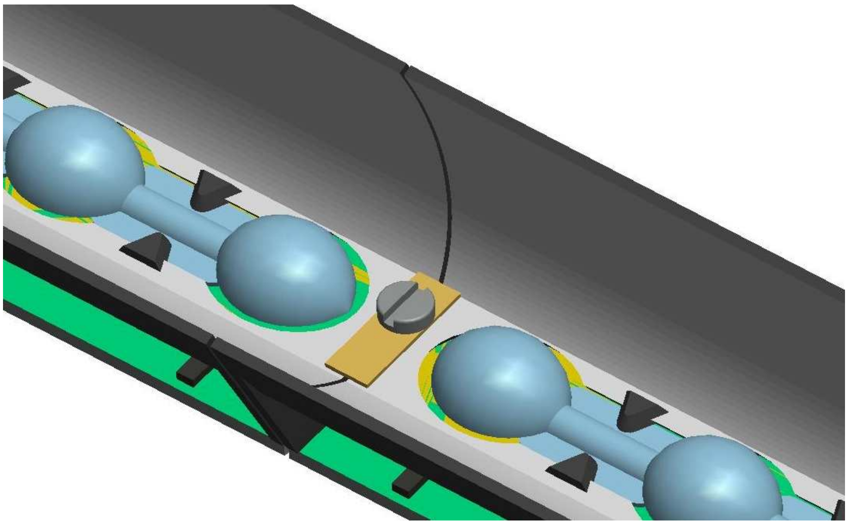


Fig.10

Fig. 8 Stopping plate (F2L3-P) to lock the reflector.
Fig. 9 M3 screw for attaching the stopping plate, reflector and PCB.
Fig. 10 Completed mechanical assembly.

- Position and orientation of the optic:

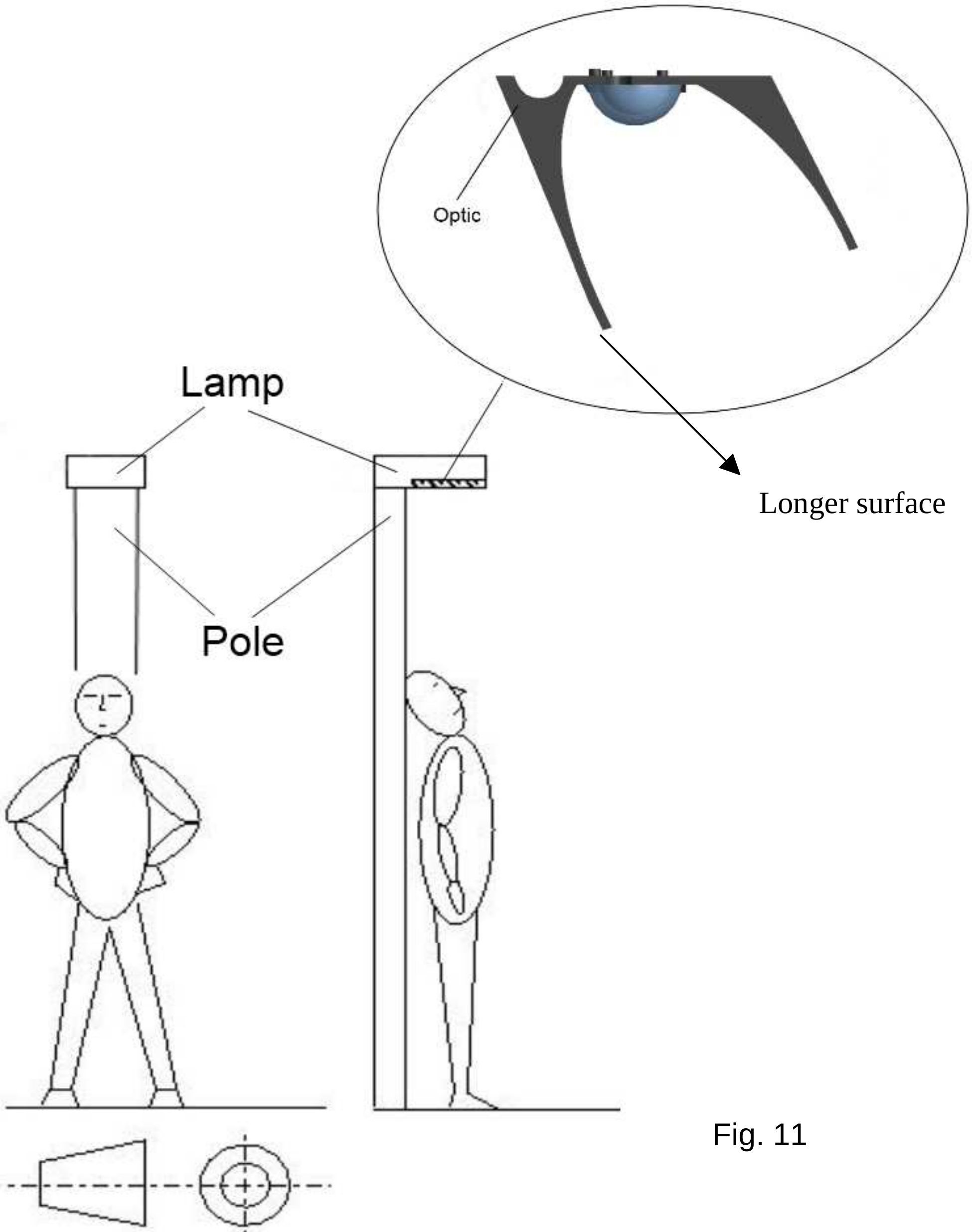


Fig. 11

Fig. 11. The figure shows how to position the optic in the fixture in relation to the ground. The longer reflector surface must be located at the pole side. The PCB and optic must be horizontal for proper illumination and lighting distribution.

Ordering part numbers

F2L3-1-RE

F2L3-P Stopping plate – Already included in the standard box.

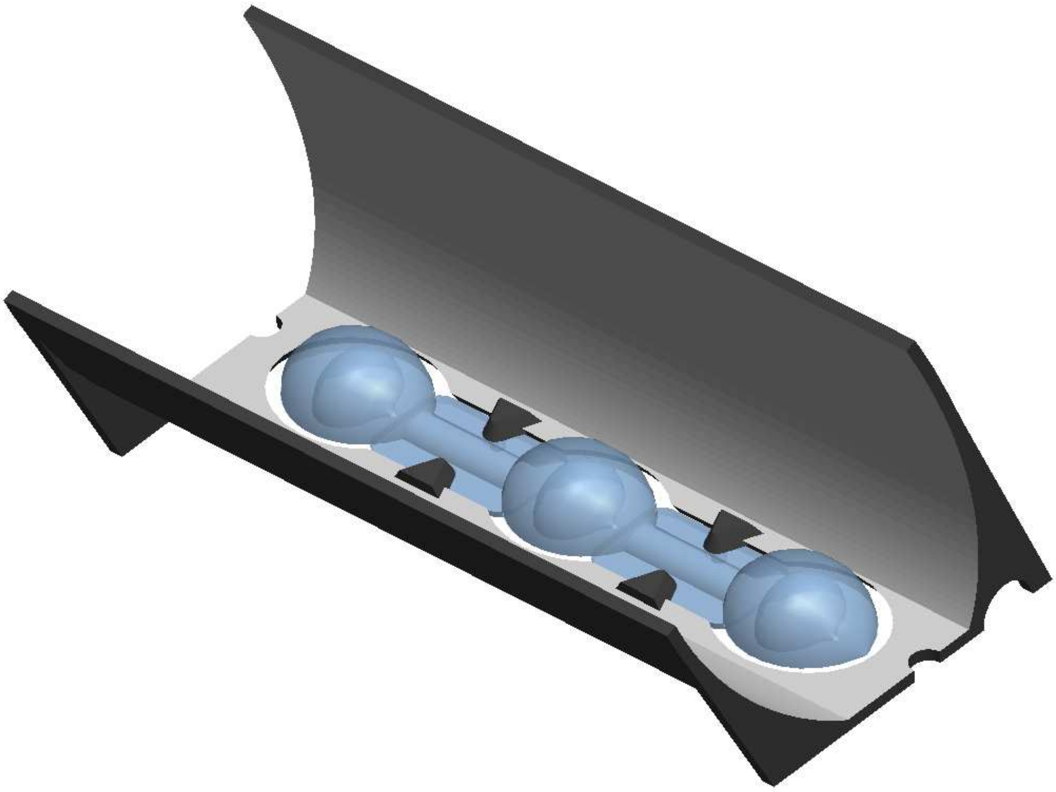
Rev	Date	Author	Description
00	31/03/2011	D.Omma, E. Grossi	Initial release

Case study

Case study for F2L3-1-RE Optics

Designed to meet European illumination specification ME3A

Street Lights for Philips™ Luxeon Rebel ES LEDs



- Dimensions of a single PCB, some examples of multiple PCB arrangements:
- PCB Study:

Single PCB 3 LED:

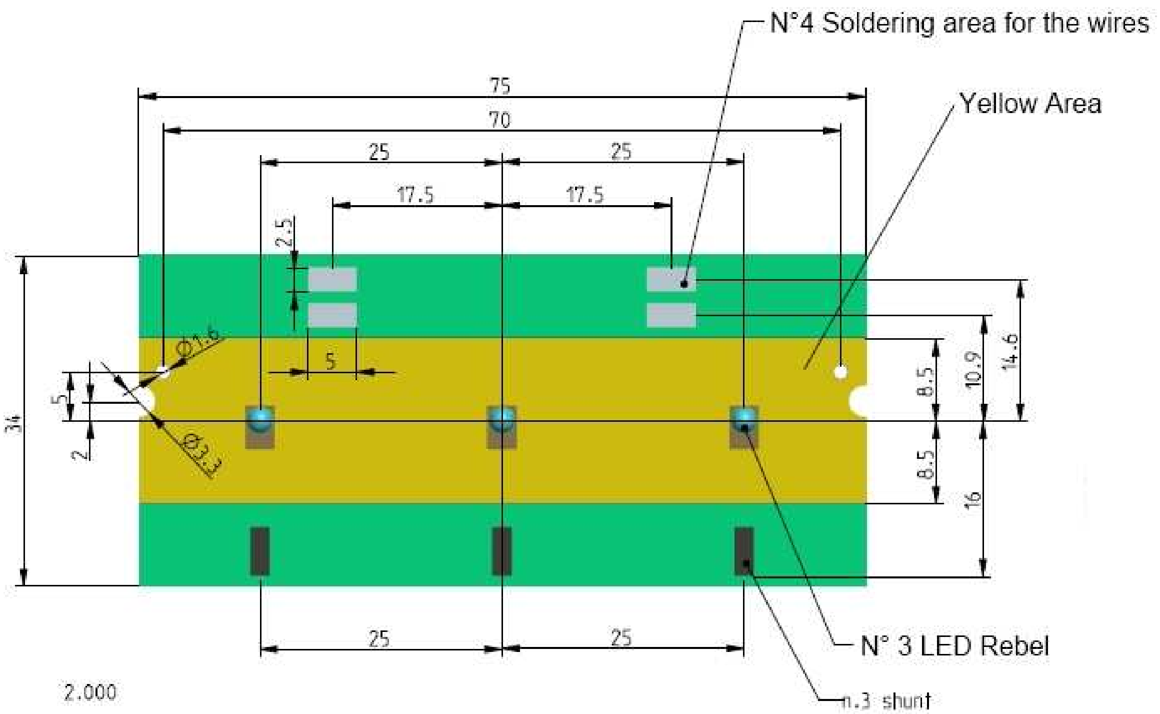


Fig.1

Fig. 1. PCB for one optic in metal core material. Dimensions, in millimeters, are shown in the picture. Please note the yellow area is required for the F2L3 optic. This area cannot have electrical components or other obstructions.

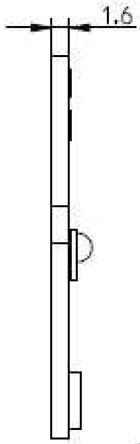


Fig. 2

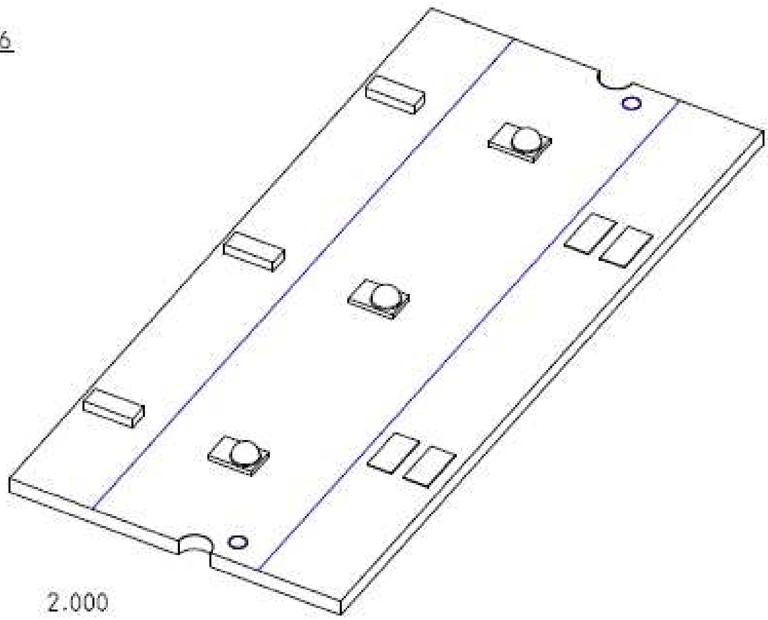
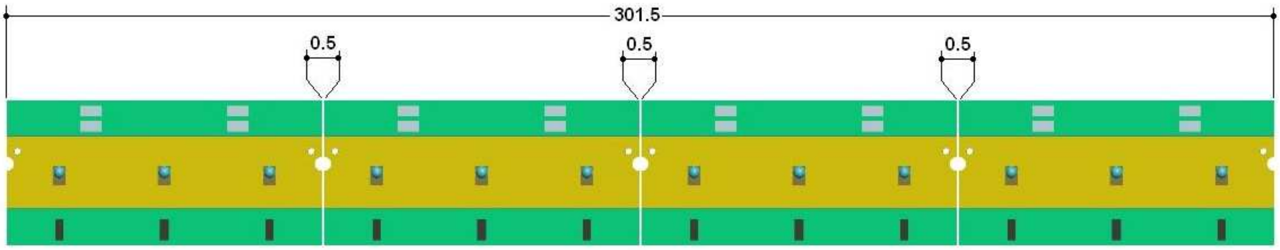


Fig. 3

Fig. 2. Thickness of the PCB.
Fig. 3. General view.

Example: Linear PCB 12 LED:



Example: Area PCB 72 LED:

Fig. 4

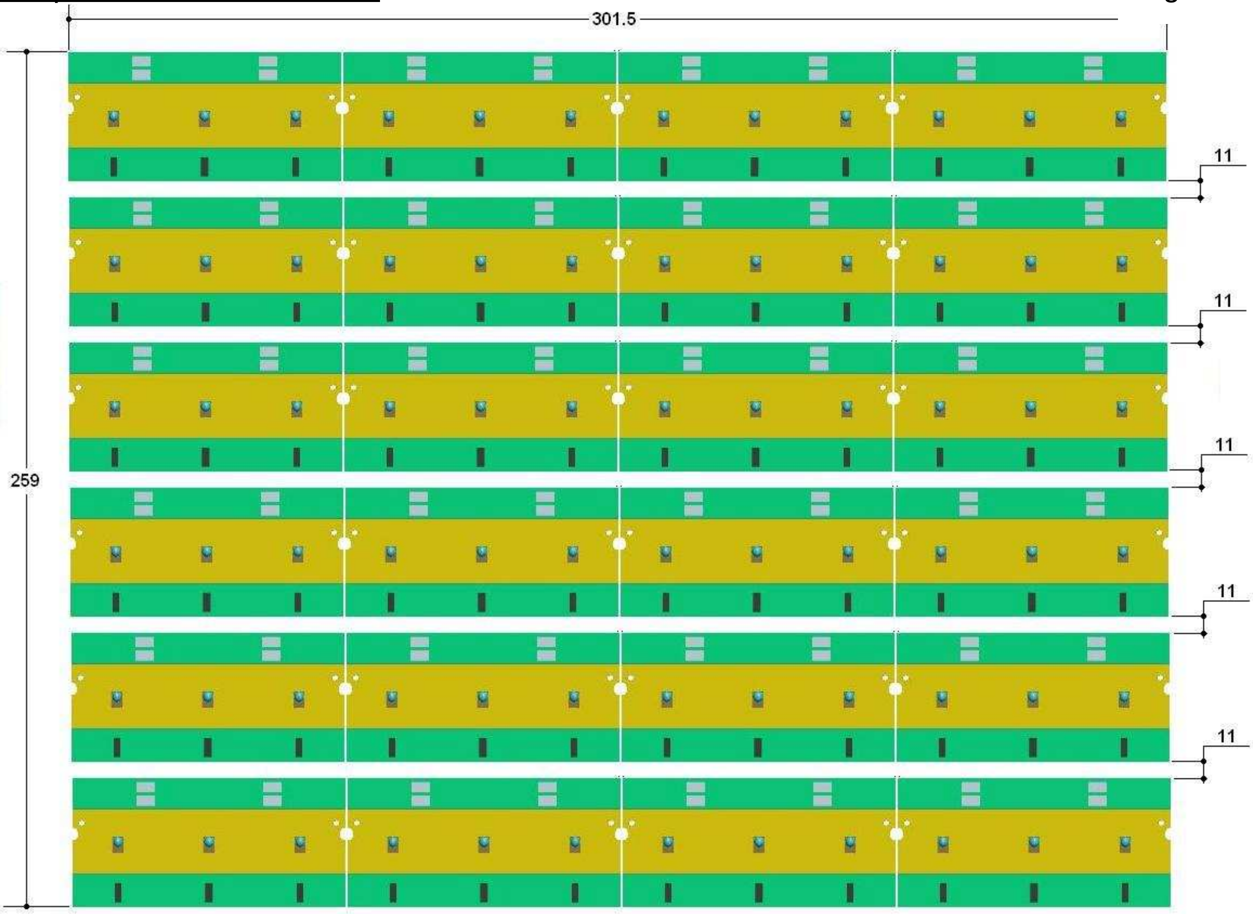


Fig. 5

Fig. 4. Dimensions for linear PCB 12 LED.
Fig. 5. Dimensions for area PCB 72 LED.
For additional dimensions see Figure 1.

- Layout examples of the optic:

Below are some examples showing how to position the optics in your design. To meet ME3A specifications, a minimum of four optics per row is required – Please see Fig. 6 showing six rows of optics with each row having 4 3-up optics. Longer rows with more than 4 3-up optics are acceptable and will result in improved system efficiencies.
Proper fixture design must include a reflective wall or closure for the ends of the optic rows to capture and direct lateral light rays. (Shown in blue in the Figs. 6,7,8)

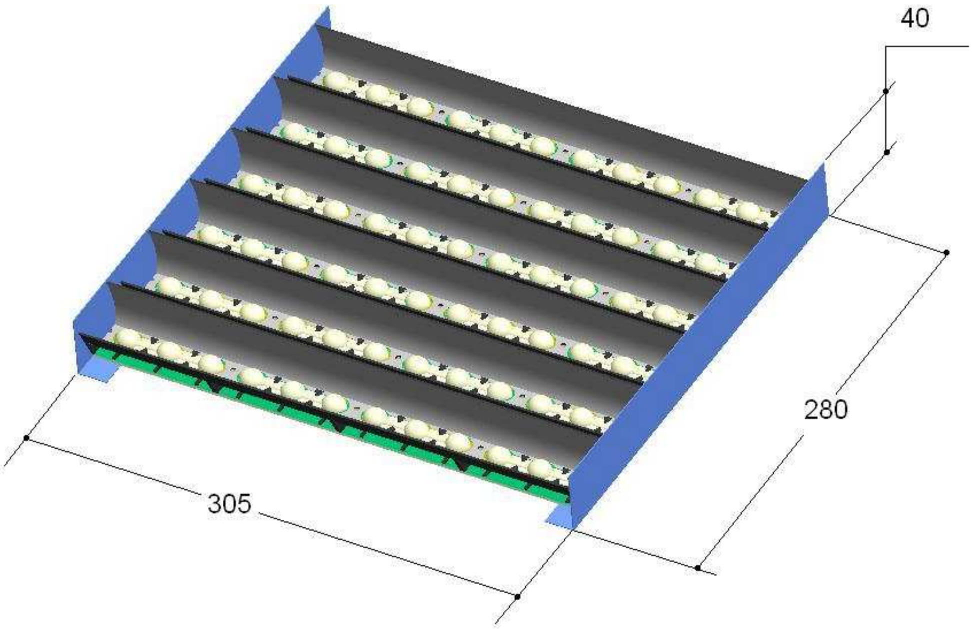


Fig. 6 Six rows of four 3-up optics

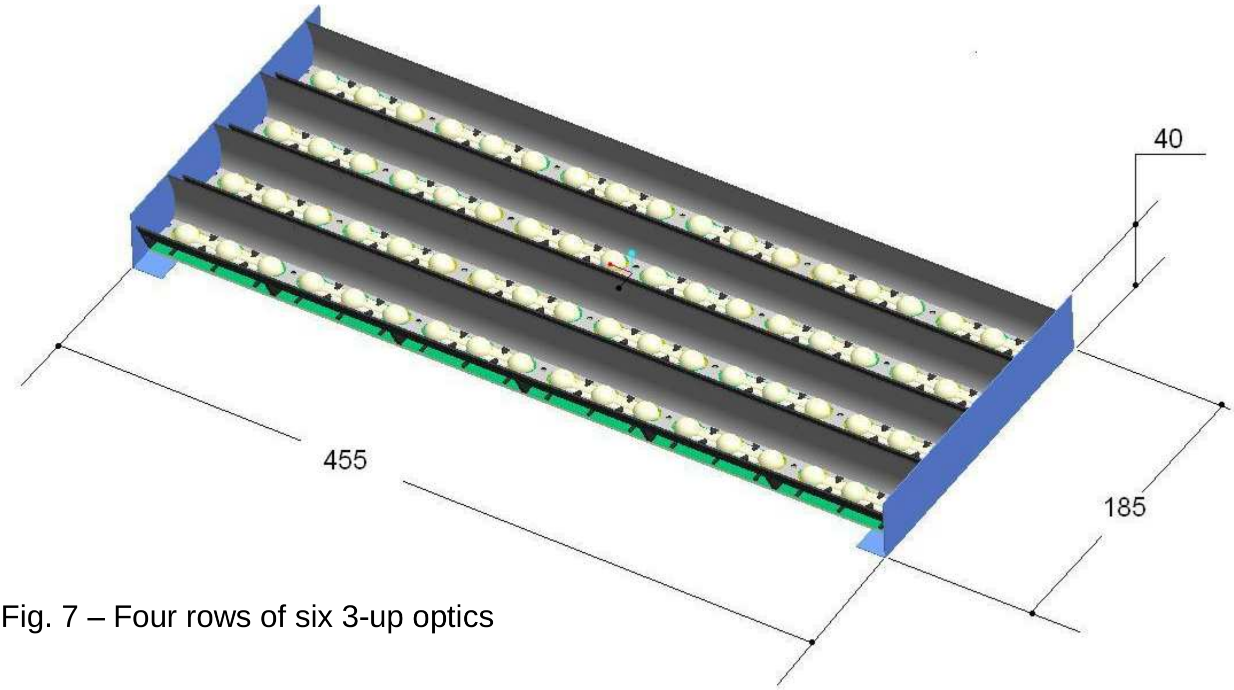


Fig. 7 – Four rows of six 3-up optics

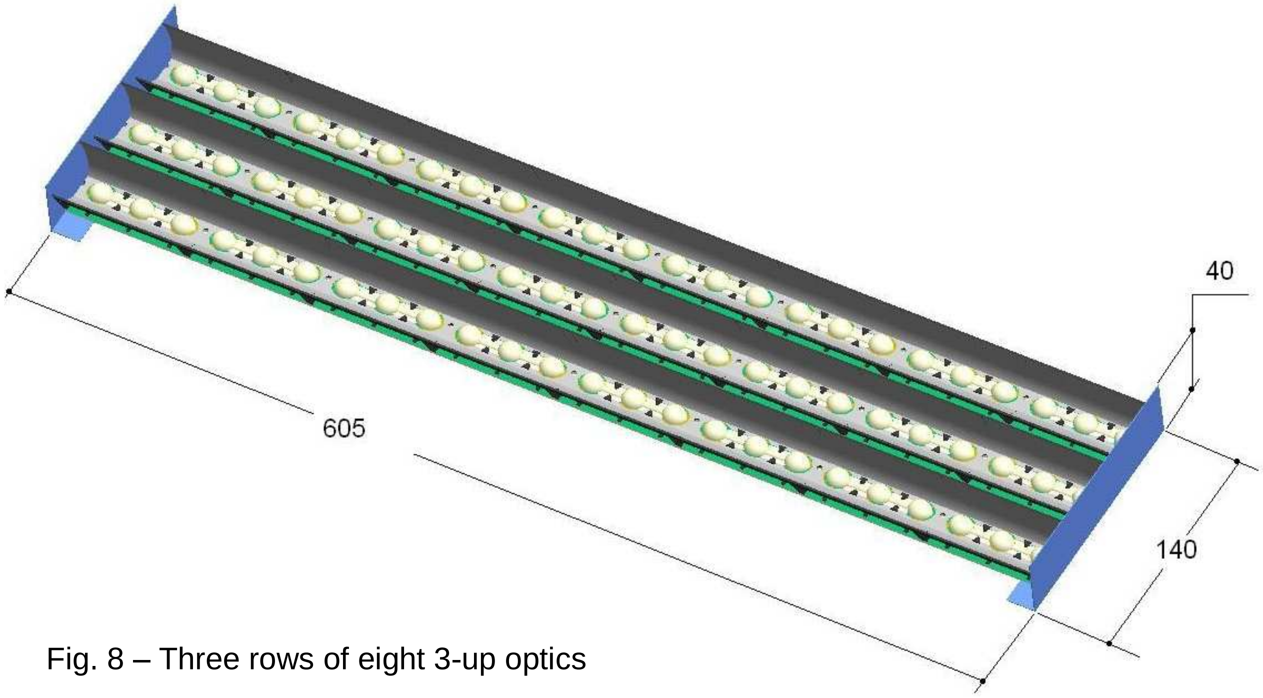


Fig. 8 – Three rows of eight 3-up optics

- Important notes for external case study:

The external fixture housing should have a free space of 75° from the reflector, on the transversal and longitudinal side.
An efficient design will minimize the distance between the reflector and the glass cover of your housing while maintaining the required 75 degrees of free space around the optic.

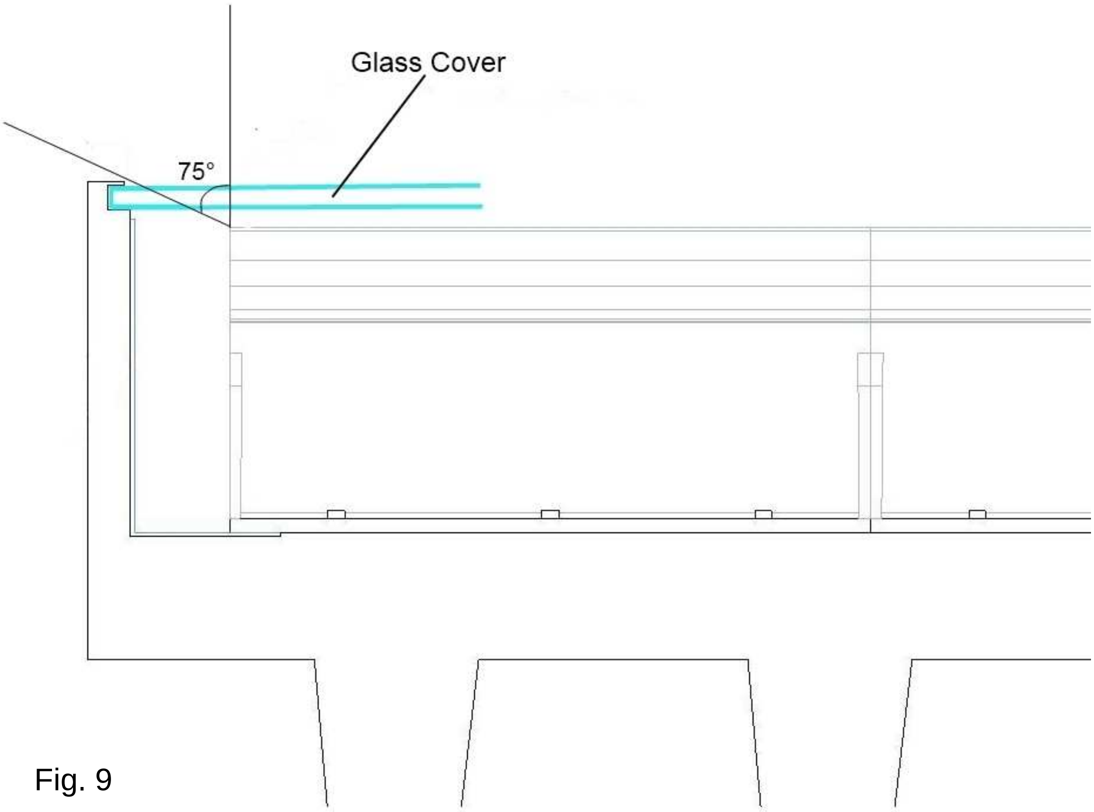


Fig. 9

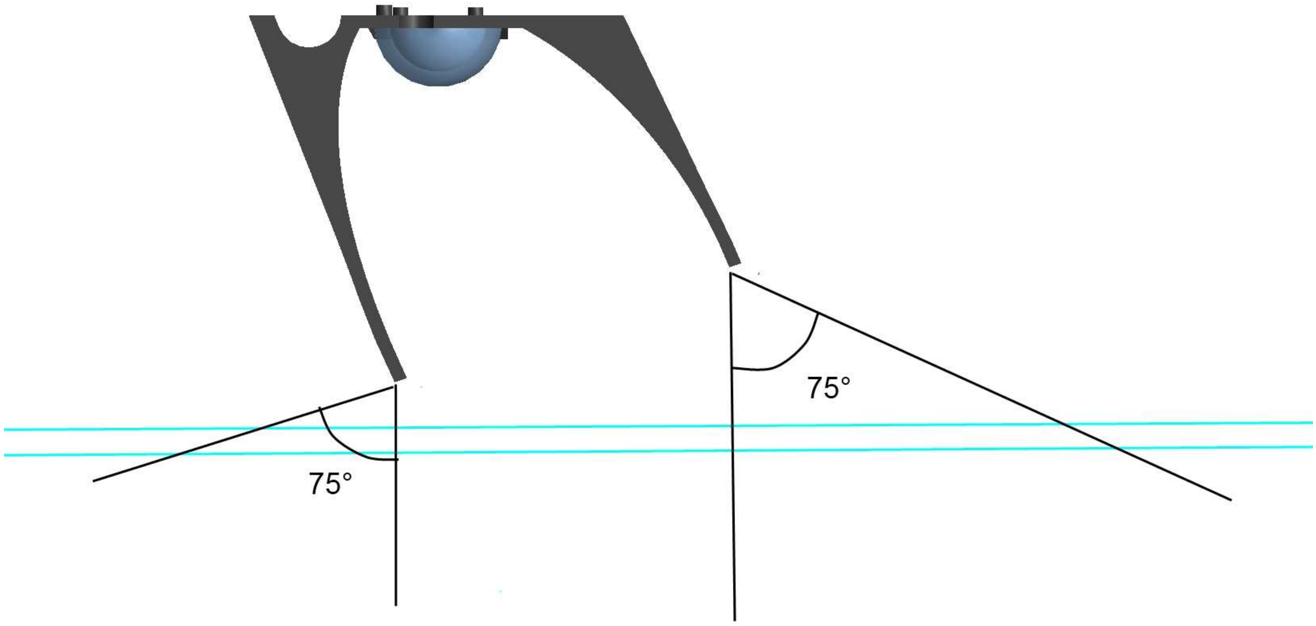


Fig.10

Fig. 9 Frontal view, showing required 75° of free s pace.
Fig.10 Side view, showing required 75° of free spac e.

- Installation on the road:

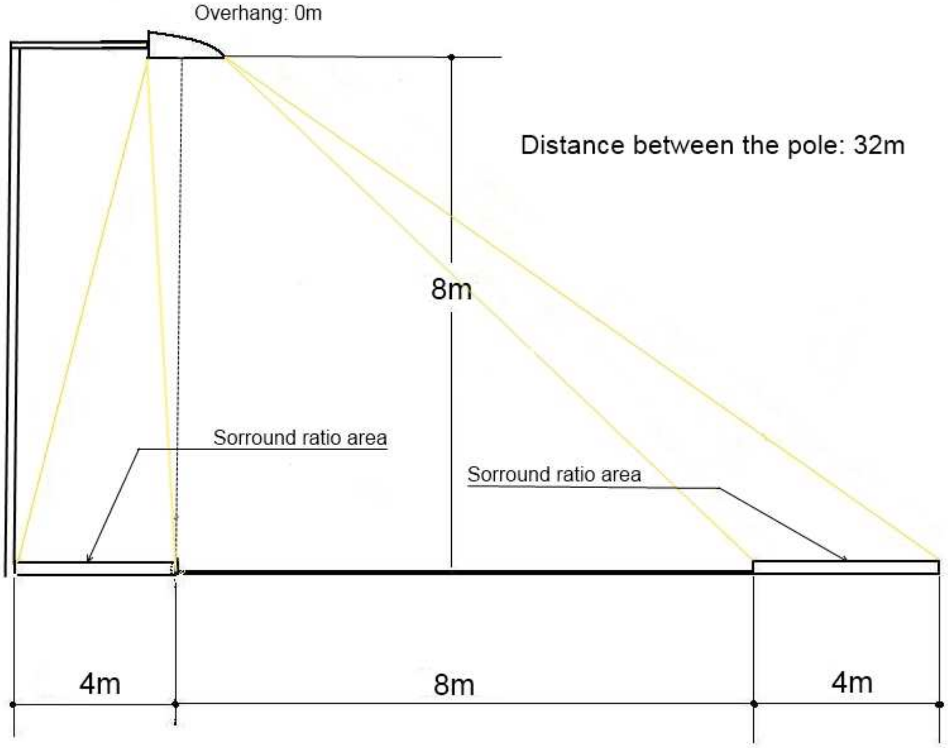


Fig. 11

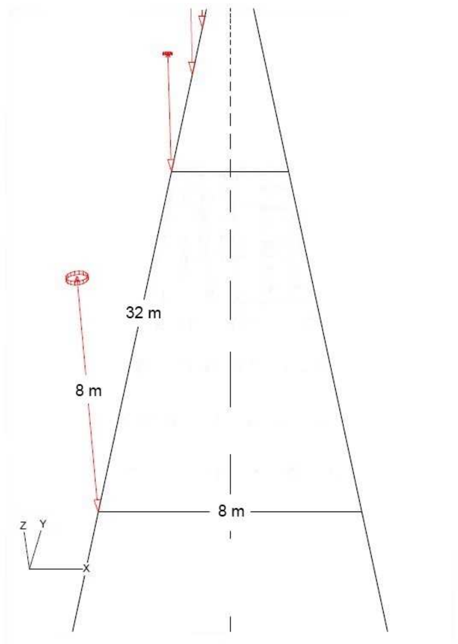


Fig. 12

Fig. 11 Side view of the street with explanation of surround ratio (lateral light).

Fig. 12 Panoramic view.

- Iso-lux at Road Surface:

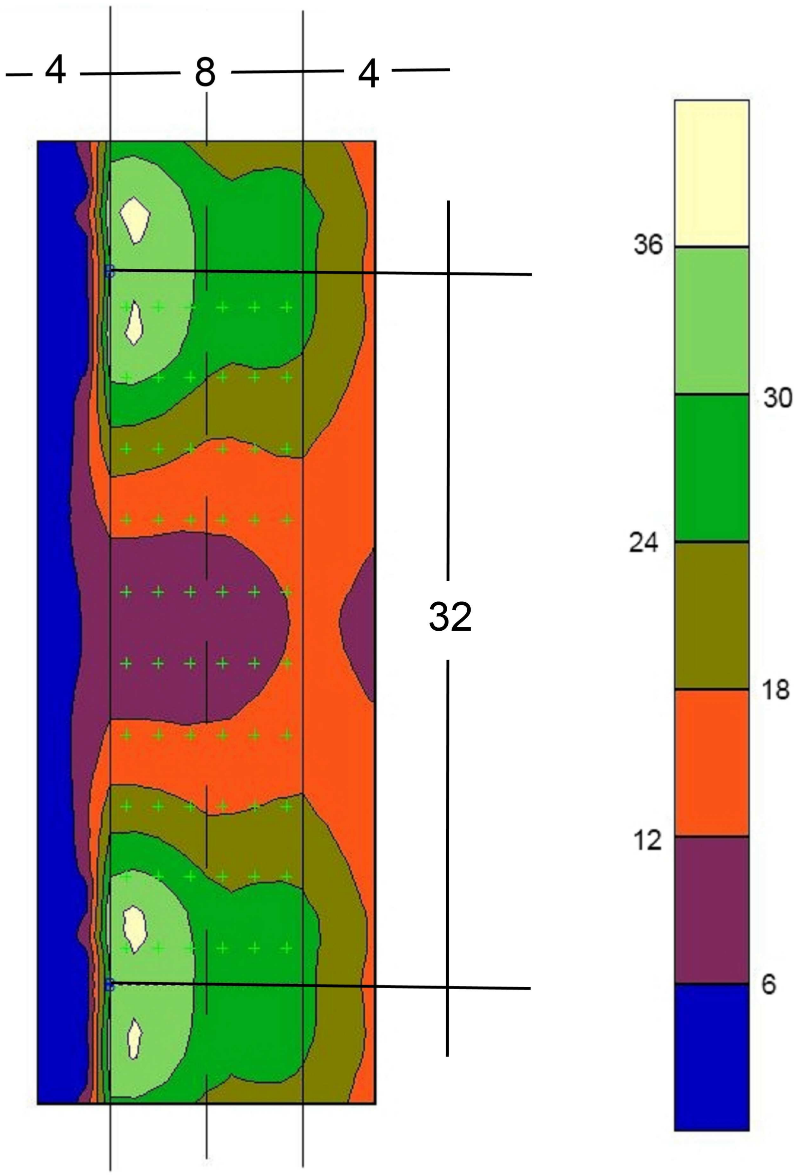


Fig. 13

Fig. 13 Graphic showing the lux distribution at the road surface.

Below the values of a correct example of a project:

LED:	Rebel ES
Number of LEDs:	72
Lumen @700mA (Tj: 25°):	235lm
Drive Current:	550mA
Flux at 550mA(Tj: 25°):	188 lm
Minimum measured flux in output of the lamp*	9753lm

*If you do not achieve these values you will not meet the illumination specification (data represents actual measured values and not a theorical results.)

The parameters are for discussion purposes only. Your design may vary. Please consider the operational characteristics of the LED in your design. For more information see the Philips Lumiled's website: www.philipslumileds.com

- Data for calculation and result:

Road:	Single Road
Installation:	1 Side
Traffic divider:	1
Width:	8m
N. of carriageway	2
Asphalt:	CIE R3
High of the pole:	8m
Distance between pole:	32m
Maintenance factor:	0,8
Tilt angle:	0
Overhang:	0,6m
L average:	1
UL (min/max)	0,7
SR	0,5

Case study

Rev	Date	Author	Description
01	04/05/2011	D.Omma	Add maintenance factor
00	31/03/2011	D.Omma, E. Grossi	Initial release