HOARE LEA

FitzWimarc School.
Rayleigh, Essex.
Kier.

MEP ENGINEERING
PLANNING REPORT – EXTERNAL LIGHTING ASSESSMENT

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Contents.

Executive summary

This document has been prepared to outline the fixed external lighting scheme proposed for the FitzWimarc School site, which is a new state secondary school to be located on Hockley Road in Rayleigh in Essex, England. The proposed FitzWimarc School complex includes a secondary school as well as sports facilities.

The external lighting scheme in this report is to be viewed as a lighting design strategy rather than a detailed design solution. The final lighting design will be subject to the detail design performed by others, the specification of which will meet or exceed the technical requirements outlined in this report. It is recommended that the lighting strategy outlined in this report is adopted including criteria, luminaire types, switching methods, lamp types etc. designed to meet Environmental Zone E3, by the developers' designers when undertaking the full external lighting design of the site.

The areas of which shall be included in the external lighting scheme are the proposed phase 3 area only, including areas such as:

- Building Perimeters
- Outdoor communal areas
- Walkways
- New Car Parking Facilities

The proposed lighting scheme will comply with all relevant British Standards, the Institute of Light and Lighting Guidelines, the Institute of Lighting Professionals and guidance provided by the Society of Light and Lighting. These documents and other relevant standards are scheduled and summarised within the report.

External lighting illumination levels will be based on BS EN 12464-2 requirements to maximise safety and security, whilst maintaining a minimal impact on the site surroundings, environment and neighbouring properties.

The proposed lighting scheme will also take into consideration the need to reduce energy consumption, whilst maintaining a high quality of illumination for the site. This shall be achieved by utilising low energy lamp types, the minimum number of columns / points, and energy efficient controls.

The impact of light to the surrounding areas has been analysed from detailed lighting modelling. The results of which are displayed by means of illuminance levels from the subsequent model have been captured in Appendix A and Appendix B.

1. Introduction

1.1 Scope of Report

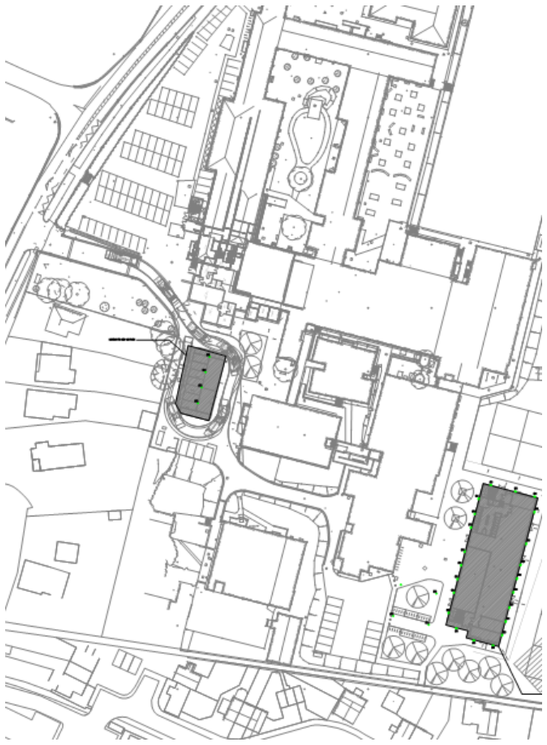
Hoare Lea were commissioned to undertake a Lighting Assessment and to provide information for the detailed application for the erection of new school buildings and outside sports facilities, as well as associated supporting access, communal areas, walkways and car parking facilities for FitzWimarc School.

This report has been prepared to demonstrate that the external lighting scheme will comply with Local and National Guidelines in terms of light pollution and minimum levels of illumination required addressing security and amenity.

1.2 Site Location and Description

The FitzWimarc School Academy School site is situated in Hockley Road, Essex. The scheme shall see the construction of a school building, in addition to existing buildings to be refurbished as part of the works. An external lighting scheme has therefore been developed for the modified areas only. Figure 1 below shows the location of the site, and figure 2 shows the proposed site extents.

Figure 1-Site Location



Landscape layout, where grey hatches indicates areas where external lighting has been provided as part of HL scope.

1.3 Objectives

Specific objectives of the proposed lighting scheme when fully designed include:

- To limit light pollution and sky glow;
- To limit obtrusive light, spill light / trespass light and glare to neighbouring land and properties;
- To provide an adequate level of illuminance for the proposed exterior areas;
- To provide a suitable lighting control strategy to minimise energy consumption.

1.4 Relevant Standards & Guidance

Light and people's perception of it, are a complex interaction and vary from person to person. Therefore, there are recognised standards that are based on current good practice.

The proposed developments external lighting shall be designed in accordance with the following regulations, standards and guidance:

- SLL Code of Lighting
- Society of Light & Lighting Handbook
- CIE Technical Report, CIE 150 – Guide to the Limitation of the Effects of Obtrusive Light from Outdoor Installations
- CIBSE Lighting Guide 6 – The Outdoor Environment
- BS EN 12464-2 Lighting of work places. Part 2: Outdoor work places

Light pollution criteria can be found in the following publications:

- Guidance Notes for the Reduction of Obtrusive Light – ILP

The above publications refer to five environmental zones E0-E4 which are based on background brightness, for which several limiting technical parameters are given. See Section 4 for further detail.

The legal requirements for good lighting are limited to those aspects relevant to safety and are encompassed in the following UK sets of Regulations:

- Health & Safety at Work etc. Act
- Health & Safety Commission, Approved Code of Practice Regulation 8 Lighting

2. Methodology

2.1 Assessment of Night Time Visibility

The most recent significance criteria as published in the Institute of Lighting Professionals (ILP) PLG04 guidance is reproduced below. These criteria have been used to assess the impact of lighting on the local area.

TABLE 1 : ILP PL04 GUIDANCE

Nature	Ref	Level of significance	Descriptions	Remedial Needs
Positive	1	Major / substantial beneficial effects	Significant improvement in night environment and/or reductions in glare, spill light and sky glow etc.	
	2	Moderate beneficial effects	Noticeable improvement in night environment and/or reductions in glare, spill light and sky glow etc.	
	3	Minor beneficial effects	Slight improvement in night environment and/or reductions in glare, spill light and sky glow	
Neutral	4	None / negligible	No significant effect or overall effects balancing out	None
Negative	5	Minor adverse effects	Slight increase in visibility of site, glare, and sky glow etc.	Develop appropriate levels and type of mitigation
	6	Moderate adverse effects	Noticeable increase in visibility of site, glare, and sky glow etc.	
	7	Major adverse effects	Significant problems with increase in visibility of site, glare, and sky glow etc.	

3. Standards and Guidance Overview

3.1 Environmental Zone Classification and Parameters

All standards consulted are nationally recognised documents, (some internationally, also) which deal with all design issues associated with external lighting.

CIE Standards, the CIBSE and the Society of Light & Lighting guidance documents all apply a common Environmental Zoning system, which is summarised in Table 1 below.

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically Dark	National Parks, Areas of Outstanding Natural Beauty etc.
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres, or suburban locations.
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

Table 1-CIE Environmental Lighting Zones

The development site has been assessed as Urban Environmental Zone E3 with 'Medium district brightness' as it is in a suburban location with surrounding residential buildings.

There are several factors which influence the appropriate design of a lighting scheme, other than illumination levels on the ground as determined by the Environmental Class. These factors are explained in more detail below.

Sky glow must be restricted, by restricting the upward light ratio of all light fittings. Table 2, from CIE guidance states the requirements that must be met.

Environmental Zone	Sky Glow ULR (Max %)	Light Intrusion (into windows) E_V (lux)		Luminaire Intensity I (candelas)		Building Luminance Pre-Curfew
		Pre-Curfew	Post-Curfew	Pre-Curfew	Post-Curfew	Average L (cd/m^2)
E0	0	0	0	0	0	0
E1	0	2	0 (1*)	2500	0	0
E2	2.5	5	1	7500	500	5
E3	5.0	10	2	10000	1000	10
E4	15	25	5	25000	2500	25

Table 2-CIE Recommendations for the limitation of Sky-Glow and Light Intrusion

The luminaires proposed for this scheme (E3) will emit less than 5% upward light and will therefore meet this objective.

Illuminance at windows in nearby properties must be limited to avoid light trespass. The values shown in Table 2 above are the suggested maximum. However, the existing light trespass at the point of measurement also needs to be considered.

The limiting illuminances directly relating to light intrusion into neighbouring windows for this development are 10 lux (pre-curfew) and 2 lux (post curfew), as defined in Table 2.

The intensity of all light sources must also be controlled such that there are no lamps visible from the site boundary exceeding the values in Table 2 above.

All specified luminaires will have clear and defined cut-off angles, so that there is no possibility of direct glare being experienced from neighbouring properties.

Signage Illumination and brightness of the building façade is also restricted by the standards. Both Institution of Lighting Engineers and the CIE publish guidance on brightness limits for signage. However due to the location of the site it is evident that any signage lighting provided shall not directly affect any neighbouring properties and / or residents.

All signage (by others) shall be specified to be within the 800 cd/m2 limit as required.

4. Legislation, Planning Policy and Guidance

4.1 Legislative Background

Light pollution was introduced within the Clean Neighbourhoods and Environment Act (2005) as a form of statutory nuisance under the Environmental Protection Act (the 'EPA', 1990), which was amended in 2006 to include the following nuisance definition:

"(fb) artificial light emitted from premises so as to be prejudicial to health or nuisance."

Although light was described as having the potential to cause statutory nuisance, no prescriptive limits or rules were set for impact assessment purposes. Guidance Notes for the Reduction of Obtrusive Light produced by the Institute of Lighting Professionals (ILP) has, therefore, been referred to for the purposes of this assessment.

Guidance produced by Defra, Statutory Nuisance from Insects & Artificial Light (2006) on section 101 to section 103 of the Clean Neighbourhoods and Environment Act (2005) has also been referred to which places a duty on local authorities to ensure that their areas are checked periodically for existing and potential sources of statutory nuisances - including nuisances arising from artificial lighting. Local authorities must take reasonable steps to investigate complaints of such nuisances from artificial light. Once satisfied that a statutory nuisance exists or may occur or recur, local authorities must issue an abatement notice (in accordance with section 80(2) of the EPA 1990), requiring that the nuisance cease or be abated within a set timescale.

4.2 Planning Policy Context

Existing planning policy in relation to landscape character at regional and local levels in general shall be adhered to. In addition to this, references of specific pertinence to this addendum are described below.

National Planning Policy - National Planning Policy Framework

The National Planning Policy Framework (NPPF) states that the purpose of the planning system is to contribute to the achievement of sustainable development and constitute the Government's view on what sustainable development in England means in practice for the planning system. A principal concept contained within the NPPF is the presumption in favour of sustainable development and with regard to artificial lighting, the NPPF states:

"…By encouraging good design, planning policies and decisions should limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation…"

4.3 International Guidance

Commission Internationale De L'Eclairage (CIE) 150: Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (the 'CIE 150', 2003).

The purpose of CIE 150 is to aid in formulating guidelines for assessing the environmental effects of exterior lighting and to provide limits for relevant lighting parameters to control the obtrusive effects of exterior lighting to tolerable levels. CIE 150 refers to the potentially adverse effects of exterior lighting on both natural and man-made environments.

CIE 126: Guidelines for Minimising Sky Glow (1997).

This document gives general guidance for lighting designers and policy makers on the reduction of sky glow. The report gives recommendations about maximum permissible values for exterior lighting installations. These values are regarded as limiting values. Lighting designers should strive to meet the lowest criteria for the design. Practical implementation of the general guidance is left to national regulations.

4.4 National Guidance

Landscape Institute (LI) and Institute of Environmental Management and Assessment (IEMA) Guidance for Landscape and Visual Impact Assessment 3rd Edition (2013)

It is recognised in this Guidance (GLVIA3) that, for some types of development, consideration may be required for the visual effects of proposed lighting, and that work should be undertaken with input from Lighting Engineers regarding modelling for quantitative assessment to help inform detailed design.

Institute of Lighting Professionals (ILP) (2011) Guidance Notes for the Reduction of Obtrusive Light (the 'ILP Guidance Notes')

The ILP has proposed lighting guidance and criteria for local authorities with a recommendation that these are incorporated at the local plan level. The ILP Guidance Notes define various forms of light pollution and describe a series of environmental zones. The ILP Guidance Notes provide suitable criteria against which the effects of artificial lighting can be assessed. This assessment has been based upon these criteria.

Institute of Lighting Professionals (ILP) (2013) PLG 04 Guidance on Undertaking Environmental Lighting Impact Assessments

The aim of this guidance is to outline good practice in lighting design and provide practical guidance on the production and assessment of lighting impacts within new developments.

Institute of Lighting Professionals (ILP) (2001) TR05: Brightness of Illuminated Advertisements.

The ILP Technical Report 05 (ILP TR05) gives recommendations for maximum levels of luminance for illuminated advertisements and signage during hours of darkness. The recommended luminance levels vary dependent upon the illuminated area and what environmental zone (see ILP Guidance Notes) the assessed site falls into.

5. Proposed External Lighting Scheme

5.1 Recommended Lighting Values

Lighting levels shall be designed in accordance with the standards and guidance listed in section 3.4 of this report, which not only stipulate the necessary requirements to reduce and/or eliminate light pollution, but also specifically detail the minimum illumination levels that should be achieved for the pedestrian areas. The external lighting scheme shall be designed in accordance with these levels.

Summary of Recommended Levels

The recommended levels of illuminance according to SLL Code for Lighting and BS EN 12464-2: 2014 and BS EN 12193:2007 applicable to this site have been taken as per the following table(s):

- BS EN 12464-2:2014 Table 5.1 — General requirements for areas and for cleaning at outdoor work places.
- BS EN 12193:2007 Table A.21 — Sports lighting.

The table below denotes the lighting levels extracted from the relevant tables as per BS EN 12464-2:2014:

Ref no.	Type of area, task or activity	Em (lx)	Uo	RGL	Ra	Specific Requirements
5.1.1	Walkways exclusively for pedestrians	5	0.25	50	20	
5.1.2	Traffic areas for slowly moving vehicles (max. 10 km/h), e.g. bicycles, trucks and excavators	10	0.40	50	20	
5.1.4	Pedestrian passages, vehicle turning, loading and unloading points	50	0.4	50	20	
5.9.2	Light traffic, e.g. parking areas of shops, terraced and apartment houses, cycle parks	5	0.25	55	20	
5.9.2	Medium traffic, e.g. parking areas of department stores, office buildings, plants, sports and multipurpose building complexes	10	0.25	50	20	
A.21	Outdoor Sports Courts and Multi-Use Games Areas	75	0.5	55	20	FA recommend minimum 120 Lux for class III football

Table 3- Extracted lighting level / requirements

The external emergency lighting is in accordance with BS EN 1838 and BS 5266 and external areas in the immediate vicinity of exits is provided with emergency lighting: “In order to assist dispersal to a place of safety, the external areas in the immediate vicinity of final exits should be illuminated in accordance with the illumination level for escape routes, given in EN 1838 (BS 5266) of not less than 1 Lux.”

5.2 Lighting Design Strategy

The site is divided into the following areas:

- Walkways
- Traffic areas
- Vehicle turning areas
- Light traffic cycle parks

External lighting will be provided to these areas to illuminate outside all exits and emergency exits. The CCTV cameras shall be infra-red, therefore, they don’t require illumination to perform correctly in darkness.

Building mounted luminaires will be provided with light pollution reducing hoods. All luminaires will have good light control and sharp cut-off angles to reduce light spillage. Any arm brackets shall have 0% uplift and column mounted luminaires shall be fitted with flat glass to reduce the visibility of the light source and glare. All luminaires shall be IP65 (minimum) rated and impact resistant.

Wherever possible luminaires are to be orientated towards the site, away from the boundary to make them less obtrusive to any current or future neighbouring properties.

All lamp types used within the scheme shall consist of high efficiency type lamps, this in turn will contribute towards achieving a good lumens per circuit watt level. This will provide a good colour rendering of greater than 60 Ra, to improve visibility and provide a safer environment in line with a ‘secured by design’ approach (colour rendering values from CIBSE SLL Code for Lighting). Utilising these lamp types will also provide an energy efficient solution and will be Building Regulation Part L compliant.

Controllable 1-day timeclocks will be the primary control for the external lighting, this shall be coupled with strategically placed photocells on each building to ensure luminaires will be in the ‘on’ state prior to complete sunset. Timeclocks will enable greater controllability, ensuring lighting is turned to the ‘off’ state at curfew time and / or at times of un-occupancy. Lighting circuits shall be suitably split to allow switching flexibility and manual override will also be provided for all external lighting circuits.

Final choice and positioning of luminaires will be subject to detail design, the specification of which will meet or exceed the technical requirements outlined in this report.

Adjacent to all exit doors, these luminaires will incorporate integral 3hr emergency battery packs to provide the required emergency lighting.

5.3 Initial Lighting Proposals

Walkways and Cycle paths are proposed to be illuminated with Lighting Columns at a height of 4m. These have been positioned to achieve the required illuminance and uniformity levels whilst also sufficiently illuminating the area surrounding the pathways.

Wall mounted luminaires are proposed to be mounted on the perimeter of the building, mounted at a height of 3.6m (between the glazing on the ground and first floors).

Rectangular surface mounted bulkheads are proposed within the bin store. Mounting height is to be co-ordinated with the height of bins.

Refer to External Lighting Layout for more detail.

5.4 Initial Control Proposals

All of the building perimeter, car park, bicycle park, and walkway lighting shall be controlled using 1-day timeclocks and photocells placed on each building. These time clocks shall be programmed to automatically switch off the external lighting after curfew between the hours of 23.00hrs-07.00hrs. The sports lighting applied to the mini soccer area and netball courts shall be controlled through manual switching rather than with timer and photocell as with the general lighting.

6. Assessment of Impacts

When considering the impact of the proposal on the dark night skies experienced within the site area the most significant factors, in terms of the lighting installation, will be the visibility of the site, and the impact from skyglow, which is the brightening of the night sky. Spill light and source intensities (glare) are less of a concern as they can more easily be quantified, controlled and limited. Each of these factors are considered in more detail below.

Please refer to appendix B for the external lighting isoline layout which indicates the control of light spill from the external lighting scheme to the surrounding area.

6.1 Skyglow

Skyglow is the brightening of the night sky caused by outdoor lighting and natural atmospheric and celestial factors. Outdoor lighting contributes to skyglow by producing light that is either emitted directly upward by luminaires or reflected from the ground. This light is then scattered by dust and gas molecules in the atmosphere, producing a luminous background.

A major effect of skyglow at night is to reduce contrast in the sky. It has the effect of reducing one's ability to view the stars. This is the most pervasive form of light pollution and can affect areas many miles from the original light source.

Skyglow is highly variable depending on immediate weather conditions, quality of dust and gas in the atmosphere, amount of light directed skyward, and the direction from which it is viewed.

Measuring and predicting sky glow from artificial lighting is a very challenging task due to the number of factors involved.

Skyglow caused by artificial light can be minimized by limiting the upward light output of luminaires used in a lighting installation. This is achieved by utilising specifically designed lighting equipment and the use of full horizontal cut-off luminaires installed at 0 degrees uplift. This type of lighting also minimizes the visual intrusion within the open landscape. It can be ensured that the lighting design for the roads properties within the development will meet the limiting guidelines. However, as previously stated, unfortunately the future lighting provided by building owners within the development cannot be predicted and can be difficult to control.

The highest impact in terms of skyglow will be the site border. Dark sky reserves and parks usually include a buffer zone at an E1 classification to ensure the dark skies are achieved in the core area. As the site is not a designated dark sky reserve or park, there is not a buffer zone in place so there is likely to be a negative impact where the lit area borders the surrounding areas of the site however the effect will be minor in the core area of the site.

Considering all these factors the impact in terms of skyglow on the site are likely to be minor adverse due to nature of this proposed development on the current site.

6.2 Light Trespass

Light trespass occurs when spill light is cast where it is not wanted. Light trespass is somewhat subjective because it is difficult to define when, where and how much light is unwanted. An example of light trespass is when spill light from a streetlight enters a window and illuminates an indoor area. The ILP guidance specifies limits for light trespass entering windows in terms of environmental zones. Other forms of light trespass are not specifically limited in the guidance, however it is becoming increasingly common to assess spill light at the boundary of a development. The only area of the site vulnerable to light trespass is immediately where the development boundary occurs to the West of the site. The proposed lighting design will aim to minimise spill light through mitigation measures. Therefore, the impact on the site in these terms will be minor adverse.

6.3 Glare/Source Intensities

Glare is the uncomfortable brightness of a light source against a darker background. The ILP guidance sets limits for the source intensity of each luminaire in a potentially obtrusive direction, outside of the site being lit. The lighting design will comply with these limits. Therefore, the impact on the site will be minor adverse.

6.4 Landscape Character

The significance of potential landscape effects resultant from completion of the proposed development and maturation of planting are as follows:

POTENTIAL EFFECTS OF THE COMPLETED PROPOSED DEVELOPMENT ON THE LANDSCAPE CHARACTER OF THE SITE		
Night Time Landscape Character Areas	Significance of Effect	Reasoning
Developments to West	Minor Adverse	In accordance with the LVIA methodology, the proposals fit well with the existing landscape character, and any negative effects are offset by beneficial aspects or fully mitigated. For this landscape of modest existing value, this category implies proposals which have no significant negative impacts on landscape character.

7. Mitigation Recommendations

In addition to the mitigation measures described within Section 7.1 in the main lighting assessment the following measures are proposed:

As part of a Carbon Reduction Programme and to conform to the required regulations and guidance, all lighting shall be controlled through energy efficient controls utilising timeclocks and photocells to ensure the lighting is only on at the required times rather than all night long.

Areas of moderate night-time activity, such as the main entrance areas, may remain lit all night, but consideration will be given to controlling the lighting levels wherever possible. A part-lighting scheme should be considered for the proposed development to further mitigate the impact of lighting on the site. As previously stated a lighting management plan will be prepared and agreed in advance of any construction, operation and decommissioning activities or preparatory work.

Lighting shields may be included should these be required to restrict unwanted light and aid in the direction of wanted light.

Lighting shields shall also be provided to ensure that no unwanted light spill directly affects sensitive external planting areas.

7.1 Mitigation during Construction

During construction, some temporary lighting will be required to enable the safe continuation of works in the early morning and late afternoons of the winter months. All luminaires, including those required for night-time security will be designed to minimise any obtrusive light.

The Contractor will be required to sign up to the “Considerate Constructors Scheme” and thereby act quickly and responsibly to rectify any lighting misaligned and/or found to be causing a nuisance.

8. Conclusion

In conclusion, the potential impact from skyglow is considered to be minor adverse which is not considered to be a largely significant effect within the scope of this assessment.

There will be a slight increase in the visibility of the site resulting in a minor adverse impact of the lighting on the site; however, but mitigation measures will be performed to ensure that this is kept to a minimum. The glare and source intensities will be minor adverse.

The potential impacts on the Landscape Character are assessed to be minor adverse as there is residential development adjacent to the South of the site. However, once all mitigation methods are incorporated into the final lighting scheme, the external lighting will not cause any significant detrimental effects to the surrounding areas.

The proposed lighting scheme will comply with all relevant British Standards, the Institute of Light and Lighting Guidelines and guidance provided by the Society of Light and Lighting, and will serve to ensure that safety and security of all areas of the development can be effectively maintained.

The lighting will be switched in accordance with good practice which will be linked via timeclock and photocell where the photocell ensures the external lighting is illuminated when the natural light is at a set level; however, the timeclock ensures this is switched off between the hours or 11pm and 7am.

Upward light pollution will be limited in accordance with the standards. Light spillage to adjacent site boundaries will be kept within reasonable limits, defined by the standards, by the careful selection and positioning of the luminaires.

It is considered that the significant effects could be reduced given the implementation of the mitigation recommendations stated in this report. To ensure successful mitigation it is recommended that further design and analysis is carried out on the detailed proposals to ensure that visibility and skyglow are kept to a minimum.

9. Appendix A – External Lighting Layout

10. Appendix B – Luminaire Schedule

Luminaire Schedule			
Reference	**Image**	**Wattage/Lumen Output**	**Description**
EX1		**1844 lumens, 15W**	**Wall Mounted bulkhead luminaire. Emergency versions to be implemented beside external entrances/exits**
EX2		**2900 lumens, 28W**	**Rectangular IP64 rated bulkhead luminaire. Emergency versions to be implemented.**

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