Robust Lighting
Agenda

- About Designplan
- Robust Applications - Characteristics
- Considerations for Robust Products
- Applications
- Questions
Established Designplan 1963

1983

March 2011
Acquired by Fagerhult Lighting Group

2011

August 2014
Moved to new purpose built BREEAM Facility

2014
About Designplan

- Purpose-built 70,000 sq. ft facility
- c.£16M revenue and growing!
- Approx. 160 people – mainly UK based
- Automated manufacturing
- Market leading testing and performance to standards e.g. > IK10
- Sector specific approvals
About Designplan

New facility is BREEAM ‘Excellent’

100% LED Lighting and associated controls

Solar wall (heats air before it enters the heating system – energy reduction of 30%)

Solar panels

Rain water harvesting

New paint plant £500K investment
Lighting Challenging Environments

Transport

Social Housing

Custodial

Secure Healthcare

Urban Exterior
Robust Applications – Considerations

- Vandal resistant
- Weatherproof
- Potential for impact
- Secure projects
- Maintenance & through life cost
Robust Applications – Characteristics

- Impact resistance – IK rating
- Ingress resistance – IP rating
- Construction of product
- Light source
- Maintenance
The European standard **EN 62262** relates to **IK ratings**. This is an international classification for the degrees of protection provided by enclosures for electrical equipment against external mechanical impacts.

The standard for measuring the impact is defined in **EN60068-2-75** which uses the pendulum hammer test to give an IK rating.
## Robust Applications – IK Rating

<table>
<thead>
<tr>
<th>IK Rating</th>
<th>Measure of protection – impact energy (joules)</th>
<th>Test requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>IK00</td>
<td>No protection to this standard</td>
<td></td>
</tr>
<tr>
<td>IK01</td>
<td>0.15</td>
<td>0.20kg impact</td>
</tr>
<tr>
<td>IK02</td>
<td>0.20</td>
<td>0.20kg impact</td>
</tr>
<tr>
<td>IK03</td>
<td>0.35</td>
<td>0.20kg impact</td>
</tr>
<tr>
<td>IK04</td>
<td>0.50</td>
<td>0.20kg impact</td>
</tr>
<tr>
<td>IK05</td>
<td>0.70</td>
<td>0.20kg impact</td>
</tr>
<tr>
<td>IK06</td>
<td>1.00</td>
<td>0.50kg impact from 200mm</td>
</tr>
<tr>
<td>IK07</td>
<td>2.00</td>
<td>0.50kg impact from 400mm</td>
</tr>
<tr>
<td>IK08</td>
<td>5.00</td>
<td>1.75kg impact from 295mm</td>
</tr>
<tr>
<td>IK09</td>
<td>10.00</td>
<td>5.00kg impact from 200mm</td>
</tr>
<tr>
<td>IK10</td>
<td>20.00</td>
<td>5.00kg impact from 400mm</td>
</tr>
</tbody>
</table>
IK10 at 20 joules is very limiting, so other IK ratings have been developed for more robust applications.

<table>
<thead>
<tr>
<th>IK11 – IK16</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IK11</td>
<td>10.0 Kg impacting from a height of 350mm = 35 Joules</td>
</tr>
<tr>
<td>IK12</td>
<td>10.0 Kg impacting from a height of 500mm = 50 Joules</td>
</tr>
<tr>
<td>IK13</td>
<td>10.0 Kg impacting from a height of 750mm = 75 Joules</td>
</tr>
<tr>
<td>IK14</td>
<td>10.0 Kg impacting from a height of 1000mm = 100 Joules</td>
</tr>
<tr>
<td>IK15</td>
<td>10.0 Kg impacting from a height of 1250mm = 125 Joules</td>
</tr>
<tr>
<td>IK16</td>
<td>10.0 Kg impacting from a height of 1500mm = 150 Joules</td>
</tr>
</tbody>
</table>

**IK + - IK++** (generally between IK10 – IK12)
The Standard for IP rating is **EN 60529**

**EN 60529** covers the intrusion of foreign bodies such as tools, dust, fingers and moisture.

The ‘IP’ (“Ingress Protection”) classification, followed by two digits.
A robust luminaire is required to have an IP rating appropriate to its application. Below is the level of ingress protection provided by an IP65 rated product.
Considerations For Robust Products

Product recommendations

- Impact resistant housing, diffuser and fixings
- Zinc coated steel gives added corrosion resistance
- Fully welded construction or aluminium extrusion and casting
- Thermal testing to high and low ambient temperatures
Considerations For Robust Products

Product recommendations

- Tamper proof screws e.g. Resistorx
- Flame resistant materials
- Corrosion resistant paint and pre-treatment restores protective coating
- Salt-spray testing, 1000 hr testing, 20-30 year design life for paint
Considerations For Robust Products

Maintenance

- Quick and easy maintenance
- Energy saving technology upgrades
- Removable and upgradable retrofit gear trays
LEDs in Robust Products

Light Source - LED
LEDs in Robust Products

Dispelling the myths

LEDs never fail

LEDs have a significantly longer useful life than conventional sources. Lumen output reduces through life, but 80% lumen maintenance after 50,000 hours is realistic.

BUT

LEDs will fail early if thermal management and drive characteristics are not controlled.

Drivers have previously had higher failure rates but have significantly improved and are generally very reliable.
LEDs in Robust Products

Dispelling the myths

**LEDs run cool**

The beam of light is cool, as LEDs do not emit infra red wavelength electromagnetic radiation

**BUT**

Typically only 50% of energy consumed is converted to light, the rest converted to heat within the die/package

Excess heat can severely reduce life, colour and efficacy performance, so good thermal management is essential
LEDs in Robust Products

Dispelling the myths

**LED light quality is poor**

If LED luminaires are purchased based purely on cost, the results can be disappointing

**BUT**

To ensure colour consistency the manufacturer needs to use tight binning

Colour rendering Ra of 80+ can be specified
LEDs in Robust Products

Dispelling the myths

LED efficacy is now over 160 lm/W

Some high efficacy LEDs can achieve a die efficacy of over 160 lm/W

BUT

This can be measured in ideal conditions in the laboratory

The true measure of efficacy is luminaire lumens per circuit watt
High wattage LEDs are brighter than lower lumen output increases as current increases

**BUT**

Wattage is not a good index of light output. It is more appropriate to compare luminaire lumen output data and efficacy (lumens per watt).
LED Specification Consideration

- Branded LED and Driver – important for future maintenance
- Warranty – 5 years for LEDs and Driver
- Life – ≥ 50,000hrs L80B10
- Colour – MacAdam Ellipse is 3 step or better
- CRI – >80
Applications - Custodial

Standards

- NOMS – National Offender Management Service
- Standard Cells and Safer Cell requirements
- Anti-ligature as well as impact resistant

Custodial Property

TECHNICAL SPECIFICATION
VANDAL RESISTANT LUMINAIRES FOR ‘STANDARD’ CELLULAR ACCOMMODATION

Standard Number: STD/E/SPEC/021
Luminaires meeting this specification are primarily intended for use within prison cells and therefore must be vandal resistant. This means that they must resist attacks made upon them by a prisoner using such implements as may be expected to be available to him or her. For guidance, these attacks may take the form of repeated hitting with a wooden chair leg or pool cue, prising off the diffuser with a piece of metal cutlery or other implement, or burning with a cigarette lighter or matches.

Applications - Custodial

Standards
The luminaires must be designed so as to reduce the potential for a prisoner to attach a ligature in order to attempt suicide.
Applications - Secure Healthcare

Special considerations

- Increasingly important sector as population ages and mental health issues increase
- Similarities to custodial sector but hospital environments
Anti-ligature luminaire anatomy

A. An oven-baked finish provides a protective skin of tough polyester paint. The die cast aluminium body is strong and durable ensuring the luminaire can resist up to 150 joules of impact (IK16).

B. A removable gear tray allows for easy upgrade and maintenance of all component parts without the need to disturb the anti-pick mastic.

C. The high impact resistant diffuser is secured by Resistox screws ensuring that its tamper proof rating is maintained.

D. Minimise aperture between diffuser and body.
Applications – Rail / Underground

Special considerations

- Section 12 LUL Standard 1-085 – Fire safety performance of materials
- Vibrations and dust caused by rolling stock
- Changes in air pressure in underground
- Changes in ambient temperature across the network
- Stringent lighting requirements on platform edge and public spaces
Applications – Rail / Underground

A  Low smoke/zero halogen cables
all LUL Standard 1-085 (also known as section 12) fittings have to use low smoke and zero halogen emitting cabling, to prevent air becoming toxic in the case of a fire.

B  High IP65 rating
rating to prevent ingress of particulates commonly found in the sub-surface rail environment (brake dust particulates for example).

C  Glass diffuser
diffusers must be glass and at least 6mm thick to prevent harm to passengers and staff during a fire.
Applications – Social Housing

Special considerations

- Vandal resistance through design and construction
- Ingress protection - many applications are exterior
- LED luminaires help reduce energy and maintenance cost
- Easily upgradable with new technologies
- Improved efficiencies in output lead to fewer luminaires required
- Through life costs improved further with integrated controls
Applications – Urban Exterior

Special considerations

- Ambient and feature lighting still requires a robust solution
- Weather, vandal resistance and safety factors need to be addressed
- Controls in output, colour and presence are designed into the product
- LEDs on removable gear trays for ease of maintenance
- Integration with the fabric of the building, façade or balustrade
Robust applications come in all shapes and sizes

Chose a luminaire that fits the application

Ensure correct level of protection for application

Use controls where applicable

Ensure compliance and standards are met
Questions?