

THORN

LIGHTING PEOPLE

SLL Masterclass 2013/14 Energy Reduction By Retrofit

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Introduction

Technological Advances

Understanding Requirements

Establishing Balance

Choosing Solutions

Case Study

Interactive Discussion

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Technological Advances

Light Sources

Control

Optics

Technological Advances

Light Sources

BUILDING TECHNOLOGIES PROGRAM

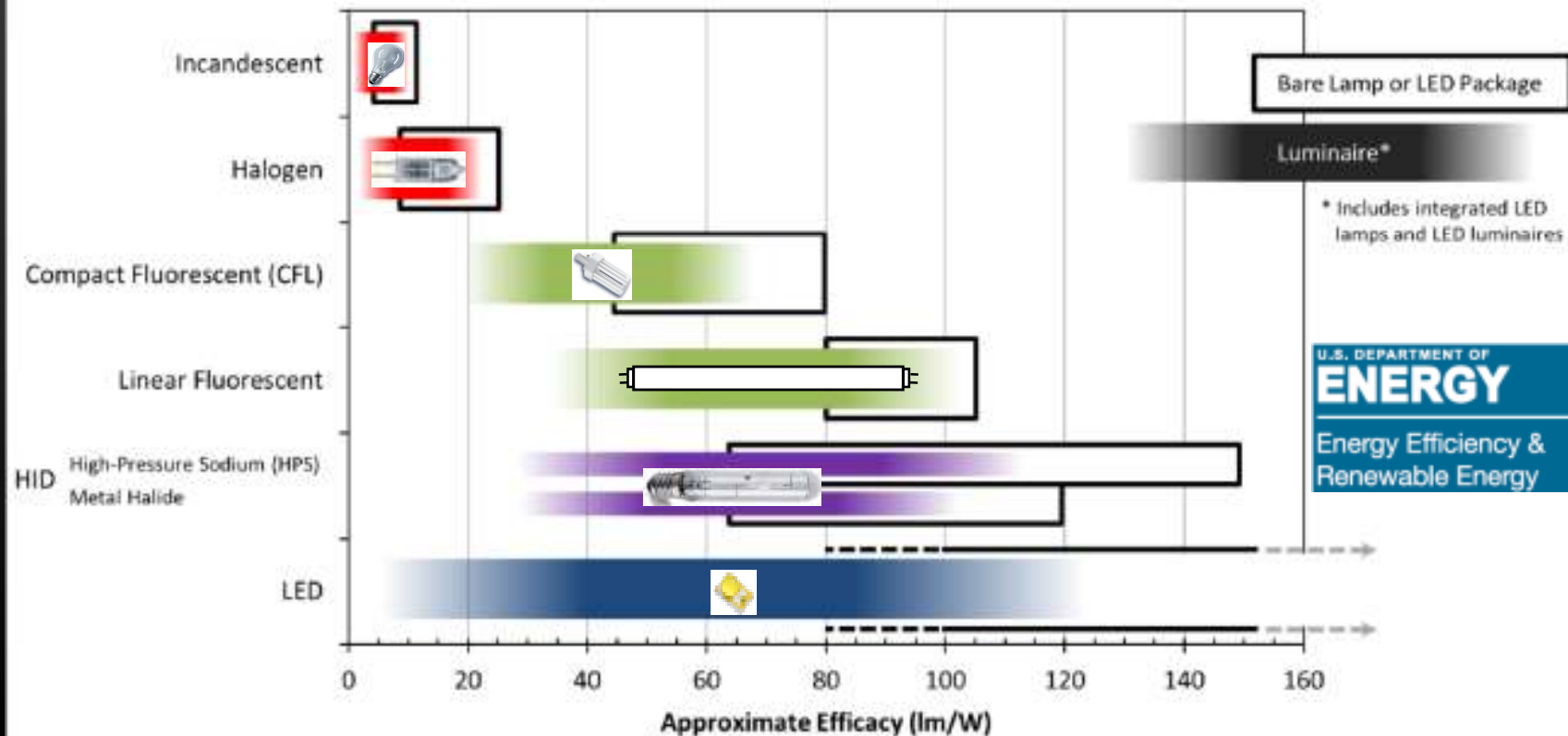
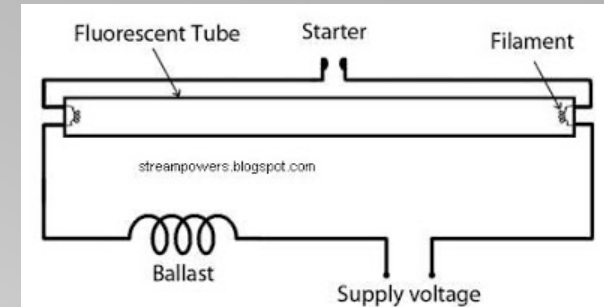


Figure 4. Approximate range of efficacy for various common light sources, as of January 2013. The black boxes show the efficacy of bare conventional lamps or LED packages, which can vary based on construction, materials, wattage, or other factors. The shaded regions show luminaire efficacy, which considers the entire system, including driver, thermal, and optical losses. Of the light source technologies listed, only LED is expected to make substantial increases in efficacy in the near future.

Technological Advances

Control Gear

- Wire Wound control gear
- Electronic High Frequency for efficiency & comfort
- Electronic drivers
 - Affordable Dimming and Power Control Options

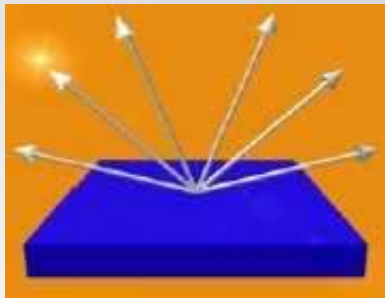


Technological Advances

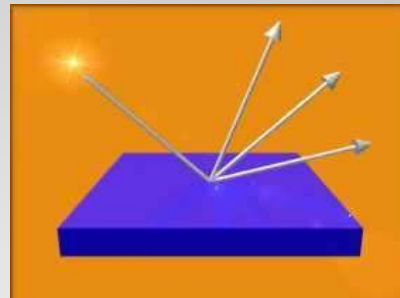
Optical Materials & Control Techniques

Reflections (Reflectors)

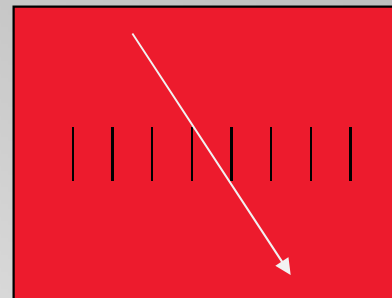
Diffuse



Mixed



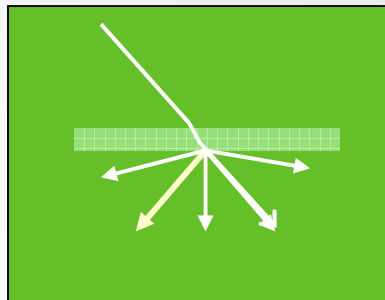
Obstruction (Louvres)



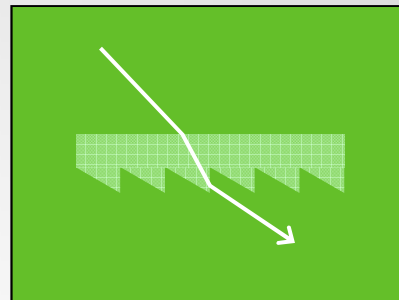
- Existing Reflector with cross blades

Transmittance (Diffusers & Solid Optics)

Diffuse



Refraction

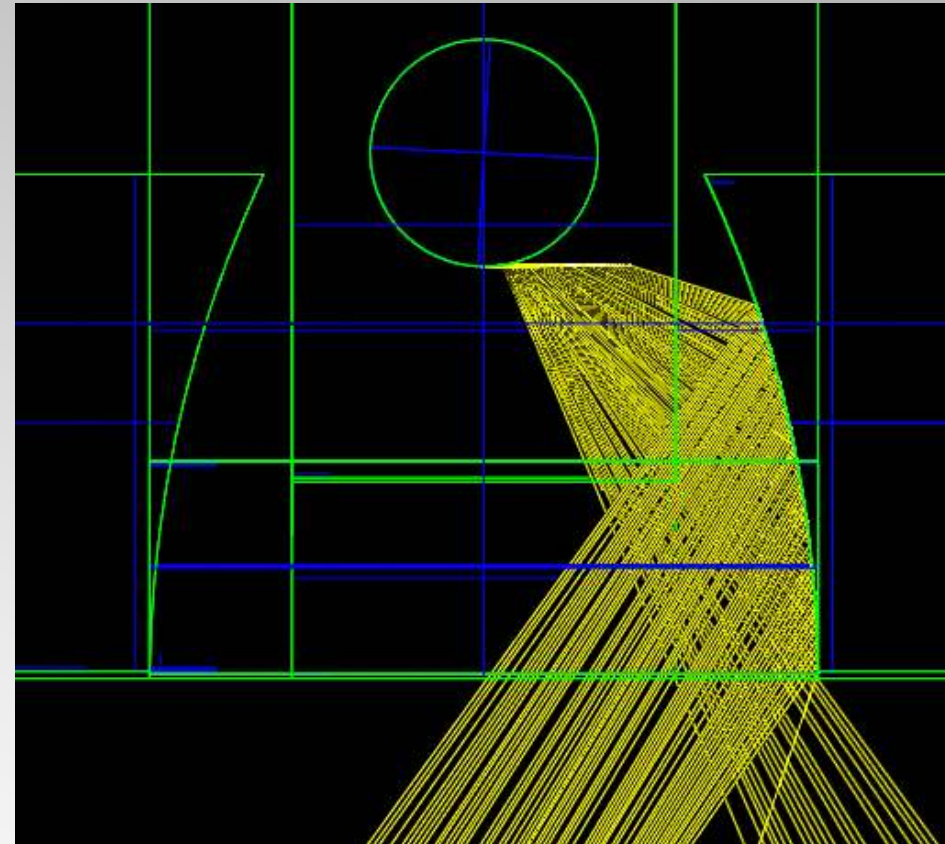
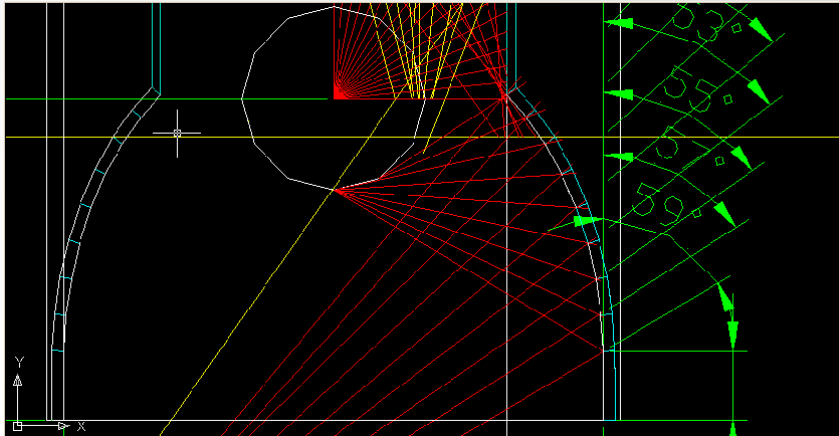


- New Diffuser Options

Technological Advances

Existing Reflector Technology

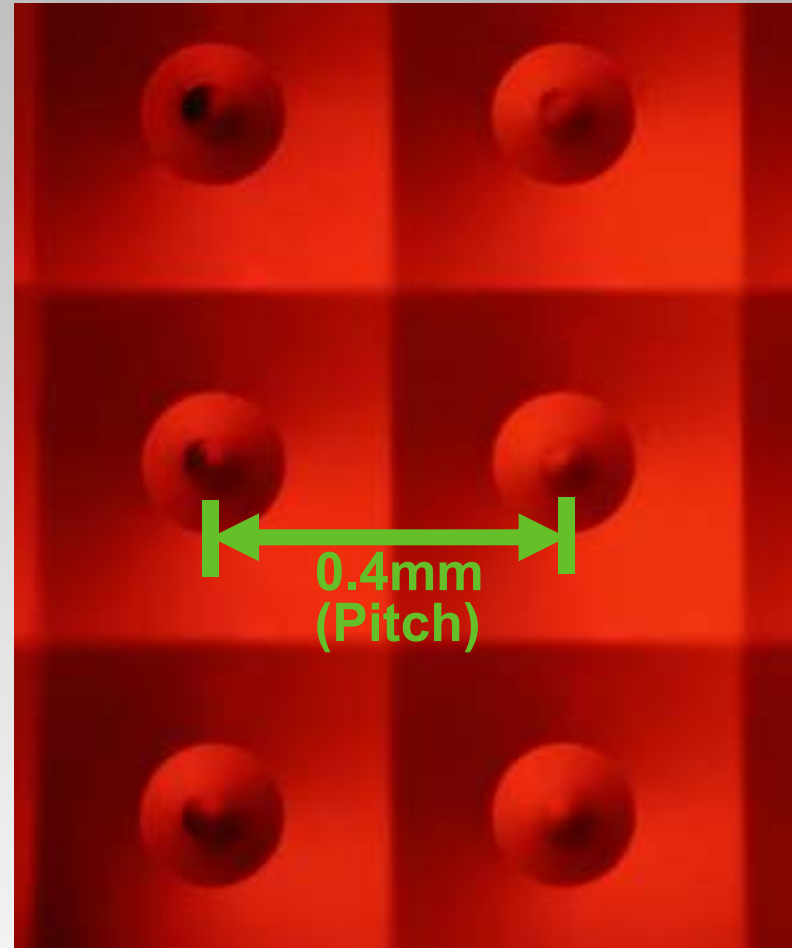
- Reflection
 - controlled by profile and type of material
- Baffles or Louvres
 - added for glare control



Technological Advances

Micro-Prisms

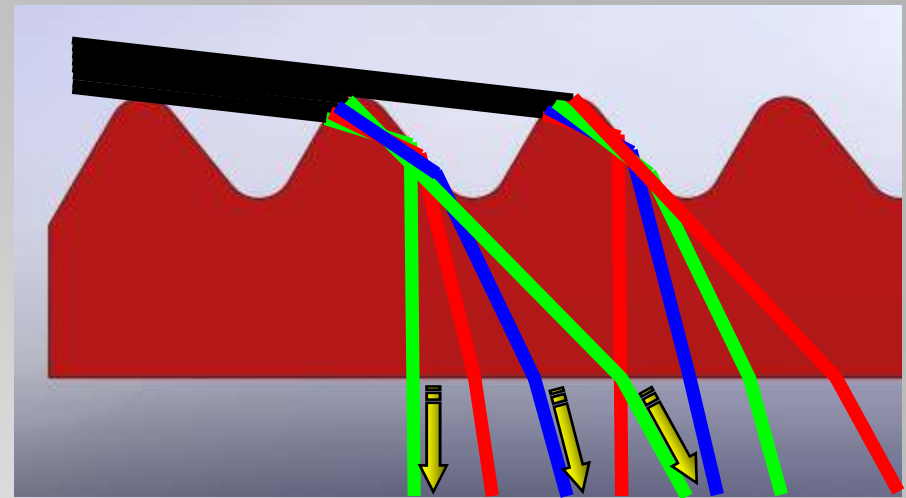
- Micro-prisms
 - Small Prisms or Lenses
 - generally with less than a millimetre (mm) in diameter.
 - Redirect high angle incident light down towards the working plane.
 - Do not hide the lamp. Can displace lamp image or make multiple images
 - Can split light into the spectrum



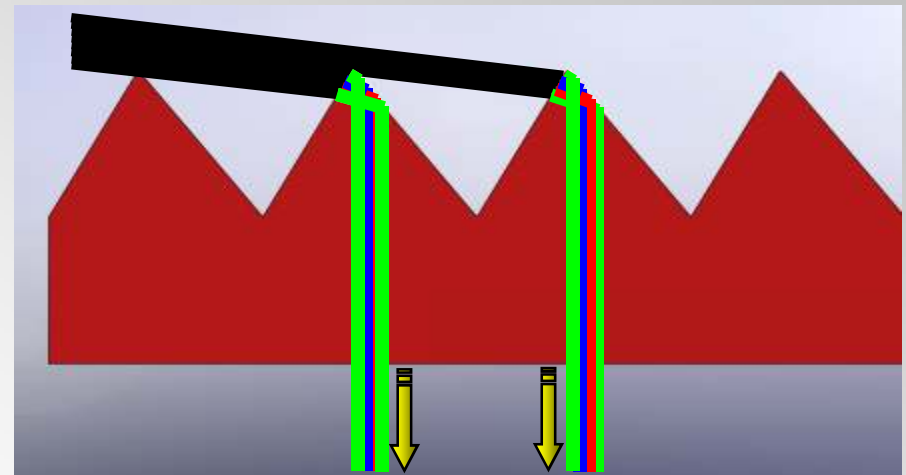
Technological Advances

Prismatic Panels

- Prismatic Panel



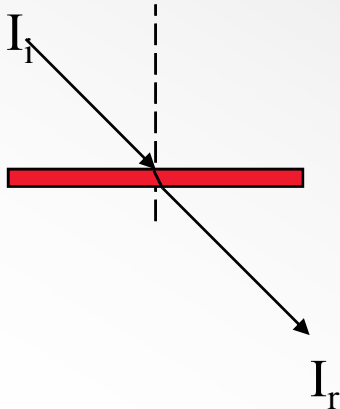
- Micro-Prism
 - Better prisms – less aberration
 - Improved optical control



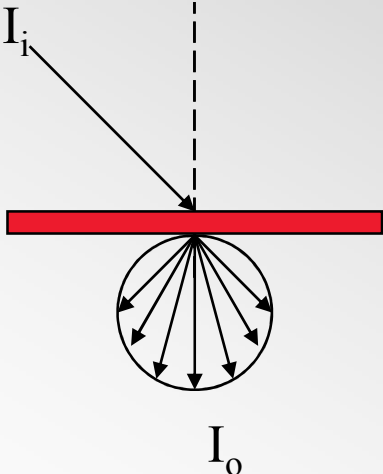
Technological Advances

How Diffuse?

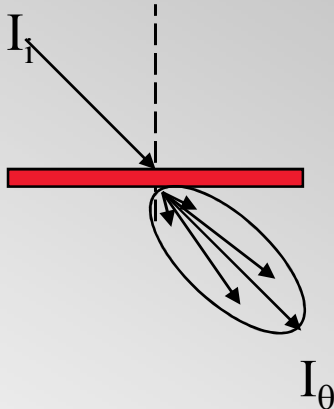
Clear



Dense Opal



Translucent



Technological Advances

How Diffuse?

Transmission factors

Micro-prism 80%

Opal 38% – 83%

Losses up to 15%

MATERIAL	Transmission %	Reflectance %
2mm Diffusion material	83	8
2mm Thick opal light	38	47



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Understanding Requirements

Brief

Situation

Current Needs

Constraints

Application

Existing Building

Timescale

Cost / Payback

Understanding Requirements

Brief - Situation

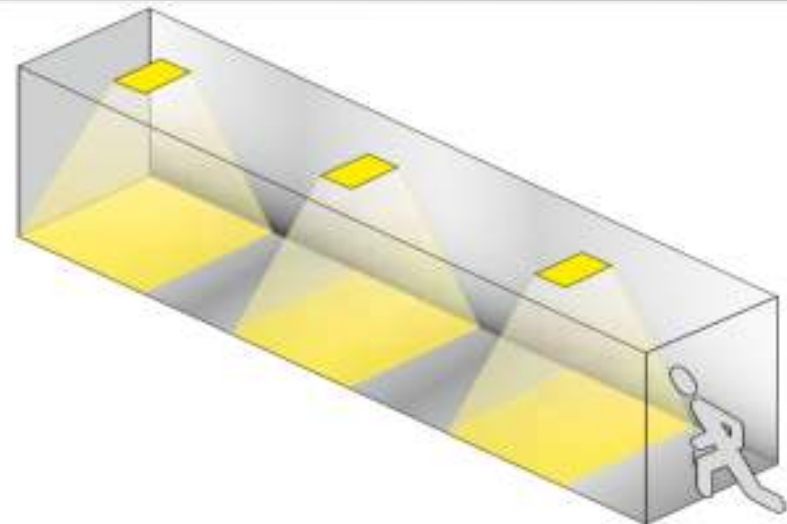
- What is today's use the building?
 - Different to the concept?
 - Task Areas?
- Are users happy with the lighting?
- Carbon Reduction Aims
 - Energy Saving / Payback Needs
- Maintenance costs
- Risk



Understanding Requirements

Brief – Current Needs

- Lighting
 - Current levels and quality?
 - Colour?
 - Feel?
 - Less, Equal or Better?
- Maintenance regime
 - what has been used?
- Standards
 - what has changed?
- Lighting requirements
 - Discuss / Agree
- Emergency lighting
- Future proof?



Understanding Requirements

Constraints – Existing Building

- Fixing / mounting locations (spacings)
- Co ordination with other services
- Extent of refurbishment?
 - Luminaires
 - Ceilings
 - Entire area / building
- Suitability of existing wiring, circuits, and controls
- Access and logistics



Understanding Requirements

Opportunities

Score extra goals:

- New technology
- Integral controls
- Indirect savings
- Enhanced environment
- Change of use
- Different “Feel”
- Aesthetic changes



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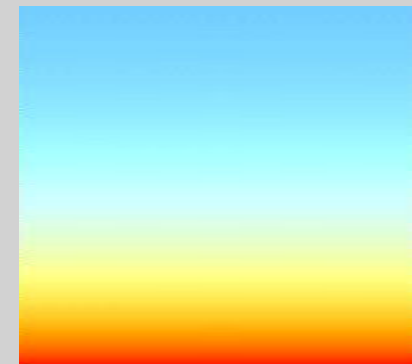
Establishing Balance

Efficiency vs Quality

Establishing Balance

Efficiency vs Quality

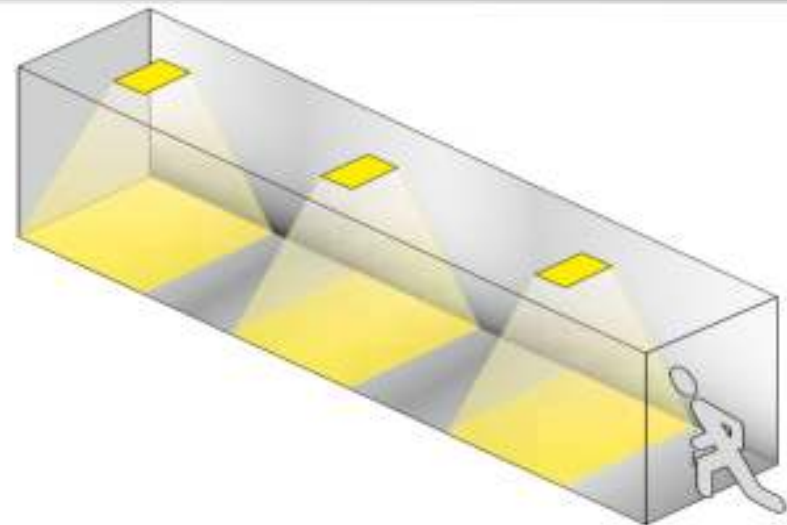
- Quantity of light
- Quality of light
 - Glare
 - Colour Rendering
 - Colour appearance
- Comfort
- Feel



Establishing Balance

Efficiency vs Quality

- System Efficiency
- Costs / Benefits
- Final Testing
- Aesthetics
- Mock Up
- Environmental Improvement
- Affordability



Establishing Balance

Quality check - How does light make *you* feel? – *an alternative view*

- Who has heard the term “Cave Like” for a poor interior lighting scheme?
- “Natural”
- “Euphoric”
- “Better?”



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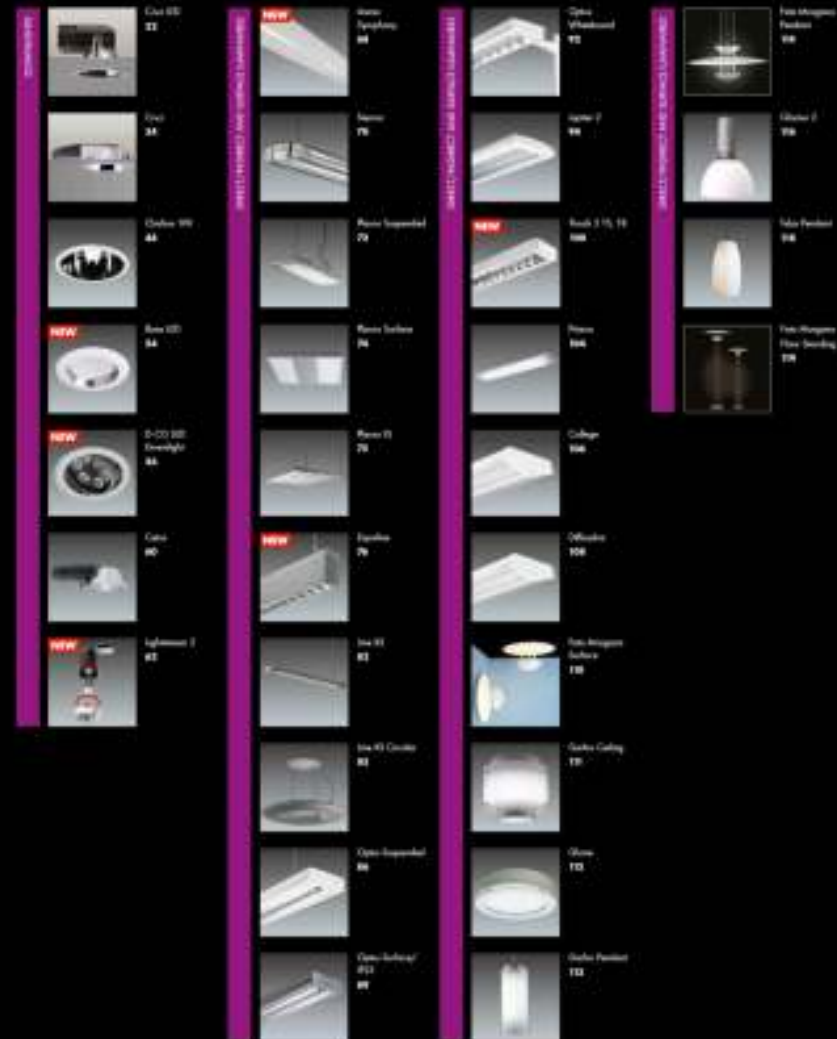
Choosing the Solution

Standard
Or
Bespoke?

Choosing The Solution

Standard Luminaire

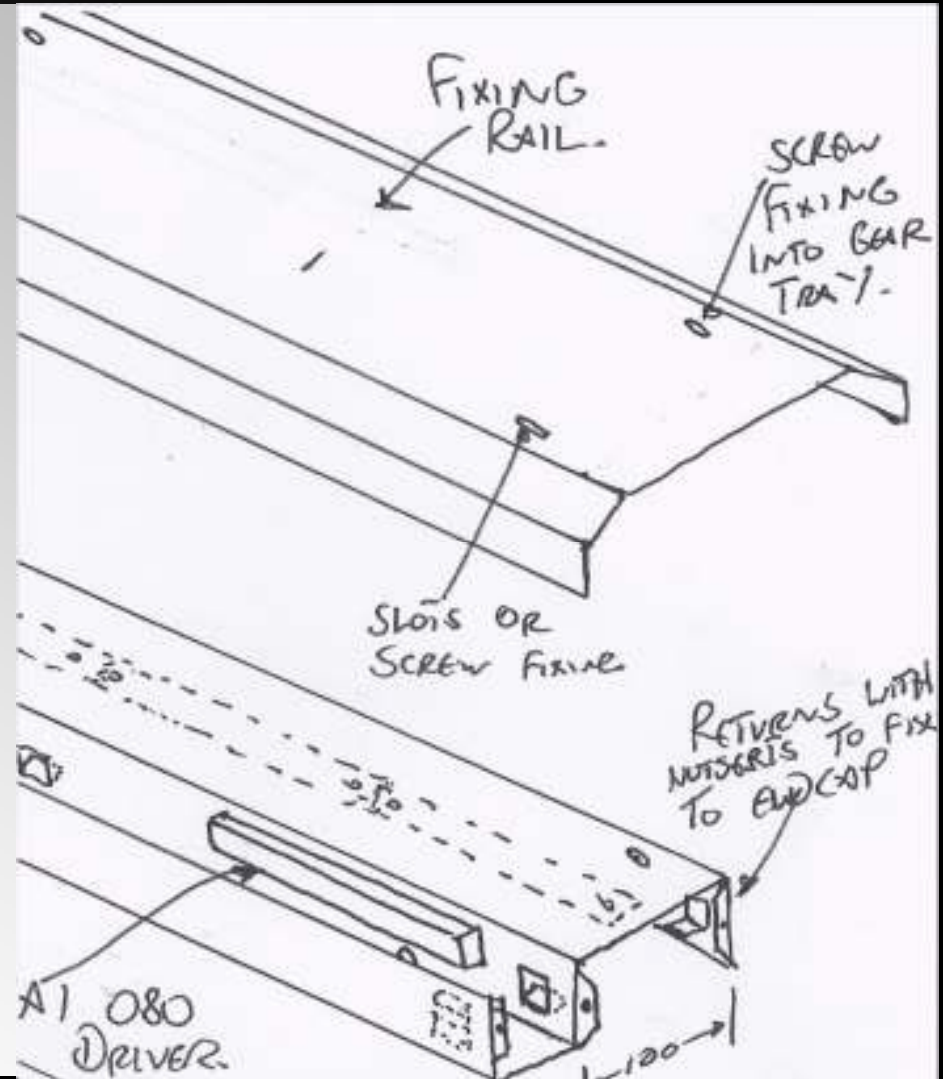
- Straightforward selection
- Regularly updated technology
- Volume Manufacture
- Availability
- Ready Tested and Approved
- Data
- O&M information
- Recyclable



Choosing The Solution

Bespoke Luminaire

- Tailor to project constraints
- Embrace latest technology
- Co-ordinate with existing services
- Aesthetics
- Optimise light distribution
- Ease of installation
- Add Flexibility
- Reduced waste
- Costs and Time for
 - Development
 - Testing



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Case Study

Morrisons Supermarket
Bradford, UK

Case Study

Morrisons Supermarket
Bradford, UK

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Case Study

Wm Morrisons Supermarket, Bradford UK

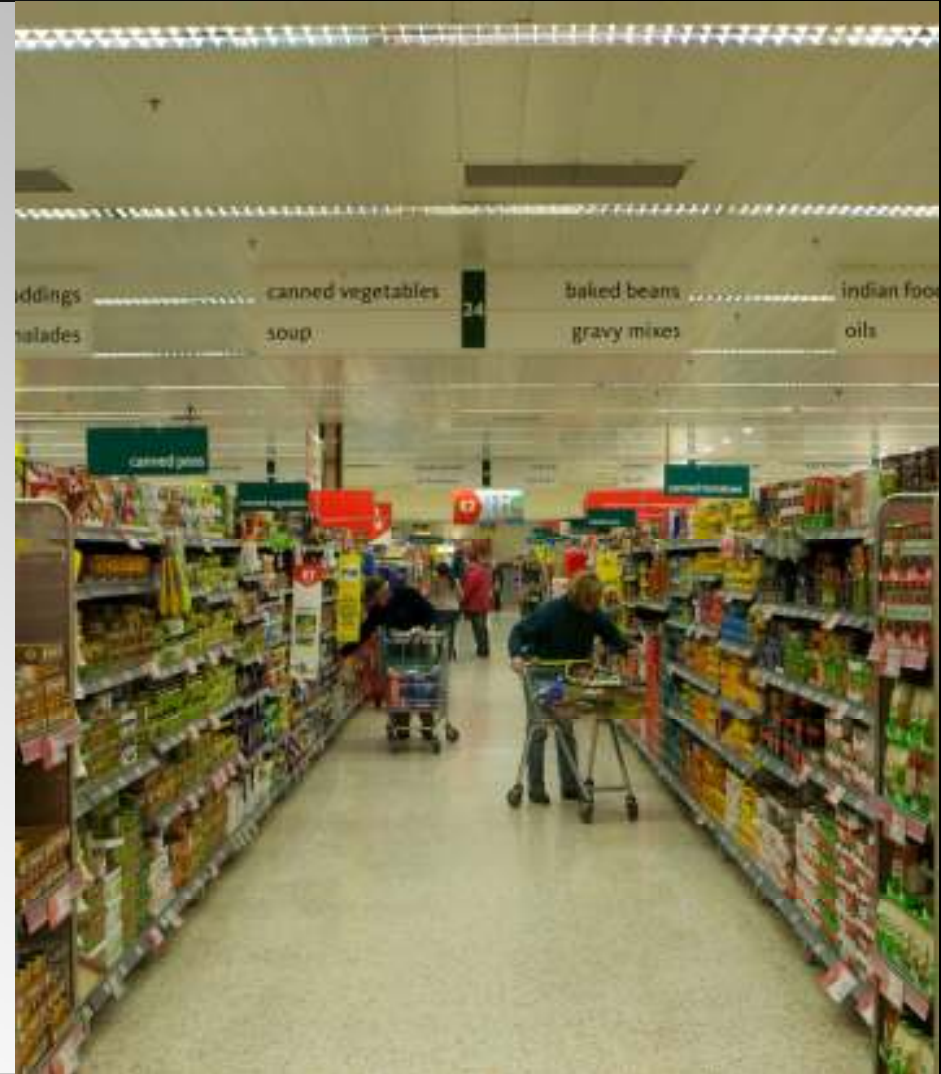
Energy Savings:
70%



Understanding Requirements

Brief - Situation

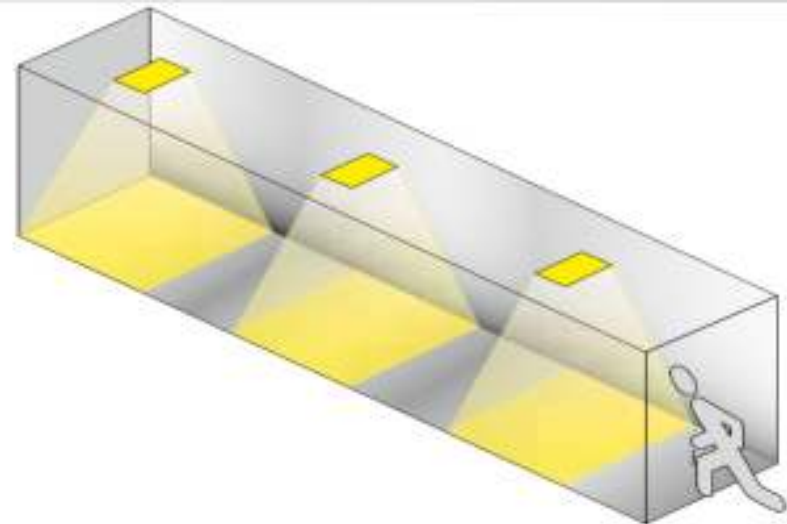
- Carbon Reduction –
£17 Million Energy Saving Target
- Update lighting to maximise energy savings
- Ageing (20 year old) installations
- Maintain High Quality of Lighting -
integral with shopping experience



Understanding Requirements

Brief – Current Needs

- 750 Lux Horizontal
- Reduce maintenance costs
- Good colour rendering
- Minimise cost and disruption
 - Install within 3 nights a store
- Emergency lighting – Mix of
 - 110v Central Battery
 - Self Contained 3hr



Understanding Requirements

Constraints – Existing Building

- Use existing continuous luminaires
- Luminaires provide structural support for ceiling tiles
- Existing spacings to be maintained
- Existing wiring points to be maintained
- Existing emergency lighting systems and points to be used



Understanding Requirements

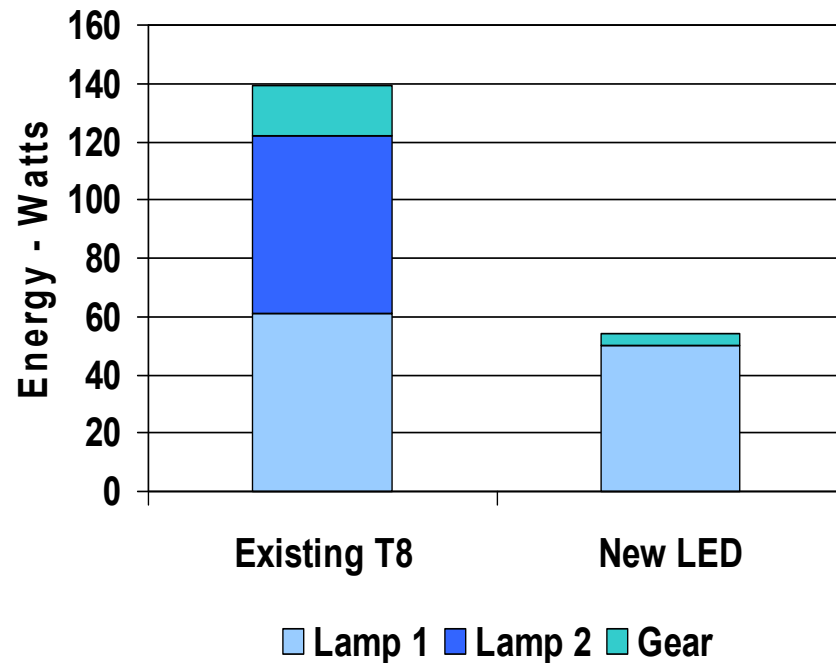
Opportunities

- Add infill Panels
 - Less luminaires
 - Future Flexibility
 - Display Lighting can be added
- Aesthetics
- Indirect benefits
 - Improved environment – new or better business
 - Enhance other refurbishments
 - Easier to clean
 - Less lamp changes



Technological Advances

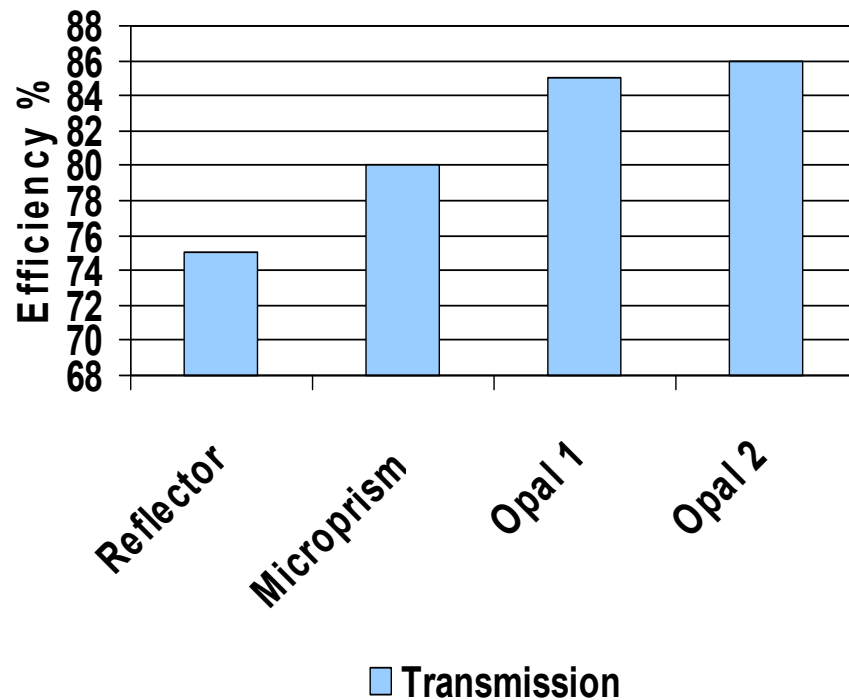
Light Source and Gear Savings



- Existing luminaires have 2 x 70w T8 lamps, various control gear scenarios.
- LED Technology brings potential savings
- ECO mode of driver allows more efficient operation at 300mA (350mA standard)

Technological Advances

Optic Efficiency



- Optical system - Transmission
- Reflector technology was the most efficient when installed 2 years ago
- LED's need to be obscured from direct view.
- Microprism was less efficient and too downward
- High Transmission opals were better.
- Aesthetic decision required

Case Study

Before - Fluorescent

After - LED



Case Study

Before - Fluorescent

After - LED



Case Study

Before - Fluorescent

After - LED



Case Study

Before - Fluorescent

After - LED



Case Study

Savings



Annual savings:
£32,271



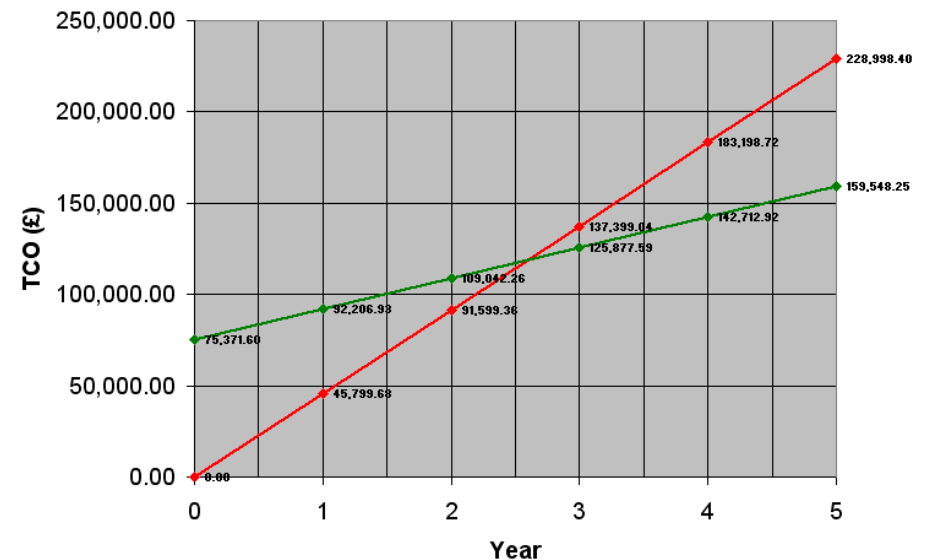
Energy Savings:
70%



Payback:
2.6 years



CO₂ Savings:
195 tonnes/yr



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Thank you

Interactive Discussion

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