**Lighting**

#### Introduction

The Network Rail property portfolio makes considerable use of lighting. Based on estimates, an average of between 10 and 20% of non-traction energy consumed by Network Rail sites is used for lighting. Given this knowledge, the minimisation of energy requirements of lighting across Network rail properties will present significant savings of both energy (and consequently CO2) and money. There are two areas to consider when addressing efficiency of lighting use, the lighting equipment in use and the behaviour of the people who use it.

Categories

Lighting installations fall into two primary categories:

1. Lamps
2. Lighting Controls

Both of these categories cover a huge range of equipment, so the focus will be on what is most applicable to the current Network Rail property portfolio

The following types of lamps can be found at network Rail properties:

1. Filament/incandescent and halogen lamps
2. Fluorescents
	1. Compact fluorescent lighting
	2. Fluorescent Tubes
3. Induction lights
4. LEDs

#### Filament or incandescent lamps

The filament lamp is a common type of light bulb. It contains a thin coil of wire called the filament. This heats up when an electric current passes through it, and produces light as a result. Incandescent bulbs are much less efficient than most other types of electric lighting as they convert less than 5% of the energy they use into visible light. Old-style incandescent bulbs have already been phased out across the EU and will be followed by Halogen lamps from 2018.

It is estimated that at least 80 per cent of UK businesses have some form of halogen or incandescent light source within them

#### Fluorescent lamps

These are by far the most common in Network rail and can be found almost anywhere. They mostly are in form tubes or compact fittings. The most commonly used fluorescent tubes are T5 and T8.

A fluorescent lamp or a fluorescent tube is a low pressure mercury-vapour gas-discharge lamp that uses fluorescence to produce visible light. An electric current in the gas excites mercury vapour which produces short-wave ultraviolet light that then causes a phosphor coating on the inside of the lamp to glow. A fluorescent lamp converts electrical energy into useful light much more efficiently than incandescent lamps. The typical luminous efficacy of fluorescent lighting systems is 50–100 lumens per watt, several times the efficacy of incandescent bulbs with comparable light output.

Because they contain mercury, many fluorescent lamps are classified as hazardous waste.

#### Induction lamps

These lamps are very similar to conventional fluorescent lamps. Mercury vapour in the discharge vessel is electrically excited to produce short-wave ultraviolet light, which then excites internal phosphors to produce visible light. Unlike an incandescent lamp or conventional fluorescent lamps, there is no electrical connection going inside the glass bulb; the energy is transferred through the glass envelope solely by electromagnetic induction. Leeds city Station is one place where induction lights have been used to light the concourse area. Typical life span is up to 100,000 operating hours and has a higher efficacy than ordinary fluorescent lamps.

#### Light Emitting Diode (LED) Lighting

An LED lamp is a light-emitting diode (LED) which is assembled into a lamp (or light bulb) for use in lighting fixtures. LED lamps have a lifespan and electrical efficiency which are several times greater than incandescent lamps, and are significantly more efficient than most fluorescent lamps.

An example of LED installation is at Glasgow Central station where the concourse, basement and lower ground floors have all been deployed with LED.

Like incandescent lamps and unlike most fluorescent lamps (e.g. tubes and compact fluorescent lamps or CFLs), LEDs come to full brightness without need for a warm-up time; the life of fluorescent lighting is also reduced by frequent switching on and off, which is not the case for LED lamps. The initial cost of LED is usually higher.

## Lighting Controls

The term lighting controls is typically used to indicate stand-alone control of the lighting within a space. This may include occupancy sensors, time clocks, and photocells that are hard-wired to control fixed groups of lights independently. Adjustment occurs manually at each device’s location.

The following controls are available on the market:

* Passive Infra-Red (PIR) sensors (mostly in offices)
* Lux/Dimming control
* Photocell

In a number of Network Rail offices, PIRs are deployed, while photo cells are for outdoor lighting controls.

Where there are no controls, the most effective way of controlling energy use is by switching off when lighting is not in not in use. Even if controls are present, it is always best practice to switch off lights when not needed, as controls often leave areas lit for 20-30 minutes after they have been vacated.