High Intensity Discharge Lighting

High Intensity Discharge (HID) lighting is widely used for industrial and warehouse sites. Originally popular for providing a cost-effective form of good quality lighting for work environments.

HID lightings are also popular for external lighting and have been used extensively as vehicle lights. A feature of this form of lighting is that bulbs reach very high temperatures during use and operate at high internal pressure, presenting a range of potential fire and safety hazards.

What are High intensity Discharge Lights?

Commonly referred to as HID lights – a generic term for bulbs which use a ballast to produce light when an electric current is passed between two tungsten electrodes inside a gas filled quartz or ceramic arc tube. The flow of current creates an arc that vaporises the metallic content in the tube. Unlike conventional incandescent bulbs there is no filament.

Differing types of bulb are available including:

Metal Halide

Mercury, argon and metal halides in a gas filled tube, creating a bright white light. Most frequently used inside buildings. Usually denoted 'M' rated bulbs.

High Pressure Sodium Vapour

Solid sodium and mercury sealed in a zenon (or neon-argon) inert gas-filled tube within an outer glass envelope. The arc tube is made of ceramic material because hot sodium attacks glass and quartz. These characteristically produce a yellow/orange light that can be used inside buildings and also is commonly used for street lighting. Usually denoted 'S' rated bulbs.

Mercury Vapour

Relatively uncommon, these bulbs have mercury sealed in an argon gas filled quartz tube and emit a blue/white light. Usually denoted 'H' on the bulb.

HID bulbs should always be installed in fittings that have been specifically designed for the type of bulb being used. These are most typically either semi-dome pendants, or rectangular metal boxes enclosing the bulb and fitting.

What are the main hazards?

HID bulbs operate at high temperature - up to 1300°C - at internal pressure of up to 6bar. Failure of bulbs can therefore result in catastrophic discharge of extremely hot material propelled by the high pressure within the bulb. Should the hot internal components come into contact with combustible materials, then a fire can result. A number of large fires have been attributed to failure of HID bulbs - a QBE client had a significant fire in 2011 resulting in a total loss, caused by an HID light fitting overheating and igniting combustible insulation material behind wooden roof cladding.

Lights can fail following a range of incidents such as:

- Damage by mechanical impact, possibly from a fork lift truck positioning stock into racking and the driver misjudging the proximity of the light fitting.
- Scratches on the surface of the glass dome can indicate inherent weakness resulting in failure.
- Water dripping onto bulbs can cause sudden cooling and cracking of the outer glass dome.
- Incorrectly installed bulbs, or use of an incorrect ballast.
- 'Self Cycling' of the bulb where a bulb repeatedly attempts to light, fails, cools and attempts to re-light.
- Failure due to age and hours of use.

What can be done to mitigate the risk?

- Light fittings should incorporate borosilicate glass barriers below the bulb to capture fragments if there is a failure. Glass plates should not be retro-fitted to units unless they conform to manufacturers' specification. Confirming whether lights have glass plates below bulbs can be difficult during site inspections, particularly if the glass is clean – the lights tend to dazzle, reducing the ability to see clearly.
- As an alternative, bulbs are available which include an internal shroud around the arc tube, usually made of quartz, alumina Silicate or steel mesh. These are normally denoted 'O' (or 'MP') and are suitable for use in open fittings because the shroud is designed to contain arc tube fragments in the event of a violent rupture
- Light fittings should be positioned clear of any combustible construction or building materials as well as combustible storage. The fittings themselves can also become very hot during operation.
- HID lights should be located over aisles or other clear spaces, not over stock or combustible items.
- Fork lift truck drivers, and others who might position stock in racking, should be trained to recognise the hazards of HID lighting.
- Bulbs and HID light fittings should only be installed or changed by experienced engineers who have been trained to install HID bulbs, and are aware of the indications of possible weakness in bulbs (such as scratches on the glass domes).
- Any bulbs that show signs of deterioration should be changed immediately. Warnings signs include bulbs that take longer than usual to reach full brightness, bulbs that run through repeated start cycles and bulbs that flicker during use.
- To reduce the impact of deterioration due to age, it is recommended that bulbs should be renewed when they have been in use for 70% of the lifetime suggested by manufacturers.
- If HID lights are in constant use, as in some warehouses or industrial sites, they should be turned off at least once a week for a minimum of 15 minutes. They should be monitored when turned back on to identify any that are showing signs of deterioration.

Alternatives

For new installations, or where replacement of existing HID lights with alternative lighting systems is a feasible option, the following generic types lighting equipment present inherently less hazardous solutions:

Conventional incandescent lightbulbs

Produce light when an electrical current is passed through a filament, which heats and becomes incandescent. Not energy efficient as they convert only a small percentage of energy into visible light (typically about 2.5%), otherwise generating heat. Rarely used in industrial settings other than where localised lighting is needed. Hot fragments can be discharged following failure, but this is unusual and as the bulbs are not under high pressure the results are far easier to contain than when an HID bulb shatters.

Fluorescent lights

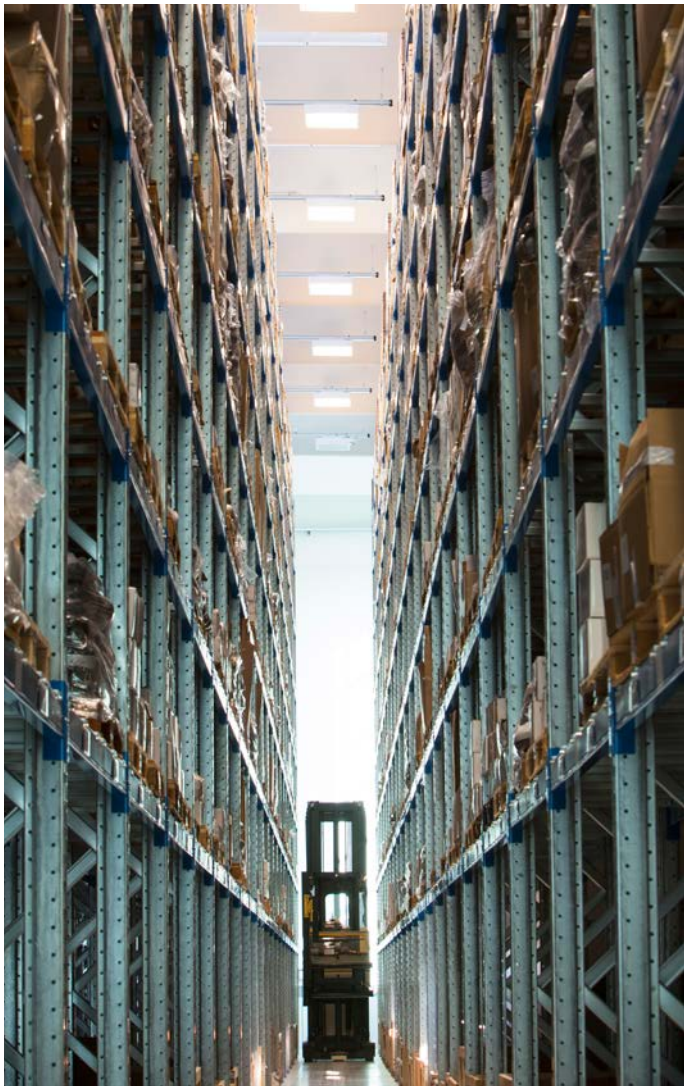
Low pressure mercury-vapor gas-discharge lamps that use fluorescence to produce visible light. An electric current in the gas excites mercury vapour which produces short-wave ultraviolet light that then causes a phosphor coating on the inside of the bulb to glow. Familiar as tube lighting, also as compact fluorescent lamps (CFL) which have become common as replacements for incandescent bulbs especially in household use. Fluorescent lights are more energy efficient, but most require a ballast and starter to operate. Fluorescent lights operate at far lower temperatures than HID lights, and are not pressurised, so although failure can result in hot fragments being discharged the result is far less potentially catastrophic than failure of an HID lamp.

LED

Increasingly popular as industrial and warehouse lighting because of high energy efficiency and adaptability. LED bulbs use light emitting diodes to generate light. LED bulbs operate at low temperature compared with alternative bulbs, and they have a long life-span which helps to off-set their initial high cost. LED's are gaining popularity in industrial and household use because of their low energy consumption and extended lifespan.

Further Considerations

- Robust inspection procedures should be in place covering the fixed electrical installation to ensure compliance with the Electricity at Work Regulations 1989 and in accordance with BS7671: 2008 Requirements for Electrical Installations (incorporating Amendment No 3 2015).
- Infra-red thermography (thermographic surveys) are a useful tool for identifying potential over-heating of the structure or contents resulting from HID or other forms of lighting.
- The safety of employees and others within the premises should be considered, including the possibility of injury from lighting. Risk assessments should include reference to lighting hazards where necessary.
- The Fire Risk Assessment for the site should include reference to potential hazards arising from lighting, especially where this could impact on fire evacuation procedures.



Guidance and useful information:

A range of information is available in QBE Risk Solutions Property Technical Guides, including –

- Periodic Inspection and Testing of Electrical Installations
- Thermographic Surveys

For further guidance and general enquiries please contact: RS@uk.qbe.com

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