Metal halide lighting systems

Introduction
This document provides information concerning a specific type of High Intensity Discharge (HID) light, known as Metal Halide, used in many industrial/commercial facilities, and provides guidance for facilities where this type of lighting is present.

Background
Metal Halide is a type of HID light; others include Mercury Vapor and High Pressure Sodium. An HID lamp is a sealed, gas filled arc tube, made of quartz or ceramic material, surrounded by an outer glass envelope or bulb. The term lamp is used throughout this article to refer to the bulb itself, consistent with terminology used by Underwriter's Laboratories (UL). An arc forms between two coiled tungsten electrodes, which heats and pressurizes the gas, up to 70 psi and 2000 °F (1100 °C), resulting in light emission.

You have undoubtedly seen these types of lights, often in large, open areas with high ceilings, such as warehousing and manufacturing, because they are generally more energy efficient for their wattage than other light sources. HID lamps often have specific color characteristics. Typically a mercury vapor lamp will produce a white light with a bluish tinge, while a high pressure sodium lamp produces a red-orange-yellow light. Metal Halide lights have gained popularity as they produce a clean, white, natural looking light.

Normally the failure of a light fixture, or lamp, means that the lamp fails to illuminate when it is energized, however, on occasion, the lamp can fail violently, or rupture, fracturing the arc tube and expelling hot quartz fragments, with the potential for ignition of nearby combustible materials. Any type of HID lamp can rupture; however, when it comes to fires started by lighting in commercial establishments, metal halide lamps have been, and continue to be, identified as one of the largest causes of ignition in large fire losses. Major manufacturers of metal halide lighting have issued product specification literature and bulletins warning consumers of the possibility of violent failure of these lamps. Many of the manufacturers list these warnings on the product packaging itself.

The establishment of the rated life of a lamp is not an exact science; rather, it is set by statistical analysis, and is based on a 50% probability of failure. Therefore, if you have 100 metal halide lamps in service and they are kept energized throughout their rated life, 50 will have failed. One manufacturer estimates a 20% failure rate for lamps reaching only 50% of their rated life. Obviously not all failures are violent; however, when you consider the number of metal halide lamps and fixtures in service, the number of potential fires is quite significant.

Most manufacturers also produce lamps that have an internal arc tube shield, or containment barrier, of tempered or borosilicate glass. The barrier is designed to resist the rupture of the quartz arc tube and contain the hot fragments within the outer bulb. These lamps will indicate on the packaging that they are “suitable for use in open fixtures”. Lamps that do not have this internal arc tube shield, or similar means of containment, will state that they “must be operated in a suitably enclosed fixture”.

Some manufacturers also market lamps having a shatter-resistant, plastic or Teflon coating on the exterior of the bulb. These coatings are typically designed to contain glass fragments in the event of physical damage or breakage of the outer bulb, and not to contain hot arc tube fragments, expelled during a violent rupture of the arc tube.

Underwriter’s Laboratories (UL) provides listings for metal halide light fixtures, which meet the requirements of UL 1572 “High Intensity Discharge Lighting Fixtures”. Containment barriers, lenses, or diffusers must be able to contain hot arc tube fragments heated to 2000 °F (1100 °C), in accordance with the specific test methods listed in this standard. No UL standard exists, however, for the testing or manufacturing requirements for metal halide lamps. They rely on manufacturers' tests regarding the acceptability of a lamp for open fixtures, and to match listed fixtures with the proper lamps.
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There are three classifications of lamps provided by the American National Standards Institute (ANSI).

1. **E-type** These lamps are to be used only in suitably enclosed fixtures, in accordance with UL 1572
2. **S-type** May be used in open fixtures, when operated vertically and all manufacturers instructions are followed
3. **O-type** Quartz Metal Halide lamps that comply with ANSI C78.387 for containment, testing and recommended for use in open fixtures

An important note about the S-type lamps - Manufacturers instructions indicate that the lamp may be operated in an open fixture “PROVIDED THE INSTALLATION IS NOT NEAR PEOPLE OR FLAMMABLE OR COMBUSTIBLE MATERIAL”. The Travelers interpretation of this requirement would include areas with warehousing or storage of combustible materials or manufacturing areas with combustible loading.

Unfortunately, both types of lamps have the same type of threaded base that screw into the fixture. A properly installed lamp, suitable for an open fixture, can easily be replaced at the end of its service life with a lamp requiring installation in a suitably enclosed fixture.

**Controls**

Lamps in continuous operation, 24 hours/day, 7 days/week should be turned off once a week. Some manufacturers suggest that by shutting the lights down weekly, and allowing the lamps to cool, that units at the end of their useful life will simply fail to illuminate, as opposed to failing violently. This alone, cannot be relied upon to prevent violent failure of metal halide lamps as they could fail at any other time during the week.

Review the different types of lights and fixtures in your facility and note the existence of metal halide lamps. For these units, perform the following:

- Lamps should be replaced at, or prior to, the end of their rated life. Group relamping is recommended in order to ease record keeping of replacement dates.
- Verify that lamps are matched with their suitable listed fixtures. Only a lamp with an arc tube shield/shroud, or other internal containment feature, should be installed in an open fixture. For lamps without internal containment and/or whose packaging indicates that they should be installed only in suitably enclosed fixtures, modify the existing fixtures by installing tempered or borosilicate glass containment barriers, lenses, diffusers, or enclosures. Consult the original fixture manufacturer when planning modifications. Use the manufacturer's listed components and retrofit kits, if available.
- A priority should be established to replace lamps in areas of high combustible loading, such as warehousing and storage areas first.
- For lamps placed in “continuous operation”, make provisions for a weekly 15 minute shutoff.
- As with all HID lights, minimum clearance, as recommended by the manufacturer, should be maintained from combustibles.

These items should be included in your facility’s electrical and lighting Preventive Maintenance Program.

**Summary**

A metal halide lighting system presents a special challenge in fire prevention. It is important to properly install and protect metal halide lighting systems in order to reduce the potential for fire loss. Proper utilization and maintenance practices can also help to minimize the likelihood of a fire.

For more information, log in to the Risk Control Customer Portal at travelers.com/riskcontrol. (Need help? Read our Registration Quick Guide.) You also can contact your Risk Control consultant or email Ask-Risk-Control@travelers.com.