

Metal Halide Lamps

Risk Solutions

HSB Professional Loss Control

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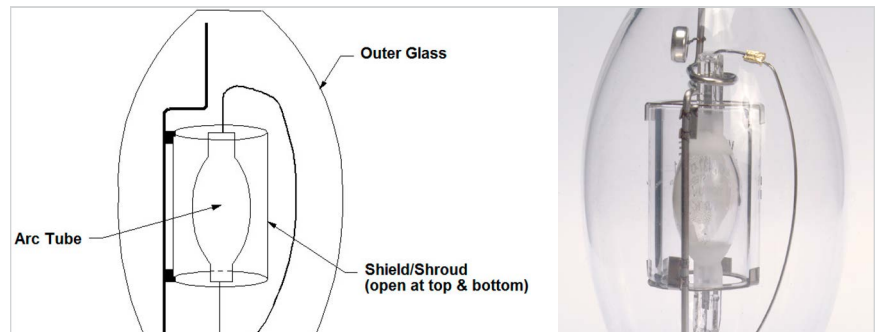
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Scope

High Intensity Discharge (HID) lamps describe a family of lamps of which Metal Halide lamps are but one member. It is important to be able to distinguish between the other HID lamps as they do not have the requirements of safe operation as Metal Halide lamps. Once a lamp has been identified as a Metal Halide, one must then identify the type or class of Metal Halide of which there are three; Type O, S, and E. It is at that point that you can begin the process of determining the level of protection provided or needed.

Identification

The Type-O Metal Halide lamp is now the only Metal Halide lamp that does not require a bottom lens on the luminaire per the National Electric Code beginning with the 2005 edition. The Type-O lamp can be easily identified by the inclusion of a shield or shroud around the arc tube as shown below. A Metal Halide lamp without an arc tube shield/shroud is a Type-E or Type-S. When the arc tube ruptures, the shield/shroud is designed to prevent the shards from breaking the outer glass bulb which is designed to contain the high temperature shards.



Hazards

The primary hazard regarding property lines of insurance associated with metal halide lamps is fire damage to the building and stock with associated business interruption. Metal Halide lamps, if they rupture when at their hottest point, may send shards of glass and quarts at 2,000 degrees Fahrenheit onto



Hartford Steam Boiler

the commodities below. Depending on the commodities, storage arrangement, and level of automatic protection, an ensuing fire could be significant.

Controls

There are three levels of control besides substitution to a non-Metal Halide lighting system: Cycling, Containment, and Fuel Load Restrictions. Below is a discussion of each.

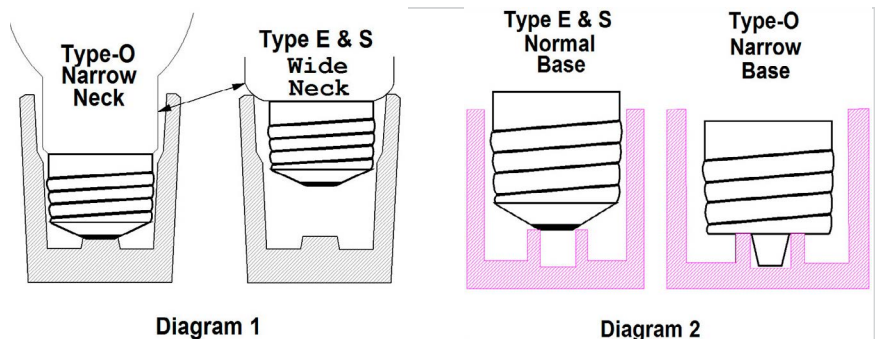
Cycling

First, for those locations that operate lamps continuously 24 hours per day and 7 days per week, at least once per week they should “cycle” them off for at least 15 minutes. Cycling of lamps helps to cause the lamps nearing end-of-life to passively fail. As lamps age, stresses in the arc tube gradually increase. If the stresses are severe enough, they can cause the arc tube to crack. When operating, the combination of a crack and high pressure in the arc tube can cause a rupture. However, if the lamp is periodically cycled, the cooling down or heating up of the arc tube can cause those cracks to propagate while the internal arc tube pressure is low, preventing a violent failure.

Containment

This control is to prevent the hot shards of glass and quartz after a rupture from contacting commodities. That is, although relatively few of the lamps rupture violently, we should recommend controls for any metal halide lamp that may rupture. Containment within the outer glass of the lamp or within the light fixture is the primary key to fire prevention. Therefore, it is the special Type O metal halide lamp with the arc tube shield/shroud or the UL 1598 listed luminaire (has a bottom lens) that is vital to fire protection.

Type-S Metal Halide lamps formally could be installed in luminaires without a bottom lens, PROVIDED they were switched-off for at least 15 minutes each week. The 2005 edition of the NEC changed this condition such that Type-S Metal Halide lamps need to be enclosed. Type-E lamps have always been required to be enclosed. But it is not enough for an engineer to simply recommend that the currently installed Type-E or Type-S lamps be replaced with a Type-O lamp as the NEC states that Luminaires that use a metal halide lamp ... shall be provided with a containment barrier that encloses the lamp, or shall be provided with a physical means that only allows the use of a lamp that is Type-O. Simply stated, substitution of lamps alone is not sufficient, the lampholder must also be changed so that Type-E and Type-S lamps are excluded. Diagram 1 and 2 below show two methods for Type-E and Type-S lamps to be excluded.

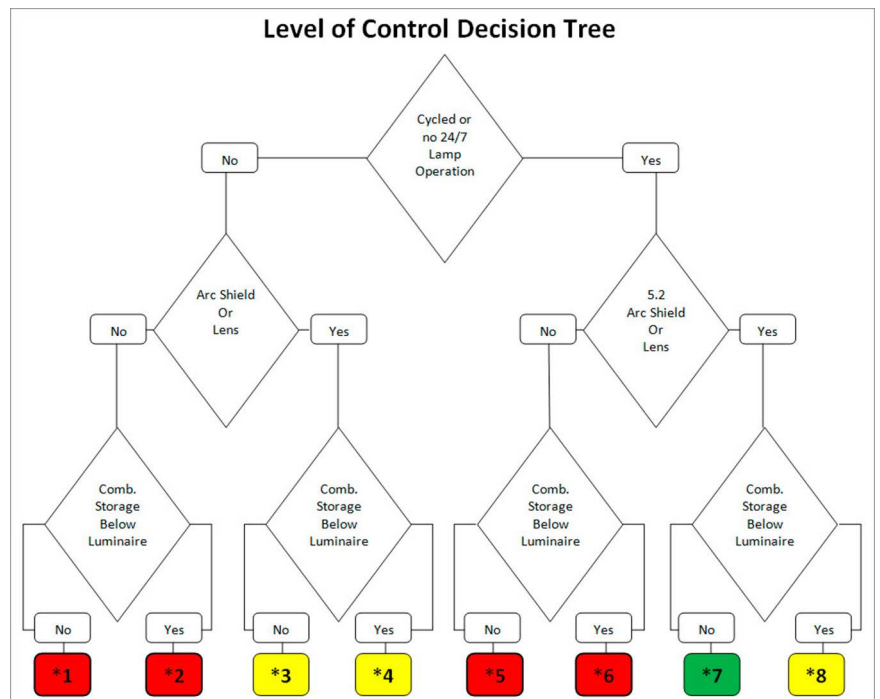


Fuel Load Restrictions

It is obvious that if there is no fuel, then there is no fire. In a non-combustible building, the fuel load would be the stock or furnishings. Warehouses are best arranged where the luminaires are located over the aisles but we frequently encounter situations where rack systems have been moved but management did not move the luminaires. Also, movable type rack systems are guaranteed to NOT always be placed in the proper place. Pile storage will almost always be susceptible to creating a fuel load directly below a luminaire. It may be a hard sell to get the client to arrange storage so that luminaires are not directly above combustible stock, but it is worth exploring. This type of control is the least effective from a practical standpoint.

Rating of Control

There are multiple arrangements found in the field ranging from totally poor to fully in compliance with loss prevention. Below is a decision tree to help you make a conclusion as to the degree of hazard and what you should recommend to the client.



* Notes for "Level of Control Decision Tree"

1. Not in accordance with the NEC. Recommend compliance to NEC & cycling

This arrangement is the use of Type E or Type-S lamps. The frequency of a rupture while the lamp is extremely hot and at high pressure is increased due to the lack of cycling them on and off. There is no protection provided when the arc tube ruptures such that hot shards of glass and quartz are going to fall. The favorable factor was that there are no combustible materials below the luminaires.

2. Not in accordance with the NEC. Recommend NEC, luminaire location, & cycling

This is the worst case scenario. There is use of Type-E or Type-S lamps with no means to prevent the hot shards of glass and quarts from falling on the combustible materials below. Due to the lack of cycling, the potential for a violent rupture is increased.

3. OK with NEC. Advise to cycle lamps and stress aisle maintenance

This condition is adequately controlled per the National Electric Code. However, there is room for improvement by cycling the lamps. While manufacturers do not call for the cycling of Type-O lamps, it is still advisory for the lamps to rupture at lower pressures and temperatures. Note that the arc tube may still rupture leaving us to depend on the quality of the shield/shroud or bottom lens of the luminaire.

4. OK with NEC. Recommend luminaire location & advise cycling

This condition is adequate per the National Electric Code, however there still remains the potential for a ruptured Type-O lamp or the luminaire lens to break and thus result in an ignition source for the combustible materials located directly below the lamp.

5. Not in accordance with the NEC. Recommend compliance to NEC

This installation is not in compliance with the National Electric Code because there are Type-E or Type-S lamps in a luminaire without a bottom lens or there are no Type-O lamps installed. If the lamps are Type-S and installed before 2005, this configuration was in compliance with the electrical standards provided the location was cycling the lamps. This condition is not as bad as some situations since the lamps are being cycled so that rupture is likely to occur when there is limited pressure and temperature. Also, if rupture occurs, there are no combustible materials to serve as fuel for a fire.

6. Not in accordance with the NEC. Recommend compliance to NEC and luminaire location

This installation is not in compliance with the current National Electric Code because there are Type-E or Type-S lamps in a luminaire without a bottom lens or there are no Type-O lamps installed. It is good that the client is cycling the lamps such that rupture is likely to occur when the lamp is at a reduced pressure and temperature. But the fuel load below a ruptured lamp is going to feed a fire if ignited.

7. OK with NEC. No recommendations

This is the best case scenario. The client is cycling the lamps so that rupture is more likely to occur when the pressure and temperature inside the lamp is low and if rupture occurs there is a means to prevent the shards of glass and quarts from falling onto combustible materials. But even if there shards get free from the lamp or luminaire, there is no fuel load for the shards to ignite.

8. OK with NEC. Advise luminaire location

This scenario is good but can be improved. The client is cycling the lamps so that rupture is more likely to occur when the pressure and temperature in the lamp is low. Also, if rupture occurs there is a means to prevent the shards of glass and quarts from falling onto combustible materials. However, if the arc tube shield/shroud of the lamp or the bottom lens of the luminaire fail, then there are combustible materials to serve as a fuel source directly below the lamp. It is advisable for lamps to not be located directly over combustible materials.

Summary

High Intensity Discharge lamps describes a family of lamps of which Metal Halide lamps are a member. But knowing that the lamp is a metal halide is not enough to determine the exposures and needed controls. There are three common types of metal halides which need to be discerned from each other, or at least we need to know whether we have Type-O or a Types E and S in order to properly apply loss prevention techniques. Type-E lamps have always needed to be enclosed and for those locations where Type-S lamps are installed in open luminaires, the NEC as of 2005 requires them to be within an enclosed luminaire. To lessen the potential for a violent arc tube rupture, the manufacturer's requirements to reduce the loss potential is through cycling. Also, it is recommended that no combustibles be situated directly below the luminaires in case of a non-passive failure.