1. Introduction

Guidance on fire safety in buildings can be found within the following documents:


Each document deals specifically with the use of thermoplastic materials, which are commonplace in lighting fixtures. This Factfile reviews the requirements set out and any implications they may have on the selection and use of luminaires within buildings.

2. Luminare mounting type

The requirements set out relate only to recessed luminaires where the lighting diffuser forms part of the ceiling. Surface mounted luminaires are not considered as the materials used within a surface mounted luminaire have no effect on the fire rating properties of the surface it is attached to, or the spread of fire across it. In any event however, all luminaires, whether recessed or surface mounted, should be designed and manufactured in accordance with safety requirements set out in BS EN 60598-1, which also deals with resistance to flame and ignition.

Where a luminaire is recessed into the ceiling, any diffuser fixed to the front of the light fitting is now considered part of the ceiling, see Figure 1. It is therefore most important that the luminaire diffuser does not impact on any fire protection offered by the ceiling material.

(a) Diffuser forming part of ceiling

Luminaire

(b) Diffuser in fitting below and not forming part of ceiling

Luminaire

Figure 1

3. Thermoplastic Material Types

If a luminaire has a thermoplastic lighting diffuser, then the type of plastic being used has to be established along with its ability to prevent the spread of flame. Different types of plastic and thicknesses react differently when subjected to a flame, their reaction therefore is critical.

There are different material classifications according to the material’s ability to prevent the spread of flame. The material classifications are broken down into three types: TP(a) rigid, TP (a) flexible and TP(b). For the purposes of luminaires, TP(a) rigid and TP(b) are normally only used as TP(a) flexible refers to material thicknesses of 1 mm or less, which is uncommon within typical luminaire design. The definitions of TP(a) rigid and TP(b) are given below:

TP(a) rigid

A solid polycarbonate sheet which is at least 3 mm thick. Multi-layered rigid sheets made from polycarbonate, which has a class 1 rating when tested in accordance with BS 476-7.

Any other rigid thermoplastic product, a sample of which, when tested in accordance with method 508A as defined in BS 2782-0, extinguishes before the first mark and flaming and afterglow does not exceed five seconds after the source of flame has been removed.

TP(b)

A solid polycarbonate sheet which is less than 3 mm thick, or multi-layered sheet products that do not qualify as TP(a) by test.

Other products which, when tested in accordance with method 508A in BS 2782-0, has a rate of burning that does not exceed 50 mm per minute. Thermoplastic materials that do not meet either TP(a) or TP(b) ratings should not be used as light fitting diffusers.

Most lighting diffusers are made from polycarbonate, acrylic or polystyrene. As described above, polycarbonate which is at least 3 mm thick will be classified as TP(a) rated, other materials and thicknesses have to be tested to establish their rating. Due to the nature of the material it is highly unlikely that acrylic or polystyrene diffusers will meet the TP(a) test requirements as set out in BS 476-7 or BS 2782-0. These diffuser types are therefore most likely to be TP(b) rated, or have no rating at all.
A common material used for lighting diffusers is PMMA. PMMA or Poly(methyl methacrylate) is an acrylic material, therefore it is important to understand the TP rating from the lighting manufacturer in order to comply with the fire safety regulations.

4. Limitations on Thermoplastic Materials

Depending on whether the type of diffuser material is TP(a) or TP(b) rated, there are different limitations on the amount of material that can be used within a room or area.

If the material is TP(a) rated, there are no limits imposed on the amount of material that can be used. The only area in which TP(a) cannot be used is within protected zones or stairways where no type of thermoplastic material should be used. Luminaires that use TP(a) rated diffusers are therefore most flexible with minimal considerations needed as to their use.

If light fittings with TP(b) diffusers are used, then depending on the type of area there are limits to the amount of material that can be used, and also restrictions on the spacing between light fittings. The restrictions for TP(a) and TP(b) are as follows.

**TP(a) requirements**

When using TP(a) classified material, there are no limits or restrictions on use, except within protected zones or stairways where no thermoplastic material of any type should be used.

**TP(b) requirements for circulation spaces**

- The total area of diffuser panels must not exceed 15% of the total floor space.
- The maximum area of one diffuser must not exceed 5 m².
- Where a number of smaller panels are used (most types of luminaire) then a 5 m × 5 m group of panels must have a 3 m gap between each group, as shown in Figure 2 above.

**TP(b) requirements for rooms**

- The total area of diffuser panels must not exceed 50% of the total floor space.
- The maximum area of one diffuser must not exceed 5 m².
- Where a number of smaller panels is used (most types of luminaire) then a 5 m × 5 m group of panels must have a 3 m gap between each group, as shown in Figure 2. In England, Wales and Scotland, Figure 3 defines an alternative spacing method whereby the distance between luminaires must be equal to or greater than the longest dimension of the thermoplastic diffuser. Guidance given for Wales and Northern Ireland currently does not have this alternative and therefore the spacing shown in Figure 2 needs to be adhered to.

![Figure 2](image-url)
5. Conclusion

When selecting a recessed luminaire with a thermoplastic diffuser, it is most important to ascertain from the luminaire manufacturer whether it is TP(a) or TP(b) rated. Of course, it may not have a rating at all or, in some instances, the luminaire manufacturer may not know. In this situation extreme caution is needed and a sample of the luminaire’s diffuser should be tested and its properties known before installation within the building.

If using TP(a) rated material, then it can be assured that this material is the best at limiting the spread of flame and therefore offers the optimum solution. There are no limitations on its use within circulation areas or rooms.

6. Bibliography


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