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KNOWLEDGE SHARE: 007

PFKG
Passive Fire Knowledge Group

TITLE: INSULATION PERFORMANCE OF PENETRATION SEALS FOR ELECTRICAL SERVICES

BUILDING TYPE: ALL BUILDINGS

Figure 1: Insulation fitted to busbar electrical services.

OVERVIEW OF THE PROBLEM

Some electrical services such as cables and busbar trunking may not be able to provide both an integrity and insulation fire resistance as required by the project fire strategy.

Typically, the integrity performance can be provided, but the insulation performance may not be achievable without causing overheating of the electrical service in normal use.

WHY IS THIS A PROBLEM?

This is a problem because most project fire strategies require penetration seals for MEP services to have the same integrity and insulation performance as the compartment wall or floor through which they are passing. If the penetration seal cannot provide an insulation rating, this could be deemed to conflict with the fire strategy requirements.

In addition, BS 7671 (IET Wiring Regulations) only provides derating factors for cables with conductors of up to 10mm2 in thermal insulation having a thermal conductivity greater than 0.04W/mK (fire batt material is typically lower). Furthermore, BS EN/IEC 61439-6, the harmonised and international standard for busbar trunking, does not consider derating factors for busbar trunking in thermal insulation at all, and has its own test requirements for fire resistance in building penetrations that conflict with Annex D of BS EN 1366-3.

DISCUSSION

Before considering any recommendations, it is worthwhile to remember why insulation performance is required and why in some cases a lower insulation performance may be acceptable.

Insulation performance exists to stop fire spreading through separating elements by excessive radiation onto combustible materials nearby or by combustible materials in contact with the unexposed face of the separating element. Consequently, if combustible material can be removed, or it can be guaranteed that none will be placed there, then a justification can be made for reduction or removal of the insulation requirement.

This is the case with fire doors which are not required to have any insulation performance at all because combustible materials are not contacting the unexposed face or stored near to the doors. The same argument can be made for penetrating services in some locations.

If insulation performance is a requirement, then the MEP consultant will need to exercise their own engineering judgement, without any industry available data being available, and apply derating factors when calculating the sizes of cables and busbar trunking. This can lead to significantly oversized conductors, which may prove uneconomical, and in some cases impractical to install.

RECOMMENDATIONS

During RIBA stage 2, the routing of Busbars and Cables should be considered in relation to them passing through areas that may be susceptible to ignition of the contents of the space or linings of protected escape routes e.g. by radiation or conduction. As this could lead to the Busbars and/or cables needing supplementary insulation which in turn can affect the cable/busbar current carrying capability leading to local over heating of the affected service.

The Fire Engineer should determine the E&I rating of any services passing through compartment walls as part of the Fire Strategy. Where insulation performance is a requirement, the MEP consultant shall determine the consequences that any required supplementary insulation may have to the selected electrical services.