SCOTTISH EXECUTIVE

BUILDING REGULATION NOTE Note No 3/99

Building Standards (Scotland) Regulations 1990 (as amended):

Fire Behaviour of Insulating Core Panels used for Internal Structures.

1. This note is intended to provide guidance and advice on the fire behaviour of insulating core panels used for internal structures. It refers to guidance produced by the International Association of Cold Storage Contractors which has now been published.

2. Insulating core panel systems are used for external cladding as well as for internal structures. However, whilst both types of panel system have unique fire behaviour characteristics, it is those used for internal structures that can present particular problems with regard to fire spread. The most common use of insulating core panels is to provide an enclosure in which a chilled or sub zero environment can be generated for the production, preservation, storage and distribution of perishable foodstuffs. However this type of construction is also used in many other applications, particularly where the maintenance of a hygienic environment is essential. These panels typically consist of an inner core sandwiched between, and bonded to, a membrane such as facing sheets of galvanised steel, often bonded with a PVC facing for hygiene purposes. The panels are then formed into a structure by jointing systems, usually designed to provide an insulating and hygienic performance. The panel structure can be free standing, but is usually attached to the building structure by lightweight fixings and hangers. The most common forms of insulation in present use are:

- expanded polystyrene,
- extruded polystyrene,
- polyurethane,
- mineral fibre.

However panels with the following core materials are also in use:

- polyisocyanurate,
- modified phenolic.

3. The degradation of polymeric materials can be expected when exposed to radiated/conducted heat from a fire, with the resulting production of large quantities of smoke. It is recognised that the potential for problems in fires involving mineral fibre cores is less than those for polymeric core materials. In

addition, irrespective of the type of core material, the panel, when exposed to the high temperatures of a developed fire will tend to delaminate between the facing and core material, due to a combination of expansion of the membrane and softening of the bond line. Therefore once it is involved, either directly or indirectly in a fire, the panel will have lost most of its structural integrity. The stability of the system will then depend on the residual structural strength of the non-exposed facing, the joint between panels and the fixing system. Most jointing or fixing systems for these systems have an extremely limited structural integrity performance in fire conditions. If the fire starts to heat up the support fixings or structure to which they are attached, then there is a real chance of total collapse of the panel system. The insulating nature of these panels, together with their sealed joints, means that fire can spread behind the panels, hidden from the occupants of occupied rooms/spaces. This can prove to be a particular problem to fire fighters as, due to the insulating properties of the cores, it may not be possible to track the spread of fire, even using infra red detection equipment. This difficulty, together with that of controlling the fire spread within and behind the panels, is likely to have a detrimental effect on the performance of the fixing systems, potentially leading to their complete and unexpected collapse, together with any associated equipment.

4. When compared with other types of construction techniques, these panel systems therefore provide a unique combination of problems for fire fighters, including:

- hidden fire spread within the panels,
- production of large quantities of black toxic smoke and
- rapid fire spread leading to flashover.

These three characteristics are common to both polyurethane and polystyrene cored panels, although the rate of fire spread in polyurethane cores is significantly less than that of polystyrene cores, especially when any external heat source is removed. In addition, irrespective of the type of panel core, all systems are susceptible to:

- delamination of the facing steel,
- collapse of the system,
- hidden fire spread behind the system.

5. To identify the appropriate solution, a risk assessment approach should be adopted. This would involve identifying the potential fire risk within the enclosures formed by the panel systems and then adopting one or more of the following at the design stage:

- removing the risk,
- separating the risk from the panels by an appropriate distance,
- providing a fire suppression system for the risk,
- providing a fire suppression system for the enclosure,
- providing fire-resisting panels,
- specifying appropriate materials/fixing and jointing systems.

In summary the performance of the building structure including the insulating envelope, the superstructure, the substructure etc, must be considered in relation to their performance in the event of a fire.

6. Where at all possible the specification of panels with core materials appropriate to the application will help ensure an acceptable level of performance for panel systems, when involved in fire conditions. The following recommendations are made for the provision of core materials appropriate to the application concerned.

- Mineral fibre cores:
- cooking areas,
- hot areas,
- bakeries,
- fire breaks in combustible panels,
- fire stop panels,
- general fire protection,
- All cores:
- chill stores,
- cold stores,
- blast freezers,
- food factories,
- clean rooms.

Note: Core materials can be used in other circumstances where a risk assessment has been made and other appropriate fire precautions have been put in place.

7. The following are methods by which the stability of panel systems may be improved in the event of a fire, although they may not all be appropriate in every case.

a. The details of construction of the insulating envelope should, particularly in relation to combustible insulant cores, prevent the core materials from becoming exposed to the fire and contributing to the fire load.

b. Insulating envelopes, support systems, and supporting structure should be designed to allow the envelope to remain structurally stable by alternative means such as catenary action following failure of the bond line between insulant core and facing materials. This will typically require positive attachment of the lower faces of the insulant panels to supports.

c. The building superstructure, together with any elements providing support to the insulating envelope, should be protected to prevent early collapse of the structure or the envelope.

Note: Irrespective of the type of panel provided, it will remain necessary to ensure that the supplementary support method supporting the panels remains stable for an appropriate time period under fire conditions. It is not practical to fire protect light gauge steel members such as purlins and sheeting rails which provide stability to building superstructures and these may be compromised at an early stage of a fire. Supplementary fire protected heavier gauge steelwork members could be provided at wider intervals than purlins to provide restraint in the event of a fire.

d. In designated high risk areas consideration should be given to incorporating non-combustible insulant cored panels into wall and ceiling construction at intervals, or incorporating strips of non-combustible

rial into specified wall and ceiling panels, in order to provide a barrier to fire propagation throug
nsulant.

rrect detailing of the insulating envelope should ensure that combustible insulant is fully
psulated by non-combustible facing and flashing materials which remain in place during a fire.

ese panels should incorporate pre-finished and sealed areas for penetration of services.

nels or panel systems should not be used to support machinery or other permanent loads. Any ca
ed by the arrangement of panels their supporting structure or other building elements should be
ided with suitable cavity barriers.

amples of possible solutions and general guidance on insulating core panels construction can be
d in: *Design, construction, specification and fire management of insulated envelopes for tempera
rolled environments* published by The International Association of Cold Storage Contractors. Of
cular relevance is Chapter 9 of the document which gives guidance on the design, construction a
agement of insulated structures. Whilst the document is primarily intended for use in relation to c
ge environments, the guidance, particularly in Chapter 9, is considered to be appropriate for mos
ating core panel applications.

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