



INTERNATIONAL ASSOCIATION FOR COLD STORAGE CONSTRUCTION (IACSC)

Protocol of designing/constructing new insulated envelope buildings in respect of fire safety considerations

When contemplating the design and construction of a new insulated envelope building utilising sandwich panels to provide any specified environmental conditions required for the manufacturing process; i.e. temperature control or cleanliness, there are a number of key issues to be resolved. The major issues relating to fire are:

- Approval by the Building Control Authorities (including compliance with fire safety regulations)
- Compliance with the self administrated Workplace (Fire Safety) Regulations 1997 (amended 1999) or Fire Precautions (Workplace) Regulations (Northern Ireland) 2001
- Insurability
- Acceptance by the Fire Service in respect of fire fighting policy
- Impact of the fire performance of the building on business continuity

As a consequence the design team needs to consider the influence of each of the above points in turn on the building design and construction. The objective of this Guidance Note is to define the preferred protocol for the design and construction process in order to ensure that the building satisfies all relevant requirements/recommendations as it progresses and that there are no unexpected delays in the process.

Building Regulations

In the United Kingdom (UK) any new building, or major refurbishment, that may constitute a material change of use (as defined) has to obtain approval in respect of the National Building Regulations of England & Wales, Scotland, or N. Ireland, as appropriate.

This approval is granted by the Local Authority Building Control Department, or in England & Wales only by an Approved Inspector, once the facility has been shown to comply with the Regulations. Each set of National Regulations will cover all aspects of safety (and more recently energy/environmental conservation) with specific discreet regulations covering each aspect;

- structural stability
- energy conservation
- fire safety, etc

In each of the regions of the UK the Fire Safety Regulations are given in separate parts;

- England & Wales - Regulation B
- Scotland - Regulation 12 (Structural Fire Precautions)
- Regulation 13 (Means of Escape etc)
- N. Ireland - Part E

None of the above Regulations are prescriptive in nature, i.e. being restrictive about the materials of construction, the size of the building/compartment, the

distance of travel, or the fire performance requirements of the materials of construction. All of these regulations are expressed in functional terms, which means they may be expressed in performance terms, such as ‘...the building shall be fire safe with respect to means of warning and escape, fire spread on linings, or through the structure, external fire spread, access and facilities for the Fire Service’.

Compliance with all of these can be justified by any quantifiable or judgemental process that is acceptable to the Approving Authority. Alternatively, they can be satisfied by complying with guidance published by the Governing Authority. Each of the Authorities publishes guidance documents as follows:

- England & Wales - Approved Doc ‘B’ *1)
- Scotland - Building Standard D *2)
(Structural)
- Building Standard E *3)
(Means of Escape)
- N. Ireland - Technical Booklet E *4)

In these Guidance documents all aspects of the construction, as they relate to fire safety, are covered by a ‘prescription’ expressed in terms of dimensional limits or material fire properties, normally related to a performance defined by a particular test standard. The use of sandwich panels is, however, the critical aspect that is unique to the construction of cold stores, food factories and clean rooms and the regional guidance varies when giving recommendations covering their specification and use.

In England & Wales, if the design team are following the prescriptive approach, then reference to Appendix F is vital. This Appendix summarises the problems associated with the use of panels, and discusses constructional issues related to the choice of panel core. It recommends that the selection of the panel type is

based upon a Risk Assessment, but in any event recommends the use of panels, which will remain relatively stable in the event of a fire. In the summary it states that ‘...examples of possible solutions and general guidance on insulating core panel constructions can be found in “Design, Construction, Specification and Fire Management of Insulated Envelopes for Temperature Controlled Environments”, a Guide published by this Association’ *5).

In Scotland the Building Standards are slightly more specific, stating in Technical Standard D, in Clause 7.3 that ‘...A sandwich panel used for internal walls or linings in a building of purpose groups 1 or 2 (institutional or residential) must be fully filled with a core that consists of a non-combustible materials’.

For buildings without a sleeping risk, Clause D7.4 states that ‘...the panel must be suitably designed and installed’. The deemed to satisfy section of the standard states that this requirement is met when the installation is in accord with Chapter 8 of ‘Design, Construction, Specification and Fire Management of Insulated Envelopes for Temperature Controlled Environments’, published by the Association, as above.

N. Ireland has not yet given specific guidance on the selection and installation of sandwich panels, but in the light of the functional nature of the Regulations, provided the requirements of the Regulations are met a designer can adopt another solution such as one accepted in England & Wales, or Scotland .

The selection of panels and their method of construction/installation therefore needs to be established and approved early in the Building Regulatory approval process.

Workplace (Fire Safety) Regulations (1997) and Fire Precautions (Workplace) Regulations (Northern Ireland) 2001

Upon occupation of the building and commencement of its proposed use, the facility becomes the subject of a Risk Assessment process to determine the adequacy of its fire safety provisions in respect of the employees which is now required under the above legislation. This process is the responsibility of the property owners/managers, and is either carried out in-house, or sub-contracted out to appropriate experts. All areas of a building need to be assessed, even if the area is only visited by single employees on a non-continuous basis.

Normally, compliance with primary legislation is sufficient to ensure compliance with the Workplace Regulations, but in the context of single storey cold stores, food factories and clean rooms the primary legislation is not particularly demanding and could leave employees vulnerable to fire risks. One particular area where this may manifest itself is in roof voids where employees may be required to work from time to time, and yet, the ceiling of the environmentally controlled area may not be provided with any fire resistance. Generally it would only be provided with fire resistant if the Authority deemed it to be a first floor above ground as part of the Regulatory Approval. Only in this case will appropriate provisions have been made that would ensure employee safety. Without fire resistance or a restricted travel distance and alternative means of escape, including the provision of a protected stair, an employee may be considered to be at risk.

As part of the design protocol it is recommended that even at this embryonic stage a 'virtual' Risk Assessment against the objectives of this legislation should be

undertaken of the whole of the facility to ensure compliance at handover of the building. Enhanced standards of construction may be required above those that may satisfy the Local Authority.

Insurability of the facility

Because of the magnitude of the losses experienced by the insurance industry in certain categories of buildings or market sectors, insulated buildings have become difficult to insure. It is imperative, therefore, that the design team, as part of the design process, make contact with the intended insurer at an early stage in the design process to ensure that the risk is acceptable to the insurers. It may require the owner/manager to shop around for an insurer, if the preferred insurer is unable to accept the risk, or wishes to impose unrealistic requirements on the design that may compromise its performance with respect to non-fire related criteria.

The basic requirements of the insurance industry are given in the LPC Design Guide for the Fire Protection of Buildings 2000 ^{*6)} and this should be referred to as part of the design guidance. This is not, however, specific in respect of the selection of panels for cold stores and/or clean rooms, but does give an exemplar of a 'model' food factory identifying the recommended panel performance levels.

The LPC the technical advisors to the ABI (Association of British Insurers) rely heavily on panel products that have satisfied product testing to the appropriate Loss Prevention Standards (LPS's) the major ones being

- LPS 1208-2
- LPS 1181 [Part 1: External cladding, Part 2: Internal walls]

Initially those products that satisfied LPS 1208 and LPS 1181 were Grade A, whilst panels only satisfying LPS 1181 were

rated Grade B. These designations are used in the Design Guide. This method of grading products for internal use has now been enhanced and grades products Int-1, Int-2 and Int-3, where Int-1 and -2 incorporate various levels of fire resistance with the basic lining test LPS 1181: Part 2, whilst Int-3 uses the LPS 1181: Part 2 on its own.

It is often an added recommendation of the insurers that the products are not only tested, but are BRE Certification (formerly LPCB) approved, but this would be difficult to impose.

The specification of LPS tested and/or approved product is only one stage. After test, or as part of the approval process, there will be various limiting parameters restricting the height/width/length and levels of restraint of the panels. It is important that the product selected is not proposed to be used outside of these defined parameters.

Similarly, the basic panel may have required additional enhancements to achieve the certified performance level and the tendered and built construction must reflect this.

In recent times there has been a reluctance to insure a property if combustible cored panels are used at all, but this is unjustifiable. Conversely, recent output from the insurance sector has indicated that Fire Risk Management makes a greater contribution to reducing fire losses than just the make up of the panel. It is a fact that behind most fires involving polymeric cored sandwich panels lays a hot working or poor maintenance incident, which is the real cause of the loss, not the materials of construction.

To summarise, therefore, it is important to hold a dialogue with the insurers at an early stage in the design process to

establish their requirements and, as part of that process, have available a 'virtual' Risk Assessment and Risk Control Strategy for the plant that can be factored into the insurance proposal right from day one.

Acceptance by the Fire and Rescue Service

Fire fighting can both be aggressive, or defensive, albeit should there be any risk of person being trapped in the building requiring rescue, then fire fighting has to be aggressive to protect the rescue team. Aggressive fire fighting can significantly reduce damage to a building whilst defensive fire fighting will only prevent spread to any adjacent buildings. Sandwich panel buildings have, in the past, had poor fire stability regardless of the panel core selection, mainly due to delamination of the panels, which deters aggressive fire fighting, especially in unfenestrated buildings where fire fighters have to be committed to the inside of the building.

In order to enhance the protection to fire fighters, both during rescue and fire fighting the IACSC has strongly promoted the construction of 'fire stable structures', as part of the philosophy contained in its Design Guide ^{*5)}. Indeed the Association has developed an accreditation mechanism for fire stable structures, either built in a fire stable manner or constructed from fire stable panels. The scheme principles and details of the supporting test are to be found in the scheme document ^{*7)}.

Fire stability is only achieved if the method of construction incorporates measures to make the construction stable. LPS 1181 approved products do not ensure stability, and in order to meet the recommendations in Building Regulation, additional fixings may be needed on top of those required to achieve LPC accreditation.

Fire fighters have endorsed the IACSC/IFC labelling initiative as this affords full details of the materials that they will encounter on the fire ground making their dynamic fire incident Risk Assessment easier. Full details of the Labelling Scheme are to be found in the IACSC Guidance Note No. 1 ^{*8)}.

Liaison with the Fire Service closest to the facility being designed is strongly recommended and if there are any unusual features within your facility, co-operation with the Fire Service on matters, such as training, could be offered at an early stage.

For your building to gain favour with the Fire Service, labelling should form part of the design concept and the construction of a fire stable building should reduce potential property losses and encourage a more aggressive fire fighting policy by the Fire Service right from their arrival on site.

Implications on business continuity

A building or factory complex which suffers disproportionate damage in the event of a fire will have a major impact on production. With the simplest and cheapest of sandwich panel structures the impact of even a small fire will be probably be disastrous. Statistics show that companies that suffer such a fire in their primary manufacturing facility rarely survive the event in the long term. Loss of confidence in supply, especially by major clients is only one such reason. Even in companies with multiple sites it is common for the fire damaged site to remain closed for good, with its attendant impact on employment.

It is invariably in the interest of the business owner(s) to prevent disproportionate damage. The implementation of a robust Fire Risk Management regime will make the largest contribution to this, especially if it is

subject to ongoing audit. However, the incorporation of a higher build quality, that is more fire stable and probably better compartmented than regulations require, and where the products of combustion are controlled will hopefully limit the damage that any unforeseen event may cause. Any insulated envelope building that is built in accordance with the Association's Guide should make a major contribution in reducing the business's exposure to risk.

Model Building Specifications

Once the protocol has considered all of the above, then a tender specification is drawn up. In order to make it easy for the Design Team to produce a specification that meets the above objectives the IACSC has produced a model specification ^{*9)} that is available from the Association at the address given at the back of this Guidance Note. An NBS application is in progress.

Conclusion

It can be seen from this Guidance Note that there is more to the protocol of building a new insulated structure than obtaining Planning and Building Regulation Approval. The use of panels with certain performances in respect of LPS Standards is the minimum that may be required for insurance needs. Fire stability and labelling are favoured by fire fighters who are those most at risk in the event of a fire. Business cannot accept disproportionate damage, or anything other than a very minor fire, and the building owner must consider the fire safety of his employees during the design process, regardless of whether Regulatory Approval has been received or not.

Make the IACSC, or one of its member companies, a partner in the design process to steer your project through the complexity of the total design protocol.

References

- *1) England & Wales - Approved Doc 'B'
- *2) Scotland - Building Standard D (Structural)
- *3) - Building Standard E (Means of Escape)
- *4) N. Ireland - Technical Booklet E

- *5) Design, Construction, Specification and Fire Management of Insulated Envelopes for Temperature Controlled Environments", published by this Association.
- *6) LPC Design Guide for the Fire Protection of Buildings 2000.
- *7) Fire Stable Certification Scheme for Insulated Panel Systems and Structures.
- *8) IACSC Guidance Note No. 1, Protocol for labelling.
- *9) IACSC Model Specification for Designing Installation and Commissioning Insulated Envelopes.

Contact Point for further information

For information relating to:

- Design Protocol for insulated envelope buildings, or
- Details of the Design Guide for the 'Design Construction, Specification and Fire Management of Insulated Envelopes for Temperature Controlled Environments', or
- Document on the Fire Stable Certification Scheme, or
- Guidance Note No. 1,

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