



ASFP Technical Guidance Document - TGD 14

Code of practice for the installation and inspection of board systems for the fire protection of structural steel work

FIRE AND YOUR LEGAL LIABILITY

2008 produced the highest UK peace time fire losses of all time, rising over the previous year by 16% to a record £1.3bn. That's why we must all play our part.

Why is this of relevance to me?

If you are involved in provision of a fire protection package, at any level, then you share liability for its usefulness and its operation when it's needed in fire, and that liability will still be there in the event of a court case.

I place the order; it is not my responsibility to install the works!

If it is your responsibility to specify the materials and/or appoint the installation contractor, it is also your responsibility to ensure that they can prove competency for the fire protection materials used, or the works to be carried out. It's no longer simply a duty of care or voluntary – it's a legal obligation.

If you knowingly ignore advice that leads to a failure in the fire performance of any element of installed fire protection within a building, then you are likely to be found to be just as culpable as the deficient installer.

You share liability for the provision of information required under Building Regulation 16B that tells the user of the building about the fire prevention measures provided in the building. Otherwise, the user cannot make an effective risk assessment under the Regulatory Reform (Fire Safety) Order 2005.

What is expected of me?

In the event of fire, and deaths, a court will want to know how every fire protection system was selected; the basis for selection of the installer, whether adequate time was provided for its installation, and whether there was adequate liaison between the different parties to ensure it was installed correctly. No ifs, no buts – it's all contained in the Construction, Design and Management Regulations 2007.

The CDM 2007 regulations, enforced by Health and Safety Executive concentrate on managing the risk, and the health and safety of all those who build, those that use the building, those who maintain it and those that demolish it – cradle to grave.

Be aware – the time to consider the above is before the event, not after it!

The Association for Specialist Fire Protection (ASFP)

The Association was formed in 1976, and currently represents the majority of UK contractors and manufacturers of specialist fire protection products, with associate members representing regulatory, certification, testing and consulting bodies.

The ASFP seeks to increase awareness and understanding of the nature of fire, and the various forms, functions and benefits provided by passive fire protection.

It is willing to make available its specialist knowledge on all aspects of fire protection and can assist specifiers and main contractors in identifying products suitable for specific requirements, both in UK and overseas.

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1 INTRODUCTION

This Code of Practice has been issued to enable specifiers and installers of fire protection systems incorporating boards and slabs to ensure that these systems are specified and installed in a manner that assures their effectiveness when used for the fire protection of structural steel. It will provide confidence that they will perform as required in the event of fire and also continue to do so for a reasonable period during the lifetime of the building.

The importance of fire safety is emphasised under the Regulatory Reform (Fire Safety) Order 2005⁽²⁾ in which the 'responsible person' (who may be the owner, designer or architect, specifier or contractor) is responsible for ensuring that the structure is fully compliant with all known, current legislation appertaining to the fire protection of the building

Readers are also reminded of the statutory duties arising from Building Regulation 16B and Appendix G of Approved Document B. The Construction Design & Management 2007 Regulations⁽³⁾ urges a prudent approach to the selections of fire protection product & on site installers. Regulation 16B requires that those making risk assessments [as required by Regulatory Reform Fire Safety Order 2005] are provided with all relevant detail of the fire protection as selected and installed. This can only be done if effective records are made in the selection, purchasing and installation stages of providing fire protection measures. There can be more than one responsible person etc.

There are several mechanisms, namely passive or active fire protection, by which steel structures can be protected from the heat generated in fire, in order to prevent or delay collapse of the building. Typical passive systems incorporate fire resistant boards, mineral fibre slabs or mats. The on-site installation of these products is discussed in this publication. Complementary publications are available as ASFP TGD 11⁽⁴⁰⁰⁾ and TGD 15⁽⁴³⁾ for the on-site installation of intumescent coatings and spray applied coating products.

The ASFP 'Yellow Book'⁽³²⁾ publication 'Fire protection for structural steel in buildings' provides detailed technical information on the fire performance and requirements of steel in fire as well as the thickness of a wide range of fire tested fire protection products to provide the required levels of fire resistance. The latest version is available as a free download at www.asfp.org.uk/publications.

All fire protection systems must be installed in a manner which will provide full compliance with the manufacturer's fire tested system.

Passive fire protection systems comprising fire protection boards and slabs are installed during the construction phase on or around the structural steel elements to be protected and provide localised protection by means of their integrity. Although they do not fulfil any structural function, fire protection systems utilising boards and slabs can be considered to be part of the fabric of the building. They may also enhance the thermal and acoustic performance of buildings.

1.1 SCOPE

This code of practice describes the specification and installation of rigid or semi-rigid boards and slabs for the fire protection of structural steelwork in the form of beams, columns, with solid, hollow, cellular or circular sections as defined in BS 5950 "The structural use of steelwork in buildings"⁽²¹⁾ and other steel structural members e.g. angles, tees etc The code applies to products manufactured by members of ASFP as well as products manufactured or sold within the EC.

In its section on 'Use of Guidance – Materials and Workmanship', Approved Document B⁽¹⁰⁾ advocates the adoption of independent 3rd party certification schemes for manufacture and installation of fire protection, as follows: *'Since the fire performance of a product, component or structure is dependent on satisfactory site installation and maintenance, independent schemes of certification and registration of*

installers and maintenance firms of such will provide confidence in the appropriate standard of workmanship being provided'.

This guidance document considers the installation of fire protection board systems, but its prime objective is to establish procedures for the effective application and control of these coatings at site.

In conjunction with the appropriate product manufacturer's instructions these procedures will serve as a guide to determine that the required level of fire protection is provided for the structure, and collectively will offer evidence to satisfy the 'responsible person' that the installation has been correctly carried out.

1.2 TYPES OF FIRE PROTECTION BOARDS

There is a very wide variety of board products, using various different fixing systems depending on the physical characteristics of the boards themselves, to enable cost effective, all weather installation with minimum disruption to other trades on site. The primary generic types are as follows:-

Plasterboard

Paper faced core of gypsum, which may contain glass fibre and/ or other additives in the core. Paper may be faced with PVC film.

Glass reinforced gypsum

Gypsum either faced with glass tissue or reinforced with glass fibre

Fibre reinforced gypsum

Gypsum reinforced with cellulose fibre or synthetic fibre or mixture of these

Fibre reinforced calcium silicate

Autoclaved calcium silicate reinforced with cellulose fibre or synthetic fibre or mixture of these and other additives.

Fibre reinforced cement

Air cured Ordinary Portland Cement or other inorganic cement reinforced with cellulose fibre or synthetic fibre or mixture of these and other additives.

Organic cement bonded lightweight filler

Vermiculite, perlite or other lightweight filler bonded with organic resin

Inorganic cement bonded lightweight filler

Vermiculite, perlite or other lightweight filler bonded with inorganic cement

Resin bonded inorganic fibre

Rock, mineral, stone, ceramic or slag fibres bound with organic resin with or without plastic film or aluminium foil facing.

Metal casings

A composite system, suitable for jointed assembly, consisting of an inner layer of a fire protection board bonded to an outer layer of steel sheet.

2 DEFINITIONS

Board

Rigid product of rectangular shape and cross section in which the thickness is uniform and substantially smaller than the other dimensions. Also see definition for 'slab' below.

Building regulations

Building regulations apply to most new buildings and many of the alterations to existing buildings in the United Kingdom. They exist to ensure the health and safety of people in and around buildings and the energy efficiency of buildings.

CDM regulations

Construction (Design and Management) Regulations 2007⁽³⁾: Managing health and safety in construction

Castellated beam

See 'cellular 'beam

CE mark

European standard mark that shows that a product complies with a European standard or a European Technical Approval

Cellular beam

A steel beam with one or more web openings of one or more types of shapes such as circular, rectangular, hexagonal, connected circular openings, etc

Class 0

A product fire performance classification defined in Approved Document B

Contract administrator

The person responsible for co-ordinating the various requirements of the contract and ensuring that all documentation is completed and in order. The contract administrator may be a nominee of the client or specifier, but usually would be appointed by the contractor.

COSHH regulations²⁷

Regulations for Control of Substances Hazardous to Health

Designer

The architect or structural engineer responsible for the design of the structure. The designer will generally define the fire protection standards for the building, but not necessarily the detailed fire protection specification which may be left to the installer.

Euroclass

One of a number of product classifications for fire contained in EN 13501 Parts 1 -5^(25, 26). Part 1 is concerned with classifications for reaction to fire, whereas Part 2 is primarily concerned with classifications for resistance to fire, excluding ventilation systems.

European Technical Approval Guide (ETAG)

An ETAG is a 'Guideline for European technical approval' such as ETAG 018⁽²⁹⁾ 'Fire protective products' parts 1 to 4. See www.eota.be for full information on published ETAGS. They were originally introduced for innovative products or when there is no suitable European product standard.

Fire assessment

An opinion by an expert of the likely fire performance (fire resistance period) of an element of a building or element of structure if it were to be tested using a standard fire test.

Fire engineer (Fire safety engineer)

A qualified, competent and experienced person responsible for fire safety engineering design.

Fire safety engineering

The application of scientific and engineering principles, rules (e.g. Structural Codes etc), and expert judgement, based on an understanding of the phenomena and effects of fire and of the reaction and behaviour of people to fire, to protect people, property and the environment from the destructive effects of fire. See BS 7974 Code of practice on the application of fire safety engineering principles to the design of buildings⁴⁹.

Fire resistance period

The length of time, expressed in minutes, for which the steel member or other components is required to withstand exposure to standardised fire testing methods, such as BS 476 Parts 20, 21 and 22, without the load capacity falling below the fire limit state factored load or loss of integrity and/or insulation.

Installer

The competent person, fire protection contractor or company responsible for the execution of the fire protection work.

Intumescent coatings (reactive coating)

A coating which reacts to heat by swelling in a controlled manner to many times its original thickness to produce a carbonaceous char which acts as an insulating layer to protect the steel substrate

Lattice beam

An open beam built from members joined and braced by an intersecting diagonal members.

Limiting design (steel) temperature

The maximum temperature of the critical element of a steel member prior to failure under fire conditions as defined in BS 449-2:1996 Structural steel in Buildings⁽¹⁵⁾ and as discussed in BS 5950-8; 1990⁽²¹⁾

It is the temperature determined by calculation at which failure of the structural steel element is expected against a given load level at a particular location in the building

Method statement

A Method Statement is a document detailing how a particular work item will be carried out. It should include details of the possible dangers/risks associated with the work, the methods of control to be established, and how the work will be managed.

Non-combustible

The highest level of reaction to fire performance derived from BS 476 fire tests. Non-combustible materials are defined in Approved Document B, Appendix A Table A6⁽¹⁰⁾ or in terms of performance when tested to BS 476 Part 4 1970⁽¹⁶⁾ or Part 11: 1982⁽¹⁹⁾. The Approved Document B now includes 'equivalent' classifications as derived from BS EN 13501-1⁽²⁵⁾ for the European classification system.

Passive fire protection products

Products which do not change their physical form on heating and which provide fire protection by means of their physical and/or thermal properties.

Quality and inspection plan

The document setting out the specific quality practices, standards and sequence of activities relevant to the contract. This document may be used as an aid to efficient management of the contract, as a 'sign-off' document verifying formal inspection and acceptance of the work, or both.

Reaction to fire

The response of a test specimen when it is exposed to a fire under specified conditions

Responsible person

Responsible person is defined in several ways:-

[a] in relation to a workplace, the employer, if the workplace is to any extent under his control.

[b] In relation to any premises not falling within [a]

[i] The person who has control of the premises (as occupier or otherwise) in connection with the carrying on by him of a trade, business or other undertaking (for profit or not), or

[ii] The owner, where the person in control of the premises does not have control in connection with the carrying on by that person of a trade, business or other undertaking

Section factor (A/V or Hp/A)

The rate of increase in temperature of a steel cross-section is determined by the ratio of the heated surface (A) to the volume (V) (also known as Hp/A) has units of m^{-1}). Sections with low section factors heat up more slowly.

For boxed protection, the section factor is the ratio of the inner surface area of the smallest possible rectangle or square encasement that can be measured round the steel member per unit length to the cross sectional volume (area) of the steel member per unit length.

Slab /batt

Semi-rigid product of rectangular shape and cross section in which the thickness is uniform and substantially smaller than the other dimensions

Specification

In this Code of Practice, it is the document in which the requirements of the board or slab system are defined for fire protection of the structural steelwork. The specification may allow the use of any approved product or system and it may nominate a preferred supplier for the fire protection system, depending on the client's wishes.

Specifier

The person or organisation that issues the specification.

The installer may also be responsible for selection of the fire protection product/system.

Steel UB or UKB

Universal beam of steel as manufactured to BS 4 Part 1 2005⁽¹⁴⁾

Steel UC or UKC

Universal column of steel as manufactured to BS 4 Part 1 2005⁽¹⁴⁾

3 GUIDANCE FOR THE USE OF FIRE PROTECTION BOARD SYSTEMS

Note: In this Code of Practice the term "board" will apply to both "boards and slabs".

This list is for guidance purposes and it may not be exhaustive. The installer may wish to include other factors. The manufacturer should be contacted whenever detailed guidance and information is required.

3.1 General information

All manufacturers of selected board systems should be independently certificated to ISO 9001⁽³⁰⁾ for quality management and assurance

3.1.1 Type of board fixings

Rigid boards or semi rigid slabs may be fixed by mechanical means or by adhesive systems or using a combination of both methods. Some products can be edge screwed so that a framing system can be avoided or reduced. Others may have proprietary fixing systems.

Adhesive fixed systems may need to be supplemented by pins, staples or nails at joints particularly when adhesive curing times are slow due to low temperatures at high humidities.

For mechanical fixed systems, components could include steel angles, screws and fixings, noggins (if required), backing strips and sealants (if required). The details for positions and spaces between fixings, positions of joints, positions of noggins etc must be in accordance with the manufacturer's instructions.

3.1.2 Joints

For some systems, joint sealing between boards is not required but others specify that a sealant or fire protection sealant must be used. Others may use suitable noggins behind the joint position. Contact manufacturer for advice on sealing joints between boards and adjacent building elements.

3.1.3 Type of fire protection enclosure

Board systems are usually applied to box out the extent of the exposed steelwork which is to be protected, but the profile of the steel can be followed with mineral wool board systems, using stud welded pin fixings.

3.1.4 Board dimensions

Depending on the fire resistance period required, board thicknesses may range from 6 mm for the higher density products based on gypsum, cement or calcium silicate to 110mm for mineral fibre and lower density boards.

Resin bonded mineral fibre type boards are typically 2000mm x 1200mm

Fibre reinforced cement and calcium silicate and cement boards are typically 1800 -3000mm x 1200mm.

Lightweight aggregate boards are typically 1000 x 610mm.

Users should consider how the size and weight might affect working and compliance with Health & Safety regulations. The manufacturer should always be contacted to check the latest product information

3.2 Management of installation on site

The following contractual requirements should be covered in the contract documentation.

3.2.1 Choice of installer

Approved Document B Volume 2 states

'Since the fire performance of a product, component or structure is dependent on satisfactory site installation and maintenance, independent schemes of certification and registration of installers and maintenance firms of such will provide confidence in the appropriate standard of workmanship being provided'.

Requirements for such an independent third party certification scheme include verifying skills, training, ability to choose suitable products, certificated operatives and supervisors, planned and random inspection, issue of certificates of conformity on completion, an audit trail, etc. There are a number of suitable UKAS approved schemes available.

Competence in application requires an understanding of the importance of installation to the manufacturers' specification for mechanical fixed systems in terms of boards sizes, screw centres etc. and for adhesive fixed systems, the use and fixing of noggins, application of adhesive etc.

Confirmation of installer competence in the procedures for installation of fire protection and the control of quality can be provided through third party contractor certification, and all ASFP installer / contractor / applicator members must now hold third party certification. Requirements for such a scheme include verified skills training, ability to choose suitable products, certificated operatives and supervisors, random inspection, issue of certificates of conformity on completion, an audit trail and a UKAS accredited approval body. There are several such schemes available. However inclusion in the scheme does not necessarily mean the contractor has skills in each discipline

At the level of the operative, Informal evidence of competence of installation can be provided in the form of completion of training courses run by individual manufacturers, but as these courses are unregulated the quality of the 'applicator approval' may vary.

Many client authorities and specifiers require installers to provide more formal evidence of staff competence, through completion of recognized applicator training courses.

As well as competence in installation, specialist installers should be able to demonstrate a commitment to the health and safety of their staff working on site, as well as an appreciation of their Health and Safety

and Environmental obligations under the law. Many clients and specifiers require membership of the Contractor Health and Safety Assessment Scheme as an essential element of their installer selection criteria.

Use of such independent assessment schemes provides clients and specifiers with confidence regarding the competence of potential contractors, helps to fulfil their own duty of care responsibilities under the CDM regulations and gives the 'responsible person' confidence of compliance with the Regulatory Reform Order.

3.2.2 Design review

Prior to commencement of installing the fire protection system, a design review should be carried out to confirm that no alterations to the design have been made that might affect the drawings or the board thickness requirements for the structural members.

3.2.3 Board thickness specification

The correct board thickness must be determined for each steel section used throughout the project.

The detailed breakdown of board thicknesses will normally be the responsibility of the installer (but may in some circumstances be provided by the architect / specifier). Most of the necessary information regarding the thickness of the boards in relation the steel section and period of fire resistance can be obtained from the board manufacturer's product fire certification and assessments. Generally, most of the manufacturer's technical literature contains details of A/V for most common sections and other steel structural members with information of the thickness of their boards which are need to provide the required level of fire protection. This information is specific for the products of one manufacturer and must not be applied to another manufacturer's products.

NOTE: it should not be assumed that the fire resistance period available can be increased in linear relationship to the thickness of the board. For example, a doubling of the thickness of the board will not result in double the fire resistance period.

Any variations in board thicknesses resulting from specific design features must be noted by the installer and reported back up the contractual chain via the Contract Administrator. The installer will prepare a schedule of board thicknesses required to provide fire protection to each of the steel sections throughout the building in order to achieve the fire resistance periods given in the contract documents. This schedule will be submitted to the Contract Administrator for review, prior to commencing the works.

Some manufactures provide a board-fixing schedule but the installer may prefer to use his own procedure. It is suggested that by inputting information about every section in the project – including location, surface area etc.- a product calculator can produce not only a schedule for the installer but can be used as a means of proving that the specification complies with the design, and can also generate a cost model for the project. However, the installer should be aware that the latter would be based on theoretical data and so would have to be modified to include his estimate for losses during installation etc.

In addition to the above, the specifier must provide all relevant structural information, including that relating to steelwork connections, which may affect the limiting temperatures to be used in designing the fire protection thicknesses.

The schedule of board thicknesses should include, but not be limited to, the following:

- (i) Name of board system specified / selected.
- (ii) Steelwork references as noted on general drawings
- (iii) Steelwork section sizes and A/V factors.
- (iv) Fire resistance period(s) required
- (v) Details of any partial fire protection provided by other parts of the construction, e.g. concrete floor slabs, etc.
- (vi) Board thicknesses

3.2.4 Regulatory issues

Fire safety of life in new buildings and major alterations is regulated throughout the UK by building regulations, which are enforced by the local building control authority.

The Building Regulations 2000 (SI 2000/2531)⁽¹⁾ apply in England and Wales and are expressed in broad functional requirements namely B1 Means of Escape, B2 Internal fire spread (linings), B3 Internal fire spread (structure) B4 External Fire Spread and B5 Access to the Fire Brigade.

Clause 1 of Internal fire spread Requirement B3 of the Building Regulations 2000⁽¹⁾ states that 'the building shall be designed and constructed so that, in the event of fire, its stability will be maintained for a reasonable period' and Clause 4 states, "the building shall be designed and constructed so that the spread of unseen fire and smoke within concealed spaces in its structure is inhibited"

Approved Document B (2006), volumes 1 and 2⁽¹⁰⁾ provide non-mandatory guidance that is deemed to comply with the functional requirements of the Building Regulations. Appendix A1 provides the specific provisions of test for fire resistance of elements of structure, whereas Appendix A2 states the minimum periods of fire resistance required.

Alternative approaches are permitted, such as an intermediate approach using BS 9999 or via fire safety engineering approaches to BS 7974 *provided that* the designer *can* demonstrate that legislative requirements have been satisfied.

The Building Scotland Regulations 2004⁽¹¹⁾ apply in Scotland and are supported by Technical handbook (Fire) 2005⁽⁴⁾.

The **Building Regulations (Northern Ireland) 2000**⁽¹²⁾ supported by guidance document DFP Technical Booklet E-Fire safety 2005⁽¹²⁾ apply in Northern Ireland.

Other fire legislation may also apply for certain buildings e.g. health premises, schools, underground railways etc and these may require a different level of fire protection from those required in the Building Regulations.

3.2.4.1 Statutory duties

The major regulatory requirements are the Regulatory Reform (Fire Safety) Order 2005⁽²⁾ and the CDM Regulations 2007⁽³⁾

The importance of fire safety is emphasised in recent legislation by means of the RRO and equivalent legislation in other parts of the UK. This legislation applies to occupied buildings and states that there must be a 'responsible person' (see definitions) who is responsible for reducing the risk of fire and its spread, ensuring that fire protection in the premises is maintained and repaired and carrying out a fire risk analysis of the building

A legal duty and liability arises under Regulation 16B of the Building Regulations (England and Wales) to provide details of all fire precautions to the client so that the Responsible Person can carry out the required statutory duties. Regulation 16B of the Building Regulations is specifically referenced in Appendix G of Approved Document B, and requires that fire safety information shall be given to the 'responsible person' - as defined in RRO 2005⁽²⁾ - at the completion of the project or when the building is first occupied

The use of fire protection board systems will assist the building to comply with both the RRO⁽²⁾ and the CDM Regulations⁽³⁾ because these systems are of low maintenance and have been shown to be durable.

3.2.5 Health and safety issues

The Construction, Design and Management Regulations 2007⁽³⁾ are the responsibility of the Main Contractor and apply to the building process and include the construction, alterations and maintenance of buildings and require that dangerous products should be replaced as far as reasonable with those which do not present or which have a lower hazard. It would be prudent to ensure that measures to ensure regulatory compliance are built into every contract at the specification stage.

Although implementation of the CDM Regulations⁽³⁾ is the responsibility of the main contractor, the specifier/installer should try to remove or reduce the effect of hazardous products by specifying safer alternatives.

The specifier/installer should ensure that the products are not harmful during application or to the building occupants during the lifetime of the building. They should therefore not degrade with time and give off toxic fumes or other materials. If work has to be carried out whilst it is occupied, harmful products should not be liberated into the atmosphere during application.

Health, Safety and Environmental precautions on site are delegated to the everyone involved with the contract, but the installer should also require that any products used on site are used in full compliance with the recommendations of manufacturers' health and safety data sheets, and that the safety of all personnel in the vicinity of the application is protected.

The installer must ensure that all relevant Health and Safety data sheets, application instructions and method statements are available to the application operative(s) and client & that they are fully understood.

Boards will support their own weight but are not load bearing. Horizontal boards e.g. the upper face over the web of a box system etc must not be walked *upon* as they are not designed to take additional loads between supports. If there is a risk of this occurrence then warning notices must be displayed.

3.2.6 Compliance with EU Environmental Regulations

During and throughout the application process, full compliance with all relevant environmental legislation must be demonstrated. As a minimum, this includes:

- Observance of all precautions and conditions for use of the fire protection system, as defined in the manufacturer's Product Safety Data Sheets and manufacturers' safe working recommendations.
- Compliance with relevant Site Storage Regulations, including COSHH Regulations⁽⁵⁾ where applicable.

3.2.7 Waste disposal

Compliance where relevant with Waste Disposal Regulations, in particular the Hazardous Waste (England and Wales) Regulations 2005⁽⁶⁾, Waste Duty of Care Regulations 1991⁽⁹⁾ and, as of April 2008, the Site Waste Management Plan Regulations 2008⁽⁸⁾ which will apply to all contracts with a value of £300,000 or more.

During and throughout the application process, full compliance with all relevant Health and Safety and Environmental legislation must be demonstrated. As a minimum, this includes:

- Observance of all precautions and conditions for use of the board and the components of the fire protection system, as defined in the manufacturer's Product Safety Data Sheets and manufacturers' safe working recommendations e.g. dust control when cutting, handling etc
- Compliance with relevant Site Storage Regulations, including COSHH Regulations⁽⁵⁾ where applicable.

4 APPLICATION OF BOARDS AT SITE

4.1 Properties of board and system

4.1.1 Durability

ETAG 018 Part 4⁽²⁹⁾ includes tests for durability in different environments. All products should be 'fit for purpose'. For more information on ETAG 018 Part 4 see www.eota.be

There are two main types of fire protection boards and slabs for fire protection. They consist of inert cementitious or gypsum binders with small amounts of fibre and other ingredients or consist of inert mineral fibres bonded with small quantities of resin.

Some boards are suitable for internal and semi – exposed applications and high humidity environments. Some boards, if subjected to moisture during installation, will regain their strength. Boards are resistant to vermin and mould growth.

The durability of a fire protection system depends on the whole system i.e. the board, mechanical fixings, adhesive (if used) and any other components not failing within a reasonable period of time. With suitable choice of board to match the environmental conditions and planned maintenance, excellent long-term durability can be expected.

4.1.2 Resistance to damage

ETAG 018 Part 4⁽²⁹⁾ sets out the various impact zones of a building.

The choice of the board system should take impact resistance into account and it may be necessary to protect the fire protection system in susceptible areas, such as car parks, to prevent damage.

Broken or damaged boards should be replaced at the installation stage. It may be viable to repair surface damage with filler, but manufacturer's instructions should always be followed.

At the base of columns, boards should not be allowed to stand in water during the fixing stage. If standing water is a problem, it may be desirable to delay installation of the bottom 300mm and finish off at a later date. Check with manufacturer if a problem is encountered.

Similarly, board enclosures should not be fitted until the deck above steel beams is made watertight by the main contractor.

4.2 Steelwork to be protected

4.2.1 Steel preparation requirement

No special steelwork preparation is required for mechanical fix. Simply remove oil grease, rust, loose or foreign matter at contact points when using adhesive or pins.

If steelwork has to be prepared before an adhesive or pin fixed system is used this could result in the need for more detailed project planning and the manufacturer should be contacted for details.

4.2.2 Fire protection requirements for the steel

Various fire resistance requirements may apply in different parts of the building.

The thickness of fire protection boards to be installed will vary according to the size, mass and potential exposure of the particular steel section to a fire.

Calculate section factors A/V (H_p/A) of each steel section by measuring dimensions of structural steel section or consult tables in manufacturers' technical literature or the Yellow Book⁽³²⁾.

Determine thickness of board required for specific steel member for required fire resistance, and exposure conditions, and format of enclosure [boxing or profiling] by consulting manufacturers' literature or the Yellow Book⁽³²⁾.

NOTE that other types of steel sections or 'cellular' beams with openings in the web may have lower limiting temperatures than usually encountered with solid beams or columns. The limiting temperature should be provided by the designer. Also see ASFP 'Yellow Book' section 6 for the latest guidance.

Other fire resistance tests can be used if they can be shown to satisfy the requirements of the guidance documents to the building regulations.

Some steel sizes may have inherent fire protection for limited periods. These are listed in Approved Document B⁽¹⁰⁾, Appendix A.

4.3 Installation issues

4.3.1 Steelwork fit for purpose

The main contractor must first ensure that the steelwork is properly installed and is suitable for installation of the specified fire protection system. The main contractor should provide limiting temperature information for the steelwork and define the scope of protection required.

4.3.2 Storage

Storage of fire protection products must always be carried out according to manufacturers' instructions. It is common practice that products should be stored under cover on a flat base, clear of the ground. If stored in the open, the stack should be fully protected from the weather. If stored on racks, they should be off the ground and boards should be fully supported across their width at not more than 1m centres.

As a general guide, the storage temperature for adhesives will be within the range of 5 - 30°C, and any water-based adhesives should be protected from frost. Material containers should remain unopened until needed and should be used in date order.

It is vitally important that manufacturer's instructions are followed. If they are not followed then the installation company will be liable for all that follows. The installer should make and maintain full records such as deliveries, usage, product stock identification marks, etc to justify the installation being made.

The manufacturer's recommendations should always be followed in all instances.

4.3.3 Cutting, shaping, fixing

Some boards use noggins or can be edge screwed.

Cementitious and gypsum boards (less than 6mm) may be cut with conventional tools and the softer boards may cut with a knife or scored and snapped. Thicker boards or higher density boards can be cut more easily with a power saw with tungsten tipped blades or a jig saw. Mineral fibre type boards or slabs can be cut with saw or knife. Manufacturers printed instructions should always be followed. All cutting should be carried out in well-ventilated areas using suitable dust extractors and operators should wear protective facemasks, as advised by the manufacturer.

Resin bonded mineral fibre products are simple to install either by means of adhesives, stud welded pins or push fit with non-return clips.

Carry boards on edge and do not drop onto corners or onto trestles.

4.3.4 Site humidity

Some systems can withstand the effects of moisture and high humidity and can then be installed before the building is watertight. This enables fire protection to steel to be completed during the construction phase according to the board manufacturer's instructions.

Mechanically fixed systems can generally be fixed under most humidity conditions.

4.3.5 Adhesives and glues

All adhesives or joint sealants delivered to site must be used within the manufacturers' stated shelf life, or otherwise be approved as suitable for use by the manufacturer and used in rotation. Any mixing and use should be carried out in accordance with the manufacturers' instructions. Adhesives taken from store should attain the temperature recommended for use before being applied.

Application of adhesive for bonding to steelwork should not take place on site when environmental conditions – air and steel temperatures, relative humidity etc – are outside the limits laid down by the manufacturer. It is the applicator's responsibility to monitor these conditions in accordance with the specification, and, when necessary, to maintain auditable records to demonstrate compliance.

Adhesives are usually water-based silicates but contact the manufacturer for information if other types of adhesive are specified. Silicate based adhesives should be applied at various air temperatures and humidity levels in accordance with the manufacturer's instructions. Setting times are 4-8 hours depending

on temperature, humidity, thickness of the adhesive, and use of an accelerator. The installer should therefore allow for any potential delays when planning the work programmes.

4.3.6 Finishes

The installer may be asked to provide a basic finish unless otherwise stated in the contract documents

The decorative quality of fire protection systems can be a subjective issue depending on the personal preferences of the viewer. Where considered appropriate, a sample area of application should be carried out on site so that the standard of workmanship and finish can be predetermined and accepted by all interested parties.

Boards may be left unfinished or have a facing which needs no further decoration.

Cement based products may need an alkali resistant primer.

Calcium silicate and gypsum boards can be decorated with normal paints, renders, tiles etc.

4.3.7 Scheduling of work

The scheduling of the works should allow free access for the installer to cut the boards and to fix the system, particularly when working from raised platforms. The installer and main contractor should take into account the potential of the application process for causing disruption of other activities on site. Once the fire protection system is selected, the installer is responsible for agreeing the site application schedules with the main contractor.

The fixing schedule must be drawn up being mindful of other trades, so that all parties understand the demands and constraints of the installation process. Following trades should avoid damaging any installed boards.

This interaction with other trades and services is an important part of the site management role of the installer, not only in avoiding conflict but also in ensuring that the time and conditions for a quality system application are maintained throughout the programme.

4.3.9 Disruption of site activities

A designated cutting area may be required to avoid interruptions to /from other trades

5 QUALITY CONTROL AT SITE

This section sets out the factors that need to be considered to ensure that the site installation delivers the quality of work defined in the specification, and satisfies all legal requirements.

5.1 Verification of fire performance

5.1.1 Fire properties of the board in the system

Typical requirements would be taken from one or more of the following requirements:-

- Non combustible to BS 476 Pt 4⁽¹⁶⁾ or BS 476 Pt 11⁽¹⁹⁾
- Class 0 as defined in guidance documents for UK and Ireland Regulations
- BS 476 Pt 6 – Fire propagation⁽¹⁷⁾
- Surface Spread of Flame to BS 476 Pt 7⁽¹⁸⁾
- European class A1 (Reaction to fire) to BS EN 13501-1:2002⁽²⁵⁾

These properties apply to the performance of the product and not to the system. Boards meet one or more of these properties and specifiers should check which apply to manufacturer's products and if they are required by regulations. European fire tests for Reaction to Fire show that most boards have low smoke emission. This is not currently a requirement of UK building regulations but the specifier may

decide that for safety reasons and possible future requirements that low smoke emission is important. Similarly, it may be considered desirable to specify a Class 0 or non-combustible product.

5.1.2 Fire resistance of the board system

Systems should have been tested to BS 476 – 21 1987⁽²⁰⁾, the equivalent European fire test ENV 13381-4 or its expected replacement EN 13381- Part 4⁽²⁷⁾ or other test which can be shown to be suitable .

All fire tests must be carried out by a UKAS approved laboratory and assessments be given in accordance with published ASFP practice – see ASFP ‘Yellow Book’ entitled ‘Fire protection for structural steel in buildings: 4th Edition’. Products may benefit from being part of an independent recognised 3rd party certification scheme.

Fire resistance periods required are usually 30, 60, 90 120 or 240 minutes for the appropriate thickness of boards. Approvals relate to a limiting temperature over the range of steel over the range of 300-700°C for steel loaded to the maximum permissible stresses specified in BS 449: Part 2 1996⁽¹⁵⁾.

The limiting temperature of the test data should always be provided for clarity.

The specific thicknesses of fire protection boards will depend on the specified fire resistance periods, and the size and exposure of the individual steel elements.

Different boards of the same thickness should not be expected to provide the same fire resistance period for a given application. The characteristics of different boards and fixing systems directly affect the performance in fire

Fire resistance tests are based on specific systems consisting of one or more components. It is essential that the board, its thickness, and any other component are as specified by the manufacturer.

For mechanical fixed systems, this includes steel angles, screws and fixings, screw fixing centres, positions of joints, noggins (if required), backing strips and sealants (if required). For adhesive fixed systems, this includes, adhesives, and positions of noggins, sealants and any mechanical fasteners

Fixing tolerances and any changes in the fixing specification must be agreed with the manufacturer of the system. The fire resistance of systems using the different boards vary with type of product, system type and structural steel section and the limiting temperature.

Unless specified, joint sealants are not required for joints between boards or when board is abutting surfaces adjacent to the fire protection system.

5.1.3 Fire resistance requirements

The minimum fire resistance requirements for life safety are listed in the documents supporting the relevant building regulations e.g. Approved Document B – Appendix A and will depend on the type of building, its use and its height.

The specifier or the installer will then be able to decide what thicknesses of a board are required. The board thickness is obtained by calculating the A/V (Hp/A) factors and then checking manufacturers’ literature for the thickness required. Most manufacturers and the ASFP Yellow Book⁽³²⁾ give tables of A/V section factors for steel sections and each manufacturer will provide details of the thicknesses of the boards to give the required fire resistance for a specific section. The thicknesses will vary for one, two, three-sided protection etc or for columns and beams etc

5.1.4 Fire safety engineering

If there has been a fire safety engineering design to Structural Euro codes⁽³¹⁾ or BS 7974 or BS 9999⁽²⁴⁾ for the building then fire resistance levels may differ from those recommended in Approved Document B² and the board thicknesses may also differ. The deemed to satisfy guidance in Approved Document B² may not be suitable for large and complex buildings and a fire safety engineering design may be required.

5.1.6 Life safety or property protection

The Building Regulations of the UK are intended to protect life of persons in and around a building. They are intended to ensure that people can escape safely in the event of a fire and to provide safety for the fire and rescue personnel who may need to enter the building. Fire resistance periods are sometimes lower than those specified for insurance requirements, which are designed to protect property. Insurers

have their own requirements for fire resistance periods, as detailed in Approved Document B: Fire safety (Volume 2) Incorporating Insurers requirements for property protection⁽³³⁾.

5.2 Quality control considerations and equipment

Quality control and supervision measures at site must be adequate to confirm that the standards of installation stipulated in the specification and the manufacturers' technical data sheets are being met. They should also be realistic and cause minimal disruption to the overall fixing process (unless defective work is identified and corrective action becomes necessary).

Essential quality control criteria are defined below and may require suitable measurement equipment to be available on site:

- A standard rule or tape measure is required to check steel section sizes, size of boards, noggins, position of fixings etc. Manufacturers' measurement procedures should be followed.

5.3 Product quality assurance

The manufacturer of boards and slabs should be capable of providing evidence of product quality and fitness for purpose and should be registered to ISO 9000⁽³⁰⁾ Quality Management System via a recognised agency.

ASFP listed products will also have been assessed to independent third party certification schemes which assess the performance or quality of the product and fire protection systems, Third party product certification provide quality audits specifically on fire protection and consistency in the manufacture, testing and batch approval process, where relevant.

UKAS accredited third party product certification is now a requirement for listing of products in the ASFP Yellow Book⁽³²⁾, as well as being favoured by Building Regulations AD-B and contributing significantly to compliance with the Regulatory Reform Order.

Manufacturers of the components used in the system should also be registered for Quality Assurance.

In the future, testing to BS EN 13381-4⁽²⁷⁾ and CE-marking will provide a further step in verifying product performance.

5.4 Board Thickness Plan

Most construction projects are complex and involve a range of section sizes and configurations, each requiring a different thickness of board. However, one thickness of most boards will often satisfy much of the specified levels of protection required for one project and the fixing schedule will be simplified. This is because boards are manufactured in discreet thicknesses which can cover a range of requirements. In many cases a limited range of board thicknesses will be required on a given project. Different systems might be used on large contracts or preferred for different steel sections. Information on 'junctions' between different fire protection systems are provided in ASFP Publication TGD 08.

In order to assist the installer to deliver the correct quality of work, and to provide an easy reference for subsequent quality control checks, the following documents should be made available at the commencement of the work:

- A copy of the plans and drawings of the structure
- A list of the board thicknesses formally required for each steel section size.

A rationalised list of thicknesses may be used to aid site control. The required and installed board thicknesses should be provided for all types of steel sections as used on the contract. This documentation should be retained for quality control purposes, by the installers' own QA inspector and to assist any third party inspection.

6 QUALITY PLAN, INSPECTION CRITERIA AND METHODOLOGY

6.1 Quality plan

Competent installers may already have in-house or independently certificated systems in place to control site work in order to demonstrate compliance with specification requirements. The following mechanism is offered as a suggested refinement of those systems, but is not a mandatory or prescriptive requirement.

For most sizeable projects involving several tiers of contractual responsibility, it is good practice for the contractor to prepare a quality plan that documents the sequence of activities required to deliver the specified quality of the system.

This plan also identifies any inspection stages in the process, and will normally be submitted to the Contract Administrator at the commencement of the work for his comment and approval, and also to advise him of any key inspection stages or quality 'hold points' in the process. 'Hold points' are points in the installation programme where opportunities are offered to the client or third party inspector to confirm acceptance of the standards being achieved, before work is allowed to proceed to the next stage. The frequency of inspections should be agreed between specifier, installer, third party inspectors etc.

The quality plan can be produced in the form of a simple table and may serve a number of functions, as follows:

- It summarises the quality requirements contained in the specification. It can be structured to include criteria for work acceptance
- It can be used to record conformance with specification at each stage of the process
- It can be structured to include sign-off by client, third party agency etc at key points in the process. However, periodic inspection by the client or third party inspector does not absolve the installer of the ultimate responsibility for the quality of the finished work.
- The quality plan could be used as both a checklist for inspection, and a summary verification document to demonstrate compliance with the specification.

A typical layout for a quality plan / checklist is provided in Annex A.

6.2 Site inspection and criteria

6.2.1 Site inspections

Site inspections should be carried during the installation programme to ensure that the system is being fixed as according to the manufacturers' specifications. The installer should inspect the installation or if desired a third party at agreed intervals to check that the system is being fixed to the manufacturers' specification. In particular, board thicknesses, position of noggins and backing boards should be checked before facing boards are applied. When adhesives or mechanical fastening are applied directly to the steelwork, the latter must be inspected before and after cleaning to ensure that it has been carried out properly. Adhesives must be checked for setting before the next stage of work takes place.

6.2.2 Site inspection criteria

Typically, the inspection criteria for a large construction project would include the following:

- Check product or products that are specified for the contract
- Check the system or systems (note these could be boards or other types of passive fire protection) that are used for the contract
- Check the board thicknesses that are required for the steelwork
- Check the quality and appearance of the boards. Reject broken boards which cannot be used for small areas. Reject boards with damaged edges or rebates. Reject prefinished boards if surface damaged and a good visual appearance required
- Check that the components are those specified by the manufacturer for use with the board to produce the fire protection system.

- Check that adhesives correct suitably packaged and are within sell by or use by dates
- Check that components are not broken or damaged
- Check steelwork is satisfactory for application of the fire protection.

1. Surface preparation:

- Surface preparation of steelwork is only required when adhesive or metal fastenings applied directly to the steelwork.
- Removal of dust, loose material, visual moisture or other contamination – visual inspection

2. Application:

- For adhesive or pin fixed systems, condition of steelwork, steel temperatures, etc in cold weather as specified in manufacturers' data sheet. No requirements of this nature are needed for mechanically fixed systems.

Inspect during application to check if [a] system is meeting manufacturers' installation specification and [b] that backing strips and noggins are of the correct material and [c] that thickness and that they are fixed properly in the correct position. The final inspection should check if product meets manufacturers' fixing specification.

- Batch numbers of adhesives used
- Dates and times of application for systems using adhesives or pins fixed to steelwork.

6.3 Inspection methodology

Application of adhesive fixed systems must not proceed if the prevailing environmental conditions are outside the limits set out in the manufacturer's technical data sheets. Mechanical systems have the same fixing conditions as those for general-purpose building work.

It is suggested that steel temperatures should be determined before commencement of adhesive fix work in the morning and at other times if conditions become colder. All measurements should be logged and be available for inspection.

Visual checks are sufficient for surface preparation and application checks and the criteria for acceptance should be stipulated as those given in the manufacturer's technical data sheets.

The most important inspection requirement to ensure fitness for purpose of the applied board fire protection system is that it has been fixed as according to the manufacturers' instructions.

6.4 Site remedial work

6.4.1 Repair procedure

Before carrying out on-site remedial works, a written Method Statement for repair procedures shall be prepared by the installer and submitted to the Contract Administrator.

The installer or maintenance team shall be responsible for identifying all areas requiring remedial works and for rectification in accordance with the manufacturers' instructions or recommendations.

During the application process and after completion of the work, boards may be broken or cracked. These should be replaced. Minor surface damage can be ignored unless a quality surface finish is required when these should then be filled and decorated in the normal way. Damaged foil faced or plastic faced boards should be repaired or replaced if there is a visual problem

Where fixing details are checked after application of the system, it is a simple procedure to correct for incorrect or inaccurate positions of boards, screws, pins, framing, noggins or backing strips. The incorrectly fixed board or component should be removed and replaced with the correct materials in accordance with the manufacturer's instructions.

In all cases, records must show the nature of defect, source of remedial advice and the full extent of remedial work carried out at site.

If incorrect fixing is found after the application of the system has been completed, it may be necessary to replace the entire system or seek the manufacturer's advice regarding the best method of bringing the system up to the required level of performance.

NOTE: ASFP Installers are required to be part of an independent 3rd Party Certification scheme so that such risks are avoided.

6.4.2 Refurbishment or upgrading fire protection

The ASFP recommends that the refurbishment or upgrading of fire protection systems shall always be carried out in accordance with the advice of the system manufacturer.

Guidance on junctions between different types of fire protection on a structure is given in ASFP Technical Guidance Note 008⁽³⁶⁾.

Further information is provided in ASFP Technical Guidance Note TGD 10⁽³⁹⁾ Code of practice for the refurbishment & up grading of fire protection of structural steelwork

6.4.3 Junctions between different fire protection systems

Where unprotected areas of steelwork meet fire protected elements in a structure, it is normally considered good practice to overlap the fire protection onto the adjoining 500mm of 'unprotected' structural steel to limit heat transfer into the protected substrate.

Further guidance on junctions between different types of fire protection on a structure is given in ASFP Technical Guidance Note 008⁽³⁶⁾

6.4.4 Planned maintenance

Periodic inspections should be carried out as part of the normal maintenance plan for the building and any damaged boards should be replaced and fixed in the same way as in the original manufacturers' specification.

Decorated boards should be re-decorated at the appropriate intervals recommended by the manufacturer of the decorative system used.

6.5 Dispute procedure

A dispute as to the satisfactory fixing of the fire protection may arise for a variety of reasons, including:

- Misinterpretation of specification.
- Incorrect matching of board to section size.
- Incorrect component for use with board system
- Faulty or inappropriate measurement equipment.
- Incorrect calibration of measurement equipment.
- Products and/or components not fixed to manufacturers specifications
- Products not to technical specification e.g. too soft, too hard, wrong colour etc
- Products not to dimensional specification. Wrong size, wrong thickness, poor thickness tolerances etc

Where the parties are unable to agree, the following procedures are recommended:

- The basis of the dispute is set out in written format.
- Where appropriate the board or component manufacturer's advice is sought.
- The extent of the disputed area(s) is clearly defined.

7 RECORDS AND REPORTS

Detailed and accurate records are an essential contract requirement. Information should be kept available until handover to the client is completed and statutory duties under Building Regulation 16B are completed – see requirements summarised in Approved Document B Appendix G

Where appropriate, site records should contain the following information:

- Verification of Product and Specification
- Basic Contract Information
- Contract documents for installation of the fire protection product.
- Quality Control Records

7.1 Independent verification of site application

In the section on ‘Use of Guidance – Materials and Workmanship’, Approved Document B advocates the adoption of independent certification schemes specifically in the installation of fire protection, as follows:

‘Since the fire performance of a product, component or structure is dependent on satisfactory site installation and maintenance, independent schemes of certification and registration of installers and maintenance firms of such will provide confidence in the appropriate standard of workmanship being provided’.

The ASFP insists that contractor / applicator members must have third party accreditation, which aids compliance with the Regulatory Reform (Fire Safety) Order 2005⁽²⁾.

Installers who subscribe to such schemes would be expected to maintain detailed records of the work and to carry out their own coating thickness surveys to ensure that the completed job complies with the specification, and inspection/approving bodies should then be able to accept their data and/or Certificates of Conformity as a basis for signing off the work.

Building owners and designers should be aware of the benefits of using reputable, independently certificated applicators and fire protection systems.

7.2 Contract document checklist

Compliance with this process and contract checklist will provide confidence that the board fire protection system has been correctly installed and that the relevant statutory requirements have been diligently and responsibly complied with.

PROCESS REQUIREMENT	DOCUMENTARY EVIDENCE
Design requirements & Suitability of Product and Specification	3 rd Party Certificated product (+ Yellow Book listing), assessed to agreed guidelines to meet the fire performance required Section factors and agreed board thickness table. Supplier confirmation of fitness-for-purpose for service environment and life to first maintenance
Correct and Complete Contract Documentation	Complete / accurate contract details Complete / accurate specification, including any surface preparation (if required)
Quality of Site Installation	3 rd party certificated installer Method statement(s) and quality and inspection plan. Design Review to confirm accuracy of board thickness schedule Batch records for all short life products. Concession records i.e. agreed changes (if any) Environmental records at site. Contractor Safety Policy, project risk assessments & safe working plans Compliance with site storage and waste disposal regulations. Compliance with Contractor Health and Safety Assessment Scheme.
Verification of board system, thickness and compliance.	Board thickness schedule for each steel section Component schedule Completed Quality and Inspection plan Corrective action records (if required) 3 rd party certification report (if applicable) Project finalisation and signing off.

ANNEX A1 Site Quality and Inspection Plan / Checklist

The Inspection Plan / Checklist is not prescriptive, but may be used as a template either for:

- A verification document to confirm that every stage of the process has been completed satisfactorily in accordance with the specification. If used in this way, it could be submitted along with the full documentation package as a summary of the evidence (of compliance) or
- A simple checklist to assist the Contractor, Specifier, 3rd Party Inspector etc. to monitor or audit the process.

PROJECT (X)

Site Quality and Inspection Plan / Checklist			
1	Contractor	A	Approval Required
2	Sub-contractor	D	Document Required
3	Customer	H	Hold Point (advance written notice required)
4	Customer Agency	W	Witness Point (advance written notice required)
		V	Verification (may be observation or document review)
		R	Review
	PROJECT		ISSUE DATE

Ref No	Activity	Procedure	Acceptance Criteria	1	2	3	4	Remarks
	Job or part identification							
1	DESIGN CRITERIA	Document check	Validation of requirements					
2	PRODUCT CERTIFICATION	Document check	Independent report or 3 rd party certification					
3	FIRE ASSESSMENT VALIDATION	Document check and qualification check	3 rd party certification and Yellow Book/PFPF guidelines					
4	FIRE SAFETY ENGINEERING	Document and qualification check	3 rd party certification and details of fire safety engineer					
5	DOCUMENT AVAILABILITY							
	Product / system data sheets	Document check	Available and complete					
	Method statement	Document check	Available and complete					
	Design drawings	Document check	Available and complete					
	Other contract documents	Document check	Available and complete					
Ref	Activity	Procedure	Acceptance	1	2	3	4	Remarks

No			Criteria					
6	STEELWORK							
	Confirm steelwork suitable to receive fire protection	Document check	Main contractor to advise					
	Details of steel sections	Document check	Specification and design criteria					
	Mechanical fixings	Physical check	Manufacturers recommendation					
7	BOARD APPLICATION							
	Pre-application checks - environmental conditions – air and surface temperature, humidity, dew point.							
	Steelwork prior and after cleaning and application of adhesives or pins.	visual	No defects					
	Check that board products are correct and of suitable quality	Record	As per specification					
	Check shelf life and correct application	Record	As per specification					
	Check that system has been fixed to manufacturer's instructions.	Visual Record details	As per specification. No defects					
	Dates and details of problem and remedial action	Record	As per specification. No defects					
8	FINAL INSPECTION - HOLD POINT							
9	FINAL DOCUMENT CHECK	Document check	Full data pack, independent certification if required, approval of remedial works if any.					
10	SIGN OFF							

ANNEX A2 GENERAL INFORMATION

ITEM	INFORMATION REQUIRED
Contract number and date	Number and date
Building	Address
Building owner/customer – det	Name and address
Specifier	Name and address
Main contractor	Name and address
Specialist Installer of fire protection	Name and address if different from a
Name of specified fire protection board and system	Give details
Name and type of product installed	State name and type
Product manufacturer	Details plus certification body – from manufacturer or Yellow Book ²⁰
3 rd party certification body	State name
Supplier	details

ANNEX A3 FIRE RESISTANCE INFORMATION

ITEM	INFORMATION REQUIRED
Period of fire resistance In AD/B	Give details
Building control office	Name and address
Any fire safety engineering input	Yes/no – plus details of fire engineer
Period of fire resistance resulting from fire engineering	Give details

ANNEX B CONTRACT VALIDATION CHECKLIST

Process Stage	Key Criteria	Requirement / Evidence
1. Design requirements	Is the basis for fire resistance rating defined?	AD-B ⁽²⁾ , BS 9999 ⁽²²⁾ , insurance design code, other fire legislation. The limiting temperature should be stated for all steel sections.
	What is the basis for load ratio / limiting temperature?	BS 5950-8:2003 ⁽⁹⁾ or Structural Eurocodes ⁽²¹⁾ ENV 1993-1.2 and 1994-1.2
2. Product Testing and Assessment	Has the product been manufactured to quality assured level and fully tested for technical performance and approved for fire resistance? Has the fire protection system been fully and independently assessed across a defined A/V range?	BS 476 Pt 21 ⁽¹⁷⁾ or BS EN13381-4 ⁽³³⁾ Third party certificated system Tested in accordance with Yellow Book ⁽²²⁾ protocol
3. Contract specification	Will the product satisfy all design requirements for the project?	Does product and system meet technical and fire performance requirements of the project.
	Are any fire-engineered assessments included and are these correct?	Independent fire-engineer's assessment to agreed guidelines
	Has a board thickness breakdown for each section been produced?	Steel section v. board thickness table
	Will the system satisfy durability requirements?	Manufacturers' literature
	Have any product hazards been identified	Health and safety data sheets
4. Installers competence	Is the installer competent in his understanding, application and quality control of board fire protection systems	Contractor audit, or third party accreditation and Yellow Book ⁽²⁰⁾ listing. It is desirable but not essential that the installer is ISO 9000 ⁽³¹⁾ registered.
	Are the installer's site supervisors and operatives competent in all aspects of installation of board fire protection systems	Training verified ideally by third party certification.
	Does the installer have a complete understanding of the particular project, and a working plan to deliver contract requirements in full?	Contract schedule, method statement(s) and quality and inspection plan.
	Is independent inspection of the installer's work required to validate the installation of fire protection?	Third party accreditation should increase confidence that work has been carried efficiently.

Process Stage	Key Criteria	Requirement / Evidence
	Are site Health & Safety measures properly covered?	Contractor Safety Policy, project risk assessments and safe working plans Should include compliance with site storage and waste disposal regulations. Compliance with / membership of the Contractor Health and Safety Assessment Scheme. Product Safety Data Sheets.
5. Audit trail & Contract Documentation (required at start-up)	Evidence that all above requirements are met.	Existence and quality of documents and supporting evidence.
	Correct allocation of board thickness to each element of the structure	Board thickness schedule, steel sections, and drawings (relating board thickness to each individual structural element)
	All components are readily available and allocated	Component schedule
	Evidence of safe, serviceable and accurate equipment.	Servicing records or calibration certificates as appropriate.
	Other contract specific requirements.	Supporting documents Product Technical Data Sheets etc.
6. Completed project documentation.	Start-up documentation	Copies of all relevant documentation from the above.
	QA records – surface preparation, product and component details, environmental conditions, application, etc.	Completed Quality and Inspection plan (or equivalent) plus supporting detailed records from site.
	Problems, faults requiring rectification during the course of the contract, corrective actions and concessions.	Documented evidence of any problems and actions taken, including all correspondence, justification, supporting evidence, manufacturer recommendations etc and authorisation of action.
	Any other contract specific documentation required.	Supporting documents.
	System validation.	Independent survey report (if any)
	Conclusion	Project finalisation and signed off.

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