

## **APPENDIX C**

# Fire Stopping – Workmanship and Performance

## Specialist Contractor Certification

The installers of the fire stopping system are to be installer/contractor members of:

- (ASFP) the Association for Specialist Fire Protection
- (IFCC) International Fire Consultants
- BM Trada
- (FARAS) installers Certification Scheme  
or similar UKAS accredited certification body.

And, also hold a recognised third-party installer certification or similar governing body certificate scheme.

The certification shall include the following:

- Verification of the skills of operatives
- Verification of ability to evaluate suitable products and identify mismatched products or proposed designs that will not work
- Registration of operatives and supervisors
- Planned and random inspection of installations
- Issuing of certificates of conformity on completion
- Audit trail of materials used in each job

## Installer Certification

Third party certification for installers is to demonstrate that the contracting company employs appropriately trained, competent staff to install the required passive fire protection system. The work is to be subject to independent auditing by site inspections from the third-party organisation and a full record system is required as part of the scheme. Installer certification specifically involves:

1. Auditing of offices to check
2. that written procedures are in place to account for the correct use of staff records for the correct purchase of appropriate materials/products are present
3. Engagement of staff whose competency has been evaluated
4. Use of proven e.g. CE marked or third party certificated fire-stopping products or systems
5. Certificate of completion of works lodged with certification body
6. Independent inspection of works by certification body

The installer of the fire stopping systems shall follow and comply with the governing body On-site guide to installing fire-stopping

## Site conditions

Confirm the environment is right for installing fire-stopping (temperature, humidity). Check if there are any chemicals present that might affect fire-stopping materials and the substrates are clean and dust free

Do not use the penetration seal area and space around a duct or damper assembly for the passage of other building services as their presence may invalidate the tested penetration seal method.

All penetrating services should be supported either side of the wall by fire tested supports to prevent collapse of the seal in a fire. The distance to the first support is particularly important. Check the

manufacturer's information. In the absence of any information, the first support should be no more than 300mm from the face of the seal.

If the service is already installed (supports have already been fitted) ensure that the fire-stopping is installed with the supports at the correct distance from the faces of the seal.

Dampers must be independently supported so that when activated they do not affect the stability of the surrounding fire-stop unless it is designed to support them and has been tested in the fire damper test EN 1366-2. This should be clarified with the damper manufacturer.

Fire dampers should be situated within the thickness of the fire separating element and be securely fixed. It is also necessary to ensure that, in a fire, expansion of the ductwork does not push the fire damper through the structure. In all cases, check with the fire damper manufacturer's EN1366-2 fire tested installation methods.

### **Pre-installation checks**

Ensure that the fire-stopping system being installed is correct and suitable for the affected areas:

Check the fire resistance time provided by the seal. A minimum of a 60mins fire resistance time is required for all the affected areas.

Establish if the seal is suitable for the type and size of penetrating service and the size and orientation of the service being sealed?

Establish correct size of the seal. Ensuring that it is neither too small or too large for the penetrating pipe?

Is the wall or floor the seal is to be installed within constructed correctly?

Is the aperture suitable e.g. correct size and in good condition?

Check the product's fire test and other evidence to ensure it adequately supports the end use application being used e.g. products tested only as linear gap seals should not be used in a penetration seal application.

Install a loadbearing fire seal for all floor penetrations where there is ANY risk of any person standing on it. and provide further details.

Establish from the system manufacturer if in each circumstance whether the mortar systems will require steel reinforcement over certain spans,

Ensure that where penetration seals are to be installed around fire dampers or ducts, that the seal used is approved for use and is compatible with the damper/duct in question

Install a tested and certified system when installing a flexible cavity barrier which requires services to pass through it.

Don't mix one manufacturer's product with another's in a single seal e.g. batts and mastics from different manufacturers or pipe collars and batts from different manufacturers. Consult the manufacturer's literature.

Don't install intumescent wraps or collars in non-loadbearing barriers such as coated stone wool (batt and mastic systems) unless proven by a fire test or assessment.

Don't use batt and mastic systems in floors where there may be a requirement to support foot traffic without separate mechanical protection e.g. a steel grid fixed above the seal.

## **Workmanship**

Ensure full compliance with the manufacturers' recommendations on coating/mastic for 'buttering' batt to batt, batt to wall and batt to penetration joints.

Ensure that the depth of the floor seal is achieved using the correct number of pours for mortars Consult manufacturer's instructions.

Install pipe wraps within the fire-stop mortar such that they finish flush with the seal soffit.

Check and if required carry out repairs to any damaged/defective fire-stopping or penetration seal using manufacturer-approved methods. If the defective/damaged seal is historic and installed by other, it is to be removed and replaced.

Ensure that no glass wool or combustible materials have been used around penetrations and in joints unless they have been successfully tested for the particular application.

Ensure compartment walls have been taken up to the underside of compartment floors (above suspended ceilings) and that a suitable deflection head is fitted if the wall is non-load bearing.

Ensure that fire-stopping reaches the edge of floor slabs e.g. for curtain walling.

Ensure all possible routes for smoke, gases and flame have been sealed.

Do not leave stone wool packed around services without any fire-stopping material covering it.

Do not use plastic plugs for installing supports or collars

## **After Installation**

Ensure a complete record is made of all installations and referred to in the labelling. This will be needed for the certificate of completion and as part of the inspection process.

Apply labels as part of the certification process and for traceability for future remedial work.

Take photographs of the completed installation to assist verification of the work.

## **Choice of Products (CONTRACTORS DESIGN)**

The installer shall be required to obtain from the manufacturer(s) of the fire stopping systems evidence of product quality and fitness for purpose e.g. if they hold third party certification via a UKAS accredited certification body. They are to be able to provide detailed evidence of the fire performance in terms fire test and assessment reports and third-party product certification.

Under no circumstances are fire stopping products from one manufacturer to be mixed and matched in the same application with fire stopping products from another manufacturer.

In addition, products must be third party certificated by UKAS accredited certification bodies, which assess the performance and quality of the fire stopping product/system.

Fire stopping Systems shall have been fire tested to "BS EN 1366 all parts" or BS EN 1364 parts 3 or 4 (10) as appropriate and classified to BS EN 13501-2 or have been fire tested/assessed to BS 476 Part 22.

Products tested/assessed against BS 476: Part 22: 1987 (11) may be third party certificated but will not be CE marked.

All fire tests must be carried out by a laboratory accredited to EN ISO 17025 (12) by a national accreditation organisation e.g. UKAS or by a body Notified to the European Commission by a Member State for such purposes.

Classifications shall be provided for the relevant field of application in accordance to recognised rules for direct and extended application of test data. Fire resistance periods required are usually 30, 60, 90 120 or 240 minutes. It is important to ensure that the design of the system provides insulation performance as well as integrity performance when required.

## **Code of Practice**

The installation of Fire stopping shall be in full compliance with the following ASFP documents or similar documents issued by other third party installer certification or similar governing body certificate scheme or UKAS accredited certification body:

1. ASFP Technical Guidance Documents – TCD 17 - Code of practice for the installation and Inspection of fire stopping systems in buildings: Linear joint seal, penetration seals, small cavity barriers
2. ASFP – Red Book – fire stopping: Linear joint seal, penetration seals, small cavity barriers 4th Edition
3. ASFP on-site guide to installing fire stopping:

## **INSPECTIONS**

### **General**

Pre-handover and final inspection of the completed installation is a requirement of the above code of practice.

An independent inspection is required of the completed works and the contractor shall engage a third-party inspectors may be used. Photographic evidence may be used in reports of inspections.

### **Work-in-progress inspections**

Site inspections should be carried out during installation to ensure that the system is being installed correctly. The installer shall inspect the installation (or if desired a third party may do so at agreed intervals) validate and check that the system is being fixed to the manufacturers' specification. The Principal Designer shall monitor compliance with the project-specific design and ensure that the work-in progress is regularly inspected in accordance with the installers approved method statement and the system design.

### **Pre-handover activities**

That pre-handover inspections by the fire stopping installer and the hand-over itself are to following a pre-handover inspection by an independent 3rd party certified and approved by the certification body and be based on an agreed check list. The Installer shall as part of their Method statement provide a sample inspection and pre-handover check list suitably detailed enough to capture the fire stopping works to be undertaken on this project. Such inspection and pre-handover check list will be issued to the Principal Designer for review and approval prior to works commencing on site.

### **Final inspection**

At the outset of their involvement, all team members must be made aware of the intended final inspection regime. The final installation must be checked for compliance by an independent 3rd party certified and approved by the certification body. The completed installation forms shall form part of the building's fire safety strategy and are to be included in the Health and Safety file for this project. Every aspect of the installation should be checked against the project-specific drawings included in the system design.

All final inspections must be documented in a handover register and Health and Safety file that must be retained by members of the team responsible for system design and installation.

## **Coated Stone Wool Batts / Boards**

### **Description**

Coated stone wool for fire-stopping applications supplied as batts or boards.

### **Areas of Use**

Coated stone wool batts to be used to fire-stop penetrations through compartment walls and floors and allow additional services to be readily installed as required. Where a structural support for the seal may be required – refer to manufacturers' recommendations. Additional provisions to satisfy load bearing requirements may also be required, particularly in the case of horizontal seals but should not be confused with the structural support that the seal may require. A separate loadbearing provision (e.g. steelwork and grating) should be provided in this case. Coated stone batts may be installed as a patress

### **Installation**

Coated stone wool batts are to be installed as pre-formed shapes or as standard batts for tailoring to fit openings. Batts can be friction fitted to the clean and dust free sides of the opening and around the penetrating services. A 'fire resistant' sealant that has been tested with the batt and is part of the manufacturers system is to be applied to all joints and to the raw edges of the slab.

## **Sealant/mastic coatings**

### **Description**

Sealant or mastic (silicone, acrylic etc.) applied by a mastic gun or trowel applied into an opening and between/around penetrating services.

### **Areas of Use**

These are to be used to seal around any penetrating services where testing indicates their suitability. They can be used when appropriate and suitable in conjunction with coated batts/boards in all forms of fire resistant construction, where openings are small, where penetrations are complex and where there is imperfection of fit between building elements.

When used in linear joints where movement is expected, a sealant with the ability to accommodate the movement of the joint should be used so that a seal is maintained in service and during fire conditions. The movement capability should be assessed against ISO 11600 and fire resistance tested to EN 1366-4.

### **Installation**

Use of mastic guns or trowels. Dusty/friable surfaces may need additional treatment prior to the application of the sealant/mastic – refer to manufacturer's instructions.

## **Mortars (Compound)**

### **Description**

Gypsum or cementitious based powder blended with inorganic lightweight fillers, composite reinforcement and chemical modifiers. The compounds are to be mixed with water and placed around and between penetrating services giving a rigid seal with some products providing a loadbearing seal.

## **Areas of Use**

The systems can be used to fire-stop penetrations through concrete and masonry compartment wall and floor constructions. In certain circumstances a supporting structure will be required – refer to manufacturers' instructions.

Blank seals can also be installed, so that when services are required to penetrate a wall or floor, they can be quickly installed and the seal reinstated.

## **Application**

- Cables and metallic pipes.
- Rigid walls and floors of 150 mm minimum thickness.

### **Concrete slab openings.**

Mixing and trowelling into a vertical opening, and working around services without slumping.

Casting into blocks for building into larger openings using a stiff mix of the same compound as bedding.

Consult manufacturer performance data for each application and to determine suitability for proposed location and use.

## **Installation**

The mortar is to be mixed close to the opening. For large installations, some materials are capable of being pumped after mixing and in some cases a mechanical support system would be required. In floor penetrations, a temporary or permanent damming board is to be used with the mortar poured in place. This will need to be able to carry the wet weight of compound.

For wall penetrations, mortars are often trowelled using a single damming board or no damming board, dependent upon the opening size. Some mortars can be pre-formed into blocks so that wall seals can be built up with the same wet mortar to bind the blocks using masonry building techniques. Small penetrations can sometimes be made by trowelling the mortar into the opening without the use of a damming board.

## **Preformed elastomeric seals**

### **Description**

These are made from elastomeric foam, sometimes with reinforcing sheets on either side. The foam and/or the reinforcing sheets may be intumescent. These products are generally supplied in a strip form.

## **Areas of Use**

These products are generally used to seal the gap at a movement joint between two building elements, such as between a floor and a wall.

## **Installation**

These products are fitted by compressing by hand and then by pushing into the gap which ensures they remain in place. It is important to ensure that the correct size seal is installed into the joint to allow expansion as well as contraction.

## **Bags / Pillows / Cushions**

### **Description**

Bags / pillows or cushions in various sizes and shapes are to be used in temporary or permanent fire-stopping situations where services such as cables pass through walls and floors.

Bags / pillows are made from special fabrics and enclose a filling material and incorporating an intumescent material.

### **Areas of Use**

Bags / pillows can be used wherever services, such as cables, penetrate a fire-resistant element. Since they are easily removed, they are to be used where services are likely to be frequently re-routed, and can be used as temporary protection during construction work.

### **Installation**

Bags / pillows must be placed into the opening(s) using the correct orientation, packing density and overlap (staggered joints), to achieve the desired fire resistance. For wall penetrations, bags/pillows are normally self-supporting, but large openings with few penetrating services may require a steel retaining mesh for support on both sides of the penetration. The size of mesh and method of fixing may affect the support of the bags/pillows and the manufacturers fixing specification must be adopted. Floor penetrations normally require a well anchored steel retaining mesh or basket to support the bags/pillows. (to follow the manufacturer's instructions).

## **Pipe closures**

### **Description**

Pipe closures are to be used to preserve the integrity of a fire-resistant compartment where various cross-link plastic pipes (PEX), plastic pipes, plastic trunking, steel pipes with insulation or plastic pipes with insulation pass through floors or walls. And such these service penetrations may have the risk of softening and collapsing under heating, therefore some means of preventing the passage of fire is required by crushing the cross-section of the pipe or trunking.

There are variations in design of pipe closures. The three principal methods of pipe closure are pipe collars, pipe wraps and high-pressure exerting sealants. All systems are to confine an intumescent compound, which is to expand on exposure to fire, rapidly exerting pressure upon the pipe or, in some cases, insulation. The service penetrations, which will have softened due to the heat, are to collapse under this pressure creating a constriction. Some pipe closures incorporate a mechanical device which may or may not include an intumescent compound. Pipe collars incorporate an outer casing which acts as a restraint for the intumescent material, enabling the collar to be either surface fixed to the separating element or incorporated within it. Pipe wraps have no casing and hence must be located within the separating element, which acts as a restraint for the intumescent. High pressure exerting sealant is installed to a prescribed annular gap to a predetermined depth between the service penetration and the constructing element.

### **Areas of Use**

Pipe collars, pipe wraps and high-pressure exerting sealants can be used where plastic pipes (PEX), plastic pipes, plastic trunking, steel pipes with insulation or plastic pipes with insulation pass through fire resistant elements such as floors or walls.

## **Installation: Pipe wraps**

Pipe wraps are to be fitted where there are oversize holes in the separating element, surrounding the pipe(s). If there is a fire risk on both sides of a compartment wall or floor two wraps may be required. The position of the pipe wrap within the wall or floor can be critical e.g. many pipe wraps for soil pipes passing through floors need to be positioned at the bottom of the opening in the floor to activate properly. Similarly, a pipe wrap tested in a rigid wall may not work when tested in a flexible wall without suitable framing out. Specifiers and installers should check that the supporting fire test evidence is applicable for the end use application envisaged.

## **Installation: Pipe collars**

The fitting of the pipe collars to the wall or soffit/floor is generally to be on the fire side, although in some instances, can be recessed into the structure or fitted on the non-risk side. If there is a fire risk on both sides of a compartment wall or soffit/floor, each side may require protection.

It is essential that the method of securing the collar to the fire-resistant element will not be compromised by the action of fire. As certain types of fixing components may not be suitable, the manufacturers fixing instructions must be followed.

High Pressure Exerting Sealants are to be installed into an oversize aperture in the separating element, surrounding the penetrating service. If there is a fire risk on both sides of a compartment wall or floor, HPE sealant may be required on both sides. The high-pressure exerting sealant is to be installed to a prescribed annular gap to a predetermined depth between the service penetration and the constructing element and in line with the manufacturer's instructions. The backing material for these sealants should be checked before use to ensure they are approved. High pressure exerting sealants tested in a rigid wall may not work when tested in a flexible wall without suitable framing out. The installers should check that the supporting fire test evidence is applicable for the end use application envisaged.

## **Cautionary note – CPVC pipes**

Care should be taken when fire-stopping around CPVC sprinkler pipes because there have been compatibility issues with some fire retardants and plasticisers in fire-stopping products reacting with the CPVC pipes and causing integral damage (fracture) to the pipes in the non-fire condition. Some manufacturers of pipes carry a listing of tested and approved fire-stopping products. However, the best way to be sure is to use a third party certificated fire-stopping product that has been tested for compatibility by the manufacturer. Manufacturers of fire-stopping collars and other pipe closure will be able to advise on any compatibility issues.

## **Plugs / blocks**

### **Description**

Plugs / blocks to fit around cables and pipes are to be formed from materials such as bonded vermiculite, mineral wool, gypsum or cementitious materials, polyurethane, modified rubber, etc. Fire-stopping plugs/blocks to be used shall be in a variety of shapes and sizes and suitable for the proposed location such as, rectangular blocks for rectangular penetrations or cylindrical/conical for circular penetrations. Pre-formed trapezoidal plugs/blocks are available for sealing openings below profiled metal decking.

### **Areas of Use**

Plugs/blocks are to be used for a wide variety of fire-stopping requirements. They can be used individually in small penetrations or in multiple layers for larger openings. They are useful where services require occasional re-routing.

## **Installation**

Fire-stopping plugs/blocks can be used individually where the penetration is small, or in multiple layers for larger openings. The various types can be loose laid, compression/friction fitted, or bonded together. Some types will require a fire-resistant sealant to be applied along joints and interfaces. For circular penetrations, cylindrical or conical plugs/blocks can be used.

Some plugs/blocks, such as those based on calcium, potassium, or sodium silicate, (e.g. bonded vermiculite plugs/blocks) may require additional protection in high humidity environments.

Specialist advice from manufacturers should be sought where these materials are to be used in combination with other fire-stopping materials.

## **Cavity barriers**

Cavity barriers are defined as a construction, other than a smoke curtain, designed to close a concealed space, such as that in a cavity wall or ceiling void, against penetration of smoke or flame, or provided to restrict the movement of smoke or flame within such a space. Cavity barriers require special attention from the designer. By their very nature they are usually hidden once installed and are therefore difficult to inspect after installation, handover and subsequently through the life of the building. However, the barrier will not become effective until it has been covered up and post-installation inspection could affect the usefulness of the cavity barrier by opening the works.

Cavity barriers can be divided into two types: 'small' cavity barriers e.g. those used within the leaves of a masonry wall and 'large' cavity barriers which can be several metres high/wide which are used to divide large, enclosed spaces e.g. in under floor voids and within roof spaces. Small cavity barriers are usually made from stone wool slabs and strips or preformed elastomeric seals.

Large cavity barriers are usually made from either non-combustible fabric such as glass or ceramic cloths or are fabricated e.g. from stone wool curtains.

## **Areas of Use**

Cavity barriers are used: around window frames, within cavity walls (masonry and in timber frame constructions) in floor voids e.g. below raised floors, and in ceiling spaces and roof voids.

## **Installation**

Particular care is required in the installation of some types of cavity barriers e.g. those within cavity walls because they will become inaccessible after installation and so cannot be inspected or maintained.

## **Performance**

### **Open cavity barriers e.g. for rain-screen cladding**

#### **Description**

Open cavity barriers to be installed in rain screen cladding systems are to be cavity barriers which are open to allow ventilation and drainage in the cold state, but which either close in a fire, or are inherently fire resisting providing fire separation in the cavity. They are to be made from stone wool slabs faced with aluminium foil together with a reactive component such as an intumescent which causes the seal to close in fire.

## **Areas of Use**

Open cavity barriers are to be used in ventilated rain screen cladding, roof ventilation, eaves, within internal walls in buildings and other areas where ventilation is required in the cold state. As with ordinary sealed cavity barriers, they are not normally intended to act as fire separating elements which have higher requirements for fire resistance.

## **Installation**

Particular care is required in the installation of some open cavity barriers as these are normally difficult to access after installation. For this reason, the use of specialist contractors is recommended.

## **Performance**

Open cavity barrier systems are to have been fire tested in line with the Accreditation bodies fire test methods for open state cavity barriers for the comparative fire testing of open state cavity barriers. A variant of this has been put forward in CEN and it is intended that this will be correlated with large scale facade and cladding tests.

## **Fire barriers**

### **Description**

Fire barriers are to be large curtain type barriers which are to be constructed from either non-combustible fabric such as glass or ceramic cloths or are fabricated from stone wool curtains incorporating a reinforcing mesh.

## **Areas of Use**

Although fire barriers to be used as large cavity barriers to continue the compartment line of a fire resisting wall up to a roof or to the underside of a compartment floor. They are to be used to seal large openings, which commonly occur within roof spaces or ceiling voids and they must maintain the Integrity and Insulation rating of the wall that they are continuing.

## **Installation**

Particular care is required in the installation of fire barriers e.g. those within timber roof spaces because in many cases they will require the protection of the supporting substrate. Fire barriers are usually hung as a curtain from a metal angle/frame system.

The Contractor is to confirm the number of minutes the system shall give in terms of fire integrity and fire insulation required for cavity barriers

## **Curtain wall seals - fire-stopping at junctions of floors slabs**

These products manufactured from stone wool are to be used in conjunction with metal support systems and/or mastics/self-levelling or sprayed compounds to seal the gap between a floor slab and a curtain walling system. Throughout their lifetime these fire-stopping systems are to be able to withstand large amounts of movement due to dynamic loading of the superstructure, as well as the seismic and fire loads imposed on the curtain wall system. These deflections can be large in magnitude in comparison with the void dimension being sealed.

## **Areas of Use**

Generally used between compartment floor slabs and curtain walling systems to maintain compartmentation.

Curtain walling fire-stopping systems are to be installed as pre-formed shapes or as standard sized products that are cut to shape onsite. The effectiveness of the fire-stop will depend on the ability of the curtain walling/cladding system to maintain the compression fit for the duration of the required fire resistance period. Unless the system is installed pre-compressed and can move to maintain compression, premature failure of the fire-stopping may occur.

Some systems require secondary support and/or the use of mastics/self-levelling or sprayed compounds.

These requirements will vary from manufacturer to manufacturer.

## **Performance**

Edge of slab fire-stopping should only be used if tested to BS EN 1364-4 and within the field of application of the particular system, since the fire resistance periods obtained may vary from one curtain wall system to another.

## **Classification of Curtain Wall Fire-Stopping**

Curtain wall fire-stopping tested to BS EN1364-4 is classified into two curtain wall types;

Curtain Wall Type A – Non fire rated curtain walling.

This is only fire resisting in the spandrel zone i.e. it is a typical curtain walling system made from aluminium with no fire resistance – Curtain Wall Type B – Fully Fire Rated Curtain Walling. This is a steel based or upgraded fire protected aluminium system

Note: materials tested in Curtain Walling Type B cannot be utilised to assess performance for Curtain Walling Type A

BS EN 13830: 2015: Curtain walling — Product Standard; is the harmonised product standard for curtain walling. (see 7.5 for more information on CE marking). The standard contains the following statement with regards to compartmentation

“5.4 Fire propagation (to upper levels) Partial configuration of curtain walling kit shall be tested in accordance with EN 1364-4. Test results shall be classified in accordance with EN 13501-2”

## **Stone wool mineral fibre slabs and strips**

### **Description**

Stone wool products for fire-stopping are supplied in a number of forms; typically referred to as mats, batts, or pre-formed shapes.

## **Areas of Use**

Stone wool products are those that are manufactured for a specific purpose such as rain screen systems, cavity barriers, heads of walls, blank seals and penetration seals, as used for fire sealing of voids through compartment walls and floors.

## **Installation**

Stone wool products are installed as pre-formed shapes or components designed to carry a specific firestop purpose. Some systems may require secondary support or fixing systems and further sealing or coating to maintain a resilient seal for long term movement e.g. deflection head joints. Refer to manufacturer's instructions.

## **Foam**

### **Description**

Foams can be of the following two types; silicone based foams and polyurethane (PU) based foams. Silicone based and polyurethane fire-stopping foams are normally provided in two components which, when mixed together, cause the material to foam and increase its volume. The material cures at room temperature resulting in the formation of a highly resilient seal. Systems can be expected to prevent the passage of cold smoke, or halon gas where such use is permitted, and have good resistance to water, including flooding.

Polyurethane (PU) based foams are usually supplied in an aerosol can with a dispenser to guide and shape the resulting mix. The foam sets at room temperature to provide a seal capable of fitting around difficult to access constructions.

Note: It should be noted that one component aerosol applied polyurethane based foams may have a limited field of application for fire resistance and are generally not suitable for use in conjunction with metallic service penetrations, pipes or large or complex penetration seals. Testing indicates they have a limited use for linear joint seals such as the gaps around door frames and small/simple penetration seals. Fire resistance periods are also generally less than those which can be achieved with silicone foams or other types of firestop. It is essential that the designer, specifier and installer work within the limitations of the product concerned.

This warning is highlighted here in respect of aerosol applied PU foams due to the widespread abuse of such products where they are used in situations where their performance is not supported by appropriate and relevant testing.

Neither silicone nor PU foams, floor seals would be considered load bearing.

### **Area of Use**

Suitable for the fire-stopping of service openings through compartment walls and floors, particularly where access is difficult and where there are complex spaces between groups of services.

## **Installation**

Metered mixing is essential and reaction times will vary. Some manufacturers supply these as easily dispensed pre metered self-mixing cartridges. In the case of aerosol PU foams, this is provided by the aerosol can.

Manufacturer's instructions must be referred to, ensuring the correct installation of the seal. Temporary or permanent damming boards may need to be used to contain the expanding mixture. Where permanent damming boards are used their presence must not adversely affect the fire performance of the finished seal and specialist advice should be sought.

## **Cable transits and sleeves**

### **Description**

These are to be preformed firestopping units that can easily facilitate the removal, replacement and addition of cables at any future point. Some of these systems are made in such a way that they have explosion and blast resistance properties as well as high water table resistance.

### **Areas of Use**

In walls or floors where cables have to be moved, changed or replaced on a regular basis without disturbing or damaging the fire resistant properties of the fire-stop seal and therefore the building element. They are to be used where there are active working environments where shut downs to replace and reinstate traditional fire-stop would be inconvenient and disruptive.

### **Installation**

These are generally mechanically assembled and fixed into openings. They are opened and closed with a simple hand action or are assembled using pre-made sealing units. Refer to manufacturer's instructions.

### **Ductwork and damper penetration sealing systems**

The fire performance of fire resisting and smoke extraction ducts and fire or smoke control damper systems and their associated penetration seals is determined by fire tests particular to those products, not to EN 1366-3 (penetration seals fire test). These fire tests include a specified fire-stopping system and significant provisions for supporting the duct or damper being tested. These should not be replaced by other systems in practice, unless additional information justifies the change.

Penetration sealing systems for cables and pipes are not suitable for ducts and dampers unless proven by test. The applicable fire tests are BS 476: Part 24 for fire resisting and smoke extraction duct and EN 1366, Fire resistance tests for service installations:

- Part 1: Ventilation ducts;
- Part 2: Fire dampers;
- Part 5: Service ducts and shafts
- Part 8: Smoke extraction ducts
- Part 9: Single compartment smoke extraction ducts
- Part 10: Smoke control dampers
- Part 12: Non-mechanical fire barriers

It should also be noted that to satisfy both criteria for fire resistance (integrity and insulation) ductwork needs to be insulated to prevent heat transmission through the fire-stop seal. It is important that the dampers are appropriately supported and restrained back to the building element or adjacent structure through which it penetrates in a manner that maintains the support and restraint function in a fire condition. Dampers must also be in line with the building element unless the manufacturer has test data to the relevant part of EN 1366 that permits an 'out of line' installation.

Mixed penetrations (ducts, dampers, pipes and cables in the same opening) should also be avoided wherever possible. It is known that heat from a duct penetration and movement due to expansion adversely affects the fire resistance of other services. The method of testing for ductwork is to a different standard than that for other service penetrations. Therefore a mixed penetration cannot be

validated by test in the strict sense of the term. In the event of a mixed penetration, advice and design of a suitable seal should be sought from a UKAS accredited laboratory, a suitably qualified fire consultant or a fire engineer with experience of mixed penetrations.

## **Partial penetration fire-stopping devices / systems**

### **Description**

Where the fire resistance of separating elements is compromised by the addition of 'partial penetrations' such as down-lighters, electrical sockets and switches, and sound systems. In such fire conditions, a premature failure may occur due to the fittings permitting a more rapid ingress of heat into the cavity of the wall, partition, floor or ceiling. Partial penetration fire-stopping devices are to be used to prevent the passage of fire through part of the separating element and usually comprise electrical socket box inserts, putty pads, intumescent pads, downlighter covers, fire protection hoods / boxes, conduit fillers, etc.

Whatever system is used, it is vital that it has been demonstrated by test and/or assessment so that the overall fire performance of the wall, partition, floor or ceiling will not be compromised.

### **Areas of use**

Where a service penetrates one part of a separating element but does not exit on the other side, a device will be required to prevent the passage of fire through or around that service.

### **Performance**

Partial penetration systems are fire tested in an ad-hoc manner based on the fire exposure conditions of BS 476 Part 20/EN 1363-1 and/or load bearing or non-load bearing requirements of walls or floors according to BS 476 Parts 21 or 22/EN 1365-2 respectively. A fire test is being developed specifically for partial penetrations and this will be put forward to CEN at the appropriate time.

In the meantime, the installers are to request the test and assessment evidence from the manufacturer that supports the use of their product in the relevant separating element. The supporting evidence must consider all factors which may influence the overall fire performance of the wall, partition, ceiling or floor, as referred to above, such as the type of outlet its position relative to the floor and of the wall construction (e.g. timber, metal framing).

## **Patressing**

### **Description**

Patressing is only to be considered where the application of penetration sealing systems e.g. for cables and pipes is only viable onto the face of the separating element rather than within the thickness of it. Patressing is usually used where it is impossible or impractical to install a penetration sealing system in the normal way and is often installed on an ad-hoc basis. There are some tested and approved patressing products that are fixed in place around cables. Patressing sealing systems include batt and mastic systems and patressing devices.

### **Areas of use**

Patressing is used where it is impossible or impractical to install a penetration sealing system in the normal way within the thickness of the separating element (wall, floor, partition, ceiling).

### **Installation**

Patressing tends to be used on an ad-hoc basis by installers where the normal installation methods cannot be used unless a manufacturer has testing and approvals for a patress detail or device. It is

important to ensure that such an installation method is covered by appropriate fire test data from the manufacturer or the installer and/or suitable technical advice in the form of engineering judgements are sought from the manufacturer. It is recommended that only specialist installers are permitted to use patressing. The installer must fully demonstrate that there is no other technical option before the Contract Administrator would consider his use of surface fixed patrasses.

### **Service supports**

The installer is to fully assess the condition and suitability of the existing M&E service supports to ascertain if they can support the service in fire. This not only assists the fire-stop in its function but also prevents the blockage of escape routes and hindrance of the emergency services. Suitable fire tested and fire rated anchors along with fire rated installation systems (e.g. formed metal channels) should be sought out and used. Some types of anchors e.g. plastic plugs and ties are not suitable for some services e.g. cables unless proven by test.

The service support centres should be as fire tested or assessed otherwise the services might collapse or distort and cause the fire-stop seal to fail prematurely.

### **Loadbearing seals**

Where there are service openings in floors, which can be subject to foot, traffic especially such as in the case of service risers where access is required for regular maintenance of the services. The fire-stop seal needs to provide resistance to the applied loads. It is possible to use non-loadbearing materials but a suitable loadbearing platform (usually consisting of secondary steel work and grating) is required. However, some fire-stopping materials can bear loads enough to negate the need for extra support. Table 1 of PD 6688-1-1:2011 gives the appropriate load action that could be applied to riser seals is to be found:

Examples of specific Use  $q_k$  (kN/m<sup>2</sup>)  $Q_k$  (kN)

Work rooms (light industrial (without storage) 2.5 1,8

Table 2: Load actions/factors from Eurocodes EN 1991-1-1: 2002

All wet-applied fire-stopping systems will take time to cure and harden before the permitted load can be tolerated. During the curing time, the installer shall display suitable warning signage and temporary barriers to prevent accidental access onto the horizontal surface and to avoid risk of injury. Any such loading could also be detrimental to the fire performance of the seal. Advice on the suitability and the design of a load bearing riser seal should be referred to the manufacturer.

### **Criteria for selection of the fire-stopping product / system**

In order to ensure the correct type of fire-stopping is specified and installed, The Installer shall in all instances consider the following issues will need to be addressed before a final selection can be made. These include:-

- a) Is the fire-stopping to be used in a wall or a floor, or a junction between fire-separating elements?
- b) If it is a floor, is it required to be loadbearing?
- c) What fire resistance period is required?
- d) How big is the gap or the opening?
- e) Does the fire-stopping have to cater for movement in the fire separating element?
- f) What kind and type of services, if any, are penetrating the construction at the opening?
- g) How many services are there?
- h) What size is each service?

- i) How close are the services positioned to each other?
- j) How close are the services positioned to the edge of the opening?
- k) Is the fire-stopping system suitable for use with the intended elements of construction?
- l) Is installation accessible for the particular type of service and fire stopping being considered?
- m) Is the seal required to have acoustic, air tightness or water resistance properties?
- n) Is it required to have a particular reaction to fire performance?
- o) Is it required to have particular electrical resistance characteristics?

### **Recommendations on fire-stopping of combustible pipes of 40mm or less**

Section 7 of the statutory guidance to the Building Regulations in England & Wales, Approved Document B, vol. 1 for dwelling houses, and section 10 of vol. 2, for buildings other than dwelling houses, provides specific guidance with respect to combustible pipes with an internal diameter of 40 mm or less.

This guidance requires that combustible pipes of 40mm internal diameter or smaller, which pass through fire-separating elements (unless the pipe is in a protected shaft), should meet the appropriate provisions in alternatives A, B or C below:

Alternative A:

Provide a proprietary sealing system which has been shown by test to maintain the fire resistance of the wall, floor or cavity barrier.

Alternative B:

Where a proprietary sealing system is not used, fire-stopping may be used around the pipe, keeping the opening as small as possible.

Alternative C: (only applicable to uPVC)

The pipe may be used with a sleeving of non-combustible pipe passing through the separating element and not less than 1000mm long on both faces

### **Walls & Floors - Head of wall**

If movement is expected, an appropriate system that can accommodate movement should be used. Ensure there are no gaps e.g. in profiled decks. If services penetrate the head of the wall joint they need to be sealed with an appropriate fire-stopping material or product.

### **Walls & Floors - Wall/floor joint**

If movement is expected, an appropriate system that can accommodate movement should be used. Facade movement must be accommodated by a flexible seal that must be adhered or mechanically fixed to the slab according to the manufacturer's guidelines.

### **Walls & Floors – Risers**

It is strongly advised that floor openings for service shafts should be sealed with a loadbearing fire seal. Plastic pipes must have pipe collars fitted to the underside of the floor or incorporated into the seal if shown by test. Any plastic/rubber in the firestop must not degrade the plastic pipe by plasticiser migration. The fire-stop should allow the pipe to move in the penetration to allow for expansion and contraction whilst maintaining a smoke seal during its normal service life.

Insulated pipes may be sealed with a pressure exerting intumescent product or intumescent sleeve to cope with shrinking insulation, or sleeved with fire-rated insulation.

HVAC dampers should be mechanically fixed to an expansion frame back to the structure. Always check with the fire damper manufacturer's fire tested/approved installation methods.

### **Walls & Floors - Access flooring**

Ensure that adequate fire barriers are in place beneath compartment walls and fire doors and at 20m maximum centres for cavity barriers. Ensure that stone wool barriers are adequately supported and in line with fire rated partitions where applicable

### **Cable trays & baskets**

Any fire seal has to have been tested for the range of cable types on site (e.g. armoured, computer etc.) and the range of diameters used. If further cables are to be added in the future, then any fire stopping may be removable or modifiable.

### **Cable trunking**

The inside of any trunking must be fire-stopped at the location where the penetration passes through the barrier. A short length of trunking lid, protruding a short distance each side of the seal, should be secured in position in line with the separating element, prior to installation of the penetration sealing system. The periphery of the trunking should be fire-stopped appropriately.

### **Electrical sockets**

When electrical outlets (back-boxes) are fitted into partition stud walls they must be fire-stopped to prevent fire penetration through the plasterboard and into the cavity using an intumescent based pad.

### **Service supports – Fixings**

The first supports for the penetrating service should be as close as possible to the seal face; and in the absence of any contrary specification positioned not more than 300mm away. The first supports for the penetrating service should use fire rated anchors, supports and other brackets able to carry the service load for the period of fire resistance.

## **Service supports - Fire curtains & cavity barriers**

Ensure that curtains are anchored to the soffit and according to manufacturer's instructions. Cavity barriers are generally not secured at their lower edge. Ensure that curtains are correctly wired/stitched or stapled together depending on the type of curtain used. Ensure that service penetrations are sleeved and that sleeves are wire stitched / stapled / glued to the curtain according to manufacturer's instructions. Ensure that cable trays are packed with recommended fire stop material when they are sleeved. If penetrating services pass through the fire curtain, ensure that there is adequate fire test evidence to demonstrate that this is acceptable.

## **Fire door frames**

Gaps between frame and wall must be fire-stopped to the same rating as the door or as per BS 8214 using a suitable fire-stopping product.

## **Plastic pipes**

Wall penetrations must have a closing device such as a high pressure exerting intumescent sealant, pipe wrap or pipe collar. Any plastic or rubber in the fire-stop must not degrade the plastic pipe by plasticiser migration. The fire-stop should allow the pipe to move in the penetration to allow for expansion and contraction whilst maintaining a smoke seal during its normal service life. Soil pipes must have a closing device installed; if it is a collar, it must be mechanically fixed to the soffit unless the manufacturer's test data supports another fixing method.

Alternative products may be used provided they have been tested. All collars must be mechanically fixed firmly against the compartment element face, unless the manufacturer's test data supports another fixing method. All collars must be secured to the element with fire-rated anchors (no wood screws and plugs nor zinc-based anchors) using all fixing brackets. Pipe wraps must be backfilled with mortar compound to the recommended depth. Pipe wraps and collars must be suitable for pipe material (PVC, PE, PP, ABP etc.). Where pipe wraps are claimed to be capable of sealing pipes without backfilling, appropriate test evidence must be supplied.

## **Metal pipes**

Seals must be flexible to allow movement. If cement has been used it must be reinforced to prevent cracking in fire and be present for the full depth of the wall or floor. Insulated pipes may be sealed with a pressure exerting intumescent sealant or intumescent sleeve to cope with shrinking insulation, or sleeved with fire rated insulation. A pipe of lead, aluminium, aluminium alloy, fibre-cement or PVCu, with a maximum nominal internal diameter of 160mm may be used with a sleeve of non-combustible pipe (1m each side of the wall), fitted with no annulus to the pipe. Fire-stopping should be provided between the sleeve and the structure.

## **Fire dampers**

Fire dampers should be situated within the thickness of the fire separating element and be securely fixed. It is also necessary to ensure that, in a fire, expansion of the ductwork would not push the fire damper through the structure. In all cases, check with the fire damper manufacturer's EN1366-2 fire tested installation methods.

Fire dampers can only be installed with the penetration seal used in the test of the fire damper to EN 1366-2. Fire-stops for solid walls and floors are usually fire resisting mortar compounds. Partition walls must have openings framed with metal studding and plasterboard before fitting of a damper unless test evidence to EN 1366-2 supports the use of an unframed opening.