



Graham Ellicott
Association for Specialist Fire Protection

Fire-stopping and penetration seals



1 Types of product

Effective fire-stopping in fire-resisting separating elements plays a critical role in containing a fire at its source, thereby reducing its effect on the primary building structure. The degree of spread is controlled by creating fire-resisting compartments which subdivide the building.

Mechanical and electrical services, by necessity, breach compartment walls and floors allowing failure of integrity and insulation to occur where gaps around services have not been adequately fire-stopped. Fire-stopping products must be able to provide sufficient insulation to the penetrating services, in order to reduce the temperature rise along conductive materials, in accordance with the required insulation criteria of the fire-separating element. In addition, the movement of smoke is often an underrated feature of fires, and needs to be considered carefully when specifying fire-stopping constructions.

Approved Document B, 2000 Edition, of the Building Regulations 1991 for England and Wales states: 'If a fire-separating element is to be effective, then every joint, or imperfection of fit, or opening to allow services to pass through the element,

should be adequately protected by sealing or fire-stopping so that the fire resistance of the element is not impaired.'

The document adds that joints between fire-separating elements should be fire-stopped, and that all openings for pipes, ducts, conduits or cables to pass through any part of a fire-separating element should be:

- kept as few in number as possible
- kept as small as practical
- fire-stopped (which in the case of a pipe or duct, should allow for thermal movement)

There is a wide range of products that are designed for use as fire-stopping and penetration seals. These include products based upon mineral wool, high and low pressure intumescent, mortars, pillows filled with fire-resistant materials, elastomers, putties, foams and mastics.

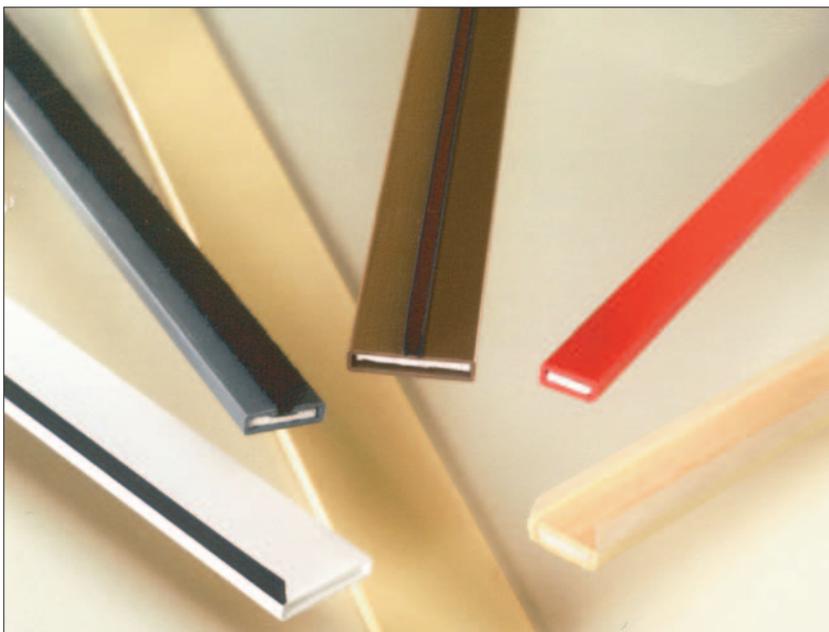
These can be divided by use:

a) Penetrations in walls and floors

- mineral fibre batts
- coated mineral fibre batts
- foams
- bags/pillows
- plugs/blocks
- pipe closures
- ducting seals
- mortars
- silicone elastomers and gels

b) Joints between construction elements

- mineral fibre batts
- foams
- bags/pillows
- intumescent
- sealant/mastics
- putties
- curtain walling seals
- preformed elastomeric seals



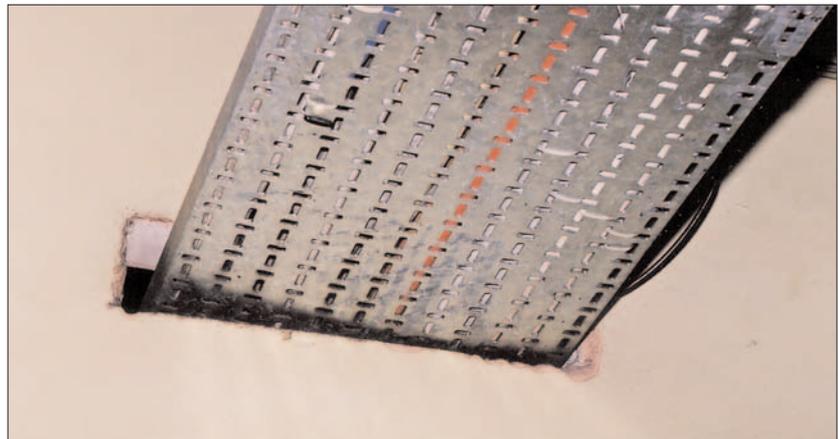
2 Design and installation issues

The use of any product can be undermined by poor application. Any work that is not of the correct quality could lead to a premature failure of a building compartment in the event of a fire. This in turn could threaten the lives of the occupants and attending firefighters. Thus it is imperative that contractors with the appropriate credentials for the work install fire-stopping and penetration seal products in accordance with the manufacturers' instructions.

Third-party accreditation schemes are in operation for installers of passive fire protection. These schemes ensure that the installing companies and their operatives have the required level of expertise to carry out the job properly. These are recognised in

Approved Document B, which states: 'Since the performance of a system, product, component, structure is dependent upon satisfactory site installation, testing 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.'

'Third-party accreditation and registration of installers of systems, materials, products or structures provide a means of ensuring that installations have been conducted by knowledgeable contractors to appropriate standards, thereby increasing the reliability of the anticipated performance in fire.'



3 Maintenance

Building managers will need to be aware of the Fire Precautions (Workplace) Regulations 1997 (as amended) and the ramifications of the impending Regulatory Reform (Fire Safety) Order. The provision and maintenance of the fire-stopping and penetration seals within a building should form part of the risk assessment for the building carried out under the Workplace Regulations (and in future the Fire Safety Order). Managers need to be aware that there may be liability issues in the failure to comply with regulations.

Where fire-stopping or penetration seal products have to be removed or have become damaged for other purposes, they must be made good as soon as possible. Ideally, where the operation and maintenance data for a building is available and the 'as-built' products can readily be procured, any changes and repairs should be carried out with the materials originally specified. Suitably skilled, experienced and accredited personnel must carry out such works, in accordance with the manufacturers' recommendations.

4 Relevant standards and other documents

Currently, fire-resistance tests for fire-stopping and penetration seal products are most likely to have test evidence created by *ad hoc* testing to BS 476: Part 20: 1987: *Fire tests on building materials and structures. Method for determination of the fire resistance of elements of construction (general principles)*. The testing is deemed *ad hoc* because there is no British Standard in existence specifically dealing with penetration and linear joint seals. However, this is all set to change.

The Construction Products Directive, a European initiative which aims to allow free trade within the European Union, has resulted in the introduction of European test methods, classification of products and CE marking. The European test methods for the fire-stopping and penetration seal products are currently still in a draft format but products are being tested to the requirements of:

(pr)EN 1366: Part 3: *Fire resistance tests for service installations: Penetration seals* provides a test method for evaluating the performance of products such as pipe closure devices, cable supporting systems (trays and ladders) and non-combustible pipe-sealing systems. Within the standard, the issues of separating wall construction,

insulation performance and pipe-end conditions are covered in a level of detail above that of current testing practice.

(pr)EN 1366: Part 4: *Fire resistance tests for service installations: Linear joint seals* provides a test method for evaluating the performance of products used for sealing between two elements of construction, such as two walls or a wall and floor slab. The standard addresses the fire test method and also considers the effect of movement on the seals. When a manufacturer claims that the seal can tolerate a certain degree of movement and still retain its fire-resistant properties, this can be proven by using the test methodology outlined in the standard.

In conjunction with the Fire Test Study Group, the Association for Specialist Fire Protection (ASFP) has published *Fire Stopping and Penetration Seals for the Construction Industry*. This publication, also known as the 'Red Book', is available as a book or as a download from the ASFP website, www.asfp.org.uk. It is recognised as the industry guide to both testing and product approval. The 'Red Book' contains third-party reviews of test reports and assessments for fire-stopping and penetration seal products.

5 Other issues

Problems may occur when the product or system has not been fire tested at all, or has test data that is not appropriate to the job at hand. In some cases, for example, it may not be possible to subject a construction or a product to a fire test because of its size, or the test data may apply to a similar, but not identical, system.

In these cases, an assessment carried out by a competent fire engineer will be required, and it is recommended that guidance in the booklet, *Guide to*

Undertaking Assessments in Lieu of Fire Tests, should be followed. This document, published by the Passive Fire Protection Federation, is available as a free download from the ASFP website or on tel: +44 (0)1252 739142. The booklet breaks down assessments into three levels of complexity: simple, intermediate and complex. It also discusses the requirements of assessors and identifies four levels of experience, which are related to the complexity of the required assessment.