ADVISORY NOTE 35

Guidance on Test Evidence of Passive Fire Protection Systems

About this document

This guidance has been published by ASFP to assist designers and other end users to determine the suitability of fire test reports as supporting fire safety information, either as stand-alone evidence or in support of assessments to evaluate the performance of a product, system or installation.

Guidance on the preparation of assessments is given in ASFP Advisory Note 34, which can be found here:- https://asfp.site-ym.com/store/viewproduct.aspx?id=24866193

Suitability of Test Evidence

Given that, for most passive fire protection products, third party certification is not mandatory, fire test reports are often used to demonstrate a product's fire performance. Unfortunately, many end-users may be unaware of the different types of fire tests that might be used, and this can result in unsuitable reports being considered when obtaining approval e.g. via Local Authority Building Control.

This document contains factors to consider in determining the appropriateness of fire test evidence. There are three main types of tests: Standard, ad-hoc and indicative.

Standard Tests

In the absence of third-party product certification, evidence of performance is best demonstrated by Standard Tests where the results are documented in a full report. The test method for a standard test are typically prepared and published by standards bodies such as BSI, or CEN. They may also be written by other bodies e.g. industry or trade associations such as the ASFP. Some standard tests incorporate product sampling requirements. Standard test methods may also include rules for extending the scope of the test result to variations on the product or installation. These rules are called Direct field of Application rules (DIAP). Where situations arise which are outside the Direct Field of Application, additional standards may be available. These help to provide an Extended Field of Application (EXAP). The DIAP and EXAP rules may be used for the generation of an assessment report, written after the testing. In some instances, it may be possible to include the DIAP assessment in the test report itself.

The content and layout of a report to a standard test method will be as defined in the test standard. The report will be comprehensive, with full details of the construction of the test specimen, including pre-sampling and conditioning details as well as the testing process, test results and

observations. The report should be reproduced in full if it is to be relied upon as the means of demonstrating performance.

Ad-hoc tests

Sometimes a standard test is used as a basis for evaluation but either the testing techniques i.e. the measurements used, or the test specimen is configured in a non-standard way. In such ad-hoc tests, both the measurement and the test configuration may be slightly or significantly different from the standard test method. Examples of test specimens configured in a non-standard way include: -

- An arrangement of cables and pipes in a penetration seal that is not allowed by the test method e.g. services too close together and/or services too close to the supporting construction (opening edges).
- A test of multiple ducts, cables, and pipes in a penetration seal.
- A test of secondary steelwork joining protected primary to evaluate thermal transfer.
- An example of a more radical departure from a standard test methodology might include the testing of 'real' three-dimensional elements such as the junction between a wall and a floor, the junction (corner) between two walls or multiple systems contained within the same wall / floor element (e.g. a wall containing doors, service penetrations).

  An even more extreme example would be a fire resistance test of a loaded beam on top of a separating element such as a partition. Such an element would need to be separating, insulating and loadbearing and would be challenging both to established products, practices, and test procedures, but would be invaluable in providing information to assist modelling real situations on site.

Such situations can still be tested using the principle and methodologies used in current standard fire resistance tests, but the test specimens being composite and multidimensional are far outside the scope of any standard method. Under normal circumstances, a product being evaluated in an ad-hoc test will already have third party certification based on testing to the appropriate full scale standard test method. Ad-Hoc testing can be used to provide supplementary secondary evidence towards a particular assessment of a product in addition to the normal standard primary testing data.

Indicative tests

Sometimes, manufacturers undertake 'Indicative tests' which are tests that generally follow the standard, but do not meet the full requirements of the standard. Examples of these are:

- the use of only one test specimen where more than one is required by the standard method to establish reproducibility. For instance, in reaction to fire testing, three or even six specimens are often required by the standard method. The use of single specimens may 'indicate' the result were a full test be undertaken, but it is only an indication.

- the use of small scale e.g. 1m × 1m × 1m fire resistance furnaces for testing items or part of items that at full scale would require the standard 3m × 3m vertical or 4m × 3m horizontal furnaces. For example, 'half height' fire doors can be tested in such furnace to give an idea of Insulation performance and burn through resistance, but a full height door in a standard test would need to be tested to evaluate thermally induced bowing which is the main cause of timber fire door failure.
- Indicative testing may also be used to check the fire performance of an alternative component or a raw material substitution.

Indicative tests are generally only used for product development. Reporting is normally by letter only, which should give the data relevant to the test result but should not interpret those results against any classification requirements. A statement should be included as follows:

"This (these) test result(s) relate to an investigation which utilised the test methodology given in (the relevant Standard); the full requirements of the Standard were not, however, complied with." Indicative testing cannot be conducted under the requirements of a laboratories UKAS accreditation.

Small scale indicative tests may not provide sufficient evidence to be used, even as secondary data as part of an assessment process.

For all types of test evidence the following should be checked.

1. **Relevance** - Check that the document submitted is relevant to the product as installed. Guidance on deciding on the relevance of supporting evidence is given in the following sections for reaction-to-fire and fire resistance tests.
2. **Completeness -** Check that all the pages are present.
3. **Appropriateness** - Check the test methods referred to in the reports is appropriate for the product or system as installed. Also check that the test has been conducted in accordance with the version of the test standard that was appropriate at the time of the test.
4. **Ad-hoc tests** - Ad-hoc tests are used when there is no formal test standard method for testing that particular end use application e.g. interfaces. They should only be used as secondary supporting evidence of performance of a product with primary test data and certification.
5. **Indicative tests** - Indicative tests are generally used for small scale or product development type tests. Indicative tests should never be used for approval on their own.

Suitability of Test evidence vs Installed product or system

Differences between the installed product and the evidence put forward to support it often means that the supporting evidence does not cover the end-use situation. In these circumstances ask the manufacturer for further evidence of the product's performance relevant to its installation.

If you are unsure whether you need further justification, the laboratory or other body e.g. a certification body can confirm if the test method is appropriate and current. If you still need further justification, ask an independent organisation to conduct a review in line with the PFPF publication 'Guide to Undertaking Technical Assessments of Fire Performance of Construction Products Based on Fire Test Evidence.'

Guidance on factors for consideration within test reports and assessments

Reaction-to-fire

For products such as wall and ceiling linings, which may be required to satisfy certain reaction-to-fire requirements (e.g. European classes B-s3, d2, or D-s3, d2) certain attributes should be checked to ensure that the product as installed complies with the evidence.

The following may affect reaction-to-fire performance: -

- Substrates - change of thickness, density, type

For example, a manufacturer having achieved a C-s3, d2 result on a fire-retardant decorative melamine laminate bonded to a C-s3, d2 chipboard seeks to use the same test evidence in support of using the laminate bonded to ordinary plywood. The reduction in density and flammability performance of the desired substrate means that such a combination is highly unlikely to achieve C-s3, d2. Substates are not normally changed unless clearly identified in the field of application of the test standards.

- Facings - change of thickness, density, type
- Composites - change of adhesives and application rate
- Coatings - change of coverage rates, number of coats
- Colour - The reaction-to-fire performance of some products may be significantly affected with colour changes. Check if the supporting documentation includes any limitations with respect to colour change.
- Mechanical - changes to the end-use condition of a product e.g. tests of a lining material bonded to a substrate being incorrectly used to justify the same lining when used stretched over a frame.
- Presence and width of Air Gap

Guidance on factors for consideration within Assessments

– Fire performance

Elements of construction – for example walls, floors, partitions may be required to satisfy periods of fire resistance (e.g. 30 minutes integrity & insulation, 60 minutes loadbearing capacity, integrity & insulation) or other relevant performances such as smoke leakage.

For products which form constructions, certain of the following attributes should be checked to ensure that the product as installed complies with the supporting evidence. The following may affect fire performance: Size, Orientation, Installation and components, symmetry, construction and materials.

- Size of test specimen - The product or system should have been tested at full size.

  This is usually in a 3m × 3m furnace for walls and a 4m × 3m furnace for floors. Tests carried out in smaller scale furnaces (e.g. 1m × 1m) can only be used for small products such as small glazed windows, access panels, linear joint seals, penetration seals etc. These cannot be used to support larger installations unless they are covered by the relevant test method or undertake further technical evaluation e.g. by an assessment conducted in line with the PFPF "Guide to undertaking technical evaluations of construction products based on fire test evidence."

  If the product is installed at much larger size than that tested then: -

  Example 1 - a rolling shutter will need further evaluation (usually by calculation) before the product may be approved.

  Example 2 - a plasterboard partition that has been subjected to an indicative fire resistance test in a small-scale furnace will not justify its use at full-scale because the small-scale test cannot evaluate: -

- Joints – often the weakest part of the construction, these are generally weaker at full size
- Shrinkage – which will be much greater at full scale
- The method of fixing the board at the periphery – which may be affected by shrinkage
- The influence of incorporating any rigid framework to support the board
- The influence of thermally induced distortion (bowing) – which is often only apparent when large scale tests are carried out.

All of these factors can only be evaluated at full scale.

- Orientation - Tests carried out in the horizontal orientation do not typically cover the vertical and vice versa

- Components - Testing of components indicates the performance of the component but does not automatically determine the effect of incorporating it into the full specimen. A link back to the full test usually by assessment is required.

  Example - a suspended ceiling protecting a structural timber floor will often include light fittings. The ceiling system alone will need to be tested to the appropriate standard (BS EN1365-1) to achieve a fire resistance performance. The effect of including a light fitting could allow excessive heat into the cavity and substantially affect the structural fire resistance of the timber floor. Data on the performance of a fitting in ceiling derived from an indicative test (1m x 1m) cannot be used unless supported by an assessment based on full-scale test data.

- Symmetry - The direction of fire resistance provided by the evidence must cover that of the installed product.

  Example - a manufacturer supplying a glazed screen carries out a test to EN 1364-1. The specimen is oriented in the furnace to represent a particular site condition. That test evidence cannot be used if the screen is required to resist fire from either side without further evaluation.

  When testing asymmetrical constructions, they should be tested from both directions unless the 'weakest' or most onerous direction can be clearly identified. The fire resistance of many constructions is highly dependent on the direction of fire attack in the test.

  Several European fire resistance standard test methods contain guidance on selecting the weakest direction and on the applicability or otherwise, of the result to the opposite direction. However, such guidance may be overruled e.g. by the requirement to test both sides e.g. as per Approved Document B requiring certain fire doors to be tested from both sides regardless of the 'weakest' direction.

- Construction - Changes to the construction, however small, may affect the fire resistance of the product and must be justified by test or assessment.

  Example - a test report describing a timber door leaf tested in a timber frame cannot be used to substantiate the performance of the same leaf installed in a steel frame due to the different thermal properties of the two framing materials. Timber shrinks in fire, causing the head and base of both leaf and frame to bow towards the heat, i.e. the leaf and frame move in the same direction. However, when the timber leaf is hung in a steel frame, the hot face of the steel frame expands, causing it to bow in the opposite direction to the leaf. Consequently, it is highly likely that the head of the leaf will bow completely out of the frame causing a significantly premature integrity failure. Furthermore, the greater thermal conductivity of steel may require the use of alternative intumescent protection to combat the effects of increased charring at the leaf edges.

- Materials - Changes in materials used in the construction will affect its fire resistance and must be justified by test or assessment.
    - General change of thickness, density, type
    - Composites change of adhesives
    - Coatings change of coverage rates, number of coats
    - Mechanical size, type and centres of fixings
    - Substrate a product will generally perform better in a concrete block supporting structure than a plasterboard supporting structure. The onsite supporting structure should be reflective of the test completed.

Variations in any of the items above may be significant. If in doubt you should go back to the manufacturer and seek further evidence to justify the performance of the product.