THE BENCH • EVIDENCE NOTE 01

The Fire Rating Is Only the Start

Why specification, exposure and maintenance matter for reactive fire-protection coatings on structural steel

Reading the evidence at application level

BENCH EVIDENCE NOTE 01 • SEPTEMBER 2026

An educational evidence note by The Bench. Not a compliance statement, product approval, certificate, fire strategy, structural assessment, thickness schedule, installation instruction or design guide. It does not assess, compare, rank or recommend any manufacturer or proprietary product.

Document control

Field	Value
Document	The Fire Rating Is Only the Start: why specification, exposure and maintenance matter for reactive fire-protection coatings on structural steel
Document type	Bench Evidence Note: an educational evidence review explaining what published evidence says, how the evidence types relate and what variables govern applicability
Publication	Bench Evidence Note 01
Prepared by	The Bench
Publisher	The Bench (This Is The Bench Ltd)
Prepared for	Specifiers, designers, structural and fire engineers, technical consultants and specification writers, with sections written to be intelligible to installers, clients, building owners and managers, distributors, approval and assurance readers and less-technical readers
Evidence baseline	The Bench's controlled review records for this note (evidence cut-off 14 September 2026): the European Assessment Document for reactive coatings, a sample of publicly available European Technical Assessments, declarations of performance, application manuals and a UK third-party certificate, official, industry and coatings-classification guidance, car-park durability research and safety-learning reports
Issue	Bench Evidence Note 01, first published September 2026
Evidence language	Five controlled conclusion categories: see "How to read this note"

What this note is, and is not. This is an educational evidence note produced by The Bench about how published evidence for reactive fire-protection coatings on structural steel is structured and how it should be read. It is not a compliance statement, a product approval, a certificate, a fire strategy, a structural assessment, a thickness schedule, an installation instruction or a design guide. It does not assess, compare, rank or recommend any manufacturer or proprietary product. It does not answer project-specific design, compliance or approval questions; those are answered by the relevant manufacturer, the appointed project professionals and the approving or assurance parties, as appropriate.

Commercial interests. The Bench and connected businesses have commercial interests in passive-fire-protection systems. This educational paper does not assess, compare, rank or recommend any individual manufacturer or proprietary product.

How to read this note

How this note was prepared. This note draws on a controlled review of primary assessment documents, recognised industry guidance and current safety-learning sources across a range of reactive-coating systems. Product-specific findings are retained internally; this public note addresses general evidence principles supported across the sources reviewed. The sample is not a census of the market, and no product was assessed. Where this note describes a pattern, it describes what the evidence sets reviewed have in common, and it says so.

Evidence language. Where precision matters, this note describes what evidence does or does not establish using five categories:

- **Supported by the applicable evidence.** The assessment or guidance covers the point directly.
- **Supported subject to stated conditions.** The evidence covers the point only where the stated conditions are met.
- **Requires project-specific confirmation.** The evidence framework does not settle the point; it needs a project answer from the manufacturer, the engineer or the approving body.
- **Not demonstrated by the evidence considered.** The documents reviewed do not show it. This is a statement about the documents, never about the product.
- **Outside the scope of this guidance.** The point sits outside what this note or the assessments it describes address.

"Not demonstrated by the evidence considered" never means not certified, non-compliant, unsuitable, unsafe or prohibited. Section 14 explains why. Terms used in this note are defined where they first appear and collected in the glossary at the end.

Contents

1. When the installed system meets the real environment

Flaking, blistering and delamination of intumescent coating were observed on perimeter steelwork in multi-storey car parks exposed to external conditions. The observation was reported to CROSS-UK, the confidential safety-reporting scheme run by the Institution of Structural Engineers with the Institution of Civil Engineers and the Institution of Fire Engineers, and published as a safety report in June 2026 (CROSS 2026). It matters. But it does not, by itself, say why the coating deteriorated or whether the technology was at fault. The report does not establish a cause, and its Expert Panel does not attribute the observations to a product defect.

What the Expert Panel does say is where to look. It frames the deterioration of intumescent fire protection through three aspects: product selection, in particular whether the system is appropriate for the prevailing service environment; application, because these systems are sensitive to installation conditions; and ongoing maintenance, because such coatings are often incorrectly assumed to be maintenance-free and can be omitted from planned regimes. A failure in any one of these, the Panel notes, may reduce fire performance.

Documented safety-learning example	CROSS-UK Safety Report 1533 (June 2026)
Observed (reporter)	Flaking, blistering and delamination of intumescent coating on perimeter steelwork in multi-storey car parks exposed to external atmospheric conditions
Established cause	Not established. The report records one professional's observations; the product, the system, its age and its environmental-use type are not stated
Control areas identified (Expert Panel)	Product selection for the service environment; application to the manufacturer's requirements; ongoing inspection and maintenance, with defects rectified in consultation with the manufacturer to the approved system specification
Lesson for readers	Visible deterioration should prompt investigation of the installed system and its evidence, not an automatic conclusion about the technology

That is the question this note is written to answer. A reactive coating is not a generic paint system. It is an assessed fire-protection system, and its performance depends on the steel member, the coating build-up, the environmental exposure, the application and the lifecycle conditions remaining within the evidence. Where deterioration is observed, the useful question is not simply whether the coating has failed. It is whether the system was correctly selected, specified, applied, protected during construction, inspected and maintained for the conditions it actually experienced. Where that cannot be established, the cause remains unresolved.

Why car parks make a useful example. Some open-sided and semi-exposed car parks subject structural steel to conditions different from a conventional enclosed interior: cycles of wetting and drying, temperature variation and, in some structures, chloride-bearing spray carried in on vehicles, together with impact risk and limited access for inspection. Published car-park durability research and steel-sector guidance describe these conditions for the structure generally; they vary between car parks, and this note does not connect any of them to the documented observation above (Henderson, Johnson and Wood 2002). Where reactive fire protection is used in such a structure, the environmental-use type of the actual system, its build-up and the arrangements for inspection and maintenance therefore matter more, not less. Not every car park uses applied fire protection, not every car park shares these conditions, and nothing in this note suggests that reactive coatings in car parks are generally problematic.

The rest of this note sets out the evidence framework that answers the question: what reactive coatings are, why a fire rating is only the start, how the evidence stack works, which variables govern application, how environmental classification works, what application, verification, inspection and maintenance add, how to read "not demonstrated", and how to check the evidence for a project.

2. Executive introduction

Reactive fire-protection coatings, including the intumescent coatings most readers will know, are one of the established ways of protecting structural steel against fire. Behind each product sits a substantial body of published evidence: a European Assessment Document that defines what is assessed, third-party assessments that report the outcome, declarations of performance, certificates, data sheets and application manuals, and a body of official and industry guidance on how such evidence should be used.

That evidence is mature and well structured. Across the evidence sets reviewed for this note, the same framework recurs: assessments express performance as tables of coating thickness against member type, exposure, fire-resistance period, design temperature and section factor, with conditions on primer, topcoat, substrate and environmental use. The framework is a strength. It lets a competent specifier find the exact thickness for a particular member, and it lets everyone else see the limits of what has been shown.

The difficulty is not the evidence. It is how the evidence is read. A headline fire rating such as "up to 120 minutes" is the upper limit of a table, not a property that travels with the product to every steel member in every condition. Whether a particular beam or column in a particular building is covered depends on a set of variables that the assessment tables distinguish and that a headline cannot. Read only at headline level, the claim can overstate what the underlying evidence establishes. Read at application level, the evidence is precise. The opening example shows why that matters in practice: an installed system can only be judged against the conditions its evidence covers.

This note asks one question throughout: does the applicable evidence cover the proposed use and all its relevant conditions?

It explains what the documents are, what each one does and does not establish, which variables govern applicability, how the environmental-use categories work, why an assumed working life is not a warranty, where application quality and in-service care sit in the picture, and how to read a gap in the evidence without turning it into a judgement about a product.

What this note covers. The evidence framework for reactive coatings applied to structural steel members: how the documents relate, what the assessed scope means, and how to ask better questions of it.

What this note does not cover. It does not assess or compare products. It does not give design temperatures, thickness values, application values or inspection intervals. It does not address the rules by which products are placed on the market in Great Britain or elsewhere, which differ between jurisdictions and are for the manufacturer and the approving body to confirm. It does not address fire protection of concrete, timber or other structures, or fire-protection routes other than reactive coatings.

3. How reactive fire-protection coatings work

A reactive coating is applied to steel as a relatively thin film. In a fire it reacts to heat: intumescent coatings expand to many times their applied thickness and form an insulating layer of char. That layer slows the transfer of heat into the steel beneath it, so the steel takes longer to reach the temperature at which it loses the strength the design relies on.

Three points follow from the mechanism, and they run through the rest of this note.

First, the coating does not have a fire resistance of its own. The fire-resistance classification is stated for the protected steel member with the coating applied at a particular thickness, under particular conditions. It is a statement about a protected member, not about a tin of paint.

Second, how much protection the layer gives depends on how thick it is, on the shape and mass of the steel it protects, and on the temperature the steel is allowed to reach. Those are the variables the assessment tables are built around (sections 6 and 7).

Third, the coating is one layer in a system. The primer beneath it, the topcoat above it and the substrate it is bonded to form part of whether the system performs as assessed (section 8).

4. Start with the evidence stack

The published evidence for a reactive coating is not one document. It is a stack of documents that answer different questions. Having one of them is not the same as that document covering the proposed use.

European Assessment Document (EAD). The EAD for reactive coatings for fire protection of steel elements, published by the European Organisation for Technical Assessment (EOTA), defines what may be assessed and how. It sets out the essential characteristics (reaction to fire, resistance to fire as the coating's contribution to the fire resistance of the protected steel member, durability under environmental exposure, adhesion, dangerous substances), the test and assessment methods, the treatment of primers, topcoats and galvanised steel, the environmental-use types and the assumed working life. The EAD states no performance for any product; it is the method (EOTA 2017).

European Technical Assessment (ETA). An ETA is a documented assessment of a product's performance in relation to its essential characteristics, issued by a Technical Assessment Body under the EAD. It is the basis for the manufacturer's declaration of performance. It reports the assessed scope: which members, which periods, which temperatures, which section factors, which thicknesses, which primers, topcoats, substrates and environmental types. It is not a certificate that a specific building's steelwork is adequately protected. ETAs are versioned and can be re-issued; the version a reader holds is not always the current one (section 15).

Declaration of Performance (DoP). The manufacturer's legal declaration of the performances it declares, by reference to the ETA. By design, a DoP condenses: it declares classes and headline periods, while the conditions attached to them (system, member type, thickness grid) sit in the ETA. Readers should go to the ETA for the condition attached to a class.

Certificate of constancy of performance. A certificate issued by a notified or approved body confirming the manufacturer's factory production control under the applicable attestation system. It does not itself establish the assessed fire-resistance scope or performance; those sit in the assessment it relates to. Holding one demonstrates a production-control status, not a fire-resistance period.

Reaction-to-fire classification. The Euroclass of the coating system (section 5).

Resistance-to-fire classification. The R period for a protected member under stated conditions, derived from test and assessment to the relevant European standard (sections 5 and 6).

Fire test reports and assessments. The test reports record what was measured on the tested sections; the assessment extends those results to the tabulated grid using one of the standard's assessment methods. UK guidance from the Association for Specialist Fire Protection (ASFP) asks that one assessment method be used for the full scope of a product's data, and that identical data sets and methods be used where a product is certified by more than one body (ASFP AN 37, 2026). Test reports and assessments are commonly held by the assessment body rather than published; that is a feature of the system, not a gap in it.

Product data sheet and application manual. The manufacturer's instructions: surface preparation, application conditions, film thicknesses, curing, repair, and the practical limits on construction-stage exposure. The assessment assumes the product is applied to these instructions.

Project-specific thickness and loading schedule. The document that turns the assessment tables into a thickness for each member on a project, using the project's section factors and design temperatures. It is a project document, produced by or for the project, and it is only as good as the inputs and the tables it draws on.

Installation and inspection records. The evidence that what was specified was applied, measured and accepted on site.

Third-party certification schemes. UK product-certification schemes exist alongside ETAs. A UK steelwork certificate structures scope in the same way (member, period, temperature, section factor, thickness) but may cite a different test basis, may route primer and topcoat compatibility and environmental questions to the manufacturer, and may state expressly that the certifier cannot opine on acceptance by Building Control.

Approved Document B accepts fire-resistance evidence by specific test, by design to standards, or by assessment applying relevant test evidence. It also warns that small differences in detail may significantly affect performance, and that assessments must not be used to avoid a necessary test (MHCLG, Approved Document B Volume 2, Appendix B). The Passive Fire Protection Forum's guide to technical assessments explains what an assessment is and who may make one (PFPF 2021). Those two documents are the reader's anchor for the evidence hierarchy in England.

The evidence stack

CONCEPTUAL DIAGRAM — NOT TO SCALE — DIAGRAMMATIC ONLY

Each document answers a different question. Having a document is not the same as that document covering the proposed use.

DOCUMENT	ANSWERS THE QUESTION	ISSUED BY and what it does not establish
European Assessment Document (EAD)	What may be assessed, and how	EOTA Does not establish: Any performance for any product (it is the method)
Fire test reports and assessment	What was measured on the tested sections; how the results extend to a tabulated scope	Laboratory; assessor. Usually held by the assessment body, not published
Reaction-to-fire and resistance-to-fire classifications	The Euroclass of the system; the R period of the protected member	Classification body Does not establish: Project suitability
European Technical Assessment (ETA)	The assessed scope: members, periods, temperatures, section factors, thicknesses, primers, topcoats, substrates, environmental types	Technical Assessment Body Does not establish: That a specific building's steelwork is adequately protected; installation quality; a warranty
Declaration of Performance (DoP)	The performances the manufacturer declares, by reference to the ETA	Manufacturer Does not establish: The conditions attached, which sit in the ETA
Certificate of constancy of performance	Factory production control status under the attestation system; relates to a specific assessment issue	Notified or approved body Does not establish: The assessed fire-resistance scope or performance (those sit in the assessment)
Data sheet and application manual	Preparation, application conditions, thicknesses, curing, repair, construction-stage limits	Manufacturer Does not establish: Assessed performance
Project thickness and loading schedule	The thickness for each member on this project, from the tables plus the project's section factors and design temperatures	Produced by or for the project Does not establish: Anything beyond the tables it draws on
Installation and inspection records	That what was specified was applied, measured and accepted	Applicator; inspector

UK third-party certification schemes sit alongside ETAs: a steelwork certificate structures scope the same way (member, period, temperature, section factor, thickness) but may cite a different test basis and may route primer, topcoat and environmental questions to the manufacturer.

None of these documents, on its own, establishes that a particular member in a particular building is covered.

Figure 1. The evidence stack. Each document answers a different question. None of them, on its own, establishes that a particular member in a particular building is covered. Conceptual diagram; generic document types only.

5. Reaction to fire is not fire resistance

Two different properties are often run together in product literature and in conversation. They answer different questions and are measured to different standards.

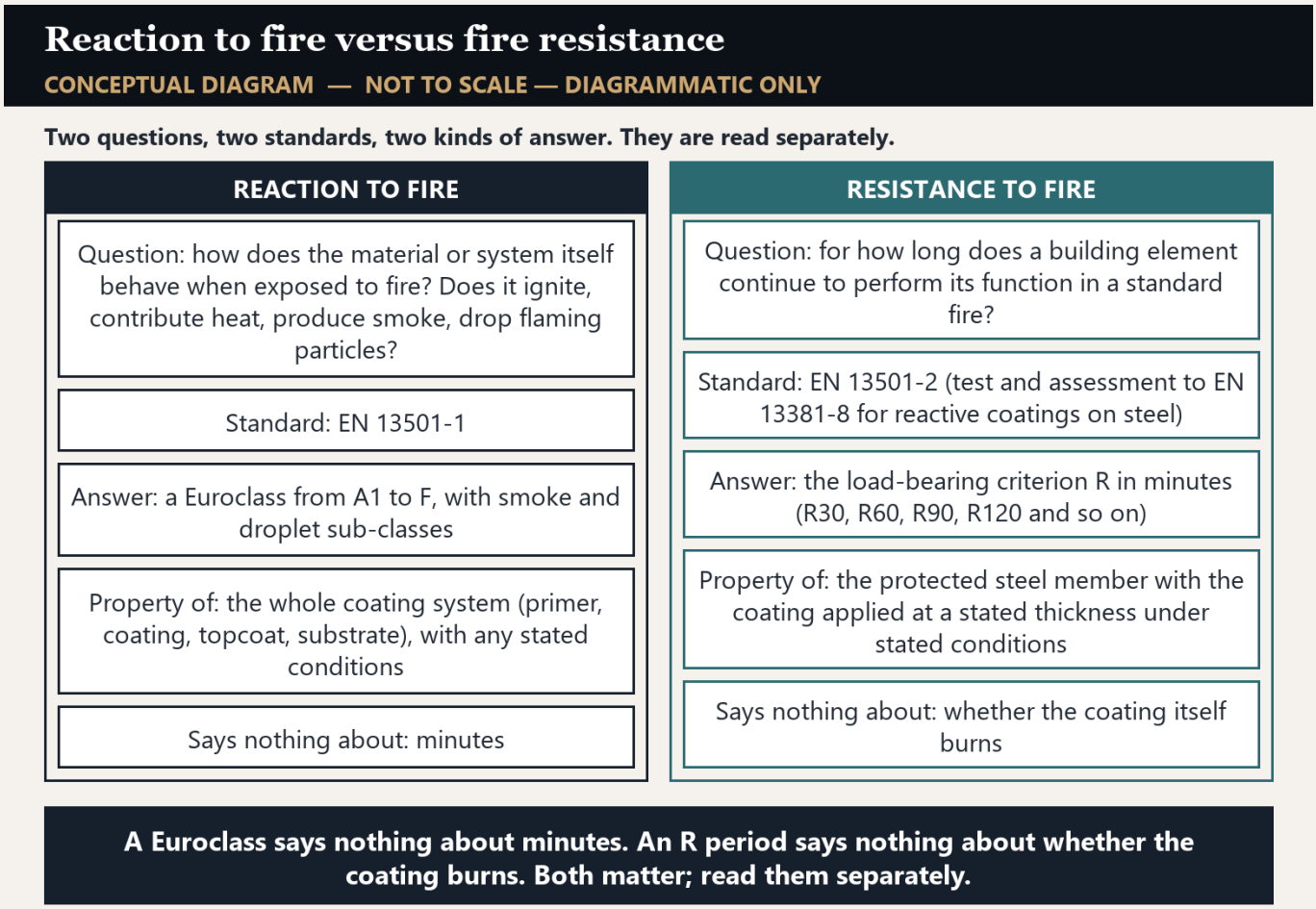


Figure 2. Reaction to fire versus fire resistance. Two questions, two standards, two kinds of answer. Conceptual diagram.

Reaction to fire asks how the material or system itself behaves when exposed to fire: whether it ignites, contributes heat, produces smoke or drops flaming particles. It is expressed as a Euroclass from A1 to F, with smoke and droplet sub-classes, under EN 13501-1. For a reactive coating the reaction-to-fire class is a property of the whole system: primer, coating, topcoat and substrate, sometimes with a minimum steel thickness attached. Across the evidence sets reviewed, the class varies between system combinations of the same product. A class stated without its conditions is incomplete.

Resistance to fire asks for how long a building element continues to perform its function in a standard fire. For structural steel this is the load-bearing criterion R, expressed in minutes (R30, R60, R90, R120 and so on), under EN 13501-2. The classification belongs to the protected member with the coating applied, not to the coating.

A Euroclass says nothing about minutes. An R period says nothing about whether the coating itself burns. Both matter, and they must be read separately.

6. Why "up to 120 minutes" is incomplete

This is the central section of the note.

An assessment does not report a single period for a product. It reports tables. Across the evidence sets reviewed, assessed fire-resistance performance is expressed as tables of coating thickness against member type, exposure, fire-resistance period, design temperature and section factor. "Up to 120 minutes" is a summary of the upper limit of such a grid. It is true, and it is not enough.

The variables that the tables distinguish, and that a headline cannot, are these.

Beam or column. Beams and columns are tested and assessed separately.

Open or hollow section. Open sections (I and H shapes) and hollow sections (circular, square and rectangular) have their own tables. Data for I and H sections is commonly extended to channels, angles and tees at the same section factor.

Exposure. Three-sided beam data is tested with a concrete slab over the top flange. Four-sided beams are commonly covered through column tables with an explicit maximum thickness. Hollow sections, and columns exposed on all sides, are assessed as such.

Section geometry and section factor. The section factor expresses how much heated surface a section has for its mass (section 7). Every table has a lower and an upper section-factor limit.

Design (critical) temperature. The temperature the steel may reach before it can no longer carry its design load in fire (section 7). The tables give thicknesses for a range of temperatures; they do not cover every value.

Dry film thickness. The thickness of the reactive coating itself that carries the period for that combination of member, exposure, temperature and section factor. The thickness in the assessment is the required minimum on site.

Primer, topcoat and substrate. The system arrangement under which the tables apply (section 8).

Surface preparation and galvanised steel. The substrate condition and route the assessment covers (section 8).

Environmental use. The environmental-use type or types assessed, which may depend on the topcoat (section 9).

Application and inspection conditions. The conditions the manufacturer's instructions and industry codes attach to applying and accepting the coating (section 12).

The variables behind a headline fire rating

CONCEPTUAL DIAGRAM — NOT TO SCALE — DIAGRAMMATIC ONLY

A headline period such as R120 is one result within an assessed table. The table's axes, and the conditions the table applies to, are shown here without values. Variables are not of equal weight and do not apply identically to every system.

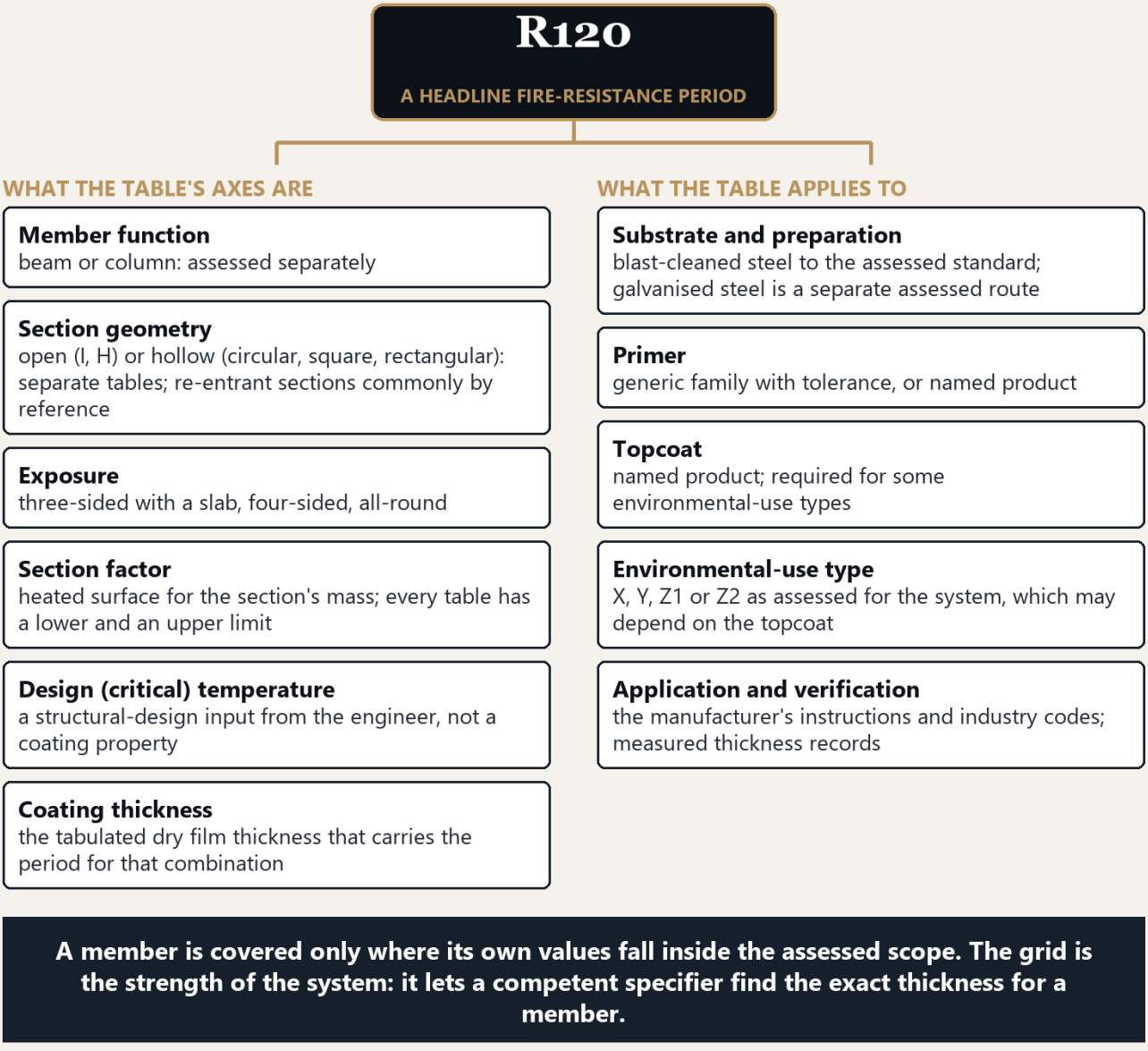


Figure 3. The variables behind a headline fire rating. A headline period such as R120 is one result within a table whose axes are the variables shown, and the table applies only to the system, substrate, environment and application it was assessed for. A member is covered only where its own values fall inside the assessed scope. Variables are not of equal weight and do not apply identically to every system. Conceptual diagram; no values shown.

Three further points prevent the tables being misread.

Assessments commonly tabulate periods other than the standard classes, for example 20, 75, 105 or 150 minutes, and some tables have no thickness for certain combinations. A blank cell is a limit of the assessed scope. It is not a failure.

Some member types sit outside the scope of the European test standard for reactive coatings on steel (EN 13381-8), or are commonly not addressed in an assessment under the EAD: cellular beams and other beams with web openings, tension members, cast iron and concrete-filled hollow sections are the usual examples. Separate assessment routes exist for some of them (for cellular beams, EN 13381-9 and the ASFP protocol), and manufacturers may hold that evidence. For a reader of a standard assessment they are outside the scope of that document, and need their own evidence.

Assessed scopes legitimately vary. Across the evidence sets reviewed, different products cover different members, periods, temperature ranges, thickness ranges, primer and topcoat routes and environmental types. Not every product uses every variable identically. A narrower assessed scope is not a weaker product and a wider one is not a better product; each is a statement of what has been demonstrated. The task is to match the proposed use to the scope, not to compare scopes.

What this means for a specification. Because the evidence is a table, not a number, a specification that says only "60-minute intumescent" or "R120 intumescent coating" does not identify what the evidence needs in order to answer. A technically meaningful specification carries, as applicable to the project: the member type and its exposure; the fire-resistance period; the critical or design temperature; the section factor range; the required dry film thickness; the primer, topcoat and substrate system; the environmental-use type; the application conditions; and the inspection and maintenance information to be handed over. Industry codes of practice set out these items (ASFP TGD 11, 2014; ASFP AN 12, 2021). This is what the evidence requires; it is not a comment on how often specifications fall short of it.

7. Section factor and critical temperature

Two of the table axes are inputs that come from the structure, not from the coating. Reading an assessment properly means knowing where they come from.

Section factor. A steel section heats up faster when it has more surface exposed to the fire for each unit of its mass. The section factor captures that ratio: a slender section with a lot of exposed surface has a high section factor and heats quickly; a heavy, compact section has a low section factor and heats slowly. Section factor drives thickness: for the same period and temperature, a higher section factor needs a thicker coating. Assessed and certified ranges have upper and lower limits, and industry guidance warns against using a maximum tested thickness on a section factor above the listed range (ASFP AN 12, 2021). The section factor of a member also depends on how many sides are exposed, which is why exposure appears as its own variable.

Design (critical) temperature. The critical temperature is the temperature at which a particular steel member, carrying its particular load in the fire condition, can no longer do its job. It is a structural-design input, derived by the structural or fire engineer from the member's utilisation, not a property of the coating. The assessment tables give thicknesses for a range of design temperatures; the project's engineer supplies the value to enter the table with. UK industry guidance publishes default critical temperatures for use where a project-specific value has not been derived; those defaults were revised in the sixth edition of the ASFP Yellow Book, as ASFP guidance explains (ASFP AN 38, 2026), and ASFP guidance advises that where a critical temperature above 650 °C is specified, a second opinion should be sought from a structural engineer with appropriate fire design and engineering experience (ASFP AN 12, 2021; ASFP AN 19, 2021). This note does not reproduce default values. The point for the reader is that a different design temperature moves the reader to a different row of the table. It is a project structural or fire-design input, not a property of the coating, and the coating assessment does not determine it.

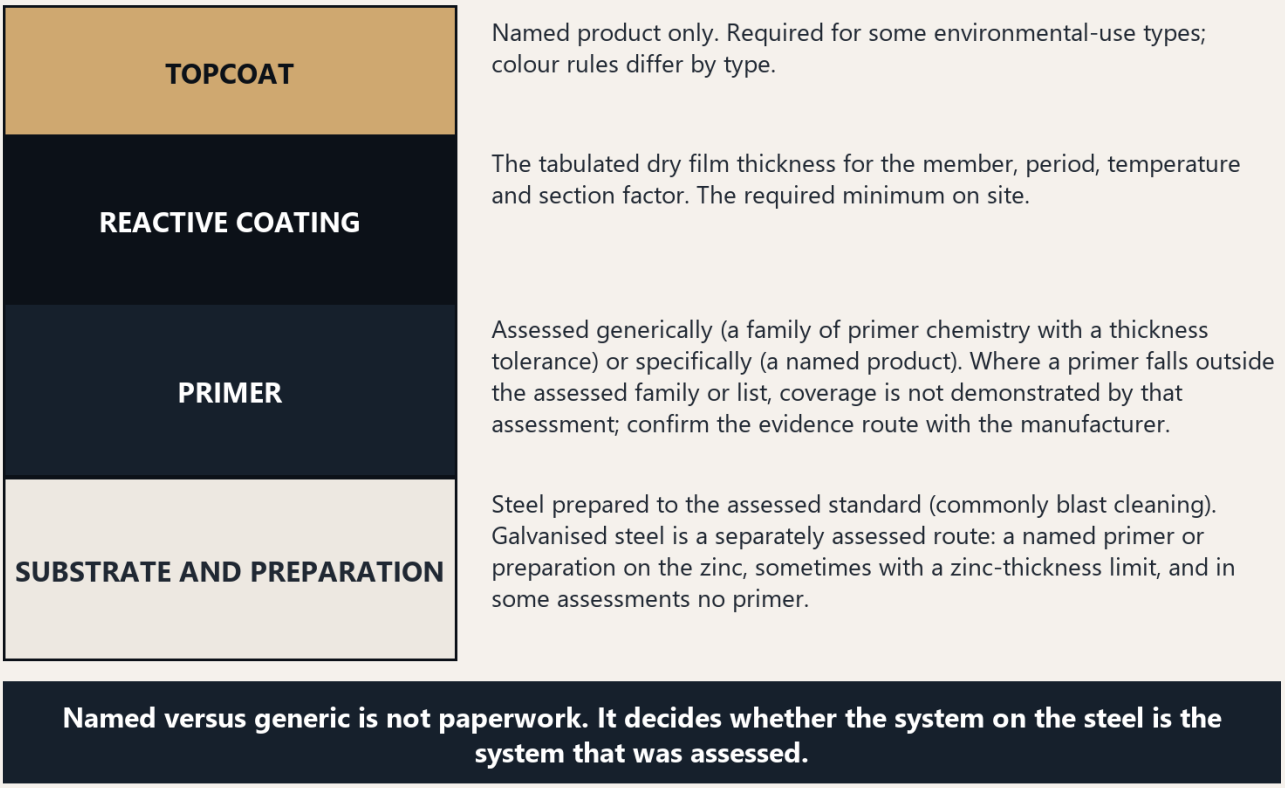
8. Primers, topcoats and galvanised steel

The reactive coating is not an isolated layer. It is bonded to a prepared substrate, usually over a primer, and often under a topcoat. The assessment covers the system arrangement that was tested and assessed, and the system is where a large share of applicability questions arise.

The protective coating system

CONCEPTUAL DIAGRAM — NOT TO SCALE — DIAGRAMMATIC ONLY

The reactive coating is one layer in an assessed system. Each layer's coverage depends on the assessment. Not to scale.



Named versus generic is not paperwork. It decides whether the system on the steel is the system that was assessed.

Figure 4. The protective coating system. Substrate and surface preparation, primer, reactive coating and topcoat. Each layer's coverage depends on the assessment; galvanised steel is a separately assessed substrate route. Conceptual diagram; not to scale.

Surface preparation. Every assessment reviewed states the surface preparation it assumes, commonly blast cleaning to a stated standard. Some assessments include other prepared substrates; most do not.

Primer. Under the EAD, primers are assessed in one of two ways: generically, as a family of primer chemistry tested on a representative product, with a thickness tolerance; or specifically, as a named product. Across the evidence sets reviewed, both routes are common, and some assessments name primers only. Where a primer already on the steel falls outside the assessed family or the named list, coverage is not demonstrated by that assessment; the applicable evidence route should be confirmed with the manufacturer.

Topcoat. Topcoats are commonly assessed by named product. For the harsher environmental-use types the EAD does not allow a generic approach, and colour rules differ by type. Where a topcoat is required for an environmental type, the assessment names it.

Galvanised steel. Galvanised steel is treated as a separate substrate. It is commonly covered only through a named route: a named primer or preparation applied to the zinc surface, sometimes with a limit on the zinc coating thickness, and in some assessments a route with no primer at all. A galvanised member is covered only where the assessment includes the galvanised route the project intends to use.

The consequence is simple to state. "Named versus generic" is not paperwork. It decides whether the system on the steel is the system that was assessed.

9. Environmental use categories

The EAD assesses the durability of a coating's fire performance under environmental exposure by exposing test specimens to defined climatic cycles and checking that the insulating performance is retained. The result is expressed as one or more environmental-use types. The EAD defines them as follows (EOTA 2017):

- **Type X:** fire protective coating products or kits intended for all climatic conditions (internal, semi-exposed and exposed to weather).
- **Type Y:** intended for internal and semi-exposed conditions. Semi-exposed includes temperatures below 0 °C, but no exposure to rain and limited or casual exposure to UV (the effect of UV exposure is not assessed).
- **Type Z1:** intended for internal conditions with humidity equal to or higher than 85 % RH, excluding temperatures below 0 °C.
- **Type Z2:** intended for internal conditions with humidity lower than 85 % RH, excluding temperatures below 0 °C.

The types nest. A product that meets Type X meets all the other types; Type Y also meets Z1 and Z2; Z1 also meets Z2.

Three points matter in practice.

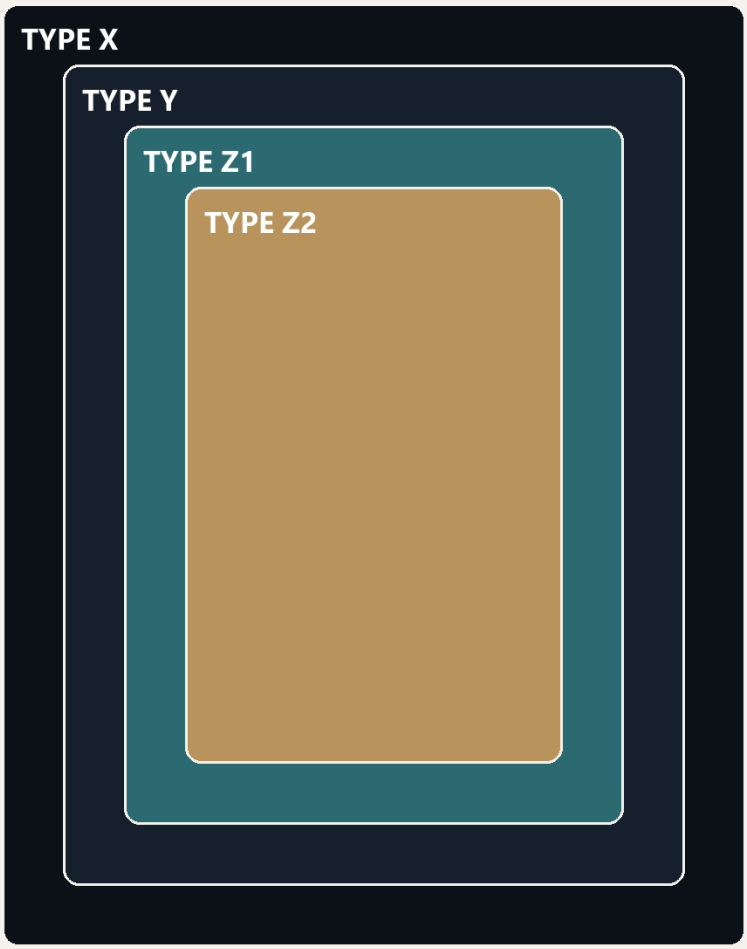
Assessed types vary between products, and can depend on the topcoat used. Across the evidence sets reviewed, some products are assessed for all four types, some for internal types only, and several make Type Y or Type X conditional on a named topcoat. Recognised safety-learning commentary makes the same point from the other direction: the selected system must be confirmed as appropriate for the prevailing service environment, particularly where steelwork is exposed to external conditions (CROSS 2026). Suitability for exposure is an assessed property, and several of the assessments reviewed demonstrate it.

The types exist because environmental conditions matter to retained fire performance. The assessment tests whether the insulating performance survives defined exposure, and industry guidance explains that reactive coatings are more susceptible to moisture and UV exposure than the steel they protect, which is why a separate durability classification is used for them rather than the corrosivity categories used for protective paints (BCF 2017). Type selection is therefore part of system selection, not a label added afterwards. The same guidance gives exposed outdoor car parks and low-salinity coastal locations as examples of conditions calling for Type X, and sheltered locations under canopies, or internal locations that are constantly damp, as examples of Type Y (BCF 2017); the project's own conditions decide which applies, and exposed or semi-exposed conditions need a system assessed for them.

Environmental-use Type hierarchy (EAD 350402-00-1106)

CONCEPTUAL DIAGRAM — NOT TO SCALE — DIAGRAMMATIC ONLY

The EAD assesses whether the fire performance is retained after defined climatic exposure cycles. The result is one or more environmental-use types. The types nest: X meets all other types; Y also meets Z1 and Z2; Z1 also meets Z2. The type is a property of the assessed system and may depend on the topcoat.



TYPE X
Fire protective coating products or kits intended for all climatic conditions (internal, semi-exposed and exposed to weather)

TYPE Y
Intended for internal and semi-exposed conditions. Semi-exposed includes temperatures below 0 °C, but no exposure to rain and limited or casual exposure to UV (the effect of UV exposure is not assessed)

TYPE Z1
Intended for internal conditions with humidity equal to or higher than 85 % RH, excluding temperatures below 0 °C

TYPE Z2
Intended for internal conditions with humidity lower than 85 % RH, excluding temperatures below 0 °C

ENVIRONMENTAL-USE CATEGORY ≠ CORROSIVITY CATEGORY

ISO 12944-2 corrosivity categories (C1 to C5, CX) describe how aggressive an atmosphere is to steel. EAD types describe where the fire performance has been shown to persist. There is no conversion from one to the other; this note draws no equivalence.

Assessed types vary between products and can depend on the topcoat. Changing or omitting the topcoat, or using an unassessed primer, can change which type the evidence supports.

Figure 5. Environmental-use Type hierarchy. Nested types X, Y, Z1 and Z2 with the EAD definitions. The type is a property of the assessed system and may depend on the topcoat. An environmental-use category is not a corrosivity category. Conceptual diagram.

An environmental-use type is not an ISO 12944 corrosivity category. ISO 12944-2 classifies the corrosivity of an atmosphere to steel (categories C1 to C5 and CX), and ISO 12944-1 sets out durability ranges for protective paint

systems. The EAD tests the retention of fire performance after climatic exposure, and brings ISO 12944 in only where a manufacturer claims that the coating system also contributes corrosion protection. A corrosivity category describes how aggressive the environment is to the steel; an environmental-use type describes where the fire performance has been shown to persist. There is no conversion from one to the other, and this note deliberately draws no equivalence. Industry guidance has recorded confusion in the construction sector where corrosivity categories were used to specify reactive coatings, and states that a system meeting a given environmental-use type does not thereby meet a particular corrosivity category, or the reverse (BCF 2017).

The exact primer, topcoat and system arrangement matters. Because the type is assessed for a system, changing the topcoat, omitting it, or using an unassessed primer can change which type the evidence supports.

10. Temporary exposure during construction

A coating assessed for internal use may be exposed to the weather during construction, before the building envelope is closed. The EAD anticipates this. It provides two routes: special provisions to protect the coating temporarily, in accordance with the manufacturer's instructions referenced in the assessment, or assessment of the product for exposed conditions, as Type X (EOTA 2017). Manufacturers' application manuals carry the practical limits, and industry codes of practice address protection during transport, handling and erection, and the treatment of coatings applied off site (ASFP TGD 11, 2014; ASFP TGD 16, 2010).

This note does not prescribe site solutions. The point is that construction-stage exposure needs to sit within manufacturer-supported arrangements or other appropriate evidence and instructions. It is not answered by the fire-resistance table.

11. Working life is not a warranty

Every assessment reviewed carries an assumed working life. The EAD's assessment methods are written for a working life of ten years when the product is installed in the works and subject to appropriate installation; a longer assumption may be made only with documented proof. The EAD is explicit that indications of working life cannot be interpreted as a guarantee, whether by the manufacturer, by EOTA or by the assessment body, and are regarded only as a means of expressing the expected economically reasonable working life of the product (EOTA 2017). The period is not the same in every assessment, and the assumption is tied to the assessed environmental type and to correct installation.

Four things are easily confused here and should be kept apart.

- **Assumed working life** is an assessment assumption. It is expressly not a guarantee.
- **Commercial warranty** is a contractual promise by a manufacturer or applicator, on its own terms and conditions. It is a different document from a different party.
- **Expected service life** is what the owner reasonably expects in the building's actual conditions. It may be longer or shorter than the assessment assumption.
- **Maintenance programme** is what keeps the installed protection in the condition the assessment assumed. An assumed working life is not a maintenance-free period.

A ten-year figure in an assessment is not a product-life claim, and this note does not treat it as one.

12. Application and quality control

Performance depends on more than selecting a product whose assessment covers the use. The assessment assumes correct application. The evidence that application was correct is generated on site or in the shop, under the manufacturer's instructions and industry codes of practice, and it is a separate document set from the assessment.

The EAD states that the dry film thickness given in an assessment is the required minimum thickness on site, and its Annex G includes rules for evaluating measured dry-film thickness: the mean thickness on a member at least the specified value, the mean on any face at least 80 % of it, isolated low readings bounded in number and none below half the specified value (EOTA 2017, Annex G). Industry codes carry the same discipline into practice and require measured records for each member (ASFP TGD 11, 2014). Acceptance on a project follows the applicable assessment, the manufacturer's instructions, the project specification and the applicable industry code or inspection regime; this note describes the framework, not an inspection procedure. Recognised safety-learning commentary adds that reactive coating systems are sensitive to installation conditions, that manufacturers specify substrate preparation, temperature, humidity and application procedures, and that failure to follow them can impair adhesion, film formation and coating integrity from the outset (CROSS 2026).

At an educational level the elements are these, each governed by the manufacturer's instructions and the applicable code, not by this note:

- substrate preparation to the assessed standard, and primer thickness records;
- application environment: temperature, humidity and the manufacturer's limits;
- wet-film checks during application where the manufacturer uses them, and dry-film thickness measurement on every member against the schedule;
- curing before topcoat, handling or exposure;
- damage during transport and erection, and repair to the manufacturer's instructions for the assessed system, in consultation with the manufacturer where needed;
- inspection against the specification, and records that trace each member to the thickness applied and the system used.

This note is not an application manual and gives no application values. It records where the values live: in the manufacturer's instructions, the industry codes and the project specification.

13. After installation: inspection and maintenance

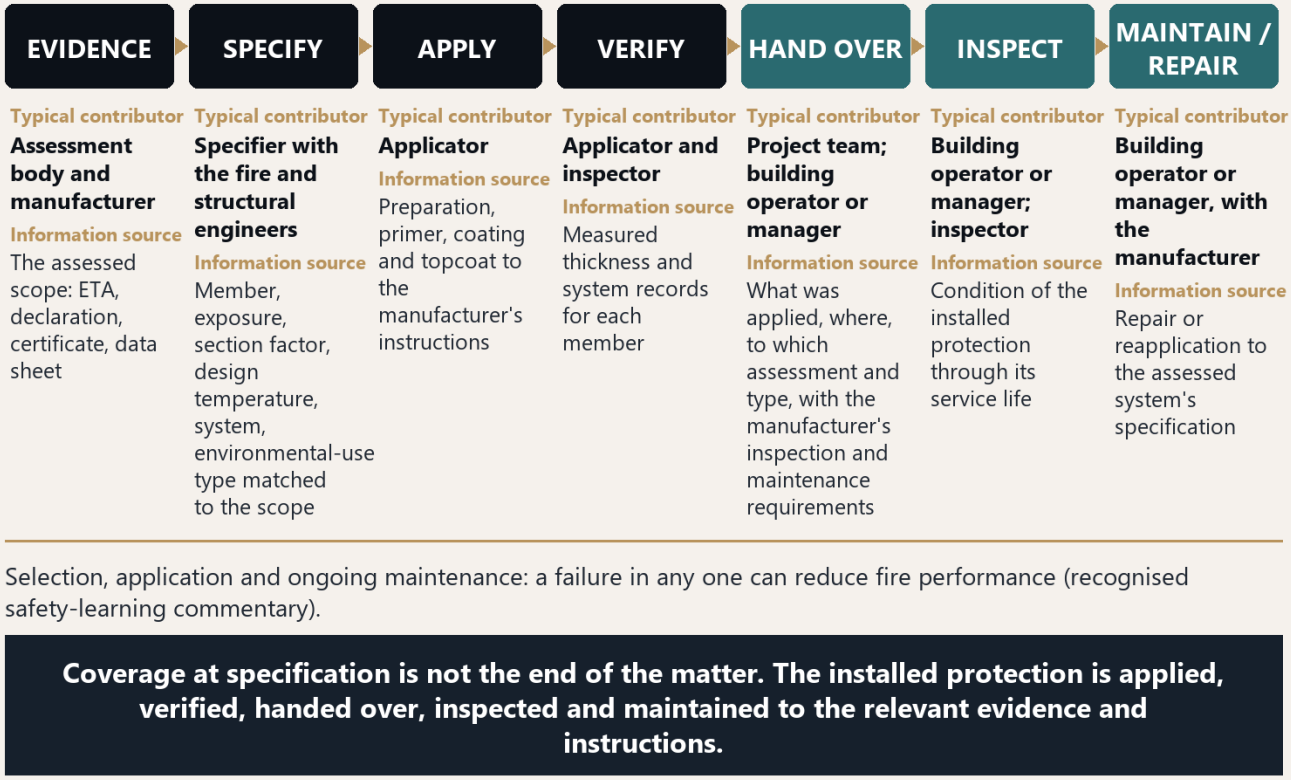
Coverage at specification is not the end of the matter. Installed passive fire protection with a defined service life, reactive coatings included, needs to be inspected and maintained through its service life to the manufacturer's instructions. Recognised industry safety-learning commentary notes that such systems are often incorrectly assumed to be maintenance-free, and can be omitted from planned maintenance regimes, which tend to prioritise active systems such as alarms and sprinklers (CROSS 2026). The same commentary frames the matter in three parts, selection, application and ongoing maintenance, and observes that a failure in any one of them can reduce fire performance. That framing is the one this note has followed.

Assessment and certification address the product as assessed and as applied. In-service condition is a separate question requiring appropriate inspection and maintenance. Damage, environmental degradation and mechanical impact may require repair or reapplication, and where defects are found they should be put right in consultation with the manufacturer, to the assessed system's specification.

The evidence and protection lifecycle

CONCEPTUAL DIAGRAM — NOT TO SCALE — DIAGRAMMATIC ONLY

Evidence suitability does not end at product selection. Each step follows the applicable assessment, the manufacturer's instructions and the project's own arrangements. Contributors shown are illustrative, not allocations of responsibility. No inspection interval, maintenance regime or legal responsibility is implied.



Selection, application and ongoing maintenance: a failure in any one can reduce fire performance (recognised safety-learning commentary).

Coverage at specification is not the end of the matter. The installed protection is applied, verified, handed over, inspected and maintained to the relevant evidence and instructions.

Figure 6. The evidence and protection lifecycle. Evidence, specify, apply, verify, hand over, inspect, maintain or repair: the typical contributor and the information source at each step. Contributors shown are illustrative, not allocations of responsibility. No inspection interval, maintenance regime or legal responsibility is implied. Conceptual diagram.

When the conditions leave the evidence. Performance evidence is conditional. An assessment answers the question for the system, substrate, environment, application and member it covers. If the installed system, or the conditions it experiences, move outside those conditions, the original assessment no longer answers the whole question: coverage is not demonstrated, and the question passes to inspection and to the manufacturer.

Recognised commentary and guidance identify the ways this can happen: selection outside the assessed environmental-use type; a primer or topcoat arrangement the assessment does not cover; application outside the manufacturer's conditions; construction-stage exposure beyond what was provided for; damage left unrepaired; the absence of inspection and maintenance; and other project-specific conditions. None of these is a finding about any installation. Each is a boundary of what the evidence answers (Figure 7).

Assessed conditions and actual conditions

CONCEPTUAL DIAGRAM — NOT TO SCALE — DIAGRAMMATIC ONLY

The evidence answers the question where the installed system and its service conditions sit inside the assessed conditions. An evidence-boundary concept, not a failure mechanism.

	ASSESSED CONDITIONS what the evidence answers	ACTUAL CONDITIONS what the installed system experiences
ENVIRONMENT	The environmental-use type (X, Y, Z1 or Z2) assessed for the system, including its topcoat	The conditions the members actually experience: heated interior, damp interior, sheltered exterior, exposure to weather, freezing, UV
SYSTEM BUILD-UP	The primer family or named primer, the named topcoat and the substrate route the assessment covers	The primer, topcoat and substrate actually on the steel, including any later recoating
APPLICATION	The manufacturer's conditions the assessment assumes: preparation, temperature, humidity, thickness, curing, construction-stage protection	The conditions and thickness actually achieved, and any weather exposure before the building envelope closed
DAMAGE	An intact, continuous coating at the specified thickness	Mechanical damage, local degradation or removal during later works, repaired or not
INSPECTION AND MAINTENANCE	Installation subject to the manufacturer's inspection and maintenance requirements	Whether the installed system is inspected, whether its information was handed over, and whether defects are repaired to the assessed system

Inside the assessed conditions: the assessment answers the question. Outside them: coverage is not demonstrated, and the question passes to inspection and to the manufacturer.

Performance evidence is conditional. Where the actual conditions leave the assessed conditions, the original assessment no longer answers the whole question.

Figure 7. Assessed conditions and actual conditions. The evidence answers the question where the installed system and its service conditions sit inside the assessed conditions; where they move outside, coverage is not demonstrated and the question passes to inspection and the manufacturer. An evidence-boundary concept, not a failure mechanism. Conceptual diagram.

Three practical points follow for those who design and those who own.

Accessibility for inspection and maintenance is a design consideration. Steelwork that cannot be reached cannot be inspected.

Relevant system, inspection and maintenance information should remain available to those responsible for the building and its fire-protection provisions: what was applied, where, to which assessment and environmental-use type, and the manufacturer's inspection and maintenance requirements. Recognised safety-learning commentary reports that this information is frequently incomplete, and that responsibility for inspecting passive fire protection can fall between different inspection regimes (CROSS 2026).

Industry codes make the lifecycle part of the specification. The code of practice for specifying intumescent coatings treats the in-service environment, the design life and life to first maintenance, the ease of maintenance and the repair procedure as matters to be considered early in design. It notes that a correctly applied system in a dry

internal environment should not normally need maintenance other than for decoration or where mechanical damage has occurred, that a good specification should nonetheless allow for regular inspections to check for degradation, damage or deterioration, that in other environments the life to first maintenance depends on the severity of the exposure, and that difficult access for maintenance is a reason to increase the safety margin in the specification (ASFP TGD 11, 2014). Where a coating has been damaged or has degraded locally, the same code describes repair as removal of the affected coating to a firm, unaffected edge and reinstatement of the assessed system to the specified thickness, with re-preparation of any corroded substrate, and advises that the manufacturer's confirmation is always sought. Published research notes that there is at present no established method of verifying on site the fire performance of a coating that has aged in service; condition is assessed by inspection against the manufacturer's requirements (Fürst et al. 2025). An assumed working life, a commercial warranty, an expected service life and a maintenance-free period remain four different things (section 11).

This note does not prescribe inspection intervals, maintenance regimes or repair methods, and it does not describe or allocate legal duties. Those belong to the manufacturer's instructions, the building's responsible parties and their professional advisers.

14. How to read "not shown"

Much of the value of an assessment lies in its limits. A member type absent from the tables, a blank cell, an environmental type not listed, a primer not named: each tells the reader where the demonstrated scope ends. What it does not tell the reader is anything about the product beyond that scope.

The five categories in "How to read this note" exist to keep those two things apart. When this note, or a reader applying its framework, records that something is **not demonstrated by the evidence considered**, that is a statement about the documents reviewed. It does not mean not certified, non-compliant, unsuitable, unsafe or prohibited, and it does not mean the product cannot be used. The manufacturer may hold further evidence; a project-specific assessment may be available; another evidence route may apply. The correct response to "not demonstrated" is a question to the manufacturer, not a conclusion about the product.

The same discipline applies in the other direction. "Supported by the applicable evidence" means the assessment covers the point for the conditions stated. It is not a certification of the project, and it does not remove the need for the project's own confirmation of the inputs that the tables depend on.

15. A practical evidence-checking framework

The framework below is an evidence-reading aid, not a compliance checklist. Every question is answered from the documents and from the project's own professionals; none is answered by this note.

The Bench evidence-checking framework

CONCEPTUAL DIAGRAM — NOT TO SCALE — DIAGRAMMATIC ONLY

An evidence-reading aid, not a compliance checklist. Every question is answered from the documents and the project's own professionals.

THE CLAIM AND ITS EVIDENCE		
1	**What is the claimed performance?**	Separate reaction to fire from resistance to fire.
2	**What evidence supports it?**	The assessment or certificate behind the headline; which document carries the conditions.
3	**Is the document current?**	Version and date against the issuing body's register and the manufacturer's current library.
THE ASSESSED SCOPE		
4	**What member type was assessed?**	Beam or column; open or hollow; included and excluded types.
5	**What exposure condition applies?**	Three-sided with a slab, four-sided, all-round.
6	**What section factor applies?**	The project value, and whether it sits within the assessed range.
7	**What critical or design temperature applies?**	The engineer's value, and whether the tables include it.
8	**What thickness is required?**	The tabulated minimum, and how it will be measured and recorded.
THE SYSTEM AND ENVIRONMENT		
9	**What primer, topcoat and system arrangement applies?**	Assessed family or named list; named topcoat; substrate route including any galvanised route.
10	**What environmental-use type is supported?**	For the system as applied, including the topcoat; construction-stage exposure provided for.
APPLICATION AND CONFIRMATION		
11	**What application and inspection conditions apply?**	Manufacturer's instructions and the applicable code; the records that will demonstrate the thickness and system.
12	**What still needs project-specific confirmation, and what will change in use?**	Structural inputs; anything outside the assessed scope; the acceptance route; the actual service environment; inspection and maintenance information; how damage or change in service will be found and repaired.

The useful question is not “does it have a certificate?” but “does the applicable evidence cover this proposed use and all its relevant conditions?”

Figure 8. The Bench evidence-checking framework. Twelve questions, from the headline to project-specific confirmation. An evidence-reading aid, not a compliance checklist.

1. **What is the claimed performance?** Identify the headline rating and separate reaction to fire from resistance to fire.
2. **What evidence supports it?** Identify the assessment (or certificate) behind the headline, and the declaration and certificate that sit with it. Which document carries the conditions?
3. **Is the document current?** Check the version and date against the issuing body's register and the manufacturer's current library. Across the evidence sets reviewed, databases, issuing bodies and manufacturer libraries could each be a version apart; numbers can change on re-issue; some current assessments are not published online and are available from the holder on request; and a certificate of constancy of performance refers to a specific assessment issue. Re-issue and re-numbering are normal features of the system, and a reason to check rather than assume.
4. **What member type was assessed?** Beam or column; open or hollow; the member types the tables include and exclude.
5. **What exposure condition applies?** Three-sided with a slab, four-sided, all-round; and whether the project condition matches the assessed one.
6. **What section factor applies?** The project value for the member, and whether it sits within the assessed range.
7. **What critical or design temperature applies?** The engineer's value for the member, and whether the tables include it.
8. **What thickness is required?** The tabulated minimum for that combination, and how it will be measured and recorded.
9. **What primer, topcoat and system arrangement applies?** Whether the primer is within the assessed family or named list, whether a named topcoat is required, and whether the substrate route (including any galvanised route) is one the assessment covers.
10. **What environmental-use type is supported?** For the system as it will actually be applied, including the topcoat; and whether construction-stage exposure is provided for.
11. **What application and inspection conditions apply?** The manufacturer's instructions and the applicable code; what records will demonstrate that the specified thickness and system were achieved.
12. **What still needs project-specific confirmation, and what will change in use?** Everything the tables do not settle: the structural inputs, any member or condition outside the assessed scope, the acceptance route with the approving body, the actual service environment and whether the installed system will remain within the environmental conditions the evidence supports, the inspection and maintenance information to be handed over, and how damage or change during service will be identified and repaired.

16. Conclusion

The useful question about a reactive fire-protection coating is not "does it have a certificate?" Within the evidence routes reviewed, certificates, assessments, declarations and product information each answer a different question. The useful question is the one this note has asked from the start: **does the applicable evidence cover this proposed use and all its relevant conditions?**

Answering it means reading the evidence at application level: the member, its exposure, its section factor and design temperature, the thickness the tables require, the primer, topcoat and substrate the assessment covers, the

environmental-use type the system supports, the way the coating will be applied and verified, and the way it will be recorded, inspected and maintained once the building is in use.

None of that is a criticism of the technology or of the evidence behind it. Reactive coatings are a mature and legitimate form of structural fire protection, and the evidence framework behind them is detailed, broad and transparent in structure. Across the evidence sets reviewed, assessments cover a wide range of members, periods, substrates and environments, and they state their own limits clearly. That is precisely what makes application-level reading possible.

The lesson of the documented example at the start of this note is not that reactive coatings do not work. It is that they should not be treated as generic paint that carries a fire rating wherever it is used. They are assessed systems, and the evidence answers the question only where the actual member, build-up, environment, application and lifecycle conditions sit within the assessed scope. Where deterioration is found, the useful response is to investigate those conditions and the installed system's evidence, with the manufacturer, rather than to draw an automatic conclusion about the product; and where the cause cannot be established, it remains unresolved. The fire rating is only the start, and the evidence framework is built to let readers go the rest of the way.

What The Bench does and does not do

The Bench reads, verifies and explains construction-product evidence. This Evidence Note does not certify or approve products, issue fire-engineering judgements, provide structural design, issue extended-application or desktop assessments, determine project compliance, or replace manufacturers, Technical Assessment Bodies, certification bodies, fire or structural engineers, Building Control or any other appointed professional.

The Bench and connected businesses have commercial interests in passive-fire-protection systems. This educational paper does not assess, compare, rank or recommend any individual manufacturer or proprietary product.

Glossary

Term	Meaning in this note
Assessment	A documented evaluation, by an assessment or certification body, extending fire-test results to a tabulated scope
AVCP	Assessment and verification of constancy of performance: the attestation system under which a notified or approved body certifies factory production control
CROSS-UK	Collaborative Reporting for Safer Structures: the confidential safety-reporting scheme run by the Institution of Structural Engineers with the Institution of Civil Engineers and the Institution of Fire Engineers; its Expert Panel commentary is cited in this note as recognised safety-learning commentary
Certificate of constancy of performance	The certificate issued under AVCP confirming factory production control; it does not itself establish the assessed scope or performance

Term	Meaning in this note
Design (critical) temperature	The temperature at which a loaded steel member can no longer carry its design load in fire; a structural-design input
DoP	Declaration of Performance: the manufacturer's declaration by reference to the ETA
Dry film thickness	The thickness of the applied reactive coating after drying, excluding primer and topcoat unless stated
EAD	European Assessment Document: the EOTA document defining how a product family is assessed
Environmental-use type (X, Y, Z1, Z2)	The EAD's categories of climatic exposure under which the fire performance has been shown to persist
ETA	European Technical Assessment: a Technical Assessment Body's documented assessment of a product's performance under an EAD
Euroclass	The reaction-to-fire class (A1 to F, with smoke and droplet sub-classes) under EN 13501-1
Reaction to fire	How a material or system behaves when exposed to fire
Reactive coating	A fire-protection coating that reacts to heat; intumescent coatings, which expand to form an insulating char, are the familiar type. Assessed under the EAD as a system with its primer, topcoat and substrate
Resistance to fire	How long an element continues to perform in a standard fire; for steel, the R period in minutes
Section factor	The ratio of a section's fire-exposed surface (or heated perimeter) to its volume (or cross-sectional area); higher values heat faster
Technical Assessment Body (TAB)	A body designated to issue ETAs
Topcoat	The finishing coat applied over the reactive coating; where required for an environmental-use type, the assessment names it

References

- EOTA (2017). EAD 350402-00-1106, Fire protective products: reactive coatings for fire protection of steel elements. European Organisation for Technical Assessment.
- BSI. BS EN 13381-8, Test methods for determining the contribution to the fire resistance of structural members: applied reactive protection to steel members.
- BSI. BS EN 13381-9, Test methods for determining the contribution to the fire resistance of structural members: applied fire protection systems to steel beams with web openings.
- BSI. BS EN 13501-1, Fire classification of construction products and building elements: classification using data from reaction to fire tests.
- BSI. BS EN 13501-2, Fire classification of construction products and building elements: classification using data from fire resistance tests.
- ISO. ISO 12944-1 and ISO 12944-2, Paints and varnishes: corrosion protection of steel structures by protective paint systems (general introduction; classification of environments).
- MHCLG. Approved Document B, Fire safety, Volume 2: Buildings other than dwellings (2019 edition incorporating amendments), Appendix B.

- Passive Fire Protection Forum (2021). Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence.
- ASFP (2021). Advisory Note 12, ASFP/BCF best practice guidance for specifying reactive coatings.
- ASFP (2021). Advisory Note 19, Critical steel temperatures above 650 °C.
- ASFP (2026). Advisory Note 37, Multiple assessment methods and data sets.
- ASFP (2026). Advisory Note 38, Critical temperatures in the 6th edition Yellow Book.
- ASFP (2014). Technical Guidance Document 11, Code of practice for the specification and on-site installation of intumescent coatings.
- ASFP (2010). Technical Guidance Document 16, Code of practice for off-site applied thin film intumescent coatings.
- BCF (2017). G020 version 2, Classifying environments: the environmental categorisation systems for corrosive and fire protection coating systems. British Coatings Federation, prepared with the Association for Specialist Fire Protection.
- Henderson, N. A., Johnson, R. A. and Wood, J. G. M. (2002). Enhancing the whole life structural performance of multi-storey car parks. Published on GOV.UK.
- Fürst, R., Hässler, D., Stelzner, L. et al. (2025). Fire resistance of existing steel structures with aged intumescent coating based on an in situ test method. Fire Safety Journal.
- CROSS-UK (2026). Safety Report 1533, Deterioration of intumescent fire protection to steelwork in multi-storey car parks. Expert Panel comments and key learning outcomes.

Standards are cited by number and title only. Assessments reviewed for this note are described generically and are not cited individually.