

Fire and heritage series

Intumescent paint systems and heritage buildings

Who is this information sheet for?

Owners, designers and contractors considering intumescent paint systems as a passive fire protection system in heritage buildings.

[Fire and heritage buildings](#) and [Equitable access, fire safety and maintaining heritage significance](#) advises on fire safety regulations and their application to heritage buildings.

Overview

- Many methods of fire protection reduce fire spread and fire damage in heritage buildings.
- Some methods have irreversible, negative impacts on significant heritage fabric, spaces and structures.
- Fire protection methods can be active (seek to extinguish or suppress a fire) or passive (slow fire spread or compartmentalise fire). Active methods are generally more effective at reducing the fire spread and damage.
- Contemporary intumescent paint systems can provide good passive fire protection to interior surfaces and often have minimal impact on heritage features.
- Owners should discuss the most suitable fire methods for their heritage building with professionals experienced in fire safety and heritage.

Fire protection methods in heritage buildings

How fire protection methods can negatively impact heritage significant features

Fire protection methods that impact the significant fabric, spaces and structures include:

- replacing or covering heritage features with fire-rated materials
- disfiguring heritage elements by installing fire safety systems (i.e. sprinklers) that are not sympathetically designed or installed to minimise impact on heritage significance.

Fire safety is best addressed with an overall fire safety package

Fire protection methods that are sympathetic to the heritage significance of a building should be considered as part of an overall fire safety package. Overall fire safety packages should:

- be designed by heritage practitioners working with accredited fire safety practitioners

- be based on a first principles analysis of the risk level and significance of the building
- consider active and passive fire protection methods.

Designers of an overall fire safety package must satisfy themselves that the selected:

- fire protection methods are suitable for application in the building or to its parts and are being used within the field of application of any standard testing and that testing has not expired.
- systems or products to be applied have valid approval from the relevant Principal Certifying Authority.

Sympathetic passive methods to improve fire resistance in heritage buildings

The following passive methods for upgrading ceiling-floor systems or walls in heritage buildings can have an acceptably low impact on significant fabric, when designed and installed sympathetically to the building's heritage significance.

EXAMPLE OF INSTALLATION OF FOAMED VERMICULITE MIX ABOVE THE CEILING

- See [The fire resistance of ceiling-floor systems in heritage buildings](#).
- This method involves removing floorboards, installing a foamed vermiculite mix above the ceiling and reinstalling floorboards to achieve a fire resistance level (FRL) 60/60/60¹.
- This method has a higher level of impact than intumescent paint.
- This method is tested and recommended on some ceiling-floor systems, not walls or other ceiling or floor systems.

APPLICATION OF INTUMESCENT PAINT TO INTERIOR HERITAGE SUBSTRATES

- Historically, intumescent paint has been used as passive fire protection for structural steel, but it is thick and unsuitable for conserving internal surfaces.
- Contemporary intumescent paint is a lower impact passive fire protection for interior surfaces.

Contemporary intumescent paint systems for interiors

- Modern thin film (less than 1 mm) intumescent paints for interiors:
 - are water based
 - when properly applied, provide a very similar finish to standard acrylic paint
 - rapidly expand in a fire into a layer of foam that carbonises into an insulating char.
- Contemporary intumescent paint systems can be applied to various internal substrates common in heritage buildings, including:
 - fibrous plaster
 - lath and plaster
 - pressed metal
 - fibre cement
 - concrete
 - timber.
- They must be applied by a trained and manufacturer-recognised and approved applicator.

¹ The FRL (or fire rating) measures how long a building element can resist fire under test conditions. It is measured against structural adequacy/integrity/insulation (e.g. minimum of 60 minutes resistance is reflected as 60/60/60).

Example of the performance of intumescent paint systems on interior substrates

A CSIRO test on the effect of an intumescent paint system on a fibrous plaster ceiling-floor system found:

- no failure to structural adequacy, integrity or insulation at 92 minutes
- resistance to incipient spread of fire (RISF) was 76 minutes².

This table summarises CSIRO test and assessment reports about the performance of intumescent paints on substrates commonly found in heritage buildings.

Substrate	CSIRO # ³	FRL (min)	RISF (min)
8mm fibrous plaster	FCO-2724	90/90/90	60
	FCO-2837	60/60/60	
Lath and plaster	FCO-2726	90/90/90	60
	FCO-2838	60/60/60	
Fibre cement sheeting	FCO-2727	90/90/90	60

Check list

Analysis of fire protection required

- Before deciding to use intumescent paint:
 - Analyse and understand the fire protection required by the National Construction Code or a Fire Safety Order.
 - Understand the structural system with input from an architect and structural engineer to determine the most appropriate fire protection system for the circumstances.
 - For floor ceiling system, consider the floor fire rating and any structure supporting the floor, which may require different fire protection solutions.
 - Confirm the protection systems for loadbearing walls, columns and beams and ensure the selected fire system or overall fire safety packages address these.
- Ensure the design of the system is in accordance with the tested and certified arrangement, including assumptions and limitations and is within the field of application of the test.

Product testing

- Ensure product has been tested to current Australian Standards by a National Association of Testing Authority registered body.
- Check the validity, assumptions and limitations of the product's test and assessment reports and ensure that information and opinions being relied upon have not expired.

Quality control of the application process

- Intumescent paint is a passive fire system, not a paint system.
- The application of intumescent paint has specific application standards.
- Intumescent paint application is a technical process and must be applied by a trained and manufacturer-recognised applicator.

² RISF apply if the roof lining is part of the fire barrier. It notes a ceiling's ability to limit temperature rise in the ceiling cavity, in minutes.

³ The CSIRO have extended the validity period of these assessments until April 2022.

- All penetrations (e.g. downlights or access panels) must have an appropriate, tested passive fire safety system installed.
- It must be applied according to the standards outlined in the manufacturer's specification.
- Intumescent paint should not be applied by general painters or home handypersons.
- The application process should include regular recording of temperature, humidity, wet film thicknesses and resultant dry film thicknesses.

Soundness and structural adequacy of the surface

- Ensure the trained and manufacturer-recognised applicator reviews and confirms the soundness and structural adequacy of surfaces to receive intumescent paint.
- Where there is doubt, obtain a report from an appropriate professional (e.g. a structural engineer or licensed builder working with an experienced built heritage professional).
- The trained and manufacturer-recognised applicator will confirm the substrate meets the Australian Standard for adhesion. If there is uncertainty, an adhesion test is to be performed.

Certification

- Certification of an intumescent paint system should be provided by a trained and manufacturer-recognised applicator.
- Certification of the intumescent paint system should reference:
 - surfaces' substrate
 - the appropriate test or assessment report and Australian Standard
 - application in compliance with the manufacturer's specification
 - dry film thickness achieved
 - FRL or RISF is achieved
 - approved applicator details.

Annual fire safety inspection statements

- Intumescent paint and foamed vermiculite installed in a building to achieve fire separation are considered fire safety measures that require annual certification via an annual fire safety statement.
- The certification of these measures for the annual fire safety statement will require inspection and assessment by an accredited practitioner (fire safety) in accordance with the requirements of the *Environmental Planning and Assessment Regulation 2000*.

Maintenance and information management

- The manufacturer's specifications should set standards and processes to be followed for annual maintenance, inspection, and/or repairs.
- Information about the intumescent paint system should be recorded and retained by the manufacturer and onsite by the owner.
- The information that should be recorded includes:
 - product details
 - application date
 - the applicator
 - the FRL and/or RFIS achieved.
- The records should be retained to inform maintenance, inspection, repair and annual fire safety inspections and further upgrades.

Conclusion

- Intumescent paint systems are proven to improve passive fire resistance in heritage buildings.
- Key benefits of intumescent paint systems:
 - tested to Australian standards
 - application is a quality-controlled process
 - the process and system are non-destructive to several common heritage fabrics
 - application facilitates retention of ornate heritage details, and
 - application can be more cost effective and quicker than alternate methods.
- In heritage buildings, intumescent paint systems should only be considered as part of an overall fire safety package.

Case Studies



Trinity College, Goulburn: Intumescent paint used to achieve FRL of 90/90/90 while preserving ornate fibrous plaster ceiling (lath and plaster substrate) and pressed metal ceiling.

Images courtesy of CAP Coatings Australia



Officers' Quarters, Paddington Barracks, Paddington: These historically significant pressed metal ceilings were restored using intumescent paint that gave FRL of 90/90/90.

Images courtesy of CAP Coatings Australia



Boat shed conversion, Lavender Bay, Sydney: Intumescent paint was used in a performance solution to provide FRL of 60/60/60 to exposed timber beams and the underside of tongue and groove flooring.

Images courtesy of CAP Coatings Australia



Louis Vuitton, Sydney: Intumescent paint applied to a heritage lath & plaster ceiling to provide an FRL of 90/90/90.

Images courtesy of CAP Coatings Australia

Further information

For further information please contact Heritage NSW. Requests for assistance in balancing fire safety requirements and heritage considerations may be referred to the Heritage Council of NSW's Technical Advisory Panel (TAP).

For information about caring for items on the State Heritage Register or subject to an Interim Heritage Order, contact Heritage NSW on +61 2 9873 8500 or heritagemailbox@environment.nsw.gov.au.

For information on fire safety regulations and a range of active and passive fire prevention and suppression methods see the Heritage Council of NSW's [technical information](#) page.

Before using intumescent paint systems, owners of heritage buildings should consult professionals experienced in fire safety and heritage about suitable fire protection methods for their building.

Testing certificates for the testing and information on the intumescent paint systems tested may be obtained by from [CAP Coatings Australia](#). Information on alternate intumescent paint systems and products can be sought from other manufacturers and manufacturer recognised applicators. Intumescent paint systems are a passive fire suppression method.

Author and acknowledgements

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