

Heritage Council



of New South Wales

**THE USE OF INTUMESCENT PAINT TO PROVIDE PASSIVE FIRE
PROTECTION TO HERITAGE BUILDINGS**

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THE USE OF INTUMESCENT PAINT TO PROVIDE PASSIVE FIRE PROTECTION TO HERITAGE BUILDINGS

1. Introduction

This document was prepared by the Fire, Access and Services Advisory Panel of the Heritage Council together with CAP Coatings to provide information to building owners about products that may assist in the fire protection of heritage buildings.

2. Background

A key issue for heritage architects and building conservators is the apparent conflict between ensuring historic buildings provide the level of fire safety expected in contemporary society whilst retaining the features that inform a building's heritage significance.

A particular challenge has been to provide the levels of fire protection mandated by the National Construction Code (NCC) Volume 1 or Local Government Fire Orders. Very often, significant heritage features (such as ornate fibrous plaster ceilings common in previous centuries) have to be removed and replaced with fire-rated plasterboard, covered up with fire rated false ceilings or disfigured by the installation of sprinkler systems. Recent technological advances in the performance of thin film intumescent paints have created a practical alternative to the destruction of the heritage values caused by the other fire protection methodologies.

Thin film intumescent paints are common and have been successfully used for many years to provide passive fire protection to structural steel elements of a building. Recently paints specifically designed for interior substrates have been developed and introduced to the Australian market. Modern thin film (less than 1 mm) intumescent paints are water based and when properly applied, provide a very similar finish to that expected from standard acrylic paint.

Intumescent paints provide passive fire protection by very rapidly expanding in a fire situation into a layer of foam which then carbonises into an insulating char. The level of insulation provided by the char is correlated to the dry film thickness (DFT) of the applied paint. Typically, fire resistance levels (FRLs) of up to 90 minutes are achievable on heritage ceiling and wall substrates.

This Information Sheet proposes the use of intumescent paint as a method of achieving FRL's of up to 90/90/90 for ceilings commonly found in heritage buildings.

3. 2002 Heritage Council Information Sheet

In 2002 the Heritage Council of NSW issued an Information Sheet that proposed a method of achieving an FRL of 60 minutes in a heritage ceiling system. This method involved "the installation of a foamed vermiculite mix from above the ceiling." The system involved the removal of floorboards above a ceiling at 1.2 metre centres, inserting lateral steel rod reinforcement and then filling the voids between the ceiling joists with a foamed vermiculite mix.

There are obvious practical difficulties and disruption associated with ensuring that all parts of a floor – ceiling system are protected. Inevitably there may be some parts of a floor-ceiling system that are difficult to access. In some instances the removal and subsequent replacement of floorboards may have a direct impact on the heritage values of a building.

4. Fire Test of a traditional heritage fibrous plaster floor – ceiling system using intumescent paint to increase fire resistance

In 2009 a full scale fire resistance test to AS1530.4 (2005) was conducted by CSIRO on a floor / ceiling system commonly found in heritage buildings. The system comprised hardwood timber floor joists lined on the exposed face with fibrous plaster panels. The floor joists were braced with herring bone timber bracing and clad on the unexposed face with tongue and groove floor boards. Cornices were applied to the ceiling and then the fibrous plaster and cornices were painted with CAP508 intumescent paint achieving a dry film thickness (DFT) of 700 microns.

The full scale test was terminated at 92 minutes with the following results:

Structural adequacy	no failure at 92 minutes
Integrity	no failure at 92 minutes
Insulation	no failure at 92 minutes
Resistance to Incipient Spread of Fire	76 minutes

5. Fire Resistance Levels and Resistance to Incipient Spread of Fire achieved by applying intumescent paint to ceiling substrates typically found in Heritage buildings

As a result of this and subsequent pilot scale tests, the following opinions about the performance of intumescent paint on a variety of substrates have been issued by CSIRO:

Substrate	Report #	FRL (min)	RISF (min)
8 mm Fibrous Plaster	FCO-2724	90/90/90	60
	FCO-2837	60/60/60	
Lath & Plaster	FCO-2726	90/90/90	60
	FCO-2838	60/60/60	
Fibre Cement Sheeting	FCO-2727	90/90/90	60

Fire engineered alternative solutions have also been developed to improve the fire performance of pressed metal ceilings and exposed timber floor joist / tongue and groove flooring systems.

6. Key issues to consider when specifying intumescent paint as a passive fire protection solution for heritage ceilings:

Issues to consider when specifying the use of intumescent paint to improve the passive fire resistance of interior substrates include:

- Analysis of the fire protection required by the BCA or Council Fire Order.
- Testing of the product to current Australian Standards by a NATA registered authority
 - Check the validity of test reports of a proposed intumescent paint product and ensure that any opinions proposed to be relied upon have not expired.
- The soundness and structural adequacy the substrate
 - Passive fire protection provided by intumescent paint relies on the soundness and structural adequacy of the ceiling substrate. Ensure that proposed applicators review and confirm the soundness and structural adequacy of the ceiling substrate. Where there is doubt obtain a report from an appropriate professional person (structural engineer, licensed builder etc)

- Quality control of the application process

The key to understanding the application of intumescent paint is recognition that these systems are not paint systems but are passive fire systems with consequent application standards. Application of intumescent paint is a technical process and must be applied according to the standards outlined in the manufacturer's specification and by trained and approved applicators. This class of products is not suitable for application by general painters or home handypersons.

Approved applicators are trained to ensure that substrate surfaces are properly prepared and that the substrate is sound and solid. The application process should include regular recording of temperature, humidity, wet film thicknesses and resultant dry film thicknesses.

- Certification of the completed passive fire system

Certification of an intumescent passive fire system should be provided by an approved applicator trained for this purpose. The final certification of the intumescent paint system should reference:

- ceiling substrate
- the appropriate test report and Australian Standard
- application in compliance with the manufacturers specification
- Dry Film Thickness achieved
- FRL or RISF achieved
- Approved applicator details

- Inclusion in the annual fire safety statement

Most Heritage buildings requiring fire separation between floors or ceiling cavities will also require annual fire safety inspections with subsequent certification of the integrity and performance of the intumescent paint system by the owner/agent of the building to the local government authority and Fire & Rescue NSW.

- Maintenance of the intumescent paint system

The manufacturer's specification for the intumescent paint system should set maintenance standards and processes to be followed for annual inspection and/or repairs if required.

- Ongoing information management of the passive fire system

It is important that an appropriate information management system records and retains information about the intumescent paint system for annual inspection purposes and for use when the building is further upgraded.

7. Case Studies

1.1. The use of intumescent paint to provide an FRL of 90/90/90 to a fibrous plaster ceiling to a heritage private school in Goulburn.



HERITAGE

Intumescent paint was used to fire rate and preserve ornate fibrous plaster and pressed metal ceilings

TRINITY COLLAGE

Substrate: lath and plaster
Substrate: pressed metal
Fire Rating: 90/90/90



1.2. The use of intumescent paint to improve the fire performance of pressed metal ceilings as an alternative solution.



HERITAGE

Historically significant ceilings were able to be restored, fire upgraded and retained

OFFICERS QUARTERS PADDINGTON BARRACKS

Substrate: pressed metal
Fire Rating: 90/90/90



- 1.3. The use of intumescent paint to provide an FRL of 60/60/60 to exposed timber beams and the underside of tongue and groove flooring in a heritage boatshed as an alternative solution.



TIMBER

BOAT SHED CONVERSION
LAVENDER BAY, SYDNEY

Exposed timber beams and timber floor coated to achieve required fire rating

Substrate: TIMBER
Fire Rating: 60/60/60



- 1.4. The use of intumescent paint to provide an FRL of 90/90/90 to a Heritage lath & plaster ceiling in a luxury retail shop.

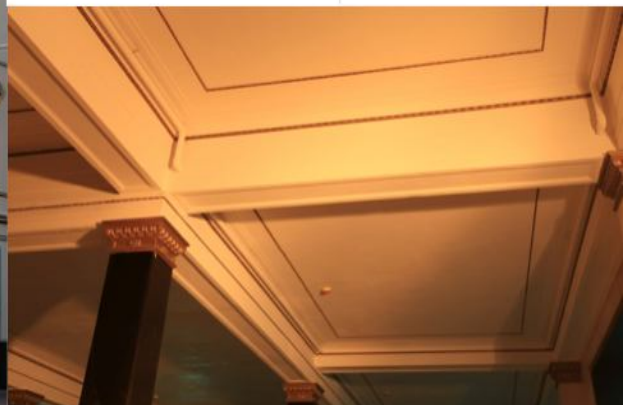


HERITAGE

LOUIS VUITTON SYDNEY

Retaining the heritage ceilings was key to this retail fit-out and the client's luxury brand

Substrate: Lath & Plaster
Fire Rating: 90/90/90



8. Conclusion

The use of intumescent paint systems to improve the passive fire resistance to heritage buildings are a proven technology with key benefits when compared to available alternatives. Key features to consider include:

- Testing to Australian Standards
- Quality application process
- Non-destructive
- Retention of ornate heritage details
- Ease and speed of application – less disruptive for owners or tenants
- Cost effective

This Information Sheet outlines the use of intumescent paint as a method of achieving FRL's of up to 90/90/90 for ceiling systems commonly found in heritage buildings.

Please contact the Heritage Branch of the NSW Office of Environment & Heritage for further information about this report:

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