

Fire and heritage series

Fire and heritage buildings

Who is this information sheet for?

Property owners, designers, contractors and local council officers who are seeking information on:

- fire safety in heritage buildings in NSW
- Fire Safety Orders that require a heritage building to undergo a fire safety upgrade
- balancing heritage significance and fire safety upgrades
- what to consider when introducing fire safety provisions into heritage buildings.

Overview

Most heritage buildings were built prior to current fire safety regulations and it is difficult to meet performance requirements without impacting the building's heritage significance. Through careful design, fire safety provisions can be introduced in heritage buildings in ways that minimise the impact on their heritage significance. The Heritage Council's Technical Advisory Panel (TAP) can provide advice (through Heritage NSW) on ways of balancing heritage significance and fire safety requirements.

Fire safety

- Fire prevention is the most effective method of dealing with fire threat.
- Building owners are responsible for maintaining fire safety measures in their building to the standard to which they were installed.
- Local councils are responsible for monitoring the fire safety of existing buildings.
- Fire Safety Orders can be served on owners whose building does not comply with fire safety requirements.
- Fire Safety Orders are issued by consent authorities, usually local councils, in accordance with the requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act).
- Fire Safety Orders require the building to be upgraded to a level acceptable to the consent authority.

Fire safety and prevention within individual buildings is the responsibility of the owners.

When issuing Fire Safety Orders, local councils will generally consider the fire safety requirements contained in the National Construction Code (NCC), which includes the Building Code of Australia volumes 1 and 2 (BCA), and is updated every three years.

Copies of the BCA can be obtained from the [Australian Building Codes Board](#).

The BCA prescribes performance requirements that can be met by either:

- **deemed-to-satisfy provisions:** technical provisions or methods detailed in the BCA that satisfy the performance requirements
- **performance solutions:** individually developed solutions that demonstrate compliance with the performance requirements.

Proposed building work, and alterations and additions to heritage buildings must comply with the fire safety requirements in the BCA. When alterations and additions are proposed to heritage buildings the consent authority, usually local councils, may require the building to undergo a fire safety upgrade.

When a development application proposes a change of use to a building and existing fire safety measures are inadequate, the consent authority (usually local councils) must require compliance with fire safety standards, even if the resulting works are not part of the original proposal.

The responsibilities consent authorities have in assessing development applications for existing buildings, including heritage buildings, are outlined in [Equitable access, fire safety and maintaining heritage significance](#).

The aims of fire safety

The fire safety objectives of building regulations ensure the:

- occupants can safely escape from the building
- building is constructed to give fire fighters access to safely fight fire
- spread of fire to other parts of the building, or to adjacent property, is prevented.

Considerations for a Fire Safety Order to require a fire safety upgrade

The EP&A Act defines provisions for fire safety as:

... provision for any or all of the following -

- (a) the safety of persons in the event of fire,*
- (b) the prevention of fire,*
- (c) the detection of fire,*
- (d) the suppression of fire,*
- (e) the prevention of the spread of fire.*

When deciding to issue a Fire Safety Order to require a heritage building to be upgraded, the consent authority will consider whether the provisions for fire safety are adequate to:

- *prevent fire, or*
- *suppress fire, or*
- *prevent the spread of fire (EP&A Act, [Schedule 5, Part 2 Fire Safety Orders](#)).*

The provisions for fire safety are generally satisfied by achieving compliance with the following.

Access and egress

The building layout must allow occupants to escape safely during an emergency and firefighters to respond to the fire. Staircases, ramps and passageways must be available and distributed to give

occupants enough time to escape. The BCA details additional 'deemed to satisfy' provisions for construction of exits.

Fire resistance

Building materials must be fire resistant to reduce the chances of a fire igniting, to limit the development of smoke, to contain the spread of fire and smoke and to enable the building to remain structurally sound to protect firefighting personnel and neighbouring buildings.

Fire services and equipment

Buildings must be provided with fire-detection and firefighting equipment to stop or slow the spread of fire, to control smoke, to warn occupants of a fire in time to allow them to escape and to indicate and illuminate escape routes.

Balancing heritage significance and fire safety upgrades

Before issuing a Fire Safety Order on a listed heritage building, authorities are required to consider the impact of the order on the heritage significance of the building (EP&A Act, [Schedule 5, Part 4 Provisions relating to development control orders](#)).

Understand the building's heritage significance

Understanding the heritage significance of a building and its significant fabric, spaces and setting (heritage features) will assist in identifying where interventions for fire safety can occur without negatively impacting the building's heritage significance.

Minimise changes to heritage features to conserve what is significant about the building.

The impacts of fire safety upgrades

Fire safety upgrades that could negatively impact heritage significance include:

- over-sheeting of significant fabric
- insensitive installation of services
- alterations for new stairs and partitions
- the loss of original doors, floors, ceilings and furnishing.

Heritage features should be conserved. This may require the development of performance solutions to satisfy fire safety regulations.

Achieving fire safety with minimal impact on heritage significance

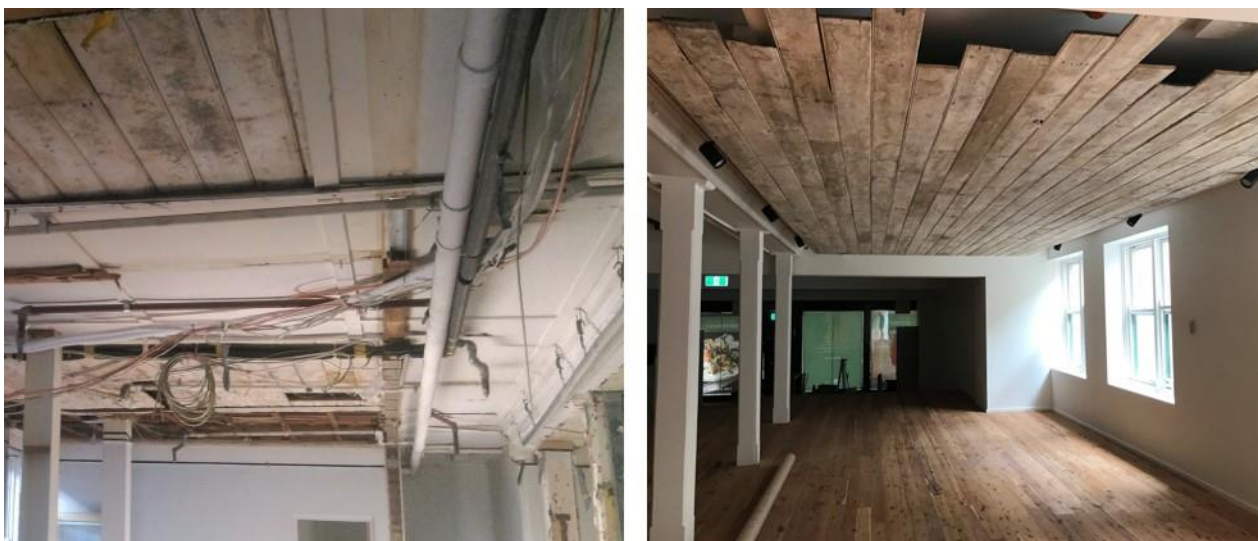
Rather than meeting performance requirements or deemed to satisfy provisions for each building element, an overall fire safety package is preferable and best practice. Consent authorities have discretionary powers to accept such fire safety upgrade solutions.

Fire safety upgrade solutions:

- must meet the objectives of the regulations
- should minimise impact to significant fabric, spaces and settings,

The requirement of a fire safety upgrade solution should be developed for each heritage building based on a first principles analysis of the risk level and significance of the building. Collaborations between heritage practitioners and accredited fire safety practitioners (such as fire engineers and accredited fire safety practitioners) to design overall safety packages, have proven successful on many heritage buildings.

The impact of fire safety solutions can be minimised with careful design and placement.



In this building in The Rocks, that contains remnants of a building from 1838, renovations revealed a timber ceiling from the late 1800s that had been over sheeted. The timber was removed and reinstated as an interpretive feature below a fire rated ceiling that protects remnants of an earlier lath and plaster ceiling.

Image: Strategic Planning and Heritage, Place Design and Public Spaces, DPIE NSW

Considerations for using common fire safety measures

Electrical fire safety services

Electrical fire safety services include smoke detectors, alarms, emergency lighting and exit signs. Careful design and placement will reduce heritage impacts when installing electrical services.

Detectors, alarms and emergency lighting

Where possible:

- minimise cutting and drilling of heritage fabric
- place detectors, alarms and emergency lighting unobtrusively
- camouflage within elements of wall and ceiling patterns
- use smaller colour coordinated detectors and emergency lighting
- conceal electrical cabling behind cornices or within floor and wall cavities
- consider use of wireless systems.

The [Heritage NSW website](#) outlines standard exemptions for upgrading or installing certain types of fire safety detection or alarm systems in buildings listed on the State Heritage Register.

Exit signs

Exit signs are designed to have a prominent appearance but their visual impact can be minimised by varying the casing, lettering style and colour to be more consistent with the building's décor.

- Exit signs should be sensitively located with cabling installed to minimise the heritage impact.
- Photo luminescent exit signs and safety labels that do not use cabling may be approved.

Hydraulic fire safety services

Hydraulic fire services include sprinkler systems, fire hose reels, hydrants and hand-held fire extinguishers.

Sprinkler outlets

Careful planning of sprinkler outlet (head) placement and sprinkler plumbing is important to minimise the disturbances of significant heritage fabric.

- Sprinkler outlet (heads) should be installed sensitively in ceilings, following geometric forms.
- Flush-mounted concealed heads or wall-mounted heads can be installed in a range of colours.
- Pipework should be installed within cavities to minimise the removal of existing materials.
- Flexible pipework has been used to good effect in some heritage buildings.

An accredited fire safety practitioner working with a heritage practitioner is often able to design sprinkler layouts to avoid or minimise visual impact and penetration through significant fabric.



Left: External drenchers were fixed to modern window fabric at Penrhyn House, The Rocks, to minimise impact to the its heritage brick work.

Courtesy Strategic Planning and Heritage, Place Design and Public Spaces, DPIE NSW

Right: A sprinkler system sympathetically installed in so that piping is hidden behind the wall.

Courtesy Orwell and Peter Philips

Fire-fighting equipment

Hydraulic services should be installed to minimise heritage impacts on fabric and spaces. If this cannot be done, consider potential alternatives, such as sympathetically designing and installing fire hydrants and sprinkler systems externally.

In heritage buildings, fire hose reels, hydrants and hand-held fire extinguishers should be sympathetically placed, yet easy to find in an emergency.

Provision for escape

Fire emergency exits

Occupants must be provided with a safe path to leave a building in the case of a fire. Current 'deemed to satisfy' provisions require a certain number of fire emergency exits and maximum distances to these exits. These requirements differ depending on the building type, size and use.

Many traditional materials, structural elements and building features such as windows, doors, roof spaces, stairwells and lift shafts do not meet current fire safety requirements.

- When dimensions of exits and stairs are inconsistent with regulations, modification of doorways and stairs should be based on assessment of risk posed and heritage impact of modification.
- Alternatives to reducing travel distances include providing early warning of fire by smoke detection, so occupants have more time to leave the building.
- Additional exits, if required, should be carefully designed to maintain the building's heritage significance.
- External fire escapes should be sympathetic to the heritage features.

Doors leading to a fire exit should open out so that people can push their way through.

Doors

- If impractical to alter an inward-opening door to be outward-opening, an automatic hold-open device could be used to enable safe egress as a possible solution.
- A hold-open device should keep the door in a fully opened position and only be considered for doors that do not perform a fire or smoke separation function.



The door swing on this heritage door was altered to outwards and new complying exit handle installed. The original locks were deactivated and retained in place.

Image: Strategic Planning and Heritage, Place Design and Public Spaces, DPIE NSW

Door hardware

Door hardware including closers, latches, knobs and handles should be sympathetic to heritage features.

- Existing hardware should be conserved in situ, wherever possible, or stored on site.
- Heritage hardware that reproduces various historic building styles is available.
- Modern magnetic door holders, electrical door strike releases and security escape latches can be incorporated into the building's existing doors.

Other options

Modifying existing doors and stairways or adding exit doors can detract from the building's appearance and significance. In such cases, options such as sprinkler systems, detectors and alarms could be an option.

Fire and smoke separation

Many traditional materials, structural elements and building features do not meet current fire safety requirements, although some have adequate inherent resistance. Resistance can sometimes be further improved using intumescent¹ paint systems.

For more information see the Heritage Council of NSW information sheet [Intumescent paint systems and heritage buildings](#).

Roof-space compartmentation

Roof spaces are one of the main areas where fires spread because they are:

- often long, unimpeded conduits
- frequently overlooked as a source of fire spread.

Special attention must be paid to roof spaces, where risk of fire spread is very high.

Compartmentalisation of roof spaces with permanent fire blanket barriers or other low impact, passive means should be one of the first works done in fire safety upgrades.

Building management solutions

For some building uses it is impractical to achieve an acceptable level of fire safety without destroying the heritage features. In such cases, it may be feasible to restrict the occupancy or type of use for the building, rather than losing heritage significance.

Good housekeeping

Good housekeeping is an important element of fire prevention.

- Storage areas - are high-risk fire areas, storage of large amounts of flammable materials and materials that produce toxic smoke and gases should be avoided in or near heritage buildings.
- Hallways and stairs - must be free of clutter to allow for unobstructed occupant evacuation.
- All smoke and fire doors - must be kept closed or be closable in the event of fire.
- Gardens and gutters – maintain their condition and remove debris from the surrounding area.

Evacuation plans

A key objective of fire regulation is to ensure occupants can safely escape from the building.

- Develop evacuation plans and train occupants on fire emergency procedures.

¹ When subjected to the heat of fire, intumescent materials expand to fill voids and block smoke and flames.

- Formal plans are required for certain building uses (such as schools) and must include fire drills and training occupants in the use of fire-fighting equipment.
- Further information can be sought from your local fire brigade.

Fire isolated compartments

Fire safety is often achieved by dividing a building into fire isolated compartments. This restricts a fire to an area of a building until it can be extinguished. To be effective, the walls, floors and ceiling need to contain flames and smoke within the compartment and provide enough insulation to prevent excessive heat radiating outside of the compartment. High levels of radiant heat passing to the outside can make escape routes unusable and may ignite materials elsewhere.

To make fire compartments work effectively:

- seal gaps around doors, glass panels, pipework and cabling that penetrates walls and floors to prevent escape of fire and smoke
- use intumescent materials on existing building elements to seal gaps.

Where enclosure of a compartment is required installation of fire resisting glass partitions and doors may be the most sympathetic solution, particularly where a significant staircase or elevator needs to be enclosed or replaced.



It is illegal to fix smoke or fire exit doors open or disengage their closers. However, solutions can be found to ensure the functionality of smoke and fire doors while maintaining their heritage significance.

This doorway leading to fire stairs at the former Bushell's Warehouse on Harrington St, The Rocks, has been fitted with a new complying fire door. The old, significant fabric was retained and fixed in place.

Image: Strategic Planning and Heritage, Place Design and Public Spaces, DPIE NSW

In heritage buildings:

- existing building materials and structure should be retained and incorporated into the fire compartment
- methods of upgrading the fire resistance of existing materials should be pursued
- ornate features may be lined with fire resistant material, but this is usually not the best solution
- if over-sheeting becomes essential, it should be done so it can be removed with little or no damage to the significant fabric
- alternative solutions such as installing fire protection above a lath-and-plaster ceiling to achieve compartmentalisation or installing automatic sprinklers should be considered.

Protection of existing combustible materials

Protection of existing significant fabric is preferable to replacing fabric with incompatible fire-resistant fabric. Where removal of significant fabric or hardware is required, items should be retained on site, in line with the Heritage Council of NSW's [Movable Heritage Principles](#).

Existing combustible materials such as curtains, carpets and upholstery can be impregnated with a fire retarding agent that provides resistance to ignition and spread of flame. Various retarding agents that protect fabrics without damage or discolouration are available in liquid form. Hard surfaces can be similarly protected.



Timber panelled doors can be upgraded on their inside face to improve their fire resistance without affecting their external (i.e. corridor side) appearance, see [Upgrading the fire resistance of timber panelled doors](#).

Images: Orwell & Peter Phillips

Fire safety management

Fire safety during construction or refurbishment

During construction or refurbishment of a heritage building, the contractor must develop a fire safety plan that identifies hazards and mitigation to limit the risk of fire during construction activities. Guidance should be obtained from [Fire and Rescue NSW](#) and the [Practice note for fire and life safety in existing buildings during construction](#) (Society for Fire Safety, NSW Chapter, Engineers Australia, 2012).

The fire regulations are designed for the rare occurrence of fire in a building. Being prepared for a fire may save lives!

Causes of fire during construction or refurbishment

Causes of fire spread include:

- Poor housekeeping - construction rubbish on floors and above ceilings, demolished materials
- Random sequence - works undertaken in an incorrect order increase opportunity for ignition
- Minimal temporary structural supports - may be inadequate in the event of a fire
- Poor or interrupted access - to the fire base by firefighters
- No protection - of adjacent significant fabric or adjacent materials
- Electrical - short circuiting initiating fire
- Hot works - welding, flame cutting, grinder sparks
- Accidental - smoking
- Malicious damage - arson, vandalism, wilful neglect
- Significant traditional building materials and finishes - may be quite combustible.

Prevention of fire during construction or refurbishment

Design of substantial works in a heritage building needs fire controls that comply with regulations. This should include passive ways to control fire spread, with as little heritage impact as possible.

It is important to note that, beyond early warning systems and alarms, operational risks are not necessarily dealt with in building management systems. Before works are started, methods for all aspects of works should be reviewed by the fire consultant. The fire consultant is to evaluate the potential fire risk during construction and submit a report to the client or project manager.

The contractor must issue the accredited fire safety practitioner's risk report to all sub-consultants and sub-contractors.

Site inductions for all workers should include fire related risks, procedures and management.

Each contractor or sub-contractor must prepare a statement about the prevention and management of fire risk for their works.

The following should be included in their statements:

- identify potential ignition sources
- works to isolate the ignition sources
- temporary fire suppression
- demonstrated understanding of the disaster and evacuation plans
- security of the site

Disaster preparedness and response

[Museums and Galleries of NSW](#) have a range of information and step-by-step guides to assist owners and contractors to prepare for and respond to man-made and natural disasters such as fire.

References

Fire and Rescue NSW (n.d.) [Building Fire Safety](#) [Fire and Rescue NSW website], Fire and Rescue NSW, accessed 20 January 2021.

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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).

This publication is based on NSW Heritage Office (1995) *The maintenance series 8.1: Fire and heritage*, NSW Heritage Office, Parramatta.

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Acknowledgement

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