

**Your bushfire-
resilient home.**

**A toolkit for
residents.**



**BUSHFIRE-RESILIENT
HOMES TOOLKIT**



Project partners

This project is proudly funded by the New South Wales Government, with assistance from Local Government NSW, Insurance Council of Australia, Minderoo Foundation and Edge Environment.



The purpose of this Toolkit is to provide guidance and advice to homeowners wishing to take action to improve the bushfire resilience of their homes.

The context, data, methodology and findings are based on a demonstration pilot, specifically for bushfire resilience of existing housing stock. The recommendations of the Toolkit focus on options for upgrading external building materials with more fire-resistant alternatives, and have been informed through analysis of housing archetype using the multi-hazard Building Resilience Rating Tool (BRRT). Consequently, this Toolkit primarily considers actions related to the materials and structure of the home. The built environment is an important aspect of resilience. Users are encouraged to consider the recommendations as part of a holistic approach, including

improved property upkeep and behavioural changes, in order to realise meaningful improvements to bushfire preparedness and housing resilience.

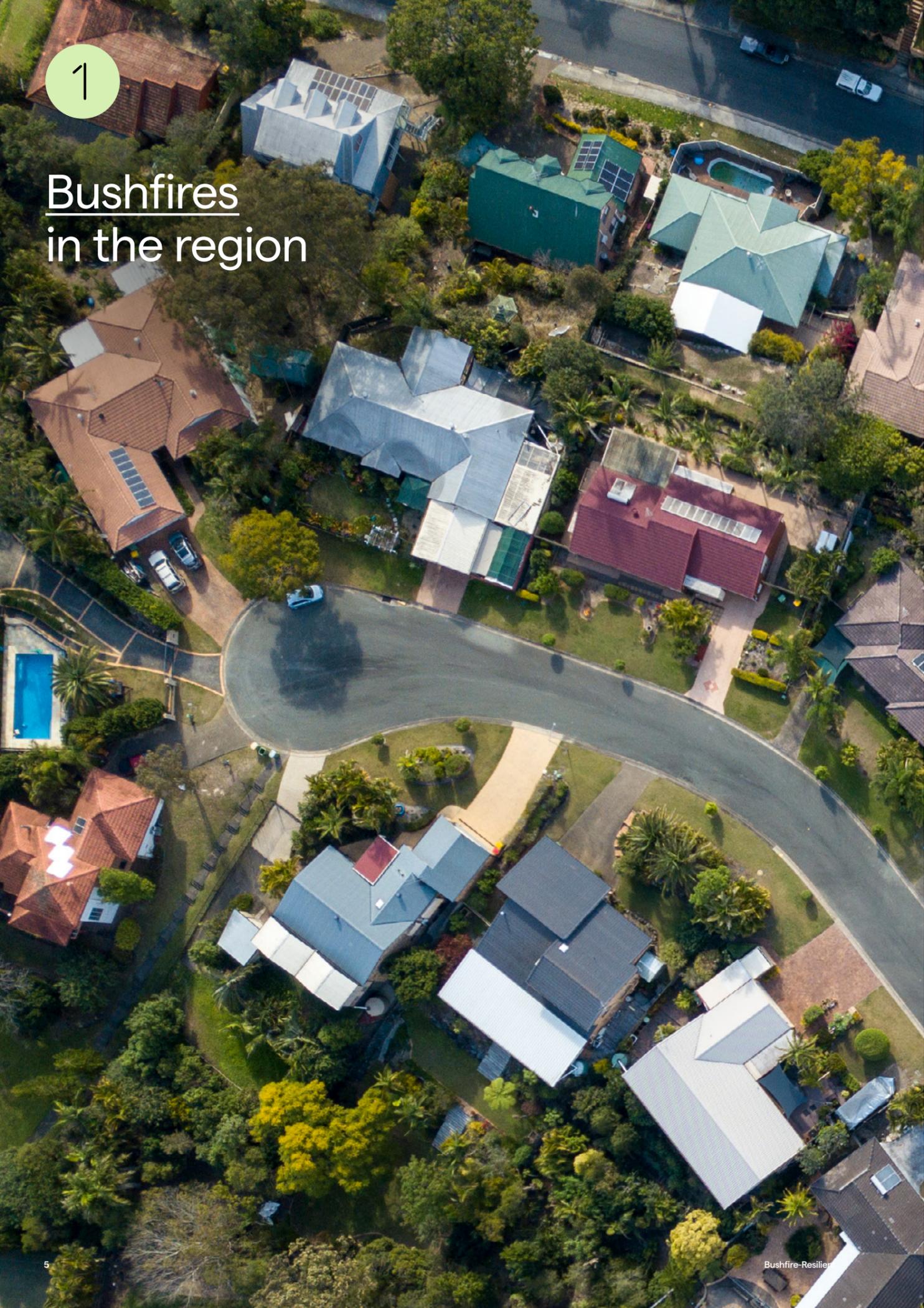
This Toolkit is provided to residents, council and industry in good faith, applying best practice principles from a range of disciplines to develop recommendations. The knowledge and understanding of resilience continues to grow and evolve, providing stakeholders with a depth and breadth of information to explore and apply in a way that is fit for their individual purpose. As such, this Toolkit is intended to be used in combination with a range of other resources and the latest bushfire resilience guidance should always be checked. A list of further resources to assist stakeholders in their own research is provided in the Toolkit.

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Bushfires in the region



Over the last two decades, the Canberra Region has experienced a number of devastating bushfires.

During the Canberra bushfires of 2003 and the 'Black Summer' of 2019-20 alone, fires burnt across 5.5 million hectares of NSW and ACT resulting in the loss of 26 lives and the destruction of 2,476 homes.

Projections for the region show that the intensity and severity of bushfires is set to increase, resulting in a greater risk of damage to our homes and communities. As bushfires increase, so too do the devastating effects. Although updated building regulations set a minimum requirement, these are limited in scope, and in many cases would not meet the level of risk mitigation which many householders might expect. To keep our communities as safe as possible, we need to ensure our homes are upgraded sufficiently to meet the escalating threat from regional bushfires.

This Toolkit provides information and guidance on how we can improve our homes beyond minimum compliance and better protect them from bushfires, and outlines how we can all help to keep our communities safe.



Two decades
of devastating bushfires
across NSW and ACT



5.5 million
hectares burnt
across NSW and ACT



2,476
homes damaged
across NSW and ACT



26
lives lost during fires
of 2003 and 2019-20

The need for bushfire-ready homes



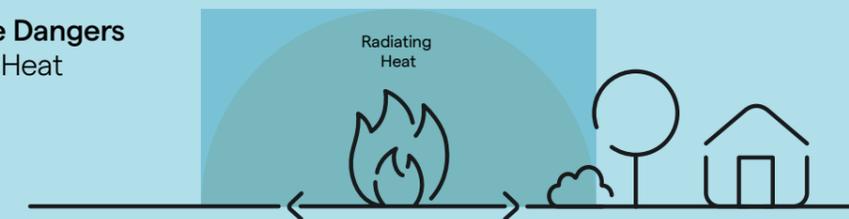
As the risk of climate impact rises, so too does the intensity and severity of bushfires. These climate hazards are having an increasing effect on communities, heightening the risk to people and property.

As risks have increased, communities which weren't traditionally affected by bushfires have been re-zoned as medium-to-high risk areas. This re-categorisation has increased the building requirements of new and substantial additions to existing homes. Bushfire Attack Level (BAL) ratings are the Australian standard for measuring a home's exposure to fire, including embers, radiant heat and direct flame contact. The BAL rating determines the construction and building requirements required for homes in bushfire-prone areas.

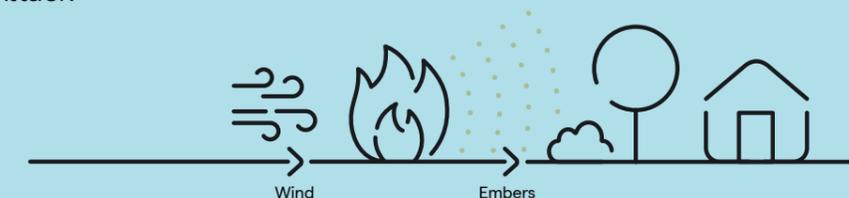
Homes which were built prior to the re-categorisation are less protected against bushfire risk. Although direct flame impact is perceived to be the biggest risk to homes from bushfire, the majority of house fires are caused by windborne embers settling on combustible materials or gaps in roofs, walls or enclosures.

To ensure our homes are better protected against these risks, structural adaptations are advised to bring existing homes up to and beyond current standards. This Toolkit details the type of adaptations homeowners can implement to improve the bushfire resilience of their homes across its lifespan, and should be considered as a boxset of measures that should be undertaken together. They have been selected based on their resilience rating and cost-effectiveness.

Bushfire Dangers Radiant Heat



Bushfire Dangers Ember Attack



Bushfire adaptations for existing homes

Bushfire-ready homes are constructed or adapted to use non-combustible construction materials.

Materials such as steel, concrete, brick, aluminium and toughened glass are designed to withstand extreme heat and ignition, lowering the risk of total loss during a fire.

These materials are incorporated into roofs, gutters and downpipes, external walls, doors and windows, as well as used in floorings, verandas, patios and decks.

The housing adaptations detailed in this Toolkit have, where possible, been selected to be appropriate for use in the second highest BAL rating zone

of BAL 40. A BAL 40 zone indicates an area with a high risk of ember attacks, where burning debris are ignited by windborne embers and increasing heat. These factors increase the likelihood of homes being exposed to flames and fire.

Through structural adaptations we can improve the bushfire-resilience of our homes and lower the risk of property loss. The next section of this Toolkit details how residents can reduce the bushfire risk to their homes and properties.



More info

Structural upgrades to make your existing home more resilient against bushfire

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Fire preparation for rentals

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Structural upgrades to make your existing home more resilient against bushfire

Several actions can reduce the likelihood of wind-borne embers affecting your home, including clearing your gutters, sealing any gaps and moving flammable items away from your home.

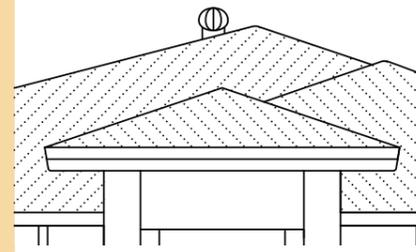
In areas of high-risk, structural adaptations to existing homes are strongly recommended. In combination with proper maintenance and preparation measures, these structural adaptations help your home to withstand ember attacks, extreme heat and direct flame contact. Structural adaptations require old materials to be replaced with non-combustible BAL-rated construction materials.

Older homes or homes originally built in low-risk areas have materials such as timber, concrete or terracotta roof tiles. These materials increase the likelihood for embers to cause ignition due to their combustibility, surface texture, spacing structure, material design and structure. Such materials aren't

designed to withstand extreme heat, direct flame or reduce the ignition of embers.

The next few pages will provide guidance on the types of materials and resilience improvements recommended, as well as the long-term benefits of upgrading your home to be bushfire-ready.

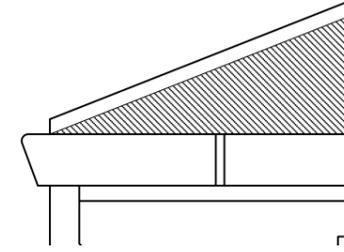
Make your roof bushfire-ready



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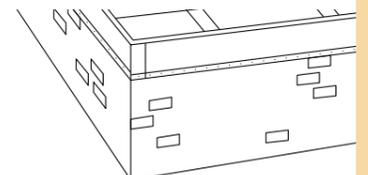
Make your gutters and pipes bushfire-ready



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Make your ground floor structures and enclosures bushfire-ready



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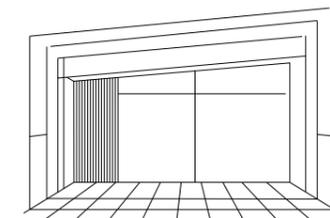
Make your windows and doors bushfire-ready



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Make your verandahs, patios and decks bushfire-ready



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More info

Fire preparation for rentals

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Structural upgrades to make your roof bushfire-ready

Existing homes in the region have roof coverings made from corrugated steel, concrete or terracotta tiles, or zinc-aluminium coated steel. Of all these materials, zinc-aluminium coated steel is the most cost-effective and resilient roofing material for upgrading existing homes.



More info

Improving the bushfire resilience of:

Older brick veneer homes?

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Newer brick veneer homes?

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Weatherboard homes?

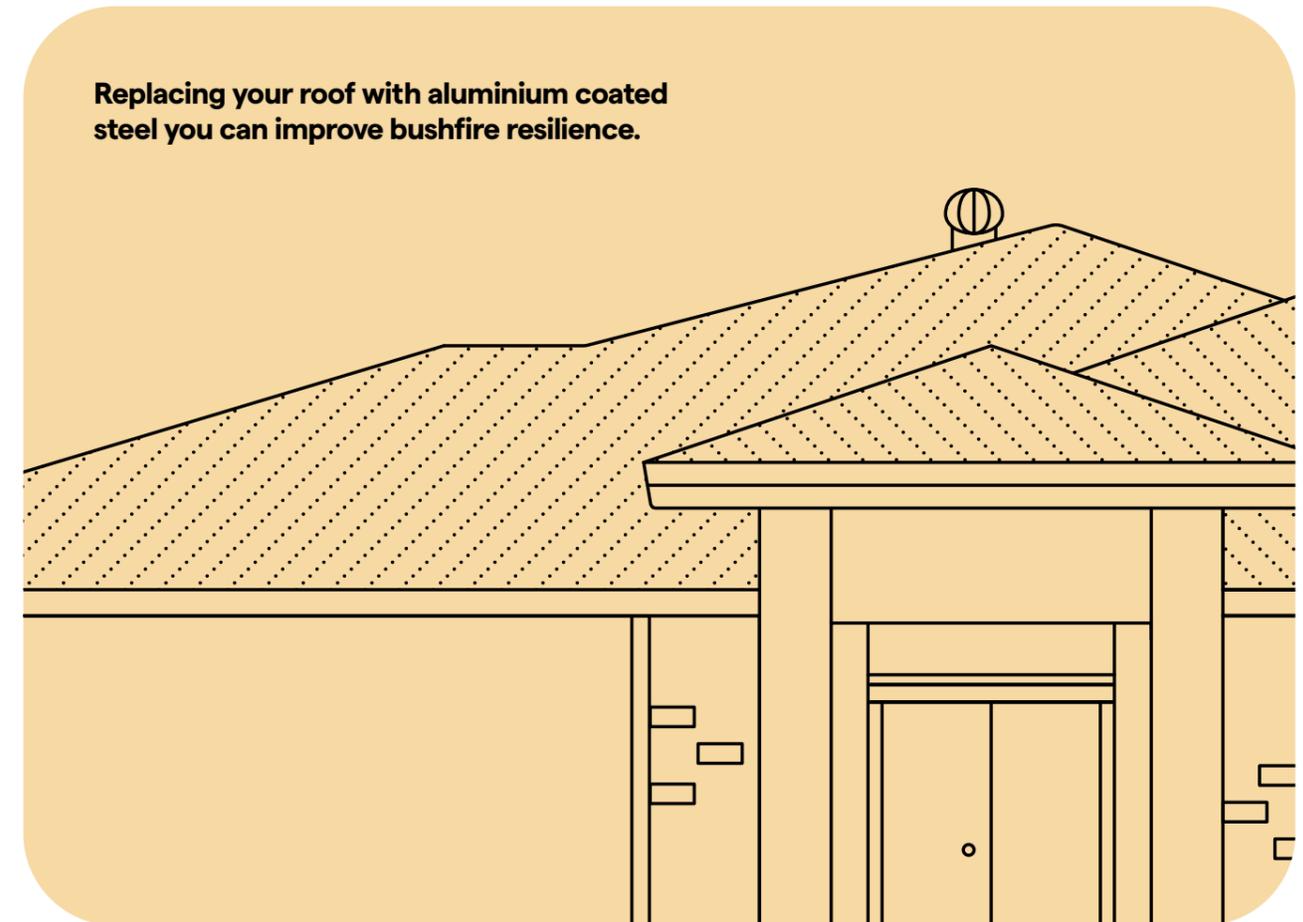
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Timber clad homes?

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Protection benefits of non-combustible material upgrades

In combination with detailed protection measures to reduce ember ingress, the high heat and flame tolerance of Zinc-aluminium coated steel can provide a higher level of resilience to bushfire than other commonly used roofing materials. Well installed zinc-aluminium coated steel roofs using steel roof framing and batons, or with sealed ridge valley and eave details, have less weak points than other coverings. The overlapping structure of concrete and terracotta tiled roofs means that fallen or windborne embers can settle and ignite in these gaps or roof spaces.

Detailed protection measures

When replacing your roof, you should also consider any weak points in ventilation areas, eaves and around the cappings, and ensure the use of non-combustible eaves fascia and lining. To fill any gaps, you can use small-aperture ventilation slots or metal flyscreen for areas requiring ventilation, or bushfire rated rockwool insulation or roof profile closures to fill other gaps.

Structural upgrades to make your gutters and downpipes bushfire-ready

Existing homes across the region have gutters and downpipes made of plastic (PVC), or painted steel. Of these materials, the most cost-effective option for upgrading your gutters and downpipes to be more resilient to bushfire, is painted steel or zinc aluminium coated steel.



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Improving the bushfire resilience of:

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Weatherboard homes?

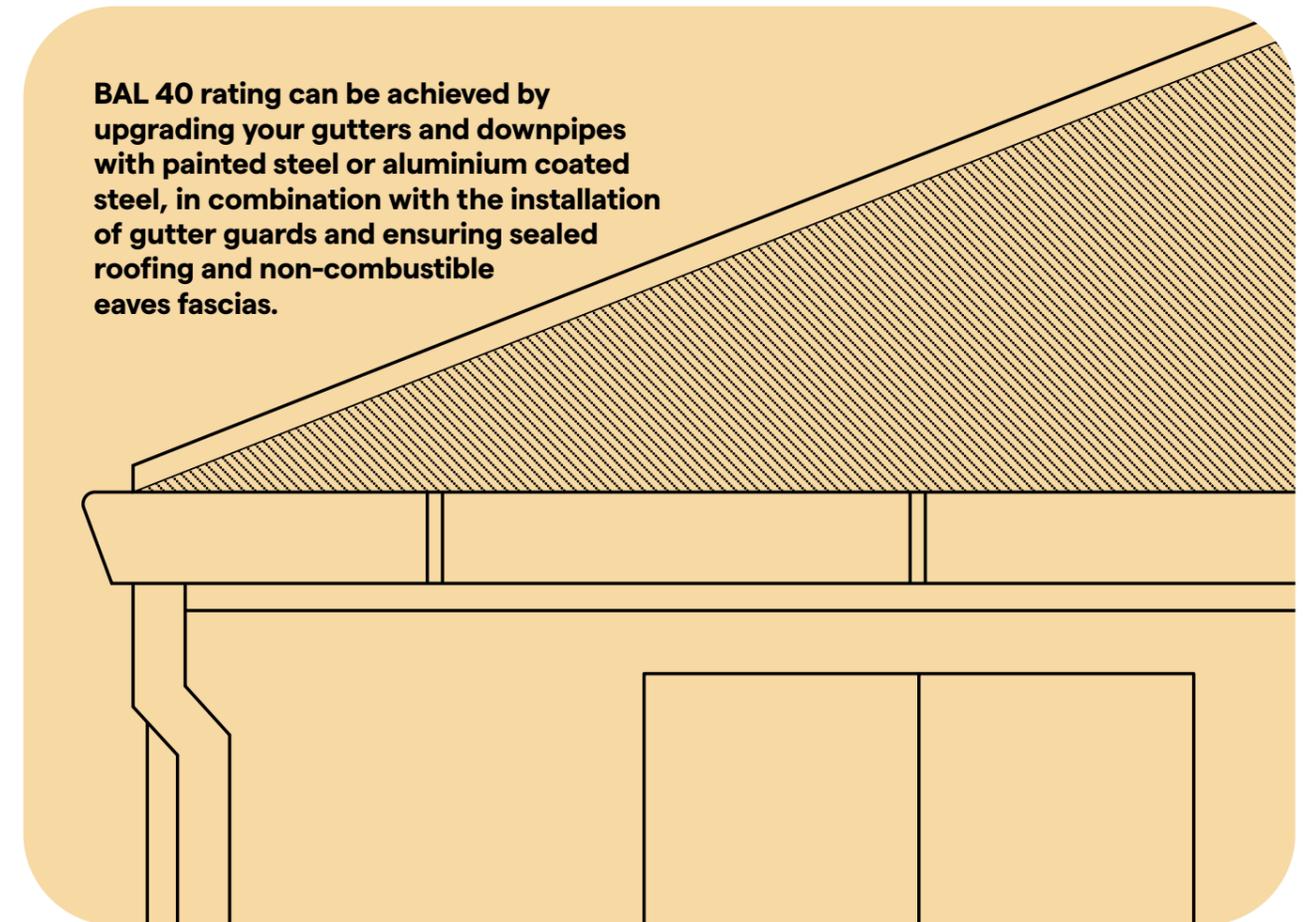
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Timber clad homes?

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Protection benefits of non-combustible material upgrades

Painted steel or zinc aluminium coated steel are a non-combustible alternative to PVC gutters and downpipes. PVC gutters are prone to melt and collapse and may add to combustible materials around the home. Upgrading guttering must be undertaken in combination with the installation of gutter guards, and ensuring sealed roofing and non-combustible eaves fascia to realise improved resilience.

Detailed protection measures

In addition to opting for steel gutters and downpipes, installing a gutter guard is necessary to improve resilience. Gutter guards should be made of non-combustible materials (steel mesh with a maximum of 1.8 mm¹ aperture). Prior to installation, clear your gutters and downpipes of leaves, twigs, bark and any other debris to avoid embers landing and igniting. Downpipe or gutter plugs can also be of use and help fill your gutters with water to defend your home².

¹Edge Environment, 2021

² RFS, Fire Ready, 2021

Structural upgrades to make your ground floor structures and enclosures bushfire-ready

The most common material used in ground floor structures across the region is a suspended timber structure (piers or piles). The most cost-effective option for upgrading your suspended timber floor is to enclose the ground floor structure with steel cladding, fine steel mesh, or masonry*.



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Improving the bushfire resilience of:

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Newer brick veneer homes?

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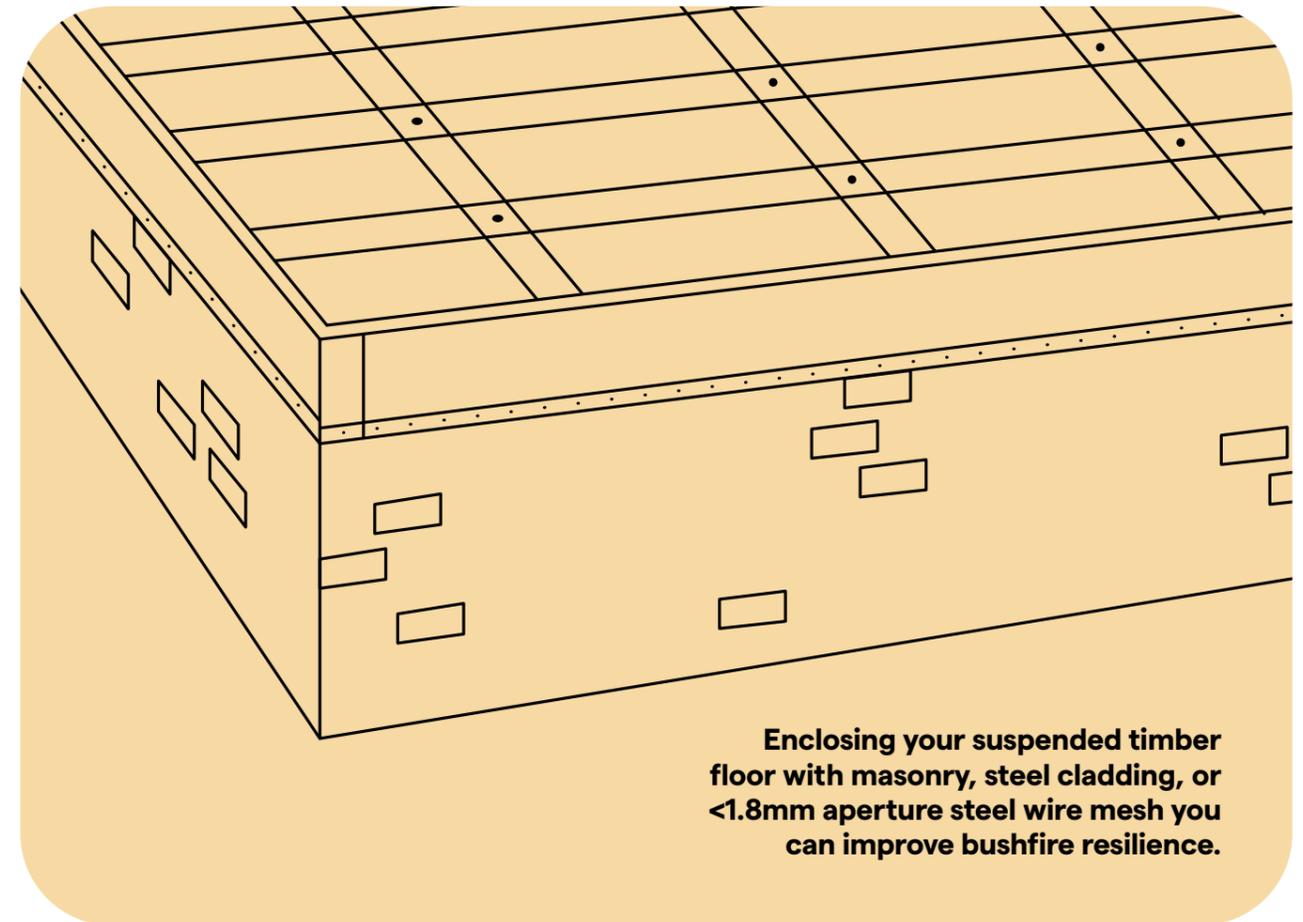
Timber clad homes?

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Metal clad homes?

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*Sub-floor area should be enclosed and sealed, however adequate ventilation (covered with <1.8mm aperture steel mesh) should be included in design to avoid timber rot and termite damage.



Enclosing your suspended timber floor with masonry, steel cladding, or <1.8mm aperture steel wire mesh you can improve bushfire resilience.

Protection benefits of non-combustible material upgrades

For homes with a raised floor structure, it is recommended to enclose the ground floor structure with steel cladding, fine steel mesh, or masonry. The most common masonry construction materials are brick, stone and concrete blocks.

Zinc aluminium coated steel can be used for metal cladding, and where mesh is selected it should be <1.8mm aperture steel wire mesh. Adequate ventilation (covered with <1.8mm aperture steel mesh) should be included in the sub-floor enclosure design to avoid timber rot and termite damage. For homes without a sub-floor structure, or concrete slab homes, the detailed protection measures guidance should be followed.

Detailed protection measures

For homes where the ground floor structure is already enclosed, it is recommended that any gaps in the cladding are sealed with a <1.8mm aperture steel wire mesh installed over vents and masonry weep holes¹. This will avoid embers settling and being able to ignite.

¹Edge Environment, 2021

Structural upgrades to make your windows and doors bushfire-ready

Existing houses in the Canberra region commonly have doors and windows framed or made of timber or aluminium. The most cost-effective option for upgrading your windows and doors to be more bushfire-resilient is to use aluminium-framed toughened glass¹.



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Protection benefits of non-combustible material upgrades

Among commonly available window and door frame materials, frames made from aluminium provide better resilience to bushfire. Doors constructed from aluminium also have greater bushfire-resilience than wooden doors. 6mm toughened glass is preferable standard glass for glazing in both windows and doors.

To achieve the greatest bushfire resilience external BAL 40-rated shutters should be installed over all windows and doors.

Detailed protection measures

Without bushfire shutters, BAL 40 compliance for windows and doors can only be achieved through installing <1.8mm aperture steel wire mesh screen externally to all windows and doors. This helps to prevent ember ingress or embers settling against frames. Additionally infill panelling should be installed above all doors and windows. Weather stripping can be placed around the doors and windows to seal any gaps³.

¹ Edge Environment, 2021

³ Capral, A guide to windows and doors in bushfire prone areas, 2019, https://www.capral.com.au/wordpress/wp-content/uploads/2019/11/A-Guide-to-Windows-and-Doors-in-Bushfire-Prone-Areas_v6.0.pdf

Structural upgrades to make your verandahs, patios and decks bushfire-ready

Existing homes in the Canberra region feature verandas, patios and decks made from timber or concrete. Concrete or steel are the most resilient and cost-effective for upgrading existing homes¹.



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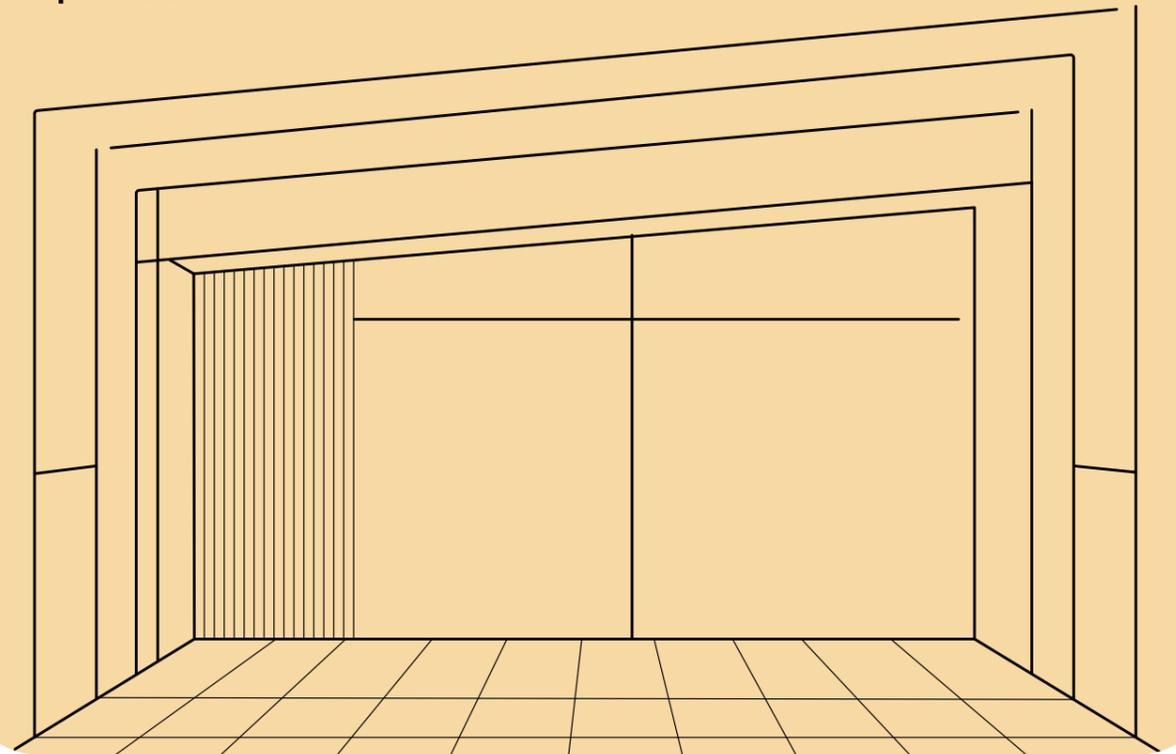
Timber clad homes?

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Metal clad homes?

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Upgrading your verandahs, patios and deck to concrete or steel can improve bushfire resilience.



Protection benefits of non-combustible material upgrades

To achieve greater bushfire resilience, it is recommended that verandas, patios and decks be upgraded to non-combustible materials such as concrete or steel¹. There are numerous non-combustible materials on the market with some designed to look like timber. If structures or building elements are connected to the house, or sit within 10m of the house, they should also be made of non-combustible materials¹.

Detailed protection measures

In addition to upgrading your verandas, patios and decks, it is advisable to enclose open areas under decks with non-combustible materials such as masonry or steel mesh (<1.8mm aperture). Gaps between decking surfaces should be filled to ensure that embers cannot fall into the sub-deck space. Any flammable items should also be moved away from the home, such as woodpiles, boxes, hanging baskets, outdoor furniture and doormats¹.

¹Edge Environment, 2021

Five common house types were identified in the Canberra region

The size and age of building elements in each home will vary. The structural bushfire resilience upgrades therefore will be dependent on your type of home and the building materials used.

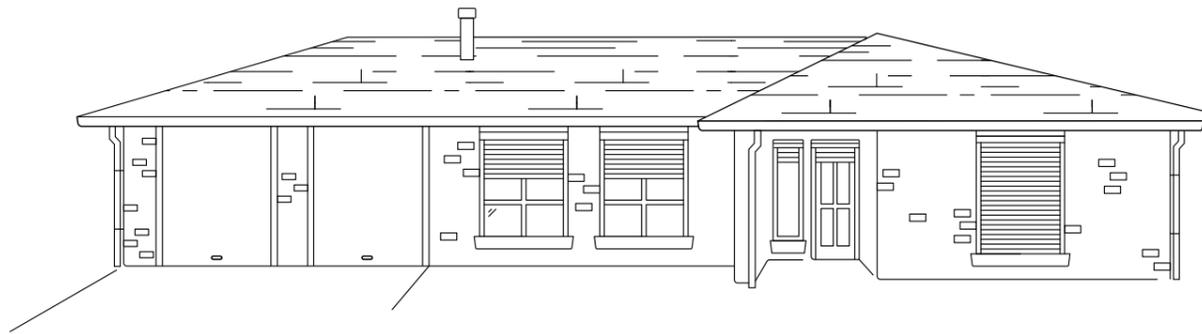
Weatherboard home

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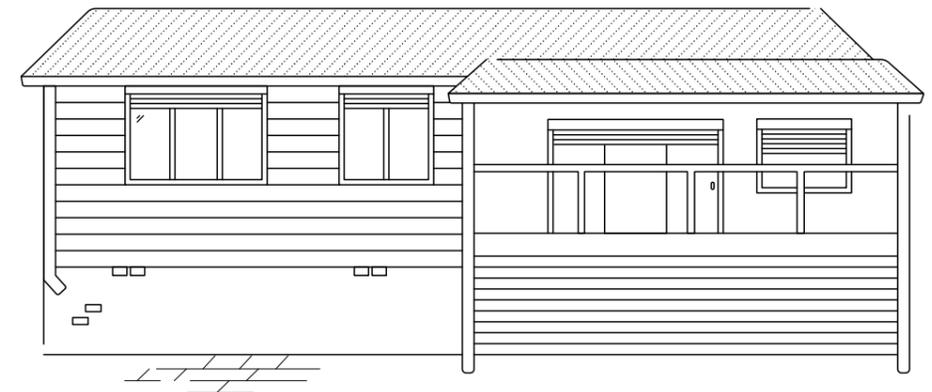
Older brick veneer home

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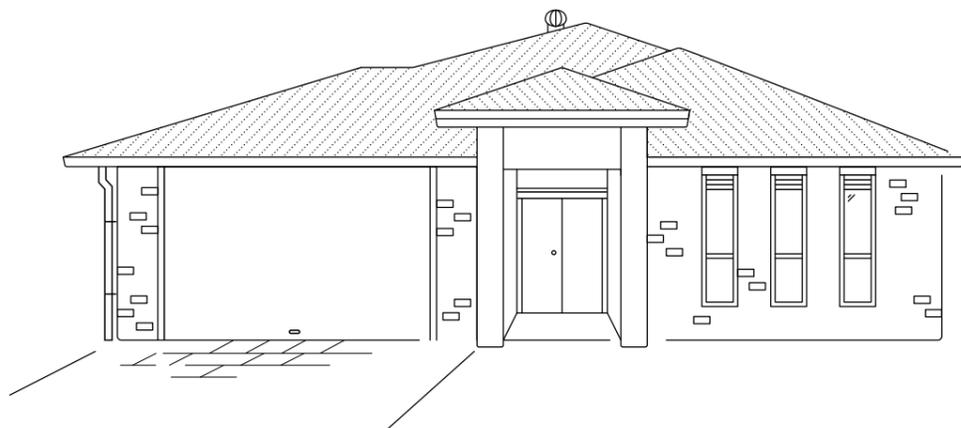
Timber clad home

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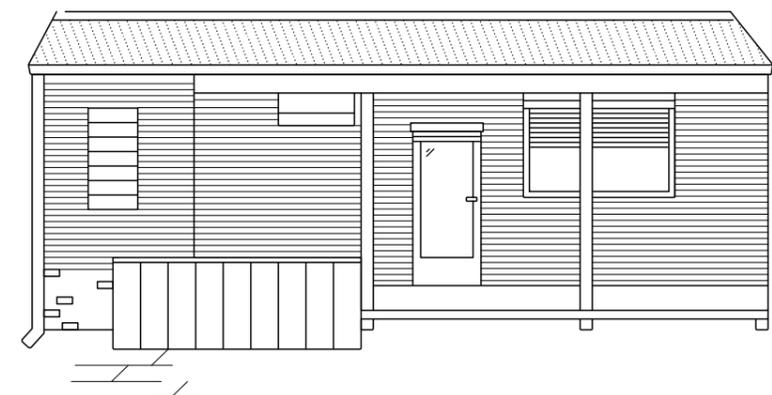
Newer brick veneer home

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Metal clad home

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Improving the bushfire resilience of older brick veneer homes

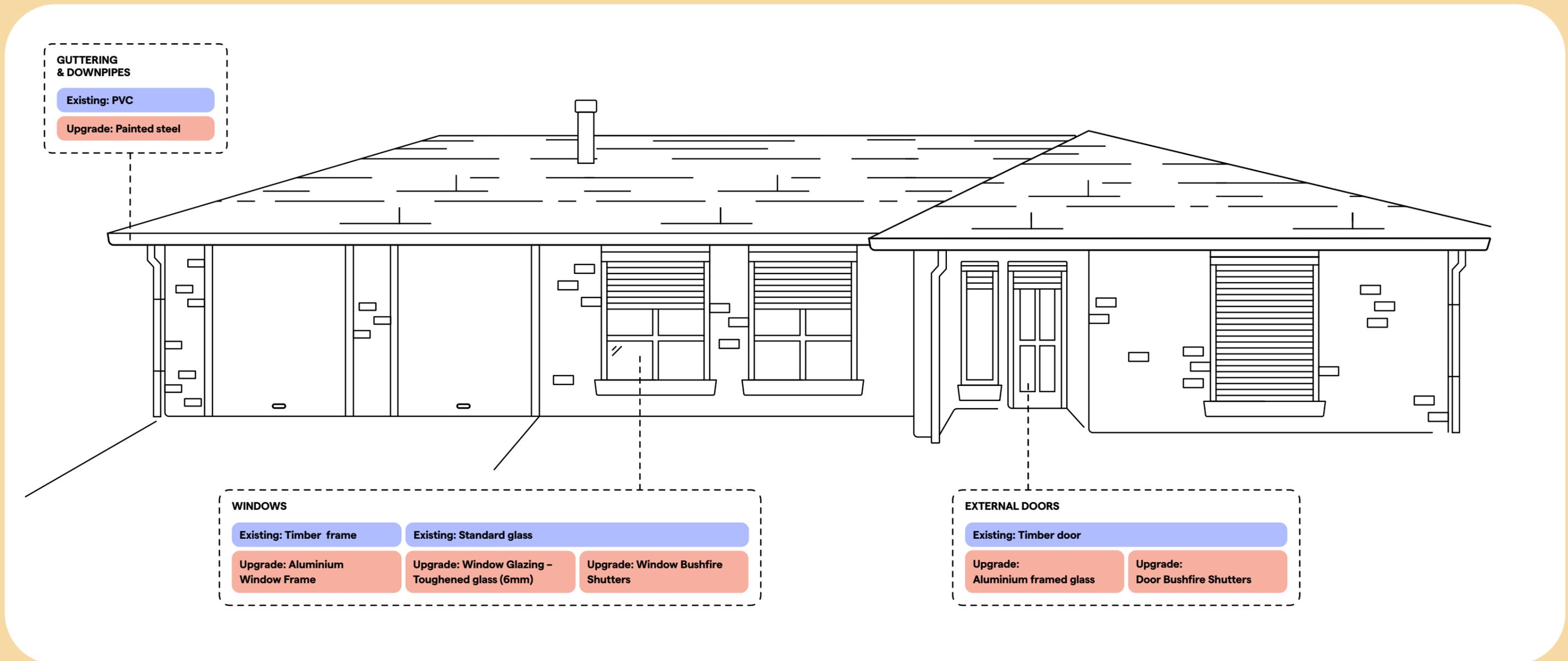
Based on common construction dates and house sizes of older brick veneer homes in the region, an archetype of older brick veneer homes has been developed. The infographic below shows common existing building materials and structural upgrades that improve bushfire resilience. The older brick veneer archetype home in this infographic has been calculated based on the following information: Size 160m², Age <1990. As the size and age of building elements in each home will vary this information should be used as guidance only.

Through upgrading the components detailed on the infographic, you can improve the bushfire resilience of your existing home.

Below are 5 key steps to starting this process:

- 1 Identify which existing material your home used for these common components.
- 2 Confirm if the material you've identified matches the recommended bushfire-resilient structural upgrades on in section 4 pages 11-22.
- 3 If not, contact your local builder to confirm if this component or material is compliant with the BAL rating for your area.
- 4 If the material is not compliant, source three quotes from three reputable builders in your area to upgrade this component to meet BAL ratings and improve your bushfire resilience.

For additional information on bushfires visit <https://research.csiro.au/bushfire/bushfire-basics/>



¹Edge Environment, 2021

Improving the bushfire resilience of newer brick veneer homes

Based on common construction dates and house sizes of older brick veneer homes in the region, an archetype of newer brick veneer homes has been developed. The infographic below shows common existing building materials and structural upgrades that improve bushfire resilience. The newer brick veneer archetype home in this infographic has been calculated based on the following information: Size 248m², Age >1990. As the size and age of building elements in each home will vary this information should be used as guidance only.

Through upgrading the components detailed on the infographic, you can improve the bushfire resilience of your existing home.

Below are 5 key steps to starting this process:

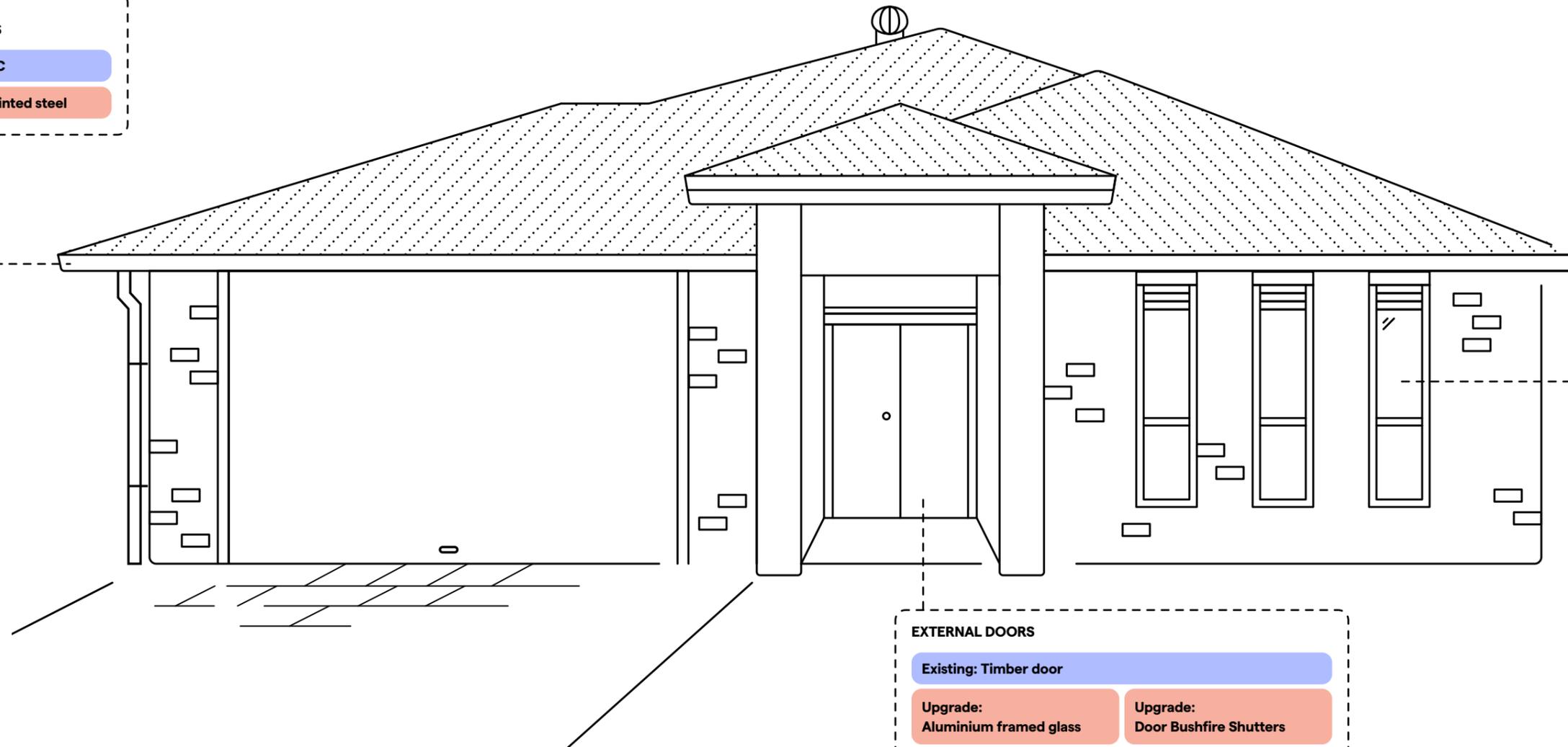
- 1 Identify which existing material your home used for these common components.
- 2 Confirm if the material you've identified matches the recommended bushfire-resilient structural upgrades on in section 4 pages 11-22.
- 3 If not, contact your local builder to confirm if this component or material is compliant with the BAL rating for your area.
- 4 If the material is not compliant, source three quotes from three reputable builders in your area to upgrade this component to meet BAL ratings and improve your bushfire resilience.

For additional information on bushfires visit <https://research.csiro.au/bushfire/bushfire-basics/>

GUTTERING & DOWNPIPES

Existing: PVC

Upgrade: Painted steel



Improving the bushfire resilience of weatherboard homes

Based on common construction dates and house sizes of older brick veneer homes in the region, an archetype of weatherboard homes has been developed. The infographic below shows common existing building materials and structural upgrades that improve bushfire resilience. The weatherboard archetype home in this infographic has been calculated based on the following information: Size 160m², Age 1946-1980. As the size and age of building elements in each home will vary this information should be used as guidance only.

Through upgrading the components detailed on the infographic, you can improve the bushfire resilience of your existing home.

Below are 5 key steps to starting this process:

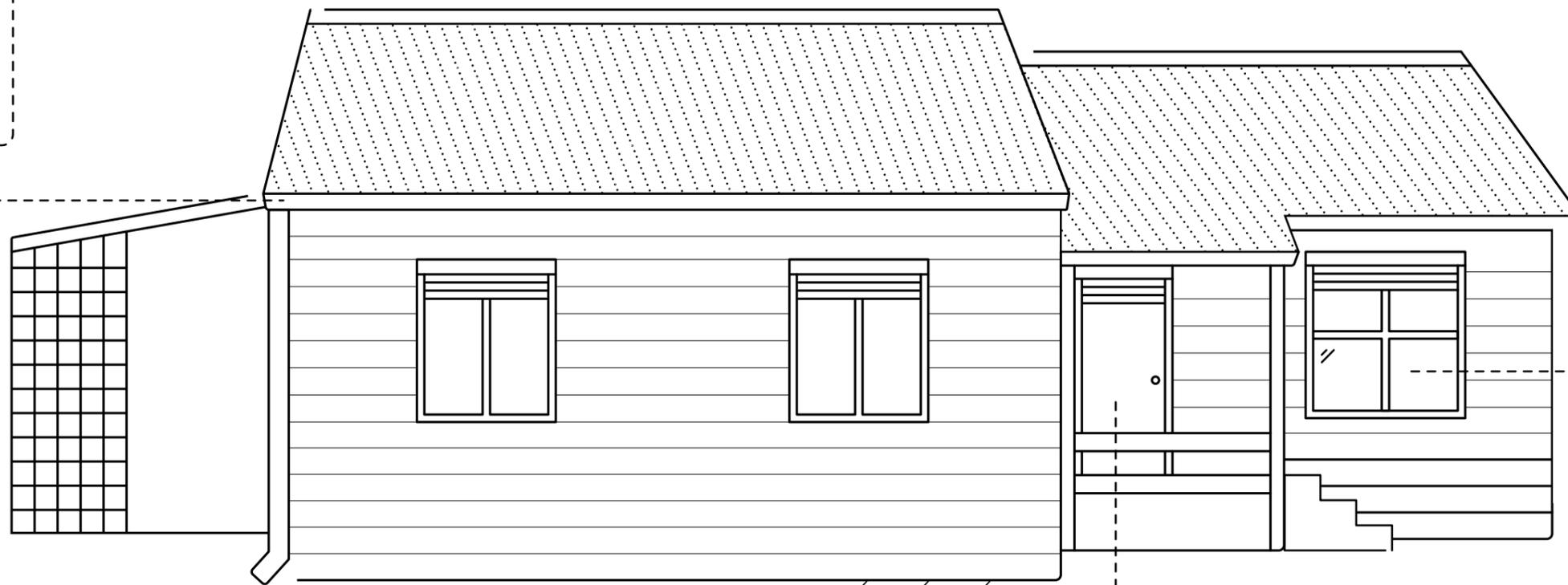
- 1 Identify which existing material your home used for these common components.
- 2 Confirm if the material you've identified matches the recommended bushfire-resilient structural upgrades on in section 4 pages 11-22.
- 3 If not, contact your local builder to confirm if this component or material is compliant with the BAL rating for your area.
- 4 If the material is not compliant, source three quotes from three reputable builders in your area to upgrade this component to meet BAL ratings and improve your bushfire resilience.

For additional information on bushfires visit <https://research.csiro.au/bushfire/bushfire-basics/>

GUTTERING & DOWNPIPES

Existing: PVC

Upgrade: Painted steel



GROUND FLOOR ENCLOSURE

Existing: None

Upgraded: Masonry, steel cladding, or <1.8mm aperture steel wire mesh.

EXTERNAL DOORS

Existing: Timber framed glass door

Upgrade: Aluminium framed glass

Upgrade: Door Bushfire Shutters

WINDOWS

Existing: Timber frames

Existing: Standard glass

Upgraded: Aluminium

Upgrade: Window Glazing - Toughened glass (6mm)

Upgrade: Window Bushfire Shutters

VERANDAHS, PATIOS AND DECKS

Existing: Timber

Upgraded: Concrete or Steel

Improving the bushfire resilience of timber clad homes

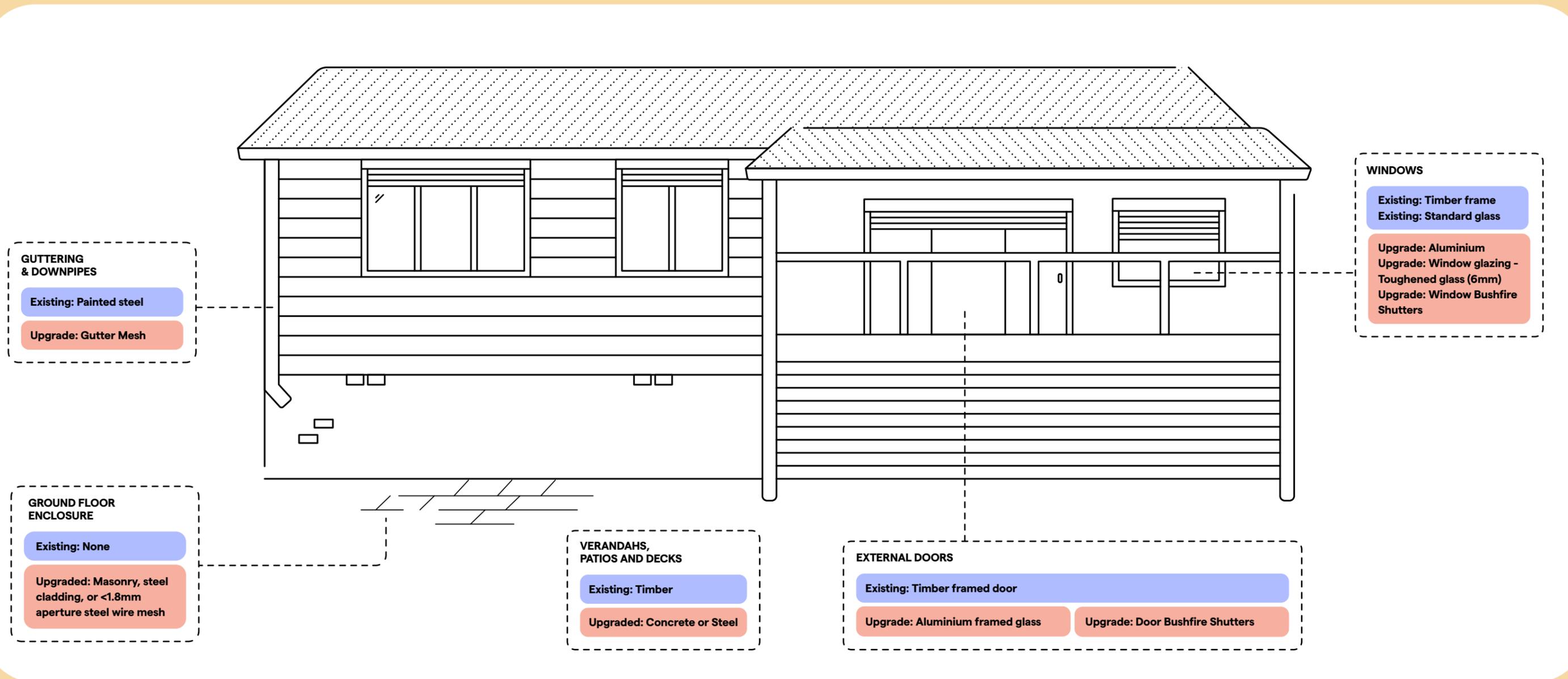
Based on common construction dates and house sizes of older brick veneer homes in the region, an archetype of timber clad homes has been developed. The infographic below shows common existing building materials and structural upgrades that improve bushfire resilience. The timber clad archetype home in this infographic has been calculated based on the following information: Size 160m², Age 1946-1990. As the size and age of building elements in each home will vary this information should be used as guidance only.

Through upgrading the components detailed on the infographic, you can improve the bushfire resilience of your existing home.

Below are 5 key steps to starting this process:

- 1 Identify which existing material your home used for these common components.
- 2 Confirm if the material you've identified matches the recommended bushfire-resilient structural upgrades on in section 4 pages 11-22.
- 3 If not, contact your local builder to confirm if this component or material is compliant with the BAL rating for your area.
- 4 If the material is not compliant, source three quotes from three reputable builders in your area to upgrade this component to meet BAL ratings and improve your bushfire resilience.

For additional information on bushfires visit <https://research.csiro.au/bushfire/bushfire-basics/>



Improving the bushfire resilience of metal clad homes

Based on common construction dates and house sizes of older brick veneer homes in the region, an archetype of metal clad homes has been developed. The infographic below shows common existing building materials and structural upgrades that improve bushfire resilience. The metal clad archetype home in this infographic has been calculated based on the following information: Size 160m², Age 1946-1990. As the size and age of building elements in each home will vary this information should be used as guidance only.

Through upgrading the components detailed on the infographic, you can improve the bushfire resilience of your existing home.

Below are 5 key steps to starting this process:

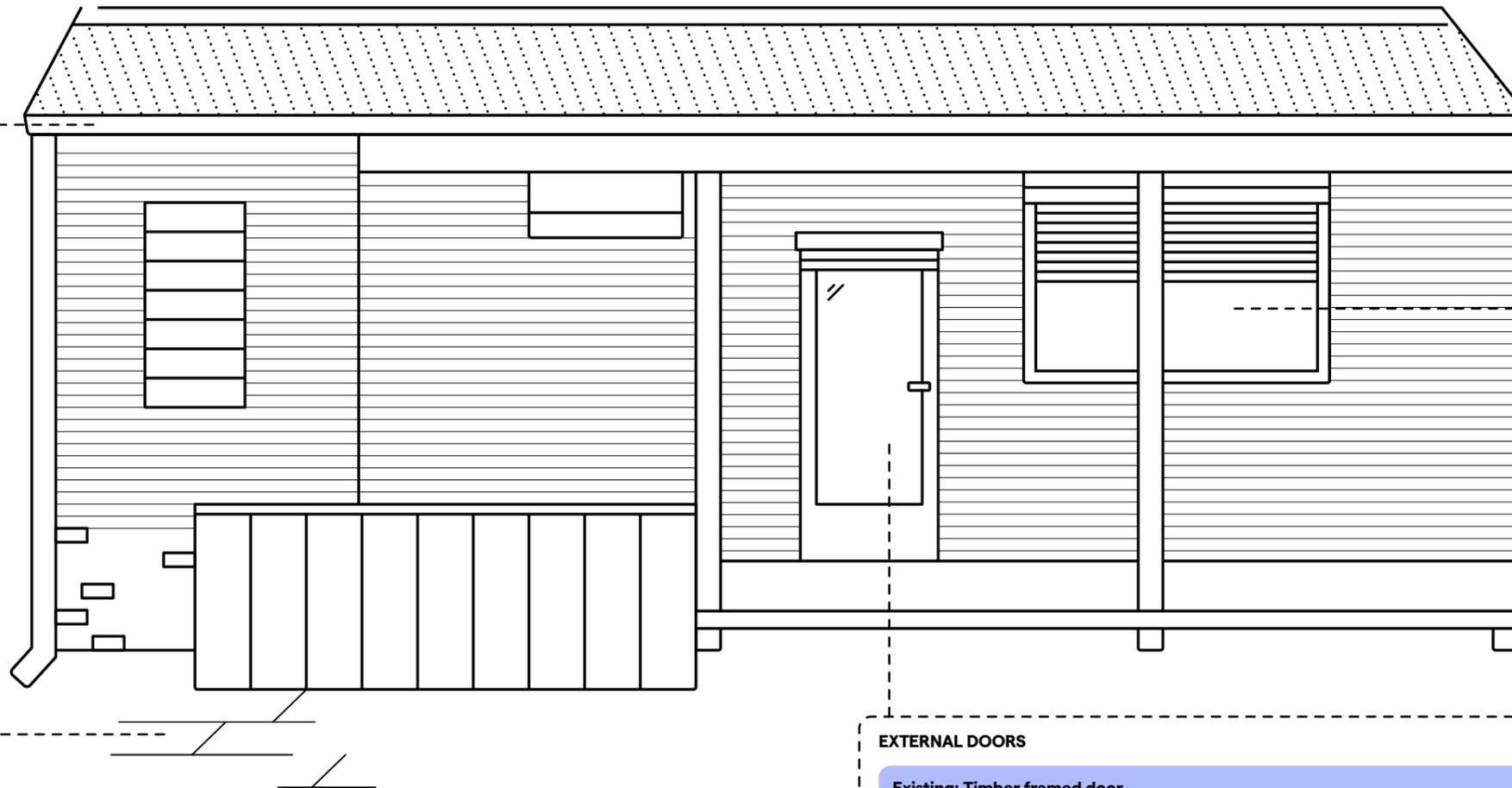
- 1 Identify which existing material your home used for these common components.
- 2 Confirm if the material you've identified matches the recommended bushfire-resilient structural upgrades on in section 4 pages 11-22.
- 3 If not, contact your local builder to confirm if this component or material is compliant with the BAL rating for your area.
- 4 If the material is not compliant, source three quotes from three reputable builders in your area to upgrade this component to meet BAL ratings and improve your bushfire resilience.

For additional information on bushfires visit <https://research.csiro.au/bushfire/bushfire-basics/>

GUTTERING & DOWNPIPES

Existing: Painted steel

Upgrade: Gutter Mesh



WINDOWS

Existing: Timber frame
Existing: Standard glass

Upgrade: Window Glazing - Toughened glass (6mm)
Upgrade: Window Bushfire Shutters

GROUND FLOOR ENCLOSURE

Existing: None

Upgraded: Masonry, steel cladding, or <1.8mm aperture steel wire mesh

EXTERNAL DOORS

Existing: Timber framed door

Upgrade: Aluminium framed glass Upgrade: Door Bushfire Shutters

VERANDAHS, PATIOS AND DECKS

Existing: Timber

Upgraded: Concrete or Steel

Fire preparation for rentals



As a tenant, there are important preparation activities you can undertake to protect your home for bushfire season. In fact, anyone can follow these steps. These actions will help reduce your bushfire risk⁴.

Get Ready for summer now in five simple steps:

1

Know your risk.

Think about the area you're in or the location of your holiday destination, and the types of disasters that could affect you.

2

Plan now for what you will do.

Sit down and talk with your family and plan for what you will do if a disaster affects your area or holiday location.

3

Get your home ready.

Prepare your home by doing general home maintenance.

4

Be aware.

Find out how to prepare and what to do if there is a disaster in your area or while you are away on holidays. Connect with NSW emergency services or keep on top of news reports if traveling so you can stay informed.

5

Look out for each other.

Share information with your family, friends, neighbours and others who may need assistance.



Get Ready is a community preparedness program coordinated by Resilience NSW.

⁴ Resilience NSW, Get Ready Campaign, 2021, <https://www.nsw.gov.au/resilience-nsw/get-ready-program-for-local-councils>

Bushfire adaptation support and material sources

Contact the following services to find out more about bushfire preparation and bushfire resilience in your area.



Local council

Contact your local council representative to find out more about the bushfire preparation activities in your region.



Rural Fire Service

Contact your local Rural Fire Service to find out more about community engagement events in your region.



Insurer

Contact your insurer to find out if they have resilience incentives to help support your resilience upgrade.



Bank

Contact your bank to find out if they have resilience or home upgrade loans to help support your resilience upgrade.