

Deck, balcony and window safety

A guideline for the use, inspection and maintenance of decks, balconies and windows

This guideline is an initiative of Growth Management Queensland.

The State Government, through Growth Management Queensland, is leading the way with a focused approach to growth management, to help shape tomorrow's Queensland.

Growth Management Queensland has the task of managing the impacts of population growth through sustainable planning practices, timely provision of infrastructure to support our population and delivering best practice building standards.

The Department of Infrastructure and Planning brings together planning, local government and infrastructure responsibilities into one department enabling government to deliver integrated solutions, face the state's population and economic challenges and secure a sustainable future for Queensland.



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Why this guideline?

This guideline has been developed to help building owners and occupiers carry out inspections on balustrades, decks and balconies in order to check the safety.

It also includes useful advice about safety issues associated with elevated floors and opening windows.

Owners and managers of non-residential buildings with a deck or balcony, such as restaurants, hotels and clubs, may also find this guideline relevant.

In recent years a number of deaths and serious injuries have occurred as a result of falls from decks, balconies and windows, or from the collapse of decks and balconies.

Statistics from pre-purchase inspection agencies suggest that approximately six per cent of Australian houses have a timber deck or balcony and about two per cent of these may

cause potentially fatal injuries if they collapsed or if the balustrade or railing failed. These numbers are estimated to be even higher in Queensland where, due to our unique climate, timber decks are a major feature of many homes. Some of these decks may have been constructed inadequately or illegally and could now be in danger of collapse.

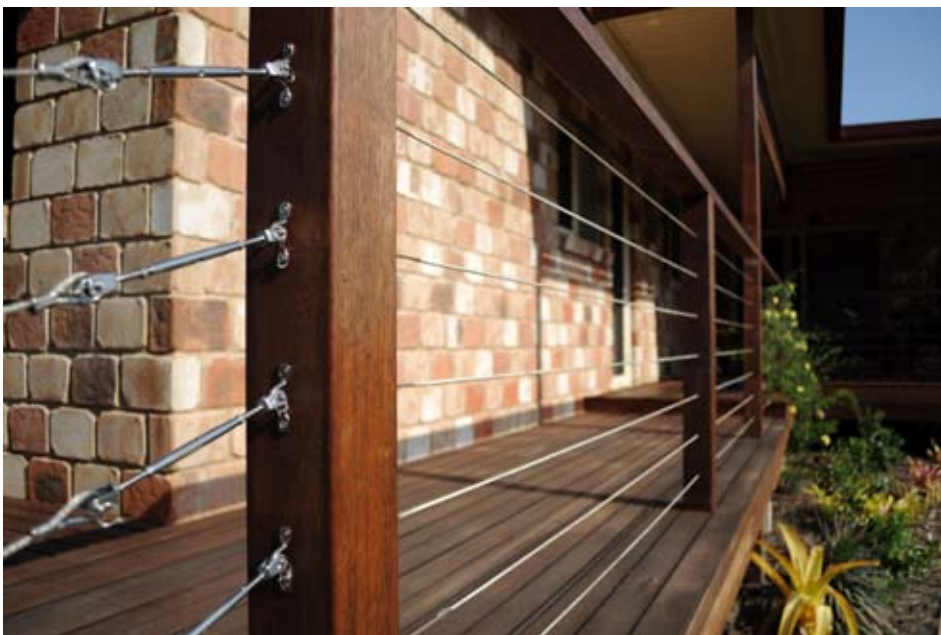
Building owners especially need to consider risks and consequences arising from an injury or death associated with a failing balustrade or deck, which is proven to be in poor condition or illegally built.

If you own a building with a balcony or deck—whether it is made from timber, metal, concrete or another material—you should ensure it is inspected carefully for decaying timbers, unstable balustrades, corrosion and cracking of concrete.

Remember

In Queensland from 1999 to 2008 more than 20 people died and hundreds injured after falling from decks or balconies, or as a result of deck or balcony collapse.

Had people been more aware of the dangers associated with elevated areas and the importance of adequate maintenance of decks and balconies, some of these deaths and injuries may have been prevented.



Adequate maintenance of decks and balconies can save lives

2010 Coroner's report into deck collapse

In November 2008 a deck collapsed causing the death of one person and injuring many. The deck was constructed prior to the 1940s using methods not common by today's standards.

On 28 June 2010, the Brisbane Coroner released the findings on the investigation into the death caused by the collapse.

The Coroner recommended occupiers of all residential dwellings that include a timber deck or balcony (particularly those built before the 1940s) have them checked for structural integrity.

Figure 2 shows a typical construction method for pre-1940s decks. The beam (or bearer) is cogged out to hold the joist. The joist is held in place with nails. This was the joining method used on the collapsed deck.

In this type of construction method the ends of the joists are concealed by the bearer in the area where the joist rests.

Over time, the nails can rust out, the beam can bow outwards and the joist can separate, potentially resulting in structure failure or collapse as shown in Figure 3.

It is important to note that this is just one way in which a deck may fail. Other areas should be inspected on a regular basis to check the structure's reliability and integrity.

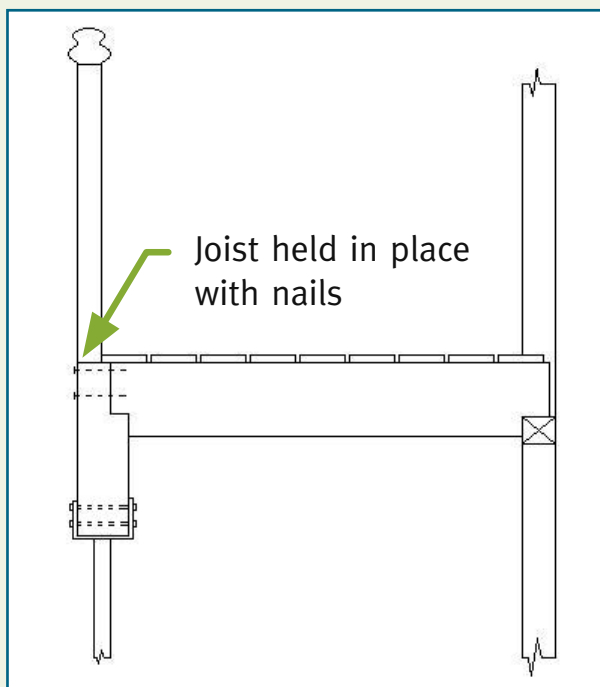


Figure 2: Pre-1940s deck construction with a cogged out beam holding the joist with nails

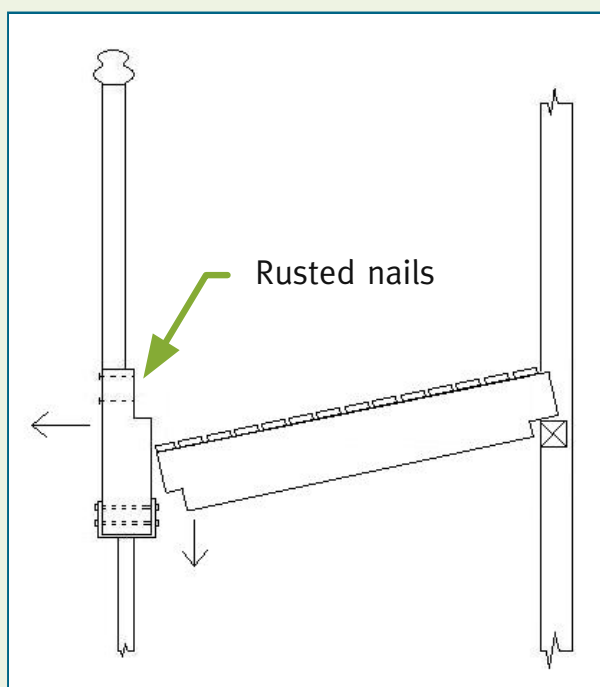


Figure 3: Old nails can rust out causing structure to collapse



1.

Decks and balconies

Balustrade requirements

In Queensland there are strict requirements for the design and construction of balustrades and railings.

Under the Building Code of Australia (BCA) a balustrade or barrier is required where people could fall one metre or more from a floor or accessible roof of a building. Put simply, where a difference in height from the deck or balcony to the ground or another lower level is one metre or more, a balustrade of at least one metre in height is required.

Retaining walls do not require a balustrade unless they are associated with a path of travel to, from or between buildings. However, for other retaining walls, it is a good idea to provide a balustrade or other barrier in situations where there is a risk of a person falling from the retaining wall.

Requirements for balustrades differ depending on the height of the deck or balcony above the ground. For decks or balconies more than one metre above the ground, a balustrade cannot have any openings greater than 125 millimetres, to help prevent people from falling through them. This is also a requirement for decorative balustrades. For decks or balconies more than four metres above the ground, a balustrade must also not have any climbable elements, such as horizontal rails, located between 150 millimetres and 760 millimetres from the floor.

Balustrades must be constructed so that they can resist the forces reasonably expected to be placed upon them. These forces include people leaning against them and strong winds.

Remember

Where a deck or balcony is one metre or higher above the ground balustrades need to be at least one metre high.

For decks more than one metre above the ground, openings in balustrades, including decorative balustrades, cannot be greater than 125 millimetres.

For decks more than four metres above the ground, balustrades cannot have any climbable elements located between 150 millimetres and 760 millimetres from the floor.

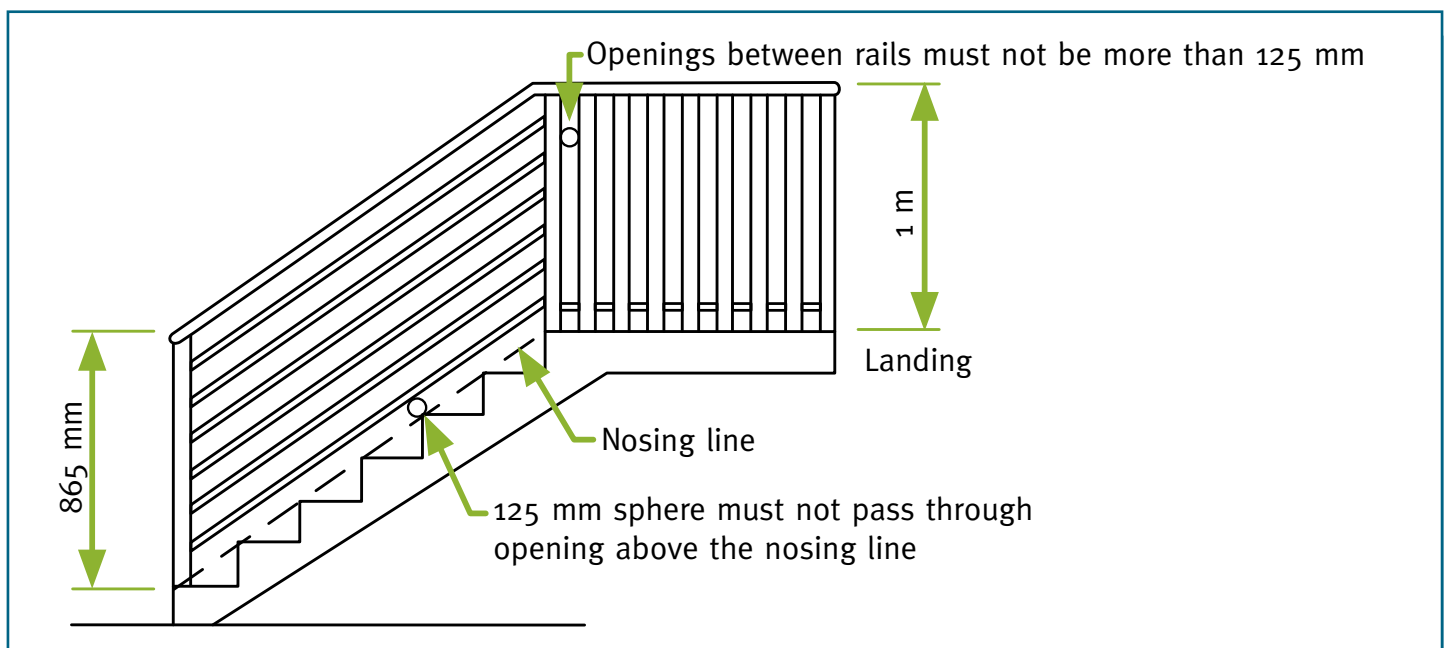


Figure 1: Balustrade or other barrier construction (Courtesy: Australian Building Codes Board)

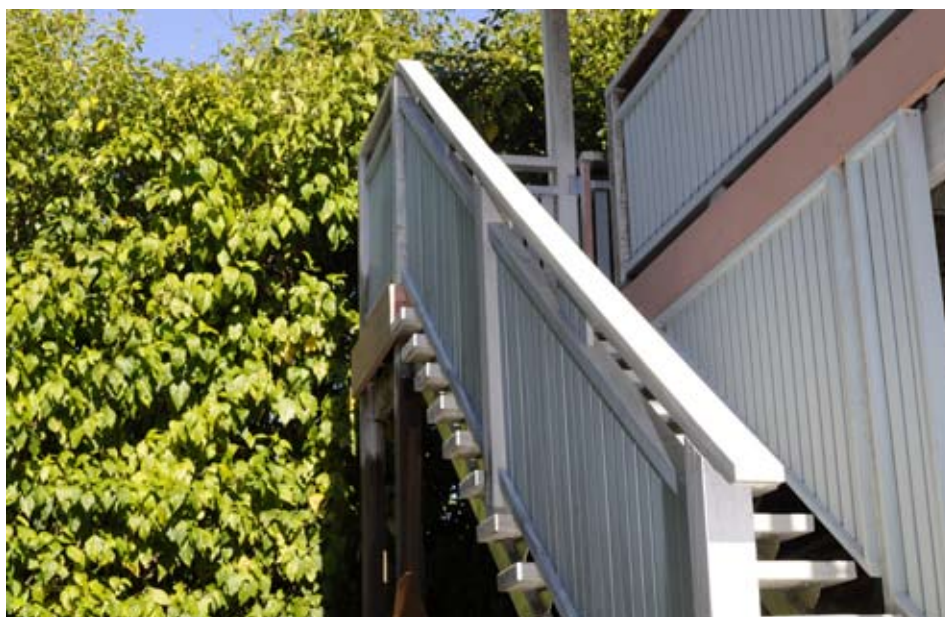


Stairs

Balustrades or railings on stairs are equally as important as those for decks and balconies. When people ascend or descend stairs, they generally gain support using the railing, which can also act as a barrier. Therefore, stairs require a similar barrier to decks and balconies, and it is important that these balustrades are sturdy and can withstand appropriate pressures, such as the force of a person.

For most stairs, a barrier of at least 865 millimetres high above the ‘nosing’ of the stair treads is required. The ‘nosing’ of the stair treads can be

measured by placing a string line, or straight object, where each stair tread begins, forming a slope. The measurement of 865 millimetres can be taken vertically anywhere along this line to the bottom of the balustrade. As with balustrades for decks and balconies, gaps in balustrades on stairs cannot have openings greater than 125 millimetres. For stairs more than four metres in height, a balustrade must also not have any climbable elements, such as horizontal rails, located between 150 millimetres and 760 millimetres from the floor.



Stairs require a similar barrier to decks and balconies

Windows

Elevated opening windows, which are common in older houses—especially Queenslander style homes and units, must have a barrier at least 865 millimetres high if a person could fall four metres or more from the window. Generally, this requirement can be met by locating the bottom of the window at least 865 millimetres above the floor. As with balustrades for decks, balconies and stairs, gaps in barriers for windows cannot have openings greater than 125 millimetres. For windows, where a person could fall four metres or more, the barrier must not have any climbable elements, such as horizontal rails, located between 150 millimetres and 760 millimetres from the floor.

Future Building Code of Australia changes

The Building Code of Australia may soon be amended to incorporate the recommendations from the Monash University’s, *Slips Trips and Falls* research paper. This paper investigated fatalities and injuries in buildings and the relationship of these injuries to the design and construction of buildings. It is expected the new requirements will be more stringent with regard to climbable elements within all balustrades. The exact nature of the changes are under consideration and if you would like any further information regarding building requirements please contact your Local Government or a private building certifier.



2.

Safety

Children

Data collected by the Queensland Injury Surveillance Unit (QISU) shows that between 1998 and 2001 there were two deaths of children under 14 years of age from balcony falls in Queensland, and from 1998 to 2002 there were 3177 hospitalisations due to children under five years of age falling from high levels.

Falls from balconies or windows accounted for 252 child hospitalisations (eight per cent of high falls). Of these, 181 were due to falls from balconies or decks and 71 were due to falls from windows.

It is estimated that this data represents only 25 per cent of actual incidents in Queensland.

Helping prevent falls from decks and balconies

The most common reasons children fall from a deck or balcony are:

- climbing horizontal parts of balustrades
- passing through the horizontal parts of a balustrade
- climbing on furniture on a deck or balcony
- lack of supervision of children on a deck or balcony.

Kidsafe Queensland and QISU advise that parents can take a number of precautions to help ensure the safety of children around decks and balconies and recommend that buildings occupied by children should be adapted to make them safe.



Thousands of children have been hospitalised after falling from high levels

Where a deck or balcony is more than one metre above the ground, there should be absolutely no climbable elements in the balustrade.

Any furniture placed on the deck should be:

- positioned well away from the balustrade
- heavy enough to discourage children from moving it close to the balustrade.

One of the best ways to help prevent a child from falling from a deck or balcony is by constantly supervising them. If a deck or balcony is inaccessible to an unsupervised child, the likelihood of a fall is dramatically decreased. Child access to decks and balconies can be restricted by installing high locks and latches and self-closing devices on the access points.

Helping prevent falls from windows

The most common reasons children fall from windows are:

- furniture placed below opening windows
- failure of flyscreens to protect openings
- non safety-grade glass (often in older buildings where this requirement did not apply at the time of construction).

Building design can play an important part in helping prevent injuries from falls from windows. QISU recommends that where rooms may be used by children, larger opening windows should be avoided and higher positioned louvre-type windows should be used instead.



Where it is likely a child can gain access to a window, the opening should be limited to a maximum of 100 millimetres. To do this, windows can be fitted with devices (to allow a window to only open 100 millimetres for example) or barriers (metal mesh or bars with no opening greater than 100 millimetres). Natural ventilation of rooms will also need to be considered where windows are fitted with these devices or barriers.

Remember

Positioning air-conditioners or other climbable objects on a balcony or deck close to a balustrade should be avoided or made non-climbable as these can be used as a foothold for children to climb on.

Do not place beds, furniture or other climbable objects beneath or near opening windows.

Fly screens may be effective barriers for insects, but they do not prevent children from falling out of windows. A metal mesh or grill is a suitable alternative that will allow a breeze through the building.



Avoid placing climbable objects close to balustrades or opening windows

Adults

The most common reasons for adults falling from balconies or decks are:

- alcohol or drugs
- sitting on top of the balustrade
- balustrade failure.

Numerous deaths associated with falls from decks and balconies have been due to alcohol or drug consumption. Most of these falls occur in high-rise buildings. Other known cases of falls have involved a person climbing from one balcony to another, or over a balustrade.

Remember

When using a deck or balcony, you need to be aware of the dangers of alcohol or drugs and the effects these can have on your judgement and balance.

Never climb from one balcony to another, or over a balustrade, especially in multi-storey or high-rise buildings.



Numerous deaths have been associated with falls from high-rise balconies



3.

Things to consider

Termite Attack

Termites can be a major problem in timber structures. Timber in the ground should be termite resistant or treated in accordance with the relevant standards in the BCA.

All timber construction should have a termite barrier, either physical or chemical, to help protect it and to help ensure termites cannot bypass protection systems to adjacent structures. Termite barriers must be designed so they can be readily inspected and maintained.

To reduce termite attacks it is also important to ensure all timber is removed from around buildings, including timber stacks, old tree stumps, sleepers and logs.

Termites also prefer humid conditions so keep air under the building or structure dry by improving sub-floor ventilation, drainage and access.

What to look for:

- any decaying timber that forms part of the deck or balcony
- discoloured or blistered paint
- depression of timber
- termite mud nests
- any build-up of soil around the base of the timber—if timber is untreated it should not be in contact with soil
- fine 'sawdust'-type material around or below timber—this can signal that termites are active.

Wet rot and moisture

Wet rot occurs when timber decomposes due to high levels of moisture. It often occurs when two pieces of timber are in contact, trapping water and moisture. Timbers exposed to the elements need to be adequately painted to help protect the timber from contact with water and moisture.

To reduce the likelihood of wet rot, any areas of the deck or balcony that are frequently damp should be addressed immediately. Dampness can occur when pot plants without bottom plates or feet are placed on the deck or balcony. Soil and other debris should also be cleared away from the deck or balcony, bearers or joists (if it is a low deck or balcony), and posts or supports.

If wet rot occurs in structural timbers (such as posts, bearers or joists), seek expert advice to establish the implications for the structural integrity of the deck or balcony.

Any structural problems need to be addressed immediately as there is little or no benefit in repairing the damage if it is only going to reappear soon.



Keep trays or feet under pot plants to reduce moisture on decking

If wet rot occurs in non-structural areas, ensure rotten timbers are removed and replaced. If the damaged area is fairly small, it can sometimes be cut away and a new piece of timber adequately joined to the remaining timber. If the damage is confined to a very small area, an epoxy-based repair kit can sometimes be used to fill the damaged area once it has been cut back to sound timber and the new surface of the timber can be treated with a suitable coating.

In some cases preservative tablets can be inserted into the timber adjacent to the repaired area, to help protect the timber 'from within'.

After repair, external timbers should be protected with adequate coats of paint or another suitable timber treatment or preservative. If there is any doubt as to whether a structural problem has been eliminated, the new and adjoining timber should be treated with a proprietary wet rot treatment before repainting or treating. Water damage to your deck or balcony may also occur at the junction of the floor material and elements such as timber posts or handrails.

In these areas there is the potential for water to lay on horizontal surfaces such as bearers or joists, particularly where structures are enclosed.

Care should be taken to inspect these sections for decay.



Water left on timber can cause fixings to deteriorate and rust



Coastal effects

Decks and balconies on properties near the coast can have a higher risk of potential failure. This is due to the harsh environment and corrosive effects of salt, sand and wind, which can affect unprotected timber and steel structures, reinforcing steel and fixings such as bolts and fixing plates. Such corrosion can lead to mechanical or abrasive wear which can cause timber to break down and steel to corrode.

One of the best ways to help protect your deck or balcony against this type of corrosion is to apply and maintain an oil-based paint on exposed timber surfaces such as bearers, joists and posts. Decking oil alone will generally not provide a sufficient barrier against the corrosive coastal atmosphere.

Steel used in coastal areas should be protected by a coat of paint or other protective coating. This protection should be carried out at the time of construction to help prevent initial deterioration. Steel that is left unprotected and starts to rust or corrode should be dealt with promptly to prevent further deterioration.

Loads

Any building element needs to be designed and engineered to withstand certain loads.

Loads are an important aspect to consider when you are establishing the stability and integrity of a deck or balcony. It is often easy to overlook the load that the combined weight of a number of people exerts on the structure. Every time 13 people gather on a deck or balcony, they exert the same force as a small car. This force is greatly increased when the people jump, dance or move about. Large pots, water features and furniture can also contribute to the loads applied to your deck or balcony.

What to look for:

- avoid installing heavy objects such as spas on a deck or balcony, unless the deck or balcony has been specifically designed to withstand this extra load
- avoid excessive jumping, dancing or other movement on a deck or balcony, unless the deck or balcony has been specifically designed to withstand this extra load
- remember that as a deck or balcony ages, elements generally deteriorate, reducing its ability to withstand the loads for which it was originally designed
- avoid having large numbers of people gather on a deck or balcony at once, unless the deck or balcony has been specifically designed to withstand this load.



4.

Inspecting decks and balconies

Decks and balconies require regular and effective maintenance to help ensure their long-term safety. The frequency of this maintenance depends on the materials, type of finish, climate and the degree of exposure to the weather.

It is important to allow access for visual inspections of a deck or balcony. Of particular interest are the areas where timbers join, where metals are in contact and areas providing ground support. Enclosing the underside of a deck or balcony by cladding between the posts or installing a ceiling, is not recommended because it can prevent the ability to visually inspect these areas.

Helpful hint

Take photos of your deck or balcony after completing building work. The section below outlines the key components that should be photographed to assist with future inspections. Use these photos as reference points when carrying out inspections to identify any changes or movement of components.

Components of decks and balustrades to regularly inspect

Fixings

Fixings, including post brackets, should be free from rust, bending or fractures. Although rust can occur more rapidly in coastal regions, products can be applied to metal fixings or components to slow or prevent this process.

For a weather-exposed deck or balcony, all fixings such as nuts, bolts, screws and nails should be metal with non-corroding properties. In most cases, hot dipped galvanised fasteners should be used. However, in some highly corrosive coastal atmospheres, stainless steel fixings may be needed.

What to look for

Bending or stress of post brackets—in most cases these brackets will be above ground level, which will make visual inspection easier.

Deterioration of nuts, bolts, screws or nails—these fasteners can be integral to the deck or balcony and need to be free from deterioration. Rusting metal may be easier to find as it may leave a mark on the connecting timber or paint. Identify, repair and replace these areas as soon as possible.



Inspect post brackets for bending or stressing

Suggestions for general maintenance

- Avoid frequently wetting decks and balconies and where possible sweep them instead of hosing.
- If your deck or balcony does get wet, ensure it is adequately ventilated to allow quicker drying.
- Place pot plants on trays and prevent them from overflowing.
- Remove shrubs or vegetation that permanently shade the deck or balcony, and remove creepers from rails or other components, as these prevent moisture from escaping.
- Ensure that timber decking is thoroughly cleaned before coating. Re-apply finishes at regular intervals depending on the finish type and degree of exposure.
- Always avoid using Oregon pine for structural purposes as it has a poor lifespan and durability.

Posts

Where the deck or balcony is raised and relies on posts for support, adequate engineering is required to ensure the strength and stability of these components.

Deterioration and subsequent failure of posts can result in death or serious injury to people and damage to property. Timber should be treated appropriately if in the ground or be of a species that will not degrade in soil.

Check timber posts for wet rot where bearers and other timbers are in contact with posts. Signs of wet rot include a fungus type growth on the timber, timber becoming spongy and fibrous and failure of the timber.

Steel posts in the ground should be checked for signs of rust and deterioration as water can pool around these areas.

What to look for:

- rusting of steel posts
- warped, cracked or damaged posts
- signs of wet rot in timber.

Bracing

Bracing is often used to support a deck or balcony, helping prevent it from moving under load. Decks and balconies can come under considerable stress from swaying or twisting. If bracing fails, there is a significant risk of harm being caused to people and property. It is therefore important to inspect any bracing of a deck or balcony to ensure there has not been any excessive structural movement.

What to look for:

- warped, cracked or damaged bracing elements
- fixings that are coming loose or deteriorating.



Inspect bracing on decks and balconies for undue structural movement



Bearers and joists

Bearers and joists are vital to the integrity of a deck or balcony. Bearers support the joists, which in turn support the decking. It is important that bearers and joists are in good condition and free from defects such as warping and cracking.

What to look for:

- warped, cracked or damaged bearers or joists.



Check bearers and joists for warping or cracking

Balustrades

Anchor points of the balustrade should be inspected regularly to ensure these are free from deterioration. Any weakening of these anchors could cause them to fail if a load was applied to the balustrade, such as a person leaning against the balustrade.

What to look for:

- rust and wear at anchor points (where the balustrade is fixed to the deck or balcony, walls or posts)
- ensure the handrail is securely fastened to the balustrade
- check that any glass balustrades are free from chips or cracks
- openings in balustrade must comply with the relevant building regulations.



Weakened anchors for balustrades could cause them to fail if people lean against them



Planning on extending or renovating

If you are planning to extend your house or carry out renovation work, ensure you use a licensed contractor. You can search the Queensland Building Services Authority's website and conduct a licence search of licensed contractors at www.bsa.qld.gov.au

You should also check with your Local Government or a private building certifier to determine if a building approval is required.

Contacts for inspection services

Queensland Building Services Authority
www.bsa.qld.gov.au

Board of Architects of Queensland
www.boaq.qld.gov.au

Board of Professional Engineers of Queensland
www.bpeq.qld.gov.au

If you have purchased a property with an existing deck or balcony, you should also contact your Local Government to check that all required building approvals have been obtained.

Acknowledgements

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www.qisu.org.au

Kidsafe Queensland provided information for the use in this guideline.

www.kidsafeqld.com.au



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