



**Te Tāhuhu o
te Mātauranga**
Ministry of Education

**Te Kāwanatanga
o Aotearoa**
New Zealand Government

Maintenance Guide for Schools | Kura

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Te Tāhuhu o te Mātauranga

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Cover image: **Hamilton East School is a Y1–6 co-educational primary school in Waikato. It is the oldest school in Hamilton, on its original site and celebrated turning 150 in 2023. Several classrooms are historic buildings, and the school is part of the Hamilton East Heritage Trail.**

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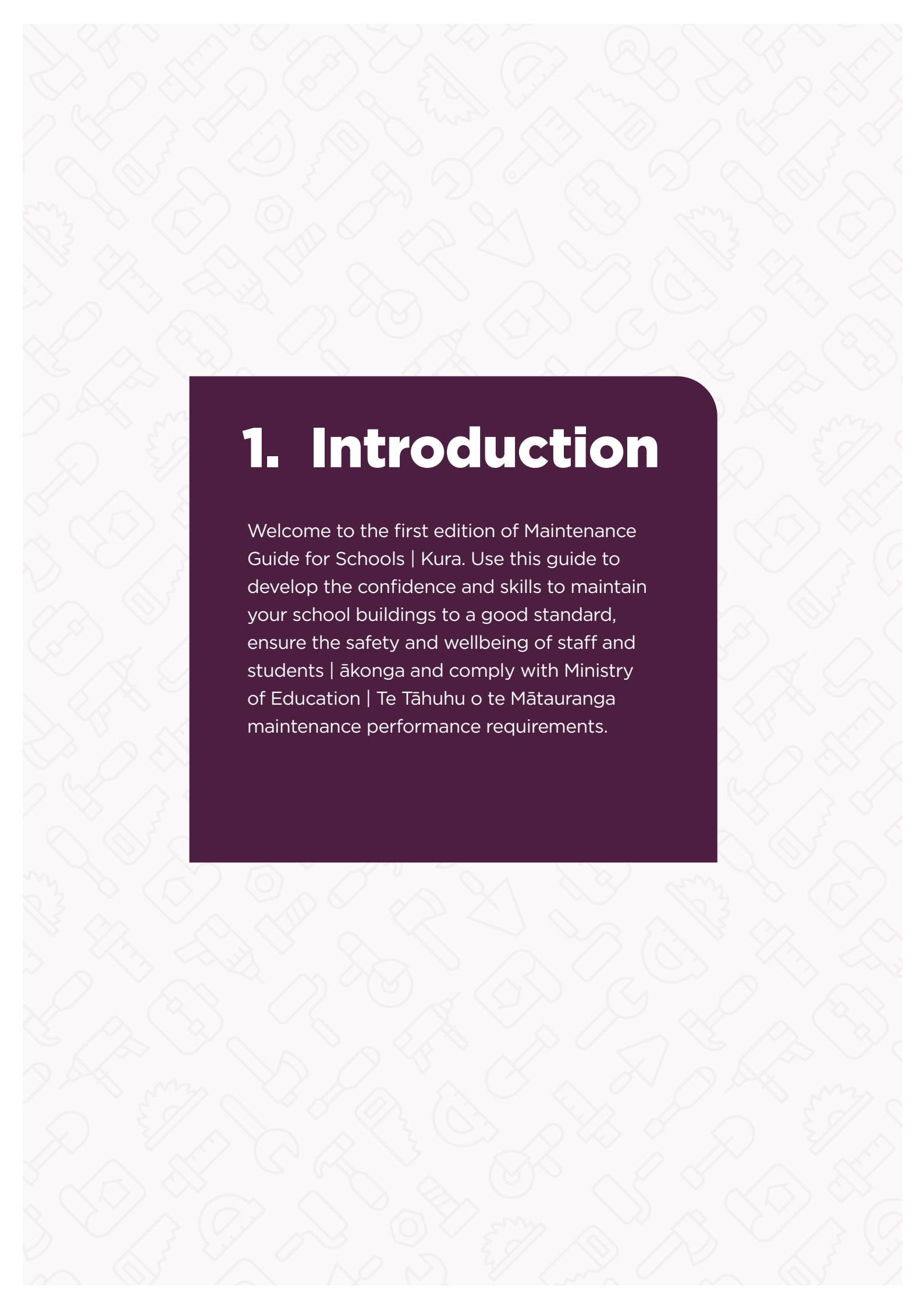
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1. Introduction

Welcome to the first edition of Maintenance Guide for Schools | Kura. Use this guide to develop the confidence and skills to maintain your school buildings to a good standard, ensure the safety and wellbeing of staff and students | ākonga and comply with Ministry of Education | Te Tāhuhu o te Mātauranga maintenance performance requirements.

Introduction

Maintenance matters

Regularly carrying out simple building maintenance activities will help keep your school | kura buildings and grounds safe and performing as intended throughout their life. It slows deterioration of materials and delays large, expensive jobs such as repainting the buildings or replacing significant building elements such as the roof.

Quality learning environments that are well managed and sustainable help to deliver equitable and excellent education outcomes for every student | ākonga. Creating and maintaining these environments is a challenge – the school property portfolio is made up of 2,100 state and state-integrated schools with an estimated replacement cost of \$39 billion.

All building materials, finishes, plant, equipment and fittings require maintenance to:

- provide a safe, warm and dry school | kura environment
- maintain the functionality and appearance of the building
- protect the value of the assets.

Unmaintained school | kura buildings will rot, decay, rust or grow mould and lichen. Eventually, they will no longer provide a safe, warm and dry learning environment.

Benefits of maintenance

We want to maintain our school buildings to optimise our assets and to:

- ensure buildings perform as expected
- extend the life of building materials, components and whole buildings
- keep building material guarantees and warranties valid
- avoid large problems by proactively identifying and fixing minor issues early
- optimise value and control possible spiralling costs.

Your school | kura benefits from having well-maintained buildings because they:

- provide healthy, safe spaces that support the wellbeing of staff, students | ākonga and visitors
- provide quality learning environments

- look cared for and inviting
- foster pride in the school | kura and community.

Types of maintenance

This guide covers two main types of maintenance.

Planned maintenance involves maintenance activities to ensure critical assets are operational and will meet their expected lifespan. This includes:

- routine maintenance – planning and carrying out simple, essential maintenance tasks at set times
- preventive maintenance – periodic checks of school buildings to identify maintenance requirements.

Reactive maintenance involves repair and replacement of building elements due to breakage. This includes:

- urgent repairs to maintain a healthy, safe and secure school environment for school occupants and visitors
- repairs for damage that doesn't present a risk to security or safety.

About this guide

This guide explains how to plan and carry out regular basic maintenance in state and state-integrated schools | kura. It is intended for school leaders responsible for maintaining their schools | kura and for those people carrying out minor maintenance and repairs.

This guide applies to shorter-term maintenance that is funded from the school operational budget (Property Maintenance Grant) and can generally be carried out without specialist expertise. Section 7 provides links for planning and organising longer-term tasks and major repairs or replacements.

This guide does not cover response to natural disasters such as flooding and earthquakes or asbestos identification and removal.

This first version of the guide covers maintenance of building exteriors (the building envelope). Maintaining the building envelope is important for keeping school buildings weathertight. Future versions will include guidance for maintaining school grounds, building interiors and services.

How to use this guide

The guide is structured to help you prioritise maintenance by need and impact:

- **Section 2** provides **templates** to create a routine maintenance plan and a preventive maintenance plan for your school | kura.
- **Section 3** covers **urgent repairs** (reactive maintenance) that need to be done quickly to maintain a healthy, safe environment and prevent issues escalating.
- **Section 4** describes **routine maintenance** tasks such as washdowns or clearing gutters.
- **Section 5** details what to look for with **preventive maintenance** checks, causes and suggested repairs.
- **Section 6** describes **common problems** found in school | kura buildings.
- **Section 7** provides **more information** and links.

We suggest discussing your routine maintenance plan with your property advisor at least annually.

Roles and expectations

The Ministry of Education and schools | kura share responsibility for managing school | kura property.

The Ministry is responsible to the government for making sure that you care for your school | kura property. It provides information, advice and funding so you can build, manage and maintain your property.

School | kura boards and proprietors are responsible for overseeing school property maintenance. The school property team is responsible for the management and maintenance of your school | kura buildings. This may include the principal | tumuaki, caretakers and others. Caretakers can do some of the maintenance, and some should be done by qualified contractors (tradespeople and professionals).

Paying for maintenance

The Property Maintenance Grant, part of your operational funding, pays for maintenance work on Ministry-owned buildings and facilities. This funding doesn't cover maintenance work on board-owned property and/or larger maintenance projects such as replacing the roof. These larger projects over \$5,000 are considered capital projects and are paid for by the Five Year Agreement (5YA) funding. You can find links to advice on budgeting for maintenance in section 7.



Engaging contractors

Sometimes, you will need to engage specialist tradespeople or licensed professionals to do investigations or repairs. If you are unsure, you should liaise with your property advisor to ensure you have obtained the right information and advice before engaging contractors.

Ask yourself these questions:

- Does the work need to be done urgently?
- Must the work be done by licensed people?
- Does the work require specialist skills, knowledge or equipment?
- Are engineering calculations or design required – for example, structural?
- Is specialist building design required?
- Does the school have anyone available to do the work?

The repair options in section 5 provide advice on when to use contractors:

- Straightforward repairs that can be clearly defined are listed. School | kura staff can carry out this maintenance or decide to engage a contractor.
- When repairs are complex, require specialist skills and tools or may include working at height or in confined spaces, the advice is to engage a relevant contractor with the skills required to carry out the work.

Examples of contractors include:

- architects – building advice, design, building contracts
- architectural designers – building advice and design
- asbestos removalists
- builders – building and construction work
- building cleaning specialists
- building surveyors – moisture, weathertightness, leaks and rotting timber issues
- drainlayers – mandatory for repairing drains (below ground)
- electricians – mandatory for all electrical work
- painters – painting (including specialist coating application)
- plant and equipment maintenance specialists
- plumbers – mandatory for plumbing, hot and cold water supply
- roofers – roofing, roof penetrations and flashings
- scaffolders
- specialist finish applicators – for example, membranes, exterior plaster or paved surfaces
- structural engineers – structural engineering design
- waterproofing membrane specialists.

You should keep a list of contractors for easy reference with their contact details and specialist skills. Include contractors you have used before



who performed well and contractors you are likely to use in the future – see section 7 for information about getting specialist help.

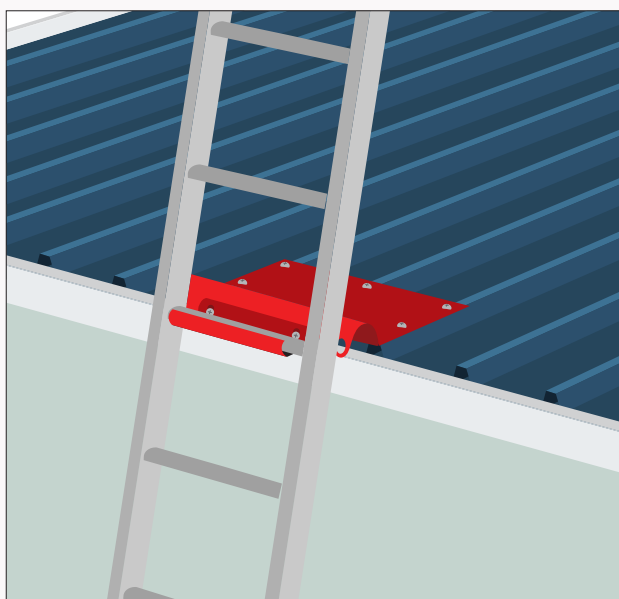
Health and safety management

You are responsible for the health and safety of students | ākonga, staff, contractors and visitors at your school | kura. A well-maintained school | kura will assist with compliance under the Health and Safety at Work Act 2015.

When planning or doing maintenance, it is good practice to record information in your risk register for each hazard identified. See section 7 for information about managing risks and hazards at school | kura.

There are some simple risk control precautions you can take for maintenance:

- Install equipment to support safe practices at maintenance sites within the school – for example, ladder brackets to provide safe access to roofs and anchor points for fixing safety harnesses.
- Keep students | ākonga, staff and visitors away from maintenance activities – for example, install cones, fences or hoardings.
- Consider whether the maintenance can be carried out after school hours.
- Provide staff with appropriate personal protective equipment (PPE) – for example, ear protection and masks.
- Provide secure spaces to store chemicals safely.



Install a ladder bracket to keep ladders safe and secure and prevent damage to spouting.

You can find health and safety guidance specific to school | kura property on the Ministry of Education website – see section 7. Topics include:

- managing contractor health and safety
- managing asbestos
- hazardous materials such as poisonous plants, lead-based paint, moulds and fungi
- urgent health and safety work.

Removing lead-based paint

Lead hasn't been used in paint for over 40 years but layers of old paint being removed from older buildings may contain lead. Lead can be a health hazard if dust or paint fragments are swallowed or breathed in during paint removal. Tests are available to check whether paint contains lead – contact your paint shop or an accredited laboratory. See painting guidance in section 4 and further information in section 7 for precautions and information when removing lead-based paint.

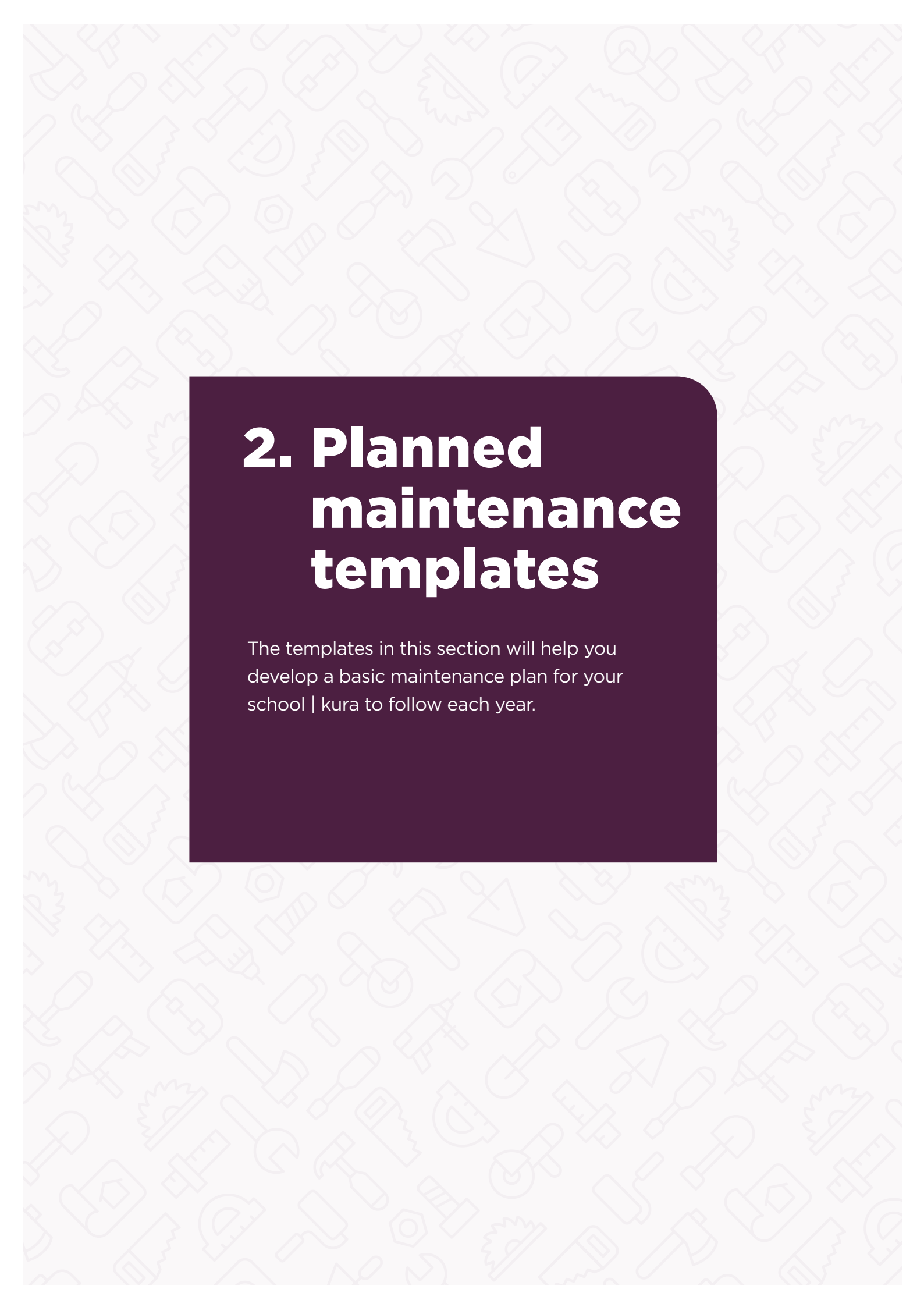
Asbestos wall claddings

If your school | kura was constructed between 1920 and 1980 and still has the original cement-based sheet or plank cladding, the cladding may contain asbestos. If asbestos fibres get into the air and are breathed in, they can cause potentially fatal illnesses. The management of asbestos is very strictly controlled. See section 7 for information about managing asbestos in schools.

Getting started

This guide provides you with the information and tools to support and maintain your school | kura and support the wellbeing of staff, students | ākonga and visitors.

Use this guide to develop a maintenance plan or update an existing plan. The sections will help you to allocate the time and resources needed to plan, carry out and complete your routine and preventive maintenance plans.



2. Planned maintenance templates

The templates in this section will help you develop a basic maintenance plan for your school | kura to follow each year.

Planned maintenance templates

Use the templates in this section to help you develop a basic maintenance plan for your school | kura to follow each year. It is divided into the two types of planned maintenance:

- Routine maintenance – a schedule of essential basic maintenance tasks (see section 4 for more).
- Preventive maintenance – a checklist to identify maintenance needed (see section 5 for more).

This first version of the templates covers maintenance of the external building envelope only. Later versions will include school grounds, building interiors and services.

Routine maintenance

Normally, you carry out routine maintenance tasks annually, but this can vary due to where your school | kura is located – for example, near the coast, you will need to wash down the roof and walls more often.

Doing tasks like regular washdowns will delay expensive repainting or reroofing jobs, saving the school | kura money.

See section 4 for how to carry out routine tasks. A caretaker could do most tasks, but you could choose to engage a contractor.



Preventive maintenance

Preventive maintenance involves regularly checking school buildings to find any issues or maintenance needed and then planning and carrying out this work.

Treat issues that need immediate attention as an urgent repair.

See section 5 for help to identify issues, understand the underlying cause and address the problem. Qualified tradespeople or specialist contractors with the necessary skills and equipment will need to carry out some repairs.



Using the templates

You can view the templates on pages 19 to 25 of this guide. You can also download the plan template Word files from the Ministry of Education at [Property maintenance – Education in New Zealand](#) and customise them for your school | kura.

Routine maintenance plan

Tip: Decide if you will cover the whole school at once or divide the school by different areas. You may need to enter several names/dates in the last three columns, especially if you are using the plan over several years (which will also be a useful record).

1. Set the frequency for each task (6 months or 12 months) in column 3.
2. Assign each task in column 4. Will this be your caretaker, property team, a contractor or someone else? Do they have the right skills and equipment?
3. Add a date for each task in column 5.
4. Share the plan with your school property team.
5. Carry out the scheduled tasks and note the date completed in column 6.
6. Add any issues seen during routine maintenance to your preventive maintenance plan.



Preventive maintenance plan

Tip: Edit the template to remove any materials/elements you don't have in your school | kura buildings to simplify the plan.

1. Note the details of issues seen in column 3:
 - Describe the issue and location (for example, building name, which side etc.)
 - Is it in multiple places? Is it a health and safety risk?
 - Take a photo of each issue.
2. Note urgent repairs in column 4. A repair is urgent if it must be addressed immediately or as soon as possible. Examples of urgent repairs are if it:
 - causes the building to leak
 - is a health and safety issue
 - is a security concern.
3. Describe the action/repair option required in column 5 (column 1 has references to sections in this guide to help with causes and repair options). This may be done during the checks or later with your school property team. Depending on the repairs and your resources, you may decide to:
 - do the work
 - contract the work out on its own or in combination with other work
 - engage experts and specialists for advice before planning repair work.
4. Develop a plan of maintenance tasks for the coming year and longer term:
 - Review the issues you noted on the preventive maintenance plan checklist.
 - Prioritise the issues and their associated maintenance repair tasks.
 - Identify issues to discuss with your school property team and have any questions ready for your property advisor on their annual visit. They can advise whether specific maintenance work is urgent, when to use contractors, how to group together similar work for contractors and how to address maintenance that is capital work.

Routine maintenance plan

[Name of your school | kura]

Created by:

Date last reviewed:

Part of building	Task (see section 4 for details)	Frequency	Who will do this	Date scheduled	Date completed
Roofs and roof flashings	Wash down	Annually or 6-monthly in seaspray and geothermal zones			
Walls, windows, doors, window and door flashings	Wash down	Annually or 6-monthly in seaspray and geothermal zones			
Gutters and downpipes	Clear and clean gutters	Annually (late autumn is ideal)			
Plants close to buildings	Prune plants away from buildings (cladding and subfloor) and fans on heat pump units	Annually (late autumn is ideal)			
Building exterior – all parts	Carry out preventive maintenance plan checks	Annually			
Building exterior – all painted surfaces	Painting	Every 8–10 years			

Preventive maintenance plan

[Name of your school kura]	
Created by:	Scheduled inspection date:
Inspection by:	Date inspected:

Part of building (and relevant section in this guide)	Look for these issues	Note details of all issues found	Is this work urgent?	Action/repair required
Walls (5.1)				
Claddings generally (5.1.1)	Dirt, grime, salt, mould and lichen Paint fading, peeling, bubbling or cracked. Plant growth up or in wall Corrosion of fixings Nails sticking out from cladding			
Concrete (5.1.2)	Cracking Corrosion of reinforcing steel Cracked or flaking concrete (spalling) Rust stains on concrete or concrete block walls Efflorescence or paint failure			
Exterior insulation and finish systems (EIFS) (5.1.3)	Impact damage Coating failure or surface cracking Cladding in close contact with the ground Water entry and deterioration of parapet			
Fibre-cement claddings (5.1.4)	Impact damage Damaged PVC joints or soakers Horizontal or vertical cracking Damaged or leaking control joints Swelling of sheet edges Cladding too close to ground level Leaking through cladding Paint fading or chalking			

Part of building (and relevant section in this guide)	Look for these issues	Note details of all issues found	Is this work urgent?	Action/repair required
Masonry veneer systems (5.1.5)	Efflorescence Crumbling mortar Cracks in mortar, bricks or blocks Blocked or no ventilation or drainage slots Uneven colouring or staining			
Metal claddings (5.1.6)	Dents, impact damage, buckling, tearing or scratches Corrosion or rust Paint peeling, bubbling, flaking or cracked Aluminium plank cladding buckling			
Plywood claddings (5.1.7)	Sheets delaminating or cupping Paint peeling, flaking or faded Failure at sheet edges			
Stonework (5.1.8)	Surface damage, deterioration or cracks Dampness in walls Crumbling mortar			
Stucco (5.1.9)	Impact damage Surface cracking Touching or in the ground			
Timber claddings (5.1.10)	Paint fading, peeling, bubbling, or cracked Joints opening Rotten, leaking, split or cracked weatherboards Rot along bottom of walls			
Windows and doors (5.2)				
Aluminium windows and doors (5.2.1)	Glazing seals failing Pitting of anodised finish Chalking of powder-coated finish Leaking at corner joints Sliding door sticking			
Glazing (5.2.2)	Glass broken, stained, scratched or damaged Putty cracked or damaged Moisture in double-glazed units			

Part of building (and relevant section in this guide)	Look for these issues	Note details of all issues found	Is this work urgent?	Action/repair required
Hardware for windows and doors (5.2.3)	Surface deterioration or corrosion Door handles loose, missing or not working Window hinges stiff or not working Self-closing doors not working			
Steel windows and doors (5.2.4)	Rusted frames Leaking junctions Cracked or damaged putty			
Timber doors and frames (5.2.5)	Difficult to close Finish deterioration Letting in water or draughts			
Timber windows and frames (5.2.6)	Rotten window sill Casement sash won't open Window draughts Timber is bowed Signs of water ingress Hardware is loose or corroded			
Roofs (5.3)				
Profiled metal roofing (5.3.1)	Buckling of roofing, ridging or flashings Corrosion at galvanised steel sheet ends Dented or damaged sheets Roofing nails damaged or missing Neoprene washers missing from screws Lifting of roof or flashing Ponding water Red rusting of galvanised steel Surface pitting of aluminium White rusting of galvanised steel			
Coil-coated steel (5.3.2)	Chalking or fading of paint finish Corroded roofing, flashings or fixings Paint damage or scratches			

Part of building (and relevant section in this guide)	Look for these issues	Note details of all issues found	Is this work urgent?	Action/ repair required
Membrane roofing (liquid-applied or paint-on) (5.3.3)	- Bubbles appearing under the membrane - Chalking - Popped nails in the substrate - Surface of membrane buckling or cracking - Water lying on the surface			
Membrane roofing (sheet applied) (5.3.4)	- Bubbles appearing under the membrane - Damage to waterproof material - Lifting of sheet joints - Nail popping in timber substrates - Roof feels springy or spongy - Splitting/surface cracking in the membrane - Water ponding on the surface			
Tiles – metal (5.3.5)	- Corrosion - Dented or damaged tiles - Loss of stone chips - Moss and lichen growth - Tile edge lifting - Water not draining to gutter			
Tiles – clay and concrete (5.3.6)	- Dirt, efflorescence, moss or lichen - Corroded valley gutters - Poor visual appearance - Broken, cracked, dislodged, loose or missing tiles - Lead flashing lifting - Roof sagging			
Translucent sheeting (5.3.7)	- Cracked sheets - Steel mesh missing or damaged - Damaged fixing seals - Dirt trapped in the sheets - Impact damage - Loose sheets - Discolouration - Surface deterioration or crazing			
Roof penetrations (5.3.8)	- Chimney or flue flashing lifted - Corrosion of metal flashings - Insecure flues or vent pipes - Safety feature connections unsafe - Poor condition of sealant and seals			

Part of building (and relevant section in this guide)	Look for these issues	Note details of all issues found	Is this work urgent?	Action/repair required
Roof glazing and skylights (5.3.9)	Dirty roof glazing Aluminium frames pitting Cracked roof glazing Moisture getting into double-glazed units Ponding around roof penetrations or skylights.			
Spouting and gutters (5.3.10)	Dirt, mould or lichen growth Corroded/deformed metal gutters Corroded metal gutters Deformed metal gutters Water spilling from external gutter Overflowing internal gutters Metal gutter joint failure PVC gutters damaged or cracked Water runs down fascia			
Downpipes (5.3.11)	Dirt, moss or lichen Impact damage Blocked stormwater drain Corrosion of metal downpipes Downpipe not connected to gutter Downpipe not discharging into drain			
Subfloors (5.4)				
Concrete foundation and basement walls (5.4.1)	Signs of moisture below ground level Cracked concrete or cement plaster Subsided or uneven floor levels Damaged timber-framed subfloor foundation walls			
Electrical wiring (5.4.2)	Damaged wiring Loose wiring			
Insulation (5.4.3)	No underfloor insulation Poorly installed insulation			

Part of building (and relevant section in this guide)	Look for these issues	Note details of all issues found	Is this work urgent?	Action/repair required
Subfloor moisture (5.4.4)	Damp ground conditions Damp stains on underside of flooring Mould and water droplets under flooring Ponding water Musty smells Timber decay Moisture within subfloor areas			
Timber-framed foundations (5.4.5)	Bearers or joists damaged Bolted connections loose Borer in joists, bearers, bottom plates Gap between pile and bearer Lateral bracing missing or damaged Rotted or undermined timber piles Rusted fixings			



3. Urgent repairs

The unexpected can happen to even well-maintained buildings, and immediate action is often needed to maintain a safe environment. This might involve fixing an item, making a temporary repair and/or engaging a specialist to repair the damage. By carrying out repairs quickly, you will maintain a healthy, safe and secure environment for students | ākonga, whānau and visitors.

Urgent repairs

Carrying out urgent repairs will help you maintain a healthy, safe and secure school environment. Sometimes, you will need to carry out a temporary repair to keep staff, students | ākonga and visitors safe, keep the school open and prevent damage from escalating. Once you have done this, you can plan and carry out the permanent repair.

Common issues requiring urgent attention include:

- water leaks through the ceiling
- faulty spouting
- broken glass – including windows
- damaged doors, door handles and locks
- broken door holdbacks.

3.1 Water coming through ceiling

Cause	Repair
Roofing leak	• Get into the roof space (if safe to do so) and find the leak if possible. • Place bucket(s) to catch drips and prevent further damage. • Organise repairs after the wind drops and the rain stops. • After the repair, ventilate the roof space to dry the space to mitigate mould growth.



Evidence of a small leak in the ceiling or the start of a larger leak.



Damage from a large leak through the roof.

3.2 Faulty spouting

Cause	Repair
Spouting blocked by vegetation, causing the accessway below to become slippery from stormwater run-off	• Cordon off the area to prevent access (having the cordon means the spouting does not need to be fixed immediately). • Clear the vegetation blockage (if safe to do so). • Prune adjacent trees to prevent leaf fall into the spouting. • Check spouting has adequate fall to the downpipes. • Check the spouting has the correct number of brackets and that they are undamaged. • You may consider engaging a contractor to clear blockages and repair or replace the spouting. Replacement spouting should comply with Designing Schools in Aotearoa New Zealand: School Property Design Standards – see section 7. • Check for consequential damage/rot to the fascia and eaves. • Check for mould inside the building at the top of wall linings. • Ensure the accessway is safe and not slippery. • Remove the cordon after the repair has been fixed.

3.3 Broken glass – including windows

Cause	Repair
Impact damage from sports equipment, wind, stones thrown up by lawnmower, bird strike etc.	• Where the glass shatters or falls out of the frame, cover the opening with plywood until replaced. • If the glass is only cracked, tape the crack(s) to hold the glass in place until replaced. • Pick up any glass on the ground and safely dispose of it. • Assess if anything has been damaged or stolen. If yes, call the police and repair as above after the police have inspected. If the damage is due to a break-in, see section 7 for Ministry of Education guidance on insurance claims. • Engage a glazing repair company to replace the glass.



Vegetation blocking the spouting causes water to overflow and make the accessway below slippery.



Impact damage to a glass panel.

3.4 Damage to doors, door hardware, handles and locks

Cause	Repair
Door slamming, tampering, forced entry or impact	- For damaged glass, see section 3.3. - Secure the door using the locking function if it still works. - Cover the damaged door with plywood to secure it until a permanent fix can be completed. - Assess if anything has been damaged or stolen. If yes, call the police and repair as above after the police have inspected. If the damage is due to a break-in, see section 7 for Ministry of Education guidance on insurance claims. - Engage a lock repair company. Ensure any master keying is compatible if changing locks. Note: Where the external door is part of the means of escape, it may have to be secured open until the end of the school day and repaired after school hours.

3.5 Broken door holdback

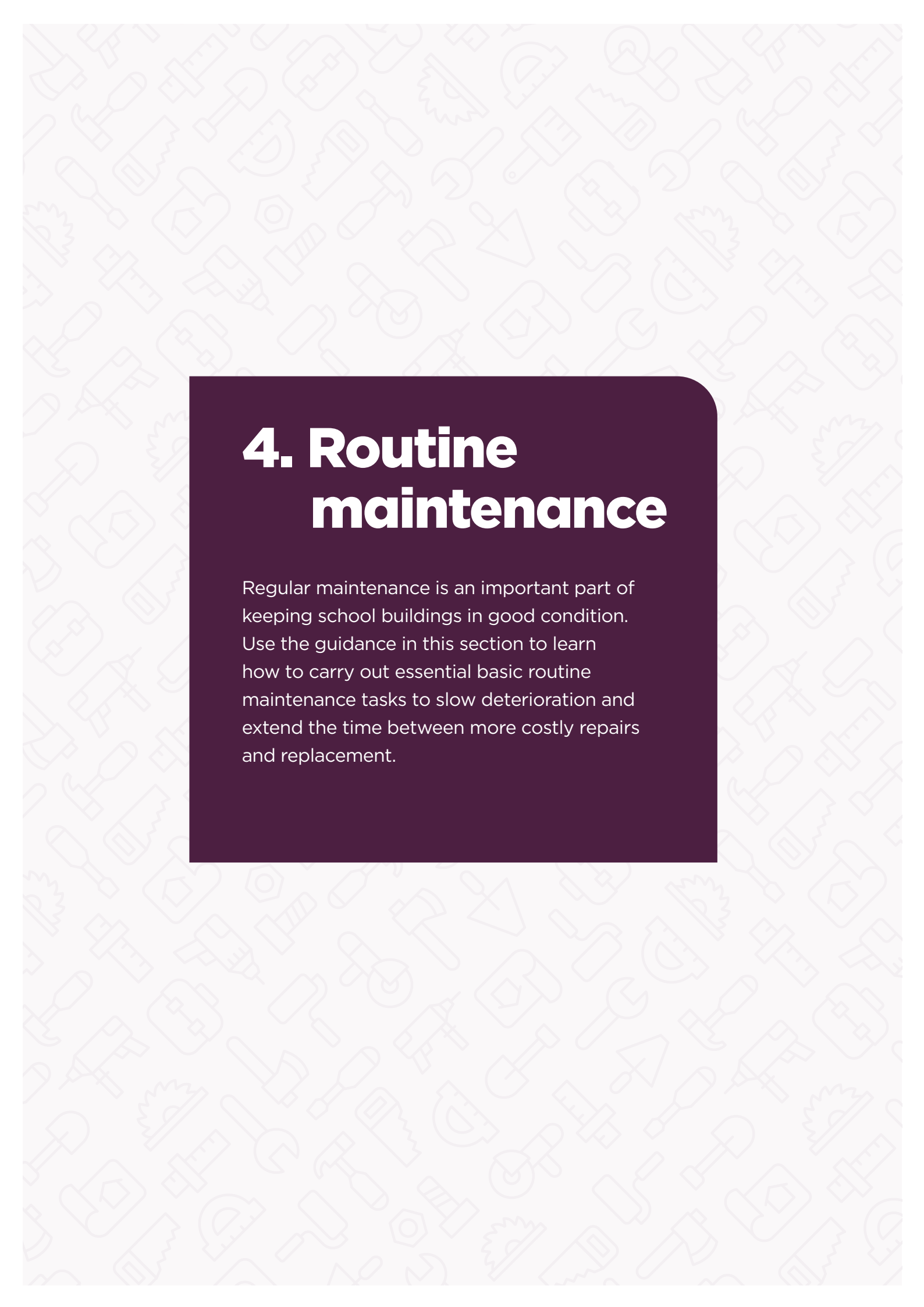
Cause	Repair
Door holdback breaks and the door is slammed shut by the wind, breaking the safety glass and the door lock	- Make the safety glass safe by covering with plywood. - Replace the door lock. Because the lock is required for the security of the school kura, it will need to be fixed the same day. Ensure any master keying is compatible if changing locks. - Engage a glazing repair company to replace the safety glass.



Broken lock.



Door hold-open device.



4. Routine maintenance

Regular maintenance is an important part of keeping school buildings in good condition. Use the guidance in this section to learn how to carry out essential basic routine maintenance tasks to slow deterioration and extend the time between more costly repairs and replacement.

Routine maintenance

Routine maintenance involves planning and regularly carrying out essential basic maintenance tasks. Washing down the outside of buildings is one task that can have a big impact, reducing the frequency and therefore cost of longer-term cyclical maintenance such as repainting.

Many of these tasks can be carried out by caretakers or school staff without specialist equipment. Your school may decide to engage contractors for some or all of this work such as washing down the roof – they will be familiar with working at height, using ladders and mobile scaffolds and using safety harnesses.

Alternatively, your school could invest in safety training and the necessary safety equipment so that school staff could carry out roof washdowns.

Start by developing a routine maintenance plan for your school | kura. You can do this by customising the routine maintenance plan template in section 2.

How to do the routine maintenance tasks, things to be aware of and health and safety issues are discussed in this section.

Equipment

Equipment you will need for the routine maintenance tasks of wash down, clearing gutters and clearing plants at your school | kura may include:

- hand tools to remove downpipes (if you don't have diverters installed)
- protective equipment – coat, gloves, goggles
- proprietary spray applicator
- garden spray applicator
- soft bristle brush on an extendable handle
- flexible hose with an attachment to the water supply
- gutter wash attachment for your hose
- gutter cleaning scoop
- garden tools – loppers, hedge trimmers, saws
- ladders
- mobile scaffold.

NOTE: Don't use a waterblaster as this will damage paintwork.



Using a ladder safely

Falling from a ladder can cause serious injuries. Using a ladder should be avoided where possible and only as a last resort. To use a ladder safely:

- check it is in good condition – do not use a ladder with missing, broken or loose parts
- ensure the ladder is level and cannot slip
- angle a straight ladder 1 m out at the base for every 4 m of height
- do not over-reach when on a ladder – maintain three points of contact with the ladder at all times – climb down and move the ladder to the correct location
- if using a stepladder, make sure that it is fully opened with both stay bars locked.

See section 7 for WorkSafe guidance on ladder safety.

Washdown

Washing down buildings removes salt spray, dirt, moss, mould, lichen and chemical deposits in geothermal areas. These can damage the paint and building materials. Paint manufacturers recommend a regular (annual) washdown to increase the life of the paint finish.



School building with lichen on the roof and mould on the wall cladding.

Regular washdowns will mean you repaint less often, the school | kura will look better and you may find areas that need repair or maintenance before they become major issues.

Washdown safety

Before starting a washdown, ensure ladders and scaffold can be used safely. Stay safe when washing the roof and high walls by following health and safety precautions for working at height and on a ladder or mobile scaffold.

Some sprayed chemical solutions need to be left to work without brushing or rinsing – read the product instructions first. Follow all safety instructions for storage and use of chemicals, especially around children, plants and the environment.

Preparing for roof and wall washdowns

Before starting a roof washdown, disconnect any downpipes, or if you have a diverter installed, engage this to divert the water from the downpipe. This stops dirt and debris from the roof entering the stormwater system and blocking the drain.

If you have a rainwater tank that collects water from the roof for use within the school | kura, disconnect this from the gutters/downpipes. Products used to wash down the roof should not enter the stormwater collection tank. When you have finished, reconnect the rainwater tank in accordance with the recommendations of the cleaning product supplier.

Washdown process

The most common way to wash down the walls and roofs is to:

- apply suitable detergents and/or chemicals
- brush with a soft bristled brush
- rinse with water.

Use a soft brush, not a pressure washer or waterblaster. Use a brush with an extendable or telescopic handle rather than a ladder or platform. Waterblasters can easily damage timber building elements and force water through the cladding and into the building structure.

Removing salt, dirt and geothermal chemicals

Salt, dirt and geothermal chemicals can be washed off the building surface. Spray the cleaning product on the surface, use a soft bristled brush to loosen the contaminants and rinse with water.

Removing lichen

Lichen is a complex lifeform made of fungi and algae in a symbiotic partnership. It is slow growing and spread predominantly by dispersing spores.

Spray lichen with one of the many proprietary products available to treat it. Leave long-acting

chemicals to kill the lichen over time. Once dead, the lichen will fall from the surface. Check instructions for application rates, time between coats (if needed) and time before rain. Any overspray on surfaces should be washed down.

Windows

Clean windows by applying window cleaning detergent, wiping or brushing and squeegeeing off. Alternatively, there are proprietary products for washing outside windows that can be sprayed on, agitated with a soft bristled brush (product dependent), rinsed with water and left to dry.

Cleaning and clearing gutters

Regularly clean gutters to remove dirt, leaves and other material washed from the roof. Remove balls and other objects that can block gutters, downpipes and drains.

When gutters are clean and clear, rainwater will flow through the downpipes into the drain. Water will not accumulate in the spouting and overflow onto the ground or into the building structure causing timber building elements to rot.

Preparing for gutter cleaning

Before you start:

- disconnect downpipes or engage a diverter (if installed) so any debris from the gutter does not enter the stormwater drain during cleaning
- check the gutters for growing plants, objects such as balls or signs of previous overflow that will need investigating.



Plants growing in a gutter.

Gutter clearing process

There are two ways to clear gutters:

- Use a ladder or a mobile scaffold (if there is level access) to get to the height of the gutter and remove debris by hand with a gutter cleaning scoop, a brush and a hose. This avoids debris being flushed into the downpipe.
- Flush debris out of the gutter from ground level with a gutter wash attachment attached to a garden hose.

When cleaning, check if there is ponding in the gutter, adequate fall to the downpipes or any broken gutter brackets. Anything found should be recorded for action in your preventive maintenance plan.

When the gutters are clear, reconnect the downpipes or deactivate the downpipe diverter. Clean up any debris removed from the gutter.



Window cleaning.



Downpipe diverter with flexible disconnect (downpipe only).



Downpipe diverter – fold-out type.

Clearing plants

Plants and weeds can grow in cracks in concrete and other hard surfaces and in gardens immediately adjacent to buildings. Prune or remove plants that:

- rub on or cause damage to the cladding
- block subfloor vents
- grow in the cladding or the fabric of the building
- grow under the building
- interfere with or restrict air movement around external heat pump units
- block subfloor vents
- shade solar panels.



Plants affecting the performance of the cladding.

Preventive maintenance check of buildings

Each year, you should have a focused inspection of your school | kura, checking each building to identify any maintenance issues. This may involve one or more members of your school property team and will provide insight into work that may need doing in the short, medium and long term.

Customise the preventive maintenance plan template in section 2 for your school | kura. This has prompts of common issues to look for in different cladding and roofing materials. Section 5 provides further guidance on causes and repairs along with pictures of issues.

Exterior painting

Paint that is in good condition makes your school | kura look smart, extends the life of buildings and helps keep them weathertight. Getting the preparation right, using quality paint and following the manufacturer's instructions are key to a long-lasting quality paint finish.

When to repaint

Repainting is usually necessary every 8–10 years. This will vary depending on the quality of preparation and materials when last painted, exposure to UV light, colour used (lighter colours tend to last longer than darker), how regularly the paint is washed down and the building material underneath.

Signs of failure may include the paint cracking, peeling, flaking, blistering or chalking. Paint failure in timber usually starts at the corners (where the coating is thin) and at joints, mitres or ends where moisture has been absorbed.

Select the right paint

Select quality paint products designed for the location and the material you are painting. Although often more expensive, quality paints will give better paint thickness and performance. Avoid the use of dark colours as this can cause the substrate to overheat and crack.

There are two broad categories of paints:

- Acrylic (water-based) paints are easy to apply, quick drying, lower odour, have better fade resistance and can be cleaned up in water.
- Alkyd (solvent or oil-based) paints have a smoother, harder finish (more scuff resistant and easier to wash) and give thicker cover. They take longer to dry, and cleanup requires paint thinner or other solvent.

Oil-based paint should generally not be applied over water-based paint or on certain cladding systems such as cement plaster-based textures.

The sequence of coats of paint:

- New or bare timber: sealer coat, optional undercoat, finish coat 1, finish coat 2.
- Plasterboard, fibrous plaster, softboard, hardboard, fibre-cement, particleboard: sealer coat (use a solvent-borne sealer in wet areas), finish coat 1, finish coat 2.

For top coats, select gloss, semi-gloss, satin or a matt finish. Gloss and satin finishes are easier to clean but a gloss finish will highlight defects or imperfections more than satin or matt finishes.

Always read and follow the paint manufacturer's instructions.

Equipment and materials

To estimate the quantity of paint you need:

- calculate the area of the surfaces to be painted

and subtract the areas of openings such as windows and doors – for example, 150 m²

- find the paint coverage rate for your chosen paint from the manufacturer's data sheet or paint container – a typical coverage rate for top coats is 12–16 m² per litre
- divide the area to be painted by the paint coverage rate – for example, 150 m²/12 m² = 12.5 litres.

For preparation work, you will need sandpaper, sanding block, hot air gun and/or electric sander for larger jobs, hand scrapers, old brushes for dusting surfaces, hammer and punch, stopping knife and drop sheets.

Painting tools include painting brushes, cut-in brushes, rollers and roller sleeves, paint pot or tray (for rollers), broad stirrers, clean rags, turpentine or water, drop sheets and masking tape.

Preparation

To prepare a surface for painting:

- Remove or repair any materials that are damaged, rotted or corroded.
- Replace damaged or corroded fixings.
- Fill and sand small holes and splits.
- Thoroughly clean the surface to remove dirt and contaminants:
 - Rust: remove with a very light sandpapering – do not use a wire brush – then apply a zinc-rich primer before overcoating.
 - Mould: remove with a mould removal product.
 - Efflorescence (salts that have come out of masonry): identify and stop any water entry to the masonry – when the wall is dry, brush the white deposits away and wash the surface thoroughly.
- Remove all loose or flaking paint (see below).
- Every fourth or fifth repaint, scrape and sand off all the old paint – especially around windows and doors.
- Sand back gloss or chalking on existing paint, smooth rough edges and remove sharp corners from boards. Brush off the dust to leave a clean surface.

Identify any asbestos-cement claddings and take special care with preparation. They should never be waterblasted, sanded or broken into pieces as asbestos fibres are dangerous if released into the air. See section 7 for information about managing asbestos in schools.

Removing existing or loose paint

Existing paint can be removed relatively easily from

some claddings such as timber weatherboards by using:

- a hot air gun – take care not to burn the timber
- an infrared heat paint remover
- a chemical stripper – this can be messy to use and you will need protective clothing but is useful on intricate or profiled woodwork
- hand scraping – slow and not suitable for large areas
- mechanical sanding using a belt sander, orbital sander, shaver (uses a carbide blades set in a spinning drum) or abrading fitting such as a wire brush used with an electric drill
- hand sanding – an important part of the final preparation.

When sanding, use sandpaper with the correct grit – the larger the number, the finer the grit. First use coarser papers (such as 60 or 80 grit) followed by finer papers (such as 180 or 220 grit).

It is more difficult to remove paint from materials such as fibre-cement or textured exterior coatings. Waterblasting should only be used to remove loose or flaking paint from hard external surfaces such as metal, concrete or brick.

Warning – old lead-based paint

Lead hasn't been used in paint for over 40 years but layers of old paint being removed from older buildings may contain lead. Lead can be a health hazard if dust or paint fragments are swallowed or breathed in during paint removal. Tests are available to check whether paint contains lead – contact your paint shop or an accredited laboratory.

Take the following precautions when removing lead-based paint:

- Wear an effective dust mask at all times.
- Use drop sheets to collect dust and debris and bag or contain in a suitable closed container (such as strong plastic bags). Dispose in a place approved by the local authority.
- Keep doors and windows closed so dust doesn't get inside.
- Use the dust catcher or vacuum device if your sanding equipment has it.
- Wet sanding reduces dust.
- Keep children away when paint is being removed.
- Wash hair and skin thoroughly after paint stripping, particularly before eating.

See section 7 for information about removing lead-based paint.

Just before you start to paint

Lay drop sheets to protect surfaces under the work area and put out cones or signs to keep students | ākongā away from the area.

Check that the surface to be painted is dry and free from dust.

Read the paint instructions thoroughly before opening the paint container and check you have enough paint for the job. Stir the paint thoroughly with a broad flat stirrer.

Applying paint

Paint can be applied by brush, roller or spray. Spraying can seem fast but is best left to professionals as it requires extensive experience to get an even, unblemished surface.

These are some general rules:

- Check the weather forecast and don't paint outside if rain is forecast.
- Only paint when temperatures are between 10°C and 25°C.
- Try not to paint in full sun.
- When using oil-based paint on windows and doors, paint early in the day to allow the paint to dry before they need to be shut.

- Don't thin the paint unless the paint label specifically directs this.
- Allow one coat to dry properly before applying the next – see the instructions on the paint container.
- For oil-based paint, sand very lightly between coats to remove any uneven undercoat application or dust particles.
- For primer used outside, overcoat within 4 weeks of application.
- For exterior walls, paint soffits then start at the top of the wall and work down.

Using a roller

Rollers are best for applying paint rapidly to large flat surfaces.

How to successfully apply paint with a roller:

- Select the correct roller for the surface being painted and the finish you want – for example, long pile for rough surfaces, foam plastic for oil-based paint.
- Paint areas that the roller can't reach (such as edges) with a brush first, then overlap the painted area with a roller while there is still a wet edge.
- Load the roller by immersing it in paint (to one-third of its diameter), then run it backwards and



forwards across the corrugated area of the tray to evenly wet it.

- Roll the paint onto the wall so the roller is almost dry as it bridges the gap to the wet edge (the last painted area) of the section previously painted.
- Always work in the same direction (up and down on vertical surfaces) and work away from the main source of light.
- Roll over the area painted with a near-dry roller to lay off the surface to give an even finish.
- Do not force the roller onto the surface being painted or over-roll the surface (this will cause patchiness).
- Maintain a wet edge of paint to roll into wherever possible.

If using a roller on consecutive days, rather than cleaning it each day, cover it tightly in cling film and store in a cool place overnight.

Using a brush

How to successfully apply paint with a brush:

- Use a brush that suits the paint being used and the material/surface being painted.
- For large areas, use the largest brush you can comfortably handle.
- For intricate areas, use a brush small enough to get into the crevices.
- Load the brush with paint, then remove excess paint by running the brush across the lip of the container.
- Use sufficiently firm pressure for the paint to properly coat the surface.
- Brush the paint in two directions, generally in the direction of the main light source.

- Always brush towards the wet edge.
- When finishing to a corner, brush out from it to meet the new paint.
- Ensure the paint is evenly applied.
- Lay off the wetted area with light brush strokes in the direction of the grain for timber and towards the main light source for flat surfaces.

Cutting in – applying a paint edge or line where two colours or finishes meet – can be tricky:

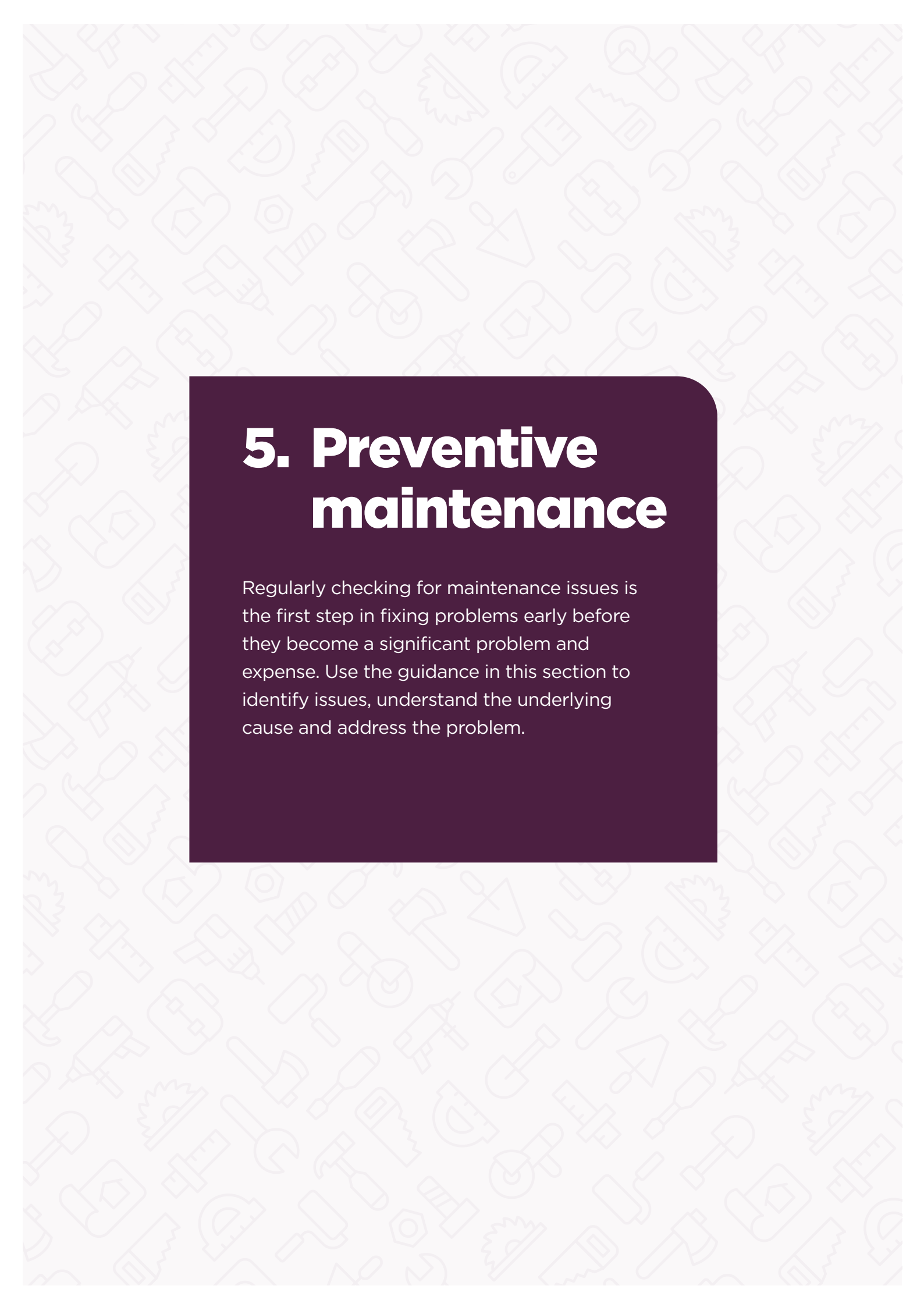
- Use a small cutting-in brush (with tapered bristles), typically no more than 50–60 mm wide.
- Dab the brush into the paint and drag it dry against the edge of the paint container – do not overload the brush.
- Using the sharp edge of the bristle wedge, drag the brush in a steady line along the required paint edge.
- Continue until most of the paint has been left on the surface.
- Repeat the procedure until the edge painting is complete.

Care of brushes

If painting in hot weather, clean the brush during the day to prevent it clogging with dried paint.

When a brush is being used on consecutive days, rather than cleaning it each day, cover it tightly in cling film and store in a cool place overnight.

After the painting job is finished, clean the brush thoroughly with the right solvent (see the paint container label), wash in warm soapy water and rinse thoroughly in clean water. Keep brushes in dry storage, hung by the handle or resting flat.



5. Preventive maintenance

Regularly checking for maintenance issues is the first step in fixing problems early before they become a significant problem and expense. Use the guidance in this section to identify issues, understand the underlying cause and address the problem.

Preventive maintenance

Preventive maintenance involves regularly checking school | kura buildings to identify any issues or maintenance required and then planning and carrying out this work.

This section has detailed guidance on maintenance issues for the exterior of buildings, the causes and repairs. Use it along with your customised preventive maintenance plan (see section 2) to identify issues during the annual check of your school buildings. Use the plan to note and let your principal/property representative know about:

- repair actions
- issues that need monitoring
- when specialist advice is needed
- engaging contractors and specialist trades
- future repairs that are complex or large that will need specific budget.

Use this information to prioritise issues as urgent, short term, medium term or long term. Plan and carry out the maintenance repair actions as part of your ongoing maintenance programme.



5.1 Walls

Exterior walls (including doors and windows) should be carefully checked at least once a year. If your school is in a coastal or geothermal area, you should check more frequently. Maintenance checks are especially important for high-risk buildings such as those that are complex, have monolithic face-sealed exteriors, parapets and balustrades or have minimal eaves protection.

The maintenance you need to carry out on exterior walls will depend on when a school building was constructed or last maintained. There may be a range of cladding materials, and while some require less maintenance than others, there is no such thing as a maintenance-free cladding. A building with monolithic cladding and no eaves has very different maintenance needs and risks compared to a weatherboard building with eaves.

If you find a problem, deal with it without delay. Putting off maintenance work can lead to the job becoming more expensive when it is finally carried out. See section 7 for information about getting specialist help.

If you think a problem may involve leaks, treat this as an urgent repair. Get expert guidance and discuss the issue with your principal/property representative. See section 6 for guidance on where leaks can occur.

Cleaning and painting

Almost all materials and finishes on the exterior walls will last longer if they are cleaned on a regular basis. Cleaning removes dust, dirt, mould, mosses, chemical residues and salt spray, which can all hasten deterioration. External paint coatings don't last forever, and recoating must be carried out routinely to maintain decorative and weather-resistant properties. How long external paint will last depends on factors such as the quality of surface preparation, condition and quality of old paint, climate, colour of paint and cleanliness of the painted surface. See section 4 for washdown and painting guidance. Check manufacturers' information. Information on inspection intervals for specific environmental conditions, maintenance and servicing requirements can usually be found on the product manufacturers' websites.

Asbestos wall claddings

If your school | kura was constructed between 1920 and 1980 and still has the original cement-based sheet or plank cladding, the cladding may contain asbestos. If asbestos fibres get into the air and are breathed in, they can cause potentially fatal illnesses. The management of asbestos is very strictly controlled. See section 7 for information about managing asbestos in schools.

5.1.1 Claddings generally

Some issues occur across all building cladding types and need the same repair.

Dirt and grime

Cause	Repair
Lack of rainwashing	Spot clean the area and/or wash down the exterior of the building – see section 4.

Salt deposits

Cause	Repair
Atmospheric conditions Lack of rainwashing	Spot clean the area and/or wash down the exterior of the building – see section 4.



Dirt splashed up onto baseboards.

Mould and lichen growth on walls and soffits

Mould is often black and can look like dirt, but it will do more damage than ordinary dirt. Mould and lichen are living organisms that can grow through the surface film of paint, shortening the life of the paintwork.

Cause	Repair
Walls and eaves are continuously damp due to heavy planting, overhanging trees or banks close by High relative humidity	• Cut back planting or overhanging trees. Where possible, redesign planting areas to stop the problem recurring. • Spot clean the area with a mould removal product. • Wash down the exterior of the building – see section 4.
Continuous wetting from an overflowing gutter or pipe Leaf fall from overhanging branches blocking gutters	• If the blockage is caused by leaves from an overhanging tree, cut back branches. • If the gutter or pipe is damaged, engage a contractor to repair or replace the gutter. • Once the problem is fixed, spot clean the area with a mould removal product. • Wash down the exterior of the building – see section 4.
Insufficient cleaning	• Remove mould or lichen with a mould or lichen removal product. • Wash down the exterior of the building – see section 4.



Moss, mould and lichen growth evident on timber cladding.

Paint fading, peeling, bubbling or cracked

Cause	Repair
Insufficient wash downs Cracking due to thermal expansion or timber movement Paint near the end of its serviceable life	• Wash down – see section 4. • Where the timber is sound: • scrape off and/or sand back loose paint • sand bare timber until the surface is sound • prime the surface • fill joints with putty or exterior-grade flexible (polyester) filler • paint with at least two coats of exterior acrylic paint. • You could engage a painter to advise on the need for repainting.

Plant growth up or within a wall

Cause	Repair
Climbing plants growing at the base of walls are sending shoots inside the wall through gaps in the cladding	• Remove all shoot growth from inside walls. • Replace plants with non-shooting varieties. • If loose mortar is present when clearing plants from brick veneer claddings, note the issue with your principal/property representative.



Plant growing in wall cladding.

Corrosion of heads of fixings

Cause	Repair
Heads of fixings are not protected by putty where punched and stopped	- Remove corrosion by sanding or brushing with a stiff bristle brush. Apply a rust removal product and punch nails at least 5 mm into the timber cladding. Prime punch holes. When dry, stop with putty or exterior-grade filler. Sand and repaint with at least two coats of quality exterior acrylic paint. - Where nails stand proud of the timber surface, try to extract them and replace with stainless steel annular grooved nails or hot-dip galvanised nails. Punch and finish as above. - Where nails are badly corroded or broken, punch them completely through the timber cladding (such as weatherboard). Drive stainless steel annular grooved nails or hot-dip galvanised nails through the same hole but slanting upwards. Punch and finish as above.
Rust not cleaned off fixings before stopping or painting Paint finish inadequate to protect fixings Fixings' corrosion protection layer (such as zinc) damaged during installation	Remove corrosion by sanding or brushing with a stiff bristle brush. Apply a rust removal product and punch nails at least 5 mm into the timber cladding. Prime punch holes. When dry, stop with putty or exterior-grade filler. Sand and repaint with at least two coats of quality exterior acrylic paint.
Incorrect fixing type used for environmental conditions, cladding type or finish	Replace existing fixings with suitable fixings for the conditions. Select hot-dip galvanised, annular grooved stainless steel or silicone bronze. Fixings in seaspray and geothermal areas need to be more durable – for example, stainless steel.
Acidic leachate from cedar or H4 treated timber (containing copper-based preservatives)	- Galvanised steel nails should not be used in these timbers. - Use annular grooved stainless steel or silicon bronze nails.



Rusty nail heads protruding through cladding.

Nails sticking out above the surface of the cladding

Cause	Repair
Timber shrinkage or movement	- Punch nails (they may work out again) or remove nails and replace with grooved shank nails. - Fill punch holes with putty or exterior-grade flexible (polyester) filler. Prime and paint with at least two coats of quality exterior acrylic paint.



Nails popping through cladding.

5.1.2 Concrete

This section applies to all concrete work, precast or in situ concrete panels, lightweight aerated concrete panels/concrete paint and plaster finishes.

Cracks appearing

Cause	Repair
Shrinkage	- For hairline cracks, fill with an exterior-grade filler and paint the concrete with a high-build exterior acrylic coating. - If cracks are wider than 1–2 mm, consult a structural engineer.
Building movement and settlement	



Hairline crack in concrete wall.

Serious corrosion of reinforcing steel

Cause	Repair
Inadequate concrete strength or poor construction	- Consult a structural engineer. This could be a health and safety risk and may require: - temporary structural support - fencing to make the area safe.
Concrete failed due to earthquake	
Concrete exposed to the elements such as seaspray zones and coastal areas	
Corroded reinforcing steel	
Not enough concrete cover to reinforcing steel	
Moisture getting into the concrete because of poor-quality concrete	
A steel component (reinforcement or fixing) embedded in the concrete has corroded and expanded	
Severe eroding of a concrete beam/lintel with exposed reinforcing steel	



Serious corrosion of reinforcing causing cracking of concrete – consider urgent repair.

Spalling (cracking or flaking concrete)

Cause	Repair
Corroded reinforcing steel caused by moisture getting into the concrete due to poor-quality concrete and/or the reinforcing being too close to the surface of the concrete	- For small areas of spalling (150–200 mm² maximum), remove loose concrete to expose the reinforcing. Use a wire brush to remove loose rust. Apply a zinc-rich paint to the reinforcing. Fill the hole with cement plaster or epoxy plaster (following the manufacturer's instructions). - For larger areas of spalling, engage a structural engineer to propose a maintenance solution for the spalling.
A steel component embedded in the concrete has corroded and expanded	



Serious spalling and cracking of concrete wall – consider urgent repair.

Rust stains on concrete, concrete block walls or foundation walls

Cause	Repair
Poor-quality concrete absorbing water causing the reinforcing to rust and the concrete to spall or crack, allowing in more water	- For small areas of concrete damage (150–200 mm² maximum), remove enough concrete to expose steel that has no rust. Sand to remove rust from the affected reinforcing and prime the reinforcing with a zinc-rich primer and a metal primer. Repair the hole with a sand-cement plaster. - For larger areas of damage or where little or no reinforcing remains, engage a structural engineer.



Inadequate installation of reinforcing causing rusting – consider urgent repair.

Signs of efflorescence or paint failure

Water migrating through masonry will cause blistering of the paint finish or efflorescence on unpainted masonry. Efflorescence that appears on masonry surfaces is the deposit of crusty white mineral salts that have leached out from within the masonry when water migrates through it.

Cause	Repair
External moisture entry through the wall (above ground) from damaged or missing gutters or downpipes, excessive planting, a concrete path or driveway built up against the wall or damage from ground subsidence	- Find the source of water entry and fix. - If the moisture entry is extensive or widespread or you cannot find the cause, engage an experienced building surveyor for advice. - If you want to seal or paint the interior wall surface, allow plenty of time for the wall to dry completely before starting work. Use a coating or product that is waterproof and designed for use on concrete or concrete masonry. These need recoating regularly. Clear coatings are available but have a very limited life.



Signs of flaking and peeling paint indicating moisture in concrete wall.

5.1.3 Exterior insulation and finish systems (EIFS)

A monolithic finish is characteristic of EIFS wall cladding. These proprietary systems include polystyrene sheets typically with a plaster-based coating and paint finish. There is often a fibreglass-reinforced base coat and jointing system and textured polymer or acrylic finishing coats. EIFS cladding has been associated with weathertightness failures, particularly in buildings constructed from the mid-1990s to the mid-2000s. Check cladding frequently for any damage or issues.

Impact damage

Cause	Repair
Impact from stones, balls, vehicles etc.	- Damage that may let in water should be repaired promptly. - Engage the original installer (if known) or another manufacturer-approved specialist installer to repair the impact damage. - School staff should not carry out EIFS repairs. Done incorrectly, repairs can cause further problems and void any warranty that may still apply.



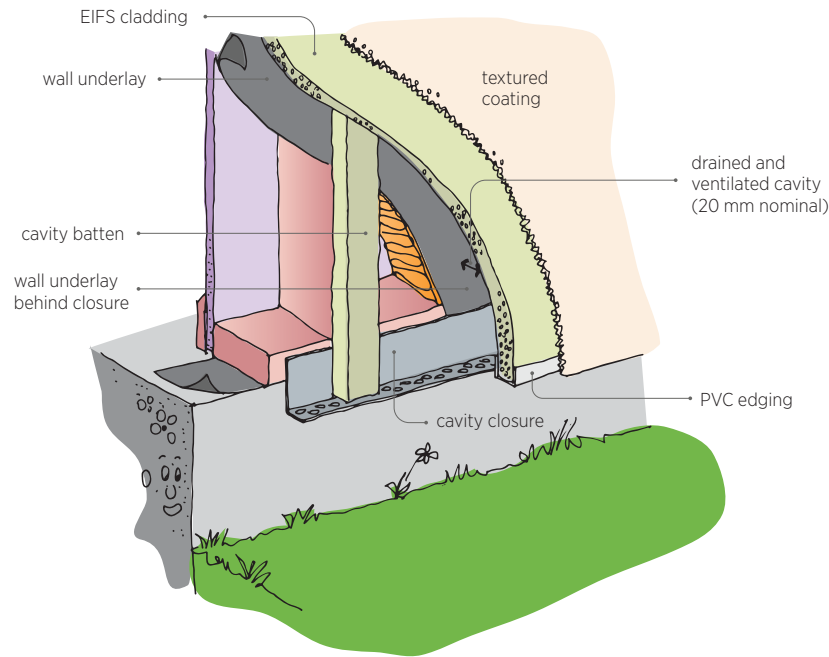
Impact damage causing failure of cladding system.

Coating failure or surface cracking (especially around windows and doors)

Cause	Repair
Lack of maintenance Moisture levels too high when coating applied Moisture getting into the coatings through cracks Differential thermal movement with adjacent materials Vibration movement during earthquake or high wind	- Engage the original installer (if known) or another manufacturer-approved specialist installer to repair the impact damage. - School staff should not carry out EIFS repairs. Done incorrectly, repairs can cause further problems and void any warranty that may still apply. - If you suspect leaks through the cladding, engage an experienced registered building surveyor to report on the building.



Signs of coating failure at panel fixing.



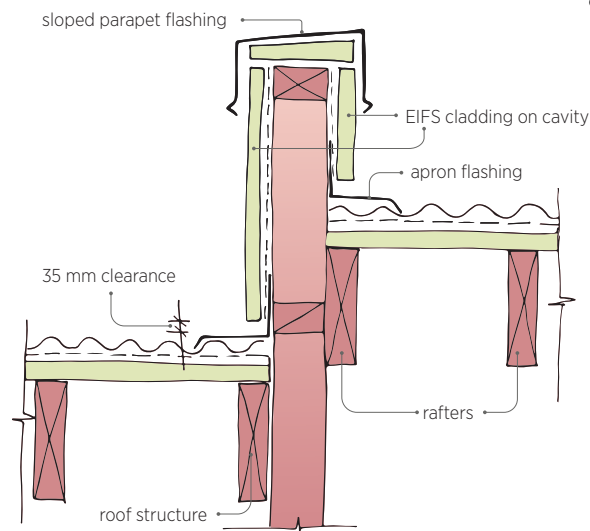
EIFS cladding construction.

Cladding too close to or in contact with ground

Cause	Repair
Wall cladding bottom edge is less than the minimum: 175 mm above unpaved ground 100 mm above paving or finished deck level	- If possible, lower the ground level to the recommended gap between the cladding and ground. Even a 50 mm gap will help reduce the risk of water entry. - Contact the original installer (if known) or engage an experienced registered building surveyor to report on the building.



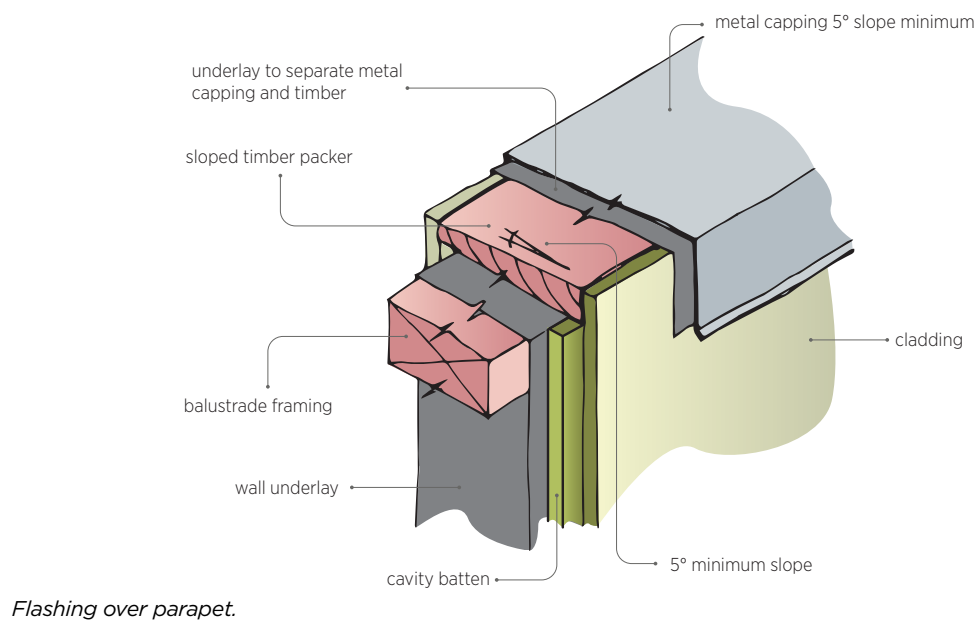
Cladding that is damaged and in contact with ground.



Roof parapet flashing.

Water entry and deterioration of parapet

Cause	Repair
Hairline cracking in cladding	Engage a registered building surveyor to report on the building.
Inadequate or no flashing to top of parapet wall	Where no consequential damage is identified by the building surveyor, engage a manufacturer-approved specialist applicator to seal the cracks and recoat the walls.
Reliance on plaster finish to provide waterproofing	



5.1.4 Fibre-cement claddings

Older fibre-cement cladding installed before the mid-1980s may contain asbestos fibres, which are a health and safety risk. The management of asbestos is very strictly controlled. See section 7 for information about managing asbestos in schools.

Impact damage

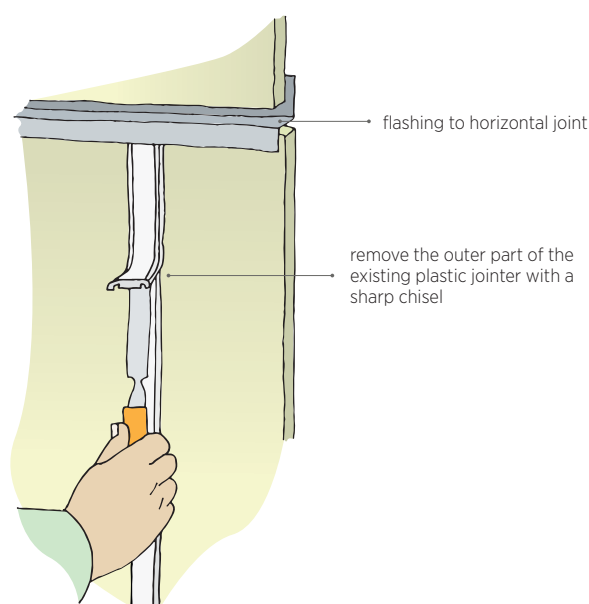
Cause	Repair
Impact from stones, balls, humans, vehicles etc.	- Repair small holes or hairline cracks if the fibre-cement is relatively new or has been confirmed as having no asbestos: - Remove loose material and dust. - Fill with an exterior-grade polyester filler. - Sand, prime and paint with a minimum of two coats of good-quality exterior acrylic paint. - Replace entire sheets for larger areas of damage. Engage a contractor.



Impact damage to sheet - consider urgent repair.

Damaged PVC jointers or soakers

Cause	Repair
Impact from stones, balls etc.	Remove the outer part of the damaged jointer and cover the joint with an H3.2 treated timber batten.
UV light exposure	
PVC jointer at end of its serviceable life and cracks are appearing	Engage a building contractor if the jointers need to be fully replaced as cladding sheets may need to be removed.



Removing a damaged PVC jointer.

Horizontal or vertical cracking in fibre-cement

Cause	Repair
Horizontal movement control joints not included	Check for water damage and leaking.
Framing timber movement	- If no damage is found, fill smaller cracks (1–2 mm): - Sand back sheets. - Fill cracks with an exterior-grade polyester filler. - Repaint to match existing coating.
Vibration movement during earthquake or high wind	
Moisture entry into building structure	- For larger cracks or cracks across the whole sheet, engage a contractor to replace the whole sheet or have a professional installer cut a horizontal joint and fill it with sealant. - If water damage and leaking is found, engage a contractor with experience in weathertightness remediation work.

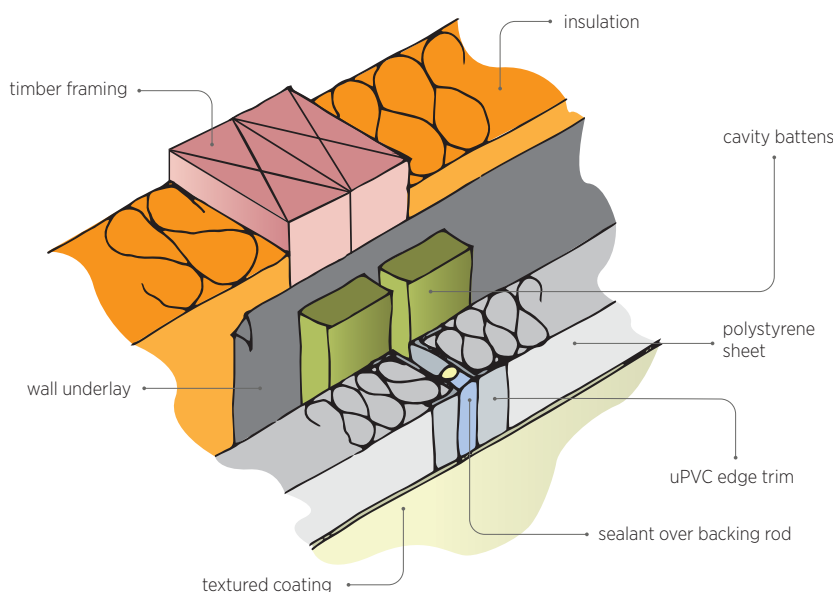


Cracking over full height of weatherboard – consider urgent repair.

Damaged or leaking control joints in fibre-cement

Movement control joints reduce the risk of cracking by allowing movement. They need to be incorporated in sheet claddings.

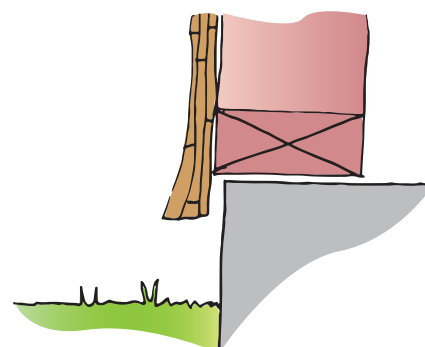
Cause	Repair
Damaged sealant, sealant falling away	Check for water damage and leaking.
No sealant	If no significant damage is found, replace the sealant:
Movement control joints not included	Remove any existing sealant.
Framing timber movement	Check the bond breaker tape. If in good condition, replace the sealant. If in poor condition, note the issue for review with your principal/property representative.
Moisture entry into building structure	Apply a finish to match the existing external coating. You may need to engage a specialist/approved applicator for this work.
Vibration movement during earthquake or high wind	- If the building is leaking, fix as an urgent repair. - If water damage and leaking is found, engage a building contractor with experience in weathertightness remediation work to replace water-damaged building elements.



Control joint construction.

Swelling of sheet edges

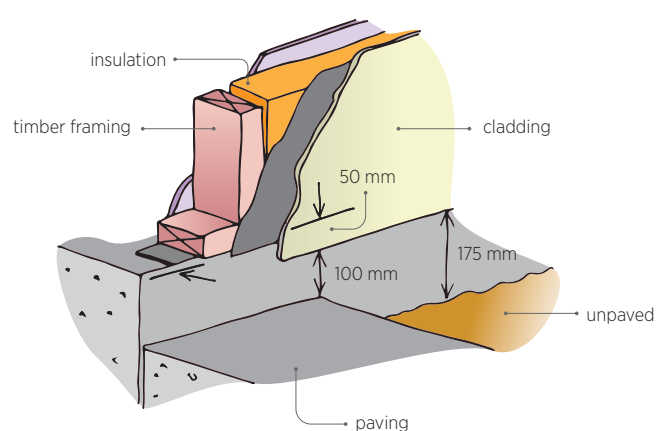
Cause	Repair
Sheets continuously damp due to soil or foliage against the cladding	Remove the cause such as clearing soil or foliage that is against the cladding. Aim for a minimum 50 mm gap between the base of the cladding and the ground to prevent moisture uptake and allow the bottom of the cladding to dry completely. Ensure that lowering the garden level does not lead to rainwater flowing under the building.
Sheets absorbing moisture at the bottom edge where not adequately primed and painted	Engage a building contractor to replace damaged sheets.



Swelling of cladding edge close to damp ground.

Cladding too close to ground level

Cause	Repair
Cladding was installed too close to the ground Soil or planting areas have been built up	- Clear soil or foliage that is against the cladding. Aim for a minimum 50 mm gap between the base of the cladding and the ground to prevent moisture uptake. Ensure that lowering the garden level does not lead to rainwater flowing under the building. - Check cladding for dampness or damage. Repair or replace as necessary.
Path or paving laid against the cladding	If concrete and paving needs to be removed, note the issue for review with your principal/property representative.



Minimum ground to cladding distances.

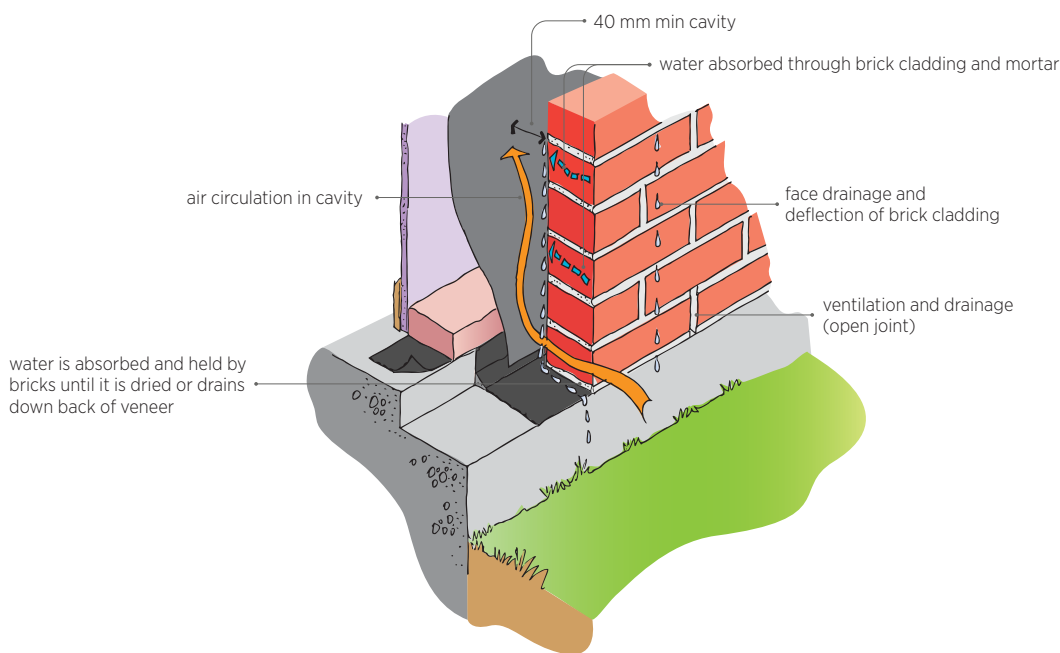
Leaking through the cladding

Cause	Repair
Cracked sheets or planks	- Engage a building surveyor to check the moisture levels of the structure. Note the issue for review with your principal/property representative. - If no damage is found, repair smaller cladding cracks (1–2 mm): - Sand back sheets. - Fill cracks with an exterior-grade polyester filler. - Repaint to match existing coating. - Engage a building contractor to repair and replace damaged boards.
Damaged sealant	- Engage a building surveyor to check the moisture levels of the structure. - If no significant damage is found, replace the sealant: - Remove any existing sealant. - Check the bond breaker tape. If in good condition, replace the sealant. If in poor condition, note the issue for review with your principal/property representative. - Apply a finish to match the existing external coating. - You may need to engage a specialist/approved applicator to replace the sealant.
Poor detailing No cap or saddle flashings at junctions of parapet and balcony walls	- Engage a building surveyor to check the moisture levels of the structure. - Engage a building contractor to install cap or saddle flashings where they are not installed.

Paint fading or chalking

Cause	Repair
Weathering UV light exposure (darker colours are more prone to fading and chalking will be more visible)	• Wash surface if necessary. Sand lightly. Paint with a minimum of two coats of quality exterior acrylic paint. • Select a lighter-coloured paint where possible.

5.1.5 Masonry veneer systems



Wet cavity (brick veneer) construction.

White salt-like deposits (efflorescence)

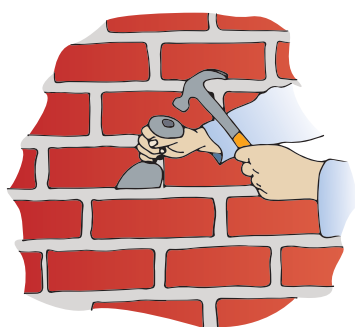
Cause	Repair
Moisture in the masonry blocks causing salts to migrate to the surface leaving a whitish-grey residue	• Usually comes off with rainwashing. • Remove non-rainwashed efflorescence by brushing off deposits with a stiff bristle brush and rinse off with water. • Find the source of moisture and address the cause.



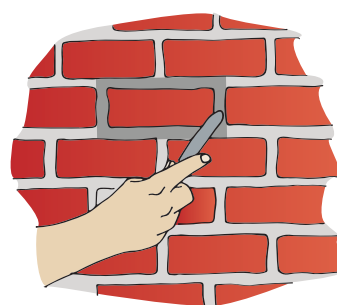
Efflorescence on brick veneer.

Crumbling mortar

Cause	Repair
Weathering Mortar quality is poor – most commonly found in pre-1930s buildings Use of lime mortar	Rake out and repoint loose mortar.



Step 1. Chisel out all loose mortar with a small cold chisel and hammer.



Step 2. Fill chiselled-out joints with new mortar. Pack mortar in and then finish off with a dowel or steel rod that is slightly wider than the joint.

Repairs to crumbling mortar between bricks.

Cracks in the mortar, bricks or concrete blocks

Cause	Repair
Differential settlement of the building, indicated by cracks in the mortar stepping across the face of the wall, caused by swelling and shrinkage of clay soils, inadequate foundations or tree roots under the foundations Soil load behind basement wall causing deformation Vibration movement during earthquake or high wind No control joints in wall	- Monitor crack width for 1 month: - If cracking increases or the foundations have subsided, consult a structural engineer for advice. - If cracking remains the same, rake and repoint mortar, replace damaged bricks if necessary.



Cracks in veneer consistent with building movement or settlement.

Cracks in bricks or concrete blocks above openings

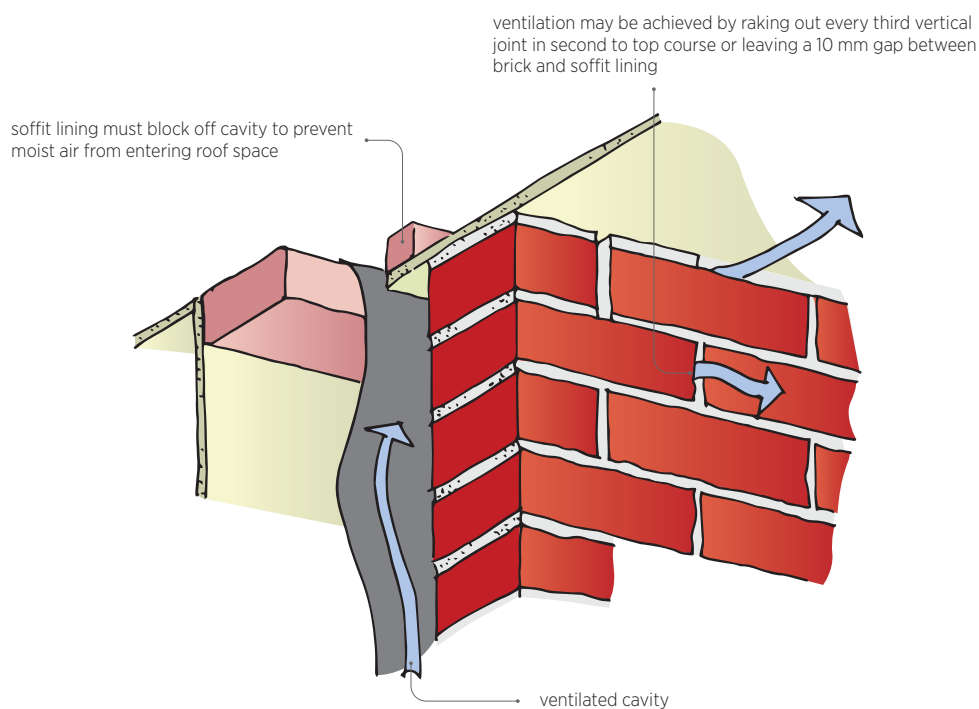
Cause	Repair
Corrosion of steel lintel bar supporting the bricks	- If the corrosion is not severe, remove by sanding or brushing with a stiff bristle brush. Apply a zinc-rich primer and a minimum of two coats of quality exterior acrylic paint. - Severe corrosion could be a health and safety risk and may require urgent structural repair. Consult a structural engineer.
Differential settlement of the building caused by swelling and shrinkage of clay soils or inadequate foundations Vibration movement during earthquake or high wind	- Monitor crack width for 1 month: - If cracking increases, consult a structural engineer. - If cracking remains the same, replace damaged bricks as necessary.



Header bricks detached from mortar indicating building movement or rusted steel lintel bar.

Blocked or no ventilation slots or gap at the top of veneer

Cause	Repair
Slots blocked by dirt or insects Slots sealed/blocked during previous maintenance work	Clean blocked drainage slots using a wire with a hook on the end or a similar device until water can run freely out of the slots. Pull blocking material out of the slot rather than pushing it further into the slot.
No ventilation slots installed	Engage a bricklayer or blocklayer to add ventilation slots.



Ventilation slots located at top of veneer cavity.

Blocked drainage slots at bottom of wall

Cause	Repair
Slots blocked by dirt, soil or plants	- Clear away built-up organic matter from the base of the wall. - Ensure the ground level allows water to drain out of the slots and away from the building and will not channel surface water back towards the wall. - Clean out blocked drainage slots with a wire with a hook on the end or similar device until water can run freely out of the slots. Pull blocking material out of the slot rather than pushing it further into the slot.
Ground level or paving built up to cover slots	Alter landscaping to clear drainage slots without making a path for water to enter the subfloor.
Drainage slots not originally provided	Engage a bricklayer or blocklayer to advise about installing drainage slots.



Cleaning drainage slots at bottom of veneer to allow for drainage of cavity.

Uneven colouring/staining

Cause	Repair
Localised water run-off across the face of the wall	- Determine cause of localised run-off and divert if possible. - Wash down brickwork to prevent build-up of discolouration.
Lack of rainwashing	

5.1.6 Metal claddings

Dents and impact damage in profiled steel cladding

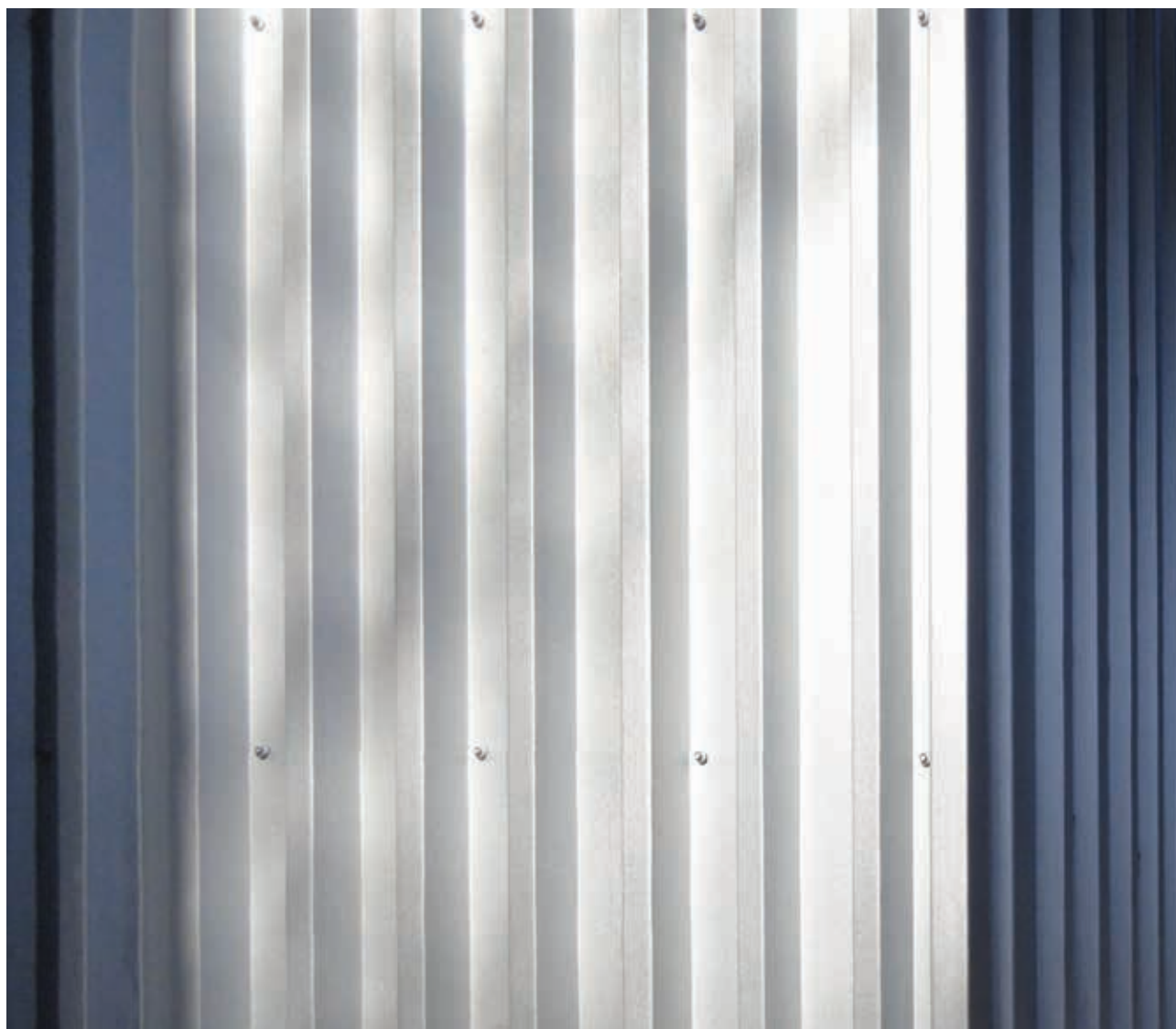
Cause	Repair
Impact from stones, balls, vehicles etc.	- For small dents in pre-finished claddings, if the finish is undamaged, leave the dents until other maintenance such as painting is required. Spot painting a pre-finished cladding will be more obvious than the damage. - Replace badly damaged sheets. - You may want to engage a building contractor to replace badly damaged sheets.



Impact damage to corner of metal cladding.

Buckling or tearing in profiled steel cladding

Cause	Repair
Inadequate allowance for thermal movement at fixings – more common with dark-coloured claddings Fixing holes are too small to allow thermal movement	• Remove fixings, enlarge fixing holes and replace fixings with new waterproof washers and fixings. Make sure the new washers and screw caps cover the enlarged fixing holes and are securely in place. • You may want to engage a building contractor to make allowance for movement.
Rivets used instead of screws, preventing thermal movement	• Replace rivets with screws, making sure fixing holes allow for thermal movement. Use appropriate weatherproof sealing washers and ensure fixings penetrate the wall framing.



Corrosion or rust in profiled steel cladding

Cause	Repair
Cladding is too close to the ground or touching the ground	Lower the soil level until clear of the cladding by 30–50 mm minimum. The bottom of the cladding can then dry completely.
Cladding covered by soil or foliage	Trim foliage from cladding.
Concrete against the cladding	- Remove concrete or paving against the cladding. Reform the ground surface with a minimum 30–50 mm gap between the base of the cladding and the ground to allow ventilation. Ensure rainwater will flow away from the building. - When spot painting or repainting, follow the instructions of the cladding and paint manufacturers. - Engage a building surveyor if you suspect damage behind the cladding such as rot in framing timbers.
Bottom of cladding is too close to another surface such as a timber or membrane waterproof deck, flashing junction or permanent structure	The minimum distance should be 35–50 mm to another surface.
Corrosion between sheets at laps and joints	Remove the deposits with a stiff bristle brush – not a wire brush – and sand the corroded areas to remove rust.
Red rust on galvanised mild steel cladding	When spot painting or repainting, follow the instructions of the cladding and paint manufacturers.
Galvanised coating damaged during fixing, exposing steel	You may want to engage a contractor to replace badly corroded sheets. Check the new material is compatible with surrounding materials.
Galvanised coating eroded to expose bare metal	
Profiled metal cladding is in contact with or has run-off from incompatible materials such as cedar, redwood or timber treated with copper-based preservative	
Exposure to a corrosive environment such as near a swimming pool or in coastal, industrial or geothermal areas	
Insufficient rainwashing	



Corrosion to base of metal cladding that is too close to ground level.

Steel is scratched

Cause	Repair
Trees or shrubs brushing against cladding Sheets dragged over rough surface during installation Careless stacking before installation	- Scratches less than 3 mm wide that do not penetrate the paint system can be left untreated. - If the scratches are widespread and expose bare metal (corroded or rusty), replace the entire roofing sheet(s). - If the scratches are localised and expose bare metal: - sand using a rotational strip disk to remove the rust and scratched paintwork. - apply spot primer to areas of bare metal - apply a full coating system as per the paint manufacturer's instructions – paint that is available to match roofing colours is designed for use on accessories to pre-painted roofing material and not for repairing marks on the roofing itself.

Peeling, bubbling, flaking or cracking of paint

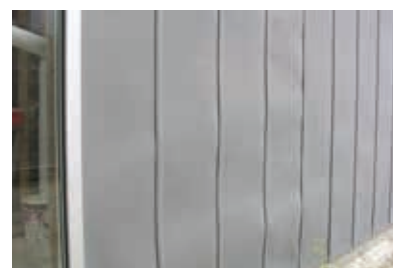
Cause	Repair
Weathering UV light exposure For factory-coated material, wrong coating specification for the in-use conditions Coating nearing the end of its serviceable life	- If within the product guarantee period (typically 15 years), contact the manufacturer for redress under the guarantee. - If failure is outside the product guarantee period, remove loose and flaking paint by sanding or brushing with a stiff bristle nylon brush. Thoroughly clean and paint following the manufacturer's instructions. Painting specifications may vary with the type of coating.



Paint peeling from metal cladding.

Aluminium interlocking plank cladding buckling

Cause	Repair
Thermal movement in the panels is restricted at fixings, interlocking junctions or at panel ends	- The panels will probably need to be replaced, with allowance made for thermal movement. - You may want to engage a building contractor to allow for thermal movement in the cladding.



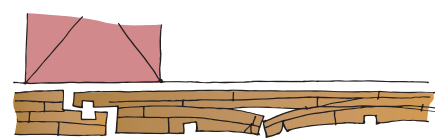
Metal cladding showing signs of buckling under thermal movement.

5.1.7 Plywood claddings



Sheets are delaminating

Cause	Repair
Manufacturing issue	- If the problem is very minor, a short-term option is to: - scrape and/or sand the paint or stain - prime (if painting) - cover delaminated edges and/or corners with timber cover boards - reapply protective paint or stain using a lighter colour to reduce the likelihood of movement. - Engage a building contractor to replace the sheets if the delamination is severe. If this is within 15 years of installation, a building consent will be needed.
Lack of maintenance	
Thermal movement of timber	
Weathering	
UV light exposure	
Timber swelling and shrinking due to moisture absorption	



Delaminated plywood sheet.

Sheets are cupping

Cause	Repair
Incorrect installation	- Engage a building contractor to remove damaged sheets and install new sheets according to the manufacturer's instructions. - Note the issue for review with your principal/property representative.
Insufficient studs or fixings	



Cupping of plywood cladding.

Paint peeling or flaking

Cause	Repair
Weathering	Scrape and sand off loose paint.
UV light exposure	Sand bare timber until the surface is sound.
Timber swelling and shrinking due to moisture entering unprimed or poorly primed timber end grain at joints	- Prime the timber. - Fill joints with putty or exterior-grade flexible (polyester) filler.
Coating nearing the end of its serviceable life	- Paint with a minimum two coats of exterior acrylic paint. - Consider engaging a painting contractor to prepare the surfaces and repaint.



Plywood showing signs of needing to be painted.

Paint faded

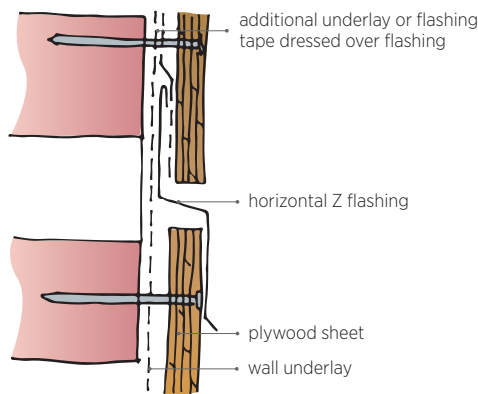
Cause	Repair
Weathering	Wash the surface, allow to dry and then sand lightly.
UV light exposure	- If necessary, fill joints with putty or exterior-grade flexible (polyester) filler. - Paint with a minimum two coats of exterior acrylic paint. Select a lighter-coloured paint where possible – darker colours fade and attract heat, which causes greater expansion/contraction of the timber, reducing the lifespan of the paintwork.



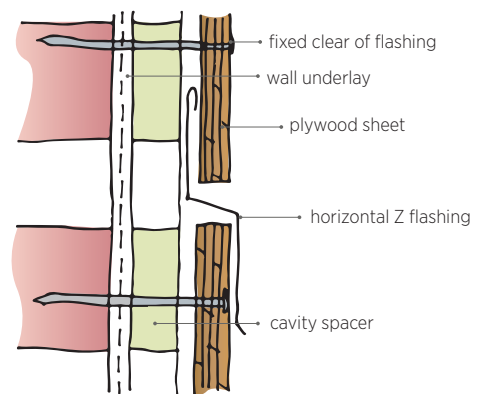
Plywood with no paint or stain protection.

Junction failed at sheet edges

Cause	Repair
Lack of horizontal flashing	Engage a building contractor to install horizontal flashing.
Horizontal flashing has not been installed correctly with an upstand behind the cladding	
Building wrap/paper has not been taped and flashed correctly over the horizontal flashing	



Direct-fixed cladding with horizontal flashing
Typical flashing details at sheet junctions.



Cladding fixed over cavity battens with horizontal flashing



5.1.8 Stonework

Surface damage or deterioration

Cause	Repair
Acid attack on the stone from airborne pollution, dust or dirt combining with rain – limestone such as Ōamaru stone is particularly susceptible	- Wash down the exterior of the building – see section 4. - If discolouration is not removed by washing down, you may want to seek advice from a suitably qualified person such as an accredited stonemason.
Oxidation of impurities in the stone	

Rising damp or dampness in walls

Cause	Repair
Deteriorating or missing damp-proof membrane allowing ground moisture to be absorbed by the stone and move up the wall	- Damp-proofing cannot be inserted without major rebuilding of the wall. - If dampness is seen within 150–200 mm of the inside floor level, you may want to seek advice from a suitably qualified person such as an accredited stonemason.
Soil bridging the damp-proof membrane or blocking drainage openings	Note the issue for review with your principal/property representative.



Subfloor ventilation is limited by concrete paving.

Crumbling mortar

Cause	Repair
Weathering	Scrape out loose mortar and repoint.
Poor mortar quality	You may want to engage an accredited stonemason to advise you on crumbling mortar.
Use of lime mortar	

Cracks in the stonework

Cause	Repair
Corrosion of steel lintel bar supporting the stone	• If lintel corrosion is not severe: • remove corrosion by sanding or brushing with a stiff bristle brush • apply a zinc-rich primer • apply a minimum of two coats acrylic paint. • Monitor crack width for 1 month: • If cracking increases, consult a structural engineer. • If cracking remains the same, replace damaged stone as necessary. • You may want to engage an accredited stonemason to advise on cracks in the stonework.
Differential settlement of the building caused by swelling and shrinking of clay soils and inadequate foundations	
Vibration movement during earthquake or high wind	



Cracking in stone wall.

5.1.9 Stucco

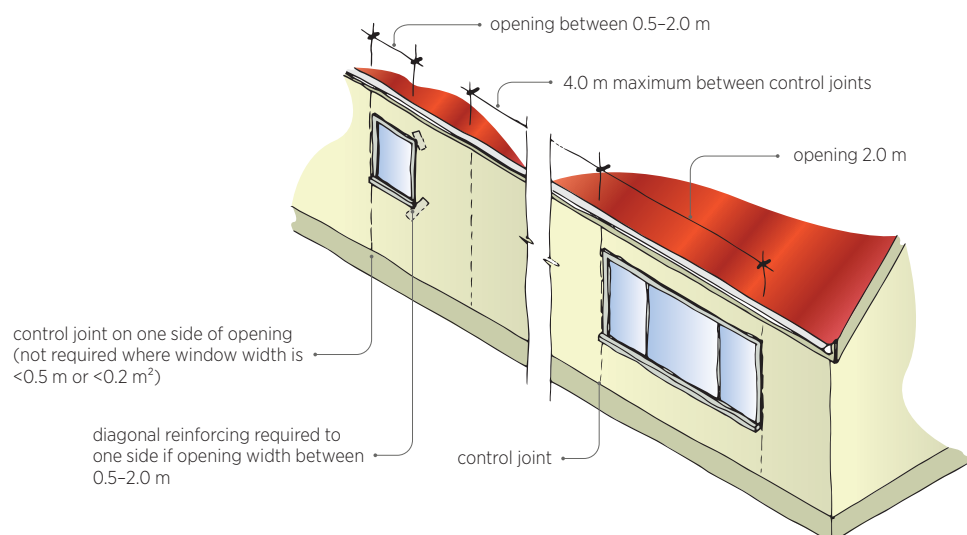
Impact damage

Cause	Repair
Impact from stones, balls, vehicles etc.	• Remove damaged stucco, replaster with cement plaster to match existing texture and repaint. • Reclad if damage is significant using a different cladding material.

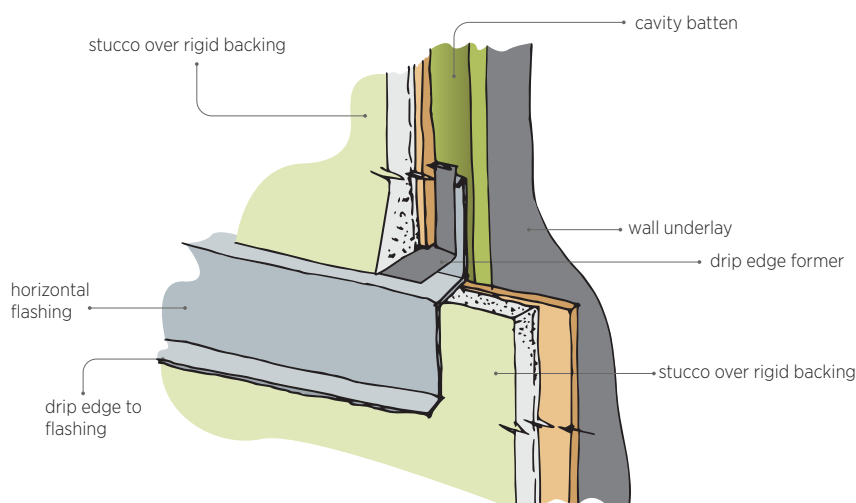


Horizontal or diagonal surface cracking

Cause	Repair
Poorly located or no movement control joints	- Monitor crack width for 1 month: - Cracks less than 1 mm wide that are not getting wider may be able to be covered with a high-build acrylic coating – check paint specification to determine crack bridging ability. - For cracks over 1 mm and cracks that are getting wider, obtain specialist or replacement advice. - Check the building after an earthquake for any new cracks – treat cracks as above. - Engage a building surveyor to report on the damage behind the cracking if you suspect the building may be leaking and there is a risk of damage behind the cladding.
No additional reinforcing at corners of openings	
Poor application of texture coating	
Insufficient or a too large separation between reinforcing and backing	
Building movement or settlement	
Framing shrinkage	
Vibration movement during earthquake or high wind	



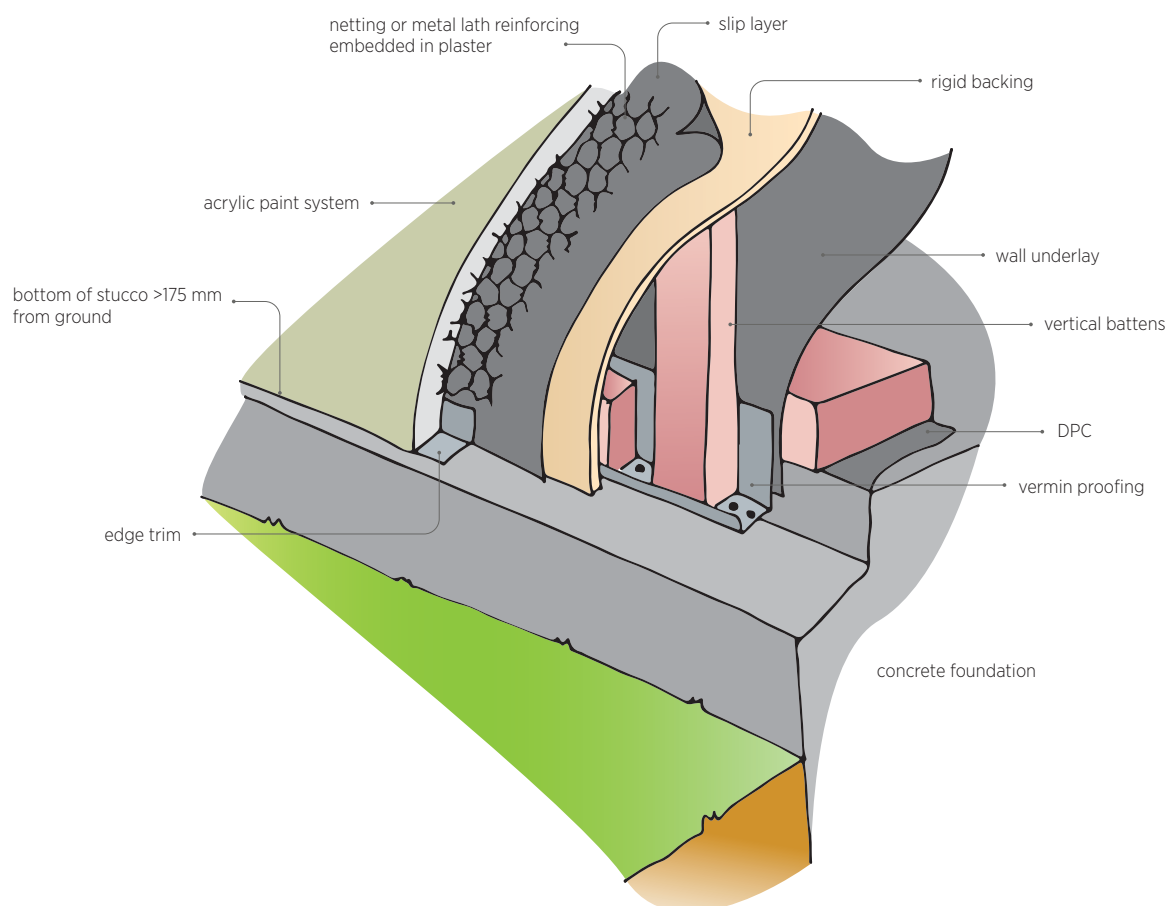
Vertical control joint locations in stucco.



Horizontal joint flashing in stucco.

Stucco too close to or in contact with the ground

Cause	Repair
Installed too close to the ground	- Lower the soil or garden level so there is a minimum 30–50 mm gap between the base of the stucco and the ground. This will prevent moisture uptake and allow the bottom of the stucco to dry completely. Ensure this does not lead to rainwater flowing under the building. - Check stucco for dampness or damage. Repair and/or repaint as necessary.
Gardens have been built up	- Lower the soil/mulch level so there is a minimum 50 mm gap between the base of the stucco and the ground. This will prevent moisture uptake and allow the bottom of the cladding to dry completely. - Clear around subfloor ventilation grating to allow airflow.
Path or paving laid against the cladding	- Where possible, break up and remove concrete or paving. - Reform the ground surface so there is a minimum 30–50 mm gap between the base of the stucco and the ground. Ensure rainwater flows away from the building.



Stucco construction at ground level.

5.1.10 Timber wall claddings

Paint fading, peeling, bubbling or cracked

Cause	Repair
Insufficient wash downs	Wash down – see section 4.
Cracking due to thermal expansion or timber movement	- Where the timber is sound: - scrape off and/or sand back loose paint - sand bare timber until the surface is sound - prime the surface - fill joints with putty or exterior-grade flexible (polyester) filler - paint with at least two coats of exterior acrylic paint.
Paint near the end of its serviceable life	You could engage a painter to advise on the need for repainting.

Joints opening

Cause	Repair
Thermal expansion and contraction of timber	- Where the timber is sound: - scrape off and/or sand back loose paint - sand bare timber until the surface is sound - prime the surface - fill joints with putty or exterior-grade flexible (polyester) filler - paint with at least two coats of exterior acrylic paint.
Timber swelling and shrinking due to moisture entering unprimed or poorly primed timber end grain at joints	- For additional protection of joints and mitred corners, after painting, cover joints and corners with galvanised steel soakers (metal covers) or timber cover boards. - Engage a building surveyor to report on the building if you suspect the building may be leaking and there is a risk of damage behind the cladding. - Note the issue for review with your principal/property representative.



Cladding joint at mitre edge indicates failed junction.



Rot in timber weatherboards

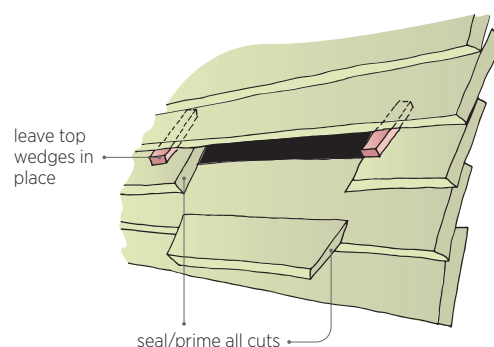
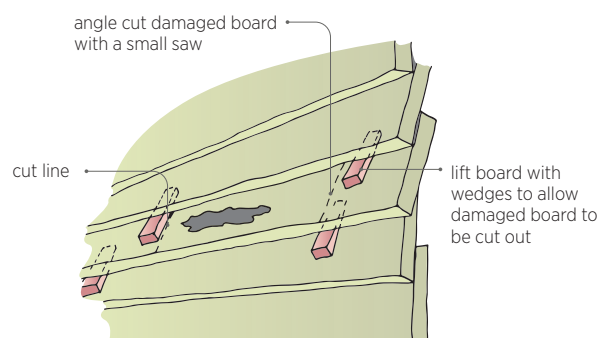
Cause	Repair
Timber is or has been continuously damp Timber was inadequately treated – radiata pine must be treated to H3.1 if painted and H3.2 if installed unpainted or unstained Non-durable or untreated timber was used – timbers such as cedar and heart macrocarpa may be untreated but they must not be continuously wet in use	• Determine and address the cause of dampness of the timber and repair rotten section of weatherboards (see below). • Remove and replace rotten section(s) of weatherboards: • Check wall underlay (building paper) and framing behind weatherboards are sound. • Splay (slant) cut back to the nearest studs (at least 600 mm in both directions). • Treat cut ends of existing boards with paint-on preservative. • Prime the cut ends, back and front face of boards. • Insert new boards (use entire boards where possible). • Nail edges of existing and new boards to studs using one nail per stud. • Fill joints with exterior-grade flexible (polyester) filler. • Paint with at least two coats of exterior acrylic paint. • To prevent moisture uptake, ensure there is at least a: • 100 mm gap above paved ground • 175 mm gap above unpaved ground. • You may want to engage a building contractor to repair the weatherboards. • If leaking is suspected, fix as an urgent repair.



Severe rot in horizontal timber weatherboards.

Leaking through timber cladding

Cause	Repair
Split or cupped boards	- Remove and replace damaged boards – see <i>Rot in timber weatherboards</i> above. - Where the timber is sound, repaint: - Scrape off and/or sand back loose paint. - Sand bare timber until the surface is sound. - Apply primer coat. - Fill joints with exterior-grade flexible (polyester) filler. - Paint with at least two coats of exterior acrylic paint. - You may want to engage a building contractor to repair the weatherboards.
Plugs missing in rusticated weatherboards	Replace or install plugs.
Scribers missing in bevel-back weatherboard	Replace or install scribes.
Joints opening due to deteriorated paint finish Poor corner detailing	- Where the timber is sound, repaint: - Scrape off and/or sand back loose paint. - Apply primer coat. - Paint with at least two coats of exterior acrylic paint. - Cover joints and corners with galvanised steel soakers (metal covers) or timber cover boards. - You may want to engage a building contractor to repair the joints and corner details.
No cap or saddle flashings at junctions of parapet and balcony walls Junctions with other claddings and/or roof poorly detailed or constructed	- Remove weatherboards, install flashings and replace with existing weatherboards if in good condition or with new weatherboards. Prime all cuts and faces of boards prior to installing new weatherboards. - You may want to engage a building contractor to install cap and saddle flashings and repair junctions.



New insert cut to match the piece removed. Slide it up and into place under wedged board. Remove wedges and nail it in place. Fill any gaps and coat to match surrounding boards.

Split or cracked timber weatherboards

Cause	Repair
Boards have been double nailed, preventing movement	- If the building is leaking, fix as an urgent repair. - If water is entering the wall cavity through the splits, replace the boards.
Boards are nailed through the lap, preventing movement	- If there is no water entry, repair the boards: - Scrape off and/or sand back loose paint. - Prime the surface. - Fill joints with exterior-grade flexible (polyester) filler. - Paint with at least two coats of exterior acrylic paint.
Timber has become too dry	
Splitting occurred during installation	You may want to engage a building contractor to repair the weatherboards.



Crack appearing in weatherboard cladding.



Repair soaker flashing at weatherboard junction.

Rot along the bottom of timber-clad walls

Cause	Repair
Boards are touching the ground or covered by soil or foliage	- Lower the soil or remove the foliage so there is a clear gap of at least 50 mm at the bottom of the cladding. This allows the cladding to dry. - Check that lowering the soil does not lead to surface water flowing under the building.
Boards have had concrete poured or paving laid against them	- Where possible, break up and remove concrete or paving. - Form the ground surface so there is at least 30–50 mm ventilation gap between the base of the timber and the ground or new paving. - If the concrete can't be removed, cut off the base of the boards to provide a 50 mm gap for ventilation between the timber and the concrete.
Boards were not primed and painted along the bottom edge	- Check for rot in the framing and bottom weatherboards with a screwdriver – if the screwdriver easily enters the timber, it is rotten. - Engage a building contractor to replace all damaged or suspect supporting framing and weatherboards with treated timber: - For framing, use H3.2 treated timber. - For weatherboards, use H3.1 timber with a three-coat paint system (prime all surfaces before installation) or H3.2 treated timber – see <i>Rot in timber weatherboards</i> above. - Where timber is sound, repaint: - Allow to dry out completely. - Scrape off loose coating. - Sand the bare timber until the surface is sound. - Prime the surface. - Paint with a minimum two coats of exterior acrylic paint.



Degrading weatherboards at base of exterior wall.

5.2 Windows and doors

If you find a problem, deal with it without delay. Putting off maintenance work can lead to the job becoming more expensive when it is finally carried out. See section 7 for information about getting specialist help.

5.2.1 Aluminium windows and doors

Failing glazing seals

Cause	Repair
General wear and tear Weathering	Reinsert seals if in good condition using the handle end of a mid-sized screwdriver.
UV light exposure has affected durability, causing rubber seals to crack Incorrect length/size of glazing seal Glazing seals stretched during installation	- Remove and replace seals if in poor condition: - Purchase replacement seals from a hardware supplier or window frame manufacturer. Take a sample of the existing seal to match the correct profile and size. - Remove old seals by starting at one corner and prising out a section of the seal. Once a section has lifted, the rest will generally pull out easily. - Cut the replacement seal slightly longer than needed for a tight fit. - Start at the top centre of the frame and push the seal into the gap between the gasket groove or bead and the glass. Spraying soapy water on the seal can help installation. - Work the seal into the gap around the perimeter of the frame. Take care to properly fit the seal into the corners of the frame. - Do not stretch the seal as you insert it. A stretched seal will eventually retract, leaving a gap. - You may want to engage a glazier to remove and replace the failing seals.



Failed rubber seals.

Pitting of anodised finish

Cause	Repair
Exposure to airborne salt, dust or dirt	Wash down/clean frames regularly.
Run-off from cement plaster/grout, CCA-treated timber, copper or lead	Clean and unclog any blocked weep slots, drain holes, roller assemblies and tracks – door thresholds and window sills are likely to corrode if not kept clean.
Lack of cleaning	- If corrosion is not severe, finishing options include: - painting – sand lightly, then apply aluminium primer and paint (follow the manufacturer's instructions) - wax finish – apply car wax to the clean, dry anodised surface (follow the wax manufacturer's instructions).
End of serviceable life – expected life is around 20 years but it may be less in corrosive environments	The windows may require replacement.



Coating failure on aluminium window.

Chalking of powder-coated finishes

Cause	Repair
Exposure to airborne salt, dust or dirt	Wash down/clean frames regularly.
Lack of cleaning	- Finishing options include: - painting – sand lightly and paint (follow the manufacturer's instructions) - wax finish – apply car wax to the clean, dry anodised surface (follow the wax manufacturer's instructions).
End of serviceable life – 12–20 years is the expected life of powder-coated finishes	Windows may require replacement.



Chalking on aluminium joinery.

Windows or doors leaking at corner joints

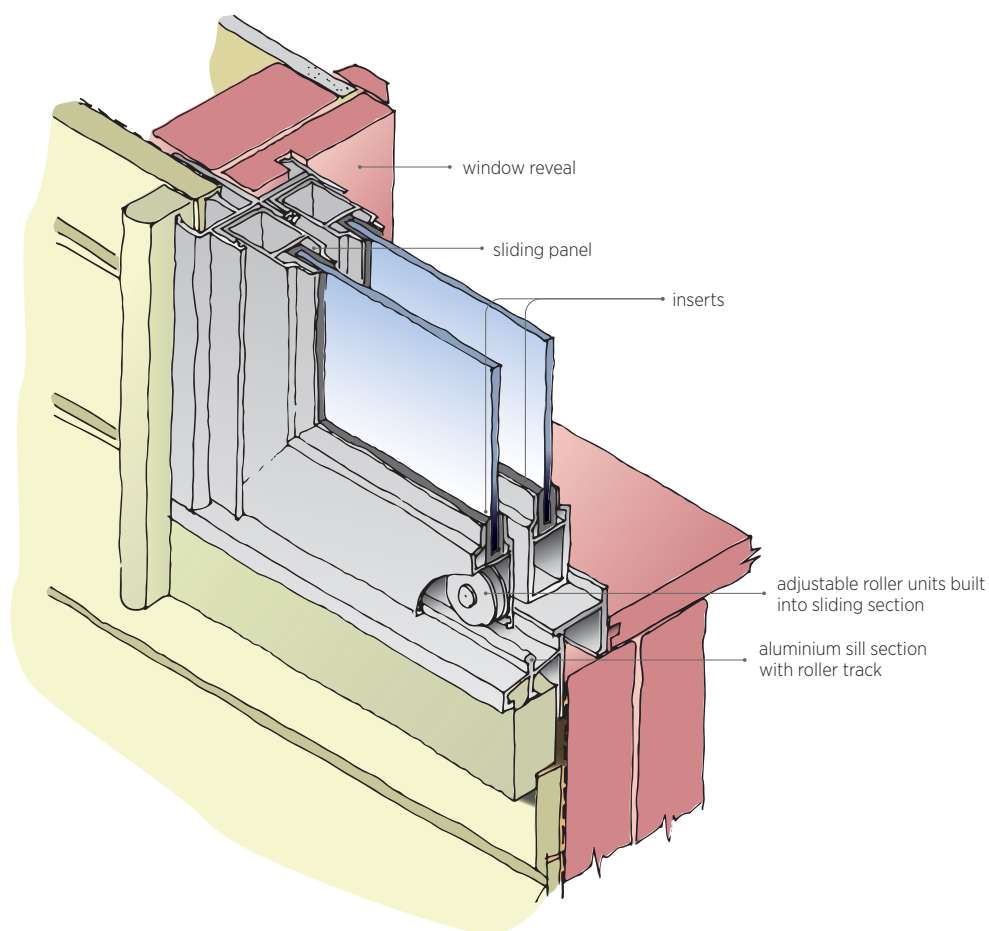
Cause	Repair
Sealant failure around the joint	- Repair leaking corner joints. - If you suspect that the building may be leaking and there is a risk of damage, engage a building surveyor to report on the building. - You may want to engage a building contractor if several windows/doors are leaking at corner joints.



Aluminium window retrofitted into existing wall with new head flashing, boxed trim and scribe.

Sliding door sticking or difficult to slide

Cause	Repair
Rollers need cleaning and/or lubricating	- Check roller assemblies and tracks are unclogged and clean – door thresholds and window sills are prone to corrosion and sticking if not kept clean. - Lubricate hardware components, roller assemblies and tracks (if needed) with a wet silicone spray using a straw applicator.
An obstruction on the track	Remove obstructions.
Rollers are worn or damaged	Engage a building contractor or joiner to remove the door and replace rollers.
Building has settled	- Relevelling or repiling may be required. - Engage a structural engineer to investigate and report on the settled building.



Aluminium sliding door construction.

5.2.2 Glazing

Broken glass

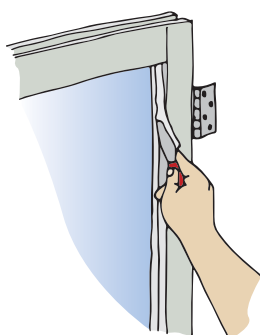
Cause	Repair
Impact from balls, stones etc.	Fix as an urgent repair – see section 3.3.
Wind slammed window or door shut	- Make the area safe. Remove broken glass and secure cracked glass with paper masking or plastic tape to hold in place until replaced. If needed, secure the window, door or joinery unit with plastic or plywood to protect people from the hazard. - Engage a glazier to repair – see section 7 for information about using the correct glazing. For example, glazed doors, sidelights and windows below 800 mm require Grade A safety glass. - Before installing new glazing, check existing joinery and framing for rot, rust or damage. - If required, fit a closer or cabin hook to hold the door securely open.



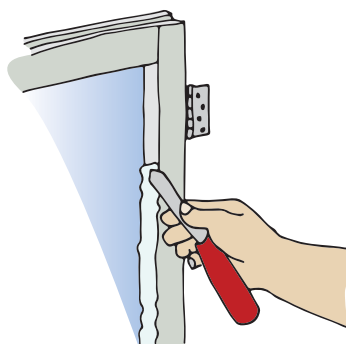
Broken toughened safety glass.

Putty cracked or loose in timber windows or doors

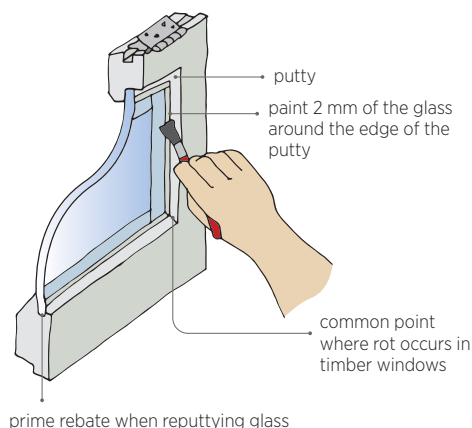
Cause	Repair
Putty is not protected by paint and has dried out	Carefully scrape out the damaged, cracked or loose putty with a hacking knife or chisel.
The glazing rebate was not primed before the glass was installed	- Apply new putty and smooth to a consistent slope (30–45°) around the window edge with a putty knife. You can use synthetic putties with laminated or treated glass but not with double-glazed units (check manufacturers' instructions). - Paint putty after 2 weeks, covering all the exterior putty and 2 mm of the glass. - You may want to engage a glazier to replace the putty.



Removing putty.



Installing putty.



Painting putty.

Surface staining of glass

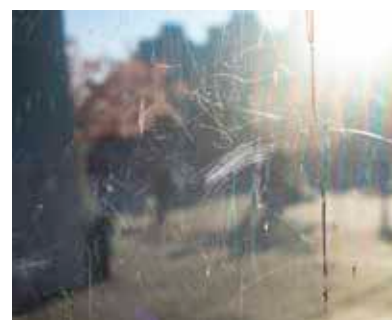
Cause	Repair
Alkaline run-off from concrete, cement plaster or cement mortar	• Avoid alkaline run-off over the glass by painting concrete and cement plaster or diverting run-off from cement mortar. • Clean windows more frequently. • If staining is not severe, rub a paste of jeweller's rouge or whiting over the stained area and rinse thoroughly. Alternatively, use a glass cleaning system. • Replace severely deteriorated glass. • You may want to engage a glazier to replace the glass – see section 7 for information about using the correct glazing.

Glass loses clarity

Cause	Repair
Exposure to airborne salt, dust or dirt	• Spot clean the glass and/or wash down the exterior of the building – see section 4. • For more serious staining, try an intensive glass cleaner or restorer. Do not get cleaning solutions on the edges of laminated glass or double-glazed units. • Clean windows more frequently. Amend your routine maintenance plan for more washdowns if required.

Scratched or damaged glass

Cause	Repair
Glass was cleaned with an abrasive cleaner Incorrect use of a metal scraper to remove paint Plaster or concrete has splashed onto the glass Run-off from cement-based products	• For minor scratches and etching in areas that are not very visible, try polishing with cerium oxide. It comes in powder form and is mixed with water to create a paste. • Engage a glazier that specialises in removing scratches or etching from glass. • In extreme cases, engage a glazier to replace the glass – see section 7 for information about using the correct glazing.
Glazing beads have come loose and allowed the glass to become damaged	• Replace and refix the timber glazing beads. Prime inside faces and mitred corner cuts before installing.



Damaged glass.

Moisture droplets between panes of sealed double-glazed units

Cause	Repair
Edge seal damage	You may want to engage a glazier to report on the condition of the glass and propose a solution.
Failure due to UV light, moisture in window frame or wind deflection	Note the issue for review with your principal/property representative.
Possible fault in the materials, manufacture or installation	



Moisture in double-glazed unit.

5.2.3 Hardware for windows and doors

Fire doors require specific hardware so check the door type before replacing hardware.

Surface finish deterioration or corrosion

Cause	Repair
Weathering	Clean and polish with a light multi-purpose oil. Avoid strong solvent-based and abrasive cleaners.
UV light exposure	
Unsuitable finish for the location or environment	If cleaning does not restore appearance, replace with hardware suitable for exterior environments and commercial use. Suitable materials and finishes include stainless steel, powder-coated zinc and solid brass.
Insufficient cleaning	



Surface deterioration on door hardware.

Broken hardware

Cause	Repair
Screws pulled loose	Tighten or replace with slightly larger screws.
Corroded fixings	Replace with hot-dip galvanised or stainless steel fixings to avoid corrosion.



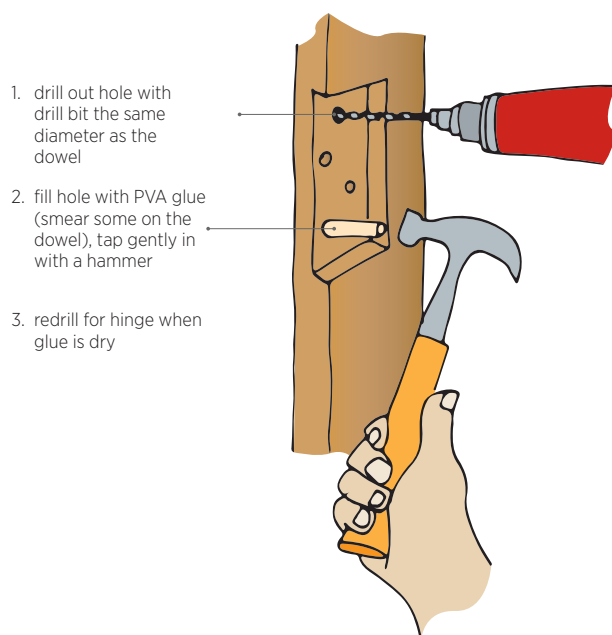
Surface deterioration on window hardware.



Damaged door jamb.

Window or door hinges difficult to open

Cause	Repair
Hinges need lubrication	Lubricate hinges with penetrating oil.
Hinges need adjustment	Adjust or reseal hinges as required.
Hinges are corroded	- Remove hinges and clean off corrosion, lubricate and reinstall. - Replace if badly corroded.



Preparing a door jamb for a hinge.

Door handles not working

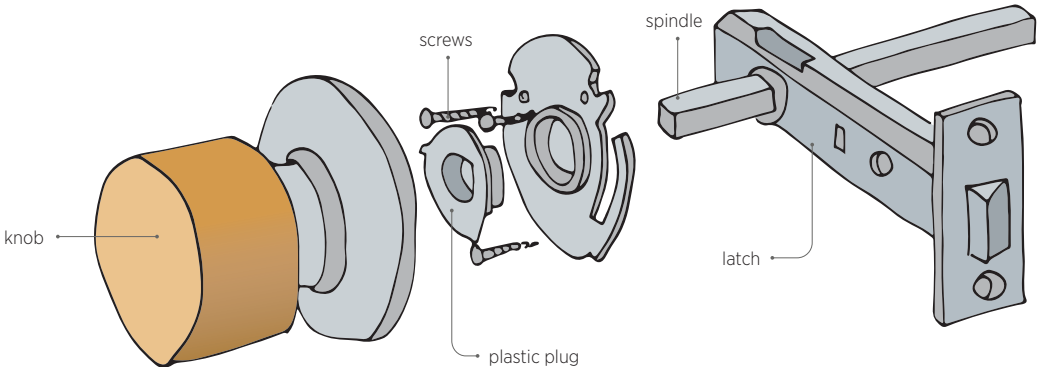
Cause	Repair
Handle needs lubrication	Lubricate with penetrating oil.
Door latch or lock set broken	Replace latch or lock set.
Spindle worn or broken	Replace spindle.



Broken handle to exterior door.

Window or door hardware not working or missing

Cause	Repair
Broken hardware	• Lubricate.
Missing hardware	• Replace broken and missing hardware.



Typical parts of a door handle.

Self-closing doors not working or closing

Cause	Repair
Not adjusted correctly	• Adjust self-closing tensioner. • Consider engaging a building contractor to adjust the self-closing tensioner.

Self-closing smoke stop doors must be fixed promptly to maintain the integrity of the school's fire safety systems.



Self-closing door hardware to exterior door.

5.2.4 Steel windows and doors

Rusted frames

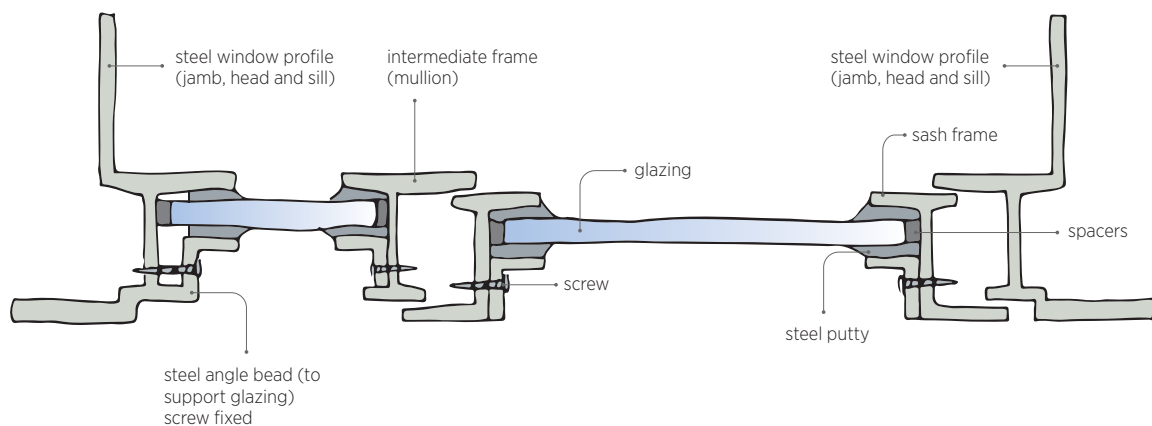
Cause	Repair
Exposure to airborne salt, dust, dirt or atmospheric moisture	For small areas of rust, follow the paint manufacturer's guidance for repainting exterior galvanised steel:
Galvanised protective coating (if present) has eroded	Remove loose putty carefully to avoid damaging the glass.
Deteriorated paint finish has exposed the metal	- Strip existing paint using a paint scraper or stripper. Remove salt, rust and flakes (you may need a metal brush or grinder) and clean surfaces. - Prime the steel frame with a zinc-rich primer (it may require two coats). Spot prime badly corroded areas with alkyd anti-corrosive primer. - Apply enamel top coats, following the manufacturer's instructions. - Repair putty and paint.
	For large areas of rust or where the steel frame is rusted through, options include specialist repair of the steel frame or replacement with an aluminium-framed window, possibly with double glazing.



Signs of surface rust appearing on steel window frame.

Leaking junctions

Cause	Repair
Junctions not weathertight	Engage a specialist to provide guidance and advice.



Cross-section through steel window.

Cracked or damaged putty

Cause	Repair
Putty is not protected by paint and has dried out	• Carefully scrape out damaged or loose putty with a hacking knife or chisel. • Apply new putty and smooth to a consistent slope (30–45°) around the window edge with a putty knife. Make sure the putty is suitable for use with steel frames. • Paint putty after 2 weeks, covering all the exterior putty and 2 mm of the glass. • You may want to engage a glazier to replace the putty.

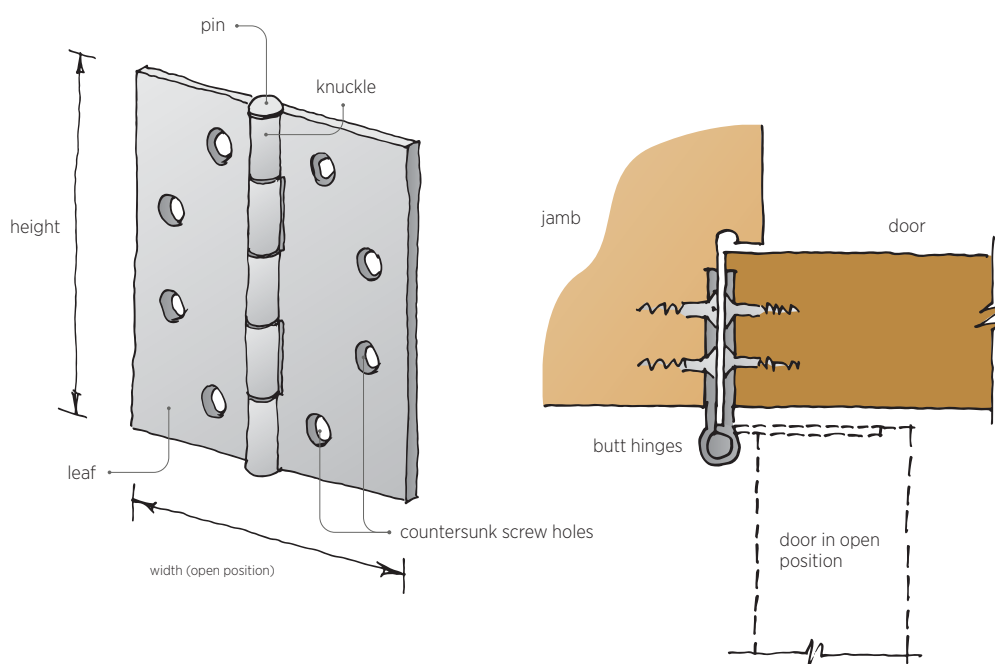


Severe corrosion on steel window frame.

5.2.5 Timber doors and frames

Door is difficult to close

Cause	Repair
Hinges need adjustment	Adjust or reseal hinges.
Hinges need lubrication	Lubricate hinges with penetrating oil or graphite powder.
Hinges are corroded	- Remove hinges and clean off corrosion, lubricate and reinstall. - Replace if badly corroded.
Door has dropped on its hinges	- Repair or replace hinges (see 5.2.3). - Install extra hinges.
Excessive paint build-up on the door edge	- Sand the door edge to remove excess paint. - Prime and repaint with at least two coats of exterior water-based enamel paint.
Door binding due to moisture uptake causing the timber to swell	Allow the door to dry out. The timber will shrink and the door should no longer stick, but this depends on the amount of moisture in the atmosphere.
Door has bowed or is out of square due to moisture uptake	- Replace the door if badly warped. - When the door no longer sticks, sand, prime and repaint both side edges of the door with at least two coats of exterior water-based enamel paint. - Using a plane on the door edges to stop binding may result in too big a gap as the timber dries and shrinks – there should only be 1 mm clearance between the door edge and jamb. - If the door is protected from the weather, the only option is to replace the door with a non-timber door. - If the door is not protected from the weather, constructing a veranda or canopy may reduce the severity of the binding.



Typical door hinge.

Door finish has deteriorated

Cause	Repair
Lack of maintenance (repainting or restaining) Door finish was not suitable for an exposed location – many external doors are only suitable for use in sheltered locations	- Where the timber is sound: - scrape off or sand back the finish to bare timber - prime the timber - paint with at least two coats of exterior water-based enamel paint. - If required, replace with a new door suitable for the level of exposure.



The door sill needs protection.

Door letting in water or draughts

Cause	Repair
Large gap between door sill and door	Install draught seals or water stops to front of exterior door.
No head flashings to doors Not enough cover over door to protect it from the environment	- Install head flashings to door. - You may want to engage a building contractor to install a head flashing.



Timber door sill removed with paving built up to underside of door – potentially degrading bottom of door.

5.2.6 Timber windows and frames

Rotten window sill

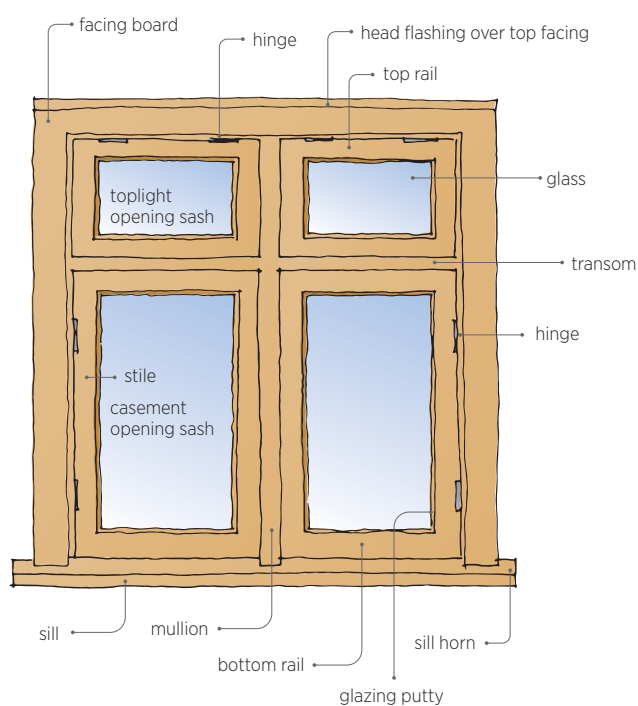
Cause	Repair
Water sits on the sill as the slope is insufficient Water is getting into the sill/jamb junction Moisture absorption into timber end grain because of inadequate priming	- Ensure the opening is made weathertight and secure while the window is being repaired. - Prime the window prior to installation. - Paint the window, reveals and cover battens with a minimum of two coats of exterior paint after installation. - Refit hardware. - Engage a qualified joiner or builder who specialises in timber joinery repairs to replace the sill.



Timber window sill and facing cover board showing signs of rot.

Casement sash won't open

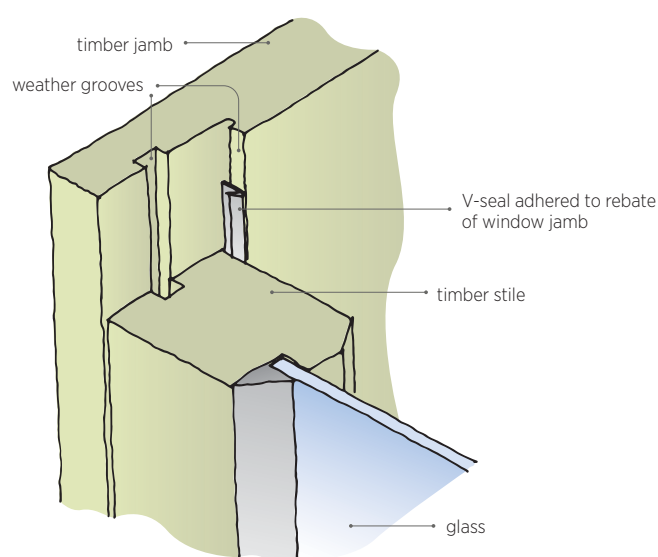
Cause	Repair
Paint has sealed window shut	- Run a blade or a power tool with an oscillating blade between the sash and the frame to cut through the paint. Gently tap around the sash to free it. - Remove the sash from the window and plane or machine sand the sash to allow it to open freely. - Prime and paint exposed timber. - Replace the sash. - You may want to engage a building contractor to restore fixed sashes to opening sashes.
Hinges are corroded or have seized	- Spray accessible parts of the hinge with a penetrating lubricant. Leave time for the lubricant to work, then gently prise the sash open. - Remove the sash, clean and lubricate or replace hinges, depending on condition.
Timber sash has rotted	- Remove and replace the sash. - Engage a qualified joiner or builder who specialises in timber joinery repairs to repair the sash.
Windows or frame warped causing sashes to stick Sash is binding on frame	- Tap along the length of the sash with a hammer and wooden block to release the bound window. - Remove the sash from the window and plane or machine sand the edge to allow it to open freely. - Prime and paint exposed timber. - Replace the sash.



Timber window with opening sashes.

Window draughts

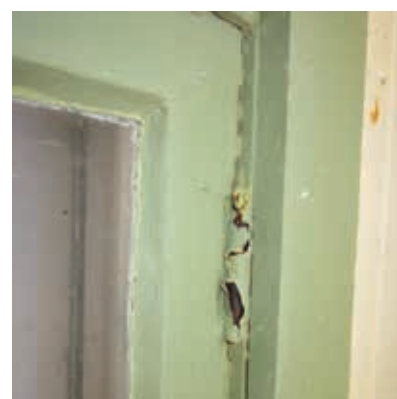
Cause	Repair
Gaps around timber doors and window sashes	- Install PVC foam draught seals or self-adhesive strips in timber window frames to fill gaps. - Check catches are pulling windows tightly into the frame.
Loose putty	See section 5.2.2.



Draught seal installed between opening sash and window frame (jamb).

Hardware is loose or corroded

Cause	Repair
Screws pulled loose	Replace screws with longer ones of the same gauge or drill out existing holes and glue in timber dowels, then refix the screws.
Corroded from lack of cleaning or lubrication Incorrect metal selected for the exposure level	- Replace corroded hardware and/or fixings: - Remove the sash. - Replace hinges with stainless steel hinges. - Reinstall the sash. If screw holes are enlarged and the original screws are no longer effective, replace with longer screws of the same gauge. Alternatively, drill out the existing holes and glue in timber dowels before reinstalling the hinges. Another option is to install the hinges at a new location on the window and fill in the old holes. - You may want to engage a building contractor to check and repair all window and door hinges and hardware.



Corrosion of hardware can prevent windows from opening.

5.3 Roofs

Roofs should be checked at least once a year, paying attention to roof claddings, fixings and flashings, roof penetrations and roof-mounted equipment, gutters and downpipes.

If tree branches have grown over the roof and leaves could potentially block gutters, shade solar panels or lead to moss growth, cut the branches back.

If you find a problem, deal with it without delay. Putting off maintenance work can lead to the job becoming more expensive when it is finally carried out. See section 7 for information about getting specialist help.

Safety

Roof repairs should be carried out by qualified trade professionals using suitable equipment and following health and safety guidelines for working at height. It is critical to ensure health and safety protocols for working at height are understood and followed by anybody undertaking maintenance checks or repairs. This includes ensuring anybody undertaking roof maintenance on school buildings has the right equipment and sets it up properly. See section 7 for information about managing risks and hazards at schools | kura.

Cleaning and painting

Areas of the cladding and flashings that are not rainwashed should be washed down at least once a year – this generally keeps them in better order and increases their serviceable life. Some roof claddings require recoating every 8–15 years, but this depends on the cladding type, applied finish and location. Roof claddings on inland school buildings typically last longer than roofing on coastal buildings.

Asbestos in roofs

Some school buildings constructed in the 1950s or 1960s may still have asbestos-cement roof claddings. If asbestos fibres get into the air and are breathed in, they can cause potentially fatal illnesses. Fibre-cement roof claddings – often corrugated sheet claddings – should never be waterblasted, sanded, cut with power saws or broken into pieces. The management of asbestos is very strictly controlled. See section 7 for information about managing asbestos in schools.

5.3.1 Profiled metal roofing

Buckling of roofing

Cause	Repair
Inadequate allowance for thermal movement at fixings – more common with dark-coloured and aluminium roofs	- Add allowance for thermal movement to the roof in accordance with instructions and guidance from the roofing manufacturer. For example, remove fixings, enlarge fixing holes and replace fixings with new, larger, waterproof washers and fixings. - You could engage a contractor to add allowance for thermal movement to the roof.

Buckling of ridging or flashings

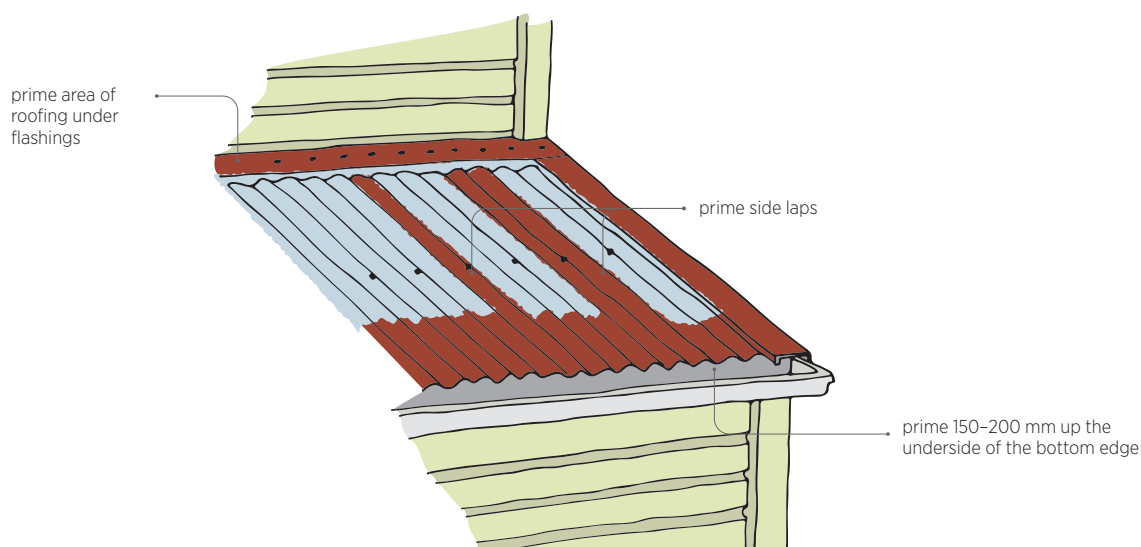
Cause	Repair
Fixings prevent thermal movement	- Add allowance for thermal movement to the ridging or flashings in accordance with instructions and guidance from the roofing manufacturer. For example, remove fixings, enlarge fixing holes and replace fixings with new, larger, waterproof washers and fixings. - You could engage a contractor to add allowance for thermal movement to the flashings.
Lengths of flashing are too long – there is not enough thermal movement	- Replace buckled sections using shorter lengths of flashing. Flashing lengths must be no more than 3 m long, with 150 mm minimum laps. Seal each edge of a lap with neutral-cure sealant and screw fix to the framing. - You could engage a contractor to replace the flashings.
Rivets used instead of screws, stopping thermal movement	- Replace rivets with screw fixings and check the fixings penetrate the roof framing. - You could engage a contractor to replace the rivets used on the roof.



Ridge flashing buckling due to thermal expansion and contraction.

Corrosion at galvanised steel sheet ends

Cause	Repair
Underside (back surface) of sheet edges not primed and does not get cleaned Moist corrosive environment as water remains in gutter	- Cut damaged roofing back to the next purlin and install short lengths of roofing, sealed to and lapping under the existing roofing by 150 mm. - You could engage a contractor to repair the roofing.



Priming profiled metal roofing.

Dented or damaged sheets

Cause	Repair
Sheets were damaged during installation	- If the roof is leaking, fix as an urgent repair. - If the roof is not leaking, repair and paint if necessary.
Impact from overhanging branches	Trim or remove overhanging branches.
Walking on unsupported parts of the roof	- Only walk on supported parts of the roof or install a walkway. - You could engage a contractor to repair or replace damaged sheets.



Damaged sheets.

Roofing nails damaged or missing

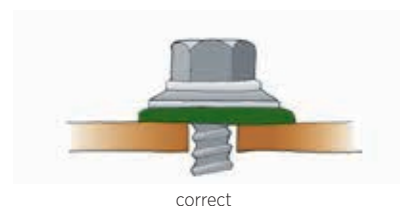
Cause	Repair
Damaged during roofing installation	Replace damaged or missing nails with roofing screws with low-carbon neoprene sealing washers. Nails are not recommended – they have a higher risk of coming out and a poorer seal under the head.
Nails have worked loose from movement	- Screw fasteners should go through sheet crests (the high part of the profile) and at least 30 mm into timber purlins. - If the roof is leaking, fix as an urgent repair. - You could engage a contractor to replace damaged or missing fixings.



Corrosion of fixings.

Lifting of roof

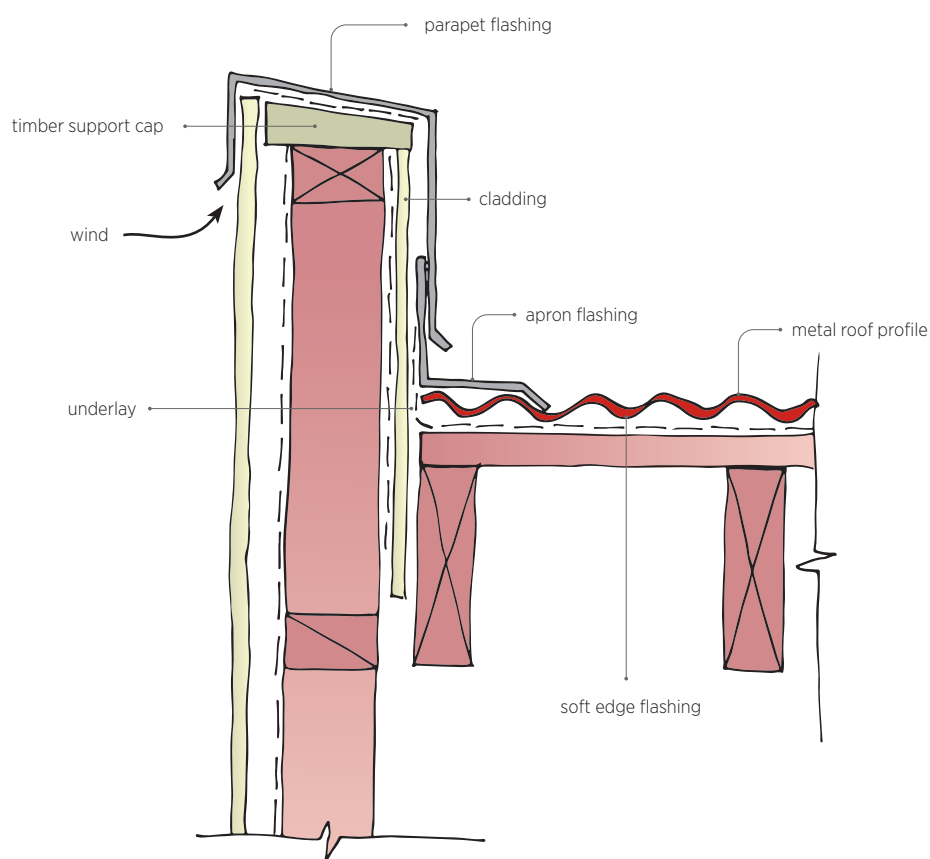
Cause	Repair
Too few fixings	Install extra fixings to hold down loose sheets and when replacing damaged sheets.
Fixings are loose, corroded or missing	Tighten loose fixings and replace missing fixings.
Nails have pulled out of the timber purlins	- Replace fixings with roofing screws. Nails are not recommended – they have a higher risk of coming out and a poorer seal under the head. - Use class 4 fixings (heavy zinc or zinc-tin coatings or zinc alloy-coated heads) when replacing galvanised fixings. - Fix roofing screws 30 mm into the timber purlins. - You could engage a contractor to repair a lifting roof.



Tightening of roof fixings.

Lifting or undersized flashings

Cause	Repair
Fixings have pulled out	- Replace fixings that have pulled out with new screw fixings. - Repair or replace the flashing if damaged. - You could engage a contractor to replace roof fixings.
Insufficient number of fixings for the wind loads	- Add extra screw fixings. - You could engage a contractor to add extra roof fixings.
Lead or soft edging has torn or lifted	- If the flashing is intact, dress (shape) the soft edge to the roofing profile. - If the flashing requires replacing, install a heavier grade soft-edge flashing. - You could engage a contractor to fix or replace the flashing.
Undersized flashings	- Replace flashing with a correctly sized larger flashing. - You could engage a contractor to replace the flashing.



Roof flashings.

Ponding of water

Cause	Repair
Insufficient fall to outlets Roof not sloping towards the drainage outlet	- If leaking, fix as an urgent repair. - The roof structure may need to be repitched to increase fall and stop ponding and deterioration of metal roofing components. - You could engage a contractor to reroof to increase the fall.
The downpipe, rainwater head or drainage outlet is blocked The rainwater outlet is too small for the volume of water	- Check outlets and clear any blockages. - If water is entering the building, fix as an urgent repair. - Flat roofs that are fully enclosed by parapets should have at least two outlets and overflows. Low-slope roof should have an overflow pipe to stop water entering the building if the main outlet or downpipe gets blocked. - You could engage a contractor to increase the size or number of the outlets, add an extra drainage outlet or clear the stormwater drain.



Insufficient fall causing ponding on roof.

Red rusting of galvanised steel

Cause	Repair
Galvanising damaged by erosion or scratching, exposing the steel Inadequately primed end and/or side laps	- If the red rust is not widespread, remove surface rust with a paint removal disc. Prime with a zinc-rich metal primer and apply two top coats of acrylic roof paint or follow manufacturer's recommendations. - You could engage a painting contractor to repair small areas of rusting. - If the rusting is extensive, engage a roofing contractor to replace the roof.
Corrosion protection damaged by contact with or run-off from: - cedar, redwood or timber treated with a copper-based preservative treatment - translucent sheeting (PVC), glass, pre-painted roofing, glazed tiles, unpainted zinc/aluminium alloy-coated mild steel or aluminium Corrosive environment such as near a swimming pool or in coastal, industrial or geothermal areas	- Address the cause of the corrosion protection damage. - Sand the corroded areas to remove rust, prime with a zinc-rich metal primer and apply two coats of acrylic paint or follow the manufacturer's recommendations. - You could engage an architect or building surveyor to advise on the best maintenance solution.
Roofing near the end of its serviceable life	- If the roof is leaking, fix as an urgent repair. - You could engage an architect or roofing/painting specialist to advise on roof cladding replacement.



Red rust on galvanised roofing.

Surface pitting of aluminium

Cause	Repair
Corrosive environment such as in coastal, industrial or geothermal areas	- Spot clean the area and/or wash down the roof – see section 4. - Paint the roof – you could engage a painting contractor for advice on suitable paints for aluminium roofs.
Lack of rainwashing such as on the exposed underside of the roof at the eaves and roofs with less than 15° slope	Engage a roofing contractor to replace the roof if it is at the end of its serviceable life.
Bird droppings not washed off by rain	

White rusting of galvanised steel

Cause	Repair
Poor initial installation	If the roof is leaking, fix as an urgent repair.
Zinc coating has corroded when water is trapped between sheets at laps and joints	- Treat the white rust. Remove deposits with a stiff bristle brush. Do not use a wire brush. Paint brushed areas with a zinc-rich primer and a metal primer, then apply at least two coats of acrylic paint. - You could engage a contractor to repair the roof and treat the white rust.
Insufficient rainwashing – common on roofs with less than 15° slope	Spot clean the area and/or wash down the roof – see section 4.



White rust around nail head.

5.3.2 Coil-coated steel roofing (pre-painted)

Chalking or fading of paint finish

Cause	Repair
Weathering	- Wash down the roof – see section 4. - You could engage a painting contractor to advise on repainting the roof. - Note the issue for review with your principal/property representative.

Corroded metal roofing, flashings or fixings

Cause	Repair
Airborne salt, dust or dirt accumulating under flashings Corroded fixings	- Spot clean to remove salt, dust and dirt and brush with a stiff bristle brush to remove corrosion. Apply zinc-rich primer plus a metal primer to sanded and brushed areas, particularly where the flashing is lapped, and apply at least two coats of acrylic paint. - Replace corroded flashings or fixings – ensure the replacement is compatible with the roofing material. Use roof screws for roof fixings. Nails are not recommended. - You could engage a roofing contractor to replace the flashings.
Loss or breakdown of stone chip coating (pressed metal tile roofing flashing) Loss of galvanising or zinc/aluminium alloy coating exposing the base metal Run-off from incompatible materials such as uncoated cedar wall cladding, glass or plastic roofing or cement-based mortar (tiled roofs) Moisture being held within the lapped joints	- Find and address the cause of the corrosion protection damage. - You could engage an architect or roofing/painting specialist to advise on options of recoating the stone chips, repainting or addressing the cause of incompatible materials.
Debris or swarf (metal filings and chips) accumulated in valley gutters	- Spot clean the valleys and gutters to remove debris – see section 4. If the gutters are beyond repair, replace with a pre-coated metal gutter or butyl membrane gutter and suitable substrate such as treated plywood. - You could engage a roofing contractor to replace damaged valleys.

Paint damage on coil-coated steel

Cause	Repair
UV light exposure, temperature changes and atmospheric conditions	- Wash down the roof of the building – see section 4. - You could engage a painting contractor to advise on repainting the roof. - Note the issue for review with your principal/property representative.

Scratches

Cause	Repair
Careless walking on the roof	- Minor scratches may be left untreated. - You could engage a painting contractor to advise on repainting the roof. - Wear soft-soled shoes and take care when walking on the roof.

5.3.3 Membrane roofing (liquid-applied or paint-on)

Bubbles appearing under the membrane

Cause	Repair
Moisture under the membrane	- If the roof is leaking, fix as an urgent repair. - Engage a specialist membrane installer or building surveyor to advise on the maintenance action required.



Bubbling under liquid-applied membrane.

Chalking

Cause	Repair
UV light degradation	If the roof is leaking, fix as an urgent repair.
Roof requires recoating	Engage a specialist membrane installer or building surveyor to recoat the roof or advise on the maintenance action required.

Popped nails in substrate under the membrane

Cause	Repair
Substrate movement such as expansion/contraction	If the roof is leaking, fix as an urgent repair.
Substrate deterioration	Engage a specialist membrane installer or building surveyor to advise on the maintenance action required.
Substrate was nailed to the framing, not screwed	



Incorrect use of fasteners can lead to deterioration of membrane and its adhesion or waterproofing.

Surface of membrane buckling or cracking

Cause	Repair
Poor initial installation	- If the roof is leaking, fix as an urgent repair. - Check the warranty period of the initial installation.
Insufficient movement control joints	- Work will probably be required on the substrate as well as replacing the membrane. - If the roof is leaking, fix as an urgent repair. - Engage a specialist membrane installer or building surveyor to advise on the maintenance action required.
UV degradation	- If the roof is leaking, fix as an urgent repair. - If the UV degradation is widespread, note the issue for review with your principal/property representative to ensure long-term coating or roof replacement.
Lack of maintenance – liquid-applied membranes must be reapplied every 7-10 years	- If the roof is leaking, fix as an urgent repair. - Engage a specialist membrane installer or building surveyor to advise on the maintenance action required.
Movement in the plywood substrate	
Membrane is at the end of its serviceable life	

Water lying on the surface

Cause	Repair
Roof has incorrect falls	- If the roof is leaking, fix as an urgent repair. - Engage a specialist membrane installer or building surveyor to advise on the maintenance action required.



Insufficient fall to roof.

5.3.4 Membrane roofing (sheet applied)

Bubbles appearing under the membrane

Cause	Repair
Poor adhesion of the membrane to the substrate Membrane is not fully adhered to the substrate	- If the roof is leaking, fix as an urgent repair. - Engage a membrane specialist to advise on poor adhesion of the membrane.
Framing and/or substrate moisture content was too high when the membrane was installed Moisture from damp substrate or roof framing trapped by the membrane Moisture in spaces below getting into the roof space (such as via open downlights) and being trapped under the membrane	- If the roof is leaking, fix as an urgent repair. - Engage a building surveyor to advise on solving the sources of moisture trapped by the membrane.
Subsequent coats of liquid-applied membrane applied before preceding coats have cured	- If the roof is leaking, fix as an urgent repair. - Get the installer back or engage a membrane specialist to advise on repair. Check <i>Designing Schools in New Zealand: Weathertightness Design Standards for School Buildings</i> to ensure the membrane is not of a prohibited type – see section 7.



Bubbles appearing under membrane.

Damage to the waterproof material

Cause	Repair
Impact damage, water getting through the membrane	- If the roof is leaking, fix as an urgent repair. - Engage a specialist membrane installer or building surveyor to advise on the maintenance action required.



Patch repair to joint.

Lifting of sheet joints

Cause	Repair
Loss of adhesion at the joint Adhesive failure at joints	• If the roof is leaking, fix as an urgent repair. • Engage a specialist membrane contractor to seal the sheet joints.
Substrate movement has damaged the membrane	• If the roof is leaking, fix as an urgent repair. • Engage an architect or building surveyor to advise on repairing damaged substrate.
Water has got under the membrane causing adhesive to break down Joint in an area where water ponds	• If the roof is leaking, fix as an urgent repair. • Engage an architect or building surveyor to advise on repairing damage.

Nail popping in timber substrates

Cause	Repair
Substrate movement such as expansion/contraction Substrate deterioration Substrate was nail fixed rather than screw fixed	• If the roof is leaking, fix as an urgent repair. • Engage an architect or building surveyor to advise on substrate movement or repair.

Roof feels springy or spongy when walked on

Cause	Repair
Damage to the substrate and/or framing due to water entry through the membrane or through adjacent wall claddings	• If the roof is leaking, fix as an urgent repair. • Engage an architect or building surveyor to advise on repairing damaged substrate or framing.
Substrate material is not thick enough to span rafters/joists	• If the roof is leaking, fix as an urgent repair. • Engage an architect or building surveyor to advise on upgrading substrate.
Particleboard has been used as a substrate and has deteriorated	• If the roof is leaking, fix as an urgent repair. • Engage an architect or building surveyor to advise on replacing damaged substrate.

Splitting or surface cracking in the sheet membrane

Cause	Repair
UV light degradation	- If the roof is leaking, fix as an urgent repair. - Engage a specialist membrane contractor to advise on recoating the membrane.
Expansion/contraction of substrate resulting in overstressing and failure of the membrane	- If the roof is leaking, fix as an urgent repair. - Engage an architect or building surveyor to advise on substrate movement.
People walking on membrane that is not suitable for foot traffic	- If the roof is leaking, fix as an urgent repair. - Ensure people do not walk on the membrane roof. - You could engage an architect to design a boardwalk.
Material is at the end of its serviceable life	- If the roof is leaking, fix as an urgent repair. - Engage a specialist membrane contractor to advise on replacing the membrane.

Water ponding on the surface

Cause	Repair
Insufficient fall to outlets Roof is not sloping towards the drainage outlet	- If the roof is leaking, fix as an urgent repair. - Engage a plumber to install more outlets or an architect or building surveyor to advise on changing the roof slope.
Drainage outlet is blocked	- Clear the blockage. - Flat roofs that are fully enclosed by parapets should have at least two outlets and overflows. - On a low-slope roof, each outlet should have an overflow pipe to prevent water entry into the building if the main outlet or the downpipe gets blocked.
Outlet is too small for the volume of water on the roof	- Engage a plumber to increase the size of or install an extra outlet. - Flat roofs that are fully enclosed by parapets should have at least two outlets and overflows. - On a low-slope roof, each outlet should have an overflow pipe to prevent water entry into the building if the main outlet or the downpipe gets blocked.
Substrate has slumped, causing localised ponding	- If the roof is leaking, fix as an urgent repair. - Engage a specialist membrane contractor to repair localised ponding.



Water ponding on membrane roof.

5.3.5 Tiles – metal

Corrosion

Cause	Repair
Loss or breakdown of the stone chip coating or paint coating	- If the roof is leaking, fix as an urgent repair. - Patch the stone chips or recoat the roof. - You could engage a specialist stone chip roofing contractor to patch or recoat the roof.
Airborne salt accumulating under tiles, particularly where tiles are damaged	- If the roof is leaking, fix as an urgent repair. - Spot clean the tiles to remove airborne salt – see section 4. - Replace damaged tiles. - You could engage a roofing contractor to replace damaged tiles.
Erosion of the galvanising, zinc/aluminium or aluminium/zinc alloy coating, exposing the base metal	- If the roof is leaking, fix as an urgent repair. - Engage a roofing contractor to advise on repairing the corrosion resistance or if a reroof is needed.
Roofing at the end of its serviceable life	- If the roof is leaking, fix as an urgent repair. - Engage a roofing contractor to advise on reroofing the building.



Severe rusting of metal surface.

Dented or damaged tiles

Cause	Repair
Damage occurred during installation	If the roof is leaking, fix as an urgent repair.
Impact from overhanging branches	Replace damaged or dented tiles.
Careless walking on the roof	- Trim overhanging branches. - You could engage a roofing contractor to replace damaged tiles.

Loss of stone chips

Cause	Repair
Breakdown of the stone chip binding to the metal surface	- Patch or recoat the stone chips on the roof. - You could engage a specialist stone chip roofing contractor to patch or recoat the roof.
Careless walking on the roof	- Ensure people do not walk on the roof. - You could engage an architect to design a boardwalk.



Loss of stone chip coating.

Moss and lichen growth

Cause	Repair
Insufficient cleaning	Spot clean or wash down the roof – see section 4.
Roof remains damp due to overhanging branches	- Trim overhanging branches. - Carry out moss and lichen treatment. Lichen can take several weeks to die away. - If water is collected from the roof for drinking, always disconnect downpipes during cleaning and rinsing.



Moss and lichen growth.

Tile edge lifting

Cause	Repair
Inadequate fixing along the front edge of tiles	- Check and refix loose tiles. - You could engage a roofing contractor to check and refix loose tiles.



Lifting tiles.

Water not draining to gutter

Cause	Repair
Tiles stop short of the gutter	- Engage a roofing contractor to repair the roof so that water goes into the gutter. - Check there is no rot damage to the fascias and eaves.



Soffit damage due to leaking gutter.

5.3.6 Tiles – clay and concrete

Dirt on concrete tiles

Cause	Repair
Build-up of dirt	Spot clean the area and/or wash down the roof – see section 4.

Corroded valley gutters

Cause	Repair
Accumulation of dirt and moisture	- Spot clean the area and/or wash down the gutters – see section 4. - If leaking, engage a contractor to repair or replace the valley gutter(s).

Efflorescence (whitish haze) on concrete tiles

Cause	Repair
Natural salts within the tiles have migrated to the surface	- No action required as this is a normal process where calcium carbonate crystals form on the surface of uncoated tiles. - This generally becomes less visible through natural weathering and rainwater washing away the deposit.

Moss and lichen growth

Cause	Repair
Roof remains damp due to overhanging branches Insufficient cleaning	- Cut back overhanging branches. - Wash down the roof regularly – see section 4. Do not waterblast – this can force water between the tiles. - If water is collected from the roof for drinking, always disconnect downpipes during cleaning and rinsing. - Nail a 150 mm wide copper strip along the roof ridge or alternatively install copper ridge flashing – the copper oxide solution produced by the rain is toxic and will restrict moss growth. Check that copper is compatible with adjacent building materials such as gutters and downpipes. - You could engage a contractor to treat the moss and lichen.



Moss and lichen growth.

Poor visual appearance

Cause	Repair
Weathering or lack of maintenance	Spot clean the area and/or wash down the roof – see section 4.
Tiles at the end of their serviceable life	- Tiles may need to be recoated or replaced. - Consider engaging a contractor to replace the roof.

Broken or cracked tiles

Cause	Repair
Wind or frost damage Careless walking on the roof	- Replace broken or cracked tiles with a matching new tiles (where available) or sound second-hand tiles. - Check the condition of the timber battens and replace damaged or rotten battens with battens treated to H1.2 and free of visual defects. - You could engage a roofing contractor to replace broken and cracked tiles.
Tiles at the end of their serviceable life	- When tiles are regularly found broken or cracked, note the issue for review with you principal/property representative. - You could engage a roofing contractor to advise on the options for replacing the tiles or replacing the roof.



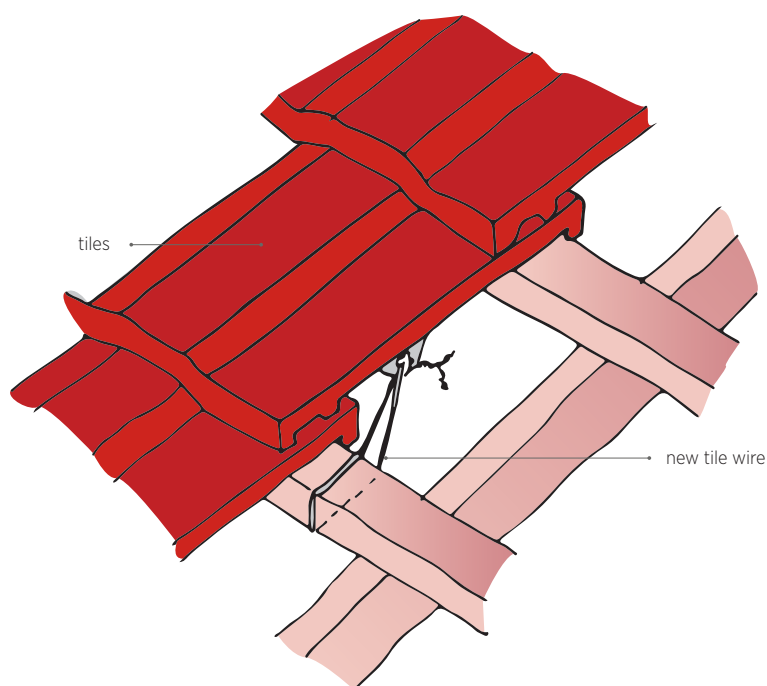
Cracked clay tile.

Dislodged or missing tiles

Cause	Repair
Wind or earthquake damage Tiles not securely fixed in place when installed	• Replace dislodged or missing tiles. • You could engage a roofing contractor to securely fix dislodged or replace missing tiles.

Loose tiles

Cause	Repair
Poor initial installation – tiles not fixed in place	• Check roof tile fixings and secure where necessary. • You could engage a roofing contractor to align and refix tiles.
Corrosion of tie wires or clips (visible in the roof space) Wind causing tiles to vibrate, loosening tie wires	• If accessible from inside the roof space, fix loose tiles or replace corroded wire by looping 1 mm (16 gauge) galvanised wire through the lug or hole in the tile and tying the wire around a tile batten. • Where roofing underlay has been installed, cut and fold back a section of the underlay to access the underside of the tiles. Fix loose tiles or replace corroded wire. Cover the cut section with new underlay and staple it to the tile battens once the tiles have been secured. • In very high or extra high wind zones, tiles should be fastened using proprietary tile clips (available from tile suppliers) that hook onto the tile and can be nailed into battens. • Check tile fixings and secure where necessary. • You could engage a roofing contractor to refix tiles.



Wire tie fixings secured to purlins.

Lead flashing lifting

Cause	Repair
Wind Lead flashing is of too light a grade	• If the flashings are intact and still in reasonable condition, dress (shape) the flashing to the tile profile. • Replace the flashing if it cannot be effectively dressed. • You could engage a roofing contractor to check and repair the lead flashings.



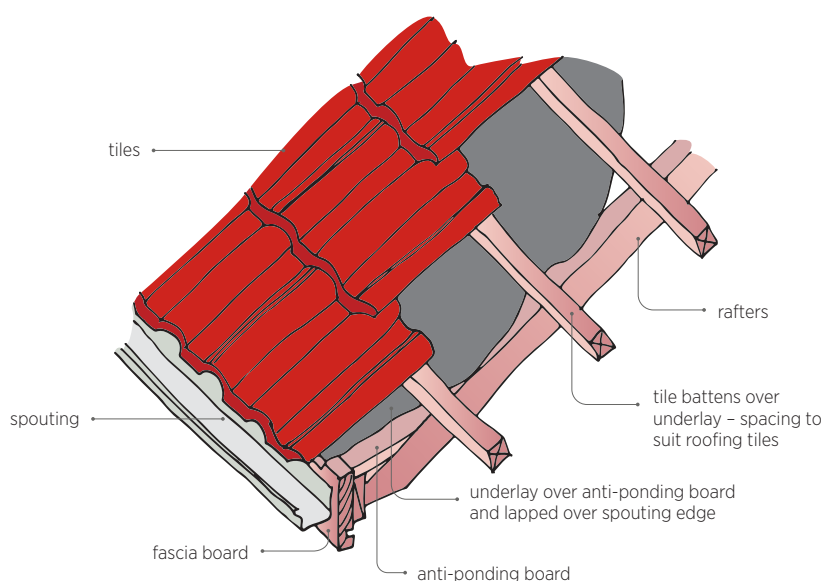
Lead flashing to clay tiles.

Loss of gloss to concrete tiles

Cause	Repair
Weathering of the polymer film on the tiles UV light	• This coating is generally cosmetic but you could engage a contractor to reapply the polymer coating if the appearance is unacceptable.

Roof sagging

Cause	Repair
Rafters inadequately sized for the roof span and weight Insufficient strutting support Roof framing has been damaged or cut Rafters damaged by borer or decay	• Engage an architect or structural engineer to inspect and advise on repairs.
Loadbearing walls below have been removed	• Engage a structural engineer to inspect and advise on repairs.



Roof construction.



Heavyweight roof (concrete tiles).



5.3.7 Translucent sheeting

Cracked sheets

Cause	Repair
Impact damage or weight on sheets	Engage a contractor to replace cracked sheets, loosen tight fixings and ensure there is sufficient allowance for thermal expansion at the fixings.
Fixings are too tight	Replacement sheets must be trafficable or have mesh installed beneath them.
Insufficient expansion and contraction allowances at fixing points	Consider replacing sheeting with new translucent sheeting and installing safety mesh.

Damaged fixing seals

Cause	Repair
Deterioration due to age	Engage a contractor to replace. Use fixings specified for the sheeting and follow the manufacturer's instructions.
Wind loading	Consider replacing sheeting with new translucent sheeting and installing safety mesh.



Translucent sheet screw fixing with EPDM washer.

Dirt trapped in the sheets

Cause	Repair
Sheet ends in twin-walled sheets were inadequately sealed	If the build-up of dirt is not possible to remove, engage a building contractor to replace sheets and install end capping to open ends.
Capping has fallen off or was not installed	Consider replacing sheeting with new translucent sheeting and installing safety mesh.



Debris on roofing.

Impact damage

Cause	Repair
High winds, hailstones, sports equipment Attempting to walk on the roof – this is dangerous and should be avoided	- Older translucent sheet roofing can become brittle from UV exposure, making it more vulnerable to hail or wind damage. - If the damage is visually unacceptable or it allows rain to get into the building, engage a contractor to replace the damaged sheets or all of the sheets. - Consider replacing sheeting with new translucent sheeting and installing safety mesh.



Translucent sheeting in corridor – a high impact area.

Loose sheets

Cause	Repair
Sheet spans are too large Insufficient, loose or missing fixings	- Engage a contractor to add additional purlins or supports, replace sheets and add fixings as required. - Consider replacing sheeting with new translucent sheeting and installing safety mesh.

Sheet discolouration

Cause	Repair
Heat trapped by the roofing causing the purlins to overheat and damage the sheets	- If sheets are not badly marked, engage a contractor to remove the sheets, paint the upper surface of purlins with white paint to prevent heat build-up and replace the sheets as required. - Consider replacing existing translucent sheeting with trafficable sheeting or installing mesh beneath existing sheeting.
Translucent sheets have been painted	- This is a health and safety hazard as they appear strong enough to walk on but they will not support the weight of a person. - Engage a contractor to replace the sheets with an alternative roof cladding. - Consider replacing sheeting with new translucent sheeting and installing safety mesh.



Sheet discolouration.

Surface deterioration or crazing, loss of transparency

Cause	Repair
UV light Fixings too tight	- Monitor deterioration – it will get worse over time. - Engage a contractor to replace when the condition becomes unsatisfactory. - Consider replacing sheeting with new translucent sheeting and installing safety mesh.
Build-up of dirt	Wash down the sheeting to remove salts and dirt – see section 4.

5.3.8 Roof penetrations

Chimney or flue flashing lifted

Cause	Repair
Wind lifting penetration flashings	- If the flashing is leaking, fix as an urgent repair. - Repair or replace the lifted penetration or flue flashing. - You could engage a plumber or roofing contractor to repair or replace the flashing.



Roof penetration inadequately sealed.

Corrosion of metal flashings

Cause	Repair
Atmospheric conditions	- If the flashing is leaking, fix as an urgent repair. - Repair or replace corroded flashings. All penetrations greater than 300 mm wide should have a pan flashing up to the ridge, if the penetration is square, a welded cricket flashing will decrease the chance of leaks. - You could engage a plumber or roofing contractor to repair or replace flashings.
End of serviceable life	Engage a plumber or roofing contractor to replace the flashing.



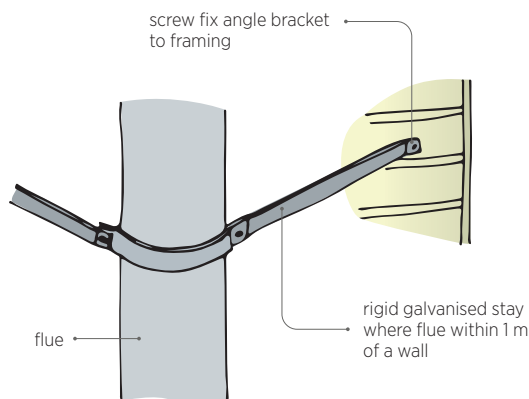
Corrosion of roof around penetration.

Insecure flues

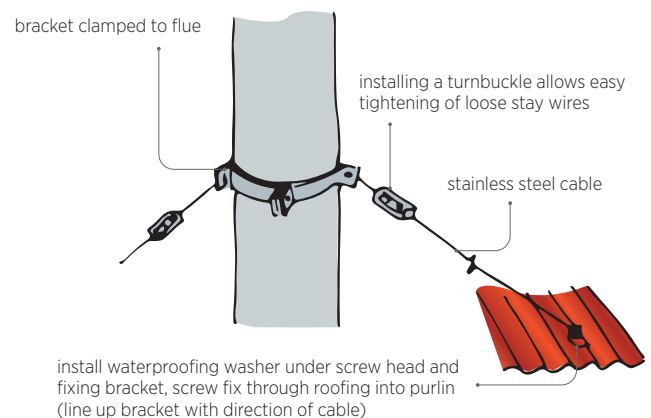
Cause	Repair
Roof stays not installed, corroded or loose	Install or tighten stays and fixings and replace corroded fittings.
Insufficient or loose fixings	You could engage a contractor to install, tighten or replace stays and fixings.



Flue stays not installed.



Flue stay construction.



Insecure vent pipes

Cause	Repair
Roof stays damaged or not installed Leaking or lifted roof flashing	Engage a plumber to repair or replace the roof stays to the vent pipe or vent pipe flashing.

Safety feature connections such as a fall arrest system

Cause	Repair
Corrosion	Treat corroded anchor points for rust.
Loose, unsafe connections	Tighten connection points.
Leaking connection point	Arrange certification or repairs, if necessary.
Wind or earthquake damage	
End of serviceable life	Carry out periodic checks.



Fall arrest roof anchor.

5.3.9 Roof glazing and skylights

Dirty roof glazing

Cause	Repair
Dirt and debris not flushed off by rain	Spot clean the area and/or wash down the roof – see section 4.
Overhanging branches	- Remove overhanging branches or remove trees. - If moss, mould or lichen is present, apply a proprietary cleaning product to treat this – see section 4.



Dirty skylight.

Aluminium frames pitting

Cause	Repair
Build-up of airborne salt, dust or dirt Lack of rainwashing	Spot clean the area and/or wash down the roof – see section 4.

Cracked roof glazing

Cause	Repair
Impact damage	If leaking, repair cracked roof glazing as an urgent repair.
Thermal stress cracking	- If the cracking is minor and no air or water is passing through the crack, monitor and repair if it starts leaking. - You could engage a specialist roof glazing contractor to repair the roof glazing.

Moisture getting into double-glazed roof windows

Cause	Repair
UV degradation of edge seal Seal continuously damp	Engage a contractor to advise or repair double-glazed units.



Dirty skylight.

Ponding around roof penetrations or skylights

Cause	Repair
Build-up of dirt and debris Installed with inadequate fall	- Remove debris. - Engage a plumber or roofer to replace or add fall to the flashing.

5.3.10 Spouting and gutters

Dirt, mould or lichen growth

Cause	Repair
Humid weather conditions and wind-blown dirt	Wash down the spouting and eaves – see section 4.



Lichen on gutter.

Corroded metal gutters

Cause	Repair
Insufficient fall to drain water	- If water still ponds in the spouting after cleaning or washing down, replace or reinstall spouting with correct fall. - You could engage a plumber or roofing contractor to replace or reinstall the spouting with the correct fall.
Leaves and other debris sitting in gutter Weeds growing in gutter Metal debris left in gutter when roof installed	Clean and wash down to remove dirt, moss, lichen, leaves and other debris – see section 4.

Deformed metal gutters

Cause	Repair
Ladders or building materials leaning against the gutter	- Repair the damaged gutter and install a ladder support bracket. - You could engage a plumber or roofing contractor to replace the broken section of gutter and install ladder supports.
Gutter corroded or damaged along the concealed back edge Snow heavier than the gutter can support No allowance for thermal expansion and contraction	- Engage a plumber or roofing contractor to repair the damaged gutter and check that: - there are enough brackets - they are close enough for the expected snow loads - they allow for thermal expansion.

External gutters – water spilling from gutter

Cause	Repair
Insufficient or no fall to outlet Gutter fitted too tightly between fascia boards and unable to expand Sagging gutter causing ponding	- Repair the gutter to allow for expansion and have the correct falls to the outlets. - You could engage a plumber or roofing contractor to install an expansion joint and to correct the fall.
Leaves, other debris or weeds growing in the gutter	Clean or wash down spouting to remove dirt, moss, lichen, leaves and other debris – see section 4.
Blocked downpipe	Remove any obvious blocking materials (such as tennis balls, leaves, twigs or plastic bags). Always pull the blockage out – avoid pushing it further into the downpipe.
Lip at the outlet of the gutter preventing water from fully draining away	Some proprietary gutters have a small lip at the outlet leaving some water remaining after rainfall, but this should evaporate.
Hail, ice or snow blockage	- Allow the ice or snow to melt and then check the gutter for damage. - Brackets fixing the gutter to the fascia should be closer – no more than 300 mm apart – in areas where snowfall is likely.
Downpipe(s) too small for area served	- Install more or larger diameter downpipes. - You could engage a plumber or roofing contractor to size and install more or larger diameter downpipe(s).

Internal gutters overflowing

Cause	Repair
Blocked outlet(s)	- Clear blockages. - If blockages are caused by leaves or twigs from overhanging trees, prune back the trees so branches are clear of the roof. - If blockages are an ongoing problem, install dome-type proprietary leaf guards. - Install snowguards in areas that get snowfall.
No overflows provided	- Clear blockages. - Engage a plumber or roofer to form a rainwater head to the top of the downpipe and an adequately sized overflow.
Single outlet with insufficient capacity for water flow/rainfall	Engage a plumber or roofer to make the overflow larger or install a second overflow.
Insufficient freeboard for local rainfall expectations	Note the issue for review with your principal/property representative – a major repair is necessary.

Metal gutters joint failure

Cause	Repair
Sealant failure	Remove sealant, clean joint and apply new neutral-cure sealant.
Soldered joint failure	- Solder the joint – only unpainted galvanised steel is able to be soldered. - You could engage a plumber or roofing contractor to solder the failed joint.
No allowance for thermal expansion and contraction	- Repair the damaged gutter and install proprietary expansion joints or expansion outlets in the gutter. - You could engage a plumber or roofing contractor to repair the damaged section of gutter and allow for expansion.



Joint failure in gutter.

PVC gutters damaged or cracked

Cause	Repair
Ladders leaning against the gutter	- Repair the damaged section(s) of gutter and replace any damaged brackets. - You could engage a plumber or roofing contractor to replace the broken section of gutter.
Insufficient allowance for thermal expansion and contraction Expansion joints poorly installed or absent	- Repair the damaged gutter and install proprietary expansion joints or expansion outlets in the gutter. - You could engage a plumber or roofing contractor to replace the broken section of gutter and allow for expansion.
Insufficient brackets to resist wind or snow loads	- Repair the damaged gutter and add extra brackets if needed for the expected weather conditions. - You could engage a plumber or roofing contractor to replace the broken section of gutter and install brackets closer together.
Gutter and/or brackets at the end of their serviceable life	- Replace gutter and brackets – see section 7 for information about sizing gutters and downpipes. - You could engage a plumber or roofing contractor to replace the gutter.



Gutter in good condition.

PVC gutters joint failure

Cause	Repair
Solvent joint failure	- Repair damaged gutter. - You could engage a plumber or roofing contractor to repair the damaged gutter.
Insufficient allowance for thermal expansion and contraction	- Repair damaged gutter and install proprietary expansion joints or expansion outlets in the gutter. - You could engage a plumber or roofing contractor to replace the broken section of gutter and allow for expansion.

Water remains in the spouting

Cause	Repair
Spouting blocked causing water to remain in spouting	Clean and wash down spouting to remove dirt, moss, lichen, leaves and other debris – see section 4.
Insufficient fall to drain water	- If water still ponds in spouting after cleaning or washing down, replace or reinstall spouting with correct fall. - You could engage a contractor to replace or reinstall the spouting with the correct fall.



Gutter requiring urgent repair.

Water runs down fascia instead of into external gutter

Cause	Repair
Gutter is corroded or damaged along the concealed back	- Repair the damaged gutter. - You could engage a plumber or roofing contractor to repair or replace the corroded gutter.
Blocked gutter or downpipe	Check and unblock gutter or downpipe.

5.3.11 Downpipes

Dirt, moss or lichen on downpipes

Cause	Repair
Insufficient cleaning Damp environment	Wash down downpipes – see section 4.



Spouting requiring urgent repair.

Impact damage

Cause	Repair
Stones thrown up by lawnmowers, damage by vehicles	• If a dent or small deformation in a metal downpipe is not serious, leave it. • If the downpipe is leaking water, repair it: • Cover small holes with duct tape as a temporary repair. • For PVC downpipes, glue a piece of PVC over the hole using a PVC solvent glue. • For metal downpipes, rivet and seal a metal patch over the hole. • If there are large holes, replace the damaged part of the downpipe. • You could engage a plumber or roofing contractor to repair or replace downpipes.

Stormwater drain blocked

Cause	Repair
Blocked by rubbish, leaves, debris	• Remove rubbish blocking the drain – avoid pushing it down the drain. If necessary, rod the drain and try to pull the blockage up. • If the drain discharges into the street channel at the kerb, rod back up the drain from the street to clear the blockage, then put a hose in the drain at the downpipe connection to flush the blockage out. • If you cannot unblock the drain, engage a registered drainlayer to unblock it.
Tree roots blocking drain	• Blockages caused by tree roots can be confirmed by a registered drainlayer using CCTV to see the condition in the drain. • A short-term solution is for the plumber or drainlayer to cut the roots away with a specialist power tool. • A permanent solution is to cut the tree down and repair the place where the tree roots enter the drain. • Engage a registered drainlayer to repair the drain.
Drain damaged by a heavy weight such as a vehicle running over a pipe that is close to the surface	• Engage a registered drainlayer to repair the damaged pipe.

Corrosion of metal downpipes

Cause	Repair
Moisture cannot readily drain away from around a bracket Moisture cannot readily drain away from the downpipe seam	- Remove loose rust by sanding or wire brushing and apply either an acrylic corrosion-inhibiting primer where the metal is not exposed to a high corrosion atmosphere or a zinc-rich primer in high corrosion zones. Paint with a minimum two coats of exterior acrylic paint. - If there are large holes, replace the downpipe. - Small holes may be covered with duct tape as a temporary repair. - You could engage a plumber or roofing contractor to repair or replace the downpipe.
Incompatible metals such as copper gutters with a galvanised steel downpipe	- Replace incompatible metal with a suitable metal or PVC downpipe. - You could engage a plumber or roofing contractor to replace the downpipe.
Wrong specification for the environment	- Remove loose surface rust by sanding or wire brushing and apply either an acrylic corrosion-inhibiting primer where the metal is not exposed to a high corrosion atmosphere or a zinc-rich primer in high corrosion zones. Paint with a minimum two coats of exterior acrylic paint. - Replace incompatible metal with a suitable metal or PVC downpipe. - You could engage a plumber or roofing contractor to replace the downpipe.
Material at end of its serviceable life	- Replace downpipe. - You could engage a plumber or roofing contractor to replace downpipes, particularly if several need replacing.

Downpipe not connected to gutter

Cause	Repair
Downpipe inadequately secured to outlet Insufficient brackets to support downpipe Brackets broken, loose or missing	- If the gutter and downpipe are in good condition, reconnect the downpipe to the gutter. Check and tighten brackets or add extra brackets if necessary. - If the gutter and downpipe are in poor condition, replace the gutter, downpipe and brackets. - You could engage a plumber or roofing contractor to replace the downpipes and/or brackets if several need fixing.
Fractured soldered joint (galvanised steel downpipe)	- If the gutter and downpipe are in good condition, reconnect the downpipe to the gutter. Check and tighten brackets or add extra brackets if necessary. - You could engage a contractor to solder joints to the galvanised gutter and downpipe. - If the gutter and downpipe are in poor condition, replace the gutter and the downpipe. - You could engage a plumber or roofing contractor to replace the gutter and downpipe.
Corroded gutter and outlet	- Replace the gutter and outlet. - You could engage a plumber or roofing contractor to replace the gutter and outlet, particularly if several need replacing.



Roof and spouting requiring maintenance.

Downpipe not discharging into drain

Cause	Repair
Downpipe is too short	Extend the length of the downpipe so water is carried directly into the drain.
Spouting outlet to drain is broken or blocked	Clear the blockage in the spouting or in the downpipe.
Stormwater drain is blocked	- Remove any obvious blocking materials (such as leaves/twigs or rubbish). Always pull the blockage out – avoid pushing it further down the drain. - If the drain cannot easily be unblocked, engage a registered plumber or drain clearing company.
Downpipe not aligned to drain	- Reinstall the downpipe so it aligns with the drain. - Ensure rainwater discharges to a stormwater system or soakpit and not to a wastewater (sewer) gully trap.
Joints in downpipe have separated	Repair downpipe joints.



Disconnected downpipe.

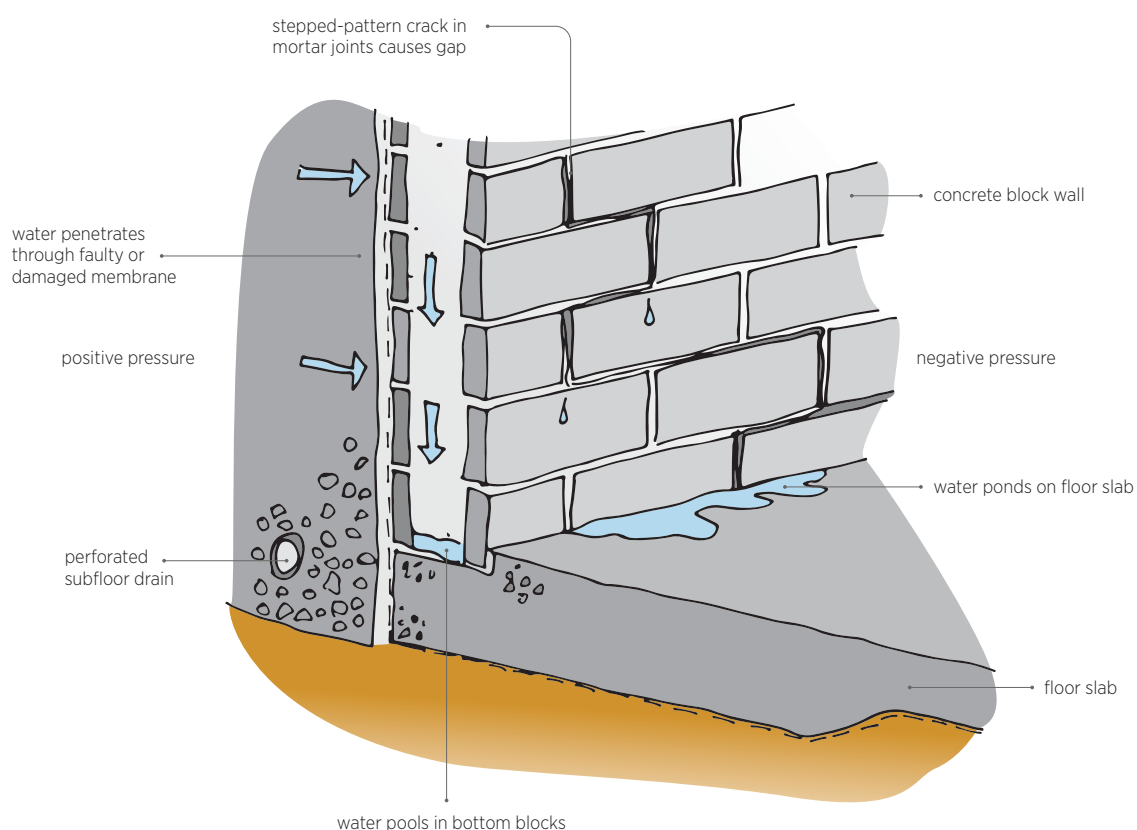
5.4 Subfloors

Dampness and other subfloor problems can lead to rot and corrosion of wood and metal and reduced durability, borer infestation in wood, loss of insulation performance and poorer earthquake performance.

Typically, maintenance checks and ensuring repairs will need to be undertaken and carried out by a suitably qualified contractor – see section 7 for information about getting specialist help. Some issues such as clearing blocked vents can readily be carried out as part of a routine maintenance plan and are not expensive to undertake. This section identifies some of the issues that can occur regarding moisture, ventilation and structure.

Safety

There are risks associated with working within the subfloor or confined spaces of a building. Anyone checking or carrying out work within the subfloor should follow health and safety guidelines and procedures.

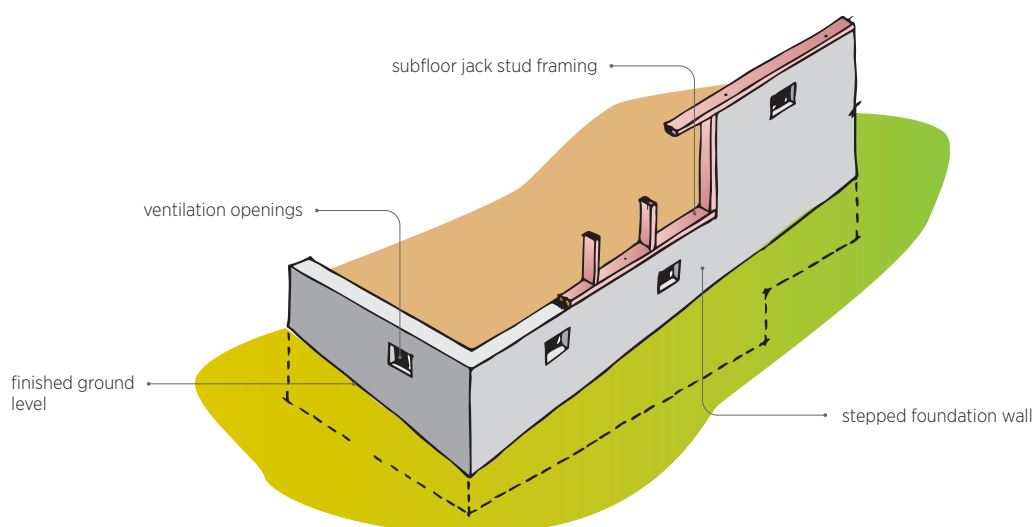


Water entry in a basement wall.

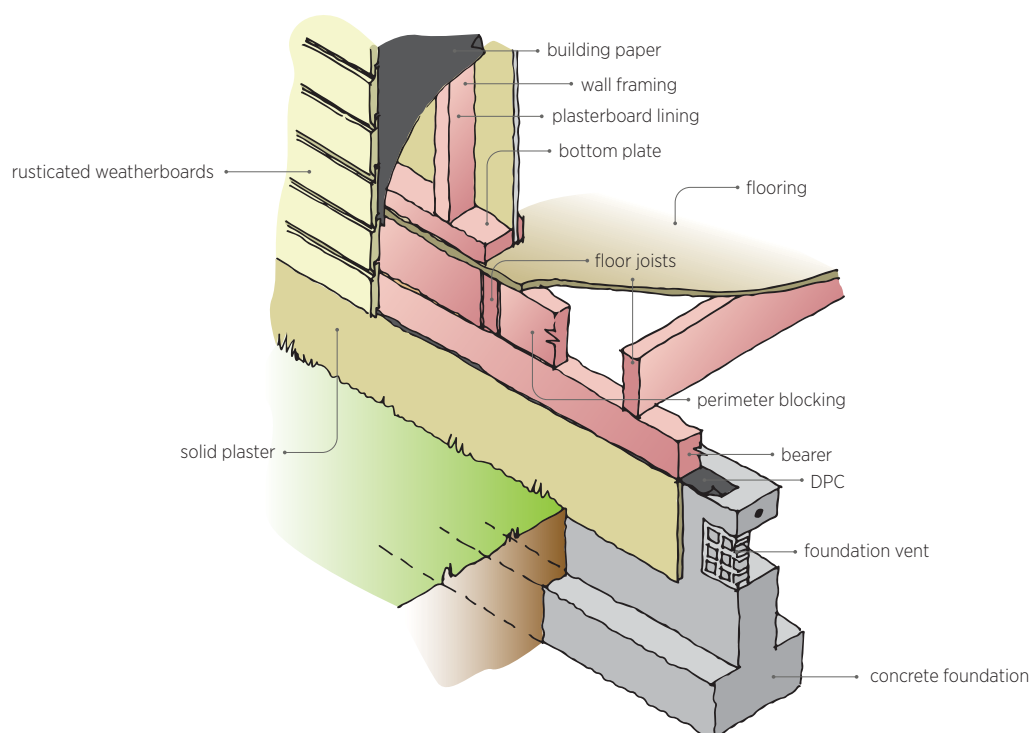
5.4.1 Concrete foundation and basement walls

Concrete foundation and basement walls are typically made from reinforced in situ (built on site) concrete or masonry block foundation walls and are usually situated around the perimeter of a building to support the floor and structural loads of the building. Basement walls (or retaining walls) are generally positioned against adjacent interior spaces and require a suitable waterproof tanking membrane to be installed when below ground level.

Concrete foundations and basement walls are required to safeguard people from structural failure, be resistant to loads from earthquakes and ground pressures and prevent moisture from being accumulated within the building.



Stepped subfloor concrete foundation wall.



Perimeter concrete foundation wall supporting timber-framed flooring.

Basement walls with signs of moisture below ground level

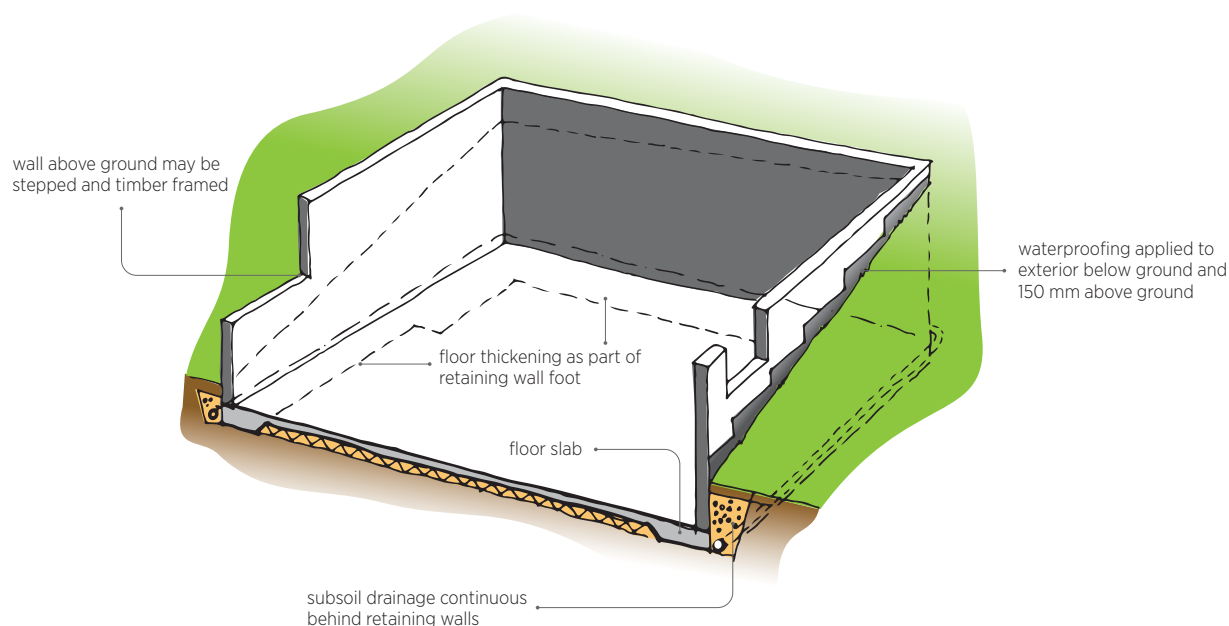
Cause	Repair
Damage to tanking membrane system Damage to tanking membrane protection sheet/layer Tanking membrane inadequately sealed against damp-proof membrane under slab Moisture coming up through slab and wall junction	• Damage to tanking membrane can lead to moisture and water coming into the building. This should be treated as an urgent repair. • Engage a building surveyor to determine the extent of the problem. This may include taking moisture level readings, destructive testing, earthworks or excavation. • Engage a structural engineer to inspect and propose a solution to install new tanking membrane, tanking protection or subsoil drainage.
Subsoil drainage behind wall has failed or become blocked Free-draining granular fill not apparent No filter fabric laid over drainage coil No water coming through into subsoil drain or sump after heavy rainfall	• Clear out adjacent stormwater drains and sumps. Subsoil drainage can usually be seen at the ends of the building, or a stormwater collection sump may be visible indicating there is subsoil drainage. However, sometimes further excavation will be needed to locate it. • Engage a drainlayer to clear silt through subsoil drain access points. • Install new subsoil drainage. Engage a registered engineer to investigate if a subsoil drain needs to be installed or repaired. Excavation work may be required.
Adjacent stormwater drains or water mains have been blocked or broken causing water or moisture to appear within the basement area Tree roots have grown into stormwater drain	• Clean out stormwater drains and sumps of debris on a regular basis and after heavy rainfall. Ensure sump gratings are free from silt, leaves, grime and dirt build-up. • Contact a registered plumber or drainlayer to replace or unblock the stormwater drains and sumps and repair broken water pipes. • Consider carrying out a CCTV inspection to locate any damage (such as invading tree roots).
Surface water flooding adjacent to retaining wall on external side of building Natural water spring	• Locate the source of surface water or natural spring, then divert surface water away from building. • Engage a contractor if required to divert excess surface water into a suitable drainage channel. • Check that broken downpipes and gutters are not spilling water behind the wall. • Turn off or temporarily isolate the mains water supply or isolating valves to the area until the cause has been identified and any repairs have been completed. • Consider carrying out a CCTV inspection to locate any damaged drains.
Dampness or mould appearing on strapped and lined concrete walls	• Remove the wall linings to investigate where the water may be coming from and follow the remedial repairs as noted above. • Engage a building surveyor to investigate the issue. This may include taking moisture level readings, destructive testing, earthworks or excavation.



Basement wall showing signs of water penetration.



Blocked sump causing dampness around exterior retaining wall.



Subfloor basement walls with tanking membrane.

Cracked concrete or cement plaster

Cause	Repair
Building settlement due to damp soil conditions causing cracks to appear in foundation walls Reinforcing too close to edge of concrete (insufficient cover of steel) Poor concrete quality/strength causing pieces of concrete to fall out of wall Rusting of reinforcing steel (swelling) causing concrete to crack Earthquake damage	- Building settlement, major cracks or earthquake damage in concrete foundations could indicate structural damage and should be treated as an urgent repair. - Engage an engineer to provide solutions for foundation repairs. - Note the issue for review with your principal/property representative.
Cracks appearing in cement plaster (finishing system) caused by a loss of bond between the concrete wall and plaster	- Cement plaster (finishing system) is not a structural issue unless the cracks are caused by a larger issue such as building settlement or rusting of reinforcing steel. - Engage a contractor to remove loose plaster, ensure underlying surface is rough to provide a good key to plaster, replaster and finish to match existing. - Note the issue for review with your principal/property representative.
Mechanical fixings (into concrete foundations) have caused a blow-out of concrete around the fixings	- Engage a building contractor to repair fixings. - Repairs may require an engineer to advise if the fixings have compromised the building's structural integrity.



Cracked concrete wall in need of repair.

Foundation walls have subsided/uneven floor levels

Cause	Repair
Building foundations have settled over time causing floor levels to become uneven Ground conditions deteriorating Earthquake damage Slips or subsidence of land around building	- Engage a structural engineer to investigate ground conditions and provide solutions for repairs to the foundation wall(s) or piles or for levelling the floor. - Engage a contractor to carry out building work as advised by an engineer.
Stormwater drainage has been damaged causing subsidence of building foundations	Engage a plumber/drainlayer to replace or repair the drain(s).
Tree roots cracking or damaging foundation walls (trees can remove moisture from the soil, causing expansive soils to shrink, which leads to differential settlement occurring under the building foundations)	- Engage a contractor to isolate areas of risk, secure the tree and follow Ministry of Education health and safety procedures and guidelines. Remove or cut away branches or remove the tree as necessary. - Engage a structural engineer to provide solutions to repair foundation walls.

Degrading or damaged timber-framed subfloor foundation walls

Cause	Repair
Signs of rot within jack stud framing Damage to jack stud framing or connections to concrete wall or floor above Bracing elements installed against jack stud framing have cracked or become damaged	- See <i>Rotted timber piles</i> in section 5.4.5. - Engage a contractor to carry out repairs. - If the structural integrity of the building is compromised, engage an engineer to provide solutions. - Damaged subfloor framing, linings and fixings can impact the building's structural integrity. It is important to engage an engineer to confirm what building repairs are required.

5.4.2 Electrical wiring

Important: Do not attempt to repair or fix electrical wiring. Always use a qualified electrician.

Damaged wiring

Cause	Repair
Poor installation Age of wiring	- Poorly installed wiring should be repaired. - Damaged wiring should be replaced. - Engage an electrician to repair or replace damaged wiring.
Wire sheathing in contact with polystyrene insulation over a long period of time	- Long term, polystyrene in direct contact with the PVC sheathing of electrical cables may cause the sheathing to deteriorate. - Damaged wiring should be replaced. - New wiring being installed in close proximity to polystyrene should be run through a sleeve to prevent direct contact. - Engage an electrician to inspect and repair wiring if required.

Loose wiring

Cause	Repair
Poor installation	Engage an electrician to fix cables to the structure to support the wiring.
Damage by tradespeople	Note the issue for review with your principal/property representative.



Loose wiring.

5.4.3 Insulation

No underfloor insulation

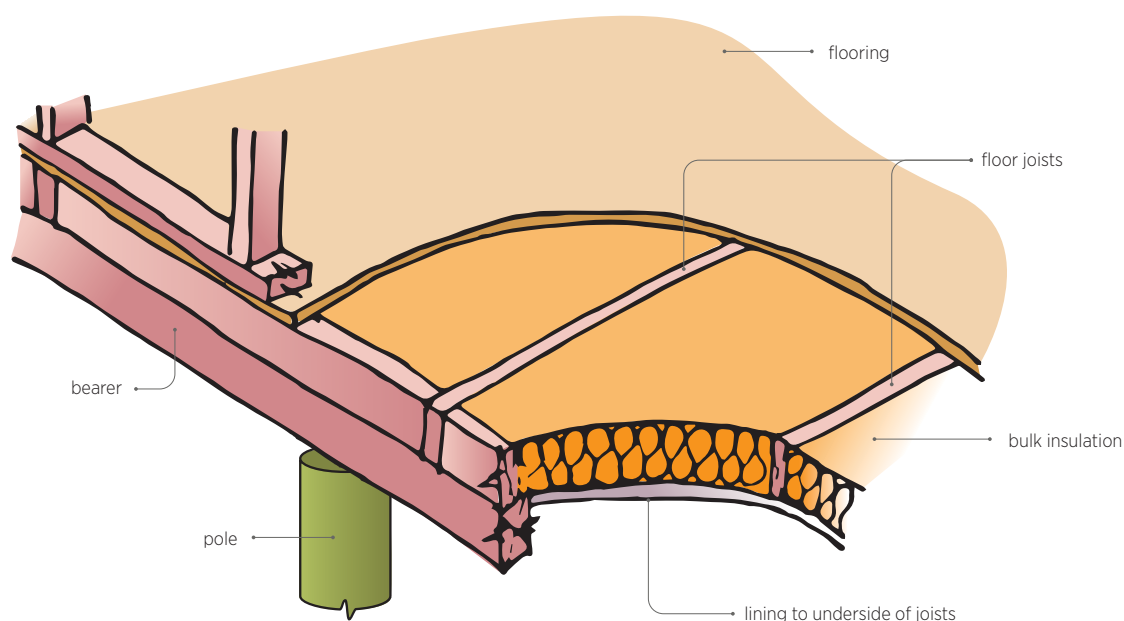
Cause	Repair
Insulation was not required when the school was built	- Consider installing underfloor insulation. Select a product specifically designed for insulating under floors. Proprietary products include polystyrene friction fitted between the joists and segments such as polyester, glass wool or sheep's wool that come with tabs for fixing or are held in place by strapping. - Retrofitting or repairing foil insulation under floors is banned. Switch off the electricity at the switchboard before entering a subfloor containing foil insulation or removing any existing foil – people have been electrocuted when staples used for fixing foil have pierced an electrical cable. - You could engage a contractor to install underfloor insulation. - Note the issue for review with your principal/property representative.
Insulation was never installed	



No subfloor insulation.

Poorly installed insulation

Cause	Repair
Insulation was incorrectly installed with gaps and spaces Insulation has been damaged by tradespeople Wind damage	- Assess whether existing (non-foil) insulation can be reused or select a new insulation product designed for use under floors. Proprietary products include polystyrene friction fitted between the joists and segments such as polyester, glass wool or sheep's wool that come with tabs for fixing or are held in place by strapping. - Retrofitting or repairing foil insulation under floors is banned. Switch off the electricity at the switchboard before entering a subfloor containing foil insulation or removing any existing foil – people have been electrocuted when staples fixing foil have pierced an electrical cable. - The subfloor space, framing timber and underside of the floor should all be dry when installing insulation. - Press the insulation firmly against the underside of the floor. There should be no gaps (and no air movement) between the insulation and the floor and between sections of insulation. - Where the subfloor is an exposed subfloor, fix sheet material under the insulation to hold it firmly in place and prevent wind damage. - Where polystyrene is used, to be conservative, keep it separated from any PVC electrical cables that run under the floor with ducting or tape around the cables. - It is a good idea to also put insulation around any hot water pipes that run under the floor. Insulating foam tubes with a slit along one side can be pressed over the piping. - You could engage a contractor to repair underfloor insulation. - Note the issue for review with your principal/property representative.

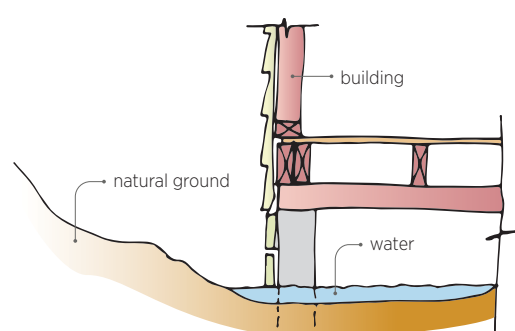


Subfloor insulation.

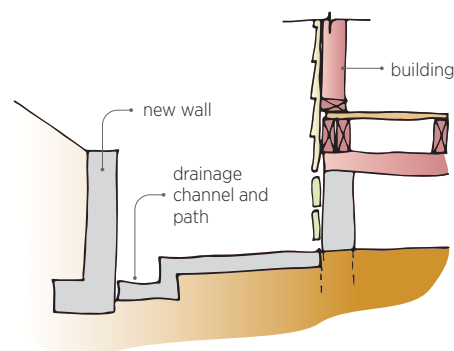
5.4.4 Subfloor moisture

Damp ground conditions

Cause	Repair
Moisture evaporating from the ground not being removed by subfloor ventilation (rising damp)	- Clear existing vents if they are blocked. - Engage a contractor to improve subfloor ventilation by installing vents into the external walls of the subfloor area – see repair for inadequate subfloor ventilation below. - If high moisture levels remain after improving subfloor ventilation, cover the ground area with polythene sheet (at least 0.25 mm thick). Seal the sheets together, to the piles and around the perimeter to stop the rising damp. - You could engage a contractor to install the polythene.
Surface water flowing underneath the building as ground levels are wrong or sloping towards the building	- Check ground levels around and under the building. To stop water flowing into the subfloor, make sure: - outside ground level is lower than the level in the subfloor space - the ground slopes away from the building - paths and paved areas slope away from the building. - You could engage a contractor to alter the ground levels and slopes or add drainage to divert water away from the subfloor area. - Note the issue for review with your principal/property representative.
High water table or natural spring	- Water from a natural spring should be piped away from the building. Consider installing a sump pit to collect the water and drain water to a stormwater drain. - You could engage a plumber to pipe the spring to the outside. - Note the issue for review with your principal/property representative.
Leaking drain or wastepipe in the subfloor space	Engage a plumber to repair the wastepipe or drain.
Inadequate subfloor ventilation due to blocked or no ventilation openings	- Clear around subfloor ventilation grating to allow airflow. - If there are no ventilation openings, install ventilation openings of 3,500 mm² per m² of floor area. - You could engage a contractor to install ventilation openings. - Note the issue for review with your principal/property representative.
Subfloor airflow restricted by rubbish or items stored under the building	- Remove rubbish stored under the building. - Clear away items to allow for free movement of air.



Before remediation – water drains under the subfloor.



After remediation – water is captured and diverted away from the building.

Damp stains on underside of flooring

Cause	Repair
Leaking water or wastepipe	Engage a plumber to repair the leaking pipe.
Overflow or leak from wet area fixtures such as handbasin, dishwasher, hot water cylinder	- Engage a plumber to fix the cause of the leak. - Identify if there is any building damage caused by the leak. - You could engage a contractor to repair any damage found.
Inadequately waterproofed tiling in wet area such as no waterproofing membrane under tiles	Engage a waterproofing specialist or building surveyor to identify the problem and suggest repair.



Leaking water pipe.

Mould and water droplets under the flooring

Cause	Repair
Damp subfloor conditions	- Engage a building contractor to improve the subfloor ventilation by installing subfloor ventilation – see repair for inadequate subfloor ventilation in <i>Damp ground conditions</i> above. - If high moisture levels remain after installing subfloor ventilation, cover the ground area with polythene sheet (at least 0.25 mm thick). Seal the sheets together, to the piles and around the perimeter to stop the rising damp. - Engage a plumber/drainlayer to repair leaking pipes.
Leaking pipes	
Leaks in exterior cladding migrating into the subfloor space	



Subfloor polythene (taped at joints) to reduce rising damp.

Ponding water

Cause	Repair
Water from leaking pipes, broken downpipes or stormwater drains	- Engage a plumber/drainlayer to repair leaking pipes, broken downpipes or stormwater drains. - Engage a building contractor to lower outside ground levels and contour to fall away from the building's perimeter. - Consider installing a path with drainage channel to direct surface water away from the building.
Surface water draining back under the building due to higher ground levels outside the building	



Subfloor brace too close to the ground and ponding water.

Musty smells

Cause	Repair
High subfloor moisture levels	Check for water entry, leaking pipes, high water table or a water spring and carry out repair – see <i>Damp ground conditions</i> above.
Items stored in the subfloor space are damp	Remove excess items stored in the subfloor to improve subfloor ventilation.
Fungal growth	- Install polythene sheeting on the ground. Seal the sheets together, to the piles and around the perimeter of the building. - You could engage a contractor to install the polythene sheeting.
Rotten timber – piles, bearers, joists	Engage a building surveyor to identify the scope of the issue and recommend repairs.



Items stored in the subfloor can restrict air movement.

Timber decay

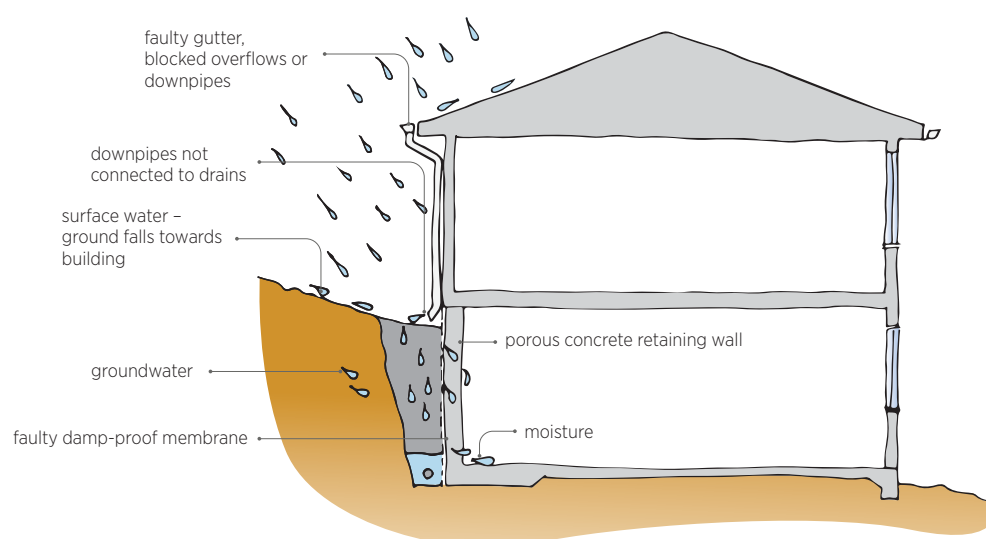
Cause	Repair
Damp subfloor space	Engage an architect or building surveyor to identify the problem and propose a solution.
High subfloor moisture levels	Note the issue for review with your principal/property representative.
Lack of ventilation	



Piles showing signs of timber decay.

Moisture within subfloor areas

Cause	Repair
Subfloor ventilation has been blocked by a building addition/extension	- Engage an engineer to provide solutions for subfloor ventilation. - Engage a contractor to install ventilation openings into concrete walls.
No or limited subfloor ventilation	Note the issue for review with your principal/property representative.



Causes of water ingress.

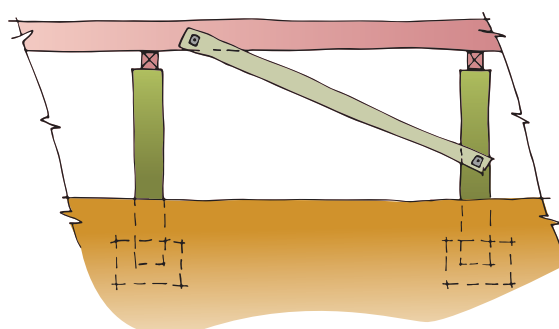
5.4.5 Timber-framed foundations

Bearers or joists sagging or deteriorated

Cause	Repair
Building movement Timber sizes are too small for the span or loading Floors have been overloaded Substandard repairs	- If bearers or joists are sagging, engage a structural engineer to assess the structural integrity of the subfloor timber and propose a solution. - Options may include adding new bearers or joists, replacing bearers or joists or replacing existing timbers. - Engage a building contractor to replace subfloor timber joists and bearers.
Untreated or inadequately treated timber	- Replace untreated or inadequately treated timber with new treated timber. - You could engage a building contractor to replace untreated or inadequately treated timber.
Rotted timber	- Check for rot in timber with a screwdriver – if the screwdriver easily enters the timber, it is rotten. - Replace rotten bearers or joists with new appropriately treated timber. If just one part is affected, replace the affected area and at least 1 m either side of the rot. In many cases, it may be a better option to replace the whole member. - Engage a building contractor to replace rotten joists and bearers.
Borer in timber	- Borer damage to old timber is relatively common, especially with untreated or sap timber. Infestation by the common house borer (which leaves round holes) generally ends before framing timber becomes structurally unsound. Common borer attacks sap timber – most framing has sufficient heartwood to avoid serious weakening. - Infestation by two-tooth borer (which produces oval holes) is more serious as they can attack heartwood as well as sapwood. - Bearers or joists (or parts of them) that show signs of structural weakness should be replaced with new appropriately treated timber. - Engage a building contractor to replace borer-ridden timber.

Bolted connections loose

Cause	Repair
Timber shrinkage has occurred since the bolts were installed Bolts were not tightened originally	- Tighten bolts as necessary. - Bolts should at the least be hot-dip galvanised. All connections to treated timber piles within 600 mm of the ground and/or in coastal areas must be 304 stainless steel. 50 x 50 x 3 mm washers must be used with bolts. - You could engage a contractor to check and tighten subfloor fixings.



Subfloor framing showing braced pile.

Borer in joists, bearers, bottom plates or flooring

Cause	Repair
Untreated or inadequately treated timber	Engage an architect to identify the problem and propose a solution.
Use of sap timber	
High subfloor moisture levels	



Signs of borer.

Gaps or loose wedges between pile and bearer

Cause	Repair
Timber shrinkage due to use of green (wet) timber during construction Wedges were not tightly inserted or were not nailed in place and have become loose	If loose wedges or gaps between the top of the pile and bottom of the bearer can be seen from the entrance to the subfloor, engage an architect or building contractor to check all the pile and bearer subfloor joints and fixings.
Pile has sunk into soft ground	- Repiling is required using H5 treated timber piles or precast concrete piles. Excavation for the piles must go down to good ground. - Engage a structural engineer to design the repiling. - Engage a contractor to carry out the repiling.

Lateral bracing support to piles missing or damaged

Cause	Repair
Bracing was not installed (even if repiled) Earthquake damage to existing bracing	If pile bracing can not be seen from the entrance to the subfloor or damaged bracing and fixings are visible, engage an architect or building contractor to check the subfloor bracing, including the fixings.



Lack of bracing to piles.

Piles undermined

Cause	Repair
Unconsented excavation to create a basement space Slumping of existing excavation	- Excavation can seriously weaken foundations especially where: - it has left piles close to the edge of an unsupported bank - the pile footings have been exposed. - Engage a structural engineer to investigate and propose a solution.



Piles undermined.

Rotted timber piles

Cause	Repair
Untreated piles in older buildings (such as tōtara or pūriri)	- Check for rot in timber piles with a screwdriver just below the ground surface – if the screwdriver easily enters the timber, it is rotten. - Engage a contractor to replace the rotten piles using H5 treated timber piles or precast concrete piles.
Damp subfloor space Lack of ventilation	- Test for rotten piles and replace as necessary. - Check subfloor ventilation – see <i>Damp ground conditions</i> in section 5.4.4. - You could engage a contractor to replace rotten piles and fix subfloor ventilation.



Rotten piles.

Rusted fixings on pile foundations

Cause	Repair
Exposure to airborne salt, dust or dirt Trapped moisture and dirt Copper-based timber treatments reacting with the metal of fixings Inadequate corrosion protection for the environment or location	- Remove and replace fixings with at least hot-dip galvanised fixings for brackets and bolts and stainless steel fixings for joist hangers and nail plates. - Engage a contractor to repair or replace rusted fixings.
Damp subfloor space Lack of ventilation	- Increase subfloor ventilation. - You could engage a contractor to add extra ventilation.



Rusting joist hangers.



Rusted connections to jack stud framing.

6. Common problems

Different building types and materials have common issues. This section describes some of the common problems with the building envelope of school buildings. You will find detailed guidance for dealing with these in section 5.

Common problems

Rainwater leaks

It is often hard to pinpoint exactly where the water is coming from in a leak. If you can't locate the source, contact a building surveyor or licensed building practitioner to determine its location and the extent of any damage.

Any penetration (opening) through the wall or roof cladding (such as a window, pipe or junction) has the potential to leak.

Leaks that start from the outside only happen during or after rain (and possibly after the building has been washed down). Leaks that appear quickly or create large amounts of water are probably close to where the leak is seen. Those that take longer to appear may be entering further away.

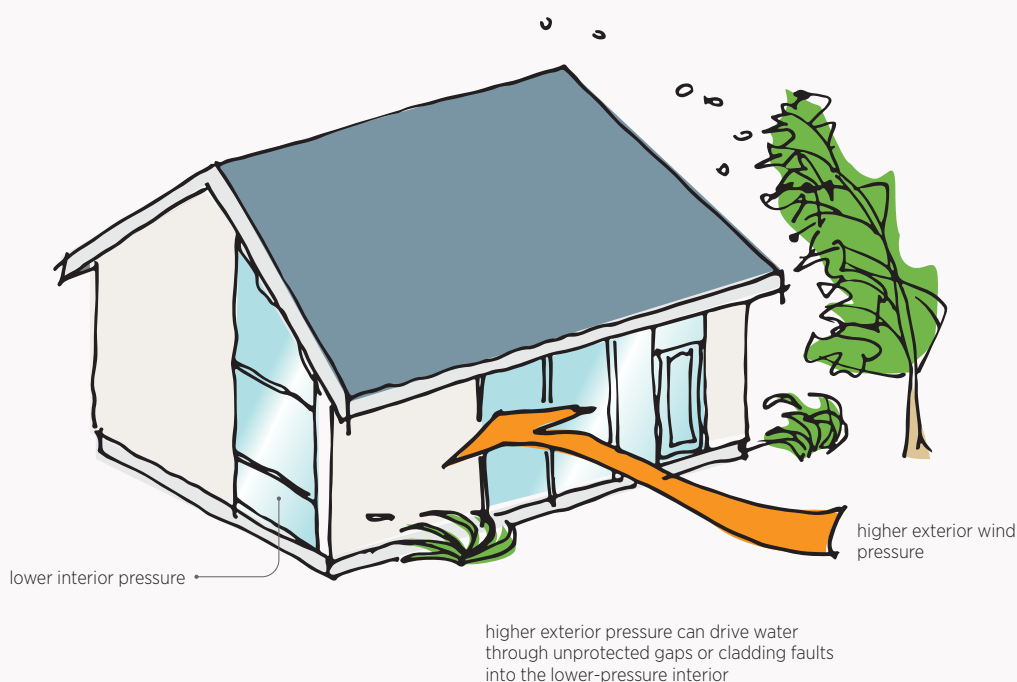
Identifying the source of the leak:

- If the leak happens when it is windy, look for a point where wind can drive in water.
- If the leak happens when it is calm, it is probably coming from above.

- A leak showing on the ceiling or near the top of the wall may be coming through the roof, so get up into the roof space (if possible and safe to do so) with a torch and look for water drips or tracks.

Causes of leaks in schools | kura

- Penetrations for pipes and services attached to or through the roof or wall cladding are not weathertight.
- Fixings (screws and nails) for heat pumps, solar panels and other services are not weathertight.
- Cladding and roof fixings are missing.
- Condensation from unvented roof cavities.
- Building elements have rotted or corroded – for example, flashings or corner soakers have rusted through.
- Gutters overflow due to incorrect fall, undersized outlets, too few brackets or blockages from balls, leaves or weeds.



Differences in air pressure can cause leaks.

Rot in timber

Rot is caused when fungal spores grow on timber with high moisture levels. The fungi use the cellulose in the timber as a food source, slowly destroying it. Rot can be inside or outside the building.

There are two main types of fungi:

- Dry rot – a small number of fungi types eventually leave the timber dry, crumbly and easily broken. Dry rot can spread up to 6 m from the source of a leak.
- Wet rot – these fungi need wetter timber. Wet rot doesn't spread past the damp wood.

Dry rot needs suitable food, moisture, air and temperature to grow. The fungi develop when the timber moisture content is over 20% and grow fastest when the moisture content is 25–30%. Temperature is important – the higher the temperature, the faster the growth. Growth stops when the temperature drops to around freezing point.

Dry rot is easy to see when advanced but hard to spot during the early stages. First signs may be a lightening or darkening of the wood colour. With advanced rot, the surface of the wood becomes wavy or develops hollows.

To test for rot, insert the point of a screwdriver into the timber. If the timber is sound, you should make a splinter when twisting the screwdriver. Where there is rot, the screwdriver will go in easily and pieces of timber will break off.

Rot can occur when wet timber cannot dry out due to:

- being closed in during construction while still damp
- poor surface drainage
- inadequate underfloor ventilation



Evidence of a leak causing rot in timber framing.

- contact with damp ground
- constant wetting from a leak in a cladding or from a pipe
- inadequate damp-proof course between timber and concrete or bricks
- water trapped between timber members.

Building elements in schools | kura that can rot

- Internal building elements such as timber framing damaged by a leak through the cladding.
- Weatherboards, window facings and sills.
- Eave timber and wall framing where gutters are blocked with vegetation or installed with uneven gradients, causing water to pond and flow into the eaves.

Metal corrosion (rust)

Metal building materials and products corrode (rust) when moisture is present. Rust is usually seen as red, brown or orange flaking or pitting on materials such as steel cladding and accessories or bright steel fixings. It can also be white on the surface of materials that contain zinc.

Below a certain moisture level, corrosion can be slow. The rate increases significantly when there is moisture and:

- surface contaminants such as salt spray, dirt or hydrogen sulphide (from coal-burning fires or geothermal activity)
- dissimilar metals in contact – for example, galvanised steel, copper and zinc/aluminium alloy-coated steel
- an acidic solution such as run-off from western red cedar draining over steel/metal
- copper-based treated timber or run-off from this in contact with steel/metal.

Corrosion is a risk almost everywhere in Aotearoa New Zealand as our buildings are relatively close to the sea or near geothermal activity. The corrosion risk at your school depends on your location. You can find this for free at www.branzmaps.co.nz.

Corrosion risk zones are classified as follows:

- Mild – areas very remote from wind-blown salt, industrial or geothermal areas.
- Moderate – light marine influence (most of the country) with little or no salt deposits, typically

500–1,000 m from surf or near calm saltwater such as estuaries.

- Marine – light salt deposits and a frequent smell of salt in the air, typically within 100–500 m of breaking surf.
- Severe marine or seaspray zone – heavy salt deposits and an almost constant smell of salt in the air, typically close to breaking surf (0–100 m).
- Industrial – near industrial sites that release pollutants into the air.
- Geothermal.
- Special conditions – for example, the West Coast of the South Island is located in a severe marine zone, and the addition of smoke from coal-burning fires and a high rainfall creates an aggressive corrosive environment.

Prevailing onshore winds can extend an environment inland well beyond the distances given above.

Different parts of a building also have micro-climates depending on how much they are washed by rain, exposed to the sun and subject to salt deposits.

Corrosion is more likely to happen:

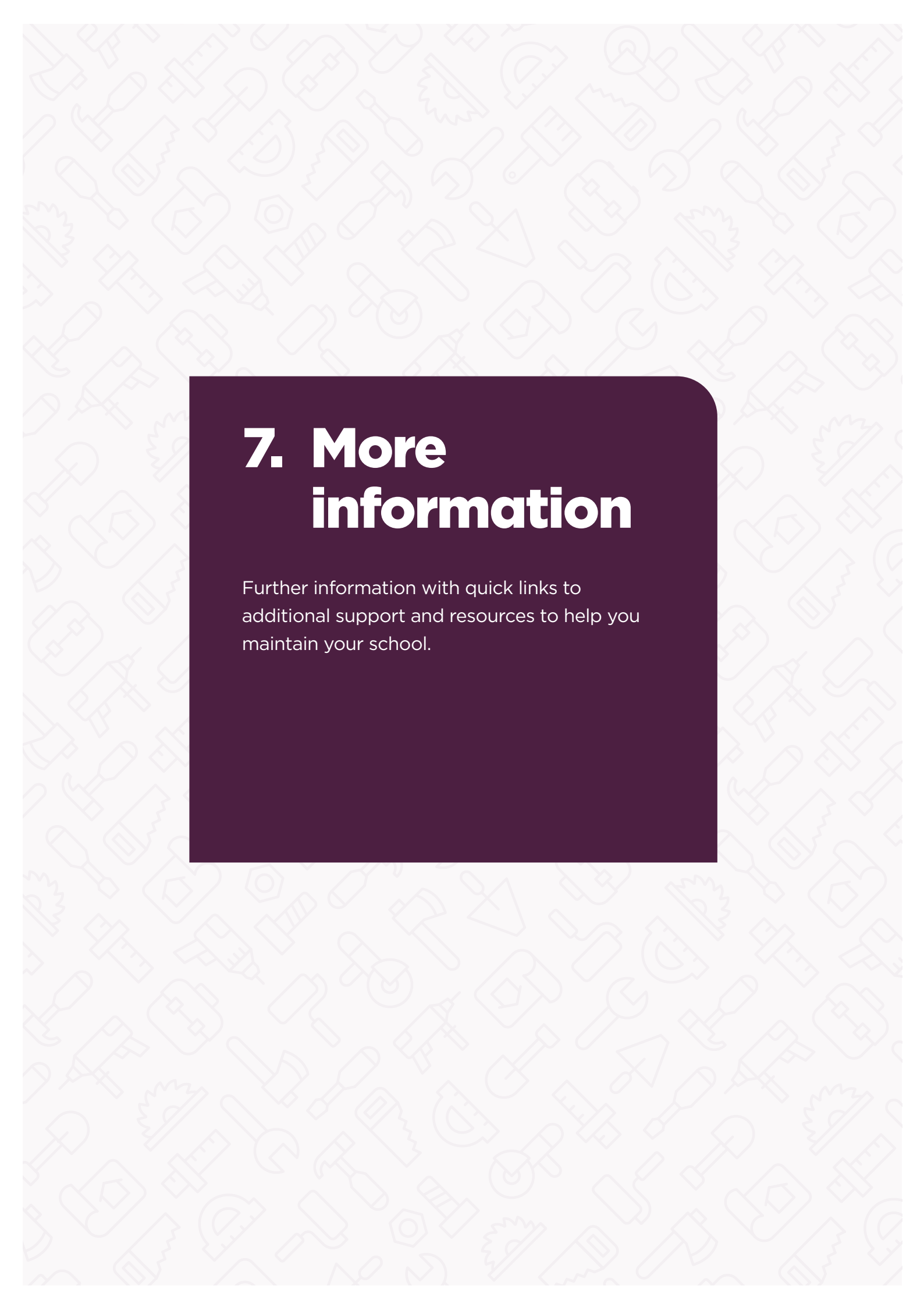
- on downward-facing metallic surfaces – for example, soffits
- faster on vertical surfaces than on upward-facing, free-draining horizontal ones
- in traps and crevices
- where water does not drain freely – for example, ponding in gutters
- where dissimilar materials are in contact or run-off passes from one to the other.

Corrosion risk is reduced by:

- regularly cleaning claddings, especially areas unwashed by rain
- painting or coating the steel
- hot-dip galvanising
- replacing with a corrosion-resistant material such as stainless steel or copper that is compatible with adjacent materials.

Where corrosion has been found in schools | kura

- Metal roofing material.
- Metal spouting.
- Metal cladding, soakers and flashings.



7. More information

Further information with quick links to additional support and resources to help you maintain your school.

More information

Maintenance of water systems

Schools | kura that supply drinking water or are discharging wastewater need to be proactively maintaining these systems. All schools | kura have some critical water services assets, and those that supply their own drinking water or treat their own wastewater need to have effective and regular maintenance regimes in place. More detail of these requirements can be found at <https://www.education.govt.nz/education-professionals/schools-year-0-13/facilities-and-operations/water-supply-schools>

If you have any questions or need further guidance, contact water.services@education.govt.nz.

Building warrant of fitness (BWOFF)

A Building warrant of fitness (BWOFF) shows that your school | kura complies with the compliance schedule, which lists the specified systems and features at your school | kura, and sets out the inspection, maintenance and reporting procedures needed to be actioned. If an issue is identified in the annual inspection and reported in the work requirement notice, this work must be actioned promptly. For more information, see <https://www.education.govt.nz/education-professionals/schools-year-0-13/facilities-and-operations/school-building-warrant-fitness>

Links to more information on topics noted in this guide

- [BRANZ Maintaining My Home](#)

Asbestos

- <https://www.education.govt.nz/education-professionals/schools-year-0-13/health-and-safety/managing-asbestos-schools>

Efflorescence

- www.branz.co.nz/pubs/bulletins/bu593

Health and safety management

- <https://www.education.govt.nz/education-professionals/schools-year-0-13/health-and-safety/health-and-safety-ministry-led-property-projects>

Insurance

- <https://www.education.govt.nz/education-professionals/schools-year-0-13/funding-and-financials/school-building-insurance-funding-programme>

Ladder safety

- www.worksafe.govt.nz/topic-and-industry/working-at-height/safe-working-with-ladders-and-stepladders-construction

Lead-based paint

- www.tewhatauora.govt.nz/our-health-system/environmental-health/hazardous-substances/lead/removing-lead-based-paint

Legislation

- www.building.govt.nz/assets/Uploads/projects-and-consents/building-work-consent-not-required-guidance.pdf

Planning for maintenance

- **Maintenance plan templates**
<https://www.education.govt.nz/education-professionals/schools-year-0-13/facilities-and-operations/planning-property-maintenance>
- [BRANZ Bulletin 632 Planning for maintenance](#)

Hazardous Substances

- <https://www.education.govt.nz/education-professionals/schools-year-0-13/health-and-safety/health-and-safety-responsibilities-schools/hazardous-substances-school-sites>

Specialists

- **Building surveyors**
www.buildingsurveyors.co.nz/find-a-surveyor
- **Joiners**
www.masterjoiners.nz/find-a-master-joiner
- **Licensed building practitioners (designers, building contractors, roofing contractors, bricklayers/blocklayers)**
www.lbp.govt.nz/do-i-need-an-lbp/find-an-lbp
- **Painters**
www.masterpainters.co.nz/find-a-painter
- **Plumbers, gasfitters, drainlayers**
www2.pgdb.co.nz/public-register

- **Stonemasons**
www.nzsma.co.nz/Members
- **Structural engineers**
www.engineeringnz.org/public-tools/find-engineer

Ministry of Education guidance and references

You can find links to more information on maintenance at www.education.govt.nz.

Design standards

- [Designing Schools in Aotearoa New Zealand](#)
- [Designing Schools in New Zealand](#)
[Weathertightness Design Standards for School Buildings](#)

Emergencies

- [Checking your property after a major incident](#)
- [Emergency response coordinators](#)

Health and safety management

- [Drinking water in schools](#)
- [Hazardous substances on school sites](#)
- [Health and safety management](#)
- [Managing asbestos in schools](#)
- [Managing contractor health and safety](#)
- [Moulds and fungi](#)
- [Safe use and testing of electrical equipment in schools](#)

Maintenance funding

- [Managing School Finances – Cyclical Maintenance Cost](#)
- [Property Maintenance Grant for state school maintenance work](#)
- [Funding for state-integrated school property maintenance and upgrades](#)

Maintenance, repairs and security

- [Building warrants of fitness for school facilities](#)
- [Property maintenance](#)

Training modules

We have developed the following online modules to support you on your maintenance journey.

- [Property maintenance compliance](#)
- [Property maintenance day to day](#)
- [Property maintenance fire safety](#)

Contact

Contact your property advisor regarding maintenance queries specific to your school | kura – see [regional office contact information](#).

For general queries regarding this maintenance guidance, email property.help@education.govt.nz.



**Te Tāhuhu o
te Mātauranga**
Ministry of Education

He mea tārai e mātou te mātauranga kia
rangatira ai, kia mana taurite ai ōna huanga

We shape an education system that delivers
equitable and excellent outcomes
