BRANZ

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BULLETIN

PLANNING FOR MAINTENANCE

February 2023

- A maintenance plan is essential for scheduling maintenance tasks and setting target dates or priorities.
- This bulletin explains the need for a maintenance plan, how it should be developed, how to prioritise the work and the need to review the plan.
- This bulletin updates and replaces Bulletin 479 of the same name.

1 INTRODUCTION

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

- ensure the safety and quality of the built environment
- ensure the functionality and aesthetics of the building are maintained
- protect the asset value of the building.

1.0.2 Maintenance includes cleaning, servicing, repairing, recoating, replacing and upgrading the elements and components of the building. It must be ongoing throughout the life of the building.

1.0.3 The amount and type of maintenance required varies according to the:

- nature of the design and construction of the building
- function of the building
- use and activities conducted in and around the building
- materials and finishes
- complexity and quality of the design and construction
- environmental conditions, both external and internal
- frequency of the maintenance.

1.0.4 All buildings should have a maintenance plan, which is a schedule of maintenance tasks and target dates or priorities for maintenance to occur.

1.0.5 Planned maintenance gives the building owner the ability to prepare for the work to be carried out and to arrange the necessary funding.

1.0.6 A maintenance plan minimises the need for costly, unplanned emergency maintenance. It allows:

- building maintenance to be carried out systematically rather than in an ad hoc way
- building services to be monitored and ensures that they remain efficient
- the standard and presentation of the building to be maintained.

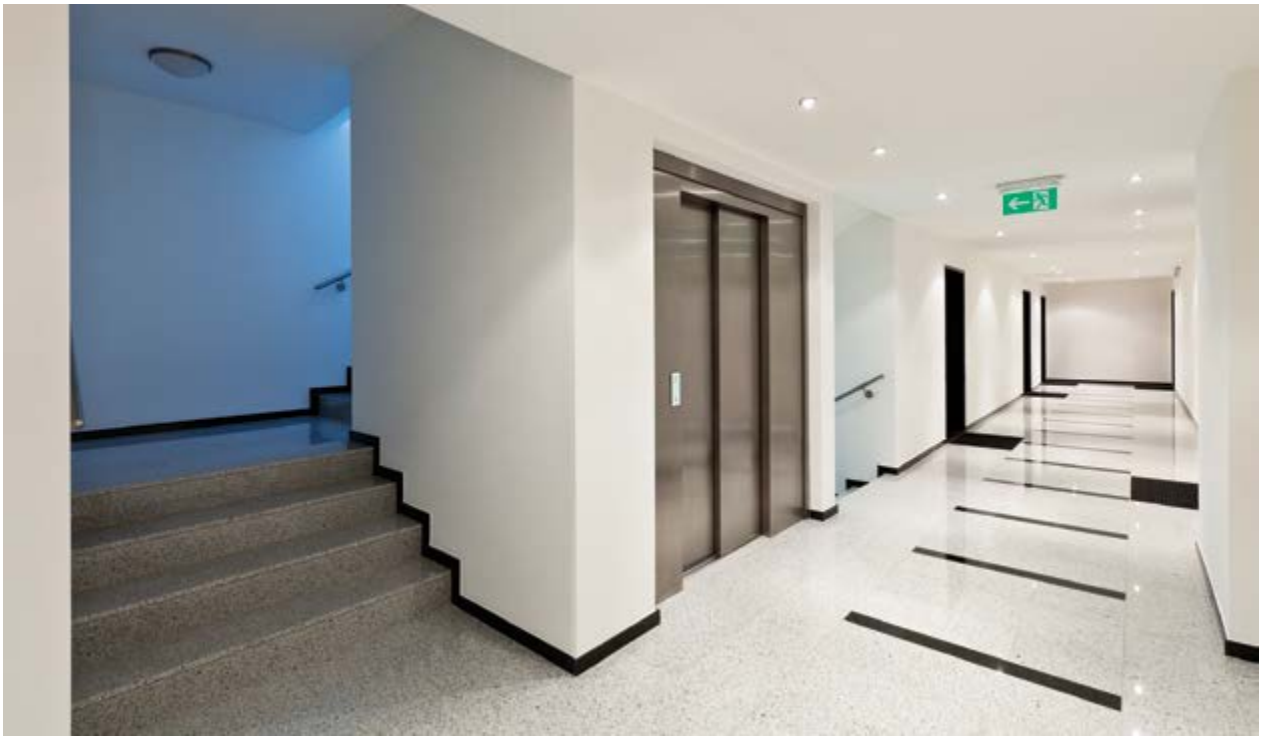
1.0.7 This bulletin updates and replaces Bulletin 479 of the same name.

2 LEGISLATIVE REQUIREMENTS

2.0.1 There is no specific requirement for maintenance in the Building Act. However, Building Code clause B2 *Durability* has an expectation of maintenance in performance requirement B2.3.1, which states that "Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code". This requirement applies only to the intended life of the building element – 50, 15 or 5 years depending on the location of the element in the building.

2.0.2 Under the Building Act, buildings that contain specified systems require a compliance schedule and a building warrant of fitness (BWOF). Specified systems include:

- automatic fire suppression systems (sprinkler systems)
- automatic or manual emergency warning systems
- electromagnetic or automatic doors or windows
- emergency lighting and power systems
- escape route pressurisation systems
- riser mains
- automatic backflow preventers connected to a potable water supply
- lifts, escalators, travelators, cable cars or other systems for moving people or goods within, around or to and from buildings



A lift is a specified system and requires regular inspections and maintenance.

- mechanical air-conditioning and ventilation systems
- building maintenance units that provide high-level access to walls
- laboratory fume cupboards
- audio loops or other listening systems
- smoke control systems
- fire and smoke separations
- final exits
- systems for communicating both spoken and written information intended to help evacuation.

2.0.3 The compliance schedule requires that regular inspections and maintenance of the specified systems are carried out. The BWOF provides the evidence that the requirements of the compliance schedule have been met.

2.0.4 Single residential buildings only need a compliance schedule and BWOF if they have a cable car but not for any other elements listed in 2.0.2.

3 DESIGNING FOR BUILDING MAINTENANCE

3.0.1 Building maintenance is an integral part of all buildings and should be planned for at the design stage of a building project.

3.0.2 A building should be designed to facilitate maintenance. Design aspects of a building that should be considered include:
- building height and complexity
- durability of materials
- accessibility to all parts of the building
- building automation and integrated systems.

3.0.3 When designing a building, features that may aid or hinder maintenance should be identified and evaluated. For example, the selection of a material such as self-cleaning glass will affect the level of maintenance required.

3.0.4 If ongoing maintenance is not included in the overall design, a building is likely to have higher maintenance costs and be more difficult to maintain than a building where maintenance has been considered.

3.0.5 Building design has traditionally only given regard to the upfront building costs but has not considered the ongoing operational, maintenance and recycling or disposal costs.

3.0.6 Systems have been developed to consider whole-of-life costs. These include:
- integrated whole-building design process
- life cycle assessment (LCA)
- building information modelling (BIM).

3.1 INTEGRATED WHOLE-BUILDING DESIGN PROCESS

3.1.1 An integrated whole-building design process aims to reduce construction, operation and maintenance costs by monitoring and managing the performance of a building throughout its life.

3.1.2 The location, selection of material and equipment, financing, construction and long-term operation of the building are identified and incorporated into the building design at the beginning of a construction project. The different disciplines involved in the project work together to ensure integration of all aspects of the building.

3.2 LIFE CYCLE ASSESSMENT (LCA)

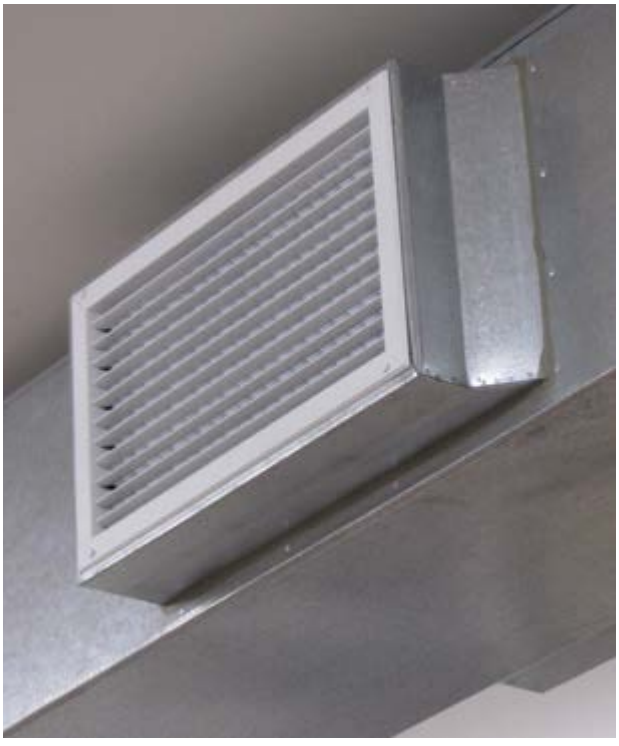
3.2.1 A building life cycle assessment (LCA) assesses the environmental impacts associated with all stages of the materials and products used in a building – raw material extraction, materials processing, manufacture, use, maintenance and finally disposal or recycling.

3.2.2 LCA considers the accumulated costs over the expected life of the building, including initial, maintenance and recycling or disposal costs rather than simply the initial cost of the product.

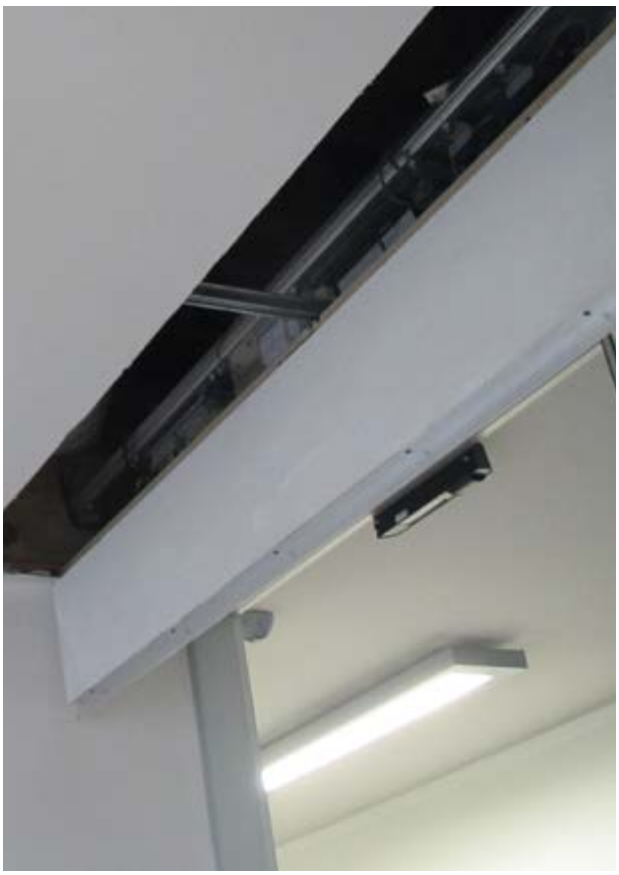
3.3 BUILDING INFORMATION MODELLING (BIM)

3.3.1 Building information modelling (BIM) combines all information about a building in a single-source virtual model. The model may include information such as:
- building materials used
- where specific components are located within the building
- changes made during construction and throughout the life of the building.

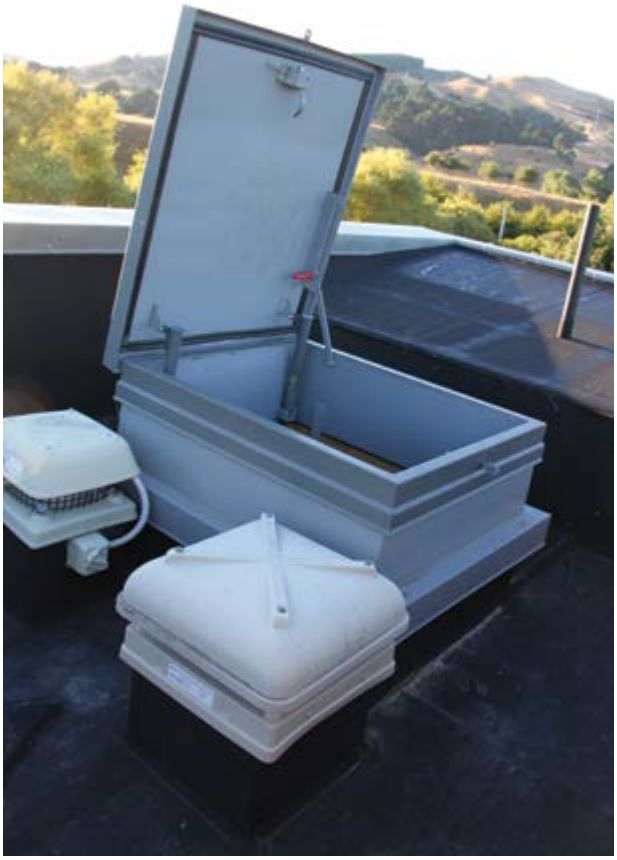
3.3.2 BIM enables a complete integration of materials, components, services and equipment and also provides for the planning, management, monitoring and recording of maintenance requirements of the building, services and equipment.



Cleaning access for ducts.



Retrofitted panel to allow access to automatic door motor.



Proprietary roof hatch to provide waterproof, secure and safe roof access.

3.4 METADATA

3.4.1 In the context of building management and maintenance, metadata refers to the collection and storage of data about elements and components of a building. The data can then be used to analyse and make decisions about ongoing maintenance on the building.

3.4.2 Metadata information such as the properties and attributes of products and materials used in the building may be added to objects in the BIM model. This also provides additional information for use in schedules of materials and quantities.

3.4.3 Metadata can assist in assessing the cost of operating, maintaining and repairing a building by:

- recording repairs and maintenance costs and operations of each element or component in a consistent way
- ensuring operating costs are separate from capital item costs
- ensuring that, within the operating costs, repairs/maintenance and operations are separate so operating efficiencies and inefficiencies can be identified
- providing guidelines for the most appropriate interventions at the most appropriate times
- helping to determine the optimal replacement time of an element or component.

3.4.4 A metadata standard provides managers with a specification standard for asset management that facilitates the analysis and planning of the building's repair and maintenance regime.

3.5 DESIGNING FOR SAFETY

3.5.1 Safety is another aspect that should be considered at the design stage of a building project to ensure that the design of the building enables construction and maintenance work to be carried out safely.

3.5.2 Safety in design requires identifying, eliminating or managing risks to building workers' health and safety. Examples include installing safety fittings such as anchor points on roofs and designing plant that can be accessed safely during construction and maintenance.

3.5.3 Incorporating safety features provides a number of benefits, including:

- improved worker safety
- improved usability of structures
- improved productivity
- reduced costs
- innovation – designing for safety requires new thinking.

3.5.4 Designing for safety can also enable better prediction and management of operational costs throughout the life of a building.

4 MAINTENANCE PLANNING

4.0.1 Maintenance planning should be an integral part of all building projects and begin at the design stage of the project.

4.0.2 An effective maintenance programme can provide benefits including:

- protecting the asset value of the building
- protecting the quality of the building
- maintaining the utility and functionality of internal spaces
- optimising the serviceable life of building components
- maintaining statutory building safety and sanitary provisions
- planning for ongoing expenditure
- maintaining the wellbeing of building occupants.

4.0.3 There are two levels of maintenance:

- Short-term maintenance includes daily, weekly or monthly maintenance of essential features such as cleaning and servicing equipment.
- Long-term maintenance is generally for a period of at least 10 years and determines how the building is going to be maintained in the future.

4.1 MAINTENANCE STRATEGIES

4.1.1 The complexity of a maintenance plan depends on the building it applies to, but a number of strategies can be used. For most buildings, a comprehensive maintenance plan will use different planning and evaluation methods to form the overall maintenance strategy.

4.1.2 Building maintenance can be categorised as:

- condition-based or preventive maintenance
- predictive maintenance
- emergency or response-based maintenance.

4.1.3 Condition-based or preventive maintenance is based on regular inspections or monitoring of building elements at predetermined intervals to reduce the likelihood of failure – for example, a regular painting programme. It is considered the most cost-effective maintenance planning system as maintenance is planned and scheduled, avoiding or reducing the likelihood of failure.

4.1.4 Predictive maintenance is based on the ability to detect a potential failure and undertake the maintenance before failure occurs. This allows optimum repair intervals to be set and can avoid costly unscheduled downtime. It tends to require a higher level of planning than preventive maintenance.

4.1.5 Emergency or response-based maintenance is work that must be carried out immediately for health, safety, security or structural reasons – for example, a broken sewer pipe or repairing damage after a storm. It is considered the least effective way to maintain elements and equipment, because in addition to higher costs, there is cost from the interruption and loss of service to other building functions.

4.2 FUNCTIONAL AND PHYSICAL OBSOLESCENCE

4.2.1 Functional obsolescence refers to the reduction of an element, component or plant's usefulness or ability to perform effectively. Physical obsolescence refers to the deterioration where an element, component or plant can no longer be maintained. In some situations, the obsolescence occurs because alternatives are available that perform better or are cheaper or because user requirements have changed.

4.2.2 In all situations, obsolescence should be factored into maintenance strategies and planning.

4.3 PREPARING A MAINTENANCE PLAN

4.3.1 The complexity of a maintenance plan depends on the building it applies to, but when preparing any maintenance plan, the following should be considered for all buildings:

- The relationships between all the constituent parts of a building such as plant, elements, building envelope and so on.
- The impact of failure of part of the building or a building service on the overall function of the building.
- The building's location and the effect of the environment on materials and finishes.
- How materials, finishes, components and elements deteriorate and how failure may occur.
- How to anticipate and prevent or limit the effect of failure.
- The role maintenance plays in reducing failure or loss of function from occurring.
- The estimated costs of planned maintenance.

4.4 RECORDING THE ASSET

4.4.1 The first step in designing a maintenance plan is to record the asset. For both new and existing buildings, information should include:

- building plans showing the location of all elements and services
- the condition of the building
- details of services including manufacturer/supplier, contact details, age and date of installation and services history (where relevant)
- maintenance/services requirements
- names and contact details of maintenance tradespeople.

4.4.2 For an existing building, this should involve assessing and recording the existing condition and the cost of bringing it up to the required standard, if required. A record of previous maintenance work should be included. An example of a condition assessment for a simple warehouse building is shown in Table 1.

4.4.3 For more-complex buildings, a condition assessment may be based on building and property asset management guidelines provided by the local authority. Alternatively, there are asset management advisors who manage and maintain buildings on behalf of building owners.

4.5 PRIORITISING MAINTENANCE WORK

4.5.1 Deferred maintenance should be prioritised, and a comprehensive maintenance plan should be developed.

4.5.2 Maintenance work may be broken down according to priority levels as follows:

- Priority 1 – work that must be done immediately as the condition and function of the item or the

building is seriously impaired and the health and safety of occupants may be at risk. Priority 1 should cover all maintenance work for the building to continue to meet statutory or legislative requirements.

- Priority 2 – work that should be done as soon as possible as the condition or function of the building and/or plant will be impaired.
- Priority 3 – work that can be left for 6–12 months without causing or resulting in further deterioration or loss of function.
- Priority 4 – work that can be left for up to 3 years without causing or resulting in further deterioration but will still require regular cleaning and condition inspections.
- Priority 5 – items that will not need to be undertaken for at least 5 years but will still require regular cleaning and condition inspections.

5 SETTING UP A BUILDING-SPECIFIC MAINTENANCE PLAN

5.0.1 A maintenance plan can be set up in a number of ways, from a simple bar chart or spreadsheet to the use of sophisticated computer-based systems. As building complexity increases, maintenance plan details also increase.

5.1 MAINTENANCE PLAN FOR A SIMPLE BUILDING

5.1.1 For a simple warehouse building (steel portal frame construction, prepainted, profiled zinc/aluminium alloy-coated steel roofing and cladding, aluminium joinery, one toilet and staffroom facilities, sprinklered), the maintenance plan will be very simple. An example of some elements of a maintenance plan is shown in Table 2. While an independent qualified person (IQP) must carry out the statutory inspections of the specific services required for the BWOF, specific skills are not required to develop and manage a maintenance plan.

5.2 MAINTENANCE PLAN FOR A COMPLEX BUILDING

5.2.1 As buildings become larger and more complex and include more services, the development of a maintenance plan also becomes more difficult. The task may be simplified by breaking the plan into separate sections.

Table 1. Sample condition assessment for a simple building – XYZ Warehouse Company.

Element	Material	Finish	Assessed condition	Date
Roof cladding	Trapezoidal profile, zinc/aluminium alloy-coated steel	Prepainted	Good	
Wall cladding	Trapezoidal profile, zinc/aluminium alloy-coated steel	Prepainted	Good – annual manual washing, 6-month manual washing where rain washing does not occur (under eaves, fascias, sheltered areas)	
Flashings/fascias	Zinc/aluminium alloy-coated steel	Prepainted	Good – regularly washed	
Gutters/downpipes	Zinc/aluminium alloy-coated steel	Prepainted	Good – replaced 2020	
External wall structure – warehouse	Steel portals/framing	Intumescent coating	Good	
External wall structure – offices	Steel portals/framing	Plasterboard over steel framing	Good	
Internal wall structure	Steel framing	Not applicable	Not assessed	
Internal linings – offices	Plasterboard	Painted	Requires repainting	
Flooring – offices	Concrete	Carpet	Good – replaced 2020	
Flooring – warehouse	Concrete	Unfinished	Minor abrasion damage	
Fire exit doors	LVL core with marine ply facings	Painted	Requires repainting (interior and exterior), closers good	
Industrial doors	Zinc/aluminium alloy-coated steel	Prepainted	Good	
Windows	Aluminium	Powder-coated	Good	
Toilet wall linings	Prefinished panels		Good	
	Plasterboard	Painted	Repainted 2020	
Toilet floor finishes	Concrete	Vinyl	Good – replaced 2020	
Fire alarms	XYZ brand	N/A	Replaced 2019	

5.2.2 Each section and area of the responsibility for it should cover a specific aspect of the building, but one person must have full oversight and understanding of the whole building. Dividing the maintenance plan into sections or aspects of the building means that conflicts and overlaps are less likely to occur and maintenance work carried out by one trade is less likely to be undone by another trade. An example is a ceiling that has recently been painted but then requires new light fittings.

5.2.3 Sections may need to be further broken down to keep the maintenance plan at a manageable scale.

5.2.4 For a complex building, the maintenance plan will also need to include scheduled maintenance for air-conditioning/ventilation plant, active and passive fire protection systems, lifts, signage and so on.

6 REVIEWING AND UPDATING THE MAINTENANCE PLAN

6.0.1 The maintenance plan must be reviewed regularly to monitor the maintenance and ensure that it is being carried out as and when required.

6.0.2 A regular review of a maintenance plan will also identify:

- where the maintenance work was not required as scheduled
- areas where building condition is behind or ahead of the desired condition level
- an analysis of the cost-effectiveness of the maintenance.

6.0.3 Adaptations may need to be made to accommodate changing circumstances such as a change of tenants or a change of use of all or part of a building. This ensures that the maintenance plan remains a dynamic rather than a static working tool.

7 SERVICEABLE LIFE OF BUILDING COMPONENTS

7.0.1 Predicting the serviceable or in-use life of building materials and components is essential to setting up a maintenance plan but can be difficult to do.

Table 2. Sample maintenance plan for a simple building – XYZ Warehouse Company.

Tasks	Frequency	2023	2024	2025	2026	2027
Cleaning						
Toilets and office	Daily					
Windows outside	3 monthly					
Windows inside	3 monthly					
Review cleaning contract	Annually (June)					
External walls	Annually (March)					
Gutters	Annually (March)					
Building elements						
Wall and roof cladding	Annual inspection (March) – replace at 25 years (2048)					
Flashings/fascias	Replace at 25 years (2048)					
Gutters/downpipes	Replace at 15 years (2038)			Replace		
Carpet	Replace 10 yearly (2030)					
Toilets	Repaint 5 yearly			Repaint		
Office	Repaint 7 yearly	Repaint				
Industrial doors	Service annually					
Site						
Landscaping (mowing)	Monthly, weekly in spring					
Paving	Check condition annually					Reseal due
Services and safety						
Sprinkler system	Annual inspection by IQP (May)					
Final exit doors	Annual inspection by IQP (May)					
Automatic emergency warning system	Annual inspection by IQP (May)					
Emergency lighting	Annual inspection by IQP (May)					
Plan management						
Review and update plan	Annual review (March)					

7.0.2 Factors that may influence how long a material or component lasts include:

- physical environment – being in a coastal or industrial area can accelerate deterioration of materials
- occupant behaviour – heavy use in a building can shorten the life of material and finishes
- building use – elements in a building used to store a corrosive product such as fertiliser are likely to have a reduced serviceable life
- climatic conditions – an air-conditioning system that is used continuously will require more-frequent maintenance than one that is intermittently used
- building design – plant or equipment in an accessible area is likely to receive more-regular maintenance and cleaning than plant or equipment in an inaccessible area
- material selection – some materials are more durable than others and require less-frequent maintenance than others.

7.0.3 Table 3 gives estimations of the serviceable life for a range of wall and roof claddings in a moderate environment, assuming no damage has occurred and regular maintenance is carried out.

8 PROVIDING DETAILS OF MAINTENANCE REQUIREMENTS

8.0.1 Under the Building Act, when residential building work is complete, contractors are required to provide details of maintenance requirements and guarantees and warranties to the building owner.

8.0.2 At the completion and handover of any new residential building, under the Building (Residential Consumer Rights and Remedies) Regulations 2014, the contractor must provide the building owner with:

- a copy of any current insurance policy they hold for building work completed under the contract (but not policies that have expired)
- copies of any guarantees/warranties for materials or services including information about how to make a claim, whether or not the guarantee/warranty is transferable and whether it must be signed and returned to the company that issued it
- an explanation of the maintenance work that must be done – this is essential if work is required for compliance with the Building Code to meet guarantee/warranty requirements

8.0.3 Designers and contractors could comply with the regulations by providing a maintenance guide and log to assist maintenance planning. For residential buildings, the guide should cover the exterior maintenance such as:

- clearing roof gutters
- inspecting roof flashings/membranes/claddings
- cleaning and recoating roof and wall finishes
- inspecting window and door flashings and glass seals
- inspecting and replacing sealants
- keeping base ventilation clear.

8.0.4 When a maintenance guide is provided, it is likely to result in a building owner having a better awareness of maintenance issues and undertaking regular maintenance of their home.

8.0.5 Under the Unit Titles Act 2010, a body corporate is responsible for maintaining and repairing common areas, building elements and infrastructure that are shared by or affect two or more units. This must be assessed in advance and budgeted for. The Act requires that all bodies corporate have a long-term maintenance plan that covers common areas, building elements and infrastructure of the development as well as any additional elements that the body corporate determines. The Unit Titles Act 2010 was amended in 2022, with one of the purposes of the amendments being to ensure that planning and funding of long-term maintenance projects is adequate.

9 RESOURCES

BRANZ

Designing for maintenance

Ministry of Business, Innovation and Employment

Managing buildings

New Zealand Asset Management Support

NAMS Property Manual – online guide to capital asset management

Table 3. Indicative serviceable life for selected wall and roof claddings.

Wall claddings in moderate environment	Estimated life with maintenance (years)	Major maintenance periods (for example, painting) [1]
Clay brick veneer	80+	Replace at end of serviceable life
Concrete brick veneer	60–80	Replace at end of serviceable life
Plastered brick	60–80	Reapply external protective coating every 12–15 years, then replace at end of serviceable life
Fibre-cement sheet 7.5 mm, texture-coated finish	40–50	Reapply external protective coating every 8–10 years, then replace at end of serviceable life
Fibre-cement sheet 9.0 mm, no coating	20–30	Replace at end of serviceable life
Fibre-cement plank, paint finish	40–50	Repaint every 8–10 years, then replace at end of serviceable life
Timber weatherboard, radiata pine, H3.1 treated, 150 mm, paint finish	70–90	Repaint every 7–9 years, then replace at end of serviceable life
Timber weatherboard, cedar, 150 mm	30–40	Replace at end of serviceable life
PVC weatherboard	40	Replace at end of serviceable life
Stucco, painted	60–90	Repaint every 12–15 years, then replace at end of serviceable life
EIFS 60 mm EPS, mesh, plaster, paint finish	40–50	Reapply protective finish every 8–10 years, then replace at end of serviceable life
Ply sheet 12 mm H3, bandsawn, no coating	30–40	Replace at end of serviceable life
Ply sheet 12 mm H3, bandsawn, painted	50–60	Repaint every 7–9 years, then replace at end of serviceable life
Natural stone veneer	70–80	Replace at end of serviceable life
Steel sheet 0.4 mm, zinc/aluminium coated, corrugated/low rib, paint finish (prepaint or in situ)	50	Manual washing every 6-12 months (high-risk and unwashed areas – every 3 months), repaint 15 years (prepainted) then 10–12 years, replace at end of serviceable life
Steel sheet 0.4 mm, zinc/aluminium coated, corrugated/low rib, unpainted	50	Manual washing every 6–12 months (high-risk and unwashed areas – every 3 months), replace at end of serviceable life
Steel sheet 0.55 mm, zinc/aluminium coated, corrugated/low rib, paint finish (prepaint or in situ)	50	Manual washing every 6–12 months (high-risk and unwashed areas – every 3 months), repaint 15 years (prepainted) then 10–12 years, replace at end of serviceable life
Roof claddings in moderate environment		
Steel 0.40 mm, zinc/aluminium coated, no paint	25–35	Manual washing every 6–12 months (high-risk and unwashed areas – every 3 months), replace at end of serviceable life
Steel 0.40 mm, zinc/aluminium coated, prepainted, corrugated	50–60	Manual washing every 6–12 months (high-risk and unwashed areas – every 3 months), repaint 15 years (prepainted) then 10–12 years, replace at end of serviceable life
Steel 0.55 mm, zinc/aluminium coated, no paint, corrugated	25–40	Manual washing every 6–12 months (high-risk and unwashed areas – every 3 months), replace at end of serviceable life
Steel 0.55 mm, zinc/aluminium coated, prepainted, corrugated	50–60	Manual washing every 6–12 months (high-risk and unwashed areas – every 3 months), repaint 15 years (prepainted) then 10–12 years, replace at end of serviceable life
Aluminium 0.70 mm, no applied coating, high rib	70	Manual washing every 6–12 months (high-risk and unwashed areas – every 3 months), replace at end of serviceable life
Aluminium 0.90 mm, no applied coating	80	Manual washing every 6–12 months (high-risk and unwashed areas – every 3 months), replace at end of serviceable life
Concrete tiles	60–80	Replace at end of serviceable life

Notes

1. Maintenance periods are indicative only. In all cases, the maintenance recommendations of the product manufacturer or supplier should be followed.

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