BUILDING PERFORMANCE

Guidance

Guide to tolerances, materials and workmanship in new residential construction **2015**

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Acknowledgements

The Ministry of Business, Innovation and Employment (MBIE) acknowledges the following organisations for providing information and feedback in the development of this guide.

- Architectural Designers New Zealand (ADNZ)
- Association of Wall and Ceiling Industries, New Zealand (AWCI)
- BRANZ Ltd
- Brick and Blocklayers Federation of New Zealand (BBFNZ)
- Canterbury Registered Master Plasterers and Tilers Association
- Cement and Concrete Association of New Zealand (CCANZ)
- Certified Builders Association of New Zealand (CBANZ)
- Consumer New Zealand
- Landscaping New Zealand (LIANZ)
- Master Painters New Zealand (MPNZ)
- Metal Roofing Manufacturers Association (MRMA)
- National Kitchen and Bathroom Association of New Zealand (NKBANZ)
- New Zealand Institute of Architects (NZIA)
- New Zealand Institute of Building (NZIOB)
- New Zealand Institute of Building Surveyors (NZIBS)
- New Zealand Stone Masons (NZSM)
- New Zealand Timber Industry Federation (NZTIF)
- Registered Master Builders Association (RMBA)
- Roofing Association of New Zealand (RANZ)
- Specialist Trade Contractors Federation (NZSTCF)
- The Australian Housing Industry Association (HIA)
- The Victorian Building Authority (VBA)
- Window Association of New Zealand (WANZ)
- Wood Processors and Manufacturers Association (WPMA)

THIS DOCUMENT'S STATUS

ISBN 978-0-478-43380-7 (Online)

Published May 2015

Ministry of Business, Innovation and Employment
PO Box 10-729, Wellington, New Zealand.

This document is issued as guidance under section 175 of the Building Act. It is not mandatory to refer to this guide in contracts if used, and adherence with this guidance does not relieve any person of the obligation to consider site specific issues.

This guide is a first edition and does not cover all building products and systems or all potential defects. There are areas where what constitutes acceptable tolerances, materials and workmanship are not yet well-defined or are not included in relevant standards or codes of practice. The guide will be updated as more information comes available, and as a result the latest edition of this guide should be used.

New Zealand Government

Contents

Glossary

WORD	DEFINITION	REFERENCE
Arris line	A natural or applied line on a stone from which all levelling and plumbing is measured; an edge at the intersection wof two planes.	Building Stone Institute[1]
Batter	1. Stable formed slopes of earthworks. 2. The slope of a wall or buttress built at an inclination to the vertical plane.	NZMP 4212: 1998 – Glossary of Building Terminology
Bituminous	Bitumen: A generic term applied to substances composed principally of hydrocarbons and sometimes associated with mineral matter. The term is restricted to bitumen products derived from natural bitumen, and to residual bitumen derived in the process of petroleum distillation. Coal tar and mineral pitch materials though of similar basic characteristics are usually classified under tar and pitch.	NZMP 4212: 1998
Course	Horizontal layer of bricks, stones or blocks, or a row of slates or tiles.	NZMP 4212: 1998
Cupping	Cup: A deviation at 90° to the longitudinal direction of a piece causing the surface to curve away from its intended flat plane.	AS/NZS 4491: 1997 – Timber – Glossary of terms in timber-related Standards
Drumminess	Drumming: Separation of layers in cement or tiled work.	NZMP 4212: 1998
Efflorescence	The formation of a white crystalline deposit on the surface of concrete, brickwork, masonry or plaster due to the evaporation and crystallisation of the alkaline salts which may be contained in the building materials.	NZMP 4212: 1998
Interpolate	Insert (an intermediate value or term) into a series by estimating or calculating it from surrounding known values.	Oxford Dictionaries [2]
Jamb	A vertical side member of a door frame, door lining, or window frame.	NZMP 4212: 1998
Proud	Slightly projecting from a surface.	Oxford Dictionaries [3]
Scriber	A piece of material marked and shaped to fit the end or edge of a piece of material to an adjoining surface.	NZMP 4212: 1998
Spalling	Spall: To break away at the edges of stone or other masonry materials, through weathering, or chemical action, or excess loading.	NZMP 4212: 1998
Substrate	An underlying substance or layer.	Oxford Dictionaries [4]

1 www.buildingstoneinstitute.org/technical-stone-information/rock-knowledge/glossary-of-terms/, accessed 24 February 2015.
2 www.oxforddictionaries.com/definition/english/interpolate, accessed 25 February 2015.
3 www.oxforddictionaries.com/definition/english/proud?q=Proud, accessed 25 February 2015.
4 www.oxforddictionaries.com/definition/english/substrate, accessed 25 February 2015.

Introduction

Purpose

This guide has been prepared by the Ministry of Business, Innovation and Employment (MBIE) to provide assistance to contractors and home owners who may be unsure of what constitutes a defect for the purposes of the Building Act 2004. This guide mainly covers aesthetic issues rather than issues of non-compliance with the Building Code. Non-compliance with the Building Code is dealt with through other avenues. If any Building Code issues appear to have been missed by the consent and inspection process, these should be notified to the relevant Building Consent Authority (Council) in the first instance.

This guide focuses on issues that can lead to disputes between building contractors and home owners but fall outside the Building Code, contract documentation and manufacturers' specifications and installation instructions. It outlines what constitutes acceptable levels of workmanship in standard domestic construction types under normal conditions, and is targeted at new residential building work. This guide has been developed in cooperation with an advisory group from the construction industry and a consumer representative. It draws on existing industry norms for workmanship set out in New Zealand Standards and trade publications.

Introduction of new consumer protection measures

The Building Amendment Act 2013 introduced new consumer protection measures which came into force on 1 January 2015. These measures are set out in Part 4A of the Building Act 2004 (sections 362A to 362V) and re-enact the previous 'Implied terms of contracts' (sections 396 to 399).

The implied warranties for building work in relation to household units (section 362I) include that the building work will be completed:

a. in accordance with the plans/ specifications and building consent;
b. in a proper and competent manner;
c. with materials that are suitable for the purpose for which they will be used;
d. with new materials, unless otherwise specified;
e. in accordance and in compliance with all laws and legal requirements, including (but not limited to) the Building Act and the regulations;
f. with reasonable skill and care;
g. by the date (or within the period) specified in the contract or, if no date or period is specified, within a reasonable time;
h. to be fit for occupation on completion of the building work if it intended to be occupied on completion of that building work;
i. so that the work is reasonably fit for the notified purpose.

The implied warranties cover almost all aspects of the building work from compliance with the Building Code, to fitness for purpose and completing work by the agreed date. The implied warranties are part of every residential building contract, whether or not the contract refers to them – the implied warranties also apply even if there is no written contract.

The measures also include a new 12 month 'defect repair period' (section 362Q) which places stronger obligations on building contractors than previously to fix any defects in residential building work[5] that they are notified of within 12 months of completion. This includes all the work covered by the residential building contract, including work done by a subcontractor. The 12 month period starts from the completion of the building work under a written contract or the completion of the physical building work in cases where there is no written contract.

5 The "building work" contemplated in this guidance document includes any construction work done on a house or other structures such as garage, retaining walls or fences. It includes work like painting/decorating and landscaping if it is part of the construction work. If the work is only re-decorating and there is no construction work involved, it is not "building work" for the purposes of this guide.

The difference in the 12 month period compared to previous obligations is that if the building contractor is notified of the defect within 12 months of completion, the onus of proof is on the building contractor to prove that work is not defective, or that any defective work is through no fault of their own or their subcontractors.

For example, if an owner[6] notifies the building contractor of what is thought to be defective work, the building contractor is obliged to remedy the work within a reasonable amount of time or prove that it is not defective. The building contractor must remedy any defective work, including repairing or replacing defective materials used in the building work so that the building work is fit for purpose, and is of the quality and standard agreed.

The 12 month period relates to the amount of time the owner has to provide the written notification to the building contractor. It does not relate to the amount of time the building contractor has to remedy the defective work. The amount of time required will depend on the nature of the defect and the work required to remedy it, but as stated above, it must be remedied within a reasonable amount of time after notification.

After the 12 month period has ended, the implied warranties and remedies in the Building Act still apply (for the remaining nine years of the 10-year limitation period); the 12 month notification provisions do not replace existing implied warranties for building work or general remedies for breaches of implied warranties. However, after the 12 month period has ended the obligation to repair is not automatic and the onus is on the owner to show the building work is defective. Owners may also have redress through the Fair Trading Act 1986, the Consumer Guarantees Act 1993 or under contract and tort law[7].

The 12 month period does not apply to work carried out before 1 January 2015 or if the building contract was signed before 1 January 2015.

Potential clients should take advice from both lawyers and building professionals before entering into building contracts.

Further information on the consumer protection measures can be found on the **Ministry of Business, Innovation and Employment's Building and Housing information website**. Guides on the new consumer protection measures for both **contractors** and **consumers** can be downloaded from the website. The site also contains other resources such as the **mandatory checklist**, the **prescribed disclosure statement template** for contractors to provide their clients, and **information on the complaints process**.

6 The term *"owner"*, as used in this document, replaces the term *"client"* as defined in s362R.

7 For more information on the Fair Trading Act and Consumer Guarantees Act see http://www.comcom.govt.nz/fair-trading/ or http://www.consumeraffairs.govt.nz/for-consumers/law

Establishing Acceptable Tolerances

Where an owner raises an issue with the contractor, the process for determining if it is a 'defect' should refer to (in order):

1. the contract, drawings, specifications and schedule of quantities if relevant
2. the building consent and supporting documentation supplied to the Council
3. manufacturers' specifications and installation instructions
4. the building contractors' defect tolerance schedule where its use was agreed to in the contract
5. any relevant NZ Standard
6. this guide.

Compliance with the Building Act (including the new consumer protection measures) and the Building Code is mandatory. It is not mandatory to refer to this guide in contracts (if used) – the building contractor and owner can agree to use other documents or standards to define what constitutes acceptable tolerances, materials and workmanship.

For example, where a consumer buys a house from a building company or developer based on viewing one of their show homes of similar design, materials and specification; the tolerances and workmanship evident in the show home would constitute the agreed level at handover unless otherwise specified. Sample panels of claddings or linings could also be used to establish an agreed level of finish.

Designers and building contractors are reminded of the need for consent documentation to include appropriately worded quality standards to assist in defining contractual obligations, as this will both minimise and also more rapidly resolve disputes.

Where an owner has a requirement or expectation of tolerances and finishes above industry norms, this should be explicitly communicated and included in the construction contract. It is best for the owner to discuss their requirements with their designer before completion of the design. A higher quality of work, for instance the desired levels of finish and flatness, may require changes to the underlying building structure; it is easier and more affordable to plan for this during design than to make changes during the construction process.

What is a defect?

This guide is concerned with defects that fall within section 362Q of the Building Act i.e. those that a contractor would be required to remedy if notified within 1 year of completion of the building work.

A defect can be defined in a number of ways including:

- non-compliance with the Building Code
- non-agreed variations from consented drawings
- failure to meet agreed contractual specifications
- premature product failure
- this guide focuses on failure to achieve acceptable industry levels of quality or performance on items not covered by the first 4 bullet points

What constitutes a defect will change over time with fair wear and tear, settlement, weathering, and aging of materials. Therefore, what may be a defect at handover may not constitute a defect after 12 months. For example, deep scratching to a polished wood floor is a defect at handover, but may not be several months later due to fair wear and tear.

If the owner believes they have identified a defect, they should talk to their building contractor in the first instance about the issue and how to resolve it.

If the contract, specifications and consent documentation do not provide sufficient information to enable the owner and building contractor to agree, the issue may be covered by an existing New Zealand Standard, industry code of practice or this guide. Where an issue is raised which is not covered by any of these sources of information, professional advice may be needed to establish if the issue is a defect and how it should be rectified.

If the defect is suspected or known to be a Building Code compliance issue, the next step should be to contact the relevant council that issued the building consent or code compliance certificate. For issues relating to the contract, seek independent legal advice.

It is common for variations[8] (both minor and major) to occur during a construction project. It is important the owner's instructions or agreement to variations proposed by the designer or building contractor are recorded to avoid differences in expectations and potential disputes.

While the building contractor is required to remedy defects notified within one year of completion of the building work, the building contractor is able to pursue the usual routes of redress for faulty products or substandard workmanship of subcontractors. However, section 362M of the Building Act requires defects to be remediated within a reasonable amount of time.

8 Changes to the agreed scope of building work, whether or not those are captured as a formal amendment or minor variation to the consent.

What is not a defect?

The defects covered in this guide are specific to those resulting from the actions (or inactions) of the building contractor. A building contractor can only be held liable for work done within the construction contract, and by the specialist trades they have commissioned. A building contractor cannot be held liable for work or damage caused by the owner, occupier, or by another person contracted separately by the owner to complete a certain task.

The building contractor cannot be held liable for an event that is not attributable to the building contractor, including:

- damage that occurs outside of human control – e.g. natural disaster
- damage done by a person outside of the building contractor's control
- damage resulting from a failure to undertake normal maintenance
- damage resulting from a failure to carry out repairs as soon as practicable after the defect becomes apparent (section 362S).

Where an owner requires a building contractor to carry out work the building contractor knows will result in a less than satisfactory finish or outcome for one or both parties, this should be put in writing to the owner before commencing such work.

Dissatisfaction with an outcome that is installed to specification and to a reasonable standard (as outlined in this guide) is not a defect. For example, an owner cannot expect a level 5 plaster finish if the specification called for a level 4 plaster finish.

ISSUES EMERGING OVER TIME

Over time, buildings are subject to the weather, shaking from traffic, minor earthquakes and ground settlement. These result in gradual deterioration of materials (particularly exterior cladding and exterior timbers used in decking, fencing and pergolas etc.), and often development of non-structural cracks at joints and junctions in sheet materials (particularly internal wall and ceiling linings). Unless otherwise agreed in the contract, provided these remain within the tolerances found in relevant parts of this document, they are not considered defects.

Where issues emerge after the 12 month defect notification period, these may still be covered under the implied warranties or other legislation (see *Introduction of new consumer protection measures)*.

OCCUPANT ACTIVITIES

Misuse of a building by occupants can impact on and lead to early deterioration of some finishes and linings. Examples of this include:

- failing to ventilate spaces used for sleeping, cooking, bathing and drying clothes will generate large amounts of moisture which can lead to condensation and mould on walls and ceilings
- allowing water to sit on timber-based flooring such as parquet and strip flooring can lead to swelling and buckling of the flooring
- cracking/peeking and popping of plasterboard due to movement can be caused by excessive heating.

When caused by occupant activities, these are not considered workmanship or material defects.

Damage caused by occupants is not considered a defect unless it is caused by an underlying defect (e.g. a "drummy" floor tile that breaks due to insufficient adhesive bedding). In general, reasonable wear and tear or damage to a house resulting from occupant use or abuse is not considered a defect.

Damage caused by the actions of an owner or occupant (such as a cracked tile resulting from an item being dropped on it or damage from an overflowing bath or shower) are not a defect that a building contractor is responsible for remedying.

MAINTENANCE REQUIREMENTS

All buildings require on-going maintenance. This requirement should be expected and it is the responsibility of the building owner to ensure it is carried out in a timely manner. Normal maintenance is defined in the Building Code as work generally recognised as necessary to achieve the expected durability for a given building element. The extent and nature of that maintenance will depend on the material or system, its geographical location and position within the building, and can involve the replacement of components subject to accelerated wear.

On completion of the building contract, the building contractor is required to provide the client with information about the processes and materials to be used to maintain any element of the building work where maintenance is required in order to meet the durability requirements of the Building Code and/or to ensure any applicable guarantee or warranty remains valid (section 362T). Failure to carry out this maintenance will limit the owner's ability to seek redress from the building contractor or product supplier if a defect subsequently occurs.

Any issues that arise through a lack of maintenance to building elements, materials, appliances or fixtures, do not represent unacceptable workmanship in the original work.

In addition, any inappropriate maintenance carried out subsequently does not represent unacceptable workmanship in the original work.

Where the correct maintenance is undertaken, but the output still fails to meet the expected performance, the building work is unacceptable.

The Building Code sets minimum requirements for the durability or lifetime of parts of a building (**www.dbh.govt.nz/codewords-21-article-7**). For example, easily replaceable non-structural items are required to be durable, with normal maintenance, for five years. However, depending on the nature of the item and its age, the owner may have redress through other avenues such as the Fair Trading Act or Consumer Guarantees Act.

DESIGN WORK

Design work, such as that carried out by Designers and Architects, is excluded from the consumer protection provisions of the Building Act discussed in this guide; however, it is included in other legislation. Restricted Building Work (i.e. anything that involves the building's primary structure, weathertightness, and design of fire safety systems) is required to be undertaken or supervised by Licensed Building Practitioners (LBPs), and must conform to the LBP Rules 2007 and other relevant provisions within the Building Act. Complaints about design work or the conduct of a Designer or Architect should be referred to the **Building Practitioners Board** for consideration[9]. Complaints may also be referred to professional membership body/ies that the designer or architect is a member of – e.g. the New Zealand Institute of Architects, or Architectural Designers New Zealand.

9 Link to LBP website: www.business.govt.nz/lbp

Additions, Alterations and Remedial Work

This guide is targeted at new buildings as well as alterations and additions to existing buildings. However, matching existing materials and finishes and tolerances may be difficult or even impossible in additions, alterations and repairs. It is important to be conscious of common issues that can arise when matching old and new materials. For example, older existing building materials will likely be machined or manufactured in imperial sizing where new materials often have a smaller finished size as they are manufactured to metric dimensions. This is typically an issue with materials such as weatherboards, skirting, scotia and the like.

Where an exact match is impractical or cannot be guaranteed, a rational approach needs to be taken to determine the options and agreement reached on what are acceptable levels of workmanship. It is important the agreed acceptable levels are recorded in writing, preferably by noting it within the contract. This is particularly the case where a building has been subject to significant damage such as from earthquake, wind, fire or land subsidence. Tolerances, particularly for floor levels and walls out of plumb, are likely to be below those achievable with new buildings. MBIE has issued guidance on 'Repairing and rebuilding houses affected by the Canterbury earthquakes' which is available on the Ministry's website (**www.dbh.govt.nz/guidance-on-repairs-after-earthquake**). Owners who have insurance should also check their policy documentation to see if it describes the level of workmanship that the repairs will be done to. Not all policies require the remedial work to be exactly the same as if the building was new.

Where the building work is attached to an existing structure, the contractor will only be liable for the work they have carried out (including junctions and connections).

How to use this guide: Measurements

Inspecting surfaces and fixtures

While some aspects of materials and workmanship can be measured (e.g. length, height, depth, angle and scale), other aspects, such as variations in texture, colour, transparency, reflectivity and finish should be observed and assessed while in a normal viewing position.

A normal viewing position is at an unobstructed viewing angle of 45° or more, and if indoors with a uniform typical level of lighting (refer 'Critical lighting' in this guide). Normal viewing positions for specific materials are set out in various Standards or recommendations, and include:

MATERIAL	VIEWING POSITION	REFERENCE
Fixtures, fittings and bench tops	Standing at a distance of ≥ 600 mm	As agreed by working group
Bathroom and kitchen cabinetry	Standing at a distance of 600 mm to 1 m	As agreed by working group
Non-concrete floor finishes (including decking)	Standing at a distance of ≥2 m	As agreed by working group
Tiled surfaces	Standing at a distance of ≥2 m	As agreed by working group
Painted non-concrete surfaces	Standing at a distance of ≥2 m	AS/NZS 2311: 2009 – Guide to the Painting of Buildings
Glass (with a sky background)	Standing at a distance of ≥2 m	AS/NZS 4667:2000 – Quality requirements for cut-to-size and processed glass
Concrete or asphalt	Standing at a distance of 3 m	NZS 3114:1987 – Specification for Concrete Surface Finishes
Roofs	Standing at a distance of ≥3 m	Recommended by the Roofing Association of New Zealand.
Internal and external exposed architectural masonry feature walls	Not less than 6.1 m away in diffuse lighting[10]	ASTM C90-14 (2014) – Standard Specification for Loadbearing Concrete Masonry Units.

10 Where it is not possible to achieve this distance, specific issues which can be viewed at closer distances and that constitute defects are outlined in this guide under 'Concrete Masonry'

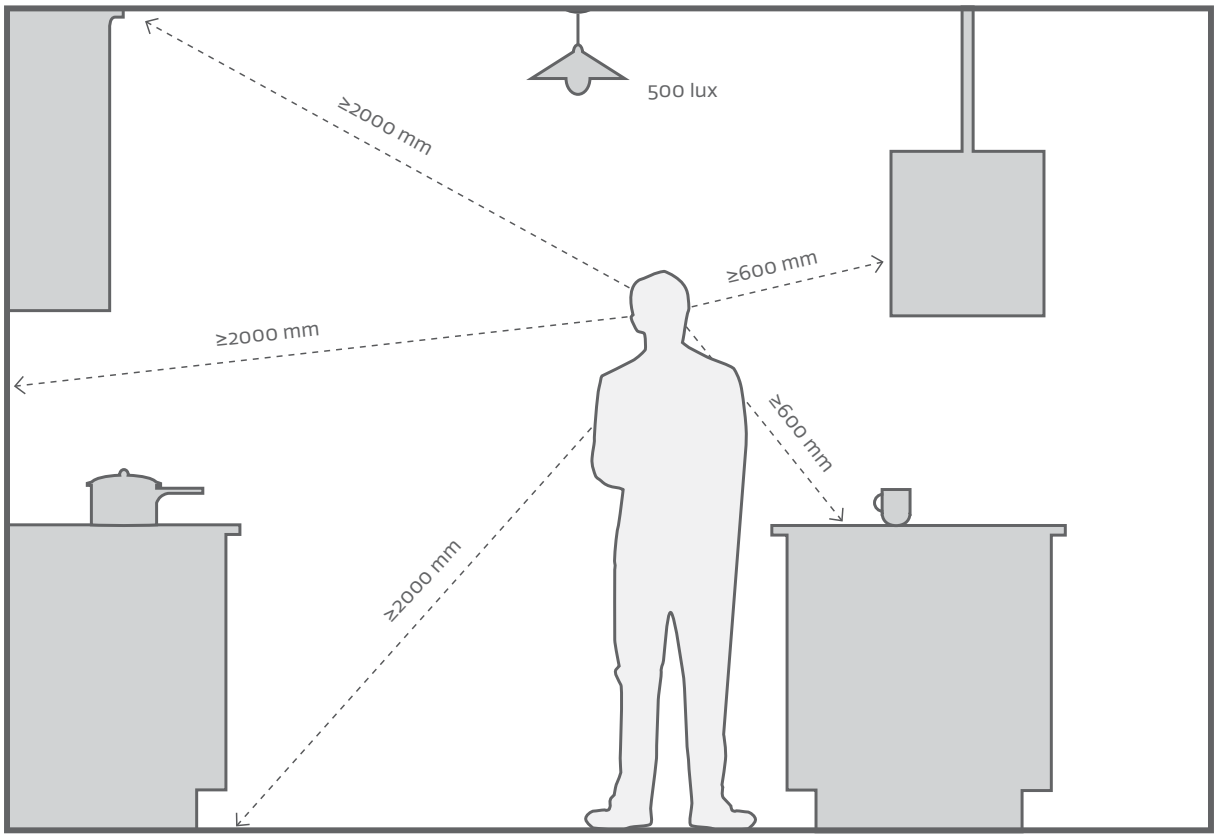

Figure 1 *Normal viewing positions vary depending on the type of surface being inspected.*

Critical lighting

Unless specifically outlined in the contract specifications, imperfections that are only visible under critical light do not indicate defective workmanship.

Critical lighting occurs when sunlight or an intense artificial light source strikes a wall or other flat surface at a low angle, typically 15° or less. Because of the low angle of the light any small variations or irregularities on the surface cast a relatively large shadow which can highlight imperfections that would not normally be visible under more diffused lighting conditions.

Critical lighting occurs naturally for a short period each day, typically 30–60 minutes in the early morning and late afternoon when the sun is low in the sky.

It is common practice to use high output lighting to accentuate areas requiring attention during the construction phase, but this level of lighting is not suitable for performing a subjective visual inspection of interior surfaces.

More information on critical lighting and its effects is available from:

- AS/NZS 2589:2007 - Gypsum linings - Application and finishing (particularly Appendix C)
- AWCIANZ Trade Guidelines and Information Booklet Oct 2012 (**www.awci.org.au/national-publications/trade-guidelines-information-booklet**)
- AWCIANZ Insight Newsletter: Critical light August 2014 (**awci.org.nz/critical-light/**

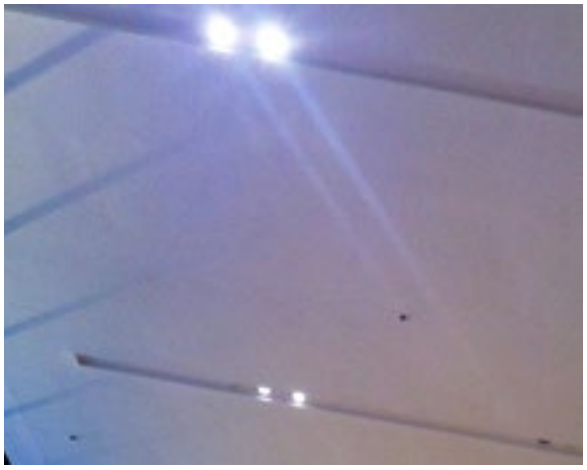

Figure 2 *Usual (or non critical) lighting on a finished ceiling. Source: AWCIANZ*

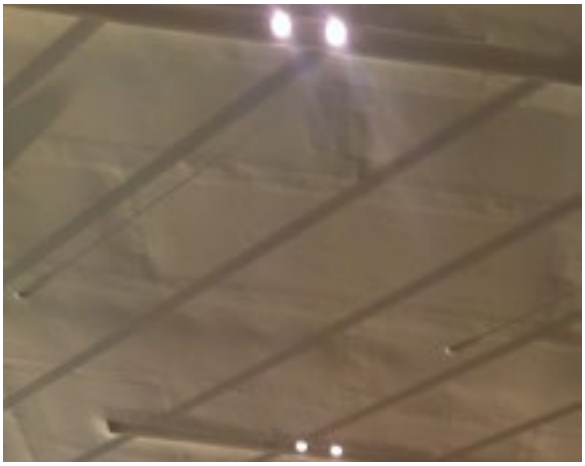

Figure 3 *Critical lighting from low level sun on the same finished ceiling. Source: AWCIANZ*

Interpreting tolerances

The tolerances in this guide apply up to and including the length over which each tolerance is stated to apply. It is not intended that tolerances will be interpolated (or proportioned) to the actual length of building element being measured.

For example, a 4 mm deviation measured over a 2 m length of wall surface means that the same 4 mm deviation is to be applied over a 1 m wall surface or a 500 mm wall surface. The tolerance cannot be interpolated to mean a 2 mm deviation over a 1 m wall surface or 1 mm deviation over a 500 mm wall surface. Similarly, deviations over longer wall surfaces would be unacceptable if the deviation exceeded 4 mm within any 2 m length of that surface.

Horizontal, vertical and diagonal surface tolerances are to be interpreted in the same way.

Derived from the "Guide to Standards and Tolerances 2015" with permission from the Victorian Building Authority.

Measuring variations

Surface variations or offsets are considered to be a deviation from a plane within a continuous flat or curved surface.

Deviations of a vertical surface from a true vertical plane should be measured from a plumb line through a plan position or reference point. The maximum deviation of a vertical surface from that plumb line should not exceed the deviation stated in this guide unless otherwise agreed.

Acceptable variations (+ or – the applicable tolerance as stated in this guide) across a horizontal surface should be measured across a given width of that surface typically 3 m. Where a 3 m length is not possible measurements should be taken from the highest or lowest point in the element being measured.

1. Landscaping and grounds

Unplanned or poorly planned landscaping can lead to a number of issues for new construction:

- Excavation should not be undertaken near a structure or foundations without first consulting an expert.
- Raised beds adjacent to the house should be taken into account at planning stage, as these can often block subfloor vents, direct water under the house or onto concrete floor slabs, and cause premature deterioration of cladding.
- Vegetation coming into contact with the house may lead to premature deterioration of finishes and materials. Planting close to a house raises the potential for roots to interfere with foundations and services.

The main contractor is not considered responsible for damage caused by landscaping features installed outside of the main contract, or landscaping-related defects resulting from a lack of maintenance.

The normal viewing position distance for concrete, paved or asphalt paths, patios and driveways is 3 m, and 2 m for timber decks.

1.1 Paving

Good long term performance of paving is reliant on the quality of the sub-base, and the underlying geology of the site.

1.1 PAVING	
COLOUR	
✗	Abrupt colour variations
✓	Paving blocks are mixed according to the manufacturer's recommendations so that the finished surface is appropriately varied in colour, texture and patterning.
LAYOUT/JOINTS	
✗	Joints are irregular or too large.
✗	Excess joint fill remaining on or extending above the surface of the block (unless otherwise specified).
✗	Joints are not evenly or properly filled.
✗	Paving blocks are uneven heights.
✗	The relative difference in height between adjacent pavers or flagstones is more than 2 mm (NZS3116:2002[11]).
✗	Landscaping reducing the required clearance between the cladding and the ground.
✗	Landscaping burying the house cladding.
✗	Landscaping diverting collected water against the cladding (unless this has been specifically designed for and included in the consented design).

11 NZS3116:2002 - Concrete Segmental and Flagstone Paving.

✓	Joints are 2–4 mm wide for rectangular or interlocking pavers.
✓	Joints are 4–10 mm (subject to size, style, and agreed specification) for large tiles and natural stone[12].
✓	Pavers are installed close butted without grout as per specification.
✓	2–4 mm joints for curves formed with cut pavers (for curves formed with uncut pavers, widths vary)
✓	Joint fill is flush with the paving surface or up to 10 mm below, and is consistent.
Note: Some paving designs, such as rough-cut and crazy paving, incorporate greater height and grout width differences and these should be expected.	
CRACKING	
✗	Cracking of individual paving stones on handover.

1.2 Retaining walls

1.2 RETAINING WALLS	
✗	Retaining wall is irregular, distorted, or shows signs of outward bowing or buckling.
✗	Water collects behind the retaining wall and does not drain.
✗	Water drains in locations contrary to design specifications under design conditions.
✗	Retaining wall allows the retained material through.
✓	Retaining wall with small gaps occasionally allows fine silt to pass through.
✓	Specified gaps between horizontal retaining wall members allow water drainage.
✓	Water collected behind a retaining wall drains as specified.
✓	Retaining wall leans into the slope it retains.

Figure 4 *Coarse fill passing through a timber retaining wall.*

12 Wider joints should be expected with irregular block sizes and shapes.

1.3 Asphalt driveways and paths

Damage caused by vehicles is the main contractor's responsibility if the damage occurred during work done as part of the contract. It is not the main contractor's responsibility if the damage was caused by trades or persons that do not fall under their contractual control.

1.3 ASPHALT DRIVEWAYS AND PATHS	
✗	Bituminous paving is gritty, patchy or discoloured.
✗	Isolated cracks in bituminous paving are more than 2 mm wide.
✗	Individual depressions are more than 3 mm deep.
✗	Individual mounds are more 6 mm high.
✗	Bituminous paving has obvious joints when viewed from the normal viewing position of 3 m.
✓	Paved surface has an even plane to within ±6 mm for every 3 m in any direction.
✓	Surface has a slight cross fall or camber to drain water.
✓	Depressions caused by a heavy vehicle after handover are not defects unless the driveway was specifically designed to take the load.
✓	Discolouring from oil from vehicles outside of the control of the main contractor.
✓	Scuffing of the surface due to low speed turning of vehicles outside of the control of the main contractor.
✓	Bituminous paving is continuous and free of obvious joints.
✓	Asphalt and bitumen patch repairs are darker than the existing surface at the time of repair (these will lighten over time).

1.4 Concreted driveways and paths

Damage caused by vehicles is the main contractor's responsibility if the damage occurred during work done as part of the contract. It is not the main contractor's responsibility if the damage was caused by trades or persons that do not fall under their contractual control.

1.4 CONCRETED DRIVEWAYS AND PATHS	
CRACKS	
✗	Unrepaired gaps greater than 3 mm wide.
✓	Cracks in a concrete driveway, patio or path up to 3 mm wide.
Note: Cracking in concrete is common and is not necessarily a sign of poor workmanship.	

FINISH	
✗	Concrete surface does not conform to the specified level of finish[13].
✗	Variations in surface texture (e.g. discolouration, unevenness or pitting) that can be seen from normal viewing position.
✗	Colour loss or fading resulting from recurring efflorescence.
✗	Abrupt changes and gradual variations on concrete surfaces exceed specifications for the relevant surface type as per NZS 3114:1987[14].
✓	A slight cross fall or camber to drain water.
✓	Other colour loss or fading.
✓	Discolouring from oil from vehicles outside of the control of the main contractor.
✓	Variations in surface texture which are not clearly visible from normal viewing position.

1.5 Timber decks

The performance of timber decking will vary depending on the species, dimensions and grade of timber used. Timber is a natural material and is subject to variability in appearance with knots and different grain angles. As timber wets and dries gaps will open and close. Cyclic shrinkage and expansion of timber decking should be expected with changes in temperature, humidity and the seasons. The degree to which it moves varies according to the species of timber, direction of grain, and how the timber was sawn from the log. The performance of the timber will also differ with the amount of exposure it is subjected to. Unfinished timber subjected to all day sun on the northern face will move more than finished timber located out of direct sun in a sheltered location.

The lower the quality of timber specified and the thinner the product, the greater the likelihood of splitting, surface cracks (checking), distortion developing and knots dislodging. The tolerances for movement increase as the quality of the wood decreases. In most cases the stability of the timber can be expected to increase with thickness. Suitably durable hardwoods can be expected to be reasonably dimensionally stable, although they will still experience expansion and shrinkage over the seasons. Premium grade softwoods will be slightly less stable than hardwoods. Merchant grade timber will generally experience the most movement and will generally be the least dimensionally stable.

For timber decks, closer joist spacings tend to reduce movement of decking boards, which in turn reduces the potential for issues.

Treated Pinus Radiata (pine) decking is commonly sold in either 19 mm or 32 mm thick lengths. NZS 3631: 1988[15] describes the allowable imperfections in softwood timber grades from “clears” through to “merchantable grade” when new. Note that some suppliers may sell other grades such as “premium” or “standard” which may not match the NZS 3631: 1988 grades. In these cases, consult the supplier for the particulars of these grades.

If any of the below defects are suspected, talk to the contractor in the first in stance.

13 More information on concrete finishes is available from: NZS 3114: 1987 - Specification for concrete surface finishes, and Concrete and Cement Association of New Zealand (CCANZ), Finishes: www.ccanz.org.nz/page/Finishes.aspx
14 NZS 3114:1987 - Specification for concrete surface finishes.
15 NZS 3631:1988 - New Zealand timber grading rules

1.5 TIMBER DECKS

CONSTRUCTION

✗	The deck surface slopes by more than 1:200, or 10 mm in 2 m of length.
✗	The deck surface deviates from level by more than 8 mm in any 3 m of length.
✗	Gaps are inconsistent across the deck.
✗	The difference in height between individual boards at butt joints is more than 3 mm.
✗	End joints are not staggered.
✗	Fixings are driven more than 2 mm below the surface (unless otherwise specified).
✗	Fixings are proud (unless otherwise specified).
✗	Rusting fixings.
✗	Timber decking is broken, split, cracked, or deteriorated on handover.
✗	End cracks and splits caused by fixings and/or that exceed 50 mm in length.
✗	Cupping is more than 3 mm per 100 mm width.
✗	Full depth splits through the timber develop within 12 months.
✓	Butt joints are tight when installed.
✓	Average gaps in butt joints are up to 6 mm during dry weather.
✓	Average gaps between adjacent decking boards range from 2–12 mm depending on the season (unless otherwise specified).
✓	Fixings align both along and across the decking to within ±3 mm.
✓	Timber decking should be the specified grade or better, and a minimum of merchant grade as outlined in NZS 3631:1988.
✓	Surface cracks (checking) and knots are within the range allowed in the specified timber grade when the deck is installed.
✓	For clears timber or premium grade, checks up to 2 mm width developing within 12 months are acceptable.
✓	Surface checking, knots cracking and/or dislodging and distortion in standard or merchantable grade decking, provided that the decking boards remain securely fastened.

Note: Gaps between adjacent decking boards depends on the species and grade of timber used.

FINISH

✓	Stains and oils fade over time.
✓	Fading, uneven weathering and silvering of unfinished timber over time.
✓	Mould growth on unfinished timbers is a natural occurrence.

Refer also to relevant manufacturer's specifications.

2 Flooring

2.1 Flooring generally

2.1 FLOORING GENERALLY	
✗	Floor level changes abruptly within a single floor plane.
✗	Differences in level between dissimilar types of floor, such as where a suspended timber floor meets a concrete slab floor, exceeds: › 10 mm at internal doorways where there is a graduated change (e.g. carpet or tile edging bars), unless a ramp is specified. › 2 mm where the floor plane is intended to be flush.
Note: Changes in surfaces should be clearly discernible.	

2.2 Concrete floors

The normal viewing position distance for concrete floors is 3 m (see Inspecting surfaces and fixtures).

2.2 CONCRETE FLOORS	
CONSTRUCTION	
✗	Concrete floor has hollows or mounds exceeding those allowed for in NZS 3114:1987 (Part 3)[16].
✗	Cracks which rupture or significantly impair the appearance or performance of the finishing floor materials – see NZS 3114:1987 (Part 3).
✗	Unrepaired concrete floor cracks of 3 mm or more in width or vertical displacement.
✗	Visible reinforcing or bony (poorly vibrated) concrete along the edge of the slab.
✓	Deviations in the floor plane are within the applicable tolerances set in NZS 3109:1997: Concrete Construction.
✓	Defined crack control joints (saw cuts or other means of inducing cracks) are usually specified and are accepted trade practice (unless in locations different to the specification).
Note: Some cracking in a concrete slab is common and is not necessarily a sign of poor workmanship.	
FINISH	
✓	Exposed concrete floors are free of stains on handover (unless otherwise specified).

16 NZS 3114:1987 (Part 3) - Specification for concrete surface finishes

2.3 Polished concrete floors

The normal viewing position distance for concrete floors is 3 m (see Inspecting surfaces and fixtures).

2.3 POLISHED CONCRETE FLOORS	
✗	Ground and polished concrete have trowel and grinding marks unless otherwise specified.
✗	Patchy finish where a clear coating has been applied to exposed concrete.
✓	Clear coatings have an even appearance.
✓	Some variation in appearance across an exposed concrete floor in accordance with specifications. Where the acceptable colour range is not specified, refer to the colour variation tolerances within NZS 3114:1987 (Part 3).
✓	Where river-run materials are used, the presence of driftwood or seeds is acceptable provided there is less than one piece of material smaller than 20 mm by 30 mm in size for every square metre, averaged across the total area of the slab.

2.4 Timber-framed floors

The main contractor is only responsible for resolving issues where the work was done within the main contract, and was not work done subsequent to the main contract (e.g. landscaping done by occupants or subsequent tradespeople). The main contractor may seek redress from subcontracted trades through the usual routes.

2.4 TIMBER-FRAMED FLOORS	
CONSTRUCTION/INSTALLATION	
✗	The floor plane slopes by more than 1:200.
✗	The floor plane deviates from level by more than 5 mm in any 10 m of length, or 10 mm total in lengths over 10 m (NZS 3604: 2011 – Timber-framed buildings).
✗	Individual sheets or boards are not flat and/or straight to within ±6 mm for every 3 m of length.
IN USE	
✗	Individual boards or sheets in timber floors move independently or in a different manner to other boards or sheets in the floor.
✗	Squeaks caused by incorrect installation practices, such as insufficient fastening of flooring to the structure beneath.
✓	All timber floors and decks move to some degree and some springiness should be expected.
✓	Springiness is acceptable provided that, unless otherwise specified, floors are built to the criteria in AS/NZS 1170.0:2002 – Structural design actions – Part 0: General principles or NZS 3604:2011 – Timber-framed buildings. Where more conservative deflection ratios are specified (e.g. for some tiled floors), less movement can be expected.
✓	Some squeaking of correctly installed flooring and timber floor framing can be expected over time.

SUBFLOOR AREA	
✗	Access to or ventilation in the subfloor area is obstructed with rubbish and/or building waste.
✗	Subfloor is damp.
✗	Subfloor vents are blocked or covered (e.g. covered by landscaping materials, or blocked by vegetation).
✗	Surface runoff is directed into the subfloor.

2.5 Timber floor boards

The normal viewing position distance for non-concrete floor finishes is ≥2 m (see Inspecting surfaces and fixtures).

2.5 TIMBER FLOOR BOARDS	
GAPS	
✗	Gaps in butt joints between boards are more than 2 mm.
✗	Gaps where dissimilar floor coverings abut are more than 3 mm wide (e.g. carpet and timber boards).
✗	Gaps between floor boards are more than 2 mm between adjacent boards, or more than 5 mm over four consecutive boards.
Cyclic shrinkage and expansion of timber flooring should be expected with changes in temperature, humidity and the seasons.	
FINISH	
✗	Timber boards do not meet the grade and appearance standards referenced in the specification (More information on acceptable appearance grades is available from: NZS 3631:1988 and AS 2796.2[17]).
✗	The surface of floor elements is broken, split, cracked, or deteriorated at handover.
✓	Cupping of 1 mm or less per 100 mm width.
✓	Some binding between boards as a result of surface coating adhesion can be expected.
✓	Clear coatings have an even appearance.
Note: As a natural material, minor deviations and imperfections in timber should be expected. Wider timber flooring (>80 mm) is more prone to shrinkage and cupping, especially if "flat" sawn which provides a more attractive face grain appearance.	
FIXING	
✗	Fixings are proud or too deep.
✗	Secret fixings are visible between boards.
✓	Visible fixings are evenly spaced and aligned (vertically and/or horizontally) within ±3 mm.
✓	Visible mechanical fixings are installed as specified.

17 NZS 3631:1988 - *New Zealand timber grading rules* for complying products, *AS 2796.2 - Timber - Hardwood - Sawn and milled products - Grade description* for complying imported Australian hardwood products.

SQUEAKS	
✗	Timber board floors squeak due to incorrect installation (e.g. insufficient fastening).
✓	Minor squeaks and creaks due to heat and moisture causing timber to expand and contract.

2.6 Particleboard and plywood floors

The normal viewing position distance for non-concrete floor finishes is ≥2 m (see Inspecting surfaces and fixtures).

2.6 PARTICLEBOARD AND PLYWOOD FLOORS	
✗	Noticeable swelling at sheet joints.
✗	A weathered appearance in clear finished particleboard when new.
✗	Floors squeak due to incorrect installation (e.g. insufficient fastening).
✗	Fixings are proud or too deep.
✓	Visible fixings are evenly spaced and aligned (vertically and/or horizontally) within ±3 mm.
✓	Fixings are installed as per specifications.

3 Wall claddings

3.1 Wall claddings generally

3.1 WALL CLADDINGS GENERALLY	
✗	Adjacent claddings are out of alignment (unless otherwise specified).
✗	Paint/plaster/mortar spatter.
✓	Claddings are fixed and/or aligned in accordance with manufacturer's instructions and consented plans.
FLASHINGS	
✗	Corrosion, dents, buckling and/or paint/plaster spatter.
✗	Scratching that goes through the full depth of the coating.
✓	Scratching that is not visible from the normal viewing position (providing it is not the full depth of the coating).
✓	Some minor depressions at fixing points that do not cause denting or buckling.

3.2 Clay brick and masonry veneer

The normal viewing position distance for internal and external exposed architectural masonry feature walls is 6.1 m (see Inspecting surfaces and fixtures). Where it is not possible to achieve this distance, specific issues can be viewed at closer distances in accordance with the details in the below table.

3.2 CLAY BRICK AND MASONRY VENEER	
CRACKS AND CHIPS UNLESS OTHERWISE SPECIFIED, EXPOSED WALLS SHOULD BE:	
✓	Free of visible cracks and chips when viewed from 6.1m in diffused light. (ASTM C90-14[18])
✓	From closer distances, chipping of edges on bricks is acceptable provided the total length of chips per brick is no more than 10% of the perimeter length of the brick and; › For 95% of the bricks the chips are no longer than 3 mm from edges and 6 mm from corners, and; › For the remaining 5% of the bricks the chips are no longer than 6 mm from edges and 9.5 mm from corners.

18 ASTM C90-14 (2014) - Standard Specification for Loadbearing Concrete Masonry Units

ALIGNMENT

✗	Brick courses are not vertical to within 10 mm for every 3 m rise in height within a single storey, or 20 mm over the total height of a building (NZS 4210:2001[19]).
✗	Courses are not horizontally level to within 5 mm in any direction up to 10 m or no more than 10 mm in total in any direction over 10 m (NZS 4210: 2001).
✗	Courses are not vertically in-line to within 3 mm on the fair (visible) face, and 5 mm on the structural face (NZS 4210:2001).

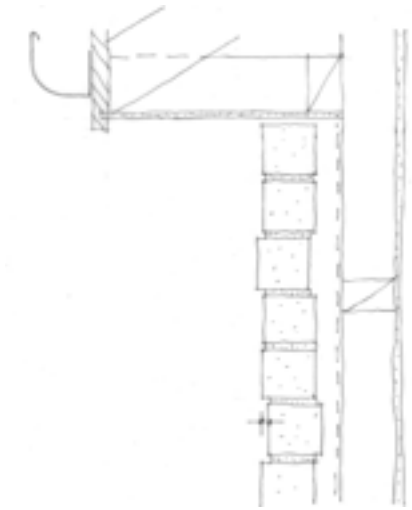

Figure 5 *Bricks out of plumb in vertical plane.*

JOINTS

✗	Joints more than 20 mm thick on the bottom course (NZS 4210:2001).
✗	Recessed (raked) mortar joints are more than 6 mm deep (unless otherwise specified) (NZS 4210:2001).
✗	Untooled mortar joints (unless otherwise specified).
✓	Perpend or vertical joints vertically align to within 10% of the brick length.
✓	Joints are evenly coloured, clean, neatly finished (pointed), free of excess mortar and have a consistent appearance from the normal viewing position of 6.1 m.
✓	Joints have an average thickness of 10 mm ± 3 mm (NZS 4210:2001).
✓	Pointing and mortar repairs match existing mortar as closely as practicable.

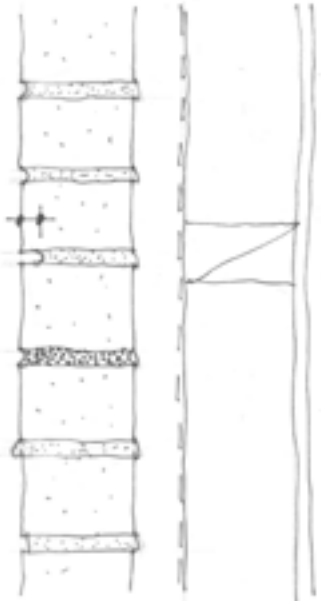

Figure 6 *Recessed mortar joint too deep.*

19 NZS 4210:2001 - Masonry construction: Materials and workmanship

GAPS	
✓	There are open weep holes at the bottom and ventilation openings along the top of the wall.

Figure 7 *Ventilation openings are a requirement in a brick veneer.*

APPEARANCE	
✗	Mortar smears on wall surface.
✗	Efflorescence cannot be cleaned off, comes back, or gets worse.
✗	Colour variation exceeds the range indicated by manufacturer's sample panels.
✗	Coloured stains (e.g. vanadium and manganese) are visible from normal viewing position and cannot be removed.
✓	Bricks are blended in accordance with manufacturers' instructions.
✓	Efflorescence appears as the new wall dries and can be removed.
Note: the firing process of clay bricks can lead to colour variation within and between batches. This is managed through blending in accordance with the manufacturer's instructions.	
Also see New Zealand Concrete Masonry Association – New Zealand Concrete Masonry Manual[20]	

3.3 Concrete masonry

The normal viewing position distance for internal and external exposed architectural masonry feature walls is 6.1 m (see Inspecting surfaces and fixtures). Where it is not possible to achieve this distance, specific issues can be viewed at closer distances in accordance with the details in the below table.

3.3 CONCRETE BLOCK	
CRACKS AND CHIPS – IN EXPOSED WALLS (UNLESS OTHERWISE SPECIFIED).	
✓	No visible cracks and chips when viewed from 6.1 m in diffused light (ASTM C90-14).
✓	Cracks up to 0.5 mm wide and up to 25% of the height of the unit that are visible from closer distances.
✓	Chipping up to 12.5 mm on any dimension on up to 5% of the units that are visible from closer distances.

20 www.nzcma.org.nz/document/279-24/5.NZCMA_MM_-_1.4_-_Mortar_and_Mortar_Joints.pdf

	ALIGNMENT
✗	Block courses are not vertical to within 10 mm for every 3 m rise in height within a single storey, or 20 mm over the total height of a building (NZS 4210:2001).
✗	Courses are not horizontally level to within 5 mm in any direction up to 10 m or no more than 10 mm in total in any direction over 10 m (NZS 4210: 2001).
✗	Courses are not vertically in-line to within 3 mm on the fair (visible) face, and 5 mm on the structural face (NZS 4210:2001).
✓	Perpends or vertical joints vertically align to within: ±10 mm for every 3 m of height on every second course for stretcher bond. ±5 mm for every 3 m of height on every course for stack bond.

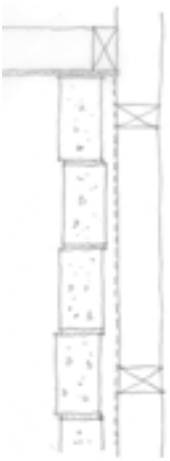

Figure 8 *Blocks out of plumb in vertical plane.*

	JOINTS
✗	Joints are more than 20 mm thick on the bottom course (NZS 4210:2001).
✗	Recessed (raked) mortar joints are more than 6 mm deep (unless otherwise specified) (NZS 4210:2001).
✗	Untooled mortar joints (unless otherwise specified).
✓	Joints are evenly coloured, clean, neatly finished (pointed) and free of excess mortar and have a consistent appearance from the viewing position.
✓	Joints have an average thickness of 10 mm ± 3 mm (NZS 4210:2001).
✓	Pointing and mortar repairs match existing mortar as closely as practicable.

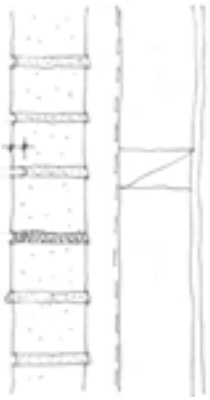

Figure 9 *Recessed mortar joint too deep.*

	GAPS
✓	There are open weep holes at the bottom and ventilation openings along the top of the wall.

	APPEARANCE
✗	Mortar smears on wall surface or joinery.
✗	Efflorescence cannot be cleaned off, comes back, or gets worse.
✗	Colour variation exceeds the range indicated by manufacturer's sample panels.
✓	Blocks are blended in accordance with manufacturers' instructions.
✓	Efflorescence appears as the new wall dries and can be removed.

Also see New Zealand Concrete Masonry Association – New Zealand Concrete Masonry Manual
www.nzcma.org.nz/home.aspx

3.4 Stone Veneer

The normal viewing position distance for internal and external exposed architectural masonry feature walls is 6.1 m (see Inspecting surfaces and fixtures). Where it is not possible to achieve this distance, specific issues can be viewed at closer distances in accordance with the details in the below table.

3.4 STONE VENEER	
ALIGNMENT	
✓	Walls are visually plumb[21] or on a consistent batter if specified (within 10 mm) when viewed from the arris line or from the external protrusion in the case of riverstone.
JOINTS	
✓	Typical joint widths and tolerances are: › Drystack 0±15 mm › 10±3 mm › 25±5 mm
✓	Pointing and mortar repairs match existing mortar as closely as practicable.
✓	Joints are evenly coloured, clean, neatly finished (pointed) and free of excess mortar and have a consistent appearance from the viewing position.
Note: These tolerances do not apply when work is to match existing or historical stonework. The width of joint will depend on the type and shape of stone and should be to the manufacturer's specification or as otherwise agreed in the contract.	
GAPS	
✓	There are open weep holes at the bottom and ventilation openings along the top of the wall.
APPEARANCE (SEE FIGURE 10 & 11 OVER PAGE)	
✗	Mortar smears or staining on wall surface or joinery.
✗	Efflorescence (salt-like deposits) cannot be cleaned off, it comes back, or it gets worse.
✗	Colour variation exceeds the range indicated by manufacturer's sample panels.
✓	Stones are blended in accordance with manufacturers' instructions.
✓	Efflorescence appears as the new wall dries and can be removed.
✓	Stonework has vertical "joints" of no more than 300 mm high, and are regularly crossed (unless otherwise specified).

21 In this context, "plumb" means straight, in line and vertical.

Figure 10 *Stones are stacked on top of each other with continual running vertical joints and very little bonding. Source: NZSMA*

Figure 11 *Acceptable stone work – joints are of an even size. Vertical joints are less than 300 mm high, and stones are regularly crossed to form good bonding. Source: NZSMA*

Note: Stone is a natural product and variation in colour and shape can be expected. Prior to finalising the contract, owners are advised to view panel samples or existing construction laid using the specified stone by the stonemason who is being contracted or subcontracted to do the stonework. To achieve a satisfactory outcome on a project involving stone veneer, it is recommended that the work be carried out by a qualified stonemason, such as those registered with the New Zealand Stone Masons Association.

3.5 Stucco

Painted non-concrete surfaces have a normal viewing position distance of ≥2 m under non-critical lighting conditions (see Inspecting surfaces and fixtures).

3.5 STUCCO	
APPEARANCE	
✗	Cracks are wider than 0.5 mm.
✗	Spalling or delamination of plaster.
✗	Finished stucco cladding is stained or has localised discolouration.
✗	Mesh is visible or is not fully embedded within the plaster.
✗	Efflorescence that cannot be removed.
✓	Stucco has a uniform appearance when viewed from normal viewing position.
Note: Some hair line cracking of stucco is a result of the drying (curing) of the cement mix and is to be expected.	
JOINTS	
✗	The omission of movement control joints specified in consent documentation.
✓	Stucco has visible sealant joints or fine vertical cracks where movement control joints have been specified.
✓	There are flashed horizontal joints at each floor level.

3.6 Timber weatherboards

Timber weatherboard claddings may be installed with boards running vertically or horizontally. Some movement of timber is to be expected, which can be exacerbated if left unpainted, stained or painted a dark colour with low light reflectance.

Painted non-concrete surfaces have a normal viewing position distance of ≥2 m under non-critical lighting conditions (see Inspecting surfaces and fixtures).

3.6 TIMBER WEATHERBOARDS	
ALIGNMENT	
✓	Vertical timber weatherboards are within ±3 mm per metre of vertical.
✓	Horizontal timber weatherboards are within ±3 mm per metre of horizontal.
✓	Individual weatherboards are straight to within ±3 mm per metre.
FIXINGS	
✗	Fixings penetrate both the outer and lapped weatherboards.
✓	Fixings of unfinished, clear finished or stained boards are flush with the face of the board (unless otherwise specified).
✓	Fixings of painted boards are punched and stopped (unless otherwise specified).
JOINTS	
✗	Butt joints between horizontal boards vertically align (unless otherwise specified).
✓	Butt joints between boards are staggered across the wall area (unless otherwise specified).
✓	End joints in horizontal weatherboards are scarfed (angle cut) or butted and covered with a soaker (flashing over joints) or back flashing (unless otherwise specified).
✓	End joints in vertical weatherboards are scarfed or horizontally flashed (unless otherwise specified).
APPEARANCE	
✗	Weatherboards that have one or more knots with a diameter more than 50 mm (NZS 3602:2003[22]), unless otherwise specified.
✗	Weatherboards have spike knots larger than 25 mm (NZS 3602:2003).
✗	Weatherboards do not meet the specified timber grade[22].
✗	Widespread knot and wood stains that bleed through the paint.
✗	Unstable finger joint lines show through a finished paint system.
✓	Variations in colour across a stained or unfinished weatherboard cladding where part of the wall is sheltered from the sun or rain by eaves or other projection.
✓	Isolated resin bleed.
✓	Stable finger joint lines that show through a finished paint system (provided the adjoining board surfaces are flush).

22 NZS 3602:2003 – Timber and wood-based products for use in building.

SPLITS

✗	Splits through the boards.

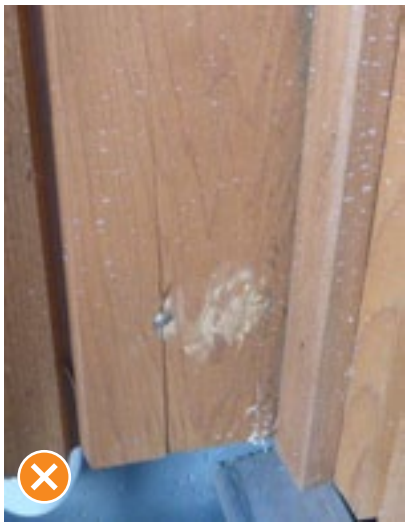

Figure 12 *Split around fixing in a timber weatherboard.*

Note: Information on acceptable grades of timber weatherboards produced in New Zealand is available from NZS 3631:1988 – New Zealand timber grading rules. For imported products, refer to the product manufacturer's literature for the grading rules used – these may be based on industry standards or standards from another country.

CUPPING/GAPS

✗	Gaps resulting from missing plugs or scribers between the board profile and window or other facings (where specified).
✓	Gaps between laps of up to 2 mm per 150 mm width of fully painted weatherboards with a light reflectance value of 40% or more.
✓	Gaps between laps of up to 6 mm per 150 mm width for: › fully painted weatherboards with a light reflectance value of less than 40% › weatherboards stained on all faces › unfinished weatherboards.

Figure 13 *Gap of more than 2 mm between weatherboard laps on a light coloured painted wall.*

Note: More movement can be expected for weatherboards that have only the front face stained, and weatherboards painted or stained in dark, low light-reflectance colours. Where weatherboards are installed and maintained in accordance with manufacturer's instructions and the contract specifications, excessive cupping is a defect.

3.7 Fibre-cement weatherboards

Painted non-concrete surfaces have a normal viewing position distance of ≥2 m under non-critical lighting conditions (see Inspecting surfaces and fixtures).

3.7 FIBRE-CEMENT WEATHERBOARDS	
ALIGNMENT/FLATNESS	
✓	Horizontal weatherboards are within ±3 mm per metre of horizontal.
✓	Individual weatherboards are straight to within ±1.5 mm per metre.
✓	The faces of individual weatherboards are flat to within ±1.5 mm per metre.
DAMAGE	
✗	Fibre-cement weatherboards have surface damage or are cracked.

Figure 14 *Crack in a fibre cement weatherboard.*

Figure 15 *Damaged fibre cement weatherboard.*

INSTALLATION	
✗	Fibre-cement weatherboards are not fixed in accordance with the manufacturer's instruction.
✗	Boards have holes from missing fixings.
✓	Boards are tightly fitted with no gaps at horizontal laps.

3.8 Profiled metal wall cladding

Painted non-concrete surfaces have a normal viewing position distance of ≥2 m under non-critical lighting conditions (see Inspecting surfaces and fixtures).

3.8 PROFILED METAL WALL CLADDING	
ALIGNMENT	
✗	The profile is not parallel or deviates by more than 10 mm in any 10 m length in any direction.
✗	The profile does not maintain the same horizontal or vertical alignment across laps, joints, openings, corners and other spaces.
✓	Metal sheets are straight to within ±5 mm per metre.
FIXINGS	
✗	Fixings are not installed as per manufacturer's specification for the cladding material, local climate, corrosion and wind zone.
✗	Fixings are not evenly spaced along the wall length.
✗	Sealing washers on fixings are distorted.
✓	Fixings are vertically aligned within ±5 mm over a 2.4 m wall height.
GAPS	
✗	There are gaps where sheets are lapped, which is contrary to the specifications.
✓	There is a 5–10 mm gap to a flashing or other fixed element to allow for thermal movement in the cladding.
DAMAGE/CORROSION	
✗	Dented profile around screw fixings.
✗	Fractures, buckles, dents and/or scratches[23].
✗	Profiled metal wall claddings and/or fixings are corroded after one year (including white or brown rust).
✗	Cladding has paint spills or concrete residue on its surface.
✓	Screw fixings may cause minor deflection of the sheet within close proximity.
SEALANT	
✗	Sealant is heaped up or humped over an area of ≥10 mm wide.
✗	Sealant has not been tooled to a neat finish.
✗	Sealant smears on surrounding surfaces.

Figure 16 *Excessive use of sealant with untidy finish.*

23 Minor scratches that do not go through to the base metal should not affect durability on coated metal cladding products which have self-healing qualities. Manufacturers may not recommend the use of touch up paint on coated metal cladding products as its chemical makeup differs from the coating. This can lead to differential weathering.

3.9 Fibre-cement sheet (flush-finished)

Painted non-concrete surfaces have a normal viewing position distance of ≥2 m under non-critical lighting conditions (see Inspecting surfaces and fixtures).

3.9 FIBRE-CEMENT SHEET (FLUSH-FINISHED)	
COATING/APPEARANCE	
✗	Uneven level of texture across the full area of the wall from the normal viewing position.
✗	Cracks are visible in the paint coating on cladding.
✗	Cladding is dented or damaged.
✗	There are dents or damage to the paint coating on cladding.
✗	Fibre-cement sheet joints, base coat, jointing tape or reinforcing mesh are visible through the coating system.
✓	Cladding has monolithic appearance which appears flat and smooth from normal viewing position.
FIXINGS	
✗	Fixings are visible through the finishing coat from the normal viewing position.
✗	Fixings are proud.
JOINTS	
✗	Sealant is not adhered to the sides of a movement control joint.
✗	Sealant in a movement control joints is cracked.
✓	Sealant filled vertical movement control joints are placed in accordance with the suppliers' instructions and the consent documentation.
✓	Sealant in movement control joints has a smooth slightly concave surface.

3.10 Sheet cladding (fibre-cement/plywood) with jointers or cover-battens

Painted non-concrete surfaces have a normal viewing position distance of ≥2 m under non-critical lighting conditions (see Inspecting surfaces and fixtures).

3.10 SHEET CLADDING (FIBRE-CEMENT/PLYWOOD) WITH JOINTERS OR COVER-BATTENS	
CRACKS/SPLITS	
✗	Sheets are damaged at handover (damage caused by occupants is outside of the responsibility of the main contractor).
✗	Battens or jointers are damaged or split.
✗	Plywood is delaminating.
ALIGNMENT	
✓	Jointers or battens are installed vertically and/ or horizontally at the edges of fibre-cement sheets.
✓	Vertical jointers or battens are within ±3 mm per metre of vertical.
✓	Horizontal jointers or battens are within ±3 mm per metre of horizontal.
✓	Jointers or battens are straight to within ±5 mm over a length of 1.2 m.
✓	Where specified, joints horizontally and vertically align to within ±1.5 mm.
FIXINGS	
✓	Fixings used meet specifications and were installed as per manufacturer's instructions.
✓	Visible fixings are evenly spaced and aligned (vertically and/or horizontally) within ±3 mm.
JOINTS	
✓	Flashed horizontal joints are visible.
✓	Lap joints are installed as per manufacturer's specifications.

3.11 Exterior insulation and finishing system (EIFS) and autoclaved aerated concrete (AAC) cladding systems

Painted non-concrete surfaces have a normal viewing position distance of ≥2 m under non-critical lighting conditions (see Inspecting surfaces and fixtures).

3.11 EXTERIOR INSULATION AND FINISHING SYSTEM (EIFS) AND AUTOCLAVED AERATED CONCRETE (AAC) CLADDING SYSTEMS	
CRACKS/DAMAGE	
✗	Damaged or cracked plaster or paint coating on an EIFS or AAC cladding at handover (damage caused by occupants is outside of the responsibility of the main contractor).
✗	Cracking or delamination of plaster coats, or between the plaster and the substrate.
APPEARANCE	
✗	The underlying polystyrene and reinforcing mesh of the EIFS or AAC cladding is visible through the plastered finish.
✗	Patchiness in the finishing coats is visible from normal viewing position.
✗	Fading and significant colour variations are visible from normal viewing position.
✗	The level of texture across the full area of the wall is uneven when viewed from normal viewing position.
JOINTS	
✗	Sealant is not adhered to the sides of movement control joints.
✗	Sealant in movement control joint is cracked.
✓	Vertical or horizontal movement control joints (typically a sealant joint) that were installed in accordance with specifications and the suppliers' installation instructions.
✓	Sealant has a smooth and slightly concave surface.

4 Roof cladding

A common cause of damage to roof claddings is foot traffic. This type of damage is the main contractor's responsibility if the damage occurred during work done as part of the contract. It is not the main contractor's responsibility if the damage was caused by trades or persons that do not fall under their contractual control.

The normal viewing position distance for roofs, guttering, downpipes and roof vents, is ≥3 m (see Inspecting surfaces and fixtures).

4.1 Pressed metal tiles

4.1 PRESSED METAL TILES	
ALIGNMENT	
✗	Front edges of tiles do not align.
✓	Courses are straight to within ±20 mm for every 4 m of length when measured in the plane of the roof.
GAPS	
✓	Tiles and accessories are installed as per manufacturer's specifications.
✗	Gaps of more than 5 mm where flashings are cut around the profile (notching).
APPEARANCE	
✗	Tiles with a dissimilar shade or texture are installed in the same plane of roof (unless otherwise specified).
✗	Excessive or differential paint fade, including that resulting from the use of touch up paint.
✗	Uneven, asymmetrical or inconsistent notching.
✓	Shade and texture matches as per manufacturer's instructions.
DAMAGE/CORROSION	
✗	Tiles are dented, scratched, chipped, distorted or corroded.
✗	Tiles have swarf stains[24].

Figure 17 *Dented metal tiles.*

Note: The specifier is responsible for ensuring correct specification of materials for the particular application. Premature failure of a correctly specified and installed product is a manufacturing defect (see also 'What is a defect?' in this guide).

24 Swarf is metal shavings or particles that are produced when grinding or cutting metal.

4.2 Profiled metal roofing

4.2 PROFILED METAL	
DAMAGE/CORROSION	
✗	Damage such as fractures, rust or swarf stains, scratches[25], dents, depressions or buckling at handover.
✗	Paints, spills, swarf or concrete residue on the surface.
✗	Deformation or denting from screw fixings.
✗	Premature failure of a correctly specified and installed product is a manufacturing defect.
✗	Sheets have empty drill holes.
✗	Sheets have burrs on cut edges.
✓	Touch up paint used to colour match certain roofing accessories prior to installation in accordance with manufacturer instructions.
ALIGNMENT	
✗	Flashings or edges have lifted or are loose.
✗	Flashings or edges are not installed to specification.
✗	Sheets and/or flashings are not straight.
✗	Fixings are not driven square to within 5° of perpendicular to the profile.
✓	Sheets and/or flashings are true to line within 15 mm over 10 m in any direction.
✓	Sheets are installed in accordance with manufacturer's instructions.
✓	Fixings are consistently applied as per specification.
✓	Fixings are aligned within ±5 mm in a straight line across the roof plane.
✓	Sealing washers on fixings are not distorted.
APPEARANCE	
✗	Excessive or differential paint fade, including that resulting from the use of touch up paint.
✗	Gaps of more than 5 mm where flashings are cut around the profile (notching).
✗	Uneven, asymmetrical or inconsistent notching.
✗	Excessive creasing due to misaligned purlins.
✓	Oil canning is a common occurrence with products which have standing seams or wider profile patterns. This is not considered a defect and will become less apparent with weathering.
✓	Creases from secret fix clips are not considered a defect, and will become less apparent with weathering.
✓	Minor creases in 0.4 mm steel and 0.7 mm aluminium products can be expected.

Figure 18 *Rust marks on roof coating.*

25 Minor scratches that do not go through to the base metal should not affect durability on coated metal roofing products which have self-healing qualities. Manufacturers may not recommend the use of touch up paint on coated metal roofing products as its chemical makeup differs from the coating. This can lead to differential weathering.

SEALANT	
✗	Sealant-filled fixing holes.
✗	Incorrect fixing location or alignment.
✗	Sealant is smeared or untidy or there is excess sealant.
✓	Sealant application is neatly applied to the item being sealed.
✓	Sealant is applied as per manufacturer's instructions.

Figure 19 *Sealant-filled fixing hole with untidy finish.*

NOISE	
✗	Noises resulting from loose underlay, such as flapping or humming in windy conditions.
✓	Noise from the thermal expansion of the metal roofing is normal and should be expected.
✓	Noise from rain and hail is normal and should be expected.
✓	Noise resulting from overhanging vegetation coming into contact with the roof or gutters is not considered a defect. It is the responsibility of the owner to keep vegetation clear of the dwelling.

Additional information can be found in the New Zealand Metal Roofing Manufacturers' Code of Practice Version 2.2, 2012.

4.3 Clay and concrete tiles

4.3 CLAY AND CONCRETE TILES	
COLOUR	
✗	Variation in colour, texture and/or pattern which exceeds specifications.
✓	Clay and concrete tiles are mixed in accordance with the manufacturer's blending instructions.
ALIGNMENT	
✓	Clay and concrete roof tile courses are straight to within ±20 mm for every 4 m of length when measured in the plane of the roof.
✓	The line of cut tiles to the valley appears neat and tidy when viewed from the normal viewing position.
MORTAR POINTING	
✗	Mortar pointing is cracked or poorly finished.
✓	Cracks in mortared finish (pointing) to ridge and hip tiles are 0.5 mm wide or less.
✓	Pointing is a consistent colour, texture and appearance across the cladding when viewed from the normal viewing position.

DAMAGE	
✓	Surface blemishes in tiles, such as chips, scuffing and hollows are ≤15 mm long.
✗	Blemishes that compromise weathertightness or are evident and unsightly when viewed from normal viewing position.
✗	Tiles are cracked or damaged at handover.

4.4 Membrane roofs

The quality of the substrate and preparation for a membrane roof is critical for its performance. Substrates must be prepared to an acceptable level of workmanship before membrane application can begin. Membrane applicators should reject the substrate if they are not satisfied with its design or construction.

4.4 MEMBRANE ROOFS	
FALLS	
✗	Membrane surface is not laid to specified falls.
✓	Finished membrane roof cladding is straight across the surface to within ±5 mm per metre in any direction below or above the specified line of fall.
✓	Expansion joints installed in accordance with the supplier's specifications.
Note: Roofs built to correct tolerances may still have water ponding after a period of rain. This is acceptable providing it remains for no more than 24 hours after rainfall, or where the roof has been built as per consented documents.	
DAMAGE	
✗	Membrane is damaged (e.g. cuts or punctures).
LAPS IN SHEET MEMBRANE	
✗	Laps in sheet membrane are lifting.
✓	Temporary retention of a small amount of water behind a sheet membrane lapped join in accordance with manufacturer's specifications is acceptable.
APPEARANCE	
✗	Bubbles or blistering.
✓	The finished membrane is neat and tidy with folded corners tightly fitted and no loose flaps.
Additional information can be found in Code of Practice for Torch-On Membrane Systems for Roofs and Decks (**www.membrane.org.nz/assets/pdf/ToM-CoP-for-Internet-30-Oct-08.pdf**).	

4.5 Guttering, downpipes and roof vents

4.5 GUTTERING, DOWNPIPES AND ROOF VENTS	
✗	Gutter end details do not match/are not consistently formed.
✗	Overflow caused by insufficient falls.
✗	Downpipes are crooked.
✗	Downpipes or guttering is damaged or leaking.
✗	Roof vents are damaged or crooked.
✗	Guttering is loose or crooked.
✗	Metal guttering contains metal offcuts, rivet stems, swarf or other discarded metal products at handover.
✗	Damage to roof vents that is visible from normal viewing position.
✗	Excessive use of silicon or an untidy finish.
✓	Roof sheet cladding profile ends are not visible from normal viewing position at ground level.
✓	Standing water in PVC guttering does not exceed 25 mm in depth.
✓	Standing water in profiled metal guttering does not exceed 5 mm.
✓	Metal guttering is installed as per manufacturer's specifications.
✓	Vertical downpipes are parallel to the closest adjacent vertical reference point (e.g. window jamb).
✓	Guttering is securely fixed and appears consistent in the line of the fall from normal viewing position.
✓	Roof vents are installed as per specifications.
✓	Silicon is applied as per manufacturer's specifications.

Figure 20 *Metal nail left in gutter at handover.*

Note: It is the occupant's responsibility to ensure gutters are cleared out and maintained correctly after handover to avoid overflows and blockages due to leaf debris.

5 Windows and doors

The normal viewing position is at a distance of ≥2 m for both glass (with a sky background) and painted non-concrete surfaces (see Inspecting surfaces and fixtures).

5 WINDOWS AND DOORS	
DOORS	
✗	Doors are not straight or square.
✗	Door binds on the jamb or flooring when opening or closing.
✗	Cavity door scrapes on the side of the cavity.
✗	The cavity door sticks or catches.
✗	The cavity door installation is out of plumb or square by more than ±1.5 mm per metre of horizontal or vertical.
✗	Doors leak under conditions that fall within the rated weather/airtightness of the unit[26].
✗	The faces and/or edges of the door are damaged at handover; for example abrasions or scratches or installation damage (tool marks) that are visible from a normal viewing position.
✓	Sliding doors are installed to manufacturer's specifications and operate smoothly by hand.
✓	Decorative finishes, such as surrounds, brackets, mounts, rings and other cosmetic elements, are in place and free from damage.
✓	Doors hang within ±1.5 mm per metre of vertical.
✓	Doors are straight to within ±1.5 mm per metre vertically and horizontally.
✓	When closed, the faces of double-hinged doors are within ±3 mm of the same plane.
✓	External doors are installed as per manufacturer's instructions.
✓	Internal and external doors fit within the doorframe as per manufacturer's instructions.
✓	Sliding doors remain in position anywhere in their range of movement.
Note: especially for solid timber sliders, some movement can be expected over time as timber swells and shrinks as the moisture and environmental conditions they are exposed to changes e.g. from winter to summer. This is not a defect provided that the door does not catch within the cavity.	

26 See NZS 4211:2008 – Specification for performance of windows.

	ALUMINIUM/PLASTIC WINDOWS AND DOORS
✗	Aluminium windows and doors have gaps, cracks or dents.
✗	Plastic windows and doors are bowed or twisted.
✗	Joints or welds are cracked.
✗	Powder coated surfaces appear "chalky".
✗	Coating failure.
✗	Mortar smears.
✓	When viewed from normal viewing position, aluminium frames are free from imperfections or blemishes such as paint smears, stains, abrasions, scratches, pitting, and local variations in colour, texture or finish[27].
	WINDOWS
✗	Windows are not straight or square.
✗	Windows leak under conditions that fall within the rated weather/airtightness of the unit[28].
✗	Seals around windows are loose, outside the frames, or too short.
✓	The sash fits squarely and remains square throughout its range of operation, as applicable.
✓	Window frames, jambs, sashes and sills are straight to within ±1.5 mm per metre.
✓	Open friction stay windows remain in position anywhere in their range of movement.
✓	All windows are solidly fixed.
✓	Windows open and close smoothly when operated by hand.
✓	Windows can be secured.
✓	Window frames are free of abrasions or scratches or installation damage (tool marks) that are visible from a normal viewing position.
	GLASS
✗	Glass is blemished, marked (e.g. scratches, mortar, stain, or paint spatter), distorts view or is poorly cut.
✗	Inconsistent tint colour or appearance across the window.
✗	The glass does not conform to the requirements set out in AS/NZS 4666:2012[29], or AS/NZS 4667:2000[30].
✗	Where designers have provided appropriate information surrounding the end location of the glazing units, including wind zones and altitude to the manufacturer, Newtons Rings and excessive visual distortion are manufacturing defects.
✓	Brewsters fringes and preferential wetting patterns are not considered a defect.

27 See WANZ Standard – Powder Coating Surface Finishing – Appearance In Situ, 2011.
28 See NZS 4211:2008 – Specification for performance of windows.
29 AS/NZS 4666:2012 – Insulating glass units.
30 AS/NZS 4667:2000 – Quality requirements for cut to size and processed glass.

HARDWARE	
✗	Hardware has excessive residue, such as oil or grease on handover.
✗	Hardware does not function correctly.
✗	Hinged door does not function correctly; for example › doors do not latch when closed › the door rattles on the latch when closed › the knob or handle is stiff to operate.
✓	Door hardware is installed at the specified height – if no height has been specified the mounting height from the Door Head (top) is consistent within 5 mm.
✓	Door latch tongue and striker plates are aligned to allow secure latching.
✓	Hinges, latches and striker plates are securely fitted.
ARCHITRAVES, REVEALS, SPLITS OR JAMBS	
✗	Imperfections or blemishes stains, abrasions or scratches are visible from normal viewing position[31] on handover.
✗	There are splits in reveals, architraves, fascias or jambs.
✗	Architrave setback is uneven or the timber is split.
✗	There are gaps larger than 0.5 mm where the wall lining fits into rebated timber reveals to aluminium windows.
✗	Edge joints appear irregular from a normal viewing position.
✗	Open joints at architrave corners.
✓	Gaps in mitred corner joints to architraves around doors and windows are ≤0.5 mm.
✓	Edge joints between architrave and jamb are installed to specifications and consistent down the length of the architrave.
GARAGE DOORS	
✓	Garage doors operate smoothly.
✓	Garage doors fully retract when open, are not loose or misaligned when closed and, if automated, stop when obstructed.
✓	Under normal conditions, the garage door prevents rain and significant draughts from entering the garage space.

31 See AS/NZS 2311:2009 – Guide to the Painting of Buildings.

6 Wall/ceiling linings

6 WALLS IN GENERAL	
✓	Finished wall is straight and plumb.
✓	Wall has been erected to NZS 3604:2011[32] › Has a gradual bow of ≤6 mm at mid-height under 3 m long horizontal straightedge or; › is ≤ 1.5 mm out of line at mid-height under a 1.3 m long horizontal straightedge.

6.1 Plasterboard, fibrous plaster

No sheet lining material or substrate has a surface that is perfectly flat or totally free from minor imperfections. Although it is impossible to get a perfectly flat or blemish free interior surface, it is possible to reduce the impact and in the end achieve 'the appearance' of blemish free flatness from the normal viewing position. Lighting design plays an obvious and significant role in disguising minor (albeit acceptable) surface blemishes.

The normal viewing position for painted non-concrete surfaces is standing at a distance of ≥2 m (see Inspecting surfaces and fixtures).

6.1 PLASTERBOARD, FIBROUS PLASTER AND FIBRE-CEMENT	
FIXINGS	
✗	Popping that is visible from normal viewing position in level 4 and 5 finishes at handover.
✗	Popping that breaks the surface.
✓	Popping of fixings (where the outlines of fixings are visible under the finish) that occur over a period of time after handover that does not break the surface and is not visible from normal viewing position.
FINISH	
✗	The finish of a flush-stopped lining does not meet the Level of Finish referenced in the design specification[33]. The default level of finish unless specified otherwise in the contract is level 4[34].
✗	Irregular or uneven appearance to the finish of a flush-stopped lining from normal viewing position.
✗	Blistering or peeling of compounds to substrate or between coats.
Note: In critical lighting conditions, surface imperfections may still be apparent in a Level 4 or 5 surface finish. Some minor surface imperfections may still be visible in a Level 5 finish; however, these will be minimized under the additional measures applied under Level 5.	

32 NZS 3604:2011 - Timber-framed buildings.
33 Where another form of finish is going to be applied that requires a different level of finish (e.g. a lower level of finish where wallpaper is to be applied), this should be stated in the contract.
34 See NZS 2589:2007 - Gypsum linings - Application and finishing, and the Association of Wall and Ceiling Industries Australia New Zealand (AWCIANZ) Trade Guidelines and Information – Walls and Ceilings (Edition One, 2012).

JOINTS	
✗	Joints between floor, wall and ceiling linings do not conform to the same level of quality as the surrounding lining (unless otherwise specified).
✗	Hollow joints or "tram tracks" are visible from normal viewing position.
✗	Joints between sheets are clearly discernible from the normal viewing position at hand over in flush stopped wall or ceiling joints in level 4 or higher finishes.
CRACKS	
✗	Cracks which are visible from normal viewing position for level 4 or 5 finishes.
✗	Cracks > 0.5 mm in size (unless otherwise specified, or a level of finish lower than 4 is used).
✗	Unrepaired cracks > 0.5 mm where the stair string abuts the wall lining.
✓	A hairline (≤0.5 mm) crack has formed where the stair string abuts the wall lining due to movement in the stair.
✓	Fine cracks ≤0.5 mm (these may be expected within the first 12 months) which are not visible from normal viewing position[35].
Note: Minor cracks along joints may occur over time due to settlement, earthquakes and wind stresses. These are only considered defects for the purpose of this document if they are caused by poor workmanship or defective materials.	

6.2 Plywood

The normal viewing position for painted non-concrete surfaces is standing at a distance of ≥2 m (see Inspecting surfaces and fixtures).

6.2 PLYWOOD	
✗	Plywood lining does not meet the Grade referenced in the design specification[36].
✗	Irregular fixing spacing and alignment.
✓	Visible fixings are evenly spaced and aligned vertically and/or horizontally within ±3 mm.

35 More cracking may occur over time as a result of timber or building movement.
36 More information on plywood grading is available from: NZ Wood – Information Sheet – Structural Materials – Plywood (http://nzwood.gpub.co.nz/wp-content/uploads/2013/08/NZW14085SM-Ply-Specification.pdf).

6.3 Timber boarding

The normal viewing position for painted non-concrete surfaces is standing at a distance of ≥2 m (see Inspecting surfaces and fixtures).

6.3 TIMBER BOARDING	
BOARDS	
✗	Timber board lining does not meet the grade and appearance standards referenced in the specification[37].
✗	Timber has installation damage, such as tool marks, unfilled nail holes, stains or residue.
✓	Individual boards in vertical timber board wall linings (excluding weatherboards – for weatherboard tolerances see Timber weatherboards) are within ±2 mm of vertical for every 2.4 m rise in height.
✓	Horizontal boards are within ±3 mm of horizontal for every 3 m of length.
✓	Individual boards are straight to within ±3 mm per 2.4 m length.
✓	Timber boards that are end-jointed have a splayed or scarfed joint located over framing (unless otherwise specified).
✓	End joints in vertical linings are staggered so they do not horizontally align across adjacent boards (unless otherwise specified).
✓	End joints in horizontal linings are staggered so they do not vertically align across adjacent boards (unless otherwise specified).
Note: As a natural material, minor deviations and imperfections in timber should be expected.	
FIXINGS	
✗	Fixings are proud or too deep.
✗	Secret fixings are visible between boards.
✓	Visible fixings are evenly spaced and aligned (vertically and/or horizontally) within ±3 mm.
✓	Mechanical fixings are installed as specified.
GAPS	
✗	Gaps in butt joints between boards are more than 2 mm.
✓	Accumulated gaps between adhered clear-finished boards are no larger than 2 mm wide[38].
Note: Cyclic shrinkage and expansion of timber should be expected with changes in temperature, humidity and the seasons.	

37 More information on acceptable appearance grades is available from: NZS 3631:1988 - New Zealand timber grading rules.
38 Clear finished timber boards may bind together when the coating dries. As the timber shrinks, this bind may break. This may cause a gap to accumulate at the weakest joint.

6.4 Finishing trim

The normal viewing position for painted non-concrete surfaces is standing at a distance of ≥2 m (see Inspecting surfaces and fixtures).

6.4 FINISHING TRIM	
✗	Trim is not straight.
✗	Fixings are proud (unless otherwise specified).
✗	Popped fixings are unacceptable if visible from the normal viewing position.
✗	Trim has unrepaired splits.
✗	Installation damage, such as tool marks, unfilled fixing holes, stains or residue are visible from normal viewing position on handover.
✓	Cornices and cove are fitted parallel to the ceiling.
✓	Architraves are parallel to the jambs.
✓	Scotia and skirtings are parallel to the floor unless otherwise specified (e.g. on stairs).
✓	Fixings in timber and MDF trims are recessed or punched and finished as per manufacturer's instructions.

7 Painting

Where paint was supplied and applied by the client or a tradesperson outside of the main contract, any defects with the paint or its finish are not considered the main contractor's responsibility provided the appropriate levels of specification have been met for the substrate.

The normal viewing position for painted non-concrete surfaces is standing at a distance of ≥2 m (see Inspecting surfaces and fixtures).

7 PAINTING	
COLOUR	
✓	Coating meets the colour, shade, hue and gloss standards referenced in the design specification.
✗	Touch up painting is clearly discernible from the normal viewing distance.
Note: Where colour variations are important, the owner should reference sample panels and agree on a range of inherent shade variations with the contractor.	
APPLICATION	
✗	Coating is inconsistent when viewed from normal viewing position (e.g. colour variation or sheen banding), or is the incorrect colour or gloss[39].
✗	Coating is blemished; it does not meet the referenced quality standards in the design specifications.
✗	Misses in coated surfaces i.e. gaps or patches.
✗	Painted surfaces with application defects as described in AS/NZS 2311:2009[40] that are visible from the normal viewing distance. These include: › Paint runs › Paint sags › Wrinkling › Fatty edges › Entrained paint skins › Bristles from paint brushes › Extraneous fibrous material e.g. hair › Dust › Bare or starved areas › Surface cracks › Irregular or coarse brush (or roller) marks › Blistering › Other discontinuities.
✗	Surface damage to the coating is visible from the normal viewing distance at handover; for example tool marks or other mechanical damage (unless otherwise specified).
✗	Chemical or abrasive damage that has altered the thickness, texture or surface gloss of the coating.

Figure 22 *Sheen banding on a finished ceiling that is clearly visible from normal viewing position under non-critical lighting conditions. Source: Winstone Wallboards*

39 More information on acceptable colour standards is available from: NZS 1580.601.5 Methods of test for paints and related materials – Colour.
40 AS/NZS 2311:2009 – Guide to the painting of buildings.

✗	Spoiling of property or other building element with drips, spills, overspray or cleaning residue.
✗	Paint odours do not dissipate within seven days after the manufacturer's recommended drying time despite proper ventilation.
✗	Coating will not dry.

For more information, see:

- Master Painters New Zealand Factsheets (**http://www.masterpainters.co.nz/**)
- Association of Wall and Ceiling Industries, Australia and New Zealand (AWCI), 2012. Trade Guidelines and Information – Walls and Ceilings. Edition One, October 2012.

8 Tiling

The normal viewing position distance for tiling is ≥ 2 m (see Inspecting surfaces and fixtures)

8 TILING	
SET OUT AND INSTALLATION	
✗	Loose tiles.
✗	Drumminess (misses in bedding) over more than 10% of each individual tile.
✗	Joints are misaligned or uneven.
✗	Tile joints have voids, cracks, pinholes or low spots when viewed from the normal viewing position.
✗	Grout is grainy or flaky, or dislodged from the joint.
✗	Joints are cracked or unfilled.
✓	Lippage is no more than: › 2 mm for a rustic or uneven tile surface with joints 2–3 mm wide › 1.5 mm for a standard tile surface (e.g. smooth porcelain tiles) with joints 2–3 mm wide › 1.0 mm on flat abutting tiles (e.g. marble or granite).
✓	Joints are consistent in width and depth and installed to specifications.
✓	Tiled surfaces are flat to within ±4 mm for every 2 m of length (unless otherwise specified)
✓	Tile layouts have been set out from the centre line of the space or surface being tiled, or as specified.
APPEARANCE	
✗	Tiles or grout are stained at handover (staining after handover is not considered the main contractor's responsibility unless due to a deficiency in the specified sealing coat).
✗	Sealant or grout has been left on the tiled surface.
✗	Tiles have not been blended according to the manufacturer's recommendations.[41]
✓	Grout is a consistent colour and texture when viewed from the normal viewing position and does not contain dirt, debris or residue on hand over.
✓	Uniform colour variation of grout within 12 months.
✓	Sealant has been used to fill joints at wall/floor and wall/wall intersections to accommodate movement.[42]

41 Tiles of the same type may vary in colour, texture and pattern and this should be expected.
42 Slight variations between the colour and gloss of sealant and grout are to be expected due to being two different products. Unless otherwise specified, installation of sealant that is an entirely different colour to the grout is a defect.

DAMAGE	
✗	Damage during work done as part of the contract.
✗	Tiles have surface chips, scratches and abrasions at handover that are visible at the normal viewing position of ≥ 2 m.
✗	Tiles do not retain the manufacturer's intended shade, texture and appearance despite correct specification for the intended application and correct cleaning procedures.

9 Floor Finishes

The normal viewing position distance for non-concrete floor finishes is ≥ 2 m (see Inspecting surfaces and fixtures).

9.1 Carpet

Damage caused by the owner or trades working outside the main contractor, and that is not the result of product failure or poor workmanship, is not the responsibility of the main contractor.

The weight of heavy furniture may leave indentations in floor coverings or finishes and these are not considered a defect. Some depressions may be permanent.

9.1 CARPET	
SET OUT AND INSTALLATION	
✗	Carpet has ripples, wrinkling and buckling.
✓	Carpet is installed as per NZS 2455.1 – Textile floor coverings – Installation practice – General.
✓	Carpet edges at the transitions to other surfaces are protected or covered with appropriate transition mouldings.
✓	The edge of the hard surface flooring is no higher than the total carpet thickness when new where no transition moulding exists.
✓	Where no transition moulding is used, a 4 mm bead of seam sealer has been used.
✓	Carpet finishing at the wall has a smooth, neat and secure transition.
✓	Skirtings and adjacent wall linings are free of any adhesive residue or damage.

9.2 Vinyl

9.2 VINYL	
✗	Vinyl has ripples, bubbles or gaps.
✗	Substrate imperfections or joints are visible through the finished vinyl from the normal viewing position.
✗	Vinyl (at handover to the owner) has cuts, surface scuffing or other damage.
✗	Vinyl cracks, rips or tears caused by poor workmanship.
✗	Permanent indentations in flooring, if caused by the main contractor or their sub-trades rolling heavy objects on a new vinyl floor.
✗	Stains and discolouration at handover.
✗	Stains and discolouration caused by the use of an incorrect adhesive, or due to chemical or product spillage during the building work.

✓	Vinyl is installed as per AS/NZS 1884:2013 – Floor coverings – Resilient sheet and tiles – Installation practices.
✓	Yellowing - is typically due to UV and/or cleaning products, and is not considered a defect unless the material is specified as UV or chemical resistant.

9.3 Cork tiles

9.3 CORK TILES	
✗	Joints do not align.
✗	Finish coatings are cracked, lifting, rough, discoloured or deteriorated.
✗	Noticeable differences in level at tile joints[43].
✗	Sanding marks and surface imperfections are visible from normal viewing position.
✓	Adjacent joints in rigid floor coverings align horizontally to within ±2 mm in the plane of the floor and vertically to within ±0.5 mm.

9.4 Timber overlay flooring

Timber overlay flooring should be carefully specified to ensure it is appropriate for the applications it is to be used for. Some types of overlay flooring should not be specified in and around wet areas due to expansion of the compressed fibres when saturated, and/or damage to surface finishes.

9.4 TIMBER OVERLAY FLOORING	
✗	Cupping or gaps resulting from incorrect installation of overlay flooring.
✗	Finish coatings are cracked, lifting, rough, discoloured or deteriorated.
✗	Scratches, dents or marking in the flooring at handover that are visible from the normal viewing position.
✗	Moisture damage to flooring[44].
✗	Damage due to wet cleaning or spills prior to handover.
✓	Colour and grain variation where the floor is installed as per specification.

43 Swelling of the flooring substrate should have been removed during floor sanding.
44 If the source of the moisture is the substrate, and the client has instructed the contractor to install the product prematurely against advice, this is not considered the main contractor's responsibility.

10 Cabinets and bench tops

Damage that occurs after handover is not a defect unless it occurs as a result of faulty installation or manufacture.

The normal viewing position distance for fittings, fixtures and bench tops is 600 mm. The normal viewing position for cabinetry is 600 mm to 1 m (see Inspecting surfaces and fixtures).

10 CABINETS AND BENCH TOPS	
SET OUT AND INSTALLATION	
✗	Cabinets don't align.
✗	Cabinets are loose or have gaps.
✗	Lipping at joins in bench tops.
✗	Kitchen island moves, lifts, distorts or deflects the floor when placed under expected loads.
✗	Bench top is not flat.
✗	Bench top has gaps.
✓	Pairs of doors meet in the middle and are parallel to within ±1 mm.
✓	Pairs of doors have a consistent gap between them, typically 2–4 mm wide depending on door thickness.
✓	Pairs of handles are within ±1 mm of horizontal.
✓	Kitchen and bathroom cabinets are securely fixed to the frame and floor structure.
✓	The cabinet joinery and floor fixings are not loose, do not rattle or deflect the supporting wall when pushed.
✓	Kitchen bench and other bench tops are within 2 mm of their specified height in at least one location along its length.
✓	Bench is flat to within 1.5 mm per metre.
✓	When closed, the faces of adjacent doors are within ±2 mm of the same plane.
✓	Kitchen bench tops are tightly butted fitted as per manufacturer's specifications and flush-filled with flexible sealant.
✓	Where the bench extends to vertical surfaces, such a splash back, the quality of the joint remains consistent.
✓	Sealed junctions between bench tops and adjoining surfaces do not leak and are neatly tooled to a smooth finish.
✓	Runner pairs are parallel and level, and do not cause the drawer to twist, lift or spontaneously open.
✓	All wall hung items such as vanities are securely fixed to framing.

DAMAGE	
✗	Bench tops have been damaged during manufacture and installation.
✗	There are tool marks, scratches, dents, chips or stains visible from the normal viewing position.
IN USE	
✓	Doors and drawers function as expected.
✓	Cabinets, drawers, hinges and runners open and close smoothly with no excessive friction or play in their range of movement.
✓	Drawers stop smoothly at their limit.

11 Plumbing and drainage

Damage that occurs after handover or is done by trades outside the main contract is not the responsibility of the main contractor (unless it occurs as a result of faulty installation or manufacture). Premature degradation of fittings and fixtures is a defect where care instructions have been correctly followed.

The normal viewing position distance for fittings and fixtures is standing at a distance of ≥ 600 mm (see Inspecting surfaces and fixtures).

	11 PLUMBING AND DRAINAGE
	INSTALLATION
✗	Persistent water hammer (plumbing bangs or rattles), providing it is not the result of temporary air bubbles trapped in the plumbing after work has been done on the system or reticulated water supply infrastructure.
✗	Fittings are crooked, off-centre, misaligned or mismatched (unless otherwise specified).
✗	Fittings have internal or external residue, such as excess sealant, oil, grease, solvent, swarf, or tape at handover.
✗	Waste pipe is leaking.
✓	All necessary fittings, fixtures and fastenings are securely installed as specified, with the correct size, type and material.
✓	All mixers/taps are securely fixed and do not move when used.
✓	Fittings and fixtures have been installed according to the manufacturer's specifications.
	DAMAGE AND WEAR
✗	Fittings and fixtures, and any visible internal pipework, have installation damage; for example tool marks, scratches, dents, chips or stains visible from the normal viewing distance.
✗	Mixers/taps drip when closed while still within the manufacturer's warranty period.
✗	Cosmetic elements, such as surrounds, brackets, mounts, rings and other decorative components damaged during installation.
✓	Fittings and fixtures retain the finish intended by the manufacturer in accordance with their expected durability.
	OPERATION
✗	Mixers/taps are stiff to operate.
✓	Some noise occurs when water flows through a floor waste.

12 Electrical fittings and fixtures

The normal viewing position distance for fittings and fixtures is standing at a distance of ≥ 600 mm (see Inspecting surfaces and fixtures) unless otherwise specified.

12 ELECTRICAL FITTINGS AND FIXTURES	
✗	Electrical plugs and switches move when used.
✓	All electrical fittings and fixtures are located according to the specifications.
✓	Fixtures are consistently laid out and vertically and horizontally aligned to the walls and floor unless otherwise specified.
✓	Electrical outlets are evenly spaced around each room and placed at the same height above the floor (or to specifications).
✓	Light switches are placed at the same height in each room and at the same distance from each entrance (or to specifications).
✓	Electrical fixtures are securely fastened to the wall or ceiling framing.
✓	Contractor supplied faceplates and surrounds for electrical fixtures are the same colour and style (unless otherwise specified).
✓	Contractor supplied groups of fittings and fixtures are the same style and model, and lamps are of the same type, wattage and colour temperature.

13 Miscellaneous items

13 MISCELLANEOUS ITEMS	
✗	Insulation has been dislodged[45].
✓	Insulation is clear of downlights unless specifically designed to be surrounded by (CA rated), or around and over the fitting (IC and IC-F rated).
✓	All contractor installed items such as towel rails are securely fixed to the wall framing.
✓	Appliances fitted by the contractor such as a wall oven are centred within openings and secured in place as per manufacturer's instructions.

45 Movement of insulation by trades other than those under the main contractor's control is not the responsibility of the main contractor.

MB13125_1370 V8 05/15