BSA

PROJECT SPECIFICATION

Hayden Alteration/Addition

49 Ashurst Avenue

Pukete

Hamilton

Issued for Consent

19122

PROJECT OVERVIEW

Scope

Addition to existing residence of new bathroom & back entry foyer, built within the exterior space between existing residence & existing garage.

Alterations to existing back entry, laundry to accomodate new kitchen & pantry layout.

New laundry within existing garage

Address

Site Address	49 Ashurst Avenue
Suburb	Pukete
City	Hamilton
Lot #	23
DP #	S 50812

Site Conditions

Wind Zone	M - Medium Wind Speed
Earthquake Zone	Zone 1
Exposure Zone	Zone B - Low
Snow Loading Zone	Zone N0

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1 SITEWORKS

1.1 Preliminary

Refer to General Conditions of Contract and the Special Conditions in this Specification as appropriate. Read this section in conjunction with all other trade sections.

1.2 Compliance

Comply with the New Zealand Building Code 1992 including all revisions and amendments, Verification Methods where appropriate, and construction principles that are embodied in the Acceptable Solutions.

Comply with all relevant provisions and recommendations of:

3012:2010(AS/NZS)	Electrical installations - Construction and demolition sites
4402.4.1.1:1986(NZS)	Soil compaction tests - Determination of the dry density/water content relationship - Test 4.1.1 New Zealand standard compaction test
4431:1989(NZS)	Code of practice for earth fill for residential development
NZBC B1	Structure
NZBC E1	Surface Water
NZBC F1	Hazardous Agents on Site
NZBC F2	Hazardous Building Materials
NZBC F3	Hazardous Substances and Processes
NZBC F4	Safety from Falling
NZBC F5	Construction and Demolition Hazards

1.3 Site & Scope

1.3.1 Site

Note that no claims will be recognised on the grounds of insufficient description of existing site conditions in the Contract Documents.

Take great care to excavate exactly for the wall foundations to avoid any damage to adjacent property.

Take great care to excavate exactly up to the wall foundations to avoid any damage to adjacent property.

1.3.2 Scope

This section covers:

Demolition work
Removal of vegetation

Excavation of topsoil and stockpiling and final distribution

Excavation as required for foundations and slabs

Supply, placing and compaction of hardfill basecourse and sand blinding

Supply and placing of any site concrete required

1.4 Partial Demolition

1.4.1 Scope

Carry out the partial demolition to the buildings and structures as indicated for demolition on the approved drawings, including those that are located below ground level, and remove and dispose of all resulting demolished debris. Aspects of this work include the provision of all precautionary safety measures, screens, scaffoldings, hoarding, covered walkways and the like necessary for carrying out and completing the demolition work. All aspects of this work shall be carried out to comply with the requirements of the NZ Building Code, relevant Regulations and Acts, the controlling Territorial Authority, and as specified herein.

1.4.2 Requirements

Safety
Comply with the Health and Safety at Work Act 2015 (HSWA), and with all relevant Health and Safety at Work Regulations 2016, and with all relevant WorkSafe New Zealand (WorkSafe) Approved Codes of Practice and WorkSafe Information and Guidance.

Comply with all relevant WorkSafe NZ Approved Codes of Practice and Information and Guidance requirements; in particular the NZDAA 'Demolition - Best Practice Guidelines for Demolition in New Zealand', and the 'OSH Guidelines For the Provision of Facilities and General Safety in the Construction Industry'.

Compliance
Allow for all work associated with the safe and orderly execution of the demolition work, including complying with all Territorial Authority requirements, Building Consent, Building Act, Health and Safety requirements, and all other acts, laws, by-laws and regulations that may affect the execution of the works.

Hours of Demolition Work - Unrestricted
The time during which demolition work may be carried out is unrestricted. Comply with all conditions of the Building Consent, including those for noise and nuisance controls.

Demolition Work

Demolition work shall be carried out by suitably skilled and experienced workers and operators trained for this type of work, including the necessary demolition methods and the maintenance and inspection of demolition plant and equipment. Carry out demolition work in a careful manner so as to avoid damage to existing buildings, structures or property not scheduled for demolition and to be retained

Ensure that supervisory personnel have a detailed knowledge of the precautions and procedures outlined in the WorkSafe NZ 'Demolition - Best Practice Guidelines for Demolition in New Zealand'.

Notify the Contract Administrator the name of the appointed demolition supervisor prior to commencement, who shall be the holder of a current safety qualification recognised by WorkSafe NZ. Evidence of this shall be made available to the Contract Administrator.

All practicable steps must be taken for the safety of employees, and equipment must be operated by competent people. Particular care must be taken when employees demolish unsafe or damaged structures such as brittle roofing, fire-damaged and cantilevered structures.

Provide all necessary shoring or strutting or other protection to ensure complete safety and protection throughout the contract.

Protect public footpaths, kerbs, gutters, crossings, etc., (and keep them free and clear of debris or excavation material), and pay all charges in connection with any damage rectification. Ensure that roads and paths are not obstructed and the traffic is not impeded while the work is being carried out.

Where there is a danger to the public, warning signs, barricades or warning devices must be provided and used.

Notify the Contract Administrator immediately of any services or conditions or constructions encountered which are inexplicable or not anticipated on the drawings or in this specification. Removal, disconnection, relocation or otherwise for these shall all be as directed and carried out by appropriately qualified tradespersons.

1.4.3 Existing Services

Take full responsibility for:

- Giving all required notices to the water, sewage, gas, telecoms and electricity authorities or companies, and the Territorial Authority, and paying all relevant fees and charges.
- Removing, disconnecting, sealing off, etc., existing service lines and items that are to be made redundant.
- Protecting existing services lines and items that are to be retained.
- Maintaining existing services to occupied areas of the building and/or site.
- Rectifying any damage or interference to existing services that are to be retained, and providing temporary services while repairs are being carried out.
- Protecting services adjacent to the site.

1.4.4 Adjacent Buildings

Integrity of Adjacent Buildings

Check the relationship and the condition of adjacent buildings, structures and areas. No part of the demolition process shall adversely affect the integrity of adjacent buildings, structures or areas to be retained.

Separation from Adjoining Buildings

Allow for the neat removal of all flashings, etc., and generally allow for all measures required to separate the building or structure from those on adjacent sites.

Make all necessary allowances where the to-be-demolished structure is attached to adjacent property, including separation measures necessary to carry out the demolition without damaging the adjacent property.

Temporary Weatherproofing of Exposed Walls

Temporarily protect and make weathertight exposed wall faces of the adjcent buildings with 0.250mm thick black polythene sheet. Lap all joints 150mm and such that any moisture will be shed to the outside, tape all lapped joints and penetrations with 50mm PVC tape, and fasten to the wall face with 50mm x 25mm timber vertical battens at 600mm centres using fasteners appropriate for the substrate.

1.4.5 Dust & Noise Control

Take all necessary measures to minimise nuisance from dust, noise and other causes affecting adjoining areas, properties and the public.

Refer to NZS 6803 'Acoustics - Construction noise', and comply with the requirements of the Building Consent (as applicable). Use appropriate plant, equipment and machinery so as to comply with required noise limits.

1.4.6 Removal from Ground

Dig out those in-ground items indicated on the drawings for demolition and removal, including paving, ground slabs, foundations, footings, trenches, pits, sumps, drains, etc. Leave the voids that result. Do not backfill voids unless instructed otherwise by the Contract Administrator.

1.4.7 Damage & Reinstatement

Make all necessary allowances to reinstate and make good any damage caused by the demolition work to any existing building or property, including site, being retained. No reinstatement or making good work shall be undertaken without prior assessment and instruction from the Contract Administrator.

1.4.8 Completion

Ensure that all demolition work has been carried out to the required standard, including the disconnection and sealing off of redundant services.

Leave the site clear of all demolition rubble, waste materials and disturbed ground to the required standard.

Remove all associated machinery, plant, tools, equipment, etc., from the site.

Check that any remedial work associated with demolition damage to other buildings or property or retained area of the site has been carried out to the requirements and satisfaction of the Architect/Designer.

Check that any materials and/or items salvaged on behalf of the Owner have been handed over to the Owner and are no longer the responsibility of the Contractor.

Provide copies of all necessary compliance documents to the relevant parties.

1.5 Siteworks

1.5.1 Scope

This section sets out the general requirements for sitework necessary for the satisfactory completion of the contract works. All aspects of this work shall be carried out to comply with all statutory obligations and regulations of regulatory bodies controlling the execution of the contract works, and in accordance with the project design documentation.

1.5.2 Requirements

Safety

Comply with the Health and Safety at Work Act 2015 (HSWA), and with all relevant Health and Safety at Work Regulations 2016, and with all relevant WorkSafe New Zealand (WorkSafe) Approved Codes of Practice and WorkSafe Information and Guidance, in particular the 'OSH Guidelines For the Provision of Facilities and General Safety in the Construction Industry'.

Carry out all construction operations in accordance with the Contractor's project-specific Health and Safety Plan.

Explosives

The use of explosives is NOT permitted.

Compliance

Allow for all work associated with the safe and orderly execution of the siteworks, including complying with all Territorial Authority requirements, Building Consent, Building Act, Health and Safety requirements, and all other acts, laws, by-laws and regulations that may affect the execution of the works.

Definition of Good Ground

Good Ground means any soil or rock capable of permanently withstanding an ultimate bearing pressure of 300 kPa (i.e. an allowable bearing pressure of 100 kPa using a factor of safety of 3.0), but excludes:

- Potentially compressible ground such as topsoil, soft soils such as clay which can be moulded easily in the fingers, and uncompacted loose gravel which contains obvious voids;
- Expansive soils being those that have a liquid limit of more than 50% when tested in accordance with NZS 4402:Test 2.2, and a linear shrinkage of more than 15% when tested, from the liquid limit, in accordance with NZS 4402:Test 2.6, and
- Any ground which could foreseeably experience movement of 25mm or greater for any reason including one or a combination of: land instability, ground creep, subsidence, (liquefaction, lateral spread - for the *Canterbury earthquake region only)*, seasonal swelling and shrinking, frost heave, changing ground water level, erosion, dissolution of soil in water, and effects of tree roots.

Soil below concrete foundations, footings and slabs-on-ground: unless specified otherwise, the general intent is to excavate to a stable, undisturbed sub-grade of 300 kPa ultimate bearing capacity.

Unless specified otherwise, soils (except those excluded from the Good Ground definition) tested with a dynamic cone penetrometer in accordance with NZS 4402: Test 6.5.2, shall be acceptable as good ground for building foundations if penetration resistance is no less than:
- 5 blows per 100mm at depths down to twice the footing width;
- 3 blows per 100mm at depths greater than twice the footing width.

Depths shall be measured from the underside of the proposed footing.

Stormwater & Sediment Control

Ensure the environmental protection of the site during the works. Carry out construction works and operations to ensure that they fully comply with the relevant controlling environmental authority's sediment control and stormwater discharge guidelines.

Provide suitable measures to prevent or minimise sediment generation and silt runoff in accordance with the requirements of the controlling Territorial Authority. Where required, detailed design of mitigation measures such as fences, cut off ditches, detention ponds, etc., shall be undertaken by a suitably qualified person employed by the Contractor.

Erosion and sediment control measures shall be maintained and remain in place until surface reinstatement has been established. If at any time the performance of the stormwater and sediment control measures, or ongoing review of them, indicates that they need to be extended or modified, the design modification and construction of these shall be undertaken by the Contractor at no extra cost to the Principal.

Basic management principles shall be implemented, in particular:
- areas being exposed at any one time shall be kept to a minimum;
- diversion ditches and catch drains or earth bunds to intercept and divert upslope stormwater runoff around areas of earthworks;
- waterborne silt captured by filter mesh fences, hay bales, vegetation buffer strips or settlement ponds/areas, in a way that manages adverse downstream effects;
- stockpiles of topsoil, excavated earth or other material shall not be positioned where they can be eroded or washed into any drain or watercourse.
- only pump water from trenches and detention areas using methods to prevent sediment entering any drain or watercourse.

- all soil-contaminated water shall be properly filtered before discharging into the stormwater drainage system.

Notifiable Work

Notify WorkSafe NZ of work that is notifiable (particular hazardous work) under the Health and Safety in Employment Regulations 1995, 24 hours before starting the work.

1.5.3 Clearing & Stripping

Clearing

Remove from the site all vegetation and obstructions within the area of the earthworks that are not designated as remaining in the contract documents.

Clearing shall be carried out as a separate operation before stripping and excavation. Clearing shall include complete removal from the site of lightweight structures, foundations, trees, tree stumps, logs, roots, scrub, grass and other vegetation, paving materials, fences and rubbish, and the off-site disposal of such items.

The removal of surface grass and weeds shall be completed as part of the topsoil stripping operation.

All trees within the limits of the earthworks shall be removed unless designated as remaining by the Contract Administrator and contract documents.

Protect trees and other vegetation designated as remaining within the earthworks area, and trees and other vegetation beyond the limits of the earthworks, from damage by these operations.

Extraction of tree stumps (if any) shall include the removal of roots greater than 25mm diameter.

Disposal of Cleared Material

Unless specified or directed otherwise, all material cleared shall become the property of the Contractor, and shall be removed from the site and disposed of in a safe and legal manner, and in such a manner as to cause as little inconvenience as possible to adjacent properties and the public. Pay all required tipping and landfill fees.

Burning of Cleared Material - Not Permitted

The disposal of cleared materials by burning is NOT permitted on the site.

1.5.4 Excavation

Excavation General

Excavate out all ground material above the finished levels or contours indicated on the design drawings, making due allowance for the construction of foundations, ground slabs, retaining walls, hard paving, underground utilities, landscaping and reinstatement of topsoil. The manner of excavations is the responsibility of the Contractor.

Excavation, as a minimum, shall include stripping of the site to remove all rubbish, noxious material and organic material, including topsoil, covering the area where the buildings, paving and other work is to be placed.

Excavations shall be undertaken in accordance with the 'Excavation Safety - Good Practice Guidelines'.

As necessary, cross reference and coordinate excavation work with the design drawings - Architectural, Structural, Building Services, Civil.

As necessary, coordinate excavation work with other trades as to set-out and timing to ensure that all cut faces are covered or finished etc. as soon as practicable after the excavation is complete.

If, in the opinion of the Contract Administrator, weather conditions or the excavation methods employed are such as to result in undue disturbance of adjacent ground or ground below final trimming level, suspend the work and complete the excavation in accordance with the Contract Administrator's instructions.

Excavation Inspections for Foundations

Give at least 48 hours' notice prior to commencement of each stage of excavation work. Where required, the proposed methods of completing each phase of the work shall be discussed and agreed with the Contract Administrator prior to starting.

Give at least 12 hours' notice of when a foundation inspection is required. Backfill, basecourse, site concrete, reinforcing, etc., shall not be placed in foundations until the Contract Administrator has been given adequate opportunity to inspect the relevant area.

Unearthing of Waahi Tapu & Cultural Sites

During excavation, should a waahi tapu or other cultural site be unearthed, cease excavation operations immediately, and inform the Contract Administrator. Inform the local Iwi, and inform Heritage New Zealand Pouhere Taonga and apply for an appropriate authority if required. Take appropriate action, following discussions with Heritage NZ Pouhere Taonga and Territorial Authority, and runanga/runaka/iwi if Maori, to remedy any damage and/or to restore the site.

Note; in accordance with the Heritage New Zealand Pouhere Taonga Act 2014, where an archaeological site is present (or uncovered), an authority from Heritage New Zealand is required if the site is to be modified in any way. An archaeological site is defined in the Heritage New Zealand Pouhere Taonga Act 2014 as any place in New Zealand (including buildings, structures or shipwrecks) that was associated with pre-1900 human activity, where there is evidence relating to the history of New Zealand that can be investigated using archaeological methods.

Excavation of Unforeseen Obstructions & Ground Conditions

Notify the Contract Administrator immediately in the event that any of the following conditions are encountered during excavation:

- unexpected underground obstructions or voids;
- unforeseen variations in ground material types or properties;
- observations of buried vegetation, groundwater flows or seepages.

Excavation of Hazardous and/or Contaminated Materials

Should material encountered during excavation appear to be hazardous and/or contaminated in any way such that it would not be accepted at a conventional landfill site, immediately cease all such work likely to spread the hazardous material or worsen the contamination, and notify the Contract Administrator and seek instruction as to how the work should proceed.

Excavations in Existing Paved Surfaces

Take all necessary precautions and make appropriate provisions to prevent damage to or contamination of existing paved surfaces that are to be retained and remain intact while the contract works are being carried out.

Prior to excavation, the paving shall be accurately cut to neat, straight lines parallel to the line of the excavation (unless shown otherwise on the drawings) with a nominal 100mm trimming allowance either side of the excavation width.

Paved surfaces shall be reinstated as specified and as shown on the drawings - refer to Reinstatement of Surfaces.

Excavation for Foundations

Foundation excavations shall be accurately cut true to line, level and angle, to minimum sizes and to the levels and grades required for all slabs, footings and foundations, and over the rest of the areas shown for levels adjustment. Foundation excavations shall extend down to firm undisturbed ground to the required depth. Refer to the foundation layout and details shown on the drawings.

Excavation for Slab Benches

Excavate and trim benches for slabs-on-ground level and true, allowing for all below-slab items such as granular hardfill base, blinding, insulation, etc., to the layout and details shown on the drawings.

Excavation for Services

Excavate trenches for all services, including drainage, plumbing, electrical, gas, telecommunications as indicated on the drawings. Cross reference and coordinate all excavations with the Architectural, Structural and Building Services drawings.

Existing Soft Spots and Previously Filled Areas

Excavate and remove from site all material from soft spots and previously filled areas as directed by the Contract Administrator. The Contract Administrator shall advise in writing the area, extent and depth of excavation required, and the backfilling requirements.

Stockpile Excavation Spoil

Plan the excavation carefully to ensure that stockpiles will not interfere with construction work. Stockpile spoil sufficient for the filling, backfilling and reshaping required later, and to avoid overlaying areas outside the works area with material.

Excavation spoil shall be stockpiled in such a manner as not to jeopardise the stability of any trench, bank, batter, etc.; or to obstruct any road, crossing or driveway without authorised consent.

On completion, remove from site and dispose of all surplus stockpiled material, unless directed otherwise by the Contract Administrator. Leave the stockpile areas clean and free of spoil to the required standard.

Surplus Material

Remove from site and dispose of in a safe and legal manner all surplus material as it is excavated. Fouling of the site or adjoining public or private property and roads by spilled material is not permitted. Pay all tipping and landfill fees required.

Maintain Excavations

Secure and maintain excavations free from slips, erosion, water and other fluids or fallen materials. Provide and maintain stable battered slopes, pile liners, shoring, strutting, sheet piling, planking, pumps and other materials or plant necessary for carrying out and maintaining excavations. Remove these when no longer necessary.

Allow to protect exposed faces of temporary batters and slopes as necessary using an approved protection method, to prevent slumping and collapse.

Excavation Dewatering and Stormwater Control

Keep excavations free from ponding stormwater, and provide all pumps, drainage pipes and other equipment necessary for dewatering operations.

As necessary, dig suitable temporary sumps/pits outside the line of foundations to receive dewatering pumps.

If water enters concrete foundation excavations, the water shall be pumped out, and any soft materials not suitable for receiving concrete shall be removed and replaced with clean compacted hardfill or site concrete to the required levels.

Comply with the conditions of the Resource Consent/Building Consent related to stormwater and sediment control during construction, and employ suitable methods for minimising the runoff of sediment laden water from the site in accordance with accepted practices and guidelines. Refer to Requirements - Stormwater & Sediment Control.

Do not permit any flooding of property, footpaths or roadways as a result of excavation operations or dewatering measures, including the use of pumping equipment.

Provide channels, pipes or other approved means for effectively conveying groundwater to the nearest adequate and approved discharge point.

The discharge of groundwater to piped or open drains or channels shall only be permitted when prior approval from the controlling Territorial Authority has been obtained.

1.5.5 Earth Fill

Imported Earth Fill

Imported earth fill material shall be consistent, well graded non-organic, clean, uncontaminated soil material that is approved suitable for filling by having grading and moisture content properties that will allow re-compaction to 95% of maximum density. Do not use material which is organic or highly plastic. Obtain the required permissions and permits, and pay all associated costs and fees for imported earth fill.

Surface Preparation

Clear and strip the areas on which earth fill material is to be placed - refer to Clearing and Stripping. Before filling commences in any area of the site, the cleared and stripped surface shall be inspected and approved by the Contract Administrator.

Any soft or compressible areas discovered shall be excavated and refilled with suitable compacted material in accordance with the Contract Administrator's instructions. The exposed surfaces shall be compacted so as to achieve relative compaction at least equal to that specified for the fill to a depth of 150mm. Where necessary the ground shall be bladed until it is uniform, free of large clods and brought to suitable water content prior to compaction.

Fill Placing

Earth fill material shall be placed and spread in a systematic manner, in near-horizontal layers of uniform thickness no greater than 230mm before compaction, progressively across the fill area. Any lumps or rocks exceeding 100mm in any direction shall be either broken down to less than 100mm or removed.

Do not place, spread or compact earth fill during or immediately after wet weather or when the ground is frozen. Except for essential work to maintain safety or drainage or prevent damage to work, no equipment shall be moved on or over the earthworks area during or immediately after wet weather.

Fill Compaction

After each layer of earth fill has been placed and spread evenly and brought to a suitable moisture content, it shall be compacted to at least 95% of NZS 4402:Test 4.1.1, unless directed otherwise. Each layer shall be compacted as a separate operation before any subsequent filling.

Compaction shall only be carried out with approved, special-purpose compaction equipment. Compaction equipment shall follow systematic patterns of travel and make sufficient passes to ensure that the required compaction has been uniformly obtained everywhere.

Compact fill-formed batter faces as a separate operation, either by overfilling and cutting back, or by rolling with compacting plant working up and down the slope.

Finished Surfaces

Finished earth-fill surfaces shall conform to the levels, lines, grades and contours shown on the drawings or as directed by the Contract Administrator, within the tolerances specified.

Finished earth-fill surfaces for the construction of structures, concrete work, etc., shall be completed to the detailed dimensions. Where earth fill abuts undisturbed ground, the ground shall be trimmed and finished either side to gradually conform to the shape of the adjacent ground for a regular appearance.

Backfilling

The backfilling of earth fill around structures, and where required to bring undercut areas to finished levels and form, shall consist of selected earth fill material, evenly spread and compacted in uniform layers, with the use of suitable plant and equipment to achieve the specified relative compaction.

Do not, under any circumstances, substitute any specified hardfill backfill with earth backfill without prior written instruction from the Contract Administrator.

1.5.6 Hardfill & Blinding

Material

Hardfill material shall be good quality low fines crushed aggregate metal of approved origin, well graded and free of deleterious and organic material, and able to be compacted to a dense uniform layer. Hardfill material with obvious clumps of plastic content will not be accepted.
Except where specified otherwise, the maximum aggregate size shall not exceed 65mm and shall conform to the following:

Test Sieve Aperture	% Passing by Mass
63mm	100%
19mm	30-70%
4.75mm	10-40%
75 micron	10% maximum

Testing & Verification of Hardfill

The Contractor remains solely responsible for compliance of all hardfill materials used. Where a material appears to fall outside the recommended parameters, the Contractor shall employ an independent testing agency to confirm that the supplied material is within the specifications. All costs associated with non-complying hardfill material, including initial and subsequent testing, shall be at the Contractor's expense.

Backfilling with Hardfill

Backfill with hardfill around the sides of foundations and retaining walls, except where specified otherwise, with approved hardfill material as specified.

Hardfill material shall be good quality low fines crushed aggregate metal of approved origin, well graded, free of deleterious and organic material, and able to be compacted to a dense uniform layer.

Ensure that all timber, rubbish and other debris and other loose material is removed before backfilling. Avoid contaminating hardfill with excavated material during placement and compaction.

Place hardfill to bring levels up to the underside of the basecourse, site concrete, capillary break material or sand blinding as appropriate, with at least 150mm hardfill under ground beams, foundation pads and pits.

Spread loose hardfill in layers no more than 150mm thick, and compact with a vibrating roller, plate compactor or other suitable equipment to achieve not less than 95% of maximum dry density determined at optimum water content in accordance with NZS 4402:Test 4.1.1.

Compaction equipment shall follow systematic patterns of travel and make sufficient passes to ensure that the required compaction has been uniformly obtained everywhere for each layer. Care should be taken not to overwork the subgrade or to cause weaving during hardfill compaction. Any soft patches evident after compacting hardfill must be brought to the attention of the Contract Administrator for consideration.

NZS 3604 Granular Base to Underside of Slab-on-Grade

Granular hardfill base used as a capillary break to the underside of concrete slabs on grade shall consist of granular fill material conforming to NZS 3604: Section 7.5.3, and be systematically placed and compacted in horizontal layers no thicker than 150mm over the entire area beneath the proposed ground slab. Each layer shall be placed and compacted as a separate operation to subsequent layers.

The total thickness of the granular base shall be as indicated on the drawings, and no less than 75mm and no more than 600mm unless specified otherwise.

Compact each layer until the material is tightly bound together and does not visibly deform under the weight of a pressed adult heel. Compaction shall only be carried out with approved, special-purpose compaction equipment appropriate for the application. Compaction equipment shall follow systematic patterns of travel, and make sufficient passes to ensure that the required compaction has been uniformly obtained everywhere for each layer. Care should be taken not to overwork the subgrade or to cause weaving during hardfill compaction.

Blind the basecourse with a uniform layer of clean sand between 5mm and 25mm thick over all areas where a damp-proof membrane (DPM) is to be overlaid. Ensure the sand blinding layer is sufficiently compacted and smoothed before laying the DPM. Do not leave sand blinding exposed to the elements any longer than necessary, and install the DPM immediately or as soon as possible.

1.5.7 Reinstatement of Surfaces

General

This section covers the reinstatement of all surfaces disturbed by excavations and construction work. Reinstate all such disturbed surfaces and features, including grass surfaces, gardens and pavements to the standards specified on the drawings or herein. Reinstatement shall generally achieve a standard equal to or better than the pre-existing situation - in no case will a lower standard be accepted.

Grassed Areas & Gardens

The surfaces of excavation carried out in grassed areas and gardens shall be reinstated by placing 200mm of topsoil or turf, levelled and sown with approved grass seed to the satisfaction of the Contract Administrator. Topsoil or turf shall be either saved from the original stripping or obtained elsewhere.

Hedges, fences and other items to be retained that have been damaged or removed during the work shall be reinstated to the satisfaction of the Contract Administrator.

Private Driveways & Paths

Reinstatement of paved private driveways and paths shall match the existing surface but the following minimum standards apply.

- Concrete: A minimum of 100mm thick Grade 20 MPa concrete, over 100mm thick compacted TNZ M4 basecourse.
- Asphalt: A minimum of 25mm thick asphalt, over 100mm thick compacted TNZ M4 basecourse.

Public Property

Before commencing any excavation in or reinstatement work to public footpaths, driveway crossings, roads or other public property, make all necessary enquiries to the relevant controlling authority (Territorial Authority or NZTA) for their standards for excavation and reinstatement.

Reinstatement of surfaces to public property shall comply with the requirements of the relevant controlling authority.

Arrange and pay for any reinstatement inspections of public property required by the controlling authority.

2 CONCRETE

2.1 Preliminary

Refer to General Conditions of Contract and the Special Conditions in this Specification as appropriate. Read this section in conjunction with all other trade sections.

2.2 Compliance

Comply with the New Zealand Building Code 1992 including all revisions and amendments, Verification Methods where appropriate, and construction principles that are embodied in the Acceptable Solutions.

Comply with all relevant provisions and recommendations of:

3101.1&2:2006(NZS)	Concrete Structures Standard
3104:2003(NZS)	Specification for concrete production
3109:1997(NZS)	Concrete construction
3112.1:1986(NZS)	Methods of test for concrete - Tests relating to fresh concrete
3112.2:1986(NZS)	Methods of test for concrete - Tests relating to the determination of strength of concrete
3114:1987(NZS)	Specification for concrete surface finishes
3121:2015(NZS)	Water and aggregate for concrete
3122:2009(NZS)	Specification for Portland and blended cements (General and special purpose)
3124:1987(NZS)	Specification for concrete construction for minor works
3125:1991(NZS)	Specification for portland-limestone filler cement
3604:2011(NZS)	Timber-framed buildings
4455.1:2008(AS/NZS)	Masonry units, pavers, flags and segmental retaining wall units - Masonry units
4671:2001(AS/NZS)	Steel reinforcing materials
NZBC B1	Structure
NZBC B2	Durability

2.3 Materials

2.3.1 Damp Proof Membrane

Polythene damp proof membrane shall be 0.25mm thick and shall be continuous under slabs on grade or fill and under foundations. All joints lapped 200mm and continuously sealed with pressure sensitive tape. Tape seal around penetrations. Inspect immediately before pouring concrete and repair any holes or other damage.

2.3.2 Reinforcement

Reinforcing grades are identified by bar diameters prefixed with letters thus:

D indicates Grade 300E deformed bar
R indicates Grade 300E plain round bar
HD indicates Grade 500E deformed bar
HR indicates Grade 500E plain round bar
RB indicates Grade 500 Reidbar (uniquely deformation patterned bars)

Imported reinforcing steel will not be accepted without the prior approval of the Engineer. Reinforcing free of loose rust, mill scale, dirt, paint, oil, etc. and stored clear of the ground. Accurately place reinforcing and tie securely to prevent displacement during pouring of concrete. Tie wires must not project into specified concrete cover. Welding of reinforcing is not permitted unless specifically approved by the Engineer.

All terminal ends of reinforcing bars shall be hooked. Intersecting walls, beams and foundations shall contain return longitudinal reinforcement, as detailed for the intersecting members, all to NZS 3109 unless shown otherwise on the drawings.

Unless detailed otherwise all bars assumed to be continuous, with lap lengths not shown otherwise to be 40 diameters for grade 300 steel, 60 diameters for grade 500 steel, 250mm for mesh. Bars shall generally have minimum bends of five times their diameter.

Support slab steel at 1 metre maximum centres. Use plastic spacers for fairface concrete. Co-operate with others to accurately place all block/brick starters, as the bending of starters to the core position will not be permitted.

2.3.3 Concrete Cover

Concrete cover not shown otherwise to be:
- Foundations - 75mm where poured against ground, 50mm elsewhere.
- Beams and columns - 40mm (for main reinforcing).
- Slabs - 50mm where poured on ground, 40mm where exposed to weather, 30mm elsewhere.
- Walls - 40mm where exposed or against ground, 30mm elsewhere.

2.4 Workmanship

2.4.1 Qualifications

Where required by the NZ Building Act 2004 it is the building contractor's responsibility to ensure that all restricted building work is carried out by a Licensed Building Practitioner.

All work shall be carried out to the latest and best trade practise standards by experienced and competent tradesmen, familiar with the materials specified and installation techniques.

2.4.2 Formwork

Provide all necessary formwork to produce finished concrete to the required dimensions, surface finishes and structural tolerances (NZS 3109 table 4, note that slab surfaces shall not vary by more than 3mm from a 3m straightedge placed anywhere on the surface, and that this maximum variation shall extend over a minimum distance of 1m).

Design and construct formwork to withstand total weights and all construction loads. Formwork constructed tightly to prevent undue slurry leaks, with no wire formwork ties, and no part of the formwork ties left within required concrete cover. 20 x 20mm fillet corners. Any release agents used shall be non staining and shall be compatible with all subsequently applied finishes.

Position construction/crack control joints (except where shown otherwise) under walls or elsewhere as approved, in accordance with the following maximum criteria:
- Slabs on ground - area 50 sq.m, length 7.5m.
- Suspended slabs - area 150 sq.m, length 15m.
- Walls - length 10m, lift 4m.

Coordinate with all trades to build in all necessary starters, fixings, anchorages, chases, sleeves, bolts, conduits, electrical / plumbing devices etc., and check their exact positioning before pouring. Coordinate with all trades to form all necessary holes, openings etc. with their positions and sizes exactly as required.

Strike formwork without shock or vibration, and without disturbing, damaging or overloading the structure. Fill all bolt holes as soon as practicable.

2.4.3 Concreting & Curing

All concrete shall be power mixed in a plant approved by the Ready Mixed Concrete Association for required grade. All structural concrete shall have a compressive strength of 20MPa at 28 days. 19mm max aggregate, 80mm slump, and with a maximum water cement ratio of 0.55.

Advise for inspection 24 hours before placing any concrete. Sequence and size of concrete pours to approval. No concrete pouring in wet weather. Clean out all formwork thoroughly before pouring. Handling, placing and vibration/compaction of concrete shall all be exactly to NZS 3109 requirements, and carried out by skilled operatives. Slabs power float finished to NZS 3114 U2 surface by kelly float, with steel troweling to a similar finish in corners etc., and to a U3 finish localized to resilient flooring areas.

Cure all concrete for 14 days. Do not use sprayed membranes. As soon as practicable pond all horizontal surfaces, or fully cover with polythene or hessian (kept wet). Periodically hose down all formwork. Stripped vertical surfaces shall be kept wet with perforated hoses or similar.

Form shrinkage control joints in concrete floor slabs-on-ground by saw cutting, without chipping, spalling and tearing the surface, to the locations and layout shown on the drawings. Saw cuts shall extend to a quarter of the depth of the slab. Saw cutting shall take place no later than 24 hours after initial set for average ambient temperatures above 20°C, and 48 hours for average ambient temperatures below 20°C.

2.4.4 Surface Finishes

General floor slabs - U3 finish.

Top surface of foundations not exposed on completion - U2.

Foundation sides exposed to view - F5.

2.4.5 Documentation

Concrete delivery dockets shall state job, date and time of mixer loading, grade, strength, and slump. Dockets shall be kept and forwarded to the Architect/Designer. Water must NOT be added after the concrete leaves the plant.

2.5 Concrete

2.5.1 Scope

This section sets out the requirements for the supply, forming, casting and finishing of all concrete and concrete elements, including precast concrete elements if required, and the building in of all cast-in items, required for the satisfactory completion of the works. All aspects of this work shall be carried out to comply with the requirements of the New Zealand Building Code and relevant Standards, and in accordance with the project design documentation, and with any relevant product manufacturers' recommendations.

The supply and fixing of reinforcing for concrete is covered in separate specification Reinforcing Steel. The supply and placing of blockwork grout is covered in separate specification section Blockwork.

2.5.2 Requirements

Safety

Comply with the Health and Safety at Work Act 2015 (HSWA), and with all relevant Health and Safety at Work Regulations 2016, and with all relevant WorkSafe New Zealand (WorkSafe) Approved Codes of Practice and WorkSafe Information and Guidance, in particular the 'OSH Guidelines For the Provision of Facilities and General Safety in the Construction Industry'.

Precast concrete shall be handled in accordance with the WorkSafe 'Approved Code of Practice for The Safe Handling, Transportation and Erection of Precast Concrete'.

Carry out all construction operations in accordance with the Contractor's project-specific Health and Safety Plan.

Quality Assurance - Option 1

Ensure that the construction of all concrete work complies in all respects with the design drawings and the specifications.

Prepare and submit details of the quality assurance procedures for concrete work for approval. These procedures should encompass all aspects of concrete construction.

The quality assurance procedure shall encompass all aspects of concrete construction including, but not limited to:

- concrete quality; and
- formwork quality; and
- construction tolerances; and

- reinforcing steel placement; and
- cast-in items; and
- concrete finishes.

Notify the name of the concrete construction representative to be responsible for the quality control of concrete work. The nominated representative shall complete and sign a written quality control checklist for each on-site concrete pour. A copy of each completed checklist shall be submitted to the Contract Administrator before pouring commences, and in sufficient time for pre-pour inspections to be carried out. The format and detail of the checklist shall be agreed to prior to the commencement of any concrete work.

Supply evidence of concrete production quality standards in advance of construction in accordance with the requirements of NZS 3109.

Tolerances

Unless specified otherwise, dimensional tolerances of concrete work shall conform to NZS 3109: Table 5.2 - 'Tolerance for insitu construction', and NZS 3109: Table 5.1 - 'Tolerance for precast components', and to NZS 3114 for off-the-form and unformed surface tolerances.

To ensure that elements such as external cladding, precast items, and lifts will properly fit the building, maintain responsibility for the accurate control of the overall set-out of the concrete structure and concrete elements.

An absolute tolerance on the position of all structural elements of 15mm shall be maintained over the full height of the structure in all directions.

Employ a registered surveyor to reset all gridlines and column positions at every second floor. Column locations, slab edge positions and positions of openings shall be adjusted to ensure that each in within 10mm of the correct position through the height of the building.

Take particular care to ensure that individual members and the building structure as a whole do not twist over the height of the building.

Inspections

All stages of the concrete construction work shall be reviewed in accordance with the requirements of NZS 3109: Section 1.3, and the conditions of the Building Consent.

All inspections shall be properly documented by the Contractor. Provide all necessary quality control checklists prior to pouring and in sufficient time for pre-pour inspection.

Give notice and provide reasonable opportunity to inspect the section of work prior to pouring. Give at least 1 working day's notice of intent to place concrete in any area.

Any instructions issued shall be carried out before concrete placing commences. Unless approval is given by the Contract Administrator and/or BCA, no concrete shall be placed in that section of work.

Any concrete placed without authorisation may require removal from the works at the Contractor's expense.

Materials & Workmanship

Adhere to the requirements of NZS 3109, except where specified otherwise or instructed by the Contract Administrator.

Producer Statement

Furnish a fully completed Producer Statement when the works are sufficiently complete and are ready for application for a Code Compliance Certificate. The Producer Statement shall cover all concrete construction work completed under this section of the specification - Concrete.

2.5.3 Reinforcement

Refer to separate section Reinforcing Steel.

Store reinforcing steel material flat, clear of the ground, on evenly spaced bearers, in a secure area clear of the building works. Keep materials protected from damage and contamination at all times. Do not use damaged, distorted or defective material.

Ensure that all reinforcing is adequately supported off the ground and remains clean from delivery until placing. Before placing reinforcing steel, check that it is free of any loose mill scale and any contamination that may impair bonding to concrete.

Take all necessary measures to ensure that reinforcing steel is not damaged or displaced during concreting.

2.5.4 Formwork

Formwork shall conform to NZS 3109: Section 5, and comply with the provisions of NZS 3114 applicable to the class of surface finish specified.

Formwork and falsework shall have sufficient strength to retain and support the wet concrete being placed to the required profiles and tolerances.

The formwork surface finish shall be of suitable quality necessary to produce the specified concrete finish. Any formwork with a deteriorated or damaged surface that does not meet the requirements of the surface finish shall not be used.

Fair-faced concrete formwork shall be constructed so as to provide straight and true angles and so as to produce cast surfaces within a maximum tolerance of 5mm of the given dimensions, and without visible offsets, bulges, or misalignment of the concrete. Form neat, clean arrised edges, except where chamfers are indicated on the drawings or required to match existing detail - in which case the fillets shall form part of the mould and not be loosely placed.

Plywood formwork shall be constructed from Formply plywood sheets or C-grade faced standard plywood sheets (according to concrete finish), placed in a regular pattern and tightly butted together to avoid grout loss. The joints shall be sealed to prevent grout loss. Plywood formwork shall not be

permitted to stain visually exposed concrete. Unless indicated otherwise on the drawings, timber or plywood formwork shall have 20mm fillets at the inside corners of beams, columns and walls.

The formwork face shall be adequately clean and treated with a general purpose concrete form release agent in accordance with the manufacturer's requirements. Diesel oil based products are not permitted. Care shall be taken to ensure that the release agent is kept out of contact with the reinforcement and is compatible with any subsequent paint or finish system applied to the finished concrete.

All ties and spreaders shall be of an approved type and placed so as to leave a regular, neat pattern on the concrete surface when withdrawn and filled. The ends of cast-in ties shall be set at least 40mm from the concrete surface. Wire ties are not permitted for the purpose of restraining, securing or supporting formwork.

Steel formwork shall be used where specified or appropriate, with all joints welded and ground smooth and flush to a uniform surface. All internal corners shall be formed by folding the steel, not butting.
Any surface required with a ribbed or grooved surface shall be formed by adhering battens of the appropriate profile to the form bed and/or mould, and treated generally as above.

Erected formwork shall be set and checked for dimensional accuracy and alignment before, during and after concreting, and any damaged formwork replaced. All debris shall be removed from the formwork immediately before concrete is placed.

When not in use, formwork shall be cleaned, oiled and stored flat on an even surface, and protected from exposure to moisture and contamination on all sides.

Formwork shall be removed without shock or vibration and in such a manner as to prevent damage and to permit the concrete to take the imposed stresses gradually. Do not permit bars or other tools to lever against set concrete when removing formwork. Any damage to the concrete occurring during removal shall be repaired by an approved method at the Contractor's expense.

Removal of formwork in multi-storey structures shall conform to NZS 3109: Section 5.4.5.

2.5.5 Finishes

NZS 3114

Unless specified otherwise in this specification or on the drawings, concrete finishes shall comply with the provisions of NZS 3114 applicable to the surface finish class specified.

Concrete surface finishes not specified in this specification or on the drawings shall be in accordance with Table 1 or Table 2 of NZS 3114 according to surface type, location and application/use.

Slab Finishes

Refer to the Schedule of Surface Finishes below for the finishes required unless specified otherwise in the contract documents.

Arrange the pouring to allow adequate time for floating and finishing.

Floating and any subsequent finishing shall be at the correct time to obtain the quality of compaction and finish required. No finishing work shall be carried out on any area where there is free surface water. The application of dry cement or sand to absorb free water is not permitted.

All trowelling ridges shall be removed while soft, or by subsequent light grinding. Slabs not fulfilling the standard of finish required shall be ground smooth or otherwise treated to the satisfaction of the Contract Administrator. Care shall be taken to avoid ridges where a newly poured slab meets existing edges.

Schedule of Surface Finishes

Schedule of Surface Finishes (according to application):
- Slabs to take plaster or tiles: *U2 Class Finish.*
- Other slabs: *U3 Class Finish*.
- Top surfaces of foundation beams and pads: *U2 Class Finish*.
- Concrete below ground: *F1 Class Finish*.
- Concrete to take plaster or tiles: *F2 Class Finish*.
- Concrete surfaces not exposed in the finished building: *F3 Class Finish*.
- Concrete surfaces exposed inside or outside the finished building: *F5 Class Finish*.
- Precast concrete surfaces exposed finishes: *F5 Class Finish & U3X Class Finish* - as described herein (sample required).
- Feature architectural finish: *F6X Class Finish* - as described herein (sample required).
- External walkways and landings: *U5 Class Finish (soft broom)*.
- Exterior paving: *U2E Class Finish* - exposed aggregate as described herein (sample required).

Description of Specific Concrete Finishes:

2.5.6 Concrete

Normal Concrete

Unless specified otherwise herein, all concrete except for 'no fines' concrete shall be Normal Concrete (N) Grade as defined by NZS 3109, produced in accordance with NZS 3104 from a New Zealand Ready Mixed Concrete Association audited plant, with sufficient cement quantity to ensure satisfactory finish and durability.

Normal Concrete maximum aggregate size shall be 19mm. Calcium chloride shall not be used.

Cement shall comply with:
NZS 3122: 'Specification for Portland and blended cements (General and special purpose)';
NZS 3125: 'Specification for portland-limestone filler cement'.

Chemical admixtures use in Normal Concrete shall comply with AS 1478.

'No fines' concrete shall be coarse aggregate/cement/water mix without sand but with selected aggregate where necessary.

The aggregate used, and overall mix design (including the use of additives) of Normal Concrete, shall meet the provisions of Section 2 of CCANZ TR 3 Alkali Silica Reaction. Evidence of this may be required by the Contract Administrator. Use of low alkali cements or aggregates from an alternative source may be required where the aggregate contains deleterious material.

Normal Concrete used in the works shall have the following minimum strengths at 28 days unless noted otherwise on the drawings:
- Blinding concrete: *10 MPa.*
- 'No fines' concrete: no minimum strength.
- Bored piles: *25 MPa*.
- Foundation pads and strip footings: *25 MPa*.
- Floor slab-on-grade: *30 MPa*.
- Superstructure generally: *30 MPa*.
- Precast concrete: *30 MPa*.
- Toppings to proprietary suspended floor systems: *30 MPa*.
- All other structural concrete not specifically mentioned: *25 MPa*.
- Driveways, pavements, landscaping: *20 MPa*.

Supply details of Normal Concrete mix designs for review prior to the ordering of any concrete.

Where a mix from the Normal Concrete range is specified with a special requirement as specified in NZS 3109, then it becomes a Special Concrete (S) - refer to Special Concrete.

2.5.7 Concreting

Handling, Placing & Compaction

All concreting shall conform to NZS 3109 unless modified in this specification.

Concrete shall be transported, handled, placed and compacted so as to:
- Prevent segregation or loss of materials;
- Produce a monolithic mass between planned joints or the extremities of members, or both;
- Completely fill the formwork to the intended level, expel entrapped air, and closely surround all reinforcement, tendons, ducts, anchorages and embedments; and
- Provide the specified finish to the formed surfaces of the member;
- Ensure there is no contamination of the concrete;
- Ensure that the transporting, handling, placing and compaction of the concrete is complete before setting reactions have passed the point which prevents the concrete from attaining its potential fully cured properties.

Concrete shall not be pumped without the Contract Administrator's approval. Where such approval is given, only a standard 'structural' concrete mix design may be used - the use of a pump mix design will not be accepted.

Vibrators shall be used for the compaction of all concrete, including floor slabs. Immersion vibrators shall be moved to new positions as frequently as necessary to ensure uniform vibration of the whole mass and fully compacted concrete. On no account shall immersion vibrators be allowed to come

into contact with the face of formwork. Vibrators shall not be used to transport concrete along the forms.

Curing & Protection

All concrete shall be cured in accordance with NZS 3109:Section 7.8.

The use of concrete curing compounds shall be only as agreed with the Contract Administrator (specifically for each occasion before it is used). Ensure that any agreed concrete curing compound is compatible with subsequent floor coverings or surface treatments, including any sealers, paints, waterproofing membranes, etc.

All concrete elements shall be protected from damage at all times. Any damaged items shall be repaired or remade to the satisfaction of the Contract Administrator.

Unfavourable Conditions

Take all necessary precautions and measures during unfavourable conditions, as required by NZS 3109: Section 7.2, to ensure quality and finish of the concrete is not compromised or reduced in any manner.

2.5.8 Construction Joints

Shrinkage-Control Joints - Crack Inducer

Shrinkage-control joints shall be formed in slab-on-grade floors with the use of cast-in ground crack inducers, installed to the layout and details shown on the drawings in accordance with the manufacturer's requirements. Unless shown otherwise on the drawings, cast-in ground crack inducers shall extend to one quarter of the of the slab thickness. Both sides of the crack inducer shall be adequately taped to the DPM to prevent displacement during pouring.

2.5.9 Penetrations and Detailing

Form all penetrations, rebates, fillets, nibs, upstands, and other detailing as shown on the drawings. Sleeves, conduits, pipes, cores or other penetrations shall not be cast in concrete unless they are indicated on the drawings. If not indicated, they must be approved by the Contract Administrator. All penetrations and concrete detailing shall be accurately positioned and formed at the time of pouring the concrete (without movement or displacement).

Set concrete shall not be cut, hacked or cored unless specific approval is obtained from the Contract Administrator.

2.5.10 Building In

As the work proceeds, build in all anchors, bolts, fixings, and other built-in items as shown on the drawings and as necessary for the satisfactory completion of the works.

Build in all necessary pockets, chases, grooves, pipe and cable sleeves, conduits, fixings, fittings, etc., required by other trades. Liaise with other trades and confirm the requirements and supply of all built-in items related to their work, and shall ensure that such items are supplied and/or positioned.

Unless specified as supplied by another trade or other party, all items specified or indicated on the drawings as built-in shall be supplied by the Contractor.

Where an item is not specified or shown on the drawings as built-in, submit all necessary details for approval before proceeding. Such items shall only be built-in when approved by the Contract Administrator.

Built-in items shall not be repositioned or eliminated from the locations shown on the drawings without prior approval.

Ensure that all built-in items are correctly positioned and that they are not displaced during concreting. Ensure suitable personnel are on call during concreting to correct any displacement that may occur. Advise the Contract Administrator immediately if any built-in item has been positioned incorrectly or left out.

No claim will be recognised for cutting away or drilling concrete work already executed as a result of not conforming to these requirements and making the necessary provisions beforehand.

2.5.11 Foundations

Form concrete foundations to the layout and details shown on the drawings. Concrete foundations shall be cast against formwork on each side unless otherwise approved by the Contract Administrator. Where approval is given to cast against ground, an additional 25mm thickness of concrete will be required on each unformed face to provide additional cover.

Allow to underpin or otherwise support adjacent foundations as necessary to ensure complete stability and no damage to adjacent structures at all times.

Cast in sleeves for all pipes and cables that pass through foundations - coordinate the location of each sleeve with the relevant trade.

Give notice and provide reasonable opportunity to inspect all foundation excavations before placing any tidy concrete or hardfill.

2.5.12 On-Ground Floor Slabs

Concrete Floor Slab-on-Grade

Unless specified or shown otherwise, cast ground-bearing concrete floor slabs on a damp proof membrane (DPM) sheet concrete underlay, laid over maximum 25mm thick layer of compacted sand blinding.

The concrete mix should be designed to ensure durability and shrinkage. The use of low sand percentage, a low water content, superplasticiser and air entrainment is required.

Cement content shall not be less than 300 kg/m³, regardless of the minimum specified concrete strength.

The slab shall be constructed between formed construction joints as shown on the drawings, and in a sequence so that two adjacent sections are not poured one after the other.

Immediately after screeding the slab shall be smoothed using a bull float. Finishing shall be carried out with the use of a power float; initially operated with the blades flat, and finally operated with the blades slightly tilted.

All slabs shall have construction joints or saw-cuts at not more than 5.0m intervals in each direction, unless shown otherwise on the drawings.

Along lines of saw-cuts accurately cut out alternate bars of the floor reinforcement and mark the proposed line of saw-cut from outside the pour area. The time of sawing will vary depending on weather conditions, and shall be such as to prevent uncontrolled cracking of the slab. Sawing of the joints shall commence as early as possible, typically within 12-18 hours, and when the concrete has sufficiently hardened to permit cutting without excessive chipping, spalling and tearing. Saw-cuts shall be to the depth shown on the drawings and shall be made using a self-propelled diamond-tipped floor saw machine.

Damp-Proof Membrane

Damp-Proof Membrane (DPM) - refer to separate section Waterproofing for specification of damp proof membrane.

Damp-proof membrane shall be continuous under slabs-on-ground and under foundations. Sheet DPM joints shall be overlapped minimum 150mm and continuously sealed with a pressure-sensitive tape or as recommended by the manufacturer.

Damp-proof membrane shall be turned up or down against foundations, walls and columns as appropriate, and tape-seal around protrusions and service pipes.

Protect the DPM during all operations until the floor slab is complete. Repair any damage that may occur or replace damaged DPM with new sections.

2.5.13 Epoxy Grouting of Reinforcing Bars

All epoxy grouted reinforcing bars shall comply with the following provisions and shall be subject to the approval of the Contract Administrator.

Epoxy grouting is not an alternative construction method to the details shown on the drawings. Remedial work to rectify new concrete work must be carried out in accordance with the Contract Administrator's instruction.

Drill all epoxy grouted reinforcing bars into concrete in accordance with the design drawings - when required for connecting into existing concrete.

The holes must be drilled with hammer drills. Diamond core drilling is not acceptable.

Holes for vertical bars shall be plumb in all directions, and holes for horizontal starters shall slope downward at a 15° angle.

The depth of hole and embedment of the reinforcing bars shall be to the minimum depths shown on the drawings. Epoxy anchoring adhesive shall be Sika AnchorFix-3+ or approved equivalent high-performance, 2-part epoxy anchoring adhesive. Alternatives cannot be used without written approval of the Contract Administrator. The grout shall be non-shrink. Moisture sensitive epoxy resins shall not be used. If the hole size is larger than the minimum specified, a sand filled grout may be required. The epoxy grout shall be used strictly in accordance with the manufacturer's requirements.

Holes must be dry prior to filling with epoxy unless the epoxy used is suitable for wet holes or underwater application. If the concrete is moist then the bonding surface must be roughened to provide a depth of surface roughness of 2-3mm or more so that the loss in chemical bonding can be replaced by mechanical bonding.

All holes shall be cleaned out using a stiff-bristled wire bottle brush and an oil-free compressed-air source so that all dust and debris are removed from the side of the hole. Give notice and provide reasonable opportunity for inspection of the holes prior to placement of bars and epoxy grouting.

The hole shall be partially filled with epoxy grout prior to inserting the reinforcing bar. Holes shall be filled from the bottom up (rather than pouring from the top). Vertical holes can be filled with pourable-grade epoxy. Horizontal holes must be filled with 'plastic' epoxy using pre-filled cartridges and sealant gun. Standard cartridges shall be modified by placing plastic hosing over the cartridge nozzle of sufficient length to reach the base of the drilled hole.

After the bar has been placed in position, ensure that the epoxy fills the hole to the surface of the concrete. Top holes if necessary. Bars shall be placed in the holes, given one turn to expel air voids, and shall be fully supported (if necessary) and left undisturbed for at least 24 hours. After 24 hours horizontal bars installed at 15° angle can be bent horizontal/level.

Notify the name of the person responsible for ensuring this specification is adhered to.

Pull-out tests shall be undertaken on a minimum 15% of all epoxy grouted bars, but with a minimum of three tests for each applicable bar size. The tension test load shall not be less than 70% of the yield strength of the bar, or as otherwise directed by the Contract Administrator. All costs for testing shall be borne by the Contractor.

2.5.14 Repair & Cleaning of Concrete

Proposed Remedial Works

When the exposed concrete surfaces of the building are complete, they shall be closely inspected for faults in surface finish, damage to corners or edges, dirty marks, splashes or dribbles and visible imperfections of every kind.

Submit any proposed remedial work procedures to the Contract Administrator for approval. If proposed remedial work procedures are not approved, remedial work shall be as specified herein.

General Repair & Cleaning

All defects and imperfections shall be removed and rectified to the satisfaction of the Contract Administrator.

The removal of surface markings shall be carefully carried out with the use of wire brushing, pumice stone, carborundum stone, or washing and scrubbing - such as will remove the marks without scratching, discolouring or otherwise affecting the surrounding or underlying concrete.

Patching or filling of fair faced concrete and making good broken edges and corners shall be done with coloured sands and cement where necessary to match the colour of the surrounding concrete when dry.

Epoxy or similar adhesives shall be used when required.

3 CARPENTRY

3.1 Preliminary

Refer to General Conditions of Contract and the Special Conditions in this Specification as appropriate. Read this section in conjunction with all other trade sections.

3.2 Compliance

Comply with the New Zealand Building Code 1992 including all revisions and amendments, Verification Methods where appropriate, and construction principles that are embodied in the Acceptable Solutions.

Comply with all relevant provisions and recommendations of:

1170.2:2011(AS/NZS)	Structural design actions - Wind actions
1734:1997(AS/NZS)	Aluminium and aluminium alloys - Flat sheets, coiled sheet and plate
2269.0:2012(AS/NZS)	Plywood - Structural - Part 0: Specifications
2295:2006(NZS)	Pliable, permeable building underlays
2588:2018(AS|NZS)	Gypsum plasterboard
2589:2017(AS/NZS)	Gypsum linings - Application and finishing
2904:1995(AS/NZS)	Damp-proof courses and flashings
2908.2:2000(AS/NZS)	Cellulose-cement products - Flat sheets
3601:1973(NZS)	Metric dimensions for timber
3602:2003(NZS)	Timber and wood-based products for use in building
3603:1993(NZS)	Timber Structures Standard
3604:2011(NZS)	Timber-framed buildings
3622:2004(NZS)	Verification of timber properties
3631:1988(NZS)	New Zealand timber grading rules
3640:2003(NZS)	Chemical preservation of round and sawn timber
4200.1:2017(AS|NZS)	Pliable building membranes and underlays - Part 1: Materials
4200.2:1994(AS/NZS)	Pliable building membranes and underlays - Installation requirements
4389:2015(AS/NZS)	Roof safety mesh
4859.1:2018(AS|NZS)	Thermal insulation materials for buildings - Part 1: General criteria and technical provisions
AS/NZS 1080.1:2012	Timber - Methods of test - Method 1: Moisture content
NASH Standard	Residential and Low-rise Steel Framing - Part 1: Design Criteria
NZBC B2	Durability
NZBC C/AS2-AS6	Protection from Fire
NZBC E2	External moisture
NZBC E2/AS1	External Moisture
NZBC E3	Internal Moisture

NZBC G6 Airborne and Impact Sound

3.3 General

This section includes the receiving, stacking and storage of all Carpenter's materials and the fabrication, erection and fixing of all framing, sheathings and finishing timbers, including all work incidental to neatly finishing in other trades and all temporary work and temporary bracing.

The Carpenter shall attend upon all trades, and shall supply and fix all obviously necessary but not specifically mentioned fixings and materials.

3.4 Timber Framing

3.4.1 Scope

Supply and install timber framing to the floors, walls, roofs, and other timber framed elements, as identified and detailed on the drawings. All aspects of this work shall be in accordance with NZS 3604, product manufacturers' recommendations, and as shown on the drawings and the specification.

3.4.2 Workmanship

Where required by the NZ Building Act 2004 it is the building contractor's responsibility to ensure that all restricted building work is carried out by a Licensed Building Practitioner.

All work shall be carried out to current best trade practise by experienced and competent tradesmen, familiar with the materials and installation techniques, in accordance with NZS 3604 and as shown on the drawings.

Co-operate with other trades to ensure that all preliminary and preparatory works are completed to specification and as shown on the drawings prior to installing timber framing.
Co-ordinate with other trades to install timber framing as required.

3.4.3 Timber Framing

Timber Grade and Quality

Unless otherwise noted or specified on the drawings or specification, all framing timber shall be minimum structural grade SG 8 Radiata pine in accordance with NZS 3622.
Framing timber shall be seasoned or kiln dried, and be straight and true and free from wind, warp and distortion, and in lengths suitable for the members required, and shall have a moisture content of between 12% and 18% before installation.
Do not used damaged, faulty or defective materials.

Timber Treatment

All non-durable timber framing shall be appropriately treated against moisture and/or insect decay by treatment plants with recognised quality assurance systems that are administered by the Timber Preservation Council (NZTPC). Treatment of timber and wood-based building products shall be to the requirements of NZS 3602 as an absolute minimum, and all treated timber shall be identified and marked as required.

Carefully manage treated framing during installation to avoid accidental use of timber with a lower performance or durability treatment than that required or specified.

Storage & Handling

Check timber framing upon delivery and reject sub-standard or damaged material.
Store timber framing dry under cover, fillet stacked and well clear of the ground, and protect from damage, moisture, and contamination.
Ensure all appropriate personal protection equipment is worn at all times when handling and cutting treated framing.

Framing Installation

All timber framing members, including all dwanging, strutting, blocking, bracing etc, shall be sized, setout, fitted and fixed to the requirements of NZS 3604 and as shown on the drawings to accommodate structural loadings, cladding and lining setout and support, and the installation of other building components, fixtures and fittings.

All framing shall be erected without deviation, true to line, level, angle and plumb, and evenly aligned and square, and within the tolerances allowed in NZS 3604 Table 2.1. Framing members accurately cut, lapped, housed, joined, and seated so as to provide full contact over the bearing surfaces.

Temporarily prop, brace, tie, and secure framing members and elements as required until the framing is complete and self supporting. Leave in place for safety purposes as long as required.

Protect timber framing as required during installation against damage and moisture, and against significant variation of moisture content until ready for lining. Avoid ponding of water around floor plates.

Concrete Separation

Separate timber framing with an approved continuous damp proof course when in direct contact with concrete or masonry. Ensure that the DPC material is compatible with the timber treatment.
Free draining separations to external vertical faces shall be 12mm minimum and as noted on the drawings.

Timber Re-treatment

All cut or drilled surfaces of H4 and H5 treated timber framing shall be flood coat re-treated, with a suitable product recommended by the original treatment plant, before installation.

Edge Notching and Centre Holes

The notching, checking, and boring of framing members shall be in strict accordance with the requirements of NZS 3604.
Avoided checking and cutting where possible and keep to such dimensions so as not to prejudice the purpose for which the member is used. Keep edge notching to a minimum and where possible use centrally bored holes instead.
Concealed services pipes and wiring shall not project beyond the framing face and where possible shall be beyond the lining's fixing reach.

Framing Protection

Protect timber framing as required during installation against damage and moisture, and against significant variation of moisture content until ready for lining. Avoid ponding of water around floor plates.

Built-up Framing Members

Except for jack studs, bottom plates and top plates, framing members may be substituted with built-up members in accordance with the limitations of NZS 3604 2.4.4.7 with the prior approval of the Architect/Designer only.

3.4.4 Steel Fixings

Fastenings and Connectors

Unless otherwise noted or specified, timber framing fastenings and connectors shall be as specified in the relevant fixing schedules of NZS 3604 or have an equivalent capacity as specified therein. Timber framing connectors and fixings shall comply with the product information as required in NZS 3604 2.4.6, and shall be used and installed in accordance with the manufacturer's recommendations. Pre-drill nail holes in split-prone framing as necessary.

Durability of Fixings & Fastenings

Unless otherwise noted or specified, the minimum durability of timber framing fixings and fastenings, excluding nails and screws, shall comply with the durability requirements of NZS 3604 Table 4.1.
Galvanised steel fixing components, excluding nails and screws, shall have galvanised coating masses in accordance with NZS 3604 Table 4.2.
Unless noted or specified otherwise, the materials for nails and screws shall be as given in NZS 3604 Table 4.3.
Steel fixings and fastenings in contact with timber treated with copper based timber preservatives (H3.2 or higher) shall be in accordance with NZS 3604 4.4.4.
Stainless steel nails shall be minimum Grade 304 unless otherwise specified or noted.

Bolts and Coachscrews

Unless specified or shown otherwise, all bolted and coach screwed connections shall be M12 or M16 in accordance with the relevant fixing requirements given in NZS 3604.
Bolted and coach screwed connections shall have either a 50mm x 3mm square, or a 55mm x 3mm round, washer to each head and nut for M12 and M16 fixings. Washers shall be of the same material and durability as the bolt or coach screw.

3.4.5 Wall Framing

Plates

Top and bottom plates shall be to the dimensions and layout shown on the drawings. Unless specified or shown otherwise, top and bottom plates shall be fixed in accordance with NZS 3604 7.5.12 and Tables 8.18 and 8.19, true to line and level or angle.
Joints in top plates shall be made over a stud or over blocking between studs, and all top plate connections shall be in accordance with NZS 3604 8.7.3. Form all holes and edge notches in top and bottom plates in accordance with NZS 3604 8.7.5.

Studs

Studs shall be to the dimensions and spacings shown on the drawings, and installed true to line and plumb in both directions between top and bottom plates.
Unless noted otherwise, non-load bearing wall studs shall be to the spacings given in NZS 3604 Table 8.4, stud width as shown on the drawings.
Form all holes and edge notches in studs in accordance with NZS 3604 8.5.1.5. Do not notch, check, cut, or bore holes in the middle third of any trimming stud.
Should the need arise, studs shall be straightened in accordance with NZS 3604 8.5.3 with prior approval from the Architect/Designer only.

Unless noted otherwise, studs in loadbearing walls for 3 kPa floor loads shall be in accordance with NZS 3604 Table 14.10.

Lintels

Lintels shall be to the dimensions and locations shown on the drawings, and installed true to line and level, and shall be supported by a 45mm thick doubling stud or jack stud fixed to a trimming stud, and secured against uplift in accordance with NZS 3604 8.6.1.8 as required.
The thickness of a lintel may be made from two or more members, where each member is the length of the lintel, in accordance with NZS 3604 2.4.4.7.

Sill & Head Trimmers

Unless specified or shown otherwise, sill and head trimmers to openings shall be the same width as the wall stud and to the thickness given in NZS 3604 Table 8.15, and installed at the required opening height true to line and level, and supported by a 45mm thick doubling stud or jack stud fixed to a trimming stud.

Dwangs

Dwangs shall be the same width and thickness as the wall stud, and installed at the centres noted on the drawings, and accurately cut and fixed in place true to line and level and flush with stud edges.
Dwangs fixed in accordance with NZS 3604 Table 8.19.

3.4.6 Roof Framing

Rafters

All rafters (including hip, valley and jack rafters) shall be to the dimensions, spacings, pitch, and layout shown on the drawings.
Rafters shall be aligned and paired at the required spacings to ridge boards, ridge beams, hip rafters and valley rafters, and as shown on the drawings, and installed parallel, true to line, pitch and plane, and fixed in accordance with NZS 3604 Table 10.1.
Any required jointing of rafters shall be made over supports shown on the drawings only.
Unless shown otherwise, rafter seating to top plates, beams, and lintels shall have a minimum bearing of 32mm without reducing the rafter depth to less than 65mm, or 80%, at the birds mouth.
Extend rafter ends to form eaves as detailed on the drawings and in accordance with NZS 3604 10.2.1.14.
Fly rafters and outriggers installed to form gable verges as detailed on the drawings and in accordance with NZS 10.2.1.15.3

Ridge Beams

Ridge beams shall be to the dimensions and locations shown on the drawings, and installed true to line and level.

Unless specified or shown otherwise, ridge beam ends shall be secured by and fixed to wall framing in accordance with the details & NZS 3604 Table 10.2.

Rafters Seated onto a Ridge Beam

Unless shown otherwise, rafters seated over a ridge beam shall each have a minimum horizontal seating of 32mm without reducing the rafter depth to less than 65mm, or 80%, at the birds mouth.

Verandah Beams

Verandah beams shall be to the dimensions and locations shown on the drawing and installed true to line and level. Unless shown otherwise, all verandah beam jointing and connections to timber posts shall be in accordance with NZS 3604 Table 9.2.

Tie bracket brand name & type as shown in details

Ceiling Joists

Unless specified or shown otherwise, ceiling joists shall be to the dimensions and spacings given in NZS 3604 Table 10.3.

Ceiling joists shall be installed parallel true to line and plane, and shall be joined directly over framing supports and lapped minimum 300mm, or butted and flitched, in accordance with NZS 3604 10.2.1.6.5.

Do not support ceiling joists from a strutting beam.

Purlins

Purlins shall be to the dimensions and spacings shown on the drawings and as required by the cladding material, and fixed to rafters and/or trusses in accordance with NZS 3604 Table 10.10 (purlins on their flat) and/or Table 10.11 (purlins on their edge).

Purlins on their flat shall be continuous over a minimum of two spans.

Provide all necessary blocking and lateral support to purlins laid on edge in accordance with NZS 3604 10.2.1.16.6, and as detailed.

Extend purlins to form gable verges as detailed and in accordance with NZS 3604 10.2.1.15.

3.4.7 Ceiling Framing

Ceiling framing shall be to the dimensions, layout, spacings, and details shown on the drawings, and shall be installed true to line, level and plane, and securely fixed in accordance with NZS 3604 Table 13.3.

Unless specified or shown otherwise, timber ceiling battens shall be to the dimensions and spacings shown on the drawings and in accordance with NZS 3604: Table 13.1, and shall be installed true to line, level and plane, and fixed to the underside of floor joists, rafters, ceiling joists or truss chords in accordance with NZS 3604: Table 13.3.

Ceiling battens shall be of Merchantable grade or better timber complying with NZS 3631.

3.5 Shadowclad

3.5.1 Scope

12mm 'Shadowclad Ultra Texture' H3.1 LOSP treated plywood cladding to the wall surfaces shown on the drawings. All aspects of the work shall be in full accordance with the Shadowclad Specification and Installation Guide (Ph 0800 326 759 to confirm date of the most recent edition).

3.5.2 Preparation

Timber Frame, Building Wrap, Vented Cavity

Coordinate with all other trades to achieve correct conditions for the cladding installation.

Check that the timber wall framing complies with NZS 3604,or specific design, has studs at maximum 600mm centres and dwangs at maximum 800mm centres, is plumb and in true alignment, includes all blocking required for cavity battens fixing at openings, joints, corners and soffits etc., and has a maximum moisture content of 20% at the time of Shadowclad installation.

Check that the building wrap as specified has been installed in accordance with NZBC requirements and the manufacturers recommendations, and with all finishing tapes, flashings etc. at windows, doors, corners and penetrations all correctly incorporated to provide a continuous seal.

Where the studs are at greater than 450mm centres, check that appropriate additional restraint is correctly installed to the wrap, to keep bulk insulation from pushing the wrap into the cavity.

Check that all preparatory materials are lapped such that any water will run down to the exterior.

3.5.3 Vertical Sheet Joins

Shiplap spaced 2mm

3.5.4 Panel Finish Coating

Paint or film-forming stain, minimum film build 90 microns.

Location:

3.5.5 Aluminium Flashing Finish

Mill Finish (for powder coating by others pre installation).

3.5.6 External Corner Backflashings

Shadowclad 90° Angle (back flashing internal corners). A 65 x 65mm aluminium back flashing, used on Shadolwclad external corners (cavity) with timber cover boards with 6x6mm weather grooves.

3.5.7 Workmanship

All Shadowclad installation work shall be carried out by skilled tradesmen experienced in cladding work and in full compliance with NZBC E2/AS1. Upon delivery, store plywood on four evenly spaced

level bearers, and protect the plywood and flashings from rain dirt etc. Handle the plywood carefully, and reject any sheets with damaged edges or faces.

3.5.8 Installation

Durability Zone B or C (Cavity, Timber Frame)

Install the ventilated cavity base strip, the cavity battens, and the Shadowclad flashings in accordance with all NZBC E2/AS1 and Shadowclad requirements. Ensure additional cavity battens are provided for cladding junctions, openings edges, corners etc. as detailed or required. Cavity battens fixed sufficiently to hold in place until the cladding is installed. Ensure special nailing pattern is followed for cavity battens where Shadowclad is used as a bracing element.

Sheet setout as drawn for expressed or battened joints, otherwise neatly set out from corners, incorporating expansion gaps at vertical joins as noted. All sheet edges fully supported. Seal all cut edges of Shadowclad with Metalex Clear, and seal 150mm up the back face in potentially damp situations.

Fix at 150mm centres to all sheet edges, 7mm in from the sheet edge (except at top or bottom laps), and 300mm centres to all intermediate supports. Minimum timber framing fixings for cavity fix are 60 x 2.8 nails or 8g x 65mm screws, use hot dip galvanised (or better) fixings.

Note: special fixing requirements are required when the Shadowclad forms part of the bracing element, and allow additional length to suit when fixing over a rigid air barrier.

3.5.9 Completion

Ensure base clearances to E2/AS1 are provided. Ensure that those selecting the finish coating are aware that it must have a Light Reflectance Value of 40% or more for 50 year durability of bracing panels. Ensure the appropriate persons are aware of the Shadowclad maintenance requirements noted in the Shadowclad specification literature.

3.6 Ecoply Roofing Substrate

3.6.1 Scope

Ecoply Roofing (DD Grade) roofing substrate to the areas shown on the Roof Plan. All aspects of this work shall be in complete accordance with the Ecoply Specification and Installation Guide (Ph 0800 326 759 to confirm date of the most recent edition).

3.6.2 Properties

17mm Ecoply, F8 Stress Grade, 600mm max. frame centres.

3.6.3 Preparation

Check that the roof framing complies with NZS 3604, has rafters (or trusses) at the required centres, is trimmed at edges and openings as required for the Ecoply roofing substrate, is accurate to plane, has provision for roofspace ventilation as required in the 'Ecoply Specification and Installation Guide', and has a maximum moisture content of 18% at the time of Ecoply roofing substrate installation.

3.6.4 Workmanship

All Ecoply roofing substrate installation work shall be carried out by tradesmen experienced in sheet material work. Upon delivery store the Ecoply on four evenly spaced level bearers, and protect from rain dirt etc. Handle the plywood carefully, and reject any sheets with damaged edges or faces.
For treated ply observe the recommendations within the Material Data Safety Sheet for H3 CCA Ecoply.

3.6.5 Installation

Sheets setout with the face grain at right angles to the rafters (or trusses), in staggered layout, in accurate alignment, and with all sheets continuous over at least two spans (three rafters) (if this is not possible at a roof edge then add boxing to support the sheet edges). Add boxing at ridge and gutter lines, and add boxing to tongued edges in maintenance access areas. Allow a 2 -3mm expansion gap at the end of each sheet. Fixings at 150mm centres to every rafter, and at 8 - 14mm in from the sheet ends. Fix with nails or screws, with all fixings in strict accordance with Sections 2 and 6 of the 'Ecoply Specification and Installation Guide', and to suit the exposure zone etc.

3.7 GIB® Plasterboard Linings

3.7.1 Scope

Supply and install GIB® Plasterboard Linings specified herein, as sheet lining materials to the walls, ceilings and other elements identified on the drawings, complete with all accessories required for proper installation, finishing and performance. All aspects of this work shall be in complete accordance with the current GIB® Site Guide and relevant GIB® Systems literature (check www.gib.co.nz, or call 0800 100 442 for the latest editions), and other relevant product manufacturers' recommendations.

No substitutions are permitted for GIB® Plasterboard Linings, GIB® Systems or GIB® System components and accessories.

This specification must be read in conjunction with relevant GIB® Systems specifications - GIB® EzyBrace® Systems, GIB® Fire Rated Systems, GIB® Noise Control Systems, GIB® Aqualine® Wet Area Systems, GIB® X-Block® Systems, GIB® Quietline®, GIB® Intertenancy Barrier System, and GIB® Rondo® Metal Batten Systems - and other specifications sections, as they are interrelated.

3.7.2 Requirements

Safety
Comply with the Health and Safety at Work Act 2015 (HSWA), and with all relevant Health and Safety at Work Regulations 2016, and with all relevant WorkSafe New Zealand (WorkSafe) Approved Codes of Practice and WorkSafe Information and Guidance, particularly those for construction and building maintenance.

Warranty
GIB® Product & System Warranty:

GIB Systems Durability.
The following systems have, unless stated otherwise in GIB® technical literature, a serviceability life in excess of that stated and satisfy the requirements of NZBC Clause B2 Durability:
15 Years:
- GIB Aqualine® Wet Area Systems.

50 Years:
- GIB® Fire Rated Systems
- GIB EzyBrace® Systems
- GIB X-Block® Systems
- GIB Noise Control® Systems.

Provide the GIB® Product & System Warranty on the manufacturer's standard warranty form. Commence the warranty from the date of practical completion of the contract works.

Include with the warranty: a copy of the completed GIB® Installation Sign-Off sheet, and the GIB® Plasterboard Lining Systems Care and Maintenance bulletin.

Inspection & Acceptance of GIB® Plasterboard Linings
Carry out all necessary pre-installation, installation and finishing inspections of GIB® Plasterboard Linings for each area of work in accordance with the requirements of the GIB® Site Guide and associated industry Code of Practice (AWCI) recommendations.

Complete the GIB® Site Guide Pre-Installation Checklist prior to installing GIB® plasterboard linings, and relevant GIB® Performance Systems Installation Checklists.

Complete the GIB® Interior Plasterer/Stopper Installation Sign-Off Certificate upon completion and before handover for subsequent decoration.

Defective Materials & Work
Should defective materials and/or work be found at any time before the final acceptance of the work, it shall be rejected. Rejected GIB® Plasterboard Linings and GIB® Systems materials and work shall be repaired and/or replaced to the satisfaction of the Architect/Designer, without delay and at no additional cost to the Principal.

Substitution of GIB® Plasterboard Linings
GIB® plasterboard linings shall be as specified herein and as indicated on the approved drawings. The substitution of GIB® branded plasterboard linings and GIB® System components for alternative brands is not permitted under any circumstances.

The substitution of a specified GIB® plasterboard lining for an alternative GIB® plasterboard lining by the Contractor shall be in strict accordance with the requirements of the GIB® Site Guide: 2.3 - Board Substitution Options, and relevant GIB® Systems literature. Such substitutions shall only be permitted with the Architect's/Designer's written authorisation, and shall be at no additional cost to the Principal. Should any resultant extra work and/or redesign work be required to accommodate alternative GIB® Plasterboard Linings to satisfy design, performance and compliance requirements, then the cost of these shall be borne by the Contractor.

3.7.3 Performance

Limitations of GIB® Plasterboard

GIB® plasterboard products must NOT be:

- used in external situations, or
- exposed to water or be installed in situations where extended exposure to humidity above 90% RH can reasonably be expected, or
- exposed to temperatures in excess of 52°C for prolonged periods.

Bracing Performance - Timber Framing

Bracing Performance - GIB EzyBrace® Systems - Timber Framing. To the timber framed elements noted as 'Bracing' on the drawings, additionally comply with all relevant aspects of the GIB EzyBrace® Systems (2016) publication and GIB Ezybrace® Bracing Software according to the specified bracing unit rating, BRANZ Appraisal No.928 (2016), and other relevant product manufacturers' recommendations. Refer to separate specification GIB EzyBrace® Systems.

Wet Areas

Wet Area Plasterboard Linings - GIB Aqualine® Wet Area Systems. To the areas noted as 'Wet Area' on the drawings, additionally comply with all relevant aspects of the GIB Aqualine® Wet Area Systems (2007) publication, BRANZ Appraisal No.427 (2007), and other relevant product manufacturers' recommendations. Refer to separate specification GIB Aqualine® Wet Area Systems.

3.7.4 GIB® Plasterboard Linings

GIB® Standard Plasterboard, 10mm

GIB® Standard Plasterboard, 10mm. A 10mm thick standard plasterboard interior lining. Suitable for use in residential and commercial applications on walls. Manufactured to exceed the requirements of AS/NZS 2588. Refer to the GIB® Site Guide.

Installed Location: Internal wall framing

GIB® Standard Plasterboard, 13mm

GIB® Standard Plasterboard, 13mm. A 13mm thick standard plasterboard interior lining. Suitable for use in residential and commercial applications on walls and ceilings. Manufactured to exceed the requirements of AS/NZS 2588. Refer to the GIB® Site Guide.

Installed Location: Ceilings

GIB Aqualine®, 10mm

GIB Aqualine®, 10mm. A 10mm thick moisture resistant plasterboard interior lining, with a water resistant polymer impregnated core to help prevent moisture penetration. Suitable for use in residential and commercial applications on walls and ceilings in spaces at risk from water or moisture damage. Manufactured to exceed the requirements of AS/NZS 2588. Refer to the GIB® Site Guide.

Installed Location: Internal wall framing in wet areas

GIB Aqualine®, 13mm

GIB Aqualine®, 13mm. A 13mm thick moisture resistant plasterboard interior lining, with a water resistant polymer impregnated core to help prevent moisture penetration. Suitable for use in residential and commercial applications on walls and ceilings in spaces at risk from water or moisture damage. Manufactured to exceed the requirements of AS/NZS 2588. Refer to the GIB® Site Guide.

Installed Location: Bathroom addition ceiling

3.7.5 Components & Accessories

Timber Ceiling Battens

Timber Ceiling Battens. Except where specified otherwise on the approved drawings, timber ceiling battens shall be minimum 70mm x 35mm, H1.2 treated, Merchantable grade Radiata, fixed in accordance with NZS 3604: Table 13.3. Refer to the GIB® Site Guide., and to separate specification section Timber Framing.

Plasterboard Fasteners

GIB® Plasterboard Fasteners. Fasteners for fixing GIB® Plasterboard Linings shall be selected and used according to best fixing practices and the GIB® Site Guide and relevant GIB® Systems literature. Fastener heads shall be set slightly below the plasterboard sheet surface without breaking the paper facing.

Screw Fixing to Timber Framing:
- GIB® Grabber® High Thread Drywall Screws: A coarse high-thread screw for fixing into timber with superior holding power and ease of penetration.
- GIB® Grabber® Self Tapping Drywall Screws: A fine self-tapping thread, needle point screw, suitable for fixing to timber and light gauge steel framing.
- GIB® Grabber® Dual Thread Drywall Screws: A dual coarse/fine threaded, needle point screw, as a component of the GIBFix® Framing System and for fixing to timber framing.

Nail Fixing to Timber Framing:
- GIB Nail: Passivated coated, annular grooved, bugle head drywall nails with chequer-keyed head.

Screw Fixing to Light Steel Framing:
- GIB® Grabber® Self Tapping Drywall Screws: A fine self-tapping thread needle point screw, suitable for fixing to light gauge (0.45-0.95mm) steel framing.
- GIB® Grabber® Dual Thread Drywall Screws: A dual coarse/fine threaded, needle point screw, suitable for fixing to light gauge (0.45-0.95mm) steel framing.

Adhesives

GIB® Adhesives. In addition to GIB® plasterboard fasteners, fix GIB® Plasterboard Linings using GIB® adhesives in accordance with the requirements of the GIB® Site Guide and GIB® System literature.

GIB® Adhesives:
- GIBFix® One: An acrylic based plasterboard adhesive with ultra low VOC, suitable for use on timber and metal substrates, including all treated timber. Minimum application temperature - 10°C.

- GIBFix® All-Bond: A solvent based plasterboard adhesive, suitable for use on timber and metal substrates, including all treated timber. Do not use on polystyrene surfaces.

Paper Faced Metal Trims

GIB® Goldline® Paper Faced Metal Trims. Paper-faced metal corner beads and edge trim made with a patented, high quality paper laminated to galvanised steel forms. Paper faced metal trims shall be embedded in jointing compound - do not mechanically fasten paper faced trims. Installed in accordance with the requirements of the GIB® Site Guide and GIB® Systems literature.

GIB® Goldline® Profiles:
- External 90° Corner Trim (G1-W): profile available in 2.4/2.7/3.0m lengths.
- External 135° Corner Trim (G1-O): profile available in 2.4m lengths.
- Internal 90° Corner Trim (G2): profile available in 2.4/2.7/3.0m lengths.
- Internal 135° Corner Trim (G2-O): profile available in 2.4m lengths.
- Bullnose External 90° Corner Trim (G1-B): profile available in 2.4/2.7/3.0m lengths.
- Reveals (GR): profiles available for 10mm thick and 13mm thick plasterboard.
- L-Trims (G4): profiles available for 10mm thick and 13mm thick plasterboard.

Joint & Finishing Compounds

GIB® Compounds. Use the most suitable GIB® Compounds to joint and finish GIB® Plasterboard Linings according to the plasterboard type, location, application, durability, and quality of finish required. GIB® Compounds shall be applied and finished in accordance with the manufacturer's requirements to the specified finish level, and used in conjunction with GIB® Paper Joint Tape and GIB® Plasterboard Trims.

GIB® Compounds:
- GIB TradeSet®: Setting type compound. Suitable for Tape Coat, 2nd Coat. Easy to scrape. 20/45/90/150 minute working/set times.
- GIB MaxSet®: Setting type compound. Suitable for Tape Coat, 2nd Coat. Scrape while 'green'. 90 minute working/set time.
- GIB Lite Blue®: Setting type compound. Suitable for 2nd Coat. Easy sanding. 90 minute working/set time.
- GIB Trade Finish® Heavy Weight: Air drying ready-mix type compound. Suitable for Finishing Coat. Moderate sanding.
- GIB Trade Finish® Multi: Air drying ready-mix type compound. Suitable for Tape Coat, 2nd Coat; Finishing Coat. Easy sanding.
- GIB Trade Finish® Lite: Air drying ready-mix type compound. Suitable for Finishing Coat. Very easy sanding.
- GIB Promix® Lite: Air drying ready-mix type compound. Suitable for Finishing Coat. Very easy sanding.
- GIB® U-Mix: Air drying powder-mix type compound. Suitable for Finishing Coat. Easy Sanding.
- GIB Plus 4®: Air drying ready-mix type compound. Suitable for Tape Coat, 2nd Coat, Finishing Coat. Very easy sanding.
- GIB Promix® All Purpose: Air drying ready-mix type compound. Suitable for Tape Coat, 2nd Coat, Finishing Coat. Moderate sanding.
- GIB-Cove® Bond: Setting type compound. Suitable for bonding GIB-Cove® cornice, back-blocking

plasterboard linings, and direct-bonding plasterboard to concrete and masonry walls. Hard to scrape. 45/90 minute working/set times.
- GIB X-Block® Jointing Compound: Used in conjunction with GIB X-Block® plasterboard wall and ceiling linings in accordance with the GIB X-Block® Radiation Shielding publication.

Joint Tape
GIB® Paper Joint Tape. A 50mm wide, spark perforated paper joint tape used to strengthen joints between plasterboard sheets. Centre-creased for internal and external corner applications. Recommended for jointing GIB® plasterboard wall and ceiling linings in accordance with the GIB® Site Guide and GIB Systems literature.

Wet Area Sealant
Wet Area Sealant. A mould resistant, flexible, neutral curing silicone sealant with strong adhesion, suitable for wet area applications and where there is high humidity, including bathrooms, toilets, showers, wash-down areas, kitchens, laundries.

Applied in accordance with the sealant manufacturer's instructions, as required by the GIB® Site Guide and GIB® System literature. Sealant joints shall be in accordance with the sealant manufacturer's joint design width-to-depth ratio.

Manufacturer & Brand:

Gap Filler
GIB® Gapfiller. A general purpose, gun applied, one-part water based, paintable acrylic gap filler. Provides excellent adhesion for gaps and cracks and other low movement joints. Used in strict in accordance with the manufacturer's requirements. Refer to the GIB® Site Guide.

3.7.6 Level of Finish

Level of Finish
To the areas noted as a specific Level of Finish (3-5) on the drawings, additionally comply with all relevant aspects of the GIB® Site Guide and AS/NZS 2589, complete with all system accessories, and other relevant product manufacturers' recommendations.

NOTE: Unless stated otherwise, Level 4 is the default Level of Finish.

Acceptance of Levels of Finish
Carry out all necessary inspections and assessments of completed plasterboard jointing and finishing prior to hand-over for subsequent decoration.

Do not apply surface sealers and decorative treatments until written agreement between the Contractor and Painter/Decorator is given confirming the specified Finish Levels have been achieved and the plasterboard linings are ready for subsequent sealing and decoration.

3.7.7 Co-operation

Co-operate with other trades to ensure that all preliminary and preparatory works are completed to specification and as shown on the drawings.
Co-operate with the Decorator to ensure that the specified Finish Levels for plasterboard jointing and finishing is achieved before decorating commences.

Coordinate with other trades to install GIB® Plasterboard Linings as required, and to ensure that:
- appropriate tolerances and clearances allow for adjacent internal linings, fixtures, fittings, services, etc; and
- the linings correctly allow for proper door and window installation; and
- penetrations for building services are correctly handled to maintain sheet integrity and system performance.

3.7.8 Workmanship

Where required by the NZ Building Act 2004, it is the building contractor's responsibility to ensure that all restricted building work is carried out by a Licensed Building Practitioner.

Installation and finishing work of GIB® Plasterboard Linings shall be carried out by qualified and experienced tradespersons, familiar with the specified materials and installation and finishing techniques, in accordance with the GIB® Site Guide and the relevant GIB® product technical literature, and to fully comply with all warranty requirements. Submit evidence of experience on request, e.g. National Certificate of Interior Systems, or Certified Business Member of AWCINZ.

GIB® Plasterboard Linings shall be jointed and finished to the specified Finish Levels in accordance with AS/NZS 2589 and GIB® Site Guide. Make all necessary arrangements for the quality assessment of plasterboard jointing and finishing Finish Levels prior to commencing decorating.

All cutting, fixing, jointing, finishing and sealing techniques shall be exactly as recommended by the manufacturer. All work shall be such as to leave a neat, efficient and robust installation, to the required standard and free from damage and defects.

Protect surrounding surfaces and areas from jointing compound splashes and sanding dust.

3.7.9 Delivery & Handling

Store GIB® Plasterboard Linings indoors, in neat, flat stacks off the floor, in dry conditions and without any sagging or distortion, in accordance with the GIB® Site Guide. Keep plasterboard linings, compounds and accessories dry, out of direct sunlight, and protected from damage, moisture and contamination at all times.

Do not use damaged or defective materials and products, or products that are beyond the designated shelf life.

Should a problem be encountered with any GIB® product during installation or delivery, immediately contact the GIB® Helpline on 0800 100 442. Do not continue to use the product that is not performing to specification or expectation. Keep samples of the product in question and where possible, document batch numbers and/or manufacturing dates.

Handle all products and materials in accordance with the manufacturer's requirements and relevant Product Data Sheets and GIB® Site Guide, and in a manner that prevents damage. Carry plasterboard sheets on edge, and avoid damage to sheet edges, ends, and surfaces.

Installers shall be familiar with and comply with the requirements of the GIB® Site Guide precautions for use, and use appropriate safety gear when handling materials.

Installers shall conform with all relevant WorkSafe NZ Guidelines and Codes of Practice - including the OSH Guidelines For the Provision of Facilities and General Safety in the Construction Industry.

3.7.10 Preparation

General

All framing and substrates shall be complete and ready for GIB® Plasterboard Lining installation.

Timber framing shall comply with NZS 3604, or with NZS 3603 and AS/NZS 1170 for specific design, and have a maximum moisture content 18% at the time of plasterboard lining installation.

Light structural steel framing shall comply with the requirements of AS/NZS 4600 or the NASH Standard for Residential and Low-rise Steel Framing, Part 1: Design Criteria. All light structural steel framing members shall satisfy the requirements of AS/NZS 1170. Comply with the steel framing fabricator's specifications and requirements for plasterboard installation.

Steel stud partitioning shall comply with AS 1397 and as specified and shown on the drawings. Comply with the manufacturer's specifications and requirements for plasterboard installation.

Concrete substrates shall comply with the CCANZ CP 01:2011 or with NZS 3109. New concrete must have aged for a minimum of 28 days. Ensure that concrete surfaces are within the tolerances specified. For of direct bonded plasterboard linings, concrete substrates must below 75% relative humidity prior to installation.

Concrete masonry substrates shall comply with NZS 4229, or with NZS 4230 and AS/NZS 1170 for specific design. For of direct bonded plasterboard linings, concrete masonry substrates must below 75% relative humidity prior to installation.

Carry out all necessary moisture readings. Do not commence installation until the moisture readings are below the required level.

Carry out all necessary substrate inspections and preparatory work in accordance with the manufacturer's recommendations and the GIB® Site Guide prior to installation. Complete and sign the GIB® Site Guide Pre-Installation Checklist.

Check that the building envelope has been finished at all penetrations including doors, windows, services, etc., and the building is weathertight.

Check junctions to all other building elements and ensure that all necessary works have been completed, including cavity insulation.

Check that all fixtures, fittings and built-in items are correctly installed, and that all framing and substrate edges are completed as detailed.

Confirm the location and details of movement control joints, as indicated on the drawings, prior to installation.

Ensure all pre-wiring and service piping is installed and complete.

Check that any required cavity insulation has been installed correctly and its bulk thickness does not exceed the framing thickness.

Remove all debris and rubbish from framing voids prior to installing linings.

The commencement of work on each section/area shall be deemed to indicate full acceptance by the installer that all preparatory works by other trades is complete.

Framing Check

Framing - check all aspects of preparatory works, including but not limited to:

- Check that the framing is straight and true to line, and is plumb/level and correctly aligned.
- Check that the framing is within the required deviation tolerances defined in AS/NZS 2589 according to the specified Finish Level.
- Check that vertical and horizontal framing members are at the spacings shown on the drawings, and that any required battens or furring channels are installed to the required layout.
- Check that the framing has no projections due to structural and bracing bracketry, etc. Ensure that framing brackets, plates, braces, hold-downs, etc., are correctly installed.

Work above Ceilings

Check that all building work, mechanical, plumbing, electrical, fire protection and other services installed above the ceiling are completed and independently supported by the building structure - not by the ceiling system.

3.7.11 Installation

General

Install GIB® Plasterboard Linings and accessories in accordance with the requirements of the GIB® Site Guide and product technical literature and associated fixing schedules, to the locations and details shown on the drawings. For GIB® Performance Systems, refer to the relevant GIB® system specification.

Prior to installation, confirm:

- The locations and construction details of all movement control joints;
- The locations and installation details of all building services items within framed structures;
- The specified GIB® plasterboard installation and fixing requirements;

- The specified Finish Level(s) for the plasterboard linings.
- Subsequent surface treatments and finishes applied to GIB® plasterboard.

Standard Ceiling - Timber Ceiling Battens

GIB® Plasterboard Ceiling Linings - Standard Ceiling Fixing with Timber Ceiling Battens. Timber ceiling battens shall be 75 x 35mm thick and fixed in accordance with NZS 3604: Table 13.3. Refer to separate specification section Timber Framing.

Unless independently supported, uniformly distributed loads (fixtures and fittings and/or overlaid insulation) supported by GIB® plasterboard ceiling linings shall not exceed 3.0 kg/m².

Timber ceiling batten spacings shall not exceed the spacings given in the GIB® Site Guide according to the specified plasterboard thickness - 600mm for 13mm or greater thickness, 450mm for 10mm thickness. Where a ceiling batten spacing given in NZS 3604: Table 13.1 is less than that stated in the GIB® Site Guide, the NZS 3604 spacing shall be achieved. Ceiling battens shall all run in the same direction within the ceiling area or between movement control joints. In no case shall ceiling battens be continuous over movement control joints in the structure.

Install GIB® Plasterboard sheets right angles to ceiling battens, with sheet end-joints staggered minimum 600mm and located off battens and back-blocked. Fully support sheets during positioning and fixing - for ceiling installations, the use of a mechanical lifting machine is recommended.

Plasterboard sheets shall be fixed to ceiling battens in conjunction with GIBFix® adhesive applied at maximum at 200mm centres. Do not apply adhesive at sheet edges or within 200mm of fasteners. Firmly press the plasterboard where adhesive has been applied to ensure full contact.

Fix sheets to timber ceiling battens with GIB® Grabber® High Thread Screws in accordance with GIB® Site Guide fastener schedule according to the plasterboard thickness. Position fasteners no closer than 12mm from a tapered edge or 18mm from a cut sheet edge.

Install all necessary paper-faced metal beads, casing beads, shadow and reveal beads and other edge trims to plasterboard corners and edges as necessary and as detailed on the drawings.

Form movement control joints to the locations and details shown on the approved drawings. Where not indicated on the drawings, movement joints shall be positioned at maximum 12m intervals in both directions on any single ceiling, and where there is a change in ceiling lining material, and shall coincide with the junctions between adjoining spaces.

Accommodate recessed light fittings, heating and ventilating diffusers and grilles and other utility fixtures and fittings that penetrate the ceiling lining.

Wall Linings - Horizontally Fixed - Timber Frame

GIB® Plasterboard Wall Linings Horizontally-Fixed to Timber Framing. Install GIB® plasterboard sheets horizontally, at right angles to studs, with any end-joints staggered, and with the bottom edge of the lower sheet gapped 5–10mm off finished floor level.

All joints between sheets shall be touch fitted. Eliminate or minimise the butting of sheet end-joints by using full-length or long-length sheets. Give careful consideration to the placement of sheet joints. Where possible, place joints in situations where they are less likely to be affected by critical lighting.

It is recommended that sheet end joints in horizontally fixed plasterboard be unsupported, off-stud and back blocked - stud centres must not exceed 600mm. For plasterboard linings with Level 3 Finish and Level 4 Finish, sheet end joints can be located on-stud.

Sheet end joints at openings, such as window and door openings, shall not coincide with the vertical edges of the opening - sheets shall be fitted so that the vertical end joint falls minimum 200mm either side of the edge of the opening.

Plasterboard sheets shall be fixed to timber framing in conjunction with GIBFix® adhesive applied at maximum at 300mm centres to intermediate studs. Do not apply adhesive at sheet edges or within 200mm of fasteners. Firmly press the plasterboard where adhesive has been applied to ensure full contact.

Fix sheets to timber framing with GIB® Grabber® High Thread Screws or GIB® Nails in accordance with GIB® Site Guide fastener schedule. Place fasteners at 300mm centres to top and bottom plates and to perimeter studs, and to each stud where the horizontal joint crosses the stud, with screws no closer than 12mm from sheet edges. It is recommended that fasteners at wall corners are placed 50mm in from the corner in each direction (horizontal/vertical).

Install all necessary paper-faced and metal beads, casing beads, shadow and reveal beads and other edge trims to plasterboard corners and edges as necessary and as detailed on the drawings.

Form movement control joints to the locations and details shown on the approved drawings. Where not indicated on the drawings, movement joints shall be positioned at maximum 12m intervals in both directions (horizontally/vertically), and shall coincide with movement joints in the primary structure, and where there is a change in wall lining material.

Accommodate piped and cabled services and other building services fixtures and fittings that penetrate the wall lining.

Wall Linings - Vertically Fixed - Timber Frame

GIB® Plasterboard Wall Linings Vertically-Fixed to Timber Framing. Install GIB® plasterboard sheets vertically, parallel with studs, with any end-joints staggered, and with the bottom edge of the lower sheet gapped 5–10mm off finished floor level.

All joints between sheets shall be touch fitted. Eliminate or minimise the butting of sheet end-joints by using full-length or long-length sheets. Give careful consideration to the placement of sheet joints. Where possible, place joints in situations where they are less likely to be affected by critical lighting.

Form sheet edge joints on studs. Short vertical edge joints (400mm or less) such as above windows and door can be made off stud and back blocked.

Sheet joints at openings, such as window and door openings, shall not coincide with the vertical edges of the opening - sheets shall be fitted so that the vertical end joint falls minimum 200mm inside the edge of the opening.

Plasterboard sheets shall be fixed to timber framing in conjunction with GIBFix® adhesive applied at maximum at 300mm centres to intermediate studs. Do not apply adhesive at sheet edges or within 200mm of fasteners. Firmly press the plasterboard where adhesive has been applied to ensure full contact.

Fix sheets to timber framing with GIB® Grabber® High Thread Screws or GIB® Nails in accordance with GIB® Site Guide fastener schedule. Place fasteners at 300mm centres around the perimeter of each sheet, no closer than 12mm from sheet edges. It is recommended that fasteners at wall corners are placed 50mm in from the corner in each direction (horizontal/vertical).

Install all necessary paper-faced and metal beads, casing beads, shadow and reveal beads and other edge trims to plasterboard corners and edges as necessary and as detailed on the drawings.

Form movement control joints to the locations and details shown on the approved drawings. Where not indicated on the drawings, movement joints shall be positioned at maximum 12m intervals in both directions (horizontally/vertically), and shall coincide with movement joints in the primary structure, and where there is a change in wall lining material.

Accommodate piped and cabled services and other building services fixtures and fittings that penetrate the wall lining.

Jointing & Finishing

Joint and finish GIB® Plasterboard Linings with GIB® joint and finishing compounds appropriate for the plasterboard type and durability, and the finish level required. Refer to Joint & Finishing Compounds clause.

Carry out jointing and finishing according to the specified Finish Level in accordance with the GIB® Site Guide and GIB® Compounds brochure. Reinforce sheet joints and internal corners with joint tape or paper-faced trim embedded into the Taping (first) Coat.

Sheet joints, internal and external corners, and fastener heads shall be evenly finished with GIB® compounds. When dry, lightly sand to a smooth finish with 220 grit sandpaper or drywall sanding screen to remove tool marks, ridges and other imperfections prior to subsequent sealing and decorating.

3.7.12 Completion

Check that GIB® Plasterboard Linings have been installed in accordance with the GIB® Site Guide and GIB® Systems literature, and are finished to the specified finish levels.

Check for any damage and defective work - repair or replace as necessary to the required standard.

Ensure that inspection and assessment of the plasterboard Finish Level has been carried out, and that written agreement stating the completed jointing and finishing is acceptable for subsequent surface sealing and decoration has been provided.

Ensure that the GIB® Installation Sign-Off Certificate has been completed and signed by the Interior Plasterer/Stopper.

Leave all of this work complete and to the required standard in accordance with the manufacturer's warranty requirements, as shown on the drawings and the conditions of the Building Consent.

Clean up thoroughly and leave the finished work and surrounding surfaces clean and free of contamination from compound splashes and dust. Remove all associated rubbish and excess material from the site.

Issue to the Owner a copy of the GIB® Plasterboard Lining Systems Care and Maintenance bulletin, and a copy of the GIB® Product and System Warranty.

Preparation and painting (by others) of GIB® Plasterboard Linings shall be carried out in accordance with AS/NZS 2311 and with the paint manufacturer's recommendations. Refer to separate specification section Painting & Decorating.

Preparation, including application of under-tile waterproofing membranes, and tiling (by others) of GIB® Plasterboard Linings shall be carried out in accordance with AS 3589.1 and the BRANZ Good Practice Guide: Tiling. Refer to separate specification section Tiling.

3.8 James Hardie Eaves & Soffits

3.8.1 Scope

Supply and install the specified James Hardie products as a fibre-cement sheet lining material to the eaves and soffits identified on the drawings, complete with all accessories. All aspects of this work shall be in complete accordance with James Hardie Eaves And Soffits Installation Manual (check www.jameshardie.co.nz, or call 0800 808 868 for the latest edition) and other relevant product manufacturers' recommendations.

3.8.2 Eaves & Soffit Lining

HardieFlex Eaves Lining - 4.5mm. 4.5mm thick fibre-cement sheet lining with an un-sanded surface finish. The sheets are to be finished with a paint system. Installed in accordance with the James Hardie Eaves And Soffits Installation Manual to the locations shown on the drawings.

3.8.3 Co-operation

Co-ordinate with other trades to ensure that the panels correctly allow for fascia and wall cladding installation and associated flashings etc., and that services penetrations are correctly handled to maintain full weathertightness and sheet integrity.

Ensure that other trades are aware of the James Hardie Safe Working Practices.

3.8.4 Preparation

Check that the timber framing elements are in accordance with NZS 3604, or in accordance with NZS 3603 and AS/NZS 1170 for specific design, and in accordance with James Hardie requirements. The fascia and framing shall be in true alignment, complete and suitable for the sheets, and maximum moisture content as per NZS 3602. Ensure that the framing is true in line with no projections due to structural and bracing bracketry etc. Ensure that any hold-downs from the roof framing to the wall framing are correctly installed.

Check that the building underlay or rigid air barrier to the wall framing has been installed in full accordance with the manufacturer's requirements and the drawings. Check junctions to all other building elements and ensure that all necessary works have been completed eg. flashings etc that will enable the sheets and all accessories to be installed.

3.8.5 Flexible Sealant

Flexible silicone sealant to be SIKA Silaflex MS. Use to seal the sheets and accessories in accordance with the sealant manufacturer's recommendations and to James Hardie requirements. Ensure sealant compatibility with selected finish.

3.8.6 Workmanship

All installation work shall be carried out by an LBP, or supervised by an LBP, in accordance with James Hardie Eaves And Soffits Installation Manual and other relevant product manufacturers' recommendations.

3.8.7 Delivery & Handling

Carry all sheets on edge. Stack sheets flat on a level platform off the ground ie. use the supplied delivery pallet on level ground (if no pallet then evenly spaced bearers on level ground at 600mm crs maximum). Keep sheets and accessories dry at all times. Avoid damage to sheet edges, ends, and surfaces. Keep uPVC flashings etc. out of direct sunlight, and store all accessories on flat and avoid damage. All installers to be familiar with and comply with the James Hardie Safe Working Practices in the Installation Manual, to use appropriate safety gear, and in particular to be aware to avoid breathing silica dust. Do not use any damaged or blemished sheets or accessories.

3.8.8 Installation

Install the sheets to the framing in accordance with the Installation Manual, complete with all accessories eg. mouldings, sealant, underflashings, etc.

Ensure that all cut edges of panels are primed prior to installation with Dulux 1 Step Prep, Resene Quick Dry, or similar. Ensure that the bottom edge of the fascia forms a drip edge of 15mm minimum to the sheet. Seal around services penetrations to maintain weathertightness and air pressure resistance.

HardieFlex Eaves Lining joints to be formed with uPVC jointers.

3.8.9 Fixings

Fix HardieFlex Sheet 4.5mm sheets with galvanised nails in accordance with James Hardie requirements.

3.8.10 Completion

Ensure that the sheets have been fixed correctly, that all joints and accessories have been completed correctly, and that all penetrations have been taped correctly. Check that no damage has occurred to any installed sheet element or associated component, replace as necessary. Ensure that the sheets are painted within 90 days of the sheet installation, complete with all accessories and flashings. Hand over a copy of the latest edition of the James Hardie HardieFlex Eaves Lining Product Warranty to the client. Hand over a copy of the latest James Hardie Eaves And Soffits Installation Manual to the client for their maintenance information.

3.9 Thermakraft Underlay, DPM & DPC

3.9.1 Scope

Supply and install Thermakraft Underlays and Membranes, as specified herein, to the locations identified on the drawings, complete with all accessories required for proper installation and performance. All aspects of this work shall be in complete accordance with Thermakraft Ltd technical information and installation requirements (check www.thermakraft.co.nz, or call 0800 806 595 for the latest editions), other relevant product manufacturers' recommendations, and as shown on the design drawings.

No substitutions are permitted for the specified products from Thermakraft Ltd.

The following is a list and a general description of the extent of the Thermakraft Underlays and Membranes works, which are more specifically defined in the contract documents, required for the completion of the contract works:

Wall framing wrap, Window flashing tape, DPC between timber members & concrete surfaces.

3.9.2 Requirements

Safety

Comply with the Health and Safety at Work Act 2015 (HSWA), and with all relevant Health and Safety at Work Regulations 2016, and with all relevant WorkSafe New Zealand (WorkSafe) Approved Codes of Practice and WorkSafe Information and Guidance, particularly those for construction and building maintenance.

Warranty

Thermakraft Ltd Product Warranty:

- 15 Years Warranty - for all Thermakraft warranted products installed, according to the warranty conditions.
- Provide the Thermakraft Ltd Product Warranty on the manufacturer's standard warranty form.
- Commence the warranty from the date of permanent installation.

Substitutions

Thermakraft Ltd products shall be as specified herein and as indicated on the approved drawings. The substitution of Thermakraft branded products for alternative brands is not permitted under any circumstances.

The substitution of a specified Thermakraft product for an alternative Thermakraft branded product by the Contractor shall only be permitted with the Contract Administrator's written authorisation, and shall be at no additional cost to the Principal. Should any resultant extra work and/or redesign work be required to accommodate alternative Thermakraft branded products to satisfy design, performance and compliance requirements, then the cost of these shall be borne by the Contractor.

3.9.3 Damp-Proof Course

PerrimeterDamp Proof Course. A bitumen saturated, heavy Kraft lightly coated with Perlite. Available in 50mm, 75mm, 90mm, 100mm, 150mm, 200mm, 250mm and 300mm roll widths. Perrimeter DPC is used as a general damp proof course (DPC) for separating timber and wood-based products and metal from concrete, masonry, brick, and stone surfaces, and as a moisture barrier.

Also used as a concealed flashing behind brick veneer cladding in accordance with NZS 4229 and NZBC E2/AS1.

Installed in accordance with the manufacturer's requirements, and as shown on the drawings.

3.9.4 Wall Underlay

Covertek 403 Plus. A fire-retardant, absorbent, breathable, synthetic non-woven polyolefin underlay. High strength, nominal weight 105g/m².

Installed as a standalone flexible wall underlay over timber or steel wall framing in accordance with the manufacturer's requirements and BRANZ Appraisal No.918 (2016), in NZS 3604 Wind Zones up to and including 'Very High'.

Installed as a flexible wall underlay over a rigid air barrier in accordance with NZBC E2/AS1 9.1.7.2 to the manufacturer's requirements and BRANZ Appraisal No.918 (2016), in NZS 3604 Wind Zones up to and including 'Extra High'.

Covertek 403 Plus can be used with absorbent and non-absorbent direct-fixed wall claddings, or absorbent and non-absorbent wall claddings over a 20mm drained cavity, and masonry veneer cladding over a drained cavity in accordance with NZBC E2/AS1 and BRANZ Appraisal No.918 (2016).

Do not leave Covertek 403 Plus exposed on walls for more than a total of 42 days before covering.

Installed Location: Exterior wall framing

3.9.5 Underlay Support

Thermakraft Stud Strap. A 25mm wide x 0.4mm thick polypropylene woven and coated strap. For use as a support for non-self support roof underlays, and to restrict the bellowing of flexible wall underlays in drained cavities. Suitably tensioned when installed to avoid any sagging and to keep the

flexible underlay in a flat plane. Installed at right angles to roof purlins or wall studs, at maximum 300mm centres.

Application/Use:

3.9.6 Window Flashing Tape

Aluband Window Flashing Tape

Aluband Window Flashing Tape. A polymeric faced, bituminous modified, self-adhesive tape with a release backing paper. Designed to be used in conjunction with Thermakraft Corner Moulded Piece and Thermakraft underlays as part of the Thermakraft Window Sealing Warranty System.

Aluband Window Flashing Tape is suitable for use on timber or steel framed buildings, in conjunction with a compatible flexible underlay, around framed joinery openings as a secondary weather barrier, in NZS 3604 Wind Zones up to and including 'Extra High'.

Aluband Window Flashing Tape can be used on the sill and lintel of framed joinery openings, and to seal flashing upstands to a flexible underlay.

Physical Properties:
- Thickness: 0.65mm.
- Installation temperature range: minimum 5°C; maximum 30°C.
- Maximum UV exposure: 42 days.
- Tape width: Available in 75mm, 150mm, and 200mm wide rolls.

The width of Aluband Window Flashing Tapes used shall be selected to suit the depth of framed openings and Thermakraft installation requirements.

Installed in accordance with the requirements of the Thermakraft Aluband Application & Installation Guide and BRANZ Appraisal No.878 (2014), to the locations and details shown on the drawings.

Aluband Window Flashing Tape should not be applied directly or indirectly (over flexible underlay) to timber that has been freshly LOSP treated. Always allow LOSP solvent to fully flash off before covering with underlay and applying Aluband Window Flashing Tape.

Do not leave Aluband Window Flashing Tape exposed to weather and UV light for more than 42 days after installation.

Flashing Tape Size:
Installed Location:

3.9.7 Underlay Penetration Seals

Multi-Fit Penetration Seals

Thermakraft Multi-Fit Penetration Seals. A range of pipe and service penetration seals consisting of soft, flexible EPDM membrane with a self-adhesive flange.

Multi-Fit Penetration Seals are part of the Thermakraft membrane system, and are a patented airtight solution for round or rectangular pipes, cables or conduits when passing through underlay barriers.

Pipe seals accommodate pipe diameters from 15mm up to 110mm. Cable seals accommodate cable diameters from 7mm up to 22mm, and 80m trunking.

Installed in accordance with the manufacturer's requirements and BRANZ Appraisal No.942 (2017), with stand-alone flexible wall underlay over timber or steel wall framed walls on buildings situated in NZS 3604 Wind Zones up to and including 'Very High'.

Installed in accordance with the manufacturer's requirements and BRANZ Appraisal No.942 (2017), with flexible wall underlay used over a rigid wall underlay on buildings situated in NZS 3604 Wind Zones up to and including 'Extra High'.

3.9.8 Co-operation

Co-operate with other trades to ensure that all preliminary and preparatory works are completed to specification and as shown on the drawings.

Coordinate with other trades to install Thermakraft Underlays, DPMs, and DPCs as required.

3.9.9 Workmanship

Where required by the NZ Building Act 2004 it is the building contractor's responsibility to ensure that all restricted building work is carried out by a Licensed Building Practitioner.

All installation work shall be carried out by experienced and competent tradespersons, familiar with the specified products and installation techniques, in accordance with the manufacturer's requirements, and to fully comply with all warranty requirements.

All cutting, joining, and fixing techniques shall be exactly as recommended by the manufacturer, and carried out with the use of suitable tools and equipment appropriate for the application. All work shall be such as to leave a neat, efficient, and weathertight installation.

3.9.10 Delivery & Handling

Store underlay rolls on end, undercover, on a flat, clean and dry surface. Keep stored materials dry, out of direct sunlight, and protected from damage and contamination at all times.

Handle materials in accordance with the manufacturer's requirements and in a manner that prevents damage to or deterioration of the product.

Do not used damaged or defective materials, or products that are beyond their designated shelf life.

Installers shall be familiar with and comply with the manufacturer's safe handling requirements and precautions for use, and shall use appropriate safety gear when handling materials.

Installers shall conform with all relevant WorkSafe NZ Guidelines and Codes of Practice - including the OSH Guidelines For the Provision of Facilities and General Safety in the Construction Industry, as well as the Best practice guidelines for working on roofs for roofing installations.

3.9.11 Preparation

General

Prior to installation, carry out all necessary inspections and preparatory work required, and ensure that all preliminary works by other trades has been completed to specification and as shown on the approved drawings.

Do not commence installation until all necessary preliminary works by others is complete and to the required standard. The commencement of work shall be deemed to indicate full acceptance by the installer that all preliminary works by other trades is complete.

Supporting timber framing shall comply with NZS 3604, or with NZS 3603 and AS/NZS 1170 for specific design, and have a maximum moisture content of 20% at the time of cladding installation. Allow LOSP treated timber to sufficiently flash-off before installing Thermakraft building underlays and foils.

Supporting light structural steel framing shall comply with the requirements of AS/NZS 4600 or the NASH Standard for Residential and Low-rise Steel Framing, Part 1: Design Criteria. Comply with the light structural steel framing fabricator's specifications and requirements for fixing cladding and roofing components.

Supporting heavy steel structures shall comply with NZS 3404.

Wall Framing

Wall Framing - prior to wall underlay installation check all aspects of preparatory works, including but not limited to:

- Check that wall framing has been completed as shown on the drawings, complies with the relevant design and construction standards.
- Check that framing is securely fixed, true to line and plane, is plumb and level where required, and is trimmed at edges, openings and penetrations as required.
- Check that there are no projections due to structural bracing and bracketry etc.
- Check that the required clearances from ground, deck, balcony or lower roof to the bottom edge of the underlay/cladding are in accordance with NZBC E2/AS1.

3.9.12 Installation - Wall Underlay

Covertek 403 Plus Wall Underlay

Covertek 403 Plus Wall Underlay shall be installed, printed face out, to the exterior face of the wall framing, run horizontally, starting from the bottom edge and finishing at the top edge, extending 35mm below the bottom plate or bearer, and lapped such that any water will be shed to the outside of the underlay with minimum 150mm horizontal laps and minimum 150mm vertical joint laps made over a stud, and kept taut without sagging or bulging.

Fix at maximum 300mm centres, with 6-8mm stainless steel staples or 20mm large-head galvanised clouts or galvanised proprietary fixings. Provide additional fasteners fixed through Thermakraft Stud Strap around framed openings before cutting Covertek 403 at openings.

Cut window and door openings just prior to joinery installation; cut underlay at 45º angle away from each corner and return full framing depth and fasten to inside of frame. Install Thermakraft Corner Moulded flashings and Thermakraft Window Flashing Tape over the underlay at opening corners and along sill trimmers in accordance with Thermakraft requirements.

For drained cavity wall construction where studs are at greater than 450mm centres, install Thermakraft Stud Strap horizontally at 300mm centres to prevent bulk insulation from pushing the underlay into the cavity space.

Finish Covertek 403 Plus Wall Underlay at edges as detailed.

Install all necessary flexible flashing tapes to openings, around pipes, ducts and other services penetrating the underlay, parapet and balustrade junctions, along head flashings and inter-storey flashings when installed, as required to seal the underlay, in accordance with Thermakraft requirements and as shown on the drawings.

Aluband Window Flashing Tape

Install Aluband Window Flashing Tape in accordance with the manufacturer's requirements, to the locations and details shown on the approved drawings.

Window Sills:

- Fit Thermakraft Corner Moulded Piece to the bottom corners of the opening.
- Cut Aluband Window Flashing Tape to the length of the sill trimmer plus an additional 400mm.
- Apply the tape over the underlay along the sill trimmer, with the back edge flush with the inside edge of the framing, and returned minimum 200mm up both trimming studs.
- Fold the tape minimum 50mm over the face of the underlay on the outside of the opening.
- Press the tape firmly in place over the underlay to ensure a continuous weathertight seal is maintained.

Window & Door Lintels:

- Install Aluband Window Flashing Tape to the top corners of framed window and door openings, over the underlay and 200mm along the lintel and 200mm down the trimming stud, with the back edge flush with the inside edge of the framing.
- Fold the tape minimum 50mm over the face of the underlay on the outside of the opening.
- Press firmly in place over the underlay to ensure a weathertight seal.
- Apply a 100mm strip of Aluband Window Flashing Tape at 45° over the taped outside face of each corner.

Avoid joining Aluband Window Flashing Tape. Where necessary, form joins with minimum 100mm overlap, keep any required joining to an absolute minimum.

Do not over-stretch tape during installation, and ensure adequate adhesion and weathertightness is maintained against the underlay.

Do not leave Aluband Window Flashing Tape exposed to weather and UV light for more than 42 days after installation - replace with new window flashing tape if 42 day's exposure is exceeded.

3.9.13 Completion

Check that all underlays have been installed correctly and are properly supported, and that all underlay edges, joins and ends are correctly finished prior to closing off with claddings - all in accordance with Thermakraft installation requirements.

Check installed membranes and underlays for defective work and damage - replace and/or repair as necessary to the required standard.

Leave all of this work complete, and free of defects, and to the required standard in accordance with the manufacturer's warranty requirements.

Issue to the Owner a copy of the Thermakraft maintenance requirements and the Thermakraft product warranties for the installed products.

4 ROOFING

4.1 Preliminary

Refer to General Conditions of Contract and the Special Conditions in this Specification as appropriate. Read this section in conjunction with all other trade sections.

4.2 Compliance

Comply with the New Zealand Building Code 1992 including all revisions and amendments, Verification Methods where appropriate, and construction principles that are embodied in the Acceptable Solutions.

Comply with all relevant provisions and recommendations of:

3604:2011(NZS)	Timber-framed buildings
BRANZ BU345	Flat membrane roofs - design and installation
BRANZ Good Practice Guide	Membrane Roofing
Membrane Group NZ Inc	Torch-on membranes code of practice
NZBC E2	External moisture

4.3 Membrane Roofing

4.3.1 Scope

The following is a list and a general description of the extent of Membrane Roofing work, which are more specifically defined in the contract documents, required for the completion of the contract works.

Supply and install the specified Waterproof Membrane Roofing System, complete with all components and accessories, to the locations shown on the drawings. All aspects of this work shall be in strict accordance with the manufacturer's technical guidelines, installation specifications and details, other relevant product manufacturers' recommendations, and as shown on the drawings.

4.3.2 Membrane Roofing System

Thermoplastic Polyolefin (TPO) Membrane Roofing System

Single ply, polyester fabric reinforced, thermoplastic polyolefin (TPO) membrane sheet, installed as a waterproof roofing system to properly prepared substrates in accordance with the manufacturer's requirements and as shown on the drawings.

Manufacturer, brand name & type: Viking STPS10 Enviroclad TPO grey
Membrane thickness: 1.52mm
Roll width: 3.000m
Colour: Dove Grey LRV 32.7%
Location: Roof of addition.

4.3.3 Co-operation

Co-operate with other trades to ensure that all preliminary and preparatory works are completed to specification and as shown on the drawings. Co-ordinate with other trades to install Waterproof Membrane Roofing as required.

4.3.4 Workmanship

Where required by the NZ Building Act 2004 it is the building contractor's responsibility to ensure that all restricted building work is carried out by a Licensed Building Practitioner.

All installation work shall be carried out by experienced contractors, authorised by the manufacturer, familiar with the specified products and installation techniques, to fully comply with all of the manufacturer's warranty requirements in accordance with the manufacturer's installation requirements and as noted and detailed on the drawings.

4.3.5 Delivery & Handling

Store products off the ground on a flat surface undercover, keep materials dry and out of direct sunlight, and protect from damage. Do not use damaged or faulty products, or products beyond the designated shelf life. Handle materials and products in accordance with the manufacturer's recommendations.

4.3.6 Preparation

Ensure that the roof substrates have a minimum fall of 1:30 (and any internal gutters 1:100, preferably 1:60, including allowing for possible deflection and/or settlement), that overflows are provided where the roof drains to an internal gutter, and that penetration flashings and edge upstands are carried above the overflow level (to allow for a drainage blockage). Check that crack control and movement joints are incorporated at the locations shown on the drawings and are constructed as recommended by the membrane manufacturer. Ensure the substrates are clean and free of oil grease etc., and are smooth (with any defects filled to an even surface).

Check that the plywood has been laid with staggered joints, and is supported on framing at maximum 600mm centres, that the plywood is 17mm minimum thickness, is CD grade (C face up), is H3 CCA treated (LOSP treated plywood must NOT be used), is installed and fixed exactly to the Ply manufacturer's and Nuralite recommendations, and complies with E2/AS1 8.5.3 and 8.5.5.
20 x 20 mm H3 fillet deck/wall junctions, and 5mm radius chamfer external edges at turn-downs.
Ensure the maximum moisture content is 20%, and that the plywood is surface dry at the time of membrane application.

4.3.7 Installation

Thermoplastic Polyolefin (TPO) Membrane System

Install the thermoplastic polyolefin (TPO) membrane roofing system, including all surface priming, membrane application, jointing, flashing and sealing, etc., and all system supplied fillets and metal edge trims, roof vents and gutter outlets, in strict accordance with the manufacturer's installation requirements and details, and as shown on the drawings.

Unroll the membrane on to the substrate and allow it to relax for at least 20 minutes prior to installation. Do not lay membrane sheets under tension.
Commence membrane installation at sumps and proceed through gutters to the main roof installing the membrane up the roof slope from the lowest edge.
Apply the membrane adhesive to the substrate only to the area where the membrane sheet will be laid, leave adhesive to activate, then fold the sheet along its length over the adhesive, thoroughly roll to remove entrapped air and to achieve full bonding, repeat the process to apply the other half of the sheet along its length. Joints shall be fully hot-air welded, overlapped as recommended by the manufacturer, and neatly finished straight and parallel.
Use neatly cut strips of membrane for gutters and upstands etc., and install system supplied preformed corners, metal edge trims, flanged drains, outlets, and vents etc., as required and/or specified to complete the installation.
Finish any control joints located on the drawings to the manufacturer's requirements.
Consult the manufacturer regarding any detail where a standard system detail does not exist.
Protect installed membrane as required, avoid puncturing or damaging the membrane during installation; repair or replace as necessary.

4.3.8 Completion

Check that the membrane roofing system has been installed correctly, and that all system accessories are correctly installed and finished. Check for damage and repair or replace as necessary.
Leave the completed membrane roofing system leak free and watertight. Completely clean the works area and remove all rubbish and waste material from the site.

Issue to the Owner a copy of the manufacturer's maintenance requirements and a copy of the product and installation warranties for the completed works.

5 ALUMINIUM JOINERY

5.1 Preliminary

Refer to General Conditions of Contract and the Special Conditions in this Specification as appropriate. Read this section in conjunction with all other trade sections.

5.2 Compliance

Comply with the New Zealand Building Code 1992 including all revisions and amendments, Verification Methods where appropriate, and construction principles that are embodied in the Acceptable Solutions.

Comply with all relevant provisions and recommendations of:

1734:1997(AS/NZS)	Aluminium and aluminium alloys - Flat sheets, coiled sheet and plate
1866:1997(AS/NZS)	Aluminium and aluminium alloys - Extruded rod, bar, solid and hollow shapes
2208:1996(AS/NZS)	Safety glazing materials in buildings
4211:2008(NZS)	Specification for performance of windows
4223.1:2008(NZS)	Code of practice for glazing in buildings - Glass selection and glazing
4223.2:2016(NZS)	Glazing in buildings - Part 2: Insulating glass units
4223.3:2016(NZS)	Glazing in buildings - Part 3: Human impact safety requirements
4223.4:2008(NZS)	Glazing in buildings - Part 4: Wind, dead, snow, and live actions
4667:2000(AS/NZS)	Quality requirements for cut-to-size and processed glass
4668:2000 (AS/NZS)	Glossary of terms used in the glass and glazing industry
AS/NZS 4666:2012	Insulating glass units

5.3 Aluminium Windows & Doors

5.3.1 Alternatives

The materials and elements specified indicate the required standards for these works. Alternatives which are equal to or superior to these materials and elements may be tendered for approval.

Thermal performance (NZBC H1/AS1) must be as required to meet the Designer's Thermal Evaluation.

5.3.2 Installation Type

Timber Frame Installation - Cavity Construction

All windows (and aluminium frame external doors) installation work shall be exactly in accordance with NZBC E2/AS1, the Windows Association's Windows Installation System (WANZ:WIS), and details on the drawings or supplied by the windows manufacturer.

Check framing alignment, and that window openings are square and the correct size for fitting tolerances.

Prepare framing openings by neatly cutting the building wrap at 45º into the corners, turning wrap through the frame depth and fixing to the inside face, flashing the bottom corners with moulded

plastic and over-flashing the full sill and 200mm up the jambs with the specified flexible flashing tape, stapled to hold the stretched external corners. At head corners install flashing tape 200mm each way from the corners.

Install the WANZ extruded aluminium support bar with built in drainage and ventilation to NZBC E2, to provide continuous support to the window unit. Install the head cavity closer, positioned to provide a 15mm drip edge to the cladding.

Set shims or pack as necessary and install the frames exactly true and square, blocked-up off the support bar as required. Use appropriate separators between aluminium and other materials, and fix securely with due regard for any anticipated movements and for linings, trim etc.

Install the head flashing, extending 35mm up behind the cladding (and in turn over-flashed with an additional piece of wrap cover extended up under the wrap or flashing or eaves above), sloping at 15º down to the exterior, and turning down to cover the top of the aluminium frame by at least 10mm, before finishing with a 5mm 45º 'kick out'. Upstand the head flashing ends as detailed. Install jamb flashings/ sealant or scribers as detailed.
After frames installation install closed cell backing rods as required and expanding foam air-seal the gap between framing and liners.

5.3.3 Interior Finish

Architraved.

5.3.4 Reveal

Timber reveals for paint finish with all sides primed.

5.3.5 Glass Platform

Double Glazed.

5.3.6 Finish

Powder Coated Aluminium - Semi Gloss
Polyester powder coating in accordance with WANZ Powder Coating Quality Assurance System and AAMA 2603-98 performance is required.

5.3.7 Hardware

Hardware colour matched to Aluminium Joinery.

Hinges, stays, catches, fasteners, latches, locks and furniture as offered by the window and door manufacturer. Key alike all lockable window hardware able to be keyed alike.

Account for all keys and deliver separately to the site manager. Factory fit all required and scheduled hardware.

5.3.8 Workmanship

These windows will be manufacturerd in workshops containing all mechanical equipment appropriate for the work, and by experienced and competent tradesmen who are familiar with the techniques and materials specified.

The manufacturer will co-ordinate with other trades to establish the exact sizes for all frames before fabrication. Frames and sashes will be fabricated true, square, rigid, and 'out of wind', with all joints strongly mechanically fixed, and with mitres tight and fully sealed. Potential thermal, wind and seismic movements will be accommodated within the construction. All cavities will drain to the exterior, and all drilling swarf etc. will be removed during fabrication.

Stays, hinges, running gear and glazing will be installed as scheduled (the Designer will be notified if any scheduled hardware of fixing position appears to be inappropriate for this project).

Hardware will be fixed true to line and position, and adjusted and oiled as required for correct operation.

Glass will be cut true and square, sized to provide correct edge clearances, blocked into place as required, and all units will be delivered either pressure fit, pocket glaze, or beaded/wedged, unless site glazing is required. Glazing gaskets will be compatible with all adjacent materials, and cut 1% over-length to absolutely avoid stretching during installation. Frames will be braced etc. as necessary for transportation to the site.

Flashings as detailed will be supplied. Flashing materials will be compatible with the windows.

5.3.9 Delivery and Installation

Comply with the New Zealand Building Code 1992 including all revisions and amendments, Verification Methods where appropriate, and the construction principles that are embodied in the Acceptable Solutions.

Arrange for delivery of windows to the site only when a suitable storage situation is available for them, handle the windows in accordance with the manufacturers requirements, avoid any frame distortion, avoid rubbing damage, avoid contact with concrete, plaster, mud etc. and keep them dry. Retain protective coverings for as long as possible, and remove them at completion.

Experienced and competent tradesmen who are familiar with the techniques and materials specified shall carry out all installation work. Fix in accordance with the manufacturer's instructions. Take utmost care to avoid damage to anodized or powder coated surfaces - correction of any such disfigurement requires written authority - replace any badly damaged items.

Use fixings compatible with the materials involved, as recommended by the windows manufacturer and to comply with the DWP requirements, basically aluminium or Type 316 stainless steel where exposed externally; galvanized to AS/NZS 4680, 610g/m2, may be used where not exposed.

Thoroughly check all preparatory work to openings prior to installation, including underlay, corner seal tapes, adjacent cladding, pre-installed flashings, waterproofing systems etc. as appropriate. Use

inert barriers or coatings to prevent contact between dissimilar metals or between aluminium and concrete.

Install flashings as detailed and supplied by the windows manufacturer, installed tightly and neatly with absolute minimum tolerances, with head weathering jamb, jamb weathering sill, and sill open (draining) to exterior. Except where the window is recessed all head flashings shall extend 30mm minimum beyond the frame.

Air-seal all frame perimeters to adjacent structure to a depth of 15 - 20mm with expanding foam or appropriate sealant including a PEF rod at head, sill and jambs to retard the spread of sealant.

Weather-seal frame jambs etc. to adjacent surfaces (or to each other) as detailed or as required by the windows manufacturer, to achieve a fully watertight installation. In preparation for sealant the joints shall be clean, dry, and primed if necessary. Insert closed cell polyethylene backer rods or a polyethylene tape slip layer if required. Mask adjacent surfaces if appropriate, install the sealant fully in accordance with the sealant manufacturer's recommendations, and finish to even smooth surfaces.

Remove trade debris progressively, appropriately clean any affected adjacent surfaces, thoroughly clean the windows, check that all hardware is in full working order, and provide safety indication of the glass for the balance of adjacent works.

6 GLAZING

6.1 Preliminary

Refer to General Conditions of Contract and the Special Conditions in this Specification as appropriate. Read this section in conjunction with all other trade sections.

6.2 Compliance

Comply with the New Zealand Building Code 1992 including all revisions and amendments, Verification Methods where appropriate, and construction principles that are embodied in the Acceptable Solutions.

Comply with all relevant provisions and recommendations of:

1170.0:2002(AS/NZS)	Structural design actions - Part 0: General principles
2208:1996(AS/NZS)	Safety glazing materials in buildings
3604:2011(NZS)	Timber-framed buildings
4211:2008(NZS)	Specification for performance of windows
4223.1:2008(NZS)	Code of practice for glazing in buildings - Glass selection and glazing
4223.2:2016(NZS)	Glazing in buildings - Part 2: Insulating glass units
4223.3:2016(NZS)	Glazing in buildings - Part 3: Human impact safety requirements
4223.4:2008(NZS)	Glazing in buildings - Part 4: Wind, dead, snow, and live actions
4232.2:1988(NZS)	Performance criteria for fire resisting enclosures - Part 2: Fire resisting glazing systems
4667:2000(AS/NZS)	Quality requirements for cut-to-size and processed glass
4668:2000 (AS/NZS)	Glossary of terms used in the glass and glazing industry
AS/NZS 4666:2012	Insulating glass units

6.3 Non-Structural Glazing

6.3.1 Scope

Supply and install the selected glass products to the windows, doors, curtain wall systems, roofs and canopies, balustrades and barriers, partitions and screens, and other non-structural glazing elements, as noted and shown on the drawings. All aspects of this work shall be in accordance with the glass manufacturer's installation requirements and recommendations, other relevant product manufacturers' recommendations, and as shown on the drawings.

6.3.2 Co-operation

Co-operate with other trades to ensure that all preliminary and preparatory works are completed to specification and as shown on the drawings.

Coordinate with other trades for all necessary holes and cut-outs, etc., for glass-mounted hardware, fittings and fixtures, and to install all glass and glazed elements as required.

6.3.3 Workmanship

All installation work shall be carried out by experienced and competent tradesmen familiar with the products specified and installation techniques, to the manufacturer's requirements and recommendations, and the requirements of the relevant Glazing Standards, and to the layout and details shown on the drawings.
Handle and store glass in accordance with the manufacturer's recommendations.
Provide temporary safety markings to all glass panes as the installation work progresses.
Finish all external glazing wind and watertight.
Do not use damaged, marked or faulty materials.

6.3.4 Glass Type

Clear Float Glass
Clear Float Glass. Clear annealed float glass, complying with AS/NZS 4667 and in accordance with NZS 4223.1. Installed to the locations identified on the drawings and schedules.

Manufacturer, brand name & type:

Obscure & Patterned Glass
Obscure and Patterned Glass. Surface patterned glass and/or obscure glass, complying with AS/NZS 4667 and in accordance with NZS 4223.1. Installed to the locations identified on the drawings and schedules.

Manufacturer, brand name & type:

Toughened Safety Glass
Toughened Safety Glass. Toughened Grade 'A' Safety Glass, complying with AS/NZS 2208 and AS/NZS 4667 and in accordance NZS 4223.1. Installed to the locations identified on the drawings and schedules. All cutting and drilling and other processing requirements must be done prior to toughening.

Manufacturer, brand name & type:

6.3.5 Insulating Glass Units

Standard Double Glazing
Standard Double Glazing. Air-filled and sealed insulating glass units (IGUs) complying with NZS 4223.2, with clear float glass complying with NZS 4223.1. Double glazed IGUs shall be manufactured and installed in accordance with AS/NZS 4666. Factory-fitted to the windows and doors identified as 'double glazed' on the drawings and schedules.

6.3.6 Components & Accessories

Aluminium Framed Glazing
Provide all necessary glazing components and accessories including glazing tape, setting and distance blocks, sealants, gaskets, etc., to complete aluminium framed glazing as required.

6.3.7 Installation

Aluminium, Double Glazed (IGU's)

Install Insulated Glass Units into aluminium frames in accordance with the glazing manufacturer's recommendations and NZS 4223.1, and as detailed.

6.3.8 Frameless Doors & Screens

Frameless glass doors and screens shall be safety glass in accordance with NZS 4223.3.

Frameless glass doors and screen panels cut to the dimensions shown on the drawings, and factory pre-drilled and cut as required for all necessary fixings, brackets, cleats, hinges, locks, latches, closers and other hardware or fixtures, and edge finished as specified, prior to installation.

Install frameless glass doors and screen panels to the layout and details shown on the drawings and in accordance with any proprietary fixing manufacturer's requirements.

Glass screen panels set straight, true to line and plumb. Panel joints plumb and parallel as detailed.

Fixings, clamps, brackets, and hardware etc. neatly set-out and aligned as detailed.

Note: where relevant, new structural glass barriers shall comply with NZBC B1/AS1 (Amendment 13) and must have an interlinking rail, unless the barrier is laminated safety glass and has features to retain panes of glass or prevent collapse, in the event of breakage. The interlinking rail shall be designed to resist serviceability limit state (SLS) loads, specified in AS/NZS 1170 and B1/VM1, in the event that a glass pane of the barrier breaks.

6.3.9 Edge Finishing

Smooth arrised exposed edges and corners to frameless glass doors and screens, and where noted on the drawings.

6.3.10 Completion

Check that all glass has been installed correctly to the required standard and as shown on the drawings. Check for damage and surface marking and replace as necessary. Clean off and remove all temporary safety markings, as programmed and when instructed, and leave glass trade clean.
Remove all rubbish and waste material from site.
Issue to the Owner a copy of the Glass Manufacturer's maintenance requirements and all necessary Manufacturer Warranties.

7 INSULATION

7.1 Preliminary

Refer to General Conditions of Contract and the Special Conditions in this Specification as appropriate. Read this section in conjunction with all other trade sections.

7.2 Compliance

Comply with the New Zealand Building Code 1992 including all revisions and amendments, Verification Methods where appropriate, and construction principles that are embodied in the Acceptable Solutions.

Comply with all relevant provisions and recommendations of:

3604:2011(NZS)	Timber-framed buildings
4220:1982(NZS)	Code of practice for energy conservation in non-residential buildings
4243.1:2007(NZS)	Energy efficiency - Large buildings - Building thermal envelope
4246:2016(NZS)	Energy efficiency - Installing bulk thermal insulation in residential buildings
4859.1:2018(AS|NZS)	Thermal insulation materials for buildings - Part 1: General criteria and technical provisions

7.3 Thermal Insulation

7.3.1 Scope

Supply and install the selected products as thermal insulation to the specified R-values, complete with all accessories, to the floors, walls, ceilings, roofs, and other thermally insulated building elements, as noted and shown on the drawings. All aspects of this work shall be in accordance with the product manufacturer's technical literature and installation requirements, other relevant product manufacturers' recommendations, and as shown on the drawings.

7.3.2 Co-operation

Co-operate with other trades to ensure that all preliminary and preparatory works are completed to specification and as shown on the drawings.
Co-ordinate with other trades to install all thermal insulation as required.

7.3.3 Workmanship

All installation work shall be carried out by experienced and competent tradesmen, familiar with the specified products and installation techniques, in accordance with the manufacturer's installation requirements, and as noted and detailed on the drawings.
Store and handle products in accordance with the manufacturer's recommendations, keep dry and protect from damage. Do not compress fibre insulation bales. Do not use damaged or defective insulation products and accessories.
The building must be completely enclosed and water tight before installation commences with the exception of roof insulation when installed with roofing. Ensure the moisture content of timber

framing is no greater than 18% prior to installing insulation to timber framed elements. Always maintain the full insulation thickness to ensure the required thermal values are achieved. Do not install insulation pads or blankets into closed cavities that are less than the stated insulation nominal thickness.

7.3.4 Product

Glass Fibre Pads
Glass fibre thermal insulating pads.

Manufacturer, brand name & type: Pink Batts
Thickness & R-Value: Ultra R2.6
Location: Wall

Thickness & R-Value: Ultra R3.2
Location: Ceilings

7.3.5 Installation

Wall Insulation - Glass Fibre Pads
Install glass fibre insulation pads, complete with accessories, friction fitted between wall studs and dwangs etc. and held in place in accordance with the manufacturer's installation recommendations. Completely fill the framing voids, leave no gaps at the edges or at penetrations etc, and maintain full insulation pad thickness. Support external wall insulation with vertical strapping tape at 400mm centres to the outside face, stainless steel stapled to the framing.

Ceiling Insulation, Truss/Framed Roof - Glass Fibre Pad
Install glass fibre insulation pads, complete with accessories, friction fitted between the ceiling joists, over the ceiling lining in accordance with the manufacturer's installation recommendations. Leave no gaps along the insulation pad edges and joints, and at the ceiling perimeter/wall junction. Separate ceiling insulation 200mm from recessed light fittings and other recessed electrical fittings; refer to the drawings for containment requirements around recessed electrical fittings.

7.3.6 Completion

Check that all insulation has been installed correctly and is correctly supported and that all edges, joins and ends are fully closed without gaps. Check for damage and faults and repair or replace as necessary. Collect and remove from site all rubbish and waste material.
Issue to the Owner a copy of any product maintenance requirements and a copy of the Thermal Insulation Product and Installation Warranties for the completed works.

8 PAINTING & DECORATING

8.1 Preliminary

Refer to General Conditions of Contract and the Special Conditions in this Specification as appropriate. Read this section in conjunction with all other trade sections.

8.2 Compliance

Comply with the New Zealand Building Code 1992 including all revisions and amendments, Verification Methods where appropriate, and construction principles that are embodied in the Acceptable Solutions.

Comply with all relevant provisions and recommendations of:

2310:2002(AS/NZS)	Glossary of paint and painting terms
2311:2017(AS/NZS)	Guide to the painting of buildings
3750.0:2008(AS/NZS)	Paints for steel structures - Introduction and list of Standards
BRANZ IB 257	Wood primers

8.3 General

8.3.1 Co-operation

Co-operate with all trades and attend upon Concretor, Joiner, Carpenter, etc. to ensure that the surfaces provided by these trades are completely suitable for the Painter works that are required.

8.3.2 Preparation

No painting or varnishing or other surface coating work shall be undertaken unless the surfaces to be coated are in a correct and proper condition to ensure first class results.

Inspect the works of other trades on which Painter work is scheduled and report to the Main Contractor and the Architect/Designer any defects or irregularities that would affect the permanency or finish of the painting work, and do not proceed until the defects or irregularities have been completely rectified. Failure to examine and report will be construed as an acceptance that all preparatory works are completely satisfactory.

This clause does not relieve the Painter of any of the usual preparatory work to surfaces customarily performed by this trade.

Clean down all surfaces with sugar soap, strippers, mould killers, etching agents, etc. as required. Sand or rub all sharp edges off exterior timbers and other materials as appropriate before painting. Finish rub down ALL surfaces. Ensure that the moisture content of all substrates is appropriate. Remove locks, fastenings, and similar hardware before painting and refix on completion. Remove all electrical switch and power plates before painting and refix them on completion. Mask adjacent surfaces as required to a true line and remove the masking on completion. Dust and wipe down all surfaces for Painter work and completely remove all dust, rubbish, dirt etc. from areas involved.

immediately prior to commencement. To each area of the works complete all surface preparation before applying paint to any surface.

8.3.3 Protection

Take adequate precautions to prevent paint spots falling on prefinished or similar surfaces, and extreme care to keep absorbent materials (e.g. cedar, sawn framing, decking, paving) completely clean during all adjacent painting work. Correction of any such disfigurement shall be to the Architect/Designer's approval.

8.3.4 Qualifications

All work by the Painting Subcontractor shall be of the highest reasonable standard, and executed by experienced and competent tradesmen to the Owner's approval.

8.3.5 Wallpapers & Lining Papers

Wallpapers and lining papers, where scheduled, shall be hung plumb, true and square, and with precise butts. Patterns shall be accurately matched at each join. All rolls used in any one area shall be from the same batch. Use a fungicide incorporated adhesive that is recommended by the supplier. Edges neatly and precisely cut to the adjacent element. Finish free of air bubbles, wrinkles, gaps or stains.

8.3.6 General

The schedules indicate the general extent of the works to be carried out but are in no way exhaustive in their description of the actual items for painter work. Complete all work necessary for the proper and entire completion of the works. All items and portions of items reasonably inferable but not specifically mentioned are deemed included, i.e. cupboard interiors, the top and bottom of doors, unseen cabinetry tops, etc. All doors shall have equal painter work on ALL surfaces.

Where timber work is specified for priming before fixing the priming shall be thoroughly brushed in to all surfaces, and all exterior timber work for paint finishing shall be fully primed within one week of fixing. Should more than one month elapse between priming and undercoating the timber shall be fully reprimed.

Stopping up work shall be carried out immediately the priming or sealing coat is dry, and shall be solidly placed to finish clean and dry. Stopping tinted to match the timber for clear finished work.

Paint putties within one month of glazing timber frames; paint to impinge on glass to assist sealing.

8.3.7 Completion

Allow to touch up to approval any Painter work which is damaged during the finishing works of other trades. Replace all hardware, remove all masking, covers, containers etc., thoroughly clean all affected surfaces, and leave all spaces ready for immediate occupation. Avoid scratching or abrading glass or hardware during any cleaning.

9 PLUMBING

9.1 Preliminary

Refer to General Conditions of Contract and the Special Conditions in this Specification as appropriate. Read this section in conjunction with all other trade sections.

9.2 Compliance

Comply with the New Zealand Building Code 1992 including all revisions and amendments, Verification Methods where appropriate, and construction principles that are embodied in the Acceptable Solutions.

Comply with all relevant provisions and recommendations of:

1221:1997(AS/NZS)	Fire hose reels
1254:2010(AS/NZS)	PVC-U pipes and fittings for stormwater and surface water applications
1260:2017(AS|NZS)	PVC-U pipes and fittings for drain, waste and vent applications
1477:2017(AS|NZS)	PVC pipes and fittings for pressure applications
1546.1:2008(AS/NZS)	On-site domestic wastewater treatment units - Septic tanks
1596:2014(AS/NZS)	The storage and handling of LP Gas
2032:2006(AS/NZS)	Installation of PVC pipe systems
2033:2008(AS/NZS)	Installation of polyethylene pipe systems
2492:2007(AS/NZS)	Cross-linked polyethylene (PE-X) pipes for pressure applications
2537.1:2011(AS/NZS)	Mechanical jointing fittings for use with crosslinked polyethylene (PE-X) for pressure applications - Part 1: Plastics piping systems for hot and cold water installations - Crosslinked polyethylene (PE-X) - General
2642.2:2008(AS/NZS)	Polybutylene pipe systems - Polybutylene (PB) pipe for hot and cold water applications
2712:2007(AS/NZS)	Solar and heat pump water heaters - Design and construction
3500.1:2015(AS|NZS)	Plumbing and drainage - Part 1: Water services
3500.1:2018(AS|NZS)	Plumbing and drainage Part 1: Water services
3500.2:2015(AS|NZS)	Plumbing and drainage - Part 2: Sanitary plumbing and drainage
3500.2:2018(AS|NZS)	Plumbing and drainage Part 2: Sanitary plumbing and drainage
3500.3:2018(AS|NZS)	Plumbing and drainage Part 3: Stormwater drainage
3500.4:2015(AS|NZS)	Plumbing and drainage - Part 4: Heated water services
3500.4:2018(AS|NZS)	Plumbing and drainage Part 4: Heated water services
3500.5:2012(AS/NZS)	Plumbing and drainage - Part 5: Housing Installations
3501:1976(NZS)	Specification for copper tubes for water, gas, and sanitation
4020:2018(AS|NZS)	Testing of products for use in contact with drinking water
4121:2001(NZS)	Design for access and mobility: Buildings and associated facilities
4517:2010(NZS)	Fire sprinkler systems for houses

4602:1988(NZS)	Low pressure copper thermal storage electric water heaters
4603:1985(NZS)	Installation of low pressure thermal storage electric water heaters with copper cylinders (open-vented systems)
4606.1:1989(NZS)	Storage water heaters - General requirements
4607:1989(NZS)	Installation of thermal storage electric water heaters: valve-vented systems
4613:1986(NZS)	Domestic solar water heaters
4614:1986(NZS)	Installation of domestic solar water heating systems
4617:1989(NZS)	Tempering (3-port mixing) valves
4692.1:2005(AS/NZS)	Electric water heaters - Energy consumption, performance and general requirements
4766:2006(AS/NZS)	Polyethylene storage tanks for water and chemicals
5601.1:2013(AS|NZS)	Gas installations - Part 1: General installations
7602:1977(NZS)	Specification for polyethylene pipe (Type 5) for cold water services
7643:1979(NZS)	Code of practice for the installation of unplasticized PVC pipe systems
7646:1978(NZS)	Specification for polyethylene pipes and fittings for gas reticulation
AS/NZS 3500.5:2012	Plumbing and drainage - Part 5: Housing installations
NZBC G11	Gas as an Energy Source
NZBC G12	Water Supplies
NZBC G13	Foul Water

9.3 General

Carry out all works necessary to leave the water, waste, vent and soil systems serving the sanitary fittings and the plumbing hardware shown on the drawings or specified below in correct working order complete with all ancillary systems (safetrays, floor drains, overflows, relief valves, etc.) required, and with all normal incidentals customarily installed by this trade.

Comply with the Building Code, Territorial Authority By-laws and statutory authority Regulations as appropriate. Obtain all necessary permits and consents, serve all necessary notices, arrange for all tests and pay all fees and customary charges in connection with the required works.

9.4 Workmanship

9.4.1 Co-operation

Co-operate with all other trades. Attend upon Concretor, Drainlayer and Carpenter to set out the exact positions of pipe runs before adjacent work is put in hand, and to ensure that all pipes, sleeves, fixings, flashings etc. are correctly incorporated into the structure as construction proceeds.

9.4.2 Workmanship

All plumbing work shall be carried out by, or under the direct control of, properly qualified tradesmen, and shall be to recognised high standards.

The cutting away and checking of timbers shall be limited to such dimensions as will not prejudice the purpose for which the timber is used; observe NZS 3604 restrictions on the holing and checking of joists and beams. Chasing and checking of other materials only to approval. Install seismic restraints to storage tanks and HWCs.

Weatherseal wherever pipes, screws, bolts or other fastenings penetrate an external surface, and particularly roofing; seal with gaskets, flashings (and overflashings if necessary) or mastic as appropriate - any damage that results from failure of such seals will be made good at the Plumber's expense.

Adequately protect all surfaces. Any damage to fittings or surfaces made good by the appropriate trade at the Plumber's expense.

9.4.3 Pipework

Joints between pipes of different materials shall always be to the approval of the TA Plumbing Inspector.

Pipework set-out neatly with a minimum number of bends, and more or less parallel to and at right angles to structural elements - avoid diagonal piping.

All internal pipework shall be concealed except where otherwise is either shown or approved. Exposed pipework shall be accurately and neatly run. Arrange all pipework (and particularly traps) in a manner which will allow maximum future accessibility for repairs or maintenance. Arrange for access panels to any primary maintenance positions, and install conveniently located isolating valves for each group of fittings. Wingbacks securely and squarely fixed. Crox unions usually acceptable only at the final connection to fittings. Install white plastic flanges where pipes penetrate linings in visible locations.

Where pipes are covered with nail fixed linings and trim ensure that their positions are marked on the linings to minimise the risk of subsequent nailings penetrating the pipe. Any such damage shall be rectified immediately, with all consequential damage made good.

Set pipework out in straight runs to even gradients. Fix all pipes to the structure sufficiently to fully support and to prevent sagging or vibration. Clips and saddles shall be the same material as the pipe. Exterior pipes on stand-off brackets. Fixings to the exterior or damp locations shall all be hot dip galvanized unless otherwise noted. Sleeves for pipes or drains penetrating concrete or masonry shall be uPVC, 20mm minimum larger internal diameter than the external diameter of the pipe, finished flush with concrete or masonry, and packed and mastic sealed.

Close open ends of the systems during construction to prevent the entry of foreign matter.

9.4.4 Temperature Movement

All work shall respect in full all probable thermal movements - layouts, fixings and jointings shall be arranged to allow thermal movement without risk of prejudice to water tight conditions, or risk of damage from straining of the pipes which will generate failures.
In particular, observe best local trade practice to avoid problems arising from freezing conditions.

9.4.5 Excavation

Allow to carry out all excavation that is required to suit the services installed by this trade. Check for other services before excavation. Trenches true to line and level, base of trenches clear of loose material, and shore trenches as required to suit the ground conditions. Backfilling shall be carried out by this trade, and be to the requirements specified in Siteworks.

9.4.6 Testing

All plumbing services shall be completed in stages which will allow for proper testing under normal working pressures prior to the application of insulation, concealment or other enclosure. Testing of piped water services shall be by hydrostatic testing in accordance with AS/NZS 3500.1 and shall not show any leakage when subjected to a hydrostatic pressure of 1500kPa for a period of not less than 30 minutes. All leaks remedied and retested. On completion the whole of the plumbing services to be subjected to full operational tests in the presence of the plumbing inspector, with any defects revealed in these tests properly remedied.

9.4.7 Warranties

Warranty cards and manufacturer's guarantees for all items supplied and installed by this trade shall be correctly filled in and handed over at Practical Completion.

9.5 Materials

9.5.1 Materials

Materials shall be delivered with packaging and labeling intact. Incidentals (jointing compounds, PTFE tape, seals, washers, silfos, solvent cements, etc.) shall be completely appropriate for the application involved. The use of imperfect items or items damaged in any way is always subject to approval.

9.5.2 Materials Separation

Separate dissimilar metals in any circumstances which could produce contact or electrolytic action by a water film, with thick plastic tape, bituminous felt or other inert material. Pipes in contact with or built into concrete or masonry shall be fully spiral wrapped in Denso tape or equal.

9.6 Systems

9.6.1 Wastes & Vents

All traps sized to AS 3500.2. Wastes and vents all uPVC. Wastes shall be to AS 3500.2 falls as a minimum. Vents shall be generally as indicated, but avoid where permissible in compliance with AS 3500.2, or shall be combined above the flood level of the fittings.

9.6.2 Cold Water System

Supply From Existing Toby

All cold water supply pipework shall be medium/high-density polyethylene (MDPE/HDPE), arranged and fixed so that all joints are in a fully 'relaxed' condition, without any stress or tension.
Lay on a 20mm main from the existing toby along the route shown on the Site Plan to the connection position noted on the Floor Plan (pipe depth, protection, backfilling, signal strip etc. to comply with all

Supply Authority requirements). At the connection position take a branch feed off for the hosecocks (and reticulate to the positions shown and install angle hosecocks) and toilet cisterns and then take the main feed through an accessibly positioned cleanable in-line sediment and dirt filter.
Primary distribution from the water filter shall be in 20mm piping, reducing to 12mm for the final feed to individual items. Install conveniently located isolating valves to turn off each group of fittings, and install a small isolating valve alongside each toilet cistern not integrally fitted with one. (Note that these isolating valves and the hosecocks are not covered by the Plumbing Hardware Prime Cost Sum).

9.6.3 Hot Water System

Gas Instant Hot Water Device

Supply the gas instant hot water device complete with a wall recess box as noted on the drawings and install it where shown on the plan and elevation.
Install pressure relief valves, cold water expansion valves, flow control valves, pressure limit valves, and non-return/isolating valves as required to leave the hot water systems in full design operational order.
Install a tempering valve to control the hot water temperature at any sanitary fixture used for personal hygiene at not more than 55°C.
Flush all pipework before making the final connections. Lag the main distribution pipes full length with wall pipe insulation.
Showers shall have priority feeds, without 'tees', and the pipework layout shall ensure that the showers temperature and pressure remain as even as possible.

9.6.4 Gas Fitting

Is included in the Plumbing trade, although all work must be carried by Registered Gasfitters, and be in complete accordance with all relevant Regulations and standards and be in full accordance with best trade practice.

Obtain all necessary permits and pay all fees. If necessary obtain a Dangerous Goods Licence for the storage installation in the name of the Owner; and if the Owner's signature is required forward all relevant papers to the Architect/Designer.

Supply two 45kg (1220 x 380mm diameter) LPG storage cylinders and install them in the position shown on the drawings. Installation to allow straightforward switchover to the second cylinder.

9.7 Elements

9.7.1 Sanitary Fittings

Supply and fix all of the sanitary fittings as scheduled on the drawings. All fittings checked on delivery for 'perfect' condition, and all fittings plain white. Supply and fix all normal accessories that are not usually supplied with the fitting.
The Plumber is responsible for fittings from delivery until Practical Completion of the contract.

9.7.2 Plumbing Hardware

There is no prime cost sum allowance. All plumbing finishing hardware is specified on the drawings.

9.7.3 Flashings

Ridges, hips, barges, valleys, aprons etc. flashings all supplied and installed by the Roofer. Metal windows flashings (those installed during windows installation ONLY) will be supplied by the windows subcontractor and installed by the Carpenter. All other flashings including wall penetration flashings, soakers, etc. that are required to leave the building completely water and weathertight are the Plumber's responsibility.

All flashings shall be machine folded to profiles as shown or required, incorporating capillary breaks where appropriate, shall be formed in one piece where possible, and lead or other soft edged where required. Stop ends, external angles, junctions etc. soldered or sealed and blind riveted as appropriate.

All flashings shall be either 0.55mm Colorsteel VP or 1mm powder coated aluminium as and where identified on the drawings, refer to the Architect for direction where unclear.

9.7.4 Appliances

All appliances are exactly identified on the drawings notes. Main Contractor will establish, in consultation with the Plumber and Electrician, which of them will be supplied by each of these trades.

10 GAS

10.1 Preliminary

Refer to General Conditions of Contract and the Special Conditions in this Specification as appropriate. Read this section in conjunction with all other trade sections.

10.2 Compliance

Comply with the New Zealand Building Code 1992 including all revisions and amendments, Verification Methods where appropriate, and construction principles that are embodied in the Acceptable Solutions.

Comply with all relevant provisions and recommendations of:

1596:2014(AS/NZS)	The storage and handling of LP Gas
5601.1:2013(AS|NZS)	Gas installations - Part 1: General installations
Gas Regulations	Gas (Safety and Measurement) Regulations 2010
LPG Association of New Zealand	LPGA CoP No 2 - Installation and maintenance of twin 45kg LPG cylinder systems
NZBC G10	Piped Services
NZBC G11	Gas as an Energy Source

10.3 Gas System - LPG Cylinders (LPGA CoP No.2)

10.3.1 Scope

Supply, install, test and commission the Gas System LPG Cylinders to the locations and layout shown on the drawings, complete with all system components and accessories required for proper performance and functionality, and compliance. Carry out the works to comply with the requirements of the LPGA CoP No.2: 'Installation and maintenance of twin 45kg LPG cylinder systems', AS/NZS 5601.1 and the NZ Building Code, and with all relevant Regulations and Acts, and the requirements of the controlling Regulatory Authorities.

For the purpose of this specification, the following definitions apply:
- EPA: Meaning the 'Environmental Protection Authority'.
- Excess Flow Valve: A normally open valve that closes automatically when a predetermined flow rate in a particular direction has been exceeded.
- HSNO: Hazardous Substances and New Organisms Act 1996.
- LAB Number: The number allocated by EPA when a cylinder is approved.
- LPGA: LPG Association of New Zealand Inc.
- POL Fitting (Prest-O-Lite): The common name given for a standard union with left hand thread, used for connection to a 45kg cylinder.
- Pigtail: A short length of flexible tube or copper pipe completed with end couplings. Use for connecting the cylinder to the manifold or the changeover valve.
- Twin Cylinder Installation: A cylinder installation where the cylinders are connected separately to the system. Each cylinder is connected to a change over valve that can be operated manually or

automatically, to change over the cylinder which is supplying LPG to the installation. Connection may be made using flexible rubber or copper pigtails, or pipe fittings.

10.3.2 Requirements

Compliance

Installation of the LPG service shall comply with the Gas Act 1992, the Gas (Safety & Measurement) Regulations 2010, and the NZ Building Code. Obtain all necessary permits, pay all fees and give all notices, and complete the works to the approval of the Territorial Authority.

Gas Compliance Certificates

In accordance with the Gas (Safety and Measurement) Regulations 2010, complete and issue to the relevant parties the following documents for the LPG service installation:

- Gasfitting Certificate of Compliance (CoC).
- Gas Safety Certificate (GSC).

Record Keeping

Maintain a complete and up-to-date record of the location of the LPG service, and of the equipment and materials used in its assembly and installation. The record shall include, but be limited to:

- A dimensioned, scaled plan of the location of LPG cylinders, and the installed layout of the LPG piping and system components.
- Details of the pipe diameters and pipe types used.
- The locations and types of mechanical joints used, with the locations clearly marked on the plan.
- Full details and exact location of valves fitted to the distribution system, giving the number of turns required to operate the valve and the direction of rotation.
- Full details of the LPG service operation and maintenance requirements.

As-Built Documents

Provide all required As-Built documentation and records. Prepare and submit As-Built drawings of the LPG service installation, based on the approved contract drawings, that accurately record the location of LPG cylinders, gas pipe runs, pipe sizes, and the locations and types of componentry and fittings.

Corrosion Control

Take all reasonable attempts to limit corrosion of the LPG service installation. Separate dissimilar metals by a 5mm air gap or by an appropriate 2mm thick isolating material. As necessary provide suitable protection from other materials with corrosion resistant coatings, by insulating joints or by sleeving. Use proprietary pipe clamps, clips, brackets and hanger supports, and fastenings and anchors appropriate for the installation and support of the piped gas system components and equipment and suitable for the environmental conditions.

Openings & Penetrations

Form openings and penetrations through walls, floors and structural elements, as required and as shown on the drawings. Provide pipe sleeves for LPG pipe penetrations through concrete foundation walls, floor slabs and concrete and/or masonry walls.

Provide proprietary intumescent fire collars around pipes that pass through a fire separation element (fire-rated wall, floor, duct or riser, or other as shown on the drawings) in accordance with the fire collar manufacturer's requirements and as shown on the drawings.

Support & Seismic Restraint

Supply and install all necessary pipe support clamps, clips, brackets, hangers, etc., required to properly support and anchor surface-mounted and suspended pipework.

Components shall be adequately fastened and restrained for both normal loadings and earthquake loadings (NZS 4219).

LPG Pipe Identification

In-ground LPG pipes shall have warning tape placed in the trench directly above the gas pipe and between 150mm and 300mm below the finished surface level.

Above-ground LPG pipes shall be identified by colours and letters within 1m of every valve and in every space/area that the pipe is run, at maximum 6m intervals. Coloured marker bands shall be minimum 50mm wide, and identifying letters shall be minimum 25mm high.

Where required, LPG pipes shall have indicating arrows, minimum 100mm long, showing the direction of flow. Colours, letters, arrows and tags shall be plainly visible from the direction the pipes are most likely to be viewed from.

Where LPG pipes are to be painted, the final coat shall be the appropriate identification colour in accordance with NZS 5807.

Identify all valves with a numbered brass label showing the normal valve position; number as shown on the drawings.

10.3.3 LPG Cylinders

Exchange Cylinders

Exchange LPG cylinders. The number of cylinders supplied shall meet the design capacity of the LPG service. Cylinders shall be full 45kg (nominal 108 litre) cylinders supplied by the LPG supplier.

LPG cylinders shall comply with the Hazardous Substances (Compressed Gases) Regulations and the Environmental Protection Authority (EPA) Guide to Gas Cylinders. Cylinders shall be stamped with a LAB number and a current test date.

Exchange cylinders shall be located and installed such that the delivery of gas can be made safely by one person without excessive manual handling or risk of damage to property.

LPG Supplier: TBA

Base Support

Cylinders shall not be supported by other cylinders. Cylinders shall be installed on a supporting base that is firm, level, of non-combustible material, and with a finished surface that is drained and at least 50mm above the surrounding surface. Cylinders shall not rest on soil.

Seismic Restraint

LPG cylinders shall be restrained against seismic activity by hot-dip galvanised steel or Grade 316 stainless steel chains, brackets and fasteners. The brackets shall be fastened to a wall or similar structural support. Fasteners used to secure chains and brackets shall be capable of withstanding applied loads at least four times the weight of the filled cylinder.

Cylinder Connection

Cylinders shall be connected directly to the changeover valve assembly by copper or flexible rubber pigtails.

An excess flow valve shall be fitted immediately upstream of the piping or hose assembly (the excess flow valve may be an integral part of the POL fitting).

Pigtails connecting cylinders to changeover valves or manifolds should not exceed 1.0m in length.

A non-return valve must be fitted in the supply between each cylinder and the changeover valve, or in a manifold system , between each cylinder and its manifold connection.

Test Points

A pressure test point should be installed immediately downstream of each second-stage regulator. The test point may be an integral part of the regulator.

10.3.4 Changeover Valves

Automatic Changeover Valve

Changeover valves shall be to the requirements of AS/NZS 5601.1 and comply with the requirements of HSNO. Changeover valves may be comprised of a first and second stage regulator system in a single body, or as a combination of separate component items.

Supply and install automatic changeover valves with a non-return valve on each pigtail connection, complete with all necessary components required for the proper operation of the LPG cylinder system, including pigtails, regulators, condensation trap, over pressure shut off, excess flow valves.

10.3.5 Copper Piping

Copper Piping

Copper tube shall be in accordance with NZS 3501 or AS 1432.

Copper and copper alloy capillary fittings shall be in accordance with AS 3688. Copper alloy compression fittings shall be in accordance with AS 3688 or AS D26.

The use of copper tube and fittings shall be in accordance with the conditions and limitations of AS/NZS 5601.1: Section 4 - in particular Table 4.1.

Copper tube shall be free of burrs, scale, damage and defects. Clean thoroughly with a solvent to remove oil and dirt prior to installation.

Pipework shall follow wall lines, and be straight and true to line, plumb and level, parallel with adjacent pipes, and have the minimum number of bends. Avoid diagonal pipe runs. Arrange pipework for easy dismantling of plant components and valves. Minimise pipe cross-overs. Grade all pipework as necessary to ensure proper venting and drainage. Install tailpipes in accordance with AS/NZS 5601.1.

Support pipework in accordance with AS/NZS 5601.1. Ensure pipework in under floor spaces is supported clear of the ground by as minimum of 100mm. Support pipe risers with suitable fixings and attachments that are capable of supporting the total weight of the riser and allow for differential expansion.

Provide pipe sleeves where pipes pass through walls, floors and ceilings to accommodate movement of the pipes. Do not joint pipes at sleeved locations. Unless shown otherwise, finish pipe sleeves flush with the finished surface. In plant rooms and wet areas, provide steel sleeves that extend above the floor level. Avoid concealed pipe joints; where essential, weld each joint and test hydraulically before embedding or covering the pipe.

Allow for movement due to expansion and contraction, either by loops, deviations in the pipework, or by fitting expansion joints as shown on the drawings. Arrange pipe supports so that the expansion is taken up by the provisions of the expansion design.

Ensure pipes are separated by a minimum of 25mm from any metallic electrical conduit, or metal armoured or metal sheathed electrical wire.

Plug open pipe ends as the works progress to ensure the pipe bore is kept clean and free of contamination.

10.3.6 Co-operation

Co-operate with other trades to ensure that all preliminary and preparatory works are completed to specification and as shown on the drawings prior to installation.

Co-ordinate with other trades as necessary to install the LPG service to the required locations and layouts, tolerances and standards - in particular with electrical installations to ensure that minimum clearances are maintained.

The LPG service layout drawings and schematics are indicative only, and indicate the main routes and positions for the LPG service installation and equipment in relation to the building and other services.

Should an alternative LPG pipe route to that shown on the drawings be proposed, submit all necessary details to the Architect/Designer for review and approval before proceeding. Alternative routes for pipework are not permitted without written instruction from the Architect/Designer.

10.3.7 Workmanship

Installation work shall be carried out by qualified and experienced tradesmen, under the direct supervision of a NZ certified Registered Gasfitter authorised to undertake the work under the Plumbers, Gasfitters, and Drainlayers Act 2006, to the requirements of AS/NZS 5601.1, NZBC G10 and NZBC G11, and with all regulatory requirements.

All pipe cutting, jointing, and supporting techniques shall be exactly as recommended by the manufacturer. Pipes, fittings and accessories shall be handled and installed in such a manner that prevents any damage, deterioration or contamination to the product.

All work shall be such as to leave a neat, efficient, robust and gastight installation.

Carry out all necessary inspections during installation, and complete all necessary commissioning tests and reports. Complete checklists for Gas Safety Certificate (GSC) and for Certificate of Compliance (CoC) - Gas.

10.3.8 Delivery & Handling

Store materials undercover, off the ground on a flat, level surface in accordance with the manufacturer's requirements. Keep materials and equipment dry, and protect from damage and contamination while stored and as necessary during installation.

Do not use damaged, defective or contaminated pipes, fittings and accessories.

Handle materials in accordance with the manufacturer's requirements.

Installers shall be familiar with and comply with the manufacturer's Material Safety Data Sheet precautions for use, and use appropriate safety gear when handling materials.

Installers shall conform with all relevant WorkSafe NZ Guidelines and Codes of Practice - including the OSH Guidelines For the Provision of Facilities and General Safety in the Construction Industry.

10.3.9 Commission

Commission

Carry out final inspections and testing. Carry out pressure testing of pipework and LPG installation for gastightness (leakage) to the requirements of AS/NZS 5601.1. Remedy any leaks and defects found in the LPG service installation to the specified standard.

Ensure that the Gasfitting Certificate of Compliance and the Gas Safety Certificate have been completed.

10.3.10 Completion

Check that the LPG service installation has been installed correctly in accordance with AS/NZS 5601.1 in compliance with the Gas (Measurement and Safety) Regulations, and that the installation has been purged, tested and commissioned in accordance with the required procedures.

Check for faults and defective work - repair/replace as necessary to the required standard.

Leave this work complete and in full working order, gastight and leak-free, to the required standard and operation.

Leave the surrounding surfaces clean and free of rubbish and debris. Remove all rubbish and excess material from the site.

Issue to the Owner a copy of the operation and maintenance requirements, and a copy of the associated warranties for the LPG installation, components and appliances.

Issue all required As-Built Documentation, the Gasfitting Certificate of Compliance, and the Gas Safety Certificate to the relevant parties.

1. BRANZ Appraisal No.764 (2017) - Shadowclad Ventilated Cavity Cladding System
2. BRANZ Appraisal No.928 (2016) - GIB EzyBrace Systems 2016
3. BRANZ Appraisal No.427 (2007) - GIB Aqualine Wet Area Systems
4. BRANZ Appraisal No.918 (2016) - Thermakraft Covertek 403 Plus Wall Underlay
5. BRANZ Appraisal No.878 (2014) - Thermakraft Aluband Window Flashing Tape
6. BRANZ Appraisal No.942 (2017) - Multi-Fit Penetration Seals
7. Viking Enviroclad
8. Branz Appraisal 656
9. Wall Cladding
10. Gib Bracing Systems
11. Rinnai Infinity

BRANZ Appraised
Appraisal No. 764 [2017]

SHADOWCLAD® VENTILATED CAVITY CLADDING SYSTEM

Appraisal No. 764 (2017)

This Appraisal replaces BRANZ Appraisal No. 764 (2011)

Amended 5 September 2018

BRANZ Appraisals

Technical Assessments of products for building and construction.

Product

1.1 Shadowclad® Ventilated Cavity is a cavity-based external wall cladding system for residential and light commercial type buildings where domestic construction techniques are used.

1.2 The system consists of Shadowclad® sheets, timber cavity battens, flashings and accessories and is finished with either an acrylic paint system, penetrating, or film forming stain.

1.3 Shadowclad® Ventilated Cavity incorporates a primary and secondary means of weather resistance (first and second line of defence) against water penetration by separating the cladding from the external wall frame with a nominal 20 mm drained cavity.

Scope

2.1 Shadowclad® Ventilated Cavity has been appraised as an external wall cladding for buildings within the following scope:

- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1; and,
- constructed with timber framing complying with the NZBC; and,
- with a risk score of 0-20, calculated in accordance with NZBC Acceptable Solution E2/AS1, Table 2; and,
- situated in NZS 3604 Wind Zones up to, and including Extra High; and,
- with a building height of ≤ 10 m and at a distance of ≥ 1.0 m to the relevant boundary.

2.2 Shadowclad® Ventilated Cavity has also been appraised as an external wall cladding for specifically designed buildings within the following scope:

- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1; and,
- constructed with timber framing complying with the NZBC; and,
- situated in specific design wind pressures up to a maximum design differential ultimate limit state (ULS) of 2.5 kPa; and,
- with a building height of ≤ 10 m and at a distance of ≥ 1.0 m to the relevant boundary.

2.3 Shadowclad® Ventilated Cavity is appraised for use with aluminium window and door joinery that is installed with vertical jambs and horizontal heads and sills. *(The Appraisal of Shadowclad® Ventilated Cavity relies on the joinery meeting the requirements of NZS 4211 for the relevant Wind Zone or wind pressure.)*

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BRANZ

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WFTAO
WORLD FEDERATION OF TECHNICAL ASSESSMENT ORGANISATIONS

Hamilton City Council

BUILDING UNIT APPROVED

BC Number - DD007.2019.00040020.001

Building Regulations

New Zealand Building Code (NZBC)

3.1 **In the opinion of BRANZ, Shadowclad® Ventilated Cavity, if designed, used, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet the following provisions of the NZBC:**

Clause B1 STRUCTURE: Performance B1.3.1, B1.3.2 and B1.3.4. Shadowclad® Ventilated Cavity meets the requirement for loads arising from self-weight, wind, impact and creep [i.e. B1.3.3 (a), (f), (j) and (q)]. See Paragraphs 9.1 – 9.3.

Clause B2 DURABILITY: Performance B2.3.1 (b), 15 years, and B2.3.2. Shadowclad® Ventilated Cavity meets these requirements. See Paragraphs 10.1 - 10.5.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.2. Shadowclad® Ventilated Cavity meets this requirement. See Paragraphs 14.1 - 14.5.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. Shadowclad® Ventilated Cavity meets this requirement and will not present a health hazard to people.

Technical Specification

4.1 System components and accessories supplied by Carter Holt Harvey Woodproducts New Zealand are as follows:

Shadowclad® Sheets

- Shadowclad® sheets are nominal 12 mm thick structural plywood sheets manufactured from New Zealand pinus radiata veneers. They are 1216 mm wide and either 2440 mm or 2745 mm long. They have a textured surface finish on the exposed face.
- Shadowclad® sheets are available as either Shadowclad® Natural or Shadowclad® Ultra finish. Shadowclad® Natural is an uncoated panel for use with penetrating stains, film forming stains and paints. Shadowclad® Ultra has a factory applied powder coat exterior primer for use with paints and film forming stain topcoats. Shadowclad® Ultra is not suitable for use with penetrating stains.
- Shadowclad® Natural and Shadowclad® Ultra are both available as Texture and Texture Groove surface finish. Texture Groove has 9 mm wide by 5 mm deep grooves at 150 mm centres running vertically down the outside face of the sheet.
- Shadowclad® Natural sheets are available as Hazard Class H3.1 treated only. Shadowclad® Ultra sheets are available in either H3.1 or H3.2 CCA treated.

Shadowclad® Accessories

- **Shadowclad® flashings:** horizontal 'Z' flashing, inter-storey 'Z' flashing, internal 90° angle, internal 'W' angle, large internal 'W' angle, external box angle, large external box angle and flat flashing for vertical negative detail. Shadowclad® flashings are available in extruded aluminium and folded stainless steel.
- **Cavity vent strip**: manufactured from aluminium or stainless steel, available in 3600 mm lengths.

4.2 Accessories used with Shadowclad® Ventilated Cavity which are supplied by the building contractor are:

- **Shadowclad® sheet fixings:** 60 x 2.8 mm hot-dip galvanised or ring shank stainless steel flat head nails, 8 gauge x 65 mm AS 3566 Corrosion Class 4 mechanically zinc plated wood screws or 8 gauge x 65 mm stainless steel wood screws. *[Note: Stainless steel fixings must be Grade 316 and hot-dip galvanising must comply with AS/NZS 4680].*
- **Exterior Battens:** 65 mm wide x 18 mm thick timber batten, dressed or handsawn, treated to Hazard Class H3.1 and with 6 x 6 mm weathergrooves.
- **Cavity battens:** nominal 45 mm wide x 20 mm thick or 75 mm wide x 20 mm thick merchant grade timber treated to Hazard Class H3.1.

- **Cavity batten fixings:** 40 x 2.5 mm hot-dip galvanised or stainless steel ring shank flat head nails.
- **Flexible wall underlay:** wall underlay complying with NZBC Acceptable Solution E2/AS1, Table 23, or breather-type membranes covered by a valid BRANZ Appraisal for use as wall underlay.
- **Rigid wall underlay:** sheet complying with NZBC Acceptable Solution E2/AS1, Table 23, or rigid sheathing covered by a valid BRANZ Appraisal for use as rigid air barrier systems.
- **Brush on timber preservative:** brush on timber preservatives as listed in the Technical Literature for Shadowclad® Ventilated Cavity.
- **Flexible flashing tape:** flexible flashing tapes complying with NZBC Acceptable Solution E2/AS1, Paragraph 4.3.11, or flexible flashing tapes covered by a valid BRANZ Appraisal for use around window and door joinery openings.
- **Window and door trim cavity air seal:** air seals complying with NZBC Acceptable Solution E2/AS1, Paragraph 9.1.6, or self-expanding, moisture cure polyurethane foam air seals covered by a valid BRANZ Appraisal suitable for use around window, door and other wall penetration openings.
- **Joinery head flashings:** folded from aluminium or galvanised steel to suit the window or door trim opening. Refer to NZS 3604, Section 4 and NZBC Acceptable Solution E2/AS1, Table 20 for durability requirements.
- **Flexible sealant:** sealant complying with NZBC Acceptable Solution E2/AS1, or sealant covered by a valid BRANZ Appraisal for use as a weather sealing sealant for exterior use.

Finishing System Specification

4.3 Paint and stain systems are not supplied by Carter Holt Harvey Woodproducts New Zealand and have not been assessed by BRANZ and are therefore outside the scope of this Appraisal.

4.4 All exposed faces, including top edges at sills and all bottom edges of Shadowclad® sheets must be finished with a latex exterior paint system complying with any of Parts 7, 8, 9, or 10 of AS 3730, or at least two coats of a film forming or penetrating stain to protect the Shadowclad® and give the desired finish colour to the exterior walls.

[Note: For Shadowclad®, Carter Holt Harvey Woodproducts New Zealand recommends using paints and stains with a Light Reflective Valve [LRV] of greater than or equal to 50%.]

Handling and Storage

5.1 Handling and storage of all materials supplied by Carter Holt Harvey Woodproducts New Zealand or the building contractor, whether on-site or off-site, is under the control of the building contractor. Shadowclad® sheets must be stacked flat, clear of the ground on at least three evenly spaced timber bearers. They must be kept dry at all times either by storing within an enclosed building or under cover when stored externally. Care must be taken to avoid damage to edges, ends and the primed surfaces.

5.2 Accessories must be stored so they are kept clean, dry and undamaged. All accessories must be used within the maximum storage period recommended by the manufacturer.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for Shadowclad® Ventilated Cavity. The Technical Literature must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Appraisal must be followed.

Design Information

Framing

Timber Treatment

7.1 Timber wall framing behind Shadowclad® Ventilated Cavity must be treated as required by NZBC Acceptable Solution B2/AS1.

Timber Framing

7.2 Timber framing must comply with NZS 3604 for buildings or parts of buildings within the scope limitations of NZS 3604. Buildings or parts of buildings outside the scope of NZS 3604 must be to a specific design in accordance with NZS 3603 and AS/NZS 1170. Where specific design is required, the framing must be of at least equivalent stiffness to the framing provisions of NZS 3604. In all cases studs must be at maximum 600 mm centres. Dwangs must be fitted flush between the studs at maximum 800 mm centres.

7.3 Additional framing may be required at soffits, internal and external corners and window and door openings for the support and fixing of cavity battens and Shadowclad® Ventilated Cavity.

7.4 Timber wall framing and cavity battens must have a maximum moisture content of 20% at the time of the cladding application. *(Note: If Shadowclad® is fixed to framing with a moisture content of greater than 20% problems may occur at a later date due to excessive timber shrinkage.)*

General

8.1 When Shadowclad® Ventilated Cavity is used for specifically designed buildings up to 2.5 kPa design differential ULS wind pressure, only the weathertightness aspects of the cladding and maximum framing centres are within the scope of this Appraisal. All other aspects of the building need to be specifically designed and are outside the scope of this Appraisal.

8.2 Punchings in the cavity vent strip provide a minimum ventilation opening area of 1000 mm^2 per lineal metre of wall in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.1.8.3 (b).

8.3 The ground clearance to finished floor levels as set out in NZS 3604 must be adhered to at all times. At ground level, paved surfaces such as footpaths must be kept clear of the bottom edge of the cladding system by a minimum of 100 mm, and unpaved surfaces by 175 mm in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Table 18.

8.4 At balcony, deck or roof/wall junctions, the bottom edge of Shadowclad® Ventilated Cavity must be kept above the top surface of any adjacent roof flashing by a minimum of 35 mm in accordance with NZBC Acceptable Solution E2/AS1, Paragraph 9.1.3.

8.5 All external walls of buildings must have barriers to airflow in the form of interior linings with all joints stopped for wind zones up to and including Very High, and rigid underlays for buildings in the Extra High wind zone and specifically designed buildings up to 2.5 kPa design differential ULS wind pressure. Unlined gables and walls must incorporate a rigid sheathing or an air barrier which meets the requirements of NZBC Acceptable Solution E2/AS1, Table 23. For attached garages, wall underlays must be selected in accordance with NZBC Acceptable Solution E2/AS1, Paragraph 9.1.3.4. Where rigid underlays are used, the cavity batten fixing lengths must be increased by a minimum of the thickness of the underlay.

8.6 Where cladding penetrations are wider than the cavity batten spacing, allowance must be made for airflow between adjacent cavities by leaving a minimum gap of 10 mm between the bottom of the cavity and the flashing to the opening.

8.7 Where the system abuts other cladding systems, designers must detail the junction to meet their own requirements and the performance requirements of the NZBC. These details have not been assessed and are outside the scope of this Appraisal.

Inter-storey Junctions

8.8 Inter-storey junctions must be constructed in accordance with the Technical Literature. Inter-storey joints must be provided to limit continuous cavities to the lesser of 2-storeys or 7 metres in height, in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.1.9.4 (b).

Structure

Mass

9.1 The mass of Shadowclad® Ventilated Cavity is approximately 6.6 kg/m^2 at equilibrium moisture content. The system is therefore considered a lightweight cladding in terms of NZS 3604.

Impact Resistance

9.2 Shadowclad® Ventilated Cavity has good resistance to impact loads likely to be encountered in normal residential use. The likelihood of impact damage to Shadowclad® Ventilated Cavity when used in light commercial situations should be considered at the design stage, and appropriate protection such as the installation of bollards and barriers should be considered for vulnerable areas.

Wind Zones

9.3 Shadowclad® Ventilated Cavity is suitable for use in all Building Wind Zones of NZS 3604, up to and including Extra High where buildings are designed to meet the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 1.1, or up to 2.5 kPa design differential ULS wind pressure where buildings are specifically designed.

Durability

10.1 Shadowclad® Ventilated Cavity meets the performance requirements of NZBC Clause B2.3.1 (b), 15 years for the Shadowclad® and flashings when used as a non-structural cladding installed in accordance with the Technical Literature.

10.2 Shadowclad® is envelope preservative treated. Where sheets are cut, all cuts must be coated with a brush on timber preservative specified in the Technical Literature for Shadowclad® Ventilated Cavity. Failure to correctly apply preservative to these areas may negatively affect the durability of the cut sheets.

Serviceable Life

10.3 Shadowclad® Ventilated Cavity installations finished with penetrating stain or non-penetrating film forming stain, are expected to have a serviceable life of at least 15 years provided they are maintained in accordance with this Appraisal. *(Note: This opinion only covers serviceability with regards to structural and weathertightness performance. It does not cover appearance, which may deteriorate significantly, especially when proper and regular maintenance is not carried out.)*

10.4 Coastal locations can be very corrosive to fasteners, especially locations within distances of up to 500 m from the sea including harbours, or 100 metres from tidal estuaries and sheltered inlets, and otherwise as shown in NZS 3604, Figure 4.2. These coastal locations are defined in NZS 3604 as Zone D. It is recommended that Shadowclad® sheets be fixed with stainless steel fasteners in these situations.

10.5 When using CCA treated Shadowclad®, aluminium extrusions must be coated in accordance with the requirements of NZBC E2/AS1, Table 20, and are not suitable for use in NZS 3604 Corrosion Zone D. When used with CCA treated Shadowclad®, horizontal Z-flashings must be manufactured from stainless steel in all Corrosion Zones.

10.6 Microclimatic conditions, including geothermal hot spots, industrial contamination and corrosive atmospheres, and contamination from agricultural chemicals or fertilisers can convert a mildly corrosive atmosphere into an aggressive environment for fasteners. The fixing of Shadowclad® sheets in areas subject to microclimatic conditions requires specific design in accordance with NZS 3604, Paragraph 4.2.4, and is outside the scope of this Appraisal.

Maintenance

11.1 Regular maintenance is essential to ensure the performance requirements of the NZBC are continually met and to ensure the maximum serviceability of the system.

11.2 Regular cleaning (at least annually) of the paint coating is required to remove grime, dirt and organic growth and to maximise the life and appearance of the coating. Grime may be removed by brushing with a soft brush, warm water and detergent. Paint systems must be recoated at approximately 7 – 10 yearly intervals in accordance with the paint manufacturer's instructions. Penetrating and non-penetrating stains must be recoated every 2 – 3 years in accordance with the stain manufacturer's instructions.

11.3 Annual inspections must be made to ensure that all aspects of the cladding system, including the selected finishing system, flashings and any sealed joints remain in a weatherproof condition. Any damaged areas or areas showing signs of deterioration which would allow water ingress must be repaired immediately. Sealant and paint coatings must be repaired in accordance with the relevant manufacturer's instructions.

11.4 Minimum ground clearances as set out in this Appraisal and the Technical Literature must be maintained at all times during the life of the system. *(Failure to adhere to the minimum ground clearances given in this Appraisal and the Technical Literature will adversely affect the long term durability of Shadowclad® Ventilated Cavity installations.)*

Control of External Fire Spread

12.1 Shadowclad® Ventilated Cavity is suitable for use on buildings with an SH Risk Group classification, a building height of ≤ 10 m and at a distance of ≥ 1.0 m to the relevant boundary. Refer to NZBC Acceptable Solutions C/AS2 – C/AS6, Paragraph 5.8.1 for the specific exterior surface finishes requirements for other building Risk Groups.

Prevention of Fire Occurring

13.1 Separation or protection must be provided to Shadowclad® Ventilated Cavity from heat sources such as fire places, heating appliances, flues and chimneys. Part 7 of NZBC Acceptable Solutions C/AS1 – C/AS6 and NZBC Verification Method C/VM1 provide methods for separation and protection of combustible materials from heat sources.

External Moisture

14.1 Shadowclad® Ventilated Cavity, when installed in accordance with this Appraisal and the Technical Literature will prevent the penetration of moisture that could cause undue dampness or damage to building elements.

14.2 The cavity must be sealed off from the roof and sub-floor space to meet code compliance with NZBC Clause E2.3.5.

14.3 Shadowclad® Ventilated Cavity allows excess moisture present at the completion of construction to be dissipated without permanent damage to building elements to meet code compliance with NZBC Clause E2.3.6.

14.4 The details given in the Technical Literature for weather sealing are based on the principle of having a first and second line of defence against moisture entry for all joints, penetrations and junctions. The ingress of moisture must be excluded by detailing joinery and wall interfaces as shown in the Technical Literature. Weathertightness details that are developed by the designer are outside the scope of this Appraisal and are the responsibility of the designer for compliance with the NZBC.

14.5 Shadowclad® Ventilated Cavity, where there is a designed cavity drainage path for moisture that penetrates the cladding, does not reduce the requirements for junctions, penetrations, etc to remain weather resistant.

Internal Moisture

15.1 Buildings must be constructed with an adequate combination of thermal resistance and ventilation, and space temperature must be provided to all habitable spaces, bathrooms, laundries and other spaces where moisture may be generated or may accumulate.

Water Vapour

15.2 Shadowclad® Ventilated Cavity is not a barrier to the passage of water vapour, and when installed in accordance with this Appraisal will not create a risk of moisture damage resulting from condensation.

Installation Information

Installation Skill Level Requirements

16.1 Installation must always be carried out in accordance with the Shadowclad® Ventilated Cavity Technical Literature and this Appraisal by, or under the supervision of, a Licensed Building Practitioner (LBP) with the relevant Licence Class.

Shadowclad® Ventilated Cavity Installation

Wall Underlay and Flexible Sill and Jamb Tape Installation

17.1 The selected wall underlay and flexible sill and jamb tape system must be installed by the building contractor in accordance with the underlay and tape manufacturers' instructions prior to the installation of the cavity battens and the rest of the Shadowclad® Ventilated Cavity system. Flexible wall underlay must be installed horizontally and be continuous around corners. Underlay must be lapped 75 mm minimum at horizontal joints and 150 mm minimum over studs at vertical joints. Generic rigid underlay materials must be installed in accordance with NZBC Acceptable Solution E2/AS1 and be overlaid with a flexible wall underlay. Proprietary systems shall be installed in accordance with the manufacturer's instructions. Particular attention must be paid to the installation of the wall underlay and sill and jamb tapes around window and door openings to ensure a continuous seal is achieved and all exposed wall framing in the opening is protected.

Cavity Batten Installation

17.2 The cavity battens must be installed over the wall underlay to the wall framing at maximum 300 mm horizontal centres where the studs are at 600 mm centres or at 400 mm centres when studs are at 400 mm centres.

17.3 Cavity battens are fixed in place with 40 x 2.5 mm hot-dip galvanised or stainless steel ring shank flat head nails at 300 mm centres when over studs or plates, and to the top and bottom plates and dwangs when between studs.

Shadowclad® Sheet Installation

17.4 Shadowclad® sheets may be cut on site by power or hand saw. Holes and cut-outs may be formed by using a hole saw.

17.5 Shadowclad is envelope preservative treated. Where sheets are cut, all cuts must be coated with a brush on timber preservative specified in the Technical Literature for Shadowclad® Ventilated Cavity. Failure to correctly apply preservative to these areas may negatively affect the durability of the cut sheets.

17.6 Shadowclad® sheets must be dry prior to installation. Before the sheets are installed, cut edges must be sealed with a brush-on timber preservative. The bottom edges and back of the Shadowclad® sheets to a height of 150 mm must be primed or stain coated at ground level and where the sheets are installed above apron flashings on roofs.

17.7 Shadowclad® sheets must be installed starting at the bottom of the wall. The bottom of the Shadowclad® sheets must overhang the bottom plate by a minimum of 50 mm.

17.8 Before the Shadowclad® sheets are installed, the corner detail must be prepared to suit the

selected option, e.g. external box angle or boxed corner. The necessary flashings must be installed before commencing sheet fixing.

17.9 The Shadowclad® sheets are fixed with 60 x 2.8 mm hot dip galvanised or ring shanked stainless steel flat head nails, or 8 gauge x 65 mm mechanically zinc plated or stainless steel wood screws at 150 mm centres around the edge of the sheets starting at the corners and at 300 mm centres in the body of the sheet. The fasteners must be no closer than 7 mm to the sheet edges, and on the rebated edge the fasteners must be inside the weather groove.

Aluminium Joinery Installation

17.10 Aluminium joinery and associated head flashings must be installed by the building contractor in accordance with the Technical Literature. A 7.5 – 10 mm nominal gap must be left between the joinery reveal and the wall framing so a PEF rod and air seal can be installed after the joinery has been secured in place.

Finishing

17.11 The coating manufacturer's instructions must be followed at all times for application of the paint or stain finish. Shadowclad® Sheets must be painted or stained as soon as practicable following fixing and must be clean and dry before commencing. If Shadowclad® sheets are exposed to the weather for more than 3 months, the surfaces must be washed with a mild detergent solution to remove any dirt, dust, mould or sea spray prior to coating. Allow the recommended drying time between coats and follow the temperature limitations for application.

17.12 Coatings should be applied by brush to ensure adequate coating film build is achieved. Application via roller or spray is not recommended.

Inspection

17.13 The Technical Literature must be referred to during the inspection of Shadowclad® Ventilated Cavity installations.

Health and Safety

18.1 Cutting of Shadowclad® sheets must be carried out in well ventilated areas and eye and hearing protection must be worn.

18.2 Safe use and handling procedures for the components that make up Shadowclad® Ventilated Cavity are provided in the relevant manufacturer's Technical Literature.

Basis of Appraisal

The following is a summary of the technical investigations carried out:

Tests

19.1 The following testing has been completed by BRANZ:

- BRANZ expert opinion on NZBC E2 code compliance for Shadowclad® Ventilated Cavity was based on testing and evaluation of all details within the scope and as stated within this Appraisal. Shadowclad® Ventilated Cavity details were tested to E2/VM1. The testing assessed the performance of the foundation detail, window head, jamb and sill details, vertical and horizontal Shadowclad® joints, internal and external corners. In addition to the weathertightness test, the details contained within the Technical Literature have been reviewed, and an opinion has been given by BRANZ technical experts that the system will meet the performance levels of Acceptable Solution E2/AS1 for cavity-based plywood claddings.
- Wind face load and fastener slip testing for Shadowclad® Ventilated Cavity. BRANZ determined design wind suction pressures, and by comparing these pressures with the NZS 3604 design wind speeds and AS/NZS 1170 pressure coefficients, the fixing requirements given in the Technical Literature were confirmed as suitable for timber framed walls.

Other Investigations

20.1 Structural and durability opinions have been provided by BRANZ technical experts.

20.2 The performance and testing of plywood wall cladding products in New Zealand and Australia has been considered, including the structural and weathertightness performance, durability and non-hazardous nature.

20.3 Site inspections have been carried out by BRANZ to examine the practicability of installation.

20.4 The Technical Literature for Shadowclad® Ventilated Cavity has been examined by BRANZ and found to be satisfactory.

Quality

21.1 The manufacture of Shadowclad® has been examined by BRANZ, including methods adopted for quality control. Details regarding the quality and composition of the materials used were obtained by BRANZ and found to be satisfactory.

21.2 The quality of materials, components and accessories supplied by Carter Holt Harvey Woodproducts New Zealand is the responsibility of Carter Holt Harvey Woodproducts New Zealand. The quality control system for the manufacture of Shadowclad® has been assessed and registered as meeting the requirements of AS/NZS 2269 by the Engineered Wood Products Association of Australasia, and ISO 9001 by Telarc SAI.

21.3 The quality control system for the timber treatment of Shadowclad® has been assessed and registered as meeting the requirements of the AsureQuality Timber Treatment Programme for treated timber by the New Zealand Timber Preservation Council Inc., Licence Number 46 for CCA treatment by Carter Holt Harvey and Licence Number 149 for H3.1 LOSP treatment by North Sawn Treatment BOP Ltd.

21.4 Quality of installation on site of components and accessories supplied by Carter Holt Harvey Woodproducts New Zealand and the building contractor is the responsibility of the installer.

21.5 Designers are responsible for the building design, and building contractors are responsible for the quality of installation of framing solutions and joinery, wall underlays, flashing tapes, cavity battens, airseals and Shadowclad® sheets in accordance with the instructions of Carter Holt Harvey Woodproducts New Zealand.

21.6 Building owners are responsible for the maintenance of Shadowclad® Ventilated Cavity in accordance with the instructions of Carter Holt Harvey Woodproducts New Zealand.

Sources of Information

- AS 3730: 2006 Guide to the properties of paints for buildings.
- AS/NZS 1170: 2002 Structural design actions.
- AS/NZS 2269: 2012 Plywood - Structural.
- AS/NZS 4680: 2006 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles.
- NZS 3602: 2003 Timber and wood-based products for use in building.
- NZS 3603: 1993 Timber Structures Standard.
- NZS 3604: 2011 Timber-framed buildings.
- NZS 4211: 2008 Specification for performance of windows.
- Acceptable Solutions and Verification Methods for New Zealand Building Code External Moisture Clause E2, Ministry of Business, Innovation and Employment, Third Edition July 2005 (Amendment 7, 01 January 2017).
- Ministry of Business, Innovation and Employment Record of amendments - Acceptable Solutions, Verification Methods and handbooks.
- The Building Regulations 1992.

Amendments

Amendment No.1, dated 5 September 2018.

This Appraisal has been amended to include the timber preservative treatment.

BRANZ

In the opinion of BRANZ, the Shadowclad® Ventilated Cavity Cladding System is fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided it is used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to Carter Holt Harvey Woodproducts New Zealand, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
   a) relates only to the product as described herein;
   b) must be read, considered and used in full together with the Technical Literature;
   c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
   d) is copyright of BRANZ.
2. Carter Holt Harvey Woodproducts New Zealand:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions;
   d) warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
3. BRANZ makes no representation or warranty as to:
   a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
   c) any guarantee or warranty offered by Carter Holt Harvey Woodproducts New Zealand.
4. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
5. BRANZ provides no certification, guarantee, indemnity or warranty, to Carter Holt Harvey Woodproducts New Zealand or any third party.

For BRANZ

Chelydra Percy
Chief Executive

Date of Issue:
21 September 2017

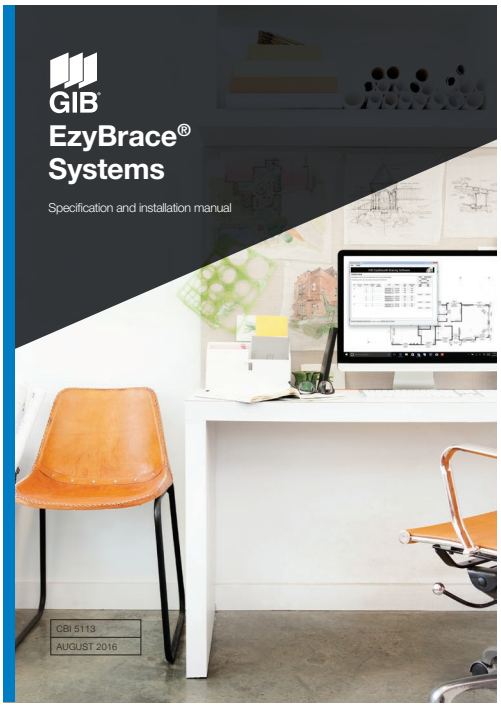
Hamilton City Council

BUILDING UNIT
APPROVED

BC Number - DD007.2019.00040020.001

BRANZ Appraised
Appraisal No. 928 [2016]

GIB EZYBRACE® SYSTEMS 2016



BRANZ Appraisals

Technical Assessments of products for building and construction.

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Product

1.1 GIB EzyBrace® Systems 2016 are a range of wall and ceiling bracing systems based on the use of GIB® Standard, GIB Braceline® and other GIB® plasterboards. GIB EzyBrace® Systems 2016 are used to resist earthquake and wind loads on timber frame buildings designed and constructed in accordance with NZS 3604 and the GIBFix® Framing System. The GIB EzyBrace® Bracing Software provides an electronic means of calculating bracing demand and resistance.

Scope

2.1 GIB EzyBrace® Systems 2016 and the GIB EzyBrace® Bracing Software have been appraised for the design and use of interior wall and ceiling bracing systems in buildings within the scope limitations of NZS 3604.

Building Regulations

New Zealand Building Code (NZBC)

3.1 **In the opinion of BRANZ, the GIB EzyBrace® Systems 2016, if designed, used, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet the following provisions of the NZBC:**

Clause B1 STRUCTURE: Performance B1.3.1, B1.3.2 and B1.3.4. GIB EzyBrace® Systems 2016 meet the requirements for loads arising from self-weight, earthquake, wind and impact [i.e. B1.3.3 (a), (f), (h) and (j)]. See Paragraphs 8.1 - 8.10.

Clause B2 DURABILITY: Performance B2.3.1 (a) not less than 50 years. GIB EzyBrace® Systems 2016 meet this requirement. See Paragraphs 9.1 - 9.4.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. GIB EzyBrace® Systems 2016 meet this requirement and will not present a health hazard to people.

3.2 The bracing demand calculation and bracing distribution rules contained in the GIB EzyBrace® Bracing Software are in accordance with Section 5 of NZS 3604. Bracing resistance is provided by bracing element ratings determined in accordance with NZS 3604, Paragraph 8.3.1.2.

3.3 NZS 3604 is an **Acceptable Solution** for compliance with New Zealand Building Code Clause B1 Structure.

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BC Number - DD007.2019.00040020.001

Technical Specification

4.1 The GIB® plasterboards and accessories used with the GIB EzyBrace® Systems 2016, and supplied or specified by Winstone Wallboards Ltd are as follows:

GIB® plasterboards

- **GIB® Standard** - GIB® Standard plasterboard is a paper-bound fibreglass reinforced gypsum-plaster core sheet lining material. GIB® Standard plasterboard is available in 10 mm and 13 mm thicknesses and a sheet width of 1200 mm and 1350 mm (GIB® Wideline). The sheets have a taper on the two long sheet edges. The 10 mm thick sheets are also available with a square edge. Sheets are available in various lengths from 2400 mm to 6000 mm. The nominal sheet weight is 6.5 kg/m² for 10 mm thick sheets and 8.5 kg/m² for 13 mm thick sheets. GIB® Standard plasterboard face paper is a light buff colour.
- **GIB Braceline®** - GIB Braceline® is a high-density fibreglass reinforced paper-bound gypsum-plaster core sheet lining material. GIB Braceline® is available in 10 mm and 13 mm thicknesses. The sheets have a taper on the two long sheet edges. GIB Braceline® has a sheet width of 1200 mm and 1350 mm, and is available in lengths of 2400 mm, 2700 mm, 3000 mm, 3600 mm and 4800 mm. The nominal sheet weight is 9 kg/m² for 10 mm thick sheets and 12.5 kg/m² for 13 mm thick sheets. GIB Braceline® face paper is a light blue in colour.
- **Alternative GIB® plasterboards** - In certain situations, as specified in the Technical Literature, substitution is permitted with GIB Aqualine®, GIB Fyreline®, GIB Toughline® and GIB Ultraline®.

Components and Accessories

- **GIB® Accessories and GIB® Jointing Compounds** - As specified in the GIB® Site Guide Technical Literature.
- **Fasteners**
  - **GIB Grabber® High Thread Screws for fixing directly to timber** – 32 mm x 6g.
  - **GIB Nail** – 30 x 2.8 mm.
  - **GIB Grabber® screws for fixing to light gauge steel battens** – 32 mm x 6g.
- **Adhesive and Sealants**
  - **GIBFix® One** – an off-white acrylic adhesive supplied in 375 ml cartridges and 600 ml sausages.
  - **GIBFix® All-Bond** – a green solvent-based adhesive supplied in 375 ml cartridges and 600 ml sausages.
- **GIBFix® Framing Components**
  - **GIBFix® Angle** – 45 x 45 x 0.55 mm galvanised steel angle with a knurled surface. Supplied in lengths of 2.4 and 2.7 m.
  - **GIB Grabber® Dual Thread Screws for fixing to timber through GIBFix® Angle** – 32 mm x 7g needle-point screw with coarse thread lower section and fine thread upper section.
- **Fasteners, Anchors and Connections**
  - **GIB® HandiBrac®** – a one-piece, 2 mm thick, galvanised-steel angle bracket approximately 95 mm high, 65 mm long and 54 mm wide. The bracket is supplied with 5 Type 17 screws 14 g x 35 mm.
  - **BOWMAC® screw bolt** – M10 x 140 mm screw anchor, with a blue painted hex-head.
  - **Coach screws** – 12 mm x 150 mm and 50 x 50 x 3 mm washer hot-dipped galvanised for fixing to timber floors.
  - **Cast-in bolts** – M12 x 150 mm minimum and 50 x 50 x 3 mm washers for fixing to concrete floors.
  - **Shot fired fasteners** – minimum 75 mm x 3.8 mm with 16 mm discs for fixing GS1-N, GS2-N and GS2-NOM internal line bracing elements to concrete slabs.
  - **Galvanised or stainless steel strap** – 25 x 0.9 mm top and bottom plate connections.
  - **Strap fixings** – 30 x 2.5 mm hot-dipped galvanised or stainless-steel flat-head nails.

  Note: For corrosion protection requirements refer to NZS 3604: 2011 Section 4.

- **Ceiling Diaphragms** – Ceiling diaphragms are constructed using timber ceiling battens, or GIB® Rondo® or similar metal ceiling batten systems.
- **Plywood**
  - **Plywood** – minimum of 7 mm thick complying with AS/NZS 2269 D-D Structural Grade.
  - **Plywood fixings** – 50 x 2.5 mm hot-dipped galvanised or stainless-steel annular-grooved, flat-head nails.

Handling and Storage

5.1 The best results are achieved when GIB® plasterboards are treated as a finishing material and protected from damage. Sheets must be stacked flat and kept dry at all times. For limits on stack heights see the GIB® Site Guide. Sheets must be carried on edge and not dragged.

5.2 All accessories must be kept dry.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for GIB EzyBrace® Systems 2016. The Technical Literature must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Appraisal must be followed.

Design Information

General

7.1 NZS 3604 provides methods to distribute the bracing elements in walls to resist forces. The use of ceiling diaphragms is defined in the Technical Literature.

7.2 GIB EzyBrace® Systems 2016 are for use in dry, internal situations only.

7.3 GIB EzyBrace® Systems 2016 must not be exposed to temperatures of 52°C or greater for prolonged periods. Refer to appliance and fitting manufacturers for installation details.

GIB EzyBrace® Bracing Software

7.4 The GIB EzyBrace® Bracing Software contains design procedures and an electronic calculation method for bracing demand calculated in accordance with NZS 3604: 2011, Section 5. Floor loadings can be selected in accordance with either NZS 3604, Bracing Demand Tables 5.5 – 5.10 for 2 kPa floor loads or less, or Tables 14.1 – 14.3 for 3 kPa floor loads.

7.5 The bracing demand calculations contained in the GIB EzyBrace® Bracing Software are based on first principles engineering and calculate wind and earthquake demand based on the building parameters entered. Resulting bracing demand calculations are project specific and can differ from values derived using NZS 3604 wind and earthquake demand tables. The GIB EzyBrace® Bracing Software has been assessed as part of this Appraisal.

7.6 The bracing ratings for GIB EzyBrace® Systems 2016 are embedded in the GIB EzyBrace® Bracing Software.

GIBFix® Framing System

7.7 The GIBFix® Framing System utilises GIBFix® Angles fixed at internal corners and at wall/ceiling junctions to reduce the potential for fastener 'popping' and joint cracking due to timber framing movement. The GIBFix® Framing System also offers an alternative arrangement of studs at corners and at intersecting walls to improve insulation and to reduce thermal bridging compared to traditional wall framing layouts. Refer to the Technical Literature for full details.

7.8 Where walls intersect, noggings are required at maximum 900 mm centres to enable fixing of the end stud of the intersecting wall to the main wall framing.

7.9 The GIBFix® Framing System permits the use of a single panel hold-down (e.g. GIB® HandiBrac®) at wall corners and T-intersections for both the across and along bracing directions.

Framing

7.10 GIB EzyBrace® Systems 2016 can be installed using conventional timber framing layouts or by using the layouts provided in the GIBFix® Framing System. The bracing ratings embedded in the GIB EzyBrace® Bracing Software are equally applicable to both framing options.

7.11 Timber framing grade, spacing and construction must comply with NZS 3604. Timber treatment must comply with NZBC Acceptable Solution B2/AS1.

7.12 Winstone Wallboards Ltd recommends the use of kiln-dried stress-graded framing timber. The minimum actual framing dimensions are 90 x 45 mm for external walls and 75 x 45 mm for internal walls.

7.13 Joints in the top plates of bracing panels must be tied together with 3 kN and 6 kN top plate connectors using 25 x 0.9 mm hot-dip galvanised mild steel strap, 3 nails each side of joint for 3 kN and 6 nails each side of joint for 6 kN.

Bracing System GS2-NOM

7.14 Most GIB EzyBrace® Systems require additional fasteners at the corners to achieve the published bracing ratings. The GS2-NOM system only requires fixings at 300 mm centres around the sheet perimeter.

7.15 Where internal doors penetrate a GS2-NOM bracing element and recessed door jambs are used, the sheets may be adhesive fixed around the door opening with GIBFix® All-Bond, instead of screw fixing. This is designed to reduce fastener 'popping' around internal doors when using grooved door frames. Screw fixing should be used where door frames are to be finished with architraves and the architrave will cover the screws. The adhesive fix option around door openings must not be used with any other GIB EzyBrace® Systems 2016.

Alternative GIB® plasterboards

7.16 On occasions, properties additional to bracing may be required of the plasterboard lining. Refer to Table 1.

BOWMAC Screw Bolts

7.17 When BOWMAC Screw Bolts are used as fixings for external walls with concrete masonry header block foundations, the minimum grout/concrete strength must be as specified in NZS 3604. BOWMAC Screw Bolts may be used in Corrosion Zones B and C as defined in NZS 3604. BOWMAC Screw Bolts may only be used in NZS 3604 Corrosion Zone D where the minimum concrete cover to the bolt is 60 mm. This cannot be achieved with standard 90 mm wide timber framing. An alternative option in this scenario is to use 140 mm wide framing.

Table 1: Permitted Alternatives in GIB EzyBrace® Systems

PERMITTED GIB® plasterboard ALTERNATIVES IN GIB EZYBRACE® SYSTEMS 2016									
GIB Ezybrace® Systems 2016 have been designed and tested using only the products specified. Occasionally additional properties may be required to be provided by a different GIB® plasterboard product. The following table provides acceptable alternative options.									
Specified	Permitted alternative GIB® plasterboard products								
GIB® plasterboard	GIB® Standard	GIB Ultraline®	GIB Braceline/ Noiseline®	GIB Aqualine®	GIB Toughline®	GIB Fyreline®			
						10mm	13mm	16mm	19mm
GIB® Standard	N/A	✓	✓	✓	✓	✓ NOTE 1	✓NOTE 1 and 3		
GIB Braceline®	X	X	N/A	✓ NOTE 2	✓	X	✓NOTES 1, 2 and 3		

- **NOTE 1:** *The fastener type and length and must be as required for the relevant FRR, system but the fixing pattern must be as required for bracing elements.*
- **NOTE 2:** *The bracing element must be 900 mm or longer. Fasteners must be at maximum 100 mm centres to the perimeter of the bracing element. The bracing corner fastening pattern applies to all four corners of the element.*
- **NOTE 3:** *Specify traditional wall framing layout where a Fire Resistance Rating (FRR) is required. See Paragraph 11.4.*

Structure

Bracing

8.1 The bracing unit (BU) ratings embedded in the GIB EzyBrace® Bracing Software and vary with the wall length.

8.2 The Technical Literature provides comprehensive construction and panel hold-down details. These include bottom plate fixings using anchor screws and cast-in bolts (concrete), coach screws (timber), GIB® HandiBrac® or nailed stud-to-plate straps.

8.3 The bracing units are derived from BRANZ P21 test method based on a wall height of 2.4 m. For greater wall heights the bracing rating is calculated by multiplying the appropriate bracing rating shown in Table 1 by a factor f=2.4 and divided by the wall height in metres. Walls lower than 2.4 m shall be rated as if they were 2.4 m high.

8.4 NZS 3604 limits wall bracing elements to a maximum of 120 BU/m for timber-framed floors and 150 BU/m for concrete floors.

Ceiling Diaphragms

8.5 GIB® ceiling diaphragms are used to space bracing lines further apart than 6 m. The basic shape of a ceiling diaphragm must be square or rectangular and the length must not exceed twice the width.

8.6 For ceiling diaphragms not steeper than 15° and not exceeding 7.5 m in length, any GIB® plasterboard may be used provided the perimeter fixing are at 150 mm centres.

8.7 For ceiling diaphragms not steeper than 45° and not exceeding 7.5 m in length, and for diaphragms not steeper than 25° and not exceeding 12 m in length, any GIB® plasterboard may be used provided the perimeter fixings are at 100 mm centres.

Openings in Bracing Elements

8.8 Small openings of 90 x 90 mm or less may be placed anywhere except within 90 mm of the edge of the bracing element.

Shower Areas

8.9 GIB EzyBrace® Systems 2016 must not be located in shower cubicles or behind baths and the like. GIB EzyBrace® Systems 2016 may be used in water-splash areas provided they are protected as required by NZBC Clause E3 Internal Moisture. Refer GIB Aqualine® Wet Area Systems.

Impact Resistance

8.10 GIB® plasterboards provide adequate resistance to soft body impact, based upon history of use in domestic and light commercial applications.

Durability

9.1 GIB EzyBrace® Systems 2016, including linings and their fixings have a serviceable life of at least 50 years. The ability of the systems to remain durable is dependent on them remaining dry in service, and being maintained in accordance with this Appraisal.

Maintenance

9.2 The building must be maintained weatherproof and GIB® plasterboards must be protected from external and internal moisture in accordance with NZBC Clauses E2 and E3.

9.3 Holes resulting from damage to the lining, up to 100 x 100 mm square, will have no significant effect on the performance of the bracing panel. Such holes may be repaired by patching, stopping and finishing as appropriate. Independent expert advice must be sought to assess the effect and repair of larger areas of damage.

9.4 Bracing elements require no ongoing maintenance, apart from decoration and the repair of any damage.

Prevention of Fire Occurring

10.1 Separation or protection must be provided to GIB® plasterboard from heat sources such as fire places, heating appliances, flues and chimneys. Part 7 of NZBC Acceptable Solutions C/AS1 – C/AS6 and NZBC Verification Method C/VM1 provide methods for separation and protection of combustible materials from heat sources.

Fire Affecting Areas Beyond the Fire Source

11.1 For Internal Surface Finish properties and Fire Resistance Ratings, refer to BRANZ Appraisal No. 289 [2012] GIB® Fire Rated Systems.

Internal Moisture

12.1 GIB® plasterboard must be used in dry internal situations, and must not be used where likely to be exposed to liquid water, or where extended exposure to humidity above 90% RH is expected, e.g., such as may be expected in sauna rooms, commercial kitchens and the like.

Installation Information

Installation Skill Level Requirement

13.1 Installation of GIB EzyBrace® Systems 2016 must be completed by, or under the supervision of a Licensed Building Practitioner with the relevant Licence Class, in accordance with the Technical Literature and this Appraisal.

General

14.1 GIB EzyBrace® Systems 2016 must be installed in accordance with the Technical Literature. For inspection, reference must be made to the Technical Literature.

Framing

14.2 To achieve an acceptable decorative finish, the GIB® Site Guide specifies that walls must not be lined unless the moisture content of timber framing is less than 18%. Winstone Wallboards Ltd recommends a moisture content of 12% or less where buildings are to be air conditioned, centrally heated or have heat pumps installed.

14.3 Where the GIBFix® Framing System is used, GIBFix® Angles are tacked to the framing with flat-head clouts prior to installation of the GIB® plasterboard.

Cutting

14.4 GIB® plasterboard is easily cut by scoring the face paper with a sharp short-bladed trimming knife, and then snapping the plasterboard away from the cut face and cutting the back paper or by sawing. Use of a metal straightedge facilitates clean straight cuts. Cut edges can be tidied up by using a knife. Paper dags should be removed.

Hold-downs

14.5 GIB EzyBrace® Systems 2016 which require hold-downs must either have a GIB® Handibrac® fitted to each end of the bracing element or alternatively a metal stud-to-plate strap and hold-down anchor may be used. Refer to the Technical Literature for full installation details. Where a metal stud-to-plate strap is used, the hold-down anchor must be placed no more than 80 mm from the end of the bracing element.

14.6 Where the GIBFix® Framing System is used, a single hold-down located at a wall intersection may be used to provide the hold-down in both the across and along bracing directions.

Plasterboard Sheet Fixing

14.7 Corner fixings must be 50 mm away from the sheet corner. Fixings must be no closer than 12 mm from the paper-bound sheet edge, and no closer than 18 mm from a cut edge, and driven at right angles to the sheet until the head is seated in a slight dimple just below the surface of the paper liner. Fixings must not be over-driven.

14.8 Wall bracing plasterboards (except for those used with the GS2-NOM system) are fixed at 150 mm centres around the perimeter framing of the bracing element *(Note variation for GIB Aqualine® and GIB Fyreline® - see Table 1)*. At the corners of the wall bracing elements, a special fastening pattern is required with fasteners spaced at 50 mm, 100 mm, 150 mm, 225 mm and 300 mm from the corner and there-after at 150 mm centres. Fixing to other framing is either mechanical or by using GIBFix® adhesives.

14.9 When installing GS2-NOM bracing elements, the GIB® plasterboard is fixed to framing around the bracing element perimeter and at sheet joints with fasteners at maximum 300 mm centres. Where recessed door jambs are used on internal door frames, the GIB® plasterboard may be fixed to the framing around the door opening with GIBFix® All-Bond. See Paragraph 7.15.

14.10 Where GIB Aqualine® or GIB Fyreline® substitutes for GIB Braceline®, bracing elements must be longer than 900 mm and the bracing element perimeter fasteners must be spaced at 100 mm centres and the corner pattern described in Paragraph 14.8 used.

14.11 Full sheets must be used wherever possible.

Fire Resistance Rated Bracing Elements

14.12 Where a bracing element is also used as a fire-rated element, the method of fixing (including the length of the fixing specified) for the fire-rated element must be used, but the perimeter fixings of the bracing element must be at 150 mm centres and fixings at corners of the bracing element must be fixed as described in Paragraph 14.8. In two-layer systems the inner layer must be used for bracing.

Plywood Fixing

14.13 Plywood is nail fixed at 150 mm centres around the perimeter of each sheet and at 300 mm centres to intermediate framing.

Ceiling Diaphragms

14.14 All GIB EzyBrace® System 2016 ceiling diaphragms require fixings around the perimeter at 100 or 150 mm centres, depending on the ceiling pitch and length. See Paragraphs 8.4 to 8.6 and refer to the Technical Literature.

14.15 The perimeter of the ceiling diaphragm is fixed to GIBFix® Angles, GIB® Rondo® perimeter channels, or alternatively, to an additional ex 150 x 40 mm timber plate fixed to the top plate.

Jointing and Finishing

14.16 All bracing element joints must be reinforced with GIB® tape and finished in accordance with the GIB® Site Guide.

Health and Safety

15.1 Dust resulting from the sanding of stopping and finishing compounds may be a respiratory irritant, and the use of a suitable facemask is recommended.

Basis of Appraisal

The following is a summary of the technical investigations carried out:

Tests

16.1 Bracing tests were carried out by Winstone Wallboards Ltd in accordance with BRANZ Technical Paper P21 to determine the performance of GIB EzyBrace® Systems 2016 when the building is subjected to lateral wind or earthquake loading. Nail and screw slip tests were carried out by BRANZ and Winstone Wallboards Ltd. The Winstone Wallboard's test facilities, procedures and results have been reviewed by BRANZ and found to be satisfactory.

Other Investigations

17.1 The GIB EzyBrace® Bracing Software has been assessed by BRANZ and found to be satisfactory.

17.2 The GIB EzyBrace® Systems 2016 and GIB® Site Guide Technical Literature have been examined by BRANZ and found to be satisfactory.

17.3 Site visits were carried out by BRANZ to assess the practicability of the installation of the systems, and to view completed installations.

17.4 An assessment was made of the durability of the systems by BRANZ technical experts and found to be satisfactory.

17.5 The properties of Winstone Wallboards Ltd GIB® plasterboards have been assessed for the following properties: MOR, MOE, paper tensile strength, paper shear strength, nail pull resistance, Hunter hardness, inspection for fungal spores, hard and soft body impact tests.

Quality

18.1 Winstone Wallboards Ltd's manufacturing process and details of the quality and composition of the materials, have been examined by BRANZ and found to be satisfactory.

18.2 The quality management systems of Winstone Wallboards Ltd have been assessed and registered by TELARC as meeting the requirements of ISO 9001, Registration No. 581.

18.3 Winstone Wallboards Ltd is responsible for the quality of the product supplied.

18.4 The quality of the application and finish on site is the responsibility of the installation and stopping contractors.

18.5 Designers are responsible for the design of buildings.

18.6 Building owners are responsible for the maintenance in accordance with the instructions of Winstone Wallboards Ltd.

Sources of Information

- AS/NZS 2269.0:2012 Plywood - Structural - Specifications
- AS/NZS 2588: 1998 Gypsum plasterboard.
- BRANZ Technical Paper P21: 2010 A wall bracing test and evaluation procedure.
- NZS 3604: 2011 Timber-framed buildings.
- Ministry of Business, Innovation and Employment Record of Amendments for Compliance Documents and Handbooks.
- The Building Regulations 1992.

BRANZ

In the opinion of BRANZ, GIB Ezybrace® Systems 2016 is fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided it is used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to Winstone Wallboards Ltd, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
   a) relates only to the product as described herein;
   b) must be read, considered and used in full together with the Technical Literature;
   c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
   d) is copyright of BRANZ.
2. Winstone Wallboards Ltd:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions.
   d) Warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
3. BRANZ makes no representation or warranty as to:
   a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
   c) any guarantee or warranty offered by Winstone Wallboards Ltd.
4. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
5. BRANZ provides no certification, guarantee, indemnity or warranty, to Winstone Wallboards Ltd or any third party.

For BRANZ

Chelydra Percy
Chief Executive

Date of Issue:
05 September 2016

Hamilton City Council

BUILDING UNIT
APPROVED

BC Number - DD007.2019.00040020.001

BRANZ Appraised
Appraisal No.427 [2007]

BRANZ Appraisals

Technical Assessments of products for building and construction

BRANZ APPRAISAL No. 427 (2007)

Amended 31 January 2012

GIB AQUALINE® WET AREA SYSTEMS

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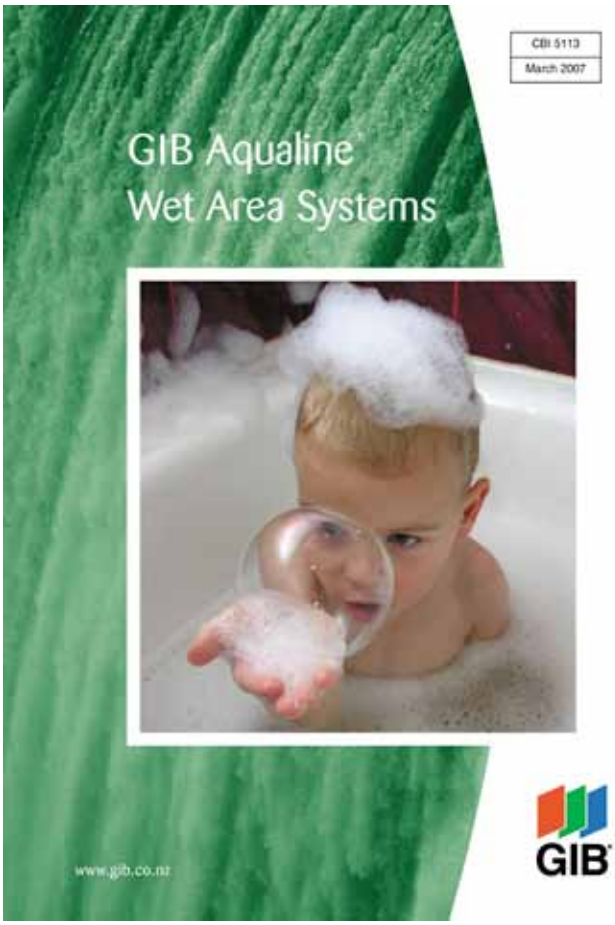
Product

1.1 GIB Aqualine® Wet Area Systems are for the interior lining of timber and steel frame walls and ceilings in wet areas such as bathrooms, laundries, kitchens and toilets where a water resistant lining material is desirable.
1.2 GIB Aqualine® Wet Area Systems are based on 10 mm and 13 mm thick GIB Aqualine® water resistant plasterboard.



Scope

2.1 GIB Aqualine® Wet Area Systems have been appraised for use as a wet area wall and ceiling lining in buildings within the following scope:
- on framed walls and ceilings within the scope limitations on NZS 3604; and,
- on timber and light gauge steel framed walls and ceiling subject to specific design; and,

2.2 GIB Aqualine® may also be used to substitute for some other GIB® Plasterboards in fire-rated, sound-rated and bracing-rated wall and floor/ceiling constructions.

Building Regulations

New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, the GIB Aqualine® Wet Area Systems, if designed, used, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet or contribute to meeting the following provisions of the NZBC:
Clause B1 STRUCTURE: Performance B1.3.1, B1.3.2 and B1.3.4 GIB Aqualine® Wet Area Systems meet the requirements for loads arising from self-weight, earthquake, wind and impact [i.e. B1.3.3 (a), (f), (h) and (j)]. See Paragraphs 8.1 - 8.3.
Clause B2 DURABILITY: Performance B2.3.1 (a) not less than 50 years, B2.3.1 (b) 15 years and B2.3.1 (c) 5 years. GIB Aqualine® Wet Area Systems meet these requirements. See Paragraphs 9.1 - 9.5.

Clause C3 SPREAD OF FIRE: Performance C3.3.1, C3.3.2, and C3.3.5. GIB Aqualine® Wet Area Systems meet these requirements by providing passive fire and smoke protection.
Clause E3 INTERNAL MOISTURE: Performance E3.3.4, E3.3.5 and E3.3.6. GIB Aqualine® Wet Area Systems meet these requirements. See Paragraphs 13.1 - 13.3.
Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. GIB Aqualine® Wet Area Systems meet this requirement and will not present a health hazard to people.
Clause G6 AIRBORNE AND IMPACT SOUND: Performance G6.3.1 and G6.3.2. GIB Aqualine® Wet Area Systems meet the requirements. See Paragraph 14.1.

3.2 This is an Appraisal of an **Alternative Solution** in terms of New Zealand Building Code compliance.

Technical Specification

4.1 The GIB® plasterboards and accessories used in the GIB Aqualine® Wet Area System and supplied or specified by Winstone Wallboards Limited are as follows:

GIB Aqualine®

4.2 GIB Aqualine® is a paper-bound, modified water-resistant gypsum-plaster core sheet lining material. The sheets have a taper on the two long sheet edges. GIB Aqualine® is available in 10 mm and 13 mm sheet thicknesses, a sheet width of 1200 mm and in lengths of 2400 mm, 2700 mm, 3000 mm and 3600 mm. The maximum weights are 7.8 kg/m^2 and 10.2 kg/m^2 for 10 mm and 13 mm thick sheets respectively. GIB Aqualine® face paper is green in colour.

Fastenings

- GIB® Grabber® High Thread Drywall screws for fixing to timber:
  6g x 25 mm and 32 mm.
- GIB® Grabber® Self Tapping Drywall screws for fixing to light gauge steel:
  6g x 25 mm and 32 mm.
- GIB® Nails
  30 mm and 40 mm x 2.8 mm

Adhesive and Sealants

- GIBFix® One (Acrylic)
- GIBFix® All-Bond (Solvent)

GIB® Accessories and GIB® Jointing Compounds

- As specified in the GIB Aqualine® Wet Area Systems and GIB® Site Guide Technical Literature.

Finishes

4.3 Finishes such as tiling, flexible sheet vinyl, paints and wallpapers have not been assessed and are outside the scope of this Appraisal.

Handling and Storage

5.1 The best results are achieved when GIB Aqualine® is treated as a finishing material and protected from damage. Sheets must be stacked flat and kept dry at all times. For limits on stack heights see the GIB® Site Guide. Sheets must be carried on edge and not dragged.
5.2 All accessories must be kept dry.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the GIB Aqualine® Wet Area System. The Technical Literature must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Appraisal must be followed.

Design Information

General

7.1 GIB Aqualine® provides a water-resistant lining as a base for finishing systems in wet areas such as bathrooms, toilets, laundries and kitchens. The typical finishes are ceramic tiles and flexible sheet vinyl to walls and paint, and wallpaper to walls and ceilings.
7.2 GIB Aqualine® must not be used in the following situations:

- For bracing applications in shower areas or adjacent baths (See Paragraphs 7.4 and 8.2).
- In areas of high humidity (above 90% RH) or continually wet such as group showers, steam rooms, or swimming pools.
- Installed over a vapour barrier.
- Applied directly to masonry, concrete or solid plaster.
- Applied over other sheet lining materials.
- Used externally of the building envelope.
- Exposed to temperatures of 52ºC or greater for prolonged periods. (Refer to appliance and fitting manufacturer's for installation details.)

7.3 GIB Aqualine® may be substituted for some other GIB® Plasterboard products in specific GIB® Bracing Systems, GIB® Fire Rated Systems, GIB® Noise Control Systems and GIB Ultraline® PLUS Lining System.

Wet Areas

7.4 Wet areas are spaces where sanitary fixture and sanitary appliances are located such as bathrooms, toilets, laundries and kitchens. There are two general categories of wet areas as follows:

1. Water Splash – These are areas subject to intermittent splashing of water such as around baths, vanities, tubs and sinks.
2. Shower Areas – These are areas subject to frequent and heavy water splash such as enclosed showers, unenclosed shower zones and showers over baths.

7.5 Both the above wet area categories must be finished with surfaces and joints that are impervious and easily cleaned. Shower areas must additionally be waterproof. This can be achieved using proprietary rigid shower lining systems, flexible vinyl shower wall finish, or tiling. Tiled shower areas must include a wet area waterproofing membrane system under the tiles.

Intertenancy Walls – Wet Areas

7.6 Intertenancy drywall constructions that incorporate fire resistance and noise control must be protected from water splash. In shower areas GIB Aqualine® must not be substituted for other GIB® Plasterboards but must be an extra lining layer. Refer to the GIB Aqualine® Wet Area Systems Technical Literature.

Tiling

7.7 GIB Aqualine® is suitable as a substrate for tiling up to the following weights:

- 10 mm GIB Aqualine® up to 20kg/m^2
- 13 mm GIB Aqualine® up to 32kg/m^2.

Note: Most ceramic and porcelain wall tiles weigh less than 20kg/m². For further information on tiling consult the BRANZ Good Practice Guide – Tiling.

Framing

7.8 Supporting framing must comprise one of the following subject to the minimum sizes, dwang centres and all other frame requirements of GIB Aqualine® Wet Area Systems Technical Literature:

- Timber framing must be designed and constructed in accordance with NZS 3604, or to a specific design using NZS 3603 and AS/NZS 1170.
- Steel framing must be designed to withstand loads in accordance with AS/NZS 1170.

Structure

Bracing

8.1 GIB Aqualine® can be used in place of GIB® Standard plasterboard in GIB® bracing elements. GIB Aqualine® can be used in place of GIB Braceline® in GIB® bracing elements 900 mm or longer, provided the perimeter of the element is fixed with GIB Braceline® Nails or GIB Braceline® screws at 100 mm centres, using the GIB Braceline® corner fixing pattern.

8.2 GIB Aqualine® must not be used for bracing in shower areas or behind baths.

Impact Resistance

8.3 GIB® plasterboards provide adequate resistance to soft body impact, based upon experience of use in domestic and light commercial applications.

Durability

Serviceable Life

9.1 GIB Aqualine® has a serviceable life of at least 15 years as a fully protected shower or water splash lining. As a general wall and ceiling lining GIB Aqualine® will have a serviceable life in excess of 50 years. The ability of GIB Aqualine® to remain durable is dependent on being protected and remaining dry in service, and being maintained in accordance with this Appraisal.

Maintenance

9.2 The building must be maintained weathertight and all lining systems protected from internal and external moisture.

9.3 Finishes to water splash and shower areas, including tiles, grout, waterproof membranes, sealants and flexible sheet vinyl must be checked to ensure the integrity of the system is maintained. They must be repaired or replaced if necessary. When repairing or replacing finishes, the GIB Aqualine® substrate must be checked for defects and repaired or replaced, as required.

9.4 For flexible sheet vinyl, particular attention must be paid to joints especially at corners. Checks should be made to ensure the vinyl has not been punctured. Where damage has occurred, repairs must be made immediately.

9.5 Impact damage to GIB Aqualine® plasterboard, resulting in small holes and cracks, may be patched, stopped and finished. For larger areas of damage, expert advice on repair must be sought from Winstone Wallboards Ltd.

Outbreak of Fire

10.1 Separation or protection must be provided to GIB Aqualine® Wet Area Systems from heat sources such as stoves, heaters, flues and chimneys.

10.2 NZBC Acceptable Solution C/AS1, Part 9 and Verification Method C/VM1 provide methods for separation and protection of combustible materials from heat sources.

Spread of Fire

11.1 When 10 mm GIB Aqualine® is substituted into fire rated systems in place of 10 mm GIB Fyreline®, the FRR of that system will be maintained. Similarly, the FRR is maintained when 13 mm GIB Aqualine® is substituted for 13 mm GIB Fyreline®.

Flame Barrier

12.1 Where flame barriers are required by Acceptable Solution C/AS1 Table 6.3, GIB Aqualine® is a suitable material to provide a 10 minute flame barrier, provided all sheet joints are formed over framing, or backblocked with GIB® plasterboard.

Internal Moisture

13.1 When installed in accordance with this Appraisal, GIB Aqualine® Wet Area Systems will provide wall surfaces adjacent to sanitary fixtures and sanitary appliances that are impervious and easily cleaned.

13.2 The construction methods meet with the internal moisture requirements of the NZBC Acceptable Solution E3/AS1.

13.3 To minimise internal condensation, adequate levels of ventilation and thermal resistance must be provided to all spaces where moisture may be generated.

Airborne and Impact Sound

14.1 When GIB Aqualine® is substituted into GIB® Noise Control systems in place of the equivalent thickness GIB® Standard plasterboard or GIB Fyreline®, the STC and IIC rating of that system will be maintained. When GIB Aqualine® is substituted in place of the equivalent thickness GIB Noiseline®, a small performance loss may occur.

Installation Information

Installation Skill Level Requirement

15.1 Installation of GIB Aqualine® Wet Area Systems can be carried out by any competent building contractor.

General

16.1 GIB Aqualine® Wet Area Systems must be installed in accordance with the Technical Literature. For inspection, reference must be made to the Technical Literature.

Cutting

16.2 GIB Aqualine® is easily cut by scoring the face paper with a sharp short-bladed trimming knife, and then snapping the plasterboard away from the cut face and cutting the back paper or by sawing. Use of a metal straightedge facilitates clean straight cuts. Cut edges can be tidied up by using a knife. Paper dags should be removed.

Health and Safety

16.3 Dust resulting from the sanding of stopping and finishing compounds may be a respiratory irritant, and the use of a suitable facemask is recommended.

Framing

16.4 To achieve an acceptable decorative finish, GIB Aqualine® Wet Area Systems and the GIB® Site Guide specifies that walls must not be lined unless the moisture content of timber framing is less than 18%. Winstone Wallboards Limited recommend a moisture content of 8-12% where buildings are to be air conditioned or centrally heated.

Fixing Sheets

Non-Tiled Areas

17.1 GIB Aqualine® sheets may be installed vertically or horizontally. Sheets are fixed with GIB® Grabber® screws or GIB® Nails at 300 mm centres around the perimeter of the sheet, and with GIBFix® adhesive on all intermediate studs and dwangs. Adhesive must not be used under fasteners. A 5-10 mm gap must be left between the floor and the bottom of the sheet.

Tiled Areas

17.2 Control joints must be provided at maximum 4 m centres.
Internal corners in shower areas must be reinforced with a minimum 32 x 32 x 0.55 mm galvanised metal angle prior to lining the walls.
17.3 GIB Aqualine® sheets may be installed vertically or horizontally. Sheets are fixed with GIB® Grabber® screws at 100 mm centres to perimeter of wall and to all intermediate studs. Adhesive must not be used in place of screws.

Ceilings

17.4 Supports of timber or steel battens or ceiling joists must be 450 centres for 10 mm GIB Aqualine®, or 600 mm centres for 13 mm GIB Aqualine®.
17.5 GIB Aqualine® sheets must be fixed with GIB® Grabber® screws at 600 mm centres around perimeter and at 200 mm centre along supports. Alternatively, sheets are screw fixed at 600 mm centres along the supports and GIBFix® adhesive fixed at 200 mm centre between.

Penetrations and Sealants

18.1 All cut-outs for pipe penetrations must be made neatly using a hole saw. Cut-outs should be made approximately 12 mm diameter greater than the pipe.
18.2 A bead of silicone sealant must be placed to the full thickness of the GIB Aqualine® sheet around all pipe penetrations, at bath rims and preformed shower bases and where an impervious junction is required at the floor/wall line.
18.3 In tiled areas, a bead of silicone sealant 6 mm wide must also be placed to the full thickness of the tiles where the above situation occurs. The sealant manufacturer's technical literature must be followed for installation.

Jointing and Finishing

19.1 Jointing must be carried out in accordance with GIB® Site Guide Technical Literature.
19.2 Tiled shower areas must incorporate a waterproofing membrane over GIB Aqualine®. Waterproofing membranes are outside the scope of this Appraisal and must otherwise be specified and approved.

Investigations

20.1 The GIB Aqualine® Wet Area Systems and GIB® Site Guide Technical Literature have been examined by BRANZ and found to be satisfactory.
20.2 Site visits were carried out by BRANZ to assess the practicability of the installation of the systems, and to view completed installations.
20.3 An assessment was made of the durability of the systems by BRANZ technical experts and found to be satisfactory.
20.4 Winstone Wallboards Limited GIB® plasterboards have been assessed for the following properties: MOR, MOE, paper tensile strength, paper shear strength, nail pull resistance, Hunter hardness, inspection for fungal spores, hard and soft body impact tests.

Quality

21.1 Winstone Wallboards Limited's manufacturing process and details of the quality and composition of the materials, have been examined by BRANZ and found to be satisfactory.
The quality management systems of Winstone Wallboards Limited have been assessed and registered by TELARC as meeting the requirements of ISO 9001, Registration No. 581.
Winstone Wallboards Limited is responsible for the quality of the product supplied.
21.2 The quality of the application and finish on site is the responsibility of the installation, stopping and finishing contractors.
21.3 Designers are responsible for the design of buildings.
21.4 Building owners are responsible for the maintenance in accordance with the instructions of Winstone Wallboards Limited.

Sources of Information

- AS/NZS 1170: 2002 Structural design actions.
- AS/NZS 2588: 1998 Gypsum Plasterboard.
- NZS 3602: 2003 Timber and wood-based products for use in building.
- NZS 3603: 1993 Timber structures standard.
- NZS 3604: 2011 Timber-framed buildings.
- BRANZ Good Practice Guide - Tiling, March 2004.
- New Zealand Building Code Handbook and Approved Documents, Building Industry Authority, 1992.
- The Building Regulations 1992, up to, and including October 2004 Amendment.

In the opinion of BRANZ, GIB Aqualine® Wet Area Systems are fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided they are used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to the Client, Winstone Wallboards Limited, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
a) relates only to the product as described herein;
b) must be read, considered and used in full together with the technical literature;
c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
d) is copyright of BRANZ.
2. The Client:
a) continues to have the product reviewed by BRANZ;
b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
c) abides by the BRANZ Appraisals Services Terms and Conditions.
3. The product and the manufacture are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ.
4. BRANZ makes no representation as to:
a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
c) any guarantee or warranty offered by the Client.
5. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.

For BRANZ

P Robertson
Chief Executive

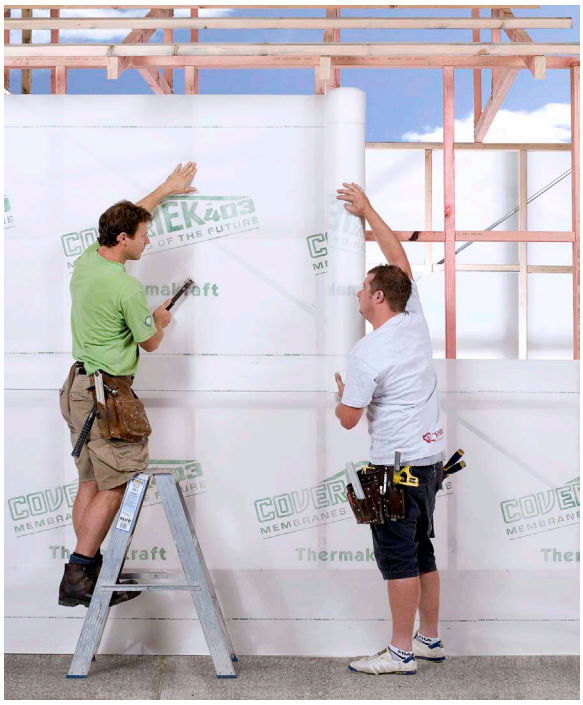
Date of issue: 4 April 2007

Amendment No. 1, dated 29 April 2010.
This Appraisal has been amended to include a new adhesive, GIBFix® One, and to update reference to AS/NZS 1170.

Amendment No. 2, dated 31 January 2012.
This Appraisal has been amended to update reference to NZS 3604: 2011.

BRANZ Appraised
Appraisal No. 918 [2016]

THERMAKRAFT COVERTEK 403 PLUS WALL UNDERLAY



Appraisal No. 918 (2016)
Amended 23 February 2017

BRANZ Appraisals
Technical Assessments of products for building and construction.

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Product

1.1 Thermakraft Covertek 403 Plus Wall Underlay is a fire retardant flexible synthetic wall underlay for use under direct fixed and non-direct fixed wall cladding on timber and steel framed buildings. The product consists of a micro-porous water resistant film ultrasonically bonded between two layers of non-woven spun-bonded polyolefin, and is coloured white.

Scope

Flexible Wall Underlay

2.1 Thermakraft Covertek 403 Plus Wall Underlay has been appraised for use as a flexible wall underlay for timber and steel framed buildings within the following scope:

- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1 with regards to building height and floor plan area; and,
- with direct fixed absorbent and non-absorbent wall claddings; or,
- with absorbent and non-absorbent wall claddings installed over an 18 mm minimum drained cavity; or,
- with masonry veneer in accordance with NZBC Acceptable Solution E2/AS1 for timber framed buildings or to a specific design for steel framed buildings; and,
- situated in NZS 3604 Wind Zones up to and including Very High.

Use over Rigid Wall Underlay

2.2 Thermakraft Covertek 403 Plus Wall Underlay has been appraised for use as a flexible wall underlay over rigid wall underlays on timber and steel framed buildings within the following scope:

- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1 with regards to building height and floor plan area; and,
- with absorbent and non-absorbent wall claddings installed over an 18 mm minimum drained cavity; and,
- with masonry veneer in accordance with NZBC Acceptable Solution E2/AS1 for timber framed buildings or to a specific design for steel framed buildings; and,
- situated in NZS 3604 Wind Zones up to and including Extra High.

Specific Design

2.3 Thermakraft Covertek 403 Plus Wall Underlay has also been appraised for use on buildings subject to specific weathertightness design. Building designers are responsible for the building design and for the incorporation of Thermakraft Covertek 403 Plus Wall Underlay into their design in accordance with the declared properties and the instructions of Thermakraft Limited.

Building Regulations

New Zealand Building Code (NZBC)

3.1 **In the opinion of BRANZ, Thermakraft Covertek 403 Plus Wall Underlay, if used, designed, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet, or contribute to meeting the following provisions of the NZBC:**

Clause B2 DURABILITY: Performance B2.3.1 (a), not less than 50 years, B2.3.1 (b), 15 years and B2.3.2. Thermakraft Covertek 403 Plus Wall Underlay meets these requirements. See Paragraphs 9.1 and 9.2.

Clause C3 FIRE AFFECTING AREAS BEYOND THE FIRE SOURCE: Performance C3.4 (c). Thermakraft Covertek 403 Plus Wall Underlay meets this requirement. See Paragraph 10.1.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.2. When used as part of the cladding system, Thermakraft Covertek 403 Plus Wall Underlay will contribute to meeting this requirement. See Paragraphs 12.1 and 12.2.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. Thermakraft Covertek 403 Plus Wall Underlay meets this requirement and will not present a health hazard to people.

Technical Specification

4.1 Thermakraft Covertek 403 Plus Wall Underlay is a synthetic building underlay for use under wall claddings. The product consists of a micro-porous water resistant film laminated between two layers of non-woven spun-bonded polyolefin. Thermakraft Covertek 403 Plus Wall Underlay is coloured white on the top and bottom faces.

4.2 The product is supplied in rolls 1.350 m wide x 18.6 m, 37.0 m and 55.0 m long. The product is printed with the Thermakraft Covertek 403 Plus logo repeated along the length of the roll. The rolls are wrapped in clear polythene film.

Accessories

4.3 Accessories used with Thermakraft Covertek 403 Plus Wall Underlay which are supplied by the installer are:

- **Fixings** - staples, clouts, screws or proprietary underlay fixings, or other temporary fixings to attach the wall underlay to the framing.
- **Wall underlay support** - polypropylene strap, 75 mm galvanised mesh or galvanised wire, or vertical cavity battens where required to support the wall underlay in accordance with NZBC Acceptable Solution E2/AS1, Paragraph 9.1.8.5.

Handling and Storage

5.1 Handling and storage of the product, whether on or off site, is under the control of the installer. The rolls must be protected from damage and weather. They must be stored on end, under cover, in clean, dry conditions and must not be crushed.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for Thermakraft Covertek 403 Plus Wall Underlay. The Technical Literature must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Appraisal must be followed.

Design Information

General

7.1 Thermakraft Covertek 403 Plus Wall Underlay is intended for use as an alternative to conventional building papers which are fixed over timber or steel framed walls in order to limit the entry of wind into building cavities, and to act as a secondary barrier to wind-driven rain. Refer to Table 1 for material properties.

7.2 The material also provides a degree of temporary weather protection during early construction. However, the product will not make the building weathertight and some wetting of the underlying structure is always possible before the building is closed in. Hence, the building must be closed-in and made weatherproof before moisture sensitive materials such as wall or ceiling linings and insulation materials are installed.

7.3 Thermakraft Covertek 403 Plus Wall Underlay must not be exposed to the weather or ultra violet light for a total of more than 42 days before being covered by the wall cladding.

7.4 Thermakraft Covertek 403 Plus Wall Underlay is suitable for use as an air barrier where walls are not lined, such as attic spaces at gable ends, in accordance with NZBC Acceptable Solution E2/AS1, Paragraph 9.1.4 (c).

7.5 In cavity installations where the cavity battens are installed at greater than 450 mm centres, the wall underlay must be supported between the battens to prevent the underlay bulging into the cavity space when bulk insulation is installed in the wall frame cavity in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.1.8.5. Wall underlay support options include polypropylene strap, 75 mm galvanised mesh or galvanised wire, or vertical cavity battens.

Table 1: NZBC E2/AS1 Table 23 (NZS 2295) Requirements

NZBC E2/AS1 Table 23 (NZS 2295) Wall Underlay Properties	Property Performance Requirement	Actual Property Performance
Absorbency	≥ 100 g/m^2	Pass
Vapour Resistance	≤ 7 MN s/g	Pass
Water Resistance	≥ 20 mm	Pass
pH of Extract	≥ 5.5 and ≤ 8	Pass
Shrinkage	≤ 0.5%	Pass
Mechanical	Edge tear and tensile strength	**Edge tear (Average):** Machine direction = 217 N Cross direction = 104 N **Tensile strength (Average):** Machine direction = 4.57 kN/m Cross direction = 2.63 kN/m
Air Barrier	Air resistance: ≥ 0.1 MN s/m^3	Pass. Thermakraft Covertek 403 Plus Wall Underlay can be used as an air barrier.

Claddings

7.6 Thermakraft Covertek 403 Plus Wall Underlay is suitable for use under wall claddings as a wall underlay as called up in NZBC Acceptable Solution E2/AS1, Table 23 on timber framed buildings, including non-absorbent wall claddings such as vinyl and metal-based weatherboards in direct fixed situations. Thermakraft Covertek 403 Plus Wall Underlay is suitable for use under cavity based wall claddings as an absorbent synthetic wall underlay as called up in NZS 2295, Table 2.4 on steel framed buildings.

Stucco Plaster

7.7 Thermakraft Covertek 403 Plus Wall Underlay is suitable for use as a non-rigid backing material for stucco plaster in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.3.5.1. The underlay must be supported with 75 mm galvanised mesh or plastic tape or wire at 150 mm centres run across the cavity battens to limit deflection to a maximum of 5 mm.

7.8 Thermakraft Covertek 403 Plus Wall Underlay may also be used as a slip layer over rigid backings for stucco plaster in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.3.3.1 (b).

Structure

8.1 Thermakraft Covertek 403 Plus Wall Underlay is suitable for use in all Wind Zones of NZS 3604 up to, and including, Very High when used as a stand-alone flexible wall underlay, and all Wind Zones of NZS 3604 up to, and including, Extra High when used as an overlay for rigid wall underlays.

Durability

9.1 Thermakraft Covertek 403 Plus Wall Underlay meets code compliance with NZBC Clause B2.3.1 (a), not less than 50 years for wall underlays used where the cladding durability requirement or expected serviceable life is not less than 50 years, e.g. behind masonry veneer, and code compliance with NZBC Clause B2.3.1 (b), 15 years for wall underlays used where the cladding durability requirement is 15 years.

Serviceable Life

9.2 Provided it is not exposed to the weather or ultra-violet light for a total of more than 42 days, and provided the exterior cladding is maintained in accordance with the cladding manufacturer's instructions and the cladding remains weather resistant, Thermakraft Covertek 403 Plus Wall Underlay is expected to have a serviceable life equal to that of the cladding.

Control of Internal Fire and Smoke Spread

10.1 Thermakraft Covertek 403 Plus Wall Underlay has an AS 1530 Part 2 flammability index of not greater than 5 and therefore meets the requirements of NZBC Acceptable Solutions C/AS2 to C/AS6, Paragraph 4.17.8 b), for the surface finish requirements of suspended flexible fabric used as an underlay to exterior cladding that is exposed to view in occupied spaces. It may therefore be used with no restrictions in all buildings.

Prevention of Fire Occurring

11.1 Separation or protection must be provided to Thermakraft Covertek 403 Plus Wall Underlay from heat sources such as fire places, heating appliances, flues and chimneys. Part 7 of NZBC Acceptable Solutions C/AS1 to C/AS6 and NZBC Verification Method C/VM1 provide methods for separation and protection of combustible materials from heat sources.

External Moisture

12.1 Thermakraft Covertek 403 Plus Wall Underlay must be used behind claddings that meet the requirements of the NZBC, such as those covered by NZBC Acceptable Solution E2/AS1, or claddings covered by a valid BRANZ Appraisal.

12.2 Thermakraft Covertek 403 Plus Wall Underlay, when installed in accordance with the Technical Literature and this Appraisal will assist in the total cladding systems compliance with NZBC Clause E2.

Installation Information

Installation Skill Level Requirements

13.1 Installation must always be carried out in accordance with the Thermakraft Covertek 403 Plus Wall Underlay Technical Literature and this Appraisal by, or under the supervision of a Licensed Building Practitioner with the relevant Licence Class.

Underlay Installation

14.1 Thermakraft Covertek 403 Plus Wall Underlay must be fixed to all framing members at maximum 300 mm centres with large-head clouts 20 mm long, 6-8 mm staples, self-drilling screws or proprietary underlay fixings. The underlay must be pulled taut over the framing before fixing.

14.2 Thermakraft Covertek 403 Plus Wall Underlay must be run horizontally and must extend from the upper-side of the top plate to the under-side of the bearers or wall plates supporting ground floor joists, or below bottom plates on concrete slabs. Horizontal laps must be no less than 150 mm wide, with the direction of the lap ensuring that water is shed to the outer face of the membrane. End laps must be made over framing and be no less than 150 mm wide.

14.3 The wall underlay should be run over openings and these left covered until windows and doors are ready to be installed. Openings are formed in the underlay by cutting on a 45 degree diagonal from each corner of the penetration. The flaps of the cut membrane must be folded inside the opening and stapled to the penetration framing. Excess underlay may be cut off flush with the internal face of the wall frame.

14.4 Thermakraft Covertek 403 Plus Wall Underlay can be added as a second layer over head flashings in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.1.10.3.

14.5 When fixing the product in windy conditions, care must be taken due to the large sail area created.

14.6 Any damaged areas of Thermakraft Covertek 403 Plus Wall Underlay, such as tears, holes or gaps around service penetrations, must be repaired. Damaged areas can be repaired by covering with new material lapping the damaged area by at least 150 mm and taping, or by taping small tears.

Inspections

14.7 The Technical Literature must be referred to during the inspection of Thermakraft Covertek 403 Plus Wall Underlay installations.

Basis of Appraisal

The following is a summary of the technical investigations carried out:

Tests

15.1 The following tests have been carried out on Thermakraft Covertek 403 Wall Underlay in accordance with NZBC Acceptable Solution E2/AS1, Table 23: tensile strength, edge-tear resistance and resistance to water vapour transmission in accordance with AS/NZS 4200.1, shrinkage in accordance with AS/NZS 4201.3, resistance to water penetration in accordance with AS/NZS 4201.4, surface water absorbency in accordance with AS/NZS 4201.6, pH of extract in accordance with AS/NZS 1301.421s and air resistance to BS 6538.3. The following tests have been carried out on Thermakraft Covertek 403 Plus Wall Underlay: resistance to dry delamination in accordance with AS/NZS 4201.1, surface water absorbency in accordance with AS/NZS 4201.6 and air resistance to BS 6538.3. A range of these tests were completed before and after the underlays were exposed to ultra-violet light.

15.2 The Flammability Index of Thermakraft Covertek 403 Plus Wall Underlay has been evaluated in accordance with AS 1530.2.

Other Investigations

16.1 A durability opinion has been given by BRANZ technical experts.

16.2 An evaluation of the expected performance of Thermakraft Covertek 403 Plus Wall Underlay in direct contact with metal wall cladding has been completed by BRANZ.

16.3 The practicability of installation of Thermakraft Covertek 403 Plus Wall Underlay has been assessed by BRANZ and found to be satisfactory.

16.4 The Technical Literature, including installation instructions, has been examined by BRANZ and found to be satisfactory.

Quality

17.1 The manufacture of Thermakraft Covertek 403 Plus Wall Underlay has been examined by BRANZ, including methods adopted for quality control. Details regarding the quality and composition of the materials used were obtained by BRANZ and found to be satisfactory.

17.2 The quality of supply to the market is the responsibility of Thermakraft Limited.

17.3 Building designers are responsible for the design of the building, and for the incorporation of the wall underlay into their design in accordance with the instructions of Thermakraft Limited.

17.4 Quality of installation is the responsibility of the installer in accordance with the instructions of Thermakraft Limited.

Sources of Information

- AS 1530.2 - 1993 Test for flammability of materials.
- AS/NZS 1301.421s: 1998 Determination of the pH value of aqueous extracts of paper, board and pulp - cold extraction method.
- AS/NZS 4200.1: 1994 Pliable building membranes and underlays - materials.
- AS/NZS 4201.1: 1994 Pliable building membranes and underlays - Methods of test – Resistance to dry delamination.
- AS/NZS 4201.2: 1994 Pliable building membranes and underlays - Methods of test – Resistance to wet delamination.
- AS/NZS 4201.3: 1994 Pliable building membranes and underlays - Methods of test – Shrinkage.
- AS/NZS 4201.4: 1994 Pliable building membranes and underlays - Methods of test – Resistance to water penetration.
- AS/NZS 4201.6: 1994 Pliable building membranes and underlays - Methods of test – Surface water absorbency.
- BS 6538.3: 1987 Method for determination of air permeance using the Garley apparatus.
- NZS 2295: 2006 Pliable, permeable building underlays.
- NZS 3604: 2011 Timber-framed buildings.
- Acceptable Solutions and Verification Methods for New Zealand Building Code External Moisture Clause E2, Ministry of Business, Innovation and Employment, Third Edition July 2005 (Amendment 7, 01 January 2017).
- Ministry of Business, Innovation and Employment Record of Amendments for Compliance Documents and Handbooks.
- The Building Regulations 1992.

Amendments

Amendment No. 1, dated 23 February 2017.

This Appraisal has been amended to update the Appraisal Holder.

BRANZ

In the opinion of BRANZ, Thermakraft Covertek 403 Plus Wall Underlay is fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided it is used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to Thermakraft Limited, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
   a) relates only to the product as described herein;
   b) must be read, considered and used in full together with the Technical Literature;
   c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
   d) is copyright of BRANZ.
2. Thermakraft Limited:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions.
   d) Warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
3. BRANZ makes no representation or warranty as to:
   a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
   c) any guarantee or warranty offered by Thermakraft Limited.
4. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
5. BRANZ provides no certification, guarantee, indemnity or warranty, to Thermakraft Limited or any third party.

For BRANZ

Chelydra Percy
Chief Executive

Date of Issue:
14 June 2016

Hamilton City Council
BUILDING UNIT
APPROVED
BC Number - DD007.2019.00040020.001

BRANZ Appraised
Appraisal No. 878 [2014]

THERMAKRAFT ALUBAND WINDOW FLASHING TAPE

Appraisal No. 878 (2014)

Amended 1 May 2019

BRANZ Appraisals

Technical Assessments of products for building and construction.

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Product

1.1 Thermakraft Aluband Window Flashing Tape in conjunction with the Thermakraft Corner Moulded Piece is a flexible flashing tape system for use around framed joinery openings as a secondary weather resistant barrier.

1.2 The system is installed into and around the framed joinery opening over the wall underlay and exposed frame to cover both the face and edge of the opening framing. Thermakraft Aluband Window Flashing Tape is also used at joinery heads to seal flashing upstands to the wall underlay.

Scope

2.1 Thermakraft Aluband Window Flashing Tape has been appraised as a flexible flashing system for use around window and door joinery openings for buildings within the following scope:

- constructed with timber framing in accordance with the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1; or,
- constructed with steel framing subject to specific engineering design with building height and floor plan area scope limitations in accordance with NZBC Acceptable Solution E2/AS1; and,
- with a risk score of 0-20, calculated in accordance with NZBC Acceptable Solution E2/AS1, Table 2; and,
- with wall cladding systems complying with NZBC Acceptable Solution E2/AS1 or a valid BRANZ Appraisal that specifies a flexible flashing system; and,
- with flexible wall underlays compatible with the flashing tape and complying with the NZBC; and,
- situated in NZS 3604 Wind Zones up to, and including, Extra High (refer to Paragraph 7.3).

Building Regulations

New Zealand Building Code (NZBC)

3.1 **In the opinion of BRANZ, Thermakraft Aluband Window Flashing Tape, if designed, used, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet or contribute to meeting the following provisions of the NZBC:**

Clause B2 DURABILITY: Performance B2.3.1 (b), 15 years and B2.3.2. Thermakraft Aluband Window Flashing Tape meets these requirements. See Paragraphs 8.1 and 8.2.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.2. Thermakraft Aluband Window Flashing Tape contributes to meeting this requirement. See Paragraphs 7.1 - 7.4 and 11.1.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. Thermakraft Aluband Window Flashing Tape meets this requirement and will not present a health hazard to people.

3.2 This is an Appraisal of an **Alternative Solution** in terms of New Zealand Building Code compliance. See Paragraph 7.1.

Technical Specification

4.1 System components and accessories supplied by Thermakraft Limited are:

- Thermakraft Aluband Window Flashing Tape is a polymeric faced, bituminous modified, self-adhesive tape with a release backing paper. The tape is supplied in rolls 200, 150 and 75 mm wide x 25 m long. The rolls are wrapped in clear polythene film.
- The Thermakraft Corner Moulded Piece is made from inert polyethylene and is coloured orange. It is used in conjunction with the Thermakraft Aluband Window Flashing Tape and building underlays as part of the Thermakraft Aluband Window Flashing Tape system.
- The Thermakraft Tool is used to ensure proper adhesion of the Thermakraft Aluband Window Flashing Tape and to achieve a tight fit into corners.

4.2 Accessories used with the system which are supplied by the installer are:

- Thermakraft Corner Moulded Piece fixings - staples, clouts or other temporary fixings to attach the corner mould to the framing prior to the installation of the Thermakraft Aluband Window Flashing Tape.
- Scotch® Super 77™ Multipurpose Adhesive is a clear spray primer.

Handling and Storage

5.1 Handling and storage of all materials supplied by Thermakraft Limited, whether on or off site, is under the control of the installer. Thermakraft Aluband Window Flashing Tape and accessories must be protected from damage and weather. Rolls must be stored under cover, in clean, dry conditions away from direct exposure to sunlight.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for Thermakraft Aluband Window Flashing Tape. The Technical Literature must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Appraisal must be followed.

Design Information

General

7.1 Thermakraft Aluband Window Flashing Tape meets the requirements of AC148: 2001 which is an alternative solution to the version of AC148 referenced by NZBC Acceptable Solution E2/AS1 Paragraph 9.1.5 (b). The installation method for Thermakraft Aluband Window Flashing Tape is an alternative solution to the installation method shown within NZBC Acceptable Solution E2/AS1, Figures 72A and 72B.

7.2 The use of flexible flashing systems around window and door joinery openings is critical to assist the overall weathertightness performance of window and door joinery installations.

7.3 Thermakraft Aluband Window Flashing Tape is suitable for use over flexible wall underlays compatible with the flashing tape in NZS 3604 Wind Zones up to and including Extra High. In the Extra High Wind Zone, the flexible underlay must be installed over a rigid underlay complying with NZBC Acceptable Solution E2/AS1, Table 23.

7.4 Thermakraft Aluband Window Flashing Tape is designed to prevent air leakage and water penetration around window and door openings at framing junctions (e.g. at the sill trimmer and opening stud junction), and to keep any water that gets past the cladding, or through the joinery, from direct contact with the framing timber.

7.5 Thermakraft Aluband Window Flashing Tape is not designed to overcome poor detailing and workmanship of the window or door joinery installation. The system must not be considered in isolation, but be considered as part of the wall cladding system. Thermakraft Aluband Window Flashing Tape is designed to be used in conjunction with air seals and joinery flashing systems, not as a substitute.

7.6 When Thermakraft Aluband Window Flashing Tape is used in conjunction with LOSP [light organic solvent preservative] treated timber, the solvent from the timber treatment must be allowed to evaporate [generally at least one week] prior to the installation of the system.

Durability

8.1 Assessment of durability to meet the NZBC is based on difficulty of access and replacement, and the ability to detect failure of Thermakraft Aluband Window Flashing Tape both during normal use and maintenance of the building.

Serviceable Life

8.2 Provided it is not exposed to the weather or ultra-violet light for a total of more than 42 days, and provided the exterior cladding is maintained in accordance with the cladding manufacturer's in-structions and the cladding remains weather resistant, Thermakraft Aluband Window Flashing Tape is expected to have a serviceable life equal to that of the cladding.

Maintenance

9.1 No maintenance is required for Thermakraft Aluband Window Flashing Tape. Regular checks, at least annually, must be made of the junctions between the joinery and wall cladding to ensure that they are maintained weathertight and that the primary means of weather resistance for the junction e.g. flashing, sealant, etc continues to perform its function, to ensure that water will not penetrate the cladding.

Prevention of Fire Occurring

10.1 Thermakraft Aluband Window Flashing Tape must be separated from fireplaces, heating appliances, chimneys and flues in accordance with the requirements of NZBC Acceptable Solutions C/AS1 to C/AS6, Paragraph 7.5.9 for the protection of combustible materials.

External Moisture

11.1 Where a cladding manufacturer specifies the use of generic flashing tapes around window and door joinery openings at framing junctions as part of their system, or they specify the use of flexible flashing tapes that comply with NZBC E2/AS1, Paragraph 9.1.5 [b], Thermakraft Aluband Window Flashing Tape may be used.

Installation Information

Installation Skill Level Requirements

12.1 Installation of Thermakraft Aluband Window Flashing Tape must be completed by trades-persons with an understanding of flexible flashing tape systems, in accordance with instructions given within Thermakraft Aluband Window Flashing Tape Technical Literature and this Appraisal.

General

13.1 The selected wall underlay must be installed in accordance with the manufacturer's instructions, and must completely cover the joinery opening. The underlay is then cut on a 45° angle away from each corner of the opening so the flaps can be folded into the opening and secured to the interior face of the timber framing.

13.2 Fit a Thermakraft Corner Moulded Piece into each of the bottom corners to create a seal at the corner junction. The corner piece must be fixed to the framing with staples or clouts.

13.3 Before the Thermakraft Aluband Window Flashing Tape is applied, the substrate surfaces must be clean, dry and free from any surface contaminants such as dust and grease that may cause loss of adhesion. Application of Scotch® Super 77™ Spray Adhesive: When installing Aluband Flashing Tapes on difficult to bond substrates, Scotch® Super 77™ Spray Adhesive may be used. Ensure that the wall underlay/substrate is dry and free of dirt before applying the spray adhesive. Apply a light spray/coating of the spray adhesive onto the underlay/substrate. Wait for a minute to allow the spray adhesive to become tacky. When tacky to the touch apply the flashing tape in the normal manner.

13.4 A length of Thermakraft Aluband Window Flashing Tape must be cut to the length of the sill plus 400 mm. The tape is installed flush with the interior face of the opening and is applied along the entire length of the sill and 200 mm up each jamb. The overhanging tape is cut at the corner of the opening to allow the tape to be folded onto the face of the building underlay. The Thermakraft Tool must be used to ensure that adequate adhesion of the tape is achieved and that the tape is installed tight into the sill/jamb junction.

13.5 A 400 mm length of Thermakraft Aluband Window Flashing Tape must be installed 200 mm down the jamb and 200 mm along the lintel at each of the top corners of the window or door joinery opening. A 75 mm wide x 100 mm long sealing tape 'butterfly' must be installed at 45° across the corner of the head/jamb junction overlapping the corner by 3 mm to create a seal at the corner junction.

13.6 Thermakraft Aluband Window Flashing Tape must not be stretched. To avoid wastage, the tape can be lapped 100 mm minimum onto itself without reducing the performance of the Thermakraft Aluband Window Flashing Tape system.

13.7 If the Thermakraft Aluband Window Flashing Tape is exposed to the weather or UV light for more than 42 days, then it must be replaced with new material.

Installation Temperature

13.8 Thermakraft Aluband Window Flashing Tape must not be installed at temperatures of less than 5°C.

Inspections

13.9 The Technical Literature must be referred to during the inspection of Thermakraft Aluband Window Flashing Tape installations.

Basis of Appraisal

The following is a summary of the technical investigations carried out:

Tests

14.1 Testing of Thermakraft Aluband Window Flashing Tape has been completed by BRANZ to the requirements of ICC Evaluation Service Acceptance Criteria for Flashing Materials AC148:2001. The adhesion of Thermakraft Aluband Window Flashing Tape to black bituminous Kraft building paper complying with the requirements of NZBC Acceptable Solution E2/AS1, Table 23 and selected other synthetic wall underlays has been tested and found to be satisfactory.

Other Investigations

15.1 An assessment was made of the durability of Thermakraft Aluband Window Flashing Tape by BRANZ technical experts.

15.2 Site inspections were carried out by BRANZ to examine the practicability of installation.

15.3 The Technical Literature has been reviewed by BRANZ and found to be satisfactory.

Quality

16.1 The manufacture of Thermakraft Aluband Window Flashing Tape has not been examined by BRANZ, but details of the quality and composition of the materials used were obtained and found to be satisfactory.

16.2 The quality of supply to the market is the responsibility of Thermakraft Limited.

16.3 Designers are responsible for the building design, and building contractors are responsible for the quality of installation of framing systems and wall underlays in accordance with the instructions of the designer.

16.4 The quality of installation, handling and storage on site is the responsibility of the installer in accordance with the instructions of Thermakraft Limited.

Sources of Information

- ICC Evaluation Service, Inc, AC148 Acceptable Criteria for Flexible Flashing Materials, July 2001.
- NZS 3604: 2011 Timber-framed buildings.
- Acceptable Solutions and Verification Methods for New Zealand Building Code External Moisture Clause E2, Ministry of Business, Innovation and Employment, Third Edition July 2005 [Amendment 7, 01 January 2017].
- Ministry of Business, Innovation and Employment Record of Amendments for Compliance Documents and Handbooks.
- The Building Regulations 1992.

Amendments

Amendment No.1, dated 23 February 2017.

This Appraisal has been amended to update the Appraisal Holder.

Amendment No. 2, dated 1 May 2019.

This Appraisal has been amended to include the application of Scotch® Super 77™ Spray Adhesive.

BRANZ

In the opinion of BRANZ, Thermakraft Aluband Window Flashing Tape is fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided it is used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to Thermakraft Limited, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
   a) relates only to the product as described herein;
   b) must be read, considered and used in full together with the Technical Literature;
   c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
   d) is copyright of BRANZ.
2. Thermakraft Limited:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions.
   d) Warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
3. BRANZ makes no representation or warranty as to:
   a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
   c) any guarantee or warranty offered by Thermakraft Limited.
4. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
5. BRANZ provides no certification, guarantee, indemnity or warranty, to Thermakraft Limited or any third party.

For BRANZ

Chelydra Percy
Chief Executive

Date of Issue:
02 December 2014

Hamilton City Council
BUILDING UNIT
APPROVED
BC Number - DD007.2019.00040020.001

BRANZ Appraised
Appraisal No. 942 [2017]

ONESEAL MULTI-FIT PIPE AND CABLE PENETRATION SEALS

Appraisal No. 942 (2017)

Amended 06 August 2019

BRANZ Appraisals

Technical Assessments of products for building and construction.

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Product

1.1 OneSeal Multi-fit Pipe and Cable Penetration Seals are a range of pipe and service penetration seals consisting of a soft, flexible EPDM membrane with a self-adhesive flange.

Scope

2.1 OneSeal Multi-fit Pipe and Cable Penetration Seals have been appraised for use as pipe and service penetration seals for use where the penetration penetrates the wall underlay on timber and steel framed buildings within the following scope:

- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1 with regards to building height and floor plan area; and,
- with stand-alone flexible wall underlays covered by a valid BRANZ Appraisal; or,
- with flexible wall underlays covered by a valid BRANZ Appraisal for use over rigid wall underlays; or,
- with proprietary plywood or fibre cement based rigid wall underlays covered by a valid BRANZ Appraisal; and,
- situated in NZS 3604 Wind Zones up to, and including Very High where stand-alone flexible wall underlays are used; or,
- situated in NZS 3604 Wind Zones up to, and including Extra High where flexible wall underlays are used over rigid wall underlays, or proprietary rigid wall underlays are used.

2.2 OneSeal Multi-fit Pipe and Cable Penetration Seals have also been appraised for use on buildings subject to specific weathertightness design. Building designers are responsible for the building design and for the incorporation of OneSeal Multi-fit Pipe and Cable Penetration Seals into their design in accordance with the declared properties and the instructions of Thermakraft Limited.

Building Regulations

New Zealand Building Code (NZBC)

3.1 **In the opinion of BRANZ, OneSeal Multi-fit Pipe and Cable Penetration Seals, if designed, used, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet or contribute to meeting the following provisions of the NZBC:**

Clause B2 DURABILITY: Performance B2.3.1 (b), 15 years and B2.3.2. OneSeal Multi-fit Pipe and Cable Penetration Seals meet these requirements. See Paragraphs 8.1 and 8.2.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.2. When used as part of the wall cladding system, OneSeal Multi-fit Pipe and Cable Penetration Seals will contribute to meeting this requirement. See Paragraphs 7.1 - 7.4 and 11.1.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. OneSeal Multi-fit Pipe and Cable Penetration Seals meet this requirement and will not present a health hazard to people.

Technical Specification

4.1 OneSeal Multi-fit Pipe and Cable Penetration Seals are manufactured with a black, soft and flexible 1.2 mm thick EPDM fabric supplied with pre-punched markings. The perimeter of the seal is coated with an acrylic adhesive, which is bonded to the wall underlay. OneSeal Multi-fit Pipe and Cable Penetration Seals are available in the sizes below..

OneSeal Multi-Fit Cable Seals;

- 55 mm Ø to 80 mm Ø
- 4 x 7 mm Ø to 10 mm Ø
- 2 x 10 mm Ø to 22 mm Ø

OneSeal Multi-Fit Pipe Seals;

- 15mm Ø to 25 mm Ø
- 40 mm Ø to 60 mm Ø
- 60 mm Ø to 90 mm Ø
- 90 mm Ø to 110 mm Ø

Handling and Storage

5.1 OneSeal Multi-fit Pipe and Cable Penetration Seals must be protected from damage and weather. They must be stored under cover in clean, dry conditions away from direct exposure to sunlight, heat or flame. OneSeal Multi-fit Pipe and Cable Penetration Seals should not be removed from the packaging until they are ready to use.

5.2 Handling and storage of OneSeal Multi-fit Pipe and Cable Penetration Seals, whether on-site or off-site, is the responsibility of the installer.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for OneSeal Multi-fit Pipe and Cable Penetration Seals. The Technical Literature must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained within the scope of this Appraisal and the Technical Literature must be followed.

Design Information

General

7.1 OneSeal Multi-fit Pipe and Cable Penetration Seals must not be exposed to the weather or ultra-violet light for longer than the exposure period stated in the relevant wall underlay Appraisal. A maximum of 90-days exposure applies to the OneSeal Multi-fit Pipe and Cable Penetration Seals.

7.2 OneSeal Multi-fit Pipe and Cable Penetration Seals when used with flexible and rigid wall underlays, provide an Alternative Solution to the pipe and service penetration detailing specified in NZBC Acceptable Solution E2/AS1, Paragraph 9.1.9.3 and Figure 68.

7.3 OneSeal Multi-fit Pipe and Cable Penetration Seals are primarily designed to prevent moisture ingress at pipe and cable penetrations through walls. The performance of OneSeal Multi-fit Pipe and Cable Penetration Seals relies on the correct size being selected for the pipe or cable penetration being sealed, and the seal being fully adhered to the wall underlay.

7.4 Where a proprietary cladding system is used, all weatherproofing details for the cladding system around the penetration must be carried out in accordance with the systems Technical Literature. Installation details which are outside the scope of the cladding system are the responsibility of the designer for compliance with the NZBC.

Durability

8.1 Assessment of durability to meet the NZBC is based on the difficulty of access and replacement, and the ability to detect failure of the OneSeal Multi-fit Pipe and Cable Penetration Seals during both normal use and maintenance of the building.

Serviceable Life

8.2 Provided the selected flexible or rigid wall underlay is not exposed to the weather or ultra-violet light for longer than stated in the relevant Appraisal, [a maximum of 90 days applies to the OneSeal Multi-fit Pipe and Cable Penetration Seals], and provided the exterior cladding is maintained in accordance with the cladding manufacturer's instructions and the cladding remains weather resistant, OneSeal Multi-fit Pipe and Cable Penetration Seals are expected to have a serviceable life equal to that of the cladding.

Maintenance

9.1 No maintenance is required for OneSeal Multi-fit Pipe and Cable Penetration Seals, however regular checks must be made of the cladding system to ensure it is sound and will not allow moisture penetration.

Prevention of Fire Occurring

10.1 Separation or protection must be provided to the OneSeal Multi-fit Pipe and Cable Penetration Seals from heat sources such as fireplaces, heating appliances and chimneys. Part 7 of NZBC Acceptable Solution C/AS1, C/AS2 and NZBC Verification Method C/VM1 provide methods for separation and protection of combustible materials from heat sources.

External Moisture

11.1 OneSeal Multi-fit Pipe and Cable Penetration Seals provide suitable flashing and sealing around pipe and cable penetrations when used in conjunction with BRANZ Appraised wall underlays, and will contribute to the wall cladding meeting code compliance with NZBC Clause E2.3.2.

Installation Information

Installation Skill Level Requirements

12.1 All design and building work must be carried out in accordance with the OneSeal Multi-fit Pipe and Cable Penetration Seals Technical Literature and this Appraisal by competent and experienced tradespersons conversant with penetration seals. Where the work involves Restricted Building Work [RBW] this must be completed by, or under the supervision of, a Licensed Building Practitioner [LBP] with the relevant License class.

General

13.1 The OneSeal Multi-fit Pipe and Cable Penetration Seals must create a tight seal around the pipe or cable penetration. The appropriate OneSeal Multi-fit Pipe and Cable Penetration Seals must be used based on the diameter of the pipe or cable penetration.

13.2 The flexible and rigid wall underlays must be clean, dust free and dry prior to adhering the OneSeal Multi-fit Pipe and Cable Penetration Seals.

13.3 The OneSeal Multi-fit Pipe and Cable Penetration Seals must be installed in a diamond pattern, which will assist with moisture run-off.

13.4 If the OneSeal Multi-fit Pipe and Cable Penetration Seals is exposed to the weather or UV light for more than 90 days, then it must be replaced with a new seal.

Installation Temperature

13.5 OneSeal Multi-fit Pipe and Cable Penetration Seals must not be installed at temperatures of less than -10°C. OneSeal Multi-fit Pipe and Cable Penetration Seals can withstand temperatures of -40°C to +80°C in service.

Inspections

14.1 The Technical Literature must be referred to during the inspection of OneSeal Multi-fit Pipe and Cable Penetration Seals installations.

Basis of Appraisal

The following is a summary of the technical investigations carried out:

Tests

15.1 Testing after various forms of accelerated aging has confirmed the adhesion of OneSeal Multi-fit Pipe and Cable Penetration Seals to a range of flexible and rigid wall underlays. The results have been reviewed by BRANZ experts and found to be satisfactory.

Other Investigations

16.1 Assessment of the composition of the materials used to make OneSeal Multi-fit Pipe and Cable Penetration Seals has been completed and a durability opinion has been provided by BRANZ experts.

16.2 The practicability of installation was assessed by BRANZ and found to be satisfactory.

16.3 The Technical Literature has been reviewed by BRANZ and found to be satisfactory.

Quality

17.1 The manufacture of OneSeal Multi-fit Pipe and Cable Penetration Seals has not been examined by BRANZ but details of the quality and composition of the materials used were obtained and found to be satisfactory. BRANZ undertakes an ongoing review of product quality on an inwards goods basis.

17.2 The quality of supply to the market is the responsibility of Thermakraft Limited.

17.3 The quality of installation on site is the responsibility of the installer.

17.4 Designers are responsible for the building design, and building contractors are responsible for the quality of the installation of the framing system, the wall underlay and cladding system.

17.5 Building owners are responsible for the maintenance of the cladding system over the OneSeal Multi-fit Pipe and Cable Penetration Seals.

Sources of Information

- NZS 3604: 2011 Timber-framed buildings.
- Ministry of Business, Innovation and Employment Record of amendments - Acceptable Solutions, Verification Methods and handbooks.
- The Building Regulations 1992.

Amendments

Amendment No.1, 06 August 2019

This Appraisal has been amended to update product name, update code references to NZBC Fire Clauses and update installation skill level requirements.

BRANZ

In the opinion of BRANZ, OneSeal Multi-fit Pipe and Cable Penetration Seals are fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided they are used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to Thermakraft Limited, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
   a) relates only to the product as described herein;
   b) must be read, considered and used in full together with the Technical Literature;
   c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
   d) is copyright of BRANZ.
2. Thermakraft Limited:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions;
   d) warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
3. BRANZ makes no representation or warranty as to:
   a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
   c) any guarantee or warranty offered by Thermakraft Limited.
4. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
5. BRANZ provides no certification, guarantee, indemnity or warranty, to Thermakraft Limited or any third party.

For BRANZ

Chelydra Percy
Chief Executive

Date of Issue:
29 May 2017

Hamilton City Council
BUILDING UNIT
APPROVED
BC Number - DD007.2019.00040020.001

17 of January 2020

To: Bruce Storrie Architecture

E: Hamilton City Council

From: Adam Gallichan
Territory Manager Waikato/ Bay of Plenty
Viking Roofspec Ltd

Reference:

Hayden Alteration
49 Ashurt Avenue
Lot 23 DP DPS 50812

To whom it may concern,

Viking Roofspec has reviewed the plans and details for the above project, specifically in regards to the roof / deck waterproofing membrane details provided by BSA for the specified Viking Enviroclad waterproofing membrane.

Viking Roofspec will provide our Viking Product Warranty on condition that a Viking Licensed Applicator (minimum Stage 1), install the specified waterproofing system as per plans and details provided.

Sincerely,

Adam Gallichan
Territory Manager / Technical Support
Viking Roofspec Ltd

Email: adam.gallichan@vikingroofspec.co.nz
Mobile: 027 4985 894

Web: www.vikingroofspec.co.nz

Hamilton City Council
BUILDING UNIT
APPROVED
BC Number - DD007.2019.00040020.001

Viking Enviroclad

Product Overview

Complies with E2 as an Alternative Solution. BRANZ Appraised - Certificate No. 656

CODEMARK 30058

BRANZ Appraised
Appraisal No. 656 [2015]

Viking Enviroclad (TPO) Waterproofing Membrane

Technical Statement

Product Description

Enviroclad is a CodeMark certified single ply, polyester fabric reinforced, thermoplastic polyolefin (TPO) waterproofing sheet membrane for flat or pitched roofs and decks. It can be applied as a fully bonded or mechanically fixed system.

Enviroclad is heat-welded, so it has strong, vulcanised seams for maximum water tightness. It possesses high puncture resistance (from the polyester mesh scrim) and elongation properties that forgive building movement. It also has high UV resistance and high solar reflectivity; both grey and white offer this, with white Enviroclad offering 92% solar reflectivity (S.R.I.) resulting in large reductions in energy use and cooling costs. Enviroclad also has the option of other colours to suite the building owner's tastes; the architect's specification or the local council's covenants.
Enviroclad's Light Reflectance Value, (L.R.V) are as followed:

- White: 87.63%
- Dove Grey: 32.7%
- Patina Green: 23.93%
- Rock Brown: 21.07%
- Slate Grey: 20.16%
- Mansard Brown: 7.40%

(Note: L.R.V is a Numeric value for the amount of *visible light reflected by a surface.***)**

Enviroclad's rolls are wider and longer (3.0m wide x 30.4m long = 91.2m2) than traditional membranes (10m2 - 25m2), meaning fewer seams on the finished roof. Weldable walkway rolls are available which provide further protection to the roof surface by providing extra durability and directing the flow of traffic when the roof is being inspected or serviced.

Enviroclad can be used for both commercial and residential buildings. It can be applied over an existing surface as a reroof solution. It is also suitable for low-slope and pitched roofs, gutters and parapets, pond-liners, balconies, decks and roof gardens.

Other features:

Enviroclad is backed by a 20-year product warranty and for specific projects, may be an eligible membrane for Viking's Full System Warranty, which covers the product and installation in one document. Enviroclad is CodeMark certified, meaning automatic compliance with the NZBC when used as specified. Enviroclad is also BRANZ Appraised (no. 656, 2015).
Enviroclad comes in grey or white (tan available on indent). Roll length: 30.4m (sold cut to length). Enviroclad

is manufactured by Carlisle-Syntec Inc. in the US and has many environmental benefits. For a full list of these benefits, see the 'Environmental' section of this
Statement.

Scope of use

Viking Enviroclad Roofing and Deck Membrane System has been assessed as a roof and deck waterproofing membrane on buildings within the following scope::

- The scope limitations of NZS 3604:2011 and NZBC Acceptable Solution E2/AS1, Paragraph 1.1; or,
- The scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1 with regards to building height and floor plan area when subject to specific structural design; and,
- Situated in NZS 3604:2011 Wind Zones, up to, and including Extra High; and,
- With substrates of plywood or suspended concrete slab.

Viking Enviroclad Roofing and Deck Membrane System has also been assessed for use as a roof and deck waterproofing membrane on specifically designed buildings within the following scope;

- Subject to specific structural and weathertightness design situated in wind pressures up to a maximum design differential ultimate limit state (ULS) of 6.5kPa; and,
- With substrates of plywood or suspended concrete slab.
- With the weathertightness design of junctions for each specific structure being the responsibility of the building designer.

New Zealand Building Code (NZBC)

The product will, if employed in accordance with the supplier's installation and maintenance requirements, assist with meeting the following provisions of the building code:

- Clause B1 Structure: Performance B1.3.1, B1.3.2, B1.3.3, B1.3.3(a), B1.3.3(c), B1.3.3(e), B1.3.3(h), B1.3.3(m), B1.3.3(p), B1.3.4, B1.3.4 (b), B1.3.4(c), B1.3.4(d), B1.3.4(e)
- Clause B2 Durability: Performance B2.3.1, B2.3.1(b), B2.3.2, B2.3.2 (a)
- Clause E2 External moisture: Performance E2.3.1, E2.3.2, E2.3.7, E2.3.7(b), E2.3.7(c)
- Clause F2 Hazardous building materials: Performance F2.3.1 Notes

Evidence

The product meets the requirements set out in the following documents, or relevant parts of cited standards within the documents:

Please refer to the CodeMark certificate attached for all evidence of compliance.

Supporting Evidence

The product has and can make available, the following additional evidence to support the above statements:

Product Criteria

Design requirements

Product specification and incorporation of Viking Enviroclad into the building design shall be carried out by a designer/ architect/engineer or a building professional who:

- Is qualified to design the buildings covered under the 'Scope' of use of this product.
- Has ready access to the technical specifications including installation details and standards referenced in both the BRANZ Appraisal No.656 (2015) and CodeMark certificate GM-CM30058-RevD where the design limitations are outlined for the scope of this PTS.

Enviroclad is supplied as a complete system with proprietary heat weldable accessories to deal with roof penetrations including internal and external corners and pourable pockets. Click here for a comprehensive list of accessories.

Installation requirements

- Installation shall be carried out by a Viking Roofspec trained and licensed installer.
- Installation shall be undertaken in accordance with all relevant technical information related to the selected installation method, including information contained within the BRANZ Appraisal No. 656 (2015) and the Viking Roofspec Enviroclad Applicator Handbook, version 1.2 (20/05/2015).
- Installer must complete the Substrate Checklist: concrete (June 2018) or Substrate Checklist: Plywood (June 2018).

For a full list of installation requirements, please refer to the CodeMark certificate GM-CM30058-RevD.

Maintenance requirements

- Maintenance requirements for Enviroclad are outlined in Viking's 'Membrane Care and Maintenance Guide".
- In the event of damage to the membrane, the membrane must be repaired by an approved applicator only who can remove the damaged portion and heat weld a patch as for new work.
- Drainage outlets must be maintained to operate effectively.

Warranties

The Viking Enviroclad system is backed by a 20-year product warranty. For specific projects, Enviroclad may be eligible for Viking's Full System Warranty, which covers the product and installation in one document, for a 20-year period.

Company Product Information

Environmental

Enviroclad is US ENERGY STAR rated and Cool Roof Rating Council certified. In New Zealand, the reduction in energy consumption will contribute points to a building's Green Star rating. Other environmental benefits include:

- Product supplied cut-to-length means minimal waste.
- 100% recycling of off-cuts during its manufacturing process.
- Aged, installed Enviroclad is 100% recyclable due to the absence of chlorinators and plasticisers.
- Solar reflectivity = lower energy usage for cooling buildings (white Enviroclad offers 92% solar reflectivity).
- Its ability to be installed over existing membranes means no dumping of old product into local land-fill.
- Enviroclad is officially potability certified for collecting drinking water off a roof.
- Heat weldability (just hot air) means no oil based tapes and primers.
- It can be installed using mechanical fastenings which negates the need for adhesive if desired..

masterspec

Visit nextgen or masterspec for the online version of our specification.

CAD Details

Please visit our website www.vikingroofspec.co.nz or our masterspec listing for our latest CAD Roofing details.

Physical Properties

Physical Properties	Test Method	Property of Unaged Sheet	Property after ASTM D573 aging 1 28 days @ 240 ºF
Tolerance on nominal tickness, %	ASTM D751	± 10	
Thickness over scrim, in. (mm) - 45-mil - 60-mil	ASTM D6878 Optical Method (avg. of 3 areas)	typical 0.018 (0.457) ± 10% 0.024 (0.610) ± 10%	
Breaking strength, lbf (kN)	ASTM D751 Grab Method	225 (1.0) min. 45-mil 320 (1.4) typical 45-mil 250 (1.1) min. 60-mil 360 (1.6) typical 60-mil	225 (1.0) min.45-mil 320 (1.4) typical 45-mil 250 (1.1) min. 60-mil 360 (1.6) typical 60-mil
Elongation at break of fabric, %	ASTM D751	25 typical	25 typical
Tearing strength, lbf (N) 8 by 8 in.specimen	ASTM D751 B Tongue Tear	55 (245) min. 130 (578) typical	55 (245) min. 130 (578) typical
Brittleness point, ºF (ºC)	ASTM D2137	-40 (-40) max. -50 (-46) tyical.	
Linear Dimensional Change (shrinkage), % -After 6 hours at 158 of (70 OC)	ASTM D1204	+/-0.5 max. - 0.2 typical	
Ozone resistance, 100 pphm, 168 hours	ASTM D1149	No cracks	No cracks
Resistance to water absorption -After 7 days immersion 158 ºF (70 ºC) -Change in mass, %	ASTM D471 (top surface only)	4.0 max. 2.0 typical	
Resistance to microbial surface growth, -rating (1 is very poor, 10 is no growth)	ASTM D3274 2 yr S. Florida	9-10 typical	
Field seam strength, lbf/in. (kN/m) -Seam tested in peel	ASTM D1876	25 (4.4) min. 60 (10.5) typical	
Water vapor permeance, Perms	ASTM E96	0.10 max. 0.05 typical	
Puncture resistance, lbf (kN) (see supplemental section for additional puncture data)	FTM 101C	250 (1.1) min. 45-mil 325 (1.4) typical 45-mil 300 (1.3) min. 60-mil 350 (1.6) typical 60-mil	
Resistance to xenon-arc weathering 2 -Xenon-Arc, 17, 640 kJm² total radiant -exposure, visual condition at 10x	ASTM G155 0.70 W/m² 80 °C B.P.T	No cracks No loss of breaking or tearing strength	

1. Aging conditions are 28 days at 240 °F (116 ºC) equivalent to 400 days at 176 ºF (80 ºC) for breaking strength, elongation, tearing strength, ozone and puncture resistance.
2. Approximately equivalent to 14, 000 hours exposure at 0.35 W/m² irradiance B.P.T. is black panel temperature.

CERTIFICATE OF CONFORMITY

This product Certificate is issued under Section 269 of the Building Act 2004 for:

Viking Enviroclad Roofing and Deck Membranes System

Product Description

Viking Enviroclad Roofing and Deck Membrane System is a single ply, polyester fabric reinforced, thermoplastic polyolefin (TPO) waterproofing sheet membrane for flat or pitched roofs and decks. It can be applied as a fully bonded or mechanically fixed system. Some Membranes are supplied with an APEEL™ protective film. The film which provides protection during construction is to be removed within 90 days of installation. The main membrane components are:

STP100 Enviroclad TPO white 1.14mm x 3.0m x 30.4m
STP500 Enviroclad TPO white 1.52mm x 3.0m x 30.4m
STP110 Enviroclad TPO grey 1.14mm x 3.0m x 30.4m
STP110A Enviroclad Apeel TPO grey 1.14mm x 3.0m x 30.4m
STP510 Enviroclad TPO grey 1.52mm x 3.0m x 30.4m
STP510A Enviroclad Apeel TPO grey 1.52mm x 3.0m x 30.4m
STP113 Enviroclad TPO grey 1.14mm x 3.66m wide
STP513 Enviroclad TPO grey 1.52mm x 3.66m wide
STP000 Enviroclad adhesive 19L

Viking Enviroclad Roofing and Deck Membrane System must be installed using Viking Roofspec ancillary components as described in the Viking Roofspec Applicator Handbook V1.3 (30/05/2016) referenced as the Handbook.

Product purpose and use

1- Viking Enviroclad Roofing and Deck Membrane System has been assessed as a roof and deck waterproofing membrane on buildings within the following scope:

- the scope limitations of NZS 3604:2011 and NZBC Acceptable Solution E2/AS1, Paragraph1.1; or,
- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1 with regards to building height and floor plan area when subject to specific structural design; and,
- situated in NZS 3604:2011 Wind Zones, up to, and including Extra High; and,
- with substrates of plywood or suspended concrete slab.

2- Viking Enviroclad Roofing and Deck Membrane System has also been assessed for use as a roof and deck waterproofing membrane on specifically designed or existing buildings within the following scope:

- subject to specific structural and weathertightness design situated in wind pressures up to a maximum design differential ultimate limit state (ULS) of 6.5 kPa; and,
- with substrates of plywood or suspended concrete slab.
- with the weathertightness design of junctions for each specific structure being the responsibility of the building designer.

Certificate holder

Viking Roofspec, A Division of Viking Group Ltd, 80 Alexander Crescent, Otara, Manukau City 2023, New Zealand
Free phone: 0800 729 799, Free fax: 0800 729 788, Email: info@vikingroofspec.co.nz
Web: www.vikingroofspec.co.nz

CodeMark Certification Body		28/03/2018	06/08/2018	28/03/2021	GM-CM30058-RevD
Global-Mark Pty Ltd, Suite 4.07, 32 Delhi Road, North Ryde NSW 2113, Australia Tel: +61 (0)2 9886 0222	Herve Michoux Managing Director	Date of issue	Last update	Date of next re-certification	Certificate Number

The purpose of construction site audits is to confirm the practicability of installing the product; and to confirm the appropriateness and accuracy of installation instructions. In issuing this certificate, Global-Mark has relied on the independent expert and/or laboratory advise or reports.
This certificate is issued by Global-Mark Pty Limited, an independent certification body accredited by the product certification accreditation body (JAS-ANZ) appointed by the Chief Executive of the Ministry of Business Innovation and Employment under the Building Act 2004. The Ministry of Business Innovation and Employment does not in any way warrant, guarantee, or represent that the building method or product the subject of this certificate conforms with the New Zealand Building Code, nor accept any liability arising out of the use of the building method or product. The Ministry of Business Innovation and Employment disclaims, to the extent permitted by law, all liability (including negligence) for claims of losses, expenses, damages, and costs arising as a result of the use of the building method(s) or product(s) referred to in this certificate. This Certificate may only be reproduced in its entirety.
It is advised to check that this Certificate of Conformity is currently valid and not withdrawn, suspended or superseded by a later issue by referring to the Ministry of Business Innovation and Employment website, http://www.mbie.govt.nz/
New Zealand Building Code (NZBC) references the Building Code in force at the time of issuing the product certificate.
Certificate holder will notify Global-Mark Pty Ltd in accordance with Regulation 15 of the Building (Product Certification) Regulations 2008.

CERTIFICATE OF CONFORMITY

This product Certificate is issued under Section 269 of the Building Act 2004 for:

Viking Enviroclad Roofing and Deck Membranes System

Compliance with the New Zealand Building Code (NZBC):

Viking Enviroclad Roofing and Deck Membrane System if designed, used, installed and maintained in accordance with the scope of this Certificate, will meet the following provisions of the NZBC:

Clause B1 STRUCTURE: Performance B1.3.1, B1.3.2 and B1.3.4 (b) (c) (d) (e) for the relevant physical conditions of B1.3.3 (a), (c), (h), & (p) Viking Enviroclad Roofing and Deck Membrane System meets these requirements.

Clause B2 DURABILITY: Performance B2.3.1 (b) and B2.3.2 (a), 15 years. Viking Enviroclad Roofing and Deck Membrane System meets these requirements.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.1, E2.3.2 and E2.3.7 (b) and (c). Viking Enviroclad Roofing and Deck Membrane System meets these requirements.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. Viking Enviroclad Roofing and Deck Membrane System meets this requirement and will not present a health hazard to people.

Water Supplies: Water is not contaminated by Viking Enviroclad Roof and Deck Membrane System which complies with AS/NZS 4020:2005.

Subject to the following conditions and limitations:

1. Maintaining the validity of and compliance with the BRANZ Appraisal No. 656 (2015) Amended 14 November 2017 Viking Enviroclad Roofing and Deck Membrane referenced as the BRANZ Appraisal including inspection and maintenance requirements
2. Comply with Viking Roofspec Membrane Care and Maintenance Guide V1.0
3. The Viking Enviroclad Roofing and Deck Membrane System can only be used with the ancillary components provided by Viking Roofspec listed in the Handbook. Where these components are substituted with alternative products, these applications fall outside the scope of this Certification.
4. For existing buildings, the suitability of the roof or deck needs to be confirmed by a professional meeting the design conditions 1 of this certificate.

Design Conditions:

1. Product specification and incorporation of the Viking Enviroclad Roofing and Deck Membrane System into the building design shall be carried out by a designer / architect / engineer or a building professional who is qualified to design the buildings covered under the 'Scope' of use of this product.
2. The design must be in compliance with the requirements of the BRANZ Appraisal and the Technical Literature Enviroclad Set series 1.10 dated 29/04/2015 Detail EC01 to EC24, which includes but not limited to drainage flanges, outlets, grates or cages, and overflow details. Penetrations and upstands of the membrane must be raised above the level of any possible flooding caused by blockage of roof drainage.
3. The design of details not covered by the Technical Literature is subject to specific weathertightness design. Weathertightness details that are developed by the designer are outside of the scope of this Certificate.
4. The design and construction of the substrate and movement and control joints is specific to each building, and therefore is the responsibility of the building designer and building contractor and is outside the scope of this Certificate. Allowance for deflection and settlement of the substrate must be made in the design of the roof to ensure falls are maintained and no ponding of water can occur.
5. Viking Enviroclad Roofing and Deck Membrane System installed using any of the three installation methods is suitable for use in areas subject to a maximum design differential Ultimate Limit State wind pressure of 2.7 kPa, subject to the limitations of the substrate.
6. Minimum fall requirements are 1 in 30 (2 degrees) for roofs; 1 in 40 (1.5 degrees) for decks and 1 in 100 (0.5 degrees) for gutters. *Note: Where possible BRANZ recommends a minimum 1:60 (1 degree) slope for gutters.*
7. All falls must slope to an outlet and be built into the substrate. Fall can not be created with mortar screeds over the membrane.
8. Separation or protection must be provided to Viking Enviroclad Roofing and Deck Membrane System from heat sources such as fire places, heating appliances, flues and chimneys. Part 7 of NZBC Acceptable Solutions C/AS1 - C/AS6 and NZBC Verification Method C/VM1provide methods for separation and protection of combustible materials from heat sources.
9. Viking Enviroclad Roofing and Deck Membrane System is impermeable; therefore a means of dissipating construction moisture must be provided in the building design and construction to meet code compliance with NZBC Clause E2.3.6.
10. Integral roof gardens, steps within the deck and direct downpipe discharge to the decks level are outside the scope of this Certificate,
11. The membrane must be continually protected from physical damage for trafficable area by pedestal protection system for deck or the use of Enviroclad walkway for roof.
12. Though Viking Enviroclad Roof and Deck Membrane Systems have been shown to comply with AS/NZS 4020:2005, it must be noted that all water collected off roof surfaces made from any material is considered to be non-potable due to possible

contamination from other sources. Water collection in this way can only be considered potable if it has been passed through a suitable sterilization system. Sterilization systems such as this have not been assessed and are outside the scope of this Certificate.

13. Viking Enviroclad Roof and Deck Membrane Systems installed using the standard method of fully bonded with heat welded seams is suitable for use in areas subject to a maximum design differential Ultimate Limit State wind pressure of 6.5kPa, subject to the limitations of the substrate. Viking Enviroclad Roof and Deck Membrane Systems installed using either of the mechanical fastenings methods, HP-X Fasteners and Piranha Plates or Rhino Bond System is suitable for use in areas subject to maximum design differential Ultimate Limit State wind pressure of 2.7 kPa, subject to the limitations of the substrate.

Product Installation Conditions:

1. Installation shall be carried out by a Viking Roofspec trained and licensed installer.
2. Installation shall be undertaken in accordance with all relevant technical information related to the selected installation method, including information contained within the BRANZ Appraisal and the Handbook.
3. Installer must complete the Substrate Checklist: concrete (September 2013) or Substrate Checklist; Plywood (March 2015).
4. Long term properties of the material may be affected by contact with bituminous materials or polystyrene insulation. Viking Roofspec should be contacted for advice in either of these situations.
5. Dry storage must be provided for all products and the rolls of membrane must be lying down on pallets.
6. Substrates must be dry, clean and stable before installation commences. Surfaces must be smooth and free from nibs, sharp edges, dust, dirt or other materials such as oil, grease or concrete formwork release agents. All surface defects must be filled to achieve an even and uniform surface.
7. Concrete substrates can be checked for dryness by using a hygrometer, as set out in BRANZ Bulletin No. 515. The relative humidity of the concrete must be 75% or less before membrane application.
8. The moisture content of a timber substructure must be a maximum of 20% and plywood sheet must be dry at time of membrane application. This will generally require plywood sheets to be covered until just before the membrane is laid, to prevent rain wetting.
9. The first 25 mm of rainfall from a newly installed Viking Enviroclad Roof and Deck Membrane System roof must be discarded before water collection starts. This is to remove residues which may have developed in the processes involved in the production of a Viking Enviroclad Roof and Deck Membrane System membrane roof

End of the record

BRANZ Appraised
Appraisal No. 656 [2015]

VIKING ENVIROCLAD ROOFING AND DECK MEMBRANE

Appraisal No. 656 (2015)

This Appraisal replaces Appraisal No. 656 (2009).

Amended 23 May 2018

BRANZ Appraisals

Technical Assessments of products for building and construction.

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Product

1.1 Viking Enviroclad is a single ply, polyester fabric reinforced, thermoplastic polyolefin (TPO) waterproofing sheet membrane for flat or pitched roofs and decks. It can be applied as a fully bonded or mechanically fixed system.

Scope

2.1 Viking Enviroclad has been appraised as a roof and deck waterproofing membrane on buildings within the following scope:

- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1; or
- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1 with respect to building height and maximum floor plan areas when subject to specific design; and,
- with building structures designed and constructed to meet the requirements of the NZBC; and,
- with substrates of plywood or concrete slab; and,
- with minimum falls for roofs of 1:30 and decks of 1:40; and,
- with decks that have a maximum area of 40 m^2; and,
- situated in NZS 3604 Wind Zones, up to, and including Extra High.

2.2 Viking Enviroclad has also been appraised for use as a roof and deck waterproofing membrane on specifically designed buildings within the following scope:

- subject to specific structural and weathertightness design; and,
- with substrates of plywood or concrete slab; and,
- situated in specific design wind pressures (refer Paragraph 8.1) and,
- with the weathertightness design of junctions for each specific structure being the responsibility of the building designer.

2.3 Roofs and decks waterproofed with Viking Enviroclad must be designed and constructed in accordance with the following limitations:

- nominally flat or pitched roofs and decks constructed to drain water to gutters and drainage outlets complying with the NZBC; and,
- with no steps within the deck level, no integral roof gardens and no downpipe direct discharge to the decks; and,
- with the deck membrane continually protected from physical damage by pedestal protection system.

2.4 The design and construction of the substrate and movement and control joints is specific to each building, and therefore is the responsibility of the building designer and building contractor and is outside the scope of this Appraisal.

2.5 The membrane must be installed by Viking Roofspec Licensed and Trained Installers.

Building Regulations

New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, Viking Enviroclad, if designed, used, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet the following provisions of the NZBC:

Clause B1 STRUCTURE: Performance B1.3.1, B1.3.2 and B1.3.4. Viking Enviroclad meets these requirements for loads arising from wind [i.e. B1.3.3 (h).] See Paragraphs 8.1 - 8.3

Clause B2 DURABILITY: Performance B2.3.1 (b) 15 years. Viking Enviroclad meets this requirement. See Paragraph 10.1.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.1, E2.3.2 and E2.3.6. Roofs incorporating Viking Enviroclad meet these requirements. See Paragraphs 13.1 - 13.8.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. Viking Enviroclad meets this requirement and will not present a health hazard to people.

Technical Specification

4.1 Materials used with the Viking Roofing and Deck Membrane supplied by Viking Roofspec are as follows:

- **Viking Enviroclad** - a light grey 1.14, 1.5 or 2.0 mm polyester fabric reinforced, multilayer, synthetic roof waterproofing sheet based on thermoplastic polyolefin (TPO). It is supplied in rolls 3.0 m wide x 30.4 m long and 3.66 m wide x 30.4 m long.
- **Viking Enviroclad with APEEL™ Protective Film** - as per Viking Enviroclad but with a removable protective film to protect the Enviroclad during construction. Note: APEEL™ Protective film is to be removed within 90 days of installation.
- **HP-X Fasteners** - #15 wire diameter, mini drill point, buttress style thread fasteners for the mechanically fixed Viking Enviroclad.
- **Piranha Plates (washers)** - Galvalume coated plates (washers) with twelve barbs (in two rows of six). They are 60 mm diameter, 0.9 mm thick with upturned edges.
- **Rhino Bond System**
  - Induction welding tool.
  - 80 mm round specially coated plates.
  - Magnetic heat sink poles.
- **Heat Weldable Walkway** - Heat weldable walkway pad with a rough upper surface for traction. It is available in 3 mm thick rolls 750 mm wide x 15 m.
- **Sure-Weld Bonding Adhesive** - a high strength, solvent based contact adhesive that is used to bond Viking Enviroclad to various porous or non porous substrates. It is supplied as a yellow liquid in 5 US Gallon pails.
- **Pipe Seal** - an injection moulded, pre-formed flashing for pipes from 25 to 650 mm diameter. They are approximately 200 mm in height with a stepped configuration with a large base diameter to cover plates used for attaching the membrane.
- **Coated Metal** - a galvanised metal sheet covered with unreinforced Enviroclad membrane. It is used for edge flashing details and is supplied as a sheet 3.1 m long x 1.2 m wide, and then cut to size.
- **Universal Corners** - Weldable pre-formed internal and external corners for detailing.
- **CCW-102 Sealant** - a one part, moisture curing, elastomeric polyurethane sealant. It is used to fill the sealant pockets to waterproof around penetrations. It is supplied as a white paste in cartridges of 10.3 Fl oz each.
- **Sealant Pockets** - pre-fabricated polymer pockets used for placing around penetrations prior to filling with CCW 102 sealant to ensure weathertight detailing.

- **Cut Edge Sealant** - a free flowing polymeric sealant designed to seal cut edges of Viking Enviroclad and therefore seal in any loose reinforcing strands at the cut edge. It is supplied as high solids, gun consistency material or medium solids, free flowing material. It is either white, grey or tan coloured in 8 oz bottles or 11 oz tubes.

Handling and Storage

5.1 Handling and storage of all materials whether on or off site is under the control of the Viking Roofspec Licensed and Trained Installers. Dry storage must be provided for all products and the rolls of membrane must be lying down on pallets.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the Viking Enviroclad Roof and Deck Membrane. The Technical Literature must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Appraisal must be followed.

Design Information

General

7.1 Viking Enviroclad membrane can be installed using three different fixing methods, one fully bonded, the other two mechanical. The standard method is fully bonded with heat welded seams. The first mechanical method uses HP-X Fasteners and Piranha Plates fixed through the membrane and then covered by the membrane laps. The second mechanical method, Rhino Bond System, induction welds the membrane to pre-installed washers beneath the membrane.

7.2 Viking Enviroclad is for use on roofs, decks, balconies, gutters and parapets where an impervious waterproof membrane is required to prevent damage to building elements and adjoining areas.

7.3 Viking Enviroclad can be adversely affected by contact with bituminous materials or polystyrene insulation. Viking Roofspec should be contacted for advice in either of these situations.

7.4 The effective control of internal moisture must be considered at the design stage due to the impermeability of the membrane. Refer to BRANZ publication "Good Practice Guide to Membrane Roofing".

7.5 Timber framing systems must comply with NZS 3604, or where specific engineering design is used, the framing shall be of at least equivalent stiffness to the framing provisions of NZS 3604, or comply with the serviceability criteria of AS/NZS 1170. In all cases framing must be provided so that the maximum span of the substrate as specified by the substrate manufacturer is met and that all sheet edges are fully supported.

7.6 Roofs where regular foot traffic is envisaged i.e. maintenance of lift equipment, a heat weldable walkway should be used to ensure the membrane is protected. Viking Enviroclad is designed for limited, irregular pedestrian access only.

7.7 Decks must always be protected by a pedestal protection system.

7.8 Refer to Viking Roofspec for deck foot traffic protection system specifications.

Structure

8.1 Viking Enviroclad installed using the standard method of fully bonded with heat welded seams is suitable for use in areas subject to a maximum design differential Ultimate Limit State wind pressure of 6.5kPa, subject to the limitations of the substrate. Viking Enviroclad installed using either of the mechanical fastenings methods, HP-X Fasteners and Piranha Plates or Rhino Bond System is suitable for use in areas subject to maximum design differential Ultimate Limit State wind pressure of 2.7 kPa, subject to the limitations of the substrate.

Substrates

Plywood

9.1 Plywood must be treated to H3 (CCA treated). LOSP treated plywood must not be used. Plywood must comply with NZBC Acceptable Solution E2/AS1, Paragraph 8.5.3 and 8.5.5. Where specific design is required (i.e. the building is outside the scope of NZS 3604 and NZBC Acceptable Solution E2/AS1), the plywood thickness and fixing size may increase and centres may decrease to meet specific wind loadings.

Concrete

9.2 Concrete substrates must be to a specific engineering design meeting the requirements of the NZBC, such as concrete construction to NZS 3101.

Existing Construction

9.3 A thorough inspection of the plywood or concrete substrate must be made to ensure it is in a fit condition and does not contain any materials or contaminants that will adversely affect the performance of the membrane.

9.4 Repairs must be undertaken, where applicable, to ensure the substrate is sound, the joints are sealed, and the flashings are sound. Plywood substrates must be checked for screw fixings, and if necessary refixed as for new plywood.

Durability

Serviceable Life

10.1 Viking Enviroclad installation when subjected to normal conditions of environment and with proper maintenance can expect to have a serviceable life of at least 15 years.

Maintenance

11.1 Maintenance requirements of the membrane are provided by Viking Roofspec.

11.2 In the event of damage to the membrane, the membrane must be repaired by removing the damaged portion and applying a patch as for new work.

11.3 Drainage outlets must be maintained to operate effectively.

Prevention of Fire Occurring

12.1 Separation or protection must be provided to Viking Enviroclad from heat sources such as fire places, heating appliances, flues and chimneys. Part 7 of NZBC Acceptable Solutions C/AS1 - C/AS6 and NZBC Verification Method C/VM1 provide methods for separation and protection of combustible materials from heat sources.

External Moisture

13.1 Roofs and decks must be designed and constructed to shed precipitated moisture. They must also be designed and constructed to shed melted snow in snow prone areas. A means of meeting code compliance with NZBC Clause E2.3.1 for buildings within the scope limitations of Paragraph 2.1 is given by the Technical Literature which aligns with details in NZBC Acceptable Solution E2/AS1.

13.2 When installed in accordance with this Appraisal and the Technical Literature, Viking Enviroclad will prevent the penetration of water and will therefore meet code compliance with NZBC Clause E2.3.2. The membrane is impervious to water and will give a weathertight roof or deck

13.3 The minimum fall for roofs is 1 in 30, for decks 1 in 40 and for gutters 1 in 100. All falls must slope to an outlet. Inadequate falls will allow moisture to collect and increase the risk of deterioration of the membrane.

(Note: Where possible a gutter fall of 1 in 60 is preferred.)

13.4 Viking Enviroclad is impermeable; therefore a means of dissipating construction moisture must be provided in the building design and construction to meet code compliance with NZBC Clause E2.3.6.

13.5 Roof falls must be built into the substrate and not created with mortar screeds over the membrane.

13.6 Allowance for deflection and settlement of the substrate must be made in the design of the roof to ensure falls are maintained and no ponding of water can occur.

13.7 Drainage flanges must be used for any outlet and must be fitted with a grate or cage to reduce potential sources of blockages. An overflow must be provided where the roof or deck does not drain to an external gutter or spouting.

13.8 Penetrations and upstands of the membrane must be raised above the level of any possible flooding caused by blockage of roof drainage.

13.9 The design of details not covered by the Technical Literature is subject to specific weathertightness design. Weathertightness details that are developed by the designer are outside of the scope of this Appraisal and are the responsibility of the designer for compliance with the NZBC.

Installation Information

Installation Skill Level Requirement

14.1 Installation of the membrane must be completed by trained installers, approved by Viking Roofspec.

14.2 Installation of substrates must be completed by tradespersons with an understanding of roof and deck construction, in accordance with instructions given within the Viking Roofspec Technical Literature and this Appraisal.

Preparation of Substrates

15.1 Substrates must be dry, clean and stable before installation commences. Surfaces must be smooth and free from nibs, sharp edges, dust, dirt or other materials such as oil, grease or concrete formwork release agents. All surface defects must be filled to achieve an even and uniform surface.

15.2 Concrete substrates can be checked for dryness by using a hygrometer, as set out in BRANZ Bulletin No. 515. The relative humidity of the concrete must be 75% or less before membrane application.

15.3 The moisture content of a timber substructure must be a maximum of 20% and plywood sheet must be dry at time of membrane application. This will generally require plywood sheets to be covered until just before the membrane is laid, to prevent rain wetting.

Membrane Installation

16.1 The installation of this membrane system is very complex and limited to trained applicators only. The Viking Enviroclad Applicators Manual should be referred to in all instances for the correct procedures.

Inspections

17.1 Critical areas of inspection for waterproofing systems are:

- Construction of substrates, including crack control and installation of bond breakers and movement control joints.
- Moisture content of the substrate prior to the application of the membrane.
- Acceptance of the substrate by the membrane installer prior to application of the membrane.
- Installation of the membrane to the Technical Literature instructions.

Health and Safety

18.1 Safe use and handling procedures for the membrane system is provided in the Technical Literature. The product must be used in conjunction with the relevant Materials Safety Data Sheet.

Basis of Appraisal

The following is a summary of the technical investigations carried out:

Tests

19.1 Testing has been carried out on the membrane by various organisations for shear/joint strength, adhesion, peel resistance, resistance to ageing, resistance to impact, resistance to frost, resistance to freeze/thaw, resistance to UV, elongation, tensile strength, seam strength, breaking strength, low temperature resistance, static puncture resistance, dynamic puncture resistance and artificial weathering followed by tensile strength, elongation, low temperature flexibility retention, and mechanical fastening. Results and test methods have been reviewed by BRANZ and found to be satisfactory.

19.2 Wind face load and fastener pull through testing was completed for the Viking Enviroclad mechanically fastened systems incorporating Piranha Plates and the Rhino Bond System. BRANZ Determined design wind suction pressures, and by comparing these pressures with the NZS 3604 design wind speeds and AS/NZS 1170 pressure coefficients, the fixing requirements were determined for plywood and concrete substrates

Other Investigations

20.1 A durability opinion has been provided by BRANZ technical experts.

20.2 Site visits have been carried out by BRANZ to assess the practicability of installation, and to examine completed installations.

20.3 The Technical Literature has been examined by BRANZ and found to be satisfactory.

Quality

21.1 The manufacture of Viking Enviroclad has not been examined by BRANZ, but details regarding the quality and composition of the materials used were obtained by BRANZ and found to be satisfactory. BRANZ has taken note of product certification covering quality aspects associated with this product.

21.2 The quality of supply of the product to the market is the responsibility of Viking Roofspec.

21.3 Quality on site is the responsibility of the Viking Roofspec Licensed and Trained Installers.

21.4 Designers are responsible for the building and substrate design, and building contractors are responsible for the quality of construction of substrate systems in accordance with the instructions of the substrate manufacturer, Viking Roofspec and this Appraisal.

21.5 The Building owners are responsible for the maintenance of the Viking Enviroclad Roof and Deck Membrane in accordance with Viking Roofer's instructions.

Sources of Information

- AS/NZS 2269: 2012 Plywood - Structural.
- AS/NZS 1170: 2002 Structural Design action - general principles.
- BRANZ Good Practice Guide - Membrane Roofing, reprint October 2015.
- NZS 3101: 2006 The design of concrete structures.
- NZS 3604: 2011 Timber-framed buildings.
- Acceptable Solutions and Verification Methods for New Zealand Building Code External Moisture Clause E2, Ministry of Business, Innovation and Employment, Third Edition July 2005 (Amendment 7, 01 January 2017).
- Ministry of Business, Innovation and Employment Record of amendments - Acceptable Solutions, Verification Methods and handbooks.
- The Building Regulations 1992.

Amendments

Amendment No.1, dated 28 January 2016.

This appraisal has been amended to update the roll sizes of the Viking Enviroclad Membrane.

Amendment No.2, dated 14 November 2017.

This appraisal has been amended to add Viking Enviroclad with APEEL™ Protective Film.

Amendment No. 3, dated 23 May 2018.

This appraisal has been amended to update the Ultimate Limit State wind pressures.

BRANZ

In the opinion of BRANZ, Viking Enviroclad Roofing And Deck Membrane is fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided it is used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to Viking Roofspec, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
   a) relates only to the product as described herein;
   b) must be read, considered and used in full together with the Technical Literature;
   c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
   d) is copyright of BRANZ.
2. Viking Roofspec:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions.
   d) Warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
3. BRANZ makes no representation or warranty as to:
   a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
   c) any guarantee or warranty offered by Viking Roofspec.
4. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
5. BRANZ provides no certification, guarantee, indemnity or warranty, to Viking Roofspec or any third party.

Chelydra Percy
Chief Executive
Date of Issue:
20 February 2015

Hamilton City Council

BUILDING UNIT
APPROVED

BC Number - DD007.2019.00040020.001

Viking Enviroclad Membrane System Product Warranty

Viking Roofspec offers this Warranty for the Viking Membrane System for 20 years from the Warranty Commencement Date ("Warranty Period").

1. Viking Roofspec warrants that the Membrane System will, subject to the terms set out below, retain its waterproofing and weatherproofing for the Warranty Period provided that the Membrane System has been properly installed by a Viking Approved Applicator in accordance with all Viking Roofspec specifications current at the time of installation, including, but not restricted to the technical data and standard details as listed on the Viking Roofspec Website at www.vikingroofspec.co.nz and training provided by Viking Roofspec ("Viking Specifications").

2. This Warranty covers only materials supplied by Viking Roofspec as the Membrane System, including the membrane, proprietary accessories and adhesives; provided materials were new and unused at the time of installation and have not been disturbed thereafter.

3. Warranty Commencement Date _____
   (Date of completion of Membrane System installation)

4. The Membrane System

   Membrane type: Viking Enviroclad

   Membrane thickness: 1.14mm / 1.5mm

   Membrane colour: Grey / White

5. The Building

   Project address _____

   Area of application (e.g. roof, deck) _____

   Installed by _____

6. This Warranty covers only the waterproofing and weatherproofing properties of the Membrane System. Viking Roofspec will not be liable for any failure of the Membrane System or damage resulting from any failure that has been caused in part or in whole by the Membrane System not being installed in accordance with the Viking Specifications. Viking Roofspec does not give any warranty as to the suitability of any installer and will not, in any circumstances be liable for the actions or omission of any installer. Viking Roofspec requires that all Viking Approved Applicators provide a separate Workmanship Warranty covering any defects in the installation of the Membrane System.

7. The Membrane System is not warranted against, and Viking Roofspec shall not be liable for loss of waterproofing properties or damage caused by:

   - objects penetrating the sheeting, or mechanical damage;
   - chemical or substance (save those specifically approved for use by Viking Roofspec);
   - any shifting or altering of the Membrane System after installation;
   - infiltration or condensation of moisture in, around, or above the walls of the Building or the failure of other Building components;

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80 Alexander Crescent, Otara
PO Box 14-541, Panmure
Auckland 1741, New Zealand

Christchurch Office
2 Nazareth Avenue, Middleton
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info@vikingroofspec.co.nz
www.**vikingroofspec**.co.nz

- the lack of positive drainage (ponded water);
- the lack of adequate ventilation;
- environmental factors including dirt, pollutants and biological agents, fungi, bacteria or spores;
- accident or intentional or negligent acts, misuse, abuse, vandalism or civil disobedience or the like; or
- Acts of God which include, but are not limited to, acts of nature without human intervention, such as earthquakes, storms, floods, lightning strikes, and explosions.

8. In addition to the above limitations, this Warranty will be void and Viking Roofspec will not be liable under it if;

- any alteration or repair is made on or through the Membrane System (including, but not limited to: structures, fixtures or utilities) without prior written authorisation from Viking Roofspec;
- any alteration or repair is made to the Membrane System by a person other than a Viking Approved Applicator;
- the owner of the Building fails to use reasonable care in maintaining the Membrane System, such maintenance to include (but not be limited to) those items listed in the Membrane Care and Maintenance information, as amended and updated from time to time. Current Membrane Care and Maintenance information is available from our website at www.vikingroofspec.co.nz. You acknowledge that Viking Roofspec has no obligation to notify you of changes to the Membrane Care and Maintenance information; or
- the Building is moved from the site at which the Membrane System was originally installed.

9. Change in the aesthetics, colour or finish of the Membrane System, or "Tenting" of the Membrane System due to substrate movement, are not covered by this Warranty.

10. Viking Roofspec shall not be liable under this Warranty (or any implied warranties which are not excluded under clause (16) for any consequential, indirect or special loss or damage of any kind whatsoever, or loss of profits, whether under contract, tort or otherwise.

11. Viking Roofspec's liability is in any circumstances limited to (at the option of Viking Roofspec) either;

- providing for the repair of the original Membrane System,
- or providing a credit to be applied towards the purchase of a new Membrane System, calculated *pro rata*, based upon the number of remaining months of the unexpired Warranty Period, using the current material prices for the Membrane System. The maximum *pro rata* value allowed by Viking Roofspec for repair or credit shall not exceed the original purchase price of the product supplied.

12. The obligations under this Warranty shall only be enforceable against Viking Roofspec upon completion of the installation of the Membrane System; completion of the installation contract; and once payment in full has been received for the product supplied.

13. Should any defect occur which requires a remedy under the terms of this Warranty, then the defect must be notified to Viking Roofspec in writing within fourteen (14) days of discovery. By notifying Viking Roofspec you authorise Viking Roofspec to investigate the Warranty claim to assess whether it falls within the terms of this Warranty. Should our investigation of the claim find that the cause is outside the terms of this Warranty, then you acknowledge and agree that Viking Roofspec may charge you its reasonable investigation costs. You agree to provide Viking Roofspec free access to the Membrane System in order to investigate or to affect repairs under this Warranty during normal business hours.

14. Any remedial work required under this Warranty shall be as determined by Viking Roofspec and shall be carried out in accordance with the Viking Specifications by a contractor nominated by Viking Roofspec. Viking Roofspec does not accept liability for delay in sourcing or inability to match repair materials exactly to those originally installed.

15. Nothing in this Warranty shall require Viking Roofspec to shift any fixtures, plant, equipment, flashings or other items so as to allow access to part of any Membrane System to be repaired or replaced. Neither shall Viking Roofspec be liable for any costs involved in such shifting or reinstallation.

16. This Warranty represents the limit of Viking Roofspec's liability for the Membrane System. All other warranties, express or implied, are hereby excluded to the maximum extent permitted by applicable law.

17. Notwithstanding any other provisions of this Warranty, nothing in this Warranty is intended to limit any condition, warranty, right or remedy available under or imposed by any applicable legislation (including, for the avoidance of doubt but without limitation, the Building Act 2004, the Fair Trading Act 1986 and the Consumer Guarantees Act 1993) except to the extent permitted by such legislation.

18. This Warranty shall be governed according to the laws of New Zealand and any disputes shall be decided in the courts of New Zealand.

Warranty Workmanship no	Viking Warranty No
For Viking Roofspec	Date issued

BRANZ Appraised
Appraisal No. 656 [2015]

VIKING ENVIROCLAD ROOFING AND DECK MEMBRANE

Appraisal No. 656 (2015)

This Appraisal replaces Appraisal No. 656 (2009).

Amended 16 August 2019

BRANZ Appraisals

Technical Assessments of products for building and construction.

Product

1.1 Viking Enviroclad is a single ply, polyester fabric reinforced, thermoplastic polyolefin (TPO) waterproofing sheet membrane for flat or pitched roofs and decks. It can be applied as a fully bonded or mechanically fixed system.

Scope

2.1 Viking Enviroclad has been appraised as a roof and deck waterproofing membrane on buildings within the following scope:

- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1; or
- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1 with respect to building height and maximum floor plan areas when subject to specific design; and,
- with building structures designed and constructed to meet the requirements of the NZBC; and,
- with substrates of plywood or concrete slab; and,
- with minimum falls for roofs of 1:30 and decks of 1:40; and,
- with decks that have a maximum area of 40 m^2; and,
- situated in NZS 3604 Wind Zones, up to, and including Extra High.

2.2 Viking Enviroclad has also been appraised for use as a roof and deck waterproofing membrane on specifically designed buildings within the following scope:

- subject to specific structural and weathertightness design; and,
- with substrates of plywood or concrete slab; and,
- situated in specific design wind pressures (refer Paragraph 8.1) and,
- with the weathertightness design of junctions for each specific structure being the responsibility of the building designer.

2.3 Roofs and decks waterproofed with Viking Enviroclad must be designed and constructed in accordance with the following limitations:

- nominally flat or pitched roofs and decks constructed to drain water to gutters and drainage outlets complying with the NZBC; and,
- with no steps within the deck level, no integral roof gardens and no downpipe direct discharge to the decks; and,
- with the deck membrane continually protected from physical damage by pedestal protection system or Viking Decoupling System.

2.4 The design and construction of the substrate and movement and control joints is specific to each building, and therefore is the responsibility of the building designer and building contractor and is outside the scope of this Appraisal.

2.5 The membrane must be installed by Viking Roofspec Licensed and Trained Installers.

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Web: www.vikingroofspec.co.nz

BRANZ
1222 Moonshine Rd,
RD1, Porirua 5381
Private Bag 50 908
Porirua 5240,
New Zealand
Tel: 04 237 1170
branz.co.nz

Building Regulations

New Zealand Building Code (NZBC)

3.1 **In the opinion of BRANZ, Viking Enviroclad, if designed, used, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet the following provisions of the NZBC:**

Clause B1 STRUCTURE: Performance B1.3.1, B1.3.2 and B1.3.4. Viking Enviroclad meets these requirements for loads arising from wind [i.e. B1.3.3 (h).] See Paragraphs 8.1 - 8.3

Clause B2 DURABILITY: Performance B2.3.1 (b) 15 years. Viking Enviroclad meets this requirement. See Paragraph 10.1.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.1, E2.3.2 and E2.3.6. Roofs incorporating Viking Enviroclad meet these requirements. See Paragraphs 13.1 - 13.8.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. Viking Enviroclad meets this requirement and will not present a health hazard to people.

Technical Specification

4.1 Materials used with the Viking Roofing and Deck Membrane supplied by Viking Roofspec are as follows:

- **Viking Enviroclad** - a light grey 1.14, 1.5 or 2.0 mm polyester fabric reinforced, multilayer, synthetic roof waterproofing sheet based on thermoplastic polyolefin (TPO). It is supplied in rolls 3.0 m wide x 30.4 m long and 3.66 m wide x 30.4 m long.
- **Viking Enviroclad with APEEL™ Protective Film** - as per Viking Enviroclad but with a removable protective film to protect the Enviroclad during construction. Note: APEEL™ Protective film is to be removed within 90 days of installation.
- **HP-X Fasteners** - #15 wire diameter, mini drill point, buttress style thread fasteners for the mechanically fixed Viking Enviroclad.
- **Piranha Plates (washers)** - Galvalume coated plates (washers) with twelve barbs (in two rows of six). They are 60 mm diameter, 0.9 mm thick with upturned edges.
- **Rhino Bond System**
  - Induction welding tool.
  - 80 mm round specially coated plates.
  - Magnetic heat sink poles.
- **Heat Weldable Walkway** - Heat weldable walkway pad with a rough upper surface for traction. It is available in 3 mm thick rolls 750 mm wide x 15 m.
- **Sure-Weld Bonding Adhesive** - a high strength, solvent based contact adhesive that is used to bond Viking Enviroclad to various porous or non porous substrates. It is supplied as a yellow liquid in 5 US Gallon pails.
- **Pipe Seal** - an injection moulded, pre-formed flashing for pipes from 25 to 650 mm diameter. They are approximately 200 mm in height with a stepped configuration with a large base diameter to cover plates used for attaching the membrane.
- **Coated Metal** - a galvanised metal sheet covered with unreinforced Enviroclad membrane. It is used for edge flashing details and is supplied as a sheet 3.1 m long x 1.2 m wide, and then cut to size.
- **Universal Corners** - Weldable pre-formed internal and external corners for detailing.
- **CCW-102 Sealant** - a one part, moisture curing, elastomeric polyurethane sealant. It is used to fill the sealant pockets to waterproof around penetrations. It is supplied as a white paste in cartridges of 10.3 Fl oz each.
- **Sealant Pockets** - pre-fabricated polymer pockets used for placing around penetrations prior to filling with CCW 102 sealant to ensure weathertight detailing.

- **Cut Edge Sealant** - a free flowing polymeric sealant designed to seal cut edges of Viking Enviroclad and therefore seal in any loose reinforcing strands at the cut edge. It is supplied as high solids, gun consistency material or medium solids, free flowing material. It is either white, grey or tan coloured in 8 oz bottles or 11 oz tubes.
- **Viking Decoupling System**
  - Viking Decoupling Mat
  - Viking Decoupling Tape
  - Base Adhesive

Handling and Storage

5.1 Handling and storage of all materials whether on or off site is under the control of the Viking Roofspec Licensed and Trained Installers. Dry storage must be provided for all products and the rolls of membrane must be lying down on pallets.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the Viking Enviroclad Roof and Deck Membrane. The Technical Literature must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Appraisal must be followed.

Design Information

General

7.1 Viking Enviroclad membrane can be installed using three different fixing methods, one fully bonded, the other two mechanical. The standard method is fully bonded with heat welded seams. The first mechanical method uses HP-X Fasteners and Piranha Plates fixed through the membrane and then covered by the membrane laps. The second mechanical method, Rhino Bond System, induction welds the membrane to pre-installed washers beneath the membrane.

7.2 Viking Enviroclad is for use on roofs, decks, balconies, gutters and parapets where an impervious waterproof membrane is required to prevent damage to building elements and adjoining areas.

7.3 Viking Enviroclad can be adversely affected by contact with bituminous materials or polystyrene insulation. Viking Roofspec should be contacted for advice in either of these situations.

7.4 The effective control of internal moisture must be considered at the design stage due to the impermeability of the membrane. Refer to BRANZ publication "Good Practice Guide to Membrane Roofing".

7.5 Timber framing systems must comply with NZS 3604, or where specific engineering design is used, the framing shall be of at least equivalent stiffness to the framing provisions of NZS 3604, or comply with the serviceability criteria of AS/NZS 1170. In all cases framing must be provided so that the maximum span of the substrate as specified by the substrate manufacturer is met and that all sheet edges are fully supported.

7.6 Roofs where regular foot traffic is envisaged i.e. maintenance of lift equipment, a heat weldable walkway should be used to ensure the membrane is protected. Viking Enviroclad is designed for limited, irregular pedestrian access only.

7.7 Decks must always be protected by a pedestal protection system or Viking Decoupling System.

7.8 Refer to Viking Roofspec for deck foot traffic protection system specifications.

Structure

8.1 Viking Enviroclad installed using the standard method of fully bonded with heat welded seams is suitable for use in areas subject to a maximum design differential Ultimate Limit State wind pressure of 6.5kPa, subject to the limitations of the substrate. Viking Enviroclad installed using either of the mechanical fastenings methods, HP-X Fasteners and Piranha Plates or Rhino Bond System is suitable for use in areas subject to maximum design differential Ultimate Limit State wind pressure of 2.7 kPa, subject to the limitations of the substrate.

Substrates

Plywood

9.1 Plywood must be treated to H3 (CCA treated). LOSP treated plywood must not be used. Plywood must comply with NZBC Acceptable Solution E2/AS1, Paragraph 8.5.3 and 8.5.5. Where specific design is required (i.e. the building is outside the scope of NZS 3604 and NZBC Acceptable Solution E2/AS1), the plywood thickness and fixing size may increase and centres may decrease to meet specific wind loadings.

Concrete

9.2 Concrete substrates must be to a specific engineering design meeting the requirements of the NZBC, such as concrete construction to NZS 3101.

Existing Construction

9.3 A thorough inspection of the plywood or concrete substrate must be made to ensure it is in a fit condition and does not contain any materials or contaminants that will adversely affect the performance of the membrane.

9.4 Repairs must be undertaken, where applicable, to ensure the substrate is sound, the joints are sealed, and the flashings are sound. Plywood substrates must be checked for screw fixings, and if necessary refixed as for new plywood.

Durability

Serviceable Life

10.1 Viking Enviroclad installation when subjected to normal conditions of environment and with proper maintenance can expect to have a serviceable life of at least 15 years.

Maintenance

11.1 Maintenance requirements of the membrane are provided by Viking Roofspec.

11.2 In the event of damage to the membrane, the membrane must be repaired by removing the damaged portion and applying a patch as for new work.

11.3 Drainage outlets must be maintained to operate effectively.

Prevention of Fire Occurring

12.1 Separation or protection must be provided to Viking Enviroclad from heat sources such as fire places, heating appliances, flues and chimneys. Part 7 of NZBC Acceptable Solutions C/AS1 - C/AS6 and NZBC Verification Method C/VM1 provide methods for separation and protection of combustible materials from heat sources.

External Moisture

13.1 Roofs and decks must be designed and constructed to shed precipitated moisture. They must also be designed and constructed to shed melted snow in snow prone areas. A means of meeting code compliance with NZBC Clause E2.3.1 for buildings within the scope limitations of Paragraph 2.1 is given by the Technical Literature which aligns with details in NZBC Acceptable Solution E2/AS1.

13.2 When installed in accordance with this Appraisal and the Technical Literature, Viking Enviroclad will prevent the penetration of water and will therefore meet code compliance with NZBC Clause E2.3.2. The membrane is impervious to water and will give a weathertight roof or deck.

13.3 The minimum fall for roofs is 1 in 30, for decks 1 in 40 and for gutters 1 in 100. All falls must slope to an outlet. Inadequate falls will allow moisture to collect and increase the risk of deterioration of the membrane.

(Note: Where possible a gutter fall of 1 in 60 is preferred.)

13.4 Viking Enviroclad is impermeable; therefore a means of dissipating construction moisture must be provided in the building design and construction to meet code compliance with NZBC Clause E2.3.6.

13.5 Roof falls must be built into the substrate and not created with mortar screeds over the membrane.

13.6 Allowance for deflection and settlement of the substrate must be made in the design of the roof to ensure falls are maintained and no ponding of water can occur.

13.7 Drainage flanges must be used for any outlet and must be fitted with a grate or cage to reduce potential sources of blockages. An overflow must be provided where the roof or deck does not drain to an external gutter or spouting.

13.8 Penetrations and upstands of the membrane must be raised above the level of any possible flooding caused by blockage of roof drainage.

13.9 The design of details not covered by the Technical Literature is subject to specific weathertightness design. Weathertightness details that are developed by the designer are outside of the scope of this Appraisal and are the responsibility of the designer for compliance with the NZBC.

Installation Information

Installation Skill Level Requirement

14.1 Installation of the membrane must be completed by trained installers, approved by Viking Roofspec.

14.2 Installation of substrates must be completed by tradespersons with an understanding of roof and deck construction, in accordance with instructions given within the Viking Roofspec Technical Literature and this Appraisal.

Preparation of Substrates

15.1 Substrates must be dry, clean and stable before installation commences. Surfaces must be smooth and free from nibs, sharp edges, dust, dirt or other materials such as oil, grease or concrete formwork release agents. All surface defects must be filled to achieve an even and uniform surface.

15.2 Concrete substrates can be checked for dryness by using a hygrometer, as set out in BRANZ Bulletin No. 515. The relative humidity of the concrete must be 75% or less before membrane application.

15.3 The moisture content of a timber substructure must be a maximum of 20% and plywood sheet must be dry at time of membrane application. This will generally require plywood sheets to be covered until just before the membrane is laid, to prevent rain wetting.

Membrane Installation

16.1 The installation of this membrane system is very complex and limited to trained applicators only. The Viking Enviroclad Applicators Manual should be referred to in all instances for the correct procedures.

Inspections

17.1 Critical areas of inspection for waterproofing systems are:

- Construction of substrates, including crack control and installation of bond breakers and movement control joints.
- Moisture content of the substrate prior to the application of the membrane.
- Acceptance of the substrate by the membrane installer prior to application of the membrane.
- Installation of the membrane to the Technical Literature instructions.

Health and Safety

18.1 Safe use and handling procedures for the membrane system is provided in the Technical Literature. The product must be used in conjunction with the relevant Materials Safety Data Sheet.

Basis of Appraisal

The following is a summary of the technical investigations carried out:

Tests

19.1 Testing has been carried out on the membrane by various organisations for shear/joint strength, adhesion, peel resistance, resistance to ageing, resistance to impact, resistance to frost, resistance to freeze/thaw, resistance to UV, elongation, tensile strength, seam strength, breaking strength, low temperature resistance, static puncture resistance, dynamic puncture resistance and artificial weathering followed by tensile strength, elongation, low temperature flexibility retention, and mechanical fastening. Results and test methods have been reviewed by BRANZ and found to be satisfactory.

19.2 Wind face load and fastener pull through testing was completed for the Viking Enviroclad mechanically fastened systems incorporating Piranha Plates and the Rhino Bond System. BRANZ Determined design wind suction pressures, and by comparing these pressures with the NZS 3604 design wind speeds and AS/NZS 1170 pressure coefficients, the fixing requirements were determined for plywood and concrete substrates

Other Investigations

20.1 A durability opinion has been provided by BRANZ technical experts.

20.2 Site visits have been carried out by BRANZ to assess the practicability of installation, and to examine completed installations.

20.3 The Technical Literature has been examined by BRANZ and found to be satisfactory.

Quality

21.1 The manufacture of Viking Enviroclad has not been examined by BRANZ, but details regarding the quality and composition of the materials used were obtained by BRANZ and found to be satisfactory. BRANZ has taken note of product certification covering quality aspects associated with this product.

21.2 The quality of supply of the product to the market is the responsibility of Viking Roofspec.

21.3 Quality on site is the responsibility of the Viking Roofspec Licensed and Trained Installers.

21.4 Designers are responsible for the building and substrate design, and building contractors are responsible for the quality of construction of substrate systems in accordance with the instructions of the substrate manufacturer, Viking Roofspec and this Appraisal.

21.5 The Building owners are responsible for the maintenance of the Viking Enviroclad Roof and Deck Membrane in accordance with Viking Roofer's instructions.

Sources of Information

- AS/NZS 2269: 2012 Plywood - Structural.
- AS/NZS 1170: 2002 Structural Design action - general principles.
- BRANZ Good Practice Guide - Membrane Roofing, reprint October 2015.
- NZS 3101: 2006 The design of concrete structures.
- NZS 3604: 2011 Timber-framed buildings.
- Acceptable Solutions and Verification Methods for New Zealand Building Code External Moisture Clause E2, Ministry of Business, Innovation and Employment, Third Edition July 2005 (Amendment 7, 01 January 2017).
- Ministry of Business, Innovation and Employment Record of amendments - Acceptable Solutions, Verification Methods and handbooks.
- The Building Regulations 1992.

Amendments

Amendment No.1, dated 28 January 2016.

This appraisal has been amended to update the roll sizes of the Viking Enviroclad Membrane.

Amendment No.2, dated 14 November 2017.

This appraisal has been amended to add Viking Enviroclad with APEEL™ Protective Film.

Amendment No. 3, dated 23 May 2018.

This appraisal has been amended to update the Ultimate Limit State wind pressures.

Amendment No. 4, dated 16 August 2019

This Appraisal has been amended to add to the Viking Decoupling System.

In the opinion of BRANZ, Viking Enviroclad Roofing And Deck Membrane is fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided it is used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to Viking Roofspec, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
   a) relates only to the product as described herein;
   b) must be read, considered and used in full together with the Technical Literature;
   c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
   d) is copyright of BRANZ.
2. Viking Roofspec:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions.
   d) Warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
3. BRANZ makes no representation or warranty as to:
   a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
   c) any guarantee or warranty offered by Viking Roofspec.
4. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
5. BRANZ provides no certification, guarantee, indemnity or warranty, to Viking Roofspec or any third party.

For BRANZ

Chelydra Percy
Chief Executive

Date of Issue:
20 February 2015

Hamilton City Council
BUILDING UNIT
APPROVED
BC Number - DD007.2019.00040020.001

shadowclad®

SHADOWCLAD® STRUCTURAL Natural GROOVE | SHADOWCLAD® STRUCTURAL Natural TEXTURE | SHADOWCLAD® STRUCTURAL Ultra GROOVE | SHADOWCLAD® STRUCTURAL Ultra TEXTURE | SHADOWCLAD® FLASHINGS

SHADOWCLAD® SPECIFICATION & INSTALLATION GUIDE

FOR MIXED CLADDING SYSTEMS ON CAVITY CONSTRUCTION

MAY 2018

CarterHoltHarvey Woodproducts New Zealand

Information contained within is specific to Shadowclad® structural plywood products and must not be used with any other plywood products, no matter how similar they may appear.

shadowclad®

MIXED CLADDING SYSTEMS ON CAVITY CONSTRUCTION

Contents

CarterHoltHarvey
Woodproducts New Zealand

1.0 SHADOWCLAD® PRODUCT RANGE

Manufactured in New Zealand by Carter Holt Harvey® Woodproducts, Shadowclad® panels are suitable for use as an exterior wall cladding when using H3 treated panels or as an internal wall or ceiling lining when using untreated panels.

Shadowclad is manufactured under a third party audited quality control programme to monitor compliance with AS/NZS 2269 Plywood Structural. All Shadowclad products carry Engineered Wood Products Association of Australasia (EWPAA) Joint Accreditation System – Australia and New Zealand (EWPAA/JAS-ANZ) certification.

Shadowclad has been BRANZ appraised as a cladding material for cavity wall construction. To view the BRANZ Appraisal No. 764 (2017) visit www.shadowclad.co.nz.

Our other plywood products:

- For specific information on plywood as a rigid air barrier, and/or bracing, refer to the current Ecoply® Barrier Specification and Installation Guide.
- For information relating to Ecoply® structural plywood and applications other than exterior cladding, refer to the current Ecoply Specification and Installation Guide.

These are all available for download from www.chhwoodproducts.co.nz.

The Shadowclad for cavity construction BRANZ Appraisal No. 764 (2017) does not cover:

- Shadowclad® used as an interior lining.
- Handiply® Utilityclad plywood products.
- Shadowclad in direct fix cladding applications.

Shadowclad products must be competently installed in accordance with good building practices and sound design principles to satisfy the requirements of the Building Act 2004, the New Zealand Building Code (NZBC), and applicable New Zealand Standards. This is the responsibility of building owners and the design professionals and builders that they engage. **This Shadowclad® Specification and Installation Guide for Mixed Cladding should be read in conjunction with the Shadowclad Specification and Installation Guide for Cavity Construction, which contains information, limitations, and cautions regarding the properties, handling, installation, usage, and the maintenance of Shadowclad products.** However, to the maximum extent permitted by law, CHH Woodproducts assumes no legal liability to you in relation to this information.

The information contained in this document is current as at May 2018. It is your responsibility to ensure you have the most up to date information available.

The information contained in this publication relates specifically to Shadowclad® structural plywood products manufactured by Carter Holt Harvey Woodproducts and must not be used with any other plywood manufacturer's products no matter how similar they may appear.

Alternative plywood products can differ in a number of ways which may not be immediately obvious and substituting them for Shadowclad structural plywood products is not appropriate, and could in extreme cases lead to premature failure and/or buildings which do not meet the requirements of the NZBC.

1.1 TECHNICAL INFORMATION & CAD DETAILS

This brochure should be read in conjunction with the Shadowclad® Specification and Installation for Cavity Construction. When specifying or installing any Shadowclad product visit www.shadowclad.co.nz or call 0800 326 759 to ensure you have current specification material and any relevant technical notes.

Having trouble installing Shadowclad®? Visit wwww.shadowclad.co.nz or download the Shadowclad APP to view the installation animation of common Shadowclad junctions.

1.2 FLASHING DESCRIPTIONS & RANGE FOR MIXED CLADDING SYSTEMS

Shadowclad® Aluminium Exterior Flashing Range

Manufactured from extruded aluminium the Shadowclad® flashings range is purpose designed to complement Shadowclad panels used in exterior applications with alternate cladding systems.

Shadowclad flashings achieve 50 year durability in all NZS 3604 exposure zones including zone D (sea spray).

Note: Stainless steel fasteners should not have contact with or pierce aluminium flashings. Where stainless steel fasteners are to pierce flashings, stainless steel flashings should be used.

The range includes internal and external angles, horizontal and inter-storey 'Z' flashings and a cavity base closure. The Shadowclad flashings range has now been expanded to include a 'T' flashing for mixed junctions. Refer to table 1 in this guide.

Aluminium horizontally installed flashings come in 3600mm lengths and vertically installed angles are available in 3000mm and 6000mm lengths. Refer to the Shadowclad Specification and Installation Guide for other flashings.

The information, details and performance statements provided in this guide are based on Shadowclad plywood panels and Shadowclad flashings being used together as a system. CHH Woodproducts does not recommend that Shadowclad plywood panels be installed with non-CHH Woodproducts flashings. Flashings not supplied by CHH Woodproducts must, as a minimum, comply with E2/AS1 specifications and be compatible for use with H3.1 LOSP or H3.2 CCA treated plywood. It is the Designer's responsibility to ensure that any non-CHH Woodproducts flashings are fit for purpose and compatible with Shadowclad products and any other building materials or components of the exterior wall.

Aluminium Flashing Finishes

Shadowclad aluminium flashings are available in either natural anodised finish (silver colour), powder coated (range of colours available via www.shadowclad.co.nz) for immediate installation or in mill finish for powder coating in alternative colours.

Shadowclad vertical aluminium flashings are provided in 3.0m length for single storey application and 6.0m length for double storey application.

Exterior Flashings & H3.2 CCA Treated Shadowclad

Exposure Zone B & C

H3.2 CCA treated Shadowclad in exposure zones B and C (where flashings are exposed to weather) must use mill finished flashings which must be powder coated to the desired colour or use stainless steel flashings.

H3.2 CCA treatment contains copper. As such, some form of isolation between aluminium flashings and H3.2 CCA treated panels such as powder coating of the flashings is required. Refer to Table 21 "Compatibility of Materials in Contact" in E2/AS1 for more information.

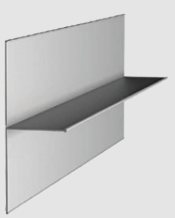
Exposure Zone D (Sea Spray)

In exposure zone D (sea spray) flashings exposed to weather must be stainless steel for H3.2 CCA treated Shadowclad.

H3.2 CCA Treated Shadowclad

Uncoated aluminium flashings are not permitted to be in direct contact in any zone with H3.2 CCA treated Shadowclad under any circumstances.

Table 1 Aluminium Shadowclad® Mixed Junction Flashings Range

Flashing	Line Drawing	Description	Finish Available	Length (mm)
'T' Flashing		'T' Flashing for mixed cladding junctions	Natural Anodised, Colour Powder Coated or Mill	3000 or 6000

For the current range of Colour Powder Coated options please visit www.shadowclad.co.nz.

1.3 PRESERVATIVE TREATMENT

Shadowclad® is available either H3 treated for use as an exterior cladding or untreated (Natural finish products only) for interior wall and ceiling linings. H3 treated Shadowclad is treated in accordance with AS/NZS 1604.3 with the standard treatment for Shadowclad panels being H3.1 LOSP (Azole). H3.2 CCA treatment is available for Shadowclad Ultra (pre-primed Shadowclad) if required.

Shadowclad® is envelope preservative treated. Where sheets are cut, cuts must be coated with a brush on timber preservative in accordance with the relevant Manufacturer's instructions. Holdfast® Metalex® Concentrated Timber Preservative Clear (Holdfast® Metalex® Clear) is recommended. Failure to properly apply preservative to cut edges will negatively affect the durability of cut panels.

H3.1 LOSP Treatment

H3.1 LOSP treatment is the standard treatment for Shadowclad panels as it does not discolour the panel surface and does not use water in the treatment process allowing panels to remain at uniform dimensions.

When coating H3.1 LOSP treated plywood some residual solvent may be present on the sheet surface from the treatment process. Sheets feeling greasy to touch should be placed in a well ventilated area and allowed to flash off to ensure proper adhesion of paints and stains to the sheet surface.

Mechanical fasteners are required to fix H3.1 LOSP treated Shadowclad to framing. Do not glue Shadowclad to frames.

H3.2 CCA Treatment

H3.2 CCA uses water during the treatment process and may leave panel surfaces with a slight green colour. For this reason H3.2 CCA treatment is available only in the Shadowclad Ultra finish.

Table 2: Preservative Treatment Options

	Untreated	H3.1 LOSP (Azole)	H3.2 CCA
Preservative Carrier	N/A	Light organic oil (white spirits)	Water
Colour	Natural	Natural	Green
Fungicide	Heat treated dry wood	Propiconazole and Tebuconazole	Copper
Insecticide	Heat treated dry wood	Permethrin	Arsenate
Other Chemicals	N/A	Butyl Oxitol (co-solvent to assist active stability)	Chrome (to fix preservative in water)
Mouldicide	N/A	IPBC	Copper (limited efficiency)
Notes	Plywood for dry interior use, supplied ex mill at <15% moisture content	Solvent does not affect dimensions. Solvent smell disappears when exposed to air flow	Dried after treatment to average 18% moisture content
Applications (Refer NZ3602)	Interior dry protected	Exterior (service performance subject to detailing & coatings used)	Exterior (service performance subject to detailing & coatings used)

1.4 PRODUCT IDENTIFICATION

In accordance with AS/NZS 2269, every sheet of Shadowclad plywood has the following information marked on the back:

- Brand name: e.g. SHADOWCLAD®.
- Intended application: e.g. STRUCTURAL.
- Glue bond: e.g. A BOND.
- Formaldehyde emission class: e.g. E0.
- Australasian Standard: e.g. AS/NZS 2269:2012.
- Treatment Standard (if applicable) e.g. AS/NZS 1604.3:2012.
- Date and time of manufacture: e.g. 01/12/15 12:34:56.
- The Engineered Wood Products Association of Australasia (EWPAA) brand and mill number: e.g. 911 (Tokoroa mill).

Treated Example:

SHADOWCLAD® STRUCTURAL A BOND
E0 AS/NZS 2269.0:2012
AS/NZS 1604.3:2012 400 64 H3 E LOSP
RETREAT CUTS PAT 01/12/15 12:23:45
911

Untreated Example:

SHADOWCLAD STRUCTURAL A BOND
E0 AS/NZS 2269.0:2012
UNTREATED – FOR INTERNAL USE
ONLY PAT 01/ 2/15 12:23:45
911

2.0 DESIGN CONSIDERATIONS

2.1 DESIGN RESPONSIBILITY

Design responsibility lies with the building owner and the professionals that they engage. The specifier for the project must ensure that the details in the specification for their individual projects are appropriate for the intended application. The specifier must also ensure that additional detailing is provided for specific design, alternate cladding systems, or any areas that fall outside the scope and specifications of this literature. It is the specifier's responsibility to ensure that non-CHH Woodproducts products are fit for purpose, and compatible with Shadowclad® products.

Good detailing which avoids moisture or dust accumulation on the sheet surface can help increase durability and aesthetics. Roof overhangs contribute to performance as they offer shade and will protect walls from rain and dust. Trims should be bevelled to shed moisture and flashings should be detailed with gaps that do not trap water at the panel edges.

2.2 LITERATURE SCOPE

Shadowclad can be used for those structures which fall within the scope of Acceptable Solution E2/AS1- External Moisture. Shadowclad is recommended for a drained and ventilated cavity, where the cladding is fixed onto timber battens fixed over the timber frame and building underlay.

Shadowclad is not recommended where a risk score >20 in accordance with E2/AS1 is established.

All alternate cladding systems detailed (weatherboard, solid plaster and brick) must comply with NZBC Clause E2 and be detailed and installed to E2/AS1 or the manufacturers installation details as applicable.

2.3 CODE COMPLIANCE

Shadowclad 'T' flashings and associated details, as an Alternative Solution, have been appraised by BRANZ as meeting the performing levels of Acceptable Solution E2/AS1.

2.4 HEALTH & SAFETY

Shadowclad should be installed and used as per the Safety Data Sheet (SDS) which can be downloaded from www.shadowclad.co.nz.

Always wear safety glasses or non-fogging goggles when cutting Shadowclad panels and flashings.

If wood dust exposures are not controlled when machining (sawing, routing, planing, drilling etc) a class P1 or P2 replaceable filter or disposable face piece respirator should be worn.

Wear comfortable work gloves to avoid skin irritation and the risk of splinters. Wash hands with mild soap and water after handling panels.

2.5 STORAGE & HANDLING

Shadowclad® Panels:

- Keep Shadowclad® panels dry.
- Store under cover.
- Handle and stack with care to avoid damage.
- Stack flat; clear of ground, on at least three evenly spaced bearers.
- Store in well-ventilated areas away from sources of heat, flames or sparks.

Shadowclad Flashings:

- Keep dry. Should a shipment of Shadowclad flashings arrive in a wet condition, they should be immediately dried before storing.
- When storing flashings avoid contact with other metals which may cause scratches or marks. The use of shelving or racks faced with dry wood is recommended.
- Keep away from caustics, nitrates and acids.

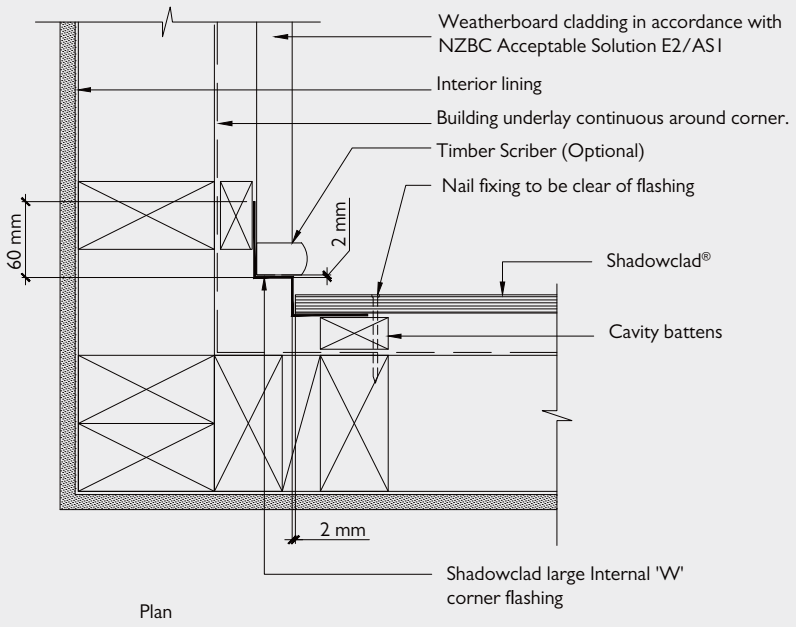
3.0 INSTALLATION – SHADOWCLAD® FLASHINGS INCORPORATING MIXED CLADDINGS

3.1 SHADOWCLAD® & WEATHERBOARD VERTICAL JUNCTIONS

Flashings should have expansion joints where necessary to provide adequate allowance for thermal expansion as set out below:

- Expansion joints to be provided for joined flashings when their combined length exceeds 8 metres.
- Even if less than 8 metres in length, where both ends of a flashing are constrained and fixed allowance should be made for expansion.

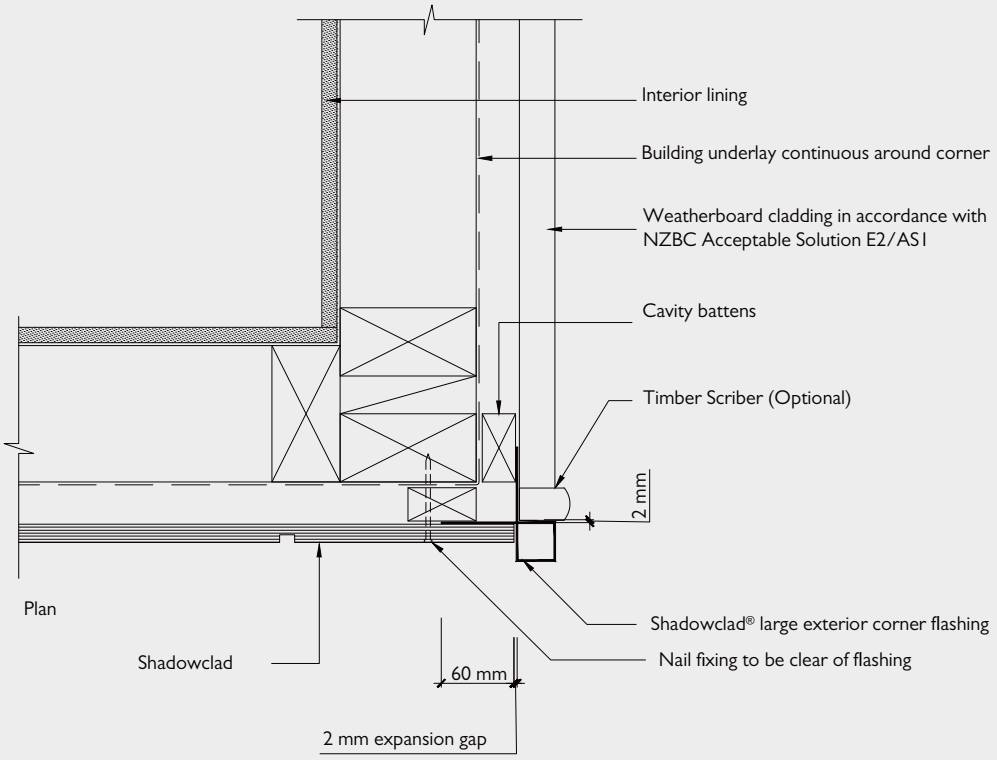
SC060: Shadowclad® to Weatherboard Internal Junctions



Plan

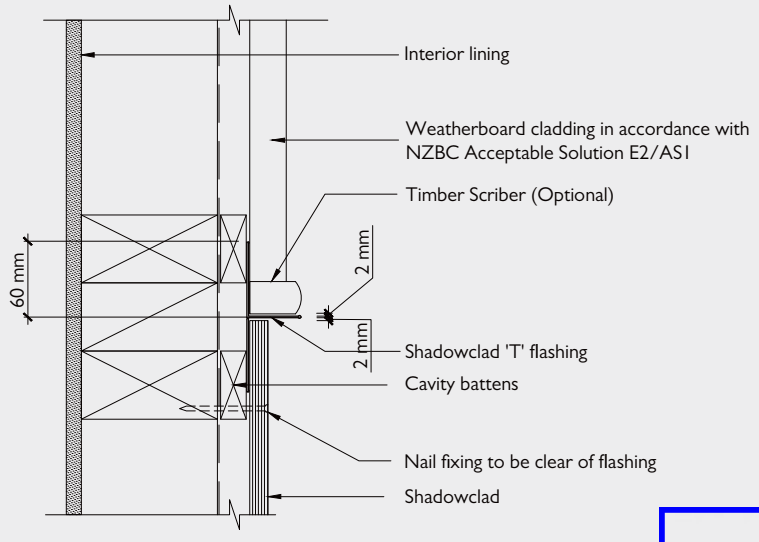
Note.
1. Allow 2 mm expansion gap between flashing and cladding
2. Treat all Shadowclad cut edges with Holdfast® Metalex® Clear

SC061: Shadowclad® to Weatherboard External Junctions



Note.
1. Allow 2 mm expansion gap between flashing and cladding
2. Treat all Shadowclad cut edges with Holdfast® Metalex® Clear

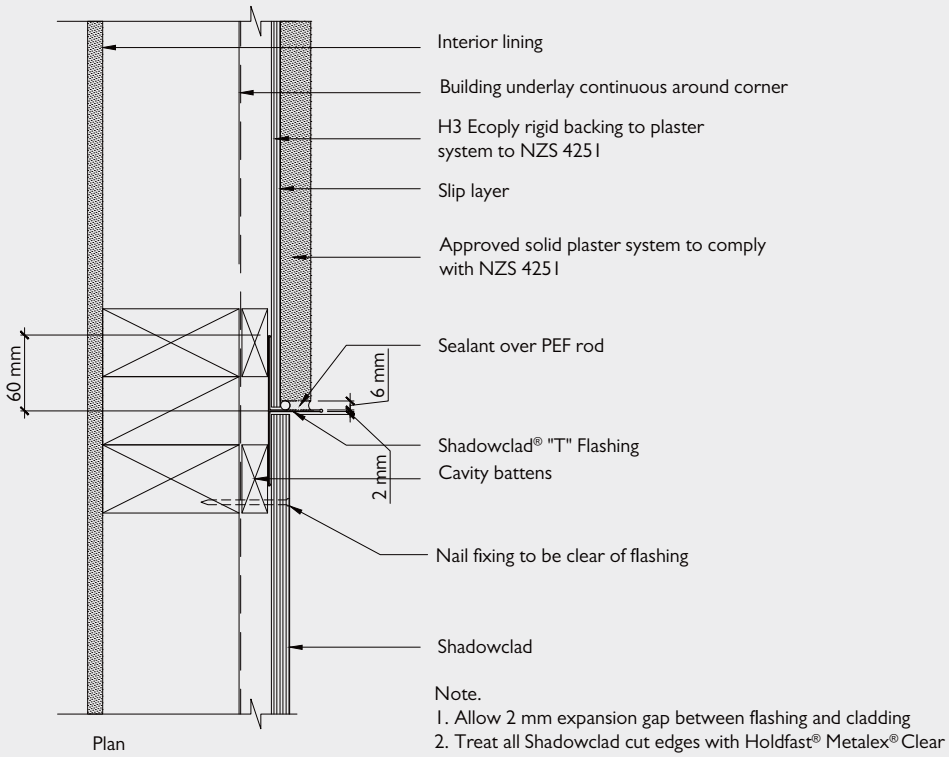
SC062: Shadowclad to Weatherboard Vertical Junction



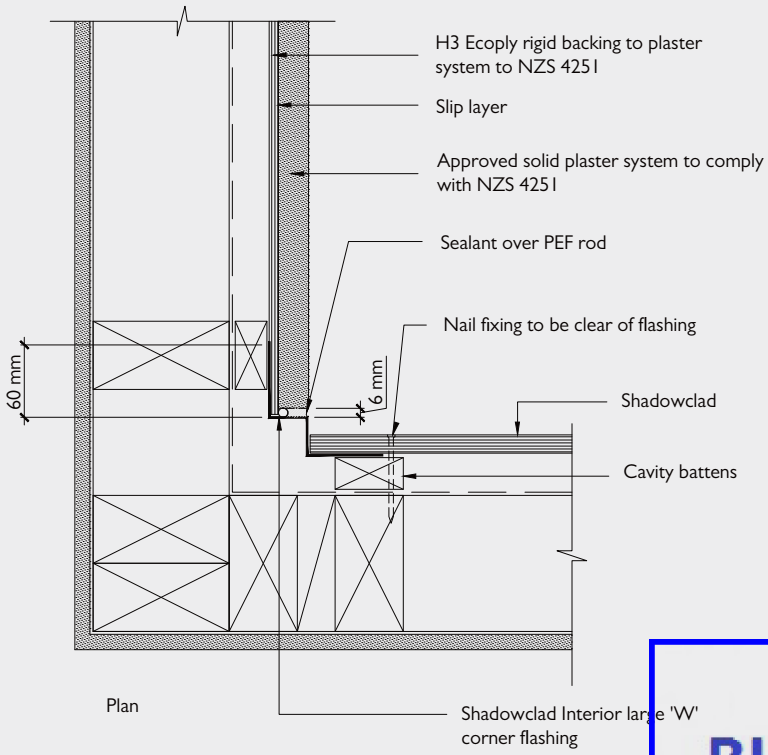
Plan

Note.
1. Allow 2 mm expansion gap between flashing and cladding
2. Treat all Shadowclad cut edges with Holdfast® Metalex® Clear

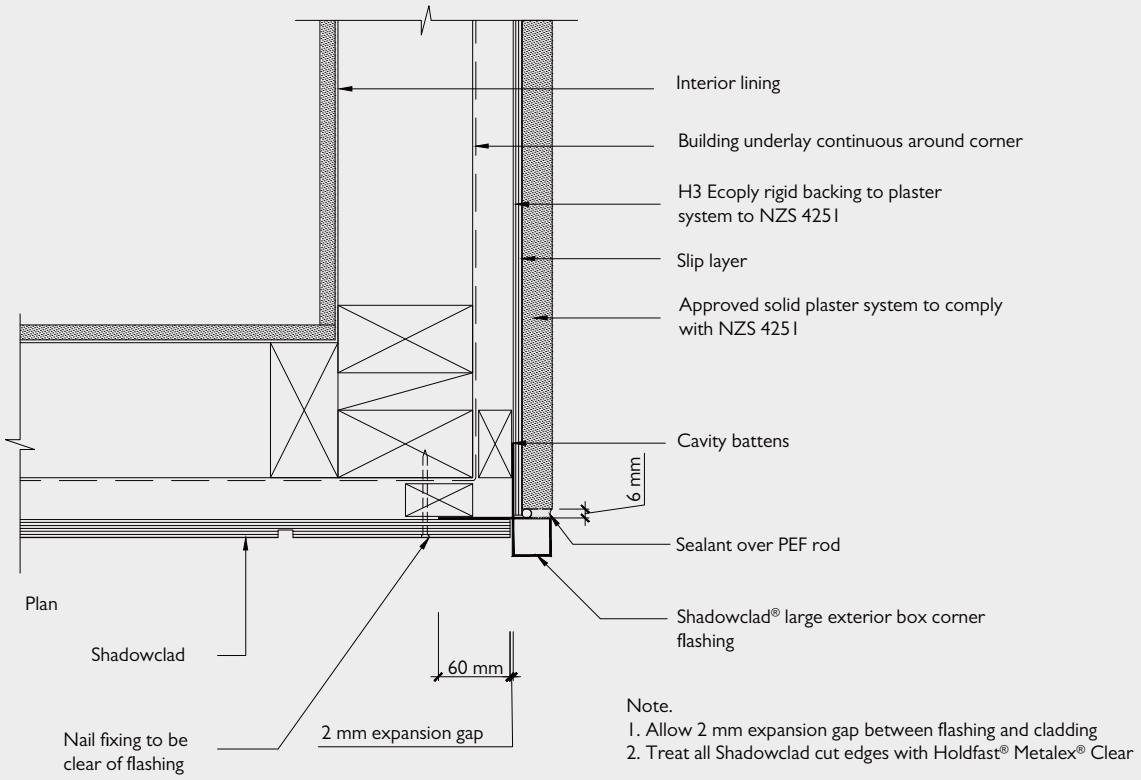
SC063: Shadowclad® to Solid Plaster Vertical Junctions



SC064: Shadowclad to Solid Plaster Internal Junctions



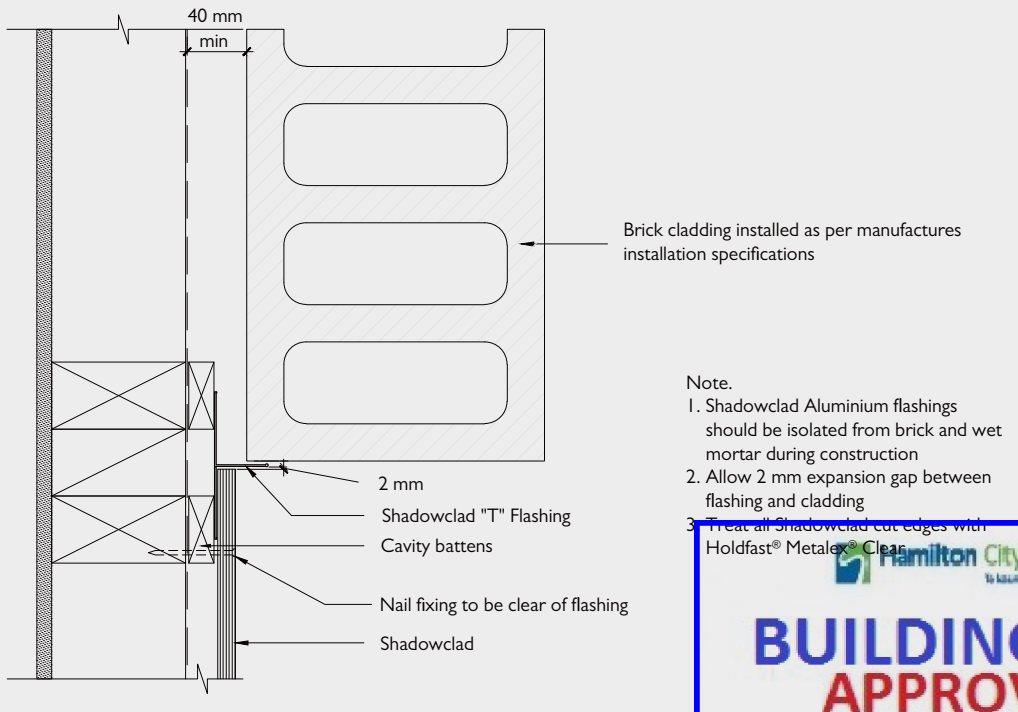
SC065: Shadowclad® to Solid Plaster External Junctions



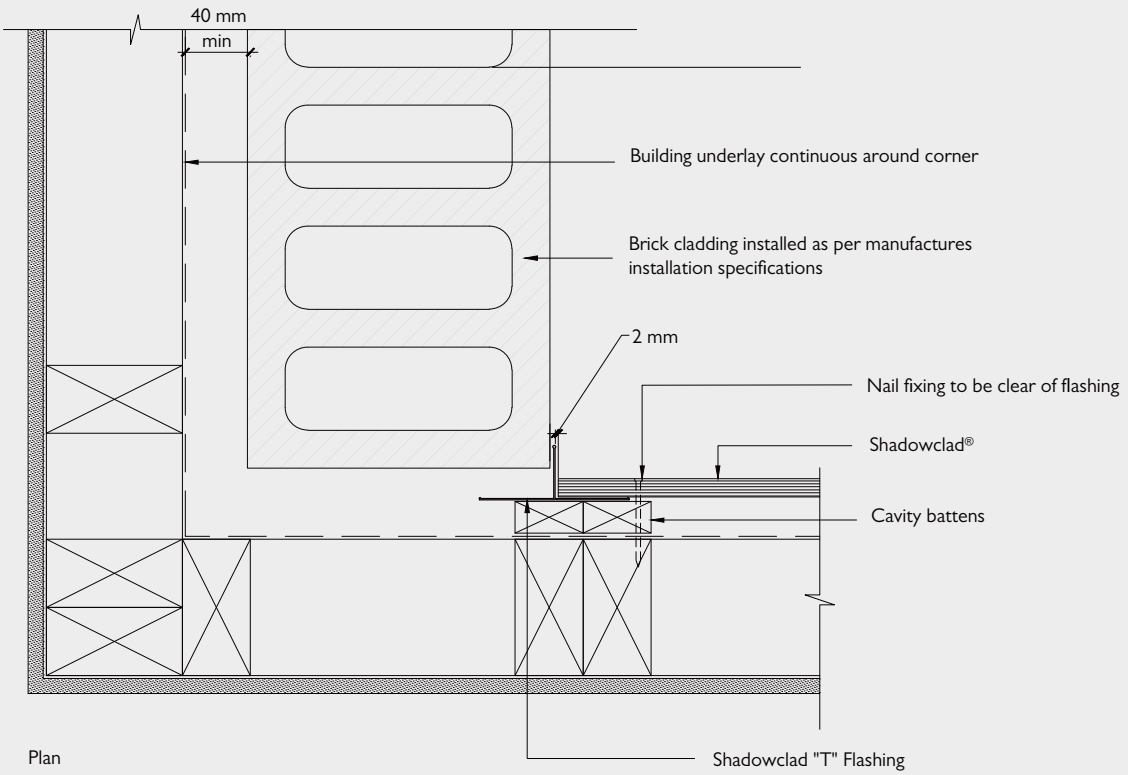
3.3 SHADOWCLAD® & BRICK VERTICAL JUNCTIONS

Shadowclad® Aluminium flashings should be isolated from brick and wet mortar during construction.

SC066: Shadowclad to Brick Vertical Junctions



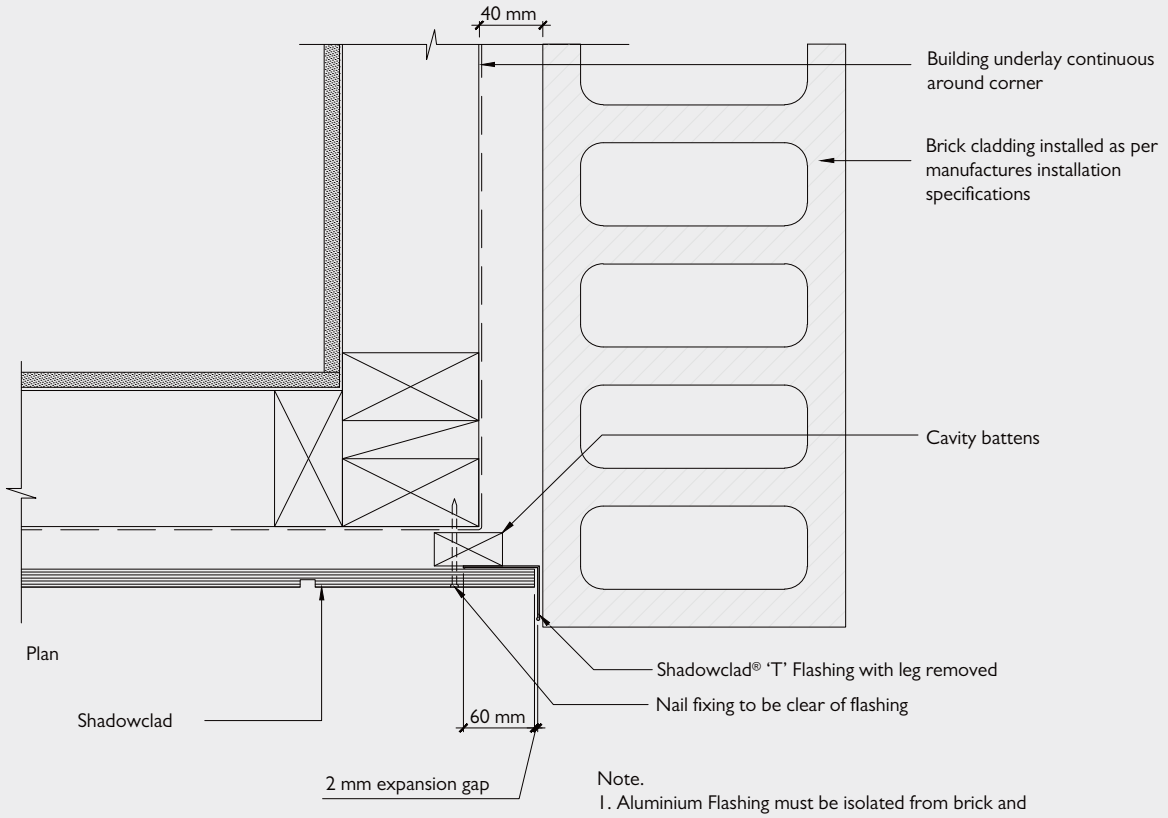
SC067: Shadowclad® to Brick Internal Junctions



Plan

Note.
1. Aluminium Flashing must be isolated from brick and mortar during construction
2. Allow 2 mm expansion gap between flashing and cladding
3. Treat all Shadowclad cut edges with Holdfast® Metalex® Clear

SC068: Shadowclad® to Brick External Junctions



Note.
1. Aluminium Flashing must be isolated from brick and mortar during construction
2. Allow 2 mm expansion gap between flashing and cladding
3. Treat all Shadowclad cut edges with Holdfast® Metalex® Clear

4.0 REFERENCES & SOURCES OF INFORMATION

- New Zealand Building Code (NZBC).
- AS/NZS 2269:2012 "Plywood Structural".
- AS/NZS 1604.3:2010 "Specification for Preservative Treatment, Part 3: Plywood".
- NZS 3602:2003 "Timber and Wood-Based Products for use in Buildings".
- NZS 3603:1993 "Timber Structures Standard".
- NZS 3604:2011 "Timber Framed Buildings".
- AS 3715:2002 "Metal Finishing – Thermoset powder coating for architectural application of aluminium and aluminium alloys".
- NZBC Clause E1 Surface Water.
- NZBC Acceptable Solution, E1/AS1 .
- NZBC Clause E2 External Moisture.
- NZBC Acceptable Solution, E2/AS1 .
- NZBC Clause E3 Internal Moisture.
- NZBC Acceptable Solution, E3/AS1 .
- NZBC Clause B2 Durability.
- NZBC Acceptable Solution, B2/AS1 .
- Product Technical Statement.
  - Shadowclad® for Cavity Construction.
- Ecoply® Specification and Installation Guide.
- Ecoply Barrier Specification and Installation Guide.
- CHH Woodproducts technical notes – downloadable from www.chhwoodproducts.co.nz/document-library.
- Safety Data Sheets.
  - SDS Shadowclad Azole Treated Plywood.
  - SDS Shadowclad CCA Treated Plywood.
  - SDS Stainless Steel flashings.
  - SDS Aluminium flashings.
  - SDS Shadowclad Ultra CCA Pre-primed Treated Plywood.
  - SDS Shadowclad Ultra LOSP Pre-primed Treated Plywood.
- Producer Statement – Compliance for Surface Treated Aluminium Products.
- Window Association of New Zealand (www.wanz.org.nz).
- APA (www.buildabetterhome.org).
- EWPAA (www.ewp.asn.au).
- BRANZ Appraised 764 – Shadowclad Cavity Fixed Cladding System.
- BRANZ Recommendations for Building Maintenance.

Standards can be purchased online at www.standards.co.nz.

Building Code Compliance Documents can be downloaded free of charge at www.building.govt.nz/building-code-compliance/.

Line drawings within this literature can be downloaded from www.shadowclad.co.nz.

5.0 GLOSSARY

Sealant: A flexible neutral cure sealant for filling of spaces/gaps and weatherproofing that complies with NZBC Acceptable Solution E2/AS1, or sealant covered by a valid BRANZ Appraisal for use as a weather sealing sealant for exterior use. It is the designers' and builders' responsibility to ensure that sealants are fit for purpose and compatible with Shadowclad products and any other building materials or components used within the Shadowclad installation.

PEF Rod: A foam formed polyethylene "noodle" that is designed to be inserted between two surfaces. Should have a 25-33% larger diameter than the gap/space you are inserting it into.

Holdfast® Metalex® Clear: A supplementary preservation treatment that preserves the treatment envelope of timbers with a Class H3.1 and above.

6.0 LIMITATIONS

The information contained in this document is current as at May 2018 and is based on data available to CHH Woodproducts at the time of going to print.

All photographic images are intended to provide a general impression only and should not be relied upon as an accurate example of Shadowclad products installed in accordance with this document or the NZBC compliance documents.

This publication replaces all previous CHH Woodproducts design information and literature relating to Shadowclad structural plywood products and flashings for mixed cladding systems on cavity construction. CHH Woodproducts reserves the right to change the information contained in this document without prior notice. It is your responsibility to ensure that you have the most up to date information available, including at the time of applying for a building consent. You can call toll free on 0800 326 759 or visit www.chhwoodproducts.co.nz to obtain current information.

CHH Woodproducts has used all reasonable endeavours to ensure the accuracy and reliability of the information contained in this document. However, to the maximum extent permitted by law, CHH Woodproducts assumes no responsibility or liability for any inaccuracies, omissions or errors in this information nor for any actions taken in reliance on this information.

shadowclad

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May 2018

JAS-ANZ

PRODUCT CERTIFIED paa ENGINEERED WOOD

Hamilton City Council

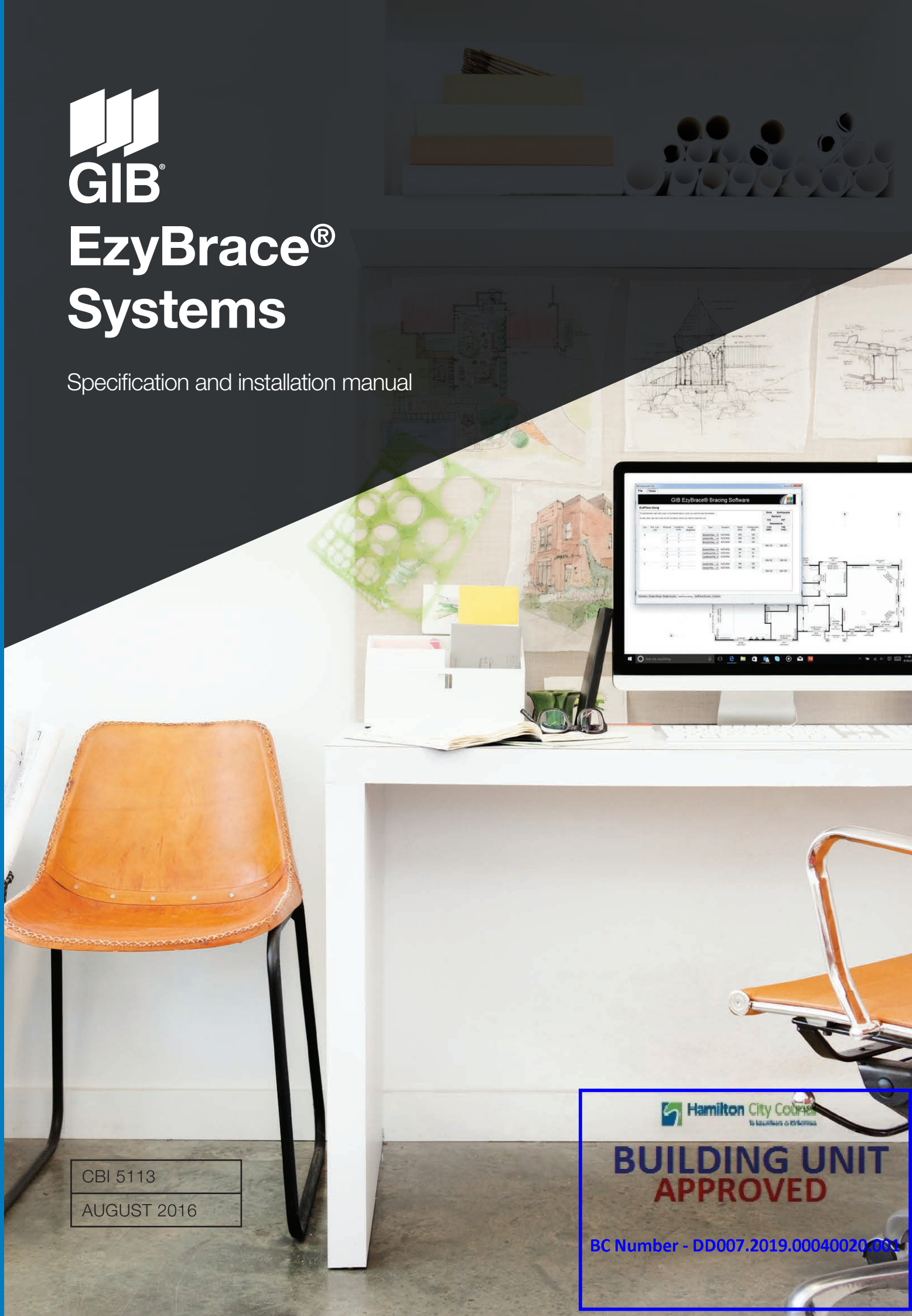
NEW ZEALAND

BUILDING UNIT
APPROVED

BC Number - DD007.2019.00040020.001

GIB® EzyBrace® Systems

Specification and installation manual



CBI 5113

AUGUST 2016

NATIONAL SUPPORT

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GIB® HELPLINE

0800 100 442

Based on learnings derived from the 2011 Canterbury earthquakes GIB EzyBrace® Systems have been updated to offer improved design flexibility and further simplification of the bracing design and build process.

NEW GIB EZYBRACE® 2016 DESIGN SOFTWARE

- Improved user interface with simplified bracing design process.
- Increased functionality including exterior line check function, easy insert/deletion of bracing elements and built in software help function.
- Includes the new GIB® Bracing element GS2- NOM
- Allows the GIBFix® Framing System to be used in GIB EzyBrace® designs.

NEW GIB® BRACING ELEMENT GS2-NOM

- Allows internal walls lined with GIB® plasterboard on both sides and fastened off as per the standard fixing requirements of the current GIB® Site Guide to contribute to bracing resistance.
- Potentially reduces the amount of fasteners[1]
- Encourages more even bracing distribution throughout the building.

[1] Actual savings dependent on building and bracing design

UPDATE TO OPENINGS IN BRACING ELEMENTS AND CEILING DIAPHRAGMS

- Large hole specification updated to use a more conservative methodology.
- Guidance included for fireplace flues and range hoods.

NEW — GIBFIX® FRAMING SYSTEM

- Reduced potential for fastener pop and joint cracking as a result of timber frame movement.
- Reduced potential for on-site call backs.
- Improved thermal performance.
- Reinforced plasterboard junctions.

CONTENTS

GIB EzyBrace® Systems — August 2016

Winstone Wallboards Ltd accepts no liability if GIB EzyBrace® Systems are not designed and installed in strict accordance with instructions contained in this publication.

USE ONLY THE CURRENT SPECIFICATION

This publication may be superseded by a new publication at any time. Winstone Wallboards accepts no liability for reliance upon publications that have been superseded. Check for the current publication at gib.co.nz/library before using this publication. If you are unsure whether this is the current publication, call the GIB® Helpline on 0800 100 442.

GIB EzyBrace® 2011 software and specification literature remains valid until futher notice.

PATENTS

GIBFix® Framing System and GIB EzyBrace® Systems, including componentry and design method, have patents pending (NZ Patent Number 596691, NZ Patent 709159 pending) and design and other IP rights reserved.

Beware of substitution

The performance of GIB® Systems are very sensitive to design detailing and construction practices. All GIB® Systems have been developed specifically for New Zealand conditions and independently tested or assessed to ensure the required level of performance. It is important to use only GIB® branded components where specified and to closely follow the specified design details and construction practices, to be confident that the required level of performance and quality is achieved on site.

For further information call our GIB® Helpline on 0800 100 442.

GIB EzyBrace® Systems have been designed and tested using only the products specified. When additional GIB® plasterboard properties are required the table below provides acceptable alternative options.

	Acceptable alternative GIB® plasterboards								
Specified GIB® plasterboard	GIB® Standard	GIB Ultraline®	GIB Braceline/ Noiseline®	GIB Aqualine®	GIB Toughline®	GIB Fyreline®			
						10mm	13mm	16mm	19mm
GIB® Standard		OK	OK	OK	OK	Note 1 and 3			
GIB Braceline®	X	X		Note 2	OK	X	Notes 1, 2 and 3		

Note 1 *The fastener type and length must be as required for the relevant FRR system using the perimeter fixing pattern illustrated for the relevant bracing specification.*

Note 2 *The element must be 900mm or longer. Decrease perimeter fastener centres to 100mm. The bracing corner fastening pattern, as illustrated for the relevant specification applies to all four corners of the element. Panel hold-down fixings are required.*

Note 3 *Specify traditional wall framing layout (see figure 1) where a Fire Resistance Rating (FRR) is required.*

Scope of use

This document is a guide to wall bracing of light timber frame (LTF) buildings constructed in accordance with NZS3604:2011 Timber Framed Buildings and presents a simple and efficient method for calculating and incorporating bracing resistance. This information draws on recent experiences from seismic activity in New Zealand and seeks to minimise earthquake damage to plasterboard linings in LTF buildings.

This document outlines the main principles of bracing design and construction using GIB® plasterboard products and systems. Further detailed information can be found in the GIB® Bracing Supplement by visiting gib.co.nz/library. This 'live' on-line document is updated continuously in response to market feedback and Winstone Wallboards' development initiatives.

Finish quality — framing and substrates

Home owners are increasingly demanding a high quality of interior finish. Finish quality is heavily influenced by the substrate to which linings are fixed. Detailed information on 'Levels of Finish' is given in AS/NZS 2589 and the latest version of the GIB® Site Guide.

New GIBFix® Framing System

With increased NZ Building Code requirements and growing customer demand for thermal efficiency and high quality interior finishes, traditional framing practices present problems such as multiple framing members at wall intersections creating thermal 'bridges' and cavities where insulation cannot be installed effectively.

Figure 1 shows a traditional wall framing layout. Figure 2 shows the alternative GIBFix® Framing System layout.

Multiple timber framing members also take longer to dry resulting in an increased risk of fastener pops and blemishes resulting from timber frame movement.

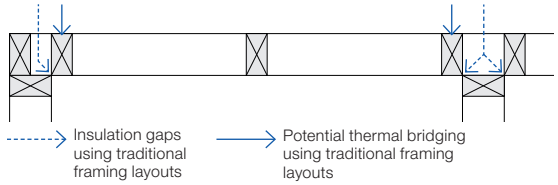
The GIBFix® Framing System offers better thermal efficiencies and minimises potential joint imperfections resulting from interior linings being fixed to multiple timber framing members.

The GIBFix® Framing System can be used in conjunction with GIB EzyBrace® Systems.

Bracing resistance is not affected by the GIBFix® Framing System if the use of this alternative timber framing layout is preferred. Refer to the GIBFix® Framing System literature for more information.

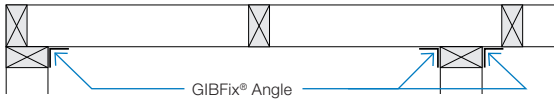
Bracing ratings apply whether fixing is directly into timber or into the metal components, provided correct construction details, fastener types and centres are applied.

FIGURE 1: TRADITIONAL WALL FRAMING LAYOUT



GFS004

FIGURE 2: GIBFIX® FRAMING SYSTEM (ALTERNATIVE LAYOUT)



GFS005

NEW GS2-NOM Bracing Element

The new GS2-NOM bracing element allows most homes to be braced with a single lining type and less fixings so that a high quality finish is maintained throughout.

GS2-NOM permits the contribution of 'nominally fixed' internal walls. Higher performance elements are commonly specified on external walls and where limited wall area is available or adjacent to significant openings.

Winstone Wallboards recommends the use of the GIBFix® Framing System in conjunction with GS2-NOM elements. Key benefits of this approach include:

- Reduced potential for fastener pop and joint cracking of plasterboard linings.
- Enhanced thermal performance.
- Allows internal walls lined with GIB® plasterboard on both sides and fastened off as per the standard fixing requirements of the current GIB® Site Guide to contribute bracing resistance.
- Potentially reduces the amount of fasteners[1].
- Encourages more even bracing distribution throughout the building.

1. Actual savings dependent on building and bracing design.

Compliance with the NZ Building Code

NZBC CLAUSE B1 — STRUCTURE

The design and material specification for steel and timber framing used in conjunction with this literature must be in accordance with the performance requirements of NZBC Clause B1. GIB EzyBrace® Systems comply with the requirements of NZS 3604:2011, when designed and installed in accordance with this publication and relevant technical literature. NZS 3604:2011 is an acceptable solution to NZBC Clause B1.

NZBC CLAUSE B2 — DURABILITY

Under normal conditions of dry internal use GIB EzyBrace® Systems have a service life in excess of 50 years and satisfy the requirements of NZBC Clause B2. When in conditions of dry internal use, the components specified in this literature satisfy the requirements of NZBC Clause B2.

GIB® EzyBrace® Systems must not be specified in areas where 15 year durability applies and where linings are subject to direct water pressure, e.g. shower cubicle or shower over bath situations.

NZBC CLAUSE F2 — HAZARDOUS BUILDING MATERIALS

Under normal conditions of use, during handling, installation or serviceable life, the products detailed in GIB EzyBrace® Systems do not constitute a health hazard and meet the provisions of the NZBC Clause F2.

NZBC CLAUSE H1 — ENERGY EFFICIENCY

Buildings must be constructed to achieve an adequate degree of energy efficiency and the building envelope must provide adequate thermal resistance. The required thermal resistance (R-value) of timber framed external walls depends on climate zone but is commonly in the range from R 1.9 to R 2.0.

CAD design details

Where applicable drawings related to GIB EzyBrace® Systems have been produced for CAD design. These are identified by a unique number in the bottom corner of each detail box. CAD design details can be found at gib.co.nz/library.

Appraisal

GIB EzyBrace® Systems 2016 have been appraised by the Building Research Association of New Zealand (BRANZ), Appraisal No. 928 (2016) GIB EzyBrace® Systems, 2016.

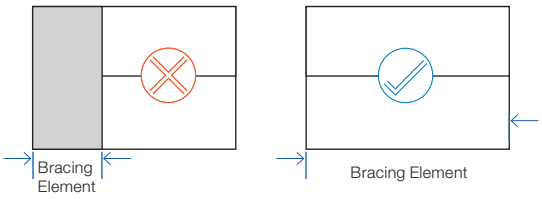
It is of prime importance to comply with the details of design, construction and workmanship in this document.

Bracing resistance

WALL BRACING LAYOUT

When designing the bracing layout, carefully consider the final finished appearance and utilise full wall lengths where possible, avoiding unnecessary fastenings in the centre of a clear wall. Using the available wall length provides additional bracing and achieves improved aesthetics.

FIGURE 3: WALL BRACING LAYOUT



BRACING DISTRIBUTION

Distribute bracing by drawing a grid pattern of bracing lines along and across the building. Bracing lines must coincide as much as possible with the wall bracing elements. Pairs of elements may be counted on a single line provided they are no more than 2 metres apart and parallel. See figure 4.

Locate bracing evenly throughout the building and as close as practical to corners of external walls.

Space bracing lines no more than:

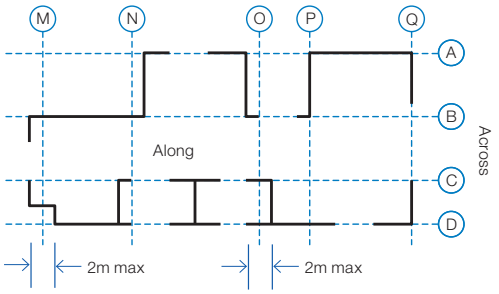
- 6 metres for standard construction with any GIB® plasterboard ceiling, or
- 7.5 metres where dragon ties in accordance with NZS3604:2011 have been installed, or
- 12 metres with a GIB® plasterboard ceiling diaphragm.

The construction of ceiling diaphragms is described in detail on p.18–20.

NZS3604:2011 requires that no bracing line shall have a capacity less than the greater of:

- 100 Bracing Units (BUs), or
- 15 x the external wall length (BUs) for bracing lines coinciding with external walls, or
- 50% of the total demand (D) divided by the number of lines (n) in the direction being considered (BUs).

FIGURE 4: BRACING GRID LAYOUT



The NZS3604 ‘rules’ are merely minimum guidelines and compliance with them does not in itself ensure even distribution. The designer is responsible for checking distribution. Poor distribution can cause torsional effects and localised or more significant damage in an earthquake event.

GIB EZYBRACE® SYSTEMS

The GIB EzyBrace® Specification Numbering System (and sub-components thereof) is protected by copyright and makes specification and identification of GIB EzyBrace® Systems transparent.

- 'GS' stands for GIB® Standard.
- 'BL' for GIB Braceline®.
- 'P' for plywood.
- '1' and '2' for linings one or both sides.
- ‘N’ stands for 'no specific panel hold-down fixings'.
- 'H' stands for 'specific panel hold-down fixing' required.
- 'NOM' stands for 'nominal plasterboard fixing'. This refers to the standard fixing method used to install plasterboard as shown in the current GIB® Site Guide.

Where specific hold-down fixings are specified, refer to p.15-16. GIB HandiBrac® is fully contained within the framing cavity and does not interfere with lining installation and quality of finish.

Where no specific hold-down fixings are required, the minimum NZS3604:2011 bottom plate fixings apply.

Full bracing element construction details are provided in this technical literature.

Further general design and construction information can also be found in our GIB® Bracing Supplement by visiting gib.co.nz/library.

Specifying GIB EzyBrace® elements (minimum wall length 400mm)

Inside lining external walls.	Nominate available lengths of wall as GS1-N elements. Use BL1-H if higher ratings are required. If the other side of the frame is lined with plywood consider GSP-H or BLP-H elements or use alternative proprietary bracing systems.
Internal walls (only one side available for bracing).	Nominate available lengths of wall as GS1-N elements. Use BL1-H if higher ratings are required.
Internal walls (both sides available for bracing).	Nominate available length of wall as GS2-NOM elements. Change to GS1-N if higher ratings are required. Change to GS2-N if higher ratings are required. Change to BLG-H for even higher ratings. Consider GSP-H or BLP-H if the opposite side is lined with plywood.

Bracing demand

GIB EZYBRACE® CALCULATOR

The GIB EzyBrace® calculator is a software tool to determine the wind and earthquake bracing demand and to design the bracing resistance for light timber-framed buildings constructed in accordance with NZS 3604:2011.

The updated GIB EzyBrace® calculator combines an up-to-date user-friendly interface with the latest knowledge relating to the performance of GIB® plasterboard in light timber-framed structures when subjected to high winds or earthquakes. The calculator can be down-loaded free of charge by visiting gib.co.nz/ezybrace and can be installed on either Microsoft® or Apple® Mac environments.

DEMAND

Wind and Earthquake 'Demand' calculates the forces a structure must be able to resist during its 'design life'. The GIB EzyBrace® calculator's Demand sheet determines the number of Bracing Units required depending on building location, building dimensions and materials used. The Demand sheet closely follows the familiar format of our Excel based GIB EzyBrace® calculator, and includes additional features such as a pop-up help facility explaining required input.

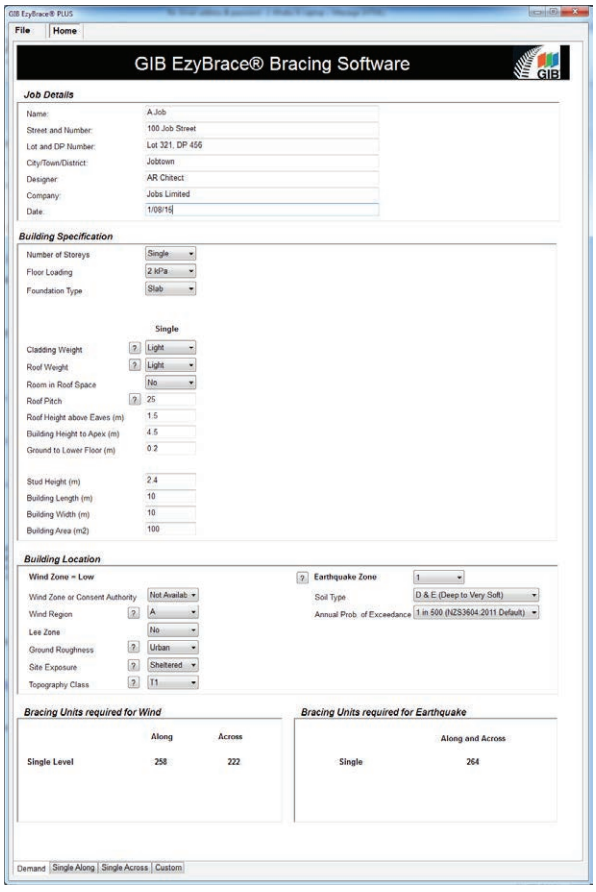
Bracing resistance sheets ('tabs') are added depending on the building specification entered. For example, subfloor bracing resistance tabs only show when a 'subfloor' foundation type has been selected.

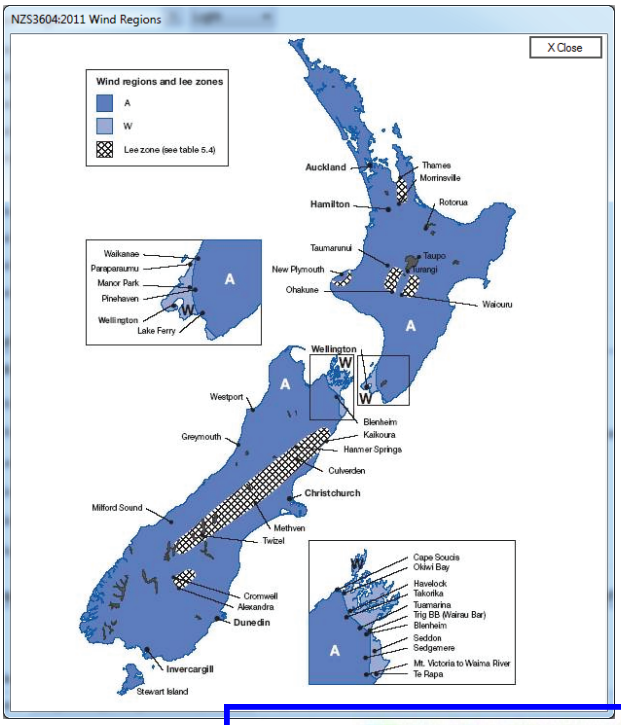
The Demand sheet gives the designer the option to select a longer earthquake return period which represents a higher earthquake design force. The default for buildings constructed in accordance with NZS3604:2011 is an earthquake that has a 10% chance of being exceeded within the assumed 50 year 'design life' of a light timber framed residential structure, a 'return period' of 500 years.

Many commercial and public buildings are designed for the more stringent requirement of a 10% probability of exceedance in a 100 or 250 year life expectancy.

A screen shot of the GIB EzyBrace® 2016 Demand Sheet and Help Facility is shown in figure 5.

FIGURE 5: GIB EZYBRACE® 2016 — DEMAND CALCULATION SHEET AND 'POP UP' HELP FACILITY





Download GIB EzyBrace® 2016 design software from gib.co.nz/ezybrace

Software functionality

Innovations adopted in the GIB EzyBrace® 2016 bracing 'resistance' calculation sheets include the ability to easily add and delete lines and elements during calculations.

The software compares bracing resistance achieved with demand and for wall bracing lines incorporating external walls, the external wall length can now be entered to check minimum bracing units required on that line. The NZS 3604:2011 rules and associated software output are not the only check. Designers must additionally check the building layout to ensure adequate bracing distribution.

Figures 6 and 7 show screen shots of the Wall and Subfloor Resistance Sheets respectively.

FIGURE 6: GIB EZYBRACE® 2016 — WALL BRACING RESISTANCE CALCULATION SHEET

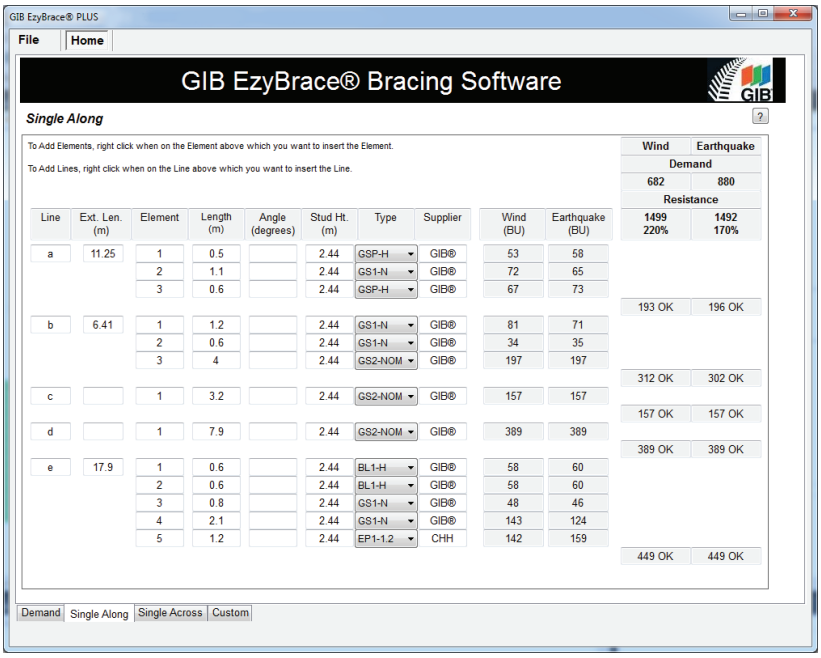
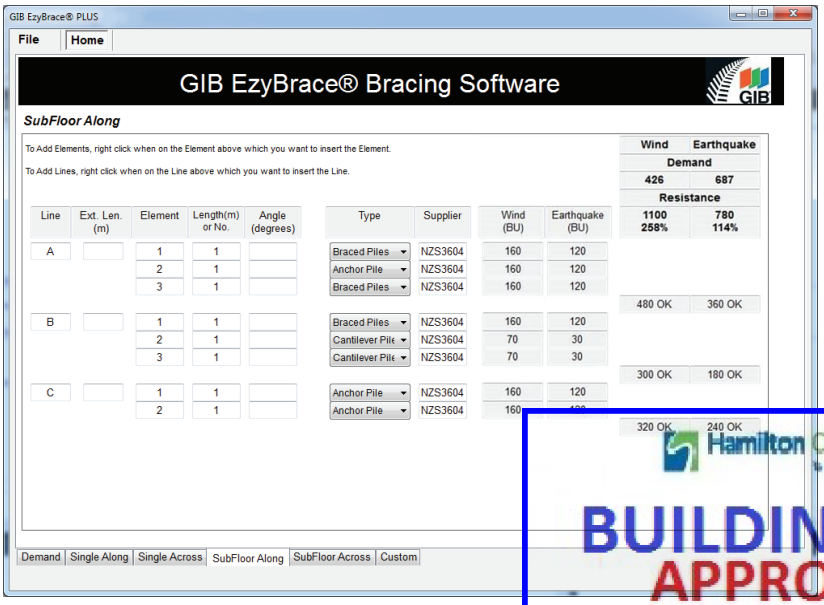


FIGURE 7: GIB EZYBRACE® 2016 — SUBFLOOR BRACING RESISTANCE CALCULATION SHEET

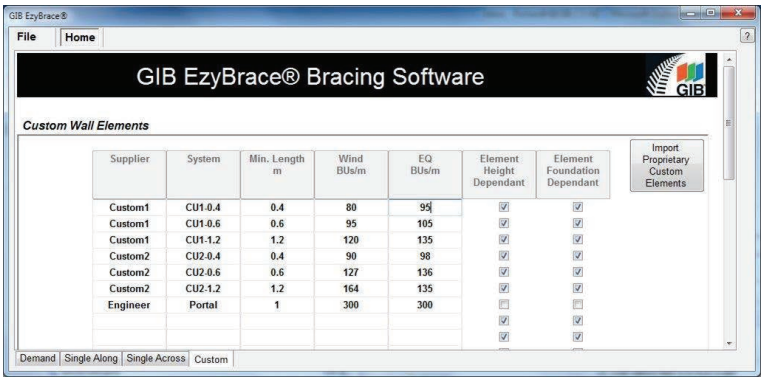


Download GIB EzyBrace® 2016 design software from gib.co.nz/ezybrace

Software functionality

Custom elements can be entered by accessing the 'custom' tab as shown in figure 8.

FIGURE 8: GIB EZYBRACE® 2016 — CUSTOM ELEMENTS SHEET



Note: Values and systems shown in Custom Elements Sheets are for illustrative purposes only.

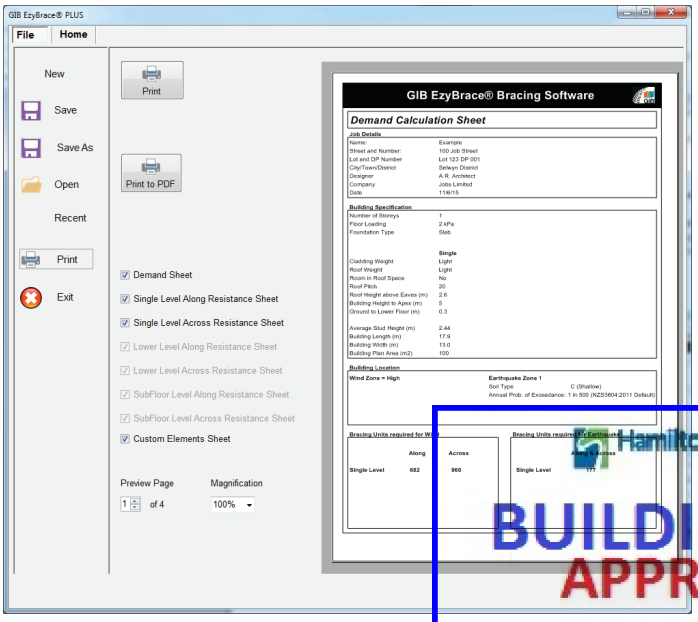
Help can be accessed by pressing the ? symbol which displays a window with further information.

The GIB EzyBrace® 2016 software has a number of options that can be accessed via the File tab at the top left hand corner of the window. The options include: New, Save, Save As, Open, Recent and Print.

- The New option closes any opened job ready for the input of a new job.
- The Save option saves the currently opened job to the same filename and the Save As option saves the job to a new filename.
- The Open option prompts for the name of an existing job.
- The Recent option displays a list of the ten latest jobs and allows for the selection of one of these jobs to be opened.
- The Print option displays the print screen. In this screen, a print preview is displayed. The print preview can be copied to the clipboard by clicking the right-hand mouse button. Also on the print screen is the option to choose which pages are to be printed and the option to print the output to a portable data format, PDF, file.
- The Print Screen View is shown in figure 9.

FIGURE 9: GIB EZYBRACE® 2016 — PRINT SCREEN VIEW

Download GIB EzyBrace® 2016 design software from gib.co.nz/ezybrace



GIB® plasterboard linings

When fixing part sheets of GIB® plasterboard, a minimum sheet width of 300mm applies for bracing elements. Horizontal fixing is recommended. If fixing vertically, full height sheets shall be used where possible. Where sheet end butt joints are unavoidable they must be formed over nogs or over the studs and fastened at 200mm centres. Alternatively, and preferably, sheet end butt joints may be back-blocked.

When a GIB® Bracing element has been designated for a section of wall, BU ratings cannot be increased by incorporating additional proprietary bracing elements within that same section of wall.

LIMITATIONS

- GIB® plasterboard must be stacked flat and protected from the weather.
- GIB® plasterboard must be handled as a finishing material.
- GIB® plasterboard in use must not be exposed to liquid water or be installed in situations where extended exposure to humidities above 90% RH can reasonably be expected.
- GIB EzyBrace® Systems must not be used in showers or behind baths.
- It is highly recommended not to install GIB® plasterboard in any situation where external claddings are not in place or the property is not adequately protected from the elements.
- If GIB® plasterboard is installed under these conditions, the risk of surface defects such as joint peaking or cracking is greatly increased.

GIB EzyBrace® Systems in water-splash areas

When GIB® plasterboard is installed in locations likely to be frequently exposed to liquid water it must have an impervious finish. Examples are adhesive fixed acrylic shower linings or ceramic tiles over an approved waterproof membrane over GIB Aqualine®. The NZBC requires 15 years durability in these situations. Bracing elements are required to have a durability of 50 years. Bracing elements are not to be located in shower cubicles or behind baths because of durability requirements, the likelihood of renovation, and practical issues associated with fixing bracing elements to perimeter framing members. Otherwise GIB EzyBrace® Systems can be used in water-splash areas as defined by NZBC Clause E3, provided these are maintained impervious for the life of the building.

For futher design details refer to the current GIB Aqualine® Wet Area Systems literature.

Renovation

When relining walls during the process of renovation, ensure that bracing elements are reinstated (check the building plans).

Openings in bracing elements

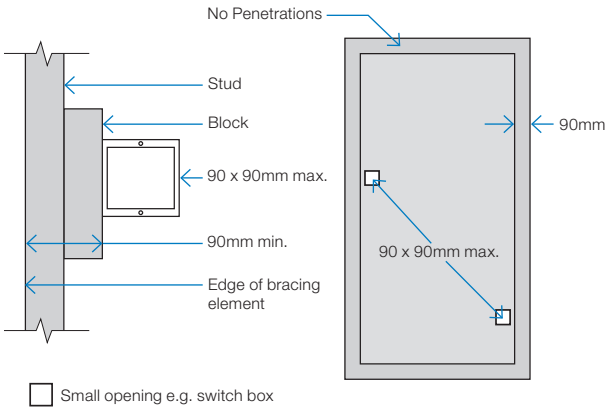
SMALL OPENINGS

Small openings (e.g. power outlets) of 90 x 90mm or less may be placed no closer than 90mm to the edge of the braced element. A block may need to be provided alongside the perimeter stud as shown below.

LARGE OPENINGS

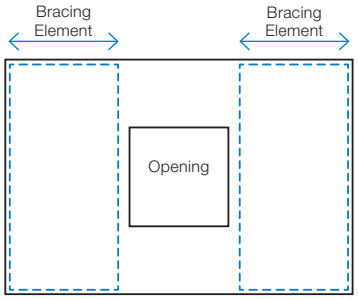
Openings above 90 x 90mm such as switch boards, recessed cabinets and TV's etc. should be placed outside of the bracing element or locate bracing on the other side of the wall framing.

FIGURE 10: SMALL OPENINGS IN BRACING ELEMENTS



GEB001

FIGURE 11: LARGE OPENINGS AND BRACING ELEMENTS



Timber framing

General framing requirements such as grade, spacings and installation shall comply with the provisions of NZS 3604:2011. To achieve the published bracing performance the minimum actual framing dimensions are 90 x 45mm for external walls and 70 x 45mm for internal walls.

As a minimum the use of Kiln Dried Stress Graded timber for all wall, roof and mid-floor framing members is recommended.

GIBFix® Framing System (alternative layout)

Practices recommended as part of the GIBFix® Framing System aim to increase timber framing efficiencies, reduce reliance on unnecessary framing at wall junctions and minimise surface imperfections that commonly arise from constructing plasterboard junctions over multiple timber members. GIBFix® Angles fixed to a single timber framing member are introduced to tie together plasterboard junctions, improving seismic resilience and decrease the risk of future defects due to timber movement. The GIBFix® Framing System can be used in conjunction with the GIB EzyBrace® System.

Note: GIBFix® Angles and 32mm x 7g GIB® Grabber® Dual Thread Screws may also be used in traditional wall framing layouts and in GIB EzyBrace® Systems.

When the GIBFix® Framing System is used a minimum of 2 equally spaced nogs for walls between 2.4m and 3m in height are required at corners and wall junctions.

When used in GIB EzyBrace® systems GIBFix® Angles must run from top to bottom on all applicable studs. If 2 GIBFix® Angles are required on a stud they must be overlapped by a minimum of 300mm with 2/32mm 7g GIB® Grabber® Dual Thread Screws penetrating through both GIBFix® Angles.

For full specification details refer to GIBFix® Framing System literature available at gib.co.nz/gibfix.

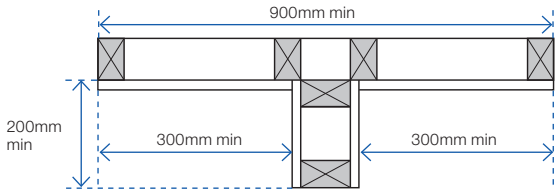
Guidelines for intersection walls

GIB® Bracing Elements may have intersecting walls with a minimum length of 200mm. Fasteners are required around the perimeter of the bracing element. Vertical joints at T-junctions shall be fixed and jointed as specified for intermediate sheet joints. The bracing element length must be no less than 900mm.

Where a Wall Bracing Element is interrupted by a T-junction the element is deemed to be continuous for the whole length (900mm minimum in the example illustrated).

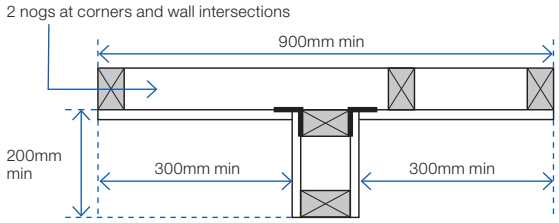
When fixing part sheets of GIB® plasterboard to the side of a T-junction, a minimum width of 300mm applies for bracing elements. See figures 12 and 13.

FIGURE 12: WALL INTERSECTION (TRADITIONAL WALL FRAMING)



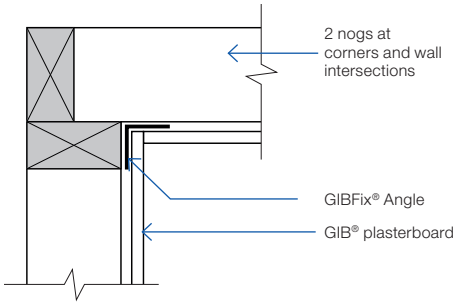
GEB002

FIGURE 13: WALL INTERSECTION (GIBFIX® FRAMING SYSTEM)



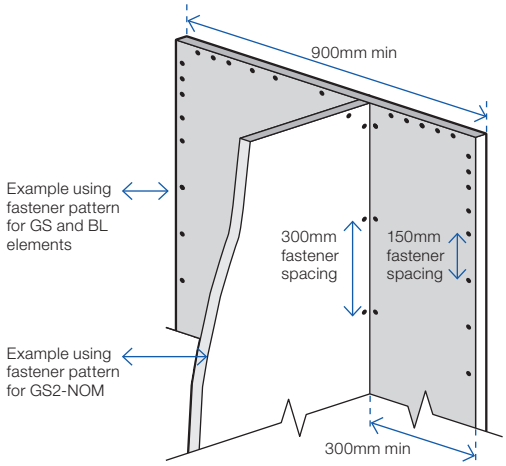
GEB003

FIGURE 14: CORNER INTERSECTION (GIBFIX® FRAMING SYSTEM)



GFS001

FIGURE 15: WALL INTERSECTION FASTENER PLACEMENT



Junction

Min 32mm x 6g GIB® Grabber® High Thread or 32mm x 7g GIB® Grabber® Dual Thread Screws @ 300mm ctrs each side.

Top plate connections

For top plate connections refer to NZS3604:2011 section 8.7.3.

Parapets and gable end walls

Bracing elements must be fixed from top plate to bottom plate. Fixing to a row of nogs is not acceptable unless either:

A continuous member such as an ex 90 x 45mm ribbon plate is fixed across the studs just above a row of nogs at the ceiling line, as shown in figure 16.

or

GIBFix® Angle as shown in figure 17. The angle is fixed to a row of nogs with 30 x 2.5mm galv flat head nails or 32mm x 7g GIB® Grabber® Dual Thread Screws at 300mm centres.

Bottom plate fixing

TIMBER FLOOR

For elements with an 'N' specification use 2/100 x 3.75mm hand or 3/90 x 3.15mm power-driven nails at 600mm centres.

In addition, for elements with an 'H' specification, use GIB HandiBrac® panel hold-down fixings at each end of the bracing element, see p.16.

CONCRETE FLOOR — EXTERNAL WALL BRACING ELEMENTS

For bracing elements with an 'N' specification fix external wall plates in accordance with NZS 3604:2011.

Use GIB HandiBrac® panel hold-down fixings at each end of bracing elements with an 'H' specification and minimum intermediate fixings as required by NZS 3604:2011.

CONCRETE FLOOR — INTERNAL WALL BRACING ELEMENTS

For bracing elements with an 'N' specification fix plates in accordance with NZS 3604:2011 or use 75 x 3.8mm shot-fired fasteners with 16mm discs spaced at 150 and 300mm from end-studs and 600mm centres thereafter.

For bracing elements with an 'H' specification use GIB HandiBrac® panel hold-down fixings at each end of the element and minimum intermediate fixings as required by NZS 3604:2011.

FIGURE 16: PARAPETS AND GABLE ENDS WITH RIBBON PLATE

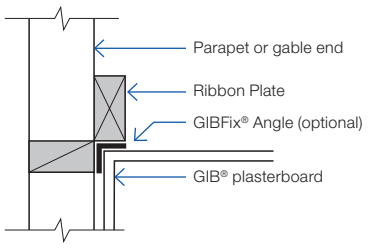
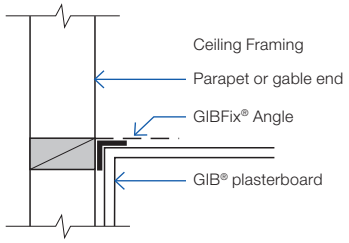


FIGURE 17: PARAPETS AND GABLE ENDS WITH GIBFIX® ANGLE



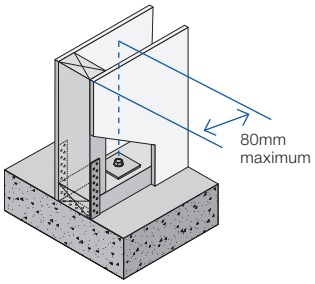
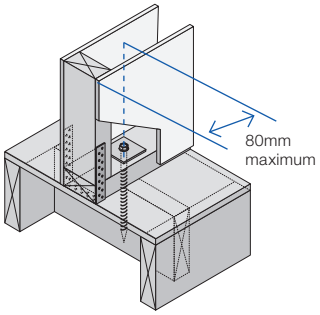
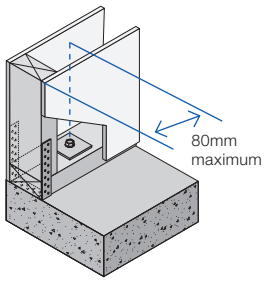
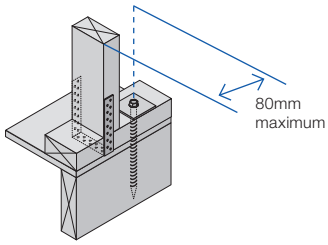
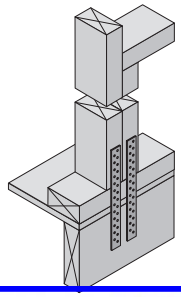
GFS003

BOTTOM PLATE FIXINGS FOR GIB® BRACING ELEMENTS

Brace type	Concrete slabs		Timber floors
	External wall	Internal wall	External and Internal walls
GS1-N	As per NZS 3604:2011. No specific additional fastening required.	As per NZS 3604:2011. Alternatively use 75 x 3.8mm shot-fired fasteners with 16mm discs, 150mm and 300mm from each end of the bracing element and at 600mm thereafter.	Pairs of 100 x 3.75mm flat head hand driven nails or 3/90 x 3.15mm power driven nails at 600mm centres in accordance with NZS 3604:2011.
GS2-N	Not applicable.		
GS2-NOM			
GSP-H BL1-H BLP-H	Intermediate fastenings to comply with NZS 3604:2011 In addition: GIB HandiBrac® fixings or metal wrap-around strap fixings and bolt as illustrated on p.15 and 16.		Pairs of 100 x 3.75mm flat head hand driven nails or 3/90 x 3.15mm power driven nails at 600mm centres in accordance with NZS 3604:2011. In addition: GIB HandiBrac® fixings or metal wrap-around strap fixings and bolt as illustrated on p.15 and 16.
BLG-H	Not applicable	As for GSP-H, BL1-H, BLP-H on concrete slab as illustrated on p.15 and 16.	

Bracing strap installation

Care needs to be taken with the installation of the bracing strap. It should be checked in to be flush with the face of the stud providing a flat substrate for the plasterboard and positioned in such a way that the corner fastenings of the bracing element are not affected by it. Keeping the strap to the edge of the end stud as shown will allow the corner fastenings to be installed without having to penetrate the bracing strap.

Concrete floor	Timber floor
400 x 25 x 0.9mm galvanised strap to pass under the plate and up the other side of the stud. Six 30 x 2.5mm flat head galvanised nails to each side of the stud. Three 30 x 2.5mm flat head galvanised nails to each side of the plate. Hold down bolt with 50 x 50 x 3mm washer to be fitted within 80mm of the end of the element.	
Internal wall	
 GEB004	 GEB005
External wall	
 GEB006	 GEB007
Note: Where applicable drawings have been produced for CAD design. These are identified by a unique number in the bottom corner of each detail box that can be found at gib.co.nz/library.	2/300 x 25 x 0.9mm galvanised straps with six 30 x 2.5mm flat head galvanised nails to each stud and into the floor joist and three nails to the plate. Block to nog fixed with 3/100 x 3.75mm nails to stud.
	 GEB008

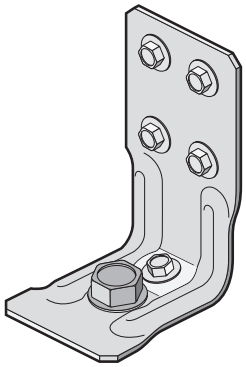
Hold-down fastener requirements	
Concrete floor	Timber floor
A mechanical fastening with a minimum characteristic uplift capacity of 15kN fitted with a 50 x 50 x 3mm square washer within 80mm of the ends of the bracing element.	12 x 150mm galvanised coach screw fitted with a 50 x 50 x 3mm square washer within 80mm of the ends of the bracing element.

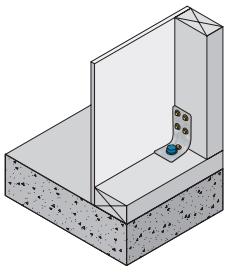
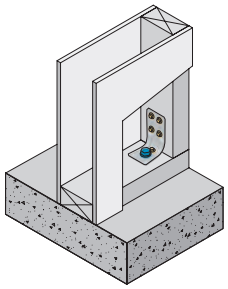
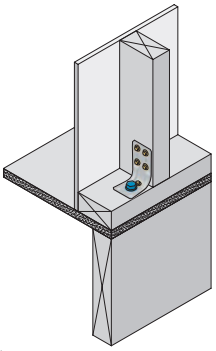
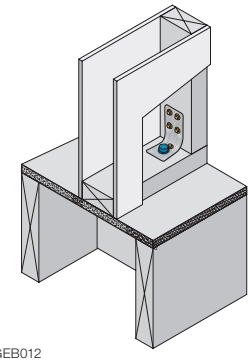
GIB HandiBrac® installation

Developed in conjunction with MiTek™, the GIB HandiBrac® has been designed and tested by Winstone Wallboards for use in GIB EzyBrace® elements that require hold-downs. The GIB HandiBrac® is a substitute for bottom plate hold-down straps.

- Quick and easy to fit.
- May be fitted at any stage before lining.
- Framing face is clear to allow flush lining.
- Easily inspected.

The GIB HandiBrac® with BOWMAC® blue head screw bolt is suitable for timber and concrete floors constructed in accordance with NZS 3604:2011.



Concrete floor		Timber floor	
External walls	Internal walls	External walls	Internal walls
 GEB009	 GEB010	 GEB011	 GEB012
Position GIB HandiBrac® as close as practicable to the internal edge of the bottom plate.	Position GIB HandiBrac® at the stud/plate junction and at mid-width of plate.	Position GIB HandiBrac® flush with the outside stud face, as close as practicable to the centre of the boundary joist.	Position GIB HandiBrac® in the centre of floor joist or full depth solid block.
Hold-down fastener requirements			
A mechanical fastening with a minimum characteristic uplift capacity of 15kN or use supplied BT10/140 screwbolt in GIB HandiBrac® pack.		12 x 150mm galvanised coach screw or use supplied BT10/140 screwbolt in GIB HandiBrac® pack.	

GIB HandiBrac® placement with GIBFix® Framing System for concrete floors

Figure 18 shows the preferred positioning of the GIB HandiBrac® panel hold-down brackets within the GIBFix® Framing System layout and where they are required by bracing systems with an 'H' in the specification code.

Note that, in corners and at wall junctions, a single GIB HandiBrac® can serve 'H' type bracing elements in both directions, but additional intermediate concrete anchors may need to be installed to meet the minimum requirements of NZS 3604:2011 for bottom plate fixing.

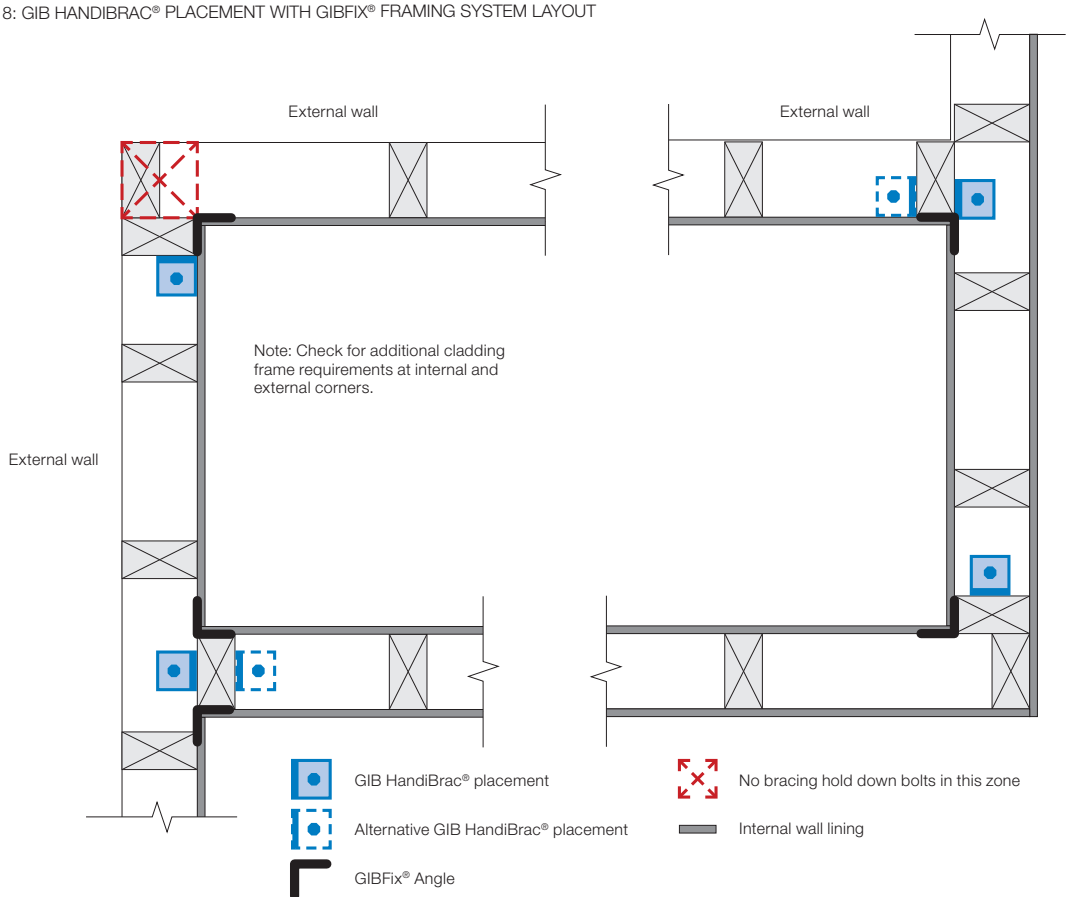
The GIB HandiBrac® is fixed to the stud which has the GIBFix® Angle.

For bracing elements with sheet material both sides of the wall connect corner studs using 8/90mm gun nails as shown in figure 19.

TIMBER FLOORS

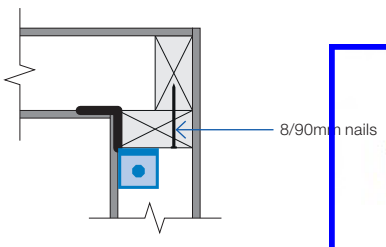
For timber floors bolt fixing in to solid joist or block is required, as shown on p 15.

FIGURE 18: GIB HANDIBRAC® PLACEMENT WITH GIBFIX® FRAMING SYSTEM LAYOUT



GEB013

FIGURE 19: STUD CONNECTION FOR 'H' TYPE BRACING ELEMENTS WITH SHEET MATERIAL BOTH SIDES



GEB014

Ceiling diaphragms

GIB® plasterboard ceiling diaphragms are stiff and strong horizontal elements which effectively transfer loads to bracing walls. They themselves do not have a bracing unit rating but are used when bracing lines exceed 6m separation. The basic shape of a ceiling diaphragm is square or rectangular. Protrusions are permitted but cut-outs are not. The length of a ceiling diaphragm shall not exceed twice its width. Dimensions are measured between supporting bracing lines. Supporting bracing lines shall have a bracing capacity no less than the greater of 100 bracing units or 15 bracing units per metre of diaphragm dimension, measured at right angles to the line being considered, see figure 21.

Limitations for GIB® plasterboard ceiling diaphragms

Ceiling diaphragms may be constructed using any GIB® plasterboard provided perimeter fixing is at;

150mm centres for: Diaphragms up to 7.5m in length, no steeper than 15°.

100mm centres for: Diaphragms up to 7.5m in length, no steeper than 45°. Diaphragms up to 12m in length, no steeper than 25°.

Diaphragms outside these parameters must be specifically designed.

General fixing requirements for GIB® Ceiling Diaphragms:

- Linings must be installed over the entire area of the diaphragm.
- Fastening must be no less than 12mm from sheet edges and not less than 18mm from sheet ends.
- Sheets must be supported by framing members (e.g., ceiling battens) spaced at no more than 500mm centres for 10mm GIB® plasterboard and at no more than 600mm centres for 13mm GIB® plasterboard.
- Sheets within the diaphragm area may be fastened and finished conventionally in accordance with the publication entitled, "GIB® Site Guide". All joints shall be GIB® Joint Tape reinforced and stopped. It is recommended that sheet butt joints are formed off framing and back-blocked (see "GIB® Site Guide").
- Use full width sheets where possible. At least 900mm wide sheets with a length not less than 1800mm shall be used. Sheets less than 900mm wide but no less than 600mm may be used provided all joints with adjacent sheets are back-blocked (see "GIB® Site Guide" and figure 22).
- Fasteners are placed at the specified centres around the ceiling diaphragm with the corners fastened using the GIB EzyBrace® fastener pattern.

FIGURE 20: PROTRUSIONS AND CUTOUTS

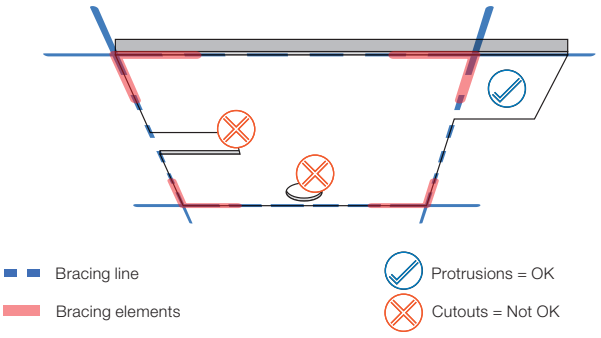


FIGURE 21: DIAPHRAGM BRACING LINING SPACINGS

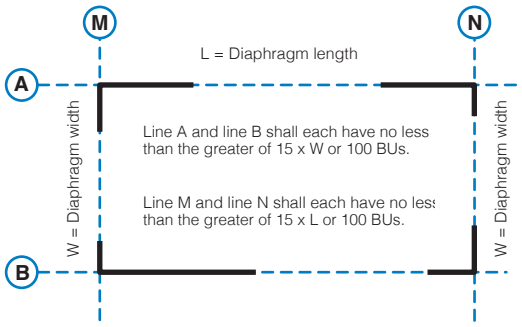
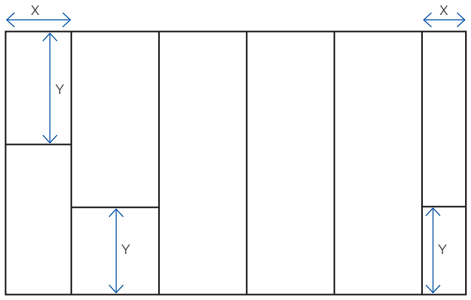


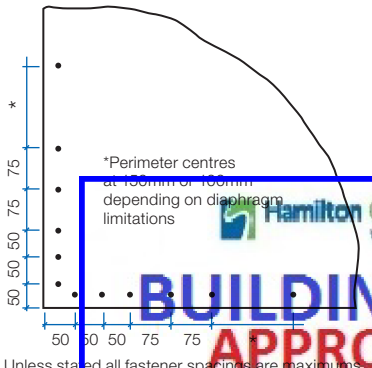
FIGURE 22: GIB® CEILING DIAPHRAGM SHEET WIDTHS AND LENGTHS



X = 900mm min or 600–900mm min provided all adjacent joints are back-blocked.

Y = 1800mm min sheet lengths at ends of ceiling diaphragms.

FIGURE 23: GIB EZYBRACE® FASTENER PATTERN



Unless stated all fastener spacings are maximums.

GEB015

Ceiling battens in ceiling diaphragms

Ceiling diaphragms may be constructed using steel or timber ceiling battens.

Battens shall be spaced at a maximum of:
- 500mm for 10mm GIB® plasterboard.
- 600mm for 13mm GIB® plasterboard.

Timber battens shall be fixed in accordance with the requirements of NZS 3604:2011.

Metal battens shall be GIB® Rondo® battens with two external flanges of 8mm to allow direct screw fixing to roof framing.

GIB® Rondo® metal battens shall be fixed with 2/32mm x 8g GIB® Grabber® Wafer Head Self Tapping screws to supporting framing.

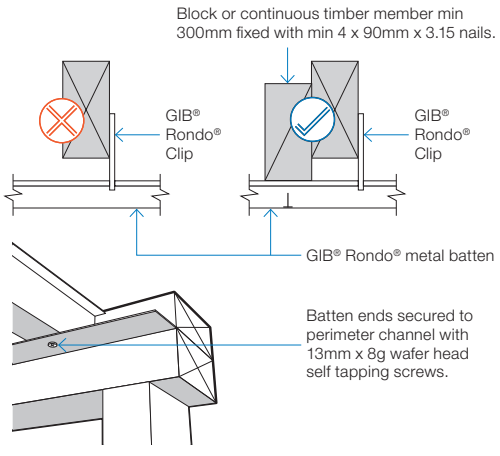
GIB® Rondo® metal battens must be fixed directly to the roof framing. If a clip system has been used, a timber block (min 300mm) or a continuous timber member can be fixed alongside the bottom chord to permit a direct connection to the batten, see figure 26.

For GIB® Rondo® metal battens, a GIB® Rondo® metal channel or metal angle is required at the perimeter of the diaphragm. The perimeter channel shall be fastened to the top plate with 32mm x 8g GIB® Grabber® Wafer Head Self Tapping screws or 32mm x 7g GIB® Grabber® Dual Thread screw at 300mm centres maximum.

Linings are fastened to metal using 25mm x 6g GIB® Grabber® Self Tapping screws and to timber framing using 32mm x 6g GIB® Grabber® High Thread screws. Alternatively 32mm x 7g GIB® Grabber® Dual Thread screws can be used in both cases. Fastener centres are specified on p.18.

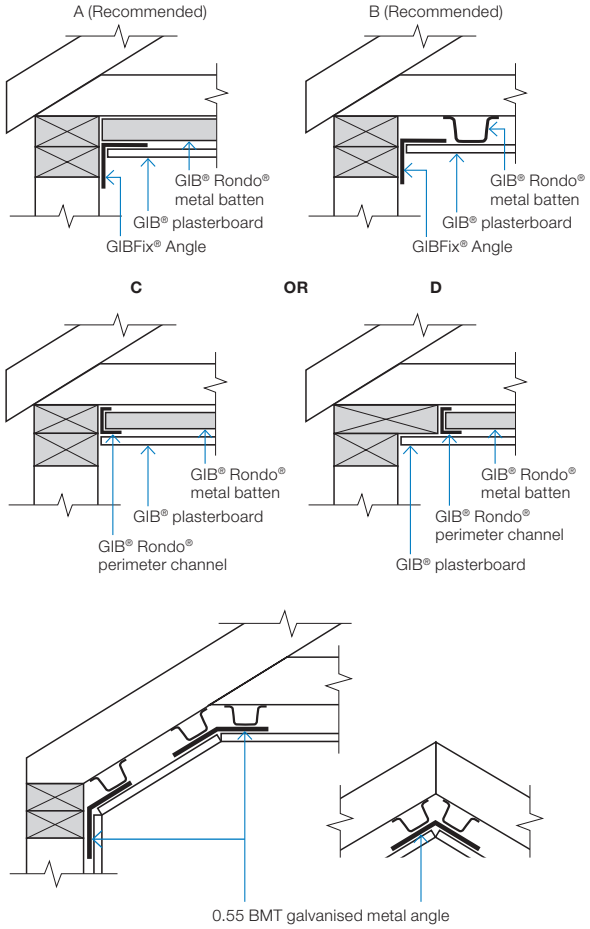
Coved ceiling diaphragms can be achieved by using nominally 32 x 32 x 0.55mm proprietary galvanised metal angles ("back-flashing") at the changes in direction. These angles shall be:
- Fastened at 300mm on each edge to metal battens using 32mm x 8g GIB® Grabber® Wafer Head Self Tapping screws or 32mm x 7g GIB® Grabber® Dual Thread screws.
- Fastened to timber framing using 32mm x 7g GIB® Grabber® Dual Thread screws when linings are installed.

FIGURE 26: GIB® RONDO® METAL CEILING BATTEN INSTALLATION



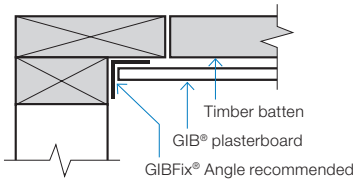
GEB016

FIGURE 27: GIB® RONDO® METAL CEILING BATTENS WITH CORNER ANGLES



GEB017

FIGURE 28: TIMBER CEILING BATTENS*



GEB018

Openings in ceiling diaphragms

SMALL OPENINGS

Small opening (e.g. down lights) of 90 x 90mm or less may be placed no closer than 90mm to the edge of the ceiling diaphragm.

LARGE OPENINGS

Openings are allowed withing the middle third of the diaphragms length and width. Fixing of sheet material to opening trimmers shall be at 150mm centres. Neither opening dimension shall exceed a third of the diaphragm width. Larger openings or openings in other locations require specific engineering design.

Where fireplace flue or range hood openings are required in a ceiling diaphragm use a galvansed metal backing plate as shown in figure 25, with a maximum hole diameter of 350mm.

Figure 25 can also be used for range hood openings in walls.

For information on openings in ceiling diaphragms contact the GIB® Helpline on 0800 100 442.

FIGURE 24: LARGE OPENINGS IN CEILING DIAPHRAGMS

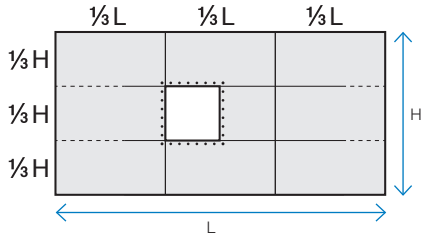
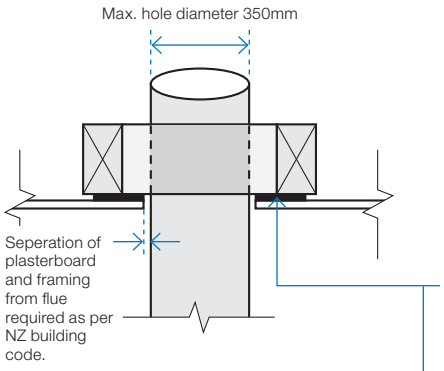
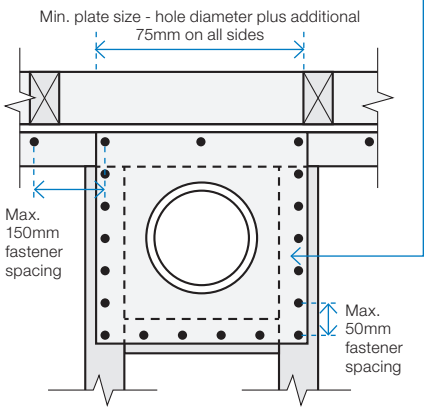


FIGURE 25: FIREPLACE FLUES AND RANGE HOOD OPENINGS

Section view



Plan view



Steel plate
0.55 BMT Galvanised sheet Max. opening 350mm diameter. Installed prior to GIB® plasterboard.

Framing
90 x 45mm framing trimmed to provide extra fixing.

GIB® plasterboard ceiling
Installed over the steel plate and into framing using a minimum of 32mm x 6g GIB® Grabber High Thread or 32mm x 7g GIB® Grabber Dual Thread screws at 50mm max centre spacing.

Plasterboard ceiling not shown in plan view

Length of GIB EzyBrace® elements ('N' Type)

The length of GIB EzyBrace® elements with an 'N' extension (requiring standard NZS3604:2011 plate connections) can be taken as the full frame length measured from the outside of the end-stud to the opening face as illustrated in figures 29-32.

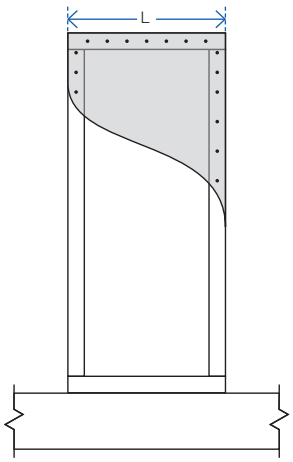
'N' type GIB EzyBrace® elements are identified by GIB® specification numbers GS1-N, GS2-N and GS2-NOM

The dimension 'L' shall not be less than 400mm.

Perimeter bracing fixing for linings of both 'H' and 'N' type elements is along the top and bottom plates, end stud, and doubling stud immediately adjacent to the opening.

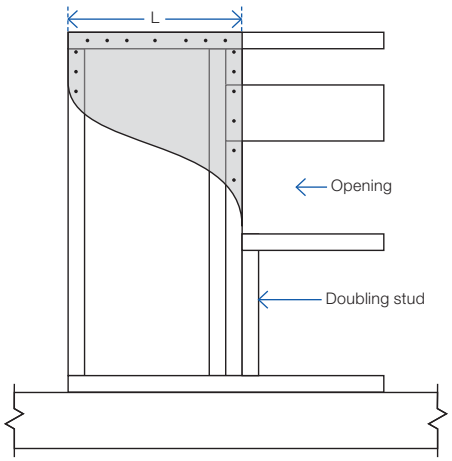
Fastener spacings and diagram scales shown in Figures 29–32 are indicative only. Refer to p.23–30 for construction details.

FIGURE 29: GS BRACING ELEMENTS (OPTION A)



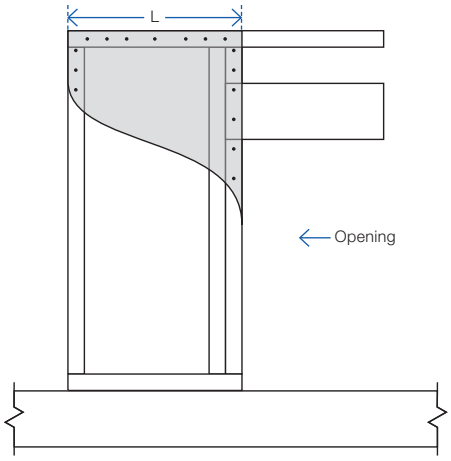
GS1-N, GS2-N elements
'L' indicates the length of the bracing element

FIGURE 30: GS BRACING ELEMENTS (OPTION B)



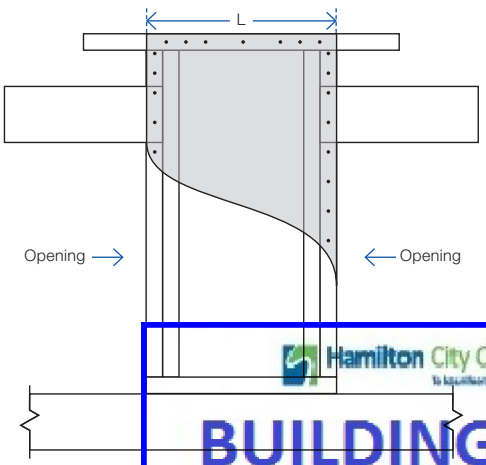
GS1-N, GS2-N elements
'L' indicates the length of the bracing element

FIGURE 31: GS BRACING ELEMENTS (OPTION C)



GS1-N, GS2-N elements
'L' indicates the length of the bracing element

FIGURE 32: GS BRACING ELEMENTS (OPTION D)



GS1-N, GS2-N elements
'L' indicates the length of the bracing element

Length of GIB EzyBrace® elements ('H' Type)

GIB EzyBrace® elements with an 'H' extension (requiring special panel hold-down fixings) can be used when the dimension 'L' as illustrated in figures 33–36 is 400mm or more.

'H' type GIB EzyBrace® elements are identified by GIB® specification numbers GSP-H, BL1-H, BLG-H and BLP-H.

The length of an 'H' type element is not only determined by the sheet material, but also by the placement of the hold-down fixings.

Hold-down fixings cannot be placed closer together than what is shown for the standard panel in figure 33.

Hold-down fixings can be placed under windows provided sill trimming studs beneath the opening are connected to the bracing element using 8/90mm gun nails, as illustrated in figure 34.

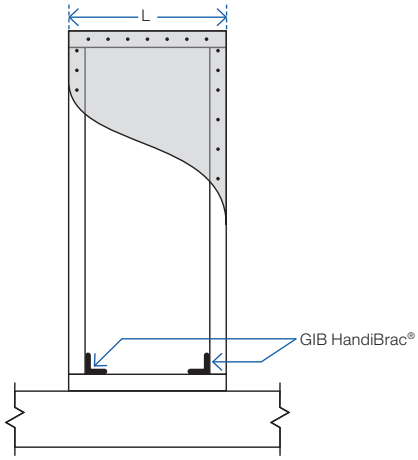
Spike doubling stud to trimming stud using a minimum of 2/90mm gun nails at 600mm centres. Lintel straps (where required for wind uplift) should be checked in and be located away from the bracing element fasteners.

Perimeter bracing fixing for linings of both 'H' and 'N' type elements is along the top and bottom plates, end stud, and doubling stud immediately adjacent to the opening as indicated in figures 34-36.

When using bracing straps, installed in accordance with p.17, fix the strap to the same framing member as shown for the GIB Handibrac® below, and install the adjacent anchor bolt in the same position as the GIB HandiBrac® bolt.

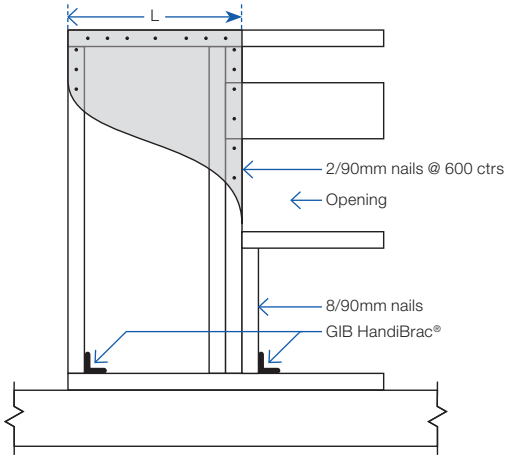
Fastener spacings and diagram scales shown in figures 33–36 are indicative only. Refer to p.23–30 for construction details.

FIGURE 33: BL BRACING ELEMENTS (OPTION A)



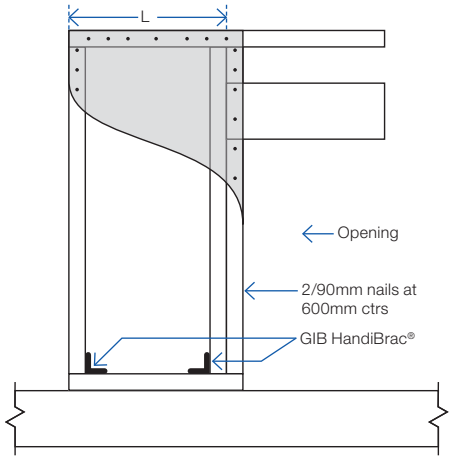
'H' type elements with specific hold downs
'L' indicates the length of the bracing element

FIGURE 34: BL BRACING ELEMENTS (OPTION B)



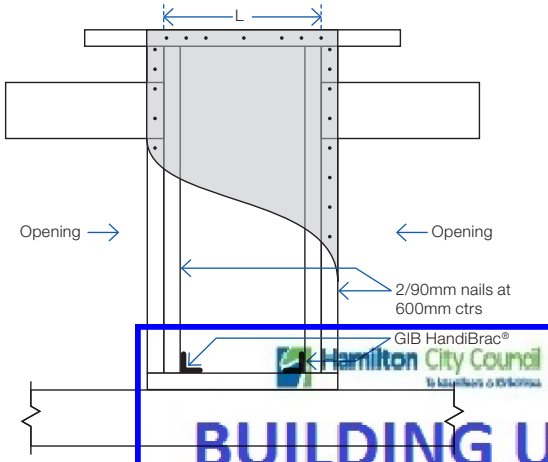
'H' type elements with specific hold downs
'L' indicates the length of the bracing element

FIGURE 35: BL BRACING ELEMENTS (OPTION C)



'H' type elements with specific hold downs
'L' indicates the length of the bracing element

FIGURE 36: BL BRACING ELEMENTS (OPTION D)



'H' type elements with specific hold downs
'L' indicates the length of the bracing element

GIB EzyBrace® Systems specification GS1-N

Specification code	Minimum length (m)	Lining requirement
GS1-N	0.4	Any 10mm or 13mm GIB® Standard plasterboard to one side only

WALL FRAMING

Wall framing to comply with;

- NZBC B1 — Structure B1/AS1 Clause 3 Timber (NZS 3604:2011).
- NZBC B2 — Durability B2/AS1 Clause 3.2 Timber (NZS 3602).

Framing dimensions and height as determined by NZS 3604:2011 stud and top plate tables for load bearing and non-bearing walls. The use of kiln dried stress graded timber is recommended.

BOTTOM PLATE FIXING

Timber floor

Pairs of hand driven 100 x 3.75mm nails at 600mm centres; or three power driven 90 x 3.15mm nails at 600mm centres.

Concrete floor

Internal Wall Bracing Lines: In accordance with the requirements of NZS 3604:2011 for internal wall plate fixing or 75 x 3.8mm shot fired fasteners with 16mm discs spaced at 150mm and 300mm from end studs and 600mm centres thereafter.

External Wall Bracing Lines: In accordance with the requirements of NZS 3604:2011 for external wall bottom plate fixing.

WALL LINING

- Any 10mm or 13mm GIB® plasterboard lining.
- Sheets can be fixed vertically or horizontally.
- Sheet joints shall be touch fitted.
- Use full length sheets where possible.

PERMITTED ALTERNATIVES

For permitted GIB® plasterboard alternatives refer to p. 5 in GIB EzyBrace® Systems literature.

FASTENING THE LINING

Fasteners

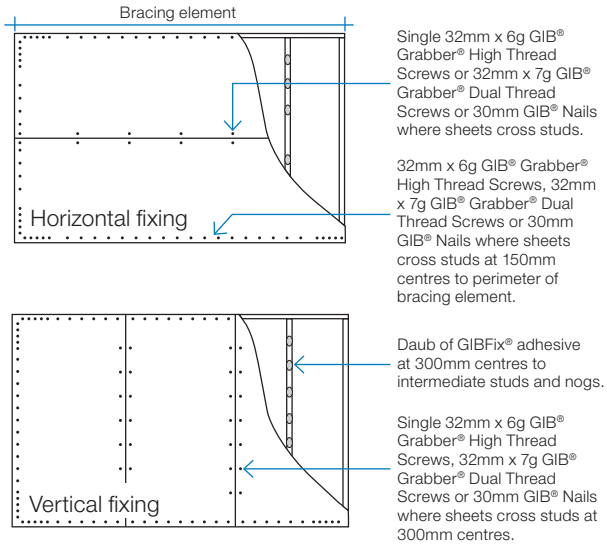
32mm x 6g GIB® Grabber® High Thread Screws, 32mm x 7g GIB® Grabber® Dual Thread Screws or 30mm GIB® Nails. If using the GIBFix® Angle use only 32mm x 7g GIB® Grabber® Dual Thread Screws.

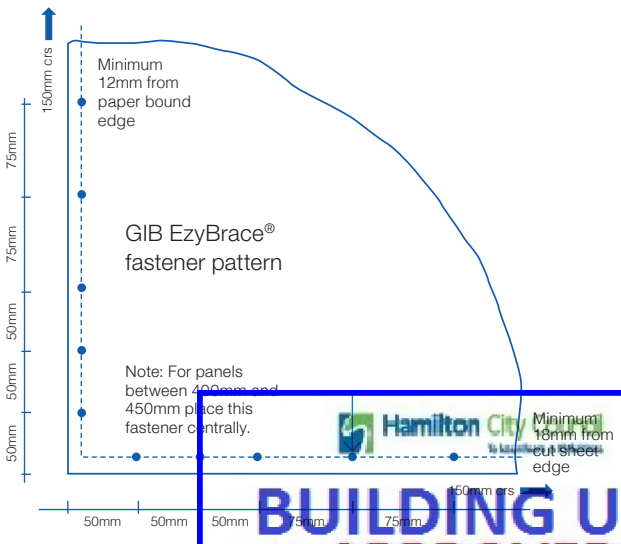
Fastener centres

50,100,150, 225, 300mm maximum from each corner and 150mm thereafter around the perimeter of the bracing element. For vertically fixed sheets place fasteners at 300mm maximum centres to intermediate sheet joints. For horizontally fixed sheets place single fasteners to the sheet edge where it crosses the stud. Use daubs of GIBFix® adhesive at 300mm maximum centres to intermediate studs. Place fasteners no closer than 12mm from paper bound sheet edges and 18mm from any sheet end or cut edge.

JOINTING

Joint strength is important in delivering bracing system performance. All fastener heads stopped and all sheet joints GIB® Joint Tape reinforced and stopped in accordance with the GIB® Site Guide.





In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow the specifications. This specification sheet is issued in conjunction with the publication GIB EzyBrace® Systems

GIB EzyBrace® Systems specification GS2-NOM

Specification code	Minimum length (m)	Lining requirement
GS2-NOM	0.4	Any 10mm or 13mm GIB® Standard plasterboard fixed to each side of the wall framing

WALL FRAMING

Wall framing to comply with;

- NZBC B1 — Structure B1/AS1 Clause 3 Timber (NZS 3604:2011).
- NZBC B2 — Durability B2/AS1 Clause 3.2 Timber (NZS 3602).

Framing dimensions and height as determined by NZS 3604:2011 stud and top plate tables for load bearing and non-bearing walls. The use of kiln dried stress graded timber is recommended.

BOTTOM PLATE FIXING

Timber floor

Pairs of hand driven 100mm x 3.75mm nails at 600mm centres; or three power driven 90mm x 3.15mm nails at 600mm centres.

Concrete floor

Internal Wall Bracing Lines: In accordance with the requirements of NZS 3604:2011 for internal wall plate fixing or 75mm x 3.8mm shot fired fasteners with 16mm discs spaced at 150mm and 300mm from end studs and then 600mm centres thereafter.

WALL LINING

- A layer of 10mm or 13mm GIB® plasterboard to each side of the wall.
- Sheets can be fixed vertically or horizontally.
- Sheet joints shall be touch fitted.
- Use full length sheets where possible.

PERMITTED ALTERNATIVES

For permitted GIB® plasterboard alternatives refer to p. 5 in GIB EzyBrace® Systems literature.

FASTENING THE LINING

Fasteners

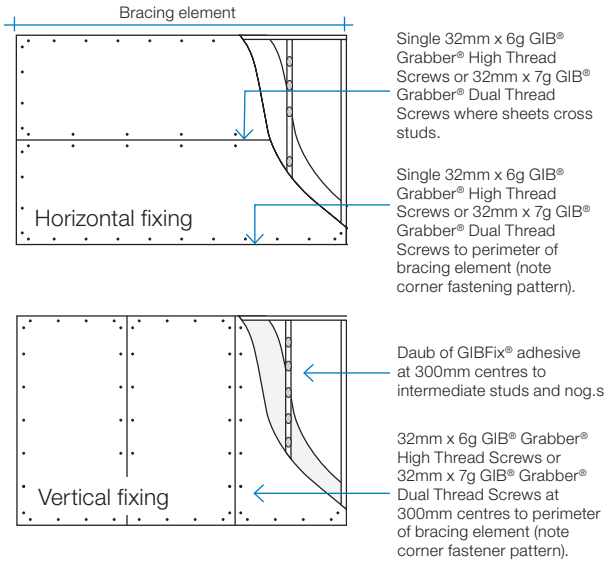
32mm x 6g GIB® Grabber® High Thread Screws or 32mm x 7g GIB® Grabber® Dual Thread Screws. If using the GIBFix® Angle use 32mm x 7g GIB® Grabber® Dual Thread Screws.

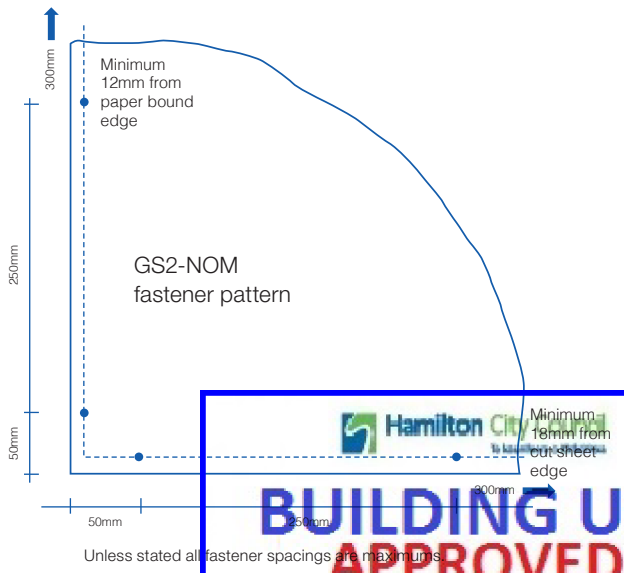
Fastener centres

50, 300mm from each corner and 300mm maximum thereafter around the perimeter of the bracing element. For horizontally fixed sheets place single fasteners to the sheet edge where it crosses the stud. Use daubs of GIBFix® adhesive at 300mm maximum centres to intermediate studs. Place fasteners no closer than 12mm from paper bound sheet edges and 18mm from any sheet end or cut edge.

JOINTING

Joint strength is important in delivering bracing system performance. All fastener heads stopped and all sheet joints GIB® Joint Tape reinforced and stopped in accordance with the GIB® Site Guide.





In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow the specifications. This specification sheet is issued in conjunction with the publication GIB EzyBrace® Systems

GS2-NOM ADHESIVE FIXING OPTION AT DOOR JAMBS

As an alternative to using screw fixings, a continuous 6-10mm bead of solvent based GIBFix® All-Bond can be applied along the full height studs immediately adjacent to an internal door opening and at the door lintel or head trimmer. The lining is then bedded into the adhesive and installed into the rebated jamb, as shown in figure 38.

This solvent based adhesive option may only be used with GS2-NOM specification and is designed to reduce popping of fasteners around door openings on internal walls.

FIGURE 37: SCREW FIX FOR OPENINGS

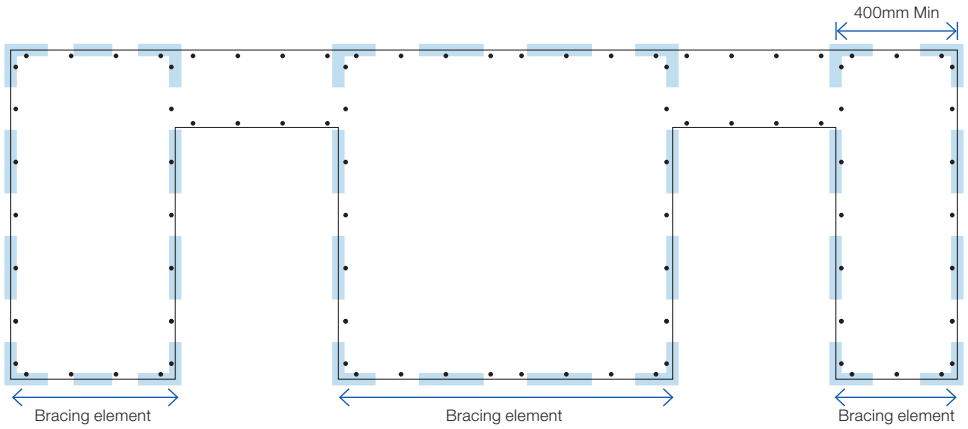
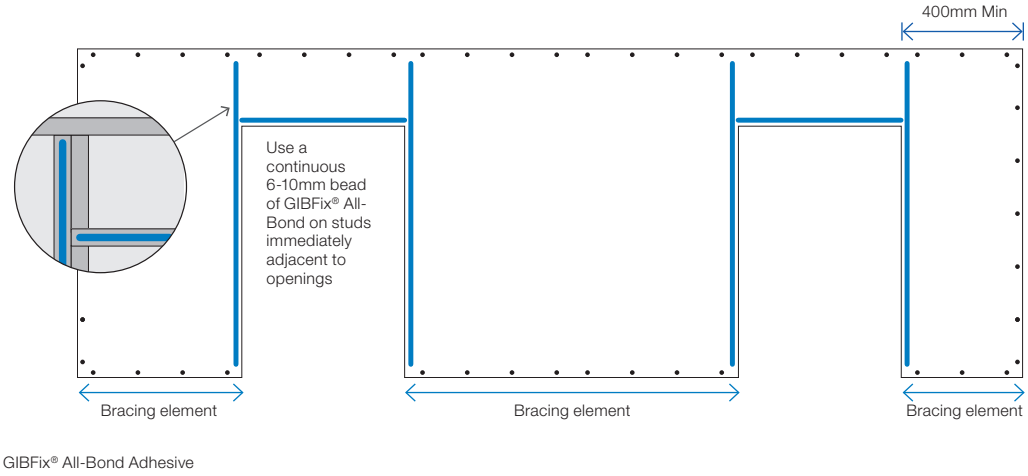
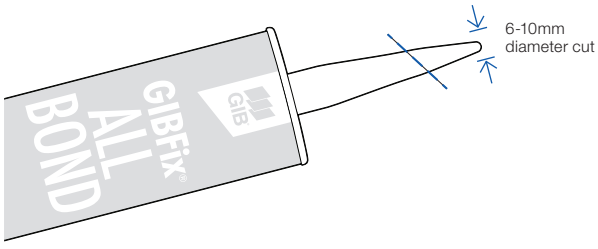


FIGURE 38: SCREW AND ADHESIVE FIX FOR OPENINGS



ADHESIVE NOZZLE APERTURE



GIB EzyBrace® Systems specification GS2-N

Specification code	Minimum length (m)	Lining requirement
GS2-N	0.4	Any 10mm or 13mm GIB® Standard plasterboard fixed to each side of the wall framing

WALL FRAMING

Wall framing to comply with;

- NZBC B1 — Structure B1/AS1 Clause 3 Timber (NZS 3604:2011).
- NZBC B2 — Durability B2/AS1 Clause 3.2 Timber (NZS 3602).

Framing dimensions and height as determined by NZS 3604:2011 stud and top plate tables for load bearing and non-bearing walls. The use of kiln dried stress graded timber is recommended.

BOTTOM PLATE FIXING

Timber Floor

Pairs of hand driven 100 x 3.75mm nails at 600mm centres; or three power driven 90 x 3.15mm nails at 600mm centres.

Concrete floor

Internal Wall Bracing Lines: In accordance with the requirements of NZS 3604:2011 for internal wall plate fixing or 75 x 3.8mm shot fired fasteners with 16mm discs spaced at 150mm and 300mm from end studs and then 600mm centres thereafter.

WALL LINING

- A layer of 10mm or 13mm GIB® plasterboard to each side of the wall.
- Sheets can be fixed vertically or horizontally.
- Sheet joints shall be touch fitted.
- Use full length sheets where possible.

PERMITTED ALTERNATIVES

For permitted GIB® plasterboard alternatives refer to p. 5 in GIB EzyBrace® Systems literature.

FASTENING THE LINING

Fasteners

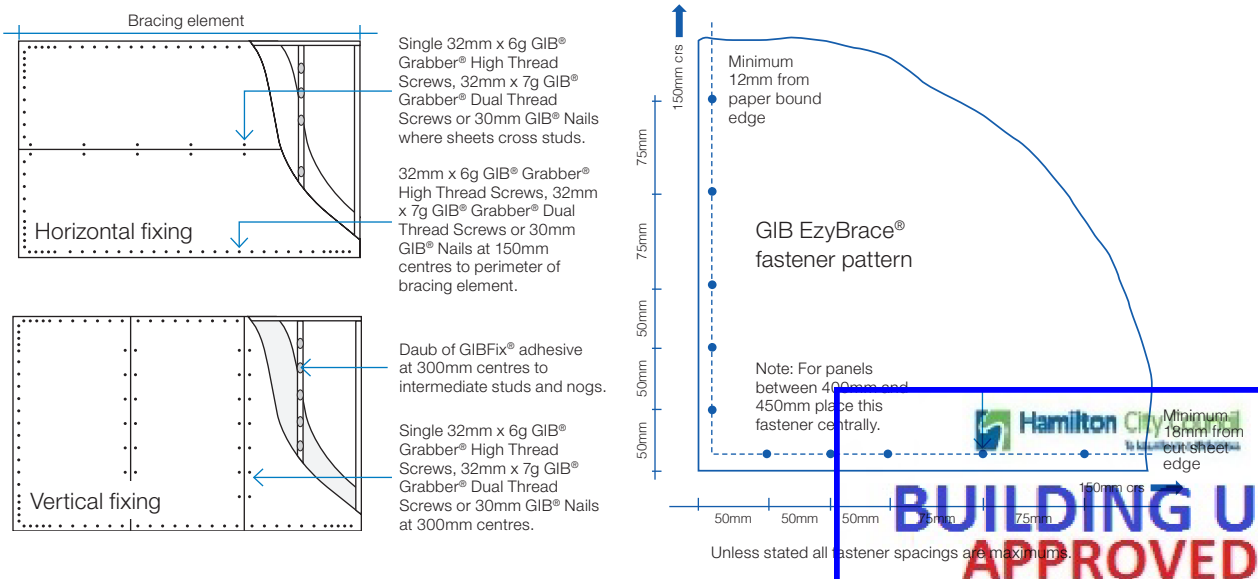
32mm x 6g GIB® Grabber® High Thread Screws,32mm x 7g GIB® Grabber® Dual Thread Screws or 30mm GIB® Nails. If using the GIBFix® Angle use only 32mm x 7g GIB® Grabber® Dual Thread Screws.

Fastener centres

50,100,150, 225, 300mm maximum from each corner and 150mm thereafter around the perimeter of the bracing element. For vertically fixed sheets place fasteners at 300mm maximum centres to intermediate sheet joints. For horizontally fixed sheets place single fasteners to the sheet edge where it crosses the stud. Use daubs of GIBFix® adhesive at 300mm maximum centres to intermediate studs. Place fasteners no closer than 12mm from paper bound sheet edges and 18mm from any sheet end or cut edge.

JOINTING

Joint strength is important in delivering bracing system performance. All fastener heads stopped and all sheet joints GIB® Joint Tape reinforced and stopped in accordance with the GIB® Site Guide.



In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow the specifications. This specification sheet is issued in conjunction with the publication GIB EzyBrace® Systems

GIB EzyBrace® Systems specification GSP-H

Specification Code	Minimum length (m)	Lining requirement	Other requirements
GSP-H	0.4	Any 10mm or 13mm GIB® plasterboard lining to one side of framing and minimum 7mm structural plywood manufactured to AS/NZ 2269.0 :2012 to the other side	Hold downs

WALL FRAMING

Wall framing to comply with;

- NZBC B1 — Structure B1/AS1 Clause 3 Timber (NZS 3604:2011).
- NZBC B2 — Durability B2/AS1 Clause 3.2 Timber (NZS 3602).

Framing dimensions and height as determined by NZS 3604:2011 stud and top plate tables for load bearing and non-bearing walls. The use of kiln dried stress graded timber is recommended.

BOTTOM PLATE FIXING

Timber floor

Use panel hold downs at each end of the bracing element. The GIB HandiBrac® is recommended. See details in GIB EzyBrace® Systems or GIB® Site Guide.

Pairs of hand driven 100 x 3.75mm nails at 600mm centres; or Three power driven 90 x 3.15mm nails at 600mm centres.

Concrete floor

Use panel hold downs at each end of the bracing element. The GIB HandiBrac® is recommended. See details in GIB EzyBrace® Systems or GIB® Site Guide. Within the length of the bracing element bottom plates are to be fixed in accordance with the requirements of NZS 3604:2011.

WALL LINING

- A layer of 10mm or 13mm GIB® plasterboard to one side of the wall plus minimum 7mm structural plywood manufactured to AS/NZ 2269.0 :2012 to the other side.
- Sheets can be fixed vertically or horizontally, with edges supported.
- Sheet joints shall be touch fitted.
- Use full length sheets where possible.

PERMITTED ALTERNATIVES

For permitted GIB® plasterboard alternatives refer to p. 5 in GIB EzyBrace® Systems literature.

FASTENING THE LINING

Fasteners

32mm x 6g GIB® Grabber® High Thread Screws, 32mm x 7g GIB® Grabber® Dual Thread Screws or 30mm GIB® Nails.

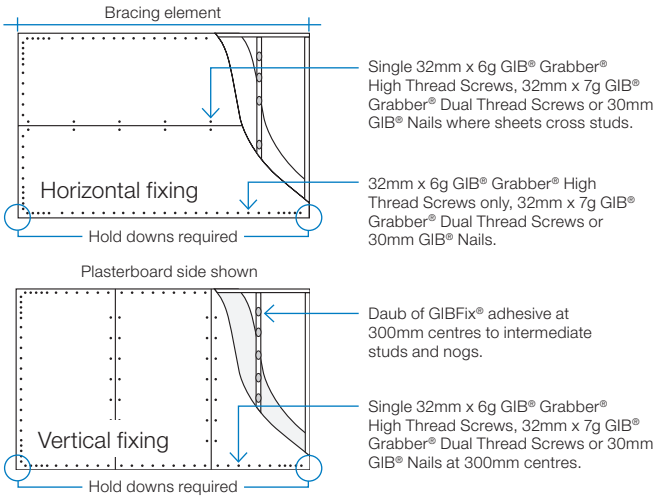
If using the GIBFix® Framing System or if fastening through GIBFix® Angles use only 32mm x 7g GIB® Grabber® Dual Thread Screws. Plywood: 50 x 2.8mm Galv or Stainless steel annular grooved FH nails.

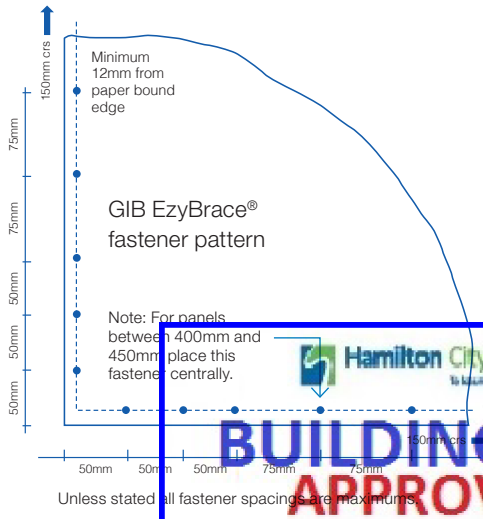
Fastener centres

GIB® plasterboard side: 50,100,150, 225, 300mm maximum from each corner and 150mm thereafter around the perimeter of the bracing element. For vertically fixed sheets place fasteners at 300mm maximum centres to the intermediate sheet joints. For horizontally fixed sheets place single fasteners to the sheet edge where it crosses the stud. Use daubs of GIBFix® adhesive at 300mm maximum centres to intermediate studs. Place fasteners no closer than 12mm from paper bound sheet edges and 18mm from any sheet end or cut edge. Plywood side: 150mm centres to the perimeter of each sheet. GIB® corner fastener pattern does not apply to the plywood side. 300mm centres to intermediate studs.

JOINTING

Joint strength is important in delivering bracing system performance. All fastener heads stopped and all sheet joints GIB® Joint Tape reinforced and stopped in accordance with the GIB® Site Guide.





In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow the specifications. This specification sheet is issued in conjunction with the publication GIB EzyBrace® Systems

GIB EzyBrace® Systems specification BL1-H

Specification code	Minimum length (m)	Lining requirement	Other requirements
BL1-H	0.4	10mm or 13mm GIB Braceline® to one side only	Hold downs

WALL FRAMING

Wall framing to comply with;

- NZBC B1 — Structure B1/AS1 Clause 3 Timber (NZS 3604:2011).
- NZBC B2 — Durability B2/AS1 Clause 3.2 Timber (NZS 3602).

Framing dimensions and height as determined by NZS 3604:2011 stud and top plate tables for load bearing and non-bearing walls. The use of kiln dried stress graded timber is recommended.

BOTTOM PLATE FIXING

Timber floor

Use panel hold downs at each end of the bracing element. The GIB HandiBrac® is recommended. See details in GIB EzyBrace® Systems or GIB® Site Guide.

Pairs of hand driven 100 x 3.75mm nails at 600mm centres; or Three power driven 90 x 3.15mm nails at 600mm centres.

Concrete floor

Use panel hold downs at each end of the bracing element. The GIB HandiBrac® is recommended. See details in GIB EzyBrace® Systems or GIB® Site Guide. Within the length of the bracing element bottom plates are to be fixed in accordance with the requirements of NZS 3604:2011.

WALL LINING

- A layer of 10mm or 13mm GIB Braceline®
- Sheets can be fixed vertically or horizontally.
- Sheet joints shall be touch fitted.
- Use full length sheets where possible.

PERMITTED ALTERNATIVES

For permitted GIB® plasterboard alternatives refer to p. 5 in GIB EzyBrace® Systems literature.

FASTENING THE LINING

Fasteners

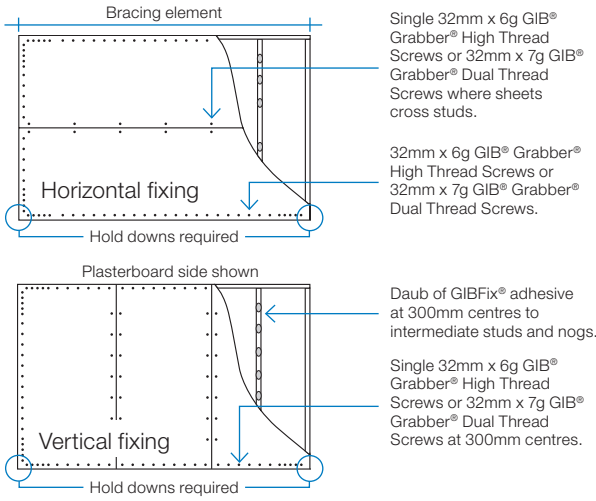
32mm x 6g GIB® Grabber® High Thread Screws or 32mm x 7g GIB® Grabber® Dual Thread Screws. If using the GIBFix® Framing System or if fastening through GIBFix® Angles use only 32mm x 7g GIB® Grabber® Dual Thread Screws.

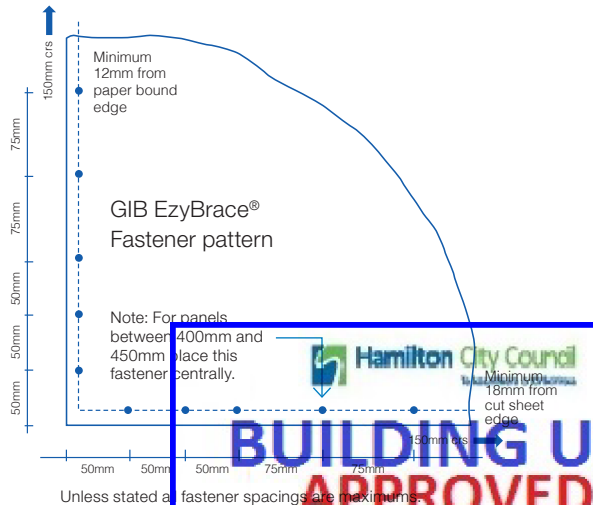
Fastener centres

50,100,150, 225, 300mm from maximum each corner and 150mm thereafter around the perimeter of the bracing element. For vertically fixed sheets place fasteners at 300mm maximum centres to the sheet joint. For horizontally fixed sheets place single fasteners to the sheet edge where it crosses the stud. Use daubs of GIBFix® adhesive at 300mm maximum centres to intermediate studs. Place fasteners no closer than 12mm from paper bound sheet edges and 18mm from any sheet end or cut edge.

JOINTING

Joint strength is important in delivering bracing system performance. All fastener heads stopped and all sheet joints GIB® Joint Tape reinforced and stopped in accordance with the GIB® Site Guide.





In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow the specifications. This specification sheet is issued in conjunction with the publication GIB EzyBrace® Systems

GIB EzyBrace® Systems specification BLG-H

Specification code	Minimum length (m)	Lining requirement	Other requirements
BLG-H	0.4	10mm or 13mm GIB Braceline® to one side of the frame plus any 10mm or 13mm GIB® plasterboard to the other side	Hold downs

WALL FRAMING

Wall framing to comply with;

- NZBC B1 — Structure B1/AS1 Clause 3 Timber (NZS 3604:2011).
- NZBC B2 — Durability B2/AS1 Clause 3.2 Timber (NZS 3602).

Framing dimensions and height as determined by NZS 3604:2011 stud and top plate tables for load bearing and non-bearing walls. The use of kiln dried stress graded timber is recommended.

BOTTOM PLATE FIXING

Timber floor

Use panel hold downs at each end of the bracing element. The GIB HandiBrac® is recommended. See details in GIB EzyBrace® Systems or GIB® Site Guide. Pairs of hand driven 100 x 3.75mm nails at 600mm centres; or Three power driven 90 x 3.15mm nails at 600mm centres.

Concrete floor

Use panel hold downs at each end of the bracing element. The GIB HandiBrac® is recommended. See details in GIB EzyBrace® Systems 2011 or GIB® Site Guide. Within the length of the bracing element bottom plates are to be fixed in accordance with the requirements of NZS 3604:2011.

WALL LINING

- A layer of 10mm or 13mm GIB Braceline® to one side of the wall plus any 10mm or 13mm GIB® plasterboard lining to the other side.
- Sheets can be fixed vertically or horizontally.
- Sheet joints shall be touch fitted.
- Use full length sheets where possible.

PERMITTED ALTERNATIVES

For permitted GIB® plasterboard alternatives refer to p. 5 in GIB EzyBrace® Systems literature.

FASTENING THE LINING

Fasteners

GIB Braceline® side: 32mm x 6g GIB® Grabber® High Thread Screws or 32mm x 7g GIB® Grabber® Dual Thread Screws.Other side: 32mm x 6g GIB® Grabber® High Thread Screws, 30mm GIB Nails or 32mm x 7g GIB® Grabber® Dual Thread Screws.

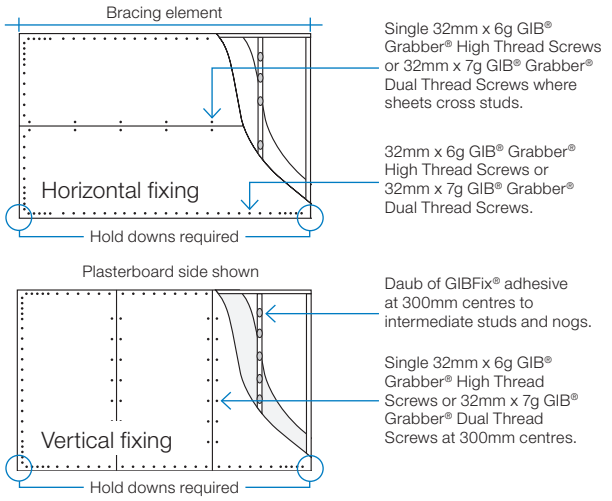
If using the GIBFix® Framing System or if fastening through GIBFix® Angles use only 32mm x 7g GIB® Grabber® Dual Thread Screws.

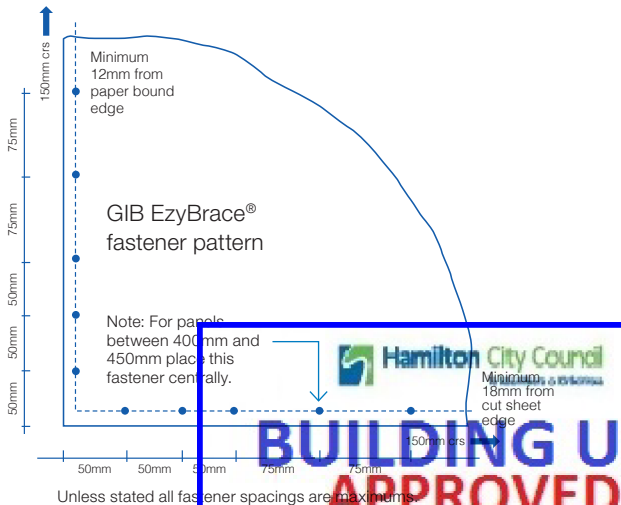
Fastener centres

50,100,150, 225, 300mm maximum from each corner and then 150mm thereafter around the perimeter of the bracing element. For vertically fixed sheets place fasteners at 300mm maximum centres to the intermediate sheet joints. For horizontally fixed sheets place single fasteners to the sheet edge where it crosses the stud. Use daubs of GIBFix® adhesive at 300mm maximum centres to intermediate studs. Place fasteners no closer than 12mm from paper bound sheet edges and 18mm from any sheet end or cut edge.

JOINTING

Joint strength is important in delivering bracing system performance. All fastener heads stopped and all sheet joints GIB® Joint Tape reinforced and stopped in accordance with the GIB® Site Guide.





In order for GIB® systems to perform as tested, all components must be installed exactly as prescribed. Substituting components produces an entirely different system and may seriously compromise performance. Follow the specifications. This specification sheet is issued in conjunction with the publication GIB EzyBrace® Systems

GIB EzyBrace® Systems specification BLP-H

Specification code	Minimum length (m)	Lining requirement	Other requirements
BLP-H	0.4	10mm or 13mm GIB Braceline® to one side of the frame plus minimum 7mm structural plywood manufactured to AS/NZ 2269.0 :2012 to the other side	Hold downs

WALL FRAMING

Wall framing to comply with;

- NZBC B1 — Structure; B1/AS1 Clause 3 Timber (NZS 3604:2011).
- NZBC B2 — Durability B2/AS1 Clause 3.2 Timber (NZS 3602).

Framing dimensions and height as determined by NZS 3604:2011 stud and top plate tables for load bearing and non-bearing walls. The use of kiln dried stress graded timber is recommended.

BOTTOM PLATE FIXING

Timber floor

Use panel hold downs at each end of the bracing element. The GIB® HandiBrac is recommended. See details in GIB EzyBrace® Systems or GIB® Site Guide.

Pairs of hand driven 100 x 3.75mm nails at 600mm centres; or Three power driven 90 x 3.15mm nails at 600mm centres.

Concrete floor

Use panel hold downs at each end of the bracing element. The GIB HandiBrac® is recommended. See details in GIB EzyBrace® Systems or GIB® Site Guide. Within the length of the bracing element bottom plates are to be fixed in accordance with the requirements of AS/NZ 2269/0 :2012.

WALL LINING

- A layer of 10mm or 13mm GIB Braceline® to one side of the wall plus minimum 7mm structural plywood manufactured to AS/NZS 2269.0 :2012 to the other side.
- Sheets can be fixed vertically or horizontally.
- Plywood is to be fixed vertically with edges supported.
- Sheet joints shall be touch fitted.
- Use full length sheets where possible.

PERMITTED ALTERNATIVES

For permitted GIB® plasterboard alternatives refer to p. 5 in GIB EzyBrace® Systems literature.

FASTENING THE LINING

Fasteners

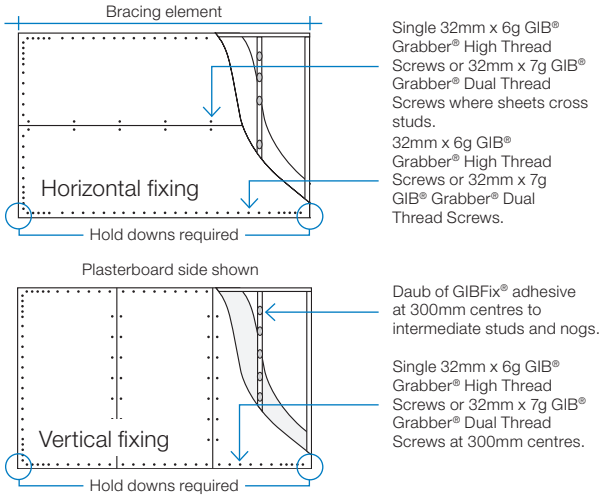
GIB Braceline® side: 32mm x 6g GIB® Grabber® High Thread Screws or 32mm x 7g GIB® Grabber® Dual Thread Screws. Plywood: 50 x 2.8mm Galv or Stainless steel annular grooved FH nails. If using the GIBFix® Framing System or if fastening through GIBFix® Angles use only 32mm x 7g GIB® Grabber® Dual Thread Screws.

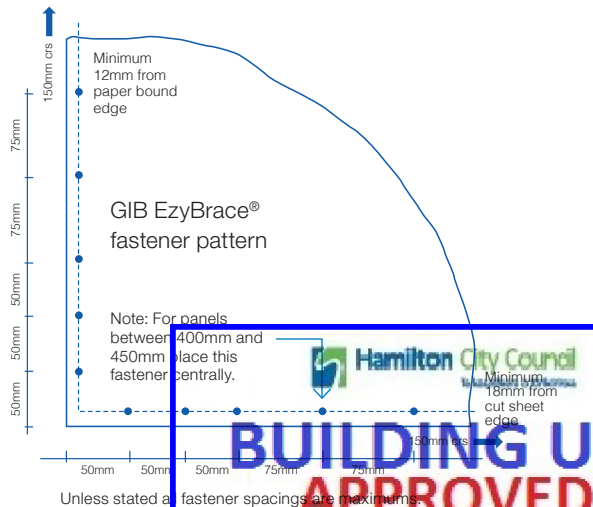
Fastener centres

GIB® Plasterboard side: 50,100,150, 225, 300mm from each corner and then 150mm thereafter around the perimeter of the bracing element. For vertically fixed sheets place fasteners at 300mm centres to the intermediate sheet joints. For horizontally fixed sheets place single fasteners to the sheet edge where it crosses the stud. Use daubs of GIBFix® adhesive at 300mm centres to intermediate studs. Place fasteners no closer than 12mm from paper bound sheet edges and 18mm from any sheet end or cut edge. Plywood side: 150mm centres to the perimeter of each sheet. GIB® corner fastener pattern does not apply to the plywood side. 300mm centres to intermediate studs.

JOINTING

Joint strength is important in delivering bracing system performance. All fastener heads stopped and all sheet joints GIB® Joint Tape reinforced and stopped in accordance with the GIB® Site Guide.





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Winstone Wallboards is committed to protecting the environment. Environmental matters are integrated into all business activities:

- Our operations strive to exceed all environmental regulatory requirements at all times.
- Protection of the environment is a day to day responsibility that we all must accept.
- We allocate appropriate management time and resources to address relevant environmental issues and continuously improve our activities in that area.
- We will achieve our standards of performance through positive action, employee involvement and constant communication with our neighbours, local authorities and customers.

Minimise on-site waste when designing and/or installing GIB® Systems. For larger projects give consideration to our cut-to-length service to reduce waste. GIB® plasterboard off-cuts, if separated from other waste building materials, can be readily recycled.

For larger projects waste can be diverted to compost manufacturers who grind up the GIB® plasterboard and use it in compost. For smaller projects, the GIB® plasterboard can be ground up and spread around the building site.

GLOBAL GREENTAG^{CERTTM}

The Global GreenTag^{CertTM} certified eco-label acknowledges product as meeting the GreenRate Standard set by Global GreenTag.^{CertTM}

GIB® plasterboard has a Level B green rating.

DECLARE CERTIFICATION

Declare is a database of non-toxic, sustainably sourced building products.

Many GIB® plasterboard products including GIB® Standard, GIB Braceline®, GIB Noiseline® and GIB Aqualine® have achieved Red List Free status in Declare certification.

For more information on Winstone Wallboards sustainability commitments visit gib.co.nz.

TRADEMARKS

The names GIB®, GIB Fyreline®, GIB Ultraline®, GIB Braceline®, GIB Toughline®, GIB Noiseline®, GIB Aqualine®, GIB Nail®, GIB Tradeset®, GIB Plus 4®, GIB-Cove®, GIB Lite Blue®, GIBFix®, the colour mauve for GIB Toughline®, GIB HandiBrac®, GIB EzyBrace®, the colour blue for GIB Braceline®, the colour pink for GIB Fyreline®, the colour green for GIB Aqualine®, and the shield device are registered trademarks of Fletcher Building Holdings Limited.

PATENTS

GIBFix® Framing System and GIB EzyBrace® Systems, including componentry and design method, have patents pending (NZ Patent Number 596691, NZ Patent 709159 pending) and design and other IP rights.

FOR MORE INFORMATION VISIT

gib.co.nz

OR CALL THE GIB® HELPLINE

0800 100 442

INFINITY A-series

continuous flow gas hot water heaters

PTS

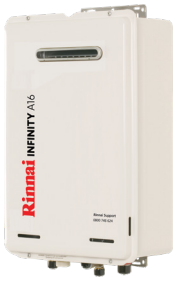
01:18

A Product Technical Statement (PTS) is a way to show how a product or system is fit for purpose for use in New Zealand and to demonstrate compliance with the New Zealand Building Code (Building Code Amendment Act 2013).

Product description

Designed and made in Japan, the Rinnai INFINITY A-series are continuous flow gas hot water heaters with inbuilt frost protection. They have electronic ignition and require electricity to operate. The temperature dip switch setting is factory preset at 55 °C.

The INFINITY A-series comes in a range of sizes, model selection is dependent on the number of outlets in the house. Click on any of the thumbnail images to view the product information.



A16

A20

A24

A26

Scope of use

Suitable for mains and medium pressure residential applications. They are designed to be externally mounted on an outside wall and located as close as practicable to the most frequently used hot water outlet(s), to reduce the delay for hot water delivery.

They are not suitable as a spa or swimming pool heater. They are also not suitable for commercial installations.

Hard or acidic water will need to be treated to use this product.

Available for connection to natural gas or LPG, this must be specified at the time of purchase.

Flue terminations must comply with the flue terminal locations shown in AS/NZS 5601.1.

Design guidelines

Specification and installation must be in accordance with Rinnai installation requirements and with the Building Code.

Rinnai specify that installation must be in compliance with AS/NZS 5601.1:2013, AS/NZS 3000:2007, and AS/NZS 3500.

Quality assurance

- ISO 9001 Certified System
- ISO 14001 Certified System

BUILDING UNIT APPROVED

Rinnai.co.nz I 0800 746 624

http://www.youtube.com/rinnainz

BC Number - DD007.2019.00040020.001

Experience our innovation

INFINITY A-series

continuous flow gas hot water heaters

PTS

01:18

Compliance with the NZ Building Code

If specified, installed and maintained in accordance with all Rinnai requirements the INFINITY A-series will comply with the below provisions of the NZ Building Code. AS/NZS 5601.1 is an acceptable solution within the NZBC for gas installations as per NZBC G11/AS1 9.0.1.

Code clause	Evidence of compliance
B1.3.1 B1.3.2 B1.3.3 (a, b, c, h, , m)	The INFINITY A-series units are certified to AS/NZS 4552, a series of standards for safety, performance and energy efficiency in gas fired water heaters for hot water supply and/or central heating.
B.2.3.1 (c)	In service history.
C2.2 and C2.3	Certification of continuous flow gas water heaters to AS/NZS 4552.
E2.3.2	Achieved by following E2/AS1
G4.3.3 (f, i)	Achieved as long as the building complies with G4/AS1
G9.3.1 (a, b, c, d, f), G9.3.3	G9/AS1 as required by Rinnai installation guidance
G10.3.1 (a, b, c, d), G10.3.2, G10.3.3, G10.3.4, G10.3.5, G10.3.6	G10/AS1 (NZS 5442 natural gas) and (NZS 5435 LPG)
G11.3.1, G11.3,2, G11.3.3, G11.3.4	G11/AS1 (AS/NZS 5601.1) as required by Rinnai installation guidance
H1.3.4	Certification of continuous flow gas water heaters to AS/NZS 4552.2 (Minimum energy performance standards for gas water heaters).

Additional evidence to support the above statements

Energy Safety Supplier Declaration of Compliance:

- INFINITY A16: Declaration number - 1825920179
- INFINITY A20: Declaration number - 1825820179
- INFINITY A24: Declaration number - 1825720179
- INFINITY A26: Declaration number - 1825620179

Seismic restraint

Rinnai has prepared a seismic restraint calculation using NZS 4219. This can be accessed from the A-series product page (technical tab) on the Rinnai website.

Special conditions - installation requirements

Full appliance information can be found at www.rinnai.co.nz.

Limitations: To be installed in accordance with all Rinnai installation requirements and by a licensed gasfitter/plumber, and electrician. Upon completion of the installation, a final inspection and test to demonstrate that the gas appliance has been installed in accordance with Rinnai's instructions and in accordance with Gas (safety and measurement) Regulations 2013 is required by the installer. The gasfitter is to issue a certificate of compliance.

Special conditions - maintenance requirements

For reliable operation Rinnai INFINITY units should be serviced every two years. Installation, servicing and repair shall be carried out only by authorised personnel.