IDSGN Architecture

PROJECT SPECIFICATION

Proposed New House - Barron Residence

64 Totara Terrace
WANAKA

Issued for Consent

11 May 2026

23.029

PROJECT OVERVIEW

Scope

Construction of new 4 bedroom, 2 storey dwelling. Concrete 300 Maxslab floor, with timber wall framing with a combination of vertical Colorsteel Kahu profile metal, Abodo vertical shiplap weatherboard and RCS concrete look plaster wall cladding systems. Low pitch timber roof trusses with TPO roof cladding. Includes the installation of Escea TFS850 free standing wood burner and Trendz T1600 insert fireplace. Both with designer flues

Address

Site Address	64 Totara Terrace
City	WANAKA
Lot #	94
DP #	10245

Site Conditions

Wind Zone	H - High Wind Speed
Earthquake Zone	Zone 3
Exposure Zone	Zone B - Low
Snow Loading Zone	Zone N5

Related Parties

Architectural Designer

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Builder

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Truss Designer

Placemakers Wanaka, Kim Wilson, Kim.Wilson@placemakers.co.nz, 8 Connell Terrace, WANAKA, 9305, 027 490 9871

Structural Engineer

Structural Design Lab, Hamish Mackinven, CPEng 1003941, info@designlab.net.nz, Loft 5, 36 Southwark Street, CHRISTCHURCH, 8011, 0272529005

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1 PRELIMINARIES & GENERAL

1.1 Project Overview

1.1.1 Contract Documents

The Contract Documents are complementary and comprise this Specification, the accompanying drawings, the Contract together with Schedules as specified below, any written documentation clarifications issued during tendering/estimating, any manufacturer/supplier information issued with this Specification, any list of agreed Subcontractors, the contract establishment letter and any other relevant correspondence, and any Site Instructions or additional details or instructions issued as Variations.

If the Architect/Designer has not been engaged to administer the Contract or observe the works, then the term Architect/Designer, where referred to in this specification, means Contract Administrator.

These Project Specific Conditions supersede the Standard Conditions where they are in conflict. Refer any ambiguity or apparent discrepancy within or between any Contract Documents to the Architect/Designer, whose interpretation shall be binding on all parties.

Ensure that all Trades are aware of all Conditions and that subcontract prices are accepted on this basis, and in a form acceptable to the Registered Master Builders Federation or the Certified Builders Association. Ensure that all persons engaged on the works are aware of all items in this specification and on the drawings that may in any way affect their section of the works.

1.1.2 Site

Relevant site conditions are believed to be correctly represented in the Contract Documents, however the Contractor (and Subcontractors where appropriate) are requested to inspect the site to ascertain for themselves the nature and extent of the works and the rights and interests that may be interfered with in the execution of the works, as no claims for additional payment will be recognised on the grounds of insufficient description.

1.1.3 Adjacent Owners

Carry out whatever actions or precautions are required to avoid or to absolutely minimise noise, dirt, dust, access, etc. inconvenience or disruption of any nature to the adjacent owners or tenants. Indemnify the Principal against any claims arising from this source.

1.1.4 Protection

Take all appropriate precautions to protect all third party property, services, etc., and indemnify the Principal against any claims arising from the construction operations. Any damage to third party property caused by construction activities or failure to protect shall be rectified as soon as possible by the person causing the damage, or by appropriately qualified trades-persons employed by the person responsible for the damage if necessary.
Suspend operations during weather which would affect the quality of work in progress. Secure the works as soon as possible against adverse weather, dust and vandals. Avoid structural damage that is

caused by overloading.
Adequately protect all finished work and maintain until the date of Practical Completion. Each trade shall protect the work of all other trades, and each trade is responsible for making good any damage they cause to finished works. Arrange special protection as required for windows and doors, finished timber work, plumbing fittings and hardware, cabinets and other joinery, and similar items.

1.1.5 Responsibility

The Contractor will be held responsible for the full period of their legal responsibility in connection with this Contract for ensuring that all work execution, materials, and fittings, are completely in accordance with Contract requirements.
The Contractor is responsible to the Principal for the appropriateness and fitness, in relation to a reasonable expectation or requirement, of all of the materials and workmanship incorporated into the works by themselves or their subcontractors; for this reason few specific guarantees are required in these contract documents. The terms and conditions of any warranty or guarantee required or provided shall not in any way negate the minimum remedies available under common law as if no warranty or guarantee had been furnished.
No apparent expression of the Architect's/Designer's reasonable satisfaction shall be deemed to be acceptance of defective materials or workmanship within the terms of the Contract or to be an authority for any Variation except where such Variation is authorised as provided for in the Contract. Instructions that are given verbally are deemed to be instructions for proper execution of the works and do not involve extra charges.

Workmanship in all trades is required to be equal to or better than recognised good trade practice. The Contractor shall provide all necessary setting out information and component dimensions for subcontractors and shall check and be responsible for the accuracy of their work.

Should any tradesperson consider that the surface finish or general conditions of previous work are unsatisfactory to ensure a proper finish for their own work thereon, that tradesperson shall give immediate notice to the Contractor or Architect/Designer as appropriate and shall not proceed until all necessary improvements have been made. Failing such notice the trade concerned will not be relieved of responsibility for a poor finish due to such unsatisfactory condition.
Specialist Finishes Subcontractors are responsible for ensuring that substrates are completely appropriate for them to achieve first class results, and to this end shall, in sufficient time, instruct the Contractor with regard any fixings, primings, sealings or whatever for the substrate that vary in any way from the substrate manufacturer's standard recommendations. The Contractor shall advise the Architect/Designer with regard these variances, and not proceed until the Architect/Designer has agreed to them.

The Contractor and all Subcontractors affected shall be jointly and severally responsible for completion of the whole of the works in a completely watertight condition and shall therefore examine all details to be satisfied that this condition can be achieved. If any detail is considered unsatisfactory the Architect/Designer shall be notified immediately and he/she will then either interpret the detail to the Contractor's satisfaction, or accept responsibility for watertightness at the points in question, always assuming reasonable workmanship.

Ensure that all materials or items incorporated into any particular construction or finish are compatible and that their individual use is approved by the manufacturers and/or suppliers of the other parts of the system.
For all electronic/electrical/mechanical operating systems all work and all necessary materials and items incidental to the primary item specified, that are incorporated into the works, shall be such as to leave a neat, efficient, easily maintained and robust installation, completely in accordance with all of the recommendations of the primary items' manufacturers. Where appropriate, source all parts of a system from a single supplier or manufacturer.

The Contractor shall make provision for all temporary works and services required for the satisfactory completion of the contract works. The Contractor shall pay all associated costs and fees; carry out all necessary maintenance, alterations and servicing requirements; and remove temporary works and services on completion of the contract works. Temporary works and services shall comply with the requirements New Zealand Building Code.

1.1.6 Specification

This Specification covers contract administration, standards, materials quality, workmanship and the scope of works only: the exact nature of the works and all specialist items, descriptions, etc., are contained on the drawings, which also take full precedence.
All clauses in all specification sections apply to their full extent and meaning to the entire Contract.
Trade sections and paragraphs have been introduced into this specification for reference only and it shall not be construed that each trade section is a complete segregation of the materials and labour of that trade. The onus is on all trades to be conversant with any and all clauses which in any way affect their work.
(Be aware that the ‘scope’ noted in the ‘Project Overview’, and scope and general extent clauses within this specification, are included to provide a general indication only and must NOT be interpreted as schedules of quantities - the exact nature and extent of all aspects of the works are shown on the drawings).

1.1.7 Standards

New Zealand Standards (NZS), Australian Standards (AS), Joint Standards (AS/NZS), British Standards (BS), Acts of Parliament, Regulations made thereunder, Codes of Practice, and any specific Manufacturer's Instructions or Manufacturer's Recommendations that are referred to in these Contract Documents shall all be deemed to be the latest published edition thereof at the time of drawings issue, and shall be followed by the Contractor and all Subcontractors to the full extent applicable consistent with the intent of this Contract. Documents cited within other cited publications are deemed to form part of this specification.
Where Standards have a number of Divisions, e.g. AS/NZS 3500.1, AS/NZS 3500.2, etc., each of the Divisions relevant to this project is deemed to form part of this specification.
Retain current copies of significant cited documents and manufacturer's technical literature on the site.

1.1.8 Authorities and Charges

Comply with all relevant provisions of the NZ Building Code, and with all relevant territorial or statutory authority regulations, by-laws, obligations, etc. Give all required notices.

The Principal has obtained a Land Use Consent. The Principal has applied for and paid for the Project Information Memoranda, the Building Consent and other approvals required for the works to start. The PIM and Building Consent will be forwarded to the Contractor as quickly as possible after they are issued by the Territorial Authority. Note: It is an offence under the Building Act to carry out work not in accordance with a Building Consent.
Should the Building Consent be subject to any conditions which modify the requirements of the Contract Documents in any way, the Architect/Designer reserves the right to negotiate any or all of these modifying conditions with the Building Consent Authority. If after these negotiations additional work is required, it will be handled as a Variation to the Contract.

1.1.9 Code Compliance Certificate

The Principal will apply for the Code Compliance Certificate (CCC) and any other licenses or approvals for the building to be used. However, Practical Completion will NOT be certified until the CCC inspection has occurred and any additional works required by the local Building Consent Authority have been completed. To this end it is recommended that the Contractor obtains all required certificates, guarantees, Producer Statements, as-built drawings, etc., required for the CCC application as work proceeds, to facilitate application for the CCC as soon as the works are completed. For their part, the Principal hereby undertakes to apply for the CCC within one day of all required material being in hand. Likewise, the Contractor should have capacity available to attend as quickly as possible to any items identified by the Building Consent Authority as being required prior to the issue of the CCC.

1.1.10 Documents Interpretation

Except where they are clearly to the contrary, all dimensions are deemed to be to the bare surface of concrete, masonry, timber framing or other basic construction material. All figured dimensions take precedence over scaled sizes. Where any detail is included in more than one drawing the larger scale detail takes precedence. Where any ambiguity exists refer to the Architect/Designer for interpretation.
The word ‘provide' and the word ‘fix' used separately in the Documents shall be taken to mean ‘provide and fix' unless otherwise stated.
When the term ‘allow' occurs in the Documents, except with reference to Monetary Allowances, the cost of the item shall be at the risk of the Contractor.
The terms ‘approved', ‘directed', and ‘selected' when used in the Documents refers to the approval, direction or selection of or by the Architect/Designer. Please give adequate notice of when these decisions are required. ‘Architect/Designer' shall mean the Architect or Designer, their representative or any Consulting Engineer engaged by the Architect/Designer.

1.1.11 Work Shown and Mentioned

The Contract Documents show the extent and nature of the works but there is no warranty expressed or implied that they show each and every minor detail or item required to be included by the Contractor. Should any material, structural member, fixing, or item or work appear to be inadequately described, yet obviously necessary for the neat, strong and satisfactory completion of the work, it shall be incorporated into the Contract Works.

1.1.12 Site 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. Comply with the relevant provisions of the New Zealand Building Code, in particular Clause F5.

So far as is reasonably practicable and according to a PCBU's (person conducting a business or undertaking) primary duty of care, take all necessary steps required to make the site and the contract works safe, and to provide and maintain a safe working environment. Ensure that all those working on or visiting the site are aware of the site safety rules and are not unnecessarily exposed to hazards.

Each PCBU, so far as is reasonably practicable, must ensure the health and safety of workers, and that other people are not put at risk by its work. If more than one PCBU has a duty in relation to the same matter, each PCBU with the duty must, so far as is reasonably practicable, consult, co-operate with, and co-ordinate activities with all other PCBUs who have a duty in relation to the same matter. PCBUs can enter reasonable agreements with other PCBUs to meet their duties, but cannot contract out of their duties.

Notify WorkSafe as soon as possible when a notifiable event occurs. Take all reasonable steps to preserve the site of the notifiable event in accordance with WorkSafe requirements. Ensure that the site of the event is not disturbed until authorised otherwise by WorkSafe. Keep records of all notifiable events.

Scaffolding shall comply with all Statutory and Local Authority Regulations, with the WorkSafe 'Best Practice Guidelines for Scaffolding', AS/NZS 1576 (Scaffolding equipment), AS/NZS 4576 (Guidelines for Scaffolding), and AS/NZS 4994 (Roof edge scaffolding), and shall be maintained for the duration and removed on completion.

The use of ballistic fixings must absolutely comply with all relevant safety recommendations at all times. No rubbish fires are allowed on site. Portable/personal disc/tape players, radios and iPods must not be used anywhere on the site. No smoking on site, except in the designated location in accordance with the Smoke Free Environments Act 1990, the location of which will be determined by the Contractor, with the approval of the Principal.

1.1.13 Cleaning and Completion

Clear construction debris and rubbish from the works at regular intervals, and additionally if so instructed by the Architect/Designer. Clean each space thoroughly before commencing any finishing works.

In preparation for the Practical Completion inspection carry out the following:
- Clean the works thoroughly, removing all debris, surplus materials, splashes, marks, temporary markings, etc. (All cleaning methods and materials shall be as recommended by the manufacturer of the item being cleaned).
- Remove protective wrappings and coverings unless otherwise directed.
- Touch up minor painting faults, carefully matching colour, and brushing out edges. Repaint any

badly marked surfaces back to suitable break-lines.
- Adjust, ease and/or lubricate as required all doors, drawers, controls and other moving parts to ensure their efficient operation.
- Any other works required to leave all spaces ready for immediate occupation and all electronic/electrical/mechanical systems fully operational.
- Clean out all spoutings, gutters, downpipes, and gullies and flush out all drains.
- Clean all sanitary appliances and check all aspects of the water services.
- Thoroughly re-inspect all aspects of the works (and have any defects fully rectified) to be certain that the works are completely ready for the Practical Completion inspection - if an unreasonable number of items are noted by the Architect/Designer during the inspection it will be terminated and then rescheduled for at least a week forward to allow proper completion to be achieved.

(Note that a Code Compliance Certificate must be obtained before Practical Completion will be certified. Obtain all required certificates, guarantees, as-built drawings, etc., as work proceeds to enable the CCC application to be submitted as soon as construction is completed).

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)
3125:1991(NZS)	Specification for portland-limestone filler cement
3604:2011(NZS)	Timber-framed buildings
4431:1989(NZS)	Code of practice for earth fill for residential development
NZBC B1/VM1	Structure
NZBC B2/AS1	Durability

2.3 Concrete

2.3.1 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.

The following is a list and/or general description of the extent of Insitu Concrete works, which are more specifically defined in the contract documents, required for the completion of the contract works:

2.3.2 Requirements

2.3.2.1 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 'Worksafe 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.

2.3.2.2 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.

2.3.2.3 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.

2.3.2.4 Erection & Temporary Works

Maintain responsibility for all erection, propping and temporary support of the works, and any other works required for the completion of the contract works, including lifting design, rigging analysis, propping and shoring design.

The extent and details of the erection systems, propping, etc., will be dependent on proposed construction methods, transport and handling methods, and construction programme. Where required, engage a Chartered Professional Engineer experienced in this type of work to undertake the design and supervision of erection systems, propping, etc. Provide written confirmation that this has been done to the Contract Administrator.

Any additional reinforcement to suit temporary erection or support methods shall be the responsibility of the Contractor.

2.3.2.5 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.

2.3.2.6 Materials & Workmanship

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

2.3.2.7 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.

2.3.3 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.

2.3.4 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.

2.3.5 Finishes

2.3.5.1 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.

2.3.5.2 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:

2.3.6 Concrete

2.3.6.1 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: *25 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.

2.3.6.2 Concrete Tests & Non-Compliant Concrete

The Ready Mix Supplier shall carry out and evaluate control tests in accordance NZS 3104, and shall pay the costs of such tests. Tests shall be made at the site at the discretion of the Contract Administrator if dissatisfied with the plant testing procedure. Submit all test results to the Contract Administrator.

In addition to the tests required by NZS 3104, allow to take test cylinders on site at random for each pour of concrete, in accordance with NZS 3112.2: Clause 3. Make four standard cylinders for the first 25m³ of concrete placed, or part thereof and test in an approved laboratory. Make four standard cylinders for each subsequent 100m³ of concrete placed, or part thereof and test in an approved laboratory. Test results for breaking one cylinder at 7 days and the remaining three cylinders at 28 days shall be forwarded to the Contract Administrator on completion of the test together with details of where the concrete was placed in the structure.

Delivery dockets and other certified records of concrete quality shall be kept on site for inspection.

Failure to conform with the requirements of this specification or failure to provide or complete the concrete manufacturer's delivery docket could result in ready mix concrete being subject to rejection at time of delivery.

In accordance with the Contract Administrator instructions, rejected placed concrete shall be cut out, removed from site and replaced with new concrete.

2.3.7 Concreting

2.3.7.1 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.

2.3.7.2 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.

2.3.7.3 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.

2.3.8 Construction Joints

2.3.8.1 Construction Joints

The location, type and detail of construction joints shall be as specified and shown on the drawings. Construction joints shall not be repositioned or eliminated from the locations shown on the drawings without approval. Where a construction joint is not specified or shown on the drawings, the location, type and detail of the joint must be approved before work commences.

2.3.8.2 Shrinkage-Control Joints - Saw Cutting

Shrinkage-control joints shall be formed in concrete slab-on-grade floors by saw-cut grooves to the layout and details shown on the drawings.

Saw cutting shall be carried out as soon as possible, after the concrete has set and before shrinkage cracking has occurred - typically within 24 hours of pouring, and without excessive chipping, spalling or tearing of the concrete. Saw cuts shall be straight and true and within 10mm of the true joint alignment.

Unless shown otherwise on the drawings, saw cut grooves shall extend to one quarter of the of the slab thickness, and be between 3-5mm in width. Under no circumstances shall the reinforcement through the joint be cut by saw cutting.

As detailed on the drawings, the joint shall be sealed with the specified sealant.

2.3.9 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.

2.3.10 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.

2.3.11 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.

2.3.12 On-Ground Floor Slabs

2.3.12.1 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/m^3, 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.

2.3.12.2 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.

2.3.12.3 Under-Slab Insulation

Under-Slab Insulation - refer to separate specification section - Insulation.

Where thermal insulating material is indicated under the concrete slab-on-grade, it shall be accurately positioned so that there is no reduction of any concrete thickness dimension (as indicated on the drawings). Tape-seal sheet joints with a suitable pressure-sensitive tape.

2.3.12.4 Shrinkage-Control Joints - Saw Cutting

Shrinkage-control joints shall be formed in concrete slab-on-grade floors by saw-cut grooves to the layout and details shown on the drawings.

Saw cutting shall be carried out as soon as possible, after the concrete has set and before shrinkage cracking has occurred - typically within 24 hours of pouring, and without excessive chipping, spalling or tearing of the concrete. Saw cuts shall be straight and true and within 10mm of the true joint alignment.

Unless shown otherwise on the drawings, saw cut grooves shall extend to one quarter of the of the slab thickness, and be between 3-5mm in width. Under no circumstances shall the reinforcement through the joint be cut by saw cutting.

2.3.13 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.

2.3.14 Grouting of Ducts

All ducts and associated gaps forming the interface between adjacent concrete components, where noted on the drawings, shall be grouted with Sika Grout 212 or approved equivalent high strength, shrinkage compensated, pourable cementitious grout.

Grouting shall be carried out so that air is expelled as grouting continues, and the voids between concrete units are completely filled with grout. The grout shall be mixed and placed in strict accordance with the manufacturer's requirements.

Ensure the quality assurance of mixing and placing grout at all times. Provide the grout manufacturer's testing programme, and ensure its is adhered to throughout construction. The tests shall demonstrate that grout, when placed:

- has a minimum 7-day strength of 40 MPa; and
- flows to entirely cover the interface between the concrete components/elements; and
- does not bleed mix-water to create voids at the interface; and
- does not shrink.

Clean off any spillage or leakage immediately after the completion of grouting.

Allow at least 24 hours for the grout to cure before applying any load to the grouted joint.

2.3.15 Repair & Cleaning of Concrete

2.3.15.1 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.

2.3.15.2 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.

2.3.15.3 Repair of Concrete

Conditions for the repair of concrete work shall include, but not be limited to:
- No repair of concrete shall be undertaken without approval of the Contract Administrator.
- Advise the presence of any defective concrete.
- The repair of concrete shall be only be carried out by skilled personnel familiar with the repair techniques and materials required.
- Except when inspection is waived, the repair of concrete shall be carried out in the presence of the Contract Administrator or their representative.
- All filling shall be bonded tightly to the cavity surfaces and shall be sound and free from shrinkage cracks and drumming after the filling has dried and cured.
- The protection of and curing of concrete repairs shall be carried out in accordance with the repair-product manufacturer's requirements.
- If the appearance of the repaired concrete surface lacks uniformity, the Contract Administrator may

give direction to apply a bag-rubbed finish to the surface, carried out to the satisfaction of the Contract Administrator.

2.4 MAXRaft® Fully Insulated Foundations

2.4.1 Scope

Supply and install MAXRaft® Fully Insulated Foundations, as specified herein, to the location, layout and details as shown on the design drawings, complete with all necessary components and accessories required for proper installation and performance. All aspects of this work shall be in complete accordance with MAXRaft® technical literature, including the MAXRaft® Technical Details and MAXRaft® Installation Manual and detail drawings (check www.maxraft.co.nz, or email info@maxraft.co.nz, or call 0800 629 7238 for the latest editions) within the conditions and limitations of the MAXRaft® Fully Insulated Foundations CodeMark Certificate of Conformity, BRANZ Appraisal 1054, and other relevant product manufacturers' recommendations.

The MAXRaft® Fully Insulated Foundations system is CodeMark assured to comply with the NZ Building Code subject to specific conditions and limitations - refer to CodeMark Certificate of Conformity No: CMA-CMA40124-101-R02, issued by CertMark International Pty Ltd.

No substitutions are permitted for MAXRaft® Fully Insulated Foundations.

For the purpose of this specification, MAXRaft® Fully Insulated Foundations is referred to as 'MAXRaft® Floor'. All associated MAXRaft® technical literature, including the MAXRaft® Technical Details and MAXRaft® Installation Manual and detail drawings and the Code Mark Certificate, are collectively referred to as the 'Technical Literature'.

All MAXRaft® Floors are fully engineered by independent engineers on a site-specific basis to ensure the design of the MAXRaft® system is appropriate for the ground conditions and building type.

This specification should be read in conjunction with other relevant specification sections as they are interrelated, in particular, Siteworks and relevant services - i.e. Drainlaying, Plumbing, Electrical, etc.

The following is a general description of the extent of the MAXRaft® Floor works, which are more specifically defined in the contract documents, required for the completion of the contract works:

2.4.2 Requirements

2.4.2.1 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.

2.4.2.2 Substitutions

The MAXRaft® Floor shall be as specified herein and on the design drawings. The substitution of the MAXRaft® Floor for an alternative brand or system is not permitted under any circumstances.

The substitution of a specified MAXRaft® Floor system/material for an alternative MAXRaft® Floor system/material 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 an alternative MAXRaft® Floor system/material to satisfy design, performance and compliance requirements, then the cost of these shall be borne by the Contractor.

2.4.2.3 Producer Statement PS1

Furnish a fully completed Producer Statement PS1 (Design) as confirmation that the MAXRaft® Floor as designed and documented complies with the relevant clauses of the New Zealand Building Code. The Producer Statement PS1 shall be submitted with the Building Consent documentation. The PS1 Producer Statement shall not serve as a product warranty or guarantee of compliance.

2.4.2.4 Producer Statement PS4

Furnish a fully completed Producer Statement PS4 (Construction Review) as confirmation that the MAXRaft® Floor as constructed complies with the relevant requirements of the Building Consent and Building Consent Amendments, with respect to the relevant clauses of the New Zealand Building Code. The Producer Statement PS4 shall be submitted by the Contractor with the application for Code Compliance Certificate of the contract works.

2.4.2.5 Certificate of Design Work

Provide all necessary Certificates of Design Work (CoW) required by the BCA for Building Consent as confirmation that the MAXRaft® Floor as designed and constructed complies with respect to the relevant clauses of the New Zealand Building Code.

2.4.2.6 Shop Drawings

Prepare and submit to the Contract Administrator for review shop drawings of the MAXRaft® Floor. The review of shop drawings shall in no way relieve responsibility for the accuracy of the shop drawings and for the correctness of the setting out and construction of the MAXRaft® Floor.

Shop drawings shall be coordinated between disciplines and incorporate specific requirements shown on all design drawings.

Shop drawings shall include, but not be limited to:
- the location, layout and general arrangement of the floor;
- dimensioned and notated plan of the MAXRaft® Floor and its components (at a suitable scale);
- dimensioned and notated construction details of all aspects of the floor (at a suitable scale);
- size, spacing and cover of all steel reinforcement;
- position and dimensions of penetrations, recesses and rebates on the floor;
- position and details of all cast-in items;
- location of in-slab hydraulic heating system pipework - as applicable;
- location and type/class of surface finishes, including surface roughening;
- concrete mix, strength, slump and volume;
- a schedule of polystyrene components;
- a schedule of all steel reinforcement.

2.4.2.7 Inspections & Reporting

BCA inspections of the works shall take place at each of the stages as scheduled in the Building Consent. Confirm a written programme to facilitate these inspections, including notification when each stage of the work is ready for inspection.

Carry out all necessary pre-installation and installation inspections for each area and stage of the works.
Complete all necessary Pre-Installation Checklists, and all necessary Installation Checklists.
Complete all necessary Sign-Off Certificates before handing over completed work.
Complete and sign the MAXRaft® Polystyrene Installation Quality Assurance Form.

Notify the BCA and the Contract Administrator for all required inspections of the MAXRaft® Floor construction, including the excavations. All inspections and test results shall be properly recorded and documented by the Contractor and made available on request.

The Contractor shall provide all necessary quality control checklists to the Contract Administrator prior to pouring and with sufficient time for their pre-pour inspection.

The Contract Administrator and BCA shall be notified and given reasonable opportunity to inspect the section of work prior to pouring. The Contractor shall give at least one working day's notice of intention to place concrete in any area.

The Contract Administrator's and/or BCA's instructions shall be carried out before concrete placing commences. Instructions issued by the Design Engineer must be authorised by the Contract Administrator. Unless approval is given by the Contract Administrator, Design Engineer (or their agent) 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.

2.4.2.8 Engineer's Site Monitoring

The Design Engineer (CPEng) or their authorised agent shall have reasonable access to the site where the work is being carried out for the purposes of inspection, recording, or testing. Any resulting notification or instruction arising from their site monitoring must be authorised by the Contract Administrator.

2.4.2.9 Quality Assurance

Maintain and comply with industry-recognised quality control and assurance procedures to ensure that all stages of the works are carried out to the highest standard. Ensure that the construction of the MAXRaft® Floor complies in all respects with the design drawings and specifications.

A signed quality assurance form must be provided from MAXRaft® confirming that the polystyrene has been installed in accordance with the Producer Statement - PS1.

If requested, prepare and submit to the Contract Administrator details of the quality assurance procedures for concrete work for approval.

The quality assurance procedures shall encompass all aspects of the MAXRaft® Floor 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.

The Contractor shall advise the Contract Administrator in writing the name of a suitably experienced and qualified representative to be responsible for the quality control of concrete work.

The Contractor's nominated representative shall be required to complete and sign a written quality control checklist for each on-site concrete pour. A copy of each completed checklist shall be provided to the Contract Administrator before pouring commences and with sufficient time for the pre-pour inspection. The format and detail of the checklist shall be agreed to by the Contract Administrator and the Contractor prior to the commencement of any concrete work.

The Contractor shall supply evidence of concrete production quality standards to the Contract Administrator in advance of construction in accordance with the requirements of NZS 3109.

2.4.2.10 Tolerances

Except where specified otherwise herein or on the drawings, dimensional tolerances of the MAXRaft® Floor shall be within 5mm of the position shown on plan and conforming to NZS 3109, Table 5.2 - 'Tolerance for *in situ* construction' for all other aspects, and to NZS 3114 for off-the-form and unformed surface tolerances.

To ensure that elements such as external claddings, window and door joinery etc will properly fit the building, the Contractor shall maintain accurate control of the overall set-out and construction of the MAXRaft® Floor.

2.4.2.11 No-Slab Heating Systems

No embedded underfloor heating in slab. MAX85 is not designed to work in conjunction with embedded Underfloor Heating.

2.4.2.12 Applied Coatings & Finishes

The MAXRaft® polystyrene insulation system exterior requires protection from physical damage, UV rays and water absorption. MAXRaft® polystyrene insulation should be protected by the use of a coating that protects the insulation and is suitable for use in the subgrade.

Refer to the Technical Literature for guidance, and to the project design drawings and specification for coatings and finishes to be applied to MAXRaft® polystyrene insulation exterior surfaces.

2.4.3 Ground Classification

2.4.3.1 Good Ground

The ground conditions have been established as good ground, as defined by NZS 3604, by a geotechnical investigation compliant with local Territorial Authority requirements and NZS 3604. Refer to the Geotechnical Report.

2.4.4 MAXRaft® & MAXSlab® Floor System

2.4.4.1 MAXSlab® 300.

MAXSlab® 300.
A reinforced concrete slab-on-ground floor and foundation system contained entirely within a thermal envelope of specifically-designed MAXRaft® insulation, consisting of perimeter footings and internal slab thickenings in conjunction with MAXRaft® insulation. Suitable for single-storey residential buildings and two-storey residential buildings depending on cladding and the bearing capacity of the ground.
The ground immediately beneath the floor must have a minimum >300kPa UBC TC1 bearing capacity.

System Details:
- Total Thickness: 300mm, including polystyrene envelope.
- Concrete Topping Thickness: 100mm, unless specified otherwise on the design drawings.
- Perimeter Footings: 500mm wide x 300mm high (100mm to underside of concrete topping) including polystyrene envelope.
- Slab Thickenings: 300mm high (100mm to underside of concrete topping) including polystyrene envelope.
- Components: MAXRaft® Insulation, concrete, steel reinforcement, damp proof membrane - refer to Materials clauses.

Installed Location:

2.4.5 Materials - MAXRaft® Insulation

MAXSlab® 300 Polystyrene Insulation Components - including, but not limited to 500mm wide x 50mm thick Perimeter Profiles, 200mm S Grade insulation, 50mm VH EPS Thickening insulation - selected according to MAXRaft® project-specific design requirements and installed to the layout shown on the project-specific MAXRaft® Panel Plan.

Load-bearing insulation material, including perimeter footings, shall be from 300kPa extruded polystyrene (XPS) or 165kPa Class-VH expanded polystyrene (EPS). All other insulation material shall be from Class-S expanded polystyrene (EPS) with a density between 16-30kg/m³.

2.4.6 Materials - Concrete

2.4.6.1 Concrete Mix

Concrete shall be 20MPa, 140mm slump mix, in either a 13mm or 19mm nominal aggregate size, Normal Concrete (N) 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.

2.4.6.2 Concrete Tests

The ready-mix concrete supplier shall carry out and evaluate control tests in accordance NZS 3104, and shall pay the costs of such tests.

In addition to the tests required by NZS 3104, take test cylinders on site at random for each pour of concrete, in accordance with NZS 3112.2, Clause 3 as follows:
- Make four standard cylinders for the first 25m³ of concrete placed, or part thereof and test in an approved laboratory.
- Make four standard cylinders for each subsequent 100m³ of concrete placed, or part thereof and test in an approved laboratory.
- Test results for breaking one cylinder at 7 days and the remaining three cylinders at 28 days shall be forwarded to the Contract Administrator on completion of the test together with details of where that particular concrete was placed in the structure.

Delivery dockets and other certified records of concrete quality shall be kept on site for inspection.

Failure to conform to the requirements of this specification, or failure to provide or complete the concrete manufacturer's delivery docket could result in the ready-mix concrete being subject to rejection at the time of delivery.

2.4.7 Materials - Steel Reinforcement

2.4.7.1 Steel Reinforcement

Steel Mesh:
- SE62 Ductile Mesh (or minimum 2.29kg/m²) Grade 500E welded steel mesh, complying with AS/NZS 4671 and subject to the requirements of NZBC B1/VM1 Paragraph 14.0.
- Machine-welded wire mesh; 500 MPa minimum yield strength; 6.1mm wire diameter; 200 x 200mm wire centres.
- Installed as slab topping reinforcement in accordance with the Technical Literature and the design drawings.

Steel Bar:
- Grade 500E to AS/NZS 4671.
- Except where otherwise specified on the design drawings, reinforcing bars shall be HD12.
- Grade 500E reinforcing bar shall be manufactured by Pacific Steel micro-alloy process. *Alternative manufacturers of Grade 500E reinforcing will only be approved if written evidence is provided, including test certificates, verifying the product*.

- Installed as main reinforcement and sundry bars; all in accordance with the Technical Literature and the design drawings.

General Requirements:
- Mill certificates must be provided to the Contract Administrator for all reinforcing steel used.
- All bundles of reinforcing steel supplied to the job shall be clearly marked with numbers relating to the Bending Schedule and related design drawing.
- Ensure that all reinforcing is adequately supported off the ground while stored on-site.
- Reinforcing bars shall be cut, bent, placed and fixed by suitably trained and experienced personnel to the requirements of NZS 3109.
- Ensure that all preparatory works and formwork have been completed to the specified requirements prior to placing reinforcing.
- Steel reinforcement shall be installed to the locations and spacings shown on the design drawings, and supported with the use of proprietary bar chairs and spacers to ensure correct placement and cover is achieved.
- All reinforcing bar laps shall be minimum 50 x the bar diameter.
- Where Ductile 500E mesh is lapped, the lap length between outer cross bars shall be to the manufacturer's requirements.
- Minimum concrete cover to reinforcement shall be as specified on the design drawings or otherwise as specified in NZS 3109 - the design drawings shall take precedence over those specified in NZS 3109.
- The ends of wire ties shall be turned away from the concrete face to maintain cover.
- Do not tie wire ties to formwork.

2.4.8 Materials - Damp Proof Membrane

2.4.8.1 Polyethylene Sheet - 250µm thick

Damp Proof Membrane (DPM) - 250µm. A 250 micron thick, tear-resistant, polyethylene (polythene) film sheet damp-proof membrane. Installed over a maximum 25mm thick layer of compacted sand blinding, in accordance with the Technical Literature and the design drawings.

The DPM shall be laid over the entire building platform directly on top of a sand blinding layer, and extend 100mm beyond the foundation perimeter to a straight line. All DPM joints shall be lapped minimum 150mm and tape-sealed with minimum 50mm wide pressure sensitive PVC tape. Tape-seal around penetrating pipes and sleeves.

Take all reasonable measures to protect the DPM from damage during construction, and repair any perforations or other damage.

Do not leave the DPM exposed for more than the maximum period recommended by the manufacturer.

2.4.9 Concrete Finishes

2.4.9.1 General

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

Surface finishes not specified in this specification or on the design drawings shall be in accordance with Table 1 or Table 2 of NZS 3114, as appropriate for location and use.

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

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 a surface where there is free surface water. The application of dry cement or sand to absorb free surface water is not permitted.

All trowelling ridges shall be removed while soft, or by subsequent light grinding where appropriate. Slabs not fulfilling the standard of finish required shall be ground smooth or otherwise treated to the satisfaction of the Contract Administrator.

2.4.9.2 Schedule of Concrete Finishes

MAXRaft® Floor Schedule of Concrete Finishes:
- Slab Surface: *U3 Class Finish*.
- Unformed Surfaces to take Plaster or Tiles: *U2 Class Finish.*
- Off-the-Form Surfaces to take Plaster or Tiles: *F2 Class Finish*.
- Off-the-Form Surfaces Exposed (inside or outside the finished building): *F5 Class Finish*.

2.4.10 Formwork

2.4.10.1 Formwork

Formwork shall conform to NZS 3109 Section 5, and comply with the provisions of NZS 3114 according to the specified off-the-form-finish classification.

Formwork 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 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 arrised edges, except where chamfers are indicated on the drawings or required to match existing detail.

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. Plywood formwork shall not be permitted to stain visually-exposed concrete.

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 and 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 coating system applied to the concrete.

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 formed voids immediately before concrete is placed.

Do not remove formwork for at least 12 hours after concrete placement. Formwork shall be removed without shock or vibration and in such a manner as to prevent damage. Do not permit bars or other tools to lever against the MAXRaft® Insulation or set concrete when removing formwork. Any damage to the concrete occurring during removal shall be repaired to the required standard by an approved method at the Contractor's expense.

2.4.11 Co-operation

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

Coordinate with other trades, as required, the installation of all cast-in items and piped and cabled services, including drains, conduits, in-slab heating system, etc, within the MAXRaft® Floor.

2.4.12 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.

MAXRaft® Floor construction work, including sand-blinding, DPM laying, formwork erection, reinforcing placement, and concrete placing and finishing techniques, shall be carried out by experienced and competent workers, familiar with the specified products and construction techniques, under the direct supervision of a Licensed Building Practitioner, in accordance with the Technical Literature and NZS 3109 and NZS 3114, and to fully comply with all warranty requirements.

All work shall be such as to leave a neat, efficient, robust and structurally sound installation, to the required standard.

2.4.13 Delivery & Handling

Take delivery of materials undamaged. Reject any item found to be defective or damaged and contact the manufacturer/supplier for replacement.

Store MAXRaft® Insulation components and reinforcing steel clear of the ground and in a manner that prevents damage and distortion in accordance with the manufacturer's requirements. Protect these materials from damage, distortion and contamination until use.

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

Should a problem be encountered with any MAXRaft® Floor product during use or delivery, immediately contact MAXRaft® on 0800 629 7238. Do not continue to use the product that is not performing to specification or expectation. Keep the product in question and where possible, the document batch numbers and/or manufacturing details.

Handle materials and products in accordance with the manufacturer's recommendations and in a manner that prevents damage.

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.

2.4.14 Preparation

2.4.14.1 Site Clearing, Stripping, Excavation & Earthfill

Site Clearing, Stripping, Excavation & Earthfill - refer to separate specification section - Siteworks.

2.4.14.2 Piped & Cabled Services

Except where shown otherwise on the design drawings, piped and cabled services shall be run in-ground beneath the MAXRaft® Floor and returned vertically, at right angles through the floor at the required exit/entry points shown on the design drawings.

All service pipes in direct contact with concrete shall be lagged with a minimum 6mm thick, compressible, impermeable material.

In-ground services installations, including trenching, bedding, backfilling, ducting and sleeving, gradients, etc., shall be as specified for the applicable service (Drainlaying, Plumbing, Electrical), and must comply with the requirements of the New Zealand Building Code and the conditions of the Building Consent.

Plumbing and drainage fixtures installed in or on the MAXRaft® Floor shall be to the locations dimensioned on the design drawings, and shall not deviate from these without written prior approval from the Contract Administrator.

IMPORTANT:
- Service pipes are not permitted to be run lengthways within any MAXRaft® Floor footing or rib under any circumstance, nor shall they penetrate vertically through a footing without specific detailing.
- A service pipe is only permitted to pass perpendicular through a footing or rib according to the requirements of the specific design drawings.

2.4.14.3 Granular Basecourse to NZS 3604

Granular base to the underside of the MAXRaft® Floor shall consist of granular fill material conforming to NZS 3604 Section 7.5.3, and shall be systematically placed and compacted in horizontal layers no thicker than 150mm over the area beneath the slab and extending minimum 1.0m beyond the slab perimeter. Each layer shall be placed and compacted as a separate operation to subsequent layers.

The total thickness of the granular base shall be in relation to the finished slab level indicated on the design drawings, and no less than 75mm and no more than 600mm.

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.

2.4.14.4 Sand Blinding

Blind the finished subgrade with a 5-25mm thick layer of clean, compacted sand or approved blinding material, covering the entire area and extending 500mm beyond the perimeter footing. Ensure the sand blinding is compacted and levelled to within +/- 3mm of the required level, without deviation. Do not leave sand blinding exposed to the elements any longer than necessary, and install the DPM immediately or as soon as practicable.

2.4.15 Installation

Damp Proof Membrane
Lay the DPM over the entire platform and extending at least 100mm beyond the perimeter footing, with joints overlapped minimum 150mm and tape-sealed, and any services penetrations tape-sealed. Tape repair any damaged DPM as soon as it occurs - check the DPM for damage during all stages and repair as necessary.

Formwork
Erect perimeter formwork to straight and true to lines, and to the slab dimensions, levels and details shown on the design drawings. Form all edge rebates, set-downs, block-outs and sloping falls as dimensioned and detailed. Do not strike formwork for at least 12 hours after concrete placement.

MAXRaft® Insulation - MAXSlab® 300

Install individual, pre-cut and numbered MAXSlab® 300 polystyrene insulation components (perimeter edge beam panels, slab thickening panels, standard panels) over the DPM according to the MAXRaft® Panel Plan layout and the Technical Literature, with all components tightly butted together without gaps or voids, and the perimeter edge beam firmly supported by formwork. Install MAXRaft Spacers at edge beam as per panel plan (remove prior to concrete pour)
Carry out any necessary site-cutting, including holes for service pipes, with a saw or suitable hot wire as required.

A signed quality assurance form must be provided from MAXRaft® confirming the polystyrene has been installed in accordance with the Producer Statement - PS1."

Steel Reinforcement - MAXSlab® 300

Do not install reinforcing steel and mesh until all polystyrene perimeter and interior panels have been installed, and all required piped services works within the slab are complete.

Steel reinforcement types, sizes and placement must be as specified and in accordance with the layout and details shown on the specific design drawings. Reinforcing bars and mesh shall be accurately positioned and firmly secured to the specified placement and cover.

Install reinforcing bars to perimeter edge beam and slab thickenings as detailed using bar chairs to achieve the specified cover. Install reinforcing mesh using mesh chairs OR pod sticks to achieve the specified concrete cover.
Install shrinkage control bars across re-entrant corners only where specified on the specific design drawings.

2.4.16 Concreting

2.4.16.1 Handling, Placement & Compaction

The handling, placement, and compacting of MAXRaft® Floor concrete shall conform to NZS 3109 and the requirements of the Technical Manual.

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 the floor slab, or both;
- Completely fill the formwork to the intended level, expel entrapped air, and closely surround all reinforcement and embedments; and
- Provide the specified finish to the formed surfaces of the floor slab;
- 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.

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

Immersion vibrators shall be used for the compaction of the concrete and 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 should not be used to transport concrete along footings.

2.4.16.2 Curing & Protection

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 before it is used or applied. Ensure that any agreed concrete curing compound is compatible with subsequent floor coverings or surface treatments, including any sealers, paints, waterproofing membranes, etc.

The finished concrete slab shall be protected from damage during subsequent stages of the building contract. Repairs and remedial work to the slab shall be carried out to the satisfaction of the Contract Administrator.

No loads are to be placed on the concrete slab or MAXRaft® insulation before the concrete has cured sufficiently over 4 days. When the perimeter formwork has been struck and removed, check all exposed perimeter polystyrene insulation surfaces for concrete slurry leaks and spills and clean down immediately.

2.4.16.3 Remedial Work

Defects and imperfections in the concrete floor shall be remedied to the satisfaction of the Contract Administrator. No structural repair of concrete shall be undertaken without specific instruction from the Contract Administrator.

The removal of surface markings from visually exposed concrete 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 visually exposed 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 compounds may be used when necessary but only with prior approval from the Contract Administrator.

2.4.17 Saw Cutting

2.4.17.1 Saw-Cut Shrinkage Control Joints

Saw-cut shrinkage control joints shall be cut into the MAXRaft® Floor within 24 hours after pouring and when the slab is sufficiently hard, and according to the control joint layout, dimensions and details shown on the design drawings.

Unless specified otherwise on the design drawings, saw cuts shall be 25mm deep for an 85mm thick concrete topping. For thicker toppings, deeper saw cuts will be required of approximately ⅓ of the topping thickness - to the cut depth specified on the design drawings.

Early-entry soft cutting is recommended. Saw cutting shall be carried out without excessive chipping, spalling or tearing of the concrete. Saw cuts shall be straight and true and within +/-5mm of correct alignment.

2.4.18 Completion

Check the MAXRaft® Floor has been correctly formed to the required setout, dimensions, levels, alignment and detailing as shown on the specific design drawings, and that any deviation from these is within the specified tolerances.

Check that all required cast-in items and provisions for services are correctly located and positioned as shown on the design drawings.

Check that concrete surfaces have been properly finished to the required finish level.

Check for any damage and defective work. Carry out any necessary repairs and/or remedial work as specified and/or instructed by the Contract Administrator to the required standard.

Leave all of this work complete and structurally sound, and to the required standard.

Leave the slab surface and surrounding work areas clean and free of rubbish. Remove all associated rubbish and excess material from site.

Provide all necessary Producer Statements.

3 STRUCTURAL STEELWORK

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:

1163:2016(AS/NZS)	Cold-formed structural steel hollow sections
1252.1:2016(AS/NZS)	High-strength steel fastener assemblies for structural engineering - Bolts, nuts and washers - Part 1: Technical requirements
1252.2:2016(AS/NZS)	High-strength steel fastener assemblies for structural engineering - Bolts, nuts and washers - Part 2: Verification testing for bolt assemblies
14341:2012(AS/NZS)	Welding consumables – Wire electrodes and weld deposits for gas shielded metal arc welding of non alloy and fine grain steels – Classifications
1554.1:2014 (AS/NZS)	Structural steel welding - Part 1: Welding of steel structures
1554.2:2003(AS/NZS)	Structural steel welding - Stud welding (steel studs to steel)
1554.4:2014(AS/NZS)	Structural steel welding - Part 4: Welding of high strength quenched and tempered steels
1554.5:2014(AS/NZS)	Structural steel welding - Part 5: Welding of steel structures subject to high levels of fatigue loading
1554.6:2012(AS/NZS)	Structural steel welding - Part 6: Welding stainless steels for structural purposes
1554.7:2014(AS/NZS)	Structural steel welding - Part 7: Welding of sheet steel structures
16834:2013(AS/NZS)	Welding consumables - Wire electrodes, wires, rods and deposits for gas shielded arc welding of high strength steels - Classification (ISO 16834:2012, MOD)
1897:1976(AS)	Electroplated coatings on threaded components (metric coarse series)
21952:2012(AS/NZS)	Welding consumables - Wire electrodes, wires, rods and deposits for gas shielded arc welding of creep-resisting steels - Classification
2312.1:2014(AS/NZS)	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Part 1: Paint coatings
2312.2:2014(AS/NZS)	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Part 2: Hot dip galvanizing
3404.1&2:1997(NZS)	Steel Structures Standard
3404:2018(SNZ TS)	Durability requirements for steel structures and components
3678:2016(AS/NZS)	Structural steel - Hot-rolled plates, floorplates and slabs

3679.1:2016(AS/NZS)	Structural steel - Part 1: Hot-rolled bars and sections
3679.2:2016(AS/NZS)	Structural steel - Part 2: Welded I sections
3750(AS/NZS):Parts 1-23	Paints for steel structures
4600:2018(AS|NZS)	Cold-formed steel structures
4680:2006(AS/NZS)	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
4781:1973(NZS)	Code of practice for safety in welding and cutting
5131:2016(AS/NZS)	Structural steelwork - Fabrication and erection

3.3 Structural Steelwork

3.3.1 Scope

Supply, fabricate, install and erect all Structural Steelwork as shown on the drawings and as required for the satisfactory completion of the works, complete with accessories, including all necessary weld plates, cleats, bolts, etc., for building into concrete and concrete blockwork. 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 following is a list and a general description of the extent of Structural Steelwork, which are more specifically defined in the contract documents, required for the completion of the contract works:

3.3.2 Requirements

3.3.2.1 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 'Worksafe 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.

3.3.2.2 Quality Assurance - Option 1

Construction of all structural steelwork shall comply in all respects with the design drawings and the specifications.

Prepare and submit details of the fabrication and erection quality assurance procedures for approval. These procedures should encompass all aspects of fabrication.

The quality assurance procedures shall encompass all aspects of the structural steel construction including, but not limited to:
- compliance of materials; and
- welding procedures; and
- steel preparation prior to painting; and

- quality of painting/coatings; and
- erection of structural steelwork.

Maintain and adhere to the quality control procedures for the fabrication and erection of structural steelwork at all times, and ensure that work is performed to the required standard in accordance with the contract documents.

Notify the name of the Structural Steelworker's representative responsible for the quality control of all structural steelwork.

3.3.2.3 Architecturally Exposed Structural Steel (AESS)

Where structural steel members are specifically designated as 'Architecturally Exposed Structural Steel' or 'AESS' on the drawings, the requirements of AS/NZS 5131 Section 10 shall apply. AESS members or components shall be fabricated and erected with the care and dimensional tolerances that are stipulated in AS/NZS 5131.

3.3.2.4 Shop Drawings

Prior to commencing steelwork fabrication, prepare and submit for review shop drawings of structural steelwork. The drawings shall provide complete details of each assembly in the steelwork together with all information relative to their fabrication, surface treatment and erection. Each component and connection shall show the relevant work points.

Allow 10 working days for the review of shop drawings. The review of shop drawings shall not relieve the Contractor of the responsibility for the accuracy of the shop drawings and for the correctness of the fabrication, setting out and erection of the steelwork. The cost of rectifying any errors shall be at the Contractor's expense.

Shop drawings shall be coordinated between disciplines and incorporate specific requirements shown on the Architectural, Structural and Building Services drawings.

Shop drawings shall include, but not be limited to:
- Design calculations;
- Fully dimensioned plans, elevations and sections of all structural steelwork elements relative to project grid and levels (at a suitable scale);
- Complete details of construction, connections and support systems relative to project grid and levels (at a suitable scale);
- Dimensions of all elements;
- Jointing details and method of fixing between individual elements and adjacent work;
- Provision for thermal movement;
- Provision for seismic movement and movement under wind loads;
- Installation sequence;
- Coordination requirements with other work and trades, including penetrations, fixings, etc.
- A full schedule of materials, finishes, and fasteners.

3.3.2.5 Materials & Workmanship

Adhere to all relevant requirements of NZS 3404, AS/NZS 1554.1 and AS/NZS 1554.2 for the supply of all materials and in workmanship both on and off site. The use of materials complying with any other Standard equivalent to those stated herein shall only be permitted with the prior approval of the Contract Administrator.

3.3.2.6 Welding Qualifications

All welders shall be suitably qualified to AS/NZS 2980, and familiar with the specified materials and welding techniques required in accordance with AS/NZS 1554. No welder shall carry out work for which he/she is not certified/qualified.

On request, provide evidence of welding qualifications, including a list of proposed welders and their welding certificates, prior to any welding being carried out.

3.3.2.7 Inspections

Provide opportunity to inspect the work on site, and give at least 24 hour's notice for the work to be inspected. Should further inspections and tests by a specialist inspector be required due to concerns about the quality of workmanship, then these shall be at the Contractor's expense.

3.3.2.8 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. All rejected structural steelwork shall be repaired and/or replaced to the satisfaction of the Contract Administrator - without delay, and at the expense of the Contractor.

If a field-weld is used to substitute (in place of) a shop-weld, the field-weld shall be deemed defective, unless it is subject to specific non-destructive examination (NDE) in accordance with AS/NZS 1554 and to the satisfaction of the Contract Administrator.

3.3.2.9 Producer Statement

Furnish a fully completed Producer Statement when the works are sufficiently complete and ready for application for a Code Compliance Certificate. The Producer Statement shall cover all structural steelwork completed under this section of the specification - Structural Steelwork.

3.3.3 Materials

3.3.3.1 Steel

All mild steel shall comply with the requirements of AS/NZS 3679.1.

Except where specified otherwise on the drawings, hot-rolled steel sections shall be Grade 300 complying with OneSteel 300PLUS specification and AS/NZS 3679.1. OneSteel 300PLUS specification shall take precedence where conflict exists with AS/NZS 3679.1.

Except where specified otherwise on the drawings, cold-formed structural steel hollow sections shall be Grade C350, and shall comply with AS/NZS 1163.

Except where specified otherwise on the drawings, structural steel welded I sections (welded beams and welded columns) shall be Grade 300, and shall comply with AS/NZS 3679.2.

Structural steel hot-rolled plate shall comply with AS/NZS 3678.

All structural steel to be welded shall be suitable for welding in accordance with the specified welding procedures of AS/NZS 1554: Parts 1, 2, 5 and 7.

The surface condition of steel shall be no worse than Rust Grade C in accordance with International Standard ISO 8501-1 or Swedish Standard SIS 05 5900.

Any unidentified steel shall not be used unless approved by the Contract Administrator. When the use of unidentified steel is approved for use, it shall only be used as specified in NZS 3404: Section 2.2.3.

Submit all mill certificates to the Contract Administrator prior to fabrication for all steel to be used.

3.3.3.2 Welding Consumables

Welding electrodes shall comply with the requirements of AS/NZS 1554.1 or AS/NZS 1554.5 as appropriate for the grade of steel being welded.

Welding wire type shall be as recommended by the manufacturer of the steel being joined and for the welding position. Wire showing signs of rust or contaminated with oil shall not be used.

Welding flux used from sealed containers must be dry. The use of unused flux recovered from welds shall only be as approved by the Contract Administrator. The use of reground flux is not permitted.

Material and welding of studs shall comply with AS 1554.2.

3.3.4 Fabrication

3.3.4.1 General

Fabrication of steel structures shall comply with the requirements of AS/NZS 5131.

Verify design dimensions against site measurements prior to fabrication of steelwork. Where new steelwork is being installed on or connecting to an existing structure, check and verify site dimensions and levels prior to fabrication of new steelwork. Refer any discrepancy between the drawings and the site dimensions to the Contract Administrator.

Fabrication tolerances shall be as given in AS/NZS 5131 Appendix F unless specified otherwise on the drawings.

As necessary and required, coordinate with other trades with regard to dimensions and setting-out of built-in items and fixings, etc., for peripheral elements. Supply and install all associated sundry fixings, weld plates, brackets, etc., necessary for the satisfactory completion of the contract works.

All steel members capable of holding water shall be provided with weep holes to prevent accumulation of water during construction or of condensation afterwards.

3.3.4.2 Holing

Comply with AS/NZS 3404.1 requirements for holing, including round and slotted holes, nominal sizes, alignment, finishing, punching and flame cutting of holes. Hand flame-cutting of a bolt hole is not permitted, except only when authorised by the Contract Administrator as a site rectification measure for holes in column base plates.

3.3.4.3 Splices

All members shall be in one length with splices only at positions shown on the drawings. If the Contractor requires additional splices or wishes to relocate a splice from the design position, formally submit such proposals to the Contract Administrator for review. Do not proceed with fabrication until the review has been completed and approval from the Contract Administrator given.

3.3.4.4 Camber

Beams and trusses without a specified camber shall be fabricated so that after erection any camber due to rolling or shop fabrication is upward.

3.3.5 Welding

3.3.5.1 Welding Quality Management System (WQMS)

The structural steelworker shall implement and maintain a Welding Quality Management System (WQMS) for all welding procedures as recommended by NZS 3404.1 and in accordance with AS/NZS ISO 3834 according to the appropriate quality level. A copy of the WQMS shall be submitted to the Contract Administrator for review prior to commencing fabrication.

3.3.5.2 Welding

Weld quality shall be Category Structural Purpose (SP) unless specific reference is made on the drawings for a specific weld to be Category General Purpose (GP).

Welding shall comply with AS/NZS 1554.1 or AS/NZS 1554.5, as appropriate and in conjunction with AS/NZS 5131.

Submit for approval, details of the welding procedures to be used including details of the equipment and consumables before any welding is carried out.

All welding shall be shop-welds unless specified otherwise on the drawings. Shop-welds shall be welding carried out under controlled conditions, in an approved facility, by certified welders under the continuous supervision of certified welding inspectors.

Any field-weld made without prior written approval from the Contract Administrator will be deemed defective and subject to rejection - refer to Requirements clause.

All weld runs shall be as specified and not finish with a concave surface. Welds shall have proper penetration, with all slag deposits removed as work proceeds and the runs are completed. Welds shall be continuous around joints to prevent the ingress of moisture.

Butt welds shall be full penetration unless specified otherwise on the drawings, and shall be ground flush.

Welding of hollow sections shall incorporate internal sections or backing plates as necessary to complete the specified weld.

Open-ended hollow sections shall be capped using 3mm plate and seal welded unless specified otherwise on the drawings.

3.3.5.3 Qualification of Welding Procedures and Personnel

All welding procedures as a minimum shall be in accordance with AS/NZS 1554.1 or AS/NZS 1554.5 as appropriate. Welding of studs shall comply with AS/NZS 1554.2.

Welding supervisors shall hold Welding Supervisor qualifications from the New Zealand Institute of Welding or an equivalent qualification recognised by HERA NZ Welding Centre. In addition all personnel involved in welding shall only be employed on the types of weld for which they are suitably qualified and they shall hold current Welding Certificates in accordance with AS/NZS 2980. Should qualification testing be required it shall be the Contractor's responsibility for arranging and payment of such tests.

3.3.5.4 Welding Testing & Inspection

The minimum extent of inspection of welding shall be as specified below and in accordance with AS/NZS 1554.1, AS/NZS 1554.5, and AS/NZS 5131 Appendix I. All welds shall be subject to inspection and testing. The testing of welds will commence with the first joints to be fabricated. Test inspections shall be carried out by a CBIP Certified Welding Inspector (CWI). The cost of testing shall be borne by the Contractor. Give at least 24 hour's notice of any welding that will be closed in by subsequent work that will prevent its inspection afterwards.

Non-Destructive Testing (NDT) and Non-Destructive Examination (NDE).
Visual Scanning:
- The minimum level of testing shall be 100% visual scanning as defined by AS/NZS 1554: Parts 1 and 5.
- At the completion of the work, the welding supervisor shall complete and submit a written statement verifying that the visual scanning has been carried out and completed.

Visual Examination:
- A visual examination shall be carried out in accordance with AS/NZS 1554.1 to determine whether the required weld quality has been achieved.
- Where the proportion of visual examination required is less than 100%, agree on a programme of testing with the Contract Administrator prior to the commencement of any welding.
- The programme shall involve full testing a specified percentage of welds, in order to pick up and correct the cause of any major defect at the commencement of welding.

- The frequency of testing may be progressively reduced on the basis of continuing compliance with the agreed testing programme and this specification.
- Welds with a Category A weld-failure-consequence shall be subject to a 100% visual examination in accordance with AS/NZS 1554.1.
- A record of all welds examined and tested shall be kept and made available on request.

Extent of Non-Destructive Examination (%)			
Weld Category	**Weld Failure Consequence Category**	**Visual Means**	
		Visual Scanning	**Visual Examination**
GP	C	100%	25% min.
SP	B or C	100%	25% min.
SP	A	100%	100%

Other Means:
- Other means of NDE include ultrasonic or radiographic (UT), magnetic particle (MT), liquid penetrant (LP).
- The extent of other means of non-destructive examination of welds shall be as indicated on the drawings and in accordance with AS/NZS 5131 and AS/NZS 1554.1.
- Agree on a programme of testing by other means with the Contract Administrator prior to the commencement of any welding.
- A record of all welds examined and tested shall be kept and made available on request.

3.3.5.5 Repair of Welding Defects

When a welding defect is disclosed by inspection or other investigation, the weld shall be cut out, remade and re-tested. The repair and re-testing of defective welds shall be carried out in accordance with AS/NZS 1554.1 or AS/NZS 1554.5, as appropriate, and to the satisfaction of the Contract Administrator. The cost of testing and repairs to all welding defects shall be at the Contractor's expense.

The welding inspector shall examine all seams from which defects have been cut out and their approval obtained prior to re-welding. Re-welding shall be carried out in a manner and by practices acceptable to the Contract Administrator, and where practicable, shall be by the same process used in the original welding.

The inspection records and re-testing records of all repaired welding defects shall be kept and made available on request.

3.3.6 Erection

3.3.6.1 Delivery & Handling

All steelwork components shall be suitably stacked clear of the ground, on bearers aligned so as to prevent any twisting, bending or other distortion of the items. Keep steelwork dry and protected from damage, moisture and contamination at all times while stored.

Store fasteners in watertight premises. Handle and store electrodes, electrode wire and flux in accordance with the manufacturer's recommendations.

As necessary, make all provisions to protect steelwork components from distortion during delivery and handling.

Do not use damaged, distorted or defective steelwork components, materials and accessories.

Handle steelwork components in a manner that prevents distortion and damage. Ensure that components maintain their manufactured shape and the integrity of corrosion protection at all times during handling.

Handlers shall be familiar with and comply with safe handling requirements, and shall use appropriate safety gear while handling steelwork.

Steelwork riggers and installers shall conform with all relevant WorkSafe NZ Guidelines and Codes of Practice.

3.3.6.2 Assembly

Erection of steel structures shall comply with the requirements of AS/NZS 5131.

Structural steelwork components shall be assembled free of damage and distortion, and so that any specified camber is maintained.

Erection tolerances shall be as given in AS/NZS 5131, Appendix F unless specified otherwise on the drawings.

Check all seatings for steelwork to ensure that they are at the correct level, truly flat and in a condition to receive the steelwork.

Field errors must not be corrected by gas cutting except with the approval of the Contract Administrator.

Each component of the structure shall be aligned as soon as practicable after it has been erected. Permanent connections shall be made when sufficient structure has been erected and the components temporarily connected and accurately aligned, levelled and plumbed, and to ensure that the structure will not be displaced during the erection or alignment of subsequent stages.

3.3.6.3 Temporary Bracing

Provide sufficient temporary bracing to keep the structure plumb and in true alignment until the structure is permanently braced. Failure to make proper and adequate provision against damage during erection shall be the full responsibility of the Contractor. All temporary bracing and guying shall be capable of resisting all loading, Including wind, liable to occur on the structure during the erection period.

Submit for review the method of erection and assembly of structural steelwork. The review shall not limit the Contractor's responsibility to ensure the safety and accurate alignment of the structure.

Connections for temporary bracing and temporary members shall be made so as not to weaken the permanent structure or reduce its performance.

Bracing shall not be used to force the structural frame into its correct position. Tighten bracing only after the frame has been squared, aligned and plumbed or, if inserted at an earlier time, loosen to permit these operations and tighten on completion.

3.3.6.4 Temporary Support of Existing Structure

Where the steelwork of an existing structure is to be removed or strengthened, provide all the necessary support required to prevent distortion of the existing structure and excessive loads being placed on other parts of the structure.

3.3.6.5 Holding Down Bolts

Unless specified on the drawings, holding down bolts shall be of the size, number and length required to achieve the correct embedment and allow the final fixing to the base plate. To ensure correct placement and alignment, a template for each holding down bolt type and configuration shall used for placement. The bending or displacing of holding down bolts is not permitted.

All holding down bolts, nuts and washers which form a permanent part of a structure subject to weather exposure or contained within exterior wall framing shall be galvanised.

3.3.6.6 Bolting

Comply with AS/NZS 3404.1 requirements for bolting. All bolts and associated nuts and washers shall comply with the material properties specified - refer to Materials clause. All material within the grip of the bolt shall be steel and no compressible material shall be permitted in the grip.

Unless specified otherwise on the drawings, all bolts shall be:
- Strength Grade 8.8, Bolting Category 8.8S, complying with AS/NZS 1252; and installed to a snug-tight condition as specified in NZS 3404.1:Section 4.2.6.2(a).
- At least one clear thread run out shall be clear beneath the nut after tightening the bolts.
- Each bolt and nut shall be assembled with at least one washer.

Bolted connections specified on the drawings with the suffix /TB (bearing-type) or /TF (friction-type) shall be fully tensioned in accordance with NZS 3404.1:Sections 4.2.5 and 4.2.6.
- Bolts used for a fully tensioned bearing-type (/TB) connection shall be Strength Grade 8.8, Bolting Category 8.8/TB, complying with AS/NZS 1252
- Bolts used for a fully tensioned friction-type (/TF) connection shall be Strength Grade 8.8, Bolting Category 8.8/TF, complying with AS/NZS 1252.
- The contact surfaces of fully tensioned connections shall be prepared in accordance with NZS 3404.1:Section 4.2.4.3.

For fully tensioned bolts, the minimum number of clear threads run out beneath the nut after tightening shall be:

- Five threads for a bolt length up to and including 4 diameters;
- Seven threads for a bolt length over 4 diameters but not exceeding 8 diameters;
- Ten threads for a bolt length over 8 diameters.

The tightening pattern of fully tensioned joints shall proceed from the stiffest point, typically the centre, towards the outer free edges of the joint, to ensure that all bolts carry an equal proportion of the load.

The re-tensioning of Strength Grade 8.8 bolts that have been fully tensioned is not permitted without the written approval of the Contract Administrator, and shall only be carried out in accordance with the Contract Administrator's instruction.

3.3.6.7 Proprietary Fasteners

Proprietary fasteners shall be as specified on the drawings and installed strictly in accordance with the manufacturer's requirements.

3.3.6.8 Grouting

Grouting of baseplates and other steelwork, where noted on the drawings, shall be carried out with the use of an approved proprietary non-shrink, pourable, cementitious grout with a minimum compressive strength of 60 MPa, in accordance with the manufacturer's recommendations. Provide all necessary holes and grout tubes to ensure the complete filling of the grout spaces.

Unless shown otherwise on the drawings, the edges from the underside of the baseplate shall be formed with a nominal 20 x 20mm chamfer. Exposed grout surfaces shall be finished smooth, free of surface defects and imperfections. Remove all leave steelwork and surrounding surfaces free of grout splashes and leakage.

3.3.6.9 Drypack

All base plates to concrete surfaces shall be grouted with drypack of Portland cement mortar, with a minimum 28 day compressive strength of 60 MPa, and mixed with an expansive admixture in accordance with the manufacturer's instructions.

Drypack shall be mixed as dry as possible, have a minimum thickness of 20mm unless otherwise shown on the drawings, and be thoroughly compacted in position by ramming to ensure the complete filling of the grout space. Exposed drypack surfaces shall be finished smooth, free of surface defects and imperfections. Unless shown otherwise on the drawings, the edges from the underside of the baseplate shall be formed with a nominal 20 x 20mm chamfer.

3.3.7 Corrosion Protection

3.3.7.1 General

Comply with the requirements of NZS 3404.1 and SNZ TS 3404 for corrosion protection. Surface preparation and application and inspection of coating systems shall be in accordance with the requirements of AS/NZS 2312.1 and/or AS/NZS 2312.2 as appropriate.

All welds shall have slag removed, and welds exposed in the finished work shall have spatter removed and be ground to a neat, clean finish.

Steelwork to be sprayed for fire protection or to be cast more than 50mm into concrete shall have all rust and mill scale, etc., removed by power or manual wire brushing and shall be left unprimed.

Surface preparation shall be carried out after the fabrication of components has taken place, and the specified coating shall be applied as soon as possible after preparation in accordance with the manufacturer's specification. Surfaces that will be in contact or near-contact after fabrication or erection should receive the specified surface preparation and treatment prior to assembly. In all cases, the total coating shall be applied in the workshop in accordance with the manufacturer's instructions.

Where site-welds are necessary, protect adjacent surfaces during welding procedures, and prepare and coat site-welds in accordance with the coating manufacturer's instructions and as approved by the Contract Administrator.

3.3.8 Painting

3.3.8.1 Painting

Comply with the requirements of AS/NZS 2312.1 for corrosion protection of structural steel using paint coatings. All structural steel which is not to be treated otherwise shall be primed before delivery to the site.

Paint coating system for structural steel shall be as specified below and in accordance with AS/NZS 2312.1: Table 6.3.

The coating manufacturer may suggest alternative paint coating systems for the protection of structural steelwork in accordance with AS/NZS 2312.1 to meet specification requirements. The use of any such alternative paint coating system shall be subject to approval by the Contract Administrator.

All coating products shall be the of the same manufacturer, and supplied in unbroken packages clearly labelled with the product name and manufacturer. Do not used damaged or defective products, or products that are beyond their designated shelf life.

Maintain and comply with industry-recognised quality assurance procedures to ensure that all sections of the work are carried out in accordance with the manufacturer's requirements.

The preparation for and application of the specified coating systems and coatings shall be carried out by experienced and skilled specialist applicators, in strict accordance with the manufacturer's technical literature and to fully comply with the manufacturer's warranty requirements. All substrate preparation and coating application and finishing techniques shall be exactly as recommended by the manufacturer.

Ensure compatibility of the substrate material and the environmental exposure conditions with the protective coating system prior to commencing.

Handle coating products in accordance with the manufacturer's requirements as set out in the manufacturer's Product Data Sheets and in a manner that prevents deterioration of the product.

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

The coating manufacturer's requirements for substrate material, substrate preparation, and coating system application methods and details, and coating thicknesses, as specified in the manufacturer's coating system specification sheet and product data sheets, shall be strictly adhered to during all stages of painting structural steelwork.

Carry out all substrate preparation and protective coating application under cover, in a well lit and ventilated, stable and weatherproof environment within the permitted temperature range. Comply with the manufacturer's parameters for application conditions for air temperature, substrate surface temperature, and relative humidity.

For on-site applications, mask off and adequately protect surrounding finished work and fixtures and fittings from contamination prior to substrate preparation and/or coating application.

Apply each coat in the manufacturer's specified sequence, uniformly to the recommended dry film thickness (DFT), and allow each coat the full drying time between coats. All over-coating and recoating must be undertaken within the manufacturer's specified recoat timeframe.

Adequately protect all work in progress from damage, contamination and exposure to the environment until complete and fully cured.

Leave finished coated surfaces clean, free from defects and blemishes of any kind, and to the required standard in accordance with manufacturer's requirements.

Dispose of coating products in accordance with local government requirements. Do not permit products to enter or contaminate the stormwater system.

Provide the completed Product Warranty and Applicator Warranty upon completion of the work.

4 B L O C K W O R K

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:

1554.3:2014(AS/NZS)	Structural steel welding - Part 3: Welding of reinforcing steel
3101.1&2:2006(NZS)	Concrete Structures Standard
3103:1991(NZS)	Specification for sands for mortars and plasters
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
3121:2015(NZS)	Water and aggregate for concrete
3404.1&2:1997(NZS)	Steel Structures Standard
4210:2001(NZS)	Masonry construction: Materials and workmanship
4229:2013(NZS)	Concrete masonry buildings not requiring specific engineering design
4230:2004(NZS)	Design of reinforced concrete masonry structures
4455.1:2008(AS/NZS)	Masonry units, pavers, flags and segmental retaining wall units - Masonry units
4455.3:2008(AS/NZS)	Masonry units, pavers, flags and segmental retaining wall units - Segmental retaining wall units
4672.1:2007(AS/NZS)	Steel prestressing materials - General requirements
4680:2006(AS/NZS)	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
CCANZ CP 01:2011	Code of Practice for Weathertight Concrete and Concrete Masonry Construction
NZBC E2/AS3	Concrete and concrete masonry buildings

4.3 Concrete Blockwork

4.3.1 Scope

Supply and construct all concrete blockwork elements, including laying block, placing reinforcement and grout filling, to the locations and details shown on the approved drawings. 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 approved project design documentation, and with any relevant product manufacturers' recommendations.

The following is a list and/or general description of the extent of Concrete Blockwork works, which are more specifically defined in the contract documents, required for the completion of the contract works:

4.3.2 Requirements

4.3.2.1 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 'Worksafe 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.

4.3.2.2 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 only be carried out by Licensed Building Practitioners - Bricklaying and Blocklaying. Submit evidence on request of experience, relevant qualifications, LBP Licence - Bricklaying & Blocklaying, New Zealand Masonry Trades Association (NZMTA) Member Registration.

Blockwork materials and workmanship shall comply with the requirements of NZS 4210.

All work shall be by or under the direct supervision of a Registered Structural Mason, registered with NZ Masonry Trades Registration Board, and carried out by competent, experienced tradespersons who are fully conversant with the detailed provisions of NZS 4210.

Tolerances of blockwork construction shall conform to NZS 4210: Table 2.2, except where specified otherwise on the drawings.

4.3.2.3 Observation Types

Blockwork shall be constructed and supervised in accordance with NZS 4230: Table 3.1 in respect to the observation type applied to the blockwork. The observation type(s) of all blockwork elements shall be as specified on the drawings.

Type C Observation:
- Observation Requirement: May be built without construction observation by a design engineer or a nominated representative thereof.
- Admissible Use: Elastic and nominally ductile structures. Face loaded walls designed for limited ductility.
- Maximum Specified Compressive Strength: 4 MPa.

Type B Observation:
- Observation Requirement: Shall be inspected by a design engineer or by a nominated

representative thereof, who may be a mason deemed to comply with the competency requirements of NZS 4210. Such inspection shall establish that the design is being interpreted correctly and that the work is being carried out generally as specified.
- Admissible Use: Elastic, nominally ductile, limited ductile or ductile structures.
- Maximum Specified Compressive Strength: 12 MPa.

Type A Observation:
- Observation Requirements: In addition to the inspection required of Type B, Type A observation of masonry shall require construction supervision at all critical stages by a person approved by a design engineer, having appropriate knowledge/experience of correct masonry trade practices and reporting to a design engineer, such as to ensure that the standards of materials and workmanship applying on the job are of a consistently high quality commensurate with the achievement of superior strengths. Masonry shall be constructed using a mason deemed to comply with the competency requirements of NZS 4210.
- Admissible Use: Elastic, nominally ductile, limited ductile or ductile structures.
- Maximum Specified Compressive Strength: ≥12 MPa.

4.3.2.4 Inspections

Blockwork construction shall be inspected in accordance with NZS 4210: Clause 1.4, as appropriate for the specified type of masonry (observation type).

Before grouting of any section of blockwork, give at least 24 hour's notice for the inspection of the blockwork. Any instructions issued shall be carried out before grouting any blockwork.

4.3.2.5 Temporary Bracing

Provide and maintain temporary support to block walls until the walls have been filled, the grout filling has cured, and the walls are adequately built into the final structure. Any damage resulting from failure or neglect to provide adequate support to concrete block walls during construction shall be repaired at the Blocklayer's expense.

4.3.2.6 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.

Coordinate with all trades to accurately position and build in all required starters, anchors, bolts, fixings, sleeves, conduits, chases, electrical and/or plumbing fixtures and fittings, etc. (conduits shall be vertical only unless approved otherwise). Coordinate with all trades to form all necessary holes, openings, etc., with positions and sizes exactly as required.

Remove all rubbish and waste material from the site as the work progresses. On completion of the work, leave the site clear of all associated rubbish, waste and excess material.

4.3.2.7 Producer Statement

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

4.3.3 Blocks

All concrete blocks shall be of hollow type masonry units from an approved manufacturer, in accordance with AS/NZS 4455. Blocks shall be of an approved standard grey colour, properly cured, square and true to shape and size. Blocks shall be manufactured from standard aggregates to NZS 3121. Lightweight aggregate blocks shall NOT be used.

Suppliers of masonry units shall provide the following information:
- Unconfined compressive strength as determined by AS/NZS 4456: Part 4.
- Work size tolerances as determined by AS/NZS 4456: Part 3.

Excessively damaged or otherwise irregular blocks will NOT be accepted. Where block types are shown on the drawings, the blocks used shall be such as to achieve the joint patterns shown on the drawings and be capable of being placed to suit reinforcing steelwork already in place.

Blocks shall be cut as necessary, to fit dimensions or to suit reinforcing. Cutting shall be done by means of a special hydraulic block cutting machine or carborundum saw, and exposed edges shall be clean, square and even.

4.3.4 Mortar

Mortar shall conform with the requirements of NZS 4210: Section 2.2.

The minimum 28 day compressive strength of mortar shall be 12.5 MPa. Allow to test mortar in accordance with Appendix 2.A of NZS 4210. A test sample of at least three cylindrical specimens shall be taken for every 200m² of wall, and the test results submitted for review.

Sand for mortar shall comply with NZS 3103, and water for mortar shall comply with NZS 3121. Sands used for mortar exposed to the weather shall not have a chloride content in excess of 0.04 % by mass.

Chemical admixtures shall comply with NZS 3113 or AS 1478, and used in accordance with the manufacturer's requirements. Calcium chloride based accelerators shall not be used in any mortar exposed to weather.

4.3.5 Grout

Grout shall be coarse grout in accordance with NZS 4210: Section 2.3. Grout shall be mixed at an approved ready mix plant in accordance with NZS 3104. Site mixing will only be permitted with the express and prior approval of the Contract Administrator.

The minimum 28 day compressive strength of the grout shall be 17.5 MPa for all durability zones except Seaspray (B2), where the minimum compressive strength shall be 25 MPa. Allow to test grout in accordance with Appendix 2.A of NZS 4210. A test sample of at least three cylindrical specimens shall be taken for every 200m² of wall filled, and the test results submitted for review.

4.3.6 Reinforcement

Refer to separate section Reinforcing Steel for specification of reinforcement.

Reinforcing steel for blockwork shall comply with the requirements of NZS 4210, be bent and installed as detailed on the drawings, and fixed by the Blocklayer.

Vertical reinforcing shall be positioned in advance of laying, and horizontal reinforcing positioned when the appropriate block course is laid. Vertical steel, including starters shall be central, unless noted otherwise on the drawings. Vertical reinforcement shall be fixed to starter bars before block laying commences.

Ensure correct location of reinforcing starter bars according to the required block layout. Starter bars cast out of position shall NOT be bent over into the correct position. In the event of starter bars being out of position, the Contract Administrator shall be notified and instruct any remedial work required.

Lap lengths shall be a minimum of 450mm long and not less than that specified below, unless specified otherwise on the drawings:
- Grade300E reinforcing: 40 bar diameters;
- Grade500E reinforcing: 70 bar diameters.

Lapping bars shall be tied to each other. The position of laps other than those detailed shall be as approved by the Contract Administrator before placing reinforcing steel.

4.3.7 Block Laying

4.3.7.1 Block Laying

Block laying shall comply with NZS 4210, Section 2.7. Except where shown otherwise on the drawings, all blocks shall be laid running bond (stretcher bond) pattern.

The base shall be scored, scabbled or otherwise mechanically roughened to a minimum amplitude of 1.5mm prior to laying of blocks. It shall be clean and free from all laitance, loose mortar or any other material which would prevent the mortar bonding to it.

Unless otherwise indicated on the drawings, all blockwork shall be laid in running (stretcher) bond throughout and all panels shall be carefully set out so as to avoid use of cut blocks wherever possible.

No blocks shall be laid during inclement weather. No blocks shall be laid on a partially built wall which has been exposed to rain until the wall has dried out. Alternatively, provide adequate cover to the top of block walls under construction during inclement weather.

To facilitate cleaning out of mortar droppings and other debris, the first course of each lift shall be laid using inverted knock-in bond beam blocks. Sand shall NOT be sprinkled at the bottom of the grout space.

Build blockwork to vertical reinforcing with open-end type blocks and end closers. Provide bond beam and open ended bond beam type blocks and end closures for horizontal reinforcement. Where blockwork is not course-bonded at wall junctions, cut blocks at all levels to allow horizontal reinforcing and grout to pass through. Blockwork shall be constructed so that filling grout is fully contained within the grout spaces and does not leak from these.

All newly laid concrete blockwork shall be protected from drying winds and from sunshine. The top surface of the grout shall be protected from premature drying for a minimum of 24 hours by covering with moist hessian or by other approved means.

4.3.7.2 Building In

The Blocklayer shall coordinate as necessary with other trades and make all necessary provisions for built-in items.

Refer to and coordinate with the Architectural Drawings to ensure all blocks around openings, etc., are correctly laid with sills, reveals and rebates as necessary.

As work proceeds, allow to drill and cut out neat rectangular holes in the concrete blocks for flush boxes for cable services outlets, switches and controls, etc., as shown on the Architectural and/or Building Services drawings. Holes shall be accurately positioned and carefully cut to exact sizes.

As the work proceeds, build into blockwork all necessary bolts, steelwork and metalwork items and other fittings and fixings as shown on the drawings or otherwise required for the work.

4.3.7.3 Cleaning Out

All walls shall have clean-out ports at the bottom with inverted open ended blocks for the length of the wall. Clean-out ports shall be spaced to match all wall starter locations and at no greater than 800mm centres.

Cleaning out of grout spaces shall include the removal of any mortar from ties and reinforcing bars, the removal of any mortar protruding into cells or cavities at joints, and the removal of all mortar droppings and other loose material.

Clean-out openings shall be left open for the inspection of tied laps in the reinforcement.

Clean-out openings shall be closed after inspection and prior to grouting by boxing with timber on concealed surfaces and by mortaring-in face shells at visible surfaces. Clean-out boxing shall be braced, and supports shall be provided to closure units at ends of walls and at openings as required to resist grout pressure.

4.3.7.4 Pointing & Finishing

As the work proceeds, blockwork joints shall be neatly and expertly pointed with joints of mortar as specified on the drawings in accordance with NZS 4210: Section 2.7.7.

Concave tooled to a depth not exceeding 6 mm and burnished after the initial stiffening has occurred.

Raked out pointed and tooled to a depth not exceeding 6 mm after the initial stiffening has occurred

Blockwork to be covered or plastered in the finished work shall have joints compacted by tooling and left flush with the block surface. Add additional mortar before tooling to ensure joints are completely full.

On completion of walls, clean down and remove all mortar projections and irregularities. Patch and make good around all pipes, conduits, etc., penetrating the blockwalls. Make good any defects in the pointing.

4.3.7.5 Control Joints

Construct vertical control joints where shown on the drawings and at not more than 8m spacing along all walls where not specifically shown. Confirm in advance the location of all control joints when they are not shown on the drawings.

Control joints shall be continuous vertical joints. Reinforcement and filling grout shall be continuous through the joint unless shown otherwise.

Mortar on internal wall faces in a control joint shall be laid and painted after all shrinkage has taken place and at least 14 days after grouting the wall. Seal control joints on external wall faces with Sikaflex AT-Façade sealant or approved equivalent high-performance movement joint sealant.

4.3.7.6 Seismic Movement Joints

Maintain clearances to columns and other structural elements as shown on the drawings. Fill joints with approved compressible fire proofing material and sealant as specified and shown on the drawings.

4.3.8 Grout Filling

4.3.8.1 General

Grouting shall not commence until the mortar joints have attained sufficient strength to resist blow-outs and grout spaces have been cleaned out. The height of individual lifts in any pour should be limited so as to prevent blow-outs.

All block cells shall be filled, unless specified otherwise on the drawings. Cells that are not to be filled shall be covered to prevent the entry of grout, provided that this shall be done in such a manner that the mortar bond between courses is not impaired.

Grout in each lift shall be thoroughly compacted in order to fill all voids and ensure bond between grout and masonry or construction joints.

Ensure all face shells, supports, forms, etc., are adequate to prevent bursting of the wall during filling. Do not pour grout until spaces to be filled have been checked for debris and restrictions.

During grout filling around reinforcement ensure that the position of reinforcing is correctly maintained. Prevent any movement of projecting reinforcement while the grout is setting.

4.4 Reinforcing Steel

4.4.1 Scope

Supply, bend, tie, place, fix, etc. all reinforcing steel required for concrete work and reinforced blockwork, as indicated on the approved drawings and as required for proper completion of the

works, complete with accessories. 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 approved project design documentation, and with any relevant product manufacturers' recommendations.

All materials and workmanship shall conform to the requirements of NZS 3109, the New Zealand Building Code, and conditions of the Building Consent.

Reinforcing steel for concrete work shall be placed by the Reinforcing Steeworker.
Reinforcing steel for concrete blockwork shall be placed by the Concrete Blockworker.
Reinforcing steel and stressing strand/wire for precast concrete and prestressed precast concrete shall be placed by the Precast Concrete Manufacturer.

4.4.2 Requirements

4.4.2.1 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.

4.4.2.2 Quality Assurance

Ensure that the reinforcement placed complies in all respects with the design drawings and specification. The reinforcing steelworker shall nominate a foreman reinforcing steel placer, or equivalent, for approval by the Contract Administrator before commencement on site. The foreman reinforcing steel placer shall inspect all completed sections of reinforcing steelwork and confirm that the work has been carried out in accordance with the design drawings and specification.

The foreman reinforcing steel placer will be required to sign a pre-pour reinforcing check list prepared by the Contractor prior to concrete being placed for that section of the works. A copy of the completed pre-pour checklist must be given to the Contract Administrator prior to observing the finished section of work.

During pouring, the reinforcing steelworker shall be available to correct any displaced or damaged reinforcing.

4.4.2.3 Inspections

Inform the Contract Administrator when reinforcing steel is being fixed. Give at least 1 working day's notice for the inspection of fixed steel reinforcing before concreting.

4.4.2.4 Testing

Provide reinforcing steel manufacturer's certificates of origin to the Contract Administrator. Should such certificates indicate the requirements of this specification may not be met, pay for such tests as required by the Contract Administrator to establish its compliance.

4.4.2.5 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 work completed under this section of the specification.

4.4.3 Reinforcing Steel

4.4.3.1 Reinforcing Steel

Reinforcing bars shall conform to AS/NZS 4671 Grade 300E or Grade 500E, except that the use of Grade 250N or Grade 500N is permitted where specifically indicated in the drawings and specifications. The use of Grade 500L bars is not permitted.

Grade 500E reinforcement shall be manufactured by Pacific Steel micro-alloy process. Alternative manufacturers of Grade 500E reinforcement will only be approved if written evidence is provided, including test certificates, verifying the product. The use of Grade 500E reinforcement manufactured by a quench and tempered process is not permitted.

All mesh shall be factory made and machine welded and conform to AS/NZS 4671.

Hard-drawn reinforcing mesh shall be Grade E complying with AS/NZS 4671.

Ductile reinforcing mesh shall be Grade E complying with AS/NZS 4671 in accordance with the requirements of NZBC B1/VM1.

Mill certificates must be provided to the Contract Administrator for all reinforcing steel used.

All bundles of reinforcing steel supplied to the job shall be clearly marked with numbers relating to the Bending Schedule and related drawing.

4.4.4 Bending of Bars

4.4.4.1 Bending of Bars

Bars shall be cut and bent in accordance with NZS 3109:Section 3 and to the dimensions and shapes indicated on the drawings.

Bend diameters for main reinforcing bars and of stirrups shall be as given by NZS 3109:Table 3.1.

Stirrups shall be bent to standard shapes as shown in NZS 3109.

Cranks or sets at laps shall have their inclined portions 12 diameters or a minimum of 300mm long unless specifically shown otherwise on the drawings.

Bars with bends or kinks not shown on the drawings shall not be used.

Bent bars shall not be rebent in the reverse direction unless specifically called for on the drawings. Rebending of steel reinforcement must be carried out to the steel manufacturer's requirements and only with approval of the Contract Administrator. Rebending of Grade 500E reinforcing steel is not permitted.

4.4.4.2 Bending Schedules

Where bending schedules are not included in the contract documents, it is the reinforcing steelworker's responsibility to produce a Bending Schedule for review by the Contractor before bending and cutting commences. Inform the Contract Administrator of any discrepancies in the contract drawings, before cutting and bending commences.

4.4.4.3 Bend Diameters

Unless otherwise noted on the drawings, main reinforcing bars shall be bent to the following internal diameters:

Steel Grade	Bar Size	Min. Bar Diameters
300E & 500E	6mm - 20mm	5 bar diameters
300E & 500E	25mm - 40mm	6 bar diameters

Bend diameters for stirrups and ties shall be to suit the diameter of the enclosed bar with a minimum of 2 bar diameters for plain bars and 4 bar diameters for deformed bars. Grade 500E steel for stirrups and ties shall be bent as for Grade 300E steel.

4.4.5 Laps, Cover & Tolerances

4.4.5.1 Laps in Reinforcing

The positions of reinforcing bar laps shall be as shown on the drawings. The positions of reinforcing bar laps other than those detailed must be approved in writing by the Engineer/Designer before cutting and bending commences. All lapping bars shall be tied to each other.

Lap lengths shall generally be as detailed on the drawings, but in any case not less than 400mm. Where laps have not been specifically detailed, laps shall comply with the table below.

Bar Diameter	Grade 300E Deformed	Grade 500E Deformed
10mm	400mm	600mm
12mm	480mm	720mm
16mm	640mm	960mm
20mm	800mm	1200mm
25mm	1000mm	1500mm
32mm	1280mm	1920mm

Lap lengths for plain round bars shall be two times the length given in the table above for the corresponding grade of deformed bar.

Laps to reinforcing mesh shall fully comply with the requirements of NZS 3101 but shall not be less than 225mm at all edges, and in any case give a minimum of 2 overlapping cross wires plus 50mm. Where Ductile 500E mesh is lapped, the lap length between outer cross bars shall be to the manufacturer's requirements.

4.4.5.2 Cover

Minimum cover shall be as specified on the drawings or otherwise as specified in NZS 3109. Covers specified on the drawings shall take precedence over those specified in NZS3109.

The ends of wire ties shall be turned away from the concrete face to maintain cover. Wire ties shall not be tied to formwork.

4.4.5.3 Tolerances

Tolerances for bending and fixing of reinforcing steel and fixing of prestressing tendons, ducts and strands shall comply with NZS 3109.

Unless tighter tolerances are specified the following tolerances shall apply:

Bending tolerances:
- Cranks stirrups and ties where -
  the member depth is less than 200mm: +0mm, -5 mm;
  the member depth is 200mm or more: +0mm, -10mm;
- Other steel: +0mm, -15mm;
- Length of straight bars: +0mm, -15mm;
- Length of straight bars where length fitment is not critical: +20mm.

Tolerances on bar spacing/position:
- Spacing of main bars in beams and columns: ±10mm;
- Distance between layers of main steel except it shall not be less than 25mm: ±5mm;
- Distance between bars along the face of walls or slabs: ±20mm;
- Spacing of stirrups or ties in beams and columns: ±20mm;
- Longitudinal position of splice: ±30mm.

Tolerances on concrete cover relative to the values specified and shown on the drawings are:
- In slabs and walls: +10mm; -0mm;
- In beams and columns: +10mm; -0mm;
- At ends of members: +25mm; -0mm.

4.4.6 Placing & Fixing

4.4.6.1 Fixing

Reinforcement shall prior to commencement of concrete placement, be placed, supported and secured against displacement in accordance with the specified tolerances.

Metal supports and tie wires to the reinforcing shall not extend into the concrete cover zone.

Reinforcement shall be supported by appropriate proprietary chairs or spacers, or tied up with wire, such that the durability and strength of the structure is not compromised. The types of distance pieces and spacers to be used shall be such as to firmly hold the steel against displacement. Cementitious spacers shall at least match the quality of the concrete being cast and shall have a minimum compressive strength of 40 MPa.

Fixing of reinforcing steel shall conform to NZS 3109. Bars shall be positioned accurately according to the drawings and securely tied with wire ties to form a rigid cage. Particular attention shall be paid to the correct lapping of all steel and laps shall be checked after fixing.

Take all necessary care when handling and fixing Grade 500E reinforcing bars. Do not use or place any excessively damaged Grade 500E bar, such damaged bars shall be rejected and replaced.

Reinforcing steel shall not be cut or bent on site without the Contract Administrator's specific approval.

All starters shall project the minimum distance prescribed for lap lengths unless detailed otherwise. All starters and other reinforcing protruding from a concrete pour shall be securely braced to prevent any movement during concreting. Starters shall NOT be placed into concrete after it has been poured.

Clean reinforcement prior to concreting to remove any dirt, release agent, slurry and other contaminants likely to affect bonding to concrete. Thoroughly clean all projecting cast-in starter bars before installing subsequent reinforcing steel.

4.4.6.2 Concrete Slab-on Grade Floor

Supply and place mesh to the slab-on-grade or the toppings over precast concrete floor units as detailed. Mesh laps shall fully comply with NZS 3101 but shall not be less than 225mm minimum at all edges, and in any case give a minimum of 2 overlapping cross wires plus 50mm. Sheets shall be cut at 4-sheet overlapping corner junctions so as to limit the overlapping to two of the four sheets.

All mesh is to extend to within 75mm of the perimeter of the building floor edges.

Mesh shall be continuous over pads and foundation beams unless additional compensating lap bars are placed across the top to lap with the mesh reinforcement each side. Unless noted otherwise, all saddle bars and other steel shown over the beams on the drawings are additional to the mesh and cannot be included in the required area of compensating steel.

Place topping tie bars as detailed on the drawings.

5 WATERPROOFING

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:

3740:2010(AS)	Waterproofing of domestic wet areas
4858:2004(AS/NZS)	Wet area membranes
NZBC B2/AS1	Durability
NZBC E3/AS1	Internal Moisture

5.3 Interior Wet Area Waterproofing Membrane Systems

5.3.1 Scope

Supply and install the specified Interior Wet Area Waterproofing System, to the locations shown on the drawings, complete with all accessories. 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.

No substitutions are permitted for the specified Interior Wet Area Waterproofing System.

5.3.2 Waterproofing System

Liquid-Applied Waterproofing Membrane System. A liquid applied, modified polyurethane, high-build acrylic, flexible waterproof membrane, suitable for residential and commercial interior wet area floor and wall applications to be subsequently tiled or otherwise covered and protected.

Installed as an interior wet area undertile waterproofing membrane system in accordance with the manufacturer's requirements, NZBC E3/AS1, AS 3740, and as shown on the drawings.

5.3.3 Primer

Primer - Liquid-Applied Waterproofing Membrane System. Apply the primer to properly prepared substrates for optimum waterproofing adhesion in accordance with the manufacturer's requirements. Use primers recommended by the waterproofing manufacturer only.

Limit priming to no more than can be covered by the waterproofing membrane in one working day or as recommended by the manufacturer, and allow the primer to properly dry before applying the waterproof membrane.

Protect primed surfaces from damage and contamination until the waterproofing membrane application is complete.

5.3.4 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 the specified Interior Wet Area Waterproofing System as required.

5.3.5 Workmanship

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.

5.3.6 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.

5.3.7 Preparation

Check that the internal wet area substrate and any channel drains are to the falls and levels as shown on the drawings, and that any floor waste and drain outlets are correctly installed.
Check that crack control and movement joints are incorporated to the locations as shown on the drawings, and are constructed as recommended by the manufacturer - do not bridge or cover them with the waterproofing.
Ensure the substrate is clean and free of oil, grease, and other contaminants, and is smooth with any defects filled to an even surface prior to installation.

Ensure the concrete substrate surface is U3 finished to NZS 3114 (by steel trowel) and to the manufacturer's recommendations, that it has cured for at least 28 days, that the relative humidity of the concrete is 75% or less, and that it is surface dry at the time of waterproofing.
Grind off any high spots on the concrete slab, FLC (proprietary levelling compound) repair flush with feathered edges any low spots or damaged areas then grind smooth. Lightly grind or shot blast any surface glazed to the extent that may compromise bonding.

Location:

Ensure the fibre cement compressed sheets are installed and fixed exactly to the sheet manufacturer's and waterproofing manufacturer's recommendations, and as shown on the drawings. Fibre cement must be fixed using a suitable glue adhesive and with countersunk head stainless steel screws at centres recommended by the sheet manufacturer.

Check that all fastenings are countersunk below the surface. All indentations flush filled with a manufacturer approved compound.

Check that the plasterboard has been installed in accordance with the manufacturer's recommendations.
Check that fixings do not protrude above the plasterboard surface, and that sheet joints have been correctly stopped.

5.3.8 Installation

Liquid Applied Waterproofing Membrane System. Install the undertile membrane waterproofing system, including surface priming, membrane application, jointing, flashing and sealing etc., and system-supplied accessories in strict accordance with the manufacturer's installation requirements and details, and as shown on the drawings. Application and workmanship shall be in accordance with AS/NZS 4858:2004 and AS 3740:2004.

Substrates shall be free of dust, grease, wax, oil, dirt, loose plaster, laitance, curing compounds, paint and other contaminants likely to prevent proper bonding, and shall be structurally sound, securely fastened and properly supported to eliminate any movement which may cause cracking. New concrete should be sufficiently aged for a minimum of 4 to 6 weeks. Allow proprietary floor levelling compounds and screeds to cure in accordance with the manufacturer's recommendations prior to application.

Seal substrate corner junctions and substrate joints and fixings and visible cracks, with a suitable sealant. Prepare all substrate floor/wall junctions and sheet joints with a system-approved pressure sensitive bond breaker tape. Prime all surfaces with the specified system primer.

Apply the specified liquid-applied membrane undiluted on to a dry and primed substrate uniformly by brush or roller in accordance with the manufacturer's instructions.
Finish the membrane at control joints, floor wastes and drain outlets to the manufacturer's requirements. Consult the manufacturer regarding any detail where a standard system detail does not exist.

Allow to membrane dry in accordance with the manufacturer's requirements. Where required; carry out a full flood test prior to tiling. Protect the installed membrane as required; avoid puncturing or damaging when exposed - repair as necessary

5.3.9 Completion

Check that the internal wet area waterproofing system has been installed correctly, and that any system accessories are correctly installed and finished. Check for damage, repair or replace as necessary.
Leave the completed waterproofing system leak free and watertight.
Leave the working area clean and tidy ready for tiling, remove rubbish from site.

Advise the Main Contractor to protect the completed works from damage until tiling is completed.

Issue to the Owner a copy of the product and installation warranty for the completed works.

6 CARPENTRY

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:

1170.2:2011(AS/NZS)	Structural design actions - Wind actions
1170.5:2004(NZS)	Structural design actions - Earthquake actions - New Zealand
1491:1996(AS/NZS)	Finger jointed structural timber
1859.1:2017(AS|NZS)	Reconstituted wood-based panels - Specifications - Part 1: Particleboard
1859.2:2017(AS|NZS)	Reconstituted wood-based panels - Specifications - Part 2: Dry process fibreboard
2270:2006(AS/NZS)	Plywood and blockboard for interior use
2271:2004(AS/NZS)	Plywood and blockboard for exterior use
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
3617:1979(NZS)	Specification for profiles of weatherboards, fascia boards, and flooring
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
4219:2009(NZS)	Seismic performance of engineering systems in buildings
4389:2015(AS/NZS)	Roof safety mesh
AS/NZS 1080.1:2012	Timber - Methods of test - Method 1: Moisture content

AS/NZS 2269.0:2012	Plywood - Structural - Part 0: Specifications
AWCI Code of Practice	For Design, Installation and Seismic Restraint of Suspended Ceilings
NASH Standard	Residential and Low-rise Steel Framing - Part 1: Design Criteria
NZBC C/AS2-AS6	Protection from Fire
NZBC G6	Airborne and Impact Sound
SNZ HB 3604:2011	Timber-framed buildings - Selected extracts from NZS 3604:2011

6.3 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.

6.4 Thermakraft Underlay, DPM, DPC & Tapes

6.4.1 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.

6.4.2 Requirements

6.4.2.1 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.

6.4.2.2 Warranty

Kingspan Thermakraft Product Warranty Statement:

- 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.

6.4.2.3 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.

6.4.3 Damp-Proof Membrane

Thermathene Black (250µm). A 250 micron thick (0.25mm), tear resistant, recycled polyethylene film sheet concrete underlay. Coloured black.

Installed over nominal 10mm (max. 25mm) thick compacted sand blinding layer, over a properly prepared base course, as a moisture vapour barrier under concrete slabs on-ground (prior to concreting), in accordance with the manufacturer's requirements and as shown on the drawings (Install Guide).

Thermathene Black must be laid in a continuous manner with all laps minimum 150mm, and penetrations to be taped with Thermakraft White General Purpose Tape. Tape-seal around penetrations. Inspect immediately before pouring concrete and repair any holes or other damage.

Installed Location:

6.4.4 Damp-Proof Course

Perimeter. 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 (Install Guide).

6.4.5 Vapour Barrier

6.4.5.1 Thermakraft Vapour Shield

Thermakraft Vapour Shield. Vapour Shield is a tear resistant polyethylene vapour barrier layer with one side that is white and one side that is black and can be laid either side up. Roll width 2130mm.

Thermakraft Vapour Shield is tear resistant, moisture proof and impervious to rot mildew and most chemicals, and can withstand climate extremes. Suitable as underlayment for roof construction where condensation and moisture control is required.

Thermakraft Vapour Shield is suitable for use in all NZS 3604 Wind Zones up to and including 'Extra High' when installed in strict accordance with the manufacturer's requirements and the NZMRM Code of Practice.

Thermakraft Vapour Shield must be installed with minimum 150mm side and end laps - lapped such that any moisture will be shed to the outside of the membrane. Seal all membrane laps and joints with Thermakraft White General Purpose Tape 60mm. Where battens are nailed through the membrane, cover pre-nail battens with sealastic at nail points. Any other projections and penetrations through the membrane and must be sealed. Ensure a minimum clearance of 200mm is maintained from the outer liner of chimney flue stacks (Install Guide).

Do not leave Thermakraft Vapor Shield exposed to atmospheric conditions and UV light for more than 7 days before covering.

Thermakraft Vapour Shield is not fire retardant.

6.4.6 Window Flashing Tape

6.4.6.1 Thermaflash High Adhesion Synthetic Window Flashing Tape

Thermaflash High Adhesion Synthetic Window Flashing Tape. Thermaflash Synthetic Window Flashing tape is part of the Thermakraft ONE WRAP System - a total building wrap solution. The advanced adhesive technology provides a high strength bond to most building surfaces and wall underlays. It is suitable for window and door installation as well as other wall penetrations. Thermaflash can be installed in a wide range of temperatures and can withstand UV exposure for up to 180 days.

Thermaflash 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.

Thermaflash Window Flashing Tape can be used as a flexible flashing system around window and door joinery openings on timber and steel framed buildings within the following scope:

- Installed into and around joinery openings over the wall underlay and exposed frame to cover both the face and edge of the opening as a secondary weather resistant barrier.
- To assist the overall weathertightness performance of window and door joinery installations.
- To be used in conjunction with air seals and joinery flashing systems. Installer must check for air seal product compatibility with Thermaflash.
- Situated in NZS3604 Wind Zones up to, and including, ‘Extra High’.
- Suitable for residential builds (E2/AS1 timber framed and E2/AS4 steel framed) and medium rise buildings (E2/VM2)

General
Physical Properties:
- Thickness: 400 µm.
- Installation temperature range: minimum -10°C.
- Maximum UV exposure: 180 days.
- Tape width: Available in 75x23mm, 150x23mm, and 200x23mm wide rolls.

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

Installed in accordance with the requirements of the Thermaflash Window Flashing Tape Installation Guide and BRANZ Appraisal No.1122 (2020), to the locations and details shown on the drawings.

Compatible with all Thermakraft building underlays. Unaffected by LOSP or other solvent based treated timber. However, LOSP or other solvent based treated timber must have sufficient time for the solvent chemical to flash off in well ventilated area. Recommended minimum 7 days.
Corner Moulds are optional however butterfly strips must be used in the absence of a corner mould (see installation guide).

Do not leave Thermaflash Window Flashing Tape exposed to weather and UV light for more than 180 days after installation.

Flashing Tape Size:
Installed Location:

6.4.7 Joining Tapes

6.4.7.1 Thermakraft Premium Joining Tapes

Thermakraft Premium Joining Tapes are high-end construction tapes to join James Hardie RAB sheets. They can also be used to join a wide range of flexible underlays and rigid sheathing products. The thick layer of acrylic adhesive, bonds to common construction substrates and supports a wide range of operating temperatures.

Thermakraft Premium Joining Tape is part of the RAB™ Board system by James Hardie™. It can be used to join the laps of wall and roof underlays, damp proof membranes, vapour control products such as foil underlays and rigid sheathing products (e.g., plywood rigid underlay, OSB board, fibre cement and insulation panels). Installer or designer must check the compatibility of Thermakraft Premium Joining Tape with the substrate manufacturer.

• With flexible underlays that meet the performance requirements outlined in standard NZS 2295.2006.
• Is suitable to use with air barrier underlays in unlined wall spaces.
• Is suitable to be used in conjunction with thermal breaks on steel framed buildings.
• Unaffected by LOSP or other solvent based treated timber. However, LOSP or other solvent based treated timber must have sufficient time for the solvent to flash off in a well-ventilated area. Recommended minimum 7 days.

General
Physical Properties:
- Thickness: 400 µm.
- Installation temperature range: minimum -10°C.
- Maximum UV exposure: 180 days.
- Tape width: Available in 75x23mm wide rolls.

Limitations :
- Thermakraft Premium Joining Tape is NOT a window flashing tape and must NOT be used as a window flashing tape.
- Must NOT be used in areas where the tape is permanently exposed to the weather or UV.

Installed in accordance with the requirements of the Thermakraft Premium Joining Tape Installation Guide, to the locations and details shown on the drawings.

6.4.8 Underlay Penetration Seals

6.4.8.1 OneSeal - Multi-fit pipe and cable penetration seals

Thermakraft OneSeal, multi-fit pipe and cable penetration seals. A range of pipe and service penetration seals consisting of soft, flexible EPDM membrane with a self-adhesive flange.

OneSeal multi-fit pipe and cable penetration seals are part of the Thermakraft ONE WRAP System - a total building wrap solution, and are a patented airtight solution for round or rectangular pipes, cables or conduits when passing through underlay barriers.

Pipe Seals
Four pre-notched rings for pipes sized from 15mm to 110mm diameter.

Cable Seals
1 x conduit – 55mm to 80mm diameter;
OR
2 x cables – 10mm to 22mm diameter; and
4 x cables – 7mm to 10mm diameter.
Installed in accordance with the manufacturer's requirements and BRANZ Appraisal No.942, 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, with flexible wall underlay used over a rigid wall underlay on buildings situated in NZS 3604 Wind Zones up to and including 'Extra High'.

6.4.9 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.

6.4.10 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.

6.4.11 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.

6.4.12 Preparation

6.4.12.1 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.

6.4.12.2 Roof Structure

Roof Structure - prior to roof underlay installation check all aspects of preparatory works, including but not limited to:
- Check that the supporting purlins or battens are set-out to the required set-out and spacings, are straight and true to line and plane, and are securely fixed.
- Check that all barge and fascia boards have been installed to the correct line and plane with all edge blocking complete and secure.
- Check that valley gutter and hidden gutter framing is to the required dimensions with solid backing supports securely fixed, true to line and plane.
- Check that internal gutter membrane linings are complete, and dressed back and adhered to a solid substrate along the roof edge as shown on the approved drawings.
- Check that all trimming for roof penetrations, all roof/wall junction blocking, and all necessary work by other trades is complete.
- Check that solid sarking required for fully-supported roofing is complete and securely fixed in accordance with the approved drawings.
- Check that any required anti-ponding boards for tiled roofs have been correctly installed to a minimum 5° (1:12) fall to the eaves gutter.

6.4.13 Installation - Wall Underlay

6.4.13.1 Thermaflash Window Flashing Tape

Thermaflash 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 Thermaflash 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 Thermaflash 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 Thermaflash Window Flashing Tape at 45° over the taped outside face of each corner.

Avoid joining Thermaflash 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 Thermaflash Window Flashing Tape exposed to weather and UV light for more than 180 days after installation - replace with new window flashing tape if 180 day's exposure is exceeded.

6.4.13.2 Thermakraft Premium Joining Tape

Thermakraft Premium Joining Tape, in accordance with the manufacturer's requirements, to the locations and details shown on the approved drawings.

Thermakraft Premium Joining Tape must be handled with care to prevent damage such as tearing, excessive puncture and roll deformation. The product must be stored under cover well away from direct moisture, rainfall contact and sunlight (UV). Care should be taken not stack other materials on top of the product

Apply the Thermakraft Premium Joining Tape just before the installation of the external cladding. This will reduce the chance of overexposing the tape to UV and strong wind undoing the tape as the underlay flexes heavily. Note, the maximum UV or weather exposure for Thermakraft Premium Joining Tape is 180 days.

Ensure the underlay has a minimum lap space of 150mm
Always ensure Thermakraft Premium Joining Tape is applied to surfaces that are clean and free of dust, contaminates, solvents, oil or waxes
Peel off the release liner from the Thermakraft Premium Joining Tape.
Firmly press Thermakraft Premium Joining Tape down and peel off more release liner from the tape as needed. Do not stretch or pull the tape at any point during the installation.
Lap join distance between Thermakraft Premium Joining Tape must be minimum 50mm.
For rigid sheathing or rigid underlay application, always check the compatibility of Thermakraft Premium Joining Tape with the substrate manufacturer before mass installation.
Note: Tape damages due to installation or site activities must be repaired by applying a second layer over the damaged area. Lap join distance is minimum 50mm.

Thermakraft Premium Joining Tape must be handled with care to prevent damage such as tearing, excessive puncture and roll deformation. The product must be stored under cover well away from

6.4.14 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.

6.5 Workmanship & Materials

6.5.1 Workmanship

6.5.1.1 Supervision

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. It is the main contractor's responsibility to ensure that the construction of all structural timber complies in all respects with the drawings and the specification.

All non-restricted building work shall be carried out by or under the direct supervision of competent tradespersons, suitably qualified for the work undertaken, and in accordance with the best and latest trade practice.

6.5.1.2 Timberwork

All timber shall be worked and cut to be true and square and free from wind and warp with all joints matching and mating to a proper contact fit over the full surface of the joint. All connections whether nailed screwed, glued, mortised or dovetailed shall be accurately made and properly executed to provide sound satisfactory connections for the class of work required.

Timber containing unacceptable defect or distortion shall not be cramped to provide mating at connections but shall be discarded and replaced by true defect-free timber before connections are made. Distribute any acceptable defects in timber so as not to impair the strength or the appearance of the finished work. Do not cut studs across the grain to straighten them.

The checking and cutting away of timbers shall be avoided where possible and shall be limited to such dimensions as will not prejudice the purpose for which the timber is used. Observe NZS 3604 restrictions on holing and checking of timber joists and beams. Concealed services pipes and wiring shall not project beyond the framing face and where possible shall be beyond the linings/claddings fixings reach.

Neatly punch exposed nailing to the diameter of the nail head below the surface. Completley remove bruises and tool marks, and replace all split timbers and hammer-marked finishing timbers.

Fit a 3-ply bituminous DPC or a single layer high impact polyethylene DPC at all timber to concrete junctions to provide complete separation. Ensure that the DPC material is compatible with the timber treatment.

Clean out framing voids before fixing sheathings or linings. Ensure framing voids are fully vermin proofed to the exterior. Build in as necessary all required flashings (supplied by others) to windows, doors, roof edges, etc.

6.5.1.3 Roof Underlay

Install heavyweight building paper or breathable/absorbent roof underlay behind roof cladding as detailed, with minimum 150mm side and end laps, lapped such that any water will be shed to the outside of the underlay, and sufficiently tensioned in a manner that prevents sagging or ponding.
R1 class roof underlays shall be fully supported on nylon straps or non-corrosive netting/mesh; R2 class self-supporting underlays shall be laid to maximum 1200mm span between adjacent supports.
Run roof underlay horizontally or vertically up the roof slope on roof pitches above 10° pitch, and horizontally on roof pitches 10° or less.
Fix roof underlay at maximum 300mm centres to purlins, with 6mm - 8mm stainless steel staples or 20mm large-head galvanised clouts or proprietary underlay fixings.
For tiled roofs, lay the roof underlay over the anti-ponding board and no-corrosive support netting/mesh, and fix at maximum 300mm centres to the rafters/trusses before the tile battens are installed.
Finish roof underlay along roof edges and junctions, valley gutters, and at the ridge as shown on the drawings. Carefully cut underlay at roof openings at 45º angle away from each corner and lap-tape closed to framed up-stands, ducts and other services penetrating the underlay in accordance with the underlay manufacturer's requirements and as detailed. Roof underlay must be separated from chimneys and flues in accordance with the requirements of the NZBC C1-C6 Acceptable Solutions.
Any damaged underlay shall be made good by lapping in a new section.
Do not leave roof underlays exposed before covering with the roof cladding for more than the manufacturer's recommended duration.

6.5.1.4 Window Installation

Prepare window and external door framing openings for joinery installation by neatly cutting the building wrap at 45º into corners, returning turning the wrap through the frame depth and fixing to the inside face.
Over-flash the underlay along the sill with a flexible flashing tape, installed full frame depth and length of the opening, returned minimum 100mm up the jambs, and with minimum 50mm return over the outside edge.
Over-flash the underlay at head/lintel corners with a flexible flashing tape, extending minimum 100mm each way from the corner, full frame depth, and with minimum 50mm return over the outside face.

Install external joinery frames with metal flashings as detailed and/or as required to completely weatherproof all frame-to-cladding junctions.
Unless shown otherwise, head flashings shall be carried minimum 75mm up behind claddings, extended at 15º out over the joinery head or facing board and returned down to cover the joinery or facing board minimum 10mm and finished with a 5mm, 45º 'kick out' drip-edge.
Neatly dress down the head flashings at the ends of the facings - for drained cavity construction, also form up-turned stop-ends in-line with the outside edge of cavity above.
Install metal (as specified) head flashings, fixed over the wall underlay, with the flashing upstand over-flashed minimum 50mm with a flexible flashing tape against the underlay, or with an additional piece

of underlay extended over and lapped behind the underlay above, behind the inter-storey flashing or sill flashing above, or to the underside of the eaves.
Unless shown otherwise, sill flashings, where required, shall have a minimum 5º slope, minimum 8mm rear upstand with sealed sloping stop-ends, and be carried down minimum 35mm over the lower cladding and finished with a 5mm, 45º 'kick out' drip-edge.

Take delivery of window and door joinery. Check substrates for correct profile and alignment and that the joinery is fabricated to the correct wall construction set-out and depth. Set shims or pack as necessary to install joinery exactly true and square. Use appropriate separators between aluminium and other materials, and fix securely with due regard for any anticipated movements and for linings, trim, etc.

Install neat sealant beads as detailed or required.

After joinery installation, install closed cell backing rods as required and expanding foam seal the gap between the opening substrate and joinery liners/reveals (all round, from the inside).

On completion ensure that all sashes and doors neatly fit the openings with regular tolerances to all edges, and that all moving components and hardware are correctly adjusted and operating smoothly, without binding, to the required functionality.

6.5.1.5 Joinery Installation

Take delivery of all scheduled joinery items (doors, cabinets, shelves, etc.) and install in the positions shown, accurately aligned, true to level, plumb and square, and securely fastened as noted and in accordance with best trade practice and with due regard for adjacent linings, finishes and trim, and anticipated movements.

Cabinets scribed and/or recessed packers scribed to adjacent surfaces as detailed or directed. Protect all installed Joinery from damage including surface marking and contamination, dirt and dust, and moisture until completion. Do not use Joinery items for working supports or platforms or for storage of materials or tools and equipments.

On completion ensure that joinery item doors and drawers all neatly fit the openings with regular tolerances to all edges, and that all moving components and hardware are correctly adjusted and operating to the required functionality.

6.5.2 Timber

6.5.2.1 Timber Materials

All timber shall be graded in accordance with NZS 3631 - Structural Grade MSG8 or better for all framing timber - (to meet the requirements of Table 2.3 of NZS 3603 for mechanically graded timber), and Dressing Grade for all finishing timber. Timber that is deemed below standard, in the opinion of the Architect/Designer, shall be removed from the site.

All non-durable timber, including components in manufactured items, 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.
Ensure that similar timbers with different treatment levels are carefully managed during construction to avoid accidental use of an H1 treated item where H3 hazard class treatment is required by the NZS 3602.
Do not use LOSP (light organic solvent-based preservative) treated timber that has not adequately 'flashed-off'.
Ensure that all cut or drilled surfaces of H4 and H5 hazard class treated timbers are flood coat re-treated, with the product recommended by the original treatment plant, before installation.

All timber shall be seasoned or kiln dried, to the stable moisture content, be straight and true and free from wind, warp and distortion, and in lengths suitable for the members required and the location in the finished construction. All framing timber shall have a moisture content between 12% and 18 % before being installed. If the use of inadequately seasoned timber results in damage or opening joints in the finished building the timber shall be replaced. Fixing of internal linings shall be delayed after closing in until the timber framing has dried back below 20% moisture content and to allow for the maximum settling of substrates.

All kiln dried, dressed and/or finishing timbers shall be stacked under cover on delivery to the site, and all timber shall be full to the nominal sizes shown or specified, subject only to normal cutting and dressing tolerances.
All finishing timber shall have machine marks, stains and roughness removed and shall be sanded smooth.

Ensure that enclosed surfaces and ends of paint-finished exterior finishing timbers are fully primed before fixing. If this trade (Carpentry) carries out the priming it shall be to the specification and standard required of the Painter.

Unless specified otherwise, exposed framing timbers shall be unfinished to the exterior, and be fine bandsawn milled, treated with a minimum of discolouration, handled carefully at all times to avoid surface damage, and delivered free of crayon or pencil or other markings. Hazard class treatment markings shall be on the ends, NOT on the faces.

6.5.2.2 Timber Species

Unless noted or specified on the drawings, in the list below, or elsewhere in this specification all timber used shall be Radiata pine.
Other timbers shall be as follows:

- Douglas Fir (*NZ Oregon, Psuedotsuga menziesii*)
- Jarrah Clears (*Eucalyptus marginata*)
- Kwila Clears (*Merbau*)
- Balau (*Shorea spp*)
- Kwila (*Merbau*)
- Cedar Clears (*Western Red Cedar, Thuja plicata*)
- Rimu - (*NZ Red Pine*)
- Vitex Clears - (*Vitex cofassus*)

- Eucalypt Saligna Clears - *(Sydney Blue Gum*)
- Tasmanian Oak - (*Eucalyptus delegatensis / obliqua / regnans*)

Note: the use of alternate grades and varieties to those specified is subject to approval in each instance.

6.5.2.3 Timber Cavity Battens

To wall areas as noted install H3.1 treated ex.50mm x 25mm timber battens to form a drained vertical cavity complying with E2/AS1 in all respects. Ensure that flexible wall underlay and flexible flashing tape are completely and correctly installed before fixing battens in place. Fix the battens with 60mm hot-dip galvanised flat head nails at maximum 400mm centres, ensuring that the batten set-out completely fulfils the cladding's fixing requirements. Install 1:12 sloping horizontal cavity spacers where required to suit claddings, keeping the ends 50mm clear of the vertical battens.

6.5.2.4 Other Materials

Materials shall be delivered to site with the packaging and labelling intact, shall be of the same type, finish or colour to maintain continuity, shall be stored, and conditioned if required, in accordance with manufacturer's recommendations, and shall be protected from damage, contamination, and moisture - as appropriate.
Handle all materials in accordance with best practice and the manufacturer's requirements, and in a manner that prevents damage or deterioration to the material. Do not use damaged or defective materials or products, or products that are beyond their designated shelf life.

6.5.3 Laminated Veneer Lumber

Laminated Veneer Lumber (LVL) shall comply with AS/NZS 4357.0. Each piece of structural LVL shall be branded at least once with the manufacturer's logo and a registered brand or marking that clearly identifies the structural properties that apply to the product and its limitations on end use; all in conjunction with associated published literature.

Structural properties identified in the associated published literature shall be:
- details of marking specific to the product
- veneer details
- physical properties including
  - modulus of elasticity
  - bending stress
  - tension stress parallel to grain
  - compression stress perpendicular to grain
  - compression stress parallel to grain
  - shear stress
- joint group
- density
- dimensional tolerances
- adhesives used
- limitations on end use

The storage and handling of LVL shall comply with Appendix A of AS/NZS 4357.0. In particular:
- LVL should be kept dry during storage and transit
- LVL should be stacked on bearers well clear of the ground and arranged so that their supporting surfaces are in the one plane
- Bearers should be spaced sufficiently close so that LVL spanning between them does not deflect excessively under its own weight.
- Bearers or spacers within a stack should be located near direct vertical alignment
- Care should be taken in lifting and handling LVL in order to avoid mechanical damage
- Wrapping should avoid and prevent entrapment of moisture
- LVL should not be used in high humidity conditions or exposed to the weather.

6.5.4 Proprietary Sheet Bracing Systems

Proprietary sheet bracing systems to walls, ceilings and sub-floor foundations shall be installed in strict accordance with the manufacturer's technical literature and design guides. No materials specified in the manufacturer's technical literature and design guide can be substituted without the written approval from the Architect/Designer.

6.5.5 Proprietary Roof Trusses

Roof trusses shall be of proprietary design, complying with the requirements of NZS 3603, NZS 3604, and AS/NZS 1170, and manufactured by suitably qualified fabricators.

Make allowance for all notching and holing to timber members to accommodate roof bracing etc., in the design of member sections of the roof trusses. Allow for all additional rafters, purlins, fixings and bracing necessary to complete the roof framing system with all accessories and incidental items necessary for proper installation even where not specifically shown on the drawings.
Proprietary roof trusses shall be designed to carry all imposed gravity and lateral loads. Refer to the approved design drawings for truss set-out and specified design loads. Roof trusses are assumed to be generally at 900mm centres spanning clear between walls or roof beams as shown on the drawings. The Main Contractor is responsible for the design of proprietary roof trusses, including their layout and interaction with and dependence on adjoining elements.

Provide all necessary design information and shop drawings for all proprietary roof trusses to be incorporated in the works for review prior to fabrication.
Provide Producer Statements from a Charted Professional Engineer covering the design and construction of the roof trusses. Provide all information required by the Territorial Authority for the purpose of obtaining a Building Consent.

6.5.6 Fixings

6.5.6.1 Nails

Comply with the requirements of NZS 3604 Section 2.4.4 and the Nailing Schedules of NZS 3604 as applicable. Unless noted or specified on the drawings or elsewhere in this specification, all nails fixing exterior timbers shall be Grade 304 or 316 stainless steel. Nails that will be covered with plaster or any similar material shall be hot-dipped galvanised, unless noted or specified otherwise.

Finishing brads to all finishing timbers shall be set out neatly and punched to the diameter of the nail below the surface. Bore slightly undersize holes for nailing that could cause splitting of the timber. Power-driven staples are completely unacceptable in finishing timbers.

6.5.6.2 Screws

Screw fastenings shall be of suitable gauge, head type, thread design, and length to provide secure fastening into the substrate material, and be suitable for the assembly/construction of the fixed item/element and the substrate material.
Unless noted or specified otherwise, screws exposed to the exterior shall be Grade 304/316 stainless steel or hot-dipped galvanised, and hot-dipped galvanised or similar corrosion resistant for damp situations.
Self-drilling screws shall be in accordance with AS 3566 for fastener type and corrosion resistance class.
Unless noted or specified otherwise, screws fixing hardware or similar shall be of the same material and finish as the hardware. Except where raised head screws are shown or specified, screws shall be countersunk flush or recessed where stopped/filled.

6.5.6.3 Bolts

Where bolts are used they shall be complete with nuts and washers unless specified otherwise. All bolts, nuts and washers shall at least meet the durability requirements of NZS 3604 Table 4.1. Where a higher durability material is specified on the drawings, the higher durability material shall be used. The diameter of a hole for a bolt shall not be less than the bolt diameter nor exceed it by 1.5mm.

For the following bolt diameters use washer sizes as below unless noted otherwise on the drawings:
- up to M8: 25x 25 x 1.5mm;
- up to M12: 50 x 50 x 3mm;
- up to M20: 65 x 65 x 5mm;
- up to M20: 75 x 75 x 6mm.

Round washers may be used proving they are of a thickness and area not less than those specified above.

Subfloor framing - unless noted otherwise on the drawings, cast-in holding down bolts for subfloor framing fixed to concrete foundation walls shall be M12 Grade 304 stainless steel, embedded minimum 150mm into concrete, to the spacings required by NZS 3604, and located centrally on the timber.
Bottom plates - unless noted otherwise on the drawings, cast-in holding down bolts for bottom plates fixed to a concrete slab shall be M12 galvanised, embedded minimum 120mm into concrete, to the spacings required by NZS 3604, and located centrally on the timber.
Framing - timber/timber and timber/steel - Unless noted otherwise on the drawings, M16, hexagonal head mild steel and with 50 x 50 x 3mm washers.
Timber/concrete (dry situations) - Unless noted otherwise on the drawings, Ramset Trubolts, T12140 at maximum 900mm centres - for damp or exterior situations use stainless steel Trubolts.
Bolts shall be tightened until the washer just indents the timber surface. Exposed bolts shall be re-tightened just prior to Practical Completion to remove any slack consequent on timber shrinkage.
Allow to countersink bolt heads and nuts as necessary to clear linings.

6.5.6.4 Framing Hardware

Proprietary timber framing hardware and fixings, including multigrips, joist shoes, Z nails, gang nails and similar hardware, may be used where specifically approved, or where required on the drawings or by NZS 3604 schedules, in accordance with the manufacturer's requirements.
Proprietary timber framing structural brackets and ties, including post and bearer brackets, beam supports, angle brackets, tie cleats and similar hardware, shall be as noted on the drawings and installed in accordance with the manufacturer's requirements.
Refer to Metalwork or Structural Steel section of this specification for specific design engineered fabricated steel components that connect structural timber framing.

6.5.6.5 Adhesives

Aliphatic PVA for dry timber applications - all other adhesives for timber jointing are subject to specific approval or as specified. Check surfaces are in appropriate condition to receive adhesive, and that adhesives are used strictly in accordance with the manufacturer's instructions. Clamp adhesive-jointed timber connections and check alignment of members before the adhesive has set.

6.5.7 Flashings

Flashing materials shall be in accordance with the requirements of NZBC E2/AS1 Sections 2.2 Materials, 4.0 Flashings, Table C.1.1.1B: Compatibility of materials in contact , and Table C.1.1.1C: Compatibility of materials subject to run-off, and as noted on the drawings.
All flashings around windows, doors and other openings and apertures, at internal and external corners, inter-storey junctions, soffit junctions, and at junctions with other building elements and cladding systems, etc., shall all be carefully constructed, fixed and finished to the details shown on the drawings.

6.5.8 Sealants

6.5.8.1 Sealants

For critical joints such as primary water/weatherproofing seals, precast panels primary seals, structural floor slab control joints, structural glazing, immersion or hydrostatic pressure seals, etc., either use the sealant noted on the drawings or obtain a reputable sealant manufacturer's recommendation for the precise situation, and submit the manufacturer's specifications covering all relevant criteria and characteristics of the proposed sealant, primers, joint surfaces preparation, etc. to the Architect/Designer for review and confirmation to proceed.
If so requested, additionally submit a sample of the proposed sealant made up into a demonstration joint, incorporating the same materials, preparation, finish tooling, etc. After confirmation to proceed with the proposed sealant install a sample joint to approval, length approximately 2% of the overall length of the joints required, with a minimum length of two metres; when accepted this joint becomes the quality control sample for all subsequent similar joints.

For less critical joints such as those in covered or protected situations, and bathroom and kitchen ceramics and sanitaryware etc., either use the sealant noted on the drawings or select the sealant from a reputable manufacturer's range for the substrate materials involved, with due regard for the flexibility required, acid or neutral curing, mould resistance, paintability or clear or standard colours, slumping characteristics, temperature range expected, etc. - silicone, polymer or polyurethane sealants are anticipated.

For all simple gap-filling and draught sealing situations, either use the sealant noted on the drawings or select from a reputable manufacturer's range for a paintable acrylic sealant with good adhesion characteristics for the substrates involved - pay particularly care in the sealant selection where bare metal, polycarbonate, polystyrene or similar substrates or where bituminous-based membranes are adjacent or where exposure to solvents is possible.

All joint surfaces preparation and priming and all sealant application work shall be exactly in accordance with the sealant manufacturer's recommendations, and carried out by competent and experienced applicators familiar with the materials and techniques required.
Ensure that the sealant is being used within the manufacturer's stated design parameters, particularly with regard joint design and anticipated cyclic movement.
Check that the joint faces are sound, completely dry, and frost free, clean and free of dirt, rust, oil, grease, laitance, etc., and they are primed to suit the surface porosity - particularly for critical locations.
Insert a polyethylene tape slip layer at the back of the joint or a closed cell polyethylene PEF backer rod where required and to the sealant manufacturer's recommendations. Mask off joint edges where a clean straight finish line is required.
Check the toxicity of the selected sealant and handle it appropriately. Check that the temperature during sealant installation is within the manufacturer's guidelines.
Apply the sealant and tool the filled joint's surface smooth and even, utilising a lubricant as necessary and strictly within the manufacturer's guidelines.
Remove any masking tape immediately after tooling, clean up all adjacent surfaces using the recommended cleaning agents as required, and protect the finished joint until the sealant has properly cured.

6.5.9 Interior Finishing Trim

All interior finishing trim shall be cut to the exact dimensions and fine sanded smooth, and with lightly sanded arrisses, and all fixed with plated finishing pins. Machine staple fixing is NOT acceptable.
Note that even traces of planer marks are unacceptable on architraves. Margins between interior trim and other elements shall be exactly even, and all mitres shall be exact and tight.

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Architraves 60mm x 18mm, finger jointed finishing Radiata, square profile, sand arrissed to wet areas, 65mm x 18mm square profile MDF elsewhere.

Skirtings 135mm x 18mm, square dressed, high moisture resistance MDF.

6.5.10 Garage Door

Garage door(s) as shown and noted on the drawings, installed complete.

6.5.11 Sundry Items

Supply and install, complete with all normal incidentals, and in total compliance with the item manufacturer's recommendations and instructions and with all of the appropriate preceding clauses:

Carry out all trimming out, etc. required for installation of wet areas exhaust fans.

Supply and install the proprietary ceiling access hatch, as specified or scheduled, to the location and details shown on the drawings in accordance with the manufacturer's requirements.

6.6 Timber Framing

6.6.1 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.

6.6.2 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.

6.6.3 Timber Framing

6.6.3.1 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.

6.6.3.2 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.

6.6.3.3 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.

6.6.3.4 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.

6.6.3.5 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.

6.6.3.6 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.

6.6.3.7 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.

6.6.3.8 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.

6.6.4 Steel Fixings

6.6.4.1 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.

6.6.4.2 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.

6.6.4.3 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.

6.6.5 Floor Framing

Unless specified or shown otherwise, timber floor joists shall be to the dimensions and spacings given in NZS 3604 Table 7.1.
Floor joists shall be laid on edge true to line and level, have a minimum support bearing of 32mm (except when cantilevered), and so that any crook will straighten under load.
Floor joists shall be jointed over supports (except when cantilevered beyond the support) in accordance with NZS 3604 7.1.1.7.

Unless specified or shown otherwise, boundary joists shall be continuous 25mm thick x joist depth as lateral support, and fixed to each end of the floor joists in accordance with NZS 3604 Table 7.5.

Loadbearing walls run parallel to the line of joists shall be supported directly over double joists located at no more than 200mm centre-to-centre from a pile row.

Loadbearing walls run at right angles to the line of joists shall be located at no more than 200mm centre-to-centre from a bearer or subfloor loadbearing wall (running parallel to the loadbearing wall).

Non-loadbearing walls, without a bracing element, within 150mm and parallel to a floor joist, shall be supported by minimum 90mm x 45mm solid blocking on-edge at maximum 1.2m centres and at each side of door openings.

Non-loadbearing walls, with a bracing element, parallel to floor joists and not supported by a floor joist, shall be supported by minimum 90mm x 45mm solid blocking on-edge at maximum 1.2m centres and at each side of door openings.

Unless specified or shown otherwise cantilevered floor joists for 1.5 kPa floors shall to the dimensions and spacings given in NZS 3604 Table 7.2, and shall be continuous over the outermost support as required by NZS 3604 7.1.5.3(a).

Unless specified or shown otherwise trimmers shall be fixed to trimming joists by proprietary joist hangers in accordance with NZS 3604 7.1.6.5(b).

6.6.6 Wall Framing

6.6.6.1 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.

6.6.6.2 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.

6.6.6.3 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.

6.6.6.4 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.

6.6.6.5 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.

6.6.6.6 Ribbon Boards

Ribbon boards shall be as dimensioned and located on the drawings, and installed on edge and checked 25mm into studs at the required height, true to line and level, and fixed in place in accordance with NZS 3604 Table 8.19.

6.6.7 Roof Framing

6.6.7.1 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.

6.6.7.2 Roof Trusses

Roof trusses shall be Specific Engineering Design (SED) in accordance with NZBC B1/VM1 and manufactured by an accredited fabricator, and shall comply with all aspects of NZS 3604 10.2.2. Roof trusses shall be fabricated to meet the specific design requirements of the roof including, but not limited to; roof layout, pitch, and details, in accordance with the drawings and specification.
Roof trusses shall be supported and fixed to the truss fabricator's specifications but shall be no less than that required by NZS 3604 Tables 10.14 and 10.15. Roof trusses shall be braced as shown on the drawings and in accordance with NZS 3604 10.3.

6.7 James Hardie Pre-Cladding

6.7.1 Scope

Supply and install HomeRAB Pre-Cladding fibre-cement sheet as a rigid air barrier to the walls identified on the drawings, complete with all accessories. All aspects of this work shall be in complete accordance with the James Hardie Rigid Air Barriers Installation Manual
(check www.jameshardie.co.nz, or call 0800 808 868 for the latest edition), BRANZ Appraisal No.611, and other relevant product manufacturers' recommendations.

6.7.2 Co-operation

Co-ordinate with other trades to ensure that appropriate clearances are allowed from roofing products and associated flashings etc, that the panels correctly allow for door and window installation, and that services penetrations are correctly handled to maintain full weathertightness and panel integrity.

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

6.7.3 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. Framing shall be plumb and in true alignment, complete and suitable for the panels, 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 the bottom plate hold-downs are correctly installed.

Check that the ground levels are sloping away from the building in accordance with E1/AS1, with no ponding water against the building, and that the ground will remain clear of the sheet by at least 100mm at all times.

6.7.4 Workmanship

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

6.7.5 Delivery & Handling

Carry all sheets on edge. Stack sheets flat on a level platform off the ground eg., use the supplied delivery pallet on level ground, or minimum 4 evenly spaced bearers on level ground. Keep sheets and accessories dry at all times. Avoid damage to sheet edges, ends, and surfaces. Keep uPVC flashings and jointers out of direct sunlight, and store all accessories on flat and avoid damage to any. 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.

6.7.6 Installation

Fix sheets vertically directly to framing in accordance with the Installation Manual.

Vertical joints on framing to be sealed with a joint sealing tape, for both non-bracing and bracing applications.

Vertical joints off framing formed with a uPVC jointer, for non-bracing applications only. Jointer to be in a single piece extending from bottom of board to top of board with no joins.

Ensure that all cut edges of sheets where exposed are primed prior to installation with Dulux 1 Step Prep, Resene Quick Dry, or similar. Ensure that the bottom edge of the sheet overhangs below the bottom plate by 15mm, and is clear of the ground surface by at least 100mm; the finished ground

clearance shall be in accordance with E2/AS1. Install flexible flashing tape to all junctions and penetrations (including cables etc), with the addition of a pipe bandage for pipes to maintain weathertightness and air pressure resistance. Do not use sealant.

6.7.7 Horizontal Joints

Horizontal joints to be formed at floor joist level with a uPVC flashing. Ensure that the sheets are not fixed to the floor joists.

6.7.8 Fixings

Fix sheets with galvanised nails in accordance with James Hardie requirements.

6.7.9 Completion

Ensure that the sheets have been fixed correctly, that all vertical joints and horizontal joints 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. Check that no dirt has been mounded up within 100mm of the sheet, and maintain the clearance. Ensure that the cladding is installed within 90 days of the sheet installation. Hand over a copy of the latest edition of the James Hardie Rigid Air Barriers Product Warranty to the client.

6.8 ABODO Vulcan Cladding - Vertical Grain - Series

6.8.1 Scope

Supply and install ABODO Vulcan Cladding - Vertical Grain, as specified herein, to the locations identified on the drawings, complete with all system components and accessories required for proper installation and performance. All aspects of this work shall be in complete accordance with ABODO product literature (check abodo.co.nz, or email info@abodo.co.nz, or call 09 249 0100 for the latest editions), and other relevant product manufacturers' recommendations. For the purpose of this specification, the Abodo CodeMark Weatherboard Cladding System Manual (2020) publication is referred to as the 'ABODO Cladding Manual'.

ABODO Vulcan Cladding is CodeMark assured to comply with the New Zealand Building Code:CodeMark Certificate of Conformity No.CM70046 Rev1, issued by Bureau Veritas New Zealand. ABODO Vulcan Cladding must be applied within the conditions and limitations of the Abodo Weatherboard Cladding CodeMark Certificate of Conformity

No substitutions are permitted for ABODO Weatherboard Cladding.

The following is a list and a general description of the extent of the ABODO Vulcan Cladding - Vertical Grain (which include the specified Architectural, Standard and Nexus series profiles), which are more specifically defined in the contract documents, required for the completion of the contract works:

6.8.2 Requirements

6.8.2.1 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.

6.8.2.2 Warranty:

ABODO Wood Ltd 'Built-to-Last Warranty':

- 25 Year Warranty (pro rata) - for all ABODO Vulcan Cladding materials installed, according to the warranty conditions:

http://www.abodo.co.nz/uploads/resource/Vulcan-25-Year-Warranty.pdf

- Provide the ABODO Wood Ltd 'Built-to-Last Warranty' on the manufacturer's standard warranty form.
- Commence the warranty from the date of permanent installation.

6.8.2.3 Substitutions:

ABODO Vulcan Cladding - Vertical Grain shall be as specified herein and as indicated on the approved drawings. The substitution of ABODO Vulcan Cladding - Vertical Grain for alternative brands is not permitted under any circumstances.

The substitution of a specified ABODO wood product for an alternative ABODO wood branded product by the Contractor 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 ABODO wood branded products to satisfy design, performance and compliance requirements, then the cost of these shall be borne by the Contractor.

6.8.2.4 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 ABODO Vulcan Cladding - Vertical Grain - Series 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.

Should a problem be encountered with any ABODO Vulcan Cladding - Vertical Grain - Series during use or delivery, immediately contact ABODO Wood on 09 2490 100. Do not continue to use the product that is not performing to specification or expectation. Keep the product in question, the order number and where possible packet numbers of the timber.

The quality of the ABODO Vulcan Cladding - Vertical Grain - Series timber needs to be assesed against the Abodo timber grading rules:

Architectural Series / C1 grade

https://www.abodo.co.nz/uploads/resource/Appearance-Grades-Timber-Grading-Rules-Abodo-Wood.pdf

Standard Series / C2 grade

https://www.abodo.co.nz/uploads/resource/Abodo-Guidelines-for-Vulcan-Cladding-Standard-Series-Clear-2-Laminated-Grade.pdf

6.8.3 ABODO Vulcan Cladding - Vertical Grain

6.8.3.1 Vulcan Cladding - Vertical Grain - Architectural Series

ABODO Weatherboard Cladding, including weatherboards and timber mouldings, shall be manufactured from Vulcan Cladding - Vertical Grain -Architectural Series thermally modified Radiata pine (*Pinus radiata*), engineered with a vertical grain orientation.

Quality:

- Select Grade: C1LAMVG Grade- Front face and edges have a good appearance which is virtually free of defects but with one edge knot and one small face defect allowed per piece in 20% of boards only. Reverse side with some defects allowed according to standard Grade. The reverse face may also skip dress present and one under thickness lamina up to 4mm depth, provided the function of the product is not compromised.

Substrate Colour:

- Chocolate brown (timber will weather to grey unless pigmented coating is applied and maintained).

Face Finish:

- Fine bandsawn face or brushed face.

Durability:

- Tested and approved for uses described in NZS 3602:2003 Table 2A 'Requirements for wood -based building to achieve a 15-year durability performance. Members exposed to exterior weather conditions and dampness'. Class 2 above ground (AS5604). Durability Class 1 (EN 350-1).

Moisture Content:

- Approximately 7% MC (+/-2%) at time of despatch.

Construction:

- Laminated wood with vertical grain orientation.
- New generation polyurethane adhesive - VOC, solvent and formaldehyde free. Exterior Type 1 - AS/NZS 4364. Approved for Service Class 3 (exposed exterior applications).

Coatings:
- Vulcan Cladding will take most stains, penetrating oils and paints well, though uptake of coating is generally higher than normal.
- At least one coat must be applied all sides, including back face and ends, and at least two coats to the front face and edges with Abodo Protector Water Borne or other approved proprietary wood stain.
- Vulcan Cladding is available factory pre-coated with 1 or 2 coats.
- Refer to Coating clause.

Vulcan Weatherboard Profile: Refer to specific Weatherboard Profile clause

For optimal coating performance on bandsawn finish apply a further coat of oil after 12 months of weathering.

For brushed finish a third coat is required between 1-12 months after installation.

Available coatings:

Abodo Protector pigmented stain

Sioo: x coating

Iron Vitirol coating

6.8.4 Architectural Series - Weatherboard Profile & Orientation

6.8.4.1 Vertical - WB18 135x18 (115mm cover) - Vulcan Cladding:

Vulcan Cladding Profile - WB18 135x18 (115mm cover). A 135mm wide x 18mm thick, secret-fixed, interlocking weatherboard, band sawn face or optionally with brushed face. Installed vertically to the locations and details shown on the approved drawings in accordance with the Abodo Cladding Manual.

6.8.5 Timber Mouldings

6.8.5.1 AW41 - Internal Corner Mould:

ABODO Wood Internal Corner Mould - AW41: 20 x 20mm and/or 40 x 40mm D4S (as detailed on the approved drawings). Supplied by ABODO, and selected to match the specified cladding material. Installed to the locations and details shown on the approved drawings in accordance with the ABODO Cladding Manual.

6.8.5.2 AW43 40mm external corner mould for WB18 profiles:

see TDS https://www.abodo.co.nz/uploads/resource/TDS/Technical-Data-Sheet-Vulcan-Cladding-Abodo-Wood-New-Zealand.pdf

6.8.6 Coating

6.8.6.1 Sioo:x

Sioo:x Wood Protection System available for Vulcan Architectural Series only.

ABODO Vulcan Cladding weatherboards and timber mouldings shall be supplied factory-coated with 3 coats of Sioo:x Wood Protector, applied to all faces and edges. Care must be taken on site to ensure the coating is not damaged.

All site-cut ends, notches and holes in ABODO Vulcan Cladding weatherboards and timber mouldings must be sealed with Sioo:x End Seal step 1 and step 2.

Refer to Sioo:x Wood Protection Manual for requirements.

6.8.7 Accessories

6.8.7.1 Joint Flashing Tape:

Weatherboard Joint Flashing Tape. 50mm wide self adhesive polythene tape. Applied to the back face of scarfed weatherboard joints, prior to fixing, in accordance with the ABODO Cladding Manual.

6.8.7.2 Adhesive Sealant:

Adhesive sealant shall be SIKA Sikaflex® 11FC or equivalent polyurethane-based joint sealant and adhesive. Use to seal and adhere ABODO weatherboards and accessories in accordance with the sealant manufacturer's recommendations and the ABODO Cladding Manual.

6.8.8 Flashings

6.8.8.1 Flashings - Aluminium:

Flashings used in conjunction with the ABODO weatherboard cladding system shall be manufactured from Grade 5005 H32 aluminium coil, 0.70mm thick, and formed to suit the details indicated on the approved drawings in accordance the ABODO Weatherboard Cladding Manual. Flashing materials shall comply with the requirements of NZBC E2/AS1 Tables 20, 21 and 22.

Standard concealed metal corner (internal/external) back flashings for ABODO weatherboard cladding systems include:

- Hemmed Internal 90° Corner Flashing: 50mm, 70mm, 90mm.
- Hemmed External 90° Corner Flashing: 50mm, 90mm.
- Hemmed W Internal 90° Corner Flashing: 70mm.
- Hemmed Internal 135° Corner Flashing: 50mm.
- Hemmed External 135° Corner Flashing: 50mm.
- Unhemmed 90° Corner Flashings: 100mm, 120mm.
- Unhemmed W Internal 90° Corner Flashing: 100mm.

Unhemmed metal corner back flashings may be used with flat profile weatherboards (Hector, Rusticated) provided minimum 75mm cover is obtained the behind weatherboards.

For Extra High Wind Zones and higher, corner back-flashings require minimum 75mm cover and folded hems.

6.8.9 Cavity Battens

6.8.9.1 Timber Cavity Battens, 20mm Cavity - Vertical Weatherboards:

Timber Cavity Battens (non-structural) - to form a nominal 20mm deep drained cavity for vertical weatherboards - ABODO CB-H-20x45 Castellated Cavity Battens. 45 wide x 20mm thick, H3.1 treated Radiata pine, bevelled and castellated cavity battens, incorporating 25mm wide x 6mm deep rebates alternating at 100mm centres either side of the batten.

Proprietary cavity battens complying with NZBC C/AS1, such as Cavibat or DriSpace, can be used.

Fixing to Timber Framing:
- Fix castellated cavity battens to timber framing using 40 x 2.5mm hot-dip galvanised flat head nails.

Fixing to Lightweight Steel Framing (painted weatherboards only):
- Fix castellated cavity battens to lightweight steel framing Refer to NASH Building Envelope Solutions document for further information on fixings and material compatibility with steel framing http://nashnz.org.nz/knowledge_hub/nash-building-envelope-solutions-2019

Installed horizontally, with batten edges sloping down and away from the framing, at maximum 480mm vertical centres, to the layout and details shown on the drawings and in accordance with the ABODO Cladding Manual.

6.8.10 Cavity Base Closer

6.8.10.1 Aluminium:

Aluminium Cavity Base Closer. Punched with 3-5mm holes or slots complying with NZBC E2/AS1 Paragraph 9.1.8.3. Fitted to the base of the drained cavity, above window and door heads, and at inter-storey junctions. Installed in accordance with the ABODO Weatherboard Cladding Manual to the locations and details shown on the drawings.

6.8.11 Co-operation

Co-operate with other trades to ensure that all preliminary and preparatory works, including membranes, flexible underlays, rigid air barriers, and trims and any other related works are completed in accordance with the ABODO Vulcan Cladding Manual.

Coordinate with trades the locations of pipes, outlets, cables, meter boards and other fittings installed by others, and to install ABODO Weatherboard Cladding as required.

6.8.12 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 (LBP). On completion of the installation, the installing LBP shall complete and sign a Restricted Building Work (RBW) memorandum, and shall issue a copy to the Building Consent Authority and to the Main Contractor (as applicable).

Installation work shall be carried out by suitably qualified and experienced tradespersons, familiar with the specified products and the required construction and installation techniques, in accordance with ABODO Vulcan Cladding Manual and to fully comply with all warranty requirements.

All work shall be such as to leave a neat, efficient, robust and weathertight installation, to the required standard, free from damage and defects, including surface marking.

Make all necessary provisions to protect adjacent finished work and surfaces from damage during installation.

6.8.13 Delivery & Handling

Take delivery of materials undamaged. Reject any item found to be defective or damaged and contact the supplier for replacement.

Store ABODO Vulcan Cladding and accessories undercover, flat and true, clear of the ground by at least 100mm and supported on dry and clean timber bearers spaced at maximum 900mm centres in accordance with Abodo recommendations. Keep stored ABODO Cladding and accessories dry and protected from damage and contamination.

Do not use damaged or defective cladding or accessories. Should a problem be encountered with any ABODO cladding product, immediately contact ABODO on 09 249 0100 with affected timber packet number and order number. Do not continue to use the product that is not performing to specification or expectation. Keep samples and take photos of the product in question.

Handle weatherboards in accordance with the manufacturer's recommendations and in a manner that prevents damage and surface marking. Abodo requires the use of gloves when handling raw timber or factory finish timber to prevent the transfer of dirt/oil.

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 Best practice guidelines for working at height in NZ, and the OSH Guidelines For the Provision of Facilities and General Safety in the Construction Industry.

6.8.14 Preparation

6.8.14.1 Vertical Cladding - Timber Frame, Rigid Wall Underlay

Vertical Vulcan Cladding - installed over a drained cavity, on timber framed walls with a rigid wall underlay; check all aspects of preparatory works, including but not limited to:
- Check that the timber wall framing complies with NZS 3604, or is in accordance with NZS 3603 and AS/NZS 1170 for specific design, and in accordance with the requirements of the ABODO Cladding Manual.
- Check that the framing has studs at maximum 600mm centres, nogs/dwangs at maximum 480mm centres, is plumb and in true alignment, includes all blocking required for cavity battens and fixing at openings, joints, corners and soffits etc., and has a maximum moisture content of 20% at the time of cladding installation.
- Check that the rigid wall underlay has been installed in accordance with the manufacturer's requirements, and is over-fixed with a flexible wall underlay.
- Check that flexible wall underlay (if required by RAB manufacturer) has been installed over the rigid wall underlay in accordance with NZBC requirements and the manufacturer’s recommendations, and with all finishing tapes, flashings, etc., at windows, doors, corners and penetrations all correctly incorporated to provide a continuous seal.
- Check that all preparatory materials are lapped such that any water will run down to the exterior.
- Check that any rigid air barrier to unlined gables and external garage walls is overlaid with an absorbent flexible wall underlay in accordance with E2/AS1 Table 23, and the manufacturer's recommendations.
- Check that the ground levels are sloping away from the building so that there will be no ponding water against the building, and that the ground will be remain clear of the cladding by at least 100mm at all times in accordance with E2/AS1.

6.8.15 Installation

6.8.15.1 Cladding General:

Install ABODO Vulcan Cladding, complete with all system components and accessories required for proper installation and performance, in accordance with the ABODO Cladding Manual and as shown on the approved construction drawings.

Confirm the layout and location of movement control joints, the layout of cavity battens, and any specific cladding detailing requirements prior to installation.

Ensure that all associated preliminary and preparatory works are completed to the required standard and specification, and as shown on the drawings.

Ensure that the current, up-to-date ABODO technical literature is readily available on site for reference during installation. Where there is any doubt, contact Abodo Wood on 09 249 0100 or email info@abodo.co.nz.

ABODO Vulcan cladding and timber mouldings must be sealed with at least one coat all four sides prior to fixing. Ensure that all site-cuts to weatherboards and timber mouldings are properly sealed with an approved coating in accordance with ABODO requirements.

Refer to Fixing clause for fixing type and placement etc.

All internal and external cladding corner junctions, inter-storey junctions, and weatherboard trim and accessories, shall be constructed and installed to the details shown on the drawings.

Always keep Vulcan cladding lines consistent and true along walls and around corners.

All flashings around windows, doors and other openings, at corner junctions, inter-storey junctions, soffit junctions, and pipe penetrations, shall be carefully constructed, fixed and finished to the details shown on the drawings.

6.8.15.2 Vulcan WB12/WB18 - Vertical Cladding:

General installation of vertical ABODO Vulcan WB12/WB18 Cladding:

Over the flexible wall underlay, install and fix the specified cavity battens and cavity closure to wall framing according to the layout and details shown on the drawings.

Back-flash all internal and external corners with corner flashings as detailed on the drawings and in accordance with the ABODO Cladding Manual.

Carefully set-out and secret-fix Vulcan WB12 Cladding to the wall framing through the cavity battens, vertically to straight plumb lines, with side-laps directed away from prevailing weather, and with ends level along the baseline, minimum 50mm, or as detailed, below the bottom plate or floor structure.

From each leading corner, interlock and fix vertical Vulcan WB12 Cladding in accordance with the ABODO Cladding Manual and as detailed on the drawings, keeping cladding lines plumb, straight and true.

Always use full length weatherboards where possible. Where joints are unavoidable, joints shall be formed over a nog/dwang line and cavity batten, and with 50mm wide PVC flashing tape applied to the back face of the boards along the joint. Weatherboard joints shall be scarfed at 35º, centred over the double dwangs/nogs, and fixed with a single fixing located minimum 12mm from the end (front edge) of each board. The scarf joint shall have adhesive sealant applied before fixing. Only if specified and shown on the drawings, the joint shall be covered with a flat soaker - as specified. Joints shall be located so as to avoid clustering, and shall be offset by at least 480mm from joints in boards either side of the joint. The use of end-matched joints made off nog/dwang fixing lines is subject to the Architect's/Designer's express approval only.

Internal and external corners, eaves junctions, windows, doors and other openings in the weatherboard cladding shall be constructed and made weathertight as detailed on the drawings in accordance with the ABODO Cladding Manual.

6.8.16 Fixing

6.8.16.1 Screw Fixing into Steel - Secret Fix Cladding WB12, WB18

Fix ABODO Secret Fix Cladding (WB12, WB18) to lightweight steel framing in accordance with ABODO fixing requirements and as shown on the drawings.

Fixing to Steel Framing over 20mm Cavity Battens (non-structural):

- Refer to NASH Building Envelope Solutions document for further information on fixings and material compatibility with steel framing http://nashnz.org.nz/knowledge_hub/nash-building-envelope-solutions-2019

Single fix cladding at every fixing point, with screws located along the positioning groove 12mm from the edge of the tongue, and no closer than 12mm from the end of the board.

Do not allow cladding fixings to penetrate through flashings under any circumstances.

Set countersunk screws heads flush with the timber surface.

Fixing Timber Mouldings:

- To Timber: Fix ABODO Timber Mouldings to timber using 40-50mm x 2.8mm Hot-Dip Galvanised Steel Jolt Head Nails. Punch jolt head nails 2mm below the surface. Ensure all jolt head nail holes are primed and flush-filled before painting.
- To Steel: Fix ABODO Timber Mouldings to steel using 10g x 40mm Hot-Dip Galvanised Steel, CSK Rib Head, Self-Drilling Wing Tek Screws. Set countersunk screws heads 2mm below the board surface. Ensure all screw holes are primed and flush-filled before painting.

6.8.17 Completion

Check that the ABODO Vulcan Cladding - Vertical Grain - System has been correctly installed and fixed to the layout and details shown on the drawings and in accordance with the requirements of the ABODO Cladding Manual.

Check that all joints, associated trim and accessories are correct, that junctions with other materials and elements are sealed, and the cladding system is weathertight.

Check for damage and defects - replace or repair as necessary to the required standard.

Ensure that the work of other trades does not negatively impact on or reduce the minimum clearances required by the NZ Building Code, between the cladding and ground, roof and/or deck junctures.

Leave all of this work complete and weathertight and to the required standard in accordance with the ABODO Wood Ltd 'Built-to-Last Warranty'.

Leave all of this work complete and weathertight and to the required standard in accordance with the ABODO Vulcan standard warranty conditions.

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

Complete and sign the Restricted Building Work (RBW) memorandum, and the ABODO Wood Weatherboard Cladding System Quality Assurance Checklist. Issue a copy of the RBW document to the Building Consent Authority and to the Main Contractor (as applicable).

Issue to the Owner a copy of the ABODO Vulcan Cladding maintenance requirements, and a copy of ABODO Wood Ltd 'Built-to-Last Warranty'.

6.9 GIB® Rondo® Metal Batten Systems

6.9.1 Scope

Supply and install the specified GIB® Rondo® Metal Batten Systems to the locations identified on the drawings, incorporating all system components and accessories required for proper installation and performance. All aspects of this work shall be in complete accordance with the GIB® Rondo® Metal Batten Systems - System and Installation Manual publication and the current GIB® Site Guide (check www.gib.co.nz, or call 0800 100 442 for the latest editions), other relevant product manufacturers' recommendations, and as shown on the drawings.

No substitutions are permitted for GIB® Rondo® Metal Batten Systems.

This specification section should be read in conjunction with the GIB® Plasterboard Linings specification and relevant GIB® Systems specifications, and other specification sections, as they are interrelated.

For the purpose of this specification, the GIB® Rondo® Metal Batten Systems - System and Installation Manual publication is referred to as the 'GIB® Rondo® Metal Batten Systems Manual'..

6.9.2 Requirements

6.9.2.1 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.

6.9.2.2 Warranty

GIB® Product & System Warranty:

- 10 Years Warranty - for all GIB® Products and Systems installed, according to warranty conditions.
- 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.

6.9.3 Performance

6.9.3.1 Ceiling Diaphragms - GIB EzyBrace® Systems

Ceiling Diaphragms - GIB EzyBrace® Systems: Where GIB® Rondo® Metal Batten Systems are a component of GIB EzyBrace® System ceiling diaphragms, additionally comply with all relevant aspects of the GIB EzyBrace® Systems (2016) publication and GIB Ezybrace® Software, BRANZ Appraisal No.928, and other relevant product manufacturers' recommendations. Refer to separate specification GIB EzyBrace® Systems.

6.9.4 GIB® Rondo® Metal Batten Systems

6.9.4.1 GIB® Rondo® 310 Ceiling Batten System

GIB® Rondo® 310 Ceiling Batten System. Incorporating 35mm deep, concealed metal ceiling battens that are either fastened with proprietary metal support clips (recommended) to the support frame or fixed directly to the support frame.

Suitable for 10mm,13mm,16mm and 19mm thick GIB® plasterboard ceiling linings for residential and commercial applications. Plasterboard ceiling linings are generally screw-fixed directly to the underside of the ceiling battens. Maximum 130mm clearance from the underside of the support frame (joist/rafter) to the top of the ceiling batten.

GIB® Rondo® System Components:
- 310 Batten: 35mm deep, galvanised steel furring channel (batten).
- 340 Perimeter Channel: 35mm deep, galvanised steel perimeter 'U' channel.
- NZ18 Perimeter Angle: 32 x 32mm, galvanised steel perimeter angle.
- 311 Clip: 92mm long, galvanised steel batten fastening clip. Provides 30mm max. clearance from supporting joist or truss.
- 313 Clip: 192mm long, galvanised steel batten fastening clip. Provides 130mm max. clearance from supporting joist or truss.
- A311 GIB Quiet Clip®: 92mm high, galvanised steel batten fastening clip with rubber cushioning grommets.
- 312 Jointer: Galvanised steel batten jointing clip.

GIB® Rondo® 311 or 313 clips can be installed to provide additional restraint and accurate batten alignment when the battens are direct-fixed to the support frame. Use GIB Quiet Clip® for GIB® Noise Control Systems.

When installed as a ceiling diaphragm, the battens must be fixed directly to the support framing. If GIB® Rondo® clips are used, then a timber block (min 300mm) or a continuous timber member must be fixed alongside the support framing to create a direct connection.

Installed with all system components and accessories required for proper installation and performance, in accordance with the GIB® Rondo® Metal Batten Systems Manual, to the locations, layout, levels and details shown on the drawings.

Where electrical earthing of GIB® Rondo® 310 Ceiling Batten System is required, the electrical earthing shall be carried out by a qualified electrician in accordance with the electrical standards and regulations.

6.9.5 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 ensure that the GIB® Rondo® Metal Batten System correctly allows for ceiling lining installation, and for the locations of recessed lights and other fittings installed by others, and to install GIB® Rondo® Metal Batten Systems as required.

6.9.6 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 of GIB® Rondo® Metal Batten Systems shall be carried out by experienced and competent tradespersons, who are familiar with the specified systems and installation techniques, in accordance with the GIB® Rondo® Metal Batten Systems - System and Installation Manual, to fully comply with all warranty requirements, and relevant requirements of AS/NZS 2785 (suspended systems). Submit evidence of experience on request, e.g. National Certificate of Interior Systems, or Certified Business Member of AWCINZ.

All cutting, jointing, fixing and supporting 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, free from damage and defects.

6.9.7 Delivery & Handling

Store all materials and accessories indoors, off the floor, on a flat, level surface in accordance with the manufacturer's requirements. Keep materials and accessories dry and protected from damage, distortion, moisture and contamination at all times.

Do not use damaged or defective materials and products.

Handle all materials in accordance with the manufacturer's requirements and Product Data Sheets, and in a manner that prevents damage and distortion to the component.

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.

6.9.8 Preparation

6.9.8.1 General

The building must be fully enclosed, weathertight and suitably dry before installation commences.

Check that all preliminary and preparatory building works have been completed to specification and as shown on the drawings.

Check that any required building services installations, including electrical, plumbing, mechanical, fire, or other service located behind the ceiling line and/or wall line, have been completed.

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 18% at the time of installation.

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. All light structural steel framing members shall satisfy the requirements of AS/NZS 1170.

Supporting steel stud partitioning shall comply with AS 1397 and as specified and shown on the drawings.

Supporting steel structures shall comply with NZS 3404.

Supporting concrete structures shall comply with the CCANZ CP 01:2011 or with NZS 3109. New concrete must have aged for a minimum of 28 days.

Supporting concrete masonry structures shall comply with NZS 4229, or with NZS 4230 and AS/NZS 1170 for specific design.

Carry out all necessary substrate inspections and preparatory work in accordance with the GIB® Rondo® Metal Batten System Manual and the GIB® Site Guide prior to installation.

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

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.

6.9.9 Installation

6.9.9.1 GIB® Rondo® 310 Ceiling Batten System (600mm c/c battens)

GIB® Rondo® 310 Ceiling Batten System. Installed in accordance with the GIB® Rondo® Metal Batten Systems Manual, to the locations, layout, levels and details shown on the drawings. Suitable for 13mm thick, single layer, internal plasterboard ceiling linings for residential applications.

Ceiling Batten Set-out:
- Batten Spacing: Maximum 600mm centreto-centre spacings.

- Batten Span: Maximum 1200mm for multi-span battens. Maximum 900mm for single-span battens (non-jointed), and for garage ceilings.

Confirm the ceiling lining fixing and installation requirements prior to installing GIB® Rondo® 310 Metal Ceiling Battens. Make allowance for the lining thickness when establishing the finished batten datum level.

For Multi-span Battens: Set-out GIB® Rondo® 310 Metal Ceiling Battens at maximum 600mm centre-to-centre spacings, with a maximum batten span of 1200mm, to the areas, levels and details shown on the drawings.

For Single-span Battens (non-jointed): Set-out GIB® Rondo® 310 Metal Ceiling Battens at maximum 600mm centre-to-centre spacings, with a maximum batten span of 900mm.

Screw-fix GIB® Rondo® perimeter angle and/or channel to walls, true to line and level, with 32mm x 8g x GIB® Grabber® wafer head needle tip screws at 300mm centres max.

Fix GIB® Rondo® batten clips along the batten lines, 900mm or 1200mm apart (as above), to the support framing with 32mm x 8g GIB® Grabber® wafer head needle tip screws or pairs of 40 x 2.8mm GIB® Nails. Batten clip fixings and set-out shall be to the manufacturer's installation requirements for the clip type, batten type and batten set-out.

Securely fasten the clips in place so that the battens are fixed at the correct datum level and are parallel, straight and true to line. Support batten ends on perimeter angle or channel, or alternatively, cut, fold and fix the batten end to the top plate.

Use full length battens. When jointing is necessary, joint battens using the manufacturer's proprietary batten jointer for the batten type.

Do not fix batten clips directly to H3.2, CCA, CuAz or ACQ treated timber - fully separate the clips from timber with DPC or other approved material.

Where required, provide additional battens for ceiling-mounted fixtures and fittings at the set-out shown on the drawings.

Ceiling Diaphragms:
- When installed as a ceiling diaphragm, the battens must be fixed directly to the support framing.
- If GIB® clips are used then a timber block (min 300mm) or a continuous timber member must be fixed alongside the support framing to create a direct connection.

6.9.10 Completion

Carry out a final inspection immediately after installation. Check that the GIB Rondo Metal Batten System has been installed correctly in accordance with the GIB® Rondo® Metal Batten Systems Manual and installation tolerances, to the correct set-out and details shown on the drawings, and that the installations are accurately aligned true to line, level (and/or plumb) and plane.

Check that the installed layout allows for the correct positioning and installation of all penetrations and services fixtures and fittings as indicated on the drawings.

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

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

Leave completed works and 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 a copy of the GIB® Product and System Warranty.

Provide all necessary Producer Statements.

6.10 GIB® Plasterboard Linings

6.10.1 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. .

6.10.2 Requirements

6.10.2.1 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.

6.10.2.2 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.

6.10.2.3 Quality Assurance

Ensure that the installation and finishing of GIB® Plasterboard Linings and associated GIB® Systems comply in all respects with the approved design drawings and specifications, and Building Consent.

Maintain and comply with industry-recognised quality control and assurance procedures to ensure that all stages of work are carried out to the highest standard.

6.10.2.4 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.

6.10.2.5 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.

6.10.2.6 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.

6.10.3 Performance

6.10.3.1 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.

6.10.3.2 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, and other relevant product manufacturers' recommendations. Refer to separate specification GIB EzyBrace® Systems.

6.10.3.3 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 publication, BRANZ Appraisal No.427 (2021), and other relevant product manufacturers' recommendations. Refer to separate specification GIB Aqualine® Wet Area Systems.

6.10.4 GIB® Plasterboard Linings

6.10.4.1 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:

6.10.4.2 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:

6.10.4.3 GIB Wideline®, 10mm

GIB Wideline®, 10mm. A 10mm thick x 1350mm wide 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:

6.10.4.4 GIB Braceline® & GIB Noiseline®, 10mm

GIB Braceline® & GIB Noiseline®, 10mm. A 10mm thick dual purpose plasterboard interior lining, with a high-density core for extra bracing and noise control performance. Suitable for use in residential and commercial applications on walls and ceilings where increased bracing and noise control performance is required. Manufactured to exceed the requirements of AS/NZS 2588. Refer to the GIB® Site Guide.

Installed Location:

6.10.4.5 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:

6.10.4.6 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:

6.10.5 Components & Accessories

6.10.5.1 Metal Ceiling Battens

Metal Ceiling Battens - GIB® Rondo® Metal Batten Systems. Installed in accordance with the manufacturer's requirements to the layout and details shown on the approved drawings. Refer to the GIB® Site Guide, and to separate specification GIB® Rondo® Metal Batten Systems.

6.10.5.2 GIBFix® Framing System

GIBFix® Framing System - incorporating GIBFix® Angle and GIB® Grabber® Dual Thread Drywall Screws. Refer to the GIB® Site Guide, and to separate specification GIBFix® Framing System.

6.10.5.3 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.

6.10.5.4 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.

6.10.5.5 Metal Trims

GIB® Metal Trims. Perforated metal corner beads and edge trim made from galvanised steel. Installed in accordance with the requirements of the GIB® Site Guide and GIB® Systems literature.

GIB® Metal Trim Profiles:
- External 90° Perforated Corner Trim (P01): GIB® Slim Angle - Standard. Available in 2.4/2.7/3.0/3.6m lengths.
- External 135° Perforated Corner Trim (P01A): GIB® Slim Angle - Off Angle. Available in 2.4/2.7/3.0m lengths.
- Perforated Curvable Corner Edge trim (P10): GIB® Slim Arch Bead. Available in 2.4/3.0m lengths.
- L-Trim for Stopped End Trim: Rondo® Stopping Angle. Profiles available for 10/13/16mm thick plasterboard. Available in 3.0m lengths.
- End Cap Bead - stopped: Rondo® Stopping Bead. Profiles available for 10/13mm thick plasterboard. Available in 2.4/3.0m lengths.
- Reveal or Z-trim: Rondo® Shadowline Stopping Bead. Profile available for 10mm thick plasterboard. Available in 3.0m lengths.

- End Cap Bead - un-stopped (P50): Rondo® Casing Bead. Profiles available for 10/13mm thick plasterboard. Available in 2.4/3.0m lengths.

6.10.5.6 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.

6.10.5.7 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.

6.10.5.8 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.

6.10.5.9 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:

6.10.5.10 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.

6.10.6 Level of Finish

6.10.6.1 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.

6.10.6.2 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.

6.10.7 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.

6.10.8 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.

6.10.9 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.

6.10.10 Preparation

6.10.10.1 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.

6.10.10.2 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.

6.10.10.3 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.

6.10.11 Installation

6.10.11.1 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.

6.10.11.2 Standard Ceiling Fixing - Metal Ceiling Battens

GIB® Plasterboard Ceiling Linings - Standard Ceiling Fixing with Metal Ceiling Battens. Metal ceiling battens shall be from the GIB® Rondo® Metal Batten Systems - refer to separate specification GIB® Rondo® Metal Batten Systems.

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.

Metal ceiling batten spacings shall be shall be as given in the GIB® Site Guide according to the specified plasterboard thickness - 600mm for 13mm or greater thickness, 450mm for 10mm thickness. Ceiling battens shall all run in the same direction within the ceiling area. 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® Self Tapping 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.

6.10.11.3 Ceiling Diaphragms

Ceiling Diaphragms - refer to separate specification GIB® Ezybrace Systems, and to the GIB EzyBrace® Systems publication.

6.10.11.4 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.

6.10.11.5 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.

6.10.12 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.

7 P L A S T E R W O R K

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:

2311:2017(AS/NZS)	Guide to the painting of buildings
3604:2011(NZS)	Timber-framed buildings

7.3 Resene Construction Systems Plaster Cladding

7.3.1 Scope

All of the wall surfaces identified for Rockcote on the drawings, together with all associated flashings, reveals finishing and other details. Note that no substitutions are permissible for any of the products specified herein.

7.3.2 General

All materials and workmanship incorporated into the house construction by this subcontract shall be such as to qualify in every detail and respect for the Rockcote 15 year Product Performance Warranty and the Licensed Rockcote Plasterers 5 year Workmanship Warranty.

If the Cladding Plasterer considers that general conditions of previous work is unsatisfactory to ensure a proper finish for the cladding work required they shall give immediate notice to the Contractor or Designer as appropriate and shall not proceed until necessary improvements have been made. Failing such notice the Cladding Plasterer will not be relieved of the responsibility for a poor finish due to such unsatisfactory condition.
(and)
'The Contractor and Subcontractors affected shall be jointly and severally responsible for completion of the whole of the works in a completely watertight condition and shall therefore examine all details to be satisfied that this condition can be achieved. If any detail is considered unsatisfactory the Designer shall be immediately notified and they will then either interpret the detail to the Contractor's satisfaction, or accept responsibility for watertightness at the points in question, always assuming reasonable workmanship.'

7.3.3 Workmanship

All work shall be carried out by experienced and skilled PPCS (Proprietary Plaster Cladding Systems) Registered Tradesmen licensed to apply Rockcote Systems exterior cladding renders, and be in

accordance with best and latest trade practice. Ensure that all plant and tools are kept clean and free from earlier mixes.

Apply all materials and install all Rockcote and Resene sealers, renders and protective coatings in strict accordance with manufacturer's recommendations.

Carefully proportion each batch and thoroughly mix. No re-tempering of any partially set or dried material. Observe Rockcote specification requirements with regard working in direct sun and protecting work from rain or frost for 24 hours or until cured.

Arrange plastering sequence to avoid conspicuous join marks or badly set out joins in large surfaces. Properly cure all plaster to prevent shrinkage or druminess. Leave all plastered surfaces clean, sound, smooth, even and with a true finish, and free from blemishes of any kind.

7.3.4 Work

Arrange for all appropriate or required inspections by Rockcote Systems registered PPCS assessors to qualify for their 15 year warranty.

Submit a clearly identified 300 x 300mm sample of the selected texture finish and colour for signed approval of the Designer or Owner as appropriate, and do not proceed until this is returned.

Ensure that the work of other trades does not reduce the cladding to ground, deck or roof clearances that are required by the Code.

Clean up thoroughly on completion, and provide the producer statement and appropriate warranties to the main contractor. Provide on-going maintenance instructions to ensure that NZBC Durability requirements are met.

7.3.5 Preparation

Check that any other fixings, brackets or electrical or plumbing elements that in any way affect the cladding plaster system are correctly in place, are flashed or taped as required, and are appropriate for finish sealing.

Install pre-primed Rockcote uPVC flashings exactly as noted, detailed, or recommended, and saddle and apron flashings, balustrades and handrails junctions, etc. as detailed or required, using sealants, adhesives and fixings as recommended by Rockcote.

Prepare for control joints in the positions shown on the drawings and elsewhere as required to fully comply with Rockcote recommendations, and arrange for a Rockcote technical inspector to confirm that the control joints are in their appropriate positions and they are all that are required. Prepare drained movement junctions at all positions where the Rockcote abuts other materials.

Mask all adjacent windows, doors or other joinery, roofs, plumbing or electrical items, and pre-finished surfaces etc. that could possibly be marked by the render work, and use drop cloths and ground covers to keep the works area clean.

Immediately prior to applying coatings check the full substrate surfaces and brush, scrub, wash, or rasp as required to remove any dirt, dust, oxidation, formwork release agents or similar. Prime to improve adhesion or damp down to control suction before applying render on hard or smooth or absorbent surfaces.

7.3.6 Wall Structure/Substrate

Check all aspects of preparatory works, including but not limited to:

Check that the timber wall framing complies with NZS 3604, 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 18% at the time of Rockcote substrate installation.

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

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

Check all aspects of preparatory works, including but not limited to:

Check that the blockwork surface is straight, plumb and sound - have any damage remedied. With a straightedge check that the wall surface is sufficiently true to achieve the required Rockcote surface. Rub off any mortar fins.

Check that all builder supplied flashings, sealing tapes etc. at windows, doors, junctions, corners and penetrations are all correctly installed.

7.3.7 Cavity Battens

Class H expanded polystyrene cavity battens.

7.3.8 Installation

7.3.8.1 50mm Integra

Install the specified ventilated cavity base strip. Install the selected cavity battens and the Integra panels exactly in accordance with all NZBC E2/AS1 requirements, BRANZ Appraisal No.681, all relevant Rockcote Specifications, and with manufacturer's recommendations.
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 Integra is installed.
Panel joints maximum 5mm, and 2mm notched trowel apply Rockcote Multistop bedding compound to the joints immediately before installing each panel.
Integra fixing screws as specified, or selected for corrosion zone and exposure class, with the length sufficient to go through the Integra (and rigid air barrier if one is installed) and penetrate the timber or steel by 30mm minimum. Fixings countersunk flush, at centres to suit wind zone, and at edge distances and layout as recommended by the manufacturer.
Ensure that the Integra is finished at openings, corners etc. exactly as detailed.

7.3.8.2 No substrate installation required - Concrete Block/Precast (plaster coating only)

Concrete Block and/or Precast/Tilt-up Concrete Panel substrate - plaster coating. No substrate installation required - plaster directly onto the substrate.

7.3.9 Mesh Coat

Mesh Coat applied to Integra: Rockcote PM 100, applied with a notched trowel,
Plus - Rockcote LiteRock Solid Render, 8-10mm thickness minimum,
Plus - Rockcote Blue Mesh (170 g/m², 8 x 9mm mesh),
Plus - Rockcote PM 100 Quick Render 1-2mm (floated to true surface).

Mesh Coat applied to Concrete Block and/or Precast Panel substrate: Rockcote PM 100, applied with a notched trowel,
Plus - Rockcote LiteRock Solid Render, 8-10mm thickness minimum,
Plus - Rockcote Blue Mesh (170 g/m², 8 x 9mm mesh),
Plus - Rockcote PM 100 Quick Render 1-2mm (floated to true surface).

7.3.10 Finish

Provide details of your custom Finish or add a new clause option.

7.3.11 Protective Finish Coat

Provide details of your custom Protective Finish Coat or add a new clause option.

8 ROOFING

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:

1170.2:2011(AS/NZS)	Structural design actions - Wind actions
2295:2006(NZS)	Pliable, permeable building underlays
3604:2011(NZS)	Timber-framed buildings
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
NZMRM Code of Practice	NZ Metal Roof and Wall Cladding Code of Practice - Version 3.0

8.3 Nuralite Membrane Roofing

8.3.1 Scope

Supply and install the selected Nuralite Membrane Roofing System as a waterproof membrane roofing to the locations shown on the drawings, complete with all accessories. All aspects of this work shall be in strict accordance with Nuralite Waterproofing Ltd (Nuralite) technical guidelines, installation specifications and details, (check www.nuralite.co.nz, or call 0800 68725483 for the latest editions),CodeMark Certificate of Conformity No:CM70032 , BRANZ Appraisal No.547 (2019), other relevant product manufacturers' recommendations, and as shown on the drawings.

No substitutions are permitted for Nuralite Membrane Roofing.

8.3.2 Rainwater Run-off

8.3.2.1 Rainwater Run-off can be Used as Potable Water

The rainwater run-off from the Nuralite Membrane Roof can be collected, stored and used as potable water.

8.3.3 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 Nuralite Authorised Applicators, familiar with the specified products and installation techniques, to fully comply with all Nuralite warranty

requirements, in accordance with the manufacturer's installation requirements and as noted and detailed on the drawings.

All membrane cutting, laying and jointing techniques shall be exactly as recommended by the manufacturer. All work shall be such as to leave a neat, efficient, robust and watertight installation.

Use only Nuralite-approved primers and adhesives compatible with the specified membranes and substrates, and the membrane's application/use.

Protect adjacent finished work and surfaces from damage and contamination during installation. Leave completed surfaces clean, sound, and free of defects and damage.

8.3.4 Delivery & Handling

Take delivery of materials undamaged. Reject any item found to be defective or damaged and contact the supplier for replacement.

Store materials and accessories undercover, off the ground, on a flat surface, and out of direct sunlight, with membrane rolls stacked on ends. Keep stored materials and accessories dry and protected from damage, contamination, and freezing conditions at all times.

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

Handle the specified materials and products in accordance with the manufacturer's recommendations and in a manner that prevents damage and surface marking.

Installers shall be familiar with and comply with the manufacturer's 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 Best practice guidelines for working on roofs and the OSH Guidelines For the Provision of Facilities and General Safety in the Construction Industry.

8.3.5 Substrate

8.3.5.1 Timber Substrate - Plywood, Strandboard and CLT

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 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 structures shall comply with NZS 3604, or with NZS 3603 and AS/NZS 1170 for specific design.

Plywood as a substrate:

Plywood materials shall comply with AS/NZS 2269, and be minimum 17mm thick for roofs or 21mm thick for decks, CD grade (C face up), H3.2 CCA treated, and installed and fixed exactly to the plywood manufacturer's requirements according to Nuralite recommendations. LOSP treated plywood must NOT be used.
Plywood must be fixed using a suitable glue adhesive and with countersunk screw heads, 10g Grade 316 stainless steel screws at maximum 150mm centres along edges and maximum 200mm centres in the body of the sheets. Ensure the plywood grain is across the line of supports below.
Plywood Substrates - check all aspects of preparatory works, including but not limited to:
- Check that sheets have been laid with staggered joints (stretcher bond) to falls, with joints flush, edges arrised, upstands filleted, with no bumps or hollows, and are smooth, clean, dry and free of debris.
- Check that the plywood sheets are rigid, and fully supported on all edges, on deck framing members spaced both ways at maximum 600mm centres (unless detailed otherwise.
- Check that the plywood substrate is smooth, clean, dry and free of debris.
- Check that any built-in falls are at the required slope - minimum 1:80 for decks; and minimum 1:100 for gutters.
H3.2 treated timber edge fillets as required, and 5mm-radius-chamfer external edges at turn-downs.

Strandboard as a substrate:

Ensure that sheets have been stretcher bond laid to falls, are rigid, with joints flush, edges arrised, no lumps or hollows, smooth, clean, dry and free of debris. To be laid length ways across the line of supports below. Strandboard sheets supported at 400mm centred rafters and nogs for roofs unless detailed otherwise. Minimum finished (constructed) falls to be 1:30 for roofs and 1:100 for gutters. Strandboard is for use on roof decks and gutters, and not to be used on balcony decks.
Strandboard substrates are best fixed with stainless steel counter-sunk screws, glued down and joints tight butted. The design and construction of the substrate and movement and control joints is specific to each building so must be considered by the building designer. Generally, 16.3mm Strandboard is required for roofs, decks are covered under BRANZ-CM-1006 Rev1. Rafters and nogs at 400 centres with all edges supported. Screws to be 150mm spaces around edges and 200mm spaces across the sheets. A 5mm clearance must be left between sheets and any element protruding through the roof such as vent pipes. Greater clearances than this may be required around flues and chimneys.

Cross Laminated Timber as a substrate:

To be fixed as per the manufacturer’s instructions. Laid to falls, are rigid, with joints flush, edges arrised, no lumps or hollows, smooth, clean, dry and free of debris. Minimum finished (constructed) falls to be 1:80 for roofs and 1:100 for gutters. Design fall recommended of 1 in 40 for roofs to provide for deflection and construction tolerance.

Plywood and the timber substructure to have a maximum moisture content of 20% when the membrane is installed. Install 20 x 20mm H3.2 treated timber edge fillets as required, and 5mm-radius-chamfer external edges at turn-downs.

8.3.6 Finish Membrane

8.3.6.1 Nuraply 3PM (double layer system) - Timber Substrate

Nuraply 3PM - as a component of the Nuraply 3PM Membrane Roofing System (*double layer system*) on a Timber Substrate. A 4mm thick reinforced fibre asphalt, flexible waterproof capping membrane with a pre-finished coloured mineral chip surface. Fabricated from modified bitumen (APP) reinforced with non-woven polyester. Available in Charcoal, Slate, White, Red or Green colour.

The Nuraply 3PM Roofing Membrane System is CodeMark assured with the NZ Building Code: CodeMark Certificate of Conformity No:CM70032, issued by Bureau Veritas Australia Pty Ltd.

Installed as a capping membrane over a Nuraply 3PB-SA base-layer in accordance with Nuralite requirements, CodeMark Certificate of Conformity No:CM70032, BRANZ Appraisal No.547 (2019), and as shown on the drawings.

Where specified, a thin coating of Nuraglaze shall be applied as a surface dressing to enhance the system's appearance and to bind any over-chipping of the mineral chip finish.

Colour (delete as appropriate): Charcoal / Gloss Black / Slate / White / Red
Installed Location:

8.3.7 Ventilation

Ventilating the structure beneath the membrane requires specific design.

8.3.8 Installation

8.3.8.1 Nuraply 3PM Membrane Roofing System - over Timber Substrates

Install Nuraply 3PM Membrane System, including all surface priming, membrane application, jointing, flashing and sealing, etc., and all Nuralite supplied fillets and metal edge trims, roof vents and gutter outlets, in strict accordance with Nuralite installation requirements (link) and details, and as shown on the drawings.

Unroll the Nuraply membranes on to the substrate and allow it to relax for at least 30 minutes prior to installation.
Lay the first NURAPLY 3PB-SA layer into NURAFLUX NO.10 or NURAFLUX QD or WB primer to NURALITE Waterproofing Limited requirements, with joints to be welded a minimum of 80mm down the roll edges and 100mm across the roll ends. Lay in order from low points, sumps, through gutters, valleys, eaves, verges main roof and upstands to cover flashings.
Lay the second NURAPLY 3PM layer by heat fusing over the surface of the first layer in the same sequence. Joints in the second layer must not correspond with joints in the first layer. Second layer joints to be welded, a minimum 80mm wide down roll edges and minimum 100mm wide across roll ends, to NURALITE Waterproofing Limited requirements. Roll junctions must be staggered to avoid 4-layer lap-weld build-up of NURAPLY 3PM at corners. Ensure unobstructed drainage flow at outlets.
Where shown on contract documents install a second capping layer as a low-volume maintenance access pathway. The pathway should be inspected regularly to ensure it is not damages through wear.

Should wear be detected the layer should be replaced.
Ensure unobstructed drainage flow at rainwater outlets.
Finish any control joints located on the drawings to Nuralite requirements.
Consult Nuralite regarding any detail where a standard Nuraply detail does not exist.
Protect installed membrane as required, avoid puncturing or damaging the membrane during installation; repair or replace as necessary.
PENETRATIONS
Form mould, weld and flash all upstands, downturns and penetrations to NURALITE Waterproofing Limited details including raised, anti-ponding water deflectors on the upside of penetrations.
MOVEMENT JOINTS
Form and weatherproof movement joints as designed to NURALITE Waterproofing Limited details.
JUNCTIONS
Check that adjoining walls and parapets are prepared ready for the installation of NURAPLY roofing.
Confirm that openings have been prepared ready for the installation of skylights and other penetrations through the roof.
Required work includes the following:
-Roofing installation neatly finished to all sides of openings and to all wall and parapet junctions.
-Installation of flashings (those required to be installed prior to installation of penetrating elements and/or wall linings).
Recommended practice on parapets is to apply NURAPLY roofing up across the top and down the outside face at least 70mm.
Limited self-checking lap welding techniques. Form and weatherproof movement joints as designed to NURALITE Waterproofing Limited details.
Thoroughly blow or sweep clean the installed Nuraply 3PM membrane to remove over-chipping, allow to dry and apply any selected coating.

8.3.9 Coating or Topping

Nuraglaze - as a component of the Nuraply 3PM Membrane Roofing System. A clear durable finishing coat, applied to the Nuraply 3PM capping membrane by brush or roller, in accordance with Nuralite requirements, as a thin coating to enhance the system's appearance and to bind any over-chipping of the mineral chip finish. Recommended for Nuraply 3PM roofs collecting potable water to assist them to remain dirt & contaminant free.

8.3.10 Temporary Protection

Keep the working area cordoned off during installation, and protect completed work from construction foot traffic and damage until hand-over, or as directed. Where necessary, provide temporary access boards as protection during subsequent operations, and remove these when no longer required.

8.3.11 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 Nuralite Membrane Roofing as required.

8.3.12 Completion

Check that the membrane roofing has been installed correctly, and that all system accessories are correctly installed and finished.

Check for damage, and repair or replace as necessary. Carry out any repairs and remedial work in accordance with Nuralite instructions to the required standard.

Where possible, flood test all gutters with a minimum 50mm depth of water at the outlet or scuppers for 24 hours. Make good any lack of water tightness when the surface is completely dry. Not all applications can be flood-test checked. All gutters should be checked.

Leave the completed membrane roofing system leak free and watertight, and to the required standard in accordance with Nuralite requirements.

Completely clean the works area, and leave adjacent surfaces and finished work clean and free of damage. Remove all associated rubbish from site.

Complete and sign the project-specific Nuralite Checklist for Project Signoff, and the Nuralite Checklist for Roof Readiness, and the project-specific Nuralite Maintenance Programme.

Issue to the Owner a copy of the Nuralite Maintenance Programme, and a copy of the Nuralite Product Warranty and the Applicator's Installation Warranty for the completed works.

8.4 Metalcraft Roofing Wall Cladding

8.4.1 Scope

Supply and install the selected Metalcraft Roofing Profiled Metal Cladding as a wall cladding to the walls identified on the drawings complete with all accessories. All aspects of this work shall be in complete accordance with Metalcraft Roofing guides and technical manuals, (check 0800 766 369 for the latest editions), and other relevant product manufacturers' recommendations, and as shown on the drawings.

No substitutions are permitted for Metalcraft Roofing Profiled Metal Wall Cladding.

8.4.2 Co-operation

Co-operate with other trades to ensure that all preliminary and preparatory works, including membranes, wraps, rigid air barriers and trims, and any other related works are completed to specification and as shown on the drawings.
Coordinate with trades the locations of pipes, outlets, cables, meter boards and other fittings installed by others.

8.4.3 Material

Steel, 0.4mm BMT.

8.4.4 Product

COLORSTEEL® Maxam™ to selected BMT. Pre-painted hot dipped aluminium/zinc/magnesium alloy coated steel coil, with a minimum coating weight of 150g/m², conforming with AS/NZS 2728 Class 6. COLORSTEEL®

Colour:

8.4.5 Profile

Metalcraft - Trapazoidal sheet - a trapazoidal profile; 19mm rib height and 875mm effective cover based on the selected BMT.

Material type - Refer to ‘Material’ clause.
Thickness - 0.40mm BMT (G300), 0.55mm BMT (G550)
Windload – Refer to 'technical literature'
Mass (KG/M2)- Refer to ‘Metalcraft’

- Sheet ends must be stop-ended under flashings.

Installed in accordance with the manufacturer's requirements to the locations and details shown on the drawings.

8.4.6 Components & Accessories

Profiled metal cladding flashings shall be fabricated from the same material and coating as the cladding material, to maintain durability and compatibility requirements.
Unless otherwise noted or specified, flashings shall be formable grade 0.55 BMT for galvanised, aluminium/zinc-coated and pre-painted steel, and 0.9mm BMT for aluminium, to the same standards as the profiled cladding sheets, and notched/scribed when installed across the cladding profile or provided with a soft edge - in accordance with the manufacturer's requirements.
Flashings, flashing fastenings and fastening frequency shall be in accordance with the manufacturer's technical literature and the NZMRM Code of Practice.
Do not construct flashing joints and flashing junctions in a manner that rely entirely on sealant to maintain weathertightness.

Profiled Foam Closure Strip. Non-bituminous, compressible, closed-cell foam strips profiled to fit the specified cladding profile. Installed to the details shown on the drawings and in accordance with the profiled metal cladding manufacturer's recommendations.

Compressible Foam Sealing Tape. Self-adhering, compressible foam sealing tape for sealing metal flashings and generally as required in accordance with the manufacturer's requirements and the NZMRM Code of Practice.

Metal Cladding Sealant. Use only neutral-curing silicone sealant, compatible with the specified metal cladding and flashing materials and finishes, that is suitable for the required application and use in accordance with the sealant manufacturer's instructions and to the profiled metal cladding manufacturer's requirements. All sealed joints must be mechanically fastened, and excess sealant

neatly removed to prevent unnecessary dirt buildup. Sealant shall only be used to seal between two metal surfaces, do not fill holes or gaps with sealant.

Proprietary Collar Flashings. Approved EDPM or silicone-polymer proprietary flexible collar flashings for weatherproofing cladding-penetrating pipes/flues/ducts. Sized to suit the applicable pipe/flue/duct and installed in strict accordance with the manufacturer's requirements and the NZMRM Code of Practice. Use only high-temperature silicone (not EDPM) collar flashings for heated flues and pipes with temperature range between 60°C - 200°C.

COLORSTEEL Altimate® must be installed with an aluminium screws only. All fasteners to be fitted with a bonded sealing washer.

8.4.7 Preparation

Check all aspects of preparatory works, including but not limited to:-
- Check that the timber wall framing complies with NZS 3604, has studs at maximum 600mm centres and nogs/dwangs at maximum 480mm centres for vertical cladding, is plumb and in true alignment, includes all blocking required for cavity battens, and fixing at openings, joints, corners and soffits etc., and has a maximum moisture content of 18% at the time of Metalcraft Roofing Wall Cladding installation.
- Check that the rigid air barrier, as specified, has been installed in accordance with NZBC requirements and the manufacturer’s recommendations, with all finishing tapes, flashings etc. at windows, doors, corners and penetrations all correctly incorporated to provide a continuous seal.
- Check that all preparatory materials are lapped such that any water will run down to the exterior.

8.4.8 Vented Cavity Closure Material

PVC cavity closure strip.

8.4.9 Installation

All installation work shall be carried out by experienced tradesmen familiar with the techniques and materials specified. All fixing, jointing and sealing, techniques and materials shall be exactly as recommended by Metalcraft Roofing.
Handle cladding material without damaging or scratching. Store undercover and off the ground on even bearers, and keep dry until installed.

Fix cavity battens through the rigid air barrier into the timber framing as noted on the drawings. Sheets set out vertically with side laps away from the main line of sight, to straight plumb line. Keep cladding lines consistent and true along walls and around corners. Check for and eliminate any creep and/or spread of sheets during installation.

Screws to comply with AS 3566 (Class 4 minimum and not less than the roofing material) and must be of a compatible material and finish with the cladding. Screws for pre-painted cladding should be factory pre-painted for an accurate colour match. Use only low carbon (<15%) non-conductive sealing washers. Set exposed fixings to level string lines. Screw fixings to be in accordance with Metalcraft

Roofing requirements and as noted on the drawings.
Screw fix through cladding trough/pan and cavity battens and rigid air barrier, minimum 30mm embedment into timber framing, at centres noted on the drawings.

All jointing techniques, fixings and sealants to be in accordance with Metalcraft Roofing recommendations, as noted on the drawings, and compatible with the cladding material and finish.

Flashings shall all be matching Colorsteel or other specified material, and shaped as shown on the drawings. Flash and seal services penetrations to details shown on the drawings.

Protect the coated surface from damage at all times; replace the whole sheet where a significant depth of the coating has been damaged. Completely clean off all drill and power-saw swarf as the work proceeds.

8.4.10 Completion

Ensure that the work of other trades does not reduce the cladding to ground, deck or roof clearances that are required by the NZ Building Code. Clean up thoroughly and remove debris and unused material from site.
Issue to the Main Contractor a copy of the Metalcraft Roofing maintenance requirements together with the Metalcraft Roofing Wall Cladding Warranty for the completed works.

9 WINDOW & DOOR JOINERY

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:

1170.2:2011(AS/NZS)	Structural design actions - Wind actions
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
3604:2011(NZS)	Timber-framed buildings
4211:2008(NZS)	Specification for performance of windows
4223.3:2016(NZS)	Glazing in buildings - Part 3: Human impact safety requirements
4303:1990(NZS)	Ventilation for acceptable indoor air quality
4680:2006(AS/NZS)	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
NZBC B1	Guidance on Barrier Design
NZBC B1/VM1	Structure
NZBC B2/AS1	Durability
NZBC E2/VM1	External Moisture
NZBC F2	Hazardous Building Materials
NZBC F4	Safety from Falling
NZBC G4/AS1	Ventilation
NZBC H1	Energy Efficiency

9.3 APL Residential Aluminium Windows & Doors

9.3.1 Scope

9.3.1.1 APL Aluminium Window & Door Systems

APL Aluminium Window & Door Systems

Supply and install the specified Aluminium Windows and Doors from APL- Window Solutions to the locations and details shown on the drawings; complete with all components (flashings, support mechanisms, brackets, etc) where required, for proper installation and operation; and commissioned to the required performance and functionality. All aspects of this work shall be in strict accordance with the manufacturer's technical literature and installation requirements (check www.aplnz.co.nz,

call 07 849 8888, or email techinfo@aplnz.co.nz for the latest editions), other relevant product manufacturers' recommendations, and as shown on the drawings.

No substitutions are permitted for the specified Aluminium Windows and Doors from APL - Window Solutions

9.3.2 Warranty

Warranty APL - Window Solutions Materials & Workmanship Warranty:
- 12 Years Warranty on Materials – AGP® Insulated glass units (Warrant glass under normal environmental and use conditions against failure of materials).
- 5 Years Warranty on Materials and Workmanship - for all APL window and door products.
- 2 Years Warranty on Materials and Workmanship – for all mirror glass and hardware.
- Provide the Materials & Workmanship Warranty on the Manufacturer's Standard Warranty Form.
- Commence the warranty from the date of practical completion of the contract works.

View the "Care and Maintenance for Windows and Doors". Terms and Conditions are here www.AGPL.co.nz

9.3.3 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.

Shop Drawings
Prepare and submit to the Main Contractor for verification and approval prior to the commencement of works, Shop Drawings describing the general arrangement and connection to the building envelope of the specified window & door systems.

These shall include, but not be limited to:
- Design calculations - where required;
- Dimensioned elevations of all aluminium joinery elements (typical scale = 1:50; minimum scale = 1:100);
- Complete details of the installation construction, connections and all support systems (typical scale = 1:2; minimum scale = 1:5);
- Sealant types and backing rods, etc;
- Provision for movement, thermal, wind load and/or seismic - where required;
- Coordination requirements/issues with other works and trades - where applicable;
- A schedule of materials, finishes, componentry, fittings, fixings and fastenings - where required.

Samples
Provide samples of the specified aluminium windows and doors, upon request, including sections (shorts or assembled corners), glazing, reveals, hardware, and colours, all as agreed, for the approval of the Architect/Designer. Manufacture should not commence until approval has been gained.

9.3.4 Performance Criteria - Wind Zone - Durability

General Performance - Wind Zone: High
The specified APL Aluminium Window and Door Systems shall comply with the requirements of NZS 4211 for all relevant clauses.

Wind Load - Non-Specific Design Wind Zone Classification. The specified APL Aluminium Window and Door Systems joinery installation is located in a NZS 3604 Wind Zone: H - High; with a maximum pressure of 0.97kPa SLS and 1.36kPa ULS.

Durability - Exposure Zone B: Low
Durability. The specified APL Aluminium Window and Door Systems joinery installation is located in a NZS 3604 Exposure Zone B: Low - within an inland area with little risk from wind-blown sea-spray salt deposits.

ISO 9223 Category: C2 Low: Characterised by no obvious marine influences. Typically, more than 1000 metres from the exposed coasts or more than 500 metres from industrial emissions.

All aspects of the specified APL Aluminium Window and Door System, including surface finishing and hardware, shall meet the durability requirements for the given Exposure Zone in accordance with NZBC B2.

9.3.5 Performance Criteria - Energy Efficiency for All Small Buildings Under 300m2

Thermal Performance - Climate Zone 6
Thermal Performance. The APL Aluminium Residential Window & Doors joinery, installation is located within the boundaries of Climate Zone 6, as defined by H1 Energy Efficiency. Unless specified otherwise, the combination of insulation, should meet the minimum H1 requirements tabled below and in accordance with, H1 Energy Efficiency for this Climate Zone.

Building Element	Construction R-values [m^2K/W] No embedded heating Climate Zone 6		Construction R-values [m^2K/W]
Roof	R6.6	Heated Ceiling	R6.6
Wall	R2.0	Heated Wall	R2.9
Slab-on-ground Floors	R1.7		
Floor other than slab-on-ground floor	R3.0	Heated Floor	R3.0
Window and Doors	R0.50		
Skylights	R0.62		

9.3.6 APL Aluminium Joinery Range

APL Architectural Series ThermalHEART®
APL Architectural Series ThermalHEART® Suitable for window and doors in large formats and exposed locations, including Extra High and SED applications. Frames designed with 114mm & 171mm option. Flush sill sliding door and window options. Dual colour availability. Windows and Doors, fully glazed,

finished, and complete with hardware and other specified components - all as specified in the following clauses. Manufactured and installed in accordance with the manufacturer's requirements to the locations, configurations and details shown on the drawings and schedules.

9.3.7 Awning & Casement Windows

APL Architectural Series ThermalHEART®
Awning and casement windows shall be manufactured using APL Architectural Series ThermalHEART® system, with a 114mm platform, incorporating a thermal break, and a cover facing to overlap the wall cladding.
Specification:
- Mullions, Transoms: with/without external fins, with guidance from APL Span Tables, shall be selected by the manufacturer for compliance with the project wind load.
- Maximum Glass Thickness: 44mm IGU
- Thermal Values: Consult APL Technical Department
- Performance: Tested to Specific Design applications to wind pressures of 2.4kPa serviceability (3.4kPa UWP)
- Glass: Double & triple glazed; complying with NZS 4223.1., NZS4223.3 & NZS4223.4 Refer to Glazing and Glass clauses.
- Finish: Refer to Aluminium Finish clause.
- Reveals: Refer to Jamb Liner clause.
Refer to the Window & Door Schedule drawings for specific requirements of individual elements.
Manufactured and installed in accordance with the manufacturer's requirements to the locations, configurations and details shown on the drawings and schedules.

9.3.8 Hinged & French Doors

APL Architectural Series ThermalHEART® - Hinged and French Doors
Hinged and French Doors shall be manufactured from APL Architectural Series ThermalHEART® 114mm frame
- Maximum Glass Thickness: 44mm IGU
- Thermal Values: Consult APL Technical Department
- Performance: Tested to Specific Design applications to wind pressures of 2.4kPa serviceability (3.4kPa UWP)
- Glass: Double & triple glazed; complying with NZS 4223.1., NZS4223.3 & NZS4223.4 Refer to Glazing and Glass clauses.
- Finish: Refer to Aluminium Finish clause.
- Reveals: Refer to Jamb Liner clause.
Refer to the Window & Door Schedule drawings for specific requirements of individual elements.
Manufactured and installed in accordance with the manufacturer's requirements to the locations, configurations and details shown on the drawings and schedules.

9.3.9 Sliding Doors

APL Architectural Series ThermalHEART® - Sliding Doors
Sliding Doors shall be manufactured from APL Architectural Series ThermalHEART® sliding door frames. Rollers are rated to 225kg each total 450kg/panel.
- Maximum Glass Thickness: 44mm IGU

- Thermal Values: Consult APL Technical Department
- Performance: Tested to Specific Design applications to wind pressures of 2.4kPa serviceability (3.4kPa UWP)
- Glass: Double & triple glazed; complying with NZS 4223.1., NZS4223.3 & NZS4223.4 Refer to Glazing and Glass clauses.
- Finish: Refer to Aluminium Finish clause.
- Reveals: Refer to Jamb Liner clause.

Refer to the Window & Door Schedule drawings for specific requirements of individual elements. Manufactured and installed in accordance with the manufacturer's requirements to the locations, configurations and details shown on the drawings and schedules.

9.3.10 Aluminium Finish

Anodised Aluminium - Frost, 25 microns

Anodised Aluminium - Frost, 25 microns. The specified aluminium joinery shall be anodised with Frost to a minimum 25 micron thickness, of the specified colour, in accordance with WANZ Anodising Standard SFA 3503-03:2005.
Suitable for applications situated in NZS 3604 Exposure Zone B, C, D or SED (SED on application).
20 years anodising performance warranty, upon application.

Frost Colour: TBC by Client

9.3.11 Jamb Liner

Wall Board Jamb Liners

Wall Board Jamb Liners (by others). 10mm thick wallboard linings, as specified and shown on the drawings, shall be returned into the aluminium joinery frame with the use of APL Lining Adaptor, factory coated to the specified coating and colour.
Except where shown or noted otherwise on the drawings and schedules, Lining Adaptors shall be fitted to the head, jambs and sill of each aluminium joinery element. Linings installed and finished separately by others.

No Jamb Liners

No Jamb Liners. APL aluminium joinery elements to be manufactured and installed without jamb liners - refer to the drawings and schedules.

9.3.12 Flashings & Support Bars

Aluminium Head Flashings

Aluminium Head Flashings shall be selected from the APL range of extruded aluminium flashings, suitably sized to suit the claddings and construction types in accordance with NZBC E2/AS1 and shown on the drawings; and finished and colour-matched with the aluminium windows and doors. All aluminium joinery flashings shall be supplied and installed by the APL aluminium joinery manufacturer.

Aluminium Sill Support Bar - Cavity Construction

Aluminium Sill Support Bar for Installations in Drained Cavity Construction. Extruded aluminium sill support bar, with built-in drainage and ventilation, for continuous support to the window or door

unit. Mill finish aluminium. Sill support bars shall be used and installed in accordance with the requirements of NZBC E2/AS1, and comply with BRANZ Evaluation Method EM6, and be sized to suit the cladding thickness and weight of the window or door.

9.3.13 Hardware Range

Elemental Hardware
APL aluminium window and door hardware and furniture shall be selected from the Elemental Hardware range. Made from extruded aluminium; precision machined; and anodised finished to the colour specified - Silver or Black. Supplied and installed by the APL aluminium joinery manufacturer to the windows and doors as indicated on the drawings and schedules.
Anodised colour:

9.3.14 Co-operation Workmanship & Delivery

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 establish exact sizes for all aluminium window and door frames; and to ensure that each element correctly allows for the installation and finishing of exterior claddings and interior linings and any specific detailing shown on the drawings; and generally, to install all APL aluminium windows, doors and accessories as required.

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.

Aluminium window and door joinery fabrication, assembly and installation work shall be carried out by experienced and competent tradespersons, authorised to manufacture and install APL - Window Solutions aluminium windows and doors, under controlled supervision and procedures, to fully comply with all warranty requirements and in accordance with the manufacturer's requirements.

Maintain and comply with industry-recognised quality control and assurance procedures to ensure that all stages of work are carried out to the highest standard.

All fabrication and assembly processes and techniques, materials and accessories shall be exactly as recommended by the manufacturer and shall be carried out using suitable machinery, tools and equipment, in a factory workshop.

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

Leave aluminium joinery and glazing clean and free from damage and defects of any kind.

Delivery & Handling
Aluminium joinery frames shall be braced and restrained as necessary for transportation and delivery

to site. All surfaces, including glass, shall be appropriately protected from marking and damage during manufacture, delivery and installation.

Inspect all aluminium joinery units upon delivery and reject any damaged or defective items. Contact the manufacturer for replacement of rejected items at time of delivery to site. Do not use or install damaged or defective materials, products and joinery elements.

Store aluminium windows, doors and accessories undercover, off the floor, on a flat, even and level surface as recommended by the manufacturer and in a manner that prevents any frame distortion and surface damage and deterioration. Keep stored aluminium joinery dry and protected from damage, moisture and contamination at all times.

Handle aluminium joinery units and accessories in accordance with the manufacturer's requirements and in a manner that prevents distortion to joinery frames and any damage to the elements - including surface marking. Retain manufacturer's protective coverings for as long as possible, and remove them upon completion.

Installers shall be familiar with and comply with the manufacturer's safe handling requirements and precautions for use, and shall use appropriate safety gear and equipment during all stages of manufacture and installation.

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

9.3.15 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 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.
Check that all window openings and door openings are correctly sized for fitting tolerances, are square and correctly aligned, with all sides plumb, level and true to line and plane.
Check window and door openings adjoining other building elements to ensure that all necessary works have been completed that will enable the windows and/or doors to be installed correctly and as shown on the drawings.
Supporting concrete structures shall be within the scope of NZBC E2/AS3, and comply with NZS 3109.
New concrete must have aged for a minimum of 28 days prior to installation.
Supporting concrete masonry structures shall be within the scope of NZBC E2/AS3, and shall comply with NZS 4229, or with NZS 4230 and AS/NZS 1170 for specific design, and NZS 4210.
Supporting timber structures shall comply with NZS 3604, or with NZS 3603 and AS/NZS 1170 for specific design, and have a maximum moisture content in accordance with the requirements of NZS 3602 at the time of installation.
Supporting lightweight steel framed structures shall comply with NZ NASH 3405, or the NZBC for

specific design.
Supporting steel structures shall comply with NZS 3404.

Concrete Slab Rebates
Concrete Slab Rebates: check that concrete slabs have been correctly rebated to accommodate door sills and floor-mounted window frames as detailed on the drawings, and that any required waterproofing membrane has been applied to the rebates.

Concrete Block Walls
Concrete Block Walls (within the scope of CCANZ CP-01) - check all aspects of preparatory works to window and door openings, including but not limited to:
- Check openings in blockwork have been correctly formed to the details shown on the drawings.
- Check openings in blockwork are clean and free of mortar, grout splashes, etc.
- Check that any required flashing chases have been properly formed as detailed on the drawings and are clean and free of mortar.
- Check that any required waterproofing system to exterior window and door openings has been applied in accordance with the manufacturer’s requirements and as shown on the drawings.

Timber Framed Walls - Rigid Underlay
Timber Framed Walls (within the scope of NZBC E2/AS1) - check all aspects of preparatory works to window and door openings, including but not limited to:
- Check that the timber framing is complete at window and door openings, and is in accordance with NZS 3604, or with NZS 3603 and AS/NZS 1170 for specific design.
- Check that the timber framing has a maximum moisture content of 20% at the time of joinery installation.
- Check that the rigid wall underlay has been correctly finished around framed window and door openings in accordance with E2/AS1 and the manufacturer’s requirements.
- Where flexible wall underlay is installed over the rigid underlay, check that the flexible underlay has been correctly finished around framed window and door openings in accordance with E2/AS1 and the manufacturer’s requirements.
- Check that flexible flashing tape has been correctly applied and finished to window and door openings in accordance with E2/AS1 and the manufacturer's requirements.

9.3.16 Fabrication

Fabrication
Do not commence production and fabrication of the joinery elements until the 'For Fabrication and Installation' shop drawings have been verified and approved by the Architect/Designer.
Fabricate and install aluminium window and door joinery in accordance with the approved shop drawings, design calculations, and the project documentation.

Unless noted otherwise on the approved shop drawings, joinery fabrication shall include the installation of all glazing, hinges, stays, running gear, and other hardware items scheduled on the approved shop drawings.

Glass shall be cut true and square, sized to provide correct edge clearances, blocked into place as required. All glazed joinery units shall be delivered either pressure fit, pocket glaze, or

beaded/wedged, unless site glazing is required. Glazing gaskets shall be compatible with all adjacent materials, and cut 1% over-length to absolutely avoid stretching during installation.

Window and door hardware shall be fixed true to line and position, and adjusted and oiled as required for correct operation. The aluminium joinery manufacturer shall notify the Architect/Designer if any scheduled hardware item or fixing position appears incorrect. Account for all keys and deliver separately to the site manager.

Factory-fit safety stays as scheduled to all opening windows, and to opening windows where safety stays are required to comply with the requirements of NZBC F4/AS1.
Factory-fit all required and scheduled passive ventilation systems to NZBC G4/AS1, 1.3.9 - Trickle ventilators, NZS 4303, and the manufacturer's requirements.

As necessary, provide protection and temporary bracing required for the transportation and general handling of the joinery elements. Ensure that all opening doors and windows are temporarily secured for transportation and general handling.

9.3.17 Installation

Flashings - Framed Openings
Install metal flashings to window and door openings, accurately level and plumb, and to the required tolerances as detailed - with the head flashing weathering jamb flashings, jamb flashings weathering sill flashing, and sill flashings open (draining) to the exterior.
Overlap and the top edge of head flashings with flexible flashing tape, or a section of additional flexible wall underlay, along the top edge to ensure water drains to the exterior.
Except where windows and doors are recessed, and where detailed otherwise, all head flashings shall extend minimum 30mm beyond the edge of the window/door frame.

Aluminium Joinery
Installation of aluminium window and door joinery shall be to the requirements of the approved shop drawings and installation details, including fixings and fasteners, flashings, bedding compounds, pointing sealants, weathering sealants, and other components and accessories required for proper installation.
Use only fasteners compatible with the materials involved, as recommended by the window manufacturer and to comply with durability and performance requirements. Fixings and fasteners exposed to weather shall be aluminium or Grade 316 stainless steel. Fixings and fasteners not exposed to weather may be galvanised in accordance with AS/NZS 4680.
Set proprietary plastic packers, sized to the required installation tolerances, to the formed opening at the appropriate fixing spacings for secure installation and allowance for wind loading for windows.
Install aluminium windows and doors exactly square, true to line, plumb and level for proper operation of opening sashes and door leaves, and with fixings fastened through jamb liners and packers.
Door installation shall allow for a minimum clearance gap of 5mm above the specified floor covering in the space that the door opens into.
Form a continuous air-tight seal between the window/door frames and the adjacent structure with a proprietary expanding foam, or appropriate sealant, to a depth of 15mm - 20mm over PEF backing rod at head, jambs and sill.

Commission opening windows and doors, sliding carriage assemblies, and all moving components to the required operation, performance and tolerances, and ensure that all hardware is in full working order.

Weather Sealing
Weather-seal frame jambs etc. to adjacent surfaces (or to each other) as detailed or as required by the window manufacturer, to achieve a fully weathertight installation.
Sealants shall be BRANZ approved for the application and be compatible with all surfaces and any applied finish.
Insert closed cell PEF backing rods or a polyethylene bond breaker tape slip where required and as shown on the drawings.
Ensure substrates are clean and dry; mask off adjacent surfaces; prime substrates and apply sealant in accordance with the sealant manufacturer's requirements and tool finish to a smooth, even surface.
Where required and as shown on the drawings, install aluminium wind deflection or pressure relief angles, over the head and jambs of frames installed within a recessed opening, prior to weather-sealing frames.

Temporary Safety Indicators
As necessary, provide temporary safety indicators to clear glass until completion of adjacent work.
Do not use masking tape or materials incompatible with the glass for this purpose.

9.3.18 Completion

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 APL Aluminium Windows & Doors work shall be repaired and/or replaced to the satisfaction of the Contract Administrator, without delay and at no additional cost to the Principal.

Completion
Check that APL aluminium window and door joinery and accessories have been installed, glazed and finished correctly and fully tested for weathertightness.
Check that all opening window sashes, doors, sliding carriage assemblies and all moving components have been commissioned to the required operating performance and functionality.
Check that all hardware, locks, latches and handles are firmly fixed in place without restricting the operation of their moving parts, and that latches and locks fully engage with strikes and keepers and are free of slack when engaged.
Check all aluminium joinery elements for damage, defects, faults and weathertightness - carry out repairs and/or replace elements as necessary in accordance with the manufacturer's instructions to the required standard.
Remove applied safety indicators and protective coverings, and clean all joinery surfaces inside and out and leave perfectly clean.
Leave this work complete, weathertight and leak-free, and in full working order to the required operating performance and functionality in accordance with the manufacturer's warranty requirements. Leave all locking keys with the Contractor.

Leave the surrounding work area clean and free of rubbish. Remove rubbish and waste material from the site.

Complete the manufacturer's warranty and maintenance requirements, online process **FOUND HERE**. APL Product and Installation Warranty for the installed aluminium windows and doors can be **FOUND HERE**.

Provide all necessary Producer Statements.

10 GLAZING

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:

1170.0:2002(AS/NZS)	Structural design actions - Part 0: General principles
1170.1:2002(AS/NZS)	Structural design actions - Permanent, imposed and other actions
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
8500:2006(NZS)	Safety barriers and fences around swimming pools, spas and hot tubs
AS/NZS 4666:2012	Insulating glass units
NZBC B1/VM1	Structure
NZBC B2/AS1	Durability
NZBC F2	Hazardous Building Materials
NZBC F9	Means of Restricting Access to Residential Pools

10.3 Non-Structural Glazing

10.3.1 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.

10.3.2 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.

10.3.3 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.

10.3.4 Glass Type

10.3.4.1 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:

10.3.4.2 Low-E Glass

Low Emissivity Glass. Heat-reflective coated surface, 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.

10.3.4.3 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.

10.3.4.4 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.

10.3.5 Insulating Glass Units

10.3.5.1 Special Double Glazing

Special Double Glazing. Air or gas-filled, sealed insulating glass units (IGUs), complying with NZS 4223.2. Glass type as specified and in accordance with NZS 4223.1 and NZS 4223.3. 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.

10.3.6 Components & Accessories

10.3.6.1 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.

10.3.7 Installation

10.3.7.1 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.

10.3.8 Glass Barriers

Glass balustrades and fences that are fully framed, unframed or partly framed or structural shall comply with section 22 of NZS 4223.3.

New structural glass barriers shall comply with NZBC B1/AS1 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.

10.3.9 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.

10.3.10 Edge Finishing

Flat and polished exposed edges to all frameless glass doors and screens, and where noted on the drawings.

10.3.11 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.

10.4 Juralco Balustrade System

10.4.1 Scope

10.4.1.1 Scope

Supply and install Juralco Balustrade System, as specified herein, to the locations and details shown on the design drawings, complete with all necessary components and accessories required for proper installation and performance. All aspects of this work shall comply with the NZ Building Code (check http://www.building.govt.nz/building-code-compliance), related Juralco Balustrade System technical literature and publications (check http://www.juralco.co.nz/products/balustrade-systems) or email specify@juralco.co.nz, or call 0508 880 088 for the latest editions), and other relevant product manufacturers' recommendations.

No substitutions are permitted for Juralco Balustrade System.

For the purpose of this specification, the Balustrade System is referred to as 'Juralco Balustrade system', and all Juralco Aluminium Building Products associated technical literature and publications, including the Product Technical Statement, installation instructions and drawings, are collectively referred to as the 'Technical Literature'.

Juralco Balustrade System are designed for residential and commercial buildings with an occupancy type classification as shown in AS/NZS1170.1 Table 3.3, and are suitable for decks, balconies and stairways in exterior and interior situations. Refer to Balustrade clause for the specific occupancy type classification for each of the Balustrade system element types.

Structural glass barriers safeguarding a fall of 1000mm or more shall have interlinking rails in accordance with NZBC B1/AS1 7.3.1 except when permitted otherwise therein.

10.4.1.2 Extent Of Work

The following is a list and/or general description of the extent of the Juralco Balustrade System works, which are more specifically defined in the contract documents, required for the completion of the contract works.

10.4.2 Requirements

10.4.2.1 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 (http://www.worksafe.govt.nz) Approved Codes of Practice and WorkSafe Information and Guidance, particularly those for construction and building maintenance.

10.4.2.2 Warranty

Juralco Balustrade System Warranty - according to the warranty terms and conditions.
- 5-year product warranty for Juralco Balustrade System materials and installation.
- Provide this warranty on the standard warranty form (https://www.juralco.co.nz/assets/Uploads/Juralco-Warranty-Sheet-JUN-2021.pdf)
- Commence the warranty from the date of permanent installation.
- Where specified, include a warranty for the powder coated aluminium finish - according to the warranty terms and conditions.
- Where specified, include a warranty for the anodised aluminium finish - according to the warranty terms and conditions.

Include a copy of the manufacturer's maintenance requirements with the warranty.

10.4.2.3 Substitutions

The Juralco Balustrade System shall be as specified herein and on the design drawings. The substitution of the Juralco Balustrade System for an alternative brand, system or product is not permitted under any circumstances.
The substitution of a specified Juralco Balustrade System or component for an alternative Juralco Balustrade System or component 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 an alternative Juralco Balustrade System or component to satisfy design, performance, and compliance requirements, then the cost of these shall be borne by the Contractor. The use of interlinking rails on all Juralco Balustrade System safeguarding a fall of 1000mm or more shall be in strict accordance with the requirements of NZBC B1/AS1 7.3.1.

10.4.2.4 Samples

As required, provide samples of the specified Juralco Balustrade System, including clamp, covers, glass, interlinking rail, and aluminium finish and colour, all as agreed, for verification by the Contract Administrator. Fabrication should not commence until approval has been gained.

10.4.2.5 Producer Statement (PS1)

Upon request, the balustrade manufacturer shall furnish a completed Producer Statement PS1 (Design) as confirmation that the specified Juralco Balustrade System, as designed and documented, complies with the relevant clauses of the New Zealand Building Code. The Producer Statement shall be prepared as part of the shop drawing process. The PS1 Producer Statement shall not serve as a product warranty or guarantee of compliance.

10.4.2.6 Producer Statement (PS3)

The Juralco Balustrade System installer shall furnish a fully completed PS3 Producer Statement (Construction) at time of application for Code Compliance Certificate. The Producer Statement shall accurately reflect the scope of the installation of the balustrade in accordance with the consented drawings and specifications.

10.4.2.7 Producer Statement (PS4)

Furnish a fully completed Producer Statement PS4 (Construction Review) as confirmation that the Juralco Balustrade System as constructed complies with the relevant requirements of the Building Consent and Building Consent Amendments, with respect to the relevant clauses of the New Zealand Building Code. The Producer Statement PS4 shall be accompanied by records of the construction monitoring undertaken to support the opinion of compliance. The Producer Statement PS4 shall be submitted by the Contractor with the application for Code Compliance Certificate of the contract works.

10.4.2.8 Inspections & Reporting

BCA inspections shall take place at each of the stages as scheduled in the Building Consent. Confirm a written programme to facilitate these inspections, including notification when each stage of the work is ready for inspection.
Carry out all necessary pre-installation and installation inspections for each area of the works.
Complete all necessary Pre-Installation Checklists prior to installation, and all necessary Installation Checklists.
Complete all necessary Final Checklists and Installation Sign-Off Certificates before handing over completed work.

10.4.2.9 Quality Assurance

Maintain and comply with industry-recognised quality control and assurance procedures to ensure that all stages of the work are carried out to the highest standard.

10.4.2.10 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 Juralco Balustrade System materials and work shall be repaired and/or replaced to the satisfaction of the Contract Administrator without delay and at no additional cost to the Principal.

10.4.3 Edgetec Infinity Balustrade System

10.4.3.1 Edgetec Infinity Balustrade System - Face-Fixed

Juralco Infinity Balustrade system, Face-Fixed. A full-height Balustrade System incorporating sections of Glass between the bottom Infinity clamp support and the underside of the handrail/top-rail, and connected to (Face-Fixed) the supporting structure.

General Details:

- Material: Glass – As specified - refer to ‘Glass clause’ Aluminium extrusion, components and hardware profiles manufactured from 6060 T5 aluminium alloy.

- Handrail/Top-Rail Profile: As specified - refer to 'Handrail/Top-Rail Profile' clause in this section.
- Horizontal Baluster: Glass section – refer to ‘Glass’ clause

- Infinity Clamp Support – 150 mm x 124 mm aluminium straight clamp (JET/IB/CB), or internal aluminium corner clamp(JET/IB/INCNRBLK) or external aluminium corner clamp (JET/IB/EXCNRBLK)
- Finish: As specified - refer to 'Finish' clause.
- Fixing: Side-Fixed assembly using stainless steel fixings as per the Technical Literature and design drawings.
- Fix to Concrete – Infinity clamp support - with M12 stainless steel threaded-stud, stainless steel washer and Fischer FIS-V mortar adhesive.
- Fix to Timber – Double Joist - Infinity clamp support - with M12 stainless steel threaded rod with stainless steel square washer, or with M12 stainless steel lagscrew, or with M12 stainless steel coachscrew (coachscrew fixing only can be used up to and including very high wind zone).
Fix to Timber – Triple Joist - Infinity clamp support - with M12 stainless steel threaded rod with stainless steel square washer, or with M12 stainless steel lagscrew or M12 coachscrew.
- Fix to Steel section – Infinity clamp support – with M12 stainless steel threaded rod with stainless steel washer.
Assembled and installed to comply with NZS 8500 and in accordance with the Technical

Literature and as indicated on the design drawings.

10.4.4 Handrail/Top-rail profile

10.4.4.1 Interlinking Toprail (JEB/222/5.8)

Juralco Balustrade system -Rectangular Toprail profile – A Rectangular profile Toprail. To the finish specified. Assembled and installed on side of the balustrade post as per the Technical Literature and design drawings.

10.4.5 Aluminium Finish

10.4.5.1 Dulux Duratec

Powder Coated Aluminium – DULUX Duratec

Juralco Balustrade aluminium components shall be powder coated with DULUX Duratec – to the colour specified. Nominal 50-90 micron thick coating (minimum 50 microns). Provide a 25-year warranty on film integrity and a 20 year warranty on colour integrity.
DULUX Duratec achieves the requirements for AAMA 2604-10 performance standard.
DULUX Duratec is suitable for coastal and high-rise commercial applications situated in NZS3604-2011 Exposure Zones B, C, & D.
DULUX Duratec coatings shall be factory-applied by a Dulux Registered Applicator to the requirements of AS 3715 and to fully comply with all DULUX NZ Ltd warranty requirements.
All substrate preparation, treatment, powder coating application and finishing techniques shall be exactly as recommended by the Manufacturer.

10.4.6 Glass

10.4.6.1 12 mm Clear Toughened Glass

Juralco Balustrade system Glass infill panels shall be manufactured from 12mm thick, clear, toughened 'Grade A' safety glass complying with AS/NZS 2208, AS/NZS 4667 and in accordance with NZS 4223-3-2016 requirements. All cutting, holing, edge finishes and other processing must be done prior to toughening.
Glass infill panels are supported by the selected Balustrade system, seated in rebate.
Glass panels shall be supplied and installed by Juralco approved installer as a component of the balustrade system and shall comply with the requirements of the NZ Building Code and the Building Consent.

10.4.7 Ancillary Components & Accessories

10.4.7.1 Stainless Steel Fittings

Stainless Steel Fixings. Juralco Balustrade stainless steel Fixings. Type, material grade (stainless steel) and minimum fixing penetration/embedment and edge distances for all fixings must be to the technical literature design and installation requirements. Fixings must be fitted as per the manufacturers specification.

10.4.8 Co-operation

10.4.8.1 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, as required, the assembly and installation of the Juralco Balustrade System to the required layout, details and tolerances.

10.4.9 Workmanship

10.4.9.1 Workmanship

Where required by the NZ Building Act 2004http://www.legislation.govt.nz/act, it is the building contractor's responsibility to ensure that all restricted building work is carried out by a Licensed Building Practitioner (http://www.lbp.govt.nz).
Fabrication and installation of the Juralco Balustrade System shall only be carried out by Juralco Approved Fabricators and Installers, familiar with the specified products and their fabrication and installation techniques, in accordance with the manufacturer's requirements and Technical Literature, and with the warranty requirements.

All fabrication and installation techniques shall be exactly as recommended by Juralco. All work shall be such as to leave a neat, efficient, robust and structurally sound installation, to the required standard and free from damage and defects. Prevent contact between dissimilar metals with neoprene washers.
Take all reasonable measures during fabrication and installation to protect the balustrade components, glass panels and aluminium finish from damage and surface marking. Provide temporary safety markings to glass infill panels as necessary until completion. Carry out routine cleaning of this work as necessary.

Make all necessary provisions to protect adjacent finished work and surfaces from damage during installation.

10.4.10 Delivery & Handling

10.4.10.1 Delivery & Handling

Take delivery of materials and accessories undamaged and in good condition. Reject any item found to be defective or damaged and contact the manufacturer/supplier for replacement.
Store components and accessories undercover in a secure and weatherproof space, off the floor, on a flat and level surface in accordance with the manufacturer's requirements. Ensure stored items are protected from damage and contamination and imposed loads until required for installation.
Do not use damaged or defective materials, or products that are beyond their designated shelf life.
Should a problem be encountered with any Juralco Balustrade System item during use or delivery, immediately contact Juralco on 0508 880 088. Do not continue to use the item that is not performing to specification or expectation. Keep the item in question and where possible, the packaging and/or manufacturer's details.
Handle materials in accordance with the manufacturer's requirements and in a manner that prevents damage and marking and does not reduce its performance.
Installers shall be familiar with, and comply with, the manufacturer's safe handling requirements and precautions for use, and shall use appropriate safety gear as necessary.
Installers shall conform to all relevant WorkSafe NZ Guidelines and Codes of Practice (http://www.worksafe.govt.nz)- including the OSH Guidelines For the Provision of Facilities and General Safety in the Construction Industry.

10.4.11 Preparation

10.4.11.1 Preparation

Supporting structures shall comply with the NZ Building Code (http://www.building.govt.nz/building-code-compliance), and must be structurally sound and dimensionally stable and in the correct alignment, true to line and level (and grade for sloped balustrades).
Confirm the location of all movement control joints prior to the commencement of the works.
Concrete:
- Supporting reinforced concrete elements shall comply with NZS 3101, or NZS 3604.
- New concrete must have aged for a minimum of 28 days prior to installation.

Concrete Masonry:
- Supporting reinforced concrete masonry elements shall comply with NZS 4229, or NZS 4230 and AS/NZS 1170.

Timber Framing:
- Supporting timber-framed structures shall comply with NZS 3604, or NZS 3603 and AS/NZS 1170.

Structural Steel:
- Supporting steel structures shall comply with NZS 3404.

10.4.12 Installation

10.4.12.1 Installation

Install Juralco Balustrade System in accordance with Juralco installation requirements and Technical Literature.

10.4.13 Completion

10.4.13.1 Completion

Check the Juralco Balustrade System have been correctly installed in accordance with the manufacturer's requirements to the locations, layout and details shown on the design drawings.
Check the installation for damage and defects, including surface marking. Carry out any necessary repairs in accordance with Juralco requirements to the required standard. Replace balustrade elements where repair is not possible or will not be accepted.
Leave all this work complete, clean and free from damage and defects, and to the required standard in accordance with the manufacturer's requirements.
Leave 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 manufacturer's maintenance requirements and a copy of the Juralco Balustrade System Warranty.
Provide all necessary Producer Statements.

11 INSULATION

11.1 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.

11.2 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:

4218:2009(NZS)	Thermal insulation - Housing and small 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

11.3 Pink Batts Insulation

11.3.1 Scope

Supply and install Pink® Batts® Insulation, 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 Tasman Insulation technical information and installation requirements (check pinkbatts.co.nz, call 0800 746 522, or email customer@pinkbatts.co.nz for the latest editions), other relevant product manufacturers' recommendations, and as shown on the drawings.

No substitutions are permitted for Pink® Batts® Insulation.

Pink® Batts® insulation is certified under the GREENGUARD Certification Program (UL 2818). Being certified for indoor air quality gives an assurance that products meet strict chemical emissions limits (including minimal levels of VOCs and formaldehyde), to help create healthier indoor environments.

The following is a list and/or general description of the extent of the Pink® Batts® Insulation works, which are more specifically defined in the contract documents, required for the completion of the contract works:

11.3.2 Requirements

11.3.2.1 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.

11.3.2.2 Warranty - applies to BRANZ Appraised Pink® Batts® Ceiling & Wall products

Pink® Batts® Lifetime Product Warranty:

- 50 Years Warranty for BRANZ Appraised Pink® Batts® ceiling and wall products installed according to the warranty conditions.
- Provide the Pink® Batts® Lifetime Product Warranty on the manufacturer's standard warranty form.
- Commence the warranty from the date of permanent installation.

11.3.2.3 Substitutions

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

The substitution of a specified Pink® Batts® product for an alternative Pink® Batts® branded product by the Installer (PinkFit® or other) 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 Pink® Batts® branded products to satisfy design, performance and compliance requirements, then the cost of these shall be borne by the Installer.

11.3.2.4 Inspections

Carry out all necessary pre-installation and pre-line inspections of Pink® Batts® Insulation for each area of work in accordance with the requirements of industry best practice recommendations and manufacturer guidelines.

Complete a Pre-Installation Checklist prior to installation, and a Pre-Line Checklist before handing over for subsequent work.

Note: Pink® Batts® checklist applies only to Pinkfit.

11.3.3 Wall Thermal Insulation

11.3.3.1 Pink® Batts® R1.2 Masonry Wall

Pink® Batts® R1.2 Masonry Wall - product code 7160134. A non-combustible, resin bonded fibrous glasswool insulation manufactured from recycled and virgin glass and cured urea extended phenolic resin. R-value R-1.2. 50mm thick x 580mm wide x 1220mm long segments.

Pink® Batts® Masonry Wall insulation is specifically designed to be installed between vertical strapping members fixed to solid concrete/masonry walls. It is recommended that an absorbent building paper or a waterproof membrane is placed between the insulation and the concrete.

BRANZ Appraised for use as a thermal insulating material for framed or part-framed walls, ceilings and roofs of domestic and commercial buildings according to the conditions and limitations of BRANZ Appraisal No.238. Refer to product data -https://www.pinkbatts.co.nz/assets/Products/April-2022-changes-/Wall-Product-Sheet_April22_1075-RevF.pdf

Installed as thermal insulation to strapped concrete/masonry wall to the locations shown on the drawings in accordance with the manufacturer's requirements.

11.3.3.2 Pink® Batts® Ultra® R3.2 140mm Wall

Pink® Batts® Ultra® R3.2 140mm Wall - product code 7127132. A non-combustible, resin bonded fibrous glasswool insulation manufactured from recycled and virgin glass and cured urea extended phenolic resin. R-value R-3.2. 140mm thick x 560mm wide x 1140mm long segments.

BRANZ Appraised for use as a thermal insulating material for framed or part-framed walls, ceilings and roofs of domestic and commercial buildings according to the conditions and limitations of BRANZ Appraisal No.238. Refer to product data - https://www.pinkbatts.co.nz/assets/Products/April-2022-changes-/Wall-Product-Sheet_April22_1075-RevF.pdf

Pink® Batts® Ultra® R3.2 140mm Wall is licenced with Environmental Choice New Zealand: Thermal Building Insulants Licence No.2504017.

Installed as wall cavity thermal insulation to the locations shown on the drawings in accordance with the manufacturer's requirements.

11.3.4 Ceiling Thermal Insulation

11.3.4.1 Pink® Batts® Superbatts® R4.5 Ceiling

Pink® Batts® Superbatts® R4.5 Ceiling - product code 7113145. A non-combustible, resin bonded fibrous glasswool insulation manufactured from recycled and virgin glass and cured urea extended phenolic resin. R-value R-4.5 - 210mm thick x 460mm wide x 1220mm long segments.

Pink® Batts® ceiling insulation is a lightweight flexible glasswool insulation product designed to:

- thermally insulate ceilings in new homes, be retrofitted into existing homes without insulation, or over existing insulation for better performance;
- fit easily into standard ceiling constructions, or be easily cut to fit non-standard constructions;
- meet the requirements of the New Zealand Building Code for different designs and environments.

Pink® Batts® Ultra® R4.5 Ceiling is BRANZ Appraised - refer to BRANZ Appraisal No.238.

Pink® Batts® Ultra® R4.5 Ceiling is licenced with Environmental Choice New Zealand: Thermal

Building Insulants Licence No.2504017. Refer to data - https://www.pinkbatts.co.nz/assets/Uploads/Downloads/Roof-and-RTA-Data-Sheet-February-2023.pdf

Installed as ceiling thermal insulation to the locations shown on the drawings in accordance with the manufacturer's requirements.

11.3.4.2 Pink® Batts® Superbatts® R6.0 Ceiling

Pink® Batts Superbatts® R6.0 Ceiling - product code 7113160. A non-combustible, resin bonded fibrous glasswool insulation manufactured from recycled and virgin glass and cured urea extended phenolic resin. R-value R-6.0 - 245mm thick x 460mm wide x 1220mm long segments.

Pink® Batts® ceiling insulation is a lightweight flexible glasswool insulation product designed to:

- thermally insulate ceilings in new homes, be retrofitted into existing homes without insulation, or over existing insulation for better performance;
- fit easily into standard ceiling constructions, or be easily cut to fit non-standard constructions;
- meet the requirements of the New Zealand Building Code for different designs and environments.

Pink® Batts® Ultra® R6.0 Ceiling is BRANZ Appraised - refer to BRANZ Appraisal No.238.

Pink® Batts® Ultra® R6.0 Ceiling is licenced with Environmental Choice New Zealand: Thermal

Building Insulants Licence No.2504017. Refer to data - https://www.pinkbatts.co.nz/assets/Uploads/Downloads/Roof-and-RTA-Data-Sheet-February-2023.pdf

Installed as ceiling thermal insulation to the locations shown on the drawings in accordance with the manufacturer's requirements.

Installed Location:

11.3.4.3 Pink® Batts® Skillion Roof R4.5

Pink® Batts® Skillion Roof R4.5 - product code 7110245. A non-combustible, resin bonded fibrous glasswool insulation manufactured from recycled and virgin glass and cured urea extended phenolic resin. R-value R-4.5. 165mm Max. thickness x 432mm wide x 1220mm long segments.

Pink® Batts® Skillion Roof insulation products are specifically designed for skiillion roofs, and provide high levels of thermal performance while ensuring the maximum thickness the segments can achieve.

Pink® Batts® Skillion Roof insulation has been BRANZ Appraised for use as a thermal insulating material for timber framed skillion roofs of domestic and commercial buildings - refer to BRANZ Appraisal No.767.

Pink® Batts® Skillion Roof R4.5 is licenced with Environmental Choice New Zealand: Thermal Building Insulants Licence No.2504017.

Installed as ceiling thermal insulation to the locations shown on the drawings in accordance with the manufacturer's requirements.

11.3.4.4 Pink® Superbatts® Skillion Roof R6.0

Pink® Superbatts® Skillion Roof R6.0 - product code 7113260. A non-combustible, resin bonded fibrous glasswool insulation manufactured from recycled and virgin glass and cured urea extended phenolic resin. R-value R-5.0. 230mm Max. thickness x 560mm wide x 1220mm long segments.

Pink® Superbatts® Skillion Roof insulation products are specifically designed for skillion roofs, and provide high levels of thermal performance while ensuring the maximum thickness the segments can achieve.

Pink® Superbatts® Skillion Roof insulation has been BRANZ Appraised for use as a thermal insulating material for timber framed skillion roofs of domestic and commercial buildings - refer to BRANZ Appraisal No.767.

Installed as ceiling thermal insulation to the locations shown on the drawings in accordance with the manufacturer's requirements.

11.3.5 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 trades to install Pink® Batts® Insulation as required.

11.3.6 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.

The building envelope must be fully enclosed and weatherproof, with construction materials framing at or below the required moisture content, before insulation installation commences.

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

Carry out all necessary pre-installation and pre-line inspections of Pink® Batts® Insulation for each area of work in accordance with the requirements of industry best practice recommendations and the manufacturer's guidelines. Inspect all Pink® Batts® insulation work before it is closed off with linings or made inaccessible.

Insulation shoud be installed without leaving gaps or compresing the material. Always maintain full insulation thickness to ensure that the stated thermal and acoustic values are achieved. Do not install insulation into closed cavities with a cavity depth less than the insulation's stated thickness.

11.3.7 Delivery & Handling

Store the Pink® Batts® Insulation materials undercover, in a weatherproof environment, off the floor, on a flat, even surface in accordance with the manufacturer's requirements. Keep materials dry and protected from damage, moisture and contamination at all times.

Do not use damaged or defective materials.

Should a problem be encountered with any Pink® Batts® Insulation product, immediately contact Pink® Batts® on 0800 746 522. Do not continue to use the product that is not performing to specification or expectation. Keep the product in question and where possible, the bale package documentation with batch number and/or date of manufacture.

Handle Pink® Batts® Insulation products in accordance with the manufacturer's requirements and in a manner that prevents damage to and contamination of the product. Ensure installed Pink® Batts® Insulation remains dry at all times.

Installers shall be familiar with and comply with the manufacturer's https://www.pinkbatts.co.nz/assets/Products/April-2022-changes-/Pink-Batts-Insulation-SDS-v-1.6.pdfprecautions for use, and use recommended safety gear when handling materials.

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.

11.3.8 Installation

11.3.8.1 General

Install Pink® Batts® Insulation in accordance with NZS 4246 and the manufacturer's requirements.

Each installation is unique, so prior to installation:
- check for all hazards that may cause injury; and
- carry out any required repair work before starting installation; and
- ensure there’s adequate lighting to identify any hazards; and
- treat all electrical cables as live, being careful not to cut or expose cables and wires; and
- beware of other sharp objects (protruding nails, splinters etc.), pests (bees and wasps), loose boards and pipe work.

11.3.8.2 Pink® Batts® Wall

Pink® Batts® wall insulation segments shall be oversized by no more than 10mm than the wall framing spacings. If cutting is required, cut oversize by 5mm to ensure a good friction fit.

Friction fit the insulation segments between wall framing members ensuring there is no undue compression, gaps, creases, tucks or folds, and the insulation is finished flush with the framing edges.

Firmly butt all insulation segment joins together, ensuring there are no gaps, and maintain full thickness of the insulation to ensure maximum thermal performance.

Refer to installation instructions - https://www.pinkbatts.co.nz/assets/Products/April-2022-changes-/Wall-Installation-instructions_April22_1076RevH.pdf

Fit Pink® Batts® insulation tight and close around electrical cables and pipes. As necessary, partially cut and fit insulation around cables and pipes. Take extreme care when working around exposed electrical cables - treat all cables as live.

11.3.8.3 Pink® Batts® Masonry Wall

It is recommended that an absorbent building paper or a waterproof membrane is placed between the insulation and the concrete prior to the installation of Pink® Batts® Masonry Wall insulation.

Pink® Batts® Masonry Wall insulation segments shall be oversized by no more than 10mm wider than spacings between the strapping spacings.

Friction fit the insulation segments between strapping members ensuring there is no undue compression, gaps, creases, tucks or folds, and the insulation is finished flush with the framing edges.

Firmly butt all insulation segment joins together, ensuring there are no gaps, and maintain full thickness of the insulation to ensure maximum thermal performance.

Refer to installation instructions - https://www.pinkbatts.co.nz/assets/Products/April-2022-changes-/Wall-Installation-instructions_April22_1076RevH.pdf

Fit Pink® Batts® insulation tight and close around electrical cables and pipes. As necessary, partially cut and fit insulation around cables and pipes. Take extreme care when working around exposed electrical cables - treat all cables as live.

11.3.8.4 Pink® Batts® Ceiling - Truss/Framed Roof

Pink® Batts® insulation segments shall be oversized by no more than 10mm wider than the ceiling framing spacings.

Lay the insulation segments over the ceiling, friction fitted between the ceiling joists/truss chords, ensuring there is no undue compression, gaps, creases, tucks or folds in the insulation.

Firmly butt all insulation segment joins together, ensuring there are no gaps, and maintain full thickness of the insulation to ensure maximum thermal performance.

Cover the entire ceiling, including the outer edge of the top plate of external walls - the insulation must cover at least 50% of external top plates.

Maintain a minimum 25mm clearance between the top of the ceiling insulation and any roofing material, including underlay. If required, trim the insulation or use a thinner product around the perimeter.

Refer to installation instructions - https://www.pinkbatts.co.nz/assets/Uploads/Downloads/Roof-Installation-Instructions-February-2023.pdf
& https://www.pinkbatts.co.nz/assets/Uploads/Downloads/Pink-Superbatts-Installation-Instructions-April-2023-v2.pdf

Ensure that the appropriate clearances are maintained for electrical equipment, heating and ventilation equipment, heated flues and pipes, etc. Where possible, place insulation beneath electrical wiring and plumbing. Take extreme care when working around exposed electrical cables - treat all cables as live.

11.3.8.5 Pink® Batts® Skillion Roof

Pink® Batts® Skillion Roof insulation segments shall be oversized by no more than 10mm wider than the rafter spacings.

Friction fit insulation segments between rafters/top chords, behind ceiling battens where provided, ensuring there is no undue compression, gaps, creases, tucks or folds in the insulation.

Maintain a minimum 25mm clearance between the top of the insulation and any roofing material, including underlay.

Firmly butt all insulation segment joins together, ensuring there are no gaps, and maintain full thickness of the insulation to ensure maximum thermal performance.

Cover the entire area, including the outer edge of the top plate of external walls - the insulation must cover at least 50% of external top plates.

Refer to installation instructions - https://www.pinkbatts.co.nz/assets/Uploads/Downloads/Skillion-Roof-Installation-Instructions-February-2023.pdf

Ensure that the appropriate clearances are maintained for electrical equipment, heating and ventilation equipment, heated flues and pipes, etc. Where possible, place insulation beneath electrical wiring and plumbing. Take extreme care when working around exposed electrical cables - treat all cables as live.

11.3.9 Completion

Check that all specified Pink® Batts® Insulation products have been installed correctly in accordance with the manufacturer's requirements.

Check for damage and defects - replace damaged and defective insulation as necessary to the required standard.

Ensure the installed insulation will be adequately protected for durability and performance in accordance with the manufacturer's warranty requirements.

Leave all of this work complete, and in the condition required for proper performance, including for the installation of subsequent linings, in accordance with the manufacturer's warranty requirements.

Leave adjacent surfaces and finished work clean and free of damage. Remove all associated rubbish and waste material from site.

Issue to the Owner a copy of the Pink® Batts® Lifetime Product Warranty for all Pink® Batts® Insulation products installed.

12 PLUMBING

12.1 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.

12.2 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
3500.1:2021(AS/NZS)	Plumbing and drainage, Part 1: Water services
3500.2:2015(AS|NZS)	Plumbing and drainage - Part 2: Sanitary plumbing and drainage
3500.2:2021 (AS|NZS)	Plumbing and drainage Part 2: Sanitary plumbing and drainage
3500.2:2021(AS|NZS)	Plumbing and drainage, Part 2: Sanitary plumbing and drainage
3500.3:2018(AS|NZS)	Plumbing and drainage Part 3: Stormwater drainage
3500.3:2021(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
3500.4:2021(AS|NZS)	Plumbing and drainage, Part 4: Heated water services
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
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 B2/AS1	Durability
NZBC G11	Gas as an Energy Source
NZBC G12	Water Supplies
NZBC G13/AS1	Sanitary Plumbing

12.3 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.

12.4 Materials

12.4.1 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.

12.4.2 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.

12.5 Workmanship

12.5.1 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.

12.5.2 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.

Observe best local trade practice to avoid problems which arise from freezing winter conditions.

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.

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

12.5.3 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.

12.5.4 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 watertight 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.

12.5.5 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.

12.6 Systems

12.6.1 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.

Fit bird proof domes to all vents.

12.6.2 Cold Water System

12.6.2.1 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 15mm 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).

12.6.3 Hot Water System

12.6.3.1 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 50°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.

12.6.4 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.

Test the full systems to all relevant requirements; if any faults are discovered rectify them and then re-test the full system.

Check that all necessary flues comply in all respects with the regulations and the item manufacturer’s requirements.

13 GAS

13.1 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.

13.2 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

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

13.3.1 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.

13.3.2 Requirements

13.3.2.1 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.

13.3.2.2 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).

13.3.2.3 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.

13.3.2.4 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.

13.3.2.5 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.

13.3.2.6 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.

13.3.2.7 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).

13.3.2.8 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.

13.3.2.9 Enclosed Pipework

Where pipework is installed in an enclosed space, the enclosed space shall be ventilated in accordance with NZBC E2/AS1. Pipework installed under floor spaces shall be suspended clear of the ground by a minimum of 100mm. Pipework installed in unventilated and/or inaccessible spaces shall be installed without joints - where joints are unavoidable in unventilated and/or enclosed spaces, each joint shall be inspected, tested and proved sound before the pipework is concealed. Do not install pipework in lift wells, air ducts, plenum ceilings, air handling plena, laundry/clothes chutes, rubbish chutes, ventilating ducts, fire hydrant cupboards or fire isolated stairways.

13.3.3 LPG Cylinders

13.3.3.1 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:

13.3.3.2 Location of Cylinders

Except where permitted by AS/NZS 1596, all LPG cylinders and associated equipment shall be installed to the exterior of the building in accordance with the requirements AS/NZS 5601.1: Section J3.

Where the LPG storage capacity does not exceed 100 kg, the minimum clearance and separation distances around the cylinder installation shall be in strict accordance with AS/NZS 5601.1: Section J5 (for New Zealand).

Where the LPG storage capacity is between 100kg to 300kg, the cylinder installation shall comply with the Environmental Protection Authority Approved Code of Practice HSNOCOP 50.

Install LPG cylinders to the specified location indicated on the approved drawings. Should a conflict arise between the specified location and the requirements of AS/NZS 5601.1: Section J3, seek advice from the Architect/Designer before proceeding.

Installed Location:

13.3.3.3 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.

13.3.3.4 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.

13.3.3.5 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.

13.3.3.6 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.

13.3.4 Changeover Valves

13.3.4.1 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.

13.3.5 Copper Piping

13.3.5.1 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.

13.3.6 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.

13.3.7 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.

13.3.8 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 Worksafe Guidelines For the Provision of Facilities and General Safety in the Construction Industry.

13.3.9 Commission

13.3.9.1 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.

13.3.10 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.

14 DRAINLAYING

14.1 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.

14.2 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:

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
2032:2006(AS/NZS)	Installation of PVC pipe systems
3500.0:2003(AS/NZS)	Plumbing and drainage - Glossary of terms
3500.2:2018(AS|NZS)	Plumbing and drainage Part 2: Sanitary plumbing and drainage
3500.2:2021 (AS|NZS)	Plumbing and drainage Part 2: Sanitary plumbing and drainage
3500.3:2018(AS|NZS)	Plumbing and drainage Part 3: Stormwater drainage
NZBC G13/AS2	Foul Water Drainage

14.3 General

Carry out all required works to leave the sewer and stormwater systems shown on the drawings in correct working order complete with all normal incidentals.

Comply with Local Authority By-laws and Health Department Regulations as appropriate. Obtain all necessary permits and consents, serve all necessary notices, arrange all tests and pay all fees and customary charges in connection with the works.

14.4 Foul Water Drainage

14.4.1 Scope

Supply, install, test and commission new, gravity-flow foul water drains on the site, to the locations, layout and details shown on the drawings, complete with all necessary components and accessories required for satisfactory completion and performance of the foul water drainage system. All aspects of this works shall comply with the requirements of the NZ Building Code, related compliance Standards, Regulations and Acts, and to the requirements of the Territorial Authority, and as specified herein and on the approved drawings and schedules. Ancillary work and/or services not specifically mentioned but necessary to complete the work to specified levels of performance shall be deemed included.

Install foul water drains in natural ground, beneath and external to the building, for the distances indicated on the drawings. Allow for all ventilation requirements, inspection openings, bends, branches, manholes, inspection chambers, overflow gully traps, etc., as required and indicated on the drawings. Unless shown otherwise, the foul water drains shall be connected to the building's sanitary drainage system, and discharge to the foul water network.

The foul water drainage plans are diagrammatic only. Allow for all necessary vents, inspection fittings, cleaning eyes, traps and venting in accordance with AS/NZS 3500.2 and to comply with the New Zealand Building Code, and as required by the Territorial Authority. Refer to the drawings for the dimensioned locations of sanitary waste pipes and outlets.

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

14.4.2 Requirements

14.4.2.1 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 'Worksafe Guidelines For the Provision of Facilities and General Safety in the Construction Industry', and the 'Excavation Safety - Good Practice Guidelines'

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

14.4.2.2 Compliance

Obtain all necessary permits and consents, serve all necessary notices, arrange all tests and pay all fees and customary charges in connection with the foul water drainage works.

The Drain Layer shall be deemed to have allowed for all work associated with the safe and orderly execution of the foul water drainage 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 work.

14.4.2.3 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.

14.4.2.4 Explosives

The use of explosives is NOT permitted.

14.4.2.5 Inspections

Inspections of foul water drainage works shall take place at each of the stages as scheduled in the Building Consent. Confirm a written programme to facilitate these inspections, including notification when each stage of the work is ready for inspection.

Obtain and pay all fees for any required inspections which are additional to the Building Consent.

14.4.2.6 Testing

Carry out all necessary testing of the foul water drainage installations, and demonstrate to the Contract Administrator and the controlling Territorial Authority that the installations are watertight and comply with the requirements of the New Zealand Building Code, related compliance Standards, and the design documents.

14.4.2.7 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.

Coordinate with other trades as necessary to install foul water drains to the required locations and layouts.

14.4.2.8 Workmanship

Foul water drainage work shall be carried out by qualified and experienced tradespersons, familiar with the required installation requirements, under the direct supervision of a NZ certified Registered Drainlayer, in accordance with AS/NZS 3500.2 in compliance with the New Zealand Building Code, and all local codes and regulatory authority requirements, and the conditions of the Building Consent.

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

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

Carry out all necessary inspections and tests during installation to ensure compliance with the design specifications and regulatory requirements. Provide test result sheets to the Contract Administrator to show compliance has been achieved.

Take all necessary measures during installation to protect the foul water drainage system from damage, and to prevent the entry of:
- extraneous water;
- soil, sand, or rock,
- the contents of any septic tank; or
- any other substance, the discharge or which could impede the operation of the foul water drainage network.

Ensure that any installed drain is adequately protected from any damage and excessive loading during the remaining construction period.

Protect adjacent finished work and surfaces from damage and contamination during installation. Any damage to fittings or finished surfaces shall be made good by the appropriate trade at the Drain Layer's expense.

Any associated electrical wiring and prescribed electrical work (by others) shall be carried out by a qualified electrician in accordance with the electrical standards and regulations and the Electrical specification.

14.4.2.9 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. All rejected foul water drainage materials and work shall be repaired and/or replaced to the satisfaction of the Contract Administrator, without delay and at no additional expense to the Principal.

14.4.2.10 Delivery & Handling

Store foul water drain pipes and accessories undercover, out of direct sunlight, clear of the ground, on an even surface, and protected from damage and contamination in accordance with the manufacturer's requirements. Keep pipes and accessories out of direct sunlight and protected from damage and contamination at all times.

Where possible, store pre-packed PVC pipes in the original delivery crate.
Store loose PVC pipes on evenly spaced bearers at maximum 1.0m centres, with pipe sockets alternated so the the sockets do not bear on each other, and with side supports if pipes are stacked more than two layers high. When loose PVC pipes are stacked in a pyramid, the maximum stack height shall be 1.0m and the bottom pipes shall be chocked.

Do not used damaged or faulty materials or products, or products that are beyond their designated shelf life. Do not use PVC materials that have been exposed to or stored in direct sunlight longer than the period specified by the manufacturer.

Handle all products and materials in accordance with the manufacturer's requirements, and in a manner that prevents damage or deterioration of the material/product.

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

Conform with all relevant WorkSafe NZ Guidelines and Codes of Practice - in particular the 'OSH Guidelines For the Provision of Facilities and General Safety in the Construction Industry' and the 'Excavation Safety - Good Practice Guidelines'.

14.4.2.11 As-Built Drawings

On completion and before application for Code Compliance Certificate, prepare As-Built Drawings of the foul water drainage system, that accurately record the new and/or modified foul water drainage installation.

Information shall include, but not limited to, type, class and size of all pipes, the location, grade and direction of flow of all pipes, the location of all bends, changes in direction, cleaning access positions, manholes, and all dimensions, levels, inverts, etc.

Submit prepared as-built drawings to the Contract Administrator for review. Issue as-built drawings in accordance with the Contract Administrator's instruction, and in the required format.

14.4.2.12 Warranties

On completion and before Practical Completion, provide all relevant manufacturer/supplier warranties in favour of the Principal, covering materials, equipment, proprietary products, etc., supplied and installed.

14.4.3 Materials

14.4.3.1 General

Supply and deliver to the site all pipes, fittings, precast manholes, granular bedding material and other materials required for incorporation in the drainlaying work. All drainlaying materials shall be fit for purpose and intended use, new, of good quality and free from defects, and as specified herein and on the approved drawings and schedules.

14.4.3.2 PVC-U Pipes & Fittings

PVC-U foul water drain pipes and fittings for non-pressure applications shall comply with AS/NZS 1260: 'PVC-U pipes and fittings for drain, waste and vent application'. Installed in accordance with AS/NZS 3500.2, and AS/NZS 2032 or AS/NZS 2566.2.

Pipe Classification:
Class SN4-SN6 - Rubber Ring Joint or Solvent Welded Joint. For domestic and residential applications, and low load areas.
Class SN8-SN10 - Rubber Ring Joint or Solvent Welded Joint. For commercial and industrial applications, and medium load areas.
Class SN16 - Rubber Ring Joint or Solvent Welded Joint. For heavy traffic load areas.

14.4.3.3 Gullies

Gully traps shall be of an approved type and installed in accordance with AS/NZS 3500.2 and the requirements of the Territorial Authority.

Gully traps shall be PVC construction, including dish and lid.

The overflow level of gully dishes shall be set no less than 25mm above paved surfaces, and no less than 100mm above unpaved surfaces.

Provide adequate support to gully riser and dish with compacted bedding or concrete.

Where subject to damage, protect gully traps with a smooth-finished concrete surround, or with 2:1 sand/cement mortar, surrounding the entire gully and separated from the building foundation, in accordance with AS/NZS 3500.2 and as shown on the drawings.

14.4.3.4 Insitu Concrete

Cast insitu concrete used for foul water drainage installation shall be 20 MPa Normal Concrete complying with NZS 3104. Where specified, used as bedding, capping and surround concrete, and for any cast-insitu concrete elements (to NZS 3104 unless specified otherwise).

14.4.3.5 Cement Mortar

Cement mortar shall consist of one part cement and two parts of fine aggregate measured by volume, properly mixed with the minimum amount of clean water necessary to render the mix workable. Do not use cement mortar that has been mixed and left standing for more than one hour.

14.4.3.6 Bedding & Surround Material

Except where specified otherwise on the drawings, bedding (underlay, side support, overlay) material shall be compacted clean granular non-cohesive material - crushed rock or gravel screenings - of nominal particle size range of 7-10mm with a maximum particle size of 20mm, that is free from organic material and clay, and have a moisture content appropriate to the degree of compaction required. If the bedding material is contaminated or an excessive amount of oversized particles are present, the bedding material shall be rejected and not used.

14.4.3.7 Backfill Material

Except where specified otherwise, backfill material above the pipe embedment layer (150mm above the top of pipe) shall be selected excavated material that is free from any builder's waste, any organic material, any rocks or hard matter larger than 20mm, and any soil lumps larger than 75mm.

Except where specified otherwise, pipes beneath private roadways and where subject to vehicular traffic - all backfill from the top of the embedment layer (150mm above top of pipe) to the underside of the pavement layer shall be GAP 65 - General All Passing 65mm.

Mechanically compact backfill material in layers not exceeding 300mm to a relative compaction no less than 95% of the NZ Standard Compaction.

Trenches in public footpaths and roads shall be backfilled in accordance with the requirements of the controlling authority.

14.4.3.8 Marking Tape

Marking tape shall be located just above the top of the pipe embedment zone, and centred over the pipe.

Non-Detectable Marking Tape:
- Non-detectable marking tape shall comply with AS/NZS 2648.1.
- Tape width shall be 100mm minimum.
- Height of message letters shall be 40mm minimum.

Detectable Marking Tape:
- Detectable marking tape shall comply with AS/NZS 2648.1.
- Tape width shall be 100mm minimum.
- Tracer wire shall be stainless steel grade 316 or copper alloy designation 122.

- Tracer wire shall allow at least 25% elongation of the plastic tape before breakage of the wire.
- Height of message letters shall be 40mm minimum.

14.4.4 Trench Excavation

14.4.4.1 Clearing of Surfaces

Where trenches are to be excavated in a grassed area, garden or a berm, the topsoil shall be stripped from the area of the excavation and stockpiled separately adjacent to the trench for use in reinstating the surface.

Where trenches are to be excavated in existing concrete or asphalt paved areas, the paving shall be cut to neat, straight lines, parallel to the trench prior to excavation, with a nominal 100mm trimming allowance either side of the excavation width. The excavation shall be carried out with minimal damage to the existing paved surface.

Where trenches are to be excavated in existing segmental paved areas, the pavers shall be removed by hand, cleaned and set aside for later reinstatement.

Subsequent trench backfill shall be adequately compacted to avoid subsidence of reinstated surfaces.

14.4.4.2 Excavation

Locate all existing buried services before commencing excavation work in any area.

Excavations for trenches and pits shall be properly executed and supported in accordance with the requirements of AS/NZS 3500.2.

Carry out excavation work to comply with all relevant health and safety regulations and guidelines, including the 'Excavation Safety - Good Practice Guidelines' where appropriate.

Unless specified otherwise, the excavation of trenches shall be taken out by open cut to the levels and grades shown or implied on the drawings. Excavate trenches to the depths which will provide for the appropriate type of bedding.

Trench excavations shall be of sufficient width to allow all operations necessary for the jointing of pipes and placing of the specified backfill. The bottom width of the trenches shall at least the combined measurement of the outside diameter of the pipe plus 200mm - with a minimum clearance of 100mm on each side of the drain barrel. The trench width at the top of the pipe shall not exceed the outside diameter of the pipe plus 600mm unless the pipe in the trench is covered with concrete. The trench above the top of the pipe may be cut wider, either by excavating a wider bench or by battering the trench wall.

14.4.4.3 Shoring

Make all necessary provisions for shoring trench walls to comply with all regulations and for health and safety measures.

Trench shoring materials and equipment must be suitable for the purpose for which they are to be used, of sound quality, and adequate in strength for the particular use.

Shoring shall be placed by experienced operators under competent supervision, and shall not be altered, dismantled, or interfered with except on the instruction of the authorised supervisor.

Ensure no voids are left in the backfill when shoring is removed, and the required compaction density of the backfill is achieved.

14.4.4.4 Dewatering

Take all necessary precautions to keep trenches and pits free from water. Provide all necessary pumps, drainage pipes and other equipments required for dewatering. Install all necessary filtering and detention measures required by the Territorial Authority.

If the bottom of the trench is likely to be adversely affected by rain, remove the final 80mm of excavation as a separate operation immediately before placing the bedding material.

14.4.5 Pipe Laying

14.4.5.1 Bedding Pipes

Provide a minimum 75mm thick underlay layer of well compacted bedding material for all pipes. A chase shall be excavated in the bedding to accommodate any jointing socket or fitting in the drain. The pipe embedment material shall be laid and compacted so that the pipe is evenly and continuously supported along its length on either side of the pipe, and with an overlay layer minimum 150mm thick.

When trench support systems are used, the bedding material shall be placed and compacted in a manner so that no loss of compaction results from removal of the trench side support systems. The trench support shall be removed in such a way as to ensure that the placing and compaction of the bedding material occurs below the trench supports and directly against the undisturbed ground of the trench walls.

After completion of the jointing and inspection of drain pipes, place and compact the bedding surround material around the pipe to the required depth over the pipe. The material shall be carefully placed around and over the pipe using hand tamping and in a manner that ensures the pipe is uniformly supported all round its perimeter and without voids. Take care during placement and compaction to ensure the pipe is not displaced or damaged.

14.4.5.2 Laying Pipes

Install foul water drains in accordance with AS/NZS 3500.2 to the layout, levels and grades shown on the drawings Drain pipes shall be laid to provide maximum falls, in straight lines and at an even grade, without obstruction to flow, and with full allowance for bedding.

Before installing the pipes, check the bore of each pipe is free from foreign matter and that the pipe exterior and the socket have not been damaged in handling or storage. All pipelines shall be kept clean and free of dirt and debris at all times during installation, testing and commissioning.

PVC-U foul water drain pipes shall be properly jointed (rubber ring joint or solvent welded joint) to produce a watertight seal in accordance with the manufacturer's instructions.

Start laying main drains at the point of outfall and insert junctions for branch drains as the work proceeds. Pipes shall be laid with the least number of bends, in the centre of the trench, in straight lines between bends, and to the grades and locations shown on the drawings.

Install all necessary fittings, including vents, inspection openings and access points, bends and junctions, to the locations shown on the drawings and in accordance with the manufacturer's instructions. Where not specified on the drawings or schedules, fittings for inspection openings, bends, junctions, etc., shall be selected from the PVC pipe system range of products and installed in accordance with the manufacturer's instructions.

Other than precautions against damage by displacement or floating pipes, no bedding surround material or backfill shall be placed until the laying of the drain has been inspected by the Territorial Authority.

14.4.5.3 Steep Gradients

Where the gradient of a foul water drain pipe exceeds 1:5 (20%), anchor blocks shall be installed at the bend or junction at the top and bottom of the inclined drain, and at intervals not exceeding 3m. Anchor blocks shall be constructed in accordance with AS/NZS 3500.2: Section 3.4.4.

14.4.5.4 Underground Drains Near & Under Buildings

Protect underground drains near and under buildings against damage in accordance with AS/NZ 3500.2 where the minimum cover specified cannot be provided.

14.4.5.5 Concrete Support

Concrete pads used to support foul water drains, gully traps, risers, etc., shall be minimum 100mm thick and in accordance with AS/NZS 3500.2: Section 5.3.

14.4.5.6 Jointing - Rubber Ring Joints

PVC-U drain pipes shall be jointed using rubber ring seals in preference to the solvent welded method - which shall be used where rubber ring jointed fittings are not manufactured. Only use seals and lubricants recommended by the pipe or fitting manufacturer. The marking of pipes by scoring is not permitted. All joints shall be watertight and prevent the infiltration of groundwater and the intrusion of tree roots.

Rubber ring joints shall be assembled in accordance with the pipe manufacturer's instructions and generally as follows:
- Ensure that all components are clean and free of dirt and debris during all stages of the jointing process;
- Ensure the pipe spigot is correctly chamfered and has a clearly visible witness mark to the correct insertion length;
- Clean and generously lubricate with jointing lubricant, especially the chamfer. Do not lubricate the ring groove;
- Where elastomeric seals are required to be fitted, clean and fit the seal, and check the elastomeric

seal sits evenly in the housing;
- Apply the manufacturer's specified lubricant to the end of the spigot and chamfer of the pipe;
- Keep the elastomeric seal and its housing free of lubricant, unless otherwise recommended by the manufacturer;
- Align the pipes so there is no deflection at the joint, then insert the spigot in the socket and push home to the witness mark;
- Hold the socket end firmly during the jointing to prevent previously assembled joints from moving;
- If excessive force is required and/or the jointing process does not comply with the manufacturer's instructions, disassemble and remake the joint.

Field cutting pipes:
- cut the spigot end square and remove all burrs;
- chamfer the cut end of the pipe with a taper of 15° to approx. half the wall thickness, or as specified by the pipe manufacturer;
- as appropriate, witness mark the pipe at the specified insert by the manufacturer.

14.4.5.7 Jointing - Solvent Cement Welded Joints

Solvent welded joints shall only be used for jointing PVC-U pipes and fittings where rubber-ring jointed fittings are not manufactured. Use only cleaner primers and solvent cements specified by the manufacturer for the application and socket type. Only sockets complying with the relevant Standard shall be installed. Do not use cleaner primers or solvent cements if the 'use by' date has expired. The marking of pipes by scoring is not permitted. All joints shall be watertight and prevent the infiltration of groundwater and the intrusion of tree roots.

Solvent welded joints shall be assembled in accordance with the manufacturer's instructions and generally as follows:
- Solvent welding shall only be carried out in dry conditions above 5°C.
- Ensure the components are dry, clean and free of dust, dirt, grease and surface contaminants during all stages of the jointing process.
- Prior to welding, the components shall be assembled dry and checked for position and alignment to ensure accurate re-assembly in the correct position.
- Mark the spigot with a witness mark (pencil, not scored) at a distance equivalent to the internal depth of the socket.
- Dry the spigot end, up to the witness mark, and the socket interior, then clean and degrease with a clean cloth moistened with the pipe or fitting manufacturer's specified priming fluid.
- Apply an even coating of solvent cement to the internal surface of the socket for the full engagement length, and to the external section of the spigot up to the witness mark.
- Only use the minimum amount of solvent cement in the socket necessary for a fully solvent-welded joint.
- Insert the spigot close to, but not beyond, the witness mark. Do not use excessive force. Firmly restrain the joint for the minimum period recommended by the pipe manufacturer.
- Wipe off excess solvent cement from the outside of the joint, and where possible from the inside.
- Adhere to the manufacturer's specified procedures and time frames for filling and testing pipework.
- Allow all solvent welded joints to fully cure before subjecting pipework to any imposed load or testing.

14.4.5.8 Pipe Cover

Unless specified otherwise on the drawings, the minimum pipe cover (finished surface to top of pipe) shall be:

- where not subject to vehicular loading: 300mm.
- where subject to vehicular loading - not in roadways: 500mm.
- where subject to vehicular loading - in sealed roadways: 500mm.
- where subject to vehicular loading - in unsealed roadways: 500mm.
- pipes in embankment conditions or subject to loading from heavy construction equipment: 750mm.

14.4.5.9 Marking Tape

Install marking tape on top of the pipe embedment zone and centred over the pipe before commencing backfilling.

14.4.6 Connection

14.4.6.1 On-Site - to Existing Foul Water Drain

Connect to discharge the new foul water drainage line to the existing, operational foul water drainage line on-site in accordance with the requirements of the Territorial Authority and as shown on the drawings.

14.4.7 Testing

14.4.7.1 Foul Water Drains

Test the foul water drainage installation, including all drains, connections and system components, for water tightness in accordance with the requirements of the Territorial Authority (TA).

Where required by the Territorial Authority, the testing shall be undertaken in the presence of a representative of the TA. Demonstrate to the Contract Administrator and the Territorial Authority that the installation complies with the requirements of the contract documents, related standards and regulatory bodies. Lodge all certificates of approval with the Contract Administrator.

Unless specified otherwise by the Territorial Authority, the test method shall be the Water Test procedure for non-pressure pipelines as defined in AS/NZS 2302. Where appropriate, the procedures in NZBC E1/VM1 may be used as an alternative. The acceptability of other test methods are be subject to the approval of the Territorial Authority and the Contract Administrator.

Provide all necessary plant, equipment and instruments required for the specified testing procedure. All testing and commissioning shall be undertaken by suitably skilled and experienced technicians.

Pressure testing shall be carried out after the pipes have been laid and the bedding material has been placed over the pipes as specified.

Prior to testing ensure that all pipe junctions and inspection eyes are exposed, and pipelines have been flushed and all residual debris cleaned out.

Foul water manholes shall be tested for watertightness by plugging all pipes and filling with water. After absorption has taken place the water level shall remain constant for thirty minutes.

Test results shall be recorded clearly on properly formatted Test Result sheets, and submitted to the Contract Administrator within 48 hours of completion of testing.

Repair or replace any materials or workmanship found to be defective or faulty during testing, and repeat the test until a satisfactory test result is achieved.

Leave the installation watertight and free of defects, and operating to the required performance standard.

The work shall be deemed incomplete unless all required testing and commissioning has been carried out and has passed the requirements of the testing specification and the Territorial Authority.

14.4.7.2 Water Test Procedure - to AS/NZS 2302

Water test procedure of foul water drains (non-pressure) - to AS/NZS 2302: Section 7.3.2.
- The pipeline shall be filled with water to a height of not less than 1m above the natural ground level at the highest point of the section being tested, or to the flood level of the lowest sanitary fixture, but not exceeding 5m at the lowest point of the test section.
- The pressure shall be maintained without leakage for at least 15 minutes.
- The source of any leaks shall then be ascertained and any defects repaired.
- The pipeline shall then be retested.

Note: Testing should not be carried out if groundwater is present above the pipeline. If groundwater is present, the test pressure should be increased to compensate for the depth of groundwater at a rate of 10 kPa for every 1m of groundwater depth.

14.4.8 Backfilling

14.4.8.1 Backfilling

Trenches shall be backfilled as soon as possible after the laying, inspecting and testing of the pipeline.

Where required, lay marker tape along the length of the drain, just above the top of the pipe embedment zone, before backfilling.

Trench backfill materials shall be placed over the pipe embedment, and compacted to restore the trench as near as practicable to the normal surrounding ground surface level and reduce the likelihood of subsidence. Backfill material shall be placed in uncompacted layers not exceed 300mm, then mechanically compacted to the required density.

Temporary trench support systems shall be lifted progressively above each layer of backfill to ensure each layer is compacted against undisturbed ground.

Any deficiencies of trench filling exposed by settlement shall be corrected to the required standard.

14.4.9 Reinstatement of Surfaces

14.4.9.1 Reinstatement of Surfaces

Refer to separate specification section - Siteworks - Reinstatement of Surfaces.

Ground and paved surfaces above excavated foul water drainage trenches shall be reinstated to the standard specified. Reinstatement shall generally achieve a standard equal to or better than the pre-existing situation - in no case will a lower standard be accepted.

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

14.5 Stormwater Drainage

14.5.1 Scope

Supply, install, test and commission new, gravity-flow stormwater drains on the site, to the locations, layout and details shown on the drawings, complete with all necessary components and accessories required for the satisfactory completion and performance of the stormwater system. All aspects of this works shall comply with the requirements of the NZ Building Code, related compliance Standards, Regulations and Acts, and to the requirements of the Territorial Authority, and as specified herein and on the design drawings and schedules. Ancillary work and/or services not specifically mentioned but necessary to complete the installation shall be deemed included.

Install stormwater drains in natural ground, beneath and/or external to the building, for the distances indicated on the drawings. Allow for all inspection openings, bends, branches, manholes, inspection chambers, etc., as required and indicated on the drawings. Unless shown otherwise on the drawings, the stormwater drains shall be connected to the roof and surface stormwater installations, and discharge to the stormwater network.

The stormwater drainage plans are diagrammatic only. Allow for all necessary inspection fittings, cleaning eyes, and traps in accordance with AS/NZS 3500.3 and to comply with the New Zealand Building Code, and as required by the Territorial Authority. Refer to the drawings for the dimensioned locations of roof drainage system rainwater pipes and outlets, and surface drainage outlets, etc.

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

14.5.2 Requirements

14.5.2.1 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 'Worksafe Guidelines For the

Provision of Facilities and General Safety in the Construction Industry', and the 'Excavation Safety - Good Practice Guidelines'

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

14.5.2.2 Compliance

Obtain all necessary permits and consents, serve all necessary notices, arrange all tests and pay all fees and customary charges in connection with the stormwater drainage works.

The Drain Layer shall be deemed to have allowed for all work associated with the safe and orderly execution of the stormwater drainage 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 work.

14.5.2.3 Inspections

Inspections of stormwater drainage works shall take place at each of the stages as scheduled in the Building Consent. Confirm a written programme to facilitate these inspections, including notification when each stage of the work is ready for inspection.

Obtain and pay all fees for any required inspections which are additional to the Building Consent.

14.5.2.4 Testing

Carry out all necessary testing of the stormwater drainage installations, and demonstrate to the Contract Administrator and the Territorial Authority that the installations are watertight and comply with the requirements of the New Zealand Building Code, related compliance Standards, and the design documents.

14.5.2.5 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 as necessary to install stormwater drains to the required locations and layout.

14.5.2.6 Workmanship

Stormwater drainage work shall be carried out by qualified and experienced tradespersons, familiar with all required installation requirements, under the direct supervision of a NZ certified Registered Drain Layer, in accordance with AS/NZS 3500.3 and to comply with the New Zealand Building Code, and all local codes and regulatory authority requirements, and the conditions of the Building Consent.

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

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

Carry out all necessary inspections and tests during installation to ensure compliance with the design specifications and regulatory requirements. Provide test result sheets to the Contract Administrator to show compliance has been achieved.

Take all necessary precautions during installation to protect the stormwater drainage system from damage, and to prevent the entry of:
- soil, sand, or rock;
- sewage, including the contents of any septic tank, or trade waste; or
- any other substance that could damage or impede the operation of the stormwater drainage network.

Ensure that any installed drain is adequately protected from any damage and excessive loading during the remaining construction period.

Protect adjacent finished work and surfaces from damage and contamination during installation. Any damage to fittings or finished surfaces shall be made good by the appropriate trade at the Drain Layer's expense.

Any associated electrical wiring and prescribed electrical work (by others) shall be carried out by a qualified electrician in accordance with the electrical standards and regulations and the Electrical specification.

14.5.2.7 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. All rejected stormwater drainage materials and work shall be repaired and/or replaced to the satisfaction of the Contract Administrator, without delay and at no additional expense to the Principal.

14.5.2.8 Delivery & Handling

Store stormwater drain pipes and accessories undercover, out of direct sunlight, clear of the ground, on an even surface, and protected from damage and contamination in accordance with the manufacturer's requirements. Keep pipes and accessories out of direct sunlight and protected from damage and contamination at all times.

Store loose PVC-U pipes on evenly spaced bearers at maximum 1.0m centres, with pipe sockets alternated so the the sockets do not bear on each other, and with side supports if pipes are stacked more than two layers high. When loose PVC-U pipes are stacked in a pyramid, the maximum stack height shall be 1.0m and the bottom pipes shall be chocked.

Do not used damaged or faulty materials or products, or products that are beyond their designated shelf life. Do not use PVC-U materials that have been exposed to or stored in direct sunlight longer than the period specified by the manufacturer.

Handle all products and materials in accordance with the manufacturer's requirements, and in a manner that prevents damage or deterioration of the material/product.

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

Conform with all relevant WorkSafe NZ Guidelines and Codes of Practice - in particular the 'Worksafe Guidelines For the Provision of Facilities and General Safety in the Construction Industry' and the 'Excavation Safety - Good Practice Guidelines'.

14.5.2.9 As-Built Drawings

On completion and before application for Code Compliance Certificate, prepare As-Built Drawings of the stormwater drainage system, that accurately record the new and/or modified stormwater drainage installation.

Information shall include, but not limited to, type, class and size of all pipes, the location, grade and direction of flow of all pipes, the location of all bends, changes in direction, cleaning access positions, manholes, and all dimensions, levels, inverts, etc.

Submit prepared as-built drawings to the Contract Administrator for review. Issue as-built drawings in accordance with the Contract Administrator's instruction, and in the required format.

14.5.2.10 Warranties

On completion and before Practical Completion, provide all relevant manufacturer/supplier warranties in favour of the Principal, covering materials, equipment, proprietary products, etc., supplied and installed.

14.5.3 Materials

14.5.3.1 General

Supply and deliver to the site all pipes, junctions, precast manholes, granular bedding material and other materials required for the satisfactory completion of the stormwater drainage works. All drainlaying materials shall be fit for purpose, new and free from damage and defects.

14.5.3.2 PVC-U Pipes & Fittings

PVC-U stormwater drain pipes and fittings for non-pressure applications shall comply with AS/NZS 1254: 'PVC-U pipes and fittings for stormwater and surface water applications'. Installed in accordance with AS/NZS 3500.3 and AS/NZS 2032 or AS/NZS 2566.2

Pipe Classification:
Class SN4-SN6 - Rubber Ring Joint or Solvent Welded Joint. For domestic and residential applications, and low load areas.
Class SN8-SN10 - Rubber Ring Joint or Solvent Welded Joint. For commercial and industrial applications, and medium load areas.
Class SN16 - Rubber Ring Joint or Solvent Welded Joint. For heavy traffic load areas.

14.5.3.3 Concrete

Cast insitu concrete used for stormwater drainage installation shall be 20 MPa Normal Concrete complying with NZS 3104. Where specified, used as bedding, capping and surround concrete, and for any cast-insitu concrete elements (to NZS 3104 unless specified otherwise).

14.5.3.4 Cement Mortar

Cement mortar shall consist of one part cement and two parts of fine aggregate measured by volume, properly mixed with the minimum amount of clean water necessary to render the mix workable. Do not use cement mortar that has been mixed and left standing for more than one hour.

14.5.3.5 Bedding & Surround Material

Except where specified otherwise, bedding (underlay, side support, overlay) material for PVC-U pipes shall be GAP 7 - General All Passing 7mm - clean, granular, non-cohesive crushed rock or gravel screenings, that is free from organic material and clay, with a moisture content appropriate to the degree of compaction required. If the bedding material is contaminated or an excessive amount of oversized particles are present, the bedding material shall be rejected and not used.

14.5.3.6 Backfill Material

Except where specified otherwise, backfill material above the pipe embedment layer (150mm above the top of pipe) shall be selected ordinary excavated material that is free from any builder's waste, any organic material, any rocks or hard matter larger than 20mm, and any soil lumps larger than 75mm.

Except where specified otherwise, pipes beneath private roadways and where subject to vehicular traffic - all backfill from the top of the embedment layer (150mm above top of pipe) to the underside of the pavement layer shall be GAP 65 - General All Passing 65mm.

Mechanically compact backfill material in layers not exceeding 300mm to a relative compaction no less than 95% of the NZ Standard Compaction.

Trenches in public footpaths and roads shall be backfilled in accordance with the requirements of the controlling authority.

14.5.4 Trench Excavation

14.5.4.1 Clearing of Surfaces

Where trenches are to be excavated in a grassed area, garden or a berm, the topsoil shall be stripped from the area of the excavation and stockpiled separately adjacent to the trench for use in reinstating the surface.

Where trenches are to be excavated in existing concrete or asphalt paved areas, the paving shall be cut to neat, straight lines, parallel to the trench prior to excavation, with a nominal 100mm trimming allowance either side of the excavation width. The excavation shall be carried out with minimal damage to the existing paved surface.

Where trenches are to be excavated in existing segmental paved areas, the pavers shall be removed by hand, cleaned and set aside for later reinstatement.

Subsequent trench backfill shall be adequately compacted to avoid subsidence of reinstated surfaces.

14.5.4.2 Excavation

Locate all existing buried services before commencing excavation work in any area.

Excavations for trenches and pits shall be properly executed and supported in accordance with the requirements of AS/NZS 3500.3.

Carry out excavation work to comply with all relevant health and safety regulations and guidelines, including the 'Excavation Safety - Good Practice Guidelines'.

Unless specified otherwise, the excavation of trenches shall be taken out by open cut to the levels and grades shown or implied on the drawings. Excavate trenches to the depths which will provide for the appropriate type of bedding.

Trench excavations shall be of sufficient width to allow all operations necessary for the jointing of pipes and placing of the specified backfill. The bottom width of the trenches shall at least the combined measurement of the outside diameter of the pipe plus 200mm - with a minimum clearance of 100mm on each side of the drain barrel. The trench width at the top of the pipe shall not exceed the outside diameter of the pipe plus 600mm unless the pipe in the trench is covered with concrete. The trench above the top of the pipe may be cut wider, either by excavating a wider bench or by battering the trench wall.

Where a trench has been excavated deeper than required without authorisation, the excess depth shall be filled either with bedding material compacted to achieve a density as near to the original soil density as possible, or with concrete.

14.5.4.3 Shoring

Make all necessary provisions for shoring trench walls to comply with all regulations and for health and safety measures.

Trench shoring materials and equipment must be suitable for the purpose for which they are to be used, of sound quality, and adequate in strength for the particular use.

Shoring shall be placed by experienced operators under competent supervision, and shall not be altered, dismantled, or interfered with except on the instruction of the authorised supervisor.

Ensure no voids are left in the backfill when shoring is removed, and the required compaction density of the backfill is achieved.

14.5.4.4 Dewatering

Take all necessary precautions to keep trenches and pits free from water. Provide all necessary pumps, drainage pipes and other equipments required for dewatering. Install all necessary filtering and detention measures required by the Territorial Authority.

If the bottom of the trench is likely to be adversely affected by rain, remove the final 80mm of excavation as a separate operation immediately before placing the bedding material.

14.5.5 Pipe Laying

14.5.5.1 Bedding Pipes

Provide a minimum 75mm thick underlay layer of well compacted bedding material for all pipes. A chase shall be excavated in the bedding to accommodate any jointing socket or fitting in the drain. The pipe embedment material shall be laid and compacted so that the pipe is evenly and continuously supported along its length on either side of the pipe, and with an overlay layer minimum 150mm thick.

When trench support systems are used, the bedding material shall be placed and compacted in a manner so that no loss of compaction results from removal of the trench side support systems. The trench support shall be removed in such a way as to ensure that the placing and compaction of the bedding material occurs below the trench supports and directly against the undisturbed ground of the trench walls.

After completion of the jointing and inspection of drain pipes, place and compact the bedding surround material around the pipe to the required depth over the pipe. The material shall be carefully placed around and over the pipe using hand tamping and in a manner that ensures the pipe is uniformly supported all round its perimeter and without voids. Take care during placement and compaction to ensure the pipe is not displaced or damaged.

14.5.5.2 Laying Pipes

Install stormwater drains in accordance with AS/NZS 3500.3 to the layout, levels and grades shown on the drawings. Drain pipes shall be laid to provide maximum falls, in straight lines and at an even grade, without obstruction to flow, and with full allowance for bedding.

Before installing the pipes, check the bore of each pipe is free from foreign matter and that the pipe exterior and the socket have not been damaged in handling or storage. All pipelines shall be kept clean and free of dirt and debris at all times during installation, testing and commissioning.

PVC-U stormwater drain pipes shall be properly jointed (rubber ring joint or solvent welded joint) to produce a watertight seal in accordance with the manufacturer's instructions.

Start laying main drains at the point of outfall and insert junctions for branch drains as the work proceeds. Pipes shall be laid with the least number of bends, in the centre of the trench, in straight lines between bends, and to the grades and locations shown on the drawings.

Install all necessary fittings, including inspection openings, bends and junctions, to the locations shown on the drawings and in accordance with the manufacturer's instructions. Where not specified on the drawings or schedules, fittings for inspection openings, bends, and junctions shall be selected from the PVC-U pipe system range of products and installed in accordance with the manufacturer's instructions.

Other than precautions against damage by displacement or floating pipes, no bedding surround material or backfill shall be placed until the laying of the drain has been inspected by the Territorial Authority.

14.5.5.3 Steep Gradients

Where the gradient of a stormwater drain pipe exceeds 1:5 (20%), anchor blocks shall be installed at the bend or junction at the top and bottom of the inclined drain, and at intervals not exceeding 3m. Anchor blocks shall be constructed in accordance with AS/NZS 3500.3: Section 7.9.

14.5.5.4 Underground Drains Near & Under Buildings

Protect underground drains near and under buildings against damage in accordance with AS/NZS 3500.3 where the minimum cover specified cannot be provided.

14.5.5.5 Jointing - Rubber Ring Joints

PVC-U drain pipes shall be jointed using rubber ring seals in preference to the solvent welded method - which shall be used where rubber ring jointed fittings are not manufactured. Only use seals and lubricants recommended by the pipe or fitting manufacturer. The marking of pipes by scoring is not permitted. All joints shall be watertight and prevent the infiltration of groundwater and the intrusion of tree roots.

Rubber ring joints shall be assembled in accordance with the pipe manufacturer's instructions and generally as follows:
- Ensure that all components are clean and free of dirt and debris during all stages of the jointing process;
- Ensure the pipe spigot is correctly chamfered and has a clearly visible witness mark to the correct insertion length;
- Clean and generously lubricate with jointing lubricant, especially the chamfer. Do not lubricate the ring groove;
- Where elastomeric seals are required to be fitted, clean and fit the seal, and check the elastomeric seal sits evenly in the housing;
- Apply the manufacturer’s specified lubricant to the end of the spigot and chamfer of the pipe;
- Keep the elastomeric seal and its housing free of lubricant, unless otherwise recommended by the manufacturer;
- Align the pipes so there is no deflection at the joint, then insert the spigot in the socket and push home to the witness mark;
- Hold the socket end firmly during the jointing to prevent previously assembled joints from moving;
- If excessive force is required and/or the jointing process does not comply with the manufacturer's instructions, disassemble and remake the joint.

Field cutting pipes:
- cut the spigot end square and remove all burrs;
- chamfer the cut end of the pipe with a taper of 15° to approx. half the wall thickness, or as specified by the pipe manufacturer;
- as appropriate, witness mark the pipe at the specified insert by the manufacturer.

14.5.5.6 Jointing - Solvent Welded Joints

Solvent welded joints shall be used for jointing PVC-U pipes and fittings where rubber-ring jointed fittings are not manufactured. Use only cleaner primers and solvent cements specified by the manufacturer for the application and socket type. Only sockets complying with the relevant Standard shall be installed. Do not use cleaner primers or solvent cements if the 'use by' date has expired. The marking of pipes by scoring is not permitted. All joints shall be watertight and prevent the infiltration of groundwater and the intrusion of tree roots.

Solvent welded joints shall be assembled in accordance with the manufacturer's instructions and generally as follows:
- Solvent welding shall only be carried out in dry conditions above 5°C.
- Ensure the components are dry, clean and free of dust, dirt, grease and surface contaminants during all stages of the jointing process.
- Prior to welding, the components shall be assembled dry and checked for position and alignment to ensure accurate re-assembly in the correct position.
- Mark the spigot with a witness mark (pencil, not scored) at a distance equivalent to the internal depth of the socket.
- Dry the spigot end, up to the witness mark, and the socket interior, then clean and degrease with a clean cloth moistened with the pipe or fitting manufacturer’s specified priming fluid.
- Apply an even coating of solvent cement to the internal surface of the socket for the full engagement length, and to the external section of the spigot up to the witness mark.
- Only use the minimum amount of solvent cement in the socket necessary for a fully solvent-welded joint.
- Insert the spigot close to, but not beyond, the witness mark. Do not use excessive force. Firmly restrain the joint for the minimum period recommended by the pipe manufacturer.
- Wipe off excess solvent cement from the outside of the joint, and where possible from the inside.
- Adhere to the manufacturer's specified procedures and time frames for filling and testing pipework.
- Allow all solvent welded joints to fully cure before subjecting pipework to any imposed load or testing.

14.5.5.7 Pipe Cover

Unless specified otherwise on the drawings, the minimum pipe cover (finished surface to top of pipe) shall be:
- where not subject to vehicular loading: 300mm.
- where subject to vehicular loading - not in roadways: 450mm.
- where subject to vehicular loading - in sealed roadways: 600mm.
- where subject to vehicular loading - in unsealed roadways: 750mm.
- pipes in embankment conditions or subject to loading from heavy construction equipment: 750mm.

14.5.6 Soak Pit

14.5.6.1 Rock Soak Pit

Construct a stormwater rock-filled soak pit, designed, constructed and connected to the private stormwater drain(s) in accordance with the requirements of the controlling Territorial Authority, to the location, layout, dimensions, levels and details shown on the design drawings, complete with all materials, components and accessories specified or otherwise required for satisfactory completion and performance, including any pre-treatment facility.

Carry out and complete all necessary testing procedures, worksheets and records required by the Territorial Authority.

On completion, issue to the Owner a copy of the rock soak pit Operation & Maintenance requirements and instructions - in bound hard-copy format.

14.5.7 Connection

14.5.7.1 On-Site - to Soak Pit

Connect to discharge the stormwater drainage line directly to the on-site stormwater soak pit in accordance with the requirements of the Territorial Authority and as shown on the drawings.

14.5.8 Testing

14.5.8.1 Stormwater Drains

Test the stormwater installation, including all drains, connections and system components, for water tightness in accordance with the requirements of the Territorial Authority (TA).

Where required by the Territorial Authority, the testing shall be undertaken in the presence of the representative of the TA. Demonstrate to the Contract Administrator and the Territorial Authority that the installation complies with the requirements of the contract documents, related standards and regulatory bodies. Lodge all certificates of approval with the Contract Administrator.

Unless specified otherwise by the Territorial Authority, the testing procedure shall be the Water Test procedure as defined in AS/NZS 3500.3: Section 9. Where appropriate, the procedures in NZBC E1/VM1 may be used as an alternative. The acceptability of other test methods are be subject to the approval of the Territorial Authority and the Contract Administrator.

Provide all necessary plant, equipment and instruments required for the specified testing procedure. All testing and commissioning shall be undertaken by suitably skilled and experienced technicians.

Pressure testing shall be carried out after the pipes have been laid and the bedding material has been placed over the pipes as specified.

Prior to testing ensure that all pipe junctions and inspection eyes are exposed, and pipelines have been flushed and all residual debris cleaned out.

Stormwater manholes shall be free of visible faults, or permeable zones, and jointing or penetration repairs shall be to best trade practice and standards.

Test results shall be recorded clearly on properly formatted test result sheets, and submitted to the Contract Administrator within 48 hours of completion of testing.

Repair or replace any materials or workmanship found to be defective or faulty during testing, and repeat the test until a satisfactory test result is achieved.

Leave the installation watertight and free of defects, and operating to the required performance standard.

The work shall be deemed incomplete unless all required testing and commissioning has been carried out and has passed the requirements of the testing specification and the Territorial Authority.

14.5.8.2 Water Test Procedure - to AS/NZS 3500.3

Water test procedure of stormwater drains (non-pressure) - to AS/NZS 3500.3: Section 9.4: The head of water on any section of drain shall not exceed 3m.

The procedure shall be as follows:
- Seal all openings except the top of the section of the below-ground drain to be tested.
- Fill the below-ground drain with water to the highest level in that section.
- 10 minutes for vitrified clay drains; or
- 5 minutes for drains of any other material.

The drain shall be deemed to have passed the test if no make-up water is required.

14.5.8.3 Air Test Procedure to AS/NZS 3500.3

Air test procedure of stormwater drains (non-pressure) - to AS/NZS 3500.3: Section 9.4:

The procedure shall be as follows:
- Apply a pressure of 30 kPa to the drain and hold this pressure for 3 minutes to allow the air temperature to stabilise.
- Shut off the air supply and measure the time taken for the pressure in the pipe to drop from 25 kPa to 20 kPa.

The drain shall be deemed to have passed the test if the time taken for the pressure to drop is greater than 90 seconds for pipes of size DN 225 or smaller, or 180 seconds for pipes of sizes DN 300 and DN 375.

14.5.9 Backfilling

14.5.9.1 Backfilling

Trenches shall be backfilled as soon as possible after the laying, inspecting and testing of the pipeline.

Where required, lay marker tape along the length of the drain, just above the top of the pipe embedment zone, before backfilling.

Trench backfill materials shall be placed on the pipe embedment, and compacted to restore the trench as near as practicable to the normal surrounding ground surface level and reduce the likelihood of subsidence. Backfill material shall be placed in uncompacted layers not exceed 300mm, then mechanically compacted to the required density.

Temporary trench support systems shall be lifted progressively above each layer of backfill to ensure each layer is compacted against undisturbed ground.

Any deficiencies of trench filling exposed by settlement shall be corrected to the required standard.

14.5.10 Reinstatement of Surfaces

14.5.10.1 Reinstatement of Surfaces

Refer to separate specification section - Siteworks - Reinstatement of Surfaces. Ground and paved surfaces above excavated stormwater drainage trenches shall be reinstated to the standard specified. Reinstatement shall generally achieve a standard equal to or better than the pre-existing situation - in no case will a lower standard be accepted.

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

15 ELECTRICAL

15.1 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.

15.2 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:

2053.1:2001(AS/NZS)	Conduits and fittings for electrical installations - General requirements
2201.1:2007(AS/NZS)	Intruder alarm systems - Client's premises - Design, installation, commissioning and maintenance
2293.2:2019(AS|NZS)	Emergency lighting and exit signs for buildings - Part 2: Routine service and maintenance
3000:2018(AS|NZS)	Electrical installations - Known as the Australian/New Zealand Wiring Rules
3100:2009(AS/NZS)	Approval and test specification - General requirements for electrical equipment
3112:2011(AS/NZS)	Approval and test specification - Plugs and socket-outlets
5000.1:2005(AS/NZS)	Electric cables - Polymeric insulated - For working voltages up to and including 0.6/1 (1.2) kV
60335.2.30:2015(AS|NZS)	Household and similar electrical appliances - Safety - Part 2.30: Particular requirements for room heaters
60335.2.30:2015(AS|NZS)INCIEC	Household and similar electrical appliances - Safety - Part 2.30: Particular requirements for room heaters
60335.2.35:2013(AS/NZS)	Household and similar electrical appliances - Safety - Part 2.35: Particular requirements for instantaneous water heaters
60598.2.2:2016(AS|NZS)	Luminaires - Part 2.2: Particular requirements - Recessed luminaires
6104:1981(NZS)	Specification for emergency electricity supply in buildings

15.3 Systems

15.3.1 Earth

Provide a driven main earth suitable for the full installation, close to the meterboard, complying fully with all appropriate regulations and to the complete approval of a certified inspector. Bond all exposed metals, including light fittings and piped services and provide earth conductors for the entire system. Sheathing to any neutral screened cables may be used for earthing.

15.3.2 Mains

Install a neutral screened 16mm main cable underground (depth, cover/protection, backfilling, signal strip etc. to comply with all relevant regulations) from the grid connection position noted on the Site

Plan along the route indicated to the meterboard, positioned where shown on the Floor Plan, and make appropriate arrangements for the grid connection. Install pilot as required. The meterboard shall be metalclad with a meter reading window, recessed maximum depth into the wall and at 2m to the top of the board, with the meters and water heater controllers by the supply company nominated by the Principal. Install all switches and fuses that are necessary. From the meterboard run (route to approval) a neutral screened 16mm main plus controllers etc. to the switchboard.

15.4 Materials & Control

15.4.1 Materials

All materials delivered with packaging and labeling intact. All required incidentals (insulating tape, seals, fixings, etc.) shall be completely appropriate for the application involved. The use of items damaged in any way is subject to approval in each instance.

15.4.2 Switchboard

The switchboard shall be an appropriate size standard PDL DBF series board installed fully recessed where shown and at 2m to the top of the board. Install appropriate sized MCB's for all circuits, including a minimum of two power and one lighting RCDs as required to cover all outlets.

15.5 Elements

15.5.1 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.

The Electrician shall supply appliances that are their responsibility, install them exactly in accordance with their manufacturer’s instructions, and protect them until completion.

15.5.2 Tele Communications

Workmanship shall be recognised best trade practice, and in accordance with the manufacturers' recommendations. All work shall be by competent and experienced operatives.

15.5.3 Other Wired Services

Co-operate with all other trades to ensure that the following services are installed complete and in accordance with their manufacturer’s recommendations with all normal or necessary incidentals and with all wiring concealed.

-Kitchen, laundry and wet areas air exhaust fans and ducting as noted - supply and install.
-Infrared / movement / daylight sensor switches as noted.
-Heated towel rails to bathroom and shower room.
-Heat pump
-Supply a Heavy Duty TV Aerial (suitable for TV1, 2, and 3, Sky, and all local and community TV stations) and install on the roof ridges where directed, stayed against wind, and with all connections compatible with the roofing and waterproof. Feed to the outlets shown with the complete system exactly to aerial suppliers recommendations.

15.6 Workmanship

15.6.1 General

Supply and install all materials, including all necessary minor and incidental items, for proper completion of all of the electrical services specified or shown on the drawings. The contract will not be deemed to be complete until the Electrician has provided an Electrical Certificate of Compliance (made available to the Contractor in time for the Code Compliance Certificate application).

Obtain all necessary permits and consents, serve all notices and pay all fees in and customary charges connection with the works.

The position of switches, light and power outlets and other fittings, although shown specifically in some instances, are in general only shown diagrammatically. The exact location of each of these items will be as directed on site by the Architect/Designer; the Electrician shall give reasonable notice of when this information is required. Items positioned in contravention of this shall be repositioned if directed, including rewiring if necessary, all at the Electrician's expense.

Unless drawn (on 1:20 wall elevations) or specified otherwise the mounting height to the centreline of the following items above the floor shall be:

-1000mm for lighting switches;
-2000mm for wall mounted lights;
-2100mm for the bayonet of pendant lights;
-300mm for power points, except at benches.

(Notify the Architect/Designer if either the actual fitting or mounting position seem to make the mounting height noted above inappropriate).

Warranty cards and manufacturers guarantees for items supplied and installed by this trade shall be filled in correctly and handed over at Practical Completion. Arrange all circuits to obtain an optimum balance of the system, and check and reconnect where necessary to achieve this on completion. Leave the works clean and tidy and in full operational order.

15.6.2 Co-operation

Co-operate with all other trades and attend upon the Concretor and Carpenter to set out all required penetrations and to ensure that all wiring and fittings are correctly incorporated as work proceeds. The Carpenter will provide and fix all necessary dwangs and timber supports in locations determined by the Electrician.

15.6.3 Workmanship

All electrical work shall be carried out by, or under the direct control of, registered tradesmen, and shall be to recognized high standards. All work shall be such as to leave a neat, efficient and robust installation. Neatly label switchboards to identify each circuit.

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: 2011 restrictions on the holing and checking of joists and beams. Chasing and checking of other materials shall be only to approval.

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

15.6.4 Wiring

Joints within cable runs will not normally be accepted. TPS cable shall be adequately supported, and clipped at regular intervals. At terminations all strands of conductors shall be fully secured in a terminal block or clamped under a screw head washer; do not cut away any strands. Wiring which terminates in enclosed fittings and/or where subject to heat liable to cause deterioration, shall be high temperature type, with the tails made off with heat resisting sleeves, to protect the permanent wiring.

Wire lights in 1.5mm 3 core - 7.5 amps loading max per circuit (allow for 100w to all light fittings unless identified otherwise).
Wire power outlets in 2.5mm 3 core - 7 maximum GPO singles or doubles per circuit. Assess power outlets for specific equipment and allow accordingly.

Conceal all wiring except as noted on drawings or below. All wiring cast into concrete shall be run in conduit pipes. All cables shall be stranded (single core is unacceptable).

Wire more or less parallel to and at right angles to the structural elements - avoid any diagonal wiring. Layout of the principal distribution wiring shall be to approval. Position all wires to minimise the risk of damage from subsequent nailing of linings etc.

Generally, do not run TPS horizontally within timber walls except in the area up to 300mm above floor. Wire in the ceiling framing and drop vertically to outlets and switches.

Wire exterior lighting in screened cable.