

Mark Lowe

P R O J E C T S P E C I F I C A T I O N

Pole Shed

177 Old Taupo Road,
Utuhina,
Rotorua

Issued for Construction

10 June 2024

20 Paddocks Ltd
Bruce Nickalls

PROJECT OVERVIEW

Scope

New Pole Shed

Address 177 Old Taupo Road

City Rotorua

Suburb

Site Address 177 Old Taupo Road, Utuhina, Rotorua

DP # Lot 11 DPS 5265

Site Conditions

Wind Zone High

Earthquake Zone Zone 2

Exposure Zone Zone B

Snow Loading Zone Zone N0

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1 PRELIMINARIES & GENERAL

1.1 Project Overview

1.1.1 Contract Documents

1.1.1.1 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

1.1.2.1 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

1.1.3.1 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

1.1.4.1 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

1.1.5.1 Responsibility

The Contractor will be held responsible for the full period of his 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 himself or his 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

1.1.6.1 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

1.1.7.1 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

1.1.8.1 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

1.1.9.1 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 his 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 Coordination of the Works

1.1.10.1 Coordination of the Works

Coordinate the works of all trades to ensure efficient progress of the works. Ensure that all holes, sleeves, penetrations, supports, etc., that are required for services are correctly incorporated as work proceeds. Identify and sufficiently forward-notify the appropriate persons of all deadlines for the supply of fittings, components, information, etc.

1.1.11 Documents Interpretation

1.1.11.1 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.

1.1.12 Work Shown and Mentioned

1.1.12.1 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.

1.1.13 Site Safety

1.1.13.1 Health & Safety Plan

Before commencing work on the site, the Contractor shall prepare and submit to the contract administrator a health and safety plan. The health and safety plan shall include, but not be limited to:

- the health and safety of all people on the site and on other properties, and the general public;
- identification of existing and potential construction hazards and risks;
- safety procedures to eliminate, isolate or minimise construction hazards;
- the equipment to be used to minimise the hazards;
- the maintenance of a register of hazards for the site;
- the name and qualifications of the site safety person;
- emergency procedures;
- first aid facilities and safety equipment;
- the methodology for notifying, recording and investigating accidents and injuries.

Carry out all construction operations in accordance with the submitted health and safety plan.

1.1.13.2 Primary Duty of Care

A PCBU's primary duty of care includes, but is not limited to, so far as is reasonably practicable:

- providing and maintaining a work environment that is without risks to health and safety;
- providing and maintaining safe plant and structures;
- providing and maintaining safe systems of work;
- ensuring the safe use, handling and storage of plant, structures and substances;
- providing adequate facilities for the welfare at work of workers in carrying out work for the business or undertaking, including ensuring access to those facilities;
- providing any information, training, instruction, or supervision that is necessary to protect all persons from risks to their health and safety arising from work carried out as part of the conduct of the business or undertaking;
- monitoring the health of workers and the conditions at the workplace for the purpose of preventing injury or illness of workers arising from the conduct of the business or undertaking.

1.1.13.3 Health & 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.

1.1.14 Cleaning and Completion

1.1.14.1 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:

1554.3:2014(AS/NZS)	Structural steel welding - Part 3: Welding of reinforcing steel
3101.1&2:2006(NZS)	Concrete Structures Standard
3104:2003(NZS)	Specification for concrete production
3109:1997(NZS)	Concrete construction
3112.1:1986(NZS)	Methods of test for concrete - Tests relating to fresh concrete
3112.2:1986(NZS)	Methods of test for concrete - Tests relating to the determination of strength of concrete
3114:1987(NZS)	Specification for concrete surface finishes
3121:2015(NZS)	Water and aggregate for concrete
3122:2009(NZS)	Specification for Portland and blended cements (General and special purpose)
3124:1987(NZS)	Specification for concrete construction for minor works
3125:1991(NZS)	Specification for portland-limestone filler cement
3404.1&2:1997(NZS)	Steel Structures Standard
3604:2011(NZS)	Timber-framed buildings
4455.1:2008(AS/NZS)	Masonry units, pavers, flags and segmental retaining wall units - Masonry units
4671:2001(AS/NZS)	Steel reinforcing materials
4672.1:2007(AS/NZS)	Steel prestressing materials - General requirements
4680:2006(AS/NZS)	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
NZBC B1	Structure
NZBC B2	Durability

2.3 Materials

2.3.1 Reinforcement

2.3.1.1 Grade

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

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

2.3.1.2 Quality

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

2.3.1.3 Installation

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

2.3.1.4 Continuous

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

2.3.1.5 Supports

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

2.3.2 Concrete Cover

2.3.2.1 Concrete Cover

Concrete cover not shown otherwise to be:

- Foundations - 75mm where poured against ground, 50mm elsewhere.
- Beams and columns - 40mm (for main reinforcing).
- Slabs - 50mm where poured on ground, 40mm where exposed to weather, 30mm elsewhere.
- Walls - 40mm where exposed or against ground, 30mm elsewhere.

2.4 Workmanship

2.4.1 Qualifications

2.4.1.1 Qualifications

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

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

2.4.2 Formwork

2.4.2.1 Formwork Quality

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

2.4.2.2 Formwork Construction

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

2.4.2.3 Formwork Suitability - Option 3

Formwork suitable for required F3 finish to all exposed locations (for stopping only prior to painting).

2.4.2.4 Co-ordination

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

2.4.2.5 Completion

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

2.4.3 Concreting & Curing

2.4.3.1 Concrete Quality

All concrete shall be power mixed in a plant approved by the Ready Mixed Concrete Association for required grade. All structural concrete shall have a compressive strength of 25MPa at 28 days. 19mm max aggregate, 80mm slump, and with a maximum water cement ratio of 0.55.

2.4.3.2 Additives

Where considered desirable the manufacturer may add an air entrainment agent complying with NZS 3109 and 3119. No other additives may be used without specific approval of the engineer. Mixes shall be capable of being readily placed and compacted and finished as specified. The manufacturer shall carry out quality control testing to NZS 3104. All other concrete 20 MPa Ordinary Grade with maximum water cement ratio 0.7.

2.4.3.3 Cold Weather Pouring

Note that appropriate cold weather pouring and curing techniques **MUST** be adopted if construction timing/temperatures so dictate.

2.4.3.4 Pouring Quality

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

2.4.3.5 Curing Completion

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

2.4.4 Surface Finishes

2.4.4.1 Exposed Foundation Sides

Foundation sides exposed to view - F5.

2.4.5 Documentation

2.4.5.1 Documentation

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

2.5 Reinforcing Steel

2.5.1 Scope

2.5.1.1 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.

2.5.2 Requirements

2.5.2.1 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 ['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.

2.5.2.2 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.

2.5.3 Reinforcing Steel

2.5.3.1 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.

2.5.4 Bending of Bars

2.5.4.1 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.

2.5.4.2 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.

2.5.4.3 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.

2.5.5 Laps, Cover & Tolerances

2.5.5.1 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 lapped 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.

2.5.5.2 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.

2.5.5.3 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: $\pm 10\text{mm}$;
- Distance between layers of main steel except it shall not be less than 25mm: $\pm 5\text{mm}$;
- Distance between bars along the face of walls or slabs: $\pm 20\text{mm}$;
- Spacing of stirrups or ties in beams and columns: $\pm 20\text{mm}$;
- Longitudinal position of splice: $\pm 30\text{mm}$.

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.

2.5.6 Placing & Fixing

2.5.6.1 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.

2.6 Concrete

2.6.1 Scope

2.6.1.1 Scope

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

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

2.6.1.2 Extent of Insitu Concrete work

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

2.6.2 Requirements

2.6.2.1 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](#)'.

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.

2.6.2.2 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 is 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.

2.6.2.3 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.

2.6.2.4 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.

2.6.2.5 Materials & Workmanship

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

2.6.3 Reinforcement

2.6.3.1 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.

2.6.4 Formwork

2.6.4.1 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.

2.6.5 Finishes

2.6.5.1 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.

2.6.6 Concrete

2.6.6.1 Normal Concrete

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

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

Cement shall comply with:

NZS 3122: 'Specification for Portland and blended cements (General and special purpose)';

NZS 3125: 'Specification for portland-limestone filler cement'.

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

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

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

Normal Concrete used in the works shall have the following minimum strengths at 28 days unless noted otherwise on the drawings:

- Blinding concrete: 10 MPa.
- 'No fines' concrete: no minimum strength.
- Bored piles: 25 MPa.
- Foundation pads and strip footings: 25 MPa.
- Floor slab-on-grade: 30 MPa.
- Superstructure generally: 30 MPa.
- Precast concrete: 30 MPa.
- Toppings to proprietary suspended floor systems: 30 MPa.
- All other structural concrete not specifically mentioned: 25 MPa.
- Driveways, pavements, landscaping: 20 MPa.

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

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

2.6.7 Concreting

2.6.7.1 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.

2.6.7.2 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.

2.6.7.3 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.

2.6.8 Penetrations and Detailing

2.6.8.1 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.

2.6.9 Building In

2.6.9.1 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.

2.6.10 Foundations

2.6.10.1 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.

3 CARPENTRY

3.1 Preliminary

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

3.2 Compliance

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

Comply with all relevant provisions and recommendations of:

1080.1:2012(AS/NZS)	Timber - Methods of test - Method 1: Moisture content
1491:1996(AS/NZS)	Finger jointed structural timber
1859.1:2004(AS/NZS)	Reconstituted wood-based panels - Specifications - Particleboard
1859.2:2004(AS/NZS)	Reconstituted wood-based panels - Specifications - Dry-processed fibreboard
2269.0:2012(AS/NZS)	Plywood - Structural - Part 0: Specifications
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
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
3618:1984(NZS)	Mechanical stress grading of timber
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

3.3 General

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

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

3.4 Timber Framing

3.4.1 Scope

3.4.1.1 Scope

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

3.4.2 Workmanship

3.4.2.1 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 prior to installing timber framing.

Co-ordinate with other trades to install timber framing as required.

3.4.2.2 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 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.

3.4.3 Timber Framing

3.4.3.1 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 use damaged, faulty or defective materials.

3.4.3.2 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.

3.4.3.3 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.

3.4.3.4 Framing Installation

All timber framing members, including all dawning, 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.

3.4.3.5 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.

3.4.3.6 Timber Re-treatment

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

3.4.3.7 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.

3.4.3.8 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.

3.4.3.9 Built-up Framing Members

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

3.4.4 Steel Fixings

3.4.4.1 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.

3.4.4.2 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.

3.4.4.3 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.

3.4.5 Wall Framing

3.4.5.1 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.

3.4.5.2 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.

3.4.5.3 Dwangs

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

3.4.6 Posts

3.4.6.1 Timber Posts

Timber posts shall be to the sizes and locations shown on the drawings, and installed true to line and plumb each way, and supported at the base by steel post brackets as detailed.

Base bracket brand name & type: Cast in

3.4.7 Roof Framing

3.4.7.1 Rafters

All rafters (including hip, valley and jack rafters) shall be to the dimensions, spacings, pitch, and layout shown on the drawings.

Rafters shall be aligned and paired at the required spacings to ridge boards, ridge beams, hip rafters and valley rafters, and as shown on the drawings, and installed parallel, true to line, pitch and plane, and fixed in accordance with NZS 3604 Table 10.1.

Any required jointing of rafters shall be made over supports shown on the drawings only.

Unless shown otherwise, rafter seating to top plates, beams, and lintels shall have a minimum bearing of 32mm without reducing the rafter depth to less than 65mm, or 80%, at the birds mouth.

Extend rafter ends to form eaves as detailed on the drawings and in accordance with NZS 3604 10.2.1.14.

Fly rafters and outriggers installed to form gable verges as detailed on the drawings and in accordance with NZS 10.2.1.15.3

3.4.7.2 Ceiling Joists

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

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

Do not support ceiling joists from a strutting beam.

3.4.7.3 Purlins

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

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

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

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

3.4.7.4 Roof Bracing

Roof bracing shall be as shown on the drawings and in accordance with NZS 3604 10.3 and 10.4 as necessary.

3.5 Workmanship & Materials

3.5.1 Workmanship

3.5.1.1 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.

3.5.1.2 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. Completely 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.

3.5.1.3 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 45° 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.

3.5.2 Timber

3.5.2.1 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 'flushed-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.

3.5.2.2 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.

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

3.5.2.3 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.

3.5.3 Fixings

3.5.3.1 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.

3.5.3.2 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.

3.5.3.3 Bolts

Where bolts are used they shall be complete with nuts and washers unless specified otherwise. All bolts, nuts and washers are to be hot-dipped galvanised finish unless noted otherwise. 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 - 25 x 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, hot-dipped galvanised, 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.

3.5.3.4 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.

3.5.3.5 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.

3.5.4 Flashings

3.5.4.1 Flashings

Flashing materials shall be in accordance with the requirements of NZBC E2/AS1 Sections 2.2 Materials, 4.0 Flashings, Table 20 - Material Selection, Table 21 - Compatibility of Materials in Contact, and Table 22 - 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.

3.5.5 Sealants

3.5.5.1 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 particular 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.

3.5.6 Garage Door

3.5.6.1 Garage Door - option 2

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

4 ROOFING

4.1 Preliminary

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

4.2 Compliance

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

Comply with all relevant provisions and recommendations of:

1170.2:2011(AS/NZS)	Structural design actions - Wind actions
1397:1993(AS/NZS)	Steel sheet and strip - hot-dipped, zinc-coated or aluminium/zinc-coated
1562.1:1992(AS)	Design and installation of sheet roof and wall cladding. Part 1: Metal
1562.2:1999(AS/NZS)	Design and installation of sheet roof and wall cladding - Corrugated fibre-reinforced cement
2295:2006(NZS)	Pliable, permeable building underlays
2728:2013(AS/NZS)	Prefinished/prepainted sheet metal products for interior/exterior building applications - Performance requirements
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
NZBC B2	Durability
NZBC E2	External moisture
NZBC E2/AS1	External Moisture
NZBC E3	Internal Moisture
NZMRM Code of Practice	NZ Metal Roof and Wall Cladding Code of Practice - Version 2.2
NZS 3441	Zinc coated steel coil

4.3 Workmanship

4.3.1 Guarantees

4.3.1.1 Guarantees

The whole of the roof covering work shall be complete in all respects and absolutely watertight. Commencement of roofing works by any Subcontractor indicates their full agreement to and acceptance of an unwritten guarantee to maintain the whole of their work in a satisfactory and watertight condition, and to arrange and pay for any damage consequential upon the failure of their materials or workmanship, for the periods stated below, irrespective of the 90 day general maintenance period.

- Butyl roofer - ten years from completion.
- Galvanised steel roofer - two years after completion.
- Aluminium roofer - ten years after completion.
- Acrylic/f.glass roofer - ten years after completion.

4.3.2 Co-operation

4.3.2.1 Co-operation

Co-operate with other trades to ensure that framed roofing substrates have appropriate spacings, alignments and fixings, and to ensure that sheet roofing substrates have the correct edge and central fixings, appropriate alignments and gradients, edge priming if necessary, and are completely clean.

Ensure that each section is waterproofed as soon as possible after preparatory work is complete; allow to carry out the works in several operations if necessary to comply with this condition.

4.3.3 Alternatives

4.3.3.1 Alternatives - Permitted

Tenderers are invited to submit a price variation for similar roofing products. Consideration of finished roofs in the alternative product and the extent that drawings will need to be modified to incorporate it will be the main items in the decision on the alternative proposed.

4.4 Roofing Systems - Profiled Steel

4.4.1 Scope

4.4.1.1 Corrugated Steel Roofing

Supply standard corrugated profile 0.55BMTxG300 galvanized steel roofing and install it to the areas shown on the Roof Plan. All handling and fixing techniques, and all jointing and sealing materials and techniques, shall be exactly as recommended by the roofing manufacturer.

4.4.2 Preparation

4.4.2.1 Preparation

Co-operate to ensure that roof framing has appropriate spacings and fixings, is in accordance with NZS 3604, and coordinate to ensure that all timber members required for ridges, hips, valleys, barges, penetrations, junctions with vertical faces, etc. are correctly in place. Lap sheets away from the prevailing wind. Set-out the roofing sheets exactly square to the building axis and maintain this throughout the works.

4.4.3 Fixings

4.4.3.1 Fixings - Corrugated Steel Roofing

Screw fix with screws that comply with AS 3566 (Self-drilling construction screws) Class 3 or 4. Use only low carbon (15% or less content) non-conductive sealing washers. Screw at centres as advised by the local Rollformer, to fully comply with the Wind Zone requirements, purlins spacings etc. Use fixing systems that will accommodate thermal expansion for long lengths. NO use of abrasive disc cutters.

4.4.4 Flashing

4.4.4.1 Flashing

Ridges, hips, and barge flashings etc. shall all be matching galvanized steel, and as detailed. Soft edge flashings very neatly dressed down where required, plumbing penetrations custom flexible rubber flashed (fully sealed), and instruct the Plumber that no copper (or brass) pipes are to discharge on to the roof.

4.4.5 Completion

4.4.5.1 Completion

Protect the galvanizing 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 and pop-rivet shanks as the work proceeds (at least daily, and keep them and other rubbish out of the spoutings).

4.5 Rainwater Goods

4.5.1 Prefinished Steel Rainwater Goods

4.5.1.1 Prefinished Steel Rainwater Goods

Standard '125 Box' (or equal) profile longrun prefinished steel spouting as for the roofing with flanged downpipe droppers siliconed into the gutter to take 80mm dia. PVC downpipes. Standard external spouting brackets at approximately 600mm centres.

4.5.1.2 Downpipes to Stormwater Drains

The downpipes shall drop directly into the stormwater drains - ensure the drains are accurately positioned.

(Any offsets and bends required in a downpipe shall be verified with the Architect/Designer before fabrication - ugly items fabricated in contravention of this must be replaced). Close off joints between downpipes and stormwater pipes with a upvc transition piece. Fix bird proof plastic 'wire' balloons to the top inlet of all downpipes.

4.6 Profiled Metal Wall Cladding

4.6.1 Scope

4.6.1.1 Inland Moderate (ISO 9223 Category: C2)

Supply and install the specified Profiled Metal Wall Cladding to the locations identified on the drawings complete with all accessories. All aspects of this work shall be in complete accordance with the roofing manufacturer's technical literature and installation requirements, other relevant product manufacturers' recommendations, and as shown on the drawings.

No substitutions are permitted for the specified Profiled Metal Wall Cladding.

4.6.2 Cladding Profile

4.6.2.1 Corrugated Profile - Inland Moderate (ISO 9223 Category: C2)

Corrugated profiled metal wall cladding. Standard corrugated profile; 18mm deep; 76mm crest pitch.

Manufactured from the material type, thickness and finish as specified below.

Installed as vertically-orientated and/or horizontally-orientated profiled metal wall cladding in accordance with the NZMRM Code of Practice and the manufacturer's requirements to the locations and details shown on the drawings.

Location:

4.6.3 Material Type, Thickness & Finish

4.6.3.1 COLORSTEEL® Endura - 0.4mm - Corrugated Profile

Corrugated-profiled metal wall cladding shall be manufactured from COLORSTEEL® Endura - 0.4mm BMT. Pre-painted hot-dipped galvanised zinc coated steel coil conforming with AS/NZS 2728.

Colour:

4.6.4 Components & Accessories

4.6.4.1 Screw Fasteners

Screw fastener type and durability shall comply with AS 3566 Class 4 or Class 5, as appropriate, and be no less than the durability of the material being fixed. Class 5 or non-ferrous screw fasteners are recommended for Severe or Very Severe environments.

Screw fastener type and placement (frequency) shall be appropriate for wind or other design loads and the material into which the screw is being fastened; all in accordance with the NZMRM Code of Practice and the roofing manufacturer's requirements.

Rivets shall be sealed aluminium, 4.8mm diameter.

4.6.4.2 Metal Flashings

Metal Flashings. Metal flashings shall be in accordance with the details shown on the drawings and to the requirements of the NZMRM Code of Practice, and shall include all folded metal sections required to make the specified profiled metal wall cladding weathertight at:

- the building periphery,
- roof and wall junctions,
- changes of direction,
- intersections with other buildings,
- any wall penetration,
- junctions with other materials.

Metal flashings shall be fabricated from ductile grade metal of same material and coating as the cladding material, to maintain durability and compatibility requirements.

Metal flashings shall be designed for lateral strength by folding, stiffening or ribbing on external edges, and have a maximum un-stiffened width of 300mm.

The minimum thickness for metal flashings shall be:

- Coated steel: 0.55mm
- Aluminium: 0.9mm
- Copper: 0.6mm
- Zinc: 0.7mm
- Stainless steel: 0.45mm.

Flashing fastenings and fastening frequency shall be in accordance with the NZMRM Code of Practice.

Do not fix flashings to timber with a moisture content greater than 18%.

Do not construct flashing joints and flashing junctions in a manner that rely entirely on sealant to maintain weathertightness.

4.6.4.3 Sealant

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 NZMRM Code of Practice recommendations.

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.

4.6.5 Co-operation

4.6.5.1 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.

Co-ordinate with other trades to ensure that the specified Profiled Metal Wall Cladding correctly allows for joinery installation, the location of pipes, outlets, meter boards and other fixtures and fittings installed by others, and to install the specified Profiled Metal Wall Cladding as required.

4.6.6 Workmanship

4.6.6.1 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, to fully comply with all warranty requirements in accordance with the roofing manufacturer's requirements. All work shall be such as to leave a neat, efficient, robust and weathertight installation.

All cutting, fixing and installation techniques, fastenings and sealants shall be exactly as recommended by the roofing manufacturer in accordance with the NZMRM Code of Practice and with the use of suitable tools and equipment appropriate for the application.

Always maintain isolation of dissimilar materials in accordance with the NZMRM Code of Practice. Isolate dissimilar materials (metal and non-metal) in close proximity as necessary by painting the surfaces or fitting separator strips. Place isolators between metals and treated timber or cement-based materials. Do not use unpainted lead-sheet or copper materials to come in contact with, or allow water run-off from these onto, galvanised or Zinalume® materials.

4.6.7 Delivery & Handling

4.6.7.1 Delivery & Handling

Store profiled metal wall cladding, flashings and accessories undercover, clear of level ground, on bearers at evenly spaced centres as recommended by the roofing manufacturer. Keep stored materials and accessories dry and

protected from damage and contamination at all times.

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

Handle materials in accordance with the manufacturer's requirements and in a manner that prevents damage to or deterioration of the material, including surface marking.

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](#).

4.6.8 Preparation

4.6.8.1 Vertical Cladding - Timber Frame, Direct-Fix (outside E2/AS1)

Vertically-Orientated Profiled Metal Wall Cladding - direct-fixed to timber framing and outside the scope of NZBC E2/AS1 - check all aspects of preparatory works, including but not limited to:

Inspect the timber framing and supporting structure to ensure that it is constructed to the required tolerances, complete and ready for cladding. Do not start work until all preparatory requirements are complete to the required standard.

Confirm that exterior wall openings have been prepared ready for the installation of all window and door frames and other penetrations through the cladding.

Required preparatory work includes the following:

- wall cladding underlay/building wrap to openings finished and dressed off ready for the installation of window and door frames and other penetrations.
- claddings neatly finished off to all sides of openings.
- installation of flashings - those required to be installed prior to installation of penetrating elements.

4.6.9 Installation

4.6.9.1 Requirements

Install Profiled Metal Wall Cladding in accordance with the NZMRM Code of Practice and the cladding manufacturer's requirements and as shown on the drawings.

As shown on the drawings, confirm the layout and location of all control joints; the layout of the cavity battens; and any specific cladding detailing requirements prior to installation.

Accurately set-out the planned cladding layout prior to fixing to ensure true and accurate cladding lines and incorporate correct relationships with other design features shown on the drawings; maintain this accurate set-out throughout installation.

Keep cladding lines consistent and true along walls and around corners; with side-laps of vertically orientated sheets directed away from the prevailing wind and/or line of sight; to straight, true and accurately aligned lines in both directions - vertical and horizontal. Check for and eliminate any creep and/or spread of sheets during installation.

4.6.9.2 Installation General

Cut Profiled Metal Wall Cladding and flashings by shear only – do not use abrasive cutting tools. Do not use black lead pencils for marking pre-finished metal cladding and flashings.

Prevent contact with, or run-off from, incompatible materials in accordance with the recommendations in the NZMRM Code of Practice.

Protect the coated surface from damage at all times; replace the whole sheet where a significant depth of the coating has been damaged (including flashings).

Screw-fixed sheets shall be fixed with fasteners appropriate for the cladding profile and material, substrate/structure and the environment in accordance with the cladding manufacturer's requirements and the NZMRM Code of Practice (minimum Class 4).

Screw fastening placement and spacings shall be strictly in accordance with the cladding manufacturer's

requirements and the NZMRM Code of Practice to fully comply with the Wind Zone requirements, support frame spacings etc. Ensure the fastener layout is balanced to other architectural features.
Screw fastenings for pre-painted metal must be pre-painted prior to installation for an accurate colour match.
Use fixing systems that will accommodate due allowance for dynamic local wind pressures on the building and thermal movement in the sheet.

Clip-fastened sheets shall be fixed with concealed fastening clips appropriate for the cladding profile and material, substrate/structure and the environment in accordance with the cladding manufacturer's requirements.

All cladding jointing techniques and sealants shall be in accordance with the cladding manufacturer's recommendations and the NZMRM Code of Practice, and shall be compatible with the cladding material and finish. Joints shall be sealed with an approved neutral-cure sealant or approved closed-cell lap tape.
Metal flashings generally, shall be in accordance with the NZMRM Code of Practice and as shown on the drawings.

Install flashings to internal and external corner junctions, window/door and other openings, eave and soffit junctions, parapets and at junctions with other cladding systems and building elements as detailed on the drawings and in accordance with the cladding manufacturer's requirements and the NZMRM Code of Practice.

All flashings shall be neatly formed and finished, securely fastened to the structure, weatherproof, and lapped such that any water will run down to the exterior.

For highly visible flashings, plan each flashing joint and/or junction with specific regard to aesthetic requirements. Penetrations in the cladding that are greater than 150mm in any direction must have support framing installed around the perimeter of the penetration. Penetration flashings shall not rely solely on silicone sealant to achieve weathertightness of the flashing.

Flash pipes penetrating the roofing with a proprietary pipe collar flashing.

Completely clean off any swarf as the work proceeds.

4.6.9.3 Control Joints

Form vertical movement control joints to the locations, layout and details shown on the drawings. Movement control joints shall be aligned with control joints in the structural framing. Confirm the location of movement control joints prior to installation.

4.6.10 Fixing

4.6.10.1 Corrugated Profile - COLORSTEEL® Endura - fixed to Timber Framing

Pan-fix Corrugated profiled metal wall cladding - manufactured from COLORSTEEL® Endura and fixed to timber framing - with minimum AS 3566 Corrosion Class 4, Hex.Head-with-seal Self-drilling Screws in accordance with the NZMRM Code of Practice and cladding manufacturer's requirements. Class 5 or non-ferrous fasteners are recommended for severe or very severe marine environments.

Primary screw fastener embedment into timber framing must be a minimum of 35mm and greater than 6 times the screw thread diameter. Where a rigid underlay/sheet bracing is installed over the support framing, increase the screw length by the thickness of the rigid underlay/sheet bracing accordingly.

Pre-painted screws shall be factory pre-painted for an accurate colour match with the cladding.

4.6.11 Completion

4.6.11.1 Completion

Check that the Profiled Metal Wall Cladding and associated flashings and accessories have been installed and finished correctly.

Check for defective work, damage and surface marking - replace and/or repair as necessary.

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.

Leave all of this work complete and weathertight and to the required standard in accordance with the NZMRM Code of Practice.

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

Issue to the Owner a copy of the cladding manufacturer's maintenance requirements upon completion of the contract works.

Provide the cladding material manufacturer's/supplier's 'Product Warranty' for the installed metal cladding product on the cladding manufacturer's Standard Warranty Form. Warrant this work under normal conditions and use against failure of coating and for weatherproofing by material penetration. Commence the warranty from the date of practical completion of the contract works.

Factory applied coatings; the warranty period is determined by the specified product and the site location and environment - contact the cladding manufacturer to evaluate the warranty conditions.

Provide the installer's 'Installation Warranty' on the installer's Standard Warranty Form. Warrant this work under normal environmental conditions and use against weatherproofing failure. Commence the warranty from the date of practical completion of the contract works.

5 DRAINLAYING

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:

1254:2010(AS/NZS)	PVC-U pipes and fittings for stormwater and surface water applications
1260:2009(AS/NZS)	PVC-U pipes and fittings for drain, waste and vent application
1546.1:2008(AS/NZS)	On-site domestic wastewater treatment units - Septic tanks
2032:2006(AS/NZS)	Installation of PVC pipe systems
3500.0:2003(AS/NZS)	Plumbing and drainage - Glossary of terms
3500.2:2015(AS/NZS)	Plumbing and drainage - Part 2: Sanitary plumbing and drainage
3500.3:2015(AS/NZS)	Plumbing and drainage - Part 3: Stormwater drainage
7643:1979(NZS)	Code of practice for the installation of unplasticized PVC pipe systems
AS/NZS 1547:2012	On-site domestic wastewater management
BS 5572	Code of practice for sanitary pipework
NZBC E1	Surface Water
NZBC G13	Foul Water

5.3 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.

5.4 Workmanship

5.4.1 General

5.4.1.1 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.

5.4.2 Co-operation

5.4.2.1 Co-operation

Cooperate with all trades and attend upon the Concretor and Plumber to set out exact pipe runs before any adjacent work is put in hand and ensure that all sleeves etc. are correctly incorporated as work proceeds.

5.4.3 Materials

5.4.3.1 Materials

All pipes and other materials shall comply with the appropriate Standards, and shall be protected from damage of any kind until installation is complete. All incidentals appropriate for the applications involved. Concrete shall be 17.5MPa and as specified under Concretor, Mortar shall be as specified in Blocklayer.

5.4.4 Workmanship

5.4.4.1 Workmanship

All drainlaying shall be carried out by, or under direct control of, properly qualified tradesmen, and shall be to recognised high standards. Ensure cast-in items are installed when required so that no delay is caused by this trade. Adequately protect all adjacent surfaces - clean down to remove dirt etc., and any damage shall be made good by the appropriate trade at the Drainlayer's expense.

On completion of drainlaying clean up full area affected by this trade to the condition it was in before drainlaying commenced.

Site is to be returned as close as possible to its present condition on completion of the contract.

5.4.5 Excavation

5.4.5.1 Excavation

As required for sewer and stormwater. Check for other service lines before excavation - the Drainlayer is responsible for making good any damage. Trenches true to line and with even gradients between gullies, soil stack terminations or downpipes, etc.

Keep the bottom of trenches clear of loose material. All pipes shall be laid in appropriate bedding material, compacted as required. Shore trenches if required to suit ground conditions. Backfilling shall be by this trade, to the standards required in Siteworks.

5.5 Elements

5.5.1 Drainlaying

5.5.1.1 Drainlaying

Commence drainlaying at the low end of even fall sections of drains and proceed in a continuous sequence to the fittings connections.

Sumps, gullies, etc. solidly bedded. Lay 110mm uPVC drains to connect gullies, sumps, stacks, and downpipes through to the street edge connections.

Every junction and bend shall be an inspection position. Temporarily seal the open ends of incomplete drains to prevent entry of foreign matter. Make appropriate provision for any anticipated differential settlement. Place signal strip above all drains.

Ensure that stormwater drains are very accurately positioned so that downpipes can drop directly into them, without offsets.

5.5.2 As Built Drawings

5.5.2.1 As Built Drawings

During drainlaying plot the location of all bends and changes in direction and all cleaning access positions. Locate each item by two diagonal measures from structure corners, etc. and record on a blank plan copy (supplied by Architect/Designer when requested).

Note that Practical Completion of the contract will not be certified until this as-built drawing has been produced (made available to the Contractor in time for the Code Compliance Certificate application).

5.6 Stormwater Drainage

5.6.1 Scope

5.6.1.1 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.

5.6.1.2 Extent of Work

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:

5.6.2 Requirements

5.6.2.1 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](#)', and the '[Excavation Safety - Good Practice Guidelines](#)'

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

5.6.2.2 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.

5.6.2.3 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.

5.6.2.4 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.

5.6.2.5 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.

5.6.2.6 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.

5.6.2.7 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.

5.6.2.8 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 use 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 '[OSH Guidelines For the Provision of Facilities and General Safety in the Construction Industry](#)' and the '[Excavation Safety - Good Practice Guidelines](#)'.

5.6.2.9 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.

5.6.2.10 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.

5.6.3 Materials

5.6.3.1 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.

5.6.3.2 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.

5.6.3.3 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).

5.6.3.4 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.

5.6.3.5 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.

5.6.4 Trench Excavation

5.6.4.1 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.

5.6.4.2 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 be 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.

5.6.4.3 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.

5.6.5 Pipe Laying

5.6.5.1 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.

5.6.5.2 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.

5.6.5.3 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.

5.6.5.4 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.

5.6.5.5 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.

5.6.6 Connection

5.6.6.1 Open Watercourse

Connect to discharge the stormwater drainage line directly to an open watercourse in accordance with the requirements of the Territorial Authority and as shown on the drawings.

5.6.7 Testing

5.6.7.1 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.

5.6.7.2 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.

5.6.8 Backfilling

5.6.8.1 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 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.

5.6.9 Reinstatement of Surfaces

5.6.9.1 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.

