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710471
ORIGINAL
BUILDINGS & STRUCTURES

Palmerston Is Cyclone Shelter – Detailed Design Stage
Structural Specification

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2241 EXCAVATION

1 GENERAL

This section relates to the excavating required for the building works, removing surface soils and the disposal of excavated material.

Documents

1.1 DOCUMENTS REFERRED TO

Documents referred to in this section are:

[NZS 4402](#) Methods of testing soils for civil engineering purposes
 WorkSafe NZ [Good Practice Guidelines - Excavation Safety](#)

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

Performance

1.2 ACCESS FOR MACHINES

Determine working conditions and access for machines. Take into account the time of year, the nature of the ground and subsoil to be excavated, the ground water table and all matters influencing the carrying out of the work.

1.3 SAFE WORKING CONDITIONS

Provide safe working conditions and adequate support to excavations at all times to WorkSafe NZ, [Good Practice Guidelines - Excavation Safety](#). Cover holes and fence off trenches and banks.

1.4 FOUNDATION BEARING

Request written instructions if a natural bearing is:

- reached at a lesser depth or
- not reached at the depth shown on the drawings.

In made-up ground excavate down to a natural bearing. Remove unsuitable material that is exposed and replace with compacted backfill.

1.5 INSPECTION

Arrange for inspections and before placing any new work. If bearing becomes inadequate due to any cause then stop work and request further instructions.

1.6 SITE MEASUREMENT, OTHER FORMATIONS

If for any reason the excavations have to vary from the drawings, those affected to be solid measured and the quantity recorded and agreed to in writing as the excavation proceeds.

2 PRODUCTS

Materials

2.1 TOPSOIL

Weathered soil, with organic inclusions capable of supporting the growth of vegetation.

2.2 CUT MATERIAL

Consisting of sands, gravels, sedimentary materials, clays, scoria and similar deposits.

2.3 ROCK

Defined as material encountered in excavations which because of its size or position can be removed only by breaking up by explosives or mechanical plant such as jack hammers or percussion drills.

2.4 UNCONTROLLED FILL

Variable fill material placed with little or no compaction control.

2.5 EXCAVATED FILL

Material from other formations in the excavation which may be selected and approved as suitable for filling and complying with [NZS 4402](#) by having grading and moisture content properties that will allow compaction to 95% of maximum density.

3 EXECUTION

Conditions

3.1 REPORT

Report any survey pegs, bench marks, and the like on any features, leaving them undisturbed until approval is given for removal.

3.2 COMPLY

Comply with the requirements of WorkSafe NZ, [Good Practice Guidelines - Excavation Safety](#).

3.3 WORK BY OTHERS

Before taking over work done on the site by others check all levels and conditions and report any discrepancies affecting further work.

3.4 EXISTING SERVICES AND FOUNDATIONS

Locate underground services and foundations before work is started. Any information provided regarding the location of these services and foundations is given from available records but with no guarantee of accuracy as regards alignment or depth. Furthermore no guarantee is given or implied that the information provided covers all existing services and foundations. Make good at no extra cost damage to existing services to the satisfaction of the appropriate network utility operator.

Protect existing roads, footpaths, gutters, crossings etc from damage during work.

3.5 KEEP FREE OF WATER

Keep excavations free from water and keep water from excavations clear of other construction work.

3.6 TERRITORIAL AUTHORITY REQUIREMENTS

Obtain from the territorial authority requirements for the method of discharging water from the site.

3.7 FORM SUMPS

Form sumps outside the line of foundations and deep enough to drain excavations. Pump from sumps without disturbing excavations or any material in place.

3.8 SILT CONTROL

Undertake silt control measures required by territorial authorities and network utility operators in relation to design, location and discharge into the drainage system.

Application

3.9 STRIP TOPSOIL

Strip topsoil carefully over the whole site and stockpile where directed on the site, on the prepared subgrade, for re-spreading at the completion of the contract.

3.10 STRIP TO SUBGRADE

Strip the soil over the whole site to form a subgrade generally, but at a minimum of 200mm below the original ground level. Leave the subgrade level, clear of all loose material and with no impediment for the excavation work.

3.11 DIVERT WATERWAYS

Temporarily divert as necessary all ditches, field drains and other waterways encountered during the excavations and reinstate to approval on completion.

3.12 DIVERT DRAINS AND SERVICE LINES

Divert services, drains and field drains encountered in the excavations to new routes clear of the building and reconnect to the requirements of the network utility operator.

3.13 BREAK OUT

Break out and remove old foundations, floor slabs, drains, manholes and septic tanks, seal up connections and remove contaminated soil. Grub out roots in excess of 75mm diameter to a minimum of 500mm below the bottom level of footings or paving. Backfill with selected excavated material, well rammed in layers.

Take special care when working close to retained trees and shrubs.

3.14 EXCAVATION GENERALLY

Excavate for pads, strip foundations and tie beams to the profiles and levels shown on the drawings. Allow clearance for working space and formwork as necessary. Trim to required profiles, falls and levels. If pouring against natural ground excavate an extra 25mm that side to provide 75mm minimum cover to reinforcement horizontally. Bench surface of sloping ground to receive filling. Use plant and equipment suitable for the purpose.

3.15 OVER EXCAVATION

Make good with well compacted backfill.

3.16 EXCAVATED BACKFILL

Stockpile selected excavated backfill on site where directed so that it does not impede continuing works until it is required.

Finishing

3.17 BATTERS, TEMPORARY PROTECTION

Protect batters with a change of level between crest and toe of more than 1.5 metres from weather erosion with a waterproof covering of either hessian and tar, or heavy duty black polythene sheet. Seal at joints and securely fix down at crest and toe. Maintain coverings in good condition until the ground is secured by permanent construction.

Completion

3.18 LEAVE

Leave work to the standard required by following procedures.

3.19 SURPLUS TOPSOIL

Remove unwanted stripped soil from the site continually as the work proceeds. Clean up continually any soil if dropped on footpaths or roads.

3.20 SURPLUS MATERIAL

Remove surplus excavated material from the site continually as the excavation proceeds. Clean up continually any excavated material dropped on footpaths or roads.

4 SELECTIONS

2242 BACKFILLING

1 GENERAL

This section relates to the supply, placing and compaction of materials for backfill, basecourse or built-up ground, as required for the contract works.

Documents

1.1 DOCUMENTS REFERRED TO

Documents referred to in this section are:

NZS 3104	Specification for concrete production
NZS 3604	Timber-framed buildings
NZS 4229	Concrete masonry buildings not requiring specific engineering design
NZS 4431	Code of practice for earth fill for residential development
NZS 4402	Methods of testing soils for civil engineering purposes
TNZ M/04	Specification for basecourse aggregate

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

2 PRODUCTS

Earth fill materials

2.1 EARTH FILL – COMMERCIAL AND INDUSTRIAL DEVELOPMENTS

Earth fill as specified/identified by the geo-professional. Refer to SELECTIONS.

3 EXECUTION

Conditions

3.1 UNSUITABLE MATERIALS

Remove from site all unsuitable filling material.

3.2 SPREAD SURPLUS

Spread and level surplus imported filling materials where directed.

3.3 PLACE FILLING

Place filling using approved methods, to required dimensions, levels, lines and profiles.

3.4 PROTECTION OF FORMATION

Do not allow construction traffic on filling until the level has been raised not less than 150mm above formation level by properly compacted temporary protective filling. Remove temporary protective filling from the site before beginning permanent construction. Do not stockpile materials on newly filled areas without permission.

3.5 DIFFERING MATERIALS

Where materials of widely divergent characteristics are used for filling, spread and compact in clearly defined separate layers.

3.6 EARTHMOVING EQUIPMENT

Do not use earthmoving equipment for compaction.

3.7 COMPACTION NEAR EDGE SUPPORTS

Ensure that edge supports are strong enough to support compaction forces without movement, cracking or other damage. Make good damage caused by compaction.

3.8 MOISTURE CONTENT, GENERAL FILL

Moisture content at time of compaction to be within the range of optimum less 6% up to optimum. Do not use filling with moisture content above optimum value. If necessary:

- adjust moisture content of filling by turning and drying
- provide water sprinkling equipment if fill is too dry.

Application - Earth fill materials

3.9 SAND PLACING

Fill shall be placed in a systematic manner, with near-horizontal layers of uniform thickness of material each being deposited progressively across the fill area. The uncompacted thickness of a layer shall be no greater than 200 mm. Each lift of 200mm the sand is to be fully flooded with water to compaction- See 3.10 below

3.10 SAND COMPACTION

Each layer shall be compacted using a 100kg Plate Compactor, doing 3 passes per layer.

Completion

3.11 LEAVE

Leave work to the standard required by following procedures.

3.12 REMOVE

Remove all debris and unused materials from the site.

4 SELECTIONS

Earth fill

4.1 EARTH FILL – COMMERCIAL AND INDUSTRIAL DEVELOPMENTS

Location: Around the foundations and bellow the ground floor(700mm bellow ground level)

Type: Sand Fill re-using the material taken from the excavation site or borrow location.

2361 STRIP FOOTINGS

1 GENERAL

This section relates to the supply and installation of concrete strip footings of non-specific design to [NZS 3604](#) and [NZS 4229](#), including;

- formwork, reinforcement, concrete mixes and the placing of concrete

1.1 RELATED WORK

Refer to 3101 Concrete Work

Documents

1.2 DOCUMENTS

Refer to the general section 1233 REFERENCED DOCUMENTS. The following documents are specifically referred to in this section:

NZS 3104	Specification for concrete production
NZS 3109	Concrete construction
NZS 3121	Water and aggregate for concrete
NZS 4229	Concrete masonry buildings not requiring specific engineering design
AS/NZS 4671	Steel reinforcing materials
NZS3604	Timber Framed Buildings

Requirements

1.3 QUALIFICATIONS

Concrete workers to be experienced, competent and familiar in the fabrication and erection of formwork and with the materials and the techniques specified.
All work to be installed or supervised by a Qualified Mason

1.4 QUALITY RECORDS

Do not place concrete/grout until all excavations, formwork/blockwork and reinforcing have been inspected and passed by the Building Consent Authority.

2 PRODUCTS

2.1 NORMAL CONCRETE

Normal concrete 25 MPa grade (refer to SELECTIONS), maximum aggregate size 19mm ready-mixed to [NZS 3104](#). Retain delivery dockets listing mix and despatch details.
Mass concrete 10 MPa grade.

2.2 REINFORCEMENT

To [AS/NZS 4671](#) Grade 500E deformed high tensile steel except for ties in plain round mild steel and as detailed.

2.3 TYING WIRE

Mild drawn steel wire not less than 1.2mm diameter.

2.4 WATER

To [NZS 3121](#). Water from a territorial authority/NUO water supply is acceptable.

2.5 SPACERS AND CHAIRS

Precast concrete or purpose made moulded PVC.

3 EXECUTION

3.1 STORAGE

Handle and store reinforcing steel and accessories without damage or contamination. Store on timber fillets on hard ground in a secure area clear of any building operation. Lay steel fabric flat.

Ensure reinforcement is clean and remains clean so that at the time of placing concrete it is free of all loose mill scale, loose rust and any other contamination that may reduce bonding capacity.

3.2 SOIL BEARING

To [NZS 3604](#) or [NZS 4229](#), Section 3, **Site Requirements**.

All soil bearing surfaces of footings shall be horizontal and may be stepped to accommodate variations in cleared ground level. Bearing shall be upon solid bottom in undisturbed good ground to [NZS 3604](#) or [NZS 4229](#), or firm fill with a "Statement Of Suitability...." to [NZS 4431](#).

3.3 DEPTH OF FOOTINGS

As shown on drawings with minimum depth of footings below cleared ground level 200mm

3.4 WIDTH OF FOOTINGS

Footing to be centred on foundation wall above. Refer to drawings or SELECTIONS for minimum dimensions.

3.5 FORMWORK

Use formwork of sufficient strength to retain and support the wet concrete to the required profiles and tolerances. Select formwork finish to produce the specified finished quality. Water blast to clean formwork. Keep formwork wet before concrete is placed.

3.6 REINFORCEMENT

Cut and bend bars using proper bending tools to avoid notching and to the requirements of [NZS 3109](#). Do not rebend bars. Where rebending is approved, use a purpose built tool, proper preparation and preheating.

3.7 REINFORCING LAPS

Refer to the drawing standard notes page SN2 for reinforcement lap or splice lengths in in-situ concrete.

Unless specified otherwise on the drawings, minimum splice lap length for deformed bars should be 70 bar diameter for grade 500 steel.

3.8 STARTER BARS

Vertical starter reinforcement to [NZS 4229](#), to match vertical wall reinforcement in size, type, location and spacing. Starters to penetrate foundation wall by 600mm minimum, and in the footing to be bent through 90° and tied to longitudinal reinforcing.

3.9 COVER

Minimum cover 75mm.

3.10 OPENINGS

Footings to be continuous under openings unless shown otherwise.

3.11 PUMPING CONCRETE

Set up and supervise pump operation, placing and compaction of the mix to, [NZS 3109](#):

7.4 Handling and placing and **7.6 Compaction**, advise the ready-mix supplier of the type of pump and the slump required, in addition to the concrete grade, strength and quantity.

3.12 STRIKE FORMWORK

Strike formwork without damaging or overloading structure to [NZS 3109](#). Do not remove formwork before the following minimum periods under average temperature conditions:

12 hours: Sides of beams, walls and columns

Completion

3.13 PROGRESSIVE CLEANING

Clean off concrete spills as they occur, making good any damage at the same time.

3.14 FINAL CLEANING

Clean down exposed walls and remove waste material from adjoining surfaces at completion.

3.15 REMOVE

Remove from the site materials not used.

4 SELECTIONS

4.1 CONCRETE

Normal concrete: 25 MPa

4.2 FOOTING SIZE AND REINFORCING

The following are minimum requirements.

Location: Strip Footings under Bock Walls

Footing width: 500 mm

Footing height/depth: 400.mm

Longitudinal steel: 2 HD-16 T & B

Stirrups: R6 ties @ 200mm CRS

4.3 PAD FOOTING SIZE AND REINFORCING

The following are minimum requirements.

Location: Under Columns

Footing width: Varies refer to drawings

Footing height/depth: 400.mm

Longitudinal steel: HD-12 T & B & Each-way

3101 CONCRETE WORK - BASIC

1 GENERAL

This section relates to formwork, reinforcement, concrete mixes and the placing of concrete.

1.1 RELATED WORK

Refer to 2361 Strip Footings

1.2 ABBREVIATIONS AND DEFINITIONS

The following definitions apply specifically to this section:

ACRS Australian Certification Authority for Reinforcing Steels - An independent certification scheme for reinforcing steel and structural steel, by product and manufacturer/processor. Certifies compliance with Australia/New Zealand Standards.

ACRS web site - www.steelcertification.com

Documents

1.3 DOCUMENTS

Refer to the general section 1233 REFERENCED DOCUMENTS. The following documents are specifically referred to in this section:

NZBC B1/AS1	Structure
NZBC E2/AS3	External moisture
NZS 3101.1	Concrete structures standard
NZS 3104	Specification for concrete production
NZS 3109	Concrete construction
NZS 3114	Specification for concrete surface finishes
AS/NZS 4671	Steel reinforcing materials
CCANZ CP 01	Code of practice for weathertight concrete and concrete masonry construction

Requirements

1.4 QUALIFICATIONS

Workers to be experienced, competent trades people familiar with the materials and techniques specified.

1.5 STEEL REINFORCING COMPLIANCE

Steel reinforcing materials for concrete to [AS/NZS 4671](#). Steel to be manufactured in New Zealand, or by an overseas manufacturer holding a current valid (or equivalent) NZ S Mark or ACRS certificate for that type of steel. Confirm compliance and provide evidence if requested.

2 PRODUCTS

2.1 NORMAL CONCRETE

Normal concrete 25 MPa grade, (refer to SELECTIONS), maximum aggregate size 19mm ready-mixed to [NZS 3104](#).

2.2 REINFORCEMENT

Bars to [AS/NZS 4671](#). Grade 500E deformed, other than for ties, stirrups and spirals, unless shown otherwise on the drawings. Welded reinforcing mesh Class E to [AS/NZS 4671](#), and 500E mesh to [AS/NZS 4671](#) as modified by NZS B1/VM1.

2.3 TYING WIRE

Mild drawn steel wire not less than 1.2mm diameter.

2.4 SPACERS AND CHAIRS

Precast concrete or purpose made moulded PVC to approval. Where concrete spacer blocks are used in exposed concrete work use blocks matching surrounding concrete.

2.5 DAMP-PROOF MEMBRANE

0.25mm minimum polyethylene to [NZS 3604](#), 7.5.4, Damp-proof membrane.

Accessories**2.6 WATERPROOFING FOR EXTERIOR OPENINGS**

Unreinforced wet area membrane to [AS/NZS 4858](#) for waterproofing around openings for windows, doors, meters and other services openings, at or above floor level, also parapets and ends of masonry walls abutting other claddings to [CCANZ CP 01](#). Refer to SELECTIONS.
Do not use bituminous coatings.

3 EXECUTION**3.1 HANDLE AND STORE**

Handle and store reinforcing steel and accessories without damage or contamination. Store on timber fillets on hard ground in a secure area clear of any building operation. Lay steel fabric flat.

Ensure reinforcement is clean and remains clean so that at the time of placing concrete it is free of all loose mill scale, loose rust and any other contamination that may reduce bonding capacity.

3.2 FALSEWORK AND FORMWORK

Use falsework and formwork of sufficient strength to retain and support the wet concrete to the required profiles and tolerances. Select formwork finish to produce the specified finished quality. Ensure timber or plywood used for formwork is non-staining to the set concrete.

Securely fix and brace formwork sufficiently to support loads and with joints and linings tight enough to prevent water loss. Do not use tie wires or rods unless approved in writing by the Contract Administrator. Unless detailed otherwise, provide a 19mm chamfer or fillet strip at all interior and exterior angles of beam and column forms. Mitre at intersections.

Water blast to clean formwork. Keep formwork wet before concrete is placed.

Unless detailed otherwise, set up soffit boxing for beams and slabs to provide a camber when forms are stripped, of 3mm rise for every 3 metres of total clear span.

3.3 INSTALL DAMP-PROOF MEMBRANE

Apply polythene membrane to prepared basecourse with 150mm laps between sheets. Tape seal laps and penetrations with 50mm wide pressure sensitive plastic tape. Refer to drawings for perimeter details.

3.4 CUT AND BEND REINFORCEMENT

Cut and bend bars using proper bending tools to avoid notching and to the requirements of [NZS 3109](#): 3.3 Hooks and bends. Minimum radii of reinforcement bends to [NZS 3109](#), table 3.1, Minimum radii of reinforcement bends. Do not rebend bars. Where rebending is approved, use a purpose built tool, proper preparation and preheating.

3.5 ADJUSTMENTS

Use a purpose built tool for on site bending and to deal with minor adjustments to steel reinforcement.

3.6 TOLERANCES, BENDING

To [NZS 3109](#), 3.9, Tolerances for reinforcement.

3.7 SECURE REINFORCEMENT

Secure reinforcement adequately with tying wire and place, support and secure against displacement when concreting. Bend tying wire back well clear of the formwork. Spacing as dimensioned, or if not shown, to the clear distance minimums in [NZS 3109](#), 3.6, Spacing of reinforcement.

3.8 LAPPED SPLICES

Length of laps where not dimensioned on the drawings in accordance with the SELECTIONS.

Provide laps only where indicated on the drawings. Tie all lapping bars to each other. Plain bars lapped splices must be hooked.

Welded wire mesh laps to [NZS 3101](#), lap one mesh square plus 50mm minimum (do not count bar extension beyond the outermost wire).

3.9 REINFORCEMENT COVER TO NZS 3101.1

Minimum cover to all reinforcing bars, stirrups, ties and spirals, as shown on drawings. Where cover is not shown on drawings provide minimum cover to [NZS 3101.1](#), table 3.6, **Minimum required cover for a specified intended life of 50 years**. Sub-soil cover to [NZS 3101.1](#), to suit soil and groundwater conditions. Fix chairs for top reinforcement in slabs at 1.0 metre centres or to ensure adequate support. Cover tolerances to [NZS 3109](#), 3.9, Tolerances for reinforcement.

3.10 CASTING IN

Build in all grounds, bolts and fixings for wall plates and bracing elements, holding down bolts, pipes, sleeves and fixings as required by all trades and as shown on the drawings, prior to pouring the concrete.

Do not use grounds exceeding 100mm in length. Location and form of conduits to be approved in writing by the Contract Administrator. Minimum cover 40mm. Do not encase aluminium items in concrete. Do not paint steel embedded items more than 25mm into the concrete encasement. Cut back form ties to specified cover and fill the cavities with mortar.

Form all pockets, chases and flashing grooves as required by all trades and as shown on the drawings.

Wrap all pipes embedded in concrete with tape to break the bond and to accommodate expansion. Do not embed pipes for conveying liquids exceeding a temperature of 50°C in concrete.

3.11 CONSTRUCTION JOINTS

Locate and construct as shown on the drawings

3.12 SURFACE FINISHES

To [NZS 3114](#), 105, Specification of finishes, as scheduled or as denoted on the drawings.

3.13 CONCRETE SURFACE TOLERANCES

To [NZS 3114](#), 104, Surface tolerances and [NZS 3114](#), 105, Specification of finishes, with the suggested tolerances becoming the required tolerances.

3.14 PUMPING CONCRETE

Set up and supervise pump operation, placing and compaction of the mix to [NZS 3109](#), 7.4, Handling and placing and [NZS 3109](#), 7.6, Compaction Advise the ready-mix supplier of the type of pump and the slump required, in addition to the concrete grade, strength and quantity.

3.15 COMPACTION

Use power operated vibrators on foundations, vertical constructions and beams.

3.16 SAW CUTS

Cut slabs where indicated on the drawings and as required to control shrinkage cracking. Carry out cutting as soon as possible, without causing tear-out of aggregate and before shrinkage cracking has occurred, generally within 24 hours of pouring. Where saw cuts are to be made, cut out 100mm of every second wire of the mesh for a length of 50mm each side of the saw cut position. Saw cuts: 1/3rd slab depth or 30mm minimum.

3.17 SURFACE DEFECTS

Make good surface defects immediately after forms are stripped. Make good hollows or bony areas with 1:2 mortar or plaster, finished to the same tolerances as the parent concrete. Fill any tie rod holes with 1:2 mortar.

3.18 CURING OF CONCRETE

Keep damp for not less than seven days. Ensure curing of slabs commences as soon as possible after final finishing, by the use of continuous water sprays, or ponding. Alternately, apply a curing membrane. Ensure any membrane used will not affect subsequent applied finishes.

3.19 STRIKE FORMWORK

Strike formwork without damaging or overloading structure. Do not remove formwork before the following minimum periods:

12 hours:	Sides of beams, walls and columns
4 days:	Slabs in beam and slab construction (leave props under slab spans over 2 metres)
10 days:	Props from under slab spans over 2 metres
18 days:	Beams, soffits and slab spans over 5 metres

3.20 WATERPROOFING EXTERIOR OPENINGS

Apply waterproofing to the exposed face of openings for, windows, doors, meters etc, also if necessary the top of parapets/balustrades and ends of masonry walls abutting other claddings. To [CCANZ CP 01](#), waterproofing manufacturer's requirements and as detailed. Provide temporary protection from direct sunlight.

3.21 REMOVE

Remove all unused materials and all concrete and reinforcing debris from the site.

4 SELECTIONS

4.1 DAMP-PROOF MEMBRANE

Brand/type: Thermathene Black 200um

4.2 REINFORCEMENT LAPS

Where reinforcement laps are not shown on the drawings, lap as follows:

Bar diameter	Grade 500E deformed
12mm	500mm
16mm	650mm

4.3 NORMAL CONCRETE

Normal concrete:

25 MPa: for Foundations and Floor Slab

4.4 SURFACE FINISHES FLOOR SLABS

Surface finish class to [NZS 3114](#): table 2, Classes of floor, exterior pavement and invert finishes.

Finish class	Location
U3	All Floors

4.5 SURFACE FINISHES PAVEMENTS AND DRIVEWAYS

Surface finish class to [NZS 3114](#): table 2, Classes of floor, exterior pavement and invert finishes.

Finish class	Location
U2 wood float finish	External Ramps and stairs

4.6 WATERPROOFING FOR EXTERIOR OPENINGS

Location: Refer to architectural drawings

Brand/name: Refer to architectural drawings

Type: Quick curing elastomeric unreinforced waterproofing membrane to [AS/NZS 4858](#)

4.7 WEATHERTIGHTNESS SYSTEM

Refer to architect

To be done by others.

3320 CONCRETE MASONRY

1 GENERAL

This section relates to the supply and installation of hollow concrete masonry to [NZS 4229](#), as modified by [NZBC E2/AS3](#), including;

- concrete masonry, mortar, reinforcement and grouting
- self insulating concrete masonry

1.1 ABBREVIATIONS AND DEFINITIONS

Refer to the general section 1232 INTERPRETATION & DEFINITIONS for abbreviations and definitions used throughout the specification.

The following definitions apply specifically to this section:

ACRS Australian Certification Authority for Reinforcing Steels - An independent certification scheme for reinforcing steel and structural steel, by product and manufacturer/processor. Certifies compliance with Australia/New Zealand Standards.
ACRS Web site - www.steelcertification.com

1.2 DOCUMENTS

Refer to the general section 1233 REFERENCED DOCUMENTS. The following documents are specifically referred to in this section:

NZBC B1/AS1	Structure
NZBC E2/AS3	External moisture
AS/NZS 2699	Built-in components for masonry
NZS 3109	Concrete construction
NZS 3121	Water and aggregate for concrete
NZS 4210	Masonry construction: Materials and workmanship
NZS 4229	Concrete masonry buildings not requiring specific engineering design
NZS 4230	Design of reinforced concrete masonry structures
AS/NZS 4455.1	Masonry units, pavers, flags, and segmental retaining wall units - Masonry units
AS/NZS 4671	Steel reinforcing materials
AS/NZS 4858	Wet area membranes
CCANZ CP 01	Code of practice for weathertight concrete and concrete masonry construction

Requirements

1.3 QUALIFICATIONS

Carry out all masonry work with people competent and experienced in this type of work, under the supervision of a suitably qualified tradesperson as required in [NZS 4229](#) and [NZS 4210](#). All work to be installed or supervised by a Registered Mason or licensed building practitioner (LBP): Licensed for Bricklaying and Blocklaying 2: Structural Masonry. RBW must be supervised by an LBP.

1.4 CONSTRUCTION CONTROL

Supervise masonry construction to [NZS 4230](#): table 3.1, Observation type B, admissible use and nominal strengths. Keep records of materials to [NZS 4210](#): 2.4.2.

1.5 CONSTRUCTION OBSERVATION BY ENGINEER

Inspections shall confirm compliance with the design and the required standards of construction. Obtain from the engineer Producer Statements required relating to the masonry construction. Where required as a condition of the building consent, advise the engineer when inspections are required.

1.6 STEEL REINFORCING COMPLIANCE

Steel reinforcing materials for concrete to [AS/NZS 4671](#). Steel to be manufactured in New Zealand, or by an overseas manufacturer holding a current valid (or equivalent) NZ S Mark or ACRS certificate for that type of steel. Confirm compliance and provide evidence if requested.

Performance

1.7 DURABILITY

To [NZS 4210](#), Table 2.E1 - **Masonry durability requirements**. Refer to SELECTIONS.

EXPOSURE		DURABILITY REQUIREMENT	
NZS 3101.1 ZONE	MORTAR (Note 1)	BUILT IN COMPONENTS (Note 2)	MINIMUM COVER REINFORCEMENT (Note 3)
Zone E (NZBC E2/AS1)	M4	R4	30 (60)mm

Notes

- 1. Mortar mixes to [NZS 4210](#), 2.2.2.1.
- 2. Classifications to the three parts of [AS/NZS 2699](#), R1 is light to heavy galvanised, R3 is heavy hot-dip galvanised, R4 is 316 stainless steel, R5 specific performance.
- 3. Cover is measured to [NZS 4210](#) from the inside face of the block cell (or in brackets to the outside face of the block, assuming 30mm shell thickness).

2 PRODUCTS

2.1 MASONRY UNITS

To [AS/NZS 4455.1](#).

2.2 REINFORCEMENT

To [AS/NZS 4671](#) deformed mild steel except for ties in plain round mild steel and as detailed. Refer to the Concrete section for reinforcing and mesh for slabs.

2.3 MORTAR

Sand to [NZS 3103](#). Chloride levels to not exceed 0.04% by dry weight of sand. Mortar to [NZS 4210](#): section 2.2, Mortar. Compressive strength minimum 12.5 MPa at 28 days

2.4 GROUT

To [NZS 4210](#): section 2.3, Grout.

2.5 WATER

To [NZS 3121](#). Water from a territorial authority/NUO water supply is acceptable.

Accessories

2.6 WATERPROOFING FOR EXTERIOR OPENINGS

Unreinforced wet area membrane to [AS/NZS 4858](#) for waterproofing around openings for, windows, doors, meters and other services openings, at or above floor level, also parapets and ends of masonry walls abutting other claddings, to [CCANZ CP 01](#). Refer to SELECTIONS. Do not use bituminous coatings.

3 EXECUTION

3.1 MASONRY CONSTRUCTION GENERALLY

To [NZS 4210](#), [NZS 4229](#) as modified by [NZBC E2/AS3](#) ([CCANZ CP 01](#)).

3.2 STORAGE

Store masonry units clear of the ground, under cover and well ventilated until placed in the work. Handle and store reinforcing steel and accessories without damage or contamination. Store on timber fillets on hard ground in a secure area clear of any building operation. Lay steel fabric flat. Ensure reinforcement is clean and remains clean so that at the time of placing concrete it is free of all loose mill scale, loose rust and any other contamination that may reduce bonding capacity.

3.3 MOISTURE CONTENT

Ensure masonry units are air dry prior to laying.

3.4 CHECK BASE CONCRETE

Ensure the base concrete is true to line and level, requiring a base mortar bed of 10mm (minimum) to 20mm (maximum). Ensure that all laitance, loose aggregate, or anything preventing bond is removed prior to laying masonry units.

3.5 STARTER POSITIONS

Before commencing laying masonry units, check the location of starter reinforcement by measure or by a dry trial lay up of the first course. Do not correct misplacement by cranking bars. Where misplacement exceeds the location tolerance, obtain written direction before proceeding.

3.6 REINFORCEMENT

Reinforcement to [NZS 4229](#) and [NZS 4210](#): 2.6, **Reinforcing details**.

Cut and bend bars using proper bending tools to avoid notching and to the requirements of [NZS 3109](#). Do not rebend bars. Where rebending is approved, use a purpose built tool, proper preparation and preheating.

3.7 REINFORCEMENT LAPS

Tie all lapping bars to each other.

Minimum wall reinforcing laps schedule

BAR TYPE	LAP LENGTH
Deformed	40 diameters

For shrinkage control joint reinforcing refer to clause VERTICAL CONTROL JOINTS.

3.8 COVER

Cover to [NZS 4210](#), Table 2.E1 - **Masonry durability requirements**, refer to DURABILITY clause in SELECTIONS.

3.9 TOLERANCES

Construct within the tolerances set out in [NZS 4210](#): clause 2.6.5, **Tolerances**, and clause 2.7.1, **General**. Lay masonry units with bedding of consistent thickness throughout.

Reinforcement to [NZS 3109](#): 3.9 **Tolerances for reinforcement**.

3.10 PROTECTION

Protect fair-faced masonry walls, keeping them clear of mortar droppings, grout splashes, or stains of any kind.

3.11 LAY MASONRY UNITS

Ensure consistent, fully filled and tooled joints. Where walls are reinforced, prevent mortar droppings from entering the cells to be grouted. Provide clean out holes at base of wall, unless "low lift" ([NZS 4210](#)) grouting is used. Ensure reinforcement is accurately placed and tied. Lay in regular stretcher bond with all necessary special units and sill units. Cut masonry, if necessary, true and square without chipping.

3.12 MASONRY UNITS JOINTS

Not exceeding 10mm thick, or less than 8mm when the units are bedded in. Joints tooled concave, unless detailed otherwise.

3.13 VERTICAL CONTROL JOINTS

To [NZS 4229](#) 12.1 **Shrinkage control joints**.

Locate at major changes of wall height or thickness, at openings, at ground slab control joints, and at not more than 6m centres, or, as shown on the drawings. Where reinforcement passes through a control joint, provide for breaking bond using methods detailed on [NZS 4229](#) fig. 12.2, **Control joint detail...**, unless specifically detailed otherwise.

3.14 BRACING

Provide sufficient temporary lateral bracing to ensure stability until the final supporting construction is in place.

3.15 GROUT CELLS

Grout all masonry unit cells.

3.16 GROUTING PROCEDURE

Use procedures set out in [NZS 4210](#). Methods acceptable on this project are:

- high lift grouting with expansive admixture

- high lift grouting without expansive admixtures
- low lift grouting.

3.17 CONSTRUCTION JOINTS

Form and treat construction joints between grout pours and between masonry walls and hardened concrete work to ensure bonding occurs. Comply with [NZS 4210: 2.16](#), **Horizontal construction joints**.

3.18 MORTAR IN COMPONENTS

Mortar in components such as sills, copings, lintels, and steps, as work proceeds.

3.19 BUILD IN

Build in plugs, bolts, ties, metal flashings, dowels, fastenings and fixings as required by all trades and as shown on the drawings.

3.20 PROGRESSIVE CLEANING

Clean off mortar splashes and grout spills as they occur, making good any damage at the same time.

3.21 WATERPROOFING EXTERIOR OPENINGS

Apply waterproofing to the exposed face of openings for, windows, doors, meters etc, also if necessary the top of parapets/balustrades and ends of masonry walls abutting other claddings. To [CCANZ CP 01](#), waterproofing manufacturer's requirements and as detailed. Provide temporary protection from direct sunlight.

3.22 FINAL CLEANING

Clean down masonry work and remove waste material from adjoining surfaces and floors at completion.

3.23 REMOVE

Remove from the site materials not used.

4 SELECTIONS

4.1 DURABILITY - PROJECT REQUIREMENTS

Refer to clause DURABILITY.

Location:	Palmerston Island
Exposure Zone:	Exposure zone E-M to NZS3101.1
Mortar mix:	M4 to NZS 4210 2.2.2.1
Components:	R4
Rebar cover:	Placed centrally withing the block cell

4.2 MASONRY UNITS

Width:	190mm
Bond:	stretcher

4.3 GROUT

Design strength:	12.5 MPa at 28 days
Aggregate size:	13.2mm maximum
Note: if expansive agents are used the minimum strength must be 20 MPa or the design strength whichever is greater.	

4.4 MORTAR JOINTS

Location:	All Block Work Joints
Joint profile:	Concave
Mortar colour:	None

4.5 WATERPROOFING FOR EXTERNAL OPENINGS

Location:	All openings
Type:	Quick curing elastomeric unreinforced waterproofing membrane to AS/NZS 4858

4.6 WEATHERTIGHTNESS SYSTEM

The weathertightness system is covered in the following section:

Refer architects drawings

3410 STRUCTURAL STEELWORK - BASIC

1 GENERAL

This section relates to the fabrication, erection and specialist coating of structural steelwork of a general nature.

1.1 DOCUMENTS

Refer to the general section 1233 REFERENCED DOCUMENTS. The following documents are specifically referred to in this section:

NZBC F5/AS1	Construction and demolition hazards
AS/NZS 1252.1	High-strength steel fastener assemblies for structural engineering - Bolts, nuts and washers - Technical requirements
AS/NZS 1554.1	Structural steel welding - Welding of steel structures
AS 1627.4	Metal finishing - Preparation and pretreatment of surfaces - Abrasive blast cleaning
AS 1627.9	Metal finishing - Preparation and pretreatment of surfaces - Pictorial surface preparation standards for painting steel surfaces
AS/NZS 2312:2002	Guide to the protection of iron and steel against atmospheric corrosion by the use of protective coatings
NZS 3404.1:1997	Steel Structures Standard
AS 3828	Guidelines for the erection of building steelwork
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
GANZ:	Galvanizing Association of New Zealand - After-Fabrication Hot Dip Galvanizing. A practical reference for designers, specifiers, engineers, consultants, manufacturers and users
HERA R4-99	Specification for the fabrication, erection and surface treatment of structural steelwork

1.2 QUALIFICATIONS

Welders to be qualified, experienced competent workers, familiar with the materials and the techniques specified.

1.3 VERIFY DETAILS AND DIMENSIONS

Refer to drawings to ensure all required details and fixings are provided for in the structural steelwork. Verify dimensions against site measurements prior to fabrication.

1.4 TEST WELDING

Non-destructive weld examination with method, extent and standards of acceptance to [AS/NZS 1554.1](#), Section 7 and [NZS 3404.1](#), Appendix D.

2 PRODUCTS

2.1 STRUCTURAL STEEL

Comply with New Zealand, Australian, British or Japanese Standards for steel as required by [NZS 3404.1](#), section 2, including, type, category, and suppression of brittle fracture.

Grade 300, except RHS sections Grade 350, unless noted otherwise on the drawings.

2.2 WELDING

Electrodes to comply with and be selected for the grade of steel being welded as required by [AS/NZS 1554.1](#). Welding wire as required by the wire manufacturer for the materials to be joined and the welding position. Welding flux: dry and used from sealed containers. Material for arc stud welding to comply with [AS/NZS 1554.1](#).

2.3 BOLTS, NUTS AND WASHERS

To [AS/NZS 1252.1](#) and to the requirements of [NZS 3404.1](#), section 2.3 **Fasteners**. Hot-dip galvanize all bolts, nuts and washers forming a permanent part of any structure subject to a protective coating, to [AS/NZS 4680](#).

3 EXECUTION

3.1 SURFACE FINISH

Grind off all burrs and sharp arrises.

3.2 TOLERANCES

Discard material showing visual defects affecting its structural integrity. Comply with the tolerances laid down for holding down bolts, columns, beams and other members in HERA R4-99 and [NZS 3404.1](#). Comply with [NZS 3404.1](#) for level and alignment of beams and alignment and plumbing of struts.

Structural elements to comply for straightness, length, full contact splices and struts not prepared for full contact with [NZS 3404.1](#).

3.3 CUTTING

To [NZS 3404.1](#), and for existing steel HERA R4-99. Hand cut only where machine cutting is not possible.

3.4 CONSTRUCT

Construct the steel structure as detailed and to [NZS 3404.1.1](#), section 14, Fabrication and section 15, Erection.

3.5 WELDING

Carry out welding in accordance with [AS/NZS 1554.1](#) and the additional requirements of [NZS 3404.1](#). Equipment to comply with [AS/NZS 1554.1](#), clause 1.8.2.

3.6 WELDING NEAR TOUCHING STEELWORK

Shop weld together touching or near-touching steelwork all round with 5mm (one pass) continuous fillet welds unless denoted otherwise on the drawings.

3.7 HOLING

Comply with [NZS 3404.1](#) for sizes, alignment, finishing, punching and flame cutting of holes.

3.8 BOLTING

Bolting, including high strength bolting to [NZS 3404.1](#). Ensure that at least one clear thread shows above the nut and at least one thread run out is clear beneath the thread after tightening.

3.9 THREADS EXCLUDED FROM SHEAR PLANE

Select length of bolts such that the threaded portion does not occur within the shear plane between joined parts.

3.10 START ERECTION

Start erection only when the holding down bolts and anchorages have achieved sufficient strength.

Carry out the erection of the structural steel to the requirements of AS 3828. Comply with [NZBC F5](#) and [NZS 3404.1](#), section 15, Erection. Provide temporary bracing as required to achieve stability during erection.

3.11 BASE PLATES

Enlargement or site cutting of holes not permitted. Bending or displacement of holding down bolts not permitted.

3.12 COLUMNS

Plumb columns using sawn steel packs and wedges not larger than necessary for the purpose. The column base must not be raised by more than 25mm. Fill space beneath the base plate with cement-sand grout, containing a non-shrink additive, the grout having a minimum compressive strength of 30MPa at 28 days. Alternately use a dry pack of 1:2 cement with the sand mortar hammered in tight to ensure complete filling of space.

3.13 INSPECTION

Inspect all stages of fabrication and construction of the structure to [NZS 3404.1](#), sections 14, Fabrication and 15 Erection.

3.14 ENCASED STEELWORK

Clean the steelwork to be encased in concrete to remove all loose mill scale, rust, dirt and other matter affecting bond with concrete. Achieve this by wire brushing and the use of suitable solvents.

3.15 ABRASIVE BLASTING

Remove oil and grease by the use of solvents. Abrasive blast clean to a Class 2.5 finish to AS 1627.4. Clean to bright metal, but avoid producing a polished surface. Select grit type and equipment such that the cleaned surface profile between peaks and valleys does not exceed one third of the dry film thickness. Check that no burrs or sharp arrises remain which may prevent the full coating thickness being attained.

3.16 STEELWORK BEING GALVANIZED

Fabricator to provide any temporary members required by the galvanizer to strengthen prefabricated elements likely to be distorted by the subsequent hot dip galvanizing process.

To galvanize, clean sections thoroughly and apply zinc coating by the hot-dip process to the requirements of [AS/NZS 4680](#). Average zinc coating to be not less than the following:

Structural steelwork	Average coating	Minimum coating
≤ 1.5mm	45 microns	35 microns
> 1.5mm ≤ 3mm	55 microns	45 microns
> 3mm ≤ 6mm	70 microns	55 microns
> 6mm	85 microns	70 microns

3.17 REPAIR WELD DAMAGED GALVANIZING

Remove welding slag, power tool clean, grind off all burrs and sharp arrises, all repairs to [AS/NZS 4680](#), 8.4 **Site repair**:

- Small repairs:- Colour matched zinc rich paint.
- Large repairs:- With approval, colour matched zinc rich paint or other agreed option.

4 SELECTIONS

4.1 STEELWORK BEING GALVANIZED

Awning SHS Posts to Galvanized to Z600

3821 TIMBER FRAMING

1 GENERAL

This section relates to the supply and erection of timber framing, as a framed structure, or as part of a partitioning system.

1.1 ABBREVIATIONS AND DEFINITIONS

Refer to the general section 1232 INTERPRETATION & DEFINITIONS for abbreviations and definitions used throughout the specification.

The following abbreviations apply specifically to this section:
SG Structural grade to [NZS 3604](#), 1.3 **Definitions**

Documents

1.2 DOCUMENTS

Refer to the general section 1233 REFERENCED DOCUMENTS. The following documents are specifically referred to in this section:

NZBC B2/AS1	Durability
AS/NZS 2904	Damp-proof courses and flashings
NZS 3602	Timber and wood-based products for use in building
NZS 3603	Timber structures standard
NZS 3604	Timber-framed buildings
NZS 3622	Verification of timber properties
NZS 3631	New Zealand timber grading rules
NZS 3640	Chemical preservation of round and sawn timber
*A copy of NZS 3604 Timber-framed building, must be held on site.	

1.3 DIMENSIONS

All timber sizes except for roof battens are actual minimum dried sizes.

2 PRODUCTS

Materials

2.1 TIMBER FRAMING, TREATED

Species, grade and in service moisture content to [NZS 3602](#), [NZBC B2/AS1](#) and treatment to [NZS 3640](#), [NZBC B2/AS1](#). Structural grade (SG) to [NZS 3604](#), [NZS 3622](#) with properties to [NZS 3603](#).

2.2 APPEARANCE TIMBERS

Graded to [NZS 3631](#), treated where required by [NZBC B2/AS1](#), [NZS 3602](#), table 1, and treatment to [NZS 3640](#).

Components

2.3 NAILS

Type to [NZS 3604](#), section 4, **Durability**, and of the size and number for each particular types of joint as laid down in the nailing schedules of [NZS 3604](#), sections 6-10. All Nails to be stainless steel.

2.4 BOLTS AND SCREWS

Bolts and screws of engineering and/or coach type complete with washers, to the requirements of [NZS 3604](#), section 4, **Durability**, and of the number and form required for each particular junction to [NZS 3604](#), sections 6-10.

2.5 TIMBER CONNECTORS AND FIXINGS

Supply for each particular joint the connectors and fixings as noted on the drawings. Comply with the requirements of the manufacturer, [NZS 3604](#), section 4, **Durability**, and of the number and form required for each particular junction to [NZS 3604](#), sections 6-10. All timber connectors and fixings to be stainless steel unless noted otherwise

2.6 BRACING STRAPS

Nail-on type to the requirements of [NZS 3604](#), section 4, **Durability**, and of the number and form required for each particular application to [NZS 3604](#), sections 6-10. All bracing strap to be stainless steel

2.7 CORROSION RISKS

For interior timber, treated with copper-based timber preservatives (H3.2 or higher), use a minimum of hot-dipped galvanized steel fixings and fasteners.

For exterior timber, timber in damp areas and timber subject to occasional wetting, use only stainless steel (or equivalent) fixings and connectors, when the timber is treated with; Copper Azole (CuAz, Preservative code 58), Alkaline Copper Quaternary (ACQ, Preservative code 90), Micronise Copper Azole (code 88) or Micronised Copper Quaternary (code 89).

3 EXECUTION

Conditions

3.1 PROTECT TIMBER

Protect all timber against damage and from inclement weather. Ensure that any variation in moisture content is kept to a minimum, before and after erection and before enclosure.

3.2 EXECUTION

Execution to comply with [NZS 3604](#), except as varied in this specification. Execution to include those methods, practices and processes contained in the unit standards for the National Certificate in Carpentry and the National Certificate in Joinery (cabinetry, exterior joinery, stairs).

3.3 SEPARATION

Separate all timber framing timbers from concrete, masonry and brick by: -

- a full length polyethylene damp-proof membrane overlapping timber by at least 6mm; or
- a 12mm minimum free draining air space

3.4 FRAMING MOISTURE CONTENT

Maximum allowable equilibrium moisture content (EMC) for non air-conditioned or centrally heated buildings, for framing to which linings are attached.

- At erection: 24% EMC maximum
- At enclosure: 20% EMC maximum
- At lining: 16% EMC maximum

3.5 TOLERANCES

Permissible deviations from established lines, grades and dimensions equal to or less than the following. Multiples of given limits are not cumulative.

- Deviation in plan, up to 10 metres, 5mm
- Deviation in plan, over 10 metres, 10mm total
- Deviation from horizontal, up to 10 metres, 5mm
- Deviation from horizontal, over 10 metres, 10mm total
- Deviation from vertical position per 3 metres, 3mm
- Deviation from horizontal and vertical, within openings, 3mm.

Application

3.6 SET-OUT

Set-out framing generally in accordance with the requirements of [NZS 3604](#), to carry superimposed loads and as required to support sheet linings and claddings. Set back nogs 12.5mm from face of studs where required for back-blocking of plasterboard non-tapered ends or edges.

3.7 SET TIMBERS

Set timbers true to required lines and levels with mitres, butt joints, laps and housings cut accurately to provide full and even contact over the whole of the bearing surface.

3.8 TIMBER CUTTING

Select and cut spanning members to minimise allowable defects and avoiding knots and short grain on edges in the middle third, and shakes, splits and checks at mid-span and close to ends.

3.9 TIMBER PLATES AND FURRING

Fix to steelwork with bolts and washers or approved proprietary fastenings at 1 metre maximum spacing and not less than 2 fixings to each member, or to engineering specific design.

3.10 HOLES AND NOTCHES

Limit holes and notches, checks and half-housing for the structure to those allowable in [NZS 3604](#). Neatly form holes and notches for services without lessening the structural integrity of the member.

3.11 CUTTING

Cutting for straightening to comply with [NZS 3604](#), 8.5.3, **Straightening studs**.

3.12 EXPOSED TIMBER CONNECTORS AND FIXINGS

Do not use steel timber connectors and fixings on any structural framing exposed to view unless detailed on the drawings.

3.13 ADDITIONAL FRAMING

Position and fix all necessary members for the fixing of all services, fittings, fixtures, edges of linings or claddings, and to provide lateral support to load carrying framing.

3.14 FORM NAILED JOINTS

Fully drive nails in all structural joints with the number and location for each particular joint, to the requirements of the nailing schedules of [NZS 3604](#). Where splitting could occur, pre-drill to 80% of nail diameter.

3.15 FORM BOLTED JOINTS

Drill for and set bolts to ensure full bearing and development of the joint strength, with tension to just set the washers into timber or to engineering specific design.

3.16 FIT CONNECTORS AND FIXINGS

Fit connectors and fixings to obtain full bearing over all contact surfaces and full development of the required loading capacity for that particular joint and in accordance with the manufacturer's requirements or to engineering specific design.

3.17 FIT BRACING

Fit and fix subfloor, wall and roof bracing elements to the requirements of the manufacturer or to [NZS 3604](#), to develop the full number of bracing units required.

Completion

3.18 CLEAN UP

Clean up timber framing as the work proceeds so no offcuts, chips, sawdust or any other matter or items remain behind the claddings or linings.

3.19 LEAVE

Leave work to the standard required by following procedures.

3.20 REMOVE

Remove debris, unused materials and elements from the site.

4 SELECTIONS

4.1 ROOF FRAMING - RADIATA PINE

Member	Species	Grade	Treatment
Rafters:	Radiata pine	SG8	H3.2
Trusses:	Radiata pine	SG8	H3.2
Purlins:	Radiata pine	SG8	H3.2
Other	Radiata pine	SG8	H3.2

4.2 CEILING FRAMING - RADIATA PINE

Member	Species	Grade	Treatment
Ceiling joists:	Radiata pine	SG8	H3.2

4.3 NAILS

Location	Type	Material	Finish
All Locations	LumberLok product nails	Stainless Steel	

4.4 BOLTS AND SCREWS

Location	Type	Material	Finish
All Locations	Varies	Stainless Steel	

4.5 NAIL PLATES

Location	Type	Material	Finish
All Locations	Varies	Stainless Steel	

4.6 CONNECTORS

Location	Type	Material	Finish
All Locations	Varies	Stainless Steel	