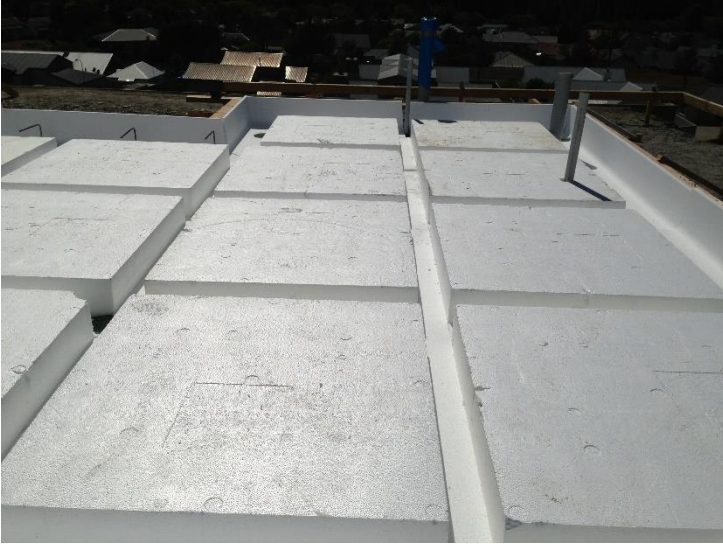




MAXRaft®

Fully Insulated Foundations



MAXRaft® Technical Details



This Manual contains design information pertaining to the specification of a MAXRaft® Fully Insulated Foundation system. Full information on the installation procedures is described in the Onsite Guide. Where Standards are referenced in this manual, these shall include the latest amendments.

1 TECHNICAL DESCRIPTION

2.1 Overview

The MAXRaft® Fully Insulated Foundation system is a reinforced concrete slab-on-ground system contained entirely within a thermal envelope of specifically designed MAXRaft® insulation. It typically consists of MAXRaft® perimeter footings and internal thickenings used in conjunction with MAXRaft® insulation. The overall depth ranges from 250mm to 400mm, depending on the soil strength and building type. Perimeter footings and internal thickenings are designed to provide for the extra load carried in these areas. The depth of the concrete slab can range from 85mm to 125mm depending on the site-specifics and the use of underfloor heating.

All MAXRaft® Fully Insulated Foundation systems are fully engineered by independent engineers on a site specific basis to ensure the MAXRaft® system is appropriate for the ground and building type.

2.2 Good Ground / TC1

Good ground is defined as per NZS 3604:2011 guidelines and is generally taken to be ground of 100kPa allowable bearing capacity or greater, or is designated as TC1 type ground. Where this bearing capacity is reached, standard MAXRaft® of 250mm high may be used.

2.3 Ground other than “Good” / TC2

Where there bearing capacity of the ground is below 100kPa, or is defined as TC2 type ground, MAXWaffleRaft™ should be specified.

This system is typically 320mm – 400mm high depending on the site specifics, and is designed to ensure the strength and stability of the foundation is suitable for the ground upon which it sits. This system utilises polystyrene pods and insulated ribs to allow for greater amounts of steel and concrete for strength, while maintaining a thermal envelope around the slab.

2.4 Building Types

MAXRaft® is suitable for single storey residential buildings, and two storey residential buildings depending on cladding and the bearing capacity of the ground.

MAXWaffleRaft can be engineered to suit any type of residential building as well as light commercial buildings.

2.5 Preliminary Work

All preparatory work for the sub-grade is to be done in accordance with NZS 4431 (current code of practice for earth fill for residential development).

Where reference is made in the MAXRaft® quote or PS1 engineering to excavations or other referenced in a Geotech report, the site must adhere to standards recommended in the Geotech report.

Where fill is used to bring a site up to the required level, or as a replacement for excavated soil, it should be tested to ensure that it meets the ground bearing capacity previously specified by MAXRaft®. Where excavation has been specified by either the Geotech or engineer, the testing done must be documented/certified by an appropriate 3rd party (Geotech engineer in the case of TC3 ground or where a gravel raft has been specified by the Geotech) and presented to MAXRaft® prior to installation.

The ground around the edge of the foundation should be designed so that there is a slight slope away from the foundation for run-off water. Concrete should not be poured

up against the exterior, rather a free draining gutter should run around the house.

2.6 Raw Materials – XPS/EPS form work

All polystyrene is injection moulded from fire retardant polystyrene beads in accordance with the specification contained in the BASF technical leaflet TL 423, January 1993, so as to produce accurate dimensionally stable sheets.

Load bearing (including perimeter footings) material shall all be XPS (300kPa) or VH grade (165kPa) with all other material being S grade (85 kPa) that shall have a final density between 16 and 30 kg per cubic meter. Please see Appendix A for EPS characteristics.

A signed quality assurance form from MAXRaft® must be provided to ensure that the polystyrene has been supplied in line with the PS1 and is covered by the Durability statement.

2 OTHER DESIGN DETAILS

2.1 R-Values

Minimum R-Values are specified by Clause H1 of the Building code. The minimum required for floors is R1.3 for light timber frame construction, and R1.5 for masonry construction. If in-floor heating is used the minimum required R-value is increased to R1.9.

The R-Value of a MAXRaft® floor is typically between R4.0 and R4.5. The R-Values have been independently calculated in accordance with the Scheduling Method detailed in NZS 4218:2009, Thermal Insulation – Housing and Small Buildings. The calculations for this are available on our website at <http://www.MAXRaft.co.nz/downloads/> (see MAXRaft® H1 calculator in Manuals section) and on Design Navigator (www.designnavigator.co.nz)

These high R-Values can assist in obtaining a Homestar rating of 7 and above.

2.2 Shrinkage Control

The extended curing time arising from the use of MAXRaft® insulation creates a stronger concrete foundation than traditional methods, thus reducing the susceptibility of the foundation to cracking.

Where control joints are necessary, floor finish, the location of load bearing walls and underfloor heating should be taken into account. Saw cuts should be cut into the slab within 24 hours after pouring once the slab is sufficiently hard.

Saw cuts should be approximately 1/3rd of the concrete topping thickness, with a minimum 25mm deep cut for concrete 85mm thick. For large floors, formed control joints may be required.

Concrete fibres/additives such as UltraFibre 500 (www.multiform.co.nz) can also be used for additional shrinkage control.

2.3 Workmanship

Sufficient care shall be taken when handling or transporting MAXRaft® so that corners, rebates, etc. are not damaged. Before use, panels shall be kept dry, free from contact with the ground, and completely covered from the weather. Caution must be taken to ensure no solvent based products come into contact with polystyrene, as these substances break down the cells of the XPS/EPS.

The MAXRaft® Fully Insulated Foundation system is to be installed in line with the instructions in the MAXRaft® Onsite Guide.

The MAXRaft® shall be placed by a tradesman experienced in this type of work. Full guidance and technical assistance is available from MAXRaft®, or approved agents. The MAXRaft® shall be true to line, level, and plumb to within the following accuracy:

- Deviation from the position shown on the plan is to be no more than 5mm;

2.4 Inspections

The Engineer or local authority shall be notified at least 48 hours before commencement of concrete works to enable inspection of the work to ensure that the work is carried out with the intent of his design.

2.5 Build – In

- Provision needs to be made for any shower or bath rebates.
- Holding Down bolts as per NSZ 3604 or as per onsite guide options
- All door/window rebates are to be H4 timber and placed pre-pour with allowances made for all floor coverings.
- All substrate plumbing is to be placed with all trenching compacted to a rate no less than 100kpa.

2.6 Holding Down Bolts / Bottom Plate Fixings

External wall bottom plate fixings & bracing hold down requirements for timber framed walls to NZS3604:2011;

- 90mm framing to have cast-in bolts as per Clause 6.11.9 of NZS 3604:2011 with any additional 15kN fixing required for bracing element hold downs to be Ramset Epcon C6 Chemical Anchors with 25mm edge distance to internal face of framing.
- Header block cast in anchor option
- 140mm framing to have cast-in bolts as per NZS 3604:2011 or Hilti M10 Screw Anchors (HUS-H10x140) with 25mm edge distance to internal face of framing. Any additional 15 kN fixing required for bracing element hold downs to be Hilti M10 Screw Anchors with 25mm edge distance to internal face of framing.

- Bottom plate fixing & bracing hold down requirements for ALL OTHER types of wall framing are to be specified by the building structural engineer.

We have recently undertaken on-site screw in bolt testing in conjunction with Ramset. These tests utilised the Ramset M10 and M12 Screw in Anchors. Both anchors met the required 15kN tensile strength tests. The results of this test are available on our website ([http://www.MAXRaft.co.nz/downloads/Testing heading](http://www.MAXRaft.co.nz/downloads/Testing%20heading))

2.7 Concrete placement

Concrete is not to be poured until all in slab plumbing is concluded. Concrete is to be placed as a semi-continuous operation allowing for consolidation as the work proceeds. All concrete work shall comply with N.Z.S.3109:1997 "Specification for Concrete Construction".

All control joints are to be placed in accordance with the PS1 as indicated necessary by the structural engineer.

2.7.1 Concrete

All concrete shall be supplied from an approved ready mix concrete plant and shall comply with NZS 3104:2003. Grout grade and strength are defined in NZS 3104.

All concrete work shall comply with NZS 3109:1997, Clause 7 Concrete Construction.

Concrete strength and depth shall be specified in the MAXRaft® engineering, however care shall be made to ensure minimum strengths are adhered to as set out below.

Concrete shall be High Grade Concrete with a minimum compressive strength of 20MPa at 28 days, unless stated otherwise on engineering, having a slump of 140mm.

Only those concrete providers whose concrete meets NZBC 1992 B2 Clause shall be used.

2.7.2 Steel Fibre Reinforced Concrete

Where the engineer has specified steel fibre reinforced concrete, this should be used as per the specifications. Depending on the nature of the house and ground, additional reinforcing rods may be specified to ensure structural integrity. Where such additional reinforcing is specified, it shall meet the requirements set out in S2.8 Reinforcement below, and shall be laid in line with the MAXRaft® Onsite Guide.

Where steel fibre reinforced concrete has been specified, the responsible party on site shall obtain the batch number and concrete grade from the concrete dispatcher and submit it to the local authority.

Steel fibre reinforced concrete shall be minimum 25mPa. The concrete element itself shall meet the standards set out in S2.7.1 above, subject to minimum 25mPA strength.

Steel fibre reinforced concrete is not suitable for polished concrete floors.

2.8 Reinforcement

All reinforcement and minimum lap length is to be as per engineer's specifications.

All reinforcing steel used is required to meet NZBC 1992 B2 Clause.

2.8.1 Bending and Placement of Reinforcement

Reinforcement shall be cut, bent and placed as indicated on the MAXRaft® Engineering and in conformity with the appropriate sections of NZS 3109:1997.

Bars shall be lapped only where detailed, except that bars in foundation and slab edge beams may be lapped to suit stock lengths

with the provision that laps shall be kept to a minimum and staggered where possible.

Before pouring begins the Engineer or local authority are to be notified and reasonable opportunity given for them to inspect the reinforcing as fixed.

If a PS4 is requested in the building consent conditions, contact any qualified engineer to supply a PS4.

2.9 Cleaning

During laying and on completion, clean down all MAXRaft® to remove all adhesive or concrete splashes and to leave a clean finish. Make good with Sika Boom-G any damaged corners or faces. Remove from the site, all plant and debris pertaining to this trade, all to the complete satisfaction of the Engineer.

2.10 External Coating

MAXRaft® should be protected through the use of a product with an appropriate coating that meets NZBC E2/AS1 and NZBC B2.3.1 requirements.

Current options for external coating include the below amongst others:

- Supercoat™ MFS Waterproofing and Finishing System;
- Sto Plaster System;
- EFIS Tape/External Plaster.

2.10.1 EPS

Our EPS product will require waterproofing. Where the EPS perimeter is below ground level, the protective coating must be suitable for use in such areas. Please contact your chosen manufacturer to confirm that the product meets the required standard.

2.10.2 XPS

Our XPS product is waterproof and so does not require a further waterproof coating, even beneath the ground.

The exterior will still require protection from physical damage and UV damage. It must be protected through the use of an appropriate coating product that meets the NZBC E2/AS1 and NZBCB 2.3.1 requirements.

2.10.3 Supercoat MFS Waterproofing and Finishing System

This system is installed by a team of Supercoat applicators. It must be applied as described in the Supercoat MAXRaft Foundation System Specification. In order to prepare the MAXRaft® for application of the Supercoat system, the MAXRaft® exterior and polythene DPM should be clean and dry. A 5 coat system will then be applied by the applicator as per the Supercoat MFS Technical Manual.

This can be applied so that the membrane discontinues at the top of the MAXRaft® exterior, Fig 2.16, or it can continue beneath the bottom plate, Fig 2.17.

4.1 MAXRaft™ Foundation System (MFS) Supercoat™ Alternative Detail 2

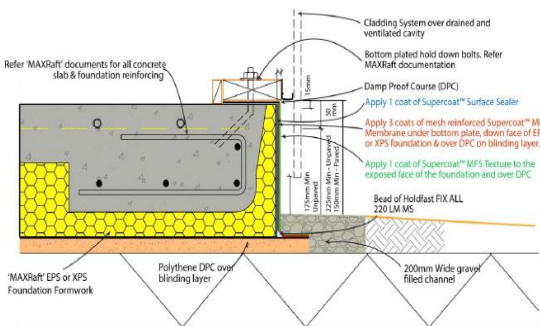


Fig 2.20

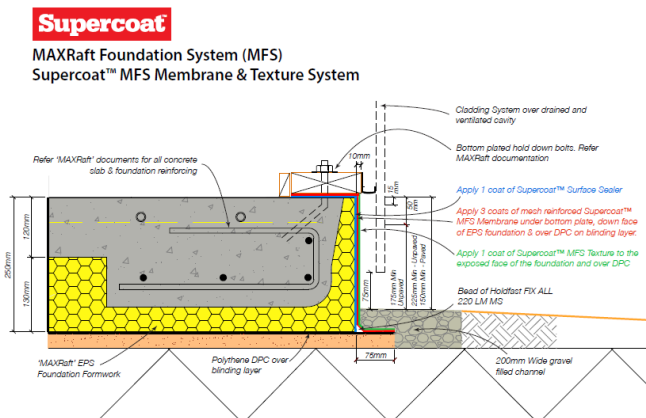


Fig 2.21

2.11 Durability

MAXRaft® insulation is designed to exceed 50 years, in line with the NZ Building Code Clause B2 - Durability.

Where MAXRaft® is correctly specified, installed and maintained in line with this Manual and the Onsite Guide, it will meet the NZBC 1992 B2 Clause requirement for at least 50 years life expectancy.

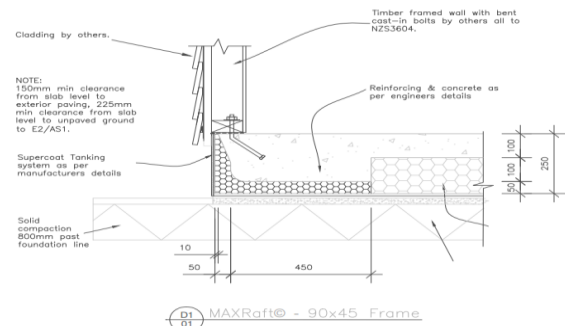
The MAXRaft® Durability Statement can be provided upon request.

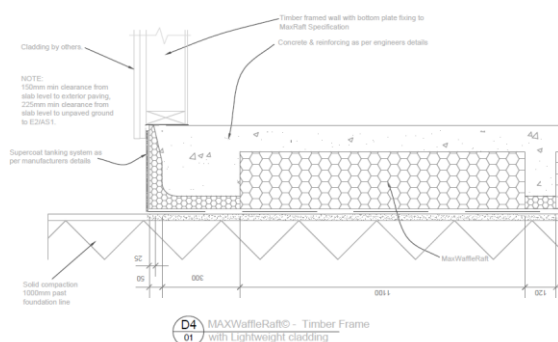
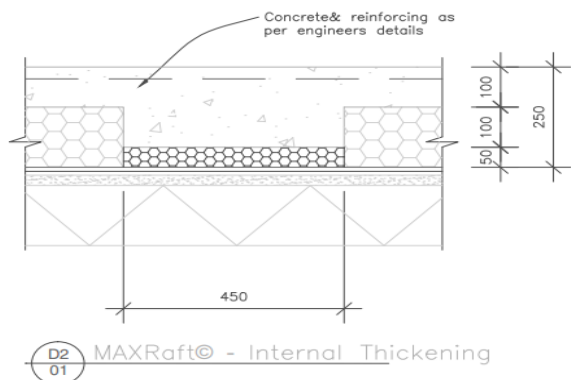
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3 Specifying MAXRaft®

As all MAXRaft® Fully Insulated Foundations are engineered on a site-specific basis by independent engineers, minimal details are required to be included on the architect’s plans. A foundation design package based on our standard designs, some of which are below, can be included in the plans with a reference to “Details as per MAXRaft engineer’s specifications”. Further designs are available at

<http://www.maxraft.co.nz/downloads/> and <http://www.eboss.co.nz/library/maxraft.>





Appendix A

XPS/EPS is an inert, organic material, and therefore will not rot and is highly resistant to mildew. It provides no nutritive value to plants, animals, micro-organisms or rodents.

XPS/EPS will last the life of most buildings in which it is used, provided it is cladded from UV rays and is not damaged.

Physical Property	Unit	SL	S	M	H	VH	Test Method
Compressive stress at 10% deformation (min)	kPa	70	85	105	135	165	AS 2498.3
Cross-breaking strength (min)	kPa	135	165	200	260	320	AS 2498.4
Rate of water vapour transmission (max) measured parallel to rise at 23°	mg/m2s	630	580	520	460	400	AS 2498.5
Dimensional stability of length, width, thickness (max) at 70°, dry condition 7 days	%	1	1	1	1	1	AS 2498.6

Thermal resistance (min) at a mean temperature of 25°	m2.K/W	1.13	1.17	1.20	1.25	1.28	AS 2464.5 or AS 2464.6
Flame propagation characteristics:							AS 2122.1