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1. OVERVIEW

1.1. Introduction

This manual provides details of the specifications, procedures and technical data required to utilise the INSULFORM continuous reinforced concrete expanded polystyrene heavy duty thermoplastic bridge block building system.

1.2. Scope

Descriptions of the INSULFORM blocks and the products used in conjunction with the blocks are contained herein.

1.3. Disclaimer

While the engineering, waterproofing and construction details shown in this manual are designed to meet the relevant performance requirements of the NZBC the responsibility for specific design and details lies with the design of the particular structure incorporating these INSULFORM blocks.

2. INSULFORM IMPORTANT INFORMATION

2.1. Fully Moulded Blocks

Features of our fully moulded block include the following:

- The R value of the insulform Poly Block System is more than double the code requirement.
- 50mm tongue and grooved sides are fully patented. (This feature considerably reduces waste)
- For superior adhesion to the concrete core fully patented dovetail slots are included.
- Fully patented heavy duty polypropylene bridges set at 125mm centres, with an off set angle design to increase the stability of the unfilled block.
- Braces are required at openings and at 1500mm centers maximum during erection.

2.2. Fully Moulded Corner Blocks

Features of fully moulded corner block includes the following:

- Left and right handed units.
- Shuttering of corners is eliminated thus saving many hours of labour.

2.3. Stop Ends

- The double dovetail design means a very tight fitting stop end that eliminates the need for time consuming shuttering.
- This detail was a “world first design” when introduced over ten years ago.

2.4. BRANZ Appraised Sill Detail – 424 2005 (See Drawing 4a)

The forming up of the sill by using wooden boxing used to be one of the most negative aspects of the ICF building method (very time consuming and still allowing water to ingress when the window leaks). Insulform Sill Block featuring the “Silltray System” has completely changed this.

- Made to measure
- Factory made
- *When* the window leaks the water is directed to the outside.

Because Christchurch is the manufacturing base for Insulform ICF units, the fully moulded block system is still the preferred option for builders in the South Island.

3. NEW DEVELOPMENTS

3.1. Insulform Supablock (assembly on site)

Due to the newly increased insulation requirements of the NZ building code and the popularity of ICF in the North Island Insulform Building Systems have developed for the North Island and other long haul destinations (export) an assembly on site system called Insulform Supablock. This has been designed to reduce the burden of ever increasing freight charges.

3.2. Design Features

The Insulform Supablock design includes the following features:

- The bridges span or tie the rows of blocks together at the horizontal joint 75mm up into the row above and 75mm down into the row below.
- Historically this has been the weakest area of site assembled blocks resulting in a “slow pour” rate.
- By utilizing the tight fitting stop ends in the standard block, corners can be fabricated very easily and quickly.
- Bracing during erection is the same as the fully moulded system.
- The freight component is reduced to about half.

4. EXPANDED POLYSTYRENE INSULATION

4.1. What is EPS?

EPS stands for expanded polystyrene. It is a light weight cellular plastics material consisting of fine spherical shaped particles that comprise 98% air. This air is trapped within a number of closed hollow cells in each particle.

4.2. How is EPS made?

When raw EPS particles containing a blowing or expanding agent are softened by heating with steam, hollow closed cells are formed within the particles that then expand up to fifty times their original volume.

4.3. Shapes

Shaped EPS products are produced either by cutting the blocks or direct moulding of the expanded particles in specially manufactured moulds – this is how INSULFORM blocks are made.

4.4. How good is EPS as insulation?

Extremely effective…essentially because the stable trapped air in the closed cells is such a good insulator. The thermal performance of a material is measured in terms of it's resistance to the flow of heat. This thermal resistance is expressed as R values. The higher the R value the better the insulation.

4.5. R Values

The R value of the most commonly used EPS is 0.57 for every 25mm of thickness. Thus 44mm of EPS delivers an R value of 1. By comparison 1240mm of concrete is required to provide the same R value.

4.6. Does EPS absorb water?

No. EPS is a closed cell material and cannot absorb water. During the process of moulding a block however, tiny channels are formed between the EPS particles. If the block is immersed in water these channels can be filled with water. After immersion for three hundred and sixty days there may be up to 6% water content by volume that has entered the channels. Even under such an adverse and rare prolonged condition of saturation EPS suffers little adverse effect. It maintains its size, shape structure, cohesion, and physical appearance. These facts are exemplified by the widespread use of EPS in floats, marinas and other fully or partially submerged applications.

4.7. Does EPS breathe?

Yes. The breathability characteristic of EPS refers to its ability to allow water vapour to pass through the cell structure. It therefore reduces the tendency towards the formation of vapour dams. In applications where high humidity and temperature differential are likely, a vapour barrier such as metal or plastic sheeting should be used. The vapour barrier is best installed on the warm side of the structural component with the insulation on the cold side. The INSULFORM block when filled with concrete does not form any vapour barriers.

4.8. Does EPS age?

Very slowly. EPS consist of 98% air and 2% polystyrene and nothing else. Because of its cellular structure EPS is dimensionally stable and will not settle over time, provided loads and temperatures are kept within specific limits. EPS used and installed correctly does not deteriorate with age and as such is able to deliver constant R values for the life of the building.

4.9. Is EPS strong?

Yes. EPS is manufactures in a number of different classes or densities. Each class exhibits excellent compressive and flexural strength and dimensional stability characteristics…at a very high strength to weight ratio. The range of classes available

enables specifies to select the most appropriate balance between structural and insulation properties for any building application.

4.10. How sound proof is EPS?

Because EPS has a closed cell it offers only a limited absorption of airborne sounds. The INSULFORM block however compensates for this with the concrete fill having excellent sound insulation.

4.11. Is EPS chemically resistant?

It depends. It is resistant to virtually all aqueous media including dilute acids and alkalis and to methanol, ethanol and silicone oils. EPS has limited resistance to paraffin oil, vegetable oils, diesel fuel and Vaseline that may attack the surface after long term contact. It is not resistant to aromatic hydrocarbons, ketones, esters, paints containing thinners and solutions of synthetic adhesives. Because it is subject to attack by such petroleum based solvents as turpentine these substances should be allowed to evaporate before coming into contact with EPS. In roofing applications requiring hot bituminous asphalt, care should be taken to prevent melting or collapse of the EPS.

4.12. Is EPS damaged by UV light?

Prolonged exposure to sunlight will cause slight discolouration of EPS and cause some surface embrittlement. Even so the thermal insulation properties will not be affected unless exposure results in a loss of thickness. For this reason EPS should be covered for protection from UV if left in the open for prolonged periods of time.

4.13. Is EPS durable?

Yes. Because EPS is an inert, organic material it will not rot and is highly resistant to mildew. It provides no nutritive value to ants, termites and rodents too.

4.14. Does EPS contain CFC's?

No. EPS is CFC and HCFC free. At no stage during the manufacture or application of EPS is the use of CFC's or HCFC's or any other compound that is said to contribute to the destruction of the Earth's ozone layer, required.

4.15. Does EPS burn?

Because INSULFORM block are manufactured from EPS containing a fire retardant additive they do not present an undue fire hazard when correctly installed. Like timber, particle board and other organic building materials, PES will burn when in contact with a flame. The combustible material in PES blocks is very small when compared to timber framing. Due to the presence of the fire retardant additive in the EPS used for INSULFORM blocks the flame will self extinguish when the source of the fire is removed.

4.16. Does EPS give off toxic fumes?

The level of toxicity of EPS in a fire situation is no greater than that of timber and other commonly used building materials. The same toxic gas, carbon monoxide, is produced. Also produced are carbon dioxide and soot (carbon). There is no gaseous emission of hydrogen cyanide or hydrogen chloride as with some treated timbers.

4.17. Can EPS be recycled?

Yes. During the production of INSULFORM blocks any EPS waste generated can be reground back into individual beads and recycled into other blocks at a level of 10% without any measurable effect on quality. This regrind can also be used as a soil aeration material for plants, landscapes, compost heaps and drainage materials.

4.18. Is EPS cost Effective Insulation?

Because EPS is versatile the cost effectiveness has to be addressed on case by case basis. In many applications however, particularly where structural strength is required, EPS is the most cost effective insulation material available.

INSULFORM POLYSTYRENE PERMANENT CONCRETE INSULATING FORMWORK EPS - TPB

5. CONSTRUCTION SPECIFICATIONS

5.1. Preliminary

Refer to the Conditions of Contract and Preliminary and General clauses which shall apply to this section of the works. Allow to co-operate with all other trades.

5.2. Scope

This section of the work consists of the supply of all labour, plant, materials, propping, temporary bracing and the like for the erection of all polystyrene blocks as formwork for the walls etc as shown on the plans. Horizontal reinforcement must be placed at the same time as the blocks are being laid. Vertical reinforcement can be placed after the blocks are laid provided wire tying loops are provided for tying the vertical bars to the starters and the horizontal bars.

5.3. Blocks

All Insulform polystyrene blocks are 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 blocks. The blocks shall have a final density between 23 and 26 kg per cubic metre.

Heavy duty thermoplastic bridging shall be polypropylene bonded into each external skin of polystyrene.

Allow to cut with a hot wire or saw to all non modular sizes. Support any cut blocks with other supports where required to prevent bulging and grout loss.

5.4. Workmanship

Sufficient care shall be taken when handling or transporting EPS blocks that corners, rebates, etc are not damaged. Before use, blocks 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 they will dissolve the polystyrene in the blocks.

All polystyrene blocks shall be laid by a layer experienced in this type of work. All walls shall be true to line, level, and plumb to within the following accuracy.

Deviation from the position shown on the plan.	20mm.
Deviation from vertical within a storey.	10mm per 3m.
Relative displacement between load bearing walls in adjacent storeys intended to be in vertical alignment.	5mm.

Deviation from line to plan.

(i)	Any length up to 10m.	5mm.
(ii)	Any length over 10m.	10mm.

Deviation from horizontal.

(i)	Any length up to 10m.	5mm.
(ii)	Any length over 10m.	10mm.

All blocks shall be accurately bedded into the blocks below and shall butt accurately up against each other so that true wall dimensions are achieved. Webs of blocks must not be placed over the vertical flue of the blocks below.

Horizontal joints can be glued with a polystyrene contact adhesive on each face if required to assist stability against wind or construction loads.

All walls shall be braced against wind and construction loads.

Where required sills, reveals, and rebates shall be formed to conform to the details drawn on the architectural drawings.

5.5. Inspections

The Engineer shall be notified 24 hours before commencement of grout filling, to enable inspection of the work to ensure that the work is carried out with the intent of his design.

5.6. Build-In

Build in all bolts, straps, fixings, switch and power boxes, etc, as shown on the drawings or as required by the various trades

Chases, holes, cut outs, and recesses in masonry shall be constructed only as specified or approved by the Engineer.

Any fixings to be cast in shall have polystyrene removed so as to give 30mm concrete cover around the fixing.

5.7. Concrete Placement

Consolidation of the concrete shall be carried out using mechanical vibration to get air out of the pour. Place grout into cells as a semi continuous operation allowing for consolidation as the work proceeds. Each lift shall be a maximum height of 1.2 metres before consolidation of itself and reconsolidating previously poured concrete to a depth of 100mm.

All concrete work shall comply with N.Z.S.3109:1997 "Specification for Concrete Construction".

5.8. Construction Joints

The preparation of construction joints shall be as specified in N.Z.S.3109:1997. Immediately before placing concrete the construction joint shall be made wet and a 10mm thick layer of slurry applied to the joint. This slurry can be all cement and water paste or a 1:1 slurry of cement and concreting sand. Well work the slurry into the construction joint before placing the concrete.

5.9. Concrete

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

Concrete shall be High Grade Concrete with a minimum compressive strength of 20MPa at 28 days, having a slump of 100mm. Higher strengths are required for specific design or for durability within 500m of a coast line. Concrete shall consist of Portland Cement, sand, aggregate up to 14mm maximum size, water, and plasticiser/water reducing agent. Super plasticisers and expansion additives must not be used.

5.10. Tests and Records

The delivery dockets and other certified records for plant mixed concrete shall be forwarded to the Engineer at fortnightly intervals.

The Contractor shall keep an accurate record of the in-place location of all batches. Tests on site shall be carried out as per Section 9 of N.Z.S.3109:1997.

5.11. Reinforcement

Bar reinforcement denoted on the drawings with the prefix H shall be deformed bars of grade 500E, complying with A.S/N.Z.S.4671:2001 "Steel Reinforcement Materials".

Bar reinforcement denoted on the drawings with the prefix D shall be deformed bars of grade 300E, complying with A.S/N.Z.S.4671:2001 "Steel Reinforcement Materials".

Bar reinforcement denoted on the drawings with the prefix R shall be plain bars of grade 300E, complying with A.S/N.Z.S.4671:2001 "Steel Reinforcement Materials".

5.12. Bending and Placing of Reinforcement

Reinforcement shall be cut, bent and placed as indicated on the drawings and in conformity with the appropriate sections of N.Z.S.3109:1997. Reinforcement shall be secured with wire ties and the cover maintained with plastic or concrete spacers.

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 proviso that laps shall be kept to a minimum and staggered where possible.

Before pouring begins the Engineer is to be notified and reasonable opportunity given for him to inspect the reinforcing as fixed.

All reinforcing steel shall be bent to return to all wall, beam, slab or column junctions, where not otherwise shown.

5.13. Cleaning

During laying and on completion, clean down all blockwork to remove all adhesive or concrete splashes and to leave a first class fair finish to all polystyrene blockwork exposed in the finished building. Make good with acrylic cement plaster 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.

6. TECHNICAL SPECIFICATIONS

6.1. Manufacture Technical

All INSULFORM blocks are manufactured by injection moulding of building grade EPS. Building grade EPS contains a fire retardant additive. The blocks are moulded to a density of approximately 23-27kg/m³. Each block contains about 700g of polystyrene bead. The heavy duty thermoplastic bridges are 2.0 mm thick bonded into the polystyrene at the time of moulding.

- INSULFORM standard block includes bridges bonded into the polystyrene at the time of moulding.
- INSULFORM Supablock features bridges inserted on site.

6.2. Series 200

The INSULFORM Series 200 block is designed for single storey and internal load bearing walls. It has applications for small retaining walls also.

LENGTH	HEIGHT	WIDTH	CONCRETE PER BLOCK	CONCRETE WALL THICKNESS
1000mm	300mm	200mm	0.03m³	100mm

6.3. Series 250

The INSULFORM Series 250 block is designed for up to three storey external walls and internal load bearing walls. Also used for retaining walls to 3m.

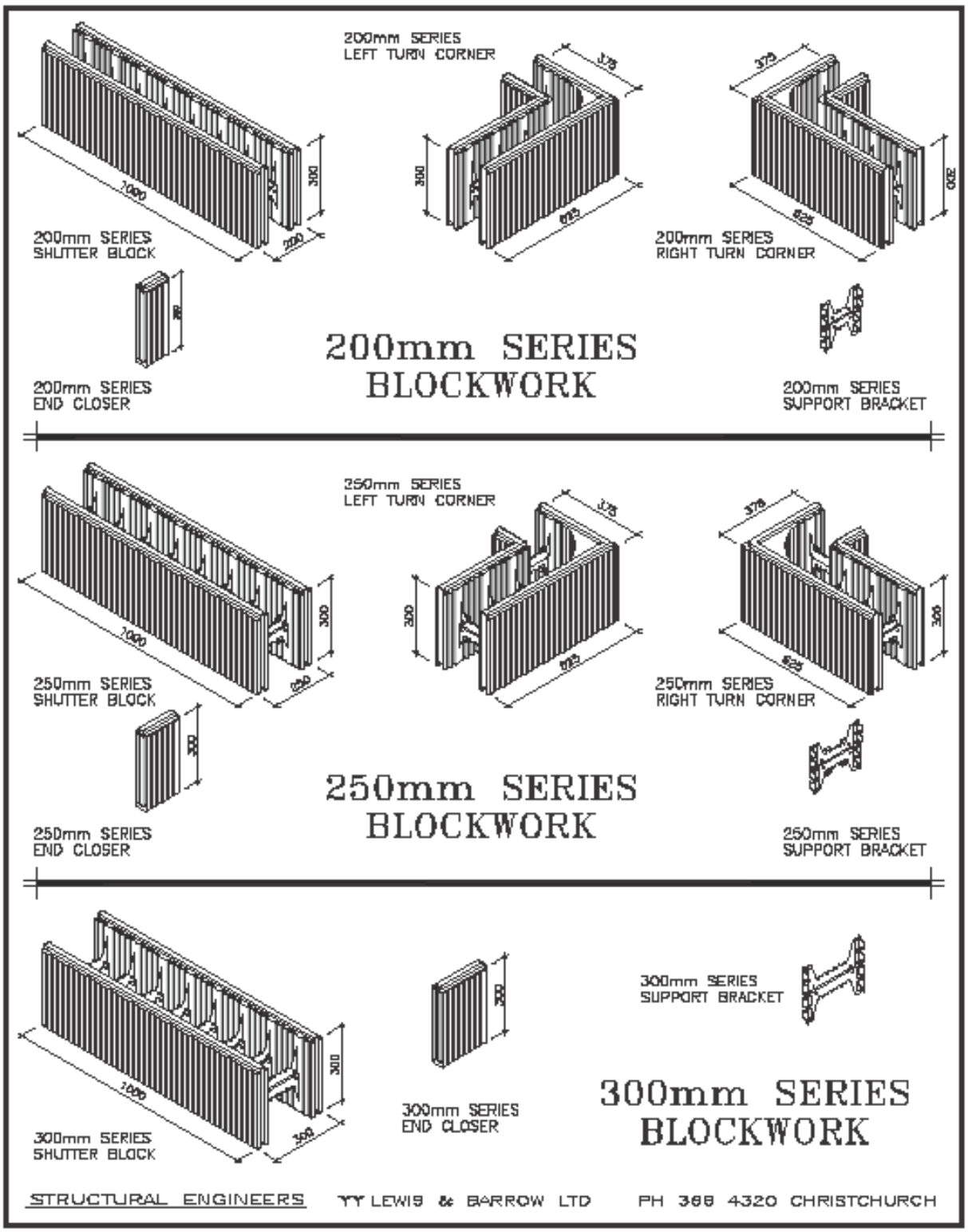
LENGTH	HEIGHT	WIDTH	CONCRETE PER BLOCK	CONCRETE WALL THICKNESS
1000mm	300mm	250mm	0.045m³	150mm

6.4. Series 300

The INSULFORM Series 300 block is designed for multi storey external load bearing and larger retaining walls.

LENGTH	HEIGHT	WIDTH	CONCRETE PER BLOCK	CONCRETE WALL THICKNESS
1000mm	300mm	300mm	0.06m³	200mm

blank



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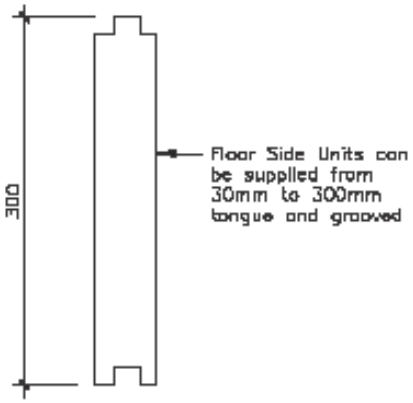
INSULFORM BLOCKWORK
PRODUCT RANGE



FLOOR SIDE UNIT

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INSULFORM BLOCKWORK
PRODUCT RANGE

7. DESIGN INFORMATION

7.1. General

The Insulform polystyrene blocks are used to form load bearing walls, beams and columns where the blocks act as formwork that remains permanently in place as insulation. Polystyrene blocks have the following advantages.

1. Light to transport and lay.

2. Large modular size, while easy and quick to lay.

3. Provides a very light and smooth walled block that is easy to inspect and check.

4. Provides a high insulation value to the structure.

5. Provides a wall that is easy to concrete thereby ensuring that concrete does not hang up as on the likes of concrete blocks.

6. Provides a stable base for approved external plaster systems.

7. Provides a stable wall for fixing internal linings to.

8. Concrete cures inside the polystyrene without losing its mixing water rapidly like other forms of concrete or concrete block construction. There is therefore no risk of shrinkage stresses reducing the strength of the concrete.

7.2. Durability

The expanded polystyrene block faces, and the heavy duty thermoplastic bridges of the blocks can be expected to satisfy the N.Z.B.C. B2 requirements, provided the blockwork is prepared and coated with an approved external plaster and covered with internal linings that are properly maintained for the life of the structure.

The reinforced concrete core has the same durability as a reinforced concrete wall of the same thickness as the core.

7.3. Limitations

As with all expanded polystyrene the blocks must not be exposed to ketones, esters, chlorinated hydrocarbons, benzene, fuels, turpentine, ether, or solvents. The approved coating system must not be over coated with any material that forms a vapour barrier. Only approved plaster and coatings are to be used to allow the blocks to evaporate any moisture from within the wall.

The expanded polystyrene melts with excess heat, so should be separated by a ventilated cavity or concrete, from chimneys, ovens, heaters and other hot items.

7.4. Fire

The Insulform block wall system is suitable for all types of residential, commercial, and industrial uses.

The blocks are formed from fire retardant polystyrene so that the polystyrene shrinks and melts away from a normal ignition source without catching fire. However where an intensely hot ignition source such as an oxyacetylene flame jet is concentrated onto the foam, and melted foam, it is possible to get the vapours to burn.

7.4.1. Outbreak of Fire

Insulform Polystyrene Block Reinforced Concrete Walls contain combustible components. To meet the performance requirements of NZBC they need to be protected from heat sources such as chimneys, solid fuel heaters and flues. Manufacturers of these products must be consulted to determine the appropriate protection measures (e.g. ventilated cavity) so that the Insulform blocks are not subject to temperatures above 50°C.

7.4.2. Spread of Fire

Insulform Polystyrene Block Reinforced Concrete walls can be used to meet the relevant provisions of NZBC C Clauses once reviewed by the fire engineer.

Internal surface finish requirements shall be as required depending on the risk group.

7.5. Dimensions

The normal range of blocks is as follows:

Length	1 metre
Height	300mm
Widths	200mm for 100mm concrete core
	250mm for 150mm concrete core
	300mm for 200mm concrete core

Other widths can be manufactured to fulfil a bulk special order.

7.6. Weight

Walls consisting of Insulform blocks, reinforced concrete, 3mm external plaster finish (Insulclad) and 9.5mm (Gib Board) internal linings weigh:

270 kg/sq metre for 100mm concrete core
390 kg/sq metre for 150mm concrete core
510 kg/sq metre for 200mm concrete core

If the external plaster finish is solid plaster in accordance with N.Z.S.4251:1998 then these weights must be increased by 45kg/m².

7.7. Insulation Value

A 100mm concrete core Insulform block wall system with external plaster and internal plasterboard linings has a thermal resistance of at least 2.9 square metres °C/W.

A 150mm concrete core Insulform block wall system with external plaster and internal plasterboard linings has a thermal resistance of at least 3.0 square metres °C/W.

7.8. Structural Strength – Non Specific Design

7.8.1. General

The building scope shall be as defined by clause 1.1.2 of N.Z.S 3604;2011

Construction is to be in accordance with N.Z.S.3604:2011 except as varied below:

- All external walls shall be Insulform walls. Or timber framed (2nd storey).
- Internal walls may be Insulform or timber framed walls built in accordance with N.Z.S. 3604:2011.

- Foundation walls must be 250mm thick (minimum) Insulform walls built in accordance with the Insulform Manual.

- Floor to ceiling heights can be up to 2.5m.

- These details shall apply to the following buildings:

    - Single storey buildings based on 100mm thick or thicker concrete Insulform walls.

    - Two storey buildings where the lower storey is of 100mm thick concrete Insulform walls and the upper storey including the floor is light timber framed construction conforming to N.Z.S. 3604:2011.

- If 100mm thick or thicker concrete core Insulform block walls are to be used for the lower and upper walls of two storey construction with a timber floor or concrete floor, a specific design is required for bracing, lintels, foundations and concrete floored. Refer to Engineer's Design Information of Page 30.

7.8.2. Bracing Requirements

These are determined as follows:

- Wind – Tables 5.1 to 5.7 of N.Z.S. 3604:2011
- Earthquakes – Tables 5.8 to 5.10 of N.Z.S. 3604:2011

7.8.3. Bracing Resistance (Ratings)

Bracing ratings shall be those for reinforced concrete walls of N.Z.S.3604:2011, except that, 100mm thick concrete core Insulform block walls have a rating of 120 bracing units per metre if the top of the storey in question finishes with a ceiling diaphragm, built in accordance with Paragraph 13.5 of N.Z.S.3604. A value of 200 bracing units per metre can be used for lower storey walls, having a first floor particle board diaphragm built in accordance with Paragraph 7.3 of N.Z.S.3604. These strengths are governed by the ceiling diaphragm or the floor diaphragm respectively, as the concrete wall formed is stronger

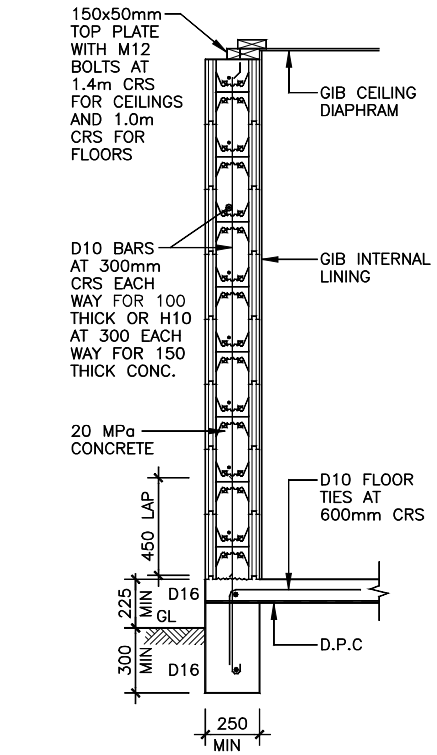
The minimum length of concrete wall for the above to apply is 0.5m.

Insulform walls must be evenly distributed around the perimeter of the building otherwise a specific design will be necessary.

Internal Timber framed walls can be used to provide bracing resistance to Insulform walls. The bracing resistance provided by these shall be determined by NZS3604:2011 or the latest version of theGib "Ezybrace Systems" manual.

Floor diaphragm connections to Insulform walls shall be as detailed in Figure 9.5 N.Z.S.4229:1999 except that the stringer or a square timber pack shall be bolted directly to the concrete by cutting away the EPS.

Ceiling and roof diaphragm connections shall be as detailed in Figs 9.2 and 9.4 of N.Z.S.4229:1999, except that connections shall be bolted directly to the concrete by cutting away the EPS, load bearing members at the top of the wall shall be located directly against the concrete.



NON SPECIFIC DESIGN WALLS

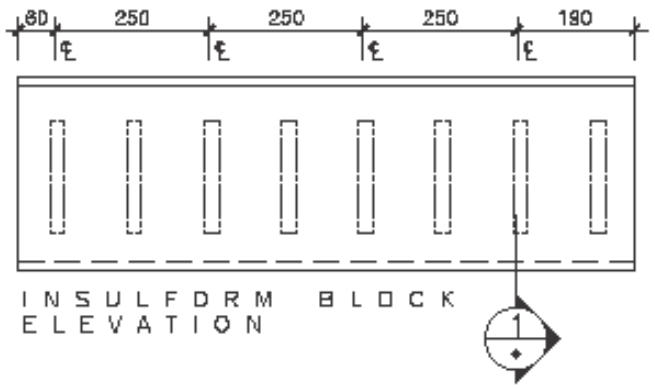
TO BE READ IN CONJUNCTION WITH OTHER DETAILS IN THE INSULFORM MANUAL

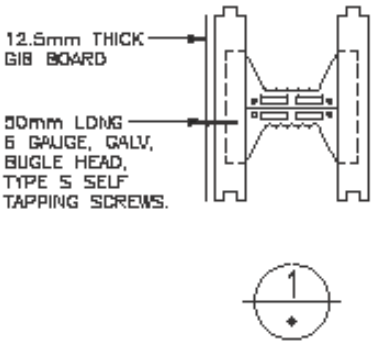
7.8.4. Lintel Beams

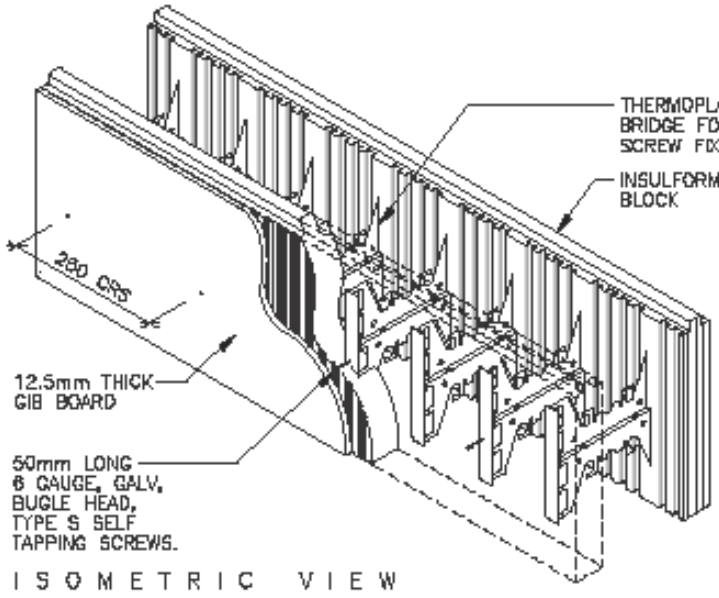
Tables A1 to A4 provide the design aid required to design lintel beams over windows or doors.

7.8.5. Approved Plaster System

The approved plaster system shall be either solid plaster in accordance with N.Z.S.4251:Part 1:1998 or all approved systems for Insulform blocks. Alternatively other proprietary systems which have a BRANZ Appraisal for use over polystyrene blocks may be used.







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INTERNAL LINING FIXINGS

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8. ENGINEER DESIGN INFORMATION

8.1. Structural Strength – Specific Design

The strength of structures can be determined by designing to the NZS 3101: Part 1 and Part 2: 2006 “New Zealand Standard – Concrete Structures Standard”.

The design of walls, beams and columns shall be carried out to the above standard except that the strength reduction factor, Φ , for shear and torsion shall be 0.65 to allow for the effects of the bridges.

Enclosed are tables for the following that can be of assistance with a specified design, however the design Structural Engineer shall do their own calculations to check the validility of all design aides used

- Insulform face loaded capacity	Design Aid 1
- Insulform lintel and beam capacity	Design Aid 2
- Insulform shear wall capacity	Design Aid 3 and 4
- Insulform wall interaction diagram	Design Aid 5 and 6

8.2. Structural Limitations

All loads must be transferred directly to the concrete, not the polystyrene.

Bolt fixings and all other fixings must be designed to allow for any extra eccentricity due to the polystyrene spacing a load away from the concrete where the fixings is not bolted directly to the concrete.

The blocks need to be braced against the wind and site working loads during erection as pour heights up to 3m are achievable.

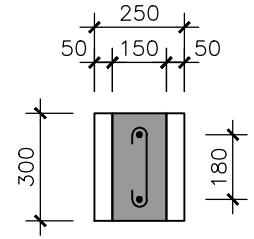
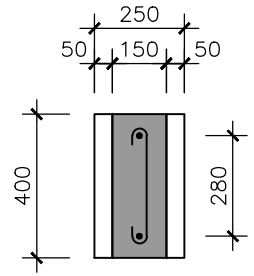
Small square or circular openings may be placed at mid depth of beams provided the reinforcement still has adequate cover and the holes are at least 200mm apart. These shall be no more than 32mm sq or 26mm diameter. Penetrations in wall may have the same size, spacing and cover as beams but shall be at least 300mm away from any wall edge. Larger holes may be permitted by Design Engineer subject to specific design.

8.3. Further Information

Reference should be made to the relevant section of the insulform manual for more detailed information such as plaster specification, standard drawing details etc.

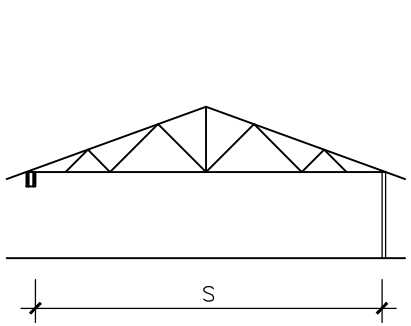
CAPACITY OF INSULFORM POLYSTYRENE BLOCK CONCRETE LINTELS

TABLE A1

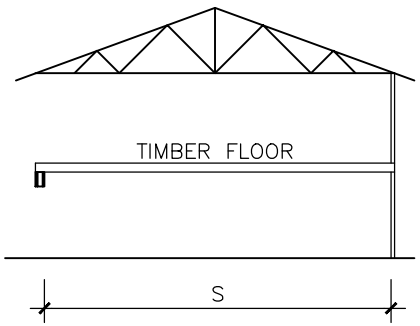
	LOADINGS See diagrams at bottom of page.		LINTEL SPAN 1m	2m	3m	4m	5m	6m
			TRUSS OR JOIST SPAN					
 2–D16 BARS WITH R6 LINKS AT 100mm CRS	1.	Heavy roof. Truss span.	20.00	15.65	7.05	2.35	0.10	–
	2.	Light roof. Truss span.	20.00	20.00	13.90	5.35	1.25	–
	3.	1.5kPa floor load only. Loaded one side only. Joist span.	19.40	12.02	4.95	2.10	0.70	–
	4.	1.5kPa floor load only. Loaded both sides. Neither S1 or S2 to exceed given value.	9.70	6.01	2.45	1.05	0.35	–
	5.	Items 1, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	9.70	5.60	1.70	–	–	–
	6.	Items 2, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	12.45	7.20	2.30	0.15	–	–
	7.	Item 4 + strutted heavy roof. Max joist span.	8.71	5.20	1.80	0.25	–	–
	8.	Item 4 + strutted light roof. Max joist span.	11.65	6.95	2.50	0.50	–	–
 2–D16 BARS WITH R6 LINKS AT 150mm CRS	1.	Heavy roof. Truss span.	20.00	17.30	12.00	5.25	2.10	0.10
	2.	Light roof. Truss span.	20.00	20.00	20.00	10.65	4.85	1.25
	3.	1.5kPa floor load only. Loaded on one side only. Joist span.	20.00	13.19	7.90	3.80	1.80	0.75
	4.	1.5kPa floor load only. Loaded both sides. Neither S1 or S2 to exceed given value.	10.88	6.55	3.95	1.90	0.90	0.35
	5.	Items 1, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	10.72	6.30	3.55	1.00	–	–
	6.	Items 2, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	13.72	8.05	4.55	1.45	–	–
	7.	Item 4 + strutted heavy roof. Max joist span.	9.60	5.80	3.50	1.20	0.10	–
	8.	Item 4 + strutted light roof. Max joist span.	12.80	7.75	4.60	1.75	0.35	–

NOTES:

1. Concrete compressive strength @ 28 days to be at least 20MPa.
2. Reinforcement shall be grade 300E deformed bars complying with AS/NZS 4671 : 2001.
3. All work shall comply with NZS,3109.
4. All lintels shall bear onto at least 500mm of concrete wall at each end of the lintel.
5. While every care has been taken in compiling this data, no responsibility is is taken for any information given. All data provided in these tables shall be checked by the Design Engineer.



1 & 2



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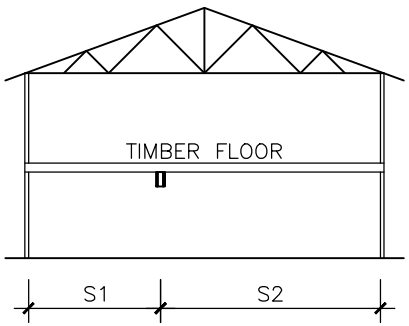

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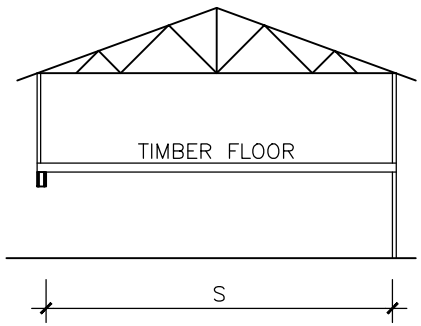

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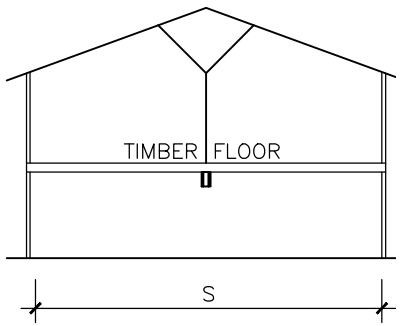
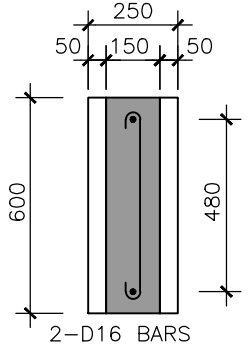
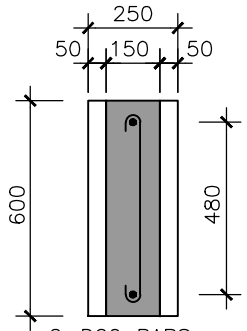


7, 8

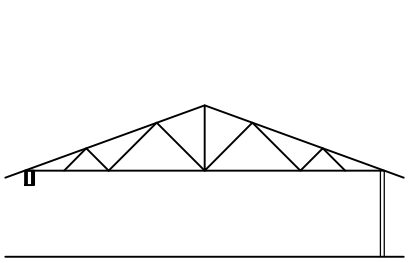
CAPACITY OF INSULFORM POLYSTYRENE BLOCK CONCRETE LINTELS

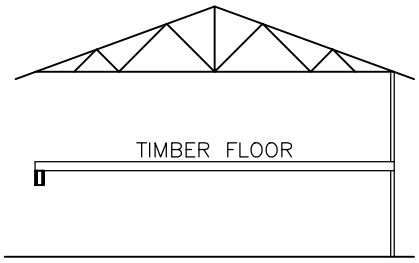
TABLE A2

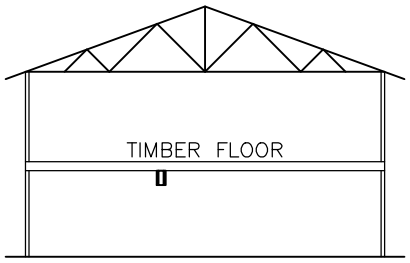
	LOADINGS See diagrams at bottom of page.		LINTEL SPAN 1m	2m	3m	4m	5m	6m	7m	8m
			TRUSS OR JOIST SPAN							
 2–D16 BARS WITH R6 LINKS AT 250mm CRS	1.	Heavy roof. Truss span.	20.00	20.00	15.50	10.90	5.90	2.75	0.95	–
	2.	Light roof. Truss span.	20.00	20.00	20.00	20.00	11.85	6.00	2.80	–
	3.	1.5kPa floor load. Loaded one side only. Joist span.	20.00	15.95	11.23	7.15	4.00	2.25	1.20	0.50
	4.	1.5kPa floor load only. Loaded both sides. Neither S1 or S2 to exceed given value.	13.00	7.95	5.60	3.55	2.00	1.10	0.60	0.25
	5.	Items 1, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	13.15	7.95	5.30	3.10	1.15	–	–	–
	6.	Items 2, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	16.75	10.05	6.75	4.00	1.65	0.30	–	–
	7.	Item 4 + strutted heavy roof. Max joist span.	11.70	7.25	5.00	3.05	1.35	0.35	–	–
	8.	Item 4 + strutted light roof. Max joist span.	15.55	9.55	6.60	4.05	1.90	0.65	–	–
 2–D20 BARS WITH R10 LINKS AT 250mm CRS	1.	Heavy roof. Truss span.	20.00	20.00	20.00	19.10	11.50	6.50	3.80	1.90
	2.	Light roof. Truss span.	20.00	20.00	20.00	20.00	20.00	12.90	8.00	4.45
	3.	1.5kPa floor load. Loaded one side only. Joist span.	20.00	20.00	20.00	12.0	7.15	4.45	2.80	1.75
	4.	1.5kPa floor load only. Loaded both sides. Neither S1 or S2 to exceed given value.	20.00	14.15	10.10	6.00	3.55	2.20	1.40	0.85
	5.	Items 1, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	20.00	15.15	10.75	6.15	3.15	1.45	0.40	–
	6.	Items 2, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	20.00	18.95	13.40	7.65	4.00	1.95	0.70	–
	7.	Item 4 + strutted heavy roof. Max joist span.	20.00	13.60	9.75	5.80	3.15	1.60	0.65	–
	8.	Item 4 + strutted light roof. Max joist span.	20.00	17.70	12.65	9.55	7.10	4.25	2.55	1.45

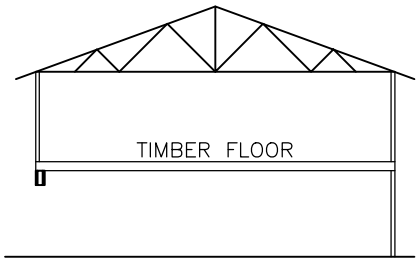
NOTES:

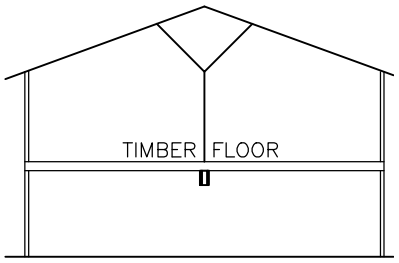
1. Concrete compressive strength @ 28 days to be at least 20MPa.
2. Reinforcement shall be grade 300E deformed bars complying with AS/NZS 4671 : 2001.
3. All work shall comply with the NZS,3109.
4. All lintels shall bear onto at least 500mm of concrete wall at each end of the lintel.
5. While every care has been taken in compiling this data, no responsibility is is taken for any information given. All data provided in these tables shall be checked by the Design Engineer.





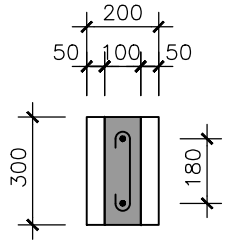
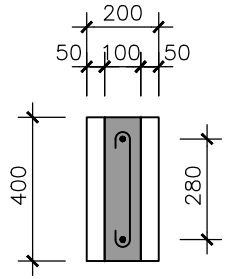






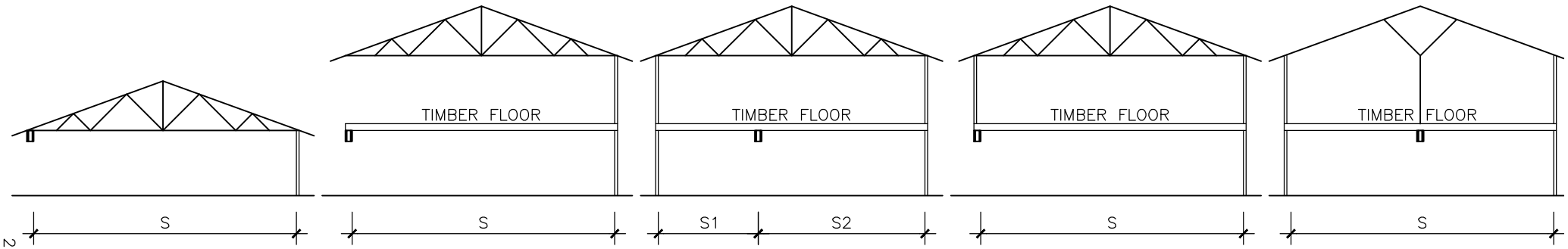
CAPACITY OF INSULFORM POLYSTYRENE BLOCK CONCRETE LINTELS

TABLE A3

	LOADINGS See diagrams at bottom of page.		LINTEL SPAN 1m	2m	3m	4m	5m	6m
			TRUSS OR JOIST SPAN					
 2–D16 BARS WITH R6 LINKS AT 100mm CRS	1.	Heavy roof. Truss span.	20.00	13.90	6.95	2.30	–	–
	2.	Light roof. Truss span.	20.00	20.00	13.75	5.25	1.15	–
	3.	1.5kPa floor load. Loaded one side only. Joist span.	17.95	10.75	4.90	2.05	0.70	–
	4.	1.5kPa floor load only. Loaded both sides. Neither S1 or S2 to exceed given value.	8.95	5.35	2.45	1.00	0.35	–
	5.	Items 1, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	8.60	4.90	1.65	–	–	–
	6.	Items 2, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	11.10	6.30	2.25	0.15	–	–
	7.	Item 4 + strutted heavy roof. Max joist span.	7.75	4.60	2.95	0.20	–	–
	8.	Item 4 + strutted light roof. Max joist span.	10.40	6.15	2.45	0.50	–	–
 2–D16 BARS WITH R6 LINKS AT 150mm CRS	1.	Heavy roof. Truss span.	20.00	14.85	10.55	5.10	2.00	–
	2.	Light roof. Truss span.	20.00	20.00	20.00	10.40	4.70	1.15
	3.	1.5kPa floor load. Loaded on one side only. Joist span.	20.00	11.40	7.80	3.75	1.75	0.70
	4.	1.5kPa floor load only. Loaded both sides. Neither S1 or S2 to exceed given value.	9.50	5.70	3.90	1.85	0.85	0.35
	5.	Items 1, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	9.15	5.30	3.35	0.95	–	–
	6.	Items 2, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	11.80	6.80	4.35	1.45	–	–
	7.	Item 4 + strutted heavy roof. Max joist span.	8.25	4.45	3.20	0.85	0.10	–
	8.	Item 4 + strutted light roof. Max joist span.	11.05	6.60	4.35	1.65	0.35	–

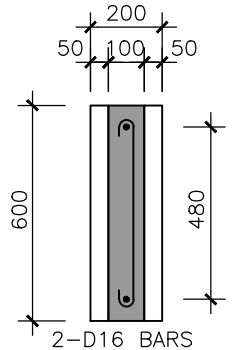
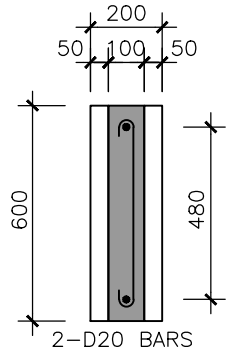
NOTES:

1. Concrete compressive strength @ 28 days to be at least 20MPa.
2. Reinforcement shall be grade 300E deformed bars complying with AS/NZS 4671 : 2001.
3. All work shall comply with the NZS.3109.
4. All lintels shall bear onto at least 500mm of concrete wall at each end of the lintel.
5. While every care has been taken in compiling this data, no responsibility is is taken for any information given. All data provided in these tables shall be checked by the Design Engineer.



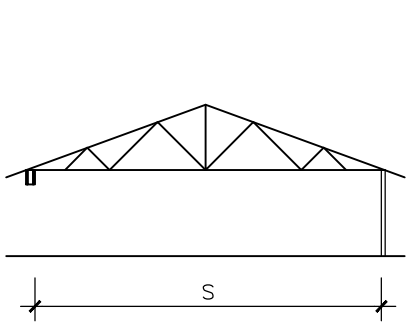
CAPACITY OF INSULFORM POLYSTYRENE BLOCK CONCRETE LINTELS

TABLE A4

	LOADINGS (See diagrams at bottom of page.)		LINTEL SPAN 1m	2m	3m	4m	5m	6m	7m	8m
			TRUSS OR JOIST SPAN							
 2–D16 BARS WITH R6 LINKS AT 250mm CRS	1.	Heavy roof. Truss span.	20.00	17.30	12.45	9.40	5.85	2.65	0.9	–
	2.	Light roof. Truss span.	20.00	20.00	20.00	18.20	11.70	5.90	2.70	–
	3.	1.5kPa floor load. Loaded one side only. Joist span.	20.00	13.20	9.20	6.75	3.95	2.25	1.15	0.50
	4.	1.5kPa floor load only. Loaded both sides. Neither S1 or S2 to exceed given value.	10.85	6.60	4.60	3.55	1.95	1.10	0.59	0.25
	5.	Items 1, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	10.70	6.30	4.10	2.75	1.15	–	–	–
	6.	Items 2, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	13.70	8.05	5.30	3.90	1.60	0.25	–	–
	7.	Item 4 + strutted heavy roof. Max joist span.	9.60	5.80	3.90	2.70	1.30	0.30	–	–
	8.	Item 4 + strutted light roof. Max joist span.	12.80	7.75	5.20	3.70	1.85	0.65	–	–
 2–D20 BARS WITH R10 LINKS AT 250mm CRS	1.	Heavy roof. Truss span.	20.00	20.00	20.00	18.75	11.25	6.35	3.70	1.80
	2.	Light roof. Truss span.	20.00	20.00	20.00	20.00	20.00	12.65	7.80	4.30
	3.	1.5kPa floor load. Loaded one side only. Joist span.	20.00	20.00	18.25	11.85	7.00	4.40	2.75	1.70
	4.	1.5kPa floor load only. Loaded both sides. Neither S1 or S2 to exceed given value.	20.00	12.75	9.10	5.90	3.5	2.20	1.35	0.85
	5.	Items 1, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	20.00	13.50	9.50	6.05	3.10	1.35	0.35	–
	6.	Items 2, 3 & wall. Max truss or joist span. (ie. neither to exceed given value)	20.00	16.95	11.90	7.50	3.95	1.90	0.65	–
	7.	Item 4 + strutted heavy roof. Max joist span.	19.00	12.10	8.70	6.50	3.05	1.55	0.65	–
	8.	Item 4 + strutted light roof. Max joist span.	20.00	15.85	11.30	7.30	4.05	2.15	1.00	0.25

NOTES:

1. Concrete compressive strength @ 28 days to be at least 20MPa.
2. Reinforcement shall be grade 300E deformed bars complying with AS/NZS 4671 : 2001.
3. All work shall comply with the NZS,3109.
4. All lintels shall bear onto at least 500mm of concrete wall at each end of the lintel.
5. While every care has been taken in compiling this data, no responsibility is is taken for any information given. All data provided in these tables shall be checked by the Design Engineer.



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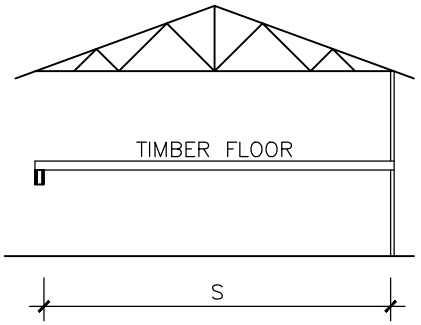

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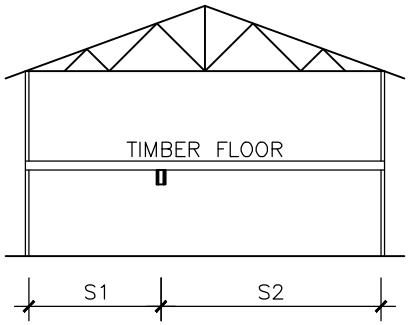

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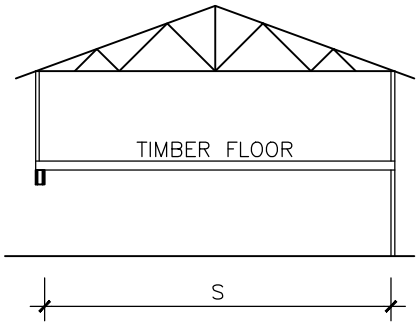

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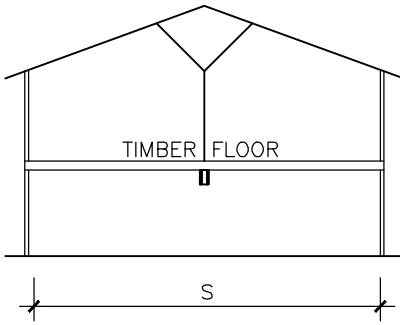


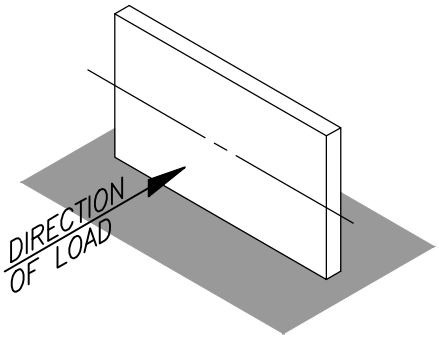
7, 8

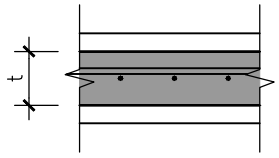
INSULFORM FACE LOADED CAPACITY

DESIGN AID 1

FACE LOADED WALLS

(i.e. strength in bending about horizontal axis)
Applies for walls restrained at top. This table may also be used for retaining walls having no axial load at top (but the interaction diagrams provided may not).





PLAN SECTION

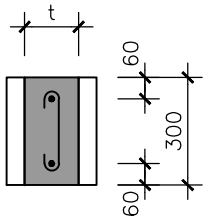
Vertical Reinforcement	ØMn per metre length for t = 100mm	ØMn per metre length for t = 150mm
H12 @ 450	–	6.59
D12 @ 300	4.48	6.89
H10 @ 300	4.46	6.86
H12 @ 300	6.23	9.68
D16 @ 300	–	11.80
H16 @ 300	–	16.29
H12 @ 200	8.85	14.02
H16 @ 200	–	22.88
H12 @ 150	–	18.04

NOTES:

1. Vertical bars assumed to be centrally placed. If this cannot be ensured this table must not be used and specific calculations are to be carried out.
2. Concrete compressive strength @ 28 days to be at least 20MPa.
3. Reinforcement designated D shall be grade 300E, where designated H shall be grade 500E, both being deformed bars complying with AS/NZS 4671 : 2001.
4. Concrete work shall comply with NZS 3109: 1997.
5. These moments are for zero axial load. Refer to the interaction diagrams (supplied) for flexural strength under axial loading.
6. While every care has been taken in compiling this data, no responsibility is taken for any information given. All data provided in these tables shall be checked by the Design Engineer.

INSULFORM LINTEL AND BEAM CAPACITIES

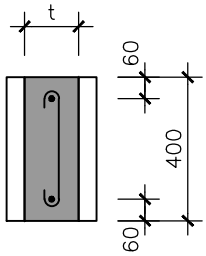
DESIGN AID 2



2–D16 BARS
WITH R6 LINKS
AT 100mm CRS

For t = 100mm, ØMn = 11.57kNm, ØVn = 23.959kN

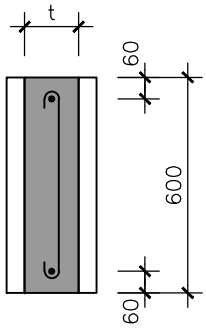
For t = 150mm, ØMn = 11.67kNm, ØVn = 26.401kN



2–D16 BARS
WITH R6 LINKS
AT 150mm CRS

For t = 100mm, ØMn = 16.7kNm, ØVn = 25.257kN

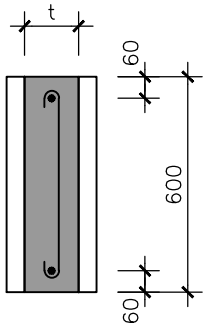
For t = 150mm, ØMn = 16.94kNm, ØVn = 28.717kN



2–D16 BARS
AT 250mm CRS
WITH R6 LINKS

For t = 100mm, ØMn = 26.9kNm, ØVn = 28.739kN

For t = 150mm, ØMn = 27.2kNm, ØVn = 34.232kN



2–D20 BARS
WITH R10 LINKS
AT 250mm CRS

For t = 100mm, ØMn = 41.46kNm, ØVn = 53.200kN

For t = 150mm, ØMn = 42.05kNm, ØVn = 58.695kN

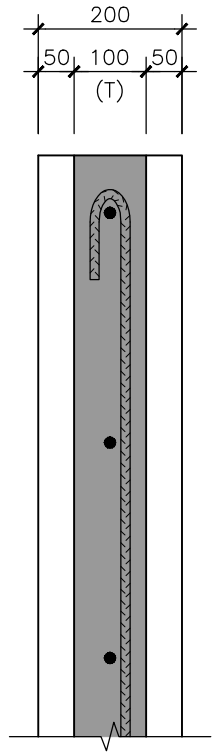
NOTES:

1. A reduced value of Ø has been used in the calculation of ØVn; 0.65 has been used rather than 0.75, to allow for the effects of the steel bridges.
2. Deflections are to be checked in accordance with NZS 3101 : 2006
3. Concrete compressive strength @ 28 days to be at least 20MPa.
4. Reinforcement shall be grade 300E deformed bars complying with AS/NZS 4671 : 2001.
5. Concrete work shall comply with NZS 3109: 1997.
6. All lintels shall bear 500mm onto concrete wall at each end of lintel.
7. While every care has been taken in compiling this data, no responsibility is taken for any information given. All data provided in these tables shall be checked by the Design Engineer.

INSULFORM REINFORCED CONCRETE SHEAR WALL PANEL (t=100mm)

WALL LENGTH	D10 @ 300 both ways		D12 @ 300 both ways		H10 @ 300 both ways		H12 @ 300 both ways	
	ØMn	ØVn	ØMn	ØVn	ØMn	ØVn	ØMn	ØVn
500	13.57	43.6	19.25	52.6	19.17	52.5	27.02	65.4
750	20.58	65.5	29.33	78.9	29.21	78.7	41.48	98.1
1000	38.05	87.3	54.12	105.3	53.92	105.0	76.28	130.8
1250	45.56	109.1	64.92	131.6	64.65	131.3	91.77	163.5
1500	70.32	131.0	100.05	157.9	99.64	157.5	141.13	196.2
2000	134.19	174.7	190.54	210.6	189.86	210.0	268.19	261.6
2500	217.20	218.3	308.01	263.3	306.91	262.6	432.70	327.0
3000	288.41	262.0	409.28	315.9	407.8	315.1	575.54	392.4
4000	496.7	349.4	702.6	421.2	699.5	420.1	981.3	523.2
5000	813.6	436.7	1149.1	526.6	1144.1	525.2	1601.3	654.0
6000	1148.5	524.1	1622.1	631.9	1615.1	630.2	2260.5	784.8

ØVn based on μ = 1.25 see note 2, below.



PLAN SECTION

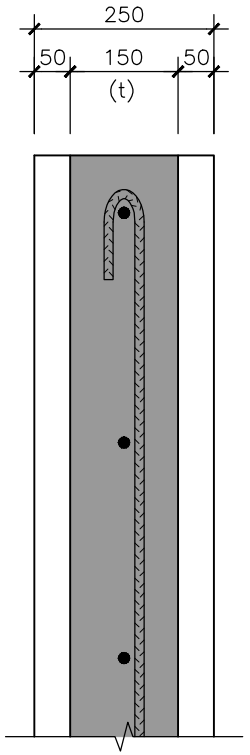
Notes:

1. The above figures are based on zero vertical load. It is assumed that compressive vertical load will be at a sufficiently low level that it enhances flexural strength. Where the compressive axial load is high or where a tensile axial load is imposed, calculation of reduction in flexural strength is to be carried out.
2. For ductile walls several conditions are imposed by NZS 3101 : 2006, which are to be applied as required. The values of ØVn given above are based on μ = 1.25 ; where a greater value of μ is required, v_c is to be reduced in accordance with the NZS 3101 : 2006, with a corresponding reduction in ØVn.
3. Walls are assumed to be braced against side sway and kLu/r less than 34. Where μ > 1.25 the provisions of 12.4 of NZS 3101 : 2006 are to be implemented.
4. Horizontal bars to be hooked at ends.
5. Concrete compressive strength @ 28 days to be at least 20MPa.
6. Reinforcement designated D shall grade 300E and where designated H shall be grade 500E, both being deformed bars complying with AS/NZS 4671 : 2001.
7. Concrete work shall comply with the NZS 3109 : 1997.
8. While every care has been taken in compiling this data, no responsibility is taken for any information given. All data provided in these tables shall be checked by the Design Engineer.
9. Foundation design must ensure that the above design capacities can be resisted by the foundations under capacity design conditions.

INSULFORM REINFORCED CONCRETE SHEAR WALL PANEL (t=150mm)

WALL LENGTH	H12 @ 450 both ways		H10 @ 300 both ways		H12 @ 300 both ways		D16 @ 300 both ways		H16 @ 300 both ways	
	ØMn	ØVn	ØMn	ØVn	ØMn	ØVn	ØMn	ØVn	ØMn	ØVn
500	18.2	62.9	19.4	64.1	27.6	77.0	33.9	87.1	47.4	109.8
750	43.1	94.4	29.5	96.2	42.1	115.5	51.8	130.7	73.1	164.7
1000	58.6	125.9	54.6	128.3	77.7	154.0	95.5	174.3	134.2	219.6
1250	68.9	157.4	65.3	160.3	93.1	192.5	114.8	217.8	161.8	274.5
1500	117.9	188.9	100.8	192.4	143.6	231.0	176.7	261.4	248.5	329.4
2000	197.3	251.9	192.5	256.6	273.6	308.1	336.2	348.6	471.0	439.2
2500	296.7	314.9	311.7	320.7	442.4	385.1	543.0	435.7	759.0	549.0
3000	416.1	377.8	413.9	384.9	587.8	462.1	721.8	522.9	1010.2	658.8
4000	715.6	503.8	713.2	513.2	1009.7	616.2	1235.4	697.2	1716.6	878.4
5000	1087.0	629.8	1168.4	641.5	1651.7	770.3	2018.6	871.5	2796.9	1098.1
6000	1542.9	755.7	1649.4	769.8	2327.7	924.3	2849.0	1045.9	3961.5	1317.7

ØVn based on μ = 1.25 see note 2, below.



PLAN SECTION

Notes:

1. The above figures are based on zero vertical load. It is assumed that compressive vertical load will be at a sufficiently low level that it enhances flexural strength. Where the compressive axial load is high or where a tensile axial load is imposed, calculation of reduction in flexural strength is to be carried out.

2. For ductile walls several conditions are imposed by NZS 3101 : 2006, which are to be applied as required. The values of ØVn given above are based on μ = 1.25 ; where a greater value of μ is required, v_e is to be reduced in accordance with the NZS 3101 : 1995, with a corresponding reduction in ØVn.

3, Walls are assumed to be braced against side sway and kLu/r less than 34. Where μ > 1.25 the provisions of 12.4 of NZS 3101 : 2006 are to be implemented.

4. Horizontal bars to be hooked at ends.

5. Concrete compressive strength @ 28 days to be at least 20MPa.

6. Reinforcement designated D shall grade 300E and where designated H shall be grade 500E, both being deformed bars complying with AS/NZS 4671 : 2001.

7. Concrete work shall comply with NZS 3109: 1997.

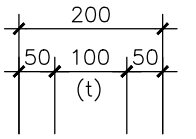
8. While every care has been taken in compiling this data, no responsibility is taken for any information given. All data provided in these tables shall be checked by the Design Engineer.

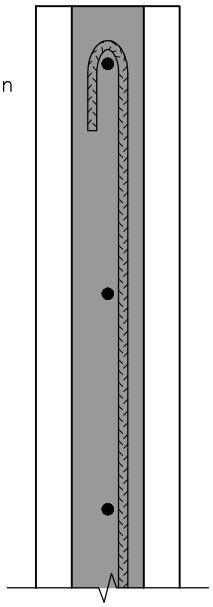
9. Foundation design must ensure that the above design capacities can be resisted by the foundations under capacity design conditions.

INTERACTION DIAGRAM FOR 200mm THICK INSULFORM WALLS FACE LOADED

Notes:

1. This graph reflects effects of axial load on walls deflecting under the action of lateral load (triangular or rectangular), and of moment Pe at top of wall where P is ultimate axial load per metre length of wall and e = 20mm. Further deflection caused by P – delta effects is also taken into account. M^*_w is ultimate moment caused by lateral load (triangular or rectangular).
2. Concrete compressive strength @ 28 days to be at least 20MPa.
3. Reinforcement designated D shall be grade 300E, where designated H shall be grade 500E, both being deformed bars complying with AS/NZS 4671 : 2001.
4. All work shall comply with NZS,3109.
5. While every care has been taken in compiling this data, no responsibility is taken for any information given. All data provided in these tables shall be checked by the Design Engineer.
6. Wall height assumed to be 3m.





PLAN SECTION

vertical bars to be centrally placed.

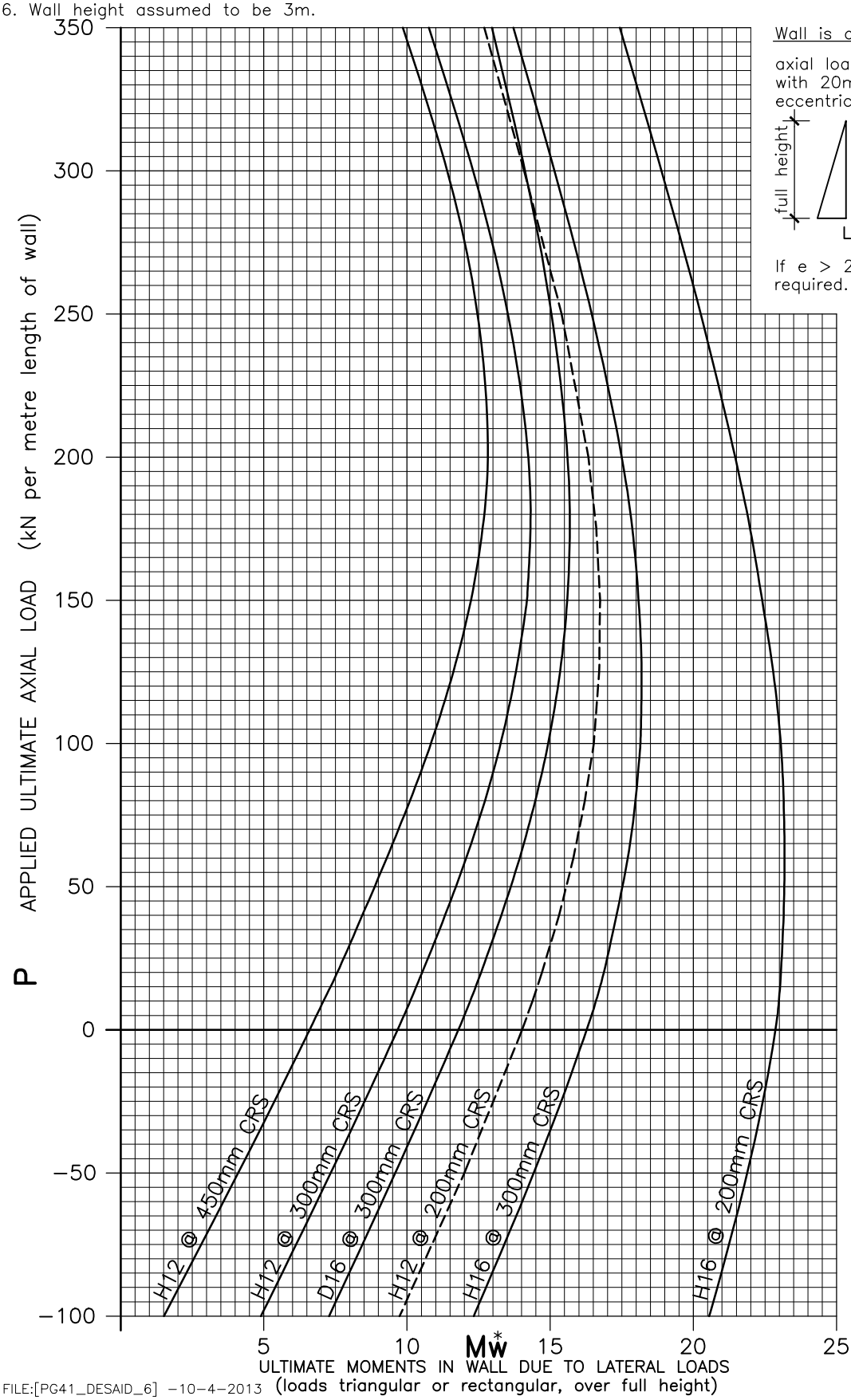
If this cannot be ensured then specific calculations must be carried out, and this chart must not be used.

ULTIMATE MOMENTS IN WALL DUE TO LATERAL LOADS
(loads triangular or rectangular, over full height)

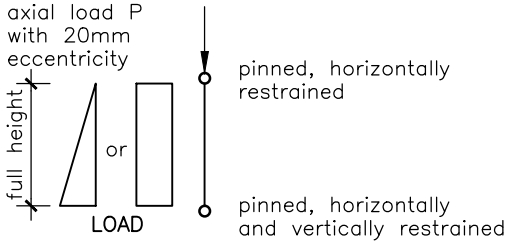
INSULFORM WALLS FACE LOADED

Notes:

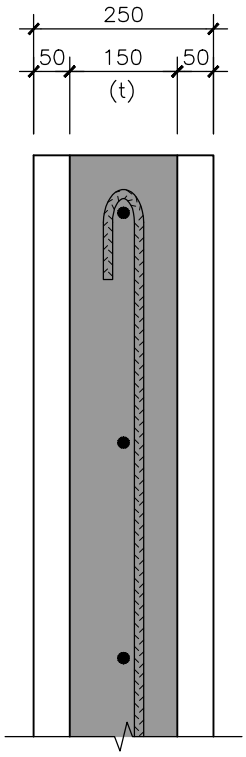
1. This graph reflects effects of axial load on walls deflecting under the action of lateral load (triangular or rectangular), and of moment Pe at top of wall where P is ultimate axial load per metre length of wall and e = 20mm. Further deflection caused by P – delta effects is also taken into account. M_w^* is ultimate moment caused by lateral load (triangular or rectangular).
2. Concrete compressive strength @ 28 days to be at least 20MPa.
3. Reinforcement designated D shall be grade 300E, where designated H shall be grade 500E, both being deformed bars complying with AS/NZS 4671 : 2001.
4. All work shall comply with NZS,3109.
5. While every care has been taken in compiling this data, no responsibility is taken for any information given. All data provided in these tables shall be checked by the Design Engineer.
6. Wall height assumed to be 3m.



Wall is assumed to be restrained at top.



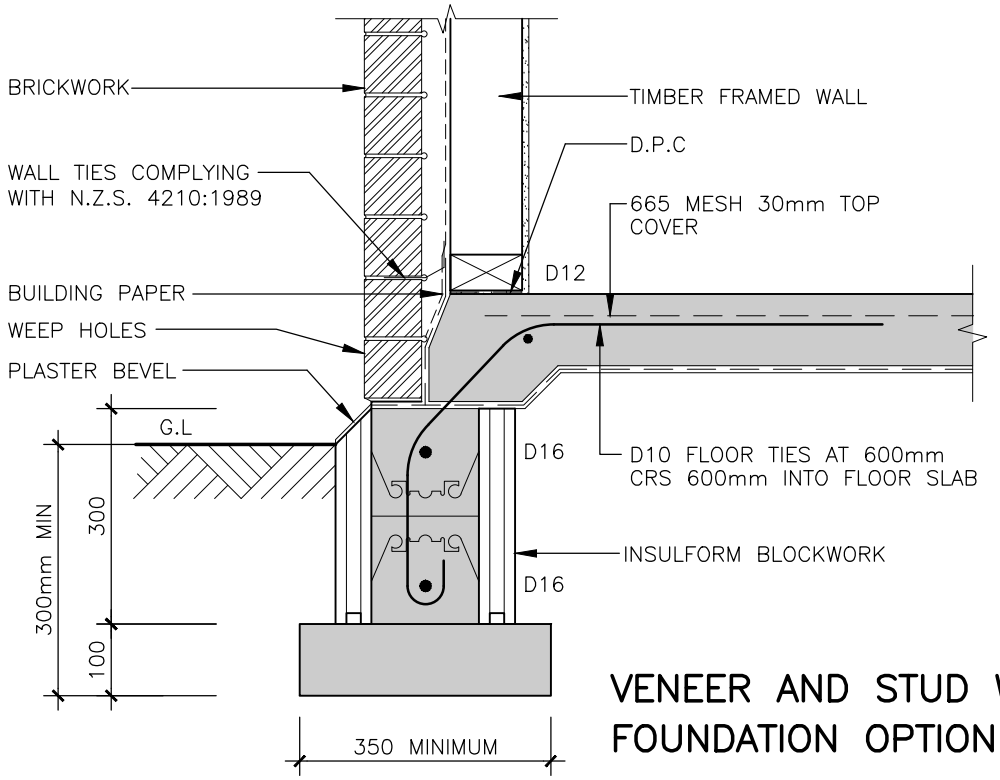
If e > 20mm, specific calculations are required.



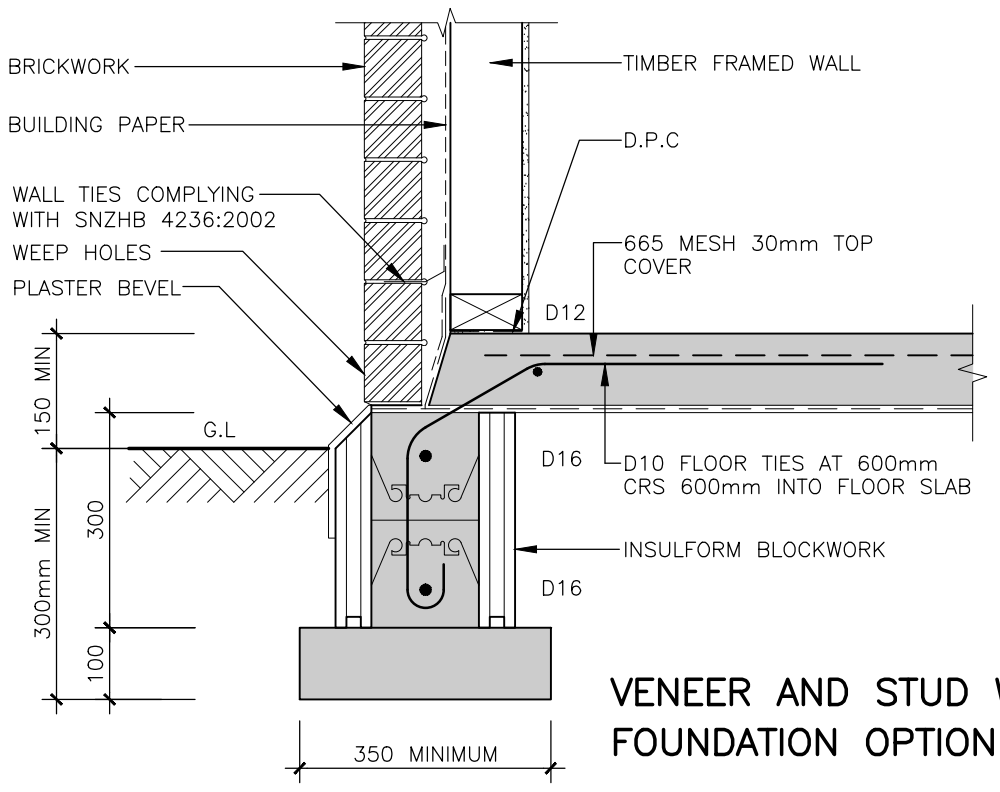
PLAN SECTION

vertical bars to be centrally placed.

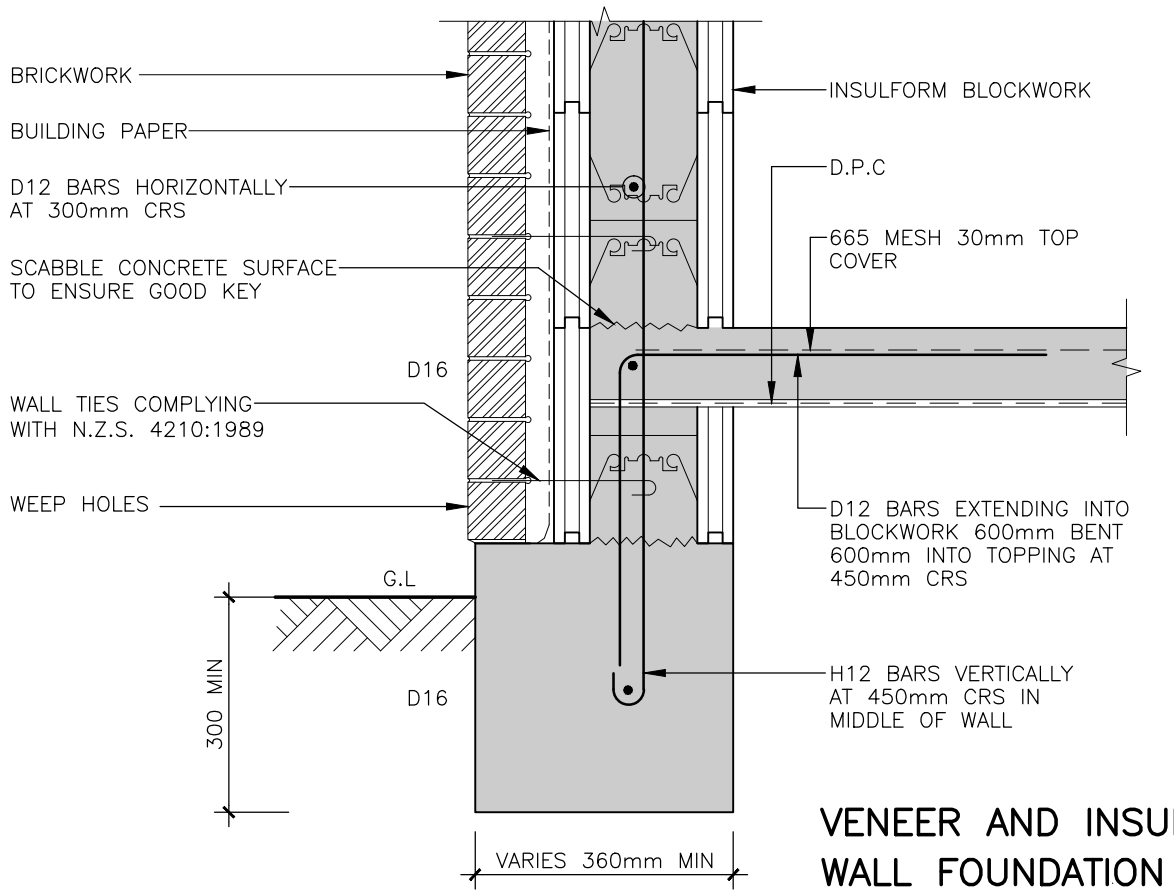
If this cannot be ensured then specific calculations must be carried out; this chart must not be used.



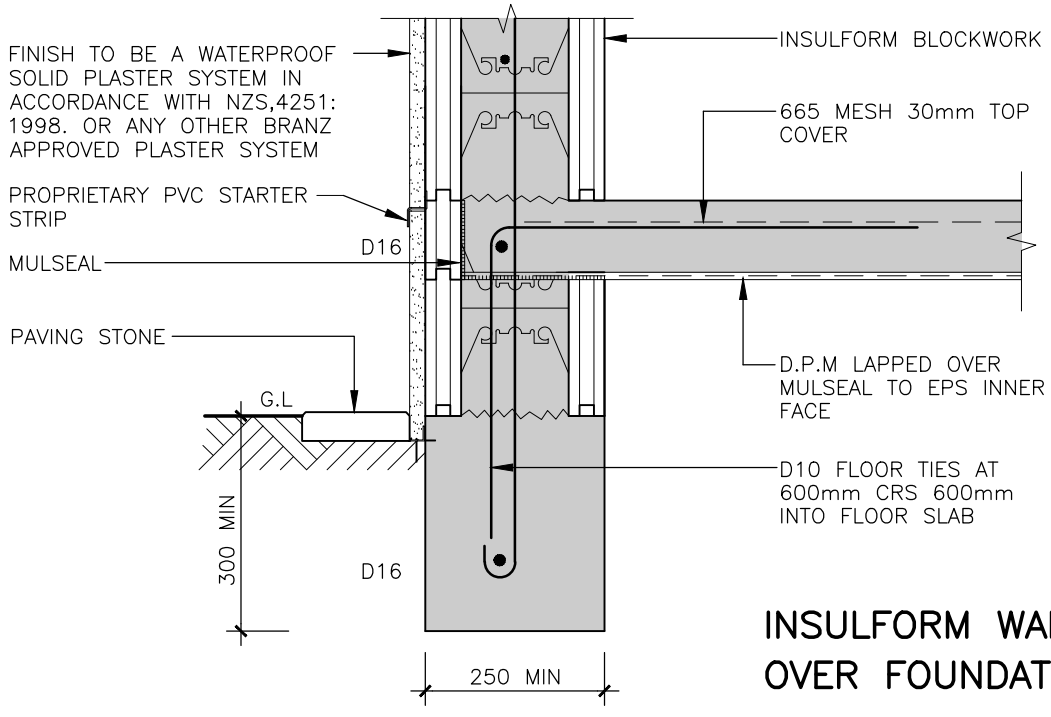
VENEER AND STUD WALL FOUNDATION OPTION ONE



VENEER AND STUD WALL FOUNDATION OPTION TWO



VENEER AND INSULFORM WALL FOUNDATION



INSULFORM WALL D.P.C OVER FOUNDATION

NOTE: REINFORCEMENT SHOWN IS THE MINIMUM THAT COULD BE REQUIRED. ADDITIONAL STEEL WILL USUALLY BE REQUIRED. THE FINAL STRUCTURAL DESIGN MUST BE CHECKED BY A REGISTERED ENGINEER.

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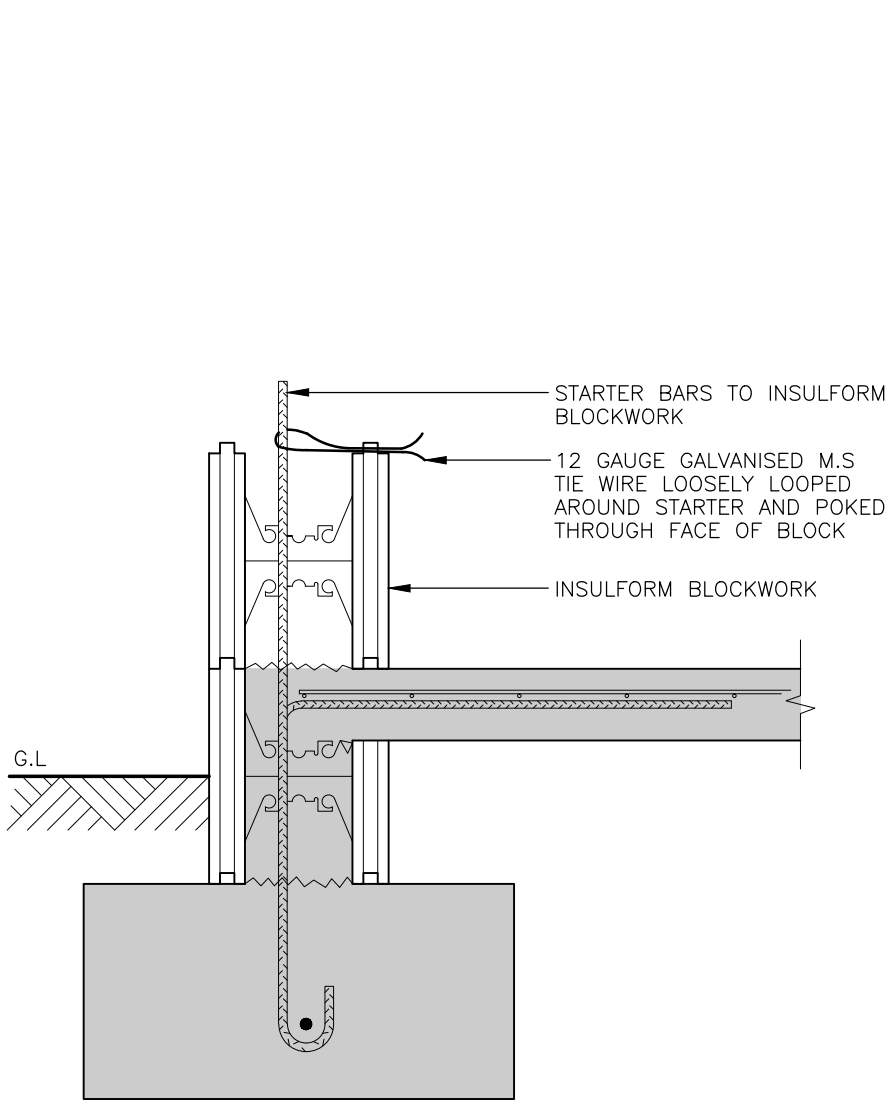
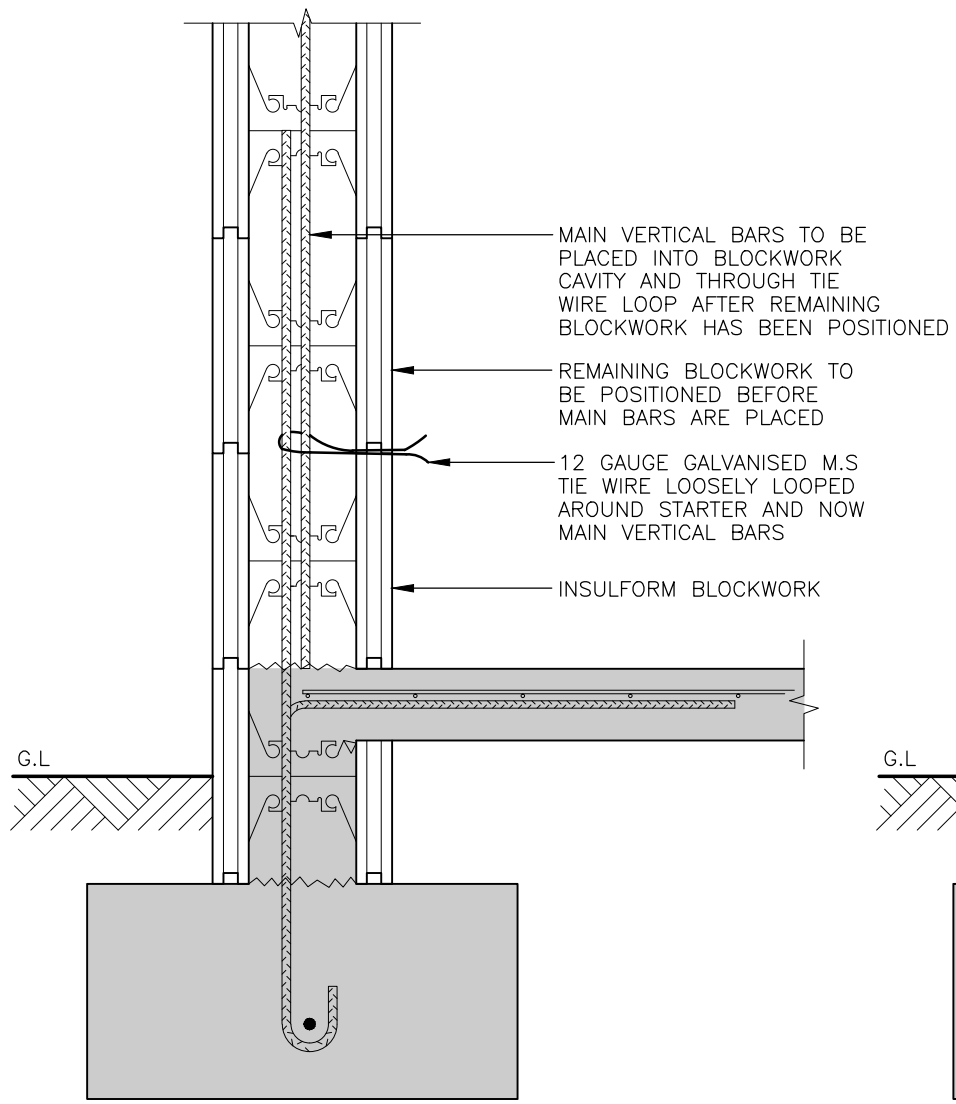
BRICKWORK FOUNDATION DETAILS

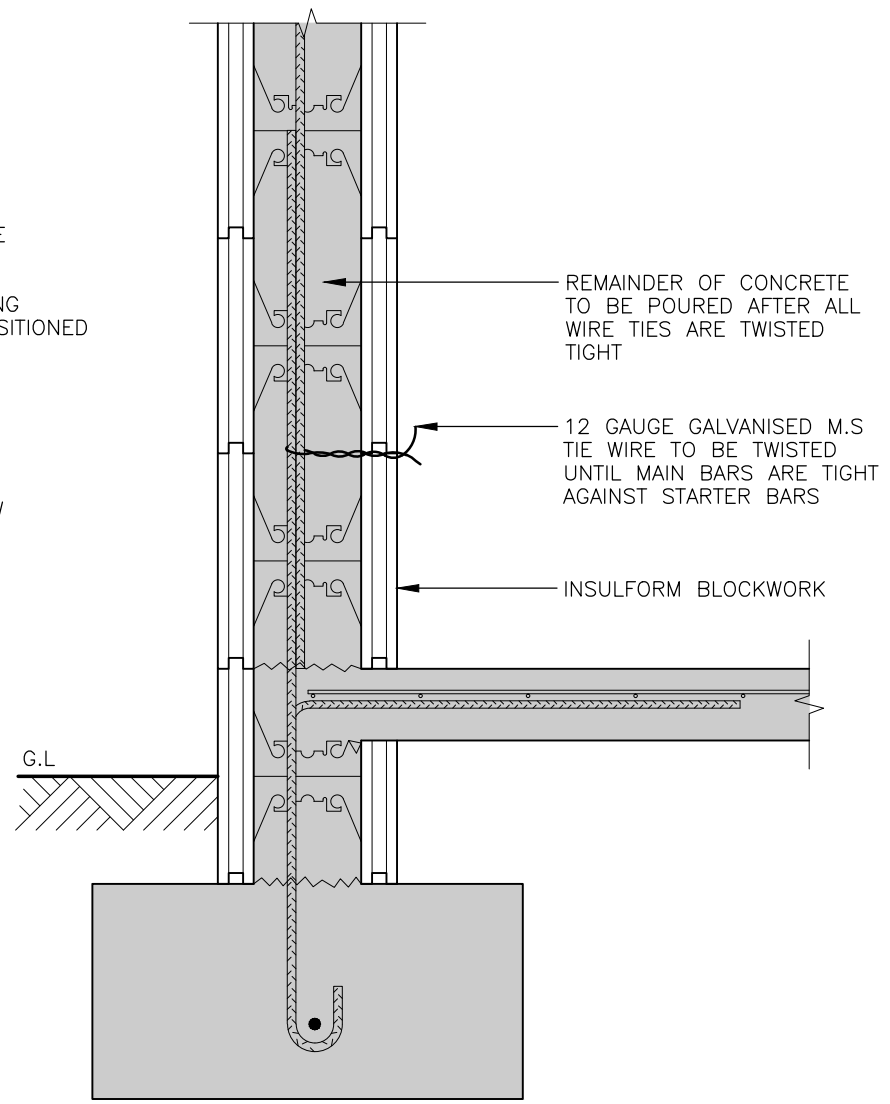
ENG W.L.	FILE	DRAWING
DRN B.T	6157	1
CHK W.L.		
DATE 4/13		



STEP 1



STEP 2



STEP 3

D E T A L A

N O T E :

FOR DPM AND OTHER FOUNDATION DETAILS REFER TO SH03

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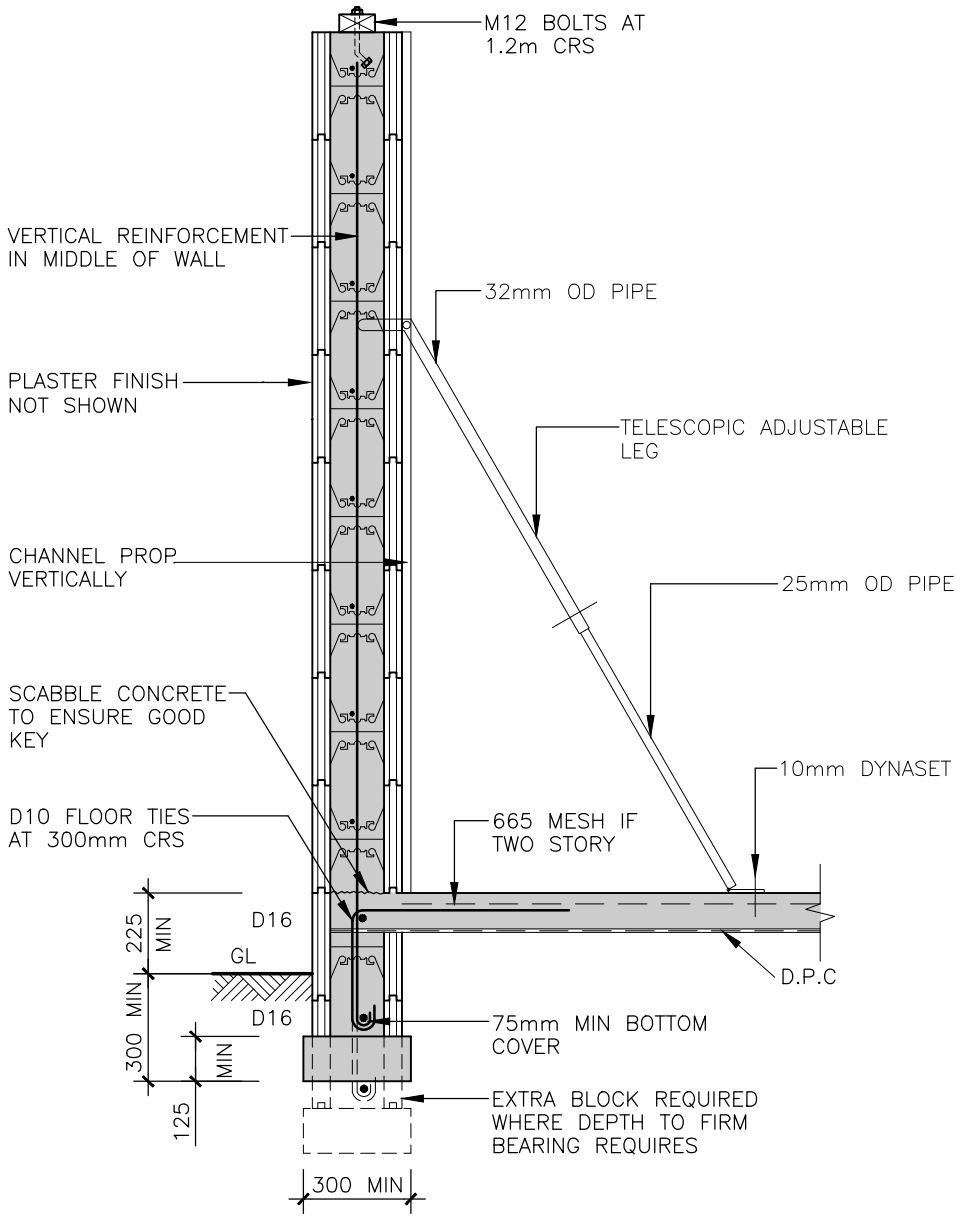
TYPICAL WIRE TIE DETAIL

ENG W.L.	FILE	DRAWING
DRN B.T	6157	2
CHK W.L.		
DATE 4/13		

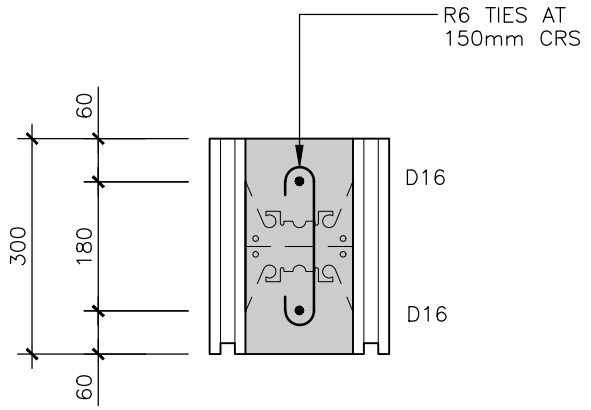
BOTH SPECIFIC AND NON–SPECIFIC DESIGN INFORMATION IS GIVEN

CONCRETE THICKNESS	VERTICAL REINFORCEMENT	HORIZONTAL REINFORCEMENT
100mm	D10 BARS AT 300mm CRS	D10 BARS AT 300mm CRS
150mm	H12 BARS AT 450mm CRS	H10 BARS AT 300mm CRS

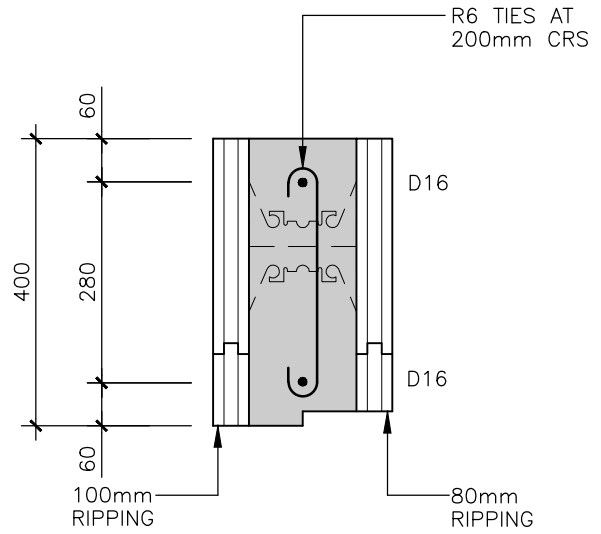


WALL SECTION

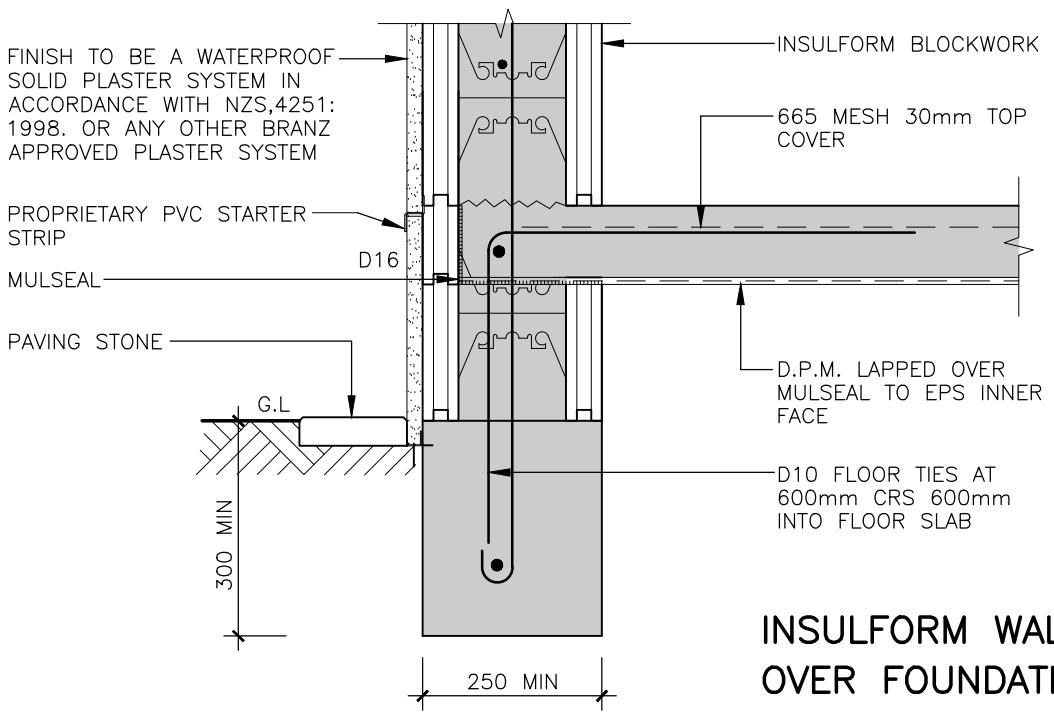
NOTE:
ALL DETAILS SHOW THE MINIMUM REQUIREMENTS FOR NON–SPECIFIC DESIGN (SEE MANUFACTURERS DESIGN INFORMATION FOR SCOPE OF NON SPECIFIC DESIGNS). SPECIFIC DESIGNS MAY REQUIRE DIFFERENT REINFORCEMENT, AND OTHER STRUCTURAL CHANGES.



300mm DEEP LINTEL



400mm DEEP LINTEL



INSULFORM WALL D.P.C OVER FOUNDATION

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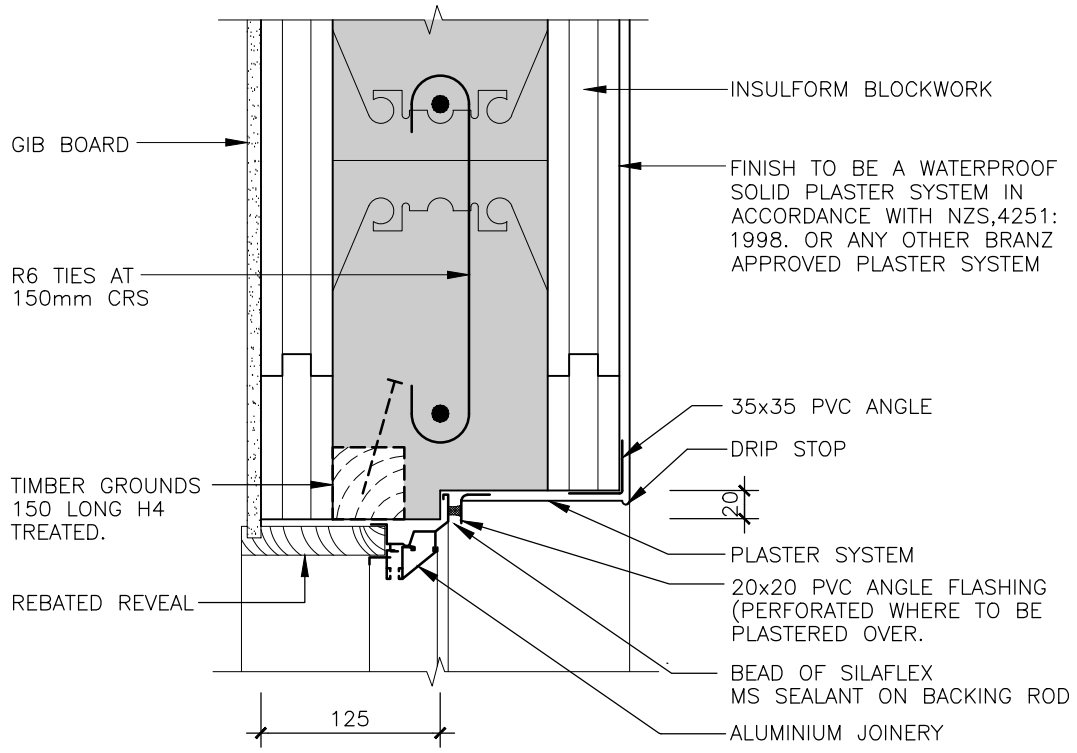
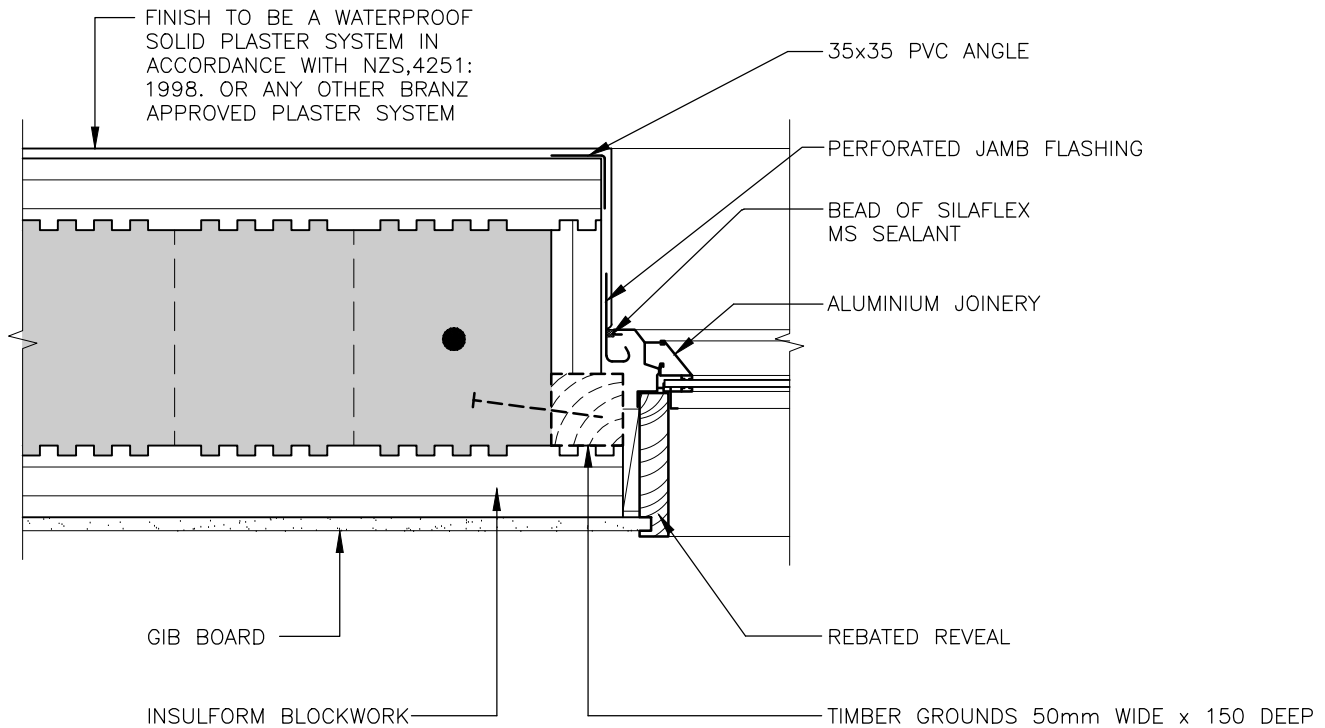
TYPICAL WALL SECTION INCL. FOUNDATION AND LINTELS

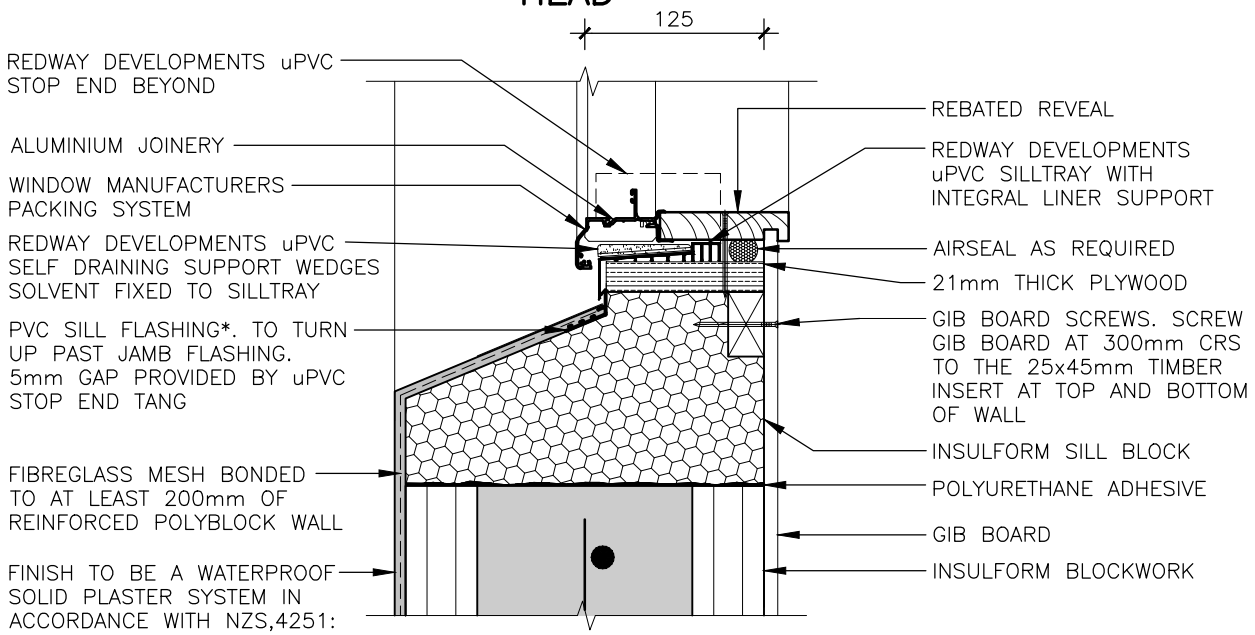
ENG W.L.	FILE	DRAWING
DRN B.T	6157	3
CHK W.L.		
DATE 4/13		



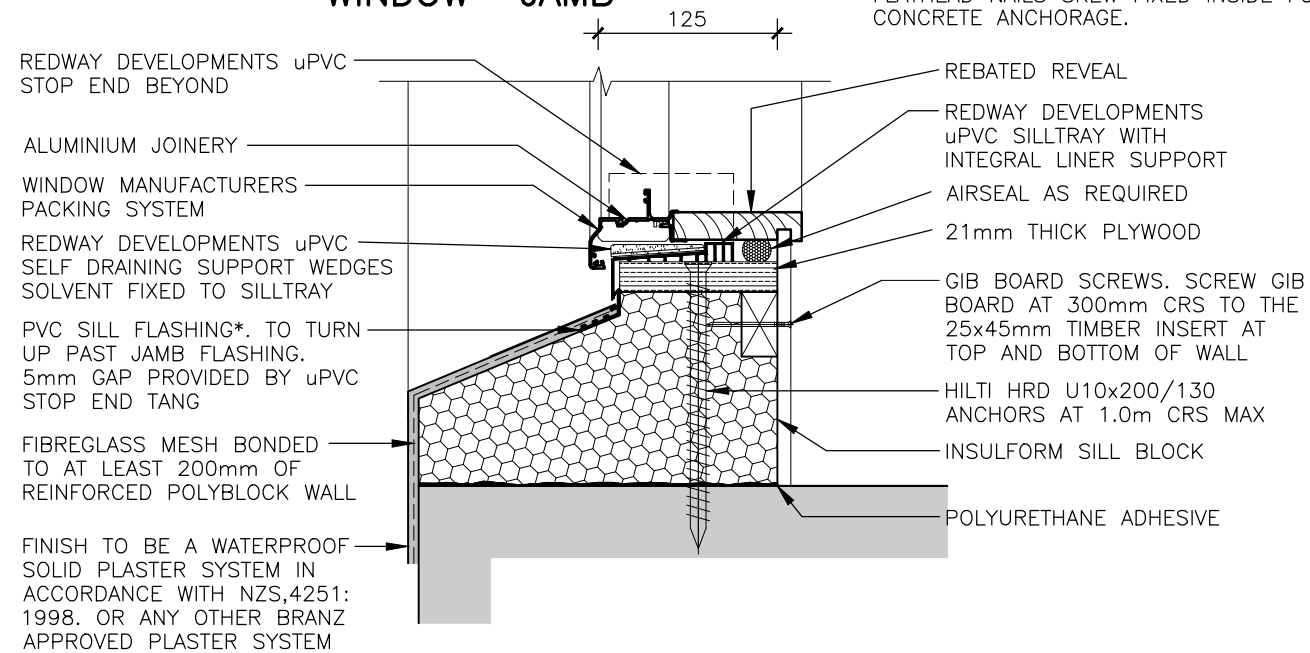
HEAD



WINDOW JAMB



SILL



SILL FIXED TO SLAB

*uPVC HINGED FLASHING CAN BE USED AS HEAD FLASHING OR JAMB FLASHING AS REEQUIRED

NOTE: REINFORCEMENT SHOWN IS THE MINIMUM THAT COULD BE REQUIRED. ADDITIONAL STEEL WILL USUALLY BE REQUIRED. THE FINAL STRUCTURAL DESIGN MUST BE CHECKED BY A REGISTERED ENGINEER. TIMBER GROUNDS ARE TO BE TREATED H4, 150mm LONG AND PLACED WHERE REQUIRED, TWO NAILS PER GROUND.
THE MANUFACTURER OF THE WINDOWS SHALL DESIGN AND MANUFACTURE WINDOWS AND FLASHINGS TO MEET THE BUILDING DESIGN WIND SPEED AND SHALL PROVIDE INSTALLATION INSTRUCTIONS TO ENSURE THAT NO WIND OR WATER LEAKAGE OCCURS.

THESE DETAILS APPLY TO NON–SPECIFIC DESIGNS

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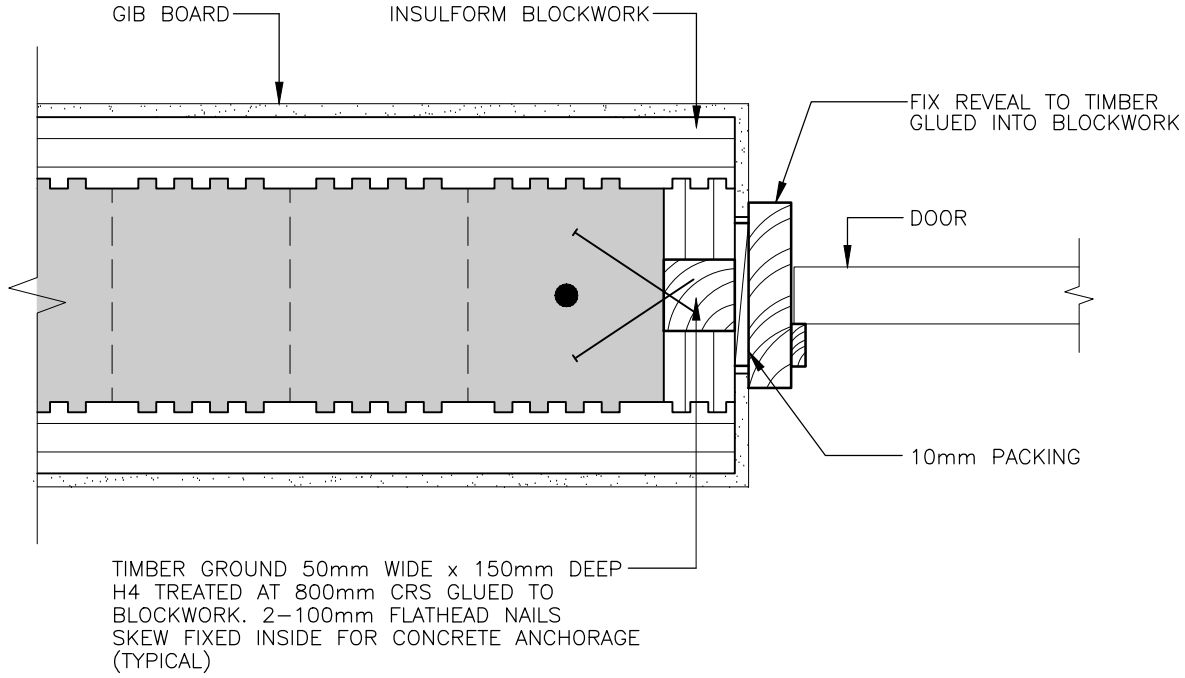
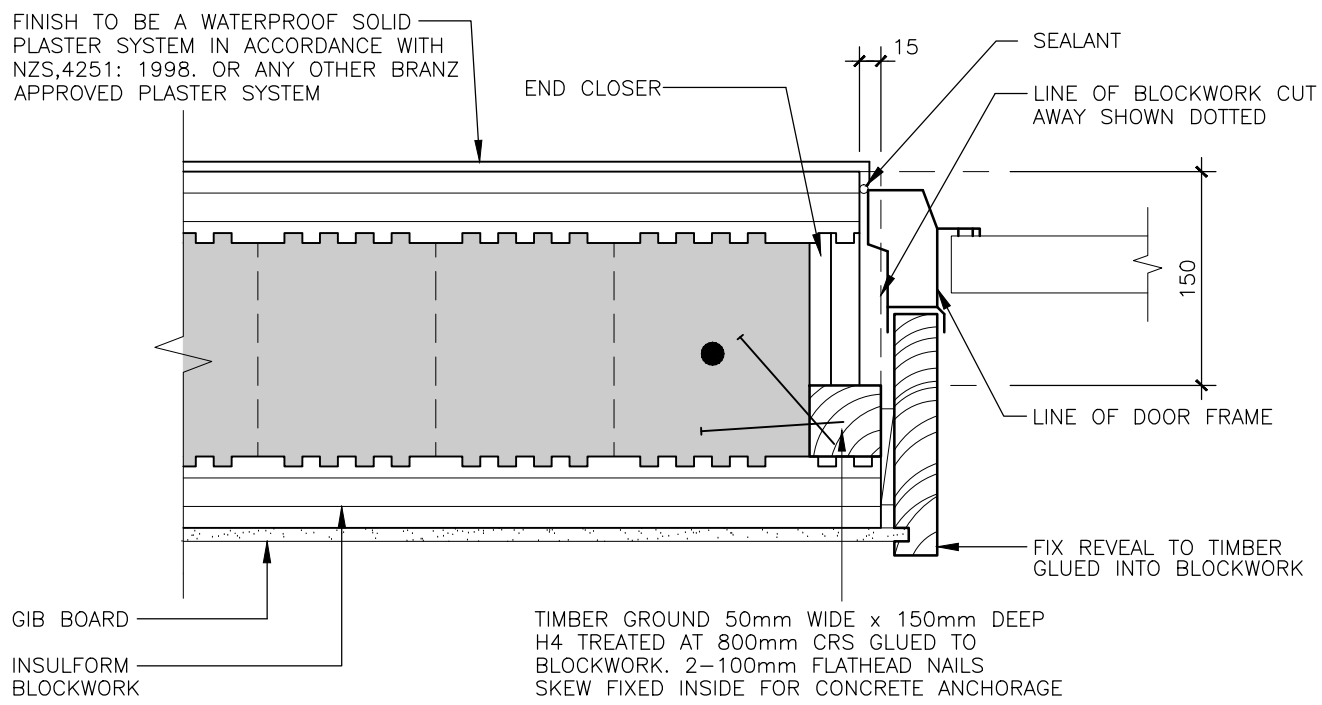
ALUMINIUM JOINERY DETAILS, WINDOWS

ENG W.L.	FILE	DRAWING
DRN B.T	6157	4a
CHK W.L.		
DATE 4/13		



INTERNAL DOOR JAMB



EXTERNAL DOOR JAMB

NOTE: DOOR HEAD DETAIL AS PER WINDOW HEAD DETAIL (DRAWING 4a).

NOTE: REINFORCEMENT SHOWN IS THE MINIMUM THAT COULD BE REQUIRED. ADDITIONAL STEEL WILL USUALLY BE REQUIRED. THE FINAL STRUCTURAL DESIGN MUST BE CHECKED BY A REGISTERED ENGINEER.

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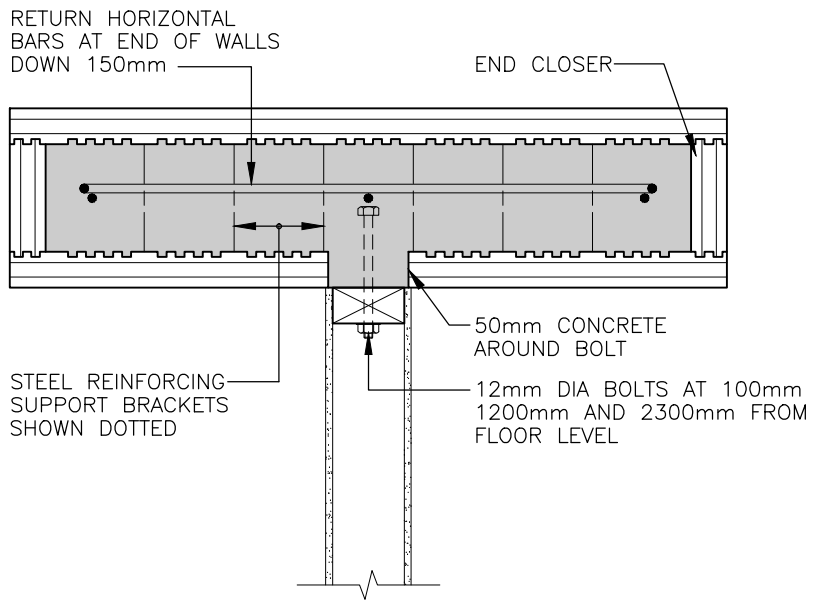
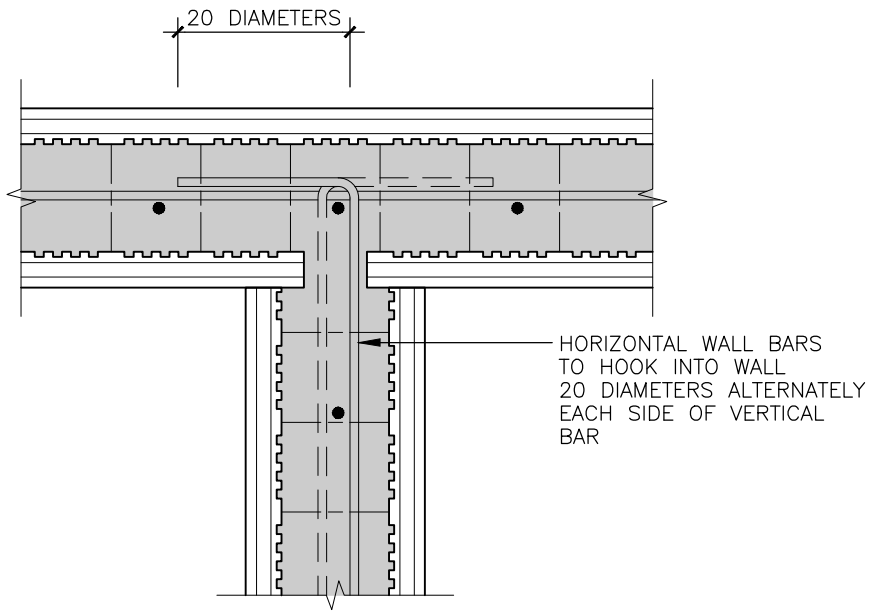
ALUMINIUM JOINERY DETAILS
INTERNAL AND EXTERNAL DOORS

ENG W.L.	FILE	DRAWING
DRN B.T	6157	4b
CHK W.L.		
DATE 4/13		

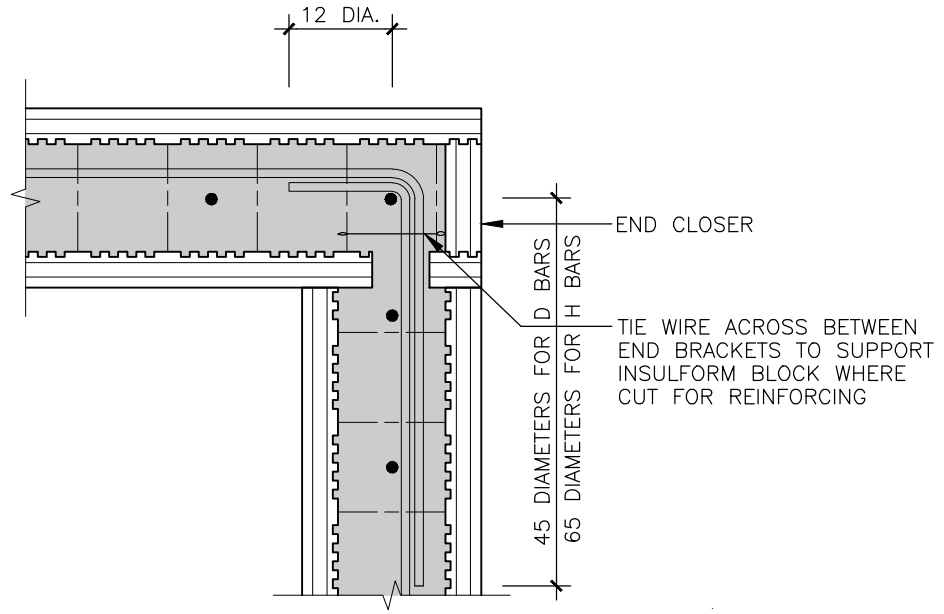
BOTH SPECIFIC AND NON–SPECIFIC DESIGN DETAILS



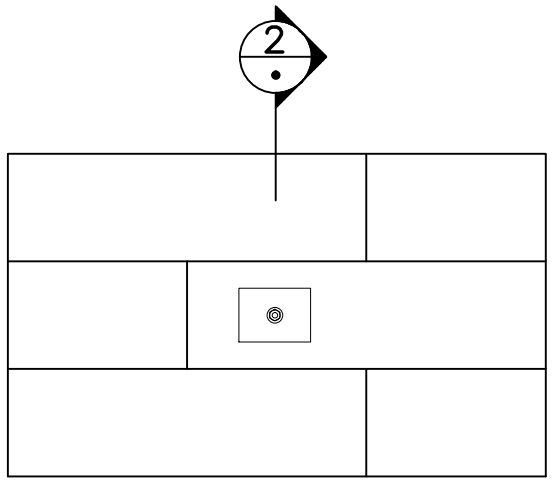
TIMBER WALL/INSULFORM WALL JUNCTION



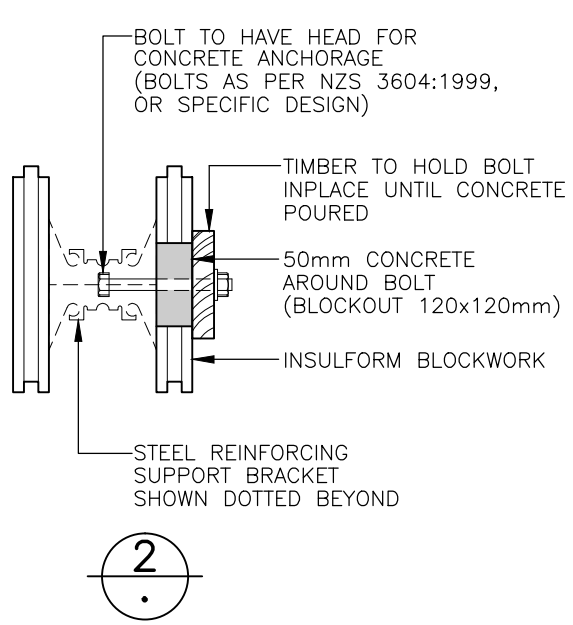
WALL JUNCTIONS



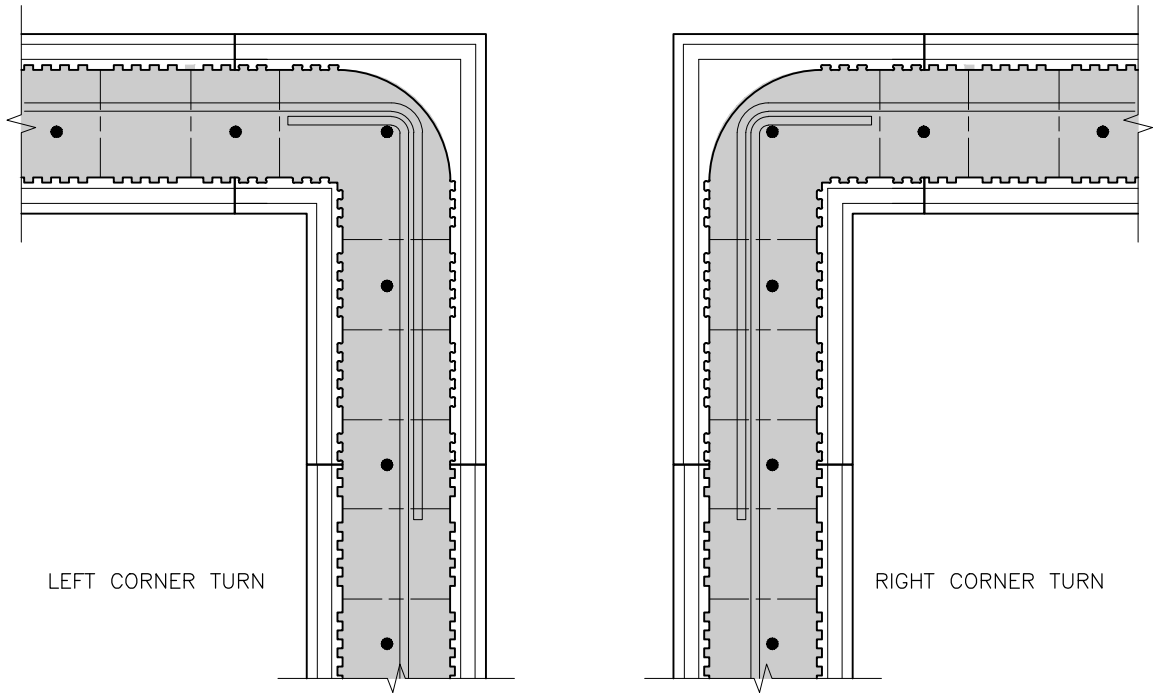
CORNERS
(WITH END CLOSERS)



WALL ELEVATION



BOLTS CAST INTO WALL



CORNERS
(USING CORNER BLOCKS)

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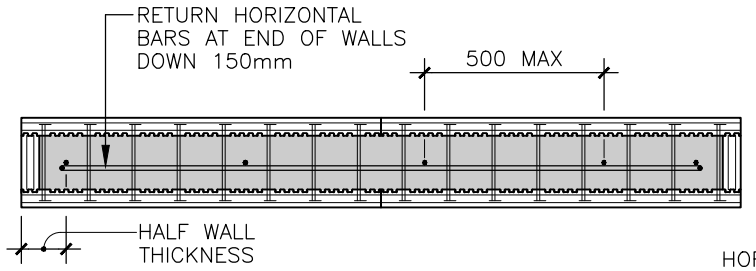
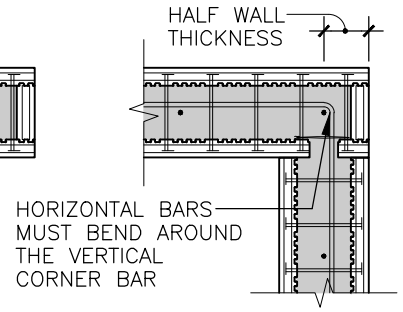
CONSTRUCTION DETAILS

ENG W.L.	FILE	DRAWING
DRN B.T	6157	5
CHK W.L.		
DATE 4/13		

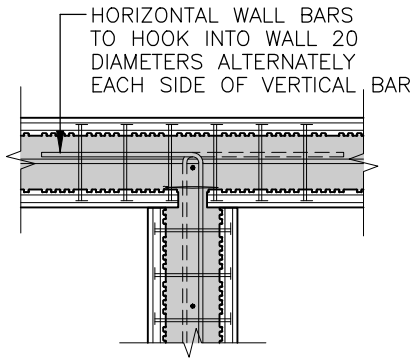
BOTH SPECIFIC AND NON–SPECIFIC DESIGN



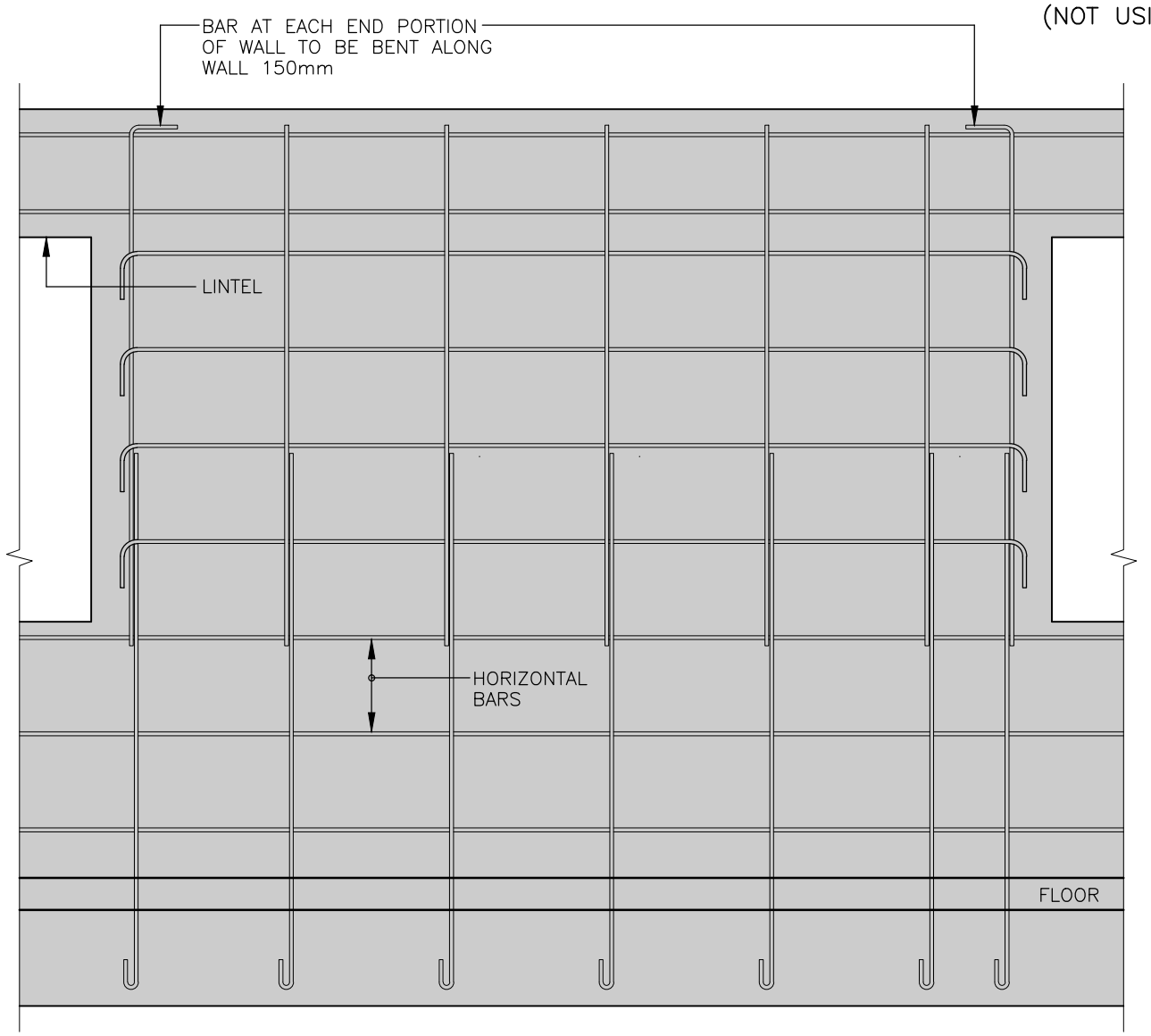
TYPICAL WALL SECTION



TYPICAL CORNER
(NOT USING CORNER BLOCKS)



TYPICAL WALL
JUNCTION
(NOT USING CORNER BLOCKS)



TYPICAL WALL SECTION

NOTES:

1. ALL WORK SHALL COMPLY WITH THE RELEVANT CLAUSES OF THE N.Z. BUILDING CODE.
2. WHERE DESIGNATED D, REINFORCEMENT SHALL BE DEFORMED BARS, WHERE DESIGNATED R, REINFORCEMENT SHALL BE PLAIN BARS, BOTH BEING GRADE 300E, COMPLYING WITH AS/N.Z.S.4671:2001. WHERE DESIGNATED H, REINFORCEMENT SHALL BE DEFORMED BARS OF GRADE 500E, COMPLYING WITH AS.N.Z.S.4671.2001.
3. WHERE LAPS ARE NOT SHOWN, THEY SHALL BE 45 DIAMETERS FOR 'D' BARS AND 65 DIAMETERS FOR 'H' BARS.
4. FOR 250mm WIDE WALLS, WHERE NOT OTHERWISE SHOWN, VERTICAL REINFORCEMENT SHALL BE D12 AT 500mm CRS AND HORIZONTAL REINFORCEMENT SHALL BE H10 AT 300mm CRS. A BOND BEAM WITH D12 BAR SHALL BE PLACED UNDER ALL SILLS EXTENDING 600mm BEYOND EACH SIDE.
5. VERTICAL BARS SHALL BE TIED TO STARTERS USING GALV WIRE LOOPS.
6. CONCRETE SHALL BE 25MPa, 150mm SLUMP AND 13mm MAX AGGREGATE.
7. IF DUST OR POLYSTYRENE BEADS GET INTO THE WALLS BEFORE CONCRETING, CLEANOUT POCKETS MUST BE MADE TO THOUGHLY CLEAN THE SCABBLED SURFACE OR RECESS OF THE FLOOR SLAB.
8. JUST BEFORE POURING THE SCABBLED SLAB OR RECESS SURFACE MUST BE WET.
9. CONCRETE SHALL BE POURED SO THAT IT FLOWS ALONG THE BOTTOM AHEAD OF THE CORE BEING CONCRETED.
10. ALL WALLS SHALL BE VIBRATED WITH A POKER VIBRATOR, RUN VERTICALLY UP AND DOWN CORES 500mm APART WITH ONE SECOND PAUSE AT THE BOTTOM.
11. WHERE THE WALLS HAVE BEEN SPECIFICALLY DESIGNED BY AN ENGINEER THEN THE DESIGN ENGINEER SHOULD BE ENGAGED TO INSPECT ALL PREPARATION BEFORE POURING.
12. WHERE WALLS ARE POURED IN MORE THAN ONE LIFT THEN THE FIRST POUR SHALL BE LEFT ROUGH. JUST PRIOR TO THE SECOND POUR COAT THE FIRST POUR WITH A 1:1 SAND / CEMENT SLURRY 20mm THICK.
13. WHERE CONCRETE IS TO BE POURED ON TOP OF THE WALL THEN STARTERS SHOULD BE PLACED WHEN POURING THE WALL AND THE CONCRETE SURFACE SHOULD BE LEFT ROUGH.

WALL/FLOOR
JUNCTION

SCABBLED SURFACE OR 25mm RECESS TO BE KEPT CLEAN

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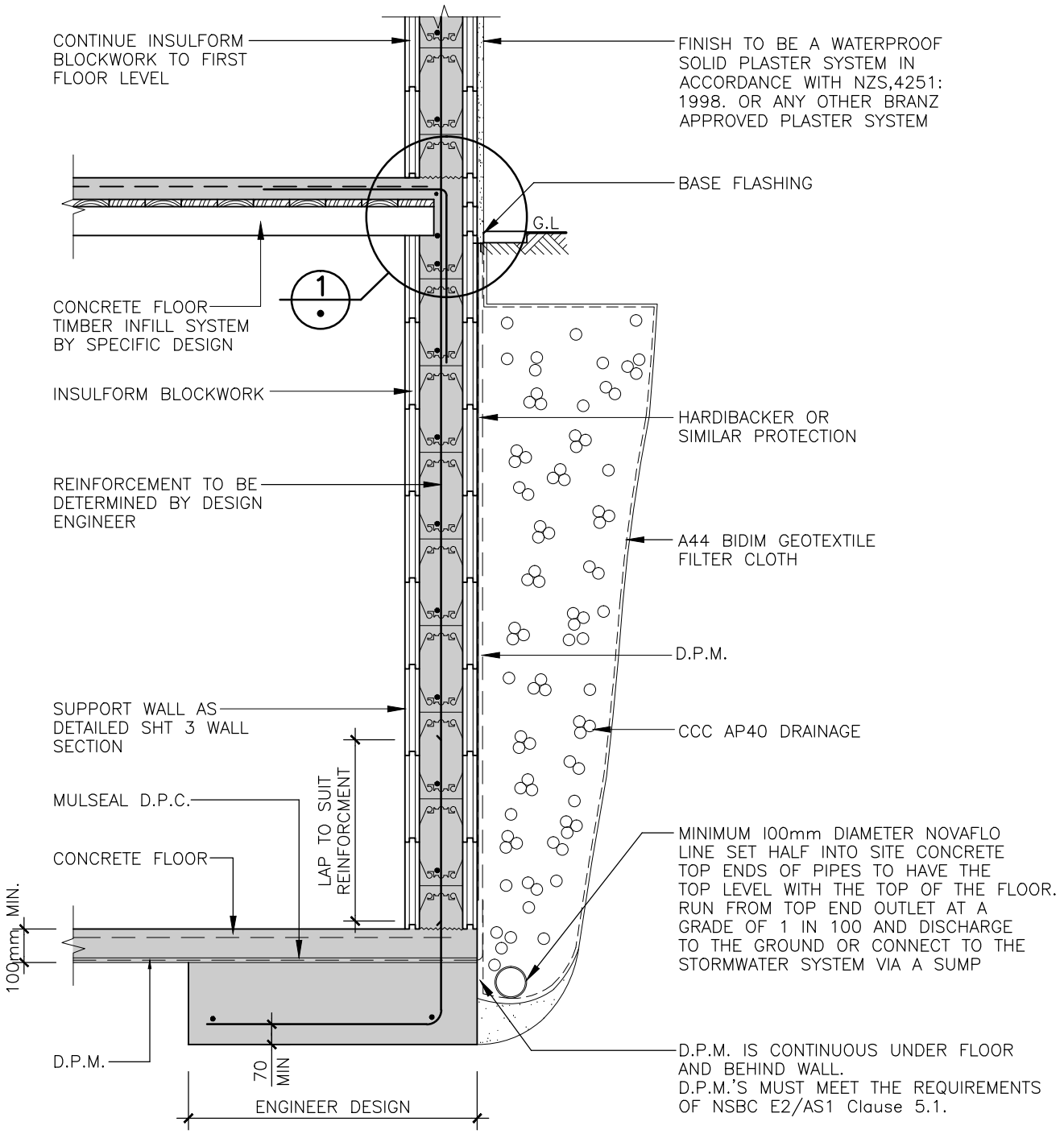
PH 366 4320
CHRISTCHURCH

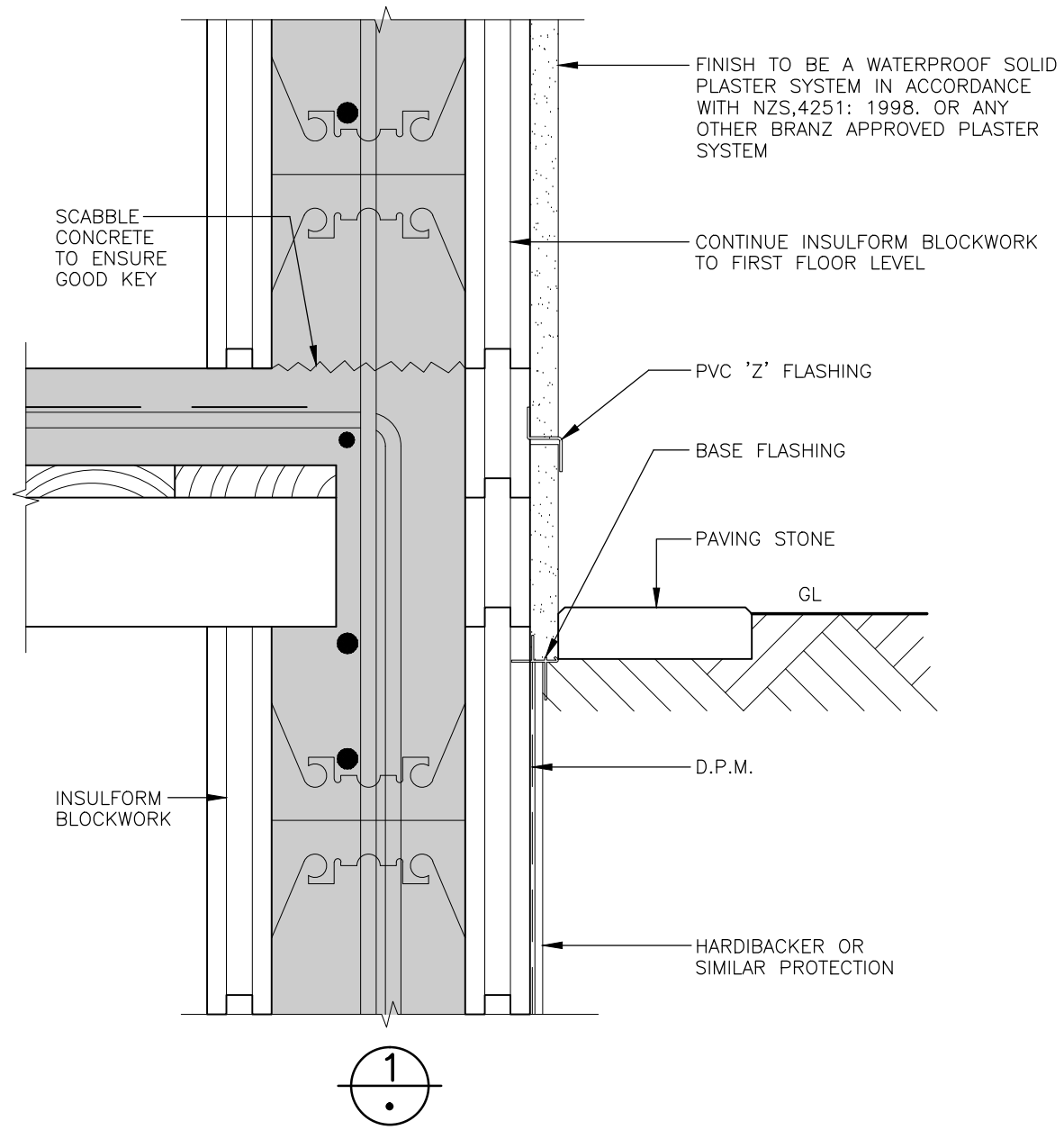
STRUCTURAL SITE
INSTRUCTIONS

ENG W.L.	FILE	DRAWING
DRN B.T	6157	6
CHK W.L.		
DATE 4/13		



BASEMENT SECTION

SPECIFIC DESIGNS MAY REQUIRE DIFFERENT REINFORCEMENT, AND OTHER STRUCTURAL CHANGES.



NOTES:

1. THE DESIGN OF ALL RETAINING WALLS SHALL BE PROVIDED BY A CHARTED PROFESSIONAL ENGINEER.
2. ALL MATERIAL SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
3. THE BACKFILL SHALL SLOPE AWAY FROM THE WALL

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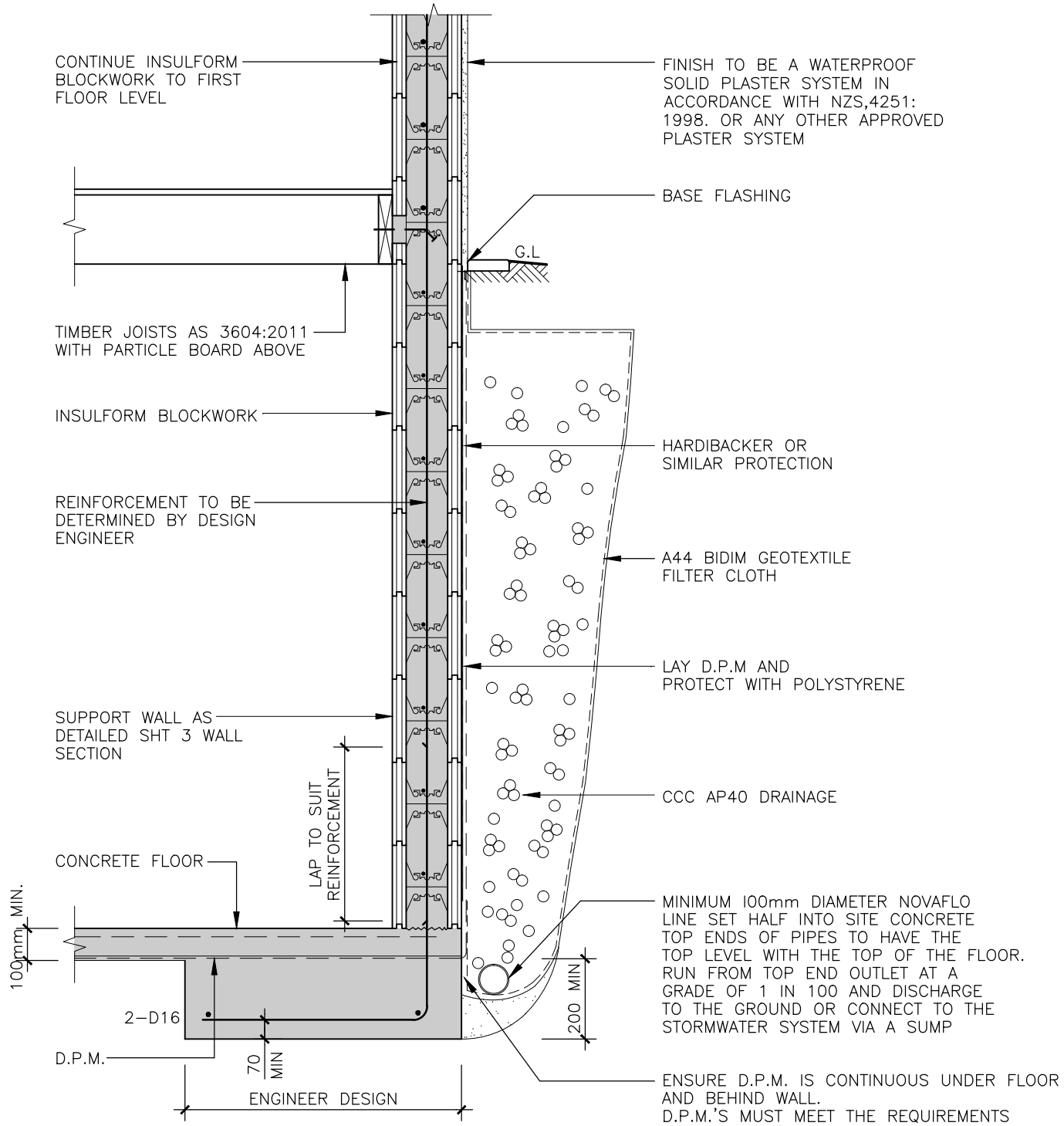
TYPICAL DETAILS OF BASEMENT WALL CONSTRUCTION WITH CONCRETE FLOOR ABOVE

ENG W.L.	FILE	DRAWING
DRN B.T	6157	7
CHK W.L.		
DATE 4/13		

THE WALL AND FLOOR DETAILS SHOWN MUST BE PART OF A SPECIFIC DESIGN. THE TIMBER FLOOR DETAILS MAY BE SPECIFIED IN TERMS OF NZS3604:1999



BASEMENT SECTION

SPECIFIC DESIGNS MAY REQUIRE DIFFERENT REINFORCEMENT, AND OTHER STRUCTURAL CHANGES.

NOTES:

1. THE DESIGN OF ALL RETAINING WALLS SHALL BE PROVIDED BY A CHARTED PROFESSIONAL ENGINEER
2. THESE DETAILS ONLY APPLY WHERE THE WALL IS BUILT BEFORE THE FLOOR IS IN PLACE.
3. THE BACKFILL SHALL SLOPE AWAY FROM THE WALL

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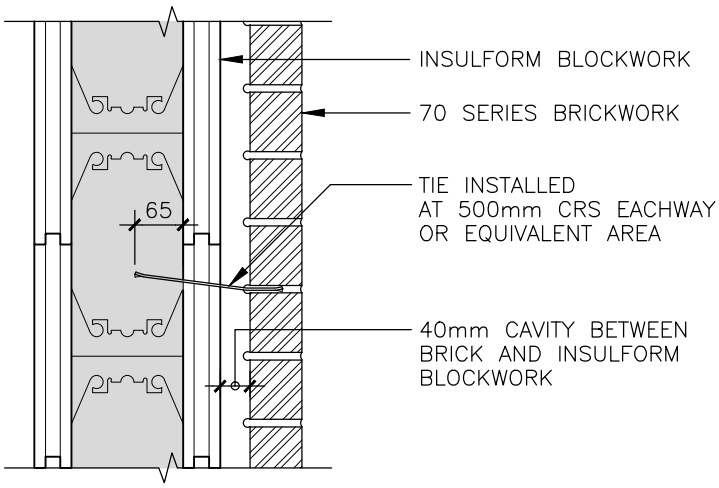
TYPICAL BASEMENT WALL FOR TIMBER FLOOR ABOVE

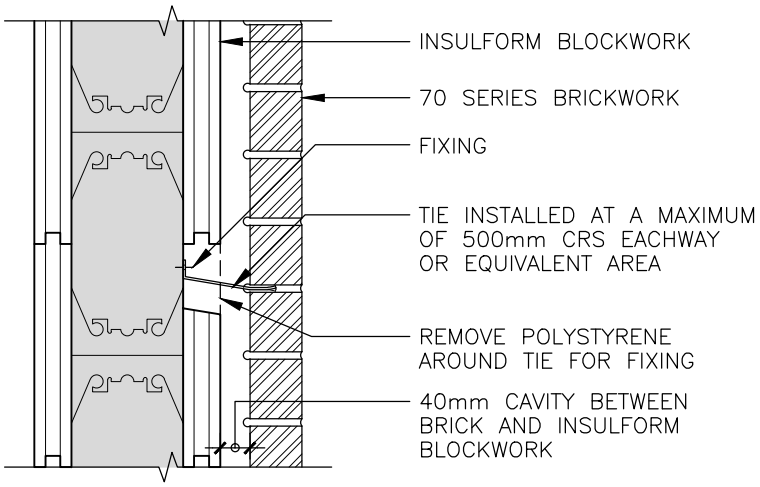
ENG W.L.	FILE	DRAWING
DRN B.T	6157	8
CHK W.L.		
DATE 4/13		

THESE DETAILS APPLY TO NON–SPECIFIC DESIGN.



FISHTAIL VENEER TIE INSTALLATION

SCALE 1:10



BOLTED VENEER TIE INSTALLATION

SCALE 1:10

NOTE:

THE INFORMATION SHOWN ON THIS SHEET SHALL BE ONLY USED FOR 70mm BRICKWORK UP TO 5.5m MAXIMUM IN HEIGHT. ANY BRICKWORK HIGHER THAN 5.5m SHALL BE SPECIFICLY DESIGNED.
TIES SHALL MEET THE RELEVANT PERFORMANCE REQUIREMENTS OF THE NZBC.

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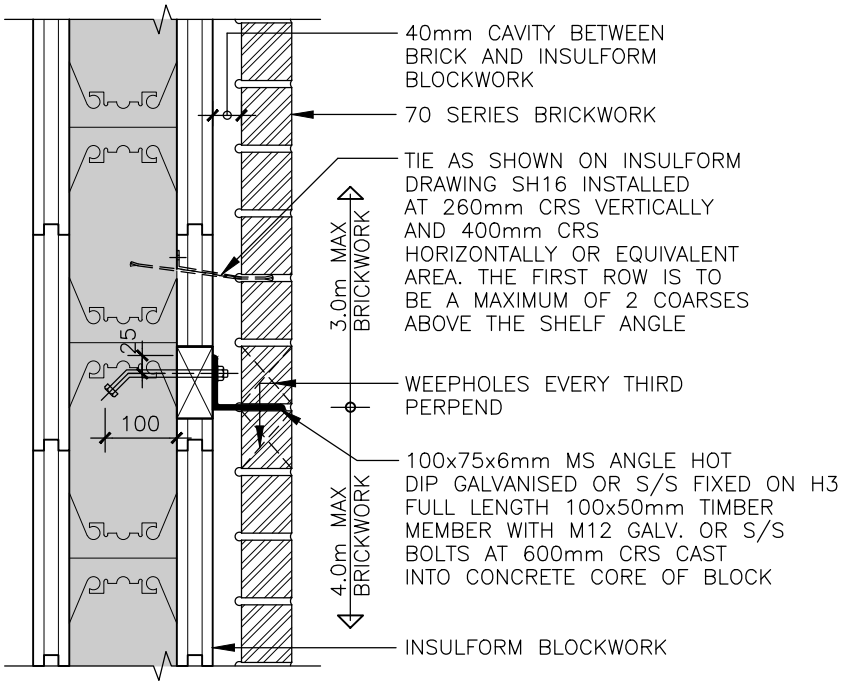
BRICKWORK VENEER TIE INSULFORM BLOCKWORK



S H E L F A N G L E D E T A I L

N O T E : SCALE 1:10

FOR 70mm THICK BRICKWORK ABOVE 4.0m HIGH MAXIMUM HEIGHT OF BRICKWORK SHALL BE 7.0m SHELF ANGLE AND BOLTS SHALL MEET THE PERFORMANCE REQUIREMENTS OF THE NZBC.

N O T E :

THIS DETAIL MUST BE READ IN CONJUNCTION WITH A SPECIFIC DESIGN WHERE THE VENEER HEIGHT EXCEEDS 5.5m ABOVE THE FOUNDATION AND SHELF ANGLES ARE DEEMED NECESSARY BY THE DESIGN ENGINEER.

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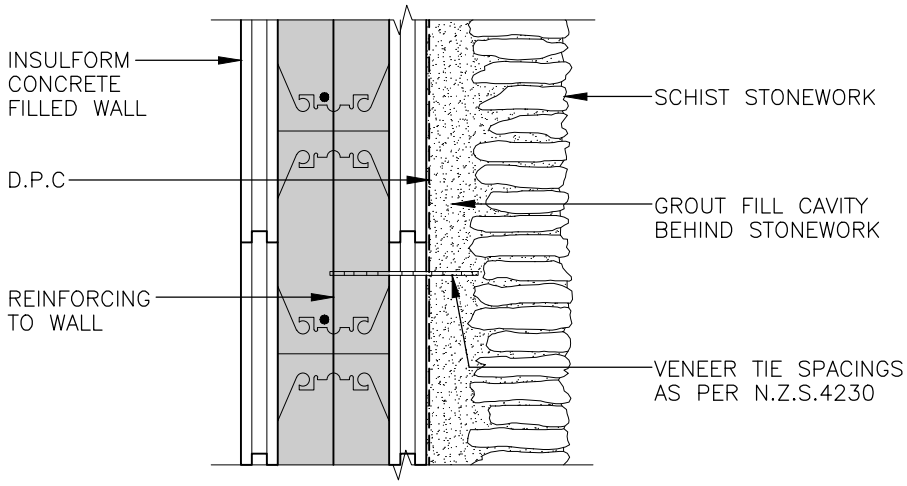
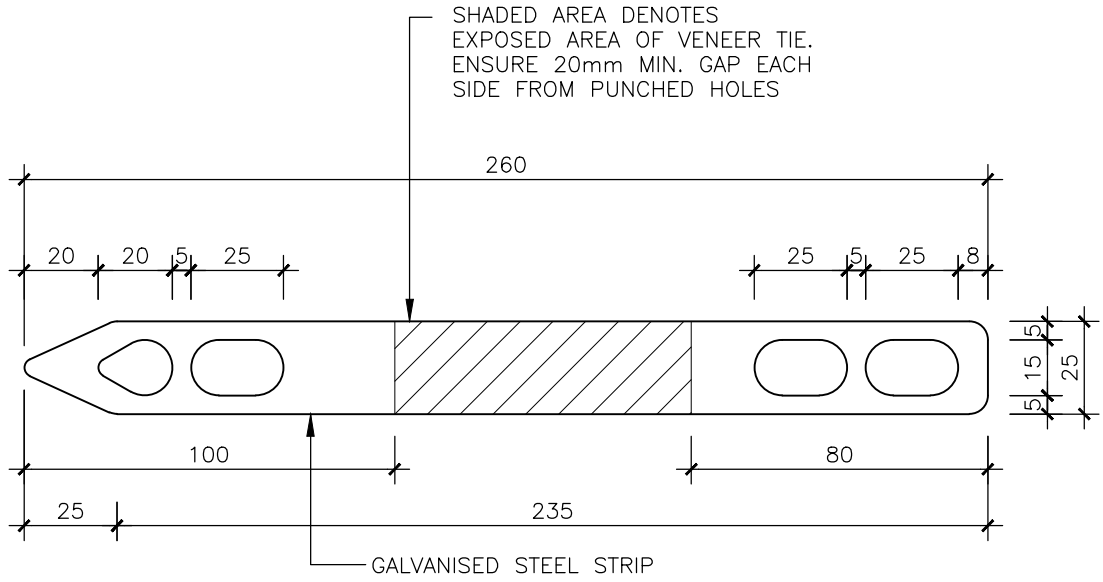
BRICKWORK SHELF ANGLE INSULFORM BLOCKWORK



TYPICAL WALL SECTION



VENEER TIE PLAN

FOR MASONRY WORK

NOTES:

260x25mm HOT DIP GALV (0.0155mm THICK TO SPECIFICATION G2502275 OR JISG3302 SGCC–CQ) WITH PUNCHED HOLES AS SHOWN EMBEDDED A MINIMUM OF 100mm INTO THE POLYSTYRENE FORMED CONCRETE WALL AND EMBEDDED A MINIMUM OF 80mm INTO THE MORTAR OR CONCRETE OF THE VENEER. TIE SPACINGS AS PER SNZ HB 4236:2002. THIS IS A TYPICAL SPECIFIC DESIGN DETAIL THAT MUST BE CHECKED, MODIFIED AND APPROVED BY A CHARTED PROFESSIONAL ENGINEER BEFORE BEING USED.

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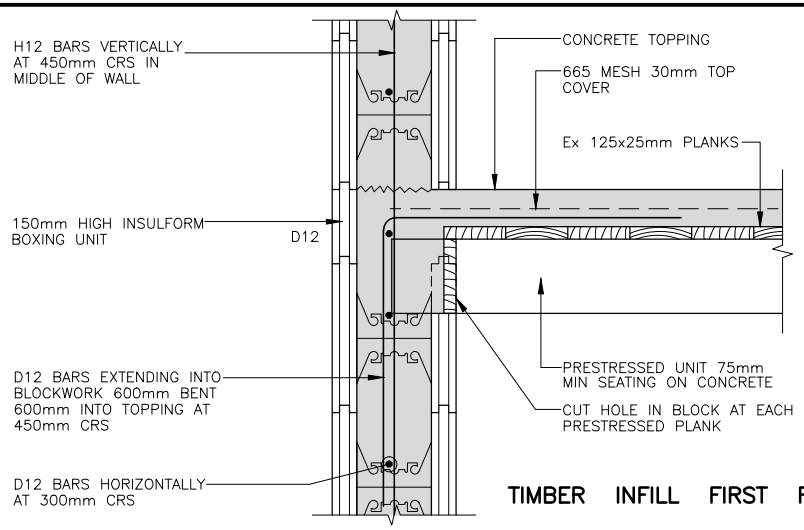
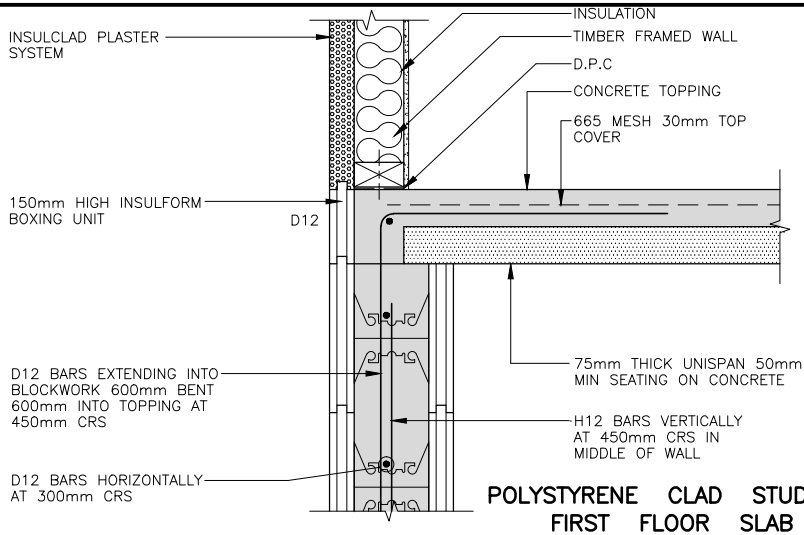
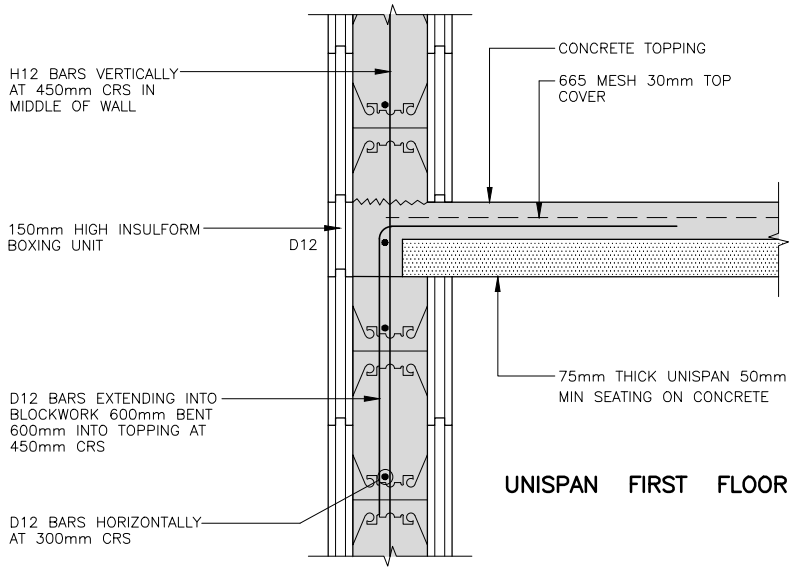
VENEER TIES FOR SCHIST STONE WORK



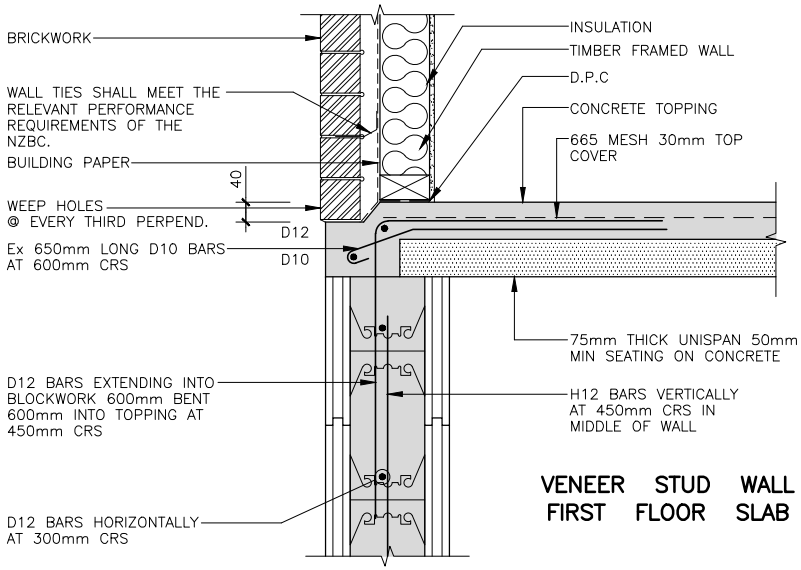
TIMBER INFILL FIRST FLOOR



POLYSTYRENE CLAD STUD WALL FIRST FLOOR SLAB



UNISPAN FIRST FLOOR



VENEER STUD WALL FIRST FLOOR SLAB

NOTE: REINFORCEMENT SHOWN IS THE MINIMUM THAT COULD BE REQUIRED. ADDITIONAL STEEL WILL USUALLY BE REQUIRED. THE FINAL STRUCTURAL DESIGN MUST BE CHECKED BY A CHARTED PROFESSIONAL ENGINEER.

THESE WALL AND FLOOR DETAILS MUST BE PART OF A SPECIFIC DESIGN

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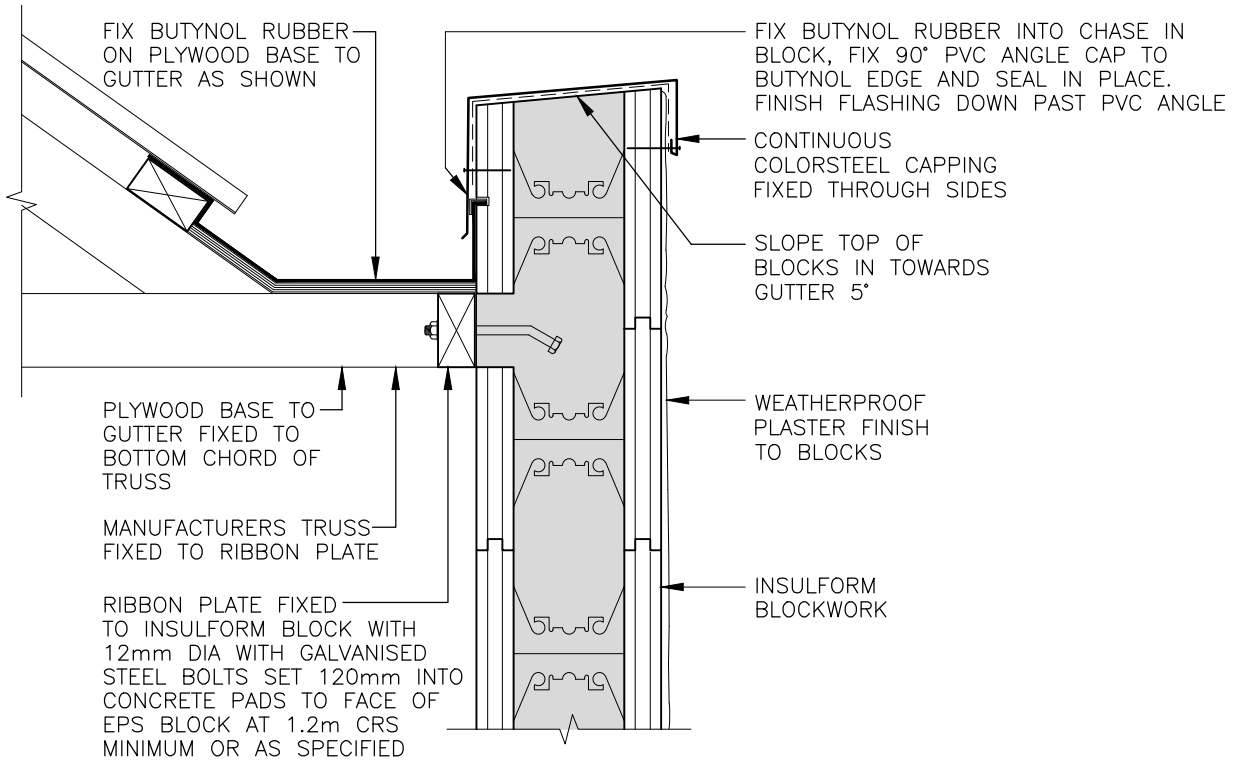
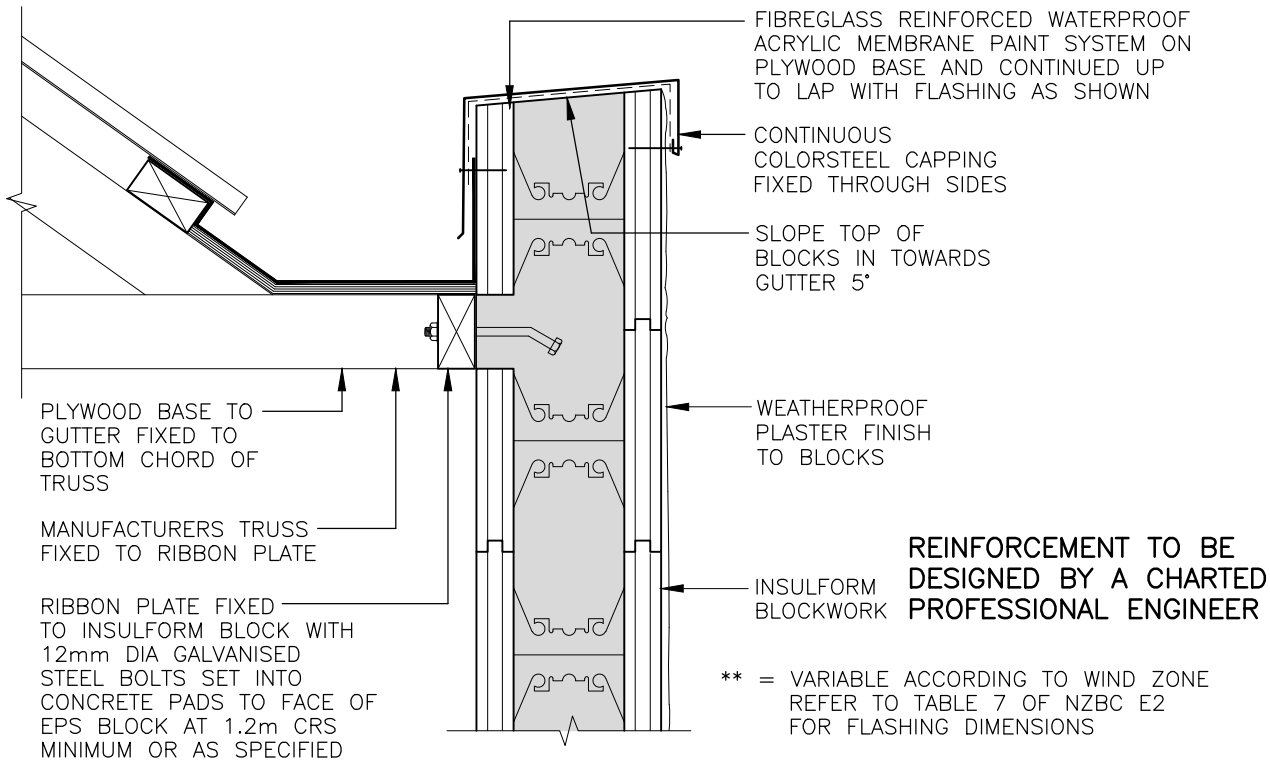
TYPICAL FIRST FLOOR WALLS AND FLOOR DETAILS

ENG W.L.	FILE	DRAWING
DRN B.T	6157	10
CHK W.L.		
DATE 4/13		

THESE DETAILS ARE FOR USE WITH BUILDINGS WHICH ARE SUBJECT TO A NON–SPECIFIC DESIGN



INTERNAL GUTTER DETAIL
(BUTYNOL LINED GUTTER)



REINFORCEMENT TO BE DESIGNED BY A CHARTED PROFESSIONAL ENGINEER

** = VARIABLE ACCORDING TO WIND ZONE
REFER TO TABLE 7 OF NZBC E2
FOR FLASHING DIMENSIONS

INTERNAL GUTTER DETAIL
(ACRYLIC PAINT MEMBRANE GUTTER)

SHT 11a

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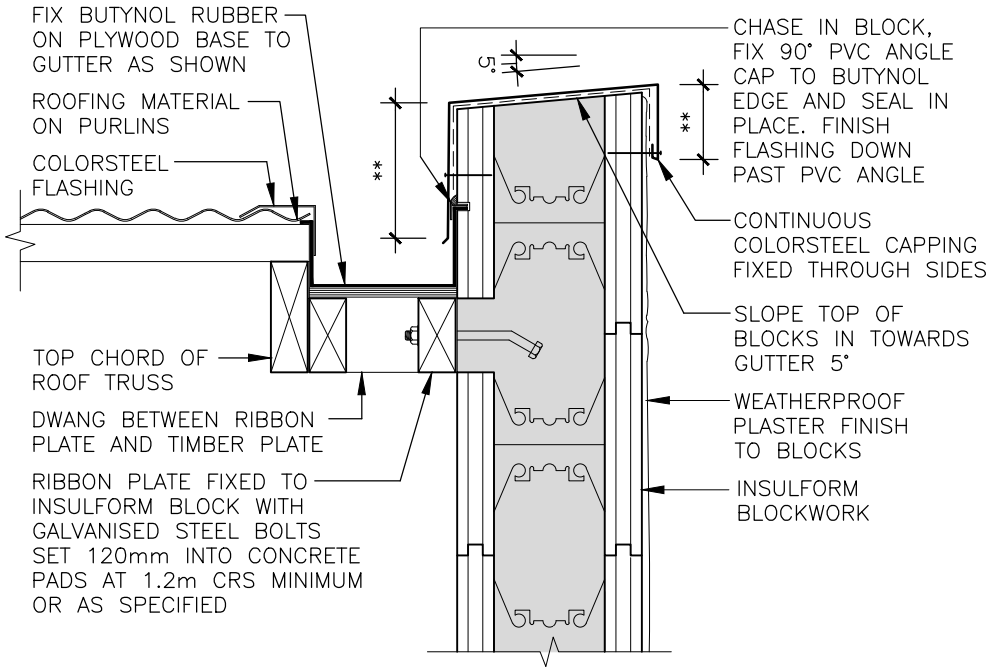
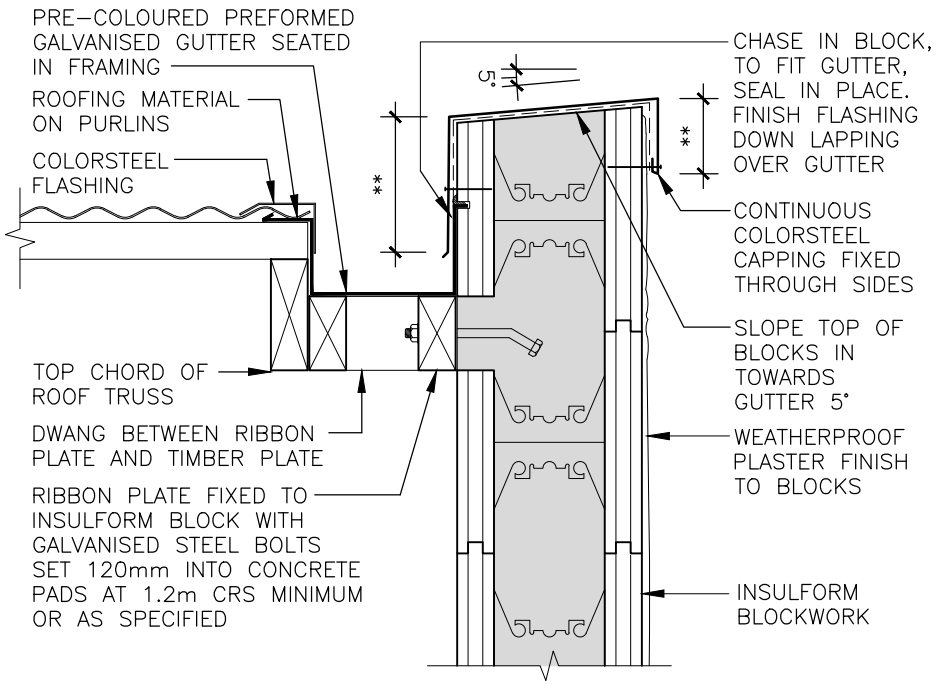
GUTTER AND PARAPET DETAILS



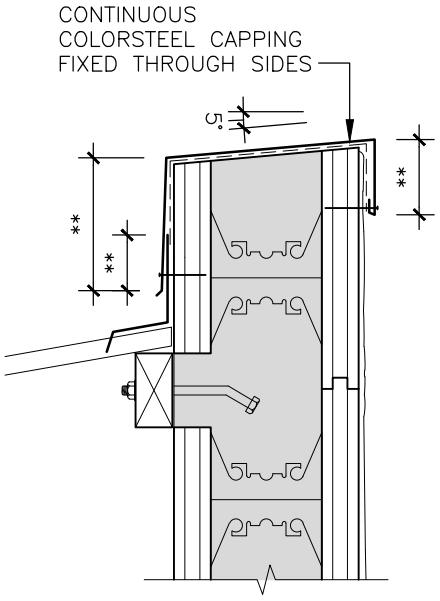
PARAPET DETAIL

(BUTYNOL LINED GUTTER)



PARAPET DETAIL

(PREFORMED GALVANISED GUTTER)



PARAPET CAPPING

** = VARIABLE ACCORDING TO WIND ZONE
REFER TO TABLE 7 OF NZBC E2
FOR FLASHING DIMENSIONS

SHT 11b REINFORCEMENT TO BE DESIGNED BY A CHARTED PROFESSIONAL ENGINEER

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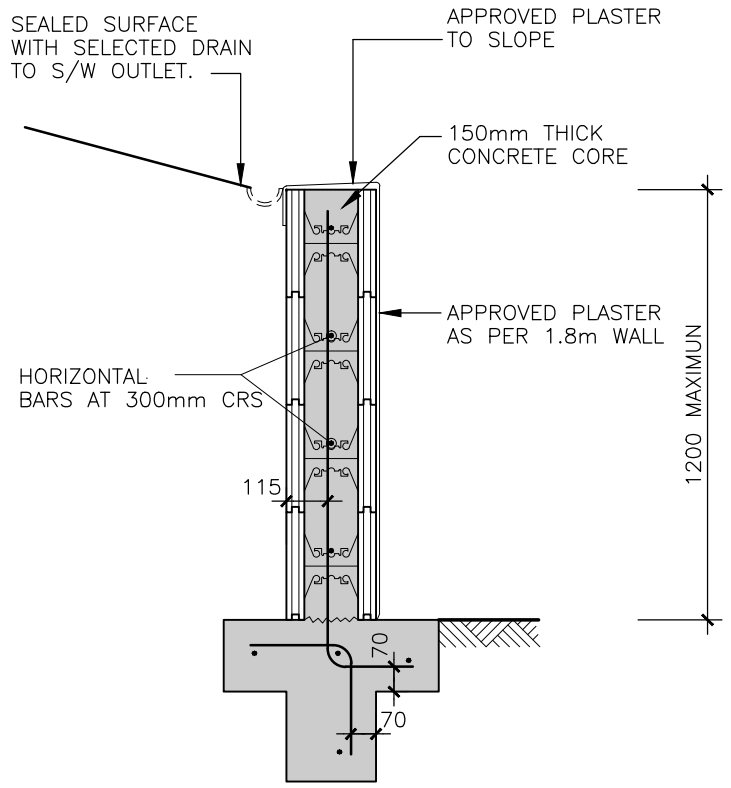
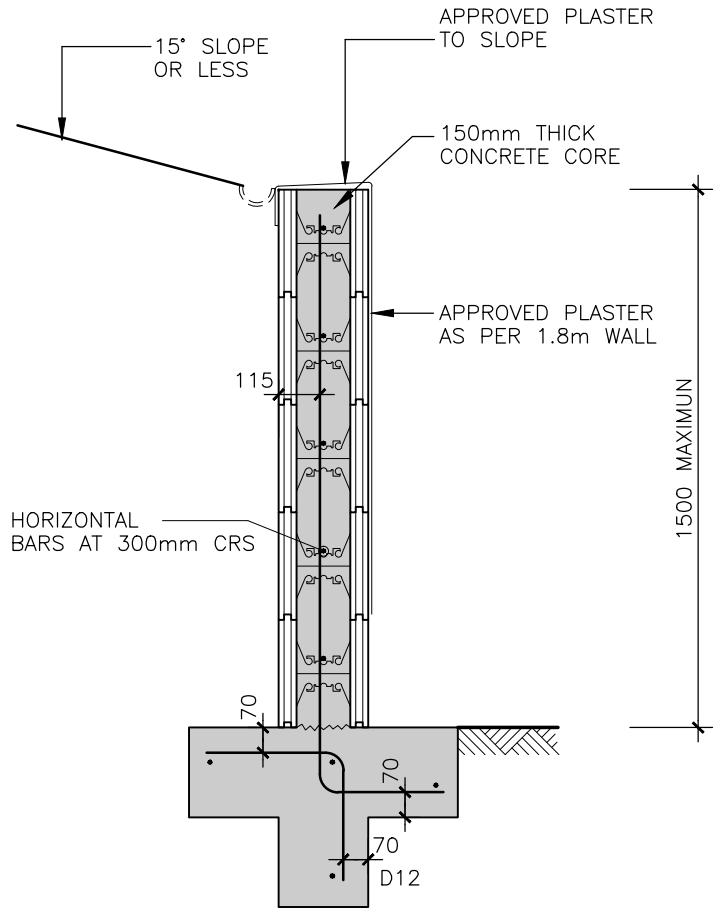
GUTTER AND PARAPET DETAILS

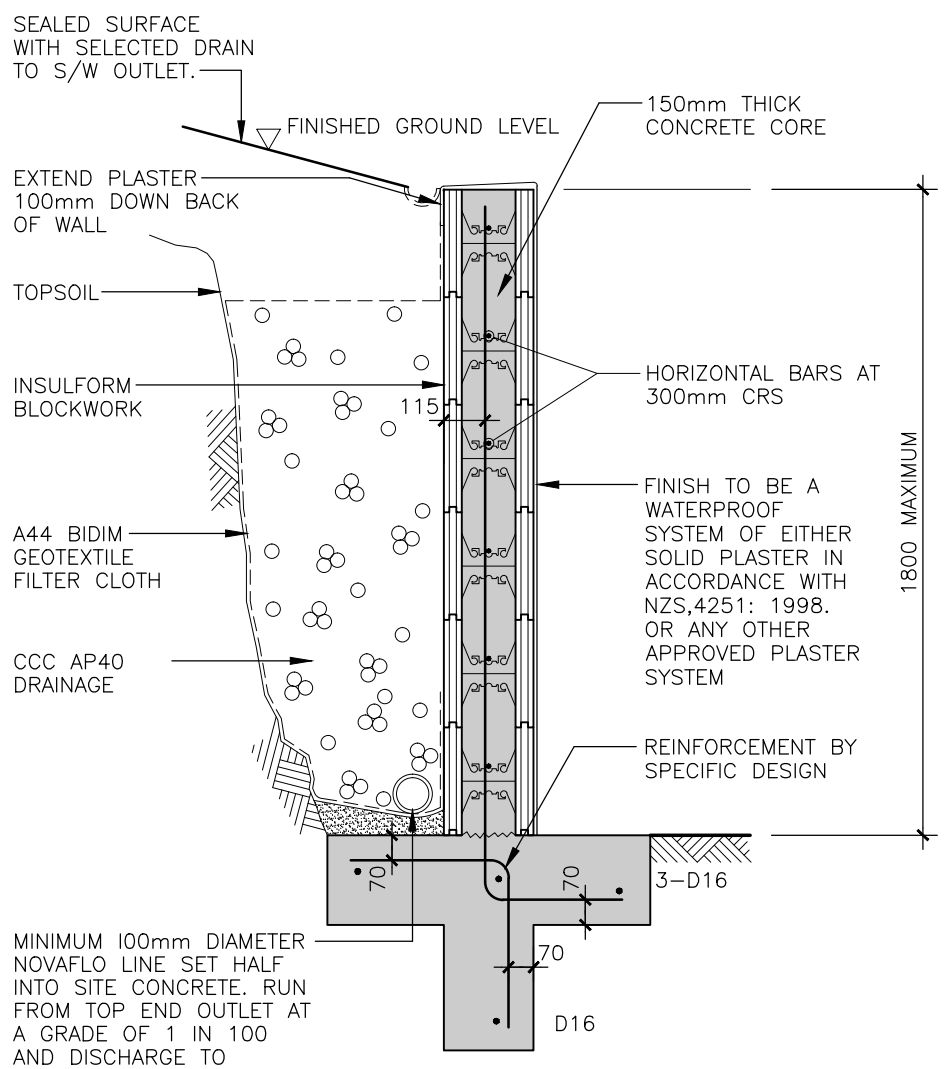
THESE DETAILS SHOW SOME TYPICAL DETAILS OF SPECIFIC DESIGN. HOWEVER THE STRUCTURAL DETAILS OF THESE WALLS MUST BE PROVIDED BY A REGISTERED ENGINEER WHO WILL DECIDE ON THE FOUNDATION DIMENSIONS AND REINFORCEMENT TO SUIT THE SITE, TYPE OF BACKFILL, DRAINAGE, OTHER LOADS, SOIL PROPERTIES ETC



1.2m MAXIMUM HEIGHT



1.5m MAXIMUM HEIGHT



1.8m MAXIMUM HEIGHT

SHOWING TYPICAL BACKFILLING, PLASTER FINISH, AND OTHER DETAILS APPLICIBLE TO ALL RETAINING WALLS.

NOTES:

1. THE DESIGN OF ALL RETAINING WALLS SHALL BE PROVIDED BY A CHARTED PROFESSIONAL ENGINEER

3. THE BACKFILL SHALL NOT SLOPE UPWARDS AWAY FROM THE WALL AT AN ANGLE GREATER THAN 15°.

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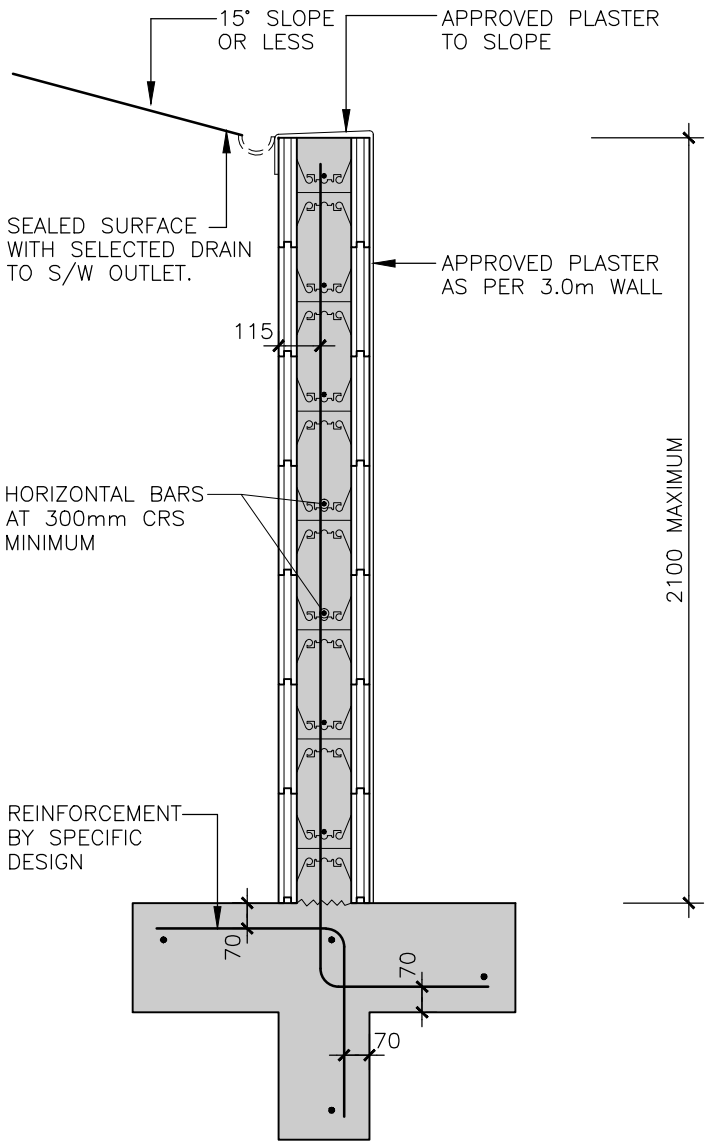
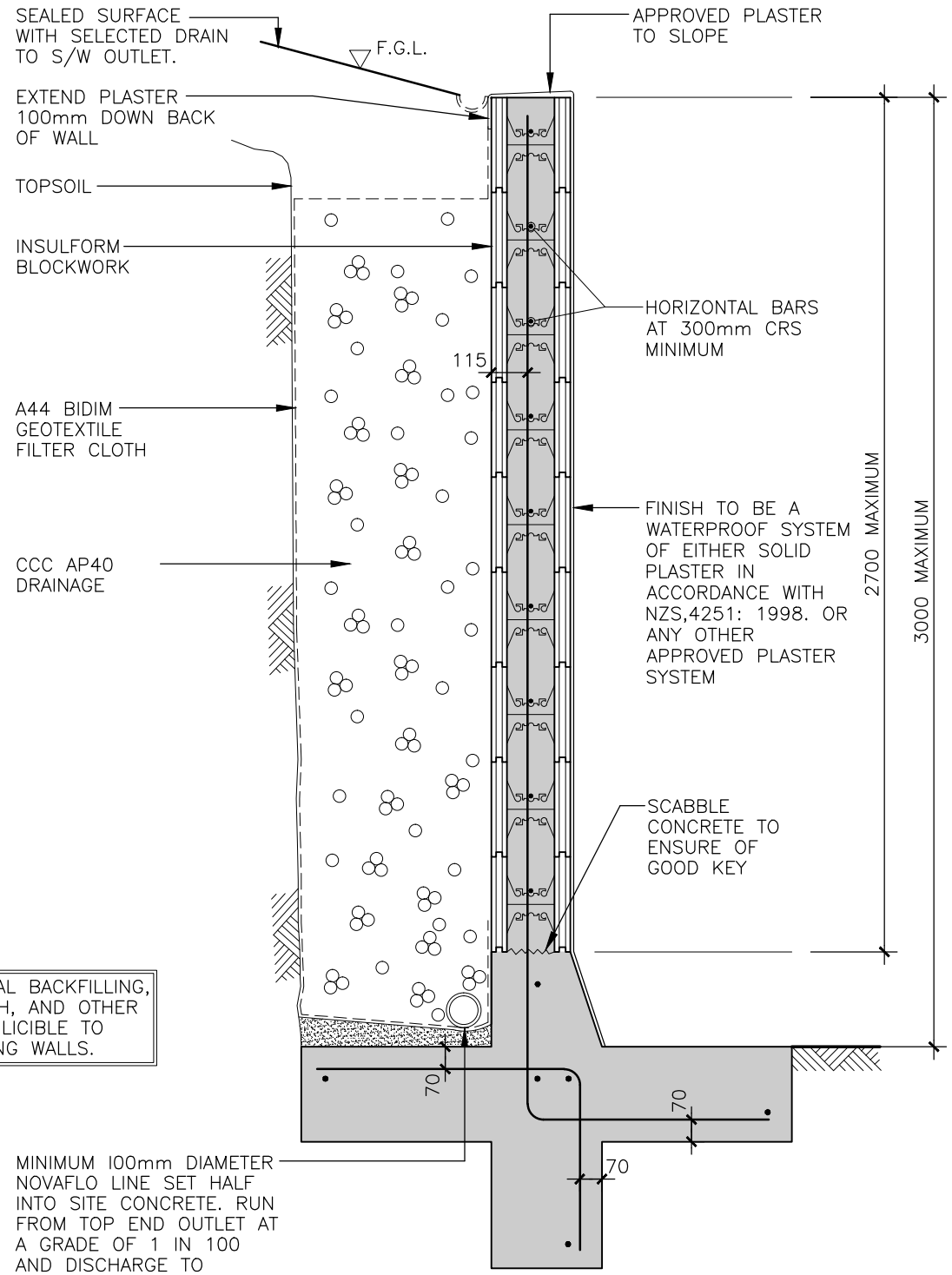
TYPICAL RETAINING WALLS TO 1.8m HIGH

ENG W.L.	FILE	DRAWING
DRN B.T	6157	12
CHK W.L.		
DATE 4/13		



2.1m MAXIMUM HEIGHT

SHOWING TYPICAL BACKFILLING, PLASTER FINISH, AND OTHER DETAILS APPLICIBLE TO ALL RETAINING WALLS.



3.0m MAXIMUM HEIGHT

NOTES:

1. THE DESIGN OF ALL RETAINING WALLS SHALL BE PROVIDED BY A CHARTED PROFESSIONAL ENGINEER

3. THE BACKFILL SHALL NOT SLOPE UPWARDS AWAY FROM THE WALL AT AN ANGLE GREATER THAN 15°.

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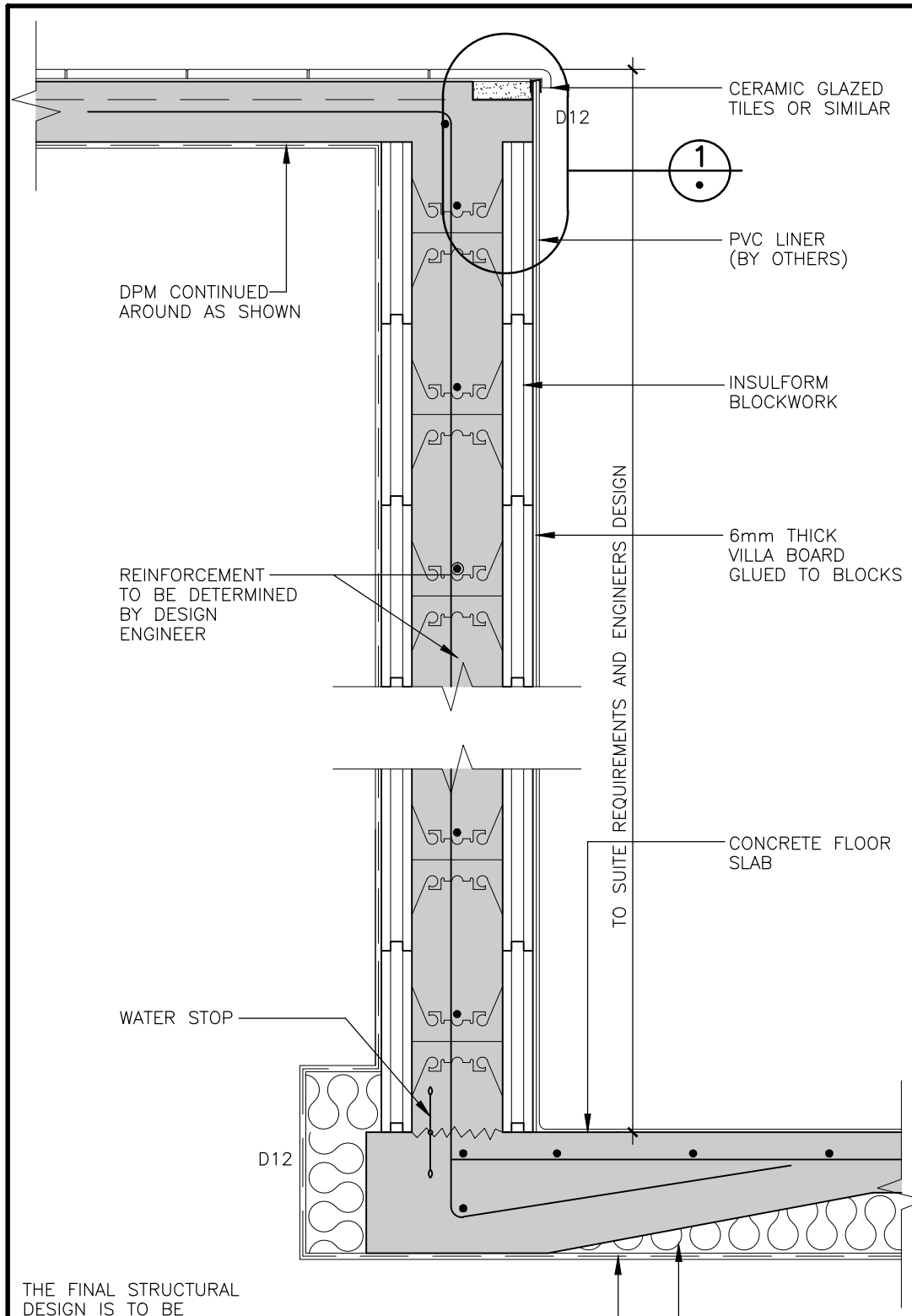
TYPICAL RETAINING WALLS TO 3.0m HIGH

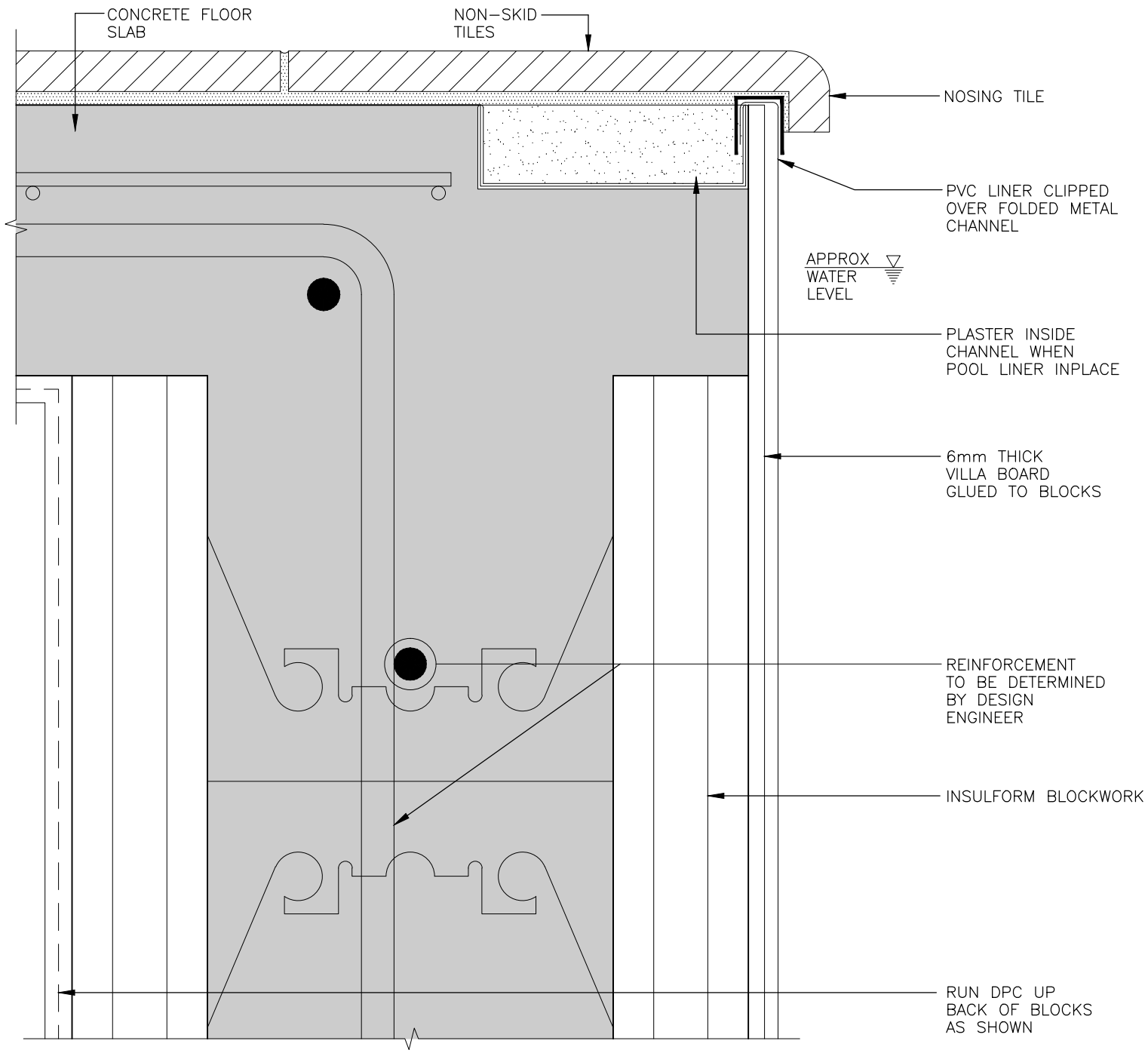
ENG W.L.	FILE	DRAWING
DRN B.T	6157	13
CHK W.L.		
DATE 4/13		

THESE APPLY TO SPECIFIC DESIGNS



THE FINAL STRUCTURAL DESIGN IS TO BE APPROVED BY A CHARTED PROFESSIONAL ENGINEER

TYPICAL SECTION THROUGH SWIMMING POOL INSULFORM WALL



SECTION 1

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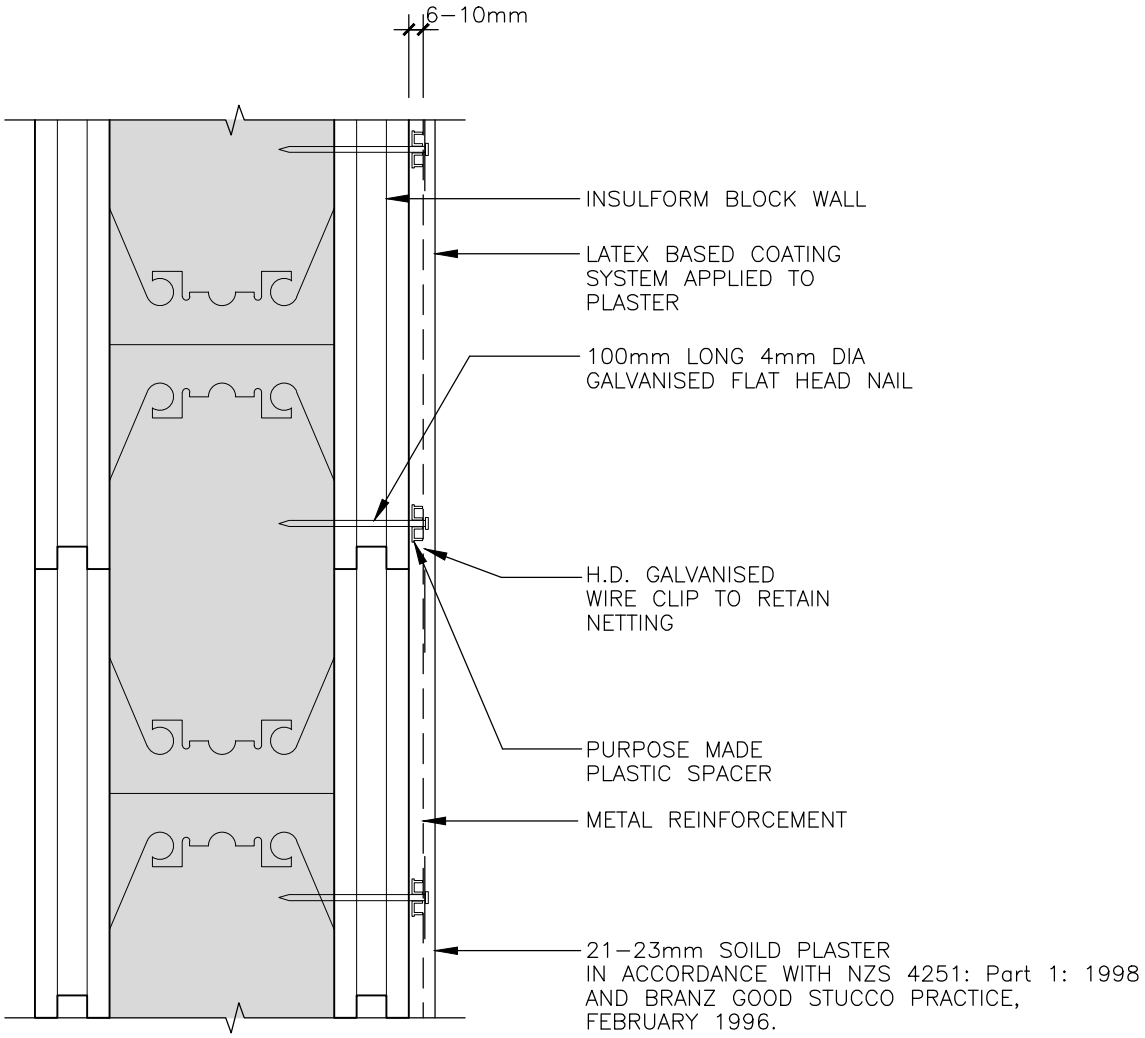
TYPICAL SWIMMING POOL DETAILS

ENG W.L.	FILE	DRAWING
DRN B.T	6157	14
CHK W.L.		
DATE 4/13		

THIS DETAIL IS FOR USE WITH BUILDINGS WHICH ARE SUBJECT TO NON–SPECIFIC DESIGN. SOLID PLASTER SHALL BE IN ACCORDANCE WITH NZS 4251:2007 EXCEPT AS VARIED BY THE DETAILS SHOWN. REFER ALSO TO THE BRANZ GOOD STUCCO PRACTISE FOR PLASTER AND REINFORCEMENT DETAILS



TYPICAL WALL SECTION SHOWING FIXINGS

N O T E S :

1. THE NAIL SPACING REQUIRED TO FULLY SUPPORT THE WEIGHT OF 22mm SOLID PLASTER IS 250mm EACH WAY. SPACING MUST BE AT 150mm AROUND ANY OPENING OR WALL PERIMETER AND PLACED AT LEAST 75mm FROM ANY OPENINGS OR WALL EDGE.

SHT 15

STRUCTURAL ENGINEERS LEWIS & BARROW LTD PH 366 4320 CHRISTCHURCH

INSULFORM NZ
CHRISTCHURCH, NZ.
Phone: 384 3804
E.P.S. THERMOPLASTIC BRIDGE BLOCK CONTINUOUS REINFORCED CONCRETE WALL SYSTEMS. PAT.NO.247577
www.insulform.co.nz

MECHANICAL FIXINGS FOR SOLID PLASTER COATINGS

9. Internal Linings

Internal sheet linings must be screwed and adhesive fixed in place. Sheet linings are fixed to timber inserts of the heavy duty thermoplastic webs using 50mm long countersunk 6 gauge self tapping screws.

Where a FRR rating is not required, screws must be spaced a maximum of 800mm horizontally and vertically. Perimeter screws must be no closer than 10mm and no further than 150mm from lining sheet edges. This equates to four horizontal rows of three screws for a standard 1200mm wide by 2400mm long internal lining sheet.

Where FRR is required, screws must be spaced at 250mm around the lining sheet perimeter edges and at 500mm centers within the body of sheet.

The adhesive must be applied in accordance with the adhesive manufacturer's instructions, the exception to this, where the manufacturer's instructions are less onerous, is that the adhesive must be applied at 250mm centers horizontally and vertically either as daubs approximately 25mm diameter and 10mm thick, or as 10mm diameter beads 50mm long.

10. Specification for Solid Plaster in Accordance with NZS4251:2007 applied to Insulform Blocks

Where a solid plaster finish is used the requirements are as follows:

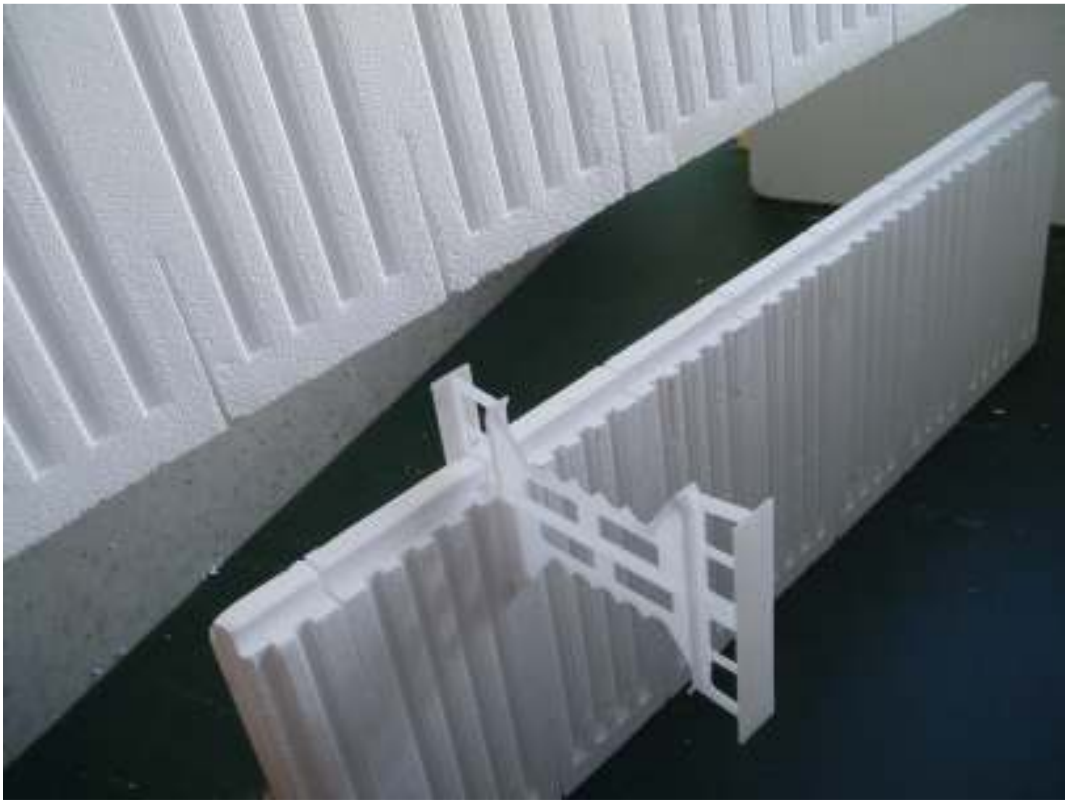
- Solid plaster must be in accordance with NZS4251:2007
- No building paper is required between the EPS and solid plaster
- Reinforcement must be anchored to the concrete walls with 100mm galvanised nails at 250mm centers in accordance with the details in this manual.
- Plaster must have a maximum thickness of 23mm and a minimum thickness of 21mm
- Control joints in the plaster must be provided. Where possible control joints shall be located at the corners of openings.
- Where there are control joints in the reinforced concrete walls there must also be control joints in the plaster located over it.
- At control joints there shall be a complete separation of the plaster and reinforcement. The gap must be 6 to 8mm wide and sealed with Fosroc Silaflex MS or other sealant with equivalent properties. The James Hardies Hardiebacker Control Joint Moulding is suitable for use in this application.

The solid plaster system shall be finished with a good quality latex based coating system for weather tightness.

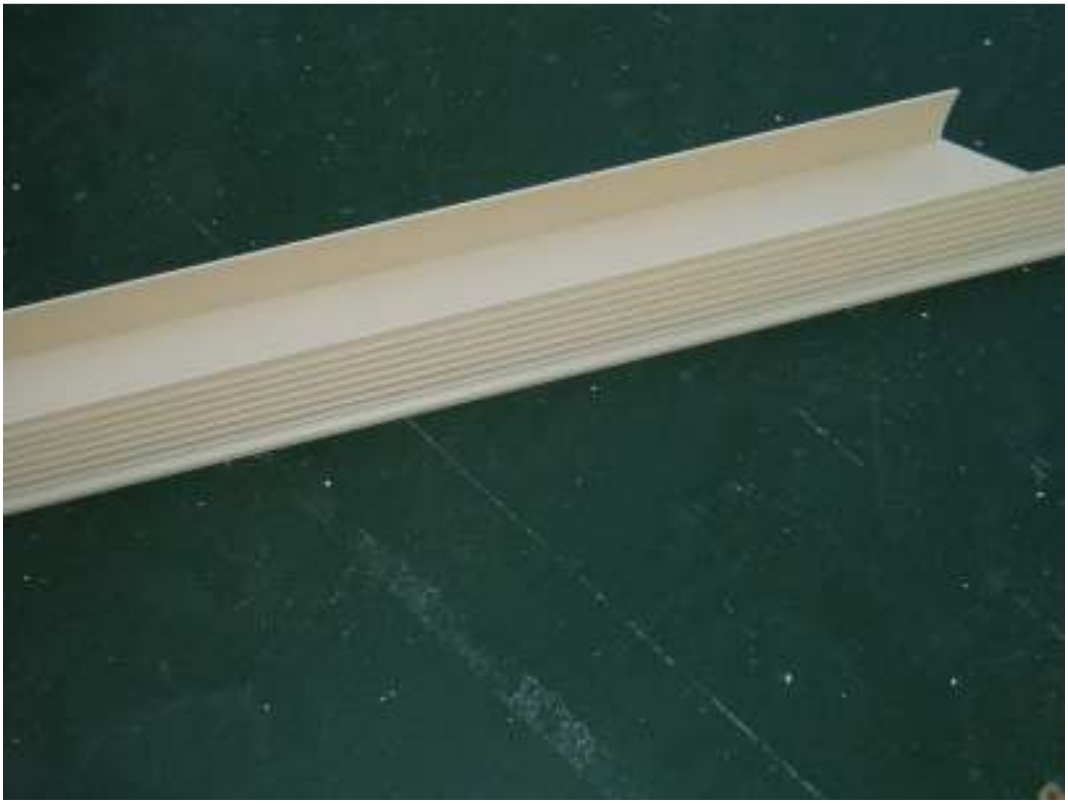
The latex coating system must:

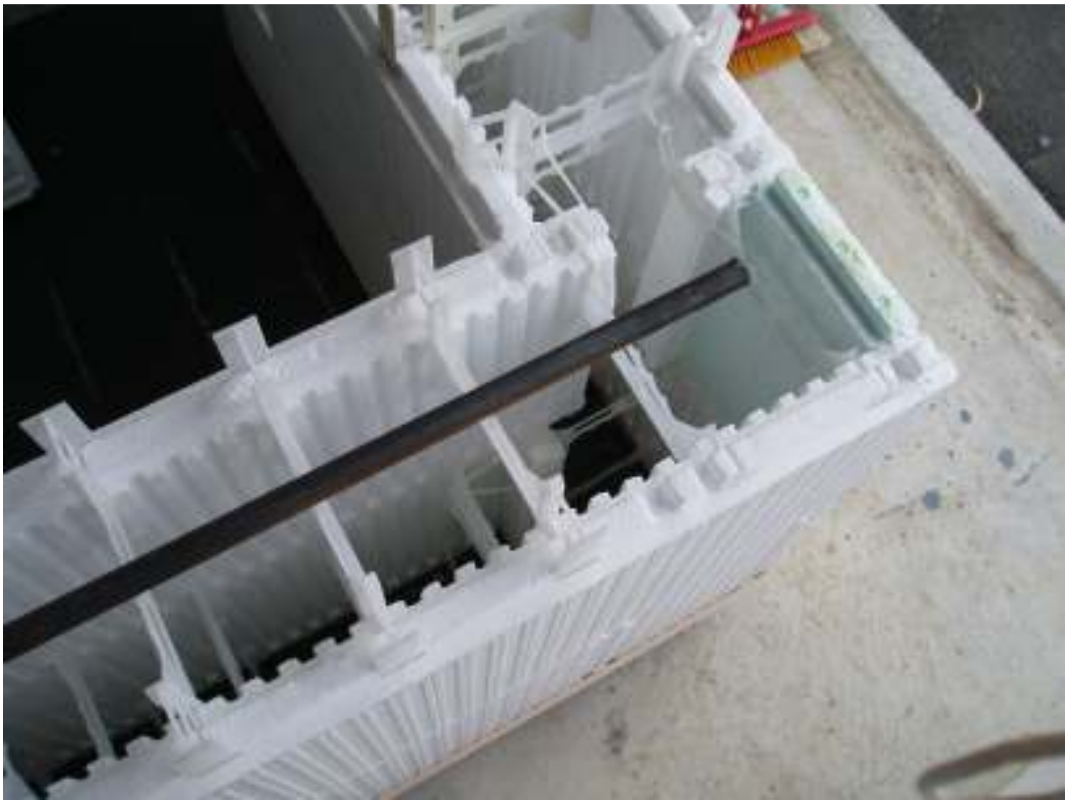
- Provide an effective barrier to liquid water
- Allow water vapour transmission
- Have a proven reformance record on cementitious material in exterior applications
- Be inspected, maintained and re-coated as necessary to ensure it remains weather tight.

INSULFORM Supa Block – Fully Patented heavy duty polypropylene bridges set at 125mm centres (8 per block)



INSULFORM Supa Block – Window drain feature, fully moulded sill. "The Silltray System" www.silltrays.co.nz





INSULFORM Supa Block – Internal External Corner, tight fitting stop ends make corner fabrication easy.

BRANZ APPRAISED

SPECIFY WITH CONFIDENCE

BRANZ APPRAISAL CERTIFICATE No. 408 (2000)

INSULFORM POLYSTYRENE BLOCK REINFORCED CONCRETE WALLS

Insulform New Zealand Ltd
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BRANZ, Private Bag 50908
Porirua City
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Product

- ***This Certificate relates to Insulform Polystyrene Block Reinforced Concrete Walls which are load bearing and thermally insulated. Construction is based on Insulform expanded polystyrene (EPS) blocks which are used as permanent formwork to form the reinforced concrete walls.***
- *A solid or proprietary plaster finish system is applied to the outside block face and internal linings are fixed to the inner block face to complete the wall construction. Insulform block walls are 200 mm, 250 mm and 300 mm thick excluding finishes.*
- *Insulform blocks have been appraised for the construction of walls subject to non-specific design, in buildings which fall within the scope identified in the Insulform Technical Manual, which is based on Clause 1.1.2 of NZS 3604:1999.*
- *Insulform blocks have also been appraised for the walls of buildings which are subject to a specific design, including multistorey buildings. The cladding system and weathertightness details relating to these buildings are also subject to specific design and are not covered by this Certificate.*
- *Design and construction must be in accordance with the Insulform Technical Manual, dated February 2000.*
- *The Insulform Technical Manual also provides information to assist with the specific design of other structures, including retaining walls, swimming pools and stone veneered buildings. These structures are not covered by this Certificate.*

BRANZ

In the opinion of BRANZ, Insulform Polystyrene Block Reinforced Concrete Walls are fit for purpose and will comply with the Building Code to the extent specified in this Certificate provided they are used, designed, installed and maintained as set out in this Certificate.

This Certificate is issued only to the Certificate Holder, Insulform New Zealand Ltd, and is valid until further notice, subject to the Conditions of Certification.

Conditions of Certification

1. This Certificate relates only to the product as described herein.
2. The Certificate Holder:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions.
3. The product and the manufacture are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ.
4. This Certificate must be read, considered and used in full together with the technical literature.
5. BRANZ makes no representation as to:
   a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product.
6. Any reference in this Certificate to any other publication shall be read as a reference to the version of the publication specified in this Certificate.
7. This Certificate does not address any Legislation, Regulations, Codes or Standards not specifically named herein.

For BRANZ

G M Lawrance

M E Reed

Date of issue: 31 August 2000

ISSN 1173-8677

2.6 Blocks are cut horizontally or vertically to coincide with door and window openings or top plate and wall ends. EPS end closers are used at jambs and wall ends. Falsework, consisting of timber plates, bearers and props, provides soffit or lintel block support.

3. Handling and Storage

3.1 The blocks must be kept clean and dry at all times, and must be protected from sunlight during storage, and on site prior to installation. The blocks must also be protected from damage, particularly to the edges and corners. Precautions must be taken to ensure that no solvent based products come into contact with the blocks.

3.2 Other materials such as plasterboard, external plaster reinforcing, and fixings should be stored off the ground, under cover in clean dry conditions.

4. General

4.1 The Insulform blocks are light and easy to place. No additional formwork is required for wall construction, other than for openings. The EPS blocks provide effective curing conditions for the concrete. In addition the EPS serves as thermal insulation for the completed structure and provides a stable base for the attachment of linings and the application of external plaster systems.

4.2 Insulform blocks are suitable for the construction of reinforced concrete walls associated with the following buildings:

Non-Specific Designed Buildings

- Single storey buildings which come within the scope of Clause 1.1.2 of NZS 3604.
- The lower storey of two storey buildings which come within the scope of Clause 1.1.2 of NZS 3604.

Specific Designed Buildings

- Buildings which fall outside the scope of Clause 1.1.2 of NZS 3604, which are subject to specific design using the design information in the Insulform Technical Manual and NZBC Verification Method B1/VM1.

4.3 For non-specific design situations, the external plaster and internal lining details including at openings shall be as shown in the Insulform Technical Manual. The external cladding must be one of: Fosroc PolyClad® Plaster System, any other proprietary external finish which has a valid BRANZ Appraisal Certificate for use over EPS blocks, or a solid plaster constructed in accordance with NZS 4251 and the specification in the Insulform Technical Manual.

4.4 The internal lining must be one of Standard 9.5 mm Gib® Plasterboard, Gib® Fyreline, Gib® Aqualine or Villaboard (for wet areas) with a conventional finish or as required for fire resistance (See Section 8, Spread of Fire).

4.5 For specific design situations the external plaster or cladding system and internal lining details must also be subject to specific design and are not covered by this Certificate.

4.6 Sound insulation aspects have not been assessed and are outside the scope of this Certificate.

5. Structure

5.1 Loads from other parts of the building structure, such as floors, roofs, heavy fixtures, fittings and the like, must be transferred directly to the reinforced concrete walls and not impose any loads on the EPS block face shell. For non-specific design applications structural connections for roofs and floors must be as required by the details in the Insulform Technical Manual. For specific design situations, structural connections for roofs and floors, and for in-plane and out-of-plane loads must be part of the specific design and are outside the scope of this Certificate.

5.2 All reinforcing steel must be either Grade 300 or Grade 430 deformed bars, up to 20 mm diameter, complying with NZS 3402. The nominal concrete cover to the reinforcement should be that value in Table 5.5 of NZS 3101 appropriate to Exposure Category A1.

5.3 All concrete must comply with NZS 3104. Only High grade concrete with minimum 28 day strength of 20 MPa must be used. The maximum size aggregate is 14 mm.

Non-Specific Design

5.4 Design details for buildings constructed to a non-specific design are presented in the Insulform Technical Manual. Lower storey walls are based on 200 mm thick Insulform block walls. The concrete thickness is 100 mm and the walls are reinforced with grade 300 deformed bars. Floor to ceiling heights are up to 2.5m. NZS 3604 is used to detail internal walls, upper floor and upper storey walls, and also to determine the bracing requirements for wind and earthquake. When determining the bracing requirements for earthquake, the Insulform walls are treated as heavy wall cladding. Bracing resistance in terms of NZS 3604 is either 120 Bracing Units per metre or 200 Bracing Units per metre. The bracing resistance value applicable is dependant on whether the building being considered is a one or two storey building and whether structural floor and ceiling diaphragms in accordance with Clauses 7.3 and 13.5 respectively of NZS 3604 are used. The Insulform Technical Manual contains the details.

Specific Design

5.5 Walls subject to specific design must be designed by a structural engineer in accordance with NZS 4203 and NZS 3101 with the exception that the Capacity Reduction Factor (Ø) which includes an allowance for the effects of the metal bridges is taken as follows:

- In-plane shear design, Ø = 0.65
- Torsion design , Ø = 0.65
- In plane flexural design, Ø = 0.85
- Face loading, flexural design, Ø = 0.85

Floors of buildings subject to specific design may be timber or concrete. Concrete floors are either insitu concrete or precast concrete with an insitu topping. The details are given in the Insulform Technical Manual.

5.6 The Insulform Technical Manual provides charts which have been prepared in accordance with the above standards to assist with specific designs. In particular the following charts based on a concrete strength of 20 MPa are available:

- Face load capacity of Insulform walls with a number of different reinforcing bar and spacing options.
- Insulform lintel and beam capacities and charts covering lintel spans up to 8 m with truss or floor joist spans up to 20 m.
- Shear wall capacities with various reinforcing bar size and spacing options for walls varying in length from 500 mm up to 6 m.
- Wall interaction diagrams (flexural capacity with axial load) for Insulform walls up to 3 m high with a maximum axial load eccentricity of 20 mm.

Wind

5.7 The EPS blocks will transfer wind loads from the external plaster system to the reinforced concrete wall under the maximum wind loading conditions specified in NZS 4203.

5.8 The blocks must be braced against wind loads during erection and also after the concrete has been placed until the

concrete has reached sufficient strength.

Impact

5.9 The external plaster and internal lining systems which form part of the non-specific wall design system, will provide an adequate resistance against normal hard and soft body impacts in domestic, and most commercial areas. The likelihood of damage in public areas and around commercial and industrial buildings where heavy impacts could occur must be considered at the design stage and appropriate protection provided in vulnerable areas by installing barriers or by using other means.

Service Penetrations

5.10 Penetrations for services in walls may have the same size spacing and cover as for beams but shall be at least 300 mm away from any wall edge. Larger holes must be the subject of a specific design.

5.11 For non-specific design applications, small square or circular openings may be placed at mid depth of the lintels/beams, provided the reinforcement still has adequate cover, and the holes are at least 200 mm apart. Such holes shall be no more than 32 mm square or 36 mm diameter.

6. Durability

6.1 The durability opinion is dependant on the external plastering system providing adequate protection from impact damage, weathering and water ingress; and the internal lining providing protection from impact damage and internal moisture. The plasters and linings appraised will meet these requirements provided external plaster is protected by a weathertight coating system, and that external plasters and linings are sealed at perimeters and openings, properly maintained, and replaced when necessary. The Insulform EPS blocks are rot-proof and are not a food source for rodents.

Maintenance

6.2 Regular inspections (at least annually) of the exterior plaster and the internal lining must be made and any damage, deterioration of seals at joints and openings etc must be repaired in accordance with the relevant manufacturer's instructions.

6.3 The exterior plaster surface should be cleaned at 12 monthly intervals using detergent and water and be re-coated at intervals of between 5 and 10 years in accordance with the requirements for the Fosroc PolyClad® Plaster System or, for solid plaster, using a latex based coating system in accordance with the requirements in the Insulform Technical Manual.

7. Outbreak of Fire

7.1 Insulform Polystyrene Block Reinforced Concrete Walls contain combustible components and must be protected from heat sources such as chimneys, solid fuel heaters and flues. Manufacturers of these products must be consulted to determine the appropriate protection measures so that the Insulform blocks are not subjected to temperatures above 50°C.

7.2 Plaster finishes and internal linings must be protected or separated from heating appliances, fireplaces, chimneys and flues either by complying with NZBC Verification Method C1/VM1 or, in accordance with the requirements of NZBC Acceptable Solution C1/AS1.

8. Spread of Fire

8.1 Internal surface finish requirements shall be as required by Table 4 of NZBC Acceptable Solution C3/AS1.

8.2 Where used in Purpose Groups SC and SD special requirements apply. These special requirements are detailed in the Insulform Technical Manual and include mechanical fixing of internal linings to timber inserts or to the metal webs of the Insulform blocks. These fixing requirements apply to all internal wall surfaces.

Fire Resistance Ratings (FRR)

8.3 The provisions of NZBC Clause C3.3.2 shall be met by the Fire Separation requirements of NZBC Acceptable Solution C3/AS1.

8.4 Insulform Polystyrene Block Reinforced Concrete Walls have a Fire Resistance Rating (FRR) based on the thickness of the concrete in the walls, as follows:

200 mm thick block wall (100 mm concrete)	FRR 90/90/90
250 mm thick block wall (150 mm concrete)	FRR 180/180/180
300 mm thick block wall (200 mm concrete)	FRR 240/240/240

8.5 These ratings take no account of any additional protection provided by the internal and external finishes.

8.6 The external surface finish requirements shall be determined from Table 2 of NZBC Acceptable Solution C3/AS1. These are governed by the surface finish, type, building height (as defined in the Annex to the Fire Documents), the distance from the relevant boundary and the properties of the cladding system.

8.7 There are no requirements for external Insulform Polystyrene Block Reinforced Concrete Walls, covered with a solid plaster in accordance with NZS 4251 and finished with a latex based paint coating system which is less than 1.0 mm thick.

8.8 Refer to BRANZ Appraisal Certificate No. 360 for spread of fire design parameters where external Insulform Polystyrene Block Reinforced Concrete Walls are finished with the Fosroc PolyClad® Plaster System for EPS block walls.

9. Structural Stability During Fire

Insulform Polystyrene Block Reinforced Concrete Walls can be used to meet the relevant performance requirements of NZBC Clause C4.

10. External Moisture

10.1 Where a solid plaster in accordance with NZS 4251 and the Specification in the Insulform Technical Manual is used, it must be coated with a latex based coating system that meets the requirements specified in the Insulform Technical Manual.

10.2 The detailing of junctions between the Insulform Polystyrene Block Reinforced Concrete Walls and external joinery, and around penetrations, must be as required by the Insulform Technical Manual or designers must provide their own details.

10.3 The weathertightness details given in the Insulform Technical Manual, which includes the use of head, jamb and sill flashings, are suitable for all Wind Zones of NZS 3604 up to and including Very High. Reliance must not be placed on sealants alone to provide weathertightness at openings.

10.4 Where designers use their own details, these must meet NZBC Clauses E2 and B2 and are not covered by this Certificate.

10.5 Regular checking (at least annually) and maintenance of protective coatings and the cladding system, including joints must be carried out to ensure the performance requirements of NZBC Clause E2 are maintained.

10.6 Insulform Polystyrene Block Reinforced Concrete Basement Walls must have their exterior face lined with a damp-proof-membrane (DPM), which is compatible with the Insulform block and meets the performance requirements of NZBC Clause E2. The floor and wall DPM shall be continuous to ensure effective tanking of the buried part of the building.

10.7 The ground surface behind the basement wall must either be sealed and sloped to shed surface water away from the wall, or be sealed and have a drainage system to remove surface

water and prevent infiltration.

10.8 Basement walls must have a drainage system installed, which prevents water pressure from developing behind the wall.

10.9 Guidance regarding basement waterproofing design principles and the selection of an appropriate membrane is given in BRANZ Bulletin No 397.

11. Internal Moisture

11.1 Provided ventilation meets the performance requirements of NZBC Clause G4.3.1, buildings constructed with Insulform Polystyrene Block Reinforced Concrete Walls will meet the performance requirements of NZBC E3.3.1.

11.2 In spaces where Insulform Polystyrene Block Reinforced Concrete Walls are adjacent to sanitary fixtures or laundering facilities, or where they are likely to be splashed or become contaminated, linings must have an impervious surface, which is sealed against the adjoining structures, and is able to be easily cleaned.

12. Energy Efficiency

12.1 Insulform Polystyrene Block Reinforced Concrete Walls can be used in housing applications to meet the thermal insulation requirements of NZS 4218. Thermal insulation which conforms with NZS 4218 will satisfy the performance requirements of NZBC Clause H1.3.1.

12.2 The thermal resistance (R-value) of Insulform Polystyrene Block Reinforced Concrete Walls (all thicknesses) externally clad with either the Fosroc PolyClad® Plaster System, or solid plaster conforming with NZS 4251 and internally lined with 9.5 mm Standard Gib® plasterboard is approximately 3 m^2°C/W.

12.3 Procedures for meeting the functional requirements of NZBC H1 for buildings other than Housing are indicated in Verification Method H1/VM1.2.

13. General

13.1 Insulform Polystyrene Block Reinforced Concrete Walls must be built by trained constructors, in accordance with the Insulform Technical Manual.

13.2 Each block is connected to the previous course by the interlocking of continuous tongue and grooved joints. The blocks are laid in stretcher bond pattern such that the webs of blocks are in vertical alignment. Blocks may be glued together by use of an EPS compatible contact adhesive such as Fosroc Panelbond or SB Foambond, to improve resistance to wind loads, construction loads and concrete leakage.

13.3 The blocks must not be exposed to organic solvents or saturated hydrocarbons. Many adhesives and paints contain these solvents.

14. Health and Safety

Suitable protective masks must be worn to prevent the inhalation of dust resulting from cutting or working with the EPS blocks.

15. Foundation

15.1 For non-specific design situations foundations must be constructed using the Insulform blocks on a concrete footing as shown in the Insulform Technical Manual.

15.2 Damp proof membranes must be either taken under the footing and stopped at the bottom of the outside face of the footing, or continued from under the slab, over the foundation and up the inside face of the outer EPS face shell over a bitumen based emulsion applied to the top of the foundation. The details are shown in the Insulform Technical Manual.

16. Walls

16.1 Where EPS blocks are used for the foundation wall or when laying EPS blocks from the floor slab for walls, the first layer must be positively located and held in position by the use of mortar, or timber plates fixed to the concrete or footing.

16.2 Horizontal reinforcement is placed in the Insulform block steel webs and vertical reinforcement tied to it. All reinforcement must be turned into other walls, slabs or lintels/beams and must have adequate laps.

16.3 Blocks at wall intersections and, where corner blocks are not used, blocks at corner walls, need to have the EPS face shell removed to maintain the concrete wall section continuity through the joint. Blocks may be cut using conventional carpentry tools. At openings EPS end closers used as stop ends need to be inserted and falsework support provided at opening jambs, heads or sills. Falsework must provide continuous support to the soffits of beams or blocks reinforced as lintels. Penetration blockouts for services, nail inserts for timber blocking and strapping and bolt connections for casting-in should be inserted and held in position until concrete placement is complete.

16.4 The wall must be braced and secured against movement, due to wind loads and construction activity, by installing purpose made falsework support channels and telescopic bracing tubes. For non-specific design situations these are placed within 1.0 m of the corners, to trim openings and otherwise at no more than 2.5 m centres. For walls which are the subject of a specific design, falsework support is dependant on the height and location of each pour and is also subject to a specific design. Additional restraint is provided by tying the steel webs to the horizontal reinforcement at the wall tops. Where corner blocks are not used, adjacent blocks at corners must have their block webs wire tied together across the corner.

16.5 The wall must be constantly checked for plumb, line and level and adjustments made as necessary. The Insulform Technical Manual sets out the acceptable tolerances.

17. Concrete Placement

17.1 Prior to concreting, any debris or water at the base of the walls or at construction joints must be removed through cut outs or by industrial vacuum.

17.2 All concreting must be carried out in accordance with NZS 3109 where not covered by the requirements of the Insulform Technical Manual.

17.3 While plasticisers and water reducing agents may be used, expansive admixtures must not be used.

17.4 Consolidation of the concrete is carried out using mechanical vibration with a 25 mm diameter poker vibrator, or by rodding with a 16 mm square ended steel rod. Concrete is placed into the block work as a semi-continuous operation allowing for consolidation as the work proceeds.

17.5 Particular care must be taken to ensure full compaction of the concrete, as this cannot be easily checked once concrete has been placed. Suitable supervision must be provided for concrete placement.

17.6 Slumps are 100-120 mm when consolidation is by mechanical vibration and 130-150 mm when concrete is consolidated by rodding.

17.7 Concrete can be placed by skip or hand but is placed most effectively by concrete pump followed immediately by consolidation. This method ensures good control over the filling operation. The maximum pour height is 3 m.

17.8 Construction joints must be prepared as specified in NZS 3109. Immediately before placing concrete the construction joint must be wetted and covered by a 10 mm thick layer of slurry applied to the joint. The slurry details are contained

within the Insulform Technical Manual.

17.9 Testing of concrete must be carried out and strengths monitored in accordance with the Insulform Technical Manual requirements.

18. Floors

18.1 Concrete floors must be constructed in accordance with the details given in the Insulform Technical Manual.

18.2 Timber floors must be directly connected by timber spacer blocks to the concrete wall. Where the wall is to continue above joist level the joist ends are temporarily supported and concrete poured up to and above the joists. The distance from the top of the previous pour to the bottom of the joists must exceed 100 mm.

19. Services

19.1 Small size services such as electrical wiring/conduit and piping up to 40 mm diameter can be located against the concrete in slots cut into the EPS. Such services must be fixed to the concrete at regular centres.

19.2 Provided water pipes are installed within the inner EPS side wall, protection against freezing will be similar to that required by Clause 5.4 of NZBC Acceptable Solution G12/AS1.

19.3 Larger services may be located in ducts inserted in the Insulform walls prior to concreting and subject to specific design.

19.4 Penetrations through Insulform walls for services must be made weathertight on the outside and impervious to moisture ingress in internal wet areas. In other internal areas, where gaps are more than 3 mm wide, an expandable foam must be used.

19.5 Penetrations through basement walls must be sealed to prevent water ingress. BRANZ Bulletin No. 290 provides guidance on how this should be done.

19.6 PVC sheathed electrical cables must not come into contact with the EPS, and must therefore be contained within plastic conduit or laid without conduits in oversize channels cut back to the concrete core. The conduit or the cables must be fixed at regular centres to the concrete core.

20. External Finish

20.1 The external plaster or cladding system must not be installed until the concrete walls have attained sufficient strength.

20.2 The surface of the EPS blocks must be adjusted for straightness, by slicing to achieve the required tolerances, and sanded to provide a key for plastering.

20.3 EPS should not be exposed to the external environment for more than one month, particularly on north or north west facing walls. Where exposed for longer periods, yellow chalking may occur due to UV light exposure. This must be removed with a hard bristle brush. All surfaces must then be hosed clean prior to plastering.

20.4 The EPS external surface of the blockwalls must be finished in accordance with the instructions for one of the plaster options given in Section 4.3.

20.5 Guidance regarding solid plaster principles is given in the BRANZ Good Stucco Practice.

21. Internal Linings

21.1 All internal linings must be screw and adhesive fixed in place. Screw fixings must be to timber inserts using 50 mm x 8 gauge zinc plated CSK self-drilling screws or to the metal webs using 50 mm x 6 gauge self-tapping bugle head zinc plated screws. Fixing centres depend on whether fire rated or non-fire rated construction applies. Adhesives used to fix the lining to the EPS must be fit for purpose and compatible with the EPS. Adhesives such as Fosroc Panelbond or Selleys Liquid Nails are suitable. Adhesives must be applied in accordance with the adhesive manufacturer's instructions and the provisions of the Insulform Technical Manual.

21.2 The Insulform Technical Manual provides the full lining and fixing details for fire rated and non-fire rated construction. See also the Spread of Fire Section of this Appraisal.

21.3 Internal linings are finished conventionally in accordance with the relevant manufacturer's requirements.

21.4 Light weight fittings, eg. mirrors can be fixed through the internal linings. Heavy items such as door frames, cupboards and sanitary ware need timber grounds anchored to the concrete core.