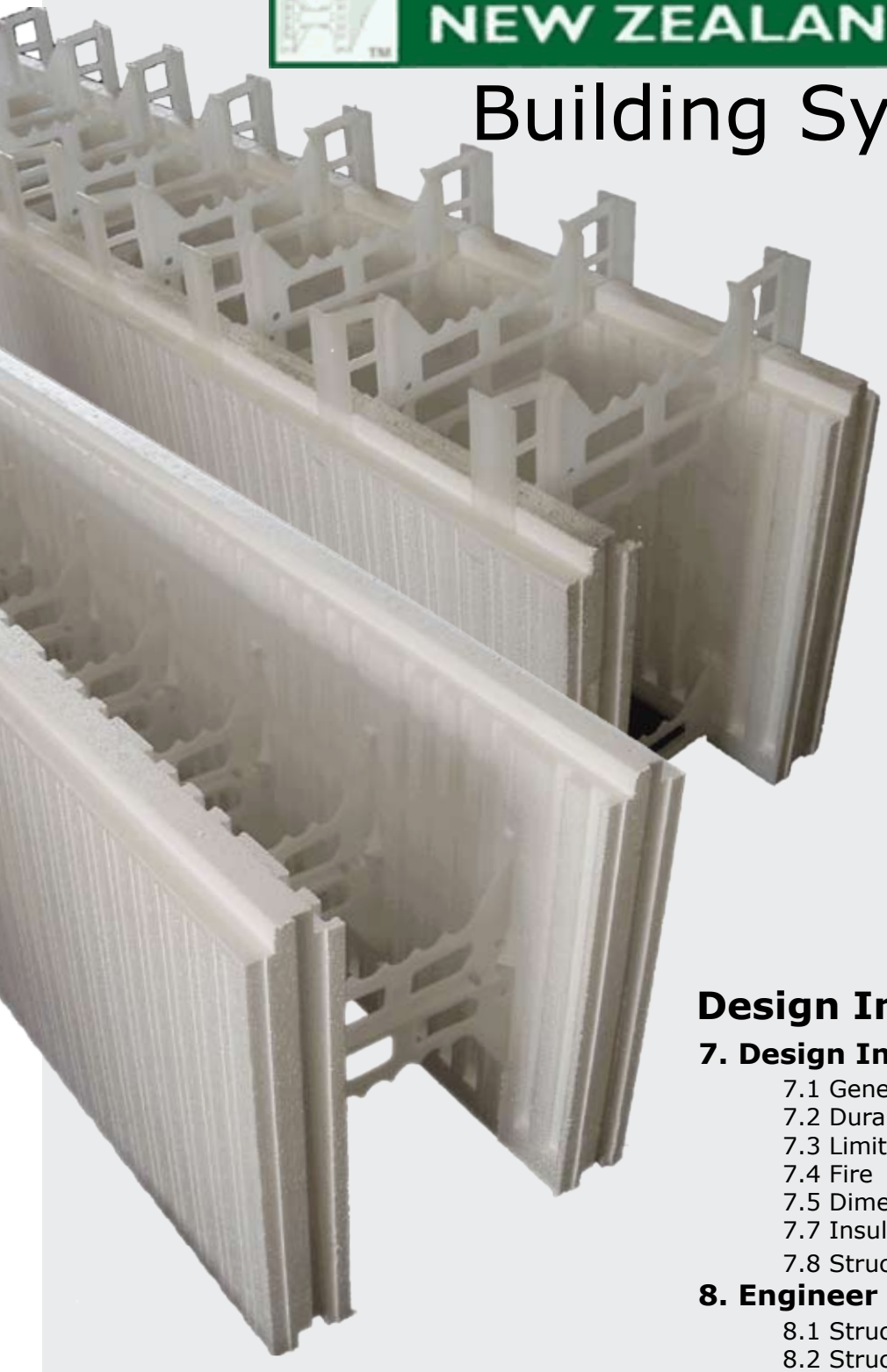
INSULFORM NEW ZEALAND LTD

Building Systems



Design Information

7. Design Information

- 7.1 General
- 7.2 Durability
- 7.3 Limitations
- 7.4 Fire
- 7.5 Dimensions
- 7.7 Insulation Value
- 7.8 Structural Strength - Non Specific Design

8. Engineer Design Information

- 8.1 Structural Strength - Specific Design
- 8.2 Structural Limitations
- 8.3 Further Information

Design Aids

- Capacity of Lintels
- Face Loaded Capacity
- Capacity of Lintels and Beams
- Concrete Chear Wall Panel

Version 6 -
Amendment Date 14 April 2009

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 C1 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 Clauses C3.3.1, C3.3.2 and C3.3.5 when the following applies:

Internal surface finish requirements shall be as required by Table 4 of NZBC C3/AS1 where used for SR or SH Purpose Group buildings no special requirements apply.

Where used in Purpose Groups SC and SD special requirements apply. These special requirements are detailed in Clause 4.5 which follows and include the mechanical fixing of internal linings to timber inserts or the metal webs of the Insulform blocks. These fixing requirements apply to both sides of internal walls and to the inside only of external walls.

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

Insulform walls finished with Insulclad Plaster System for EPS block walls and coated as required below may be used wherever an Ignitability Index of 0 is required in Table 2 of C3/AS1.

External Insulform Polystyrene Block Reinforced Concrete Walls, finished with an approved Plaster System for EPS block walls will have an Ignitability Index of 0 provided they are coated with approved plasters or one of the following finishes:

- Insulcote 100% acrylic paint.
- Formstone acrylic plaster.
- Colorplast pre-coloured plaster.

There are no requirements for External Polystyrene Block Reinforced Concrete Walls, covered with a solid plaster in accordance with N.Z.S.4251:Part 1:1998 and finished with a latex based paint coating system which is less than 1.0mm thick.

The special requirements applying to Insulform walls used in Purpose Groups SC and SD are as follows:

- One layer of 12.5mm thick standard Gib plasterboard or better must be installed in accordance with requirements to give at least a one way Fire Resistance Rating (FRR) of 15 minutes. Suitable details are contained in Winstone Wallboards Ltd's Gib Fire Rated Systems, dated July 1997. This detail calls for the plaster board to be mechanically fixed to timber inserts anchored to the concrete substrate. The minimum size timber insert shall be 200mm x 50mm anchored with a minimum of 2-100mm FH skew nails. There is an alternative fixing for these purpose groups shown on Page 29.

- The EPS must be totally sealed from the interior areas of the building and any ceiling cavities by fire stopping. Any penetration passing through the fire rated

wall must be fire stopped to a FFR of no less than that required for the building element in which it is installed.

- In multi-storey buildings (i.e. more than two floors) fire stopping must be provided at each floor level at the junction of floor and external wall.

7.4.3. Fire Resistance Rating

Insulform Polystyrene Block Reinforced Concrete Walls have a fire resistance rating (FRR) based on the thickness of concrete walls as follows:

Wall Concrete Thickness	FRR
100mm thick wall	90/90/90
150mm thick wall	180/180/180
200mm thick wall	240/240/240

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;1999

Construction is to be in accordance with N.Z.S.3604:1999 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. 3604:1999.

- 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. 3604:1999.

- 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 5.3 to 5.7 of N.Z.S. 3604:1999
- Earthquakes – Tables 5.8 to 5.10 of N.Z.S. 3604:1999

7.8.3. Bracing Resistance (Ratings)
Bracing ratings shall be those for reinforced concrete walls of N.Z.S.3604:1999, 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 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 NZS3604:1999 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.

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 he 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.

– 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.

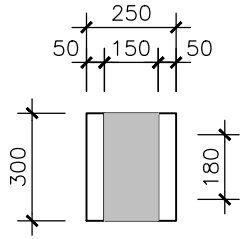
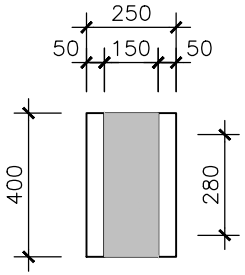
Small square or circular openings may be placed at mid depth of beams provided the reinforcement still has adequate cover and the holes are at least 200mm apart. These shall be no more than 32mm sq or 26mm diameter. Penetrations in wall may have the same size, spacing and cover as beams but shall be 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.

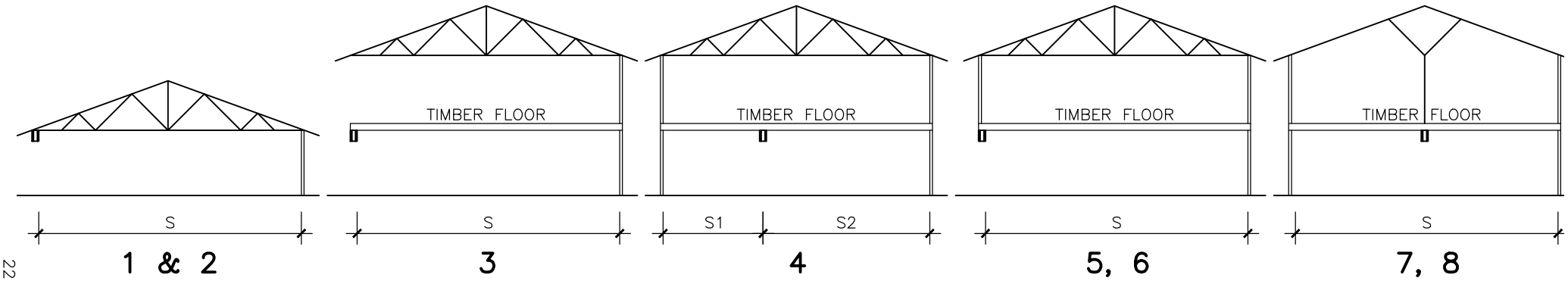
CAPACITY OF INSULFORM POLYSTYRENE BLOCK CONCRETE LINTELS

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	–

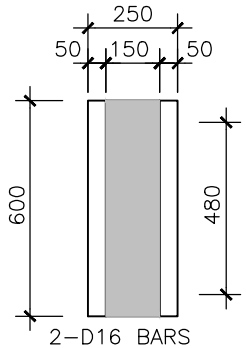
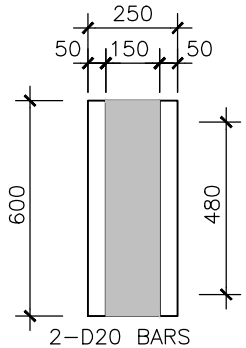
NOTES:

1. Concrete compressive strength @ 28 days to be at least 20MPa.
2. Reinforcement shall be grade 300 deformed bars complying with NZS 3402 : 1989.
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.



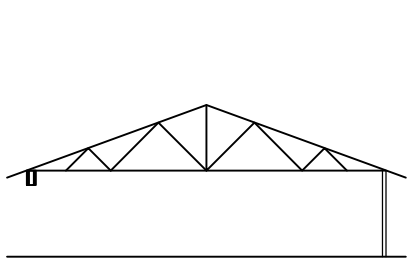
CAPACITY OF INSULFORM POLYSTYRENE BLOCK CONCRETE LINTELS

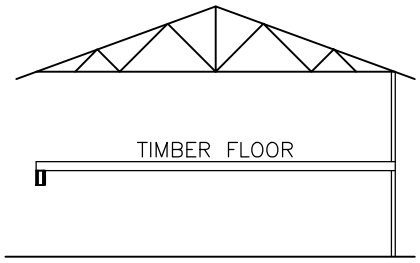
TABLE A2

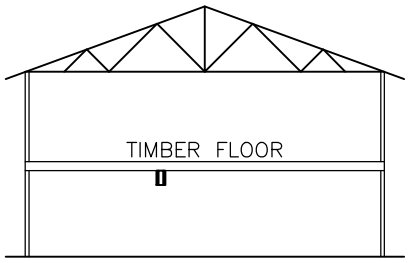
	LOADINGS See diagrams at bottom of page.		LINTEL SPAN 1m	2m	3m	4m	5m	6m	7m	8m
			TRUSS OR JOIST SPAN							
 2–D16 BARS WITH R6 LINKS AT 250mm CRS	1.	Heavy roof. Truss span.	20.00	20.00	15.50	10.90	5.90	2.75	0.95	–
	2.	Light roof. Truss span.	20.00	20.00	20.00	20.00	11.85	6.00	2.80	–
	3.	1.5kPa floor 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

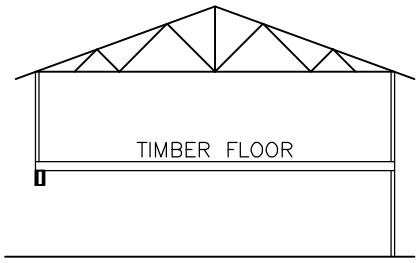
NOTES:

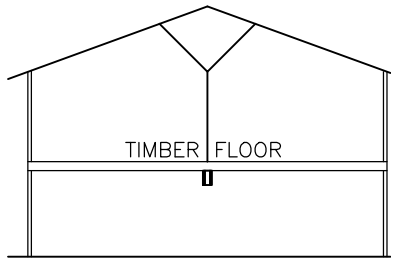
1. Concrete compressive strength @ 28 days to be at least 20MPa.
2. Reinforcement shall be grade 300 deformed bars complying with NZS 3402 : 1989.
3. All work shall comply with the NZS,3109.
4. All lintels shall bear onto at least 500mm of concrete wall at each end of the lintel.
5. While every care 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.





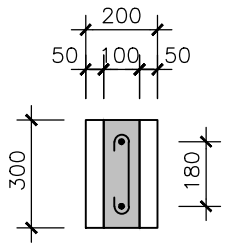
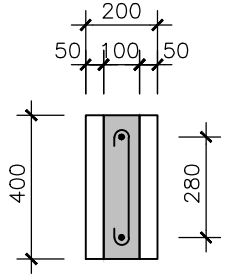






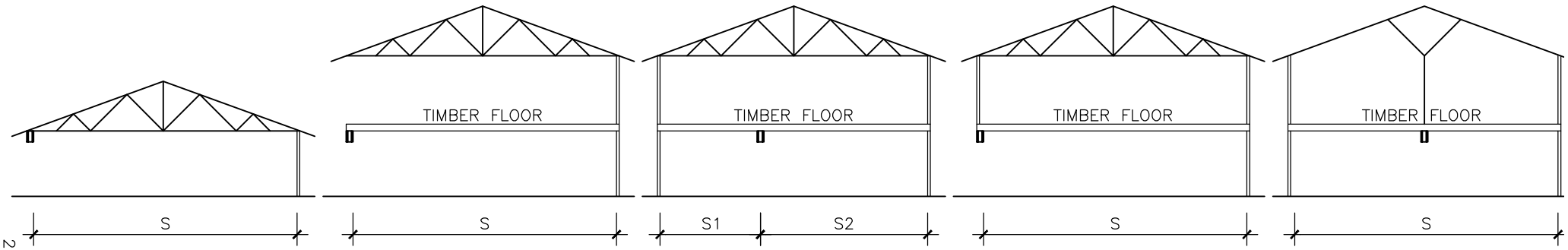
CAPACITY OF INSULFORM POLYSTYRENE BLOCK CONCRETE LINTELS

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	–

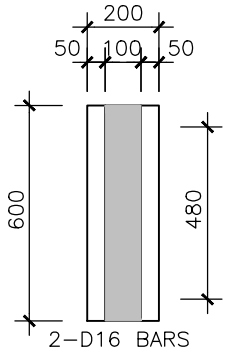
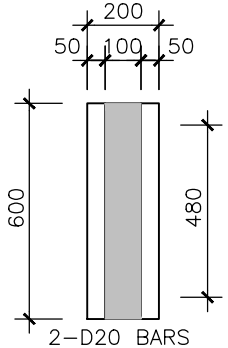
NOTES:

1. Concrete compressive strength @ 28 days to be at least 20MPa.
2. Reinforcement shall be grade 300 deformed bars complying with NZS 3402 : 1989.
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.



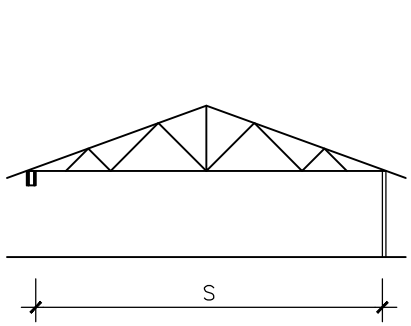
CAPACITY OF INSULFORM POLYSTYRENE BLOCK CONCRETE LINTELS

TABLE A4

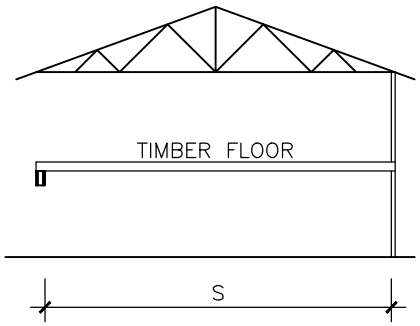
	LOADINGS See diagrams at bottom of page.		LINTEL SPAN 1m	2m	3m	4m	5m	6m	7m	8m
			TRUSS OR JOIST SPAN							
 2–D16 BARS WITH R6 LINKS AT 250mm CRS	1.	Heavy roof. Truss span.	20.00	17.30	12.45	9.40	5.85	2.65	0.9	–
	2.	Light roof. Truss span.	20.00	20.00	20.00	18.20	11.70	5.90	2.70	–
	3.	1.5kPa floor load. 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 300 deformed bars complying with NZS 3402 : 1989.
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.



1 & 2



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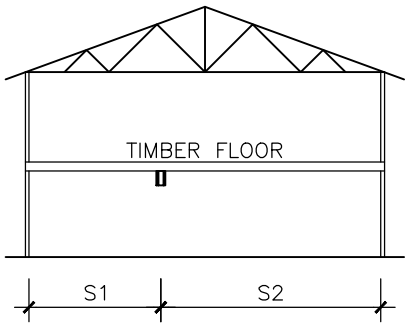

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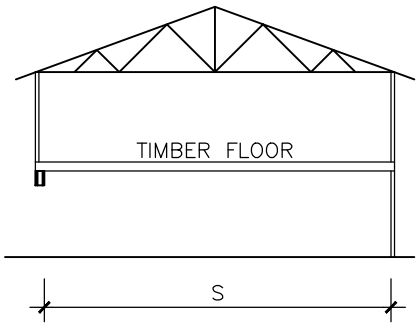

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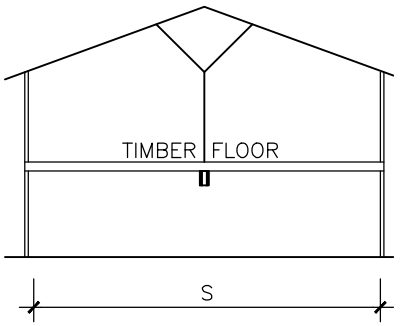


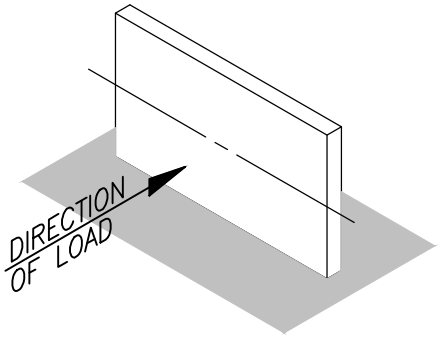
7, 8

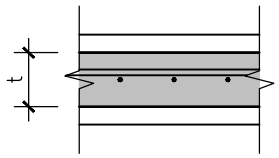
INSULFORM FACE LOADED CAPACITY

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

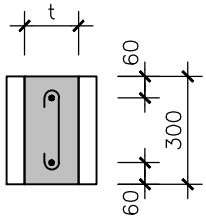
Vertical Reinforcement	ØMn per metre length for t = 100mm	ØMn per metre length for t = 150mm
H12 @ 450	–	6.59
D12 @ 300	4.48	6.89
H10 @ 300	4.46	6.86
H12 @ 300	6.23	9.68
D16 @ 300	–	11.80
H16 @ 300	–	16.29
H12 @ 200	8.85	14.02
H16 @ 200	–	22.88
H12 @ 150	–	18.04

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 300, where designated H shall be grade 430, both being deformed bars complying with NZS 3402 : 1989.
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

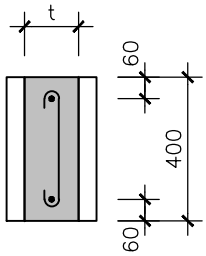
DESIGN AID 2



2–D16 BARS
WITH R6 LINKS
AT 100mm CRS

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

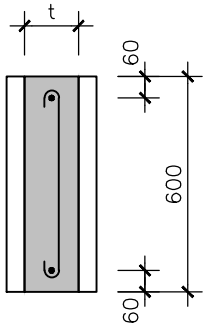
For t = 150mm, ØMn = 11.67kNm, ØVn = 26.401kN



2–D16 BARS
WITH R6 LINKS
AT 150mm CRS

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

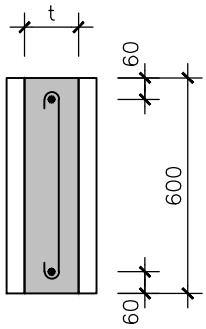
For t = 150mm, ØMn = 16.94kNm, ØVn = 28.717kN



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

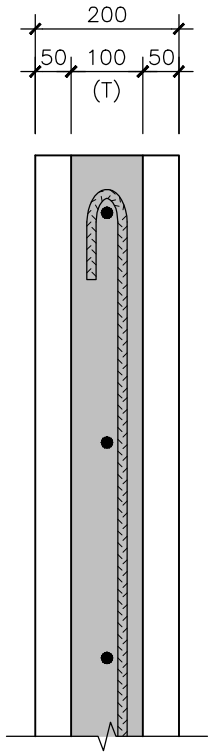
NOTES:

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 Clause 3.3 of NZS 3101 : Part 1 : 1995
3. Concrete compressive strength @ 28 days to be at least 20MPa.
4. Reinforcement shall be grade 300 deformed bars complying with NZS 3402 : 1989.
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

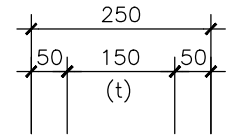
Notes:

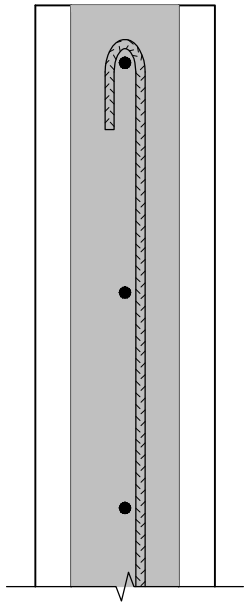
1. The above figures are based on zero vertical load. It is assumed that compressive vertical load will be at a sufficiently low level that it enhances flexural strength. Where the compressive axial load is high or where a tensile axial load is imposed, calculation of reduction in flexural strength is to be carried out.
2. For ductile walls several conditions are imposed by NZS 3101 : 1995, 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 : 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 : 1995 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 300 and where designated H shall be grade 430, both being deformed bars complying with NZS 3402 : 1989.
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 : 1995, 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 : 1995 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 300 and where designated H shall be grade 430, both being deformed bars complying with NZS 3402 : 1989.

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

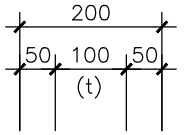
8. While every care has been taken in compiling this data, no responsibility is taken for any information given. All data provided in these tables shall be checked by the Design Engineer.

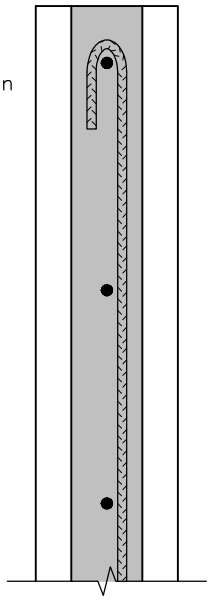
9. Foundation design must ensure that the above design capacities can be resisted by the foundations under capacity design conditions.

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 300, where designated H shall be grade 430, both being deformed bars complying with NZS 3402 : 1989.
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.

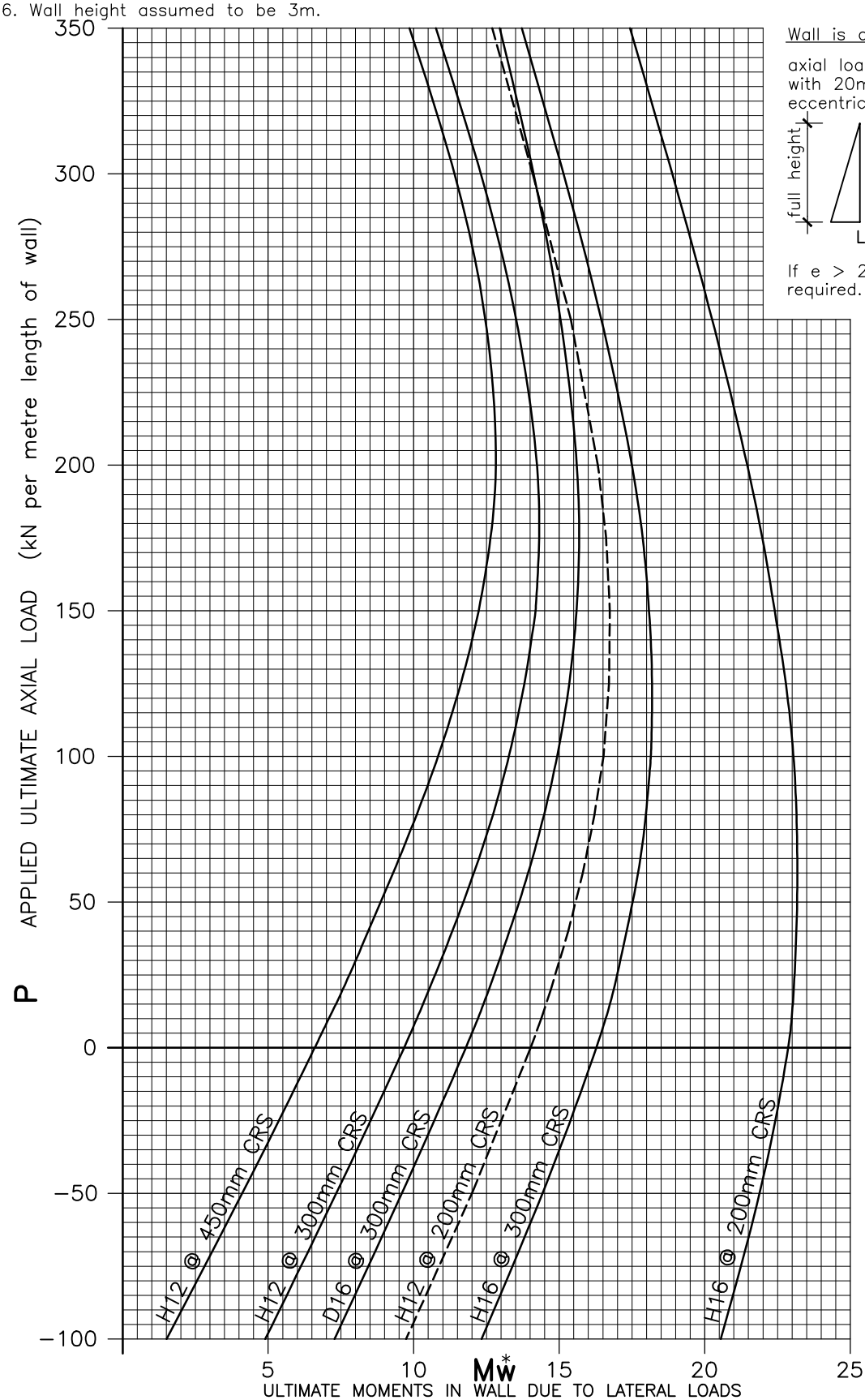
If this cannot be ensured then specific calculations must be carried out, and this chart must not be used.

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

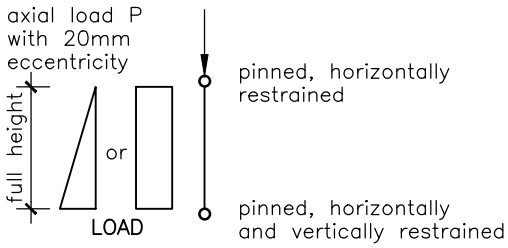
INSULFORM WALLS FACE LOADED

Notes:

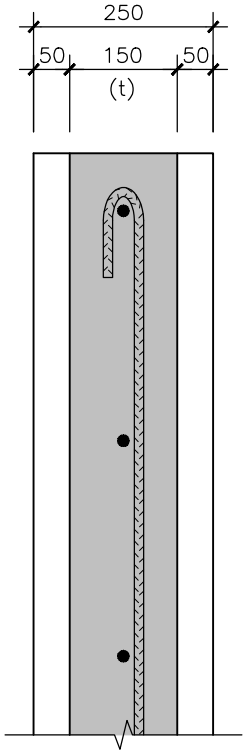
1. This graph reflects effects of axial load on walls deflecting under the action of lateral load (triangular or rectangular), and of moment Pe at top of wall where P is ultimate axial load per metre length of wall and e = 20mm. Further deflection caused by P – delta effects is also taken into account. 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 300, where designated H shall be grade 430, both being deformed bars complying with NZS 3402 : 1989.
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.