Flatslabs

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ENGINEERED CONCRETE
A division of Fulton Hogan Ltd

Product brochure

Fulton Hogan

Flat Slabs

A versatile solution for your project

The Stahlton Flatslab flooring system incorporates prestressed concrete units designed for easy and fast placement while requiring minimum on-site work to obtain a finished floor and ceiling. Flatslabs are appropriate for most floor situations and also for irregular layouts.

Flatslabs are highly versatile elements, providing minimum depth, fast construction and allowing flexible column grids. The large component units are craned into position, providing an immediate working platform which, with the addition of an in situ concrete topping, gives a suspended floor with a flat, steel formed soffit. Temporary propping is usually required.

PRECAST NEW ZEALAND INC CERTIFIED PLANT

At Stahlton, we pride ourselves on providing our customers quality, safety driven, products and services. All Fulton Hogan businesses are ISO9001 certified and our Stahlton Auckland and Christchurch plants have been certified by Precast New Zealand Incorporated.

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Acoustic rating

Stahlton Engineered Concrete Flatslabs and a 75mm minimum depth of topping concrete will provide a Standard Transmission Class (STC) rating of 55dB. If a 9.5mm thick suspended ceiling is placed to the underside, a STC rating of 58dB is achievable providing any gaps (e.g. recessed lighting), is insulated and limited to one every 5m2.

Flat Slab acoustic rating

Flat Slab + Topping depth (mm)	STC (dB)	STC plus suspended ceiling
150	55	58
225	58	61

Durability

Stahlton Flatslabs meet exposure classifications A1, A2, B1 & B2 as per table 3.6 in NZS3101:Part1:2006 for a 50 year life. Greater cover to the pre-stressing strands and a special concrete mix allow harsher environments to be achievable with Stahlton Flatslab Tee section.

Thermal rating

Estimated thermal resistance ratings for Stahlton Flatslabs and concrete topping are:

Flatslab thermal rating

Flat Slab + Topping depth (mm)	R rating (m2 oc/w)
150	0.09
175	0.11
200	0.13
225	0.15

These values are a guide only. If further information is required, please contact Stahlton.

Fire rating

All Stahlton Flatslab floors with a minimum of 75mm of on-site topping concrete have a 60 minute Fire Resistance Rating (FRR). Refer NZS3101:Part1:2006 table 4.3 & 4.4 for one way slabs.

Increased FRR, up to 4 hours with single span 150mm Flatslabs is achievable, in some circumstances; please contact Stahlton Technical Department if you wish to discuss further. Any penetrations through the Stahlton Flatslabs must also be fire rated. Advice should be sought from the fire protection suppliers regarding suitability on their tested products.

Private residence, Mt Manganui

Consulting Engineers

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Loadings

Stahlton Flatslab floor systems are generally suitable for common loadings such as residential, office and apartment buildings. The Load-span tables assume that there is maximum strand, the floor is temporarily propped, and loads are uniformly distributed. Self-weight of the floor system applied with load factors of 1.2G and 1.5Q as per AS/NZS1170.0 have been allowed for in the design analysis, noting that ultimate demands tend not to govern. For serviceability, tensile bottom fibre stresses are limited to $0.5^*\sqrt{f'c}$ when short term live load factor, ψs = 0.7, deflections are limited to span/500, vibration limits to meet domestic/office use with damping ratio of 0.05 allows for full height partitions. Simply compare your unfactored superimposed live + dead load with the allowable shown on the table. Please note high dead loads will induce higher creep values than expected. Also loads as per cl 3.4.2(a) AS/NZS 1170.1 2002 have not been allowed for. If this is the case, please contact Stahlton for further advice.

Stahlton Flatslabs can sustain point loads and line loads. However, significant loadings should be checked by a Stahlton Engineer at a preliminary design stage.

Intended unfactored loads and load factors should be clearly shown on the Consultant's drawings to avoid any confusion throughout the shop drawing and design process. Contact Stahlton for design advice on special loading cases.

End seating

Stahlton Flatslab flooring systems requires a minimum of 50mm or span/180, whichever is greater, seating on concrete walls or beams. If concrete supports are armoured or on steelwork the end seating can be reduced by 15mm as per cl 18.7.4 NZS 3101:Part1:2006. A construction tolerance of 10mm needs to be added to these figures. Stahlton recommends a minimum of 75mm end seating on masonry block-work and the 15mm reduction not apply when seating on steel. We also recommend the use of low friction bearing strips under the bearings of the Flatslabs.

Topping

The topping concrete strength should be specified as a minimum of 25MPa as per cl 5.2.1 NZS 3101:Part1:2006. Floor reinforcement and saddle bars should be designed and shown on the Consulting Engineer's drawings. Steps in the topping can be formed using suitable density polystyrene, however the extra topping thickness needs to be accounted for as a gravity load, as well as the benefit of added stiffness, and allowed for in the design.

With Stahlton Flatslabs you have the option of maintaining 75mm topping thickness and varying the flatslab depth to maintain a maximum span/depth ratio of 40, a recommended guide under normal residential or office loading conditions to meet deflection limits, or maintain 75mm Stahlton Flatslab depth and vary the topping to meet the ratio.

In-house design

Our capable in-house design team is led by our National Technical and Design Manager. We work with structural designers to provide an economical and bespoke design specifically for the needs of each structure and load case. Our National Technical and Design Manager is a Chartered Professional Engineer, signing off every shop drawing and provides a Producer Statement for the design (PS1) for every product Stahlton designs for your project. Through regular quality audits as part of our ISO9001 Certification Stahlton also provide Producer Statements for the Manufacture (PS3 & PS4).

Design weight including topping concrete

The self-weight of the various Stahlton Flat Slab systems are:

75mm of 25MPa topping concrete

Flatslab depth (mm)	Self wt (kPa)
75	3.8
100	4.4
125	5.0
150	5.6

75mm Flatslab

Topping depth (mm)	Self wt (kPa)
75	3.8
90	4.1
100	4.4
125	5.0

IRD building, Christchurch

Contractors

Temporary propping

Temporary propping is usually required for Stahlton Flatslabs to maintain bottom fibre stress limits and control deflections during construction. Under standard uniformly distributed loadings temporary propping would be expected for spans exceeding 2.5m for 75mm flatslabs and 5.5m for 150mm deep flatslabs. A suitably qualified Engineer will need to be consulted for the design of the propping system.

As a guide up to 6m span will need 1 row of props, 6m to 9m span 2 rows. Precambers to set the level of the props will be provided on a our shop drawing. Propping is required to be in place prior to placing the flatslabs on-site.

For multiple storey buildings back propping should be in place for a minimum of 2 levels below the level being constructed or to solid ground. Load on the "back-props" from the finished floors should be relieved, remaining snug, prior to the props supporting the level being constructed take wet concrete topping load.

The propping can be removed when the topping concrete strength has reached 15MPa.

Topping

Care should be taken when pouring not to mound up the concrete in one place as this can produce high point loads during construction.

Topping concrete levels generally should follow the camber of the Stahlton Flatslabs, unless instructed otherwise.

Camber

Stahlton Flatslabs may arrive at site with some camber (hog or sag). This is unavoidable due to the nature of pre-stressing. The amount of camber will depend on a number of factors, including amount of prestress, time since the units were manufactured and exposure to the elements and length to name a few variables. Propping set to the required precamber (hog) will eliminate the camber variations between flatslabs with the weight of the wet concrete topping. As a rule of thumb, allow 1mm precamber for every 1m of span. Generally we predict in the design of the floor system that long term deflections will provide a near flat suspended floor. Please contact Stahlton if you have any queries.

Handling & storage

Stahlton Flatslabs are usually lifted 1/5th of the length from each end depending on the pre-stress level, depth and length of the flatslab. Specifically designed lifting chains and hooks or lifting clutches can be used to lift the units. The Stahlton Flatslabs will arrive on site with provision for hooks or lifting clutches. These anchoring points should be used without substitution. All lifting gear should be checked for any wear or damage regularly as concrete elements can be abraisive.

Stahlton Flatslabs need to be dunnaged near the lifting points if stored on site. The dunnage blocks need to be aligned on top of each other so as to not induce large point loads on the units below.

Care needs to be taken as to the suitability of the ground the units are stored on and should be checked by a suitable qualified engineer.

Handling weights for Stahlton Flatslabs

Flatslab Depth x std width (mm)	Unit wt (kg/m)
75x1200	232
100x1200	309
125x1200	386
150x1200	463
75x2400	464
100x2400	618
125x2400	772
150x2400	926

Penetrations & fixings

An Information Bulletin IB95 Drilling, Cutting or Forming Holes in Suspended Concrete Floor Slabs, published by CCANZ, is available on the Stahlton website. Stahlton recommends that this document is read and adhered to.

Stahlton Flatslabs can have penetrations core drilled through the unit in specific locations. The area 30mm either side of the strand must be avoided altogether. If a strand is cut on-site, temporary prop either side of the penetration immediately, then contact Stahlton Engineered Concrete as a design check wiill need to be done to ascertain whether the unit is still structurally sound.

Fixings can be drilled into Stahlton Flatslabs using a hammer drill or "dyna-drill', maintaining minimum edge distances and avoiding the strands to gain adequate embedment. Please seek advice from the fixing manufacturer as to the suitability and the load carrying capacity of their products in Stahlton Flatslabs.

Units can be designed with additional pre-stressing strands to allow for cutting of occassional strands. However this needs to be considered at the start of the project and built into the design before the units are cast, bearing in mind the design may already be at our prestressing limit and extra strand could induce more hog in the slab.

Penetrations and fixings

Stahlton Flatslabs

Product data sheet

Flatslab flooring

Stahlton Flatslab flooring system incorporates pre-stressed concrete solid slabs and an in-situ concrete topping to give a cost effective, thin, suspended floor. Temporary propping is normally required.

Stahlton Flatslabs can be used for cantilever balconies as permanent formwork. They are made on a long heated steel bed to allow units to be made in any achievable length, shape and thickness.

Stahlton Flatslabs typically are placed at 1200mm or 2400mm module and come in 25mm depth increments from 75mm to 150mm deep.

Flatslab load/span table

Unfactored maximum superimposed live load (Qb) in kilopascals (kPa), (assuming no superimposed dead load ie. SDL = 0kPa).

75mm of 25MPa topping concrete

Flat Slab depth (mm)	Self wt (kPa)	Simply supported span (m)												
		3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5
75	3.8	19.0	15.0	11.6	8.4	7.0	5.7	4.4						
100	4.4		20.0	15.5	12.0	9.7	7.6	6.0	4.7	3.7				
125	5.0				15.6	12.2	9.7	7.7	6.1	4.8	3.8	2.9		
150	5.6					14.8	11.7	9.4	7.5	6.0	4.8	3.7	2.9	2.1

Note: Indicates propping may not be required for these spans for **lesser superimposed loads**.

75mm Flatslab

Topping depth (mm)	Self wt (kPa)	Simply supported span (m)										
		3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
90	4.1			14.0	10.2	7.9	6.6	5.0	4.0			
100	4.4					10.0	7.0	6.0	4.6	3.5	2.8	
125	5.0						9.0	8.0	6.0	4.0	3.5	2.3

Notes regarding load/span tables:

1. Consideration needs to be given to long term creep effects due to higher superimposed dead loads. Contact Stahlton's technical team for guidance
2. The Load Span tables assume loads are uniformly distributed. Consideration is required for shear actions induced from point loads. Contact Stahlton's technical team for advice
3. Theoretical cambers have been limited to span/400. Consider higher cambers for situations close to the tabulated load limits.
4. Refer to Stahlton's website www.stahlton.co.nz for more information.
5. The actual prestress used and the capacity of the floor varies according to the design load specified.

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Flat Slab section properties

Section properties are based on standard widths of 2.4m plus a 75mm concrete topping. Composite section modular ratio = 0.67.

Flatslab depthxwidth (mm)	Unit wt (kg/m)	Overall depth (mm)	Bare Unit A $x10^3mm^2$	Bare Unit Y_b mm	Bare Unit I $x10^9mm^4$	Bare Unit Z_b $x10^6mm^3$	Composite unit A' $x10^3mm^2$	Composite unit Y_b' mm	Composite unit I' $x10^9mm^4$	Composite unit Z_b' $x10^6mm^3$	Composite unit Z_t' $x10^6mm^3$
75x2400	464	150	179	37	0.084	2.281	359	69	0.583	8.41	7.22
100x2400	618	175	238	50	0.207	4.184	418	81	0.927	11.45	9.86
125x2400	772	200	297	62	0.393	6.340	477	93	1.389	14.94	12.98
150x2400	926	225	356	75	0.679	9.117	536	105	1.986	18.91	16.55

Section properties are based on 75mm thick Flatslab x standard width of 2.4m plus varying concrete toppings. Composite section modular ratio = 0.67.

75x2400mm Flatslab + topping (mm)											
90	464	165	179	37	0.084	2.281	395	76	0.776	10.21	8.72
100	464	175	179	37	0.084	2.281	419	81	0.926	11.43	9.85
125	464	200	179	37	0.084	2.281	479	93	1.381	14.85	12.91

Properties, except y_b to be halved for 1200mm wide module units ex Auckland.

Flatslab important information

End seating

Stahlton Flatslab flooring requires a recommended minimum, and the greater of, 75mm or L/180 seating onto unarmoured concrete beam or wall.

A construction tolerance of up to 15mm needs to be compensated for as per cl.18.74 NZS3101:Part 1:2006. Stahlton and the code requires the use of low-friction bearing strips.

Temporary propping

Stahlton Flatslab flooring does usually require propping. As a guide spans 2.5 to 6m require 1 row, 6 to 9m require 2 rows.

Camber

Stahlton Flatslabs may arrive on site with a camber. This is unavoidable due to pre-stressing. Cambers will vary and be influenced by the amount of prestress required to resist the induced load, length and age of the units exposed to the elements.

Handling & storage

Stahlton Flatslabs are designed to be lifted using hooks and chains to strand lifting eyes located at ends or length divided by 5 from each end. Flatslabs need to be dunnaged as close as possible to the lifting location and with blocks in line with the block below, on solid and even ground. Ensure lifting equipment is regularly checked.

Penetrations

Stahlton Flatslab flooring does allow flexibility for accommodating penetrations in specific locations avoiding the strands. If a strand is cut on-site, place a prop either side and contact Stahlton's Technical Department for a design review. Also refer to our standard drawings for acceptable details for attaching fixings to the soffit of the flatslabs.

Specifications

Drawing call-up

To specify the Stahlton Flatslab system on your drawings, we suggest you use the following designation:

Stahlton depth Flatslab

For example if the project is to be made from 100mm deep Stahlton Flatslab with a 75mm topping, then the specification would read:

Stahlton 100 Flatslab with 75mm topping

Written specification clauses

Stahlton Flatslab products in general comply with the following standards:

(i) NZS 3101:2006 'Concrete Structures Standard Part 1 & 2'

(ii) NZS 3109:1997 'Concrete Construction'

(iii) AS/NZS 4671:2001 'Steel Reinforcing Materials'

(iv) BS 5896:1980 'Specification for High Tensile Steel Wire and Standard for the Prestressing of Concrete'

Design

(i) The design of Stahlton Flatslab shall be in accordance with the requirements and recommendations of NZS 3101:2006 'Concrete Structures Standard Part 1 & 2' and/or any recognised international Standard or part thereof, for example BS 8110:2007 'The Structural Use of Concrete'.

(ii) The prestress strand pattern in the Stahlton Flatslab shall be designed to sustain the loadings shown on the Consulting Engineer's drawings and allowance will be made for self weight of the unit and topping concrete.

(iii) The Stahlton Flatslabs shall be designed for exposure classification A1/A2/B2/B2 as per table 3.7 in NZS 3101:2006.

(iv) The Stahlton Flatslab unit shall have a FRR (Fire Resisting Rating) of 90/90/90. Penetrations through the flooring system shall be reinstated to the required FRR by an approved fire protection system.

(v) Stahlton Flatslab shall be designed to have a maximum crack width of 0.3mm under full live load conditions.

(vi) The acoustic STC (Sound Transmission Class) and IIC rating of the floor system shall meet or exceed 55dB measured in 'on-site conditions'. These ratings apply to the finished floor system, including any carpeting and suspended ceiling systems.

(vii) The Stahlton Flatslab units shall have a minimum of 50mm end seating or L/180, whichever is greated, as per clause 18.74 in NZS 3101:2006 plus tolerance of 15mm if seated on an unarmoured concrete beam.

Materials

(i) Concrete shall be specifically mixed depending on environmental conditions and should have a 28 day cylinder strength of 45MPa as a minimum.

(ii) All concrete shall show signs of thorough compaction otherwise rejected if repair cannot be undertaken to bring the unit back to the original specification.

(iii) An air entraining agent complying with BS EN 934-2-2001 may be included in the concrete mix to improve workability.

(iv) The strand reinforcement used in Stahlton Flatslab shall be 9.6mm, 11.3mm, 12.7mm or 12.9mm diameter complying with the requirements of AS/NZS 4671:2001.

(v) Prestressing strand shall be clean and free from deleterious substances. Superficial rust is acceptable, however strand with corrosion that has caused surface pitting shall be rejected for the main longitudinal reinforcement of the unit.

Manufacture

(i) Materials, execution of stressing prestress strand and workmanship of the Stahlton Flatslab units shall conform with Stahlton Engineered Concrete ISO 9001 Quality Assurance Operating Procedures.

(ii) Stahlton Flatslab units shall be nominally 1200mm wide (Auckland) or 2400mm (Christchurch) and made in the following nominal depths 75mm, 100mm, 125mm or 150mm.

(iii) The top surface of the Stahlton Flatslab unit shall have a nominal roughness of 5mm or as stipulated in NZS3101:2006 clause 18.5.4.1(a).

(iv) The tolerance for length of the Stahlton Flatslab units shall be in accordance with NZS 3109 Table 5.1 (usually +/- 10mm).

Handling, protection & placing units

(i) The Stahlton Flatslab units shall to be designed to sustain all lifting stresses.

(ii) The Stahlton Flatslab units shall be lifted only at the lifting position as nominated by the manufacturer.

(iii) The Stahlton Flatslab units shall be handled using certified lifting hooks or clutches. Chain angles must not exceed 30 degrees to the vertical and must be checked regularly for wear and tear.

(iv) Dunnage used for storing the Flatslab units needs to be of suitable quality and placed on 'good' ground at the correct points in from the end of the units.

(v) Where units are stacked one above the other, bearing dunnage shall be positioned in vertical lines.

(vi) The Flatslab units shall be handled and placed according to references contained in the Occupational Safety & Health approved code of practice entitled 'Safe Handling, Transportation and Erection of Precast Concrete'

(vii) The units shall not be damaged in any way including chips and cracks during the erection and placing phase. Any damage should be brought to the attention of the supervising Engineer immediately.

Temporary propping

(i) Design of temporary propping, back propping, bracing systems and ground conditions to support prop loads shall be carried out by a suitably qualified Engineer.

(ii) Propping shall not be removed until the topping concrete has reached at least 60% of the 28 day strength.

(iii) It is the Contractor's responsibility to ensure the propping system used on site meets the criteria as detailed in the aforementioned design and any additional requirements shown on the Stahlton Engineered Concrete drawings.

(iv) All proposed systems with supporting calculations shall be submitted to the Specifying Engineer prior to erection on site for approval.

Topping concrete

(i) The top surface of the Flatslab units shall be clean and free of all dust, oil or any deleterious substances which may adversely affect the wet topping bond to the Flatslab units.

(ii) Pre-wet precast concrete surfaces prior to placing the topping concrete.

(iii) Free water shall be broomed away before the topping is applied.

(iv) Topping reinforcement shall be laid and supported to the Specifying Engineer's requirements and shall be supported to prevent displacement during concreting.

(v) Topping concrete shall have a maximum aggregate size of _____ (normally 13mm) and a 28 day strength of _____ (minimum of 25MPa) and be well compacted with mechanical vibrators.

(vi) Topping concrete shall be poured to a true surface so that the specified thickness of _____ (minimum of 75mm) is achieved at the centre of the span.

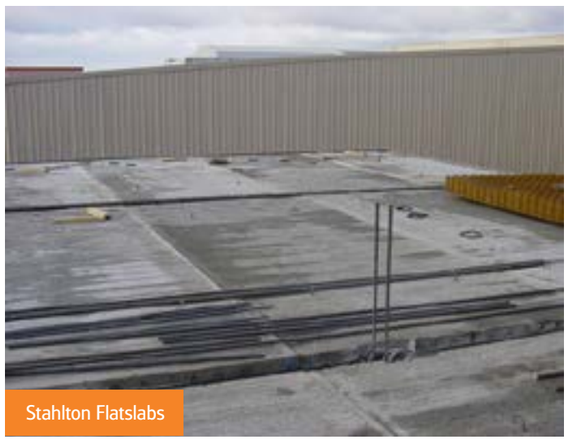
(vii) In-situ concrete shall be cured by the application of an approved curing membrane or by being kept continuously wet for not less than seven days.

Fixings & penetrations

(i) Fixing to the Flatslab units shall be in accordance with the approved details only and shall not impair or reduce the strength of the unit in any way.

(ii) Documentation of tested fixings proposed for the project shall be submitted to the Specifying Engineer prior to installation.

(iii) Penetrations, setdowns or chases to the Flatslab unit or topping concrete shall be in accordance with the details agreed by the Specifying Engineer and the Flatslab manufacturer prior to any work being undertaken on site.



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