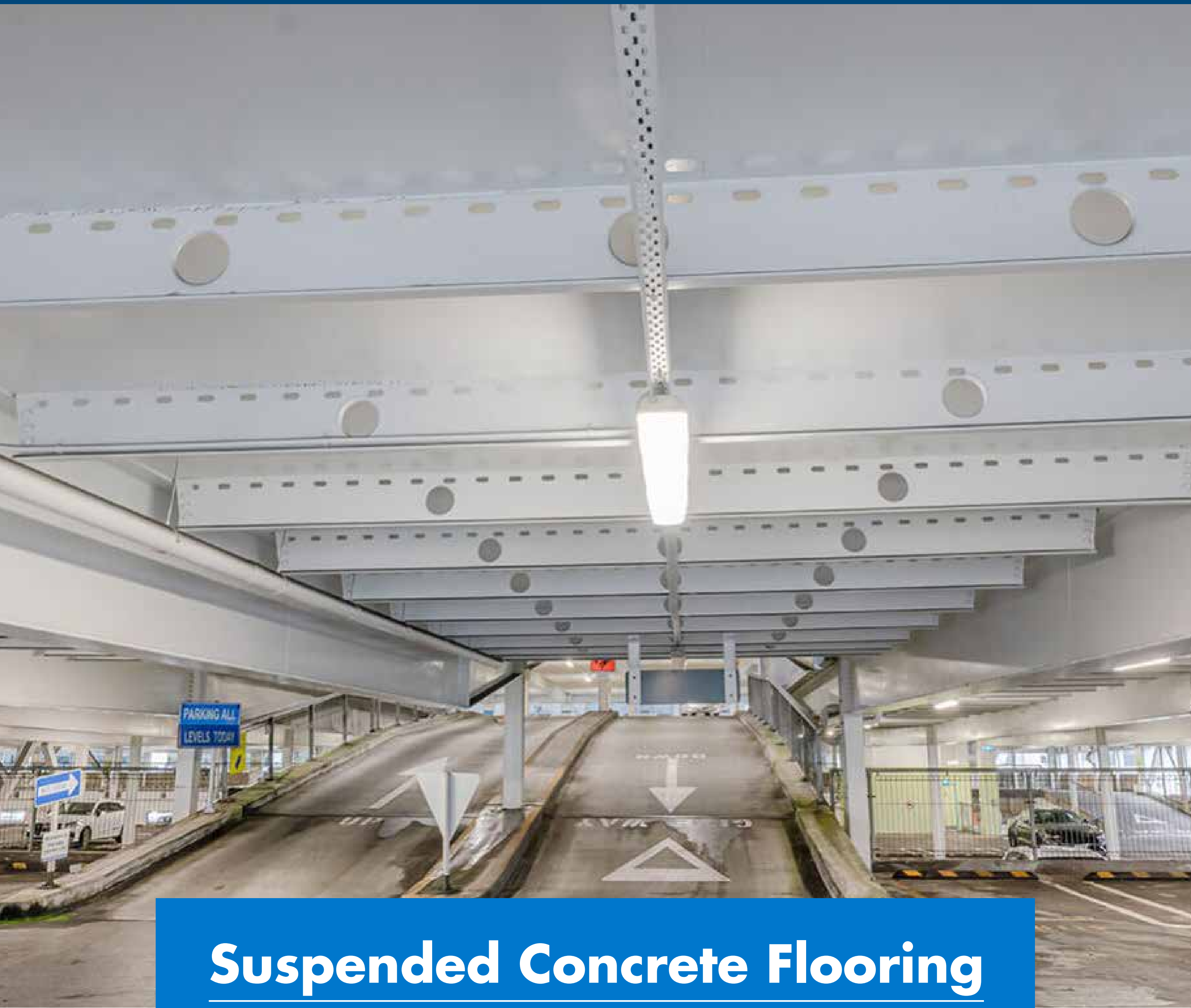
SPEEDFLOOR

The Floor System The Others Look Up To



Suspended Concrete Flooring

Product Manual

A high precision, concrete composite floor wit integrated, cold-formed, pre-galvanised steel joists for superior strength and accuracy.

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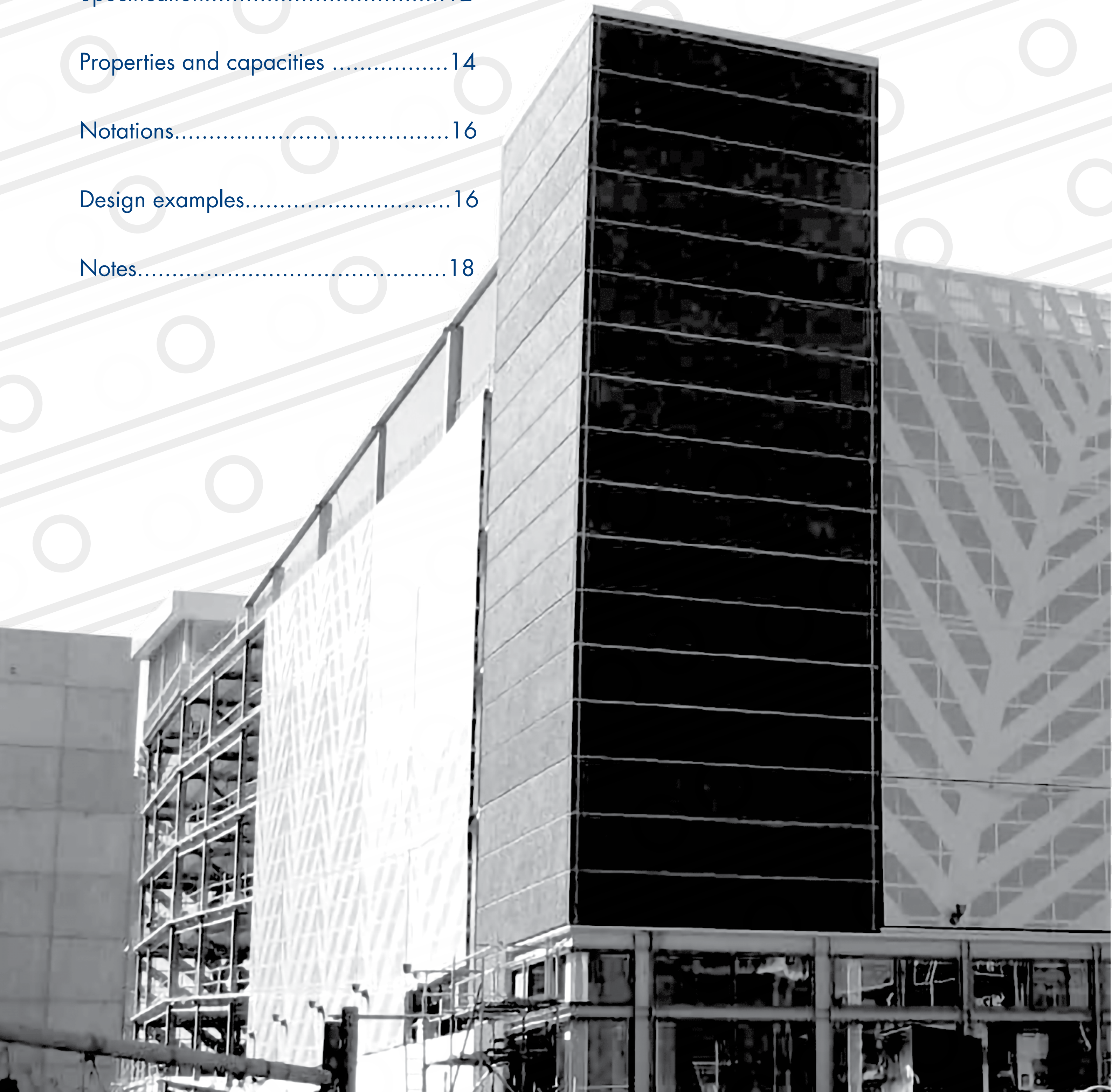


Overview

The SPEEDFLOOR® Suspended Concrete Floor System uses a cold formed steel joist as an integral part of a concrete and steel composite floor. The joist is manufactured from pre-galvanised high strength steel in a one pass rollformer giving a high degree of accuracy at a fast production rate. The ends are simply bolted to the joists which are then ready for transportation to site. At site, the individually marked lightweight joists are placed on the support medium where a shuttering system locks the joist into the exact position. The reinforcement is placed and the concrete floor is ready to pour.

Faster, lighter, easier

SPEEDFLOOR® is quick and easy to install. Unpropped spans up to 8.5 metres reduces structural support by increasing beam spacing, thus savings in both materials and time onsite are achievable.

SPEEDFLOOR® uses less concrete and less steel per m^2 for any given span. The lightweight joists are able to be manually positioned requiring less cranage and the pre-punched holes allow services to pass through the floor cavity.

Application

SPEEDFLOOR® combines a concrete slab with a rollformed galvanised steel joist for permanent structural support, using the properties of the concrete and the steel to their best advantage. The joist depth and the concrete thickness are varied depending on the span, imposed loads and other functional considerations.

The SPEEDFLOOR® Suspended Concrete Floor System is a proven performer in all types of construction, from steel structures, masonry buildings, poured in-situ or precast concrete panels, to ICF, timber and cold formed steel frame construction.

Components

The Joist: is manufactured from G350, Z275 or Z450 pre-galvanized steel. The rollformed shape with its flanged holes produces a rigid and accurate steel section that has a high load carrying capacity and therefore good spanning characteristics with no propping requirements.

The joist weights per lineal metre are as follows:

Series Joist	Weight Per Lineal Metre	Concrete Weight Per Sq M (90mm)	Total Weight Per Sq M with 90mm Concrete
200	9.41kg	216.54kg	224.38kg
250	10.59kg	216.54kg	225.37kg
300	11.76kg	216.54kg	226.34kg
350	12.94kg	216.54kg	227.32kg
400	14.12kg	216.54kg	228.31kg

Components

The top section of the joist is embedded in the concrete slab and has 4 functions;

1. It is the compression element of the non-composite joist during construction.
2. It is a "chair" that supports the welded wire mesh or the reinforcement which develops negative moment capacity in the concrete slab over the joist.
3. It locks in and supports the slab shuttering system (lock bar and plywood forms).
4. It becomes a continuous shear connector for the composite system.

The mid-section or web of the joists has the flanged service hole and the lockbar hole punched into it. The flanging of the service hole provides stability to the web and services can pass through the hole without requiring protection from the sharp edges of the punched material. The 60mm by 25mm diameter lockbar holes are punched at 150mm pitch to receive the lockbars and afford evenly distributed support for the plywood.

The bottom triangular section of the joist acts as a tension member both during the construction phase and when the joist is acting compositely with the slab.

The lockbar: Lockbars support the temporary plywood formwork between the joists during construction. They are spaced approximately 300mm apart and engage in the slotted holes punched in the top section of the joist. They also maintain the exact spacing of the joists. The standard lockbars when installed will position the joists 1230mm, 930mm or 630mm apart. There are also special adjustable lockbars that will position the joists in increments of 50mm from 330mm up to 1530mm. Other types of lockbars provide for special situations such as cantilevers or lowered soffits.

Temporary plywood formwork: High-density paper overlaid 12mm plywood is used as formwork to produce a first class finish to the underside of the slab. The rigid plywood sheets are used in conjunction with the lockbars and when locked in place, provide lateral stability to the entire SPEEDFLOOR® System during the construction phase.

Reinforcing mesh: The mesh is laid out and tied into place. No chairs are required as it is held off the plywood forms by the top section of the joist, which becomes embedded in the concrete.

Concrete: The standard concrete must have a minimum 28 day strength of 25MPa. It should be batched at 60mm slump and super-plasticed to 110mm to provide good placement and shrinkage characteristics. A curing compound should be used and an expanding agent can be introduced at the engineer's request to further control shrinkage during the curing period. The concrete should initially be placed evenly and continuously over the area to be formed. Special attention should be given to ensure the concrete is screeded and finished to the specified thickness so that designed deflections are achieved in the SPEEDFLOOR® joists and the supporting structure.

Accessories

Edge angles: SpeedEdge is available in 4 convenient heights (75mm, 90mm, 100mm and 120mm) with holding down clips which support a perimeter bar. (See SpeedEdge brochure).

Hanging angle: A galvanised steel angle with pre-punched lockbar holes is available for use on structural steel beams parallel to the SPEEDFLOOR® joists.

Packer: A re-usable plastic packer is available to help square the plywood sheet during installation and reduce the concrete seepage during the pour.

Durability

Statement: When supplied and installed in accordance with the manufacturer's specifications and design parameters, the SPEEDFLOOR® Suspended Concrete Floor System can reasonably be expected to meet the performance criteria set out in clause B2, durability of the New Zealand building code for a period of not less than 50 years.

The durability of a galvanised coating is dependent on the thickness of the zinc coating, the general environment and the level of maintenance carried out over the life of the product. Consideration must be given to these factors when specifying SPEEDFLOOR® to determine the longevity of the structural solution. Further clarification of protective coatings and corrosivity zones should be sought from AS/NZS2312:2002 and HERA Report R4 -133:2005.

If any doubt exists on the suitability of SPEEDFLOOR® in a corrosive zone, approval should be sought in writing, as SPEEDFLOOR® accepts no liability for the product other than when used in accordance with the above recommendations.

Serviceable life

SPEEDFLOOR® is a composite floor system using both steel and concrete. The two elements must be treated and maintained separately.

Steel: The rollformed joist is manufactured from steel coated with either 275g/sqm or 450g/sqm of zinc. If the joists are in a clean and dry environment they will require little or no maintenance. If they are exposed, they will require a minimum amount of maintenance to ensure the expected performance is achieved. Guidelines for this maintenance are:

1. Keep surfaces clean and free from continuous contact with moisture, dust and other debris (a 14 MPa waterblast every 2 years will suffice).
2. Periodically inspect the joists for any signs of surface corrosion. Remove any by-products of the corrosion by mechanical means and spot prime the exposed steel substrate with an approved steel primer. Repaint the area using an appropriate paint to manufacturer's recommendations.

Concrete: All calculations for the concrete slab are based on a density of 2350 kg/m^3 with a specified strength of 25 MPa and type A aggregate. Special attention is paid to the mix and placement of the concrete in the SPEEDFLOOR® System to minimise the likelihood of shrinkage cracks occurring during the initial curing period. The slump is specified at 60mm and a super-plasticiser is used to improve workability during placement. In carpark structures and exposed decks an expanding agent is generally used to reduce the effect of shrinkage during the initial cure and a curing compound is used to help control the curing process. During the service life of the SPEEDFLOOR® System if any cracks should appear in the concrete floor, they should be filled using an approved epoxy injection system or equivalent, to completely close the crack and prevent moisture ingress.

Design

SPEEDFLOOR® has been designed to comply with NZS 3404: Part 1 and 2: 1997, AS/NZS 4600: 1996 and the Australian Composite Structures standard AS 2327 Part 0 and 1, Structural Design Actions.

Design parameters: The section properties and design parameters are calculated from the section geometry, supplementary full-scale tests and finite element analysis. SPEEDFLOOR® joists have flanged service holes in the web to assist in web stiffening and to provide practical services access. The joist is simply supported during construction with generally no propping required. The concrete is cast in place and acts compositely with the SPEEDFLOOR® joist.

Detailed analysis and comprehensive physical testing have enabled load versus span tables to be established using the limit state design philosophy. A load/span calculator is available on request from a SPEEDFLOOR® representative or from the website www.speedfloor.co.nz

Material: SPEEDFLOOR® joists are rollformed from zinc coated steel coil conforming to AS 1397. The minimum mass coating of galvanizing is 275g/m^2. The standard steel used is Grade 350 and has a minimum yield stress of 350MPa and a minimum tensile stress of 380MPa.

The concrete slab requires a minimum compressive strength of 25MPa (30MPa for carparks) in 28 days. Steel mesh reinforcement is placed at minimum cover, (according to durability requirements NZS 3101 Section 3.11) primarily for crack control caused by shrinkage during curing. Guidance on crack width tolerances is given in NZS 3101 and HERA report R4-113.

Fire

Full scale fire testing has established that the SPEEDFLOOR® System can be fire rated and meet fire rating requirements set out in the New Zealand and Australian Building Codes. Options for fire protection include:

1. A fire rated suspended ceiling
2. Sprayed cementitious products directly onto SPEEDFLOOR® joist
3. The use of a performance based design method such as the 'Slab Panel Method'

1. Fire rated suspended ceiling

The installation of a fire rated suspended ceiling below the SPEEDFLOOR® System may incorporate acoustic STC requirements. The floor/ceiling structure must meet 'C4 Structural Stability During Fire' of the New Zealand Building Code Clause B1 as well as 'Integrity' and 'Insulation' requirements. SPEEDFLOOR® has been fire tested in accordance with AS 1530.4-1990 Fire Resistance Tests of Elements of Construction for which the fire resistance of the structural specimen is expressed in minutes. For more detailed information contact your SPEEDFLOOR® representative.

2. Sprayed cementitious products

There are numerous products that offer passive fire protection to the structural system including the SPEEDFLOOR® joist. This solution is typically used for small areas of low fire resistance requirements. Defined product information should be evaluated from the product suppler or applicator.

3. Performance based design methods

The New Zealand Building Code is performance based which means 'Acceptable Solutions' and 'Approved Verification Methods' that demonstrate compliance with the code can be used through satisfaction of the performance objectives of that code.

The Slab Panel Method (SPM), developed by Heavy Engineering Research Association (HERA) has been acknowledged by the Building Authority in New Zealand as an acceptable method for establishing performance of a steel structure during fire.

The procedure is based on the tensile membrane concept provided by in-slab reinforcement. Membrane action develops when slabs undergo large deflections with the edges of the slab vertically restrained. This action enhances the load carrying capacity of the slab. When a slab is subjected to elevated temperatures and the strength and stiffness of the concrete and reinforcing steel reduces, flexural yield lines will form. With further temperature increase, the slab undergoes vertical deflection and membrane action develops to maintain the structural stability of the element.

The SPM design procedure for SPEEDFLOOR® typically involves the addition of in-slab reinforcement in floors at risk of being exposed to moderate or severe fire conditions.

SPEEDFLOOR® can provide the SPM design for projects along with our PS1 to assist you in the design/consent stages of project documentation and delivery.

SCNZ in conjunction with the University of Auckland has updated the software. It is now available from SCNZ and is based on HERA Report R4 – 131:2006.

SPM PROGRAMME INPUT DATA

SPECIFIC FOR SPEEDFLOOR®

1. Mesh reinforcement cover

Cmesh(y-direction) = to - 38-dmesh

Cmesh(x-direction) = Cmesh(y-direction)-dmesh

Where:

x-direction bars are parallel to SPEEDFLOOR® joists

y-direction bars are perpendicular to SPEEDFLOOR® joists to = slab thickness

38 = height of embedment of joist top flange into concrete dmesh= diameter of mesh/bars

2. Minimum Ar mesh required for integrity

Arx,mesh; Ary,mesh $\geq$ 200 A1(x or y).A2(mm2/m width)

$$A1(xory) = \frac{Smesh(x\ or\ y)}{150} \geq 1$$

$$A2 = \frac{to - hrc/2}{110} \geq 1$$

150mm $\leq$ Smesh(x or y) $\leq$ 250mm

Where:

A1 = factor relating to mesh bar spacing = 1 for mesh with nominal pitch of 75mm or 150mm

A2 = factor relating to slab effective depth = 1 for 90mm or 75 topping

Smesh = mesh bar spacing (mm)

hrc = 0 for SPEEDFLOOR®

3. Applied Load W*= G + Gsdl + Qu

Where:

Qu = Uniformly distributed Live load (ULS)

G = Uniformly distributed Dead load

Gsdl = Superimposed Dead load

4. SPEEDFLOOR®

Requires negative reinforcement over internal primary beams. The negative reinforcement to be provided is shown on SPEEDFLOOR® standard details (min 189mm^2/m).

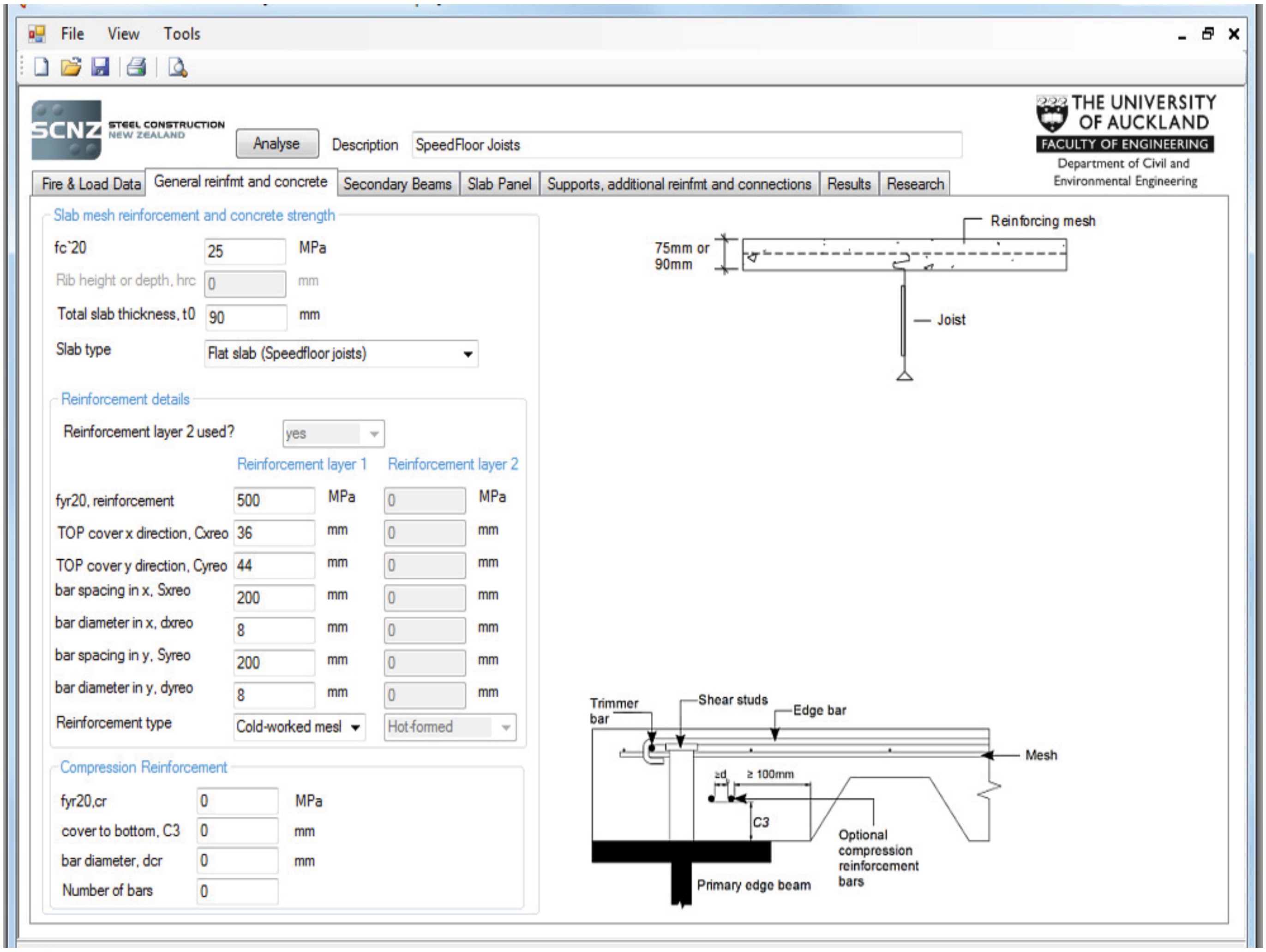
However, if interior support bars are required by the SPM program then these are to be provided instead of negative reinforcement. Interior support bars (typically 10mm or 12mm) positioned on top of the upper layer of mesh and extended 0.15 Lx+ 600mm. Lx is slab dimension in x direction which is equal to SPEEDFLOOR® span.

NOTE: All reinforcement bars used in SPM program should be Grade 500E.

Fire design using SPM computer program

This example is based on 90mm thick slab comprising of two bays:
Slab panel dimension is Lx = 6m (joist span) and LY = 20.0m
The fire rating required is 30 min
Applied load W(G+QU) = 3.8 kPa with a Fire Load Energy of 400MJ/m2
This example requires SE82 mesh and internal support bars H.D.12 at 300crs

Input screen



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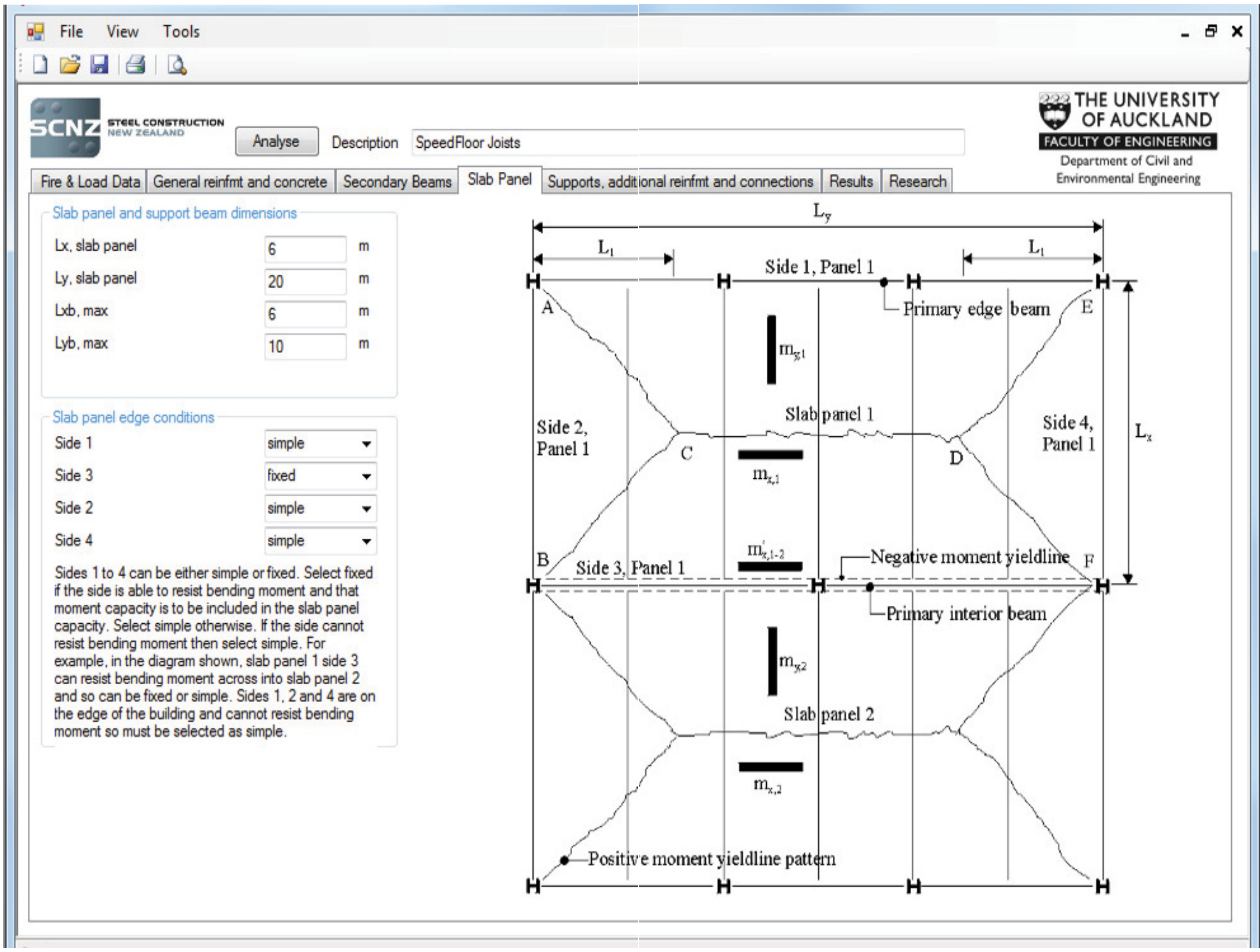
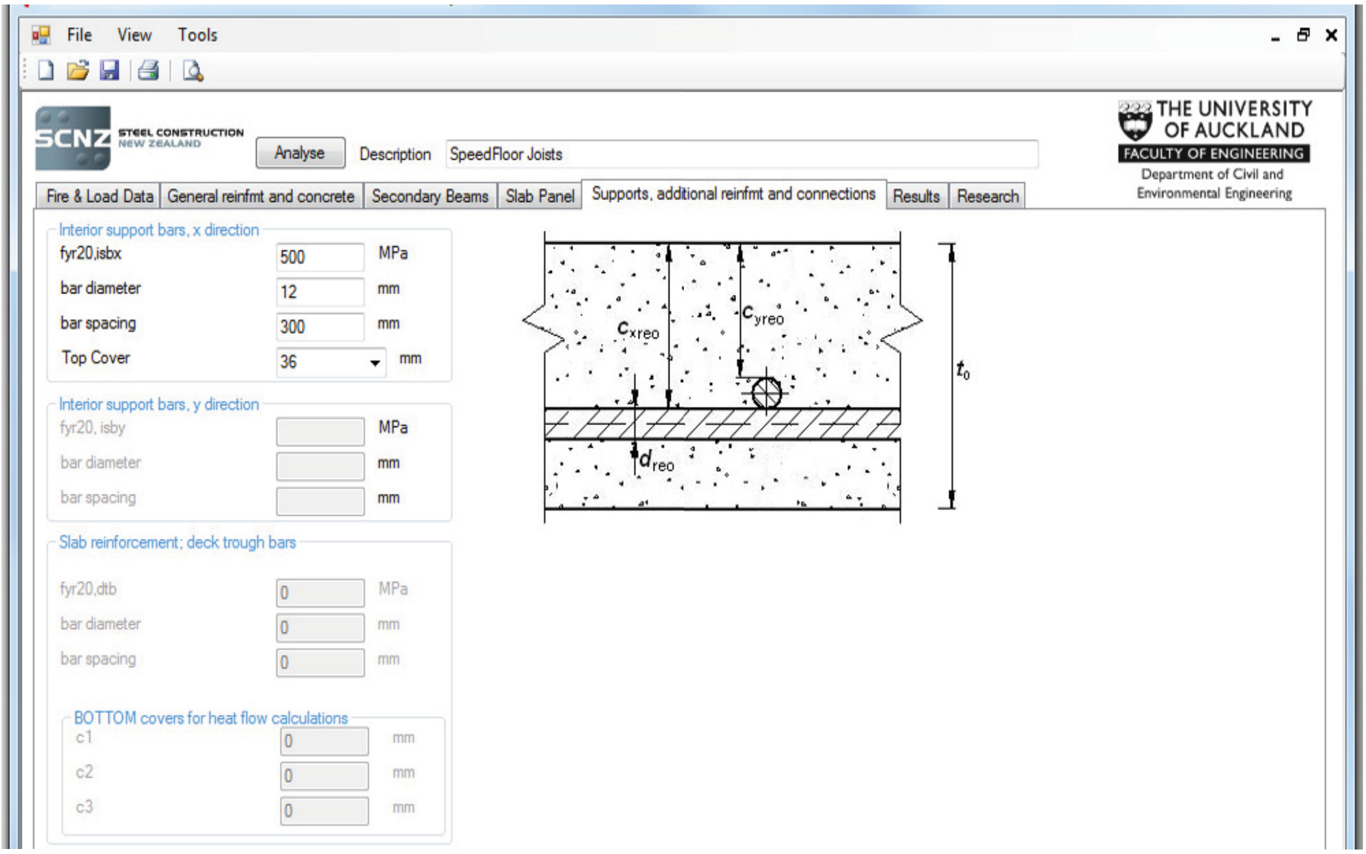
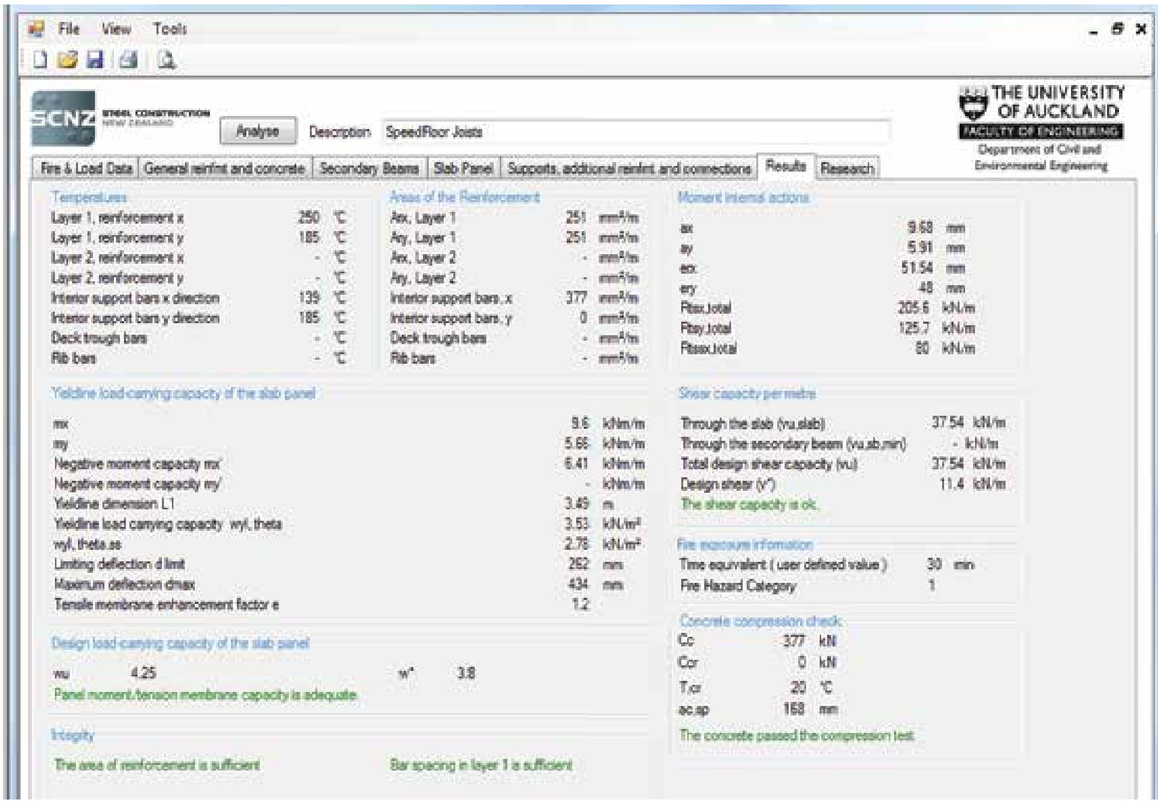




Output screen



Acoustic

Guidelines for specifier's and constructors requiring noise control systems for residential applications such as multi-unit dwellings or commercial applications are available from SPEEDFLOOR® in a separate Acoustic Design Guide produced by Marshall Day Acoustics Ltd. It is not intended that these guidelines replace the need for specialist acoustic design to meet the specified sound insulation performance for a building.

For more information about sound, its propagation, control and detailing, reference should be made to the HERA Acoustic guide, report no R4-121.

Vibration

Floor structures are designed for ultimate limit state and serviceability limit state criteria. Ultimate limit state is related to strength and stability. Serviceability limit states are mainly related to vibrations and hence are governed by stiffness, mass, damping and the excitation mechanisms. For slender floor structures such as those constructed in steel or composite floor construction, serviceability criteria can govern the design. For the prediction of vibration, several dynamic floor characteristics need to be determined. The design and assessment methods for floor vibrations are related to human induced resonant vibrations, mainly caused by walking under normal conditions.

For a detailed explanation of floor vibration, reference should be made to the Hera Report R4-112 and R4-113.

Specification

Supply and installation:

A. SPEEDFLOOR® or a SPEEDFLOOR® agent shall supply all steel joists, components, labour, material and equipment relating to the installation of the SPEEDFLOOR® Suspended Concrete Floor System. SPEEDFLOOR® steel joists and lockbars shall be manufactured and marked by SPEEDFLOOR® Ltd, or their authorised agent.

Quick selection reference span table

	Topping Thickness	Joist At C/C	Live Load 1.5kn/m²	Live Load 2.5kn/m²	Live Load 3.0kn/m²	Live Load 4.0kn/m²	Live Load 5.0kn/m²	Live Load 6.0kn/m	Live Load 7.0kn/m
SF200	120	1230mm	4.4m	4.38m	4.36m	4.23m	4.2m	4.1m	4.0m
	90	1230mm	4.6m	4.55m	4.5m	4.4m	4.38m	4.2m	4.05m
	120	930mm	4.9m	4.8m	4.75m	4.7m	4.6m	4.55m	4.5m
	90	930mm	5.2m	5.05m	4.95m	4.8m	4.75m	4.65m	4.55m
SF250	120	1230mm	5.6m	5.45m	5.4m	5.35m	5.2m	4.9m	4.7m
	90	1230mm	5.9m	5.78m	5.65m	5.6m	5.1m	4.85m	4.6m
	120	930mm	6.3m	6.1m	6m	5.9m	5.8m	5.35m	5.2m
	90	930mm	6.6m	6.45m	6.4m	6.2m	5.8m	5.55m	5.3m
SF300	120	1230mm	6.65m	6.6m	6.5m	6.45m	6.3m	5.75m	5.6m
	90	1230mm	7.05m	6.85m	6.8m	6.65m	6.2m	5.75m	5.5m
	120	930mm	7.3m	7.2m	7.15m	6.95m	6.8m	6.7m	6.4m
	90	930mm	7.7m	7.6m	7.5m	7.3m	7.1m	6.55m	6.3m
SF350	120	1230mm	7.3m	7.2m	7.15m	7.1m	7.05m	6.7m	6.4m
	90	1230mm	7.9m	7.75m	7.7m	7.55m	7.2m	6.75m	6.45m
	120	930mm	8.15m	8m	7.9m	7.75m	7.7m	7.55m	7.4m
	90	930mm	8.6m	8.4m	8.35m	8.15m	7.95m	7.75m	7.3m
SF400	120	1230mm	8.05m	7.9m	7.7m	7.05m	6.6m	6.3m	5.8m
	90	1230mm	8.5m	8.3m	7.8m	7.2m	6.7m	6.35m	5.9m
	120	930mm	8.75m	8.65m	8.6m	8.2m	7.65m	7.2m	6.7m
	90	930mm	9.3m	9m	8.85m	8.3m	7.7m	7.15m	6.7m

How to use 'quick selection reference table':

1. Calculate total applicable live load
2. Determine largest acceptable joist depth
3. Select relevant slab thickness
4. Start with 1230mm c/c
5. Scan along line to intersection of relevant total live load
6. This is the maximum span for selected criterior

Notes:

1. Tables are based on assumed Super-imposed Dead load of 0.5kPa
2. A load versus span calculator is available from SPEEDFLOOR® for a more detailed design

Properties and capacities

SPEEDFLOOR® with a 90mm concrete slab

TABLE 3: SECTION PROPERTIES

Joist Series (mm)	Non-Composite				Composite		
	1st ($x10^6$ mm^4)	Zt ($x10^3mm^3$)	Zb ($x10^3mm^3$)	Icomp ($x10^3mm^4$)	Zt ($x10^3mm^3$)	Zb ($x10^3mm^3$)	I effective for deflection ($x10^6mm^4$)
200	8.14	65.00	72.00	35.20	633.00	150.70	31.20
250	14.00	92.90	101.90	43.30	798.20	155.70	39.70
300	20.40	108.00	136.00	67.70	1130.00	205.00	60.40
350	28.70	129.00	173.00	96.30	1488.40	256.60	86.00
400	38.10	160.60	189.70	99.00	1578.90	231.60	89.90

TABLE 4: SECTION CAPACITIES

Joist Series (mm)	Non-Composite			Composite		
	Shear capacity with holes ØVv (kN)	Shear capacity without holes ØVv (kN)	ØMsx (kN.m)	Shear capacity with holes ØVrc (kN)	Shear capacity without holes ØVrc (kN)	ØMrc (kN.m)
200	NA	71.00	20.50	NA	73.00	47.80
250	30.20	100.00	29.30	32.60	102.20	43.30
300	42.00	85.00	34.00	44.00	87.00	64.00
350	60.00	72.00	40.60	62.00	74.00	86.00
400	30.20	62.00	50.50	32.60	64.40	74.40

Notes and assumptions relating to properties and charts

General:

Steel joist: f'y = 350 MPa
Steel thickness: 3mm
Concrete strength: 25 MPa (30 MPa for carparks)
Joist spacing: 1230mm, 930mm and 630mm
Slab topping typical: 90mm
Capacity of end bolted support bracket: 200mm series joist is 48 kN, 250mm - 400mm
Series joists are 77kN (Limit state)
First hole 1300mm minimum from edge of support
200mm series joist has no service holes, 250 - 350mm series joists holes are 130mm
Diameter: 400mm series joist holes are 250mm diameter.
All joists are pre-cambered.

Deflection: Deflections are an important consideration in any design. While the SPEEDFLOOR® deflection charts give options as to the amount of deflections the designer may deem acceptable in the SPEEDFLOOR® joist, the total amount of deflection in the floor system (support beams and flooring system) must be considered to meet in service code requirements).

Deflection criteria table C1 AS/NZS 1170.0:2002 Modified
For composite construction

A. Normal floor system to control noticeable sag
$\Delta Gc - \Delta pc + \Delta shr + \Delta Gs + \Delta \Psi sQ + \Delta cr = L/360$

B. Floors with line of sight along invert to avoid damage to susceptable wall or ceiling finishes.
$\Delta Gc - \Delta pc + \Delta shr + \Delta Gs + \Delta \Psi eQ + \Delta cr = L/500$

Note:

1. Charts are based on short term live load factor of 0.7 for deflection limit L/360 and long term live load factor of 0.4 for deflection limit L/500.
2. Deflection table with each chart shows total deflection of $\Delta Gs + \Delta pc + \Delta shr + \Delta Gs + \Delta cr$
The superimposed dead load (Gsdl) is based on 0.5kPa load

When superimposed dead load (Gsdl) exceeds 0.5kPa, deflection of the difference in Gsdl to be calculated and added to total deflection
Example = 400 joist, 90 topping, 1230 spacing
Span = 7.0m
Gsdl = 1.10 kPa
1.1kPa - 0.5 kPa ________
ΔGs for 0.5 kPa = 1.07mm
ΔGs for 0.6 kPa = 1.07 X (0.6x1.23)
0.5 X 1.23
= 1.29mm
Total deflection = 4.58mm +1.29mm = 5.87mm

TABLE 5: NOTATIONS		
SYMBOL	DESCRIPTION	UNITS
Δpc	SPEEDFLOOR® precamber	mm
Δcr	Deflection due to creep	mm
ΔGc	Deflection due to wet concrete & self-weight in the non-composite section	mm
Δshr	Deflection due to shrinkage	mm
ΔGs	Deflection due to superimposed dead load	mm
ΔΨsQ	Deflection due to short term live load	mm
ΔΨsQ	Deflection due to long term live load	mm
G	Uniformly distributed dead load	kPa
Gsdl	Uniformly distributed superimposed dead load	kPa
Q	Uniformly distributed live load	kN/m
Ist	Second moment of area of steel alone	mm^4
Icomp	Second moment of area of composite been transformed into equivalent steel section	mm^4
Ieff	Second effective moment of area	mm^4
ØMrc	Nominal moment capacity of a composite section	kN.m
ØMrc	Nominal moment capacity of a non-composite section	kN.m
ØVrc	Nominal shear capacity of a composite section	kN
ØVrc	Nominal shear capacity of a non-composite section	kN
Zb	Effective section modulus of a Speedfloor bottom chord	mm^3
Zt	Effective section modulus of Speedfloor top chord	mm^3

REFERENCES		
NZS 3404:1997	Part 1	Steel Structures Standard
	Part 2	Commentary to the Steel Structures Standard
AS/NZS 4600:1996		Cold-formed Steel Structures
AS/NZS 4600:1998		Cold-formed Steel Structures - Commentary Supplement 1
AS/NZ 1170	Part 0	Structural Design Actions
	Part 1	Structural Design Actions
AS 2327:1996	Part 1	Australian Composite Structures Standard
NZS 3101:1995	Part 1	The Design of Concrete Structures
	Part 2	Commentary on the Design of Concrete Structures
HERA publication	No. 71	SPM Software for Design of Floor Slab Panels for dependable inelastic response to severe fire

Design examples

Example 1- Residential floor

Floor live load Q=2.0kPa Superimposed Dead Load Gsdl = 0.5kPa

Note: The design calculator allows for a 0.5kPa superimposed dead load.

Based on 1230mm spacing of joist, then maximum span and limiting criteria for 250 and 400 joists are;

250mm Joist - 90mm topping = 5.85 m limited by defl L/360 and or strength
400mm Joist - 90mm topping = 8.35 m limited by defl L/360 and or strength

Example 2 - Retail floor

Floor live load Q= 4.0kPa Superimposed Dead load Gsdl = 2.5kPa
As the design calculator allows for 0.5kPa superimposed dead load, then treat the additional superimposed dead load of 2.0kPa (2.5 -.5) as live load. The design calculator uses a load combination of 1.2G + 1.5Q for strength, a short term live load ψ_s = 0.7 for deflection limit L/360 and long term live load ψ_e = 0.4 for deflection limit L/500.

Total load limited by deflection L/360 and or strength is the max of either
- for strength = 4kPa + (2.0 x 1.2/1.50) =5.6kPa
- or for defl L/360 = 4kPa + (2.0x 1.0/0.7) = 6.85kPa
And total load limited by defl L/500 = 4kPa + (2.0 x 1.0/0.4) = 9.0kPa

Based on 1230mm spacing of joist, then the maximum span and limiting criteria for 250 and 400 joists are:

250mm joist - 90mm topping = 4.5m limited by defl L/360 and or strength
400mm joist - 90mm topping = 5.8m limited by defl L/360 and or strength

Note: Since the load exceeds 5.0kPa slab topping requires specific design (for 5.6kPa) by a SPEEDFLOOR® engineer.

Example 3 - Office floor

Floor live load Q = 3.0kPa Superimposed Dead load Gsdl = 1.1 kPa
As the design calculator allows for 0.5kPa superimposed dead load, then treat additional superimposed dead load of 0.6kPa as a live load. The design calculator uses a load combination of 1.2G + 1.5Q for strength, a short term live load (Ψ_s = 0.7) for deflection limit L/360 and long term live load (Ψ_e = 0.4) for deflection limit U500

Total load limited by defl L/360 and on strength is the max of
- for strength = 3kPa + (0.6 x 1.2/1.5) = 3.5kPa
- or for defl L/360 = 3kPa + (0.6 x 1.0/0.7) = 3.85kPa
And total load limited by defl L/500 = 3kPa + (0.6 x 1.0/0.4) = 4.5kPa

Based on 1230mm spacing of joist, then the maximum span and limiting criteria for 250 and 400 joists are:

250mm joist - 90mm topping = 4.90m limited by defl L/500 and 5.45m limited by defl L/360 and or strength
400mm joist - 90mm topping = 7.30m limited by defl L/360 and or strength

Notes

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