



The Floor System The Others Look Up To



Transportable Concrete Floor

Product Manual

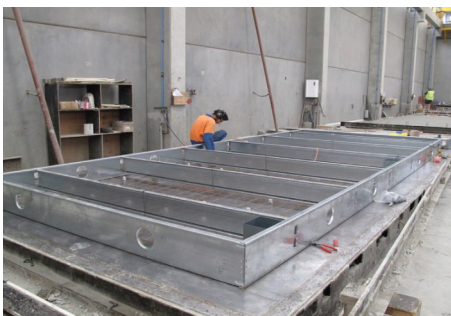
A lightweight, transportable slab that delivers the precision of the Speedfloor Steel Joist System without the cost of a mould.

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Overview

The Speedfloor Transportable Concrete Floor involves the unique combination of cold rolled steel sections and concrete to form a Transportable Concrete Floor.



Building on a great idea . . .

The galvanized steel sections are manufactured using the rollforming process for dimensional accuracy where they are punched, pressed and cut to length. The sections are simply assembled and placed upside-down on a flat surface over selected reinforcement mesh. The concrete is poured into the base and leveled to form a consistent thickness. After the initial cure the floor is lifted from the flat bed, flipped and is ready for the building frame to be attached.

The transportable floor has many features including:

- All service holes and connecting bolt holes are pre-punched into the boundary channels.
- Lifting eyes, pier positions and any frame hold down connections are factory fitted.
- Concrete slab thickness of 65mm to 95mm.
- The floor requires no mould or formwork meaning any size floor within the limits of the rollformed sections can be accommodated and produced on any flat surface.
- Any recesses are easily pre-formed into the finished slab.

This method of construction ensures accurate repeatability in size and quality of a Transportable Concrete Floor.



Design certification

The Speedfloor Transportable Floor meets or exceeds the following Australian and New Zealand Building Standards.

AS/NZS 1170.0:	Structural Design Actions Part 0: General Principles
AS/NZS 1170.1:	Structural Design Actions Part 1: Permanent, Imposed and Other Actions
AS3600:	Concrete Structures
AS/NZS 4600:2005:	Cold-formed Steel Structures
AS 4100-1998:	Steel Structure



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**Building Act 1993
Building Regulations 2006
Regulation 1507: Certificate of Compliance—Design**

To

Relevant building surveyor:

Postal address:

Postcode:

From

Building practitioner: Michael Knight

Category and class: Engineer (Civil)

Registration No: EC36404

Postal address: Suite 22, 204-218 Dryburgh St, North Melbourne, VIC

Postcode: 3051

Property details (if applicable)

Project: Speedfloor Transportable Concrete Floor

Compliance

I did prepare the design and I certify that the part of the design described as the 7.2m x 3.3m & 14.4m x 4.2m Transportable Concrete Floor complies with the following provisions of the Regulations

AS/NZS 1170.0- Structural Design Actions Part 0: General Principles

AS/NZS 1170.1- Structural Design Actions Part 1: Permanent, Imposed and Other Actions

AS3600: Concrete Structures

AS/NZS 4600:2005- Cold-formed Steel Structures

AS 4100-1998- Steel Structures

AS 2327-2003- Composite Structures Part 1

Design documents

Drawing Nos:

7.2m x 3.3m Transportable Concrete Floor, 14.4m x 4.2m Transportable Concrete Floor & 300mm Perimeter Channel 3.0mm Thk

Prepared by: Speedfloor

Date: 21.09.2012

Computations: Summary Design for 7.2mx3.3m & 14.4mx4.2m Transportable Concrete Floor

Prepared by: ADG

Date: September 2012

Test reports:

Prepared by:

Date:

Other documentation:

Prepared by:

Date:

Signature

Signed: Michael Knight (EC-36404)

Date: 21.09.2012



Speedfloor Transportable

Design Calculations

Prepared for: Speedfloor NZ

Job No. 12736

June 2013

1 Summary of Design Certification

Design Brief

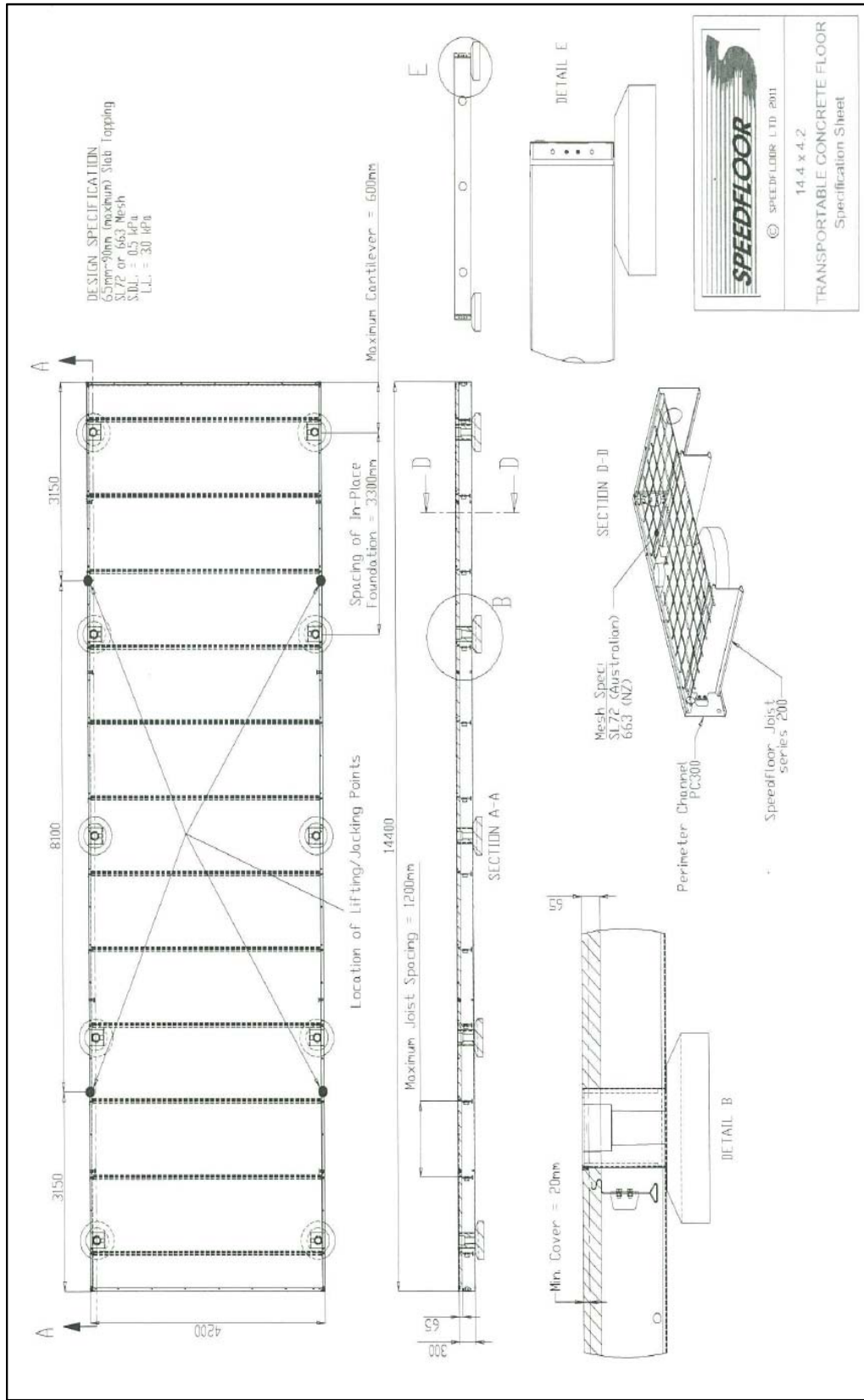
- This report outlines the minimum structural criteria adopted in the design of perimeter channel 7.2m x 3.3m & 14.4m x 4.2m transportable concrete slab.
- All loads to AS/NZS 1170 – Structural Design Action.

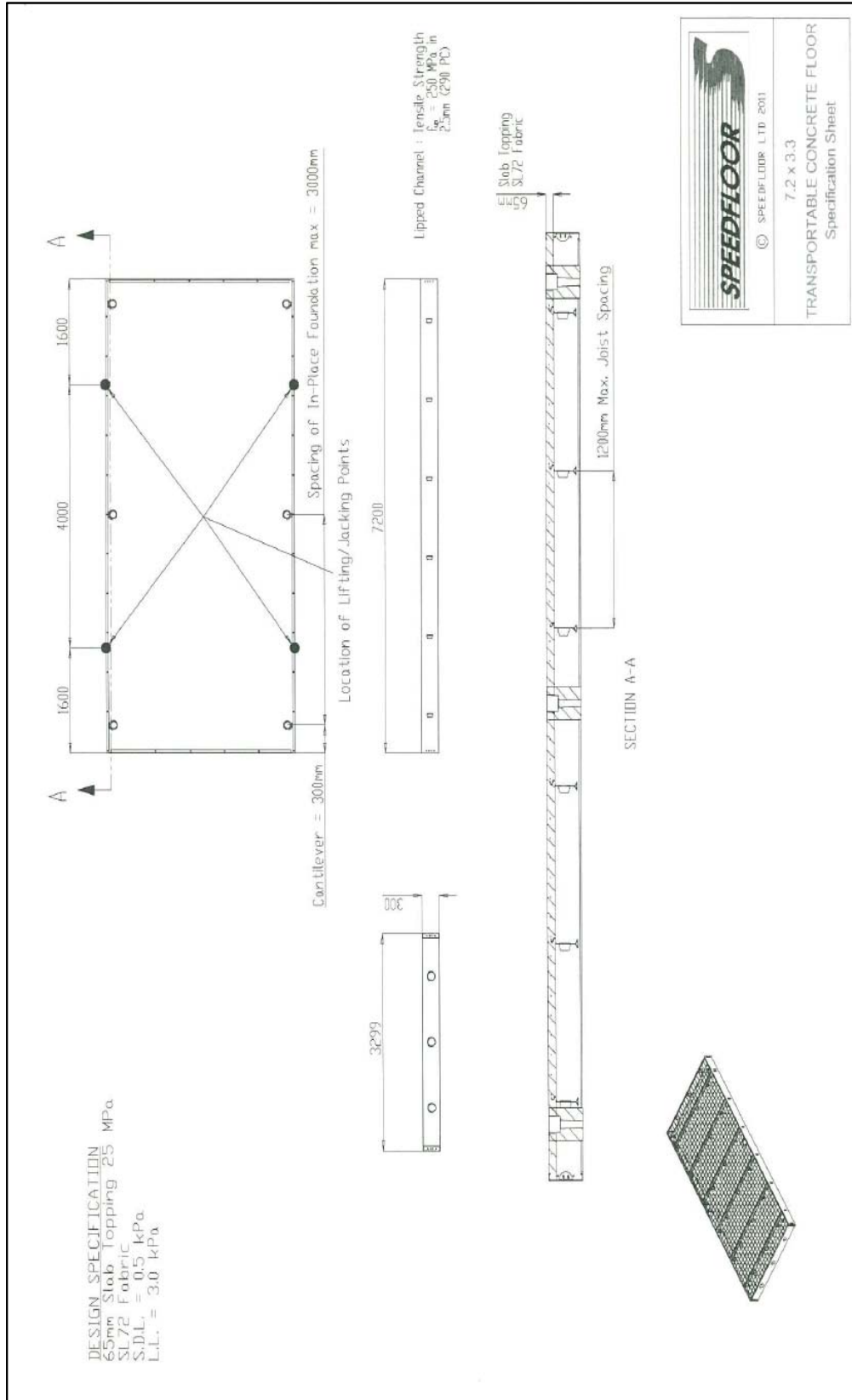
All Designs to

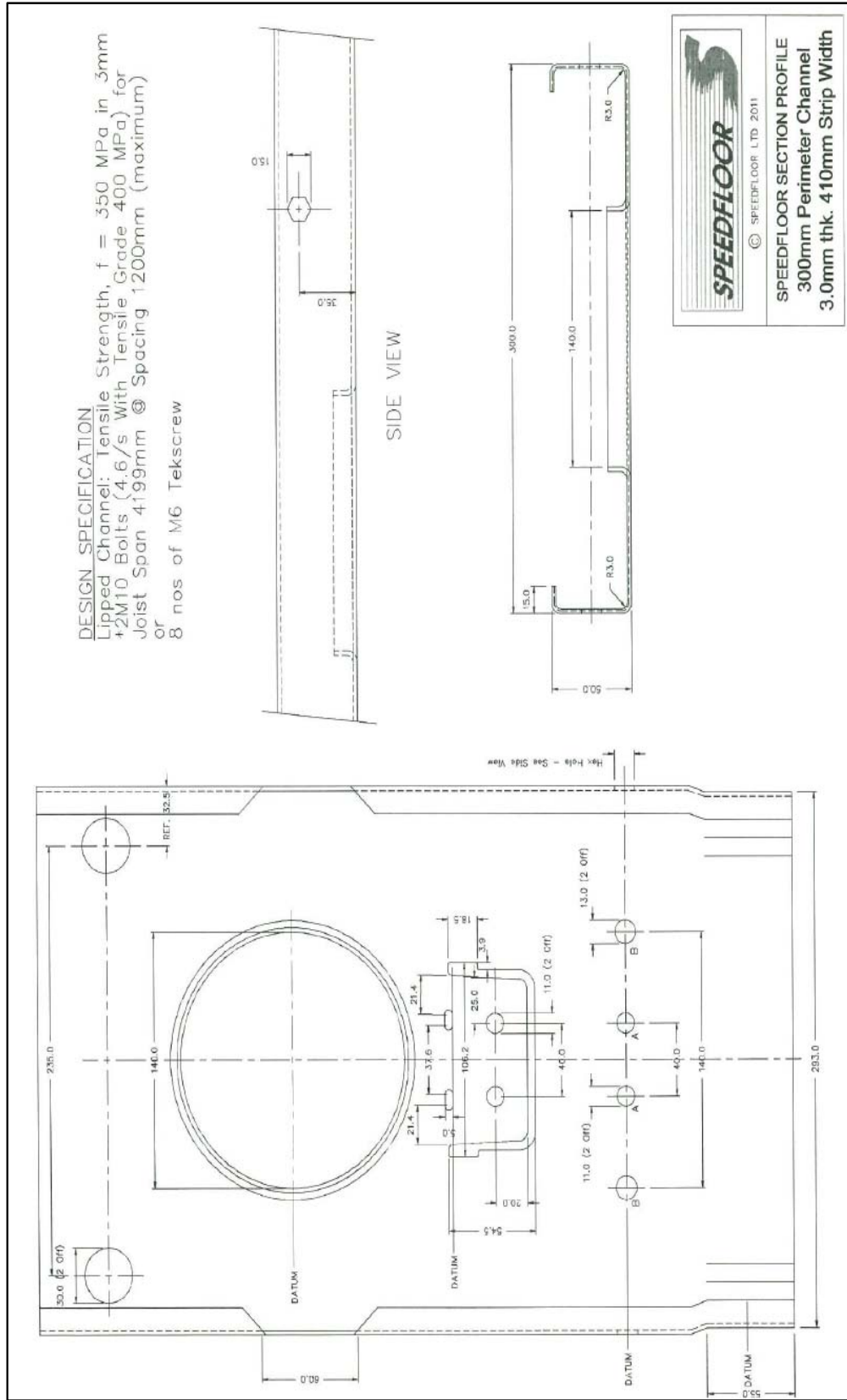
- AS 3600-2009 – Concrete Structures
- AS/NZS 4600: 2005 – Cold Formed Steel Structures
- AS 4100-1998 – Steel Structures
- AS 2327-2003 – Composite Structures Part 1

Summary

- Slab Topping: 65mm to 95mm (maximum)
- Mesh: SL72 Fabric Central
- Concrete: 25MPa minimum
- Design Load: SDL = 0.5 kPa
 L.L = 3.0 kPa
- Speedfloor Joist 200mm deep @ 1230 c/c with maximum span of
- 4200mm. Lipped channel to floor:
 - 300mm deep x 3mm thick lipped channel
 - Tensile strength = 350 MPa
- Connection for Speedfloor Joist to channel:
 - 2 M10 4.6/S bolts (Tensile Grade 400MPa) with maximum joist span 4200mm @ 1200 c/c maximum spacing.







2 Design

The typical prototype of 14.4m x 4.2m and 7.2m x 3.3m Transportable Concrete frames as detailed on Page 2 and 3 respectively.

The structural engineering scope is not intended to cover every loading condition. It is expected that each in service condition will be considered on a per site basis, including but not limited to:

- Temporary shoring.
- Site wind case for specified wind speed.
- Earthquake design.
- Durability considerations.
- Geotechnical report & recommendations.
- Point loads on slab.
- Size & weight of structure to be supported on transportable unit.

The following critical items have been checked and considered in the design:-

1. 3mm Lipped Channel Design

- a. Section Properties & Channel Capacity
- b. Strength / Lifting Case
- c. Connection Detail

2. Speedfloor Joist Design

1. 3mm Lipped Channel Design

a. Section Properties & Channel Capacity

SECTION PROPERTIES:

Lipped Channel 300mm x 50mm x 3mm thick

REMARK

f_y (Yield Stress)	350	N/mm ²	Refer Table 1.5 - AS 4600	
E	2.00E+05	N/mm ²	Refer Table 1.5 - AS 4600	
B	50	mm		
D	300	mm		
A	1200.78	mm ²		
J	3602	mm ⁴		
r_i	3	mm		
t	3	mm		
b_f	44	mm	B - (r _i + t)	b = 44
b_w	288	mm	D - 2(r _i + t)	t = 3
I_x	1.275E+07	mm ⁴		bw = 288
I_y	2.786E+05	mm ⁴		y1 148.5
I_w	4.837E+09	mm ⁴		
I_{xy}	0.000E+00			I_{eff} 1.179E+07
ϕ	0.9		Refer Table 1.6 - AS 4600	Y_{eff} 148.5
Y_{eff}	148.5	mm		
Y_{full}	150			
Z_f (full unreduced section modulus)	8.500E+04			
Z_c (eff. section modulus)	7.942E+04			

NOMINAL SECTION MOMENT CAPACITY

M_s	$Z_s f_y$	b/t	14.67	$< 1.25 Z_s f_y$
		λ_1	26.534	
		λ_2	30.598	
Z_e	$= I_y / \bar{y}_x$			
	7.942E+04			
M_s	$Z_s f_y$			
	27.797 kNm			
ϕM_s	25.017 kNm			

NOMINAL MEMBER MOMENT CAPACITY

(laterally unbraced segments of singly-symmetric section subjected to lateral buckling)

$$M_b = Z_c (M_y / Z_f)$$

For Channel or Z-sections bent about the centroidal axis perpendicular to the web:

$\lambda_b = \sqrt{(M_y / M_b)}$	0.688678543			
M_y	$Z_f f_y$	2.975E+07 Nmm		
M_o	$C_b A r_{01} V(f_{oy} f_{oz})$	62726906.0 Nmm		
		62.73 kNm		
C_b	1.22	(Table 3.3.3.2)		
A	1200.78	mm ²	$r_x = \sqrt{I_x / A}$	103.04416 mm
r_{01}	105.7028		$r_y = \sqrt{I_y / A}$	15.232 mm
$f_{oy} = \pi^2 E / (I_{oy} / r_y)^2$	318.125		x_0	17.971453
$f_{oz} = G J / (A r_{01}^2) * (1 + \pi^2 E I_{wz} / G J I_{ez}^2)$	515.8108		y_0	0
			I_{ey}	1200 mm
			I_{ex}	1200 mm
			I_{ez}	1200 mm
			G	8.000E+04
			$(1 + \pi^2 E I_{wz} / G J I_{ez}^2)$	24.015598
			$G J / (A r_{01}^2)$	21.478159
M_c	28671986.19	Nmm	2.975E+07 My	
	28.672	kNm	2.867E+07 1.11My(1-(10 λ_b^2 /36))	
			6.273E+07 My(1/ λ_b^2)	
M_b	$Z_c (M_y / Z_f)$	2.679E+07 Nmm	$Z_c = I_x / \bar{y}$	7.942E+04 mm ³
		26.79 kNm	$Z_f = I_y$	8.500E+04 mm ³
ϕM_b	24.11096315	kNm		

1. 3mm Lipped Channel Design

b. Check in Strength / Lifting Case

In Strength and Service

Factored Design Actions: $1.2G + 1.5Q$

$G, DL = 24 \text{ kN/m}^3 \times 0.090 = 2.16 \text{ kPa}$

SDL	= 1.0 kPa
	<hr/>
	3.16 kPa

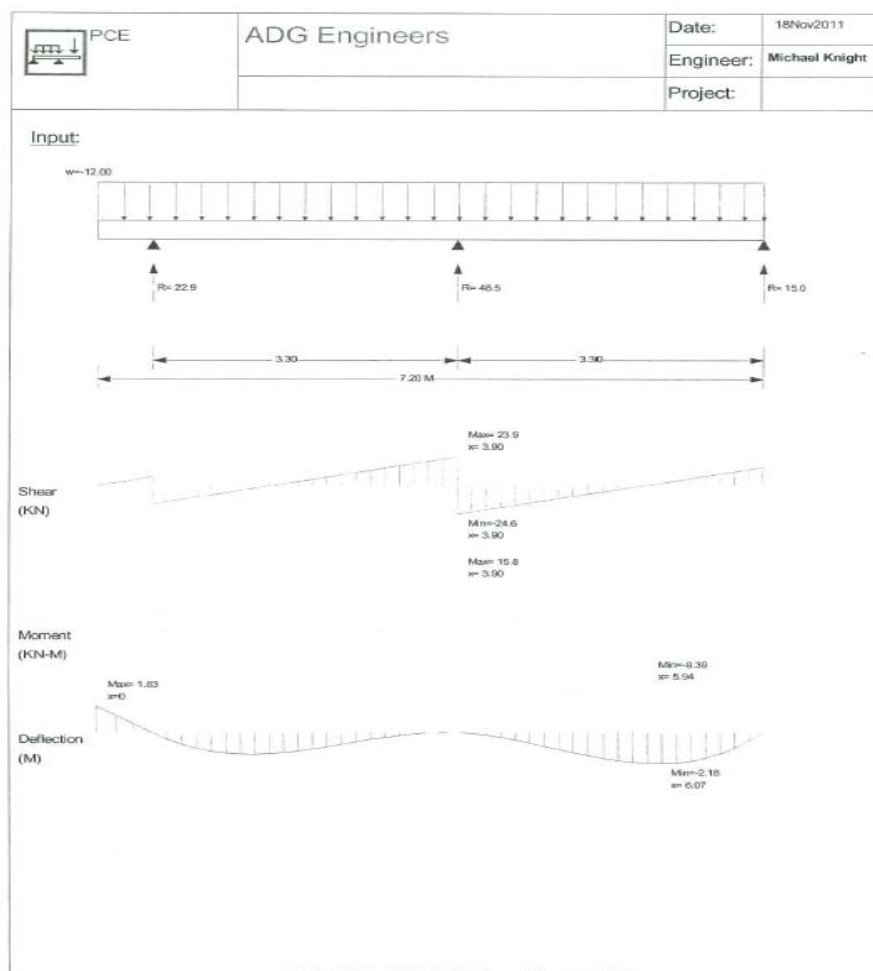
$Q, LL = 3.0 \text{ kPa}$

Assume Design Width = $4200\text{mm}/2 = 2100\text{mm}$

UDL - $G = 3.16 \text{ kPa} \times 2.1\text{m} = 6.6 \text{ kN/m}$

$Q = 3.0 \text{ kPa} \times 2.1\text{m} = 6.3 \text{ kN/m}$

$M^* = 22.9 \text{ kN/m} < \phi M_b \therefore \text{ok}$

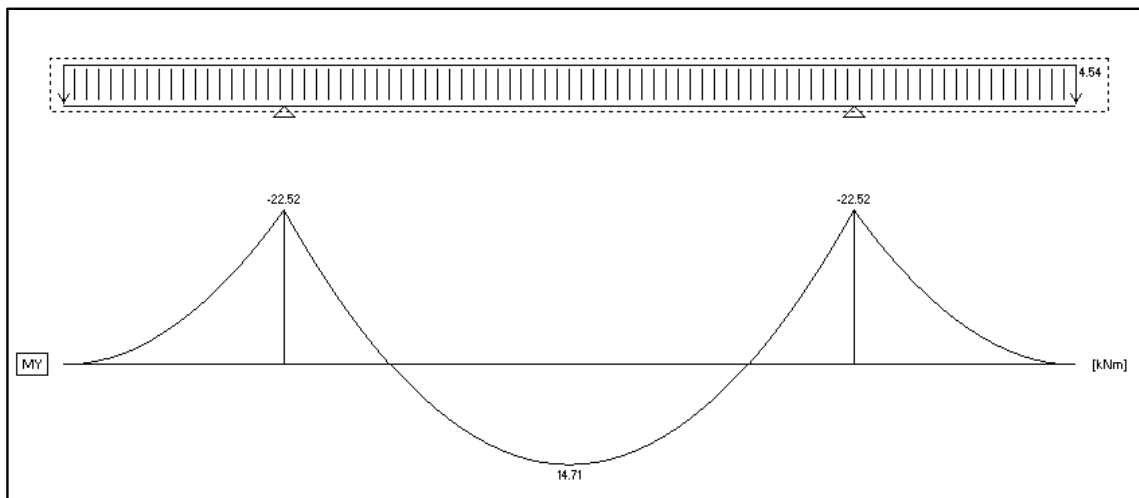


In Lifting Case

Only slab self-weight is considered for lifting case

$$W = 24 \text{ kN/m}^3 \times 0.090\text{m} \times \frac{4.2}{2} = 4.54 \text{ kN/m}$$

Maximum $M^* = 22.52 \text{ kN/m} < \phi M_b \therefore \text{ok}$



1. 3mm Lipped Channel Design

c. Connection Detail Checked

Bolt Capacity Check for Lipped Channel

4.6/s 2M10 bolts with Tensile Grade 400MPa

- (i) Shear capacity ϕV_f of a bolt

$$\begin{aligned}\phi V_f &= \phi 0.62 f_{uf} k_r (N_n A_c + N_x A_o) \\ &= 10.4 \text{ kN}\end{aligned}$$

Provide 2 nos M10

- (ii) Crushing capacity of the ply materials for bolt bearing

$$\begin{aligned}V_b &= 3.2 t_p d_f f_{up} \phi \\ &= 33.6 \text{ kN}\end{aligned}$$

$$\begin{aligned}t_p &= 3 \text{ mm} \\ d_f &= 10 \text{ mm} \\ f_{up} &= 350 \text{ MPa}\end{aligned}$$

- (iii) Bearing capacity of the ply materials for bolt tear out

$$\begin{aligned}V_p &= a_e t_p f_{up} \phi \\ &= 23.6 \text{ kN}\end{aligned}$$

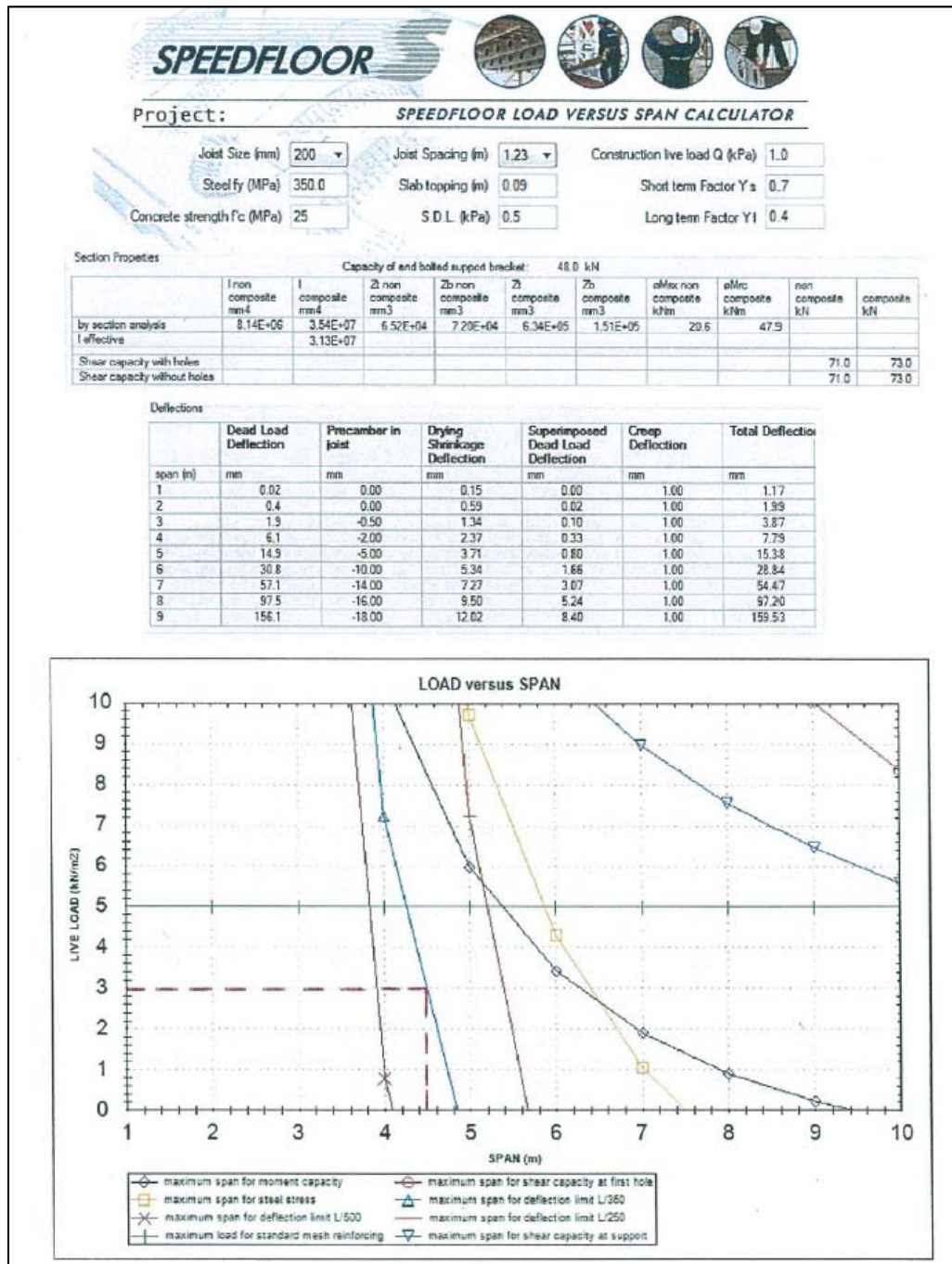
$$\begin{aligned}a_c &= 25 \text{ mm} \\ t_p &= 3 \text{ mm} \\ f_{up} &= \text{MPa}\end{aligned}$$

Note: Bolt capacity checked based on slab = 90mm maximum with Speedfloor Joist = 420mm maximum @ 1200 c/c maximum.

2. Speedfloor Joist Design

The design is carried out using the Speedfloor Joist analysis program. The program considers the joists as composite sections once the concrete is poured and cured.

The following pages are the load / span checks for each case considered.



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Durability & maintenance

Compliance

When supplied and installed in accordance with the manufacturers specifications and design parameters, the Speedfloor Transportable Concrete Floor can be reasonably expected to meet the performance criteria set out in clause B2, Durability of the New Zealand Building Code for a period of 50 years.

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 and perimeter channel is manufactured from steel coated with either 275g/sqm or 450g/sqm of zinc. If they reside in a clean and dry environment they will require no maintenance. If they are exposed, they will require a minimum 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.
2. Periodically inspect 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.
3. All cut edges will initially form a dark red by-product which will in time change to black and then to grey. This is not surface corrosion and is not detrimental to the performance of the product. It is simply a sign that zinc migration is taking place.

Concrete

Special attention is paid to the concrete mixture and the 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. An expanding agent can be used to reduce the effect of shrinkage during the initial cure and a curing compound is used to help control the curing process.

Specifications

- Zinc coating Weight – 275g/m² (Z275) or 450g/m² (Z45)
- Complying with – AS 1397:2001
- Steel grade – G250, G300, G350, G450, G500 or G550
- Steel thickness range – 2.0 – 3.0mm
- Bend diameter – G250, G300 \geq 2T. G450, G500, G550 \geq 4T





Galvanized steel

Galvanizing generally refers to hot-dip galvanizing which is a way of coating steel with a layer of metallic zinc. Galvanized coatings are quite durable in most environments because they combine the barrier properties of a coating with some of the benefits of cathodic protection. If the zinc coating is scratched or otherwise locally damaged and steel is exposed, the surrounding areas of zinc coating form a galvanic cell with the exposed steel and the coating essentially re-seals itself. Even for large areas the surrounding zinc continues to significantly impede corrosion of the base metal. This is a form of localized cathodic protection - the zinc acts as a sacrificial anode.

Because the galvanized coating is metal-lurgically bonded to the steel, under no circumstances can moisture travel under the coating to create an accelerated corrosion cell.

Reaction between galvanized surface and concrete

Zinc reacts with wet concrete to form calcium hydroxyzincate accompanied by the evolution of hydrogen. This corrosion product is insoluble and protective of the underlying zinc (provided that the surrounding concrete mixture is below a pH of about 13.3). Research has shown that during this initial reaction period until coating passivation and concrete hardening occurs, some of the pure zinc layer of the coating is dissolved. However, this initial reaction ceases once the concrete hardens and the hydroxyzincate coating has formed.



Building code parameters

Australia

The Building Code of Australia Volume 2 sets out the following requirements for coatings of steel frame products

	Area 1	Area 2	Area 3
Where	Within building envelope	Outside building envelope	Where 1 & 2 do not apply
Location	More than 300 metres from breaking surf	More than 1 kilometre from still water	
	and	and	
	Not in a heavy industrial area	More than 10 kilometres from coast with breaking surf	
		And	
		Not in a heavy industrial area	
Coating	Minimum Z275 or AZ150	Minimum Z275 or AZ150	More than Z275 or AZ150

NOTE: The building envelope is deemed to be a space in the building where the steel frame does not have direct contact with the external atmosphere, other than for normal ventilation purposes. Areas not within the building envelope include floor framing members where there is no continuous perimeter subfloor walling.

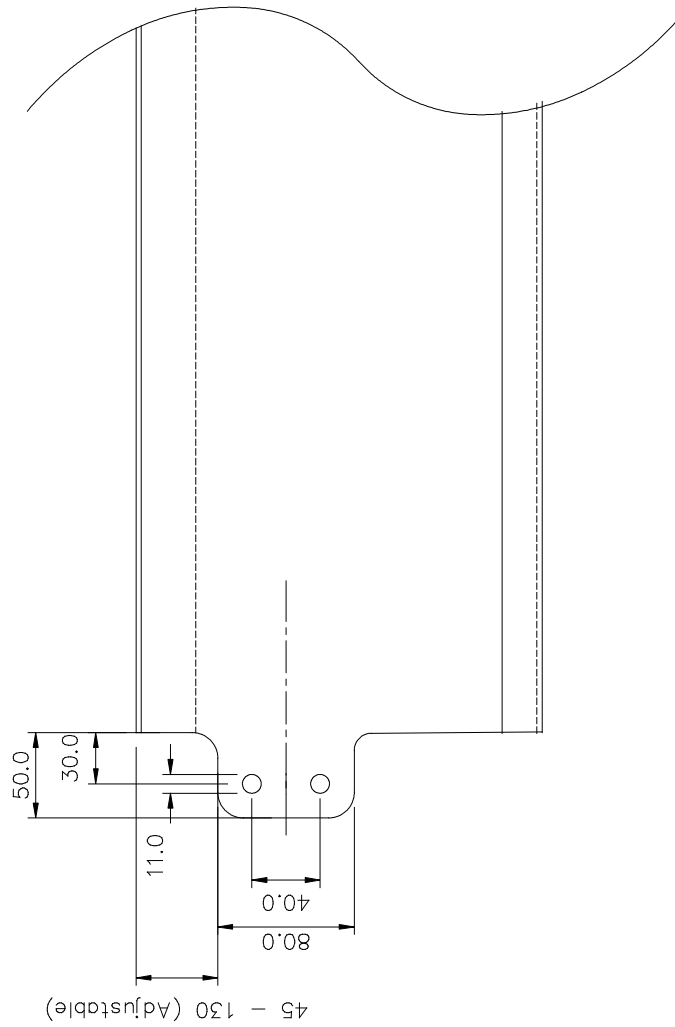
New Zealand

Corrosion map to NZS3404.1	ISO 9223	Typically	Location	Characterised by	Residential /Dry	Internal		Open front		Awning
						Damp	High humidity	Protected	Open	
Seaspray	C5	Within 200m of breaking surf	West coast, South Island	Heavy salt deposits, almost constant smell of salt spray in the air.	1	3	4	4	4	4
		Within 100m of breaking surf	West coast, North Island		1	3	4	4	4	4
		Within 50m of breaking surf	Other coasts		1	3	4	4	4	4
	C4	200m up to 500m or more inland from breaking surf. In the immediate vicinity of calm salt water such as harbour foreshores.	West coast, South Island	Medium salt deposits, frequent smell of salt in the air.	1	3	4	4	4	4
		50m up to 500m or more inland from breaking surf. In the immediate vicinity of calm salt water such as harbour foreshores.	All other coasts		1	1	3	4	4	4
		500m to 1km from breaking surf. In the immediate vicinity of calm salt water such as estuaries.	West coast of both islands and South coast of South Island.		1	1	3	4	4	4
Zone 1	C3	500m to 1km from breaking surf. In the immediate vicinity of calm salt water such as estuaries.	East coast of both islands, South coast of North Island and all harbours.	Little salt deposits, occasional smell of salt in the air.	1	1	3	3	4	4
		1km to 20 km from salt water	West coast of both islands and South coast of South Island.		1	1	3	4	4	4
		1km to 5km from salt water	East coast of both islands, South coast of North Island and all harbours.		1	1	2	3	4	4
Zone 2	C2	20km to 50km from salt water.	West coast of both islands and South coast of South Island.	No marine influence.	1	1	1	2	3	3
		5km to 50km from salt water	East coast of both islands, South coast of North Island and all harbours.		1	1	1	2	3	3
Zone 3		Inland more than 50km from salt water.	Both Islands		1	1	1	1	1	1

Note: all environments may be extended inland by prevailing winds and local conditions.

Key

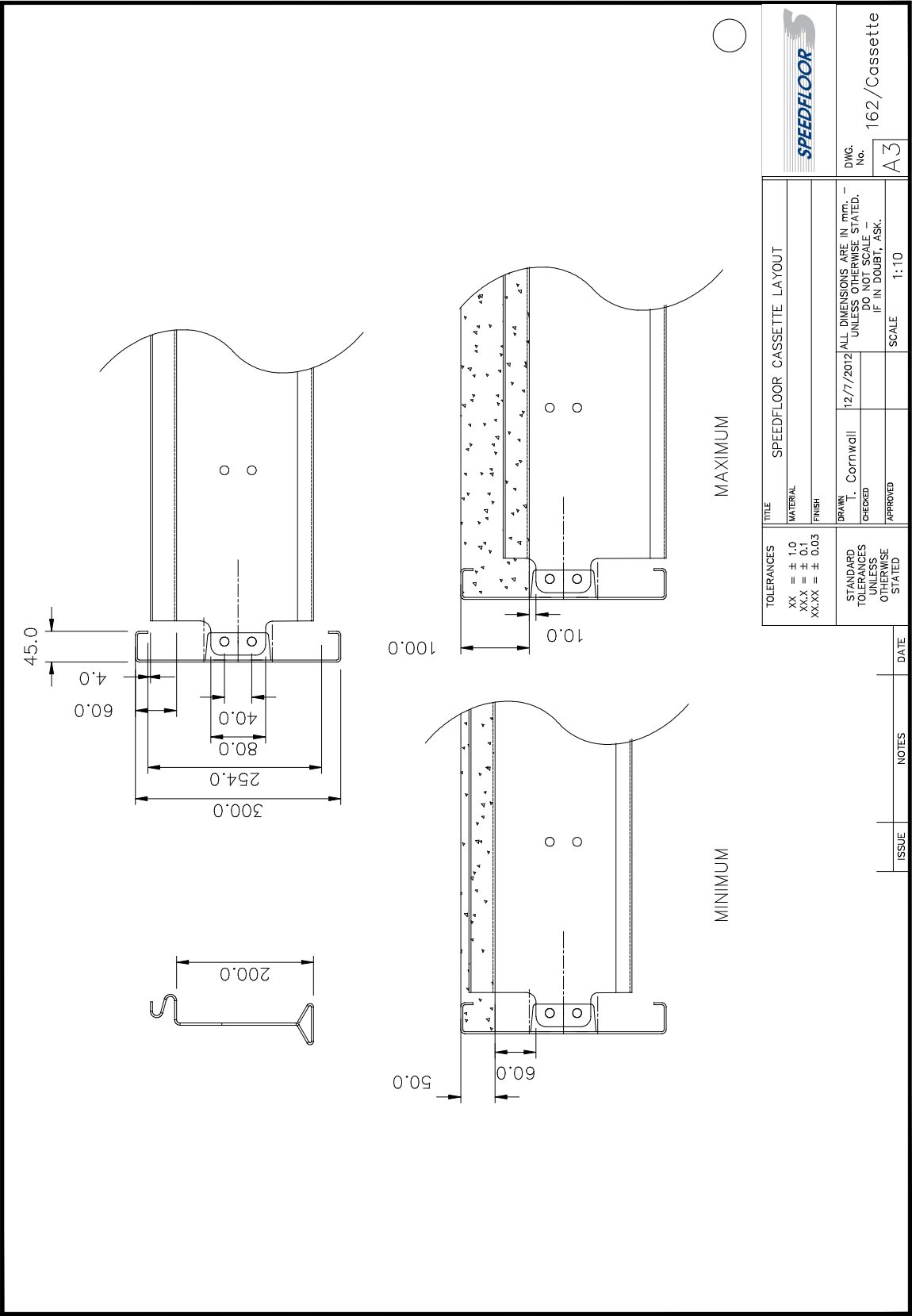
1	Z275
2	Z450 or Z275 and one of the paint systems P1 – P5 applied when new.
3	Z275 and one of (P3, P4 or P5) applied when new, or P1 or P2 applied when new and recoated every 15 years.
4	Z275 and one of (P3, P4 or P5) applied when new and then recoated every 15 years



TOLERANCES		TITLE		SPEEDFLOOR END TAB DETAIL		SPEEDFLOOR	
XX = ± 1.0		MATERIAL					
XX.X = ± 0.1		FINISH					
XX.XX = ± 0.03							
STANDARD TOLERANCES UNLESS OTHERWISE STATED		DRAWN		24/9/2012		ALL DIMENSIONS ARE IN mm. - UNLESS OTHERWISE STATED. DO NOT SCALE - IF IN DOUBT, ASK.	
		CHECKED		T. Cornwall			
		APPROVED				SCALE 1:2.5	

DWG. No.	162/End Tab
A3	

ISSUE	NOTES	DATE



BLIND RIVET NUT

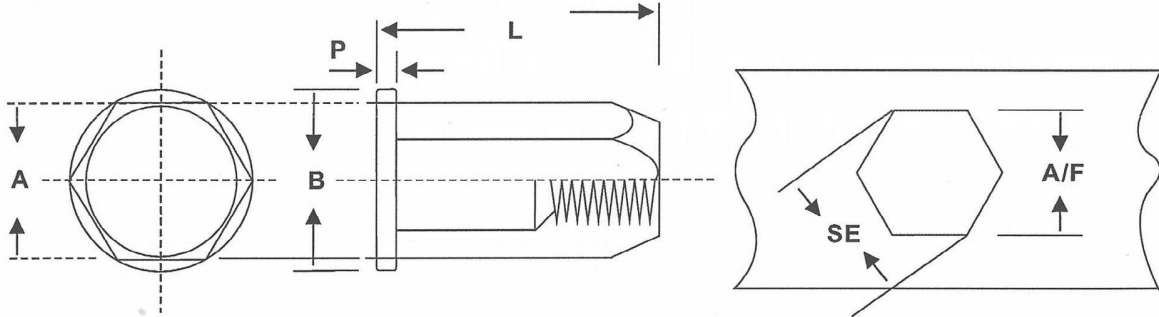
(THIN SHEET NUT-INSERT)

SPECIFICATIONS

MATERIAL: LOW CARBON STEEL

FINISH: ZINC YELLOW

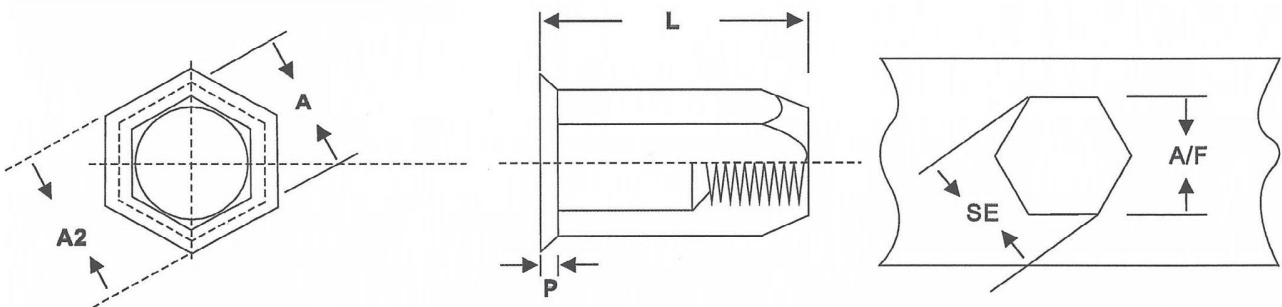
Full Hex Flat Head Type



METRIC DIMENSIONS (mm)

THREAD SIZE	ITEM NO.	A -0.2	B ± 0.3	GRIP RANGE	L +0.5/-0.3	P ± 0.3	SE Min.	HEX HOLE A/F (+0.2)
M4 x 0.7	HH LM4	6.0	9.0	0.5-2.5	11.1	0.8	6.8	6.1
M5 x 0.8	HH LM5	7.0	10.0	0.5-3.0	13.0	1.0	8.0	7.1
M6 x 1.0	HH LM6	9.0	13.0	0.5-3.0	16.0	1.5	10.3	9.1
M8 x 1.25	HH LM8	11.0	16.0	0.5-3.0	18.0	1.5	12.6	11.1
M10 x 1.50	HH LM10	13.0	19.0	1.0-4.5	24.0	2.0	14.9	13.1

Full Hex Flush Head Type



METRIC DIMENSIONS (mm)

THREAD SIZE	ITEM NO.	A +0.05/-0.1	A2 +0.2/-0.5	GRIP RANGE	L +0.5/-0.3	P ± 0.3	SE Min.	HEX HOLE A/F (+0.2)
M4 x 0.7	HH SM4	6.0	7.0	0.5-2.5	10.2	0.5	6.8	6.1
M5 x 0.8	HH SM5	7.0	8.0	0.5-3.0	12.1	0.5	8.0	7.1
M6 x 1.0	HH SM6	9.0	10.1	0.6-3.0	15.2	0.5	10.3	9.1
M8 x 1.25	HH SM8	11.0	12.0	0.7-4.0	17.8	0.6	12.6	11.1
M10 x 1.50	HH SM10	13.0	14.5	0.8-4.5	22.8	1.0	14.9	13.1



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