

Design Manual for FORMDECK™ Floor System

Think FASTER | Think STRONGER | Think INSULATED

Design Manual Editions

Current:

March 2014 Edition

Superceded:

2013 Edition

FormDeck 1.4.08

Older Editions

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INTRODUCTION



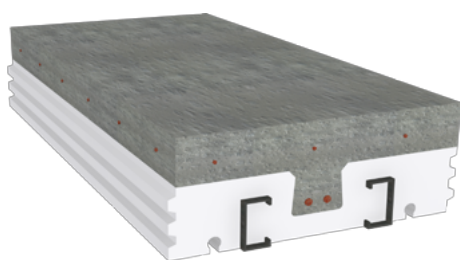
INTRODUCTION

FORMDECK™ is a lightweight polystyrene form used to create insulated suspended slabs. The EPS (Expanded Polystyrene) profile forms structural concrete T beams integrated with a thin, flat concrete slab. This reduces the weight of the slab significantly while maintaining strength.

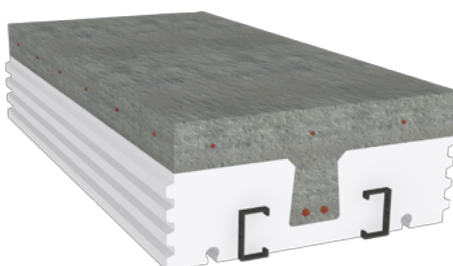
The EPS remains mechanically locked to the underside of the concrete slab once completed and provides an additional barrier for thermal and acoustic performance. The EPS form also provides service chases for plumbing and electrical services and C purlins attach plasterboard.

The FormDeck™ floor system can utilise the following EPS thicknesses to provide varying beam depths for additional strength:

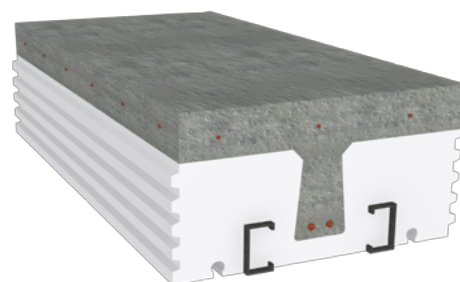
FD230	-	150mm EPS, 100mm Structural Concrete Beam.
FD280	-	200mm EPS, 150mm Structural Concrete Beam.
FD330	-	250mm EPS, 250mm Structural Concrete Beam.



FD230 Model



FD280 Model



FD330 Model

FormDeck™ Options

These options enable the construction of slabs with a range of slab thicknesses, beam depths and finishes to provide suitable structural, fire, sound and thermal performance for any application.

This manual has been prepared to assist in the detailing of the FormDeck™ floor system. It provides a basis from which to work, but does not replace the services of professional consultants on specific projects.

Formcraft provides technical support throughout the design and construction process to ensure quality project outcomes.

Advantages

FormDeck™ is a sustainable floor system that is fast to construct, minimises concrete usage, delivers high energy efficiency and creates a quiet, comfortable interior environment.

Speed/Cost Savings

Formcraft's T-beam concrete forming technology delivers proven savings through its innovative design providing the required strength and minimising concrete usage. Additional cost savings are derived from earlier occupancy and a low maintenance environment.

The lightweight product enables convenient on-site assembly and provides furring strips ready for ceiling installation to the underside.

Strength

The use of a steel reinforced concrete beam integrated with the slab provides the required strength while reducing the weight of the building.

The integration of FormDeck™ with Formcraft's walling system FormPro® creates an exceptionally solid superstructure with reduced air infiltration and high structural, thermal and sound performance.

Sustainable/Green Building

FormDeck™ floors allow architects and designers to create buildings that use fewer natural resources and provide ongoing energy savings for the project.

FormDeck™ floors:

- Provide substantial reductions in heating and cooling costs because of the effective R-value (thermal resistance level) of between R3.8 - R6.0
- Allow any waste produced to be 100% recyclable
- Are manufactured using no HCFCs or CFCs during the manufacturing process
- Create structures that last longer and require less maintenance.

When the FormDeck™ floor system is incorporated into a project, its energy efficiency and material properties can help a project qualify for superior performance under the new Section J requirements of the BCA.

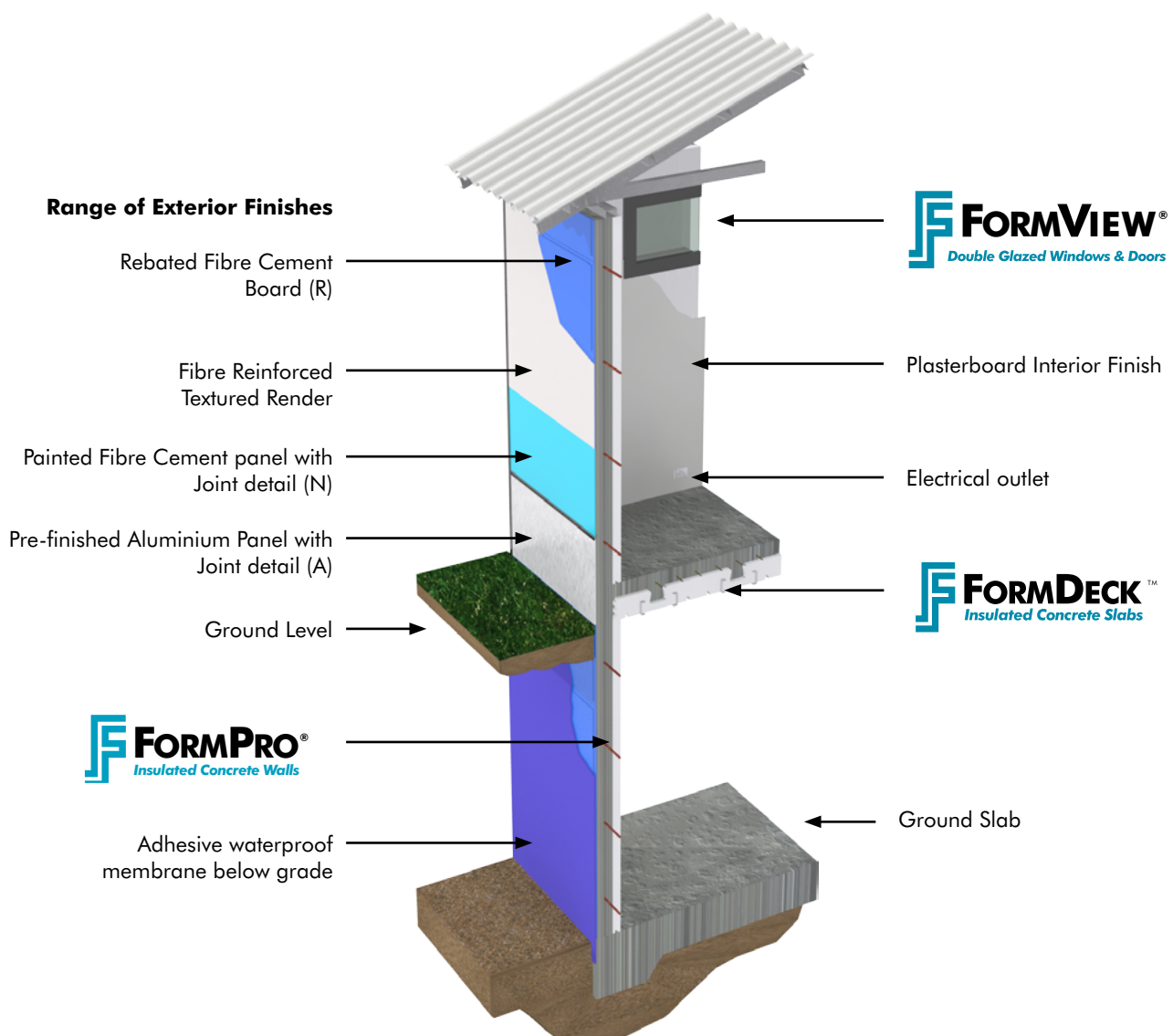
FORMDECK™ CHARACTERISTICS

The FormDeck™ formwork is designed to stay in place on the underside of the slab and also serve as the substrate for finishing systems. When concrete is poured into the FormDeck™, the concrete forms a structurally sound, light and insulated floor slab.

The concrete beam depths are variable to allow for differing span requirements. In addition, the slab topping thickness can be easily varied to increase or decrease FRL ratings. FormDeck™ floors are used in commercial and residential construction.

Product literature, technical information, CAD/BIM details, specifications and product samples are available upon request.

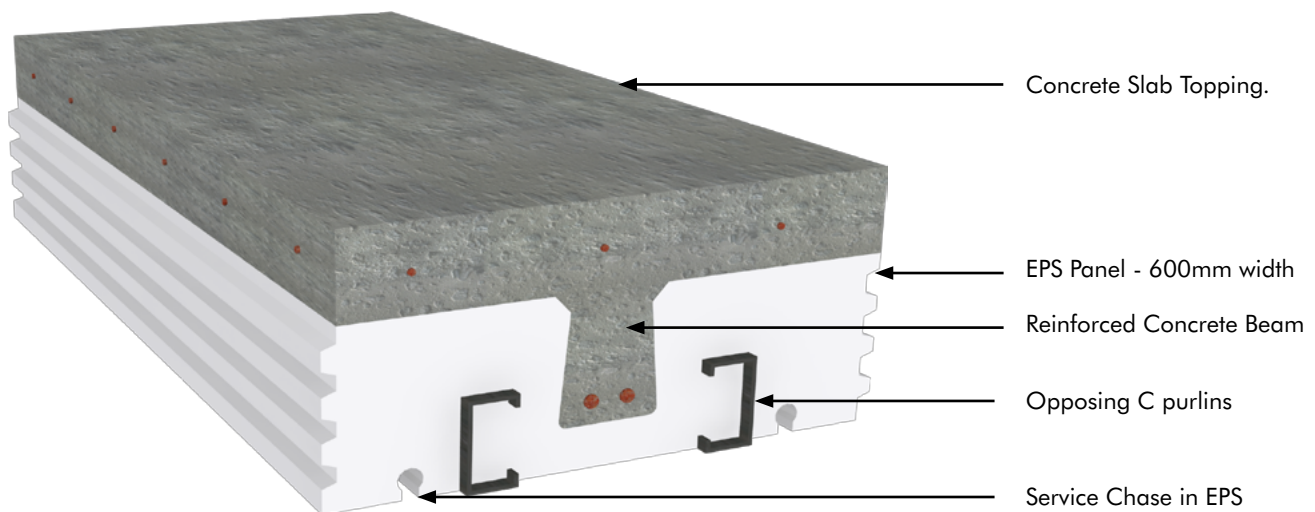
All FormDeck™ C purlins are delivered custom cut to span lengths ready for on-site assembly.



FORMDECK™ CHARACTERISTICS

FormDeck™ is a modular form that comprises an EPS block that is 600mm wide by 3600mm long and are fed onto the continuous C purlins to make the required span. The EPS blocks are designed with groove joints on either side for interlocked assembly and to provide adequate seal between modules. These blocks are supported by one continuous C purlin every 300mm which provides support during the concrete pour and also doubles as a furring channel for ceiling installation.

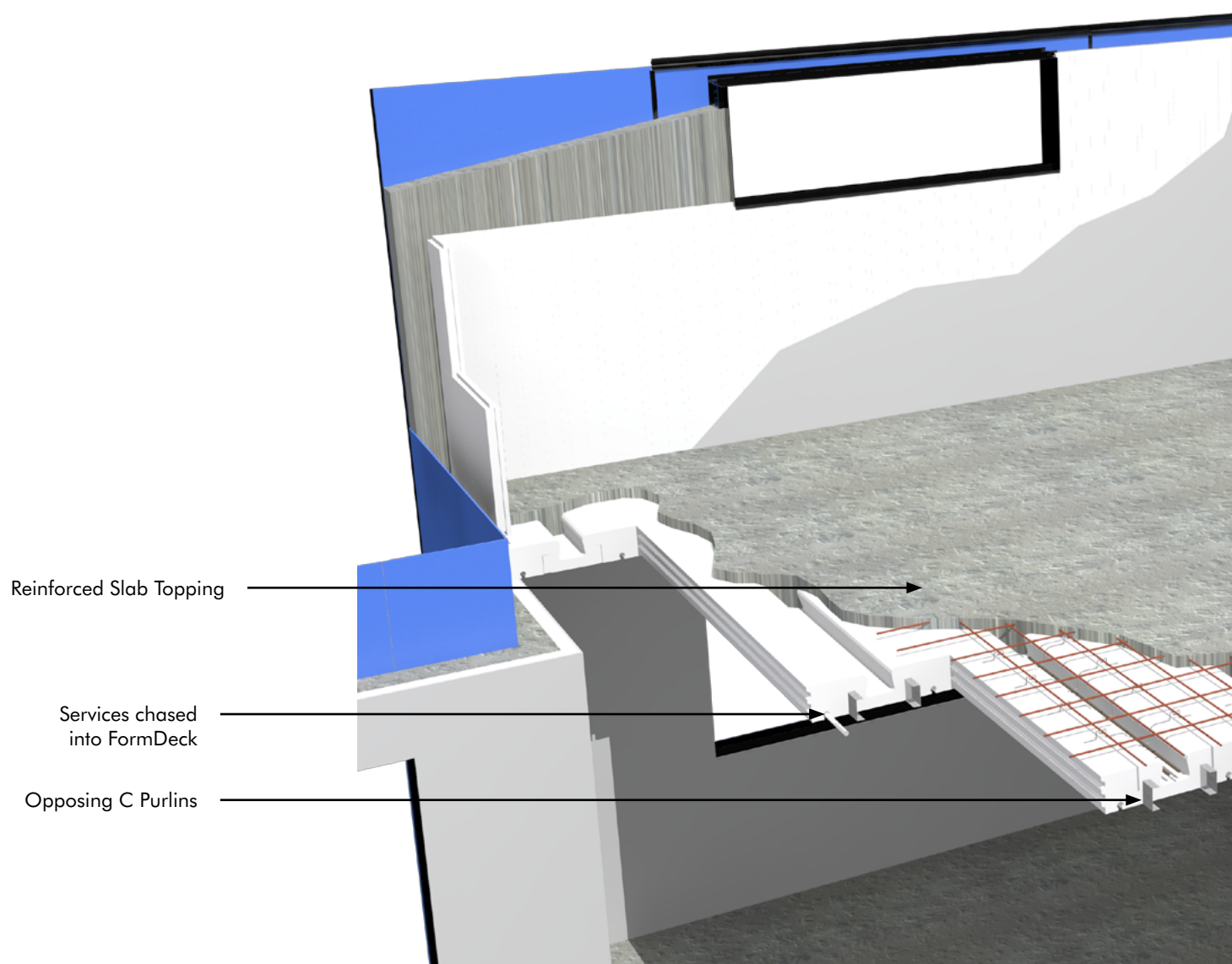
The FormDeck™ blocks are easily assembled on site.



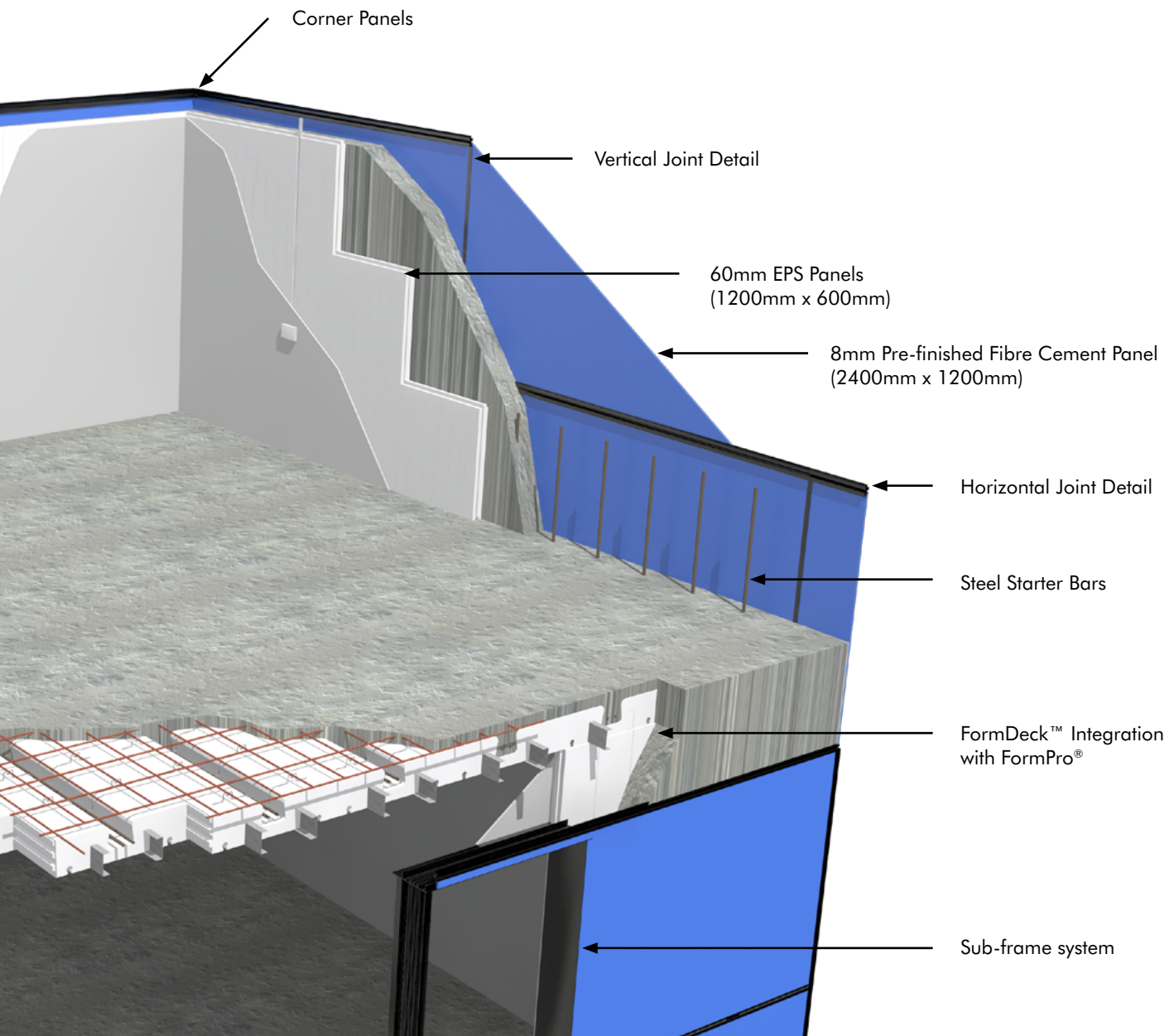
FormDeck™ FD280 Module

FORMDECK™ TYPICAL LAYOUT

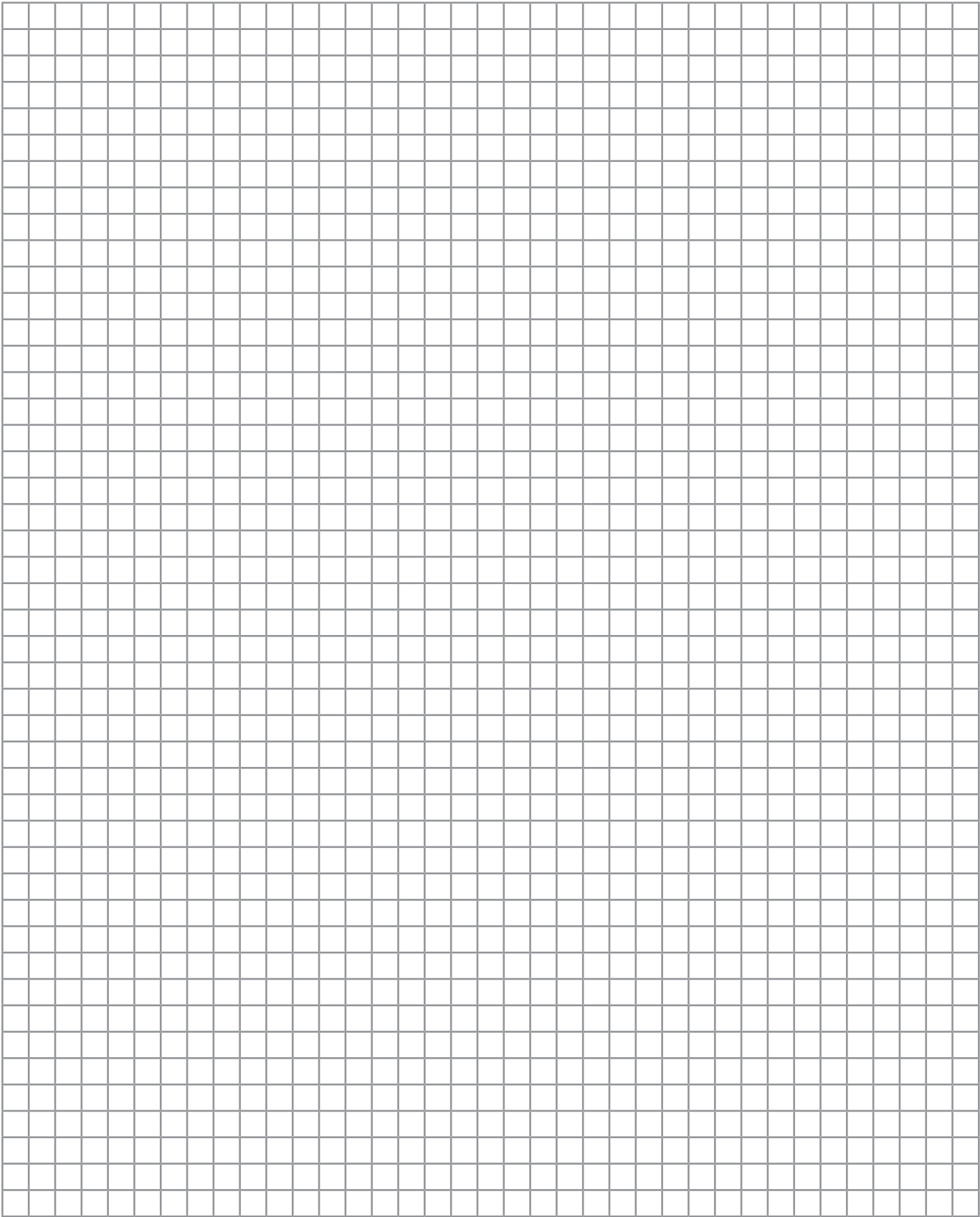
Integration of FormDeck™ with the FormPro® Wall System



FORMDECK™ TYPICAL LAYOUT



NOTES

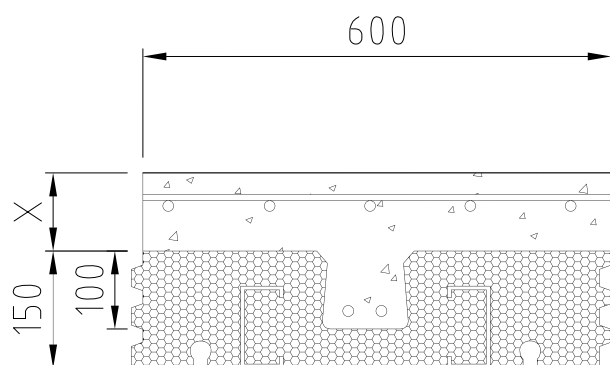


ARCHITECTURAL

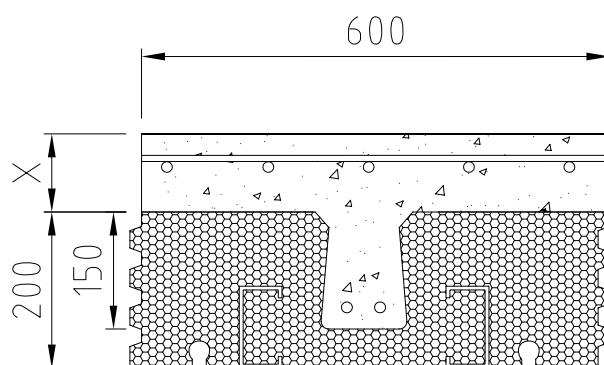


FORMDECK™ SELECTION GUIDE

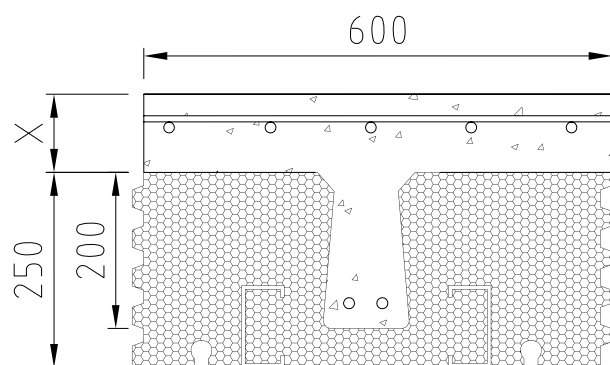
Selection Guide



FD230



FD280



FD330

MODEL NO.	BEAM DEPTH EX. TOPPING	TOTAL EPS THICKNESS	TOPPING THICKNESS	TOTAL SLAB THICKNESS	FIRE	THERMAL
					FRL	R-Value
FD230	100mm	150mm EPS	80mm	230mm	60/60/60	3.81 m ² .K/W
			100mm	250mm	90/90/90	
			120mm	270mm	120/120/120	
FD280	150mm	200mm EPS	80mm	280mm	60/60/60	4.92 m ² .K/W
			100mm	300mm	90/90/90	
			120mm	320mm	120/120/120	
FD330	200mm	250mm EPS	80mm	330mm	60/60/60	6.04 m ² .K/W
			100mm	350mm	90/90/90	
			120mm	370mm	120/120/120	

Ceiling Finishes

The most common and cost effective interior finishing material used is Plasterboard. Plasterboard can be applied directly to the ceilings using conventional drywall screws that are fixed into the C purlins, or with drywall screws and EPS compatible adhesives.

It is recommended that plasterboard is applied to FormDeck™ ceilings to give a high level of internal finish.

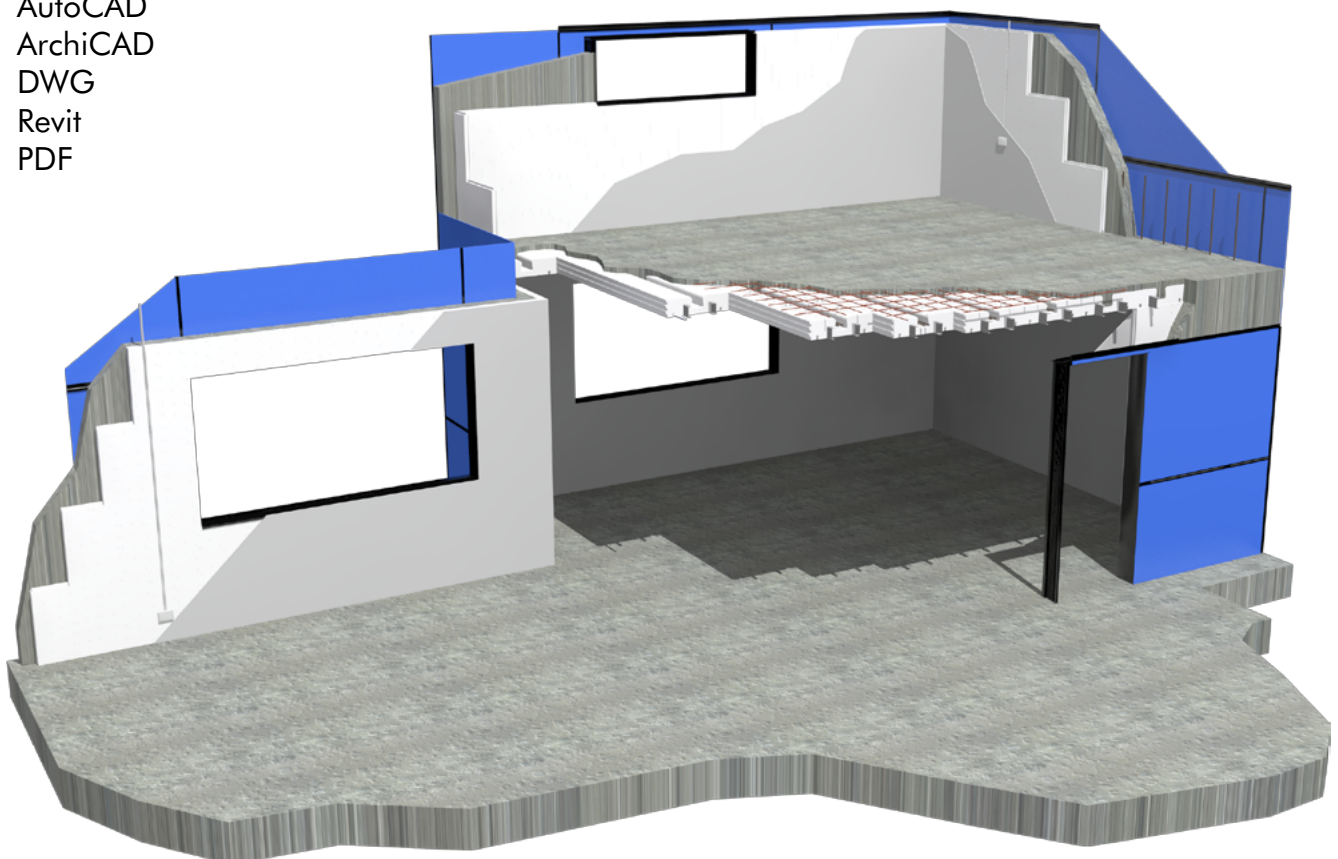
This can be achieved by one of two methods;

1. Direct stick plasterboard – is used internally to achieve a high level of finish.
2. Plasterboard on battens – is used when there is a high level of service reticulation required.
3. Dropeiling - Drop ceiling is used when mechanical ducting is required in the ceiling space.

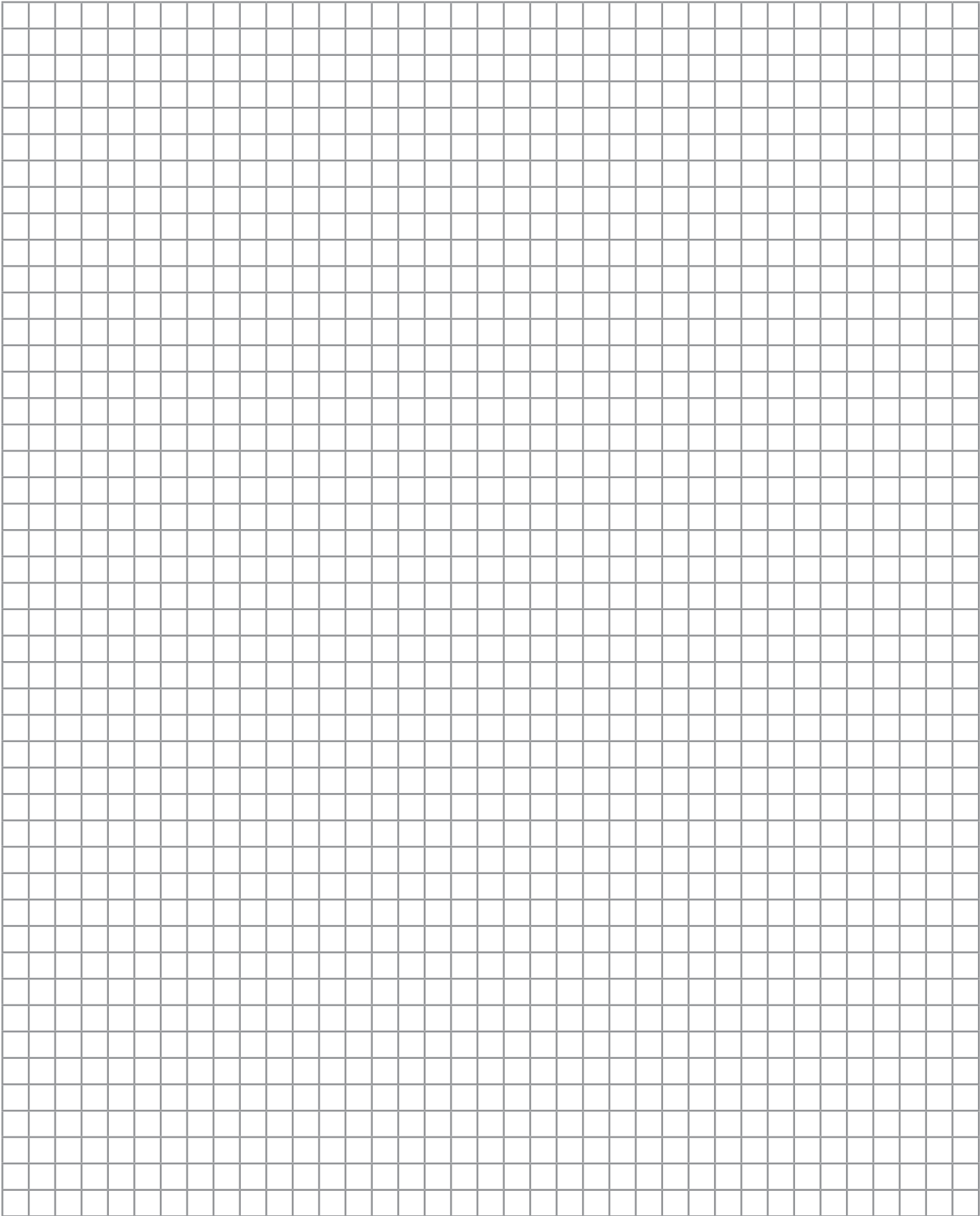
BIM Software

Formcraft realises the importance of software in the design of buildings and so can provide product details and models in the following formats;

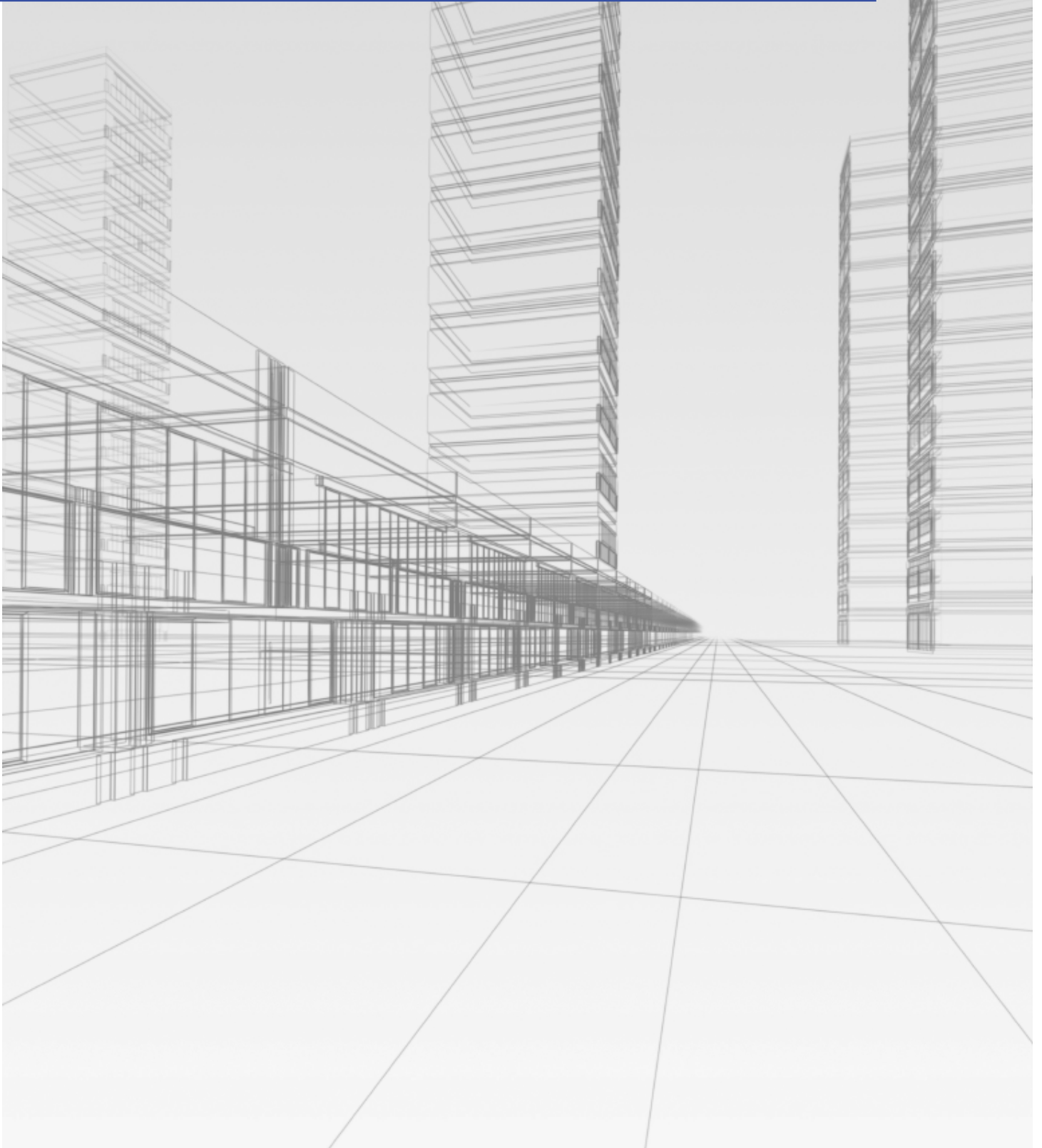
- AutoCAD
- ArchiCAD
- DWG
- Revit
- PDF



NOTES

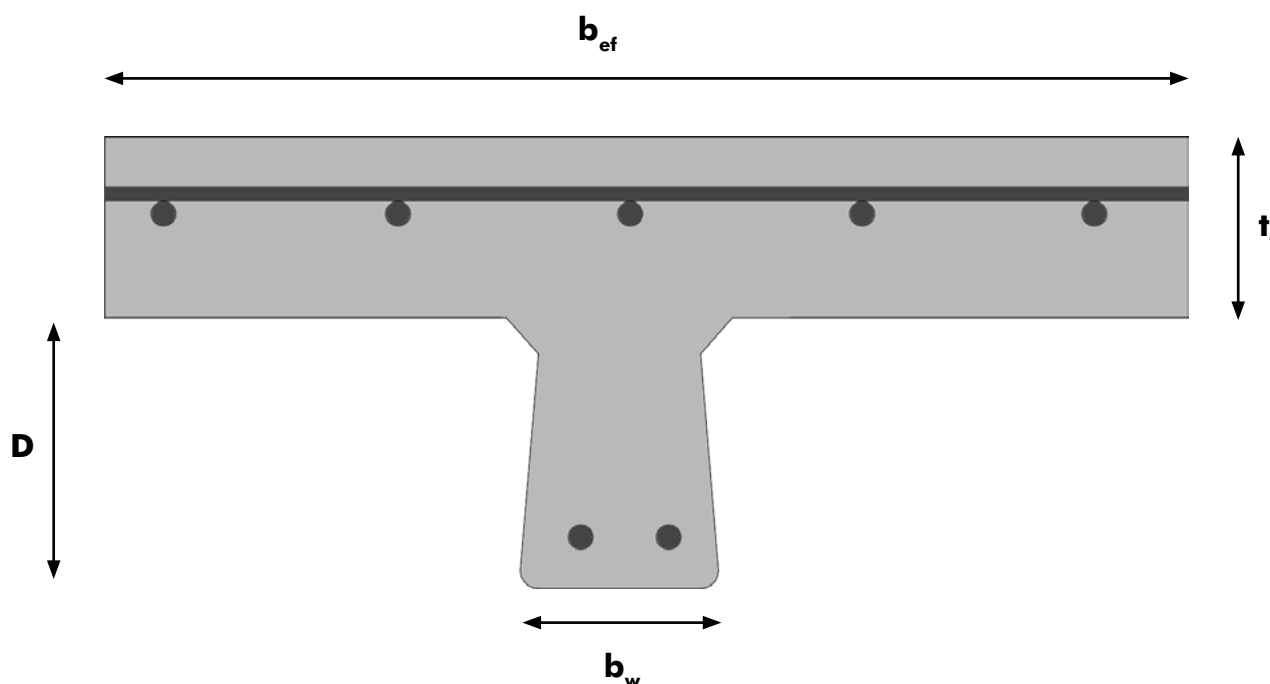


STRUCTURAL



Design Input

Beam Spacing	600mm
Average beam width (b_w)	100mm
Slab Thicknesses (t_f)	100mm
Slab Mesh	SL62
G Superimposed	0.25 kPa
Concrete Density	2400 kg/m ³
f'_c	25 MPa
f_{cm}	29.6 MPa
Bottom Cover	20mm
ψ_l	0.4



NOTES

1. ALL values given are for ESTIMATING PURPOSES ONLY. Detailed calculations by a suitably qualified Engineer are to be performed based from first principles for each specific project.
2. Deflections may be reduced by providing continuous spans, increased area of top steel and increased concrete strength.
3. Mesh type for slab to be chosen accordingly for imposed loading and exposure conditions.
4. A 0.25kPa superimposed Dead Load (G) has been incorporated, to account for ceiling, and services loads.

Limit State Capacity (Bending and Shear)

N-bar /beam	N-bar Area/m (mm ² /m)	Beam D (mm)	f _{m_v} /m width (kNm/m)	f _{v_{sc}} /m width (kN/m)	Total G (kPa)	Max. allowable Live Load Q (kPa)																			
						Span (m)																			
						2.0	2.5	3.0	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	10.0			
2-N12	377	100	25.5	44.2	2.66	27.4	19.7	13.0	9.0	6.4	4.6	3.3	2.4	1.7	1.1	0.7	0.3								
2-N12	377	150	33.1	51.2	2.94	31.8	24.9	17.3	12.1	8.7	6.4	4.7	3.5	2.6	1.8	1.3	0.8	0.4							
2-N12	377	200	40.6	58.1	3.22	36.2	28.4	21.5	15.1	11.0	8.1	6.1	4.6	3.4	2.6	1.8	1.3	0.8	0.4						
2-N16	670	100	44.0	44.0	2.66	27.2	21.3	17.4	14.6	12.5	9.5	7.3	5.6	4.4	3.4	2.7	2.0	1.5	1.1	0.8	0.5				
2-N16	670	150	57.4	50.9	2.94	31.6	24.8	20.3	17.0	14.6	12.7	9.9	7.8	6.2	4.9	3.9	3.1	2.4	1.9	1.4	1.0	0.7			
2-N16	670	200	70.8	57.8	3.22	36.0	28.3	23.1	19.5	16.7	14.6	12.5	9.9	7.9	6.4	5.1	4.1	3.3	2.7	2.1	1.6	1.2			
2-N16	670	250	84.2	64.8	3.50	40.4	31.7	26.0	21.9	18.8	16.4	14.5	12.0	9.7	7.8	6.4	5.2	4.2	3.4	2.7	2.2	1.7			
2-N20	1047	150	87.0	50.6	2.94	31.4	24.6	20.1	16.9	14.5	12.6	11.1	9.9	8.9	8.0	7.1	5.9	4.9	4.1	3.4	2.8	2.3			
2-N20	1047	200	107.9	57.6	3.22	35.8	28.1	23.0	19.4	16.6	14.5	12.8	11.4	10.2	9.2	8.4	7.7	6.4	5.4	4.5	3.8	3.2			
2-N20	1047	250	128.8	64.5	3.50	40.2	31.6	25.9	21.8	18.7	16.3	14.4	12.8	11.5	10.4	9.5	8.7	7.9	6.7	5.7	4.8	4.1			

Values are limited by shear strength

Long Term Total Deflection Limits (Span/250) - Single Span

N-bar / beam	N-bar Area / m (mm ² /m)	Beam D (mm)	Total G (kPa)	Max. allowable Live Load Q (kPa)																
				Span (m)																
				2.0	2.5	3.0	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	10.0
2-N12	377	100	2.66			14.6	8.3	4.7	2.4	0.9										
2-N12	377	150	2.94						6.5	3.9	2.1	0.8								
2-N12	377	200	3.22								5.2	3.2	1.8	0.6						
2-N16	670	100	2.66			19.9	11.2	6.3	3.3	1.4										
2-N16	670	150	2.94						8.4	5.1	2.8	1.3								
2-N16	670	200	3.22				22.2	13.6	15.3	10.1	6.6	4.1	2.4	1.0	3.3	1.9	0.7			
2-N16	670	250	3.50							16.3	11.3	7.8	5.2	3.3						
2-N20	1047	150	2.94						19.0	11.9	7.3	4.3	2.2	0.8						
2-N20	1047	200	3.22								13.9	9.2	5.9	3.6	1.9	0.6				
2-N20	1047	250	3.50									15.3	10.6	7.2	4.7	2.8	1.4	0.3		

Values are limited by strength - See Limit State Capacity tables for maximum allowable loads

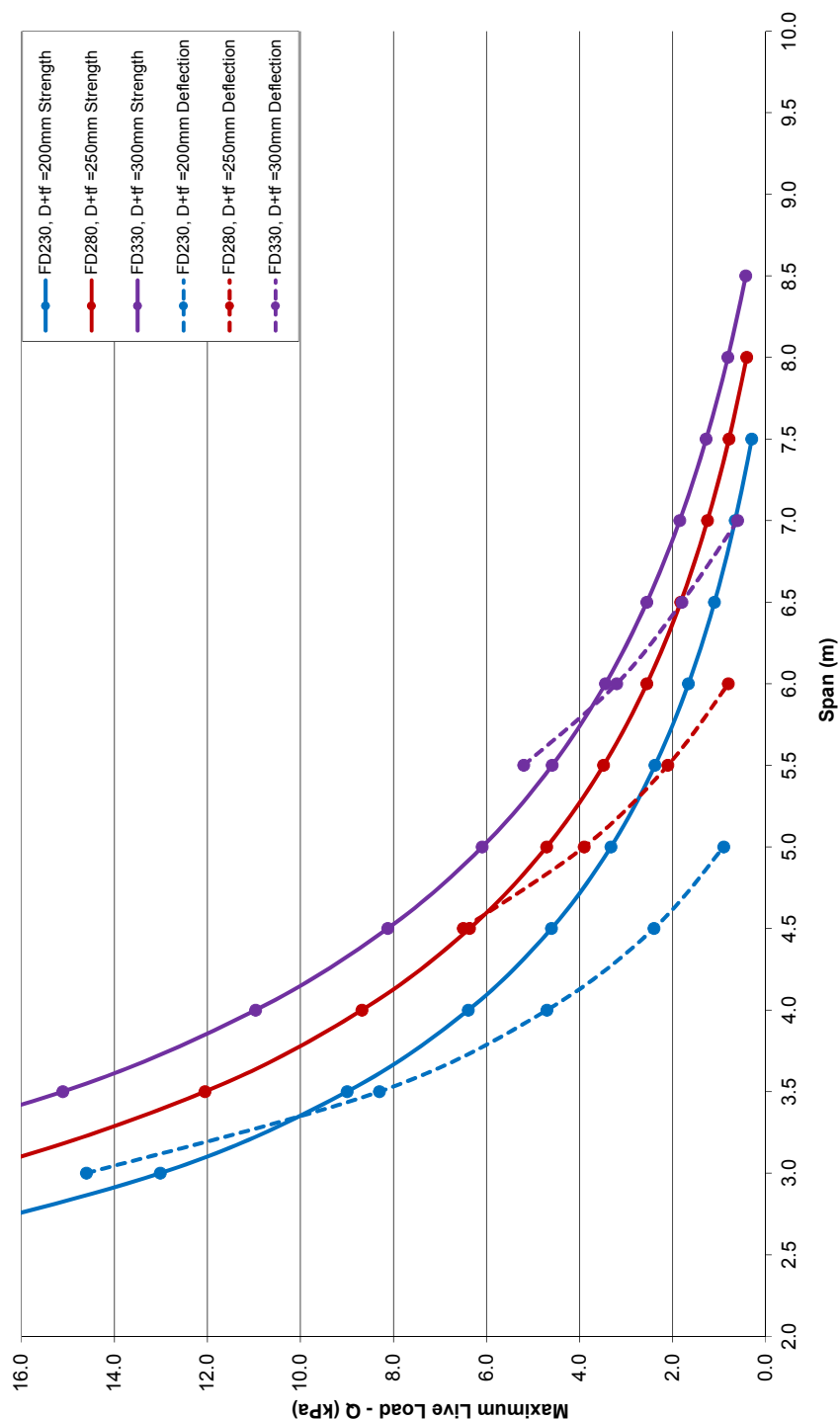
Strength and Long Term Total Deflection Limits, 2-N12 bars/beam

Concrete $f'_c = 25\text{MPa}$

Superimposed Dead Load (G) = 0.25kPa

Single span, $\psi_1 = 0.4$

Deflection limit = span / 250



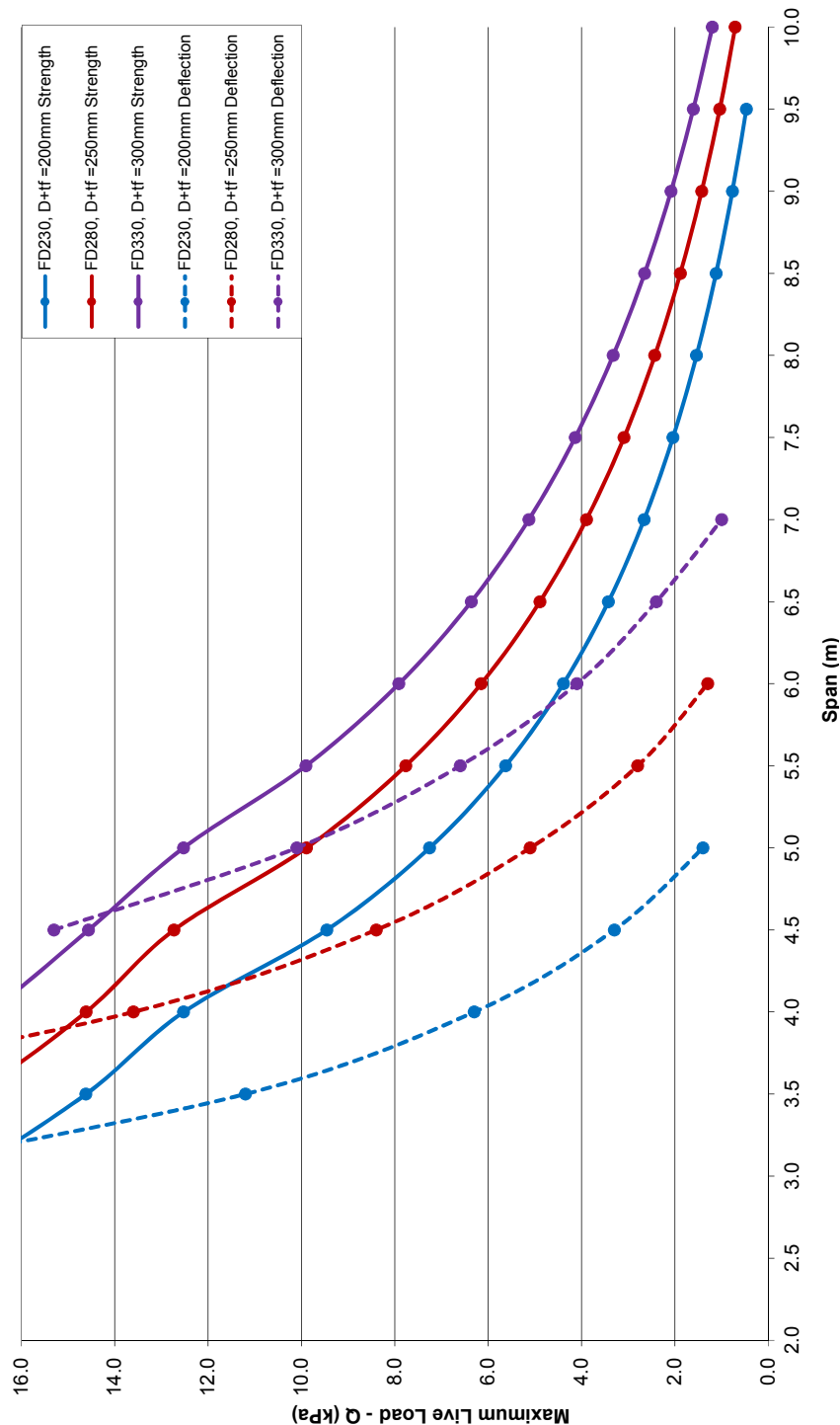
Strength and Long Term Total Deflection Limits, 2-N16 bars/beam

Concrete $f'_c = 25\text{MPa}$

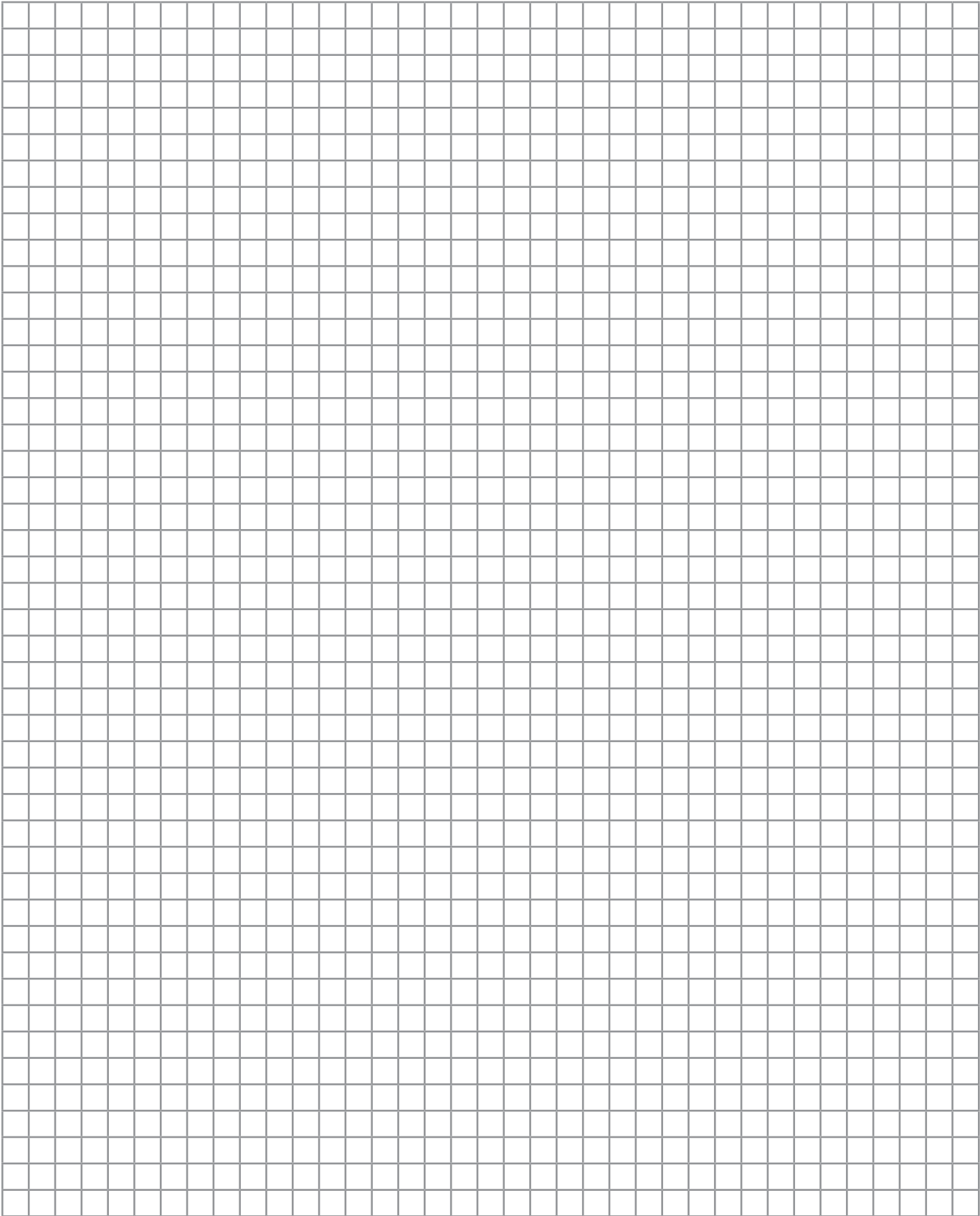
Superimposed Dead Load (G) = 0.25kPa

Single span, $\psi_1=0.4$

Deflection limit = span / 250



NOTES



PERFORMANCE



PERFORMANCE & BCA COMPLIANCE

FormDeck™ walls have been evaluated for compliance with the following Australian Standards and BCA codes

Australian Standards

- AS.3600 Concrete structures
- AS.1366 EPS
- AS.3610 Formwork for concrete
- AS.3700 Masonry structures

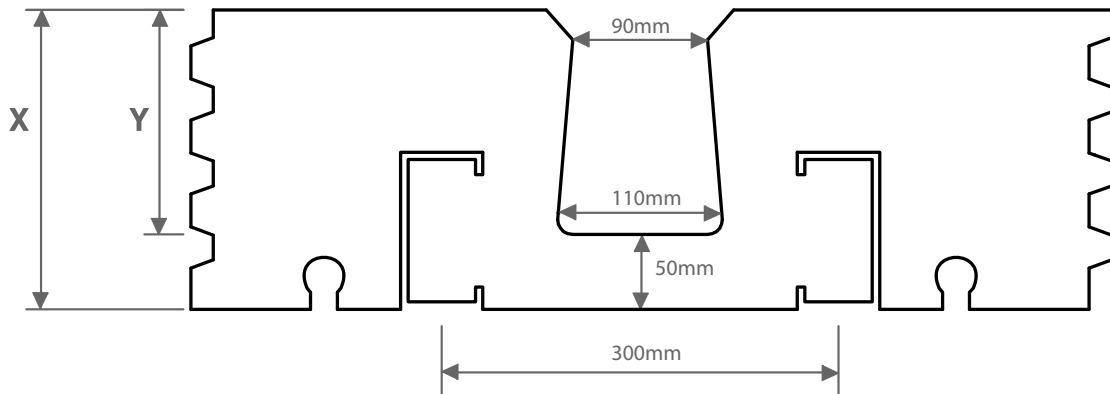
BCA Requirements

- Volume 1 - Class 2 to 9 Buildings
- Volume 2 - Class 1 & Class 10 Buildings - Housing Provisions
- Part 3.7 Fire Safety
- Part 3.8.6 Sound Insulation

Tests Conducted on EPS Material

Test Description	Value
Water Absorption	0.18%
Water Vapour Permeance	94.0ng/Pa-s-m ²
Compressive Strength	165kPa
Flexural Strength	365kPa
Dimensional Stability – Thermal & Humid Aging	0.5%
Density	27.5kg/m ³
Dimensions	+ - 3mm
Limiting Oxygen Index	29.1%
Formaldehyde Emission	No formaldehyde detected
Fungi Resistance	No fungal growth detected
Flame Spread Rating	< 25
Smoke Developed Rating	< 450

Thermal Performance Calculations (R-Value)



General assumptions:

- Concrete topping of 80mm
- Thermal conductivity for Concrete at density 2850 Kg/m³ = 1.44 W/mK
- Thermal Conductivity for EPS at density of 26 Kg/m³ and 23°C = 0.0376 W/mK
- Thermal conductivity of Plasterboard = 0.173 W/mK
- 3.4m/s wind and surface emittance = 0.9

Non-EPS R-value contribution - (thickness (m)/k)

Outside air	= 0.044
Inside air	= 0.12
80mm concrete = 0.08 / 1.44	= 0.056
10mm plasterboard = 0.01 / 0.173	= 0.057
Total non EPS contribution	= 0.28

EPS R-value contribution - (thickness (m)/k)

FD230 EPS, Average thickness of 133mm	= 0.133 / 0.0376	= 3.54
FD280 EPS, Average thickness of 175mm	= 0.175 / 0.0376	= 4.65
FD330 EPS, Average thickness of 217mm	= 0.217 / 0.0376	= 5.77

PERFORMANCE & BCA COMPLIANCE

Thermal Performance Values

Product Line	Model	Total Floor Thickness	Total EPS Thickness (X)	Beam Depth (Y)	EPS R-value	Total R-Value
FormDeck™	FD230	230mm	150mm	100mm	3.54	3.82
FormDeck™	FD280	280mm	200mm	150mm	4.65	4.93
FormDeck™	FD330	330mm	250mm	200mm	5.77	6.05

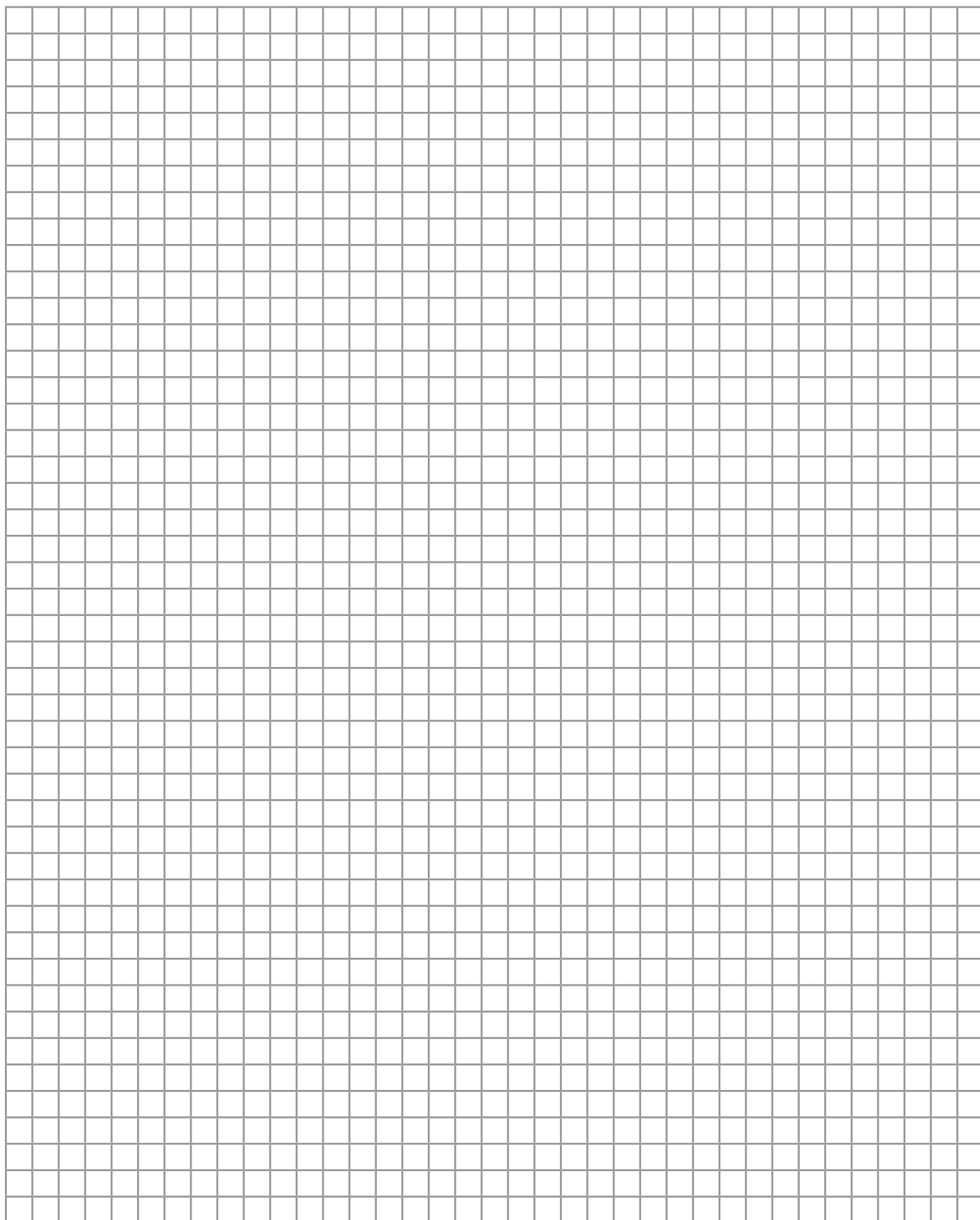
FormDeck™ Model Performance

MODEL NO.	BEAM DEPTH EX. TOPPING	TOTAL EPS THICKNESS	TOPPING THICKNESS	TOTAL SLAB THICKNESS	FIRE	THERMAL
					FRL	R-Value
FD230	100mm	150mm EPS	80mm	230mm	60/60/60	3.81 m².K/W
			100mm	250mm	90/90/90	
			120mm	270mm	120/120/120	
FD280	150mm	200mm EPS	80mm	280mm	60/60/60	4.92 m².K/W
			100mm	300mm	90/90/90	
			120mm	320mm	120/120/120	
FD330	200mm	250mm EPS	80mm	330mm	60/60/60	6.04 m².K/W
			100mm	350mm	90/90/90	
			120mm	370mm	120/120/120	

NOTES

This image shows a full page of blank graph paper. The grid consists of small, uniform squares formed by thin, light gray lines. There are no margins, text, or other markings on the page.

NOTES

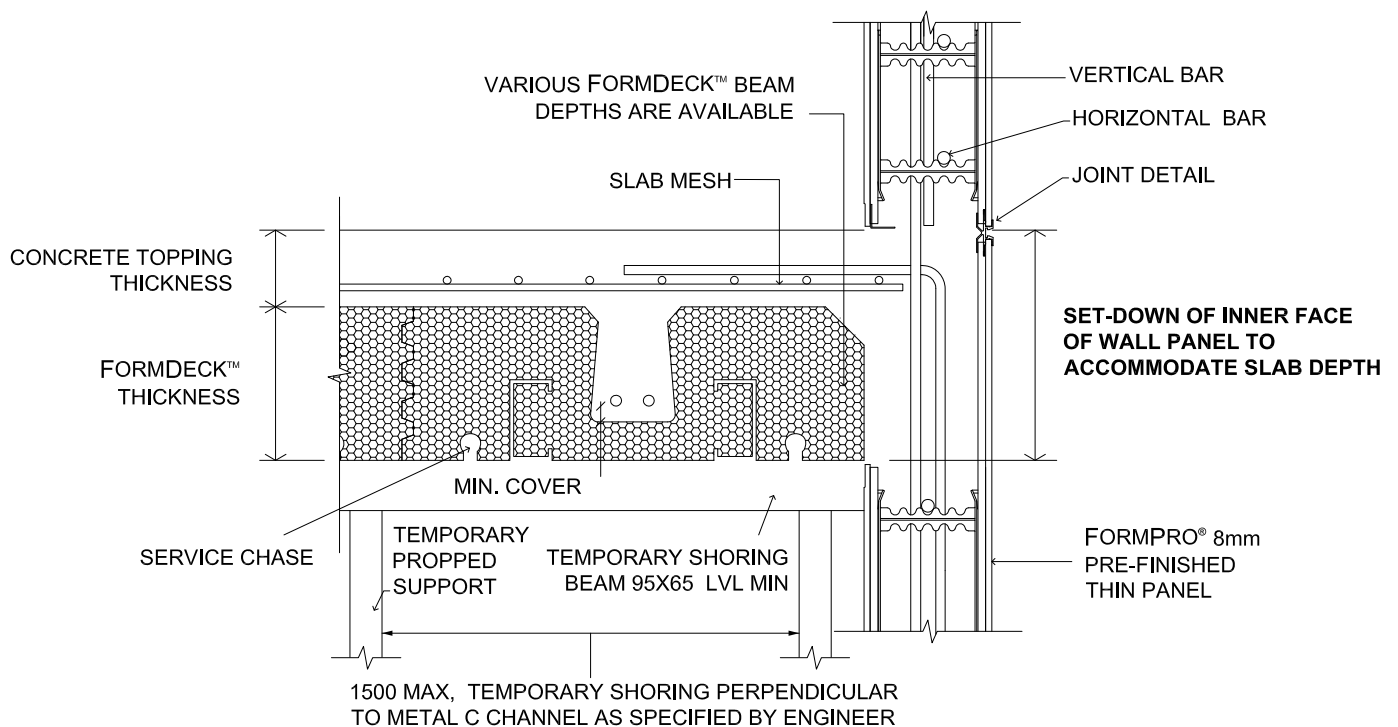


STANDARD DETAILS



Typical Wall Junction - Transverse Section

Drawing No. FD 02

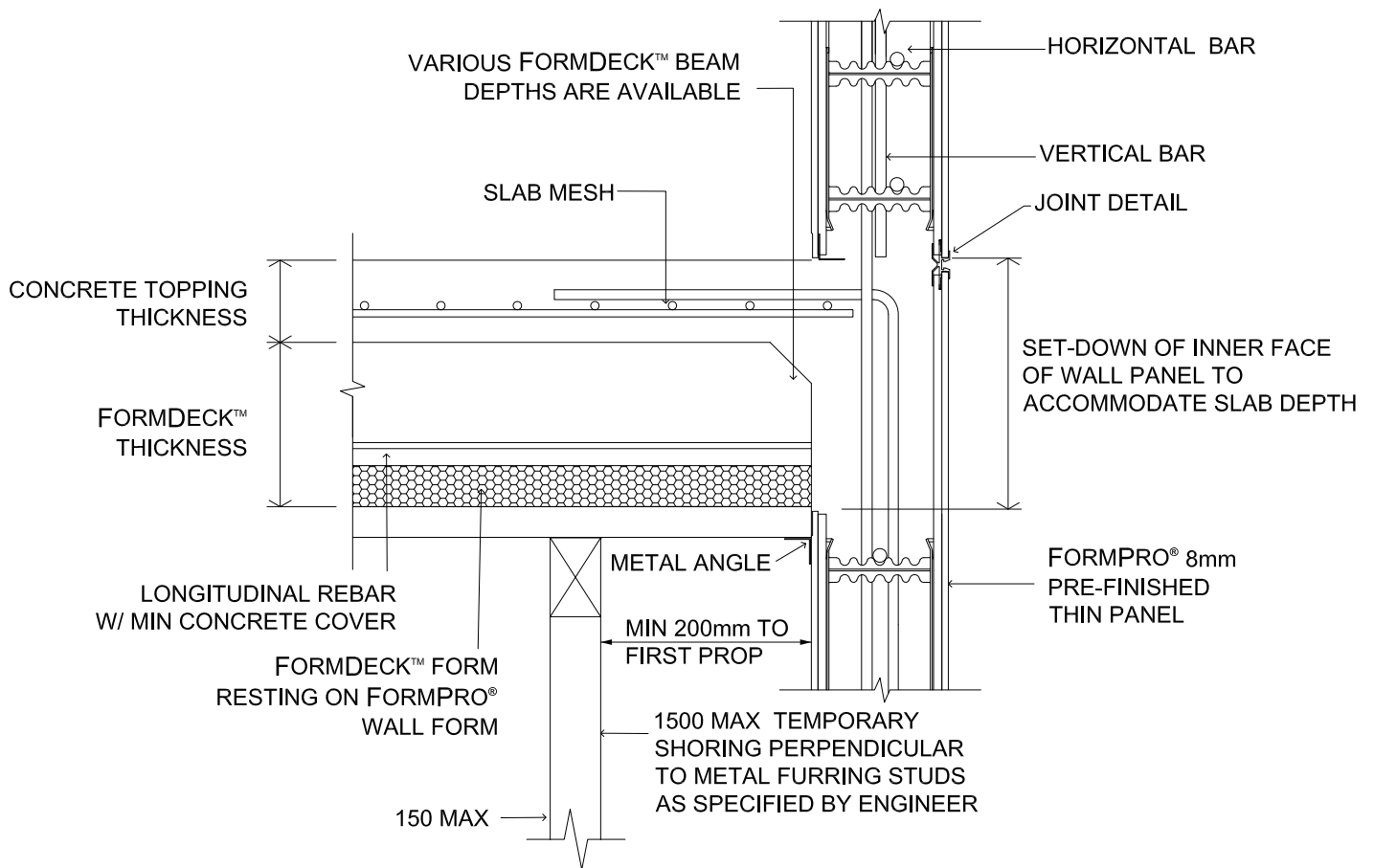


FORMPRO® TYPICAL WALL JUNCTION FOR FORMDECK™ SLAB (TRANSVERSE SECTION)

The images provided on this page are generic in detail and are provided for illustrative purposes only.
Please refer to the disclaimer at rear for further information.

Typical Wall Junction - Longitudinal Section

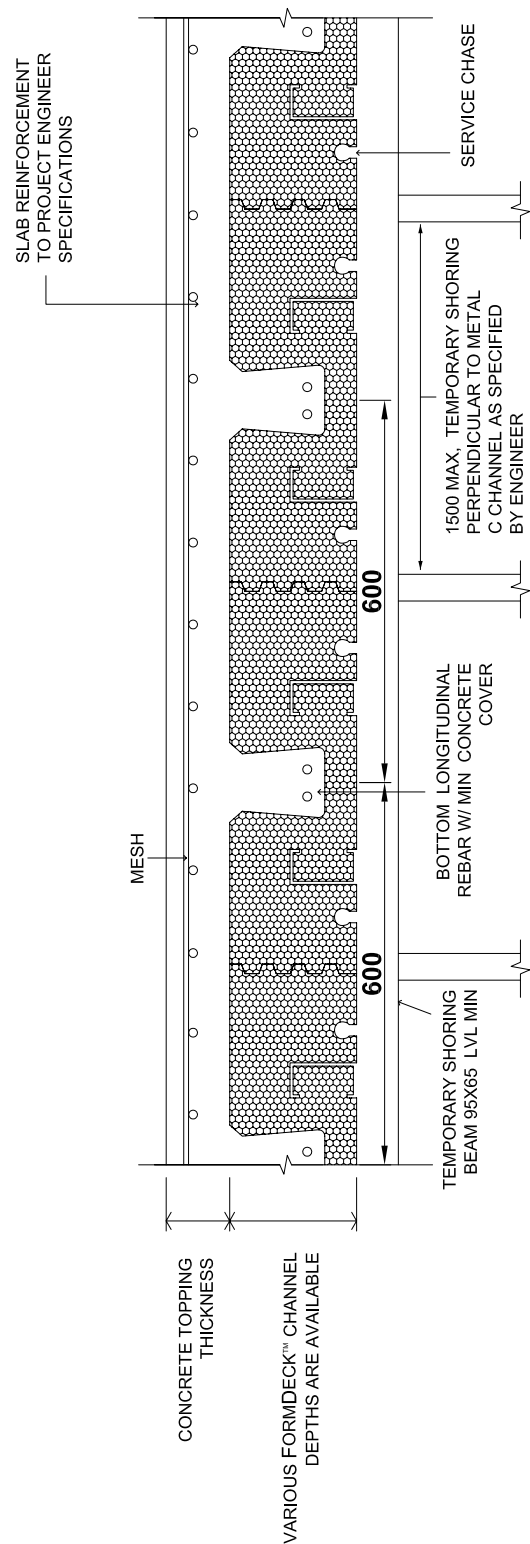
Drawing No. FD 03



FORMPRO® TYPICAL WALL JUNCTION FOR FORMDECK™ SLAB (LONGITUDINAL SECTION)

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Typical FormDeck™ Slab - Transverse Section
Drawing No. FD 04

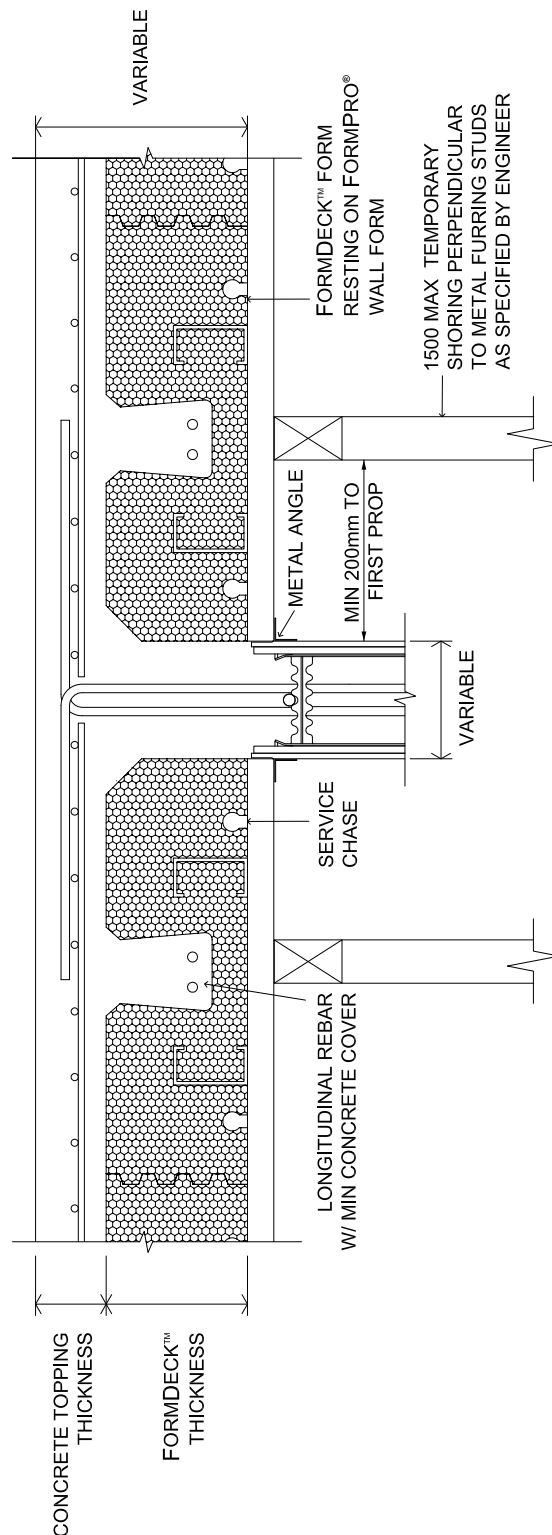


TYPICAL FORMDECK™ SLAB
(TRANSVERSE SECTION)

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Typical Internal Wall Junction - Transverse Section

Drawing No. FD 05

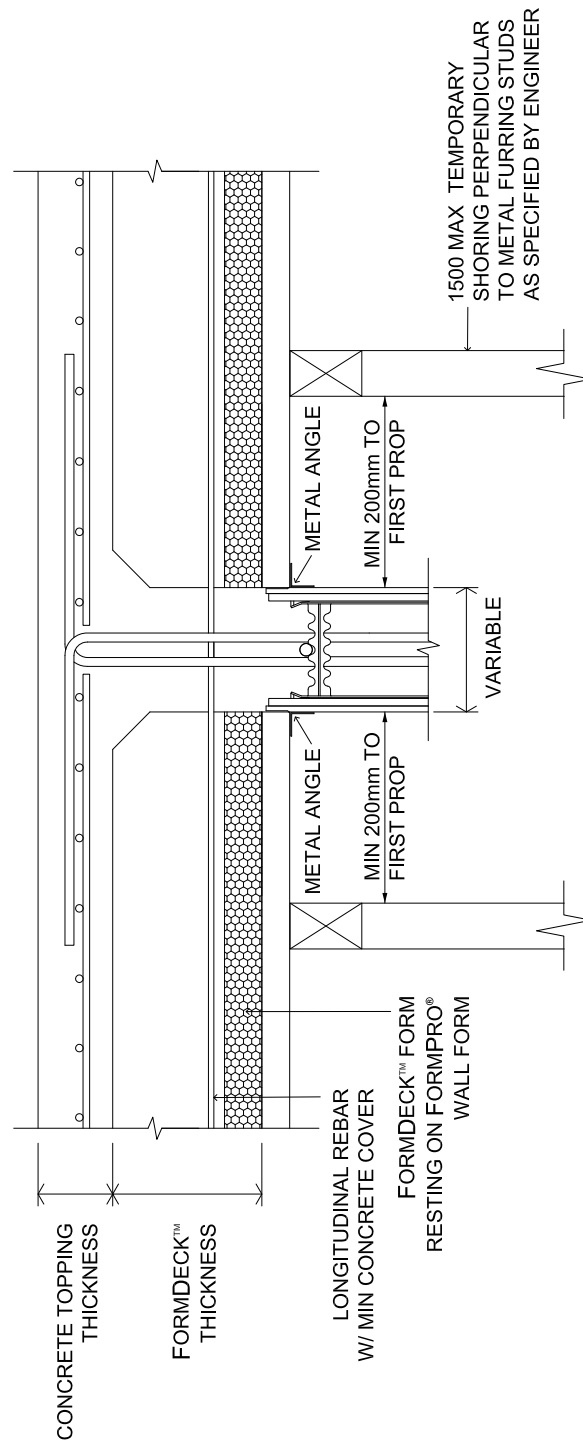


**INTERIOR FORMPRO® WALL TO
FORMDECK™ FLOOR CONNECTION
(TRANSVERSE SECTION)**

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Typical Internal Wall Junction - Longitudinal Section

Drawing No. FD 06

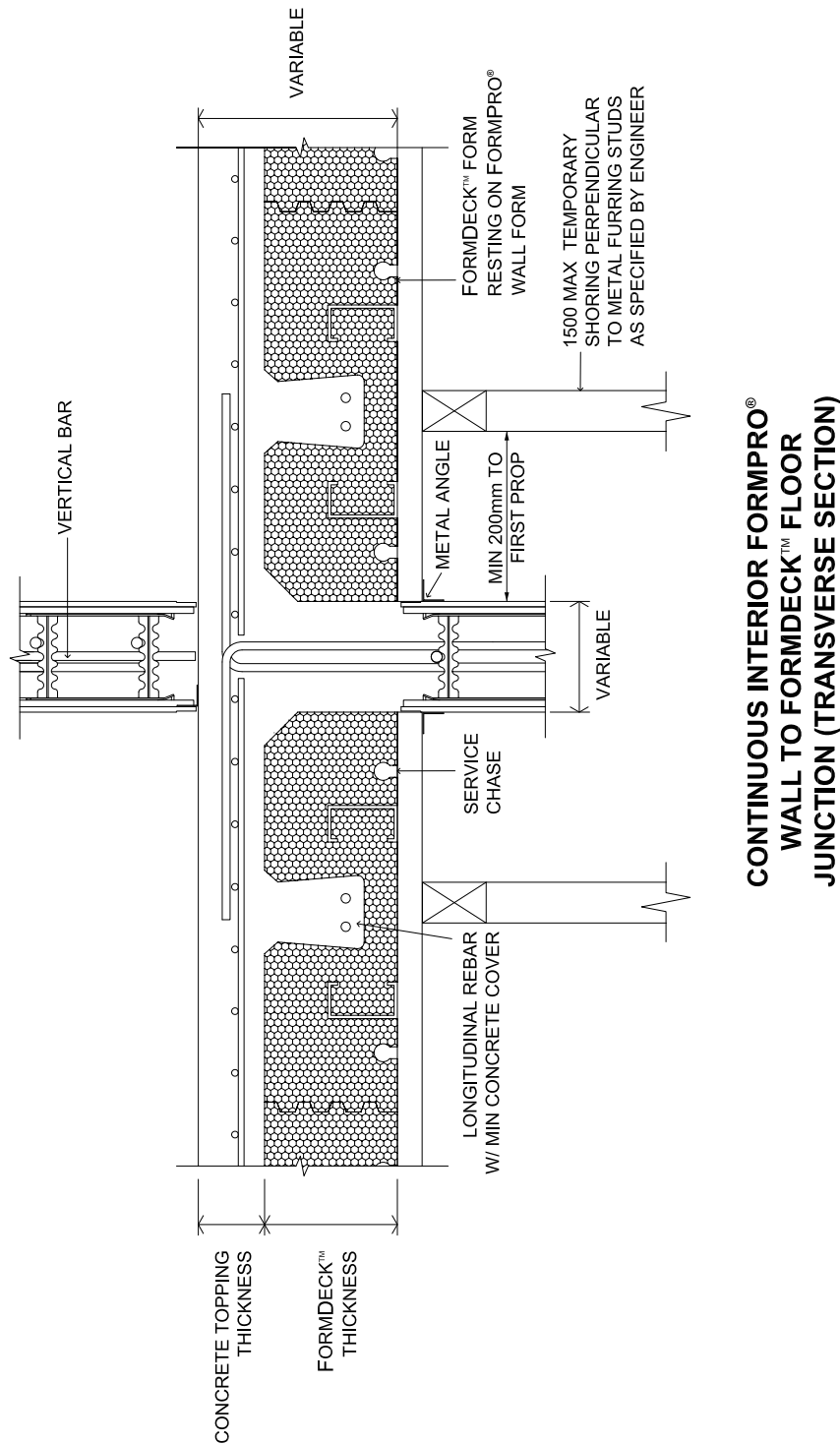


INTERIOR FORMPRO WALL TO FORMDECK FLOOR CONNECTION (LONGITUDINAL SECTION)

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Typical Continuous Internal Wall - Transverse Section

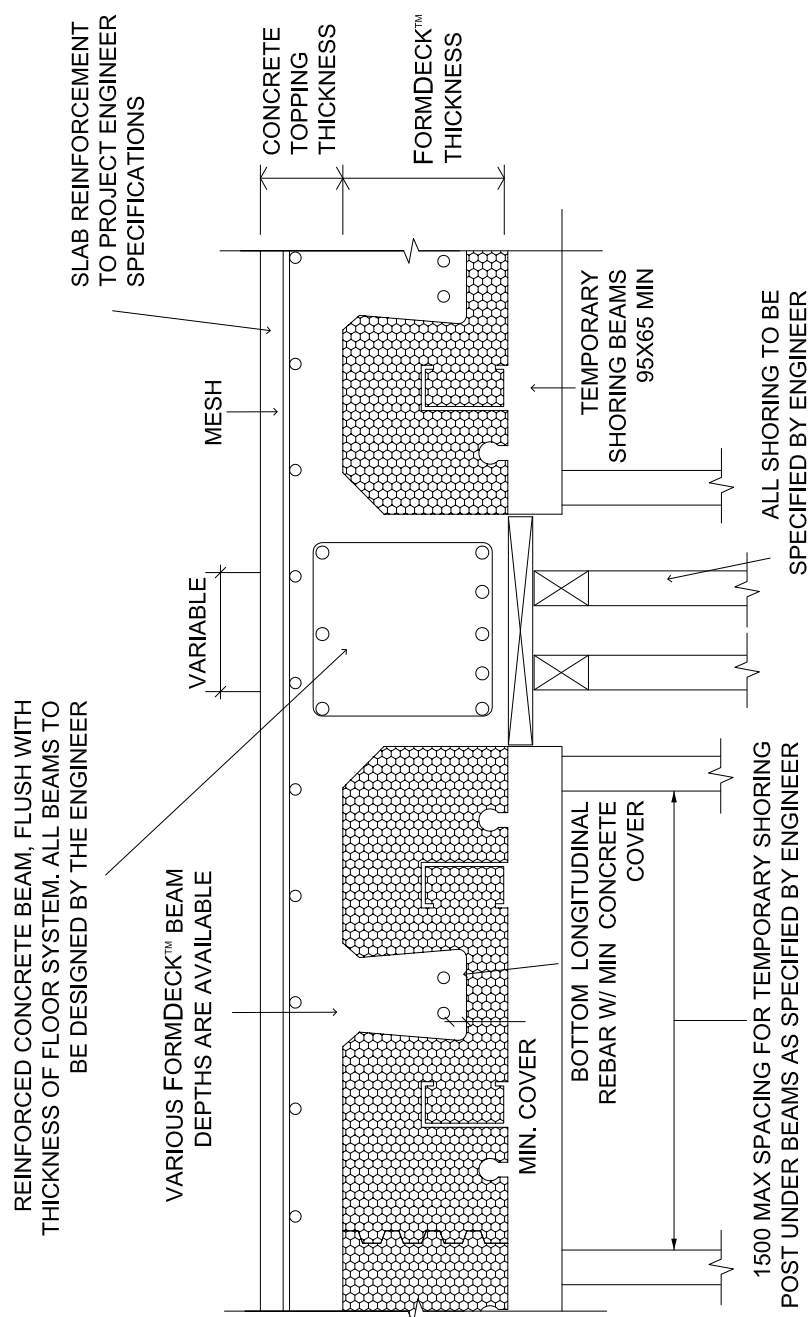
Drawing No. FD 07



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Flush Concrete Beam - Transverse Section

Drawing No. FD 08

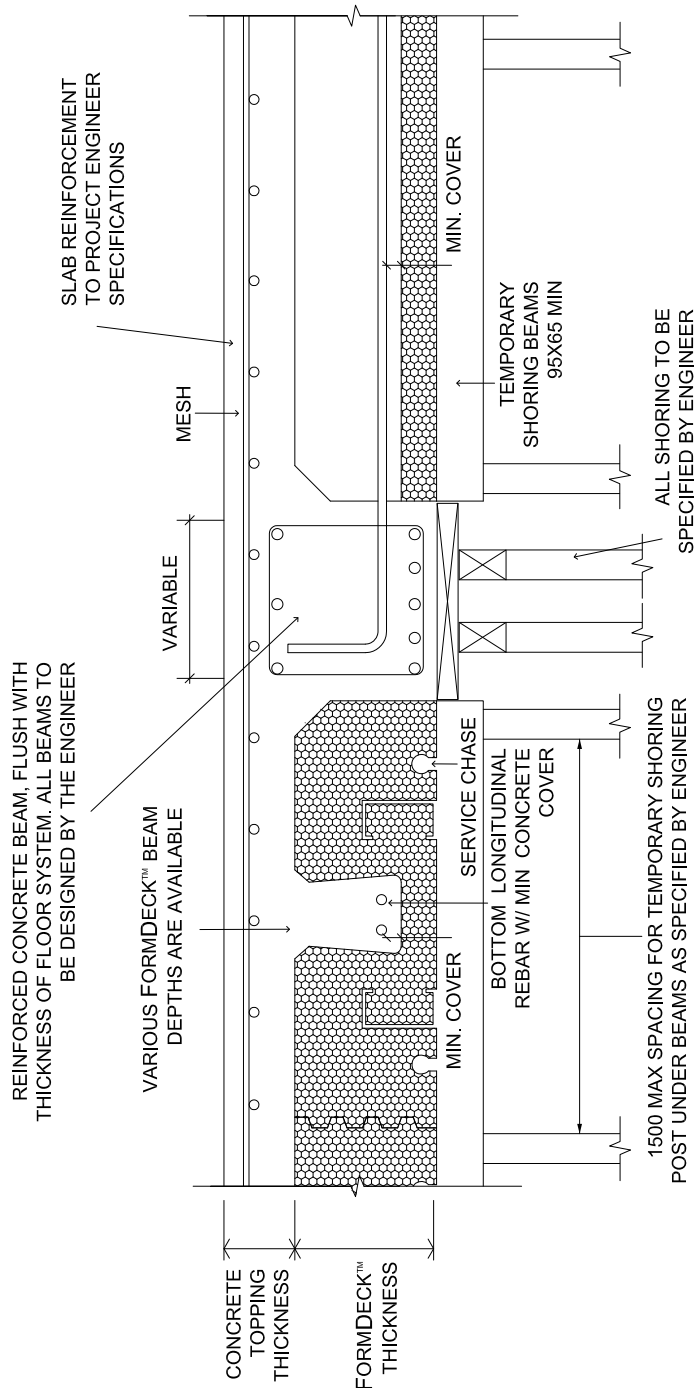


FORMDECK™ FLUSH CONCRETE BEAM (TRANSVERSE SECTION)

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Multi-Direction at Flush Concrete Beam - Transverse Section

Drawing No. FD 09

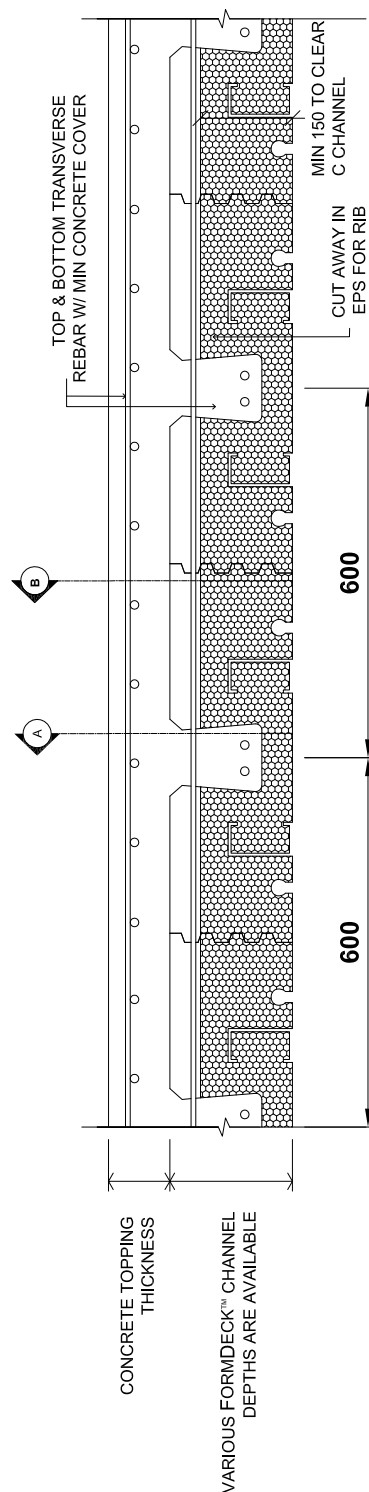


MULTI DIRECTION FORMDECK™ AT FLUSH CONCRETE BEAM (TRANSVERSE SECTION)

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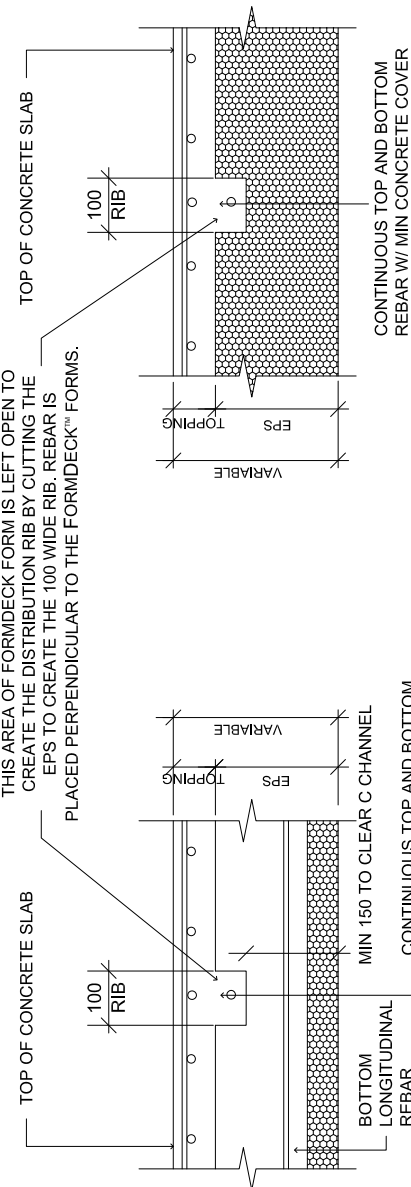
FormDeck™ Distribution Rib (100mm)

Drawing No. FD 10



FORMDECK™ 100 DISTRIBUTION RIB

THIS AREA OF FORMDECK FORM IS LEFT OPEN TO CREATE THE DISTRIBUTION RIB BY CUTTING THE EPS TO CREATE THE 100 WIDE RIB. REBAR IS PLACED PERPENDICULAR TO THE FORMDECK™ FORMS.



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Please refer to the disclaimer at rear for further information.

NOTES

This image shows a full page of blank graph paper. The grid consists of small, uniform squares formed by thin, light gray lines. There are no margins, text, or other markings on the page.

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- The engineering of the structure of any building using FormDeck™ slabs should only be undertaken by suitably qualified and experienced engineers/consultants. The full responsibility for the engineering and structural design, Certification of Compliance with all relevant Australian Standards, BCA and any other statutory requirements at Local, State and Federal levels rest with the project engineer/project consultants.
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