Design principles and Assumptions

The design and use of concrete slabs that utilise ARMOURDECK™ 300 in composite construction may be carried out using either:-

- the relevant Australian and international Standards with the material properties derived from the composite testing as detailed in the following document, or
- the use of the Design Tables presented in this document.

The Design of composite slabs with ARMOURDECK™300 are based on the following assumptions:

Design Loads

The design loads for both strength and serviceability are based on the load combinations as defined in AS1170.0-2002. Under Ultimate Limit State (ULS) the load combination for strength are determined using an Imposed Action factor of 1.5 and a Permanent Actions factor of 1.2. The long term factors utilised for determination of the deflections are as detailed in AS1170.0.

Section and Material Properties

The ARMOURDECK™ 300 has the following nominal section properties based on a unit width of deck equal to one metre.

Thickness (t_{bm}) (mm)	Mass Area (kg/m^2)	Cross section Area (mm^2)	y_{cg} (mm)	Yield Strength (MPa)
0.75	8.64	1075	15.3	550
0.90	11.52	1435	15.3	550
1.00	12.79	1590	15.3	550

The bond strength between the concrete and the steel sheeting were determined through a test program conducted at the University of Western Sydney and assessed in accordance with “Methods of Test for Elements of Composite Construction; Part 1: Slip-Block Test”, AS/NZS3600- 2009 “Concrete Structures” and AS2327.1 “Composite Structures” to establish the characteristic design parameters for the ARMOURDECK™ 300 under composite action.

These characteristic design parameters were derived as

Mechanical resistance (H_r) kPa $\quad 58 \times \sqrt{(t_{bm} f_c')}$

Coefficient of resistance (μ) $\quad 0.5,$

where t_{bm} is the base metal thickness $(0.75 \le t_{bm} \le 1.0)$ and,

f_c' is the concrete strength $(25 \le f_c' \le 40)$.

Positive Moment Regions

The strength of the composite slab and the generation of the presented tables are based on the following methodology along with the requirements of AS/NZS3600-2009.

Positive bending strength

Positive bending capacity is determined taking into account the partial shear connection theory as outlined in the methodology detailed in Design Booklet DB3.1 – Design of Composite Slabs for Strength (1998), where the positive moment capacity is dependent on the degree of shear connection as shown in Figure 1. The degree of shear connection is a function of the distance x from the end of the sheeting that is free to slip.

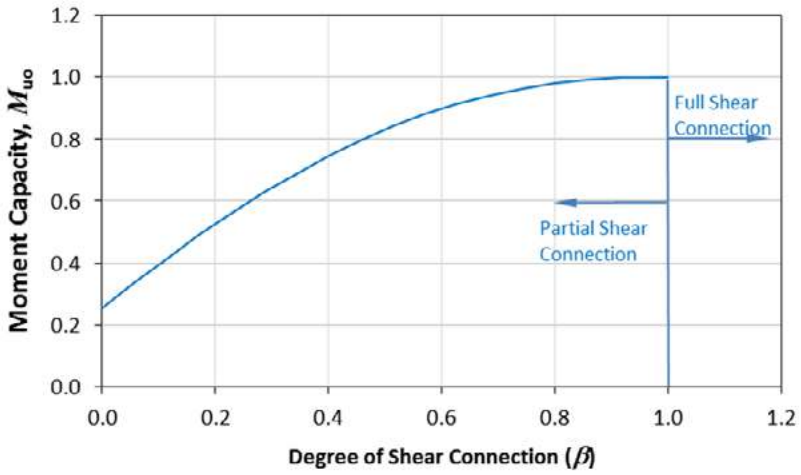


Figure 1 - Positive Moment Capacity Vs Degree of Shear Connection

Full shear connection $(\beta = 1)$ occurs when the distance x from the end of sheeting that is free to slip to the point of assessment is greater than x_{csc} which is a function of the mechanical resistance (H_r) and the tensile capacity the steel decking.

Table 1 presents the Positive Moment capacities for the ARMOURDECK™ 300 for a number of slab thicknesses and concrete strengths. The capacity is expressed in terms of a unit metre width of slab. Also presented in this table is the required distance from an end to slip to develop the full moment capacity (x_{csc}).

Table 1 - Positive moment capacity (M_{ou}^+) (β= 1) (kNm/m) (I_{cr} x 10^6 mm^4)

Slab thickness D_c (mm)	Base metal thickness t_{bm} (mm)							
	0.75				1.00			
	f_c' (MPa)				f_c' (MPa)			
	25		32		25		32	
	ϕM_{uo}^+	I_{cr} x 10^6	ϕM_{uo}^+	I_{cr} x 10^6	ϕM_{uo}^+	I_{cr} x 10^6	ϕM_{uo}^+	I_{cr} x 10^6
100	34.8	37.42	36.7	34.22	42.2	45.74	45.5	42.02
120	45.3	60.47	47.2	55.13	56.2	74.48	59.5	68.19
140	55.8	89.50	57.7	81.41	70.2	110.9	73.5	101.3
160	66.3	124.6	68.2	113.2	84.2	155.2	87.5	141.4
180	76.8	166.0	78.7	150.5	98.1	207.4	101.5	188.7
200	87.3	213.6	89.1	193.4	112.1	267.8	115.5	243.3
220	97.8	267.6	99.6	242.0	126.1	336.5	129.5	305.3
240	108.3	328.0	110.1	296.3	140.1	413.5	143.4	374.7
250	113.5	360.6	115.4	325.6	147.1	455.1	150.4	412.2
x_{csc} (mm)	2180		1930		2520		2230	

Shear strength

The positive shear capacity is calculated in accordance with EN 1992-1-1:2004 Clause 4.3.2.3 and considers the partial connection theory.

Negative Moment Region

Negative bending strength

For the negative moment regions the sheeting is effectively in the compression region of the slab and consequently ignored, the impact of the small voids is also considered negligible in the determination of the bending strength. To determine the ultimate capacity in the negative region the provisions as outlined in AS/NZS 3600-2009 are utilised. It is assumed that reinforcement for negative capacity is conventional N class reinforcement detailed in accordance with the relevant clauses in AS/NZS 3600-2009 treating the slab as a solid reinforced concrete slab. The reinforcement for negative bending is considered independent from the reinforcement that is required for crack control of the slabs.

Shear Capacity

For the shear capaity in neagtive moment regions the provisions from AS 3600 are utilised.

Deflections

The following tables are derived based on deflections resulting from loading applied in accordance with AS/NZS 3600:2009, and calculated using the methods outlined in AS3600-2009 Clause 8.5.3 – Beam Deflections by Simplified calculations.

Crack Control Reinforcement

Crack control reinforcement is determined in accordance with AS 3600-2009 Clause 9.4 Crack Control of Slabs. For the reinforcement in the negative moment regions it is recommended that smaller reinforcing bars that are suitably distributed over the region as specified in AS3600:2009 are utilised.

Fire Design

The provisions for positive reinforcement under fire conditions are based on a plastic collapse mechanism. Hence for the two or multiple spans the negative reinforcement is considered with the fire loads to determine the positive steel requirements to prevent the formation of a mechanism. The tables are developed based on a FRL 120/120/120.

For the design insulation and integrity of the composite slabs the minimum thicknesses of slabs are as defined in Table 2.

Table 2 – Minimum Slab Depth for Fire

FRP Minutes	Depth D (mm)
90	100
120	120

The tables assume that under the fire condition the steel decking does not contribute to the strength of the composite behaviour and is ignored. If additional positive reinforcement is required for fire it is assumed to have 50 mm cover from the soffit of the slab and is at least 85 mm from any rib.

ARMOURDECK™ 300 - Design Tables for Multi-span Composite Construction

The following Design Tables have been developed utilising 'Limit State' principles as detailed in AS/NZS 3600-2009 – Concrete Structures Standards, AS 2327.1 – Composite Structures Standard, AS36100 – Formwork for concrete, AS1170 – Structural Design Actions and AS4600 - Cold Formed Steel Structures.

The design spans and reinforcement are calculated using the defined superimposed permanent and imposed actions detailed for each table and all other required actions in accordance with AS1170 and AS2327.1.

The design parameters for various slab thicknesses are given at the top of each page for the corresponding end span and interior span table. The table presents the span from centre to centre, and the imposed loads. The positive composite design strength ϕMou for positive bending is given in Table 1 in the preceding page for the various base metal thicknesses.

The tables present the required amounts of reinforcement required in the negative moment region in mm2/m and are determined on the basis of elastic analysis. If values are not present in the tables a generic solution is not valid based on input parameters. Big River may be contacted
for further options."

The following assumptions are made in the presented tables.

- The type of construction is steel frame construction or equivalent
- There is a minimum support width of 100 mm at the permanent supports
- Multiple spans have equal spans, with the span measures from centre to centre of supports
- Concrete strength f'_c = 32 MPa
- Slab is designed for a unit width
- Concrete density is 2450 kg/m^3
- Classification is A1 exposure, with 20mm cover to reinforcement
- Slab deflection limits for L/250 for total loads and L/500 for incremental deflections are imposed
- Negative Reinforcement is D500N and extends at least L/3 beyond the edge of support and has 20 mm cover.
- 1/3 of negative reinforcement is to be continuous across the spans if the ratio of the live action to permanent actions exceeds 2.
- The negative reinforcement shown is additional to the required shrinkage reinforcement.

Table Parameters

In deriving the following tables it is assumed a unit width with the following assumptions and table parameters have been used:

- Slab deflection limits for L/250 for total loads and L/500 for incremental deflectionsare imposed.
- Deflections are calculated on the assumption that propped construction is utilised.

Design Loads

The type of construction is steel frame construction or equivalent

The tables have been generated on the basis of load combinations in accordance with AS/NZS 3600-2009:

$W_u = 1.2\,G + 1.5\,Q$

where $G = G_{sh} + G_c + G_{sup}$

G_{sh} and G_c are based on defined geometry

G_{sup} = 1.0 kPa for all tables

It is assumed there is a minimum support width of 100 mm at the permanent supports

Material properties

The materials are assumed to comply with the requirements of AS/NZS 3600-2009 with the following assumptions made:

Concrete

f_c = 32 MPa

ρ = 2400 kg/m^3

Top Reinforcement

N Class Reinforcement

f_y = 500 MPa

Cover = 25 mm

Reinforcement extends at least L/3 beyond the edge of support 1/3 of negative reinforcement is to be continuous across the spans if the ratio of the live action to permanent actions exceeds 2

Short and Long Term Factors

Short–Term Factor ψ_s = 0.7

Long–Term Factor ψ_l = 0.4

Combination–Term Factor ψ_c = 0.4

Fire Reinforcement

N Class Reinforcement

f_y = 500 MPa

Cover = 25 mm

Shrinkage temperature Reinforcement

Assuming moderate Degree of Crack Control

L Class Reinforcement (AS/NZS 4671)

f_y = 500 MPa

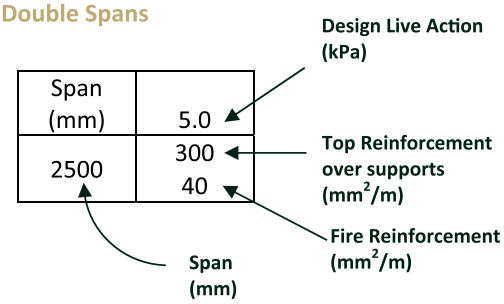
Slab Depth (mm)	*Fabric Size*
100	SL72
120	SL72
140	SL82
160	SL82
180	SL92
200	SL92
220	SL92
240	SL102
250	RL818

Interpretation of Tables

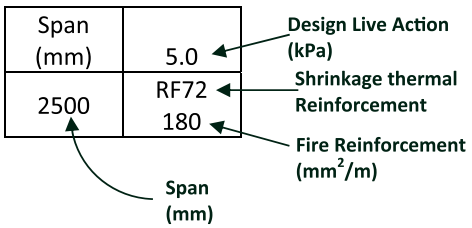
The following tables may be interpreted as outlined below::

- An empty cell indicates no solution for the designated span and load.
- A " - " in the cell indicates no requirement for additional fire reinforcement

Double Spans



Single Spans



Single Span, t_{bm} = 0.75 mm

Slab Depth D_c =100 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	SL72	SL72	SL72
1750	SL72	SL72	SL72
2000	SL72	SL72	SL72
2250	SL72	SL72	SL72
2500	SL72	SL72	
2750	SL72		
3000			
3250			
3500			
3750			
4000			

Slab Depth D_c =120 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	SL72 60	SL72 70	SL72 80
1750	SL72 80	SL72 90	SL72 110
2000	SL72 110	SL72 120	SL72 140
2250	SL72 140	SL72 160	SL72 180
2500	SL72 170	SL72 200	SL72 230
2750	SL72 210	SL72 240	SL72 280
3000	SL72 260	SL72 290	
3250	SL72 310		
3500			
3750			
4000			

Insufficient Slab depth for FLR

Single Span, t_{bm} = 0.75 mm

Slab Depth D_c =140 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	SL82 50	SL82 50	SL82 60
1750	SL82 70	SL82 70	SL82 90
2000	SL82 90	SL82 100	SL82 110
2250	SL82 110	SL82 130	SL82 150
2500	SL82 140	SL82 160	SL82 180
2750	SL82 170	SL82 200	SL82 220
3000	SL82 210	SL82 240	SL82 270
3250	SL82 250	SL82 280	
3500	SL82 290		
3750			
4000			
4250			
4500			
4750			
5000			

Slab Depth D_c =160 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	SL82 40	SL82 50	SL82 50
1750	SL82 60	SL82 60	SL82 70
2000	SL82 80	SL82 90	SL82 100
2250	SL82 100	SL82 110	SL82 130
2500	SL82 120	SL82 140	SL82 160
2750	SL82 150	SL82 170	SL82 190
3000	SL82 180	SL82 200	SL82 230
3250	SL82 220	SL82 240	SL82 270
3500	SL82 250	SL82 280	SL82 320
3750	SL82 290	SL82 330	
4000	SL82 330		
4250			
4500			
4750			
5000			

Single Span, t_{bm} = 0.75 mm

Slab Depth D_c = 180 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	SL92 40	SL92 40	SL92 50
1750	SL92 50	SL92 60	SL92 70
2000	SL92 70	SL92 80	SL92 90
2250	SL92 90	SL92 100	SL92 110
2500	SL92 110	SL92 120	SL92 140
2750	SL92 140	SL92 150	SL92 170
3000	SL92 160	SL92 180	SL92 200
3250	SL92 190	SL92 210	SL92 240
3500	SL92 230	SL92 250	SL92 280
3750	SL92 260	SL92 290	SL92 330
4000	SL92 300	SL92 330	SL92 370
4250	SL92 340	SL92 380	
4500	SL92 390		
4750			
5000			
5250			
5500			
5750			
6000			

Slab Depth D_c =200 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	SL92 40	SL92 40	SL92 40
1750	SL92 50	SL92 50	SL92 60
2000	SL92 60	SL92 70	SL92 80
2250	SL92 80	SL92 90	SL92 100
2500	SL92 100	SL92 110	SL92 130
2750	SL92 130	SL92 140	SL92 150
3000	SL92 150	SL92 170	SL92 190
3250	SL92 180	SL92 200	SL92 220
3500	SL92 210	SL92 230	SL92 260
3750	SL92 240	SL92 260	SL92 300
4000	SL92 280	SL92 300	SL92 340
4250	SL92 310	SL92 340	SL92 380
4500	SL92 350	SL92 390	
4750	SL92 400		
5000			
5250			
5500			
5750			
6000			

Single Span, t_{bm} = 0.75 mm

Slab Depth D_c =220 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
2500	SL102	SL102	SL102
	100	110	120
2750	SL102	SL102	SL102
	120	130	140
3000	SL102	SL102	SL102
	140	150	170
3250	SL102	SL102	SL102
	170	180	200
3500	SL102	SL102	SL102
	200	210	240
3750	SL102	SL102	SL102
	230	250	270
4000	SL102	SL102	SL102
	260	280	310
4250	SL102	SL102	SL102
	290	320	360
4500	SL102	SL102	SL102
	330	360	400
4750	SL102	SL102	
	370	400	
5000	SL102	SL102	
	410	450	
5250	SL102		
	460		
5500			
5750			
6000			
6250			
6500			
6750			
7000			

Slab Depth D_c =250 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
2500	RL818	RL818	RL818
	90	100	110
2750	RL818	RL818	RL818
	110	120	130
3000	RL818	RL818	RL818
	130	140	160
3250	RL818	RL818	RL818
	160	170	180
3500	RL818	RL818	RL818
	180	200	220
3750	RL818	RL818	RL818
	210	230	250
4000	RL818	RL818	RL818
	240	260	280
4250	RL818	RL818	RL818
	270	290	320
4500	RL818	RL818	RL818
	310	330	360
4750	RL818	RL818	RL818
	340	370	410
5000	RL818	RL818	RL818
	380	410	450
5250	RL818	RL818	RL818
	420	460	500
5500	RL818	RL818	
	460	500	
5750	RL818		
	510		
6000			
6250			
6500			
6750			
7000			

Single Span, t_{bm} = 1.00 mm

Slab Depth D_c =100 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	SL72	SL72	SL72
1750	SL72	SL72	SL72
2000	SL72	SL72	SL72
2250	SL72	SL72	SL72
2500	SL72	SL72	SL72
2750	SL72	SL72	SL72
3000			
3250			
3500			
3750			
4000			

Insufficient Slab depth for FLR

Slab Depth D_c =120 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	SL72 60	SL72 70	SL72 80
1750	SL72 80	SL72 90	SL72 110
2000	SL72 110	SL72 120	SL72 140
2250	SL72 140	SL72 160	SL72 180
2500	SL72 180	SL72 200	SL72 230
2750	SL72 220	SL72 240	SL72 280
3000	SL72 260	SL72 300	
3250	SL72 310		
3500			
3750			
4000			

Single Span, t_{bm} = 1.00 mm

Slab Depth D_c =140 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	SL82	SL82	SL82
	50	50	60
1750	SL82	SL82	SL82
	70	80	90
2000	SL82	SL82	SL82
	90	100	110
2250	SL82	SL82	SL82
	110	130	150
2500	SL82	SL82	SL82
	140	160	180
2750	SL82	SL82	SL82
	180	200	230
3000	SL82	SL82	SL82
	210	240	270
3250	SL82	SL82	
	250	280	
3500	SL82		
	290		
3750			
4000			
4250			
4500			
4750			
5000			

Slab Depth D_c =160 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	SL82	SL82	SL82
	40	50	50
1750	SL82	SL82	SL82
	60	70	70
2000	SL82	SL82	SL82
	80	90	100
2250	SL82	SL82	SL82
	100	110	130
2500	SL82	SL82	SL82
	120	140	160
2750	SL82	SL82	SL82
	150	170	190
3000	SL82	SL82	SL82
	180	200	230
3250	SL82	SL82	SL82
	220	240	270
3500	SL82	SL82	SL82
	250	280	320
3750	SL82	SL82	
	290	330	
4000	SL82		
	340		
4250			
4500			
4750			
5000			

Single Span, t_{bm} = 1.00 mm

Slab Depth D_c = 180 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	SL92 40	SL92 40	SL92 50
1750	SL92 50	SL92 60	SL92 70
2000	SL92 70	SL92 80	SL92 90
2250	SL92 90	SL92 100	SL92 110
2500	SL92 110	SL92 120	SL92 140
2750	SL92 140	SL92 150	SL92 170
3000	SL92 170	SL92 180	SL92 200
3250	SL92 200	SL92 220	SL92 240
3500	SL92 230	SL92 250	SL92 280
3750	SL92 260	SL92 290	SL92 330
4000	SL92 300	SL92 330	
4250	SL92 340	SL92 380	
4500	SL92 390		
4750			
5000			
5250			
5500			
5750			
6000			

Slab Depth D_c =200 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	SL92 40	SL92 40	SL92 40
1750	SL92 50	SL92 50	SL92 60
2000	SL92 70	SL92 70	SL92 80
2250	SL92 80	SL92 90	SL92 100
2500	SL92 100	SL92 110	SL92 130
2750	SL92 130	SL92 140	SL92 160
3000	SL92 150	SL92 170	SL92 190
3250	SL92 180	SL92 200	SL92 220
3500	SL92 210	SL92 230	SL92 260
3750	SL92 240	SL92 270	SL92 300
4000	SL92 280	SL92 300	SL92 340
4250	SL92 320	SL92 350	SL92 390
4500	SL92 360	SL92 390	
4750	SL92 400		
5000			
5250			
5500			
5750			
6000			

Single Span, t_{bm} = 1.00 mm

Slab Depth D_c =220 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
2500	SL102	SL102	SL102
	100	110	120
2750	SL102	SL102	SL102
	120	130	140
3000	SL102	SL102	SL102
	140	160	170
3250	SL102	SL102	SL102
	170	180	200
3500	SL102	SL102	SL102
	200	210	240
3750	SL102	SL102	SL102
	230	250	270
4000	SL102	SL102	SL102
	260	280	310
4250	SL102	SL102	SL102
	300	320	360
4500	SL102	SL102	SL102
	330	360	400
4750	SL102	SL102	
	370	410	
5000	SL102		
	410		
5250	SL102		
	460		
5500			
5750			
6000			

Slab Depth D_c =250 mm

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
2500	RL818	RL818	RL818
	90	100	110
2750	RL818	RL818	RL818
	110	120	130
3000	RL818	RL818	RL818
	130	140	160
3250	RL818	RL818	RL818
	160	170	190
3500	RL818	RL818	RL818
	180	200	220
3750	RL818	RL818	RL818
	210	230	250
4000	RL818	RL818	RL818
	240	260	290
4250	RL818	RL818	RL818
	270	290	320
4500	RL818	RL818	RL818
	310	330	370
4750	RL818	RL818	RL818
	340	370	410
5000	RL818	RL818	RL818
	380	410	450
5250	RL818	RL818	
	420	460	
5500	RL818	RL818	
	470	500	
5750	RL818		
	510		
6000			
6250			
6500			
6750			

Multiple Span, Slab Depth 100 mm, t_{bm} = 0.75 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	100	100	100
1750	100	100	140
2000	100	130	180
2250	120	170	230
2500	150	210	300
2750	180	260	360
3000	210	310	
3250	250		
3500			
3750			
4000			
4250			
4500			

End Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	100	100	120
1750	100	120	170
2000	120	170	230
2250	160	210	290
2500	200	270	370
2750	240	330	
3000	290		
3250			
3500			
3750			
4000			
4250			
4500			

Insufficient Slab depth for FLR

Shrinkage Reinforcement RF72

Multiple Span, Slab Depth 120 mm, t_{bm} = 0.75 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
2000	120	120	140
	-	-	-
2250	120	130	180
	-	-	-
2500	120	160	220
	-	-	-
2750	140	200	270
	-	-	-
3000	170	240	330
	-	-	-
3250	200	280	390
	-	-	-
3500	230	330	
	-	-	
3750	270		
	-		
4000	310		
	-		
4250			
4500			
4750			
5000			
5250			
5500			

End Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
2000	120	130	170
	20	30	30
2250	130	170	220
	40	40	30
2500	160	210	280
	50	50	40
2750	190	260	340
	70	50	50
3000	230	310	420
	80	70	50
3250	270	370	
	100	80	
3500	320		
	110		
3750			
4000			
4250			
4500			
4750			
5000			
5250			
5500			

Shrinkage Reinforcement RF72

Multiple Span, Slab Depth 140 mm, t_{bm} = 0.75 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2000	150 -	150 -	150 -
2250	150 -	150 -	150 -
2500	150 -	150 -	180 -
2750	150 -	160 -	220 -
3000	150 -	200 -	270 -
3250	170 -	230 -	320 -
3500	200 -	270 -	370 -
3750	230 -	320 -	430 -
4000	260 -	360 -	
4250	300 -		
4500	340 -		
4750			
5000			
5250			
5500			
5750			
6000			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2000	150 10	150 10	150 20
2250	150 20	150 30	180 30
2500	150 40	180 40	230 30
2750	160 60	210 50	280 40
3000	200 70	260 60	340 50
3250	230 80	310 70	400 60
3500	270 100	360 80	470 70
3750	320 110	420 90	
4000	360 130		
4250	410 140		
4500			
4750			
5000			
5250			
5500			
5750			
6000			

Shrinkage Reinforcement RF82

Multiple Span, Slab Depth 160 mm, t_{bm} = 0.75 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2500	180 -	180 -	180 -
2750	180 -	180 -	190 -
3000	180 -	180 -	230 -
3250	180 -	200 -	270 -
3500	180 -	240 -	320 -
3750	200 -	270 -	370 -
4000	230 -	310 -	420 -
4250	260 -	360 -	480 -
4500	300 -	400 -	
4750	330 -	450 -	
5000	370 -		
5250			
5500			
5750			
6000			
6250			
6500			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2500	180 20	180 30	200 30
2750	180 40	190 40	240 40
3000	180 60	230 50	290 50
3250	210 70	270 60	350 50
3500	240 90	310 80	410 60
3750	280 100	360 90	470 70
4000	320 110	410 100	540 80
4250	370 120	470 110	
4500	410 140		
4750	460 160		
5000			
5250			
5500			
5750			
6000			
6250			
6500			

Shrinkage Reinforcement RF82

Multiple Span, Slab Depth 180 mm, t_{bm} = 0.75 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2500	210 -	210 -	210 -
2750	210 -	210 -	210 -
3000	210 -	210 -	210 -
3250	210 -	210 -	240 -
3500	210 -	210 -	280 -
3750	210 -	240 -	320 -
4000	210 -	280 -	370 -
4250	240 -	320 -	420 -
4500	270 -	360 -	480 -
4750	300 -	400 -	530 -
5000	330 -	440 -	
5250	370 -	490 -	
5500	410 -		
5750	450 -		
6000			
6250			
6500			
6750			
7000			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2500	210 10	210 10	210 20
2750	210 20	210 30	220 40
3000	210 40	210 50	260 40
3250	210 60	240 60	310 50
3500	220 80	280 70	360 60
3750	260 90	320 80	410 70
4000	290 110	370 90	480 80
4250	330 120	420 110	540 90
4500	370 140	470 120	610 100
4750	420 150	530 130	
5000	470 160		
5250	520 180		
5500			
5750			
6000			
6250			
6500			
6750			
7000			

Shrinkage Reinforcement RF92

Multiple Span, Slab Depth 200 mm, t_{bm} = 0.75 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
3000	240 -	240 -	240 -
3250	240 -	240 -	240 -
3500	240 -	240 -	250 -
3750	240 -	240 -	290 -
4000	240 -	250 -	330 -
4250	240 -	290 -	380 -
4500	250 -	320 -	430 -
4750	280 -	360 -	480 -
5000	310 -	400 -	530 -
5250	340 -	450 -	590 -
5500	380 -	490 -	
5750	410 -	540 -	
6000	450 -		
6250	490 -		
6500			
6750			
7000			
7250			
7500			

End Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
3000	240 20	240 30	240 40
3250	240 40	240 50	280 50
3500	240 60	260 70	320 60
3750	240 80	300 80	370 70
4000	270 100	340 90	430 80
4250	310 110	380 100	490 90
4500	350 120	430 110	550 100
4750	390 140	490 120	620 110
5000	430 160	540 140	690 120
5250	480 170	600 160	
5500	530 190		
5750	580 210		
6000			
6250			
6500			
6750			
7000			
7250			
7500			

Shrinkage Reinforcement RF92

Multiple Span, Slab Depth 220 mm, t_{bm} = 0.75 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3500	270 -	270 -	270 -
3750	270 -	270 -	270 -
4000	270 -	270 -	300 -
4250	270 -	270 -	350 -
4500	270 -	300 -	390 -
4750	270 -	330 -	440 -
5000	290 -	370 -	490 -
5250	320 -	410 -	540 -
5500	350 -	450 -	590 -
5750	390 -	500 -	650 -
6000	420 -	540 -	
6250	460 -	590 -	
6500	500 -		
6750	540 -		
7000			
7250			
7500			
7750			
8000			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3500	270 40	270 50	300 60
3750	270 60	270 80	340 70
4000	270 90	310 90	390 80
4250	290 110	360 100	450 90
4500	330 120	400 110	500 100
4750	360 140	450 120	570 110
5000	410 150	500 140	630 120
5250	450 160	550 150	700 130
5500	490 180	610 170	770 150
5750	540 200	670 180	
6000	590 220		
6250	650 230		
6500			
6750			
7000			
7250			
7500			
7750			
8000			

Shrinkage Reinforcement RF102

Multiple Span, Slab Depth 240 mm, t_{bm} = 0.75 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3500	300	300	300
	-	-	-
3750	300	300	300
	-	-	-
4000	300	300	300
	-	-	-
4250	300	300	320
	-	-	-
4500	300	300	360
	-	-	-
4750	300	310	400
	-	-	-
5000	300	350	450
	-	-	-
5250	300	380	500
	-	-	-
5500	330	420	550
	-	-	-
5750	360	460	600
	-	-	-
6000	400	510	660
	-	-	-
6250	430	550	720
	-	-	-
6500	470	600	
	-	-	
6750	510	650	
	-	-	
7000	550		
	-		
7250	590		
	-		
7500			
7750			
8000			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3500	300	300	300
	20	30	50
3750	300	300	320
	40	60	70
4000	300	300	370
	70	80	70
4250	300	330	420
	90	100	80
4500	310	380	470
	120	100	90
4750	350	420	520
	130	120	110
5000	380	470	580
	150	130	120
5250	430	520	650
	160	150	130
5500	470	570	710
	170	160	140
5750	510	630	780
	190	170	160
6000	560	690	
	210	190	
6250	610	750	
	230	210	
6500	660		
	250		
6750			
7000			
7250			
7500			
7750			
8000			

Shrinkage Reinforcement RF102

Multiple Span, Slab Depth 250 mm, t_{bm} = 0.75 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
3500	310	310	310
	-	-	-
3750	310	310	310
	-	-	-
4000	310	310	310
	-	-	-
4250	310	310	310
	-	-	-
4500	310	310	350
	-	-	-
4750	310	310	390
	-	-	-
5000	310	340	430
	-	-	-
5250	310	370	480
	-	-	-
5500	320	410	530
	-	-	-
5750	350	450	580
	-	-	-
6000	390	490	630
	-	-	-
6250	420	540	690
	-	-	-
6500	460	580	750
	-	-	-
6750	490	630	
	-	-	
7000	530	680	
	-	-	
7250	570		
	-		
7500	620		
	-		
7750			
8000			

End Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
3500	310	310	310
	20	30	40
3750	310	310	310
	40	50	60
4000	310	310	350
	60	70	80
4250	310	330	400
	80	90	80
4500	310	370	450
	110	100	100
4750	340	410	510
	130	120	100
5000	380	460	570
	140	130	110
5250	420	510	630
	150	140	130
5500	460	560	690
	170	160	140
5750	500	610	760
	190	170	150
6000	550	670	830
	200	190	170
6250	600	730	
	220	200	
6500	650	790	
	240	220	
6750	700		
	260		
7000			
7250			
7500			
7750			
8000			

Shrinkage Reinforcement RF81

Multiple Span, Slab Depth 100 mm, t_{bm} = 1.0 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	70	70	100
1750	70	100	140
2000	90	130	180
2250	120	170	240
2500	150	210	300
2750	180	260	360
3000	220	310	
3250	260		
3500			
3750			
4000			
4250			
4500			

End Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	70	90	120
1750	90	120	170
2000	120	170	230
2250	160	220	290
2500	200	270	370
2750	240	330	460
3000	290		
3250			
3500			
3750			
4000			
4250			
4500			

Shrinkage Reinforcement RF72

Multiple Span, Slab Depth 120 mm, t_{bm} = 1.0 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
2000	100	100	140
	-	-	-
2250	100	130	180
	-	-	-
2500	120	160	220
	-	-	-
2750	140	200	270
	-	-	-
3000	170	240	330
	-	-	-
3250	200	280	390
	-	-	-
3500	240	330	
	-	-	
3750	270		
	-		
4000			
4250			
4500			
4750			
5000			
5250			
5500			

End Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
2000	100	130	170
	30	30	30
2250	130	170	220
	40	40	30
2500	160	210	280
	50	50	40
2750	190	260	350
	70	60	50
3000	230	310	420
	80	70	60
3250	280	370	
	90	80	
3500	320		
	110		
3750			
4000			
4250			
4500			
4750			
5000			
5250			
5500			

Shrinkage Reinforcement RF72

Multiple Span, Slab Depth 140 mm, t_{bm} = 1.0 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
2000	120	120	120
	-	-	-
2250	120	120	150
	-	-	-
2500	120	130	180
	-	-	-
2750	120	160	220
	-	-	-
3000	140	200	270
	-	-	-
3250	170	230	320
	-	-	-
3500	200	270	370
	-	-	-
3750	230	320	430
	-	-	-
4000	260	360	
	-	-	
4250	300		
	-		
4500			
4750			
5000			
5250			
5500			
5750			
6000			

End Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
2000	120	120	140
	10	20	20
2250	120	140	180
	30	30	30
2500	140	180	230
	40	40	40
2750	170	220	280
	60	50	40
3000	200	260	340
	70	60	50
3250	240	310	410
	80	70	60
3500	280	360	480
	90	80	70
3750	320	420	
	110	90	
4000	370		
	120		
4250			
4500			
4750			
5000			
5250			
5500			
5750			
6000			

Shrinkage Reinforcement RF82

Multiple Span, Slab Depth 160 mm, t_{bm} = 1.0 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
2500	150 -	150 -	160 -
2750	150 -	150 -	190 -
3000	150 -	170 -	230 -
3250	150 -	200 -	270 -
3500	180 -	240 -	320 -
3750	200 -	270 -	370 -
4000	230 -	310 -	420 -
4250	260 -	360 -	480 -
4500	300 -	400 -	
4750	330 -		
5000	370 -		
5250			
5500			
5750			
6000			
6250			
6500			

End Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
2500	150 30	150 40	200 30
2750	150 50	190 50	240 40
3000	180 60	230 50	290 50
3250	210 70	270 60	350 50
3500	240 90	310 80	410 60
3750	280 100	360 90	470 80
4000	320 110	420 100	540 90
4250	370 130	470 110	
4500	410 150		
4750			
5000			
5250			
5500			
5750			
6000			
6250			
6500			

Shrinkage Reinforcement RF82

Multiple Span, Slab Depth 180 mm, t_{bm} = 1.0 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2500	180 -	180 -	180 -
2750	180 -	180 -	180 -
3000	180 -	180 -	200 -
3250	180 -	180 -	240 -
3500	180 -	210 -	280 -
3750	180 -	240 -	320 -
4000	210 -	280 -	370 -
4250	240 -	320 -	420 -
4500	270 -	360 -	480 -
4750	300 -	400 -	530 -
5000	340 -	450 -	
5250	370 -		
5500	410 -		
5750			
6000			
6250			
6500			
6750			
7000			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2500	180 10	180 20	180 30
2750	180 30	180 40	220 40
3000	180 50	200 50	260 50
3250	190 70	240 60	310 50
3500	220 80	280 70	360 60
3750	260 90	320 80	420 70
4000	290 110	370 90	480 80
4250	330 120	420 110	540 90
4500	380 130	480 120	610 110
4750	420 150	530 140	
5000	470 170		
5250			
5500			
5750			
6000			
6250			
6500			
6750			
7000			

Shrinkage Reinforcement RF82

Multiple Span, Slab Depth 200 mm, t_{bm} = 1.0 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
3000	210 -	210 -	210 -
3250	210 -	210 -	220 -
3500	210 -	210 -	250 -
3750	210 -	220 -	290 -
4000	210 -	250 -	330 -
4250	220 -	290 -	380 -
4500	250 -	320 -	430 -
4750	280 -	360 -	480 -
5000	310 -	400 -	530 -
5250	340 -	450 -	590 -
5500	380 -	490 -	
5750	410 -		
6000	450 -		
6250			
6500			
6750			
7000			
7250			
7500			

End Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
3000	210 30	210 40	240 40
3250	210 50	220 60	280 50
3500	210 70	260 70	330 60
3750	240 90	300 80	380 70
4000	270 100	340 90	430 80
4250	310 110	390 100	490 90
4500	350 130	430 120	550 100
4750	390 140	490 130	620 110
5000	430 160	540 140	
5250	480 170	600 160	
5500	530 190		
5750			
6000			
6250			
6500			
6750			
7000			
7250			
7500			

Shrinkage Reinforcement RF92

Multiple Span, Slab Depth 220 mm, t_{bm} = 1.0 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
3500	240 -	240 -	240 -
3750	240 -	240 -	270 -
4000	240 -	240 -	310 -
4250	240 -	270 -	350 -
4500	240 -	300 -	390 -
4750	260 -	340 -	440 -
5000	290 -	370 -	490 -
5250	320 -	410 -	540 -
5500	350 -	460 -	590 -
5750	390 -	500 -	
6000	420 -	550 -	
6250	460 -		
6500	500 -		
6750			
7000			
7250			
7500			
7750			
8000			

End Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
3500	240 50	240 60	300 60
3750	240 80	280 70	350 70
4000	260 90	320 80	400 70
4250	290 110	360 100	450 90
4500	330 120	400 110	510 100
4750	370 130	450 120	570 110
5000	410 150	500 140	630 120
5250	450 170	560 150	700 130
5500	500 180	610 170	
5750	540 200	670 180	
6000	600 220		
6250			
6500			
6750			
7000			
7250			
7500			
7750			
8000			

Shrinkage Reinforcement RF102

Multiple Span, Slab Depth 240 mm, t_{bm} = 1.0 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3500	260 -	260 -	260 -
3750	260 -	260 -	260 -
4000	260 -	260 -	280 -
4250	260 -	260 -	320 -
4500	260 -	280 -	360 -
4750	260 -	310 -	400 -
5000	270 -	350 -	450 -
5250	300 -	390 -	500 -
5500	330 -	420 -	550 -
5750	360 -	470 -	600 -
6000	400 -	510 -	660 -
6250	430 -	550 -	
6500	470 -	600 -	
6750	510 -		
7000	550 -		
7250			
7500			
7750			
8000			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3500	260 40	260 50	280 60
3750	260 60	260 70	320 70
4000	260 80	300 80	370 70
4250	280 100	340 90	420 80
4500	310 120	380 110	470 100
4750	350 130	420 120	530 110
5000	390 140	470 130	590 120
5250	430 160	520 150	650 130
5500	470 180	570 160	720 140
5750	520 190	630 180	790 160
6000	560 210	690 190	
6250	610 230		
6500	670 250		
6750			
7000			
7250			
7500			
7750			
8000			

Shrinkage Reinforcement RF102

Multiple Span, Slab Depth 250 mm, t_{bm} = 1.0 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3500	280	280	280
	-	-	-
3750	280	280	280
	-	-	-
4000	280	280	280
	-	-	-
4250	280	280	310
	-	-	-
4500	280	280	350
	-	-	-
4750	280	300	390
	-	-	-
5000	280	340	430
	-	-	-
5250	290	370	480
	-	-	-
5500	320	410	530
	-	-	-
5750	360	450	580
	-	-	-
6000	390	490	630
	-	-	-
6250	420	540	690
	-	-	-
6500	460	580	
	-	-	
6750	500	630	
	-	-	
7000	530		
	-		
7250	580		
	-		
7500			
7750			
8000			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3500	280	280	280
	30	40	50
3750	280	280	310
	50	60	70
4000	280	290	360
	70	80	70
4250	280	330	400
	100	90	90
4500	300	370	450
	120	100	100
4750	340	410	510
	130	120	110
5000	380	460	570
	140	130	120
5250	420	510	630
	160	140	130
5500	460	560	690
	170	160	140
5750	500	610	760
	190	180	160
6000	550	670	830
	210	190	170
6250	600	730	
	220	210	
6500	650		
	240		
6750	700		
	270		
7000			
7250			
7500			
7750			
8000			

Shrinkage Reinforcement RF81