Design principles and Assumptions

The design and use of concrete slabs that contain ARMOURDECK™ 600 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™600 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™ 600 has the following nominal section properties based on a unit width of deck equal to one metre.

The bond strength between the concrete and the steel sheeting were determined through a test program

Thickness (t_{bm}) (mm)	Mass Area (kg/m^2)	Cross section Area (mm^2)	y_{cg} (mm)	Yield Strength (MPa)
0.75	10.33	1280	15.3	550
0.90	12.27	1510	15.4	550
1.00	13.57	1670	15.4	550

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™ 600 under composite action.

These characteristic design parameters were derived as

Mechanical resistance (H_r) kPa $89.9\sqrt{(t_{bm} f_c')}$

Coefficient of resistance (μ) 0.5,

where t_{bm} is the base metal thickness and f_c' is the concrete strength.

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 ARMOURDECK™ 600 Composite Tables V1.0 2 of 31 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.

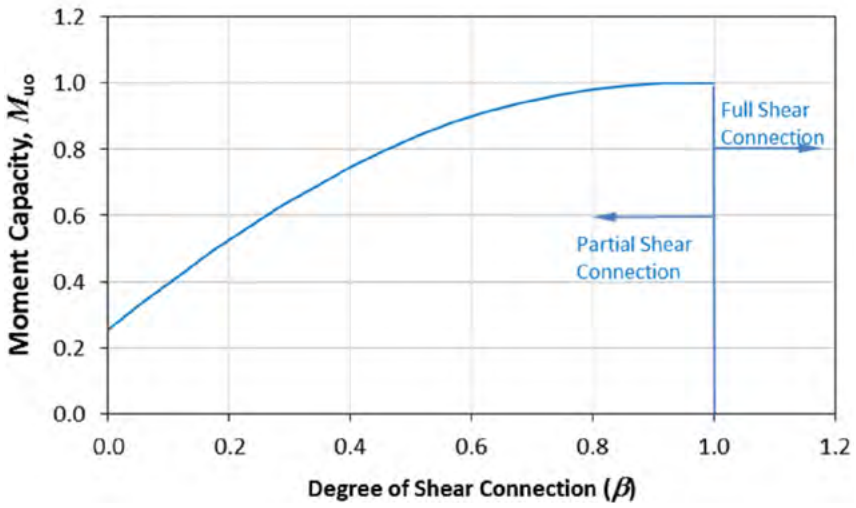


Figure 1 - Positive Moment Capacity Vs Degree of Shear Connection

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™ 600 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)

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}	ϕM_{uo}^{+}	I_{cr}	ϕM_{uo}^{+}	I_{cr}	ϕM_{uo}^{+}	I_{cr}
100	36.2	38.57	38.3	35.31	43.5	47.04	47.2	43.26
120	47.3	62.52	49.3	57.05	58.3	76.84	62.0	70.42
140	58.3	92.73	60.4	84.41	73.1	114.7	76.8	104.8
160	69.4	129.3	71.5	117.5	87.8	160.7	91.5	146.6
180	80.5	172.5	82.6	156.4	102.6	215.2	106.3	195.9
200	91.6	222.2	93.6	201.3	117.4	278.2	121.1	252.9
220	102.6	278.6	104.7	252.1	132.1	349.8	135.8	317.6
240	113.7	341.7	115.8	308.9	146.9	430.1	150.6	390.1
250	119.2	375.8	121.3	339.6	154.3	473.6	158.0	429.3
x_{csc} (mm)	1800		1600		2050		1850	

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™ 600 - 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 ϕM_{ou} 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 2400 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 deflections are 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.

Short and Long Term Factors

Short–Term Factor $\psi_s = 0.7$

Long–Term Factor $\psi_l = 0.4$

Combination–Term Factor $\psi_c = 0.4$

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.

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

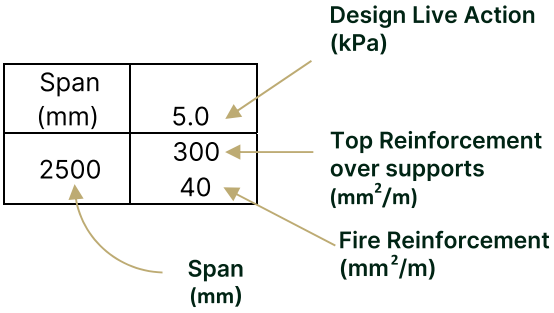
Slab Depth (mm)	*Fabric Size*
100	SL72
120	SL72
140	SL82
160	SL82
180	SL92
200	SL92
220	SL92
240	SL102
250	RL818

Interpretation of Tables

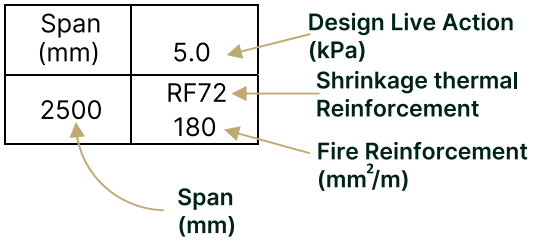
The following tables may be interpreted as outlined below:

- 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			

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 170	SL72 200	SL72 230
2750	SL72 210	SL72 240	SL72 280
3000	SL72 260	SL72 290	
3250	SL72 310		
3500			
3750			
4000			

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 230
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	SL92	SL92
	40	40	50
1750	SL92	SL92	SL92
	50	60	70
2000	SL92	SL92	SL92
	70	80	90
2250	SL92	SL92	SL92
	90	100	110
2500	SL92	SL92	SL92
	110	120	140
2750	SL92	SL92	SL92
	140	150	170
3000	SL92	SL92	SL92
	160	180	200
3250	SL92	SL92	SL92
	190	210	240
3500	SL92	SL92	SL92
	230	250	280
3750	SL92	SL92	SL92
	260	290	330
4000	SL92	SL92	SL92
	300	330	370
4250	SL92	SL92	
	340	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	SL92	SL92
	40	40	40
1750	SL92	SL92	SL92
	50	50	60
2000	SL92	SL92	SL92
	60	70	80
2250	SL92	SL92	SL92
	80	90	100
2500	SL92	SL92	SL92
	100	110	130
2750	SL92	SL92	SL92
	130	140	150
3000	SL92	SL92	SL92
	150	170	190
3250	SL92	SL92	SL92
	180	200	220
3500	SL92	SL92	SL92
	210	230	260
3750	SL92	SL92	SL92
	240	270	300
4000	SL92	SL92	SL92
	280	300	340
4250	SL92	SL92	SL92
	310	340	380
4500	SL92	SL92	
	350	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 100	SL102 110	SL102 120
2750	SL102 120	SL102 130	SL102 140
3000	SL102 140	SL102 150	SL102 170
3250	SL102 170	SL102 180	SL102 200
3500	SL102 200	SL102 210	SL102 240
3750	SL102 230	SL102 250	SL102 270
4000	SL102 260	SL102 280	SL102 310
4250	SL102 290	SL102 320	SL102 360
4500	SL102 330	SL102 360	SL102 400
4750	SL102 370	SL102 400	
5000	SL102 410	SL102 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 90	RL818 100	RL818 110
2750	RL818 110	RL818 120	RL818 130
3000	RL818 130	RL818 140	RL818 160
3250	RL818 160	RL818 170	RL818 180
3500	RL818 180	RL818 200	RL818 220
3750	RL818 210	RL818 230	RL818 250
4000	RL818 240	RL818 260	RL818 280
4250	RL818 270	RL818 290	RL818 320
4500	RL818 310	RL818 330	RL818 360
4750	RL818 340	RL818 370	RL818 410
5000	RL818 380	RL818 410	RL818 450
5250	RL818 420	RL818 460	RL818 500
5500	RL818 470	RL818 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 50	SL82 50	SL82 60
1750	SL82 70	SL82 80	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 180	SL82 200	SL82 230
3000	SL82 210	SL82 240	SL82 270
3250	SL82 250	SL82 280	SL82 320
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 70	SL82 70
2000	SL82 80	SL82 90	SL82 100
2250	SL82 100	SL82 110	SL82 130
2500	SL82 130	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 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 100	SL102 110	SL102 120
2750	SL102 120	SL102 130	SL102 140
3000	SL102 140	SL102 160	SL102 170
3250	SL102 170	SL102 180	SL102 200
3500	SL102 200	SL102 210	SL102 240
3750	SL102 230	SL102 250	SL102 270
4000	SL102 260	SL102 280	SL102 310
4250	SL102 300	SL102 320	SL102 360
4500	SL102 330	SL102 360	SL102 400
4750	SL102 370	SL102 410	
5000	SL102 410		
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 90	RL818 100	RL818 110
2750	RL818 110	RL818 120	RL818 130
3000	RL818 130	RL818 140	RL818 160
3250	RL818 160	RL818 170	RL818 190
3500	RL818 180	RL818 200	RL818 220
3750	RL818 210	RL818 230	RL818 250
4000	RL818 240	RL818 260	RL818 290
4250	RL818 270	RL818 300	RL818 320
4500	RL818 310	RL818 330	RL818 370
4750	RL818 340	RL818 370	RL818 410
5000	RL818 380	RL818 410	RL818 460
5250	RL818 420	RL818 460	
5500	RL818 470	RL818 500	
5750	RL818 510		
6000			
6250			
6500			
6750			
7000			

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

Internal Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	90	90	100
1750	90	100	140
2000	90	130	180
2250	120	170	230
2500	150	210	300
2750	180	260	360
3000	210	310	440
3250	250	370	
3500	300		
3750			
4000			
4250			
4500			

End Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	90	90	120
1750	90	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} = 0.75mm

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 -	460 -
3750	270 -	380 -	
4000	310 -		
4250	360 -		
4500			
4750			
5000			
5250			
5500			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2000	120 20	130 30	170 30
2250	130 40	170 40	220 30
2500	160 50	210 50	280 40
2750	190 70	260 50	340 50
3000	230 80	310 70	420 50
3250	280 90	370 80	
3500	320 110		
3750			
4000			
4250			
4500			
4750			
5000			
5250			
5500			

Shrinkage Reinforcement RF72

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

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 -	500 -
4250	300 -	410 -	
4500	340 -	470 -	
4750	380 -		
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} = 0.75mm

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	540
	-	-	-
4750	330	450	
	-	-	
5000	370	500	
	-	-	
5250	410		
	-		
5500			
5750			
6000			
6250			
6500			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2500	180	180	200
	20	30	30
2750	180	190	240
	40	40	40
3000	180	230	290
	60	50	50
3250	210	270	350
	70	60	50
3500	240	310	410
	90	80	60
3750	280	360	470
	100	90	70
4000	320	410	540
	110	100	90
4250	370	470	
	130	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} = 0.75mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2500	200 -	200 -	200 -
2750	200 -	200 -	200 -
3000	200 -	200 -	200 -
3250	200 -	200 -	240 -
3500	200 -	210 -	280 -
3750	200 -	240 -	320 -
4000	210 -	280 -	370 -
4250	240 -	320 -	420 -
4500	270 -	360 -	480 -
4750	300 -	400 -	530 -
5000	330 -	450 -	600 -
5250	370 -	490 -	
5500	410 -	540 -	
5750	450 -		
6000			
6250			
6500			
6750			
7000			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2500	200 10	200 10	200 20
2750	200 20	200 30	220 40
3000	200 40	200 50	260 40
3250	200 60	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	370 140	480 120	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} = 0.75mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3000	230	230	230
	-	-	-
3250	230	230	230
	-	-	-
3500	230	230	250
	-	-	-
3750	230	230	290
	-	-	-
4000	230	250	330
	-	-	-
4250	230	290	380
	-	-	-
4500	250	320	430
	-	-	-
4750	280	360	480
	-	-	-
5000	310	400	530
	-	-	-
5250	340	450	590
	-	-	-
5500	380	490	650
	-	-	-
5750	410	540	
	-	-	
6000	450	590	
	-	-	
6250	490		
	-		
6500			
6750			
7000			
7250			
7500			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3000	230	230	230
	20	30	50
3250	230	230	280
	40	50	50
3500	230	260	320
	60	70	60
3750	240	300	380
	80	80	70
4000	270	340	430
	100	90	80
4250	310	380	490
	110	100	90
4500	350	430	550
	120	110	100
4750	390	490	620
	140	120	110
5000	430	540	690
	160	140	120
5250	480	600	
	170	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} = 0.75mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3500	260	260	260
	-	-	-
3750	260	260	270
	-	-	-
4000	260	260	300
	-	-	-
4250	260	270	350
	-	-	-
4500	260	300	390
	-	-	-
4750	260	330	440
	-	-	-
5000	290	370	490
	-	-	-
5250	320	410	540
	-	-	-
5500	350	450	590
	-	-	-
5750	390	500	650
	-	-	-
6000	420	540	710
	-	-	-
6250	460	590	
	-	-	
6500	500	640	
	-	-	
6750	540		
	-		
7000			
7250			
7500			
7750			
8000			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3500	260	260	300
	40	60	60
3750	260	270	340
	70	80	70
4000	260	310	390
	90	90	80
4250	290	360	450
	110	100	90
4500	330	400	500
	120	110	100
4750	360	450	570
	140	120	110
5000	410	500	630
	150	140	120
5250	450	560	700
	160	150	130
5500	490	610	
	180	170	
5750	540	670	
	200	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} = 0.75mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3500	290 -	290 -	290 -
3750	290 -	290 -	290 -
4000	290 -	290 -	290 -
4250	290 -	290 -	320 -
4500	290 -	290 -	360 -
4750	290 -	310 -	400 -
5000	290 -	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 -	780 -
6750	510 -	650 -	
7000	550 -	700 -	
7250	590 -		
7500			
7750			
8000			

End Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3500	290 30	290 40	290 50
3750	290 50	290 60	320 70
4000	290 70	300 80	370 70
4250	290 100	330 100	420 80
4500	310 120	380 100	470 90
4750	350 130	420 120	530 100
5000	380 150	470 130	580 120
5250	430 160	520 150	650 130
5500	470 170	570 160	710 150
5750	510 190	630 180	780 160
6000	560 210	690 190	
6250	610 230	750 210	
6500	660 250		
6750			
7000			
7250			
7500			
7750			
8000			

Shrinkage Reinforcement RF102

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

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 -	810 -
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 20	310 30	310 40
3750	310 40	310 50	310 60
4000	310 60	310 70	350 80
4250	310 80	330 90	400 80
4500	310 110	370 100	450 100
4750	340 130	410 120	510 100
5000	380 140	460 130	570 120
5250	420 150	510 140	630 130
5500	460 170	560 160	690 140
5750	500 190	610 170	760 160
6000	550 210	670 190	830 170
6250	600 220	730 200	
6500	650 240	790 220	
6750	700 260		
7000			
7250			
7500			
7750			
8000			

Shrinkage Reinforcement RF81

Multiple Span, Slab Depth 100 mm, t_{bm} = 1.00 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
1500	60 -	70 -	100 -
1750	70 -	100 -	140 -
2000	90 -	130 -	180 -
2250	120 -	170 -	240 -
2500	150 -	210 -	300 -
2750	180 -	260 -	370 -
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 20	90 20	120 20
1750	90 30	130 20	170 20
2000	120 40	170 30	230 30
2250	160 50	220 40	290 40
2500	200 70	270 60	370 50
2750	240 90	330 70	460 50
3000	290 100		
3250			
3500			
3750			
4000			
4250			
4500			

Shrinkage Reinforcement RF72

Multiple Span, Slab Depth 120 mm, t_{bm} = 1.00 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2000	90 -	100 -	140 -
2250	90 -	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 30	130 30	170 30
2250	130 40	170 40	220 30
2500	160 50	210 50	280 40
2750	190 70	260 60	350 50
3000	230 80	310 70	420 60
3250	280 90	370 80	
3500	320 110		
3750			
4000			
4250			
4500			
4750			
5000			
5250			
5500			

Shrinkage Reinforcement RF72

Multiple Span, Slab Depth 140 mm, t_{bm} = 1.00 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 10	120 20	140 20
2250	120 30	140 30	180 30
2500	140 40	180 40	230 40
2750	170 60	220 50	280 40
3000	200 70	260 60	340 50
3250	240 80	310 70	410 60
3500	280 90	360 80	480 70
3750	320 110	420 90	
4000	370 120		
4250			
4500			
4750			
5000			
5250			
5500			
5750			
6000			

Shrinkage Reinforcement RF82

Multiple Span, Slab Depth 160 mm, t_{bm} = 1.00 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 60
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} = 1.00 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
2500	170 -	170 -	170 -
2750	170 -	170 -	170 -
3000	170 -	170 -	200 -
3250	170 -	180 -	240 -
3500	170 -	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	170 20	170 20	180 30
2750	170 30	170 40	220 40
3000	170 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	
4750	420 150	530 140	
5000	470 170		
5250			
5500			
5750			
6000			
6250			
6500			
6750			
7000			

Shrinkage Reinforcement RF92

Multiple Span, Slab Depth 200 mm, t_{bm} = 1.00 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3000	200 -	200 -	200 -
3250	200 -	200 -	220 -
3500	200 -	200 -	250 -
3750	200 -	220 -	290 -
4000	200 -	250 -	330 -
4250	220 -	290 -	380 -
4500	250 -	330 -	430 -
4750	280 -	360 -	480 -
5000	310 -	410 -	530 -
5250	340 -	450 -	
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	200 30	200 40	240 40
3250	200 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	440 110	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} = 1.00 mm

Internal Spans

Span (mm)	Q Design Live Action (kPa) 1.5	3.0	5.0
3500	230 -	230 -	230 -
3750	230 -	230 -	270 -
4000	230 -	230 -	310 -
4250	230 -	270 -	350 -
4500	230 -	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	230 60	240 60	300 60
3750	230 80	280 70	350 70
4000	260 90	320 80	400 80
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	550 200		
6000	600 220		
6250			
6500			
6750			
7000			
7250			
7500			
7750			
8000			

Shrinkage Reinforcement RF102

Multiple Span, Slab Depth 240 mm, t_{bm} = 1.00 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	370 -	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	580 160	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} = 1.00 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	270
	-	-	-
4250	270	270	310
	-	-	-
4500	270	270	350
	-	-	-
4750	270	300	390
	-	-	-
5000	270	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	540		
	-		
7250	580		
	-		
7500			
7750			
8000			

End Spans

Span (mm)	Q Design Live Action (kPa)		
	1.5	3.0	5.0
3500	270	270	270
	30	40	60
3750	270	270	310
	50	60	70
4000	270	290	360
	80	80	70
4250	270	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