

Load Tables for 110mm Masonry with ThorBar 9 Single Bed Joint Reinforcement in New Construction

THOR TIED ARCH LINTEL DESIGN

Design Data
Brick Width = 110 mm
Brick Height = 76 mm
Mortar Joint = 10 mm
Wt Masonry = 19 kNm ³
9mm ThorBar Area = 14.88 mm ²

Loads Shown Satisfy both Design Moment, Design Shear and 1/500 Deflection Limit
(**BOLD** values indicate that Design Shear is the Critical Factor)
(Shaded Areas Show that Span do not meet 1/500 Deflection Limit)

Courses Above ThorBar	Effective Depth of Beam (mm)	Number of ThorBars	Ultimate Linel Self Weight (kN/m)	Total Steel Area (mm ²)	LINTEL CLEAR SPAN (mm)												Ultimate Design Moment M _d (kNm)	Ultimate Design Shear V _d (kN)
					Superimposed Uniformly Distributed Ultimate Load (kN/m ²)													
					1200	1500	1800	2100	2400	2700	3000	3300	3600*	3900*	4200*	4500*		
3	253	2	0.63	29.76	2.91	1.41	0.65	0.23									3.97	7.70
3	253	3	0.63	44.64	2.91	1.41	0.65	0.23									5.73	7.89
4	339	2	0.85	29.76	7.68	4.08	2.25	1.23	0.61	0.21							5.42	10.18
4	339	3	0.85	44.64	7.68	4.08	2.25	1.23	0.61	0.21							7.91	10.37
5	425	2	1.07	29.76	15.74	8.66	5.06	3.03	1.81	1.03	0.51						6.87	12.66
5	425	3	1.07	44.64	15.74	8.66	5.06	3.03	1.81	1.03	0.51						10.08	12.86
6	511	3	1.28	44.64	19.17	15.62	9.36	5.85	3.72	2.37	1.46	0.83	0.38	0.04			12.25	15.34
6	511	4	1.28	59.52	19.43	15.62	9.36	5.85	3.72	2.37	1.46	0.83	0.38	0.04			16.05	15.54
7	597	3	1.50	44.64	22.26	18.30	15.47	9.87	6.49	4.32	2.87	1.87	1.15	0.62	0.22		14.43	17.82
7	597	4	1.50	59.52	22.52	18.52	15.47	9.87	6.49	4.32	2.87	1.87	1.15	0.62	0.22		18.94	18.02
8	683	3	1.71	44.64	32.13	25.36	20.85	17.82	15.20	10.24	7.00	4.83	3.33	2.25	1.46	0.87	16.60	20.31
8	683	4	1.71	59.52	32.45	25.62	21.06	17.81	15.32	10.24	7.00	4.83	3.33	2.25	1.46	0.87	21.84	20.50
9	769	3	1.93	44.64	36.05	28.45	23.39	19.77	17.06	14.95	10.51	7.42	5.27	3.73	2.60	1.75	18.78	22.79
9	769	4	1.93	59.52	36.38	28.71	19.96	17.22	15.09	10.51	7.42	5.27	3.73	2.60	1.75	1.11	24.74	22.99
10	855	3	2.14	44.64	39.97	31.55	25.93	21.92	18.91	16.57	14.70	10.70	7.75	5.64	4.09	2.92	20.95	25.27
10	855	4	2.14	59.52	40.30	31.81	26.15	22.11	19.08	16.72	14.83	10.70	7.75	5.64	4.09	2.92	27.64	25.47

* Clear spans of 3600mm and greater require some form of lateral restraint to prevent buckling

** Applied loads shown in the table are additional to the self weight of the brickwork forming the lintel (assuming self weight of brickwork is 19 kN/m³)

Design Data for Bending		Design Data for Shear		Data for Deflection	
φ = 0.75 (Table 4.1, AS3700-2001)	φ = 0.75 (Table 4.1, AS3700-2001)	φ = 0.75 (Table 4.1, AS3700-2001)	φ = 0.75 (Table 4.1, AS3700-2001)	E _m = 7000mm	E _m = 7000mm
tensile strength = 1040.35 MPa	f _{vm} = 0.35 MPa (Cl. 8.6.3, AS3700-2001)	f _{vm} = 0.35 MPa	f _{vm} = 0.35 MPa	E _l = 4500mm	E _l = 4500mm
f _{yt} = 755 MPa	f _{vc} = 17.5 MPa (Cl. 8.6.3, AS3700-2001)	f _{vc} = 17.5 MPa	f _{vc} = 17.5 MPa	Es = 200000 MPa	Es = 200000 MPa
f _{uc} = 15 MPa	f _{uc} = 5.4 MPa (Cl. 3.3.2, AS3700-2001)	f _{uc} = 15 MPa	f _{uc} = 15 MPa	k _{cs} = 3	k _{cs} = 3
f _m = 5.4 MPa		f _m = 5.4 MPa		ΔL _e limit = 1/500	ΔL _e limit = 1/500

Assumptions / Design Data

- Lintel is simply supported
- Load factor of 1.2 for self weight of lintel
- Design Yield Strength of Reinforcement, f_y = 2% Proof Stress
- Modulus of Elasticity of Reinforcement, E = 200,000 MPa
- Characteristic Compressive Strength of Masonry, f_m = 5.4 MPa
- M_d ≤ φ f_{yk}A_{wd}[1 - 0.6f_{yk}A_{wd} / (1.3f_{yk}b_{wd})] (Cl. 8.5, AS3700-2001)
- A_{wd} = lesser of (0.29)1.3f_{yk}b_{wd}f_{yk} and A_{wk} (Cl. 8.5, AS3700-2001)
- V_d ≤ φ (f_{vm}b_{wd}d + f_{vc}A_{wd} + f_{yk}A_{wd}/s), (Cl. 8.6.3, AS3700-2001)
- As_t = lesser of steel area and 0.02b_{wd}d, (Cl. 8.6.3, AS3700-2001)
- Minimum 2 bars
- Designed for vertical deflection limit of 1/500
- Shear = wL/2
- p = As_tb_{wd} / 0.005
- No compression (top) reinforcement
- Minimum 2 bars
- Designed for vertical deflection limit of 1/500

Load Tables for 110mm Masonry with ThorBar 6 Single Bed Joint Reinforcement in New Construction

THOR TIED ARCH LINTEL DESIGN

Design Data	
Brick Width =	110 mm
Brick Height =	76 mm
Mortar Joint =	10 mm
Wt Masonry =	19 kNm ³
6mm ThorBar Area =	7.39 mm ²

Loads Shown Satisfy both Design Moment, Design Shear and 1/500 Deflection Limit
 (BOLD values indicate that Design Shear is the Critical Factor)
 (Shaded Areas Show that Span do not meet 1/500 Deflection Limit)

Courses Above ThorBar	Effective Depth of Beam (mm)	Number of ThorBars	Ultimate Linel Self Weight (kNm)	Total Steel Area (mm ²)	LINTEL CLEAR SPAN (mm)											Ultimate Design Moment M _u (kNm)	Ultimate Design Shear V _u (kN)		
					1200	1500	1800	2100	2400	2700	3000	3300	3600*	3900*	4200*			4500*	4800*
3	253	2	0.63	14.78	6.29	2.91	1.41	0.65	0.23									2.42	7.50
3	253	3	0.63	22.17	6.29	2.91	1.41	0.65	0.23									3.55	7.60
4	339	2	0.85	14.78	15.78	7.68	4.08	2.25	1.23	0.61	0.21							3.28	9.98
4	339	3	0.85	22.17	15.81	7.68	4.08	2.25	1.23	0.61	0.21							4.84	10.08
5	425	2	1.07	14.78	19.71	13.64	8.66	5.06	3.03	1.81	1.03	0.51						4.14	12.47
5	425	3	1.07	22.17	19.87	15.68	8.66	5.06	3.03	1.81	1.03	0.51						6.13	12.56
6	511	3	1.28	22.17	23.79	18.77	15.43	9.36	5.85	3.72	2.37	1.46	0.83	0.38	0.04			7.41	15.05
6	511	4	1.28	29.56	23.95	18.90	15.64	9.36	5.85	3.72	2.37	1.46	0.83	0.38	0.04			9.78	15.14
7	597	3	1.50	22.17	27.71	21.87	17.97	14.28	9.87	6.49	4.32	2.87	1.87	1.15	0.62	0.22		8.70	17.53
7	597	4	1.50	29.56	27.87	22.00	18.08	15.28	9.87	6.49	4.32	2.87	1.87	1.15	0.62	0.22		11.50	17.63
8	683	3	1.71	22.17	31.64	24.97	20.52	16.40	12.16	9.24	7.00	4.83	3.33	2.25	1.46	0.87	0.41	9.99	20.01
8	683	4	1.71	29.56	31.80	25.09	20.63	17.43	15.04	10.24	7.00	4.83	3.33	2.25	1.46	0.87	0.41	13.22	20.11
9	769	3	1.93	22.17	35.56	28.06	23.06	18.52	13.73	10.44	8.09	6.35	5.03	3.73	2.60	1.75	1.11	11.28	22.50
9	769	4	1.93	29.56	35.72	28.19	23.17	19.68	16.89	14.45	10.51	7.42	5.27	3.73	2.60	1.75	1.11	14.93	22.59
10	855	3	2.14	22.17	39.48	31.16	25.61	20.64	15.30	11.64	9.02	7.08	5.61	4.46	3.55	2.81	2.03	12.56	24.98
10	855	4	2.14	29.56	39.64	31.29	25.71	21.73	18.75	16.12	12.65	10.08	7.75	5.64	4.09	2.92	2.03	16.85	25.08

* Clear spans of 3600mm and greater require some form of lateral restraint to prevent buckling

* Applied loads shown in the table are additional to the self weight of the brickwork forming the lintel (assuming self weight of brickwork is 19 kN/m³)

Design Data for Bending		Design Data for Shear		Data for Deflection	
φ =	0.75 (Table 4.1, AS3700-2001)	φ =	0.75 (Table 4.1, AS3700-2001)	E _m =	7000fm = 3780 MPa
tensile strength =	1181.58 MPa	f _{vm} =	0.35 MPa (Cl. 8.6.3, AS3700-2001)	E _i =	450fm = 2430 MPa
f _{ty} =	900 MPa	f _{ts} =	17.5 MPa (Cl. 8.6.3, AS3700-2001)	Es =	200000 MPa
f _{uc} =	15 MPa			k _{cs} =	3
f _m =	5.4 MPa (Cl. 3.3.2, AS3700-2001)			Δ/L _{cr} limit =	1/500 = 0.002

Assumptions / Design Data

- Lintel is simply supported
- Load factor of 1.2 for self weight of lintel
- Design Yield Strength of Reinforcement, f_y = 2% Proof Stress
- Modulus of Elasticity of Reinforcement, E = 200,000 Mpa
- Characteristic Compressive Strength of Masonry, f_m = 5.4 MPa
- M_u ≤ φ f_{ty}A_{st}[1 - 0.6 f_{ty}A_{st} / (3 f_mb d)], Cl. 8.5, AS3700-2001
- A_{st} = lesser of (0.29) f_mb d / f_{ty} and A_{req}, Cl. 8.5, AS3700-2001
- V_u ≤ φ (f_{vm}b d + f_{ty}A_{st}), Cl. 8.6.3, AS3700-2001
- A_{st} = lesser of steel area and 0.02b_wd, Cl. 8.6.3, AS3700-2001
- Bending Moment = wL²/8
- Shear = wL/2
- p = A_{st}/bd < 0.005
- No compression (top) reinforcement
- Minimum 2 bars
- Designed for vertical deflection limit of 1/500