

THOR-TIED ARCH LINTEL DESIGN

Design Data	110	mm
Brick Width =	76	mm
Brick Height =	10	mm
Mortar Joint =	19	mm
WT Masonry =	14.88	kN/m ³
9mm ThorBar Area =		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 Lintel Self Weight (kNm)	Total Steel Area (mm ²)	LINTEL CLEAR SPAN (mm)											Ultimate Design Moment M _u (kNm)	Ultimate Design Shear V _u (kN)	
					Superimposed Uniformly Distributed Ultimate Load (kNm/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	338	2	0.85	29.76	7.68	4.08	2.25	1.23	0.61	0.21							5.42	10.18
4	338	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	0.15					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	0.15					10.08	12.86
6	511	3	1.28	44.64	24.28	19.17	16.62	9.36	3.72	2.37	1.46	0.83	0.38	0.04			12.25	15.34
6	511	4	1.28	59.52	24.81	19.43	16.62	9.36	3.72	2.37	1.46	0.83	0.38	0.04			16.05	15.54
7	597	3	1.50	44.64	28.20	22.28	18.30	15.47	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	28.83	22.62	18.52	15.48	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	26.36	20.85	17.62	10.24	7.00	4.83	3.33	2.25	1.46	0.87	0.41	16.60	20.31
8	683	4	1.71	59.52	32.45	26.62	21.06	17.81	10.24	7.00	4.83	3.33	2.25	1.46	0.87	0.41	21.84	20.80
9	768	3	1.93	44.64	36.06	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	768	4	1.93	59.52	36.38	28.71	23.61	19.96	17.22	15.09	10.51	7.42	5.27	3.73	2.60	1.75	24.74	22.99
10	855	3	2.14	44.64	39.97	31.55	25.93	21.92	18.91	16.67	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	26.16	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	ψ = 0.75 (Table 4.1, AS3700-2001)	Design Data for Shear	ψ = 0.75 (Table 4.1, AS3700-2001)	Ultimate factor =	1.2	Data for Deflection	E _m = 7007m
tensile strength =	1040.35 MPa	f _{tm} = 0.35 MPa (Cl. 8.6.3, AS3700-2001)	f _{tm} = 17.5 MPa (Cl. 8.6.3, AS3700-2001)	E _i =	4507m	E _s =	200000 MPa
f _{ty} =	755 MPa			k _{ca} =		3	
f _{uw} =	15 MPa			Δ/L _u limit =	1/500	=	0.002
f _m =	5.4 MPa (Cl. 3.3.2, AS3700-2001)						

Assumptions / Design Data

1. Lintel is simply supported
2. Load factor of 1.2 for self weight of lintel
3. Design Yield Strength of Reinforcement, f_{sy} = 2% Proof Stress
4. Modulus of Elasticity of Reinforcement, E = 200,000 MPa
5. Characteristic Compressive Strength of Masonry, f_m = 5.4 MPa
6. M_u ≤ φ_b A_{st} f_{sy} (1 - 0.6 f_{sy} / A_{st}) (1.3 f_m b d²), Cl. 8.5, AS3700-2001
7. A_{st} = lesser of (0.29) 1.3 f_m b d f_{sy} and A_{req}, Cl. 8.5, AS3700-2001
8. V_u ≤ φ (f_m b d + f_{tm} A_{st} + f_{tm} A_{st} d), Cl. 8.6.3, AS3700-2001
9. A_{st} = lesser of steel area and 0.02 b_u d, Cl. 8.6.3, AS3700-2001
10. Bending Moment = wL²/8
11. Shear = wL/2
12. p = A_{st}/b d < 0.005
13. No compression (top) reinforcement
14. Minimum 2 bars
15. Designed for vertical deflection limit of 1/500