NCMA TEK

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ALLOWABLE STRESS DESIGN TABLES FOR REINFORCED CONCRETE MASONRY WALLS

TEK 14-19A
Structural (2005)

Keywords: allowable stress design, design examples, flexural strength, lateral loads, reinforced concrete masonry

INTRODUCTION

The combination of concrete masonry and steel reinforcement provides a strong structural system capable of resisting large compressive and flexural loads. Reinforced masonry structures have significantly higher flexural strength and ductility than similarly configured unreinforced structures and provide greater reliability in terms of expected load carrying capacity at failure.

Two methods of designing reinforced concrete masonry structures are commonly used:

- allowable stress design, based on service level loads and proportioning members using conservative allowable stresses.
- strength design, based on a realistic evaluation of member strength subjected to factored loads which have a low probability of being exceeded during the life of the structure.

Capacities of reinforced concrete masonry determined by the allowable stress design method are included herein. Capacities of reinforced concrete masonry determined by the strength design method are included in *Strength Design of Concrete Masonry Walls for Axial Load and Flexure*, TEK 14-11B (ref.3).

ALLOWABLE STRESS DESIGN

The wall capacities of Table 3 are determined in accordance with the requirements for allowable stress design of reinforced concrete masonry contained in Chapter 2 of *Building Code Requirements for Masonry Structures* (ref. 2). A more detailed discussion of the allowable stress design method, as well as provisions governing materials and construction for reinforced concrete masonry, are contained in *Allowable Stress Design of Reinforced Concrete Masonry*, TEK 14-7A (ref. 1).

LOAD TABLES

Tables 1 and 2 list the maximum bending moments and shears, respectively, imposed on walls simply supported at top and bottom subjected to uniform lateral loads with no applied axial loads.

WALL CAPACITY TABLES

Table 3 contains the maximum bending moments and shear loads that can be sustained by various reinforced walls, without exceeding the allowable stresses defined in *Building Code Requirements for Masonry Structures* (ref. 2). These wall strengths can be compared to the loads in Tables 1 and 2 to ensure the wall under consideration is not loaded beyond its design capacity.

The values in Table 3 are based on the following criteria:

- Allowable stresses:
  $F_b = 1/3\, f'_m$
  $F_v = \sqrt{f'_m}$, 50 psi (0.35 MPa) maximum
  F_s = 24,000 psi (165 MPa)
- f'_m = 1500 psi (10.3 MPa)
- $E_m = 900 f'_m$ or 1,350,000 psi (9,310 MPa)
- E_s = 29,000,000 psi (200,000 MPa)
- Type M or S mortar
- running bond or bond beams at 48 in or less o.c.
- reinforcement spacing does not exceed the wall height
- walls are grouted only at cores containing reinforcement
- where indicated, allowable stresses are increased by 1/3, as prescribed in *Building Code Requirements for Masonry Structures* (ref. 2), section 2.1.2.3, for load combinations including wind or seismic loads
- due to space limitations, metric equivalents are not provided in Table 3 except for reinforcement bar sizes. Metric equivalents can be obtained by applying the following conversion factors:
  in x 25.4 = mm
  in^2/ft x 2117 = mm^2/m
  lb-in/ft x 0.0003707 = kN-m/m
  lb/ft x 0.01459 = kN/m

Table 1—Required Moment Strength of Walls for Uniform Lateral Loads

Wall ht., ft (m)	Required resisting moment, M, lb-in/ft (kN-m/m)[a] Uniform lateral load, psf (kPa)						
	5 (0.24)	15 (0.72)	20 (0.96)	25 (1.20)	30 (1.44)	35 (1.68)	45 (2.15)
8 (2.4)	480 (0.18)	1,440 (0.53)	1,920 (0.71)	2,400 (0.89)	2,880 (1.07)	3,360 (1.25)	4,320 (1.60)
12 (3.7)	1,080 (0.40)	3,240 (1.20)	4,320 (1.60)	5,400 (2.00)	6,480 (2.40)	7,560 (2.80)	9,720 (3.60)
16 (4.9)	1,920 (0.71)	5,760 (2.14)	7,680 (2.85)	9,600 (3.56)	11,500 (4.27)	13,400 (4.98)	17,300 (6.41)
20 (6.1)	3,000 (1.11)	9,000 (3.34)	12,000 (4.45)	15,000 (5.56)	18,000 (6.67)	21,000 (7.78)	27,000 (10.0)
24 (7.3)	4,320 (1.60)	13,000 (4.80)	17,300 (6.41)	21,600 (8.01)	25,900 (9.61)	30,200 (11.2)	38,900 (14.4)
28 (8.5)	5,880 (2.18)	17,600 (6.54)	23,500 (8.72)	29,400 (10.9)	35,300 (13.1)	41,200 (15.3)	52,900 (19.6)
32 (9.8)	7,680 (2.85)	23,000 (8.54)	30,700 (11.4)	38,400 (14.2)	46,100 (17.1)	53,800 (19.9)	69,100 (25.6)
36 (11.0)	9,720 (3.60)	29,200 (10.81)	38,900 (14.4)	48,600 (18.0)	58,300 (21.6)	68,000 (25.2)	87,500 (32.4)
40 (12.2)	12,000 (4.45)	36,000 (13.34)	48,000 (17.8)	60,000 (22.2)	72,000 (26.7)	84,000 (31.1)	108,000 (40.0)

[a] Based on walls simply supported at top and bottom, no axial load.

Table 2—Required Shear Strength of Walls for Uniform Lateral Loads

Wall ht., ft (m)	Required resisting shear, V, lb/ft (kN/m)[a] Uniform lateral load, psf (kPa)						
	5 (0.24)	15 (0.72)	20 (0.96)	25 (1.20)	30 (1.44)	35 (1.68)	45 (2.15)
8 (2.4)	20 (0.29)	60 (0.88)	80 (1.17)	100 (1.46)	120 (1.75)	140 (2.04)	180 (2.63)
12 (3.7)	30 (0.44)	90 (1.31)	120 (1.75)	150 (2.19)	180 (2.63)	210 (3.07)	270 (3.94)
16 (4.9)	40 (0.58)	120 (1.75)	160 (2.34)	200 (2.92)	240 (3.50)	280 (4.09)	360 (5.25)
20 (6.1)	50 (0.73)	150 (2.19)	200 (2.92)	250 (3.65)	300 (4.38)	350 (5.11)	450 (6.57)
24 (7.3)	60 (0.88)	180 (2.63)	240 (3.50)	300 (4.38)	360 (5.25)	420 (6.13)	540 (7.88)
28 (8.5)	70 (1.02)	210 (3.07)	280 (4.09)	350 (5.11)	420 (6.13)	490 (7.15)	630 (9.19)
32 (9.8)	80 (1.17)	240 (3.50)	320 (4.67)	400 (5.84)	480 (7.01)	560 (8.17)	720 (10.5)
36 (11.0)	90 (1.31)	270 (3.94)	360 (5.25)	450 (6.57)	540 (7.88)	630 (9.19)	810 (11.8)
40 (12.2)	100 (1.46)	300 (4.38)	400 (5.84)	500 (7.30)	600 (8.76)	700 (10.2)	900 (13.1)

[a] Based on walls simply supported at top and bottom, no axial load.

DESIGN EXAMPLE

A warehouse wall will span 34 ft (10.4 m) between the floor slab and roof diaphragm. The walls will be 12 in. (305 mm) thick. What is the required reinforcing steel to support a wind load of 20 psf (0.96 kPa)?

From interpolation of Tables 1 and 2, respectively, the wall must be able to resist:

M = 34,800 lb-in/ft (12.9 kN-m/m)
V = 340 lb/ft (4.96 kN/m)

Assuming d = 8.625 in. (219 mm), from Table 3 (for load combinations including wind or seismic) no. 7 bars at 48 in. (1219 mm) on center provides sufficient strength:

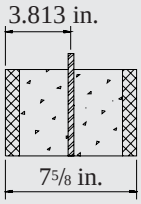
M_r = 38,512 lb-in/ft (14.3 kN-m/m) > M OK
V_r = 5345 lb/ft (77.9 kN/m) > V OK

Note: Since wind loads can act in either direction, two bars must be provided in each cell when using off center reinforcement - one next to each faceshell. Alternatively no. 6 bars at 24 in (19M at 610mm) or no. 8 at 40 in (25M at 1016 mm) could have been used in the center of the wall.

NOTATION

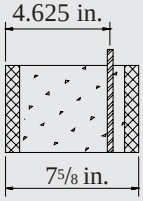
A_s = net area of steel per foot of wall length, in.^{2}/ft (mm^2/m)
b = effective width of compression zone, in. (mm)
d = distance from extreme compression fiber to centroid of tension reinforcement, in. (mm)
E_m = modulus of elasticity of masonry, psi (MPa)
E_s = modulus of elasticity of steel, psi (MPa)
F_b = allowable compressive stress due to flexure, psi (MPa)
F_s = allowable tensile stress in reinforcement, psi (MPa)
F_v = allowable shear stress in masonry, psi (MPa)
f'_m = specified compressive strength of masonry, psi (MPa)
M = applied moment, in.-lb/ft (kN·m/m)
M_r = resisting moment of wall, in.-lb/ft (kN·m/m)
V = applied shear, lb/ft (kN/m)
V_r = resisting shear of wall, lb/ft (kN/m)

Table 3—Allowable Stress Design Capacities of 8 in. Concrete Masonry Walls



Nominal wall thickness = 8 in. Effective depth, d = 3.813 in.

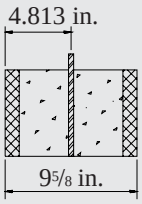
			Not including wind or seismic		Including wind or seismic					Not including wind or seismic		Including wind or seismic	
Bar Size no.	Bar Spacing in	A_s in^2/ft	M_r lb-in/ft	V_r lb/ft	M_r lb-in/ft	V_r lb/ft	Bar Size no.	Bar Spacing in	A_s in^2/ft	M_r lb-in/ft	V_r lb/ft	M_r lb-in/ft	V_r lb/ft
8 (25M)	8	1.19	21,860	1,772	29,146	2,363	7 (22M)	48	0.15	12,171	1,772	16,227	2,363
7 (22M)	8	0.90	20,647	1,772	27,529	2,363	6 (19M)	40	0.13	10,888	1,772	14,518	2,363
6 (19M)	8	0.66	19,201	1,772	25,602	2,363	6 (19M)	48	0.11	9,146	1,772	12,195	2,363
8 (25M)	16	0.59	18,055	1,772	24,073	2,363	4 (13M)	24	0.10	8,348	1,772	11,130	2,363
5 (16M)	8	0.47	17,511	1,772	23,348	2,363	5 (16M)	40	0.09	7,786	1,772	10,381	2,363
7 (22M)	16	0.45	16,963	1,772	22,617	2,363	5 (16M)	48	0.08	6,534	1,772	8,712	2,363
8 (25M)	24	0.40	16,306	1,772	21,741	2,363	6 (19M)	72	0.07	6,097	1,181	8,130	1,575
6 (19M)	16	0.33	15,660	1,772	20,880	2,363	4 (13M)	40	0.06	5,104	1,772	6,805	2,363
4 (13M)	8	0.30	15,381	1,772	20,507	2,363	6 (19M)	96	0.06	4573[e]	886	6097[g]	1,181
7 (22M)	24	0.30	15,196	1,772	20,262	2,363	5 (16M)	72	0.05	4,356	1,181	5,808	1,575
8 (25M)	40	0.24	14,181	1,772	18,908	2,363	4 (13M)	48	0.05	4,278	1,772	5,705	2,363
5 (16M)	16	0.23	14,127	1,772	18,836	2,363	6 (19M)	120	0.04	3658[c]	709	4878[d]	945
6 (19M)	24	0.22	13,871	1,772	18,494	2,363	5 (16M)	96	0.04	3267[e]	886	4356[g]	1,181
8 (25M)	48	0.20	13,392	1,772	17,856	2,363	4 (13M)	72	0.03	2,852	1,181	3,803	1,575
7 (22M)	40	0.18	12,982	1,772	17,309	2,363	5 (16M)	120	0.03	2614[c]	709	3485[d]	945
5 (16M)	24	0.16	12,315	1,772	16,420	2,363	4 (13M)	96	0.03	2,139	886	2,852	1,181
4 (13M)	16	0.15	12,171	1,772	16,227	2,363	4 (13M)	120	0.02	1,711	709	2,282	945



Nominal wall thickness = 8 in. Effective depth, d = 4.625 in.

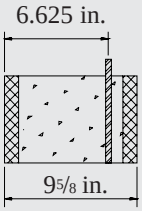
			Not including wind or seismic		Including wind or seismic					Not including wind or seismic		Including wind or seismic	
Bar Size no.	Bar Spacing in	A_s in^2/ft	M_r lb-in/ft	V_r lb/ft	M_r lb-in/ft	V_r lb/ft	Bar Size no.	Bar Spacing in	A_s in^2/ft	M_r lb-in/ft	V_r lb/ft	M_r lb-in/ft	V_r lb/ft
8 (25M)	8	1.19	30,928	2,150	41,237	2,866	4 (13M)	16	0.15	15,058	2,150	20,077	2,866
7 (22M)	8	0.90	29,071	2,150	38,762	2,866	6 (19M)	40	0.13	13,321	2,150	17,761	2,866
8 (25M)	8	0.66	26,892	2,150	35,856	2,866	6 (19M)	48	0.11	11,183	2,150	14,911	2,866
8 (25M)	16	0.59	24,724	2,150	32,966	2,866	4 (13M)	24	0.10	10,204	2,150	13,605	2,866
5 (16M)	8	0.47	24,384	2,150	32,512	2,866	5 (16M)	40	0.09	9,515	2,150	12,687	2,866
7 (22M)	16	0.45	23,202	2,150	30,935	2,866	5 (16M)	48	0.08	7,981	2,150	10,641	2,866
8 (25M)	24	0.40	22,140	2,150	29,520	2,866	6 (19M)	72	0.07	7,455	1,433	9,940	1,911
6 (19M)	16	0.33	21,408	2,150	28,544	2,866	4 (13M)	40	0.06	6,230	2,150	8,307	2,866
4 (13M)	8	0.30	21,276	2,150	28,369	2,866	6 (19M)	96	0.06	5592[e]	1,075	7455[g]	1,433
7 (22M)	24	0.30	20,669	2,150	27,558	2,866	5 (16M)	72	0.05	5,321	1,433	7,094	1,911
5 (16M)	16	0.23	19,321	2,150	25,761	2,866	4 (13M)	48	0.05	5,220	2,150	6,960	2,866
8 (25M)	40	0.24	19,273	2,150	25,697	2,866	6 (19M)	120	0.04	4473[a,c]	860	5964[b,e]	1,146
6 (19M)	24	0.22	18,921	2,150	25,228	2,866	5 (16M)	96	0.04	3990[e]	1,075	5321[g]	1,433
8 (25M)	48	0.20	18,251	2,150	24,335	2,866	4 (13M)	72	0.03	3,480	1,433	4,640	1,911
7 (22M)	40	0.18	17,730	2,150	23,640	2,866	5 (16M)	120	0.03	3192[c]	860	4256[e]	1,146
5 (16M)	24	0.16	15,542	2,150	20,722	2,866	4 (13M)	96	0.03	2610[e]	1,075	3480[g]	1,433
7 (22M)	48	0.15	15,061	2,150	20,081	2,866	4 (13M)	120	0.02	2,088	860	2,784	1,146

Table 3—Allowable Stress Design Capacities of Concrete Masonry Walls (continued)



Nominal wall thickness = 10 in. Effective depth, d = 4.813 in.

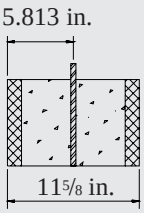
			Not including wind or seismic		Including wind or seismic					Not including wind or seismic		Including wind or seismic	
Bar Size no.	Bar Spacing in	A_s in²/ft	M_r lb-in/ft	V_r lb/ft	M_r lb-in/ft	V_r lb/ft	Bar Size no.	Bar Spacing in	A_s in²/ft	M_r lb-in/ft	V_r lb/ft	M_r lb-in/ft	V_r lb/ft
9 (29M)	8	1.49	34,782	2,237	46,375	2,982	7 (22M)	48	0.15	15,691	2,237	20,922	2,982
8 (25M)	8	1.19	33,203	2,237	44,270	2,982	6 (19M)	40	0.13	13,884	2,237	18,511	2,982
7 (22M)	8	0.90	31,178	2,237	41,571	2,982	6 (19M)	48	0.11	11,654	2,237	15,539	2,982
6 (19M)	8	0.66	28,810	2,237	38,413	2,982	4 (13M)	24	0.10	10,633	2,237	14,178	2,982
9 (29M)	16	0.74	28,106	2,237	37,475	2,982	5 (16M)	40	0.09	9,915	2,237	13,221	2,982
8 (25M)	16	0.59	26,777	2,237	35,702	2,982	5 (16M)	48	0.08	8,316	2,237	11,088	2,982
5 (16M)	8	0.47	26,093	2,237	34,790	2,982	6 (19M)	72	0.07	7,834	1,864	10,446	2,485
9 (29M)	24	0.50	25,297	2,237	33,730	2,982	4 (13M)	40	0.06	6,491	2,237	8,654	2,982
8 (25M)	24	0.40	23,997	2,237	31,996	2,982	6 (19M)	96	0.06	5876[g]	1,398	7,834	1,864
4 (13M)	8	0.30	22,737	2,237	30,317	2,982	5 (16M)	72	0.05	5,584	1,864	7,445	2,485
7 (22M)	24	0.30	22,323	2,237	29,764	2,982	4 (13M)	48	0.05	5,438	2,237	7,250	2,982
9 (29M)	48	0.25	21,042	2,237	28,056	2,982	6 (19M)	120	0.04	4700[e]	1,118	6,267	1,491
8 (25M)	40	0.24	20,784	2,237	27,712	2,982	5 (16M)	96	0.04	4188[g]	1,398	5,584	1,864
6 (19M)	24	0.22	20,340	2,237	27,120	2,982	4 (13M)	72	0.03	3,647	1,864	4,863	2,485
8 (25M)	48	0.20	19,617	2,237	26,156	2,982	5 (16M)	120	0.03	3,350	1,118	4,467	1,491
7 (22M)	40	0.18	18,686	2,237	24,915	2,982	4 (13M)	96	0.03	2,735	1,398	3,647	1,864
5 (16M)	24	0.16	16,191	2,237	21,588	2,982	4 (13M)	120	0.02	2,188	1,118	2,918	1,491



Nominal wall thickness = 10 in. Effective depth, d = 6.625 in.

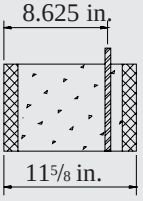
			Not including wind or seismic		Including wind or seismic					Not including wind or seismic		Including wind or seismic	
Bar Size no.	Bar Spacing in	A_s in²/ft	M_r lb-in/ft	V_r lb/ft	M_r lb-in/ft	V_r lb/ft	Bar Size no.	Bar Spacing in	A_s in²/ft	M_r lb-in/ft	V_r lb/ft	M_r lb-in/ft	V_r lb/ft
9 (29M)	8	1.49	61,632	3,079	82,176	4,105	7 (22M)	48	0.15	21,945	3,079	29,260	4,105
8 (25M)	8	1.19	58,450	3,079	77,933	4,105	6 (19M)	40	0.13	19,376	3,079	25,835	4,105
7 (22M)	8	0.90	54,459	3,079	72,612	4,105	6 (19M)	48	0.11	16,234	3,079	21,645	4,105
6 (19M)	8	0.66	49,897	3,079	66,530	4,105	4 (13M)	24	0.10	14,803	3,079	19,737	4,105
9 (29M)	16	0.74	46,932	3,079	62,577	4,105	5 (16M)	40	0.09	13,799	3,079	18,399	4,105
5 (16M)	8	0.47	44,788	3,079	59,718	4,105	5 (16M)	48	0.08	11,564	3,079	15,418	4,105
8 (25M)	16	0.59	44,595	3,079	59,460	4,105	6 (19M)	72	0.07	10,900	2,566	14,533	3,421
9 (29M)	24	0.50	41,384	3,079	55,179	4,105	4 (13M)	40	0.06	9,017	3,079	12,022	4,105
8 (25M)	24	0.40	39,292	3,079	52,390	4,105	6 (19M)	96	0.06	8175g	1,924	10,900	2,566
4 (13M)	8	0.30	38,637	3,079	51,517	4,105	5 (16M)	72	0.05	7,758	2,566	10,343	3,421
7 (22M)	24	0.30	36,639	3,079	48,852	4,105	4 (13M)	48	0.05	7,549	3,079	10,065	4,105
9 (29M)	48	0.25	34,295	3,079	45,727	4,105	6 (19M)	120	0.04	6540[b,g]	1,540	8720[b,f]	2,053
8 (25M)	40	0.24	33,984	3,079	45,312	4,105	5 (16M)	96	0.04	5818[g]	1,924	7,758	2,566
6 (19M)	24	0.22	31,815	3,079	42,421	4,105	4 (13M)	72	0.03	5,059	2,566	6,745	3,421
8 (25M)	48	0.20	28,701	3,079	38,269	4,105	5 (16M)	120	0.03	4655[e]	1,540	6206[f]	2,053
7 (22M)	40	0.18	26,208	3,079	34,944	4,105	4 (13M)	96	0.03	3794[g]	1,924	5,059	2,566
5 (16M)	24	0.16	22,641	3,079	30,188	4,105	4 (13M)	120	0.02	3,035	1,540	4,047	2,053

Table 3—Allowable Stress Design Capacities of Concrete Masonry Walls (continued)



Nominal wall thickness = 12 in. Effective depth, d = 5.813 in.

			Not including wind or seismic		Including wind or seismic					Not including wind or seismic		Including wind or seismic	
Bar Size no.	Bar Spacing in	A_s in^2/ft	M_r lb-in/ft	V_r lb/ft	M_r lb-in/ft	V_r lb/ft	Bar Size no.	Bar Spacing in	A_s in^2/ft	M_r lb-in/ft	V_r lb/ft	M_r lb-in/ft	V_r lb/ft
9 (29M)	8	1.49	48,819	2,701	65,092	3,602	7 (22M)	48	0.15	19,103	2,701	25,471	3,602
8 (25M)	8	1.19	46,422	2,701	61,897	3,602	6 (19M)	40	0.13	16,896	2,701	22,528	3,602
7 (22M)	8	0.90	43,390	2,701	57,853	3,602	6 (19M)	48	0.11	14,176	2,701	18,901	3,602
6 (19M)	8	0.66	39,891	2,701	53,189	3,602	4 (13M)	24	0.10	12,930	2,701	17,240	3,602
9 (29M)	16	0.74	38,714	2,701	51,619	3,602	5 (16M)	40	0.09	12,055	2,701	16,073	3,602
8 (25M)	16	0.59	36,789	2,701	49,052	3,602	5 (16M)	48	0.08	10,105	2,701	13,474	3,602
5 (16M)	8	0.47	35,935	2,701	47,914	3,602	6 (19M)	72	0.07	9,578	2,701	12,771	3,602
9 (29M)	24	0.50	34,604	2,701	46,138	3,602	4 (13M)	40	0.06	7,883	2,701	10,510	3,602
8 (25M)	24	0.40	32,771	2,701	43,694	3,602	6 (19M)	96	0.06	7,184	2,026	9,578	2,701
4 (13M)	8	0.30	31,125	2,701	41,500	3,602	5 (16M)	72	0.05	6,815	2,701	9,087	3,602
7 (22M)	24	0.30	30,428	2,701	40,571	3,602	4 (13M)	48	0.05	6,601	2,701	8,802	3,602
9 (29M)	48	0.25	28,622	2,701	38,163	3,602	6 (19M)	120	0.04	5747[f]	1,621	7,663	2,161
8 (25M)	40	0.24	28,272	2,701	37,696	3,602	5 (16M)	96	0.04	5,112	2,026	6,815	2,701
6 (19M)	24	0.22	27,626	2,701	36,835	3,602	4 (13M)	72	0.03	4,443	2,701	5,924	3,602
8 (25M)	48	0.20	24,906	2,701	33,207	3,602	5 (16M)	120	0.03	4,089	1,621	5,452	2,161
7 (22M)	40	0.18	22,769	2,701	30,359	3,602	4 (13M)	96	0.03	3,332	2,026	4,443	2,701
5 (16M)	24	0.16	19,714	2,701	26,286	3,602	4 (13M)	120	0.02	2,666	1,621	3,555	2,161



Nominal wall thickness = 12 in. Effective depth, d = 8.625 in.

			Not including wind or seismic		Including wind or seismic					Not including wind or seismic		Including wind or seismic	
Bar Size no.	Bar Spacing in	A_s in^2/ft	M_r lb-in/ft	V_r lb/ft	M_r lb-in/ft	V_r lb/ft	Bar Size no.	Bar Spacing in	A_s in^2/ft	M_r lb-in/ft	V_r lb/ft	M_r lb-in/ft	V_r lb/ft
9 (29M)	8	1.49	98,140	4,009	130,853	5,345	7 (22M)	48	0.15	28,884	4,009	38,512	5,345
8 (25M)	8	1.19	92,583	4,009	123,444	5,345	6 (19M)	40	0.13	25,484	4,009	33,979	5,345
7 (22M)	8	0.90	85,727	4,009	114,303	5,345	6 (19M)	48	0.11	21,328	4,009	28,437	5,345
6 (19M)	8	0.66	78,030	4,009	104,040	5,345	4 (13M)	24	0.10	19,434	4,009	25,912	5,345
9 (29M)	16	0.74	72,397	4,009	96,529	5,345	5 (16M)	40	0.09	18,109	4,009	24,145	5,345
5 (16M)	8	0.47	69,562	4,009	92,750	5,345	5 (16M)	48	0.08	15,166	4,009	20,221	5,345
8 (25M)	16	0.59	68,555	4,009	91,407	5,345	6 (19M)	72	0.07	14,371	4,009	19,161	5,345
9 (29M)	24	0.50	62,992	4,009	83,989	5,345	4 (13M)	40	0.06	11,816	4,009	15,755	5,345
8 (25M)	24	0.40	59,697	4,009	79,596	5,345	6 (19M)	96	0.06	10,778	3,006	14,371	4,009
4 (13M)	8	0.30	55,971	4,009	74,628	5,345	5 (16M)	72	0.05	10,210	4,009	13,613	5,345
7 (22M)	24	0.30	55,575	4,009	74,100	5,345	4 (13M)	48	0.05	9,887	4,009	13,183	5,345
9 (29M)	48	0.25	47,187	4,009	62,917	5,345	6 (19M)	120	0.04	8622[f]	2,405	11,497	3,207
8 (25M)	40	0.24	45,192	4,009	60,255	5,345	5 (16M)	96	0.04	7,657	3,006	10,210	4,009
6 (19M)	24	0.22	41,921	4,009	55,895	5,345	4 (13M)	72	0.03	6,645	4,009	8,860	5,345
8 (25M)	48	0.20	37,822	4,009	50,429	5,345	5 (16M)	120	0.03	6126[f]	2,405	8,168	3,207
7 (22M)	40	0.18	34,521	4,009	46,028	5,345	4 (13M)	96	0.03	4,984	3,006	6,645	4,009
5 (16M)	24	0.16	29,794	4,009	39,726	5,345	4 (13M)	120	0.02	3,987	2,405	5,316	3,207

Table 3—Allowable Stress Design Capacities of Concrete Masonry Walls (continued)

Notes:

For reinforcement spacings exceeding six times the wall thickness, the loads must be distributed to the reinforced sections by action parallel to the bed joints (horizontally).

Where indicated by the following superscripts, the plain masonry capacity parallel to the bed joints of both portland cement/lime and mortar cement mortars are exceeded and shall not be used for loadings exceeding the following without further special analysis:

a. 25 psf
b. 35 psf

Where indicatedby the following superscripts, the plain masonry capacity parallel to the bed joints of masonry cement mortars are exceeded and shall not be used for loadings exceeding the following without further special analysis:

c. 15 psf
d. 20 psf
e. 25 psf
f. 30 psf
g. 35 psf

REFERENCES

1. *Allowable Stress Design of Reinforced Concrete Masonry*, TEK 14-7A. National Concrete Masonry Association, 2004.
2. *Building Code Requirements for Masonry Structures*, ACI 530-05/ASCE 5-05/TMS 402-05. Reported by the Masonry Standards Joint Committee, 2005.
3. *Strength Design of Concrete Masonry Walls for Axial Load & Flexure*, TEK 14-11A. National Concrete Masonry Association, 2003.