Concrete Design Handbook – 4th Edition

CHAPTERS 1, 5, 7 AND 12: ADDITIONAL DESIGN AIDS

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Pages of this document were numbered sequentially with the Handbook chapter material to which they pertain, such that a user may print these design aids and add them to the hard cover book should they choose to do so.

This document has been prepared by the Cement Association of Canada (CAC) to aid in the design of reinforced concrete building structures. It has been the intent of the CAC to present this information in a manner which will serve as an extension to the CSA Group standard A23.3-14, Design of concrete structures, and the other documents referenced herein. While every attempt has been made to present information that is factual and in a useable format, none of the references to the CSA Group standard or the National Building Code of Canada should be construed as an endorsement of the material appearing in the Handbook by the agencies responsible for the referenced material.

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Concrete Design Handbook – 4th Edition
Chapters 1, 5, 7 and 12: Additional Design Aids
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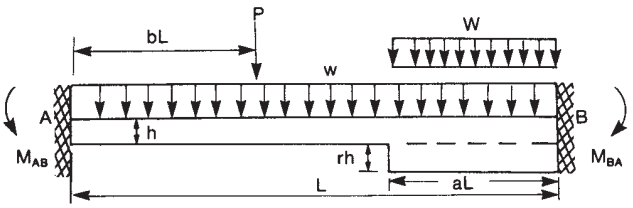
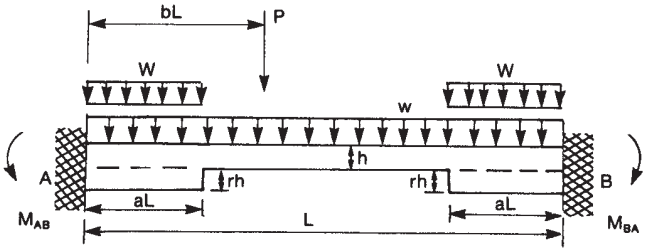
Table 1.20: Beams with Prismatic Haunch at One End



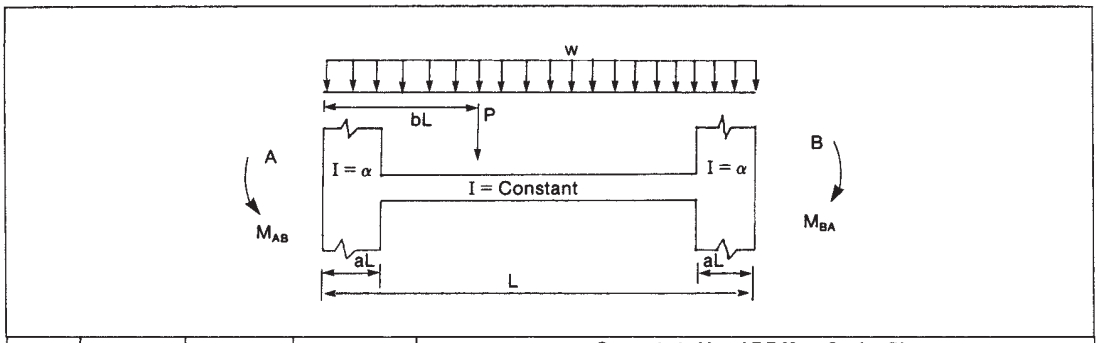
Right haunch		Carry-over factors		Stiffness factors		Unif. load F.E.M. coef. × wL^2		Concentrated load F.E.M. — coef. × PL										Haunch load F.E.M. coef. × WL^2	
								b											
								0.1		0.3		0.5		0.7		0.9			
a	r	C_{AB}	C_{BA}	k_{AB}	k_{BA}	M_{AB}	M_{BA}	M_{AB}	M_{BA}	M_{AB}	M_{BA}	M_{AB}	M_{BA}	M_{AB}	M_{BA}	M_{AB}	M_{BA}	M_{AB}	M_{BA}
0.1	0.4	0.593	0.491	4.24	5.12	0.0749	0.1016	0.0799	0.0113	0.1397	0.0788	0.1110	0.1553	0.0478	0.1798	0.0042	0.0911	0.0001	0.0047
	0.6	0.615	0.490	4.30	5.40	0.0727	0.1062	0.0797	0.0119	0.1378	0.0828	0.1074	0.1630	0.0439	0.1881	0.0029	0.0937	0.0001	0.0048
	1.0	0.639	0.488	4.37	5.72	0.0703	0.1114	0.0794	0.0125	0.1358	0.0873	0.1035	0.1716	0.0396	0.1974	0.0016	0.0966	0.0001	0.0049
	1.5	0.652	0.487	4.40	5.89	0.0690	0.1143	0.0792	0.0129	0.1346	0.0898	0.1012	0.1764	0.0373	0.2026	0.0008	0.0982	0.0000	0.0049
	2.0	0.658	0.487	4.42	5.97	0.0684	0.1156	0.0791	0.0131	0.1341	0.0910	0.1002	0.1786	0.0361	0.2050	0.0005	0.0990	0.0000	0.0050
0.2	0.4	0.677	0.469	4.42	6.37	0.0706	0.1126	0.0791	0.0134	0.1345	0.0925	0.1020	0.1788	0.0409	0.1975	0.0050	0.0890	0.0013	0.0171
	0.6	0.730	0.463	4.56	7.18	0.0664	0.1225	0.0785	0.0149	0.1302	0.1025	0.0942	0.1972	0.0335	0.2148	0.0037	0.0917	0.0010	0.0178
	1.0	0.793	0.458	4.74	8.22	0.0610	0.1353	0.0777	0.0168	0.1248	0.1154	0.0843	0.2207	0.0242	0.2368	0.0022	0.0951	0.0006	0.0187
	1.5	0.831	0.455	4.86	8.88	0.0576	0.1434	0.0772	0.0180	0.1214	0.1235	0.0781	0.2355	0.0182	0.2507	0.0012	0.0973	0.0003	0.0193
	2.0	0.849	0.453	4.91	9.20	0.0559	0.1473	0.0769	0.0186	0.1197	0.1276	0.0750	0.2429	0.0153	0.2576	0.0007	0.0984	0.0002	0.0196
0.3	0.4	0.741	0.439	4.52	7.63	0.0698	0.1155	0.0787	0.0149	0.1319	0.1013	0.0987	0.1899	0.0420	0.1929	0.0056	0.0868	0.0045	0.0338
	0.6	0.831	0.427	4.75	9.24	0.0642	0.1296	0.0777	0.0175	0.1255	0.1182	0.0877	0.2185	0.0338	0.2130	0.0045	0.0893	0.0036	0.0359
	1.0	0.954	0.415	5.09	11.69	0.0559	0.1511	0.0762	0.0215	0.1158	0.1440	0.0711	0.2621	0.0217	0.2436	0.0028	0.0930	0.0023	0.0391
	1.5	1.036	0.409	5.34	13.53	0.0497	0.1673	0.0751	0.0245	0.1085	0.1633	0.0587	0.2948	0.0128	0.2665	0.0017	0.0959	0.0014	0.0415
	2.0	1.078	0.407	5.48	14.54	0.0464	0.1762	0.0745	0.0262	0.1045	0.1740	0.0520	0.3129	0.0080	0.2792	0.0010	0.0974	0.0008	0.0448
0.4	0.4	0.774	0.405	4.55	8.70	0.0703	0.1117	0.0786	0.0156	0.1315	0.1035	0.0992	0.1855	0.0445	0.1773	0.0059	0.0849	0.0106	0.0509
	0.6	0.901	0.86	4.83	11.28	0.0646	0.1269	0.0774	0.0192	0.1240	0.1254	0.0875	0.2182	0.0377	0.1932	0.0049	0.0869	0.0089	0.0547
	1.0	1.102	0.367	5.33	16.03	0.0549	0.1548	0.0752	0.0257	0.1105	0.1658	0.0671	0.2780	0.0267	0.2222	0.0034	0.0904	0.0063	0.0616
	1.5	1.260	0.357	5.79	20.46	0.0462	0.1807	0.0732	0.0319	0.0982	0.2035	0.0485	0.3339	0.0173	0.2491	0.0022	0.0938	0.0037	0.0679
	2.0	1.349	0.352	6.09	23.32	0.0407	0.1975	0.0719	0.0358	0.0903	0.2278	0.0367	0.3699	0.0113	0.2664	0.0014	0.0959	0.0027	0.0720
0.5	0.4	0.768	0.371	4.56	9.45	0.0700	0.1048	0.0786	0.0154	0.1312	0.0993	0.0983	0.1679	0.0442	0.1663	0.0059	0.0836	0.0189	0.0656
	0.6	0.919	0.343	4.84	12.94	0.0651	0.1176	0.0774	0.0193	0.1240	0.1218	0.0884	0.1935	0.0386	0.1769	0.0051	0.0849	0.0167	0.0702
	1.0	1.200	0.316	5.42	20.61	0.0561	0.1451	0.0749	0.0280	0.1096	0.1709	0.0706	0.2486	0.0299	0.1993	0.0038	0.0877	0.0131	0.0802
	1.5	1.470	0.301	6.10	29.74	0.0466	0.1777	0.0720	0.0384	0.0934	0.2290	0.0516	0.3137	0.0215	0.2255	0.0027	0.0909	0.0094	0.0918
	2.0	1.647	0.295	6.63	37.04	0.0393	0.2036	0.0698	0.0466	0.0807	0.2755	0.0370	0.3655	0.0153	0.2463	0.0019	0.0934	0.0067	0.1011
0.6	0.4	0.726	0.341	4.62	9.84	0.0675	0.0986	0.0782	0.0146	0.1280	0.0916	0.0923	0.1519	0.0419	0.1603	0.0056	0.0829	0.0283	0.0769
	0.6	0.872	0.305	4.88	13.97	0.0630	0.1072	0.0771	0.0183	0.1214	0.1096	0.0835	0.1664	0.0368	0.1666	0.0048	0.0837	0.0254	0.0813
	1.0	1.196	0.267	5.43	24.35	0.0560	0.1277	0.0748	0.0274	0.1092	0.1537	0.0705	0.1999	0.0299	0.1804	0.0038	0.0854	0.0212	0.0913
	1.5	1.588	0.247	6.18	39.79	0.0482	0.1572	0.0718	0.0408	0.0939	0.2183	0.0572	0.2478	0.0237	0.1997	0.0030	0.0878	0.0171	0.1055
	2.0	1.905	0.237	6.92	55.51	0.0412	0.1870	0.0688	0.0544	0.0792	0.2839	0.0455	0.2960	0.0186	0.2189	0.0023	0.0901	0.0136	0.1197
0.7	0.4	0.657	0.321	4.86	9.96	0.0631	0.0954	0.0770	0.0138	0.1175	0.0846	0.0844	0.1461	0.0392	0.1582	0.0053	0.0827	0.0372	0.0854
	0.6	0.770	0.275	5.14	14.39	0.0580	0.1006	0.0758	0.0167	0.1097	0.0955	0.0745	0.1543	0.0335	0.1621	0.0045	0.0832	0.0330	0.0890
	1.0	1.056	0.224	5.62	26.45	0.0516	0.1122	0.0738	0.0243	0.0992	0.1213	0.0626	0.1710	0.0269	0.1694	0.0035	0.0841	0.0280	0.0965
	1.5	1.491	0.196	6.24	47.48	0.0463	0.1304	0.0714	0.0371	0.0890	0.1633	0.0537	0.1959	0.0223	0.1796	0.0028	0.0854	0.0241	0.1076
	2.0	1.944	0.183	6.95	73.85	0.0417	0.1523	0.0687	0.0530	0.0793	0.2149	0.0468	0.2255	0.0191	0.1915	0.0024	0.0869	0.0210	0.1210
0.8	0.4	0.583	0.319	5.46	9.97	0.0585	0.0951	0.0741	0.0137	0.1040	0.0837	0.0793	0.1456	0.0380	0.1580	0.0053	0.0826	0.0452	0.0917
	0.6	0.645	0.263	5.89	14.44	0.0516	0.0990	0.0721	0.0160	0.0921	0.0907	0.0667	0.1520	0.0311	0.1614	0.0043	0.0831	0.0388	0.0951
	1.0	0.818	0.196	6.47	27.06	0.0435	0.1053	0.0696	0.0211	0.0781	0.1025	0.0521	0.1615	0.0232	0.1660	0.0031	0.0838	0.0314	0.1004
	1.5	1.128	0.155	6.98	50.85	0.0385	0.1130	0.0676	0.0296	0.0692	0.1175	0.0432	0.1715	0.0184	0.1705	0.0024	0.0844	0.0268	0.1064
	2.0	1.533	0.135	7.47	84.60	0.0355	0.1222	0.0658	0.0412	0.0638	0.1357	0.0384	0.1824	0.0159	0.1750	0.0020	0.0849	0.0242	0.1133
0.9	0.4	0.524	0.356	6.87	10.10	0.0604	0.0948	0.0674	0.0157	0.1031	0.0835	0.0844	0.1439	0.0418	0.1568	0.0059	0.0824	0.0550	0.0942
	0.6	0.542	0.295	7.95	14.58	0.0497	0.0991	0.0623	0.0184	0.0866	0.0913	0.0691	0.1510	0.0339	0.1605	0.0048	0.0830	0.0460	0.0985
	1.0	0.594	0.206	9.44	27.16	0.0372	0.1052	0.0553	0.0226	0.0642	0.1023	0.0484	0.1609	0.0231	0.1656	0.0032	0.0837	0.0337	0.1044
	1.5	0.695	0.142	10.48	51.25	0.0289	0.1098	0.0506	0.0266	0.0492	0.1105	0.0346	0.1680	0.0159	0.1692	0.0021	0.0842	0.0255	0.1089
	2.0	0.842	0.107	11.07	86.80	0.0245	0.1147	0.0481	0.0306	0.0414	0.1159	0.0274	0.1723	0.0121	0.1714	0.0016	0.0845	0.0213	0.1117

Table 1.21: Beams with Prismatic Haunch at Both Ends



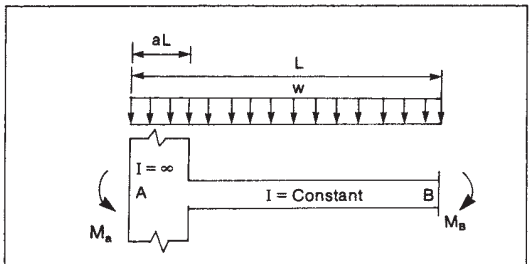
		Carry-over factors	Stiffness factors	Unif. load	Concentrated load F.E.M. — coef. × PL										Haunch load both haunches
				F.E.M. coef. × WL^2	b										F.E.M. coef. × wL^2
					0.1		0.3		0.5		0.7		0.9		
a	r	$C_{AB} = C_{BA}$	$k_{AB} = k_{BA}$	$M_{AB} = M_{BA}$	M_{AB}	M_{BA}	M_{AB}	M_{BA}	M_{AB}	M_{BA}	M_{AB}	M_{BA}	M_{AB}	M_{BA}	$M_{AB} = M_{BA}$
0.1	0.4	0.583	5.49	0.0921	0.0905	0.0053	0.1727	0.0606	0.1396	0.1396	0.0606	0.1727	0.0053	0.0905	0.0049
	0.6	0.603	5.93	0.0940	0.0932	0.0040	0.1796	0.0589	0.1428	0.1428	0.0589	0.1796	0.0040	0.0932	0.0049
	1.0	0.624	6.45	0.0961	0.0962	0.0023	0.1873	0.0566	0.1462	0.1462	0.0566	0.1873	0.0023	0.0962	0.0050
	1.5	0.636	6.75	0.0972	0.0980	0.0013	0.1918	0.0551	0.1480	0.1480	0.0551	0.1918	0.0013	0.0980	0.0050
	2.0	0.641	6.90	0.0976	0.0988	0.0008	0.1939	0.0543	0.1489	0.1489	0.0543	0.1939	0.0008	0.0988	0.0050
0.2	0.4	0.634	7.32	0.0970	0.0874	0.0079	0.1852	0.0623	0.1506	0.1506	0.0623	0.1852	0.0079	0.0874	0.0187
	0.6	0.674	8.80	0.1007	0.0899	0.0066	0.1993	0.0584	0.1575	0.1575	0.0584	0.1993	0.0066	0.0899	0.0191
	1.0	0.723	11.09	0.1049	0.0935	0.0046	0.2193	0.0499	0.1654	0.1654	0.0499	0.2193	0.0046	0.0935	0.0195
	1.5	0.752	12.87	0.1073	0.0961	0.0029	0.2338	0.0420	0.1699	0.1699	0.0420	0.2338	0.0029	0.0961	0.0197
	2.0	0.765	13.87	0.1084	0.0976	0.0018	0.2410	0.0372	0.1720	0.1720	0.0372	0.2410	0.0018	0.0976	0.0198
0.3	0.4	0.642	9.02	0.0977	0.0845	0.0097	0.1763	0.0707	0.1558	0.1558	0.0707	0.1763	0.0097	0.0845	0.0397
	0.6	0.697	12.09	0.1027	0.0861	0.0095	0.1898	0.0700	0.1665	0.1665	0.0700	0.1898	0.0095	0.0861	0.0410
	1.0	0.775	18.68	0.1091	0.0890	0.0084	0.2136	0.0627	0.1803	0.1803	0.0627	0.2136	0.0084	0.0890	0.0426
	1.5	0.828	26.49	0.1132	0.0920	0.0065	0.2376	0.0492	0.1891	0.1891	0.0492	0.2376	0.0065	0.0920	0.0437
	2.0	0.855	32.77	0.1153	0.0943	0.0048	0.2555	0.0366	0.1934	0.1934	0.0366	0.2555	0.0048	0.0943	0.0442
0.4	0.4	0.599	10.15	0.0937	0.0825	0.0101	0.1601	0.0732	0.1509	0.1509	0.0732	0.1601	0.0101	0.0825	0.0642
	0.6	0.652	14.52	0.0966	0.0833	0.0106	0.1668	0.0776	0.1632	0.1632	0.0776	0.1668	0.0106	0.0833	0.0668
	1.0	0.744	26.06	0.1067	0.0847	0.0112	0.1790	0.0835	0.1833	0.1833	0.0835	0.1790	0.0112	0.0847	0.0711
	1.5	0.827	45.95	0.1131	0.0862	0.0113	0.1919	0.0852	0.1995	0.1995	0.0852	0.1919	0.0113	0.0862	0.0746
	2.0	0.878	71.41	0.1169	0.0876	0.0108	0.2033	0.0822	0.2089	0.2089	0.0822	0.2033	0.0108	0.0876	0.0766
0.5	0.0	0.500	4.00	0.0833	0.0810	0.0090	0.1470	0.0630	0.1250	0.1250	0.0630	0.1470	0.0090	0.0810	0.0833

Table 1.22: Prismatic Member with Equal Infinitely Stiff End Regions



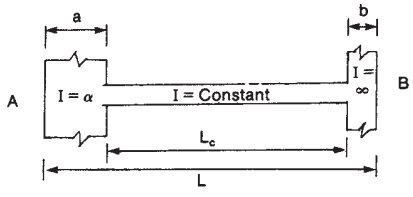
a	Carry-over Factors	Stiffness Factors	Unif. Load F.E.M. Coef. × wL²	Concentrated Load F.E.M. — Coef. × PL									
				b									
				0.1		0.2		0.3		0.4		0.5	
	C	k	M	M_{AB}	M_{BA}	M_{AB}	M_{BA}	M_{AB}	M_{BA}	M_{AB}	M_{BA}	M_{AB}	M_{BA}
0.05	0.575	5.23	0.0913	0.0940	0.0030	0.1505	0.0245	0.1711	0.0595	0.1640	0.0999	0.1375	0.1375
0.10	0.648	7.11	0.0983	0.1000	0.0000	0.1722	0.0152	0.1968	0.0532	0.1856	0.1019	0.1500	0.1500
0.15	0.719	10.17	0.1046	0.1000	0.0000	0.1909	0.0056	0.2247	0.0431	0.2095	0.1013	0.1625	0.1625
0.20	0.786	15.56	0.1100	0.1000	0.0000	0.2000	0.0000	0.2546	0.0286	0.2369	0.0964	0.1750	0.1750
0.25	0.846	26.00	0.1146	0.1000	0.0000	0.2000	0.0000	0.2830	0.0118	0.2699	0.0851	0.1875	0.1875

Table 1.23: Prismatic Member with Infinitely Stiff Region at One End



a	Carry-over Factors		Stiffness Factors		Unif. Load F.E.M. Coef. × WL²	
	C_{AB}	C_{BA}	k_{AB}	k_{BA}	M_{AB}	M_{BA}
0.05	0.496	0.579	4.91	4.21	0.1002	0.0752
0.10	0.486	0.657	6.00	4.44	0.1175	0.0675
0.15	0.471	0.765	7.64	4.71	0.1352	0.0602
0.20	0.452	0.875	9.60	5.00	0.1533	0.0533
0.25	0.429	1.000	12.44	5.33	0.1719	0.0469

Table 1.24: Prismatic Member with Unequal Infinitely Stiff End Regions



$$k' = \left[1 - \left[\frac{3\,(L_c + 2b)\,(L_c + 2a)}{L_c^2}\right]\right]\frac{L}{L_c}$$

$$k_{AB} = \left[1 + 3\left[\frac{L_c + 2a}{L_c}\right]^2\right]\frac{L}{L_c}$$

$$k_{BA} = \left[1 + 3\left[\frac{L_c + 2b}{L_c}\right]^2\right]\frac{L}{L_c}$$

$$C_{AB} = k'/k_{AB}$$

$$C_{BA} = k'/k_{BA}$$

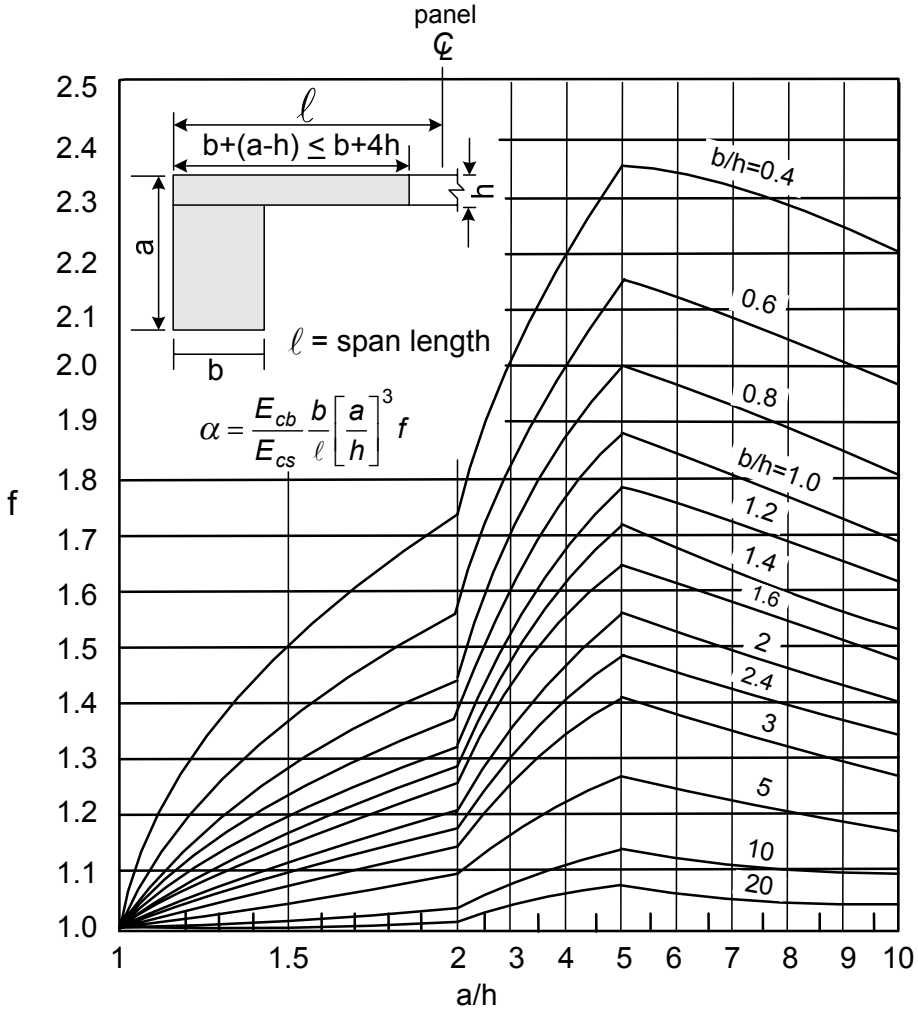


Table 5.1 Beam to Slab Ratio α (Edge Beams)

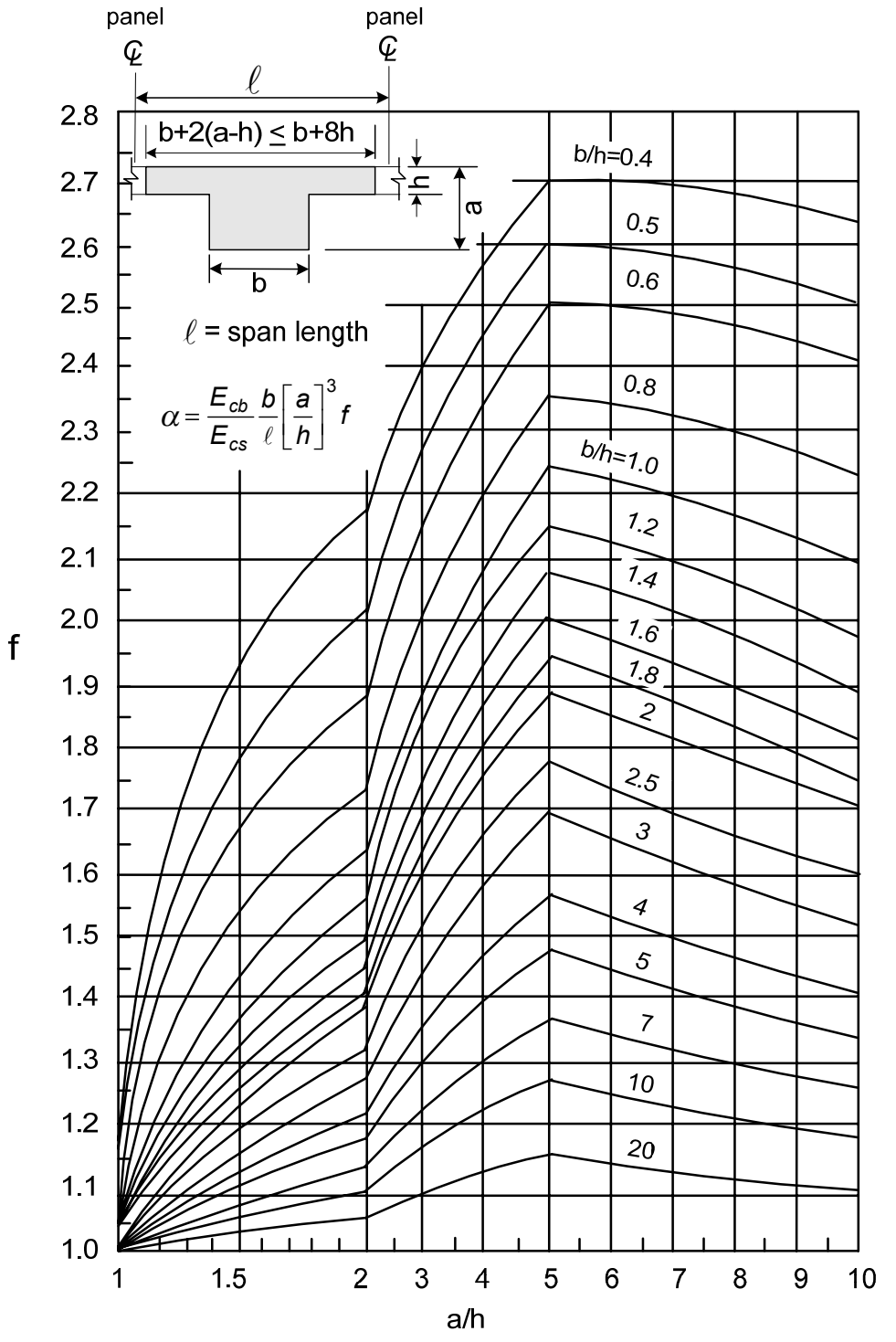


Table 5.2 Beam to Slab Ratio α (Interior Beams)

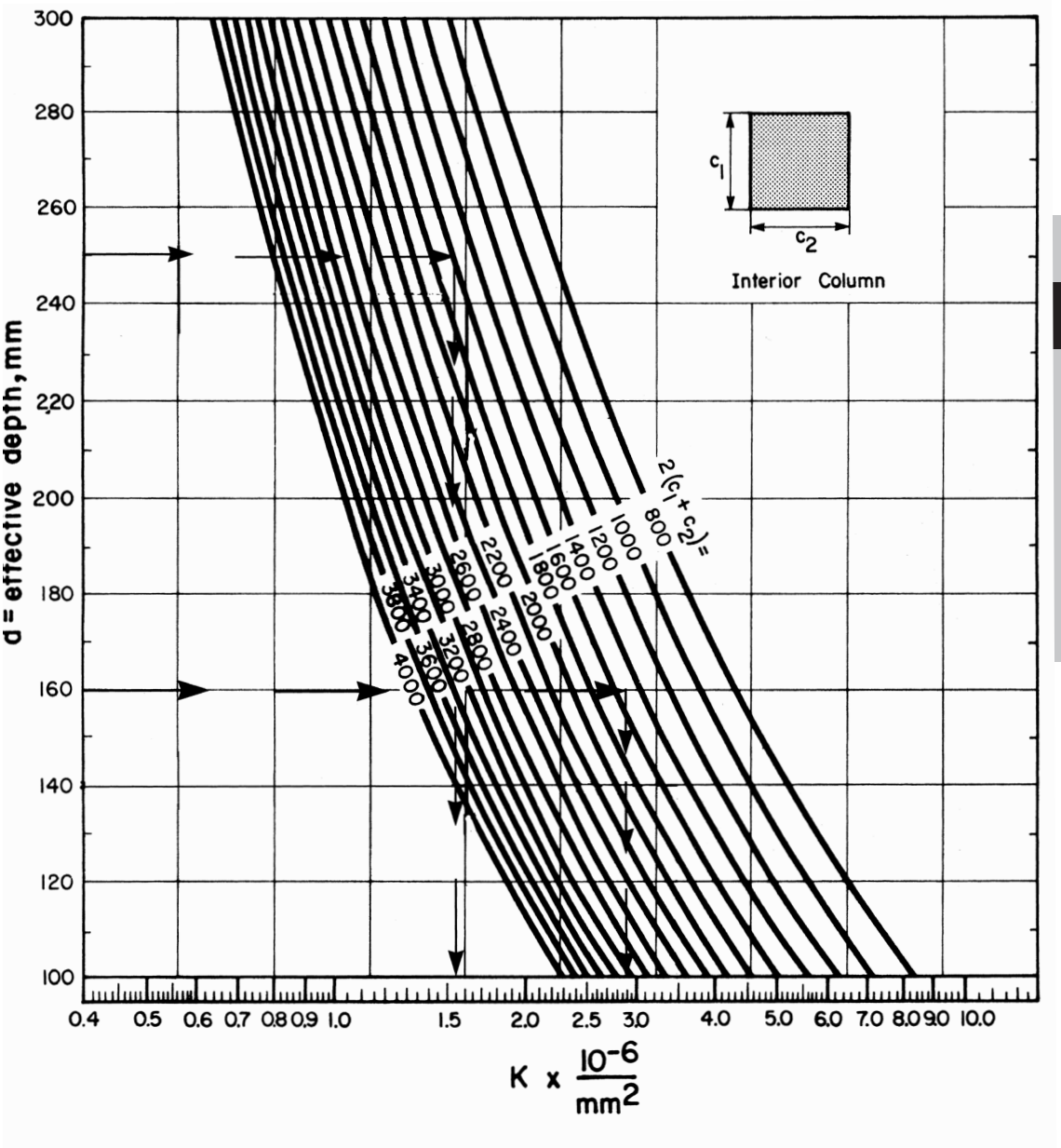


Table 5.3 Factor *k*, Shear-Moment Transfer, Interior Column

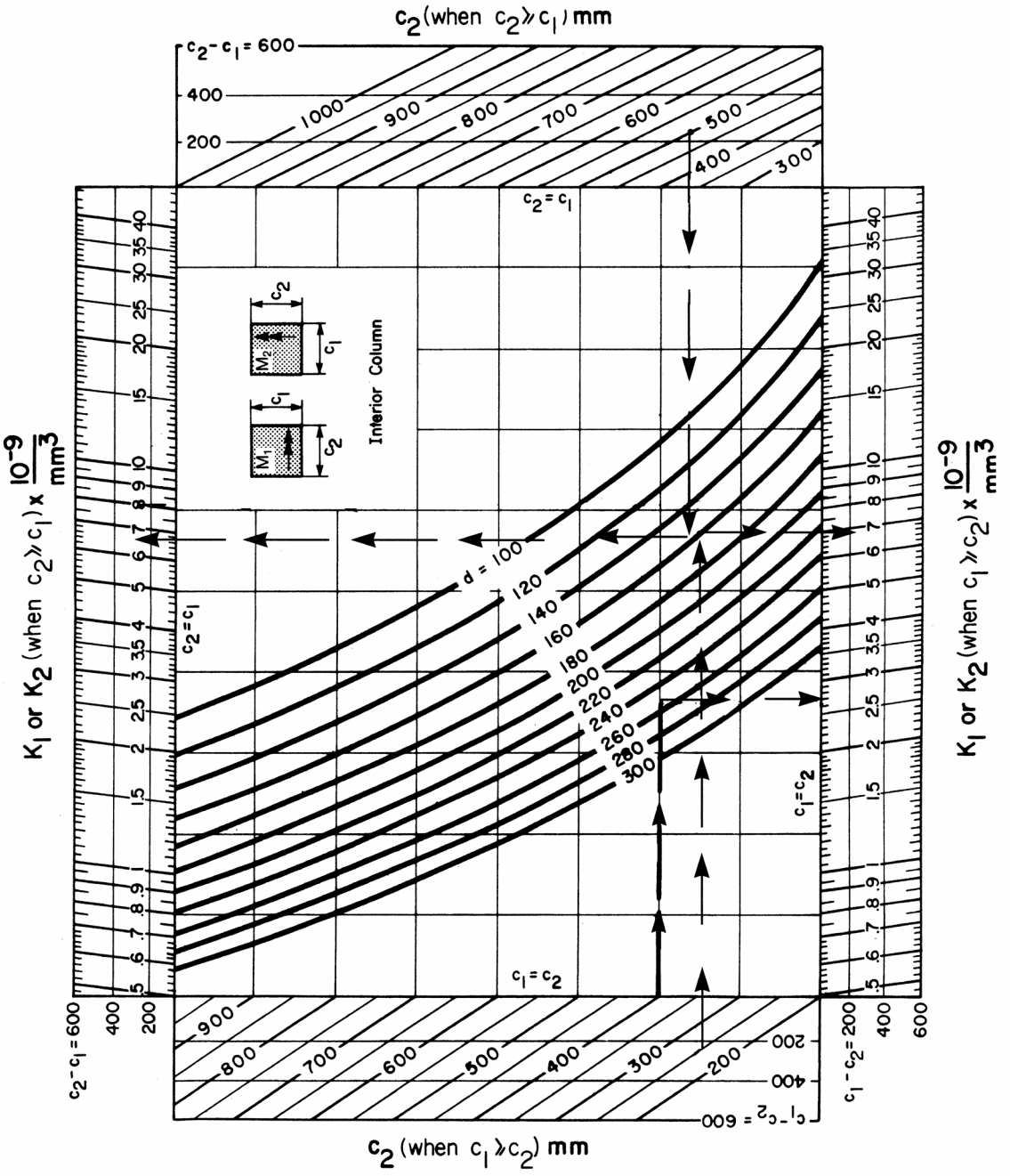


Table 5.4 Factor k_1 or k_2, Shear-Moment Transfer, Interior Column

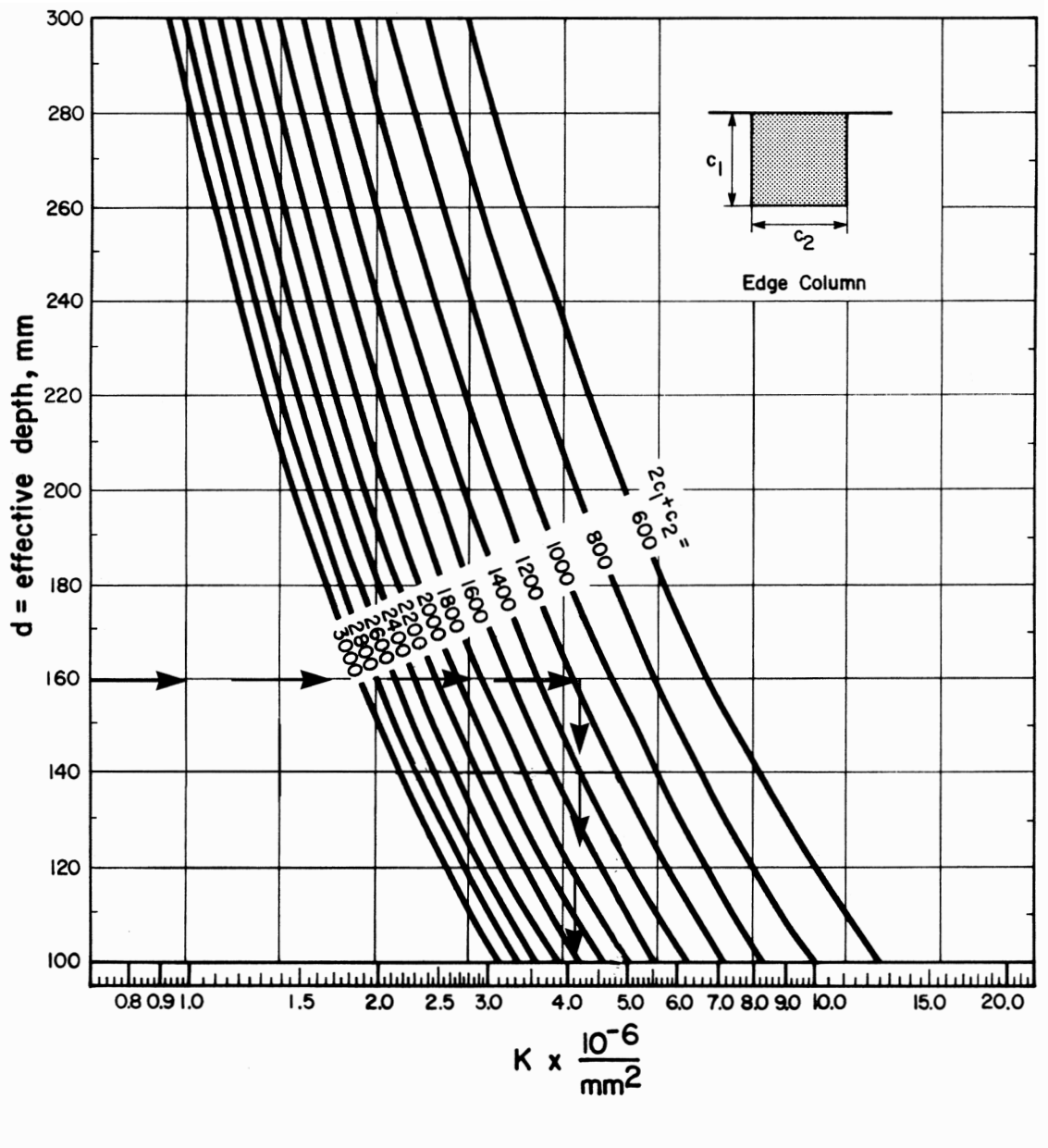


Table 5.5 Factor *k*, Shear-Moment Transfer, Edge Column

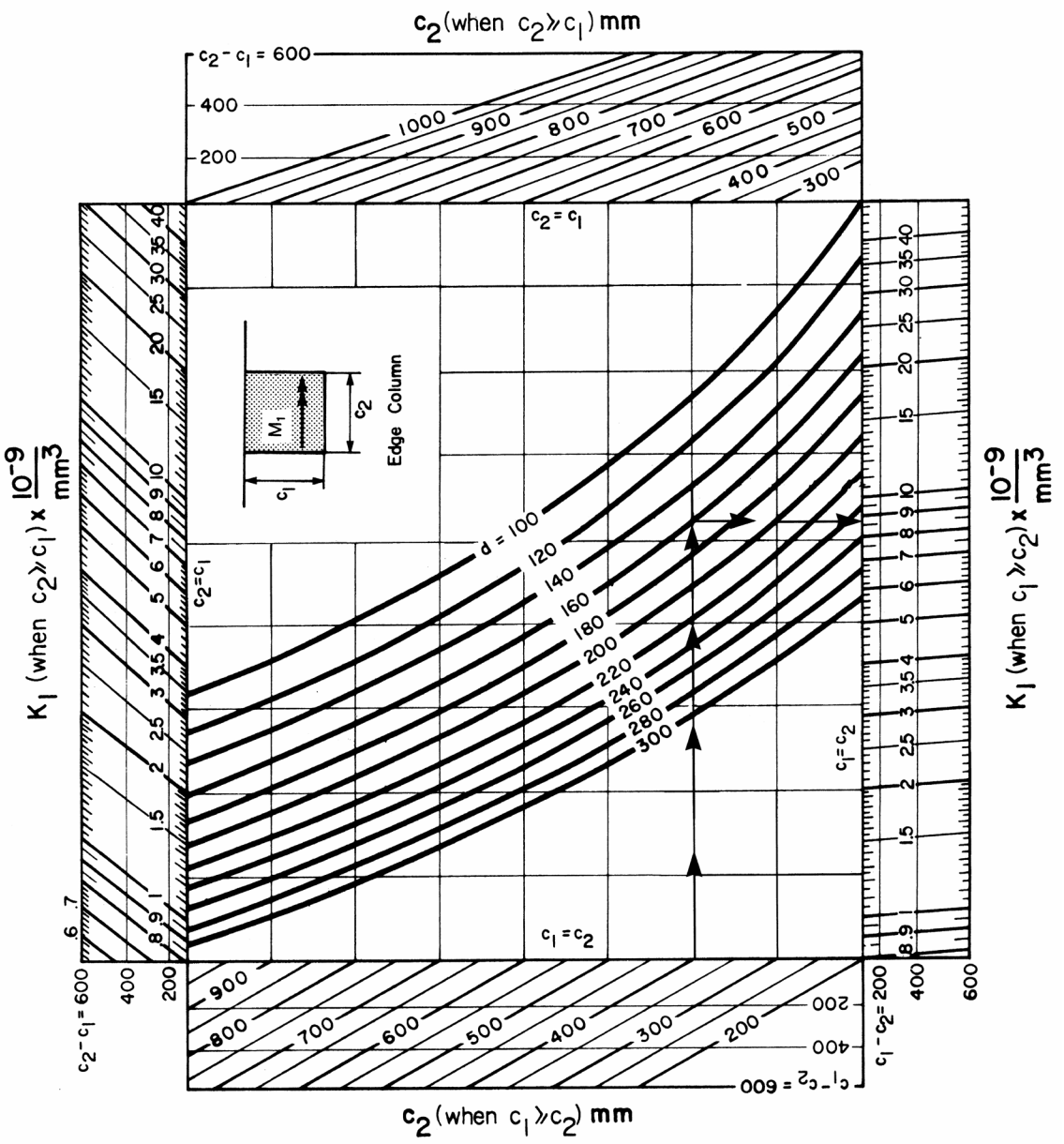


Table 5.6 Factor k_1, Shear-Moment Transfer, Edge Column

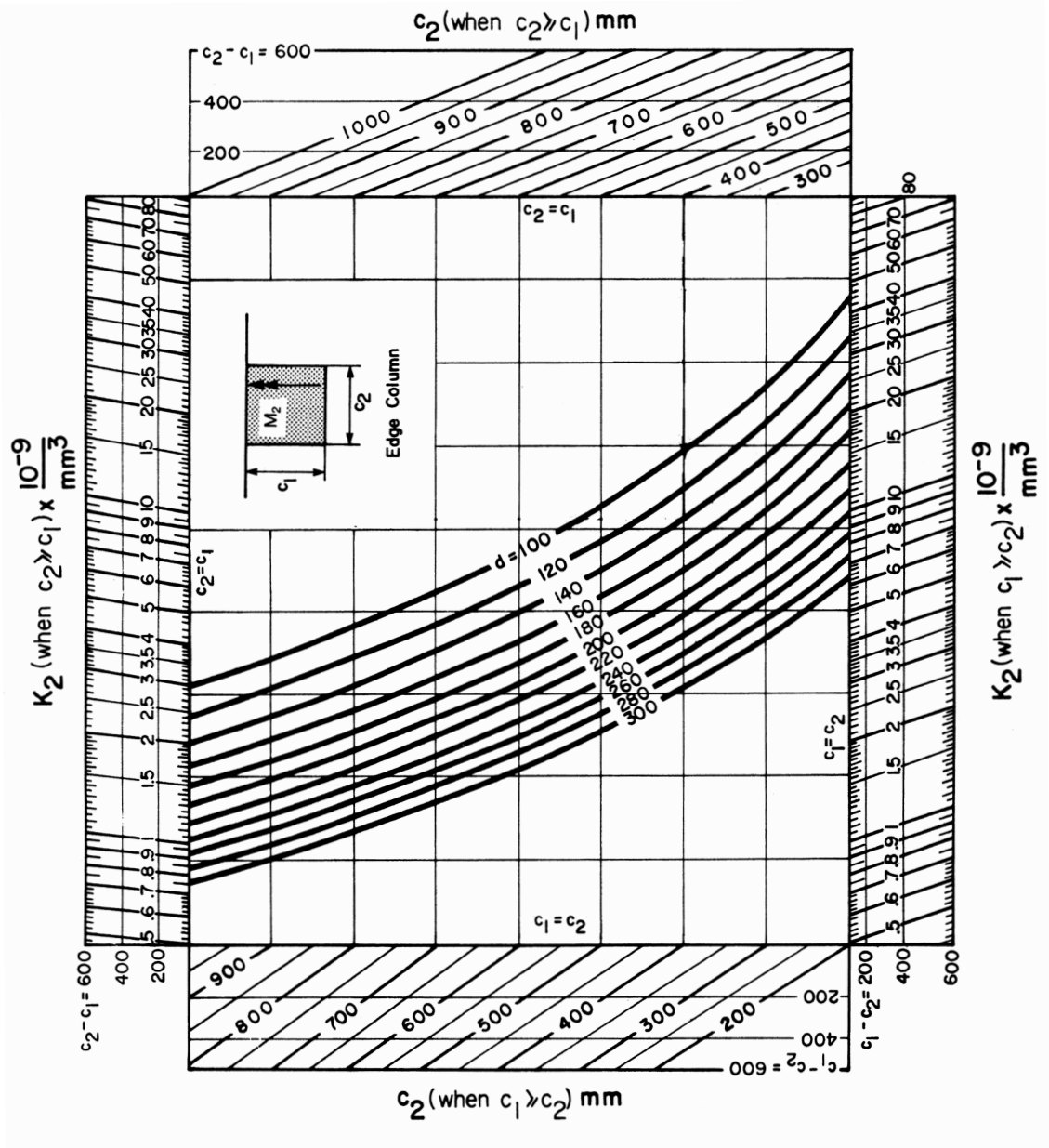


Table 5.7 Factor k_2, Shear-Moment Transfer, Edge Column

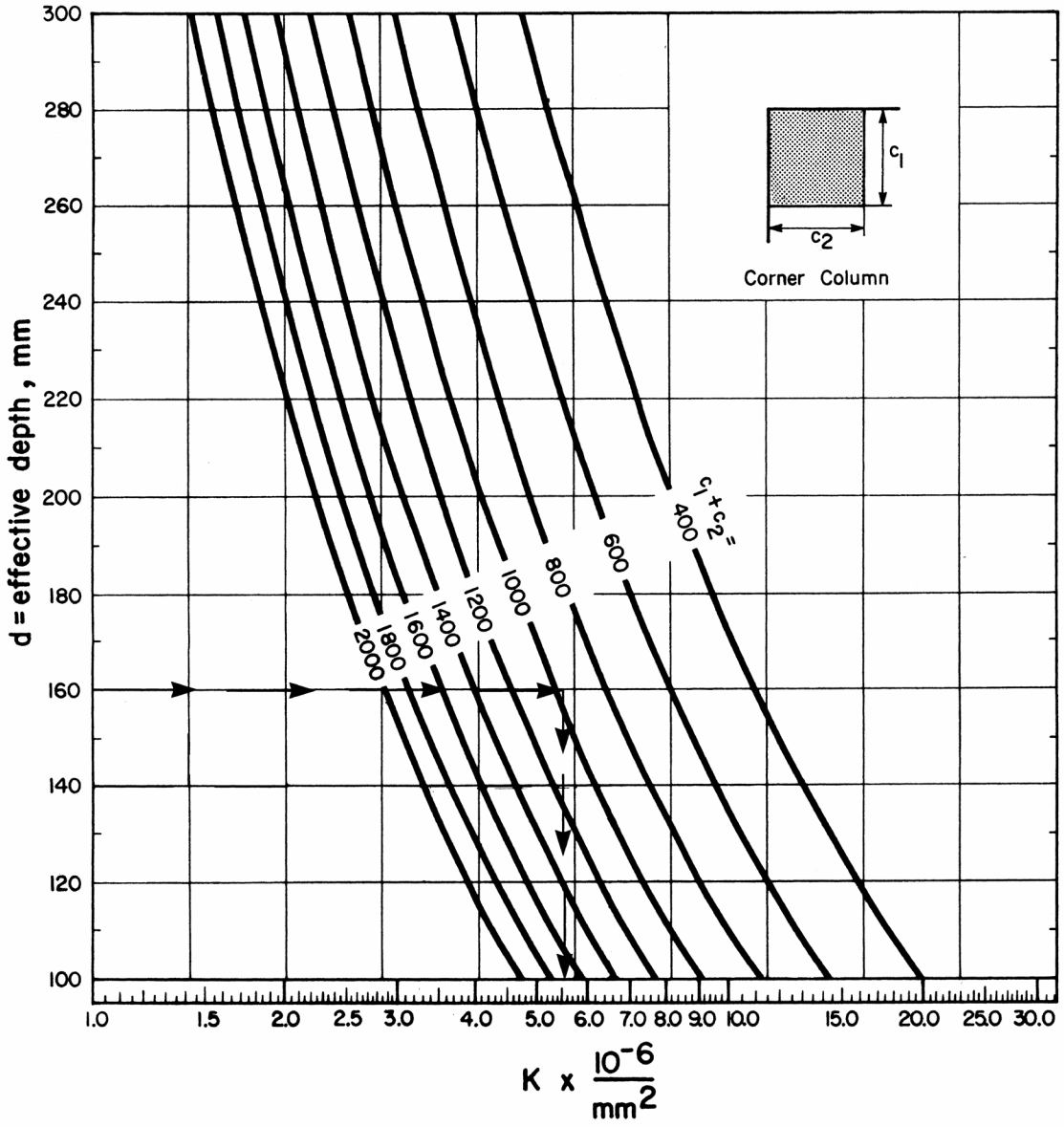


Table 5.8 Factor k_1, Shear-Moment Transfer, Corner Column

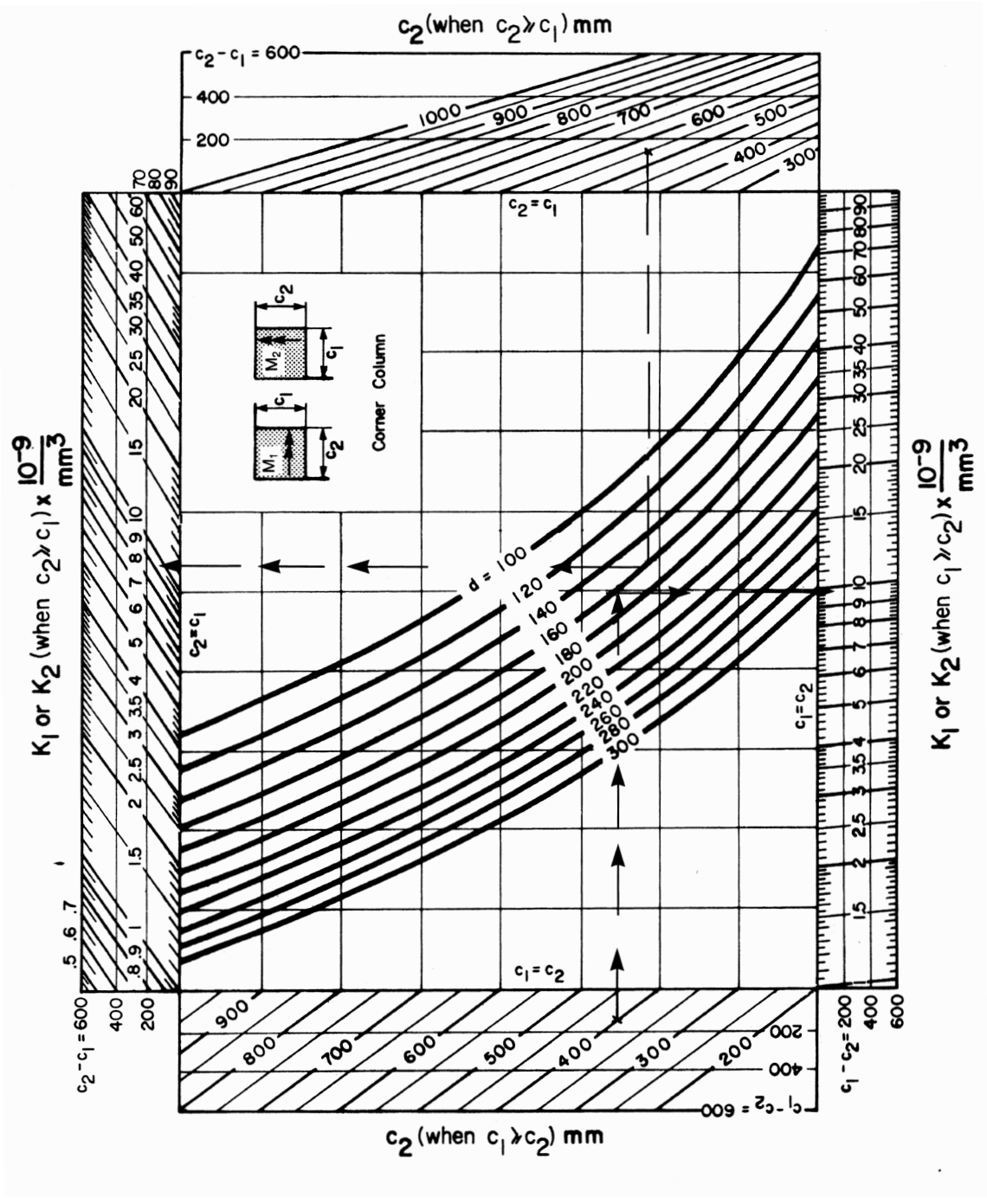


Table 5.9 Factor k_1 or k_2, Shear-Moment Transfer, Corner Column

Table 5.10
Area of Reinforcing Steel (A_s mm^2)
Per One Metre Strip

Bar Spacing mm	Bar Size (No.)					
	10	15	20	25	30	35
50	2000	4000	6000	10000	14000	20000
80	1250	2500	3750	6250	8750	12500
100	1000	2000	3000	5000	7000	10000
120	833	1667	2500	4167	5833	8333
150	667	1333	2000	3333	4667	6667
180	556	1111	1667	2778	3889	5556
200	500	1000	1500	2500	3500	5000
220	455	909	1364	2273	3182	4545
240	417	833	1250	2083	2917	4167
250	400	800	1200	2000	2800	4000
260	385	769	1154	1923	2692	3846
280	357	714	1071	1786	2500	3571
300	333	667	1000	1667	2333	3333
320	313	625	938	1563	2188	3125
340	294	588	882	1471	2059	2941
360	278	556	833	1389	1944	2778
380	263	526	789	1316	1842	2632
400	250	500	750	1250	1750	2500
420	238	476	714	1190	1667	2381
440	227	455	682	1136	1591	2273
460	217	435	652	1087	1522	2174

Table 7.10.1 Rectangular Columns with Equal Numbers of Bars on all Faces

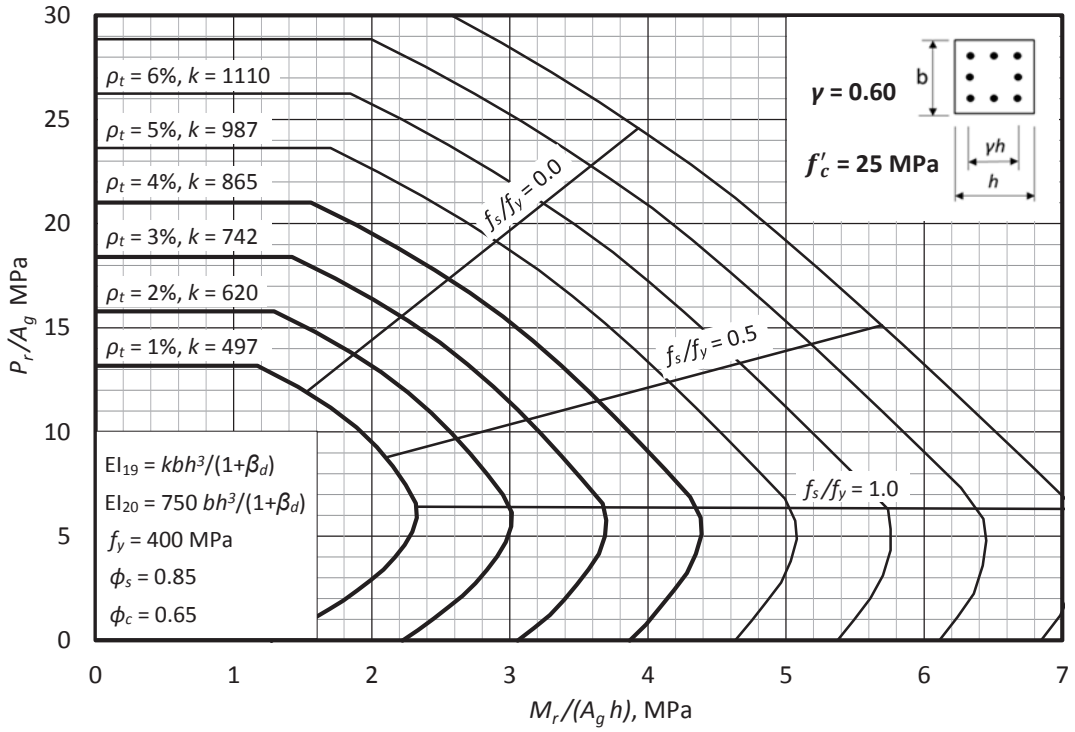


Table 7.10.2 Rectangular Columns with Equal Numbers of Bars on all Faces

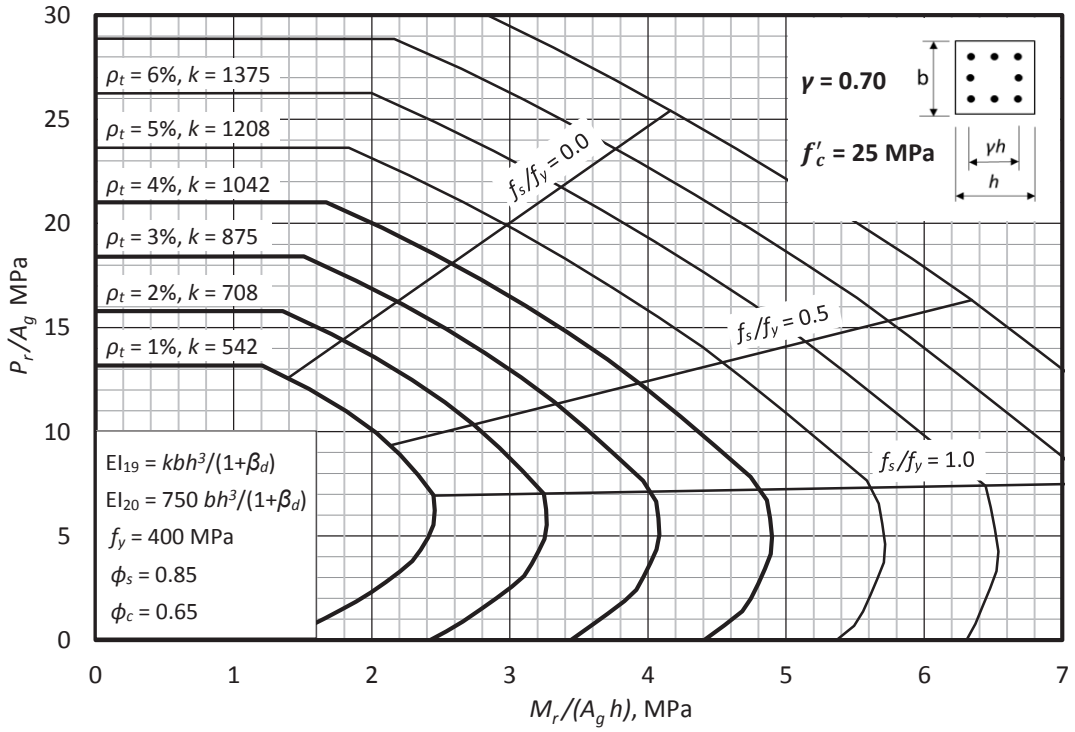


Table 7.10.3 Rectangular Columns with Equal Numbers of Bars on all Faces

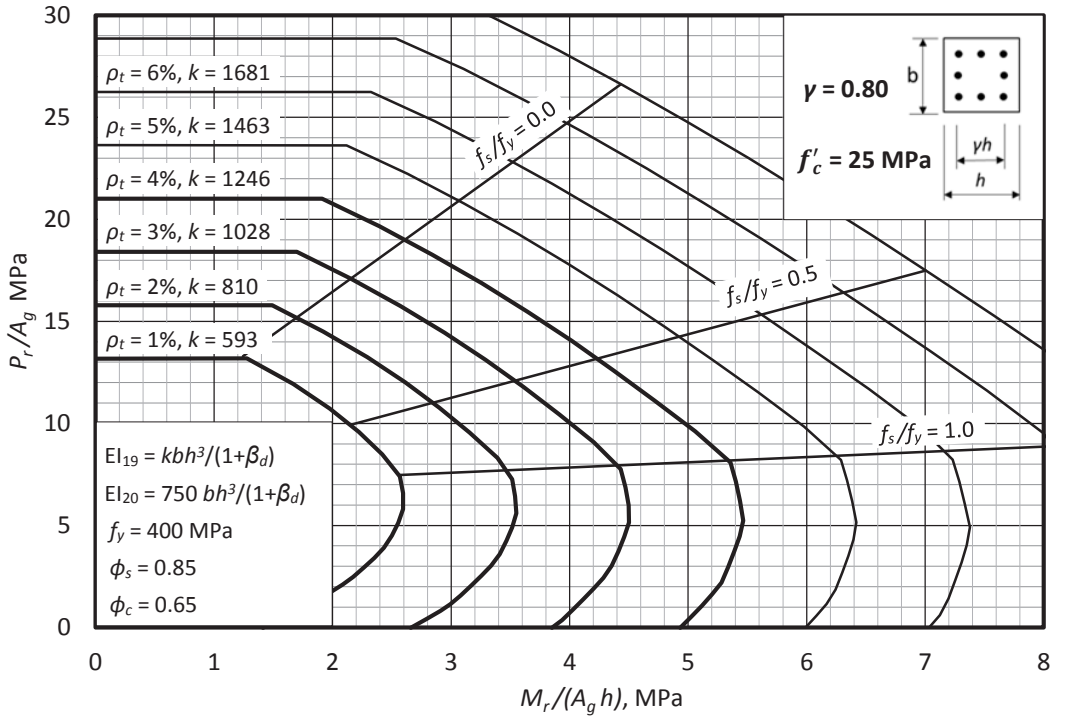


Table 7.10.4 Rectangular Columns with Equal Numbers of Bars on all Faces

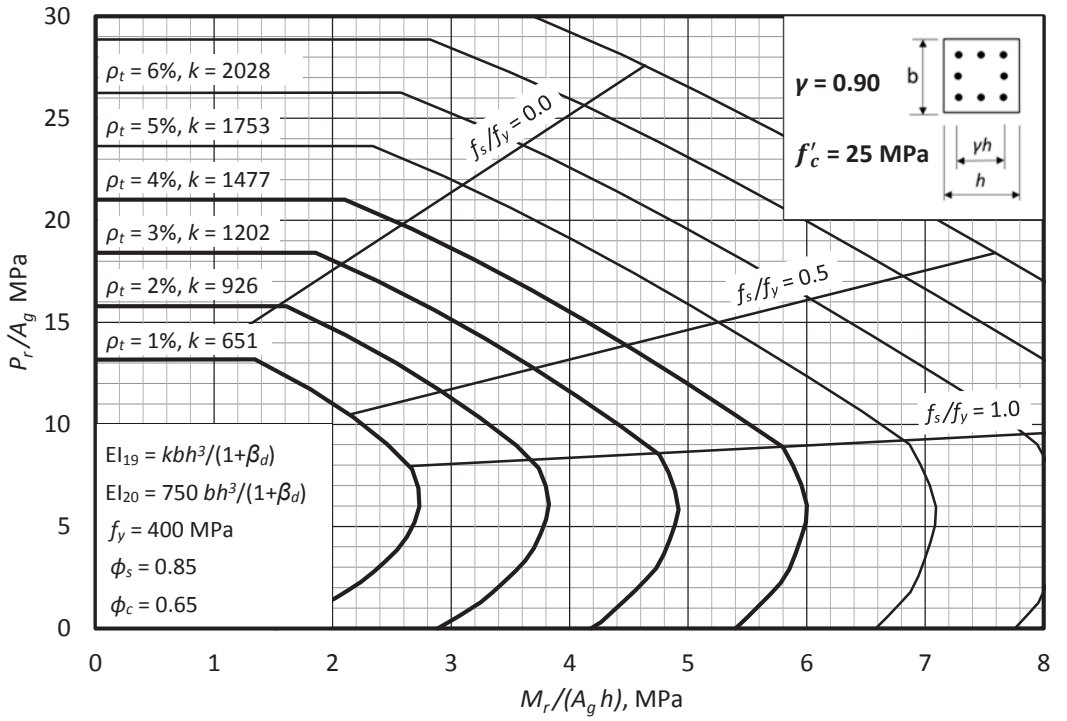


Table 7.10.5 Rectangular Columns with Equal Numbers of Bars on all Faces

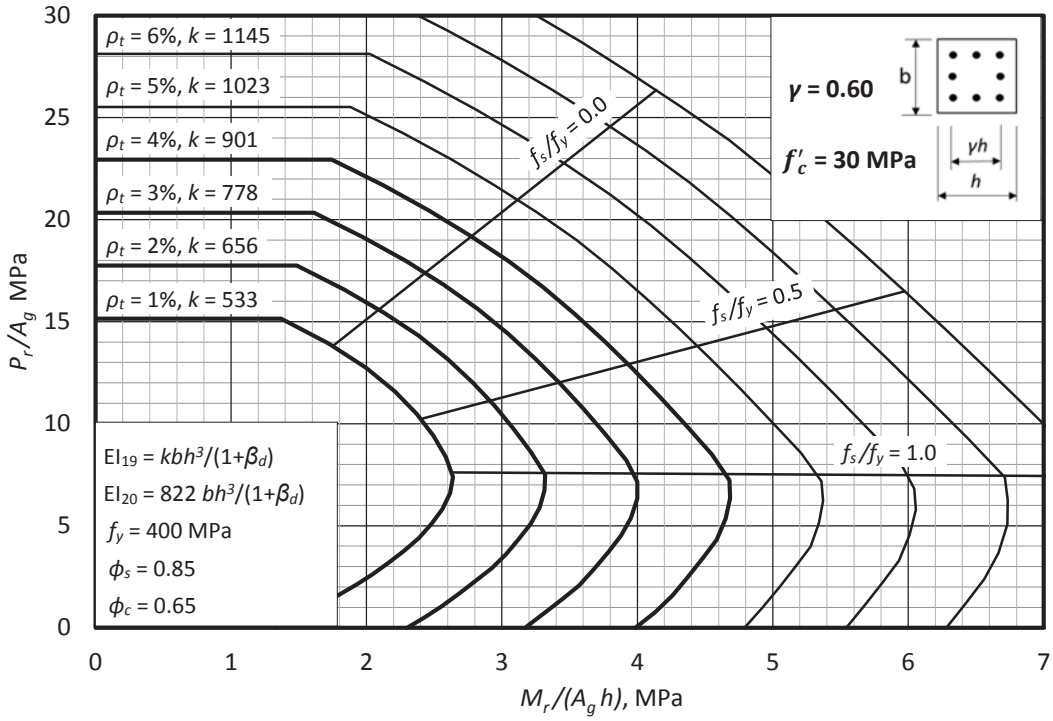


Table 7.10.6 Rectangular Columns with Equal Numbers of Bars on all Faces

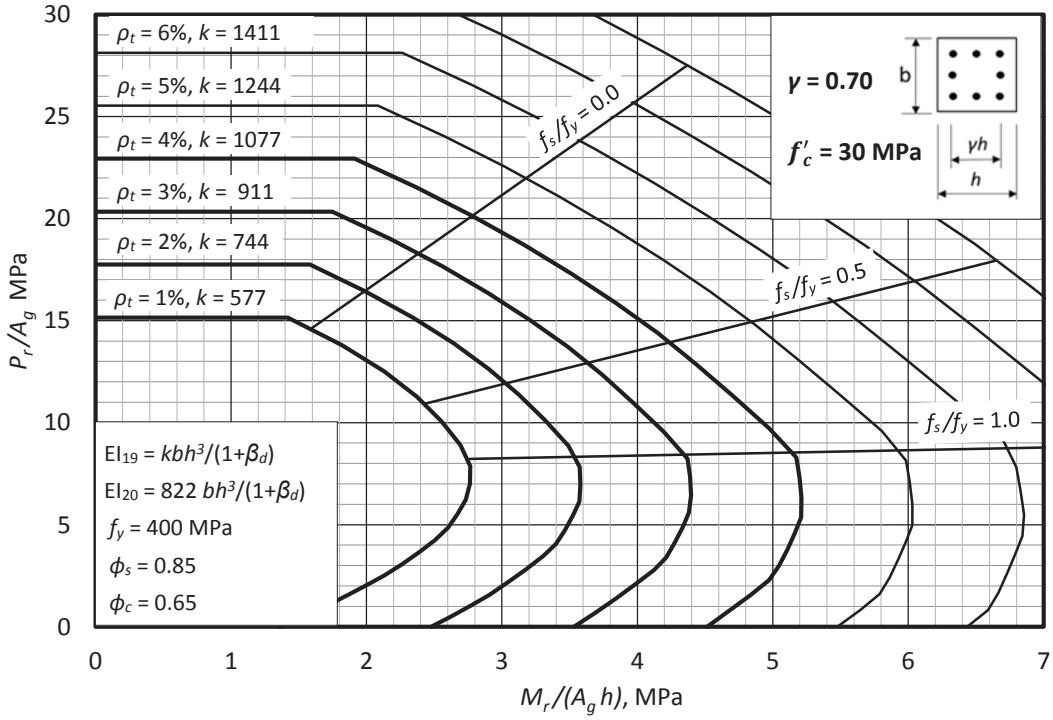


Table 7.10.7 Rectangular Columns with Equal Numbers of Bars on all Faces

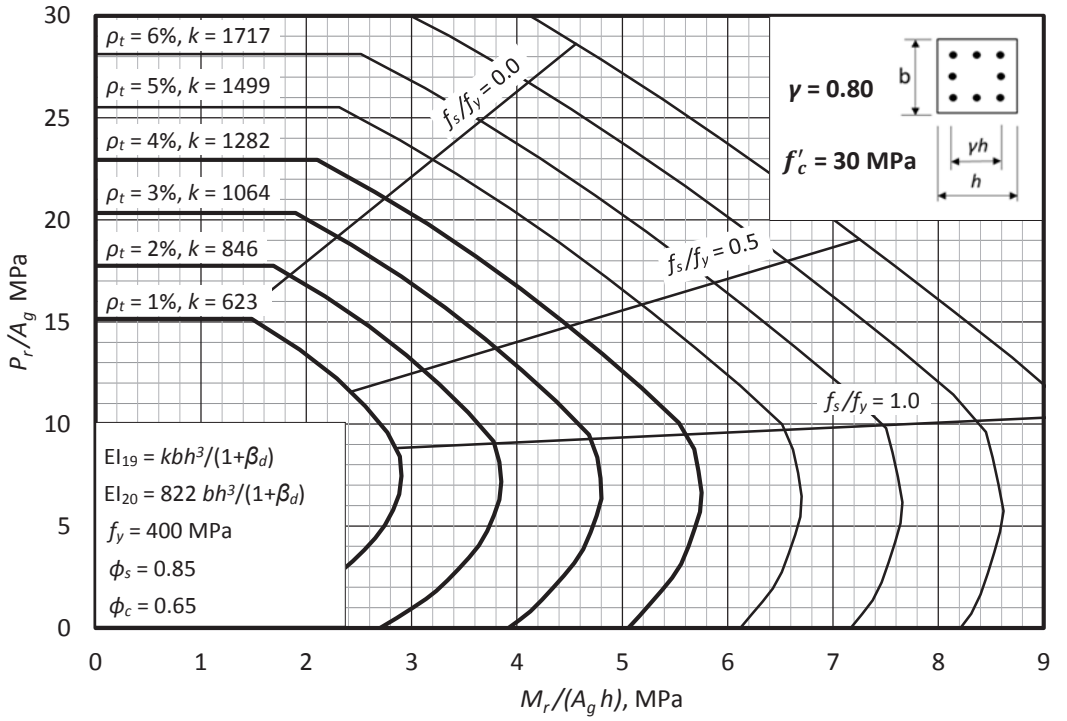


Table 7.10.8 Rectangular Columns with Equal Numbers of Bars on all Faces

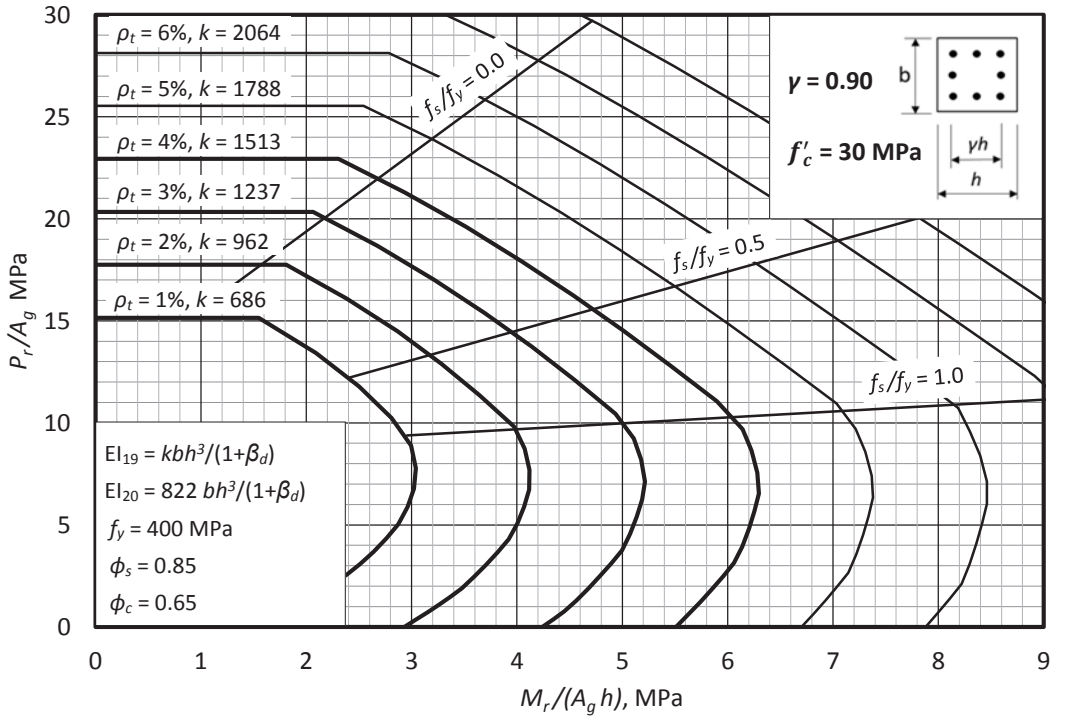


Table 7.10.9 Rectangular Columns with Equal Numbers of Bars on all Faces

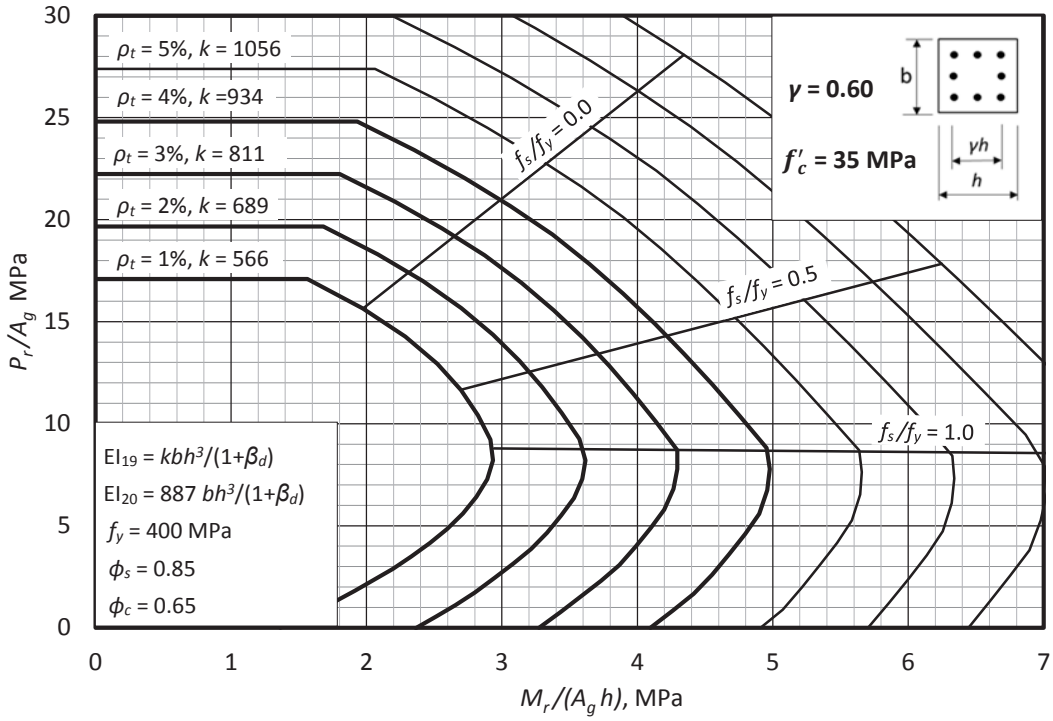


Table 7.10.10 Rectangular Columns with Equal Numbers of Bars on all Faces

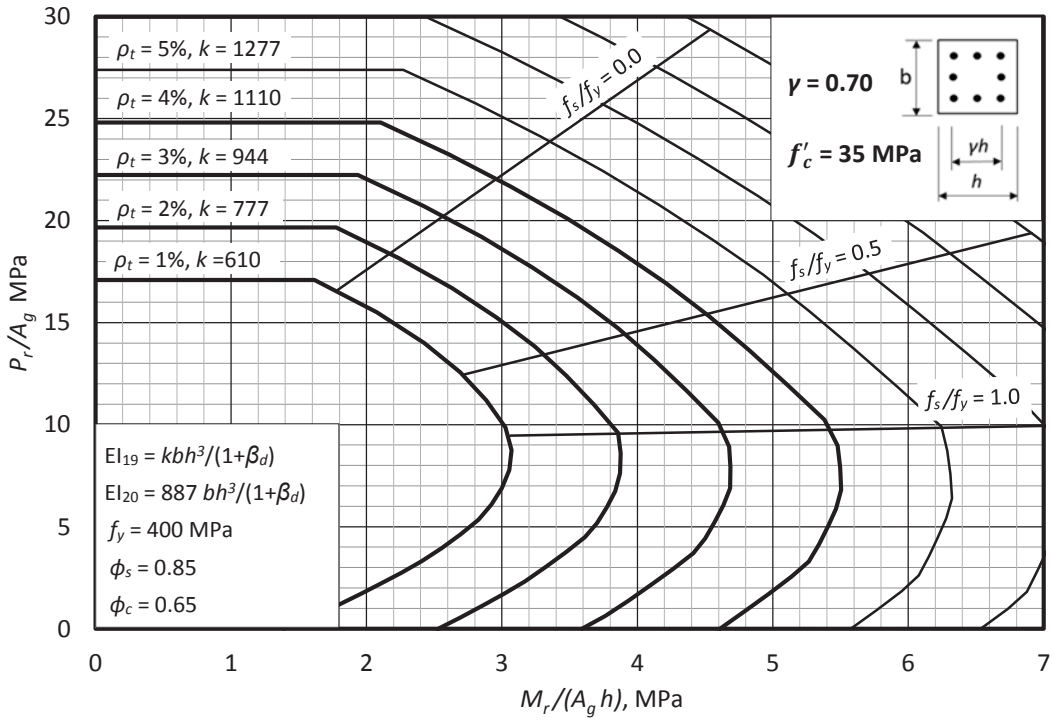


Table 7.10.11 Rectangular Columns with Equal Numbers of Bars on all Faces

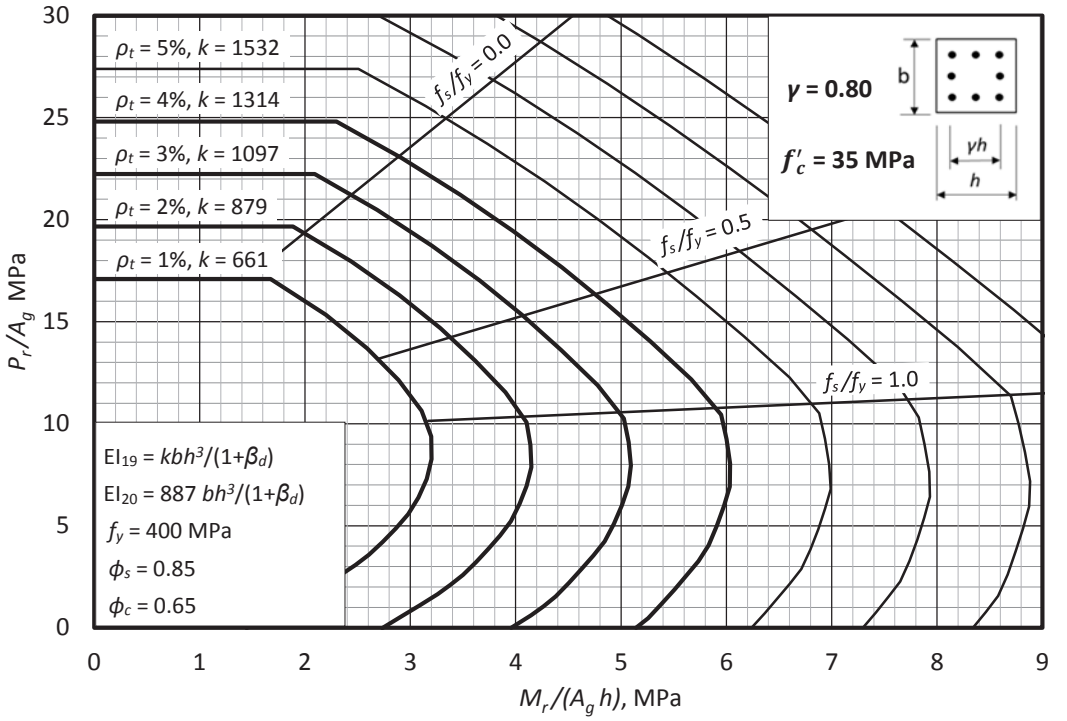


Table 7.10.12 Rectangular Columns with Equal Numbers of Bars on all Faces

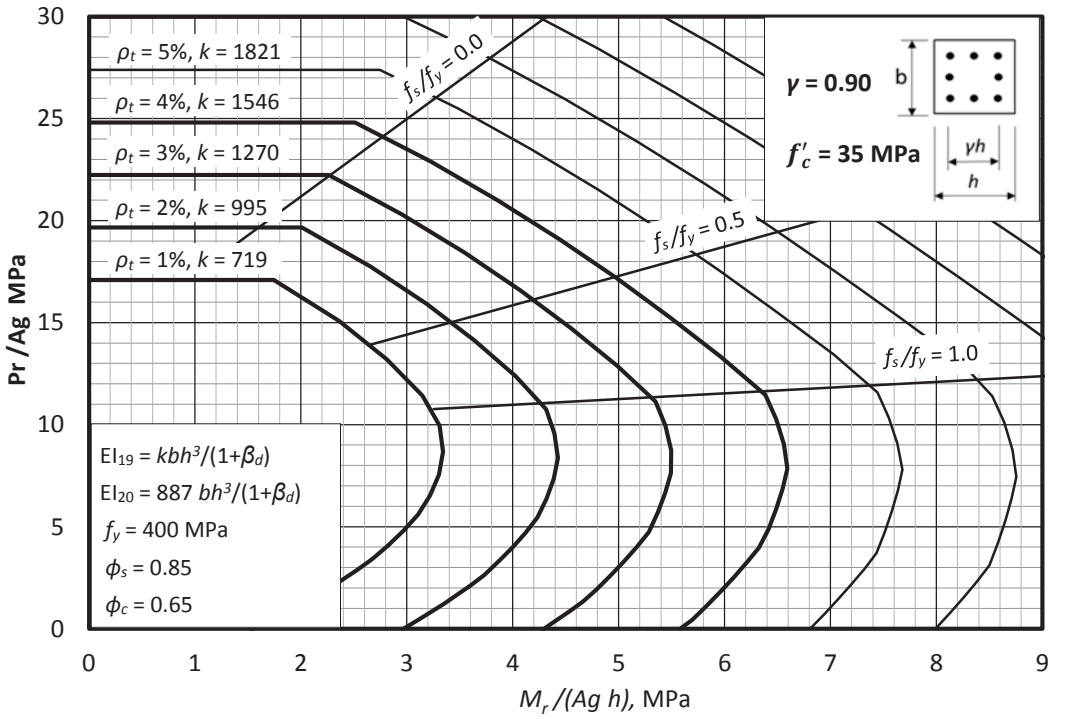


Table 7.10.13 Rectangular Columns with Equal Numbers of Bars on all Faces

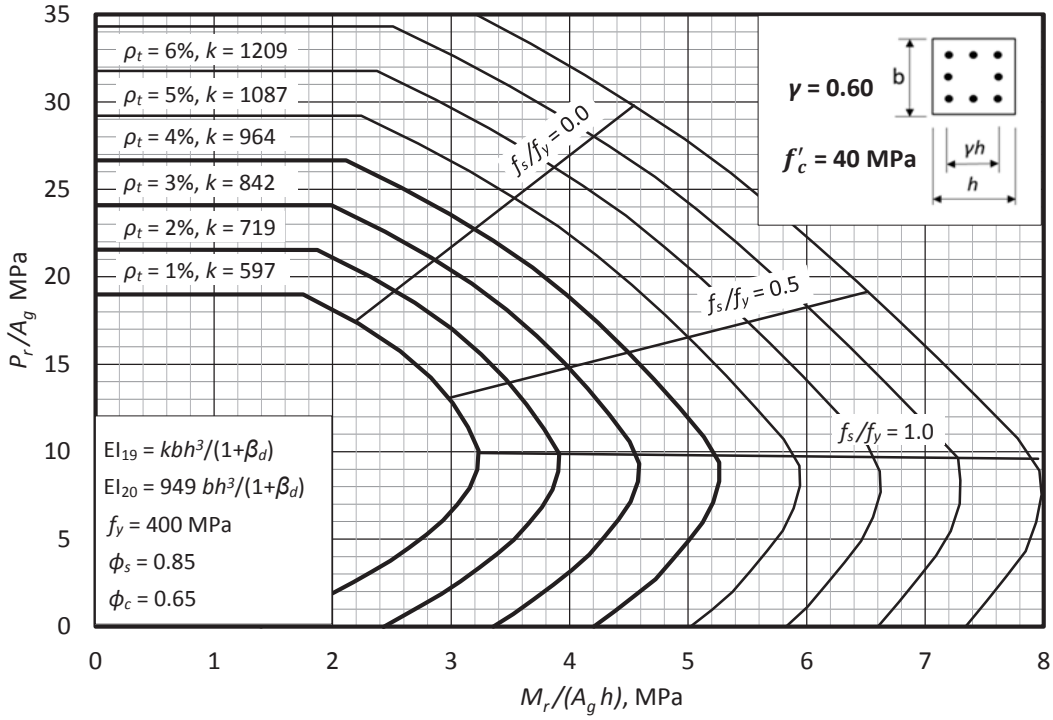


Table 7.10.14 Rectangular Columns with Equal Numbers of Bars on all Faces

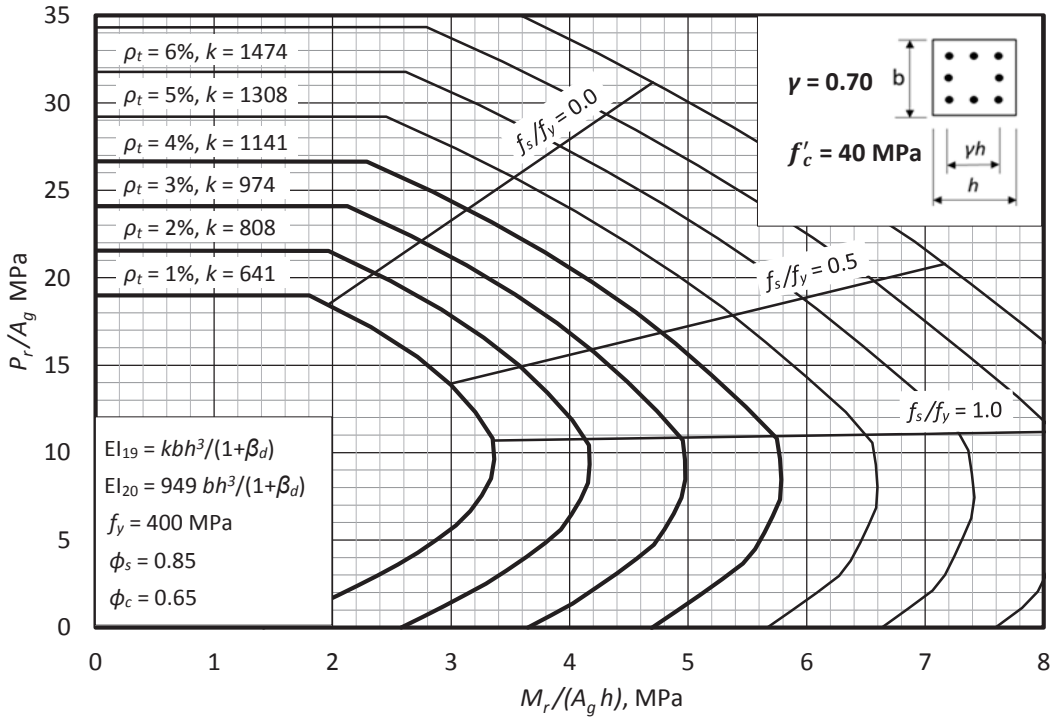


Table 7.10.15 Rectangular Columns with Equal Numbers of Bars on all Faces

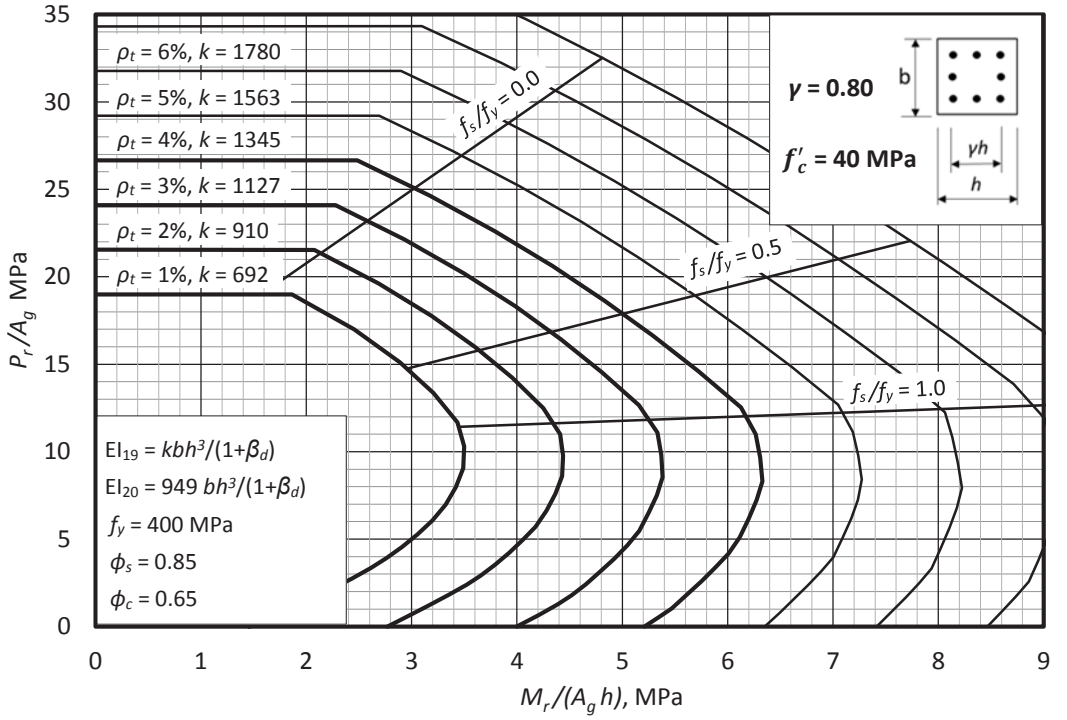


Table 7.10.16 Rectangular Columns with Equal Numbers of Bars on all Faces

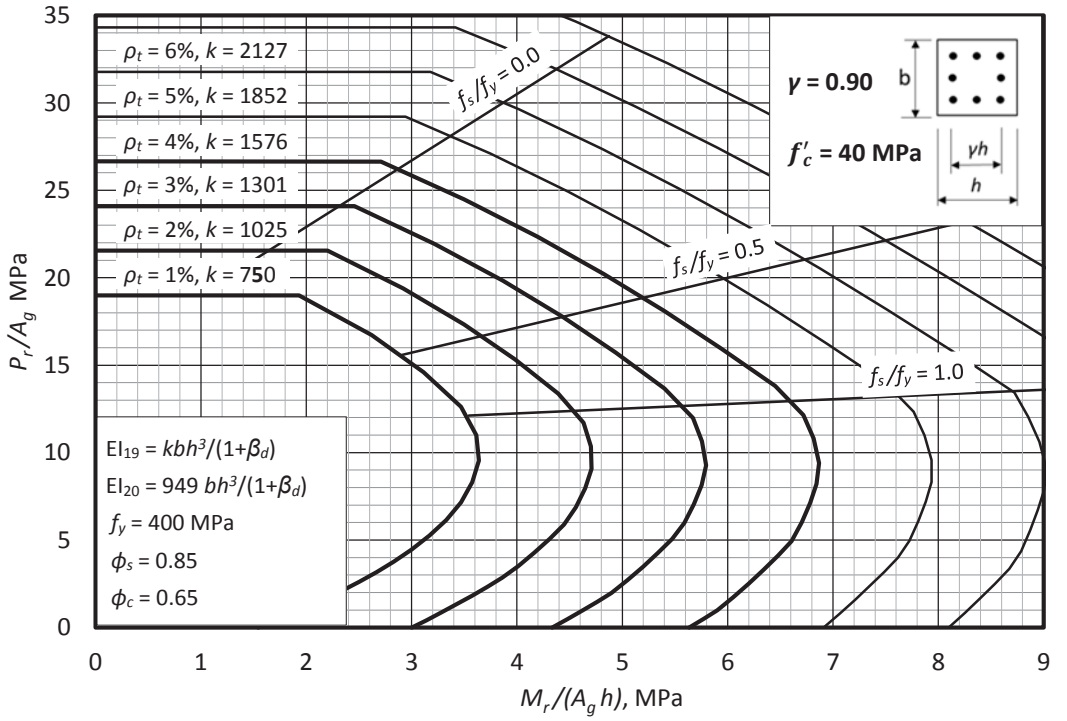


Table 7.10.17 Rectangular Columns with Equal Numbers of Bars on all Faces

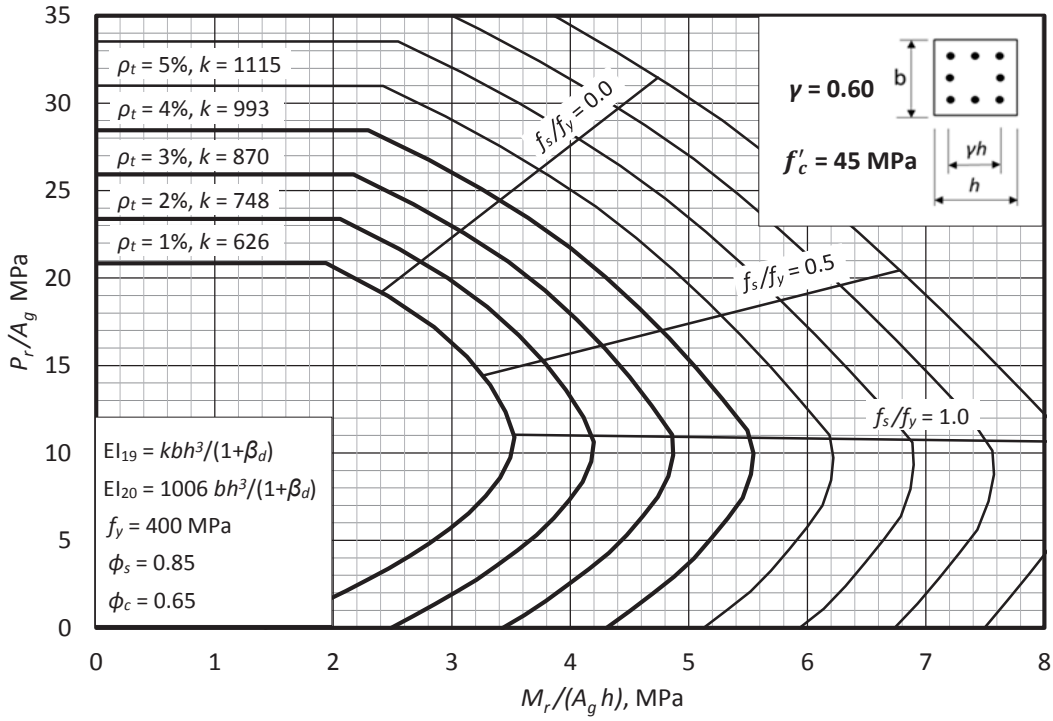


Table 7.10.18 Rectangular Columns with Equal Numbers of Bars on all Faces

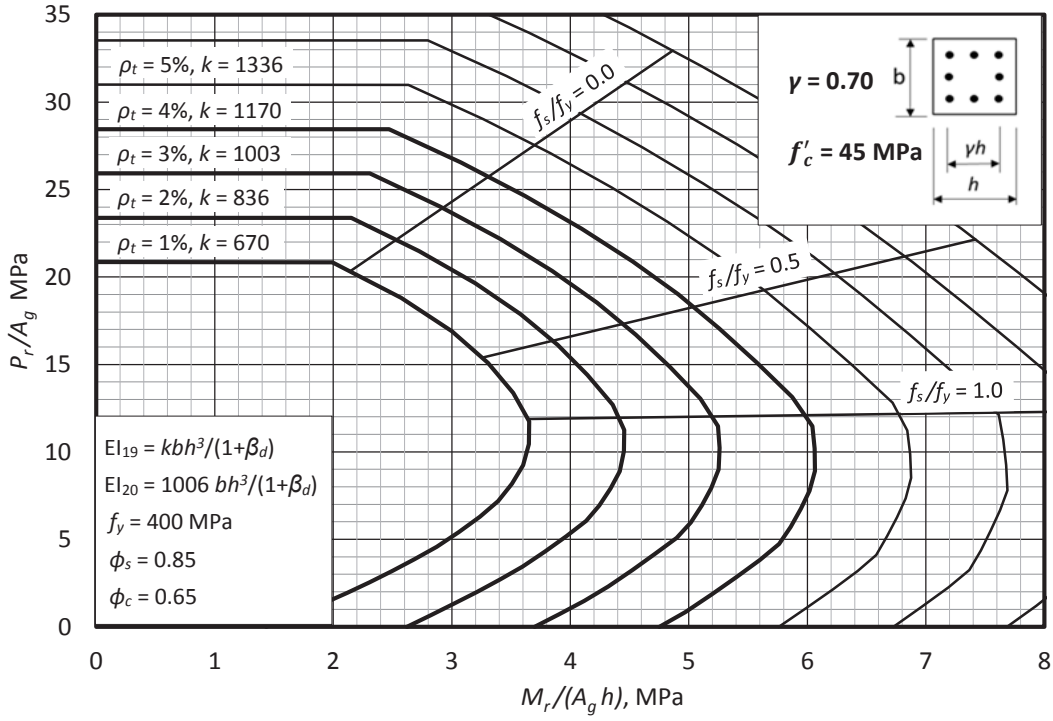


Table 7.10.19 Rectangular Columns with Equal Numbers of Bars on all Faces

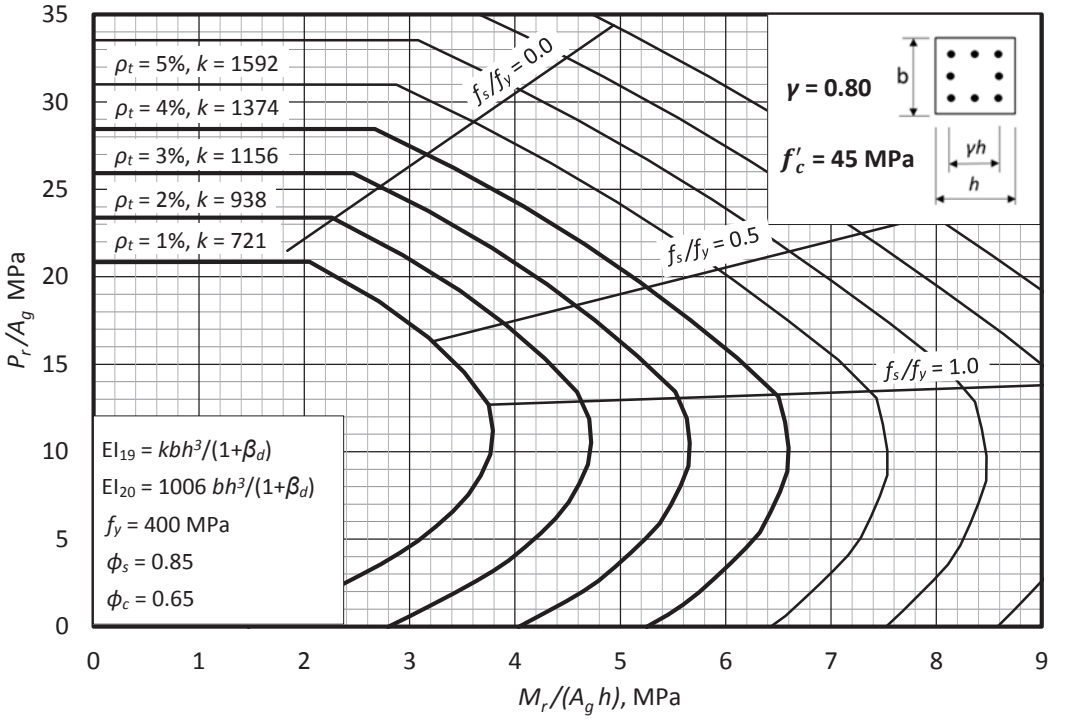


Table 7.10.20 Rectangular Columns with Equal Numbers of Bars on all Faces

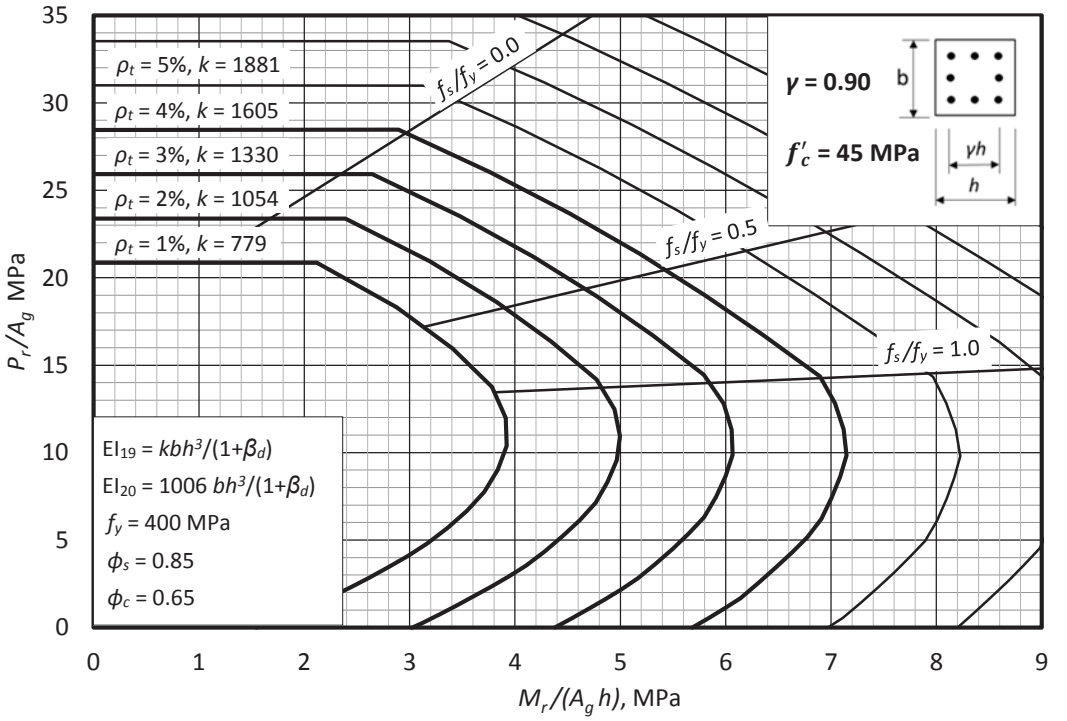


Table 7.11.1 Rectangular Columns with Bars on End Faces Only

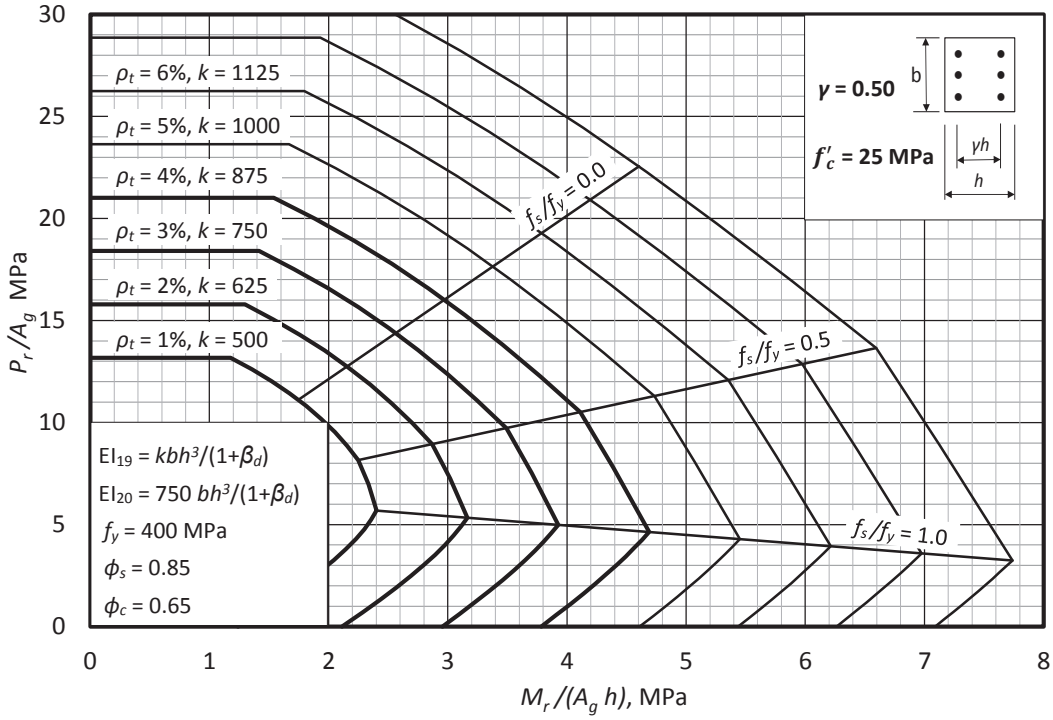


Table 7.11.2 Rectangular Columns with Bars on End Faces Only

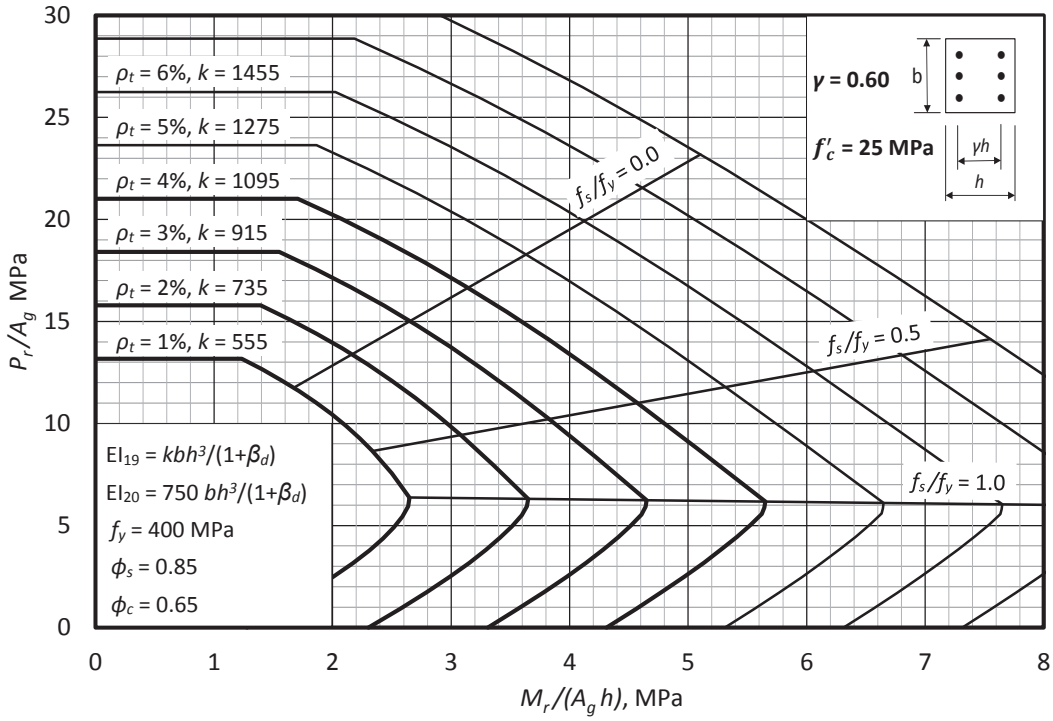


Table 7.11.3 Rectangular Columns with Bars on End Faces Only

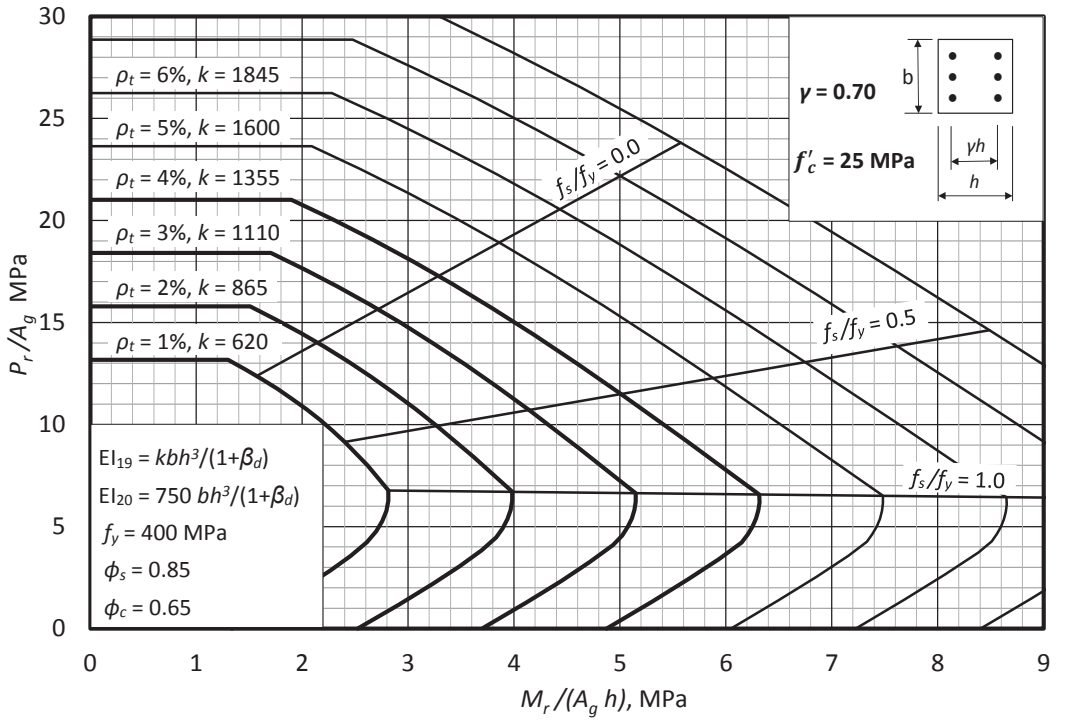


Table 7.11.4 Rectangular Columns with Bars on End Faces Only

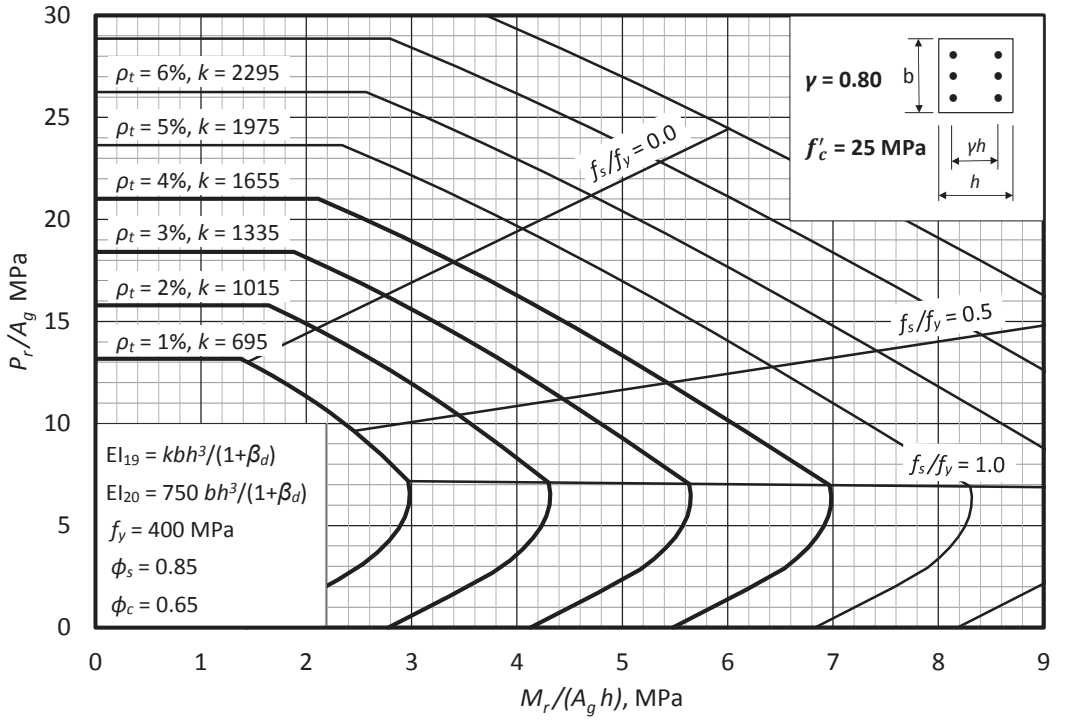


Table 7.11.5 Rectangular Columns with Bars on End Faces Only

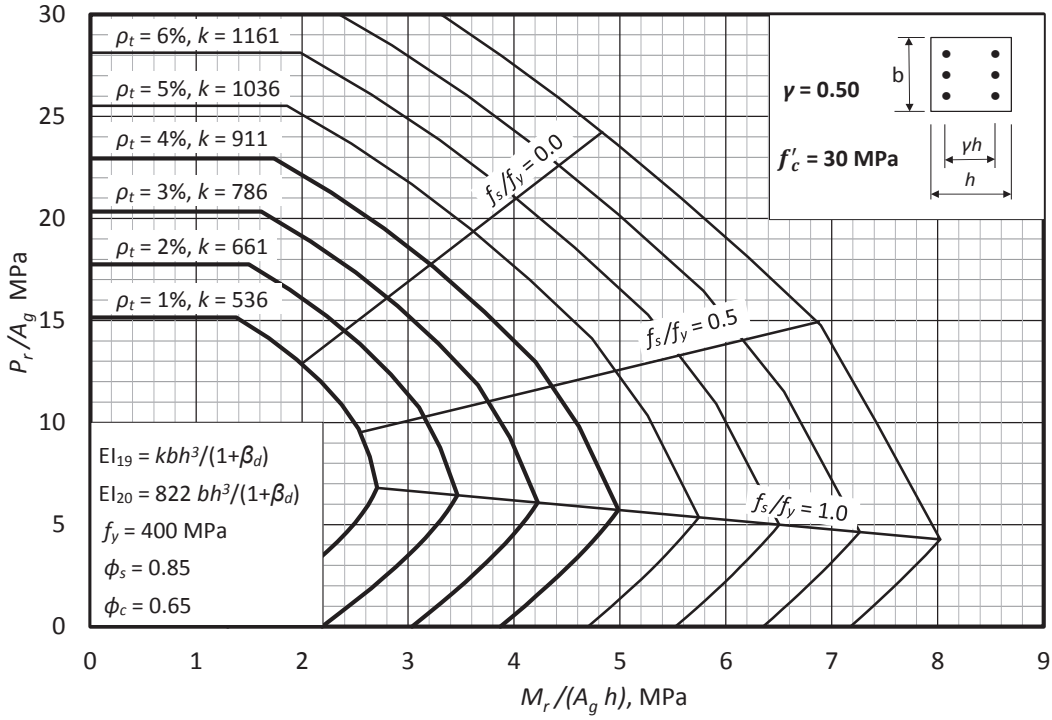


Table 7.11.6 Rectangular Columns with Bars on End Faces Only

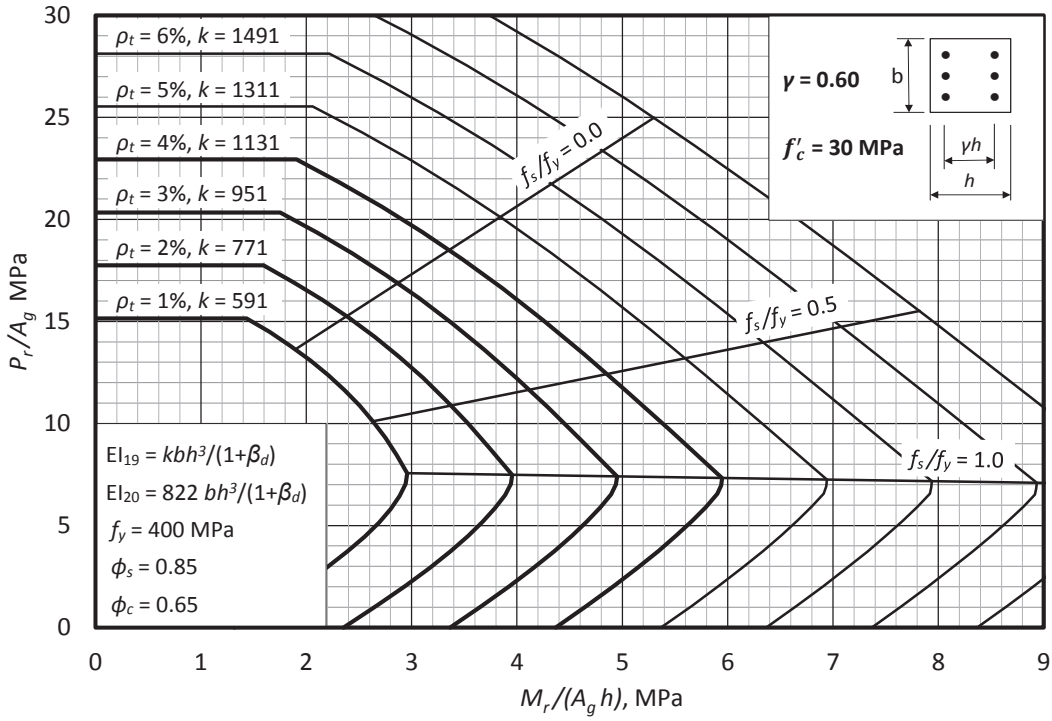


Table 7.11.7 Rectangular Columns with Bars on End Faces Only

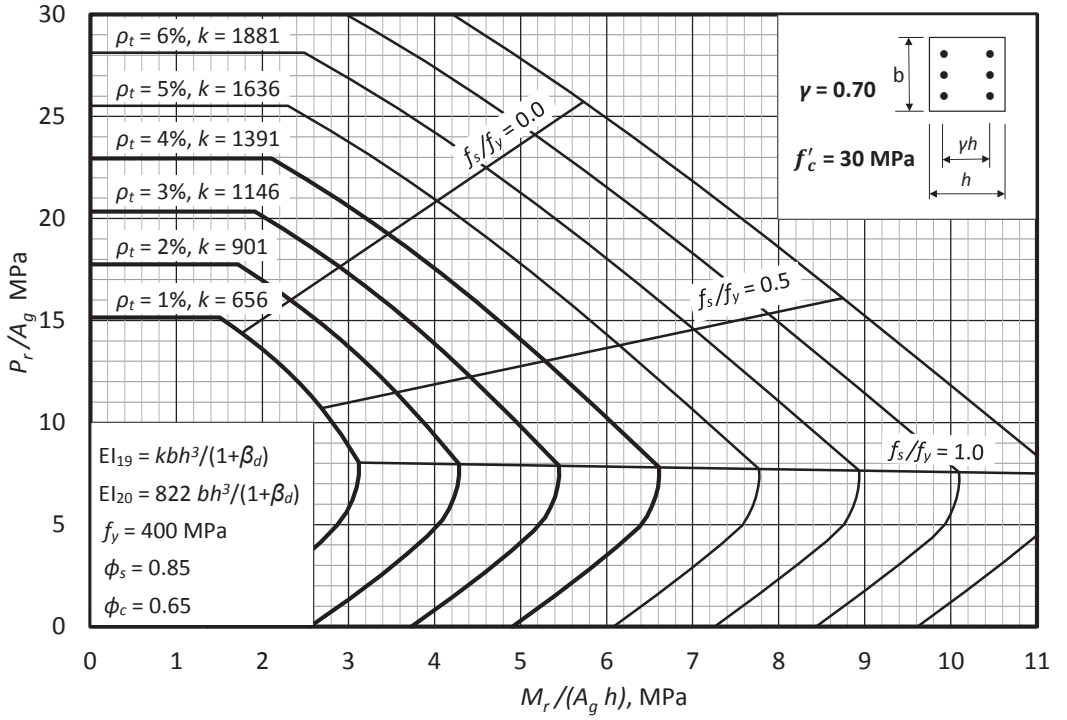


Table 7.11.8 Rectangular Columns with Bars on End Faces Only

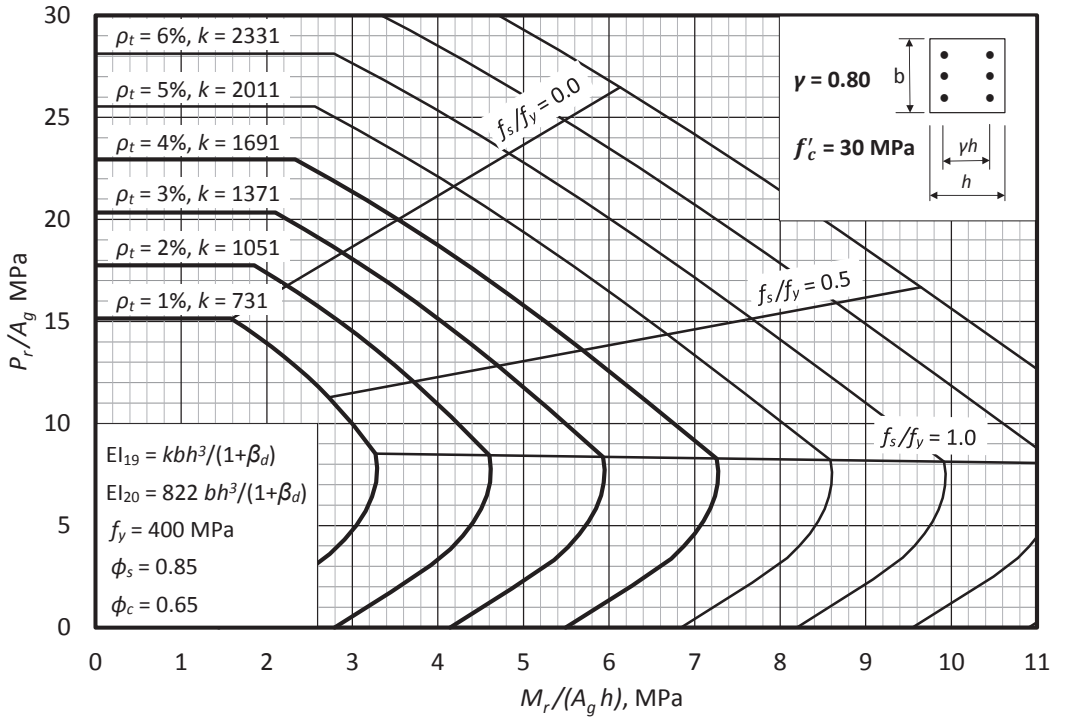


Table 7.11.9 Rectangular Columns with Bars on End Faces Only

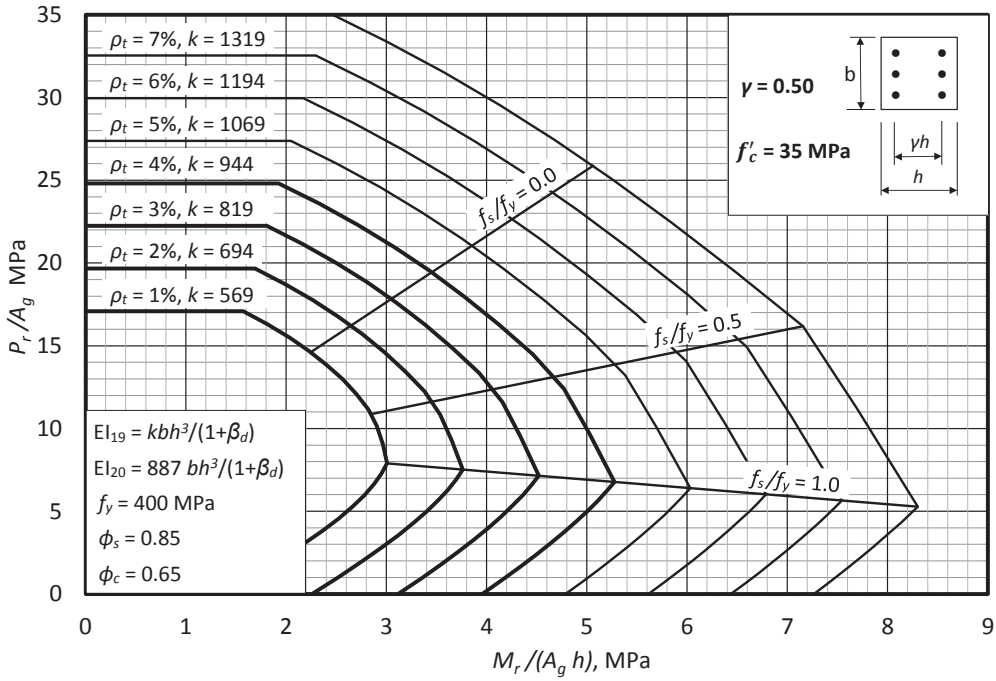


Table 7.11.10 Rectangular Columns with Bars on End Faces Only

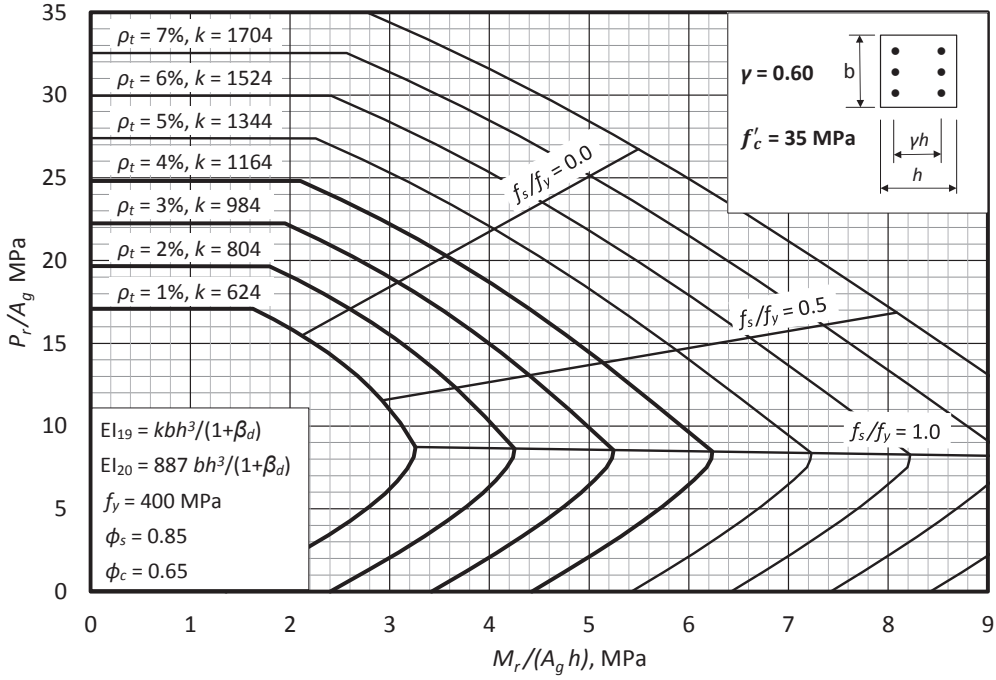


Table 7.11.11 Rectangular Columns with Bars on End Faces Only

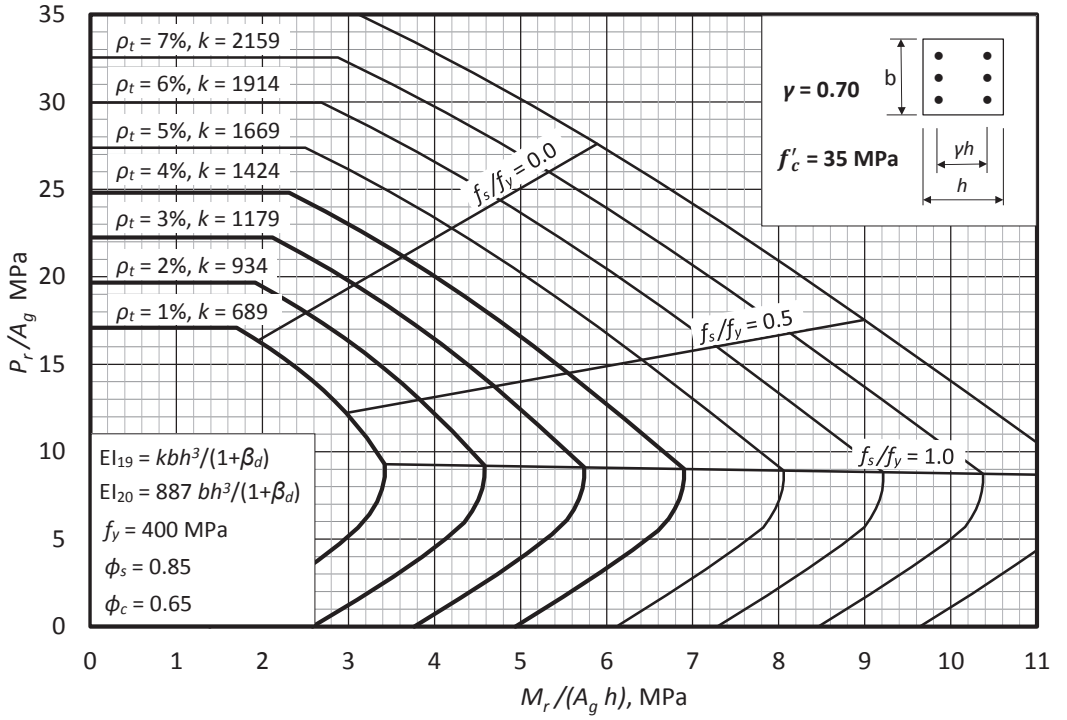


Table 7.11.12 Rectangular Columns with Bars on End Faces Only

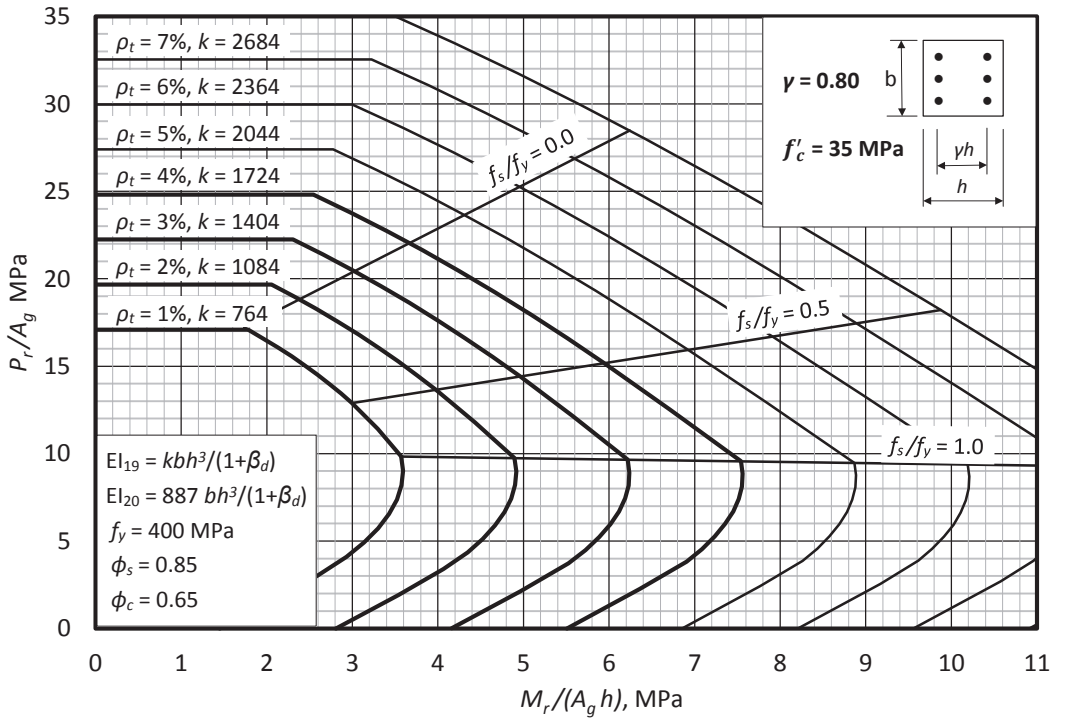


Table 7.11.13 Rectangular Columns with Bars on End Faces Only

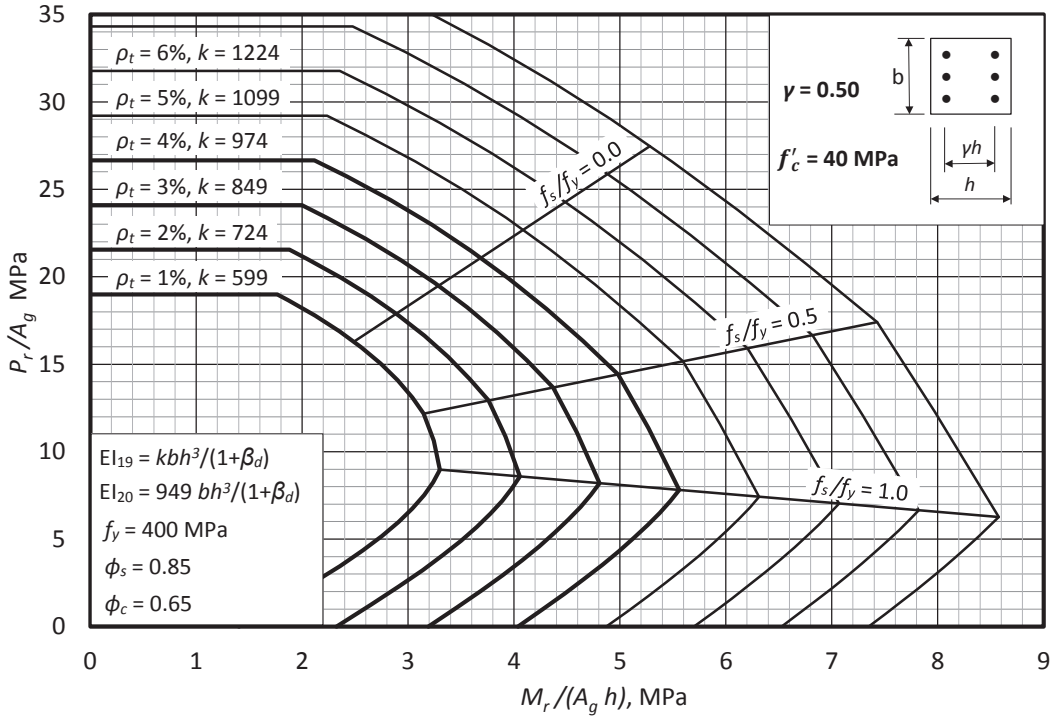


Table 7.11.14 Rectangular Columns with Bars on End Faces Only

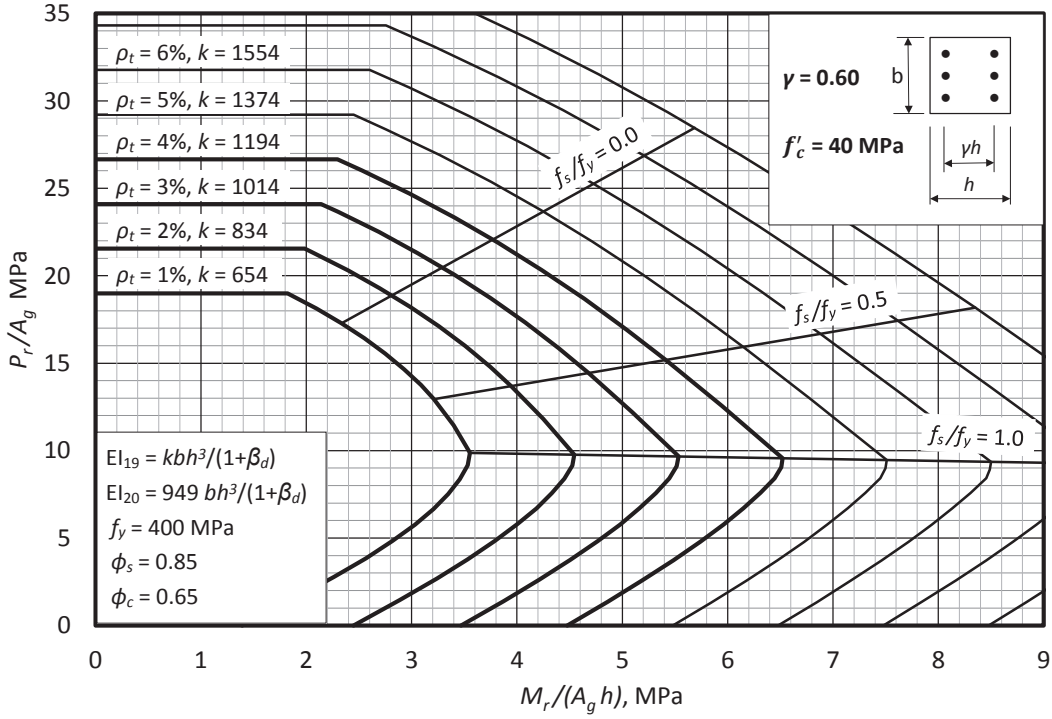


Table 7.11.15 Rectangular Columns with Bars on End Faces Only

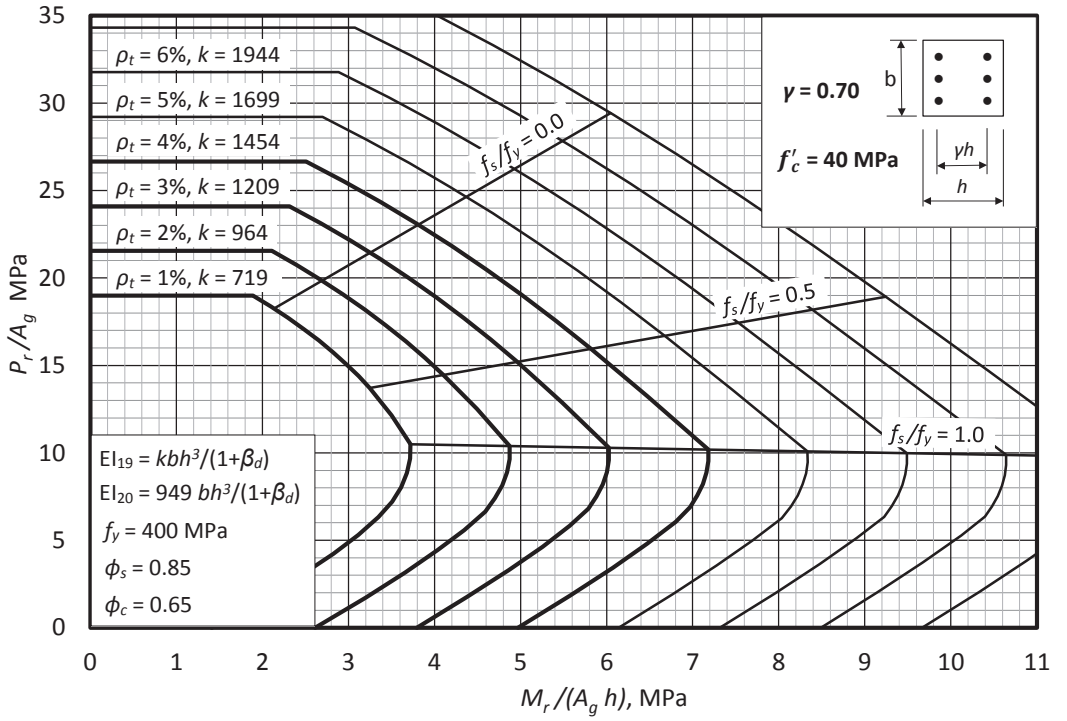


Table 7.11.16 Rectangular Columns with Bars on End Faces Only

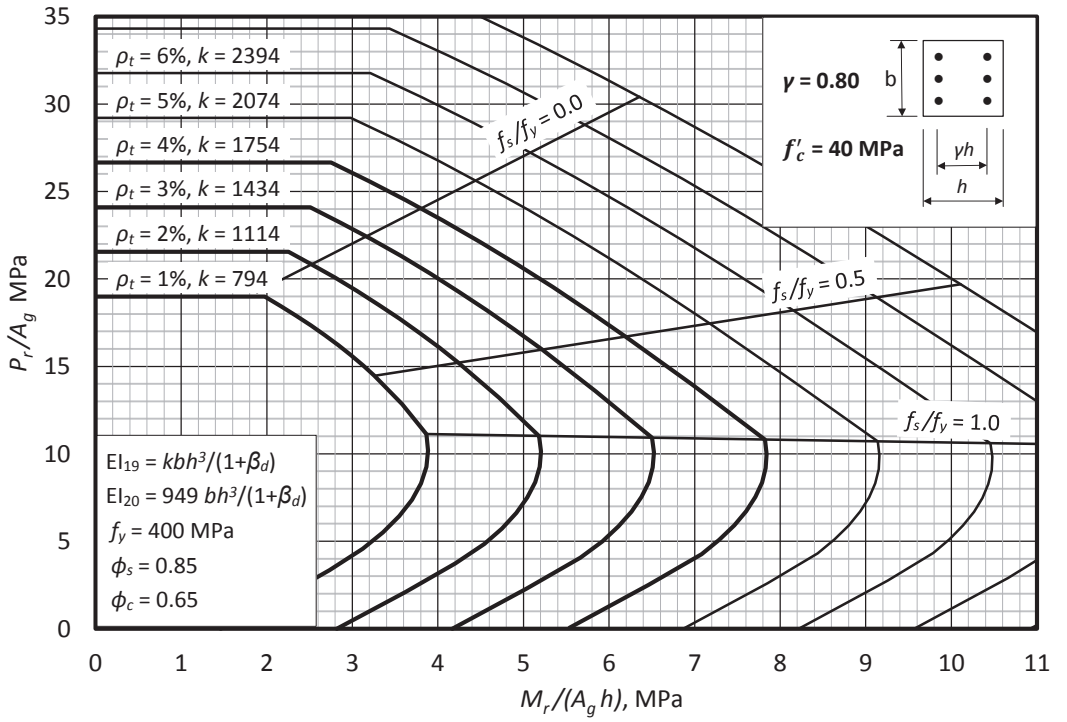


Table 7.11.17 Rectangular Columns with Bars on End Faces Only

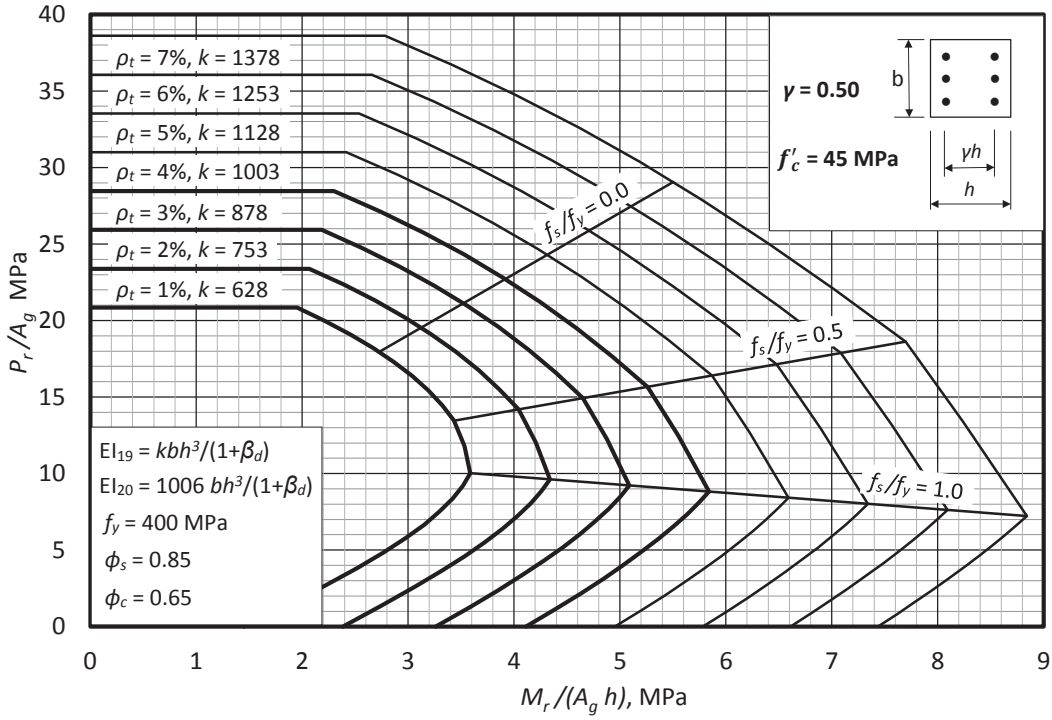


Table 7.11.18 Rectangular Columns with Bars on End Faces Only

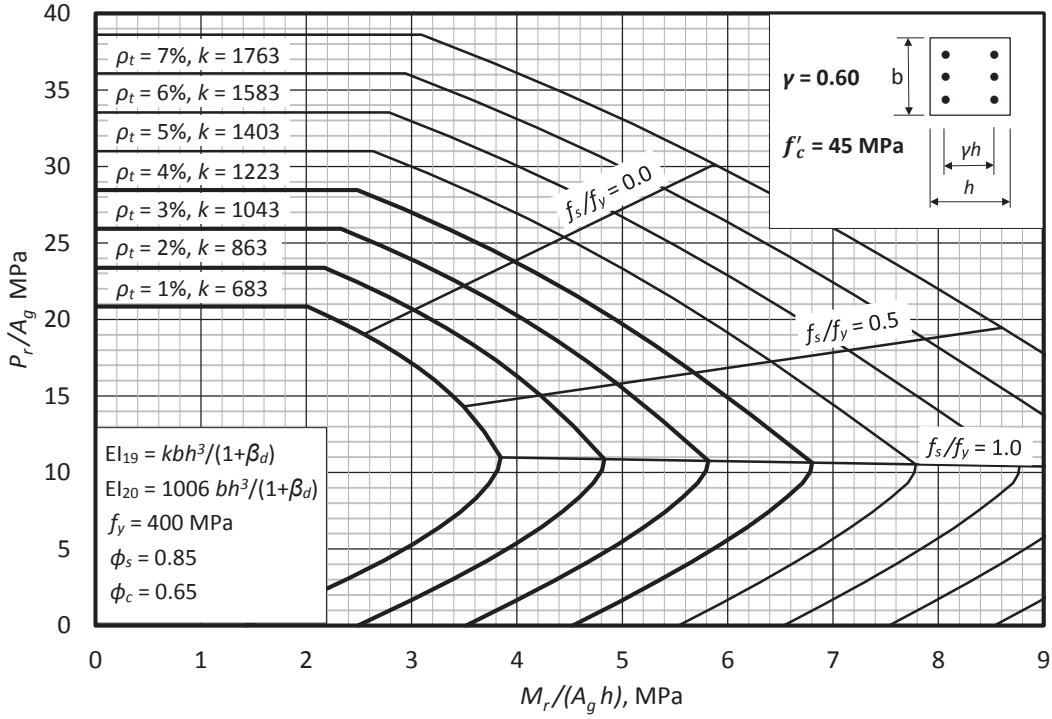


Table 7.11.19 Rectangular Columns with Bars on End Faces Only

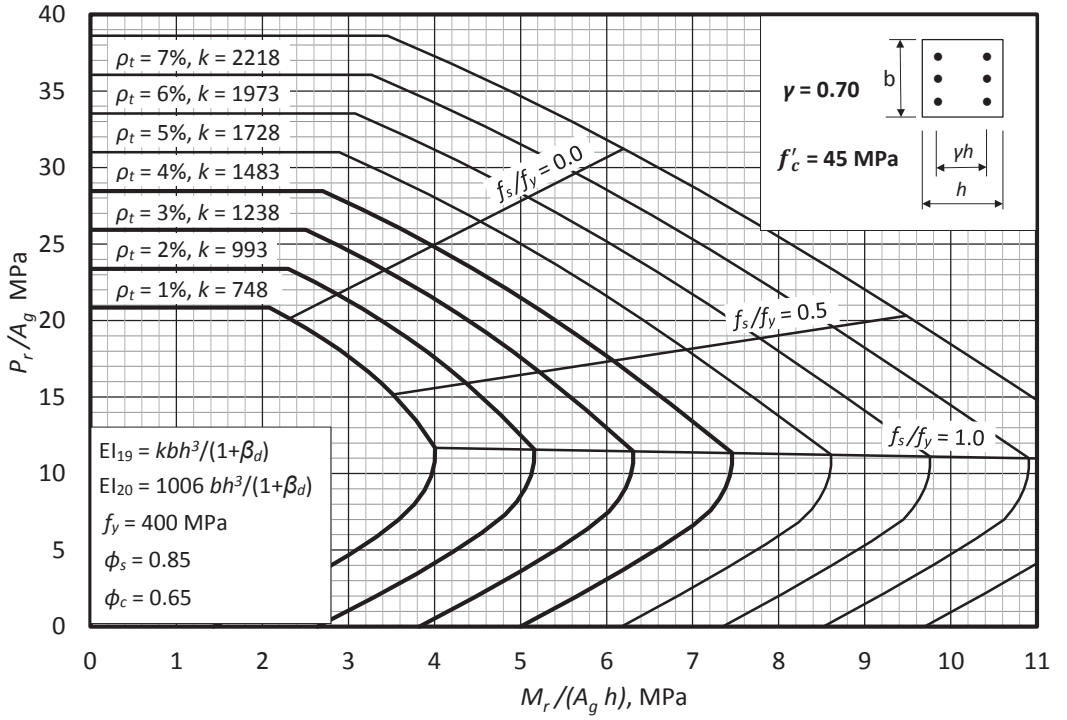


Table 7.11.20 Rectangular Columns with Bars on End Faces Only

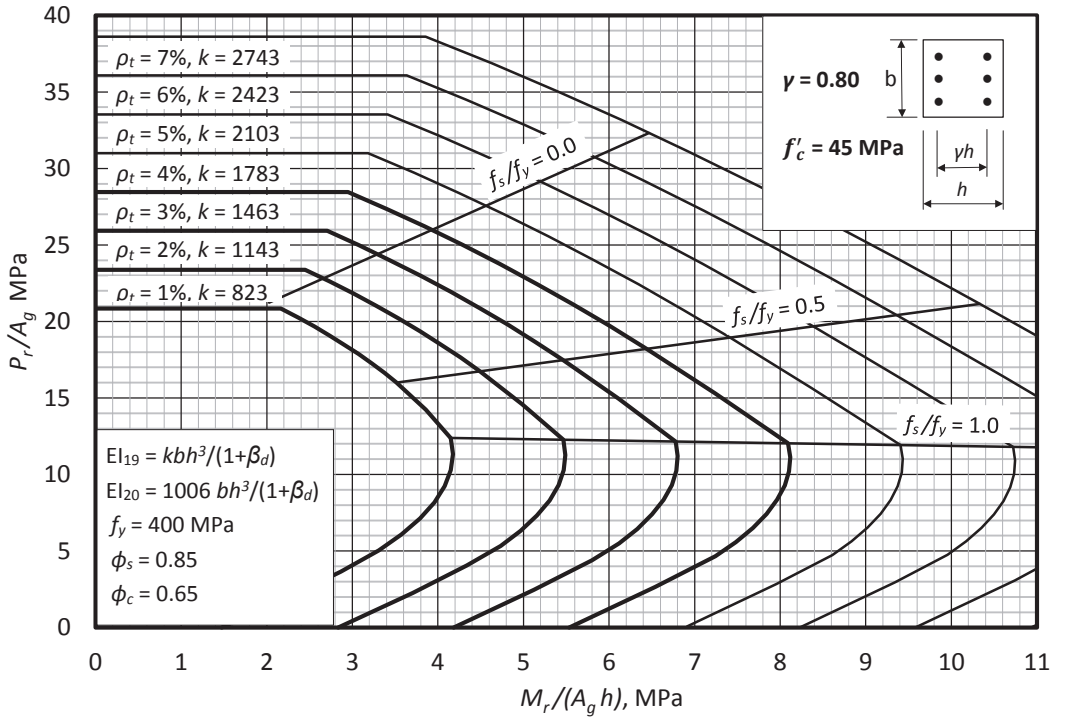


Table 7.12.1 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

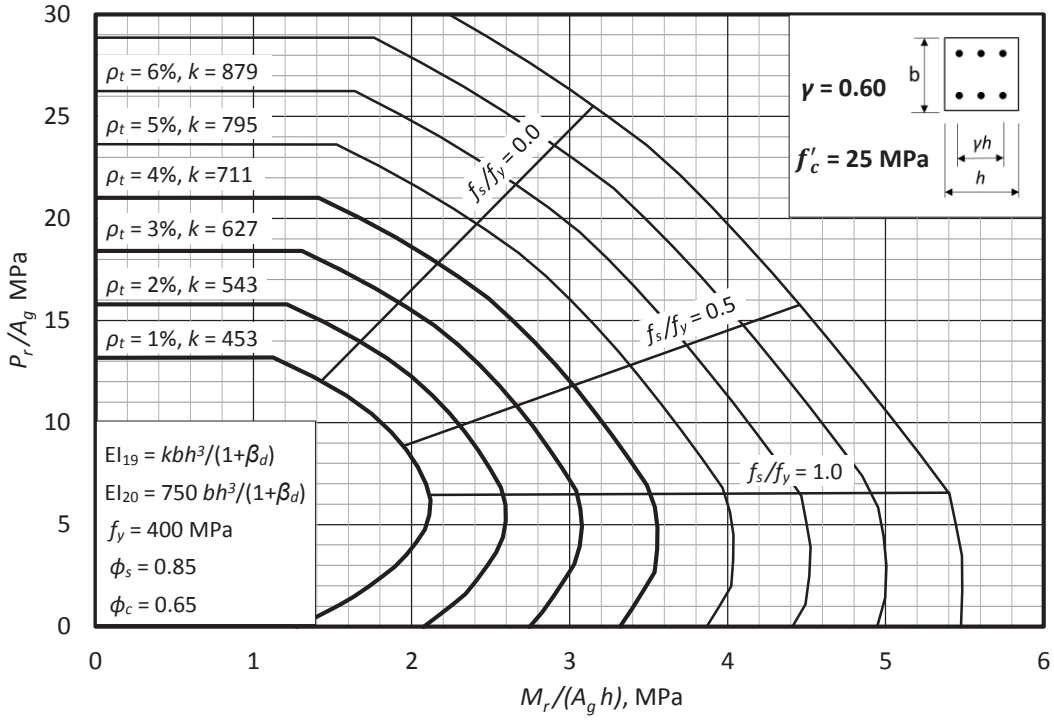


Table 7.12.2 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

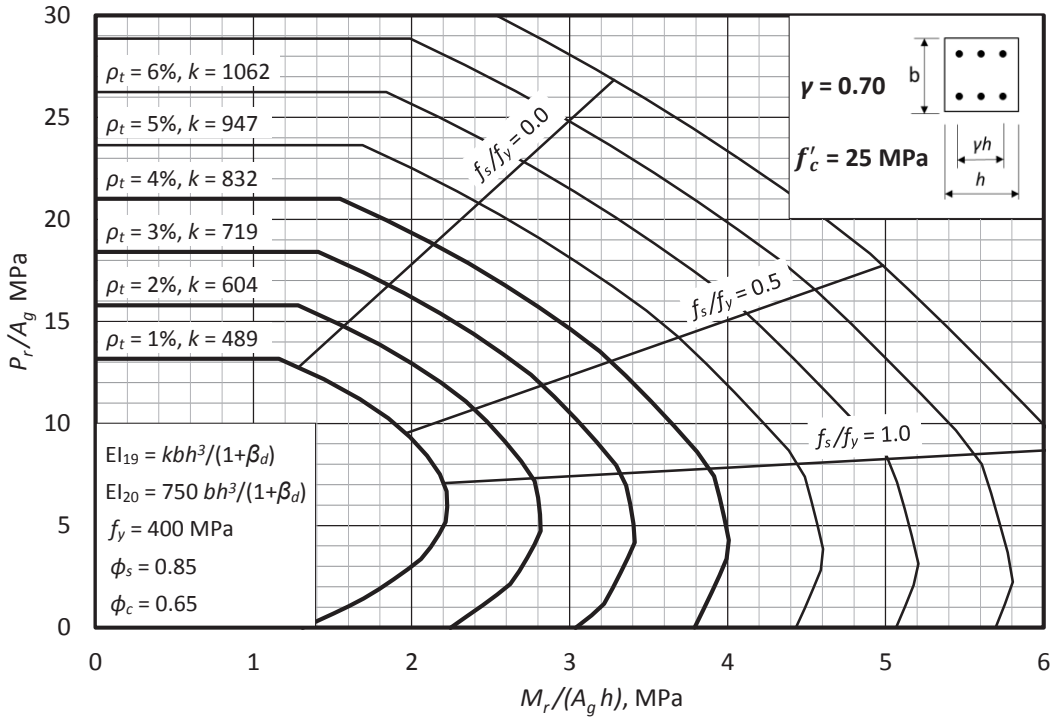


Table 7.12.3 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

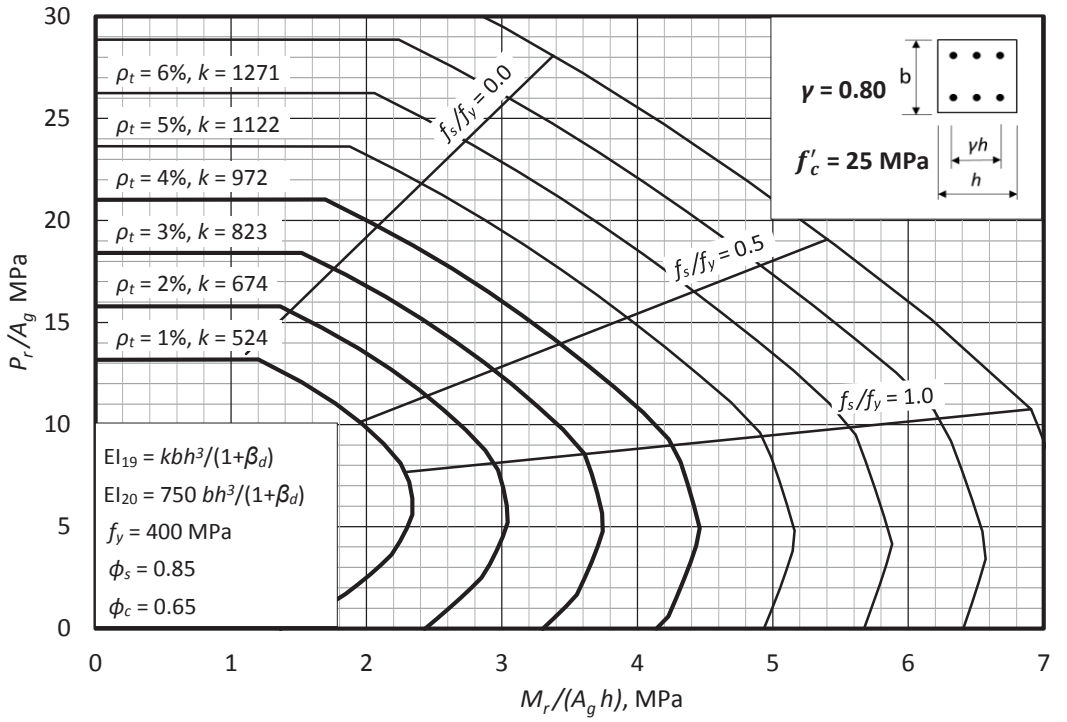


Table 7.12.4 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

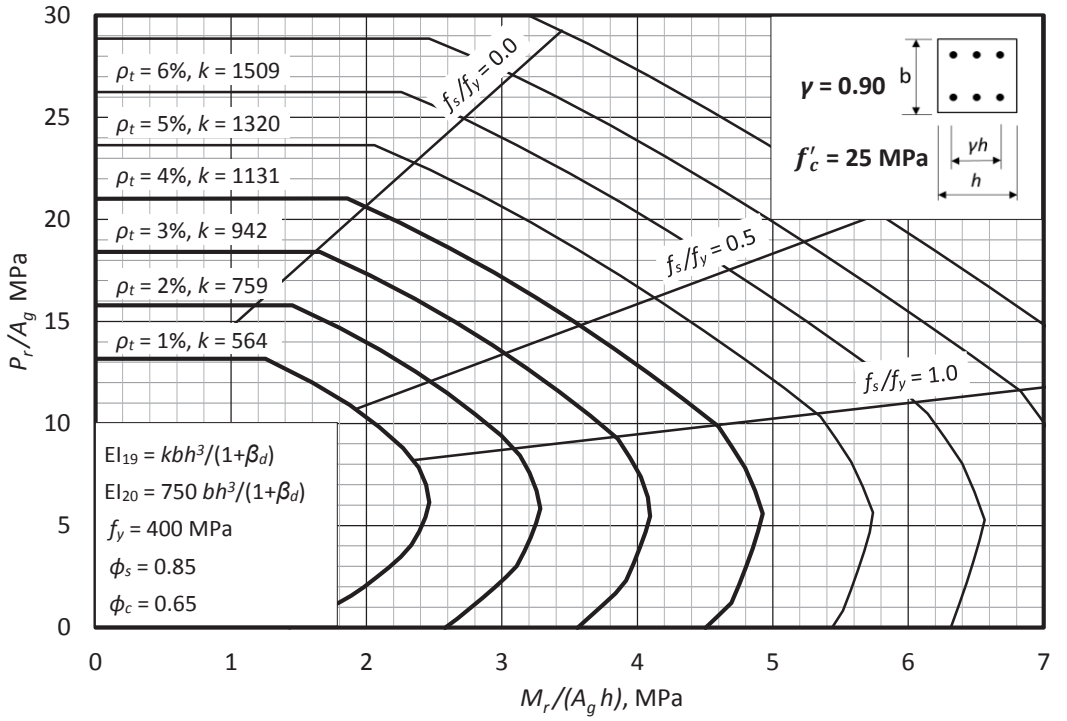


Table 7.12.5 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

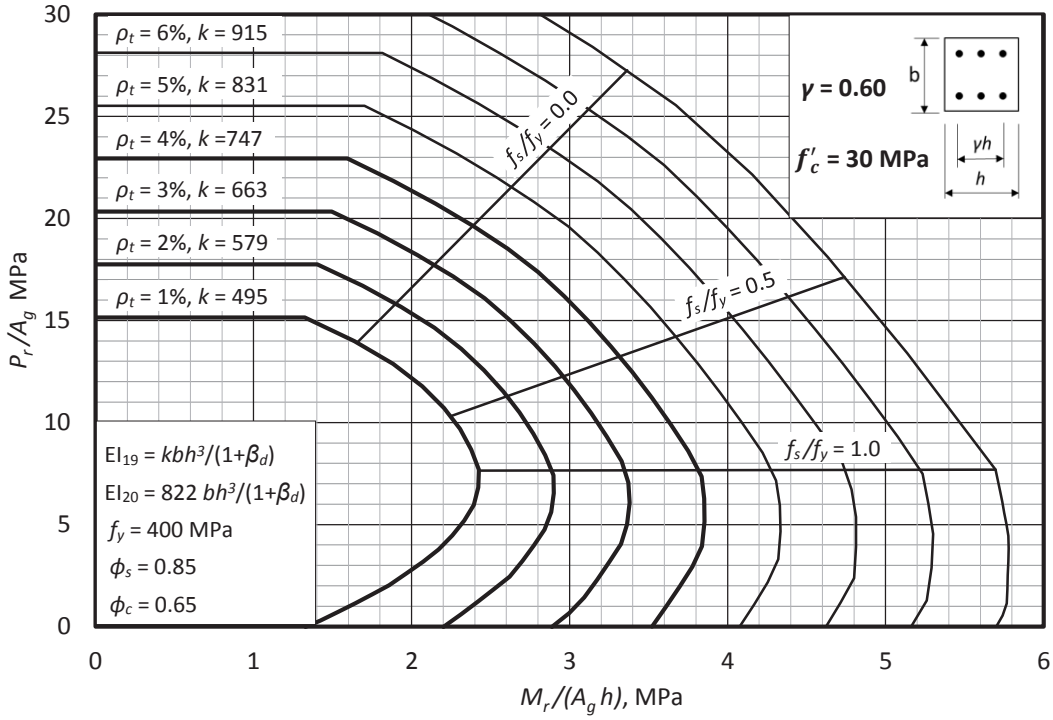
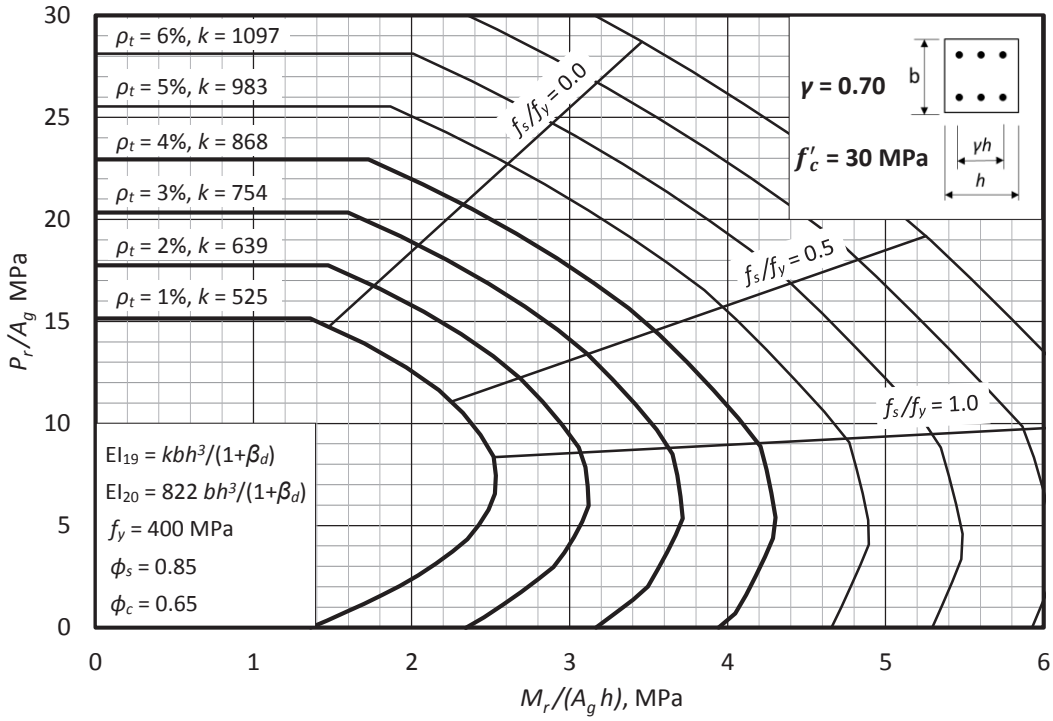


Table 7.12.6 Rectangular Columns with Equal Numbers of Bars in Side Faces Only



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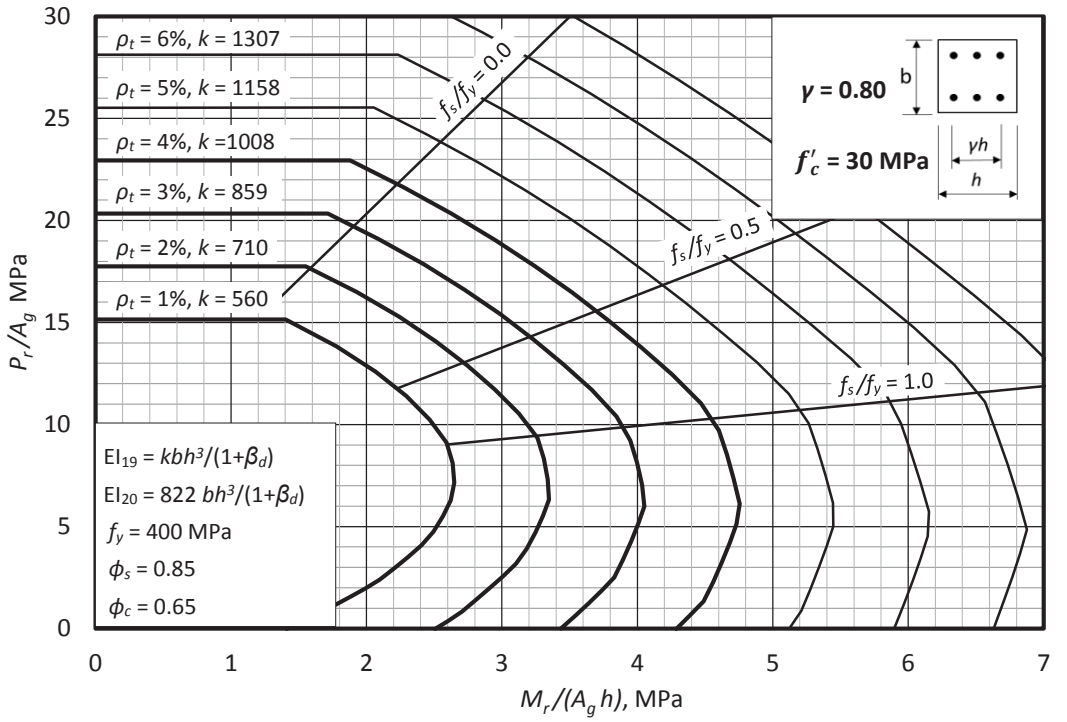


Table 7.12.8 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

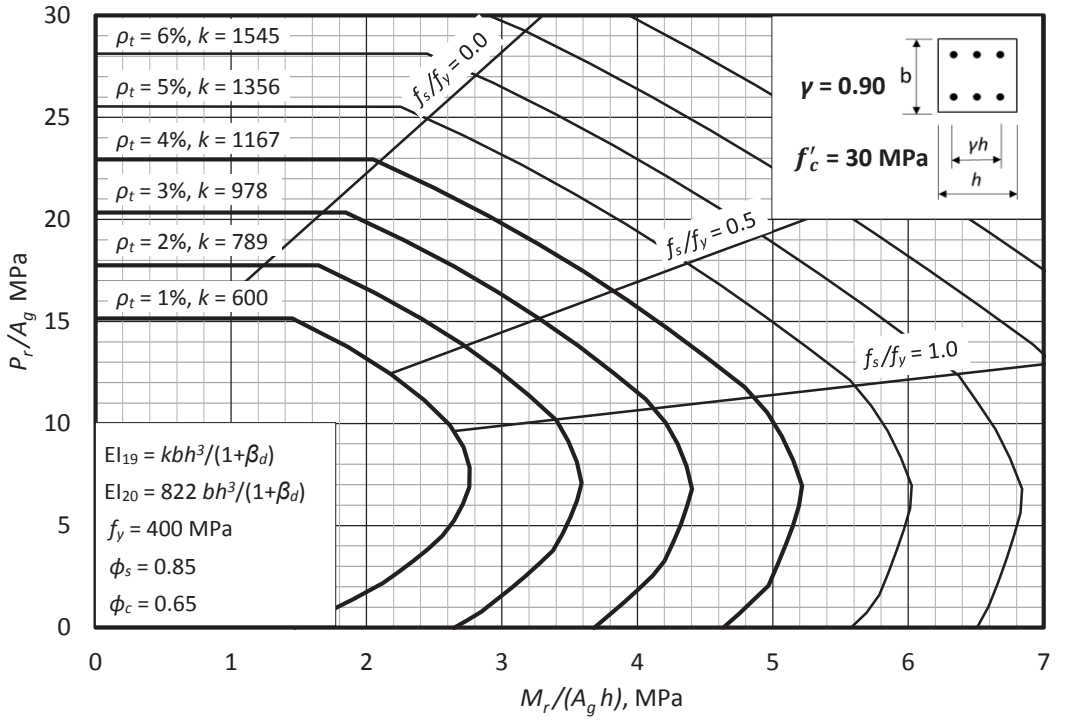


Table 7.12.9 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

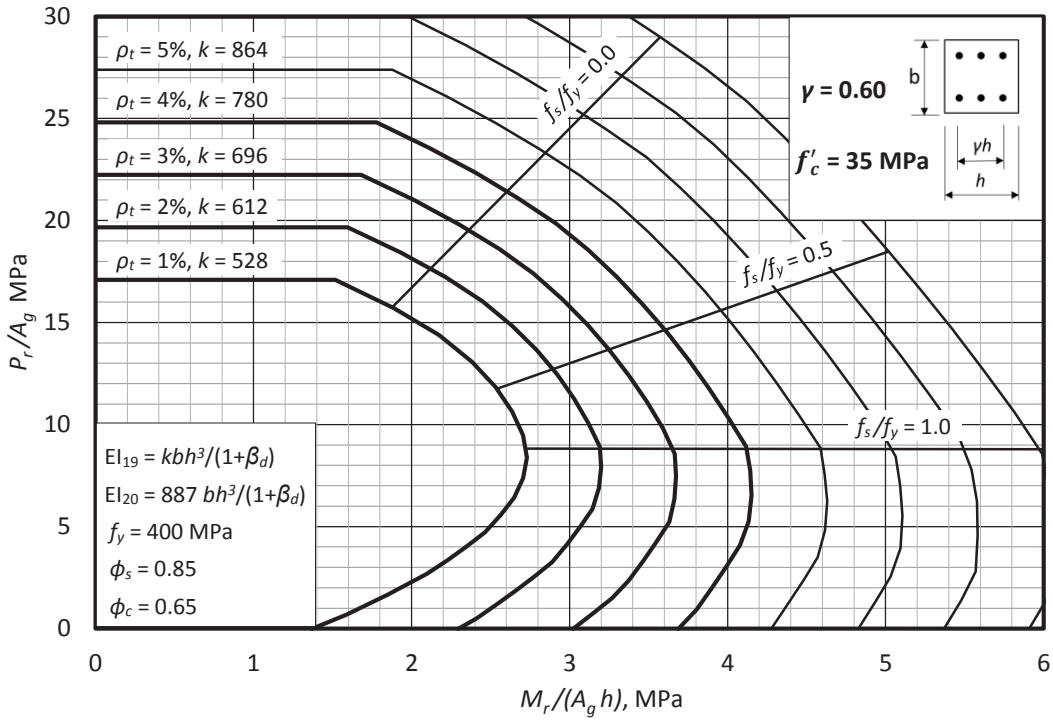
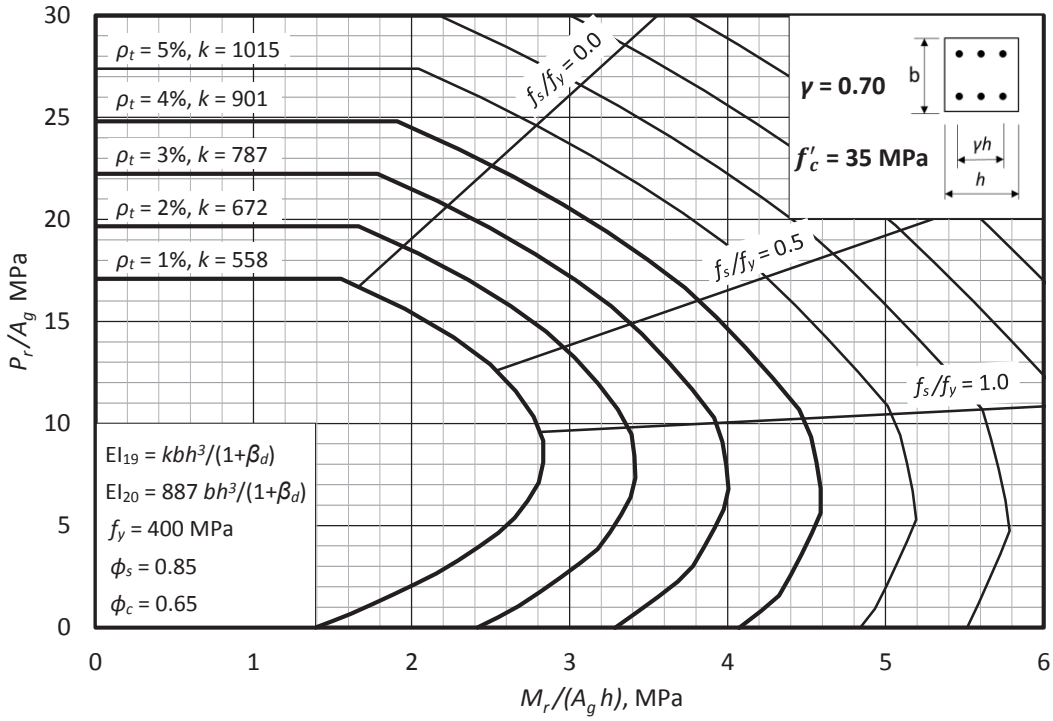


Table 7.12.10 Rectangular Columns with Equal Numbers of Bars in Side Faces Only



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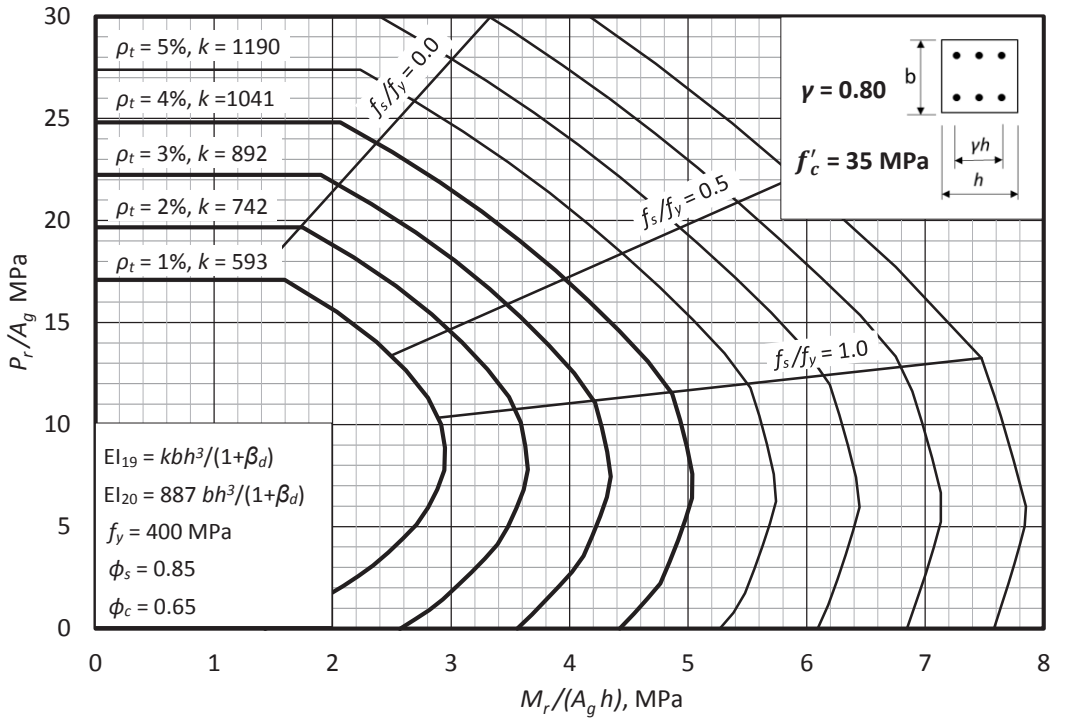


Table 7.12.12 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

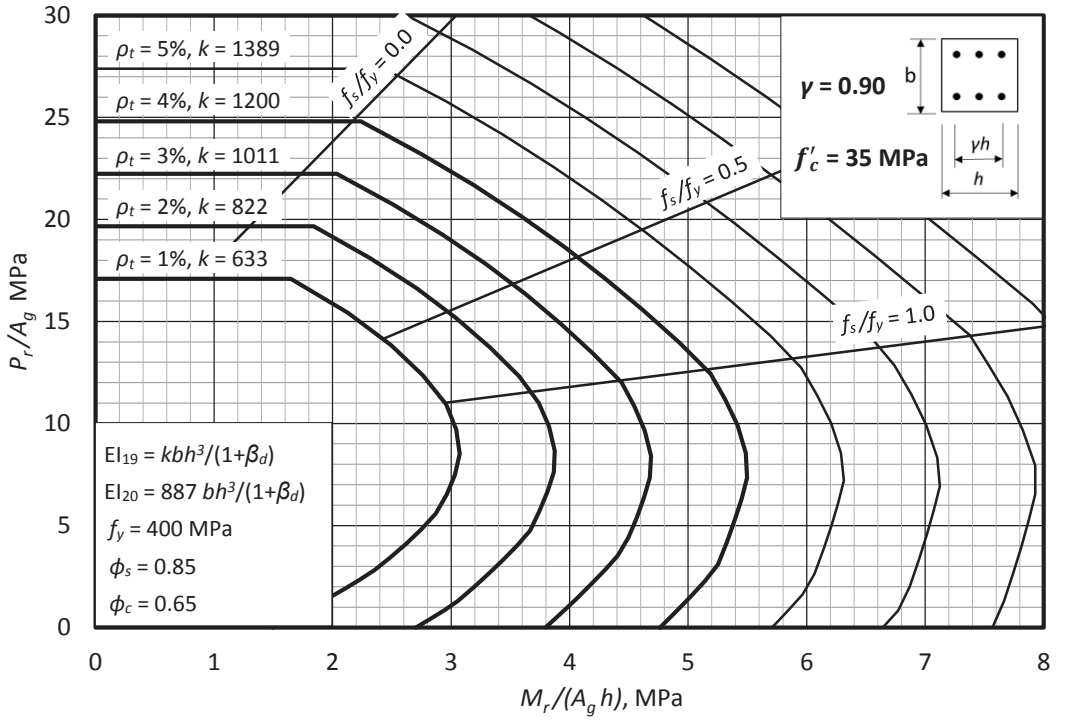


Table 7.12.13 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

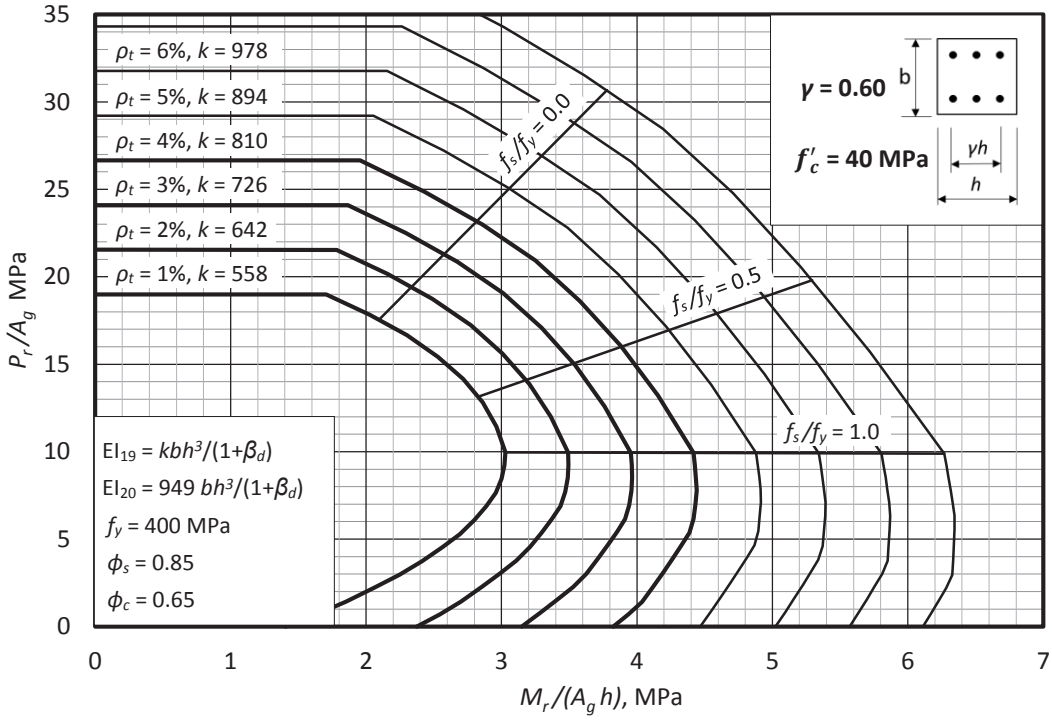


Table 7.12.14 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

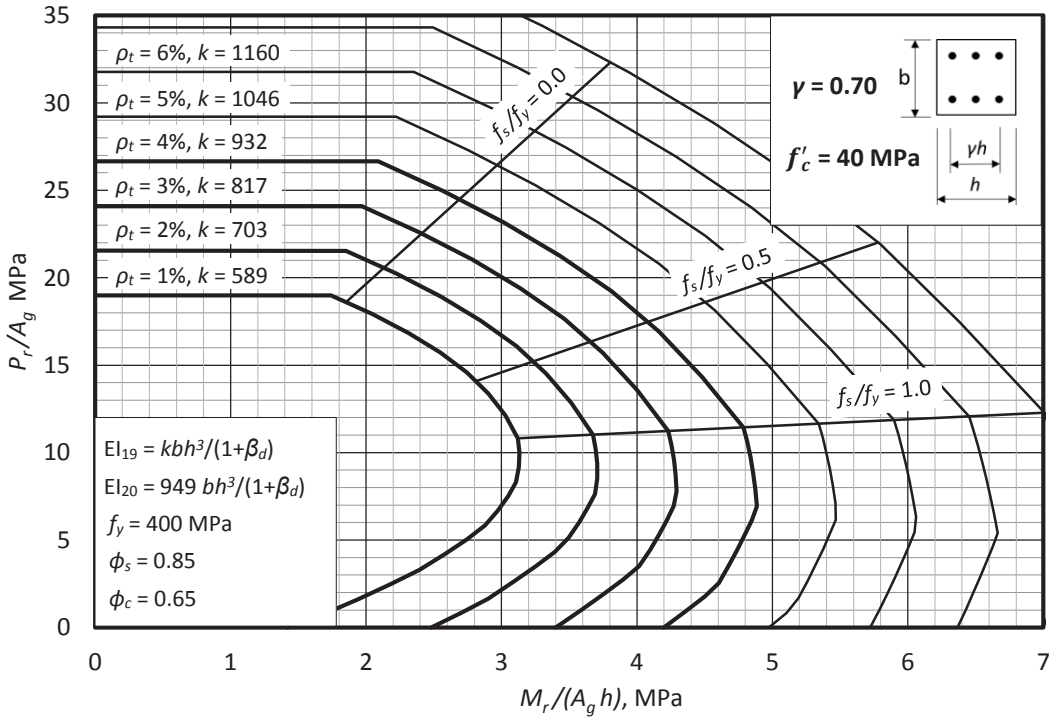


Table 7.12.15 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

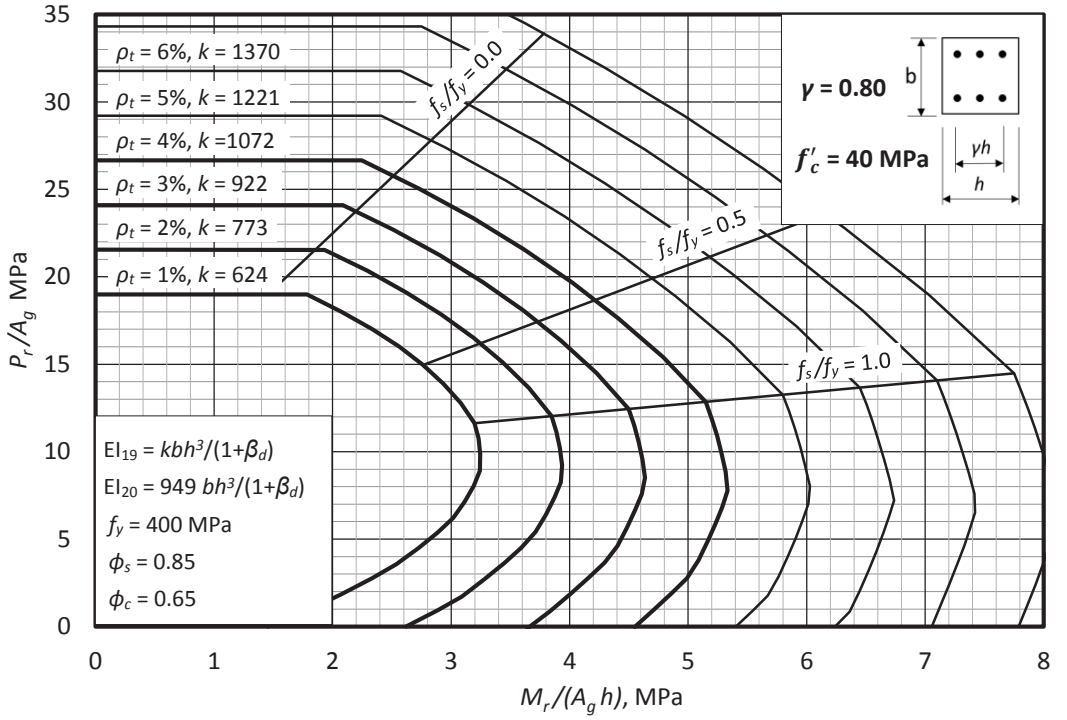


Table 7.12.16 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

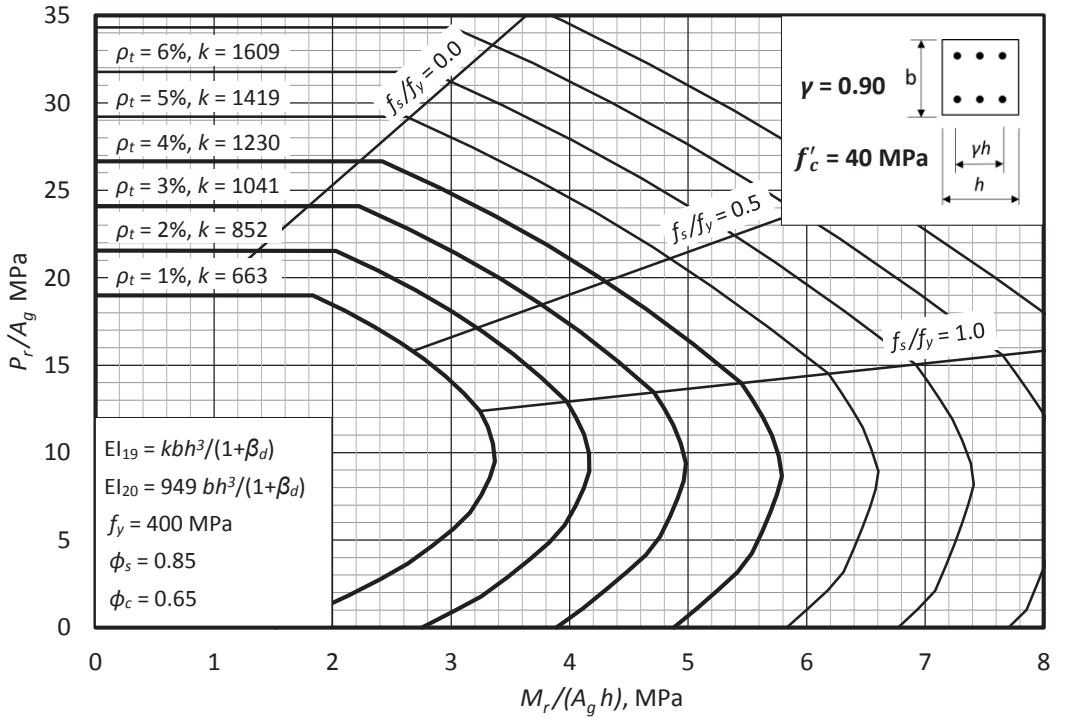


Table 7.12.17 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

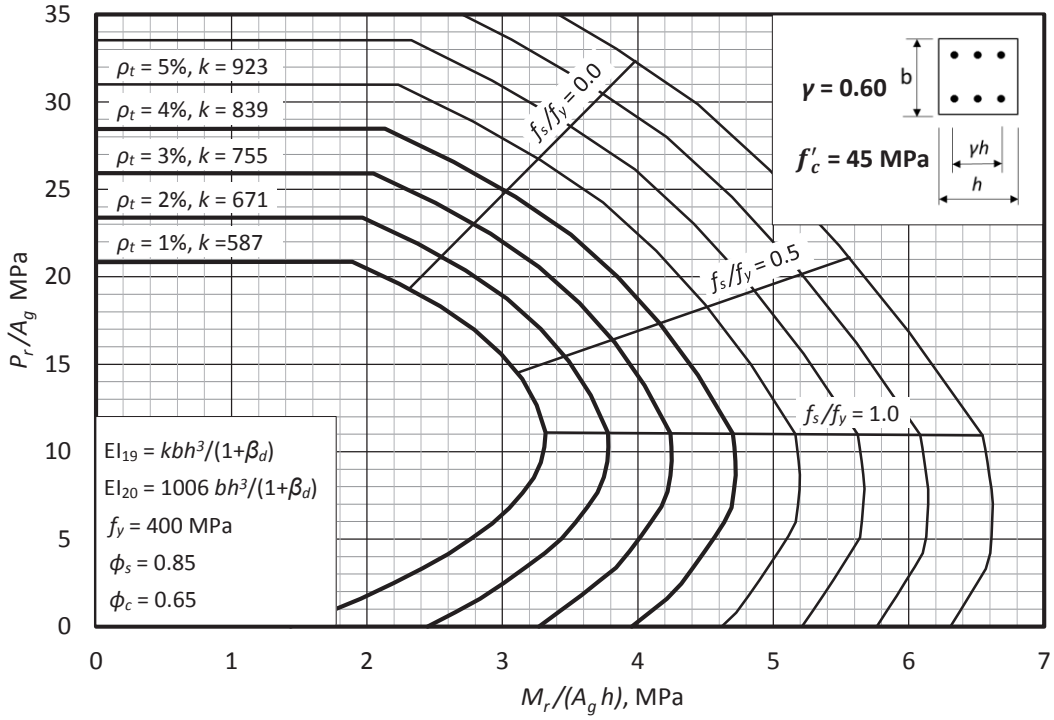


Table 7.12.18 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

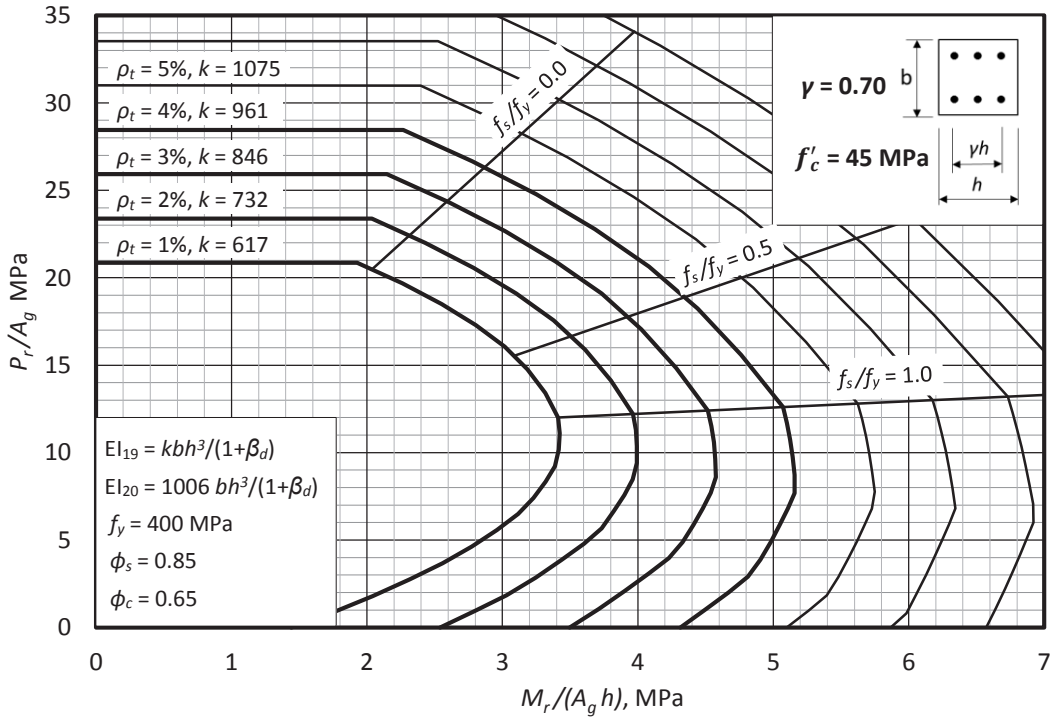


Table 7.12.19 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

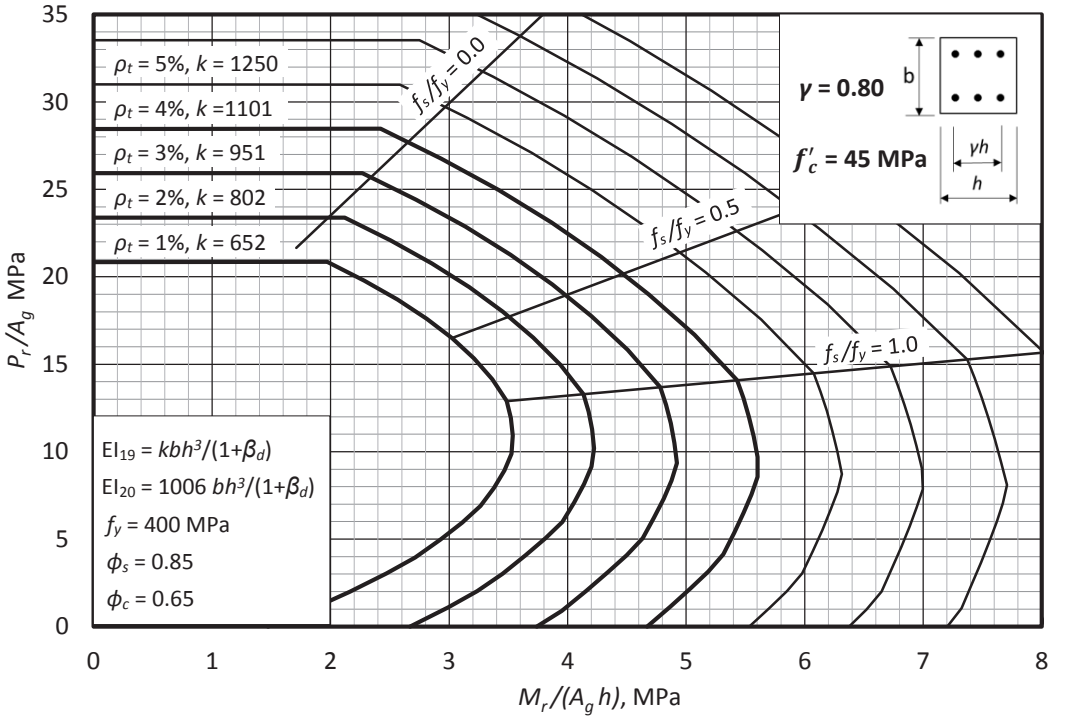


Table 7.12.20 Rectangular Columns with Equal Numbers of Bars in Side Faces Only

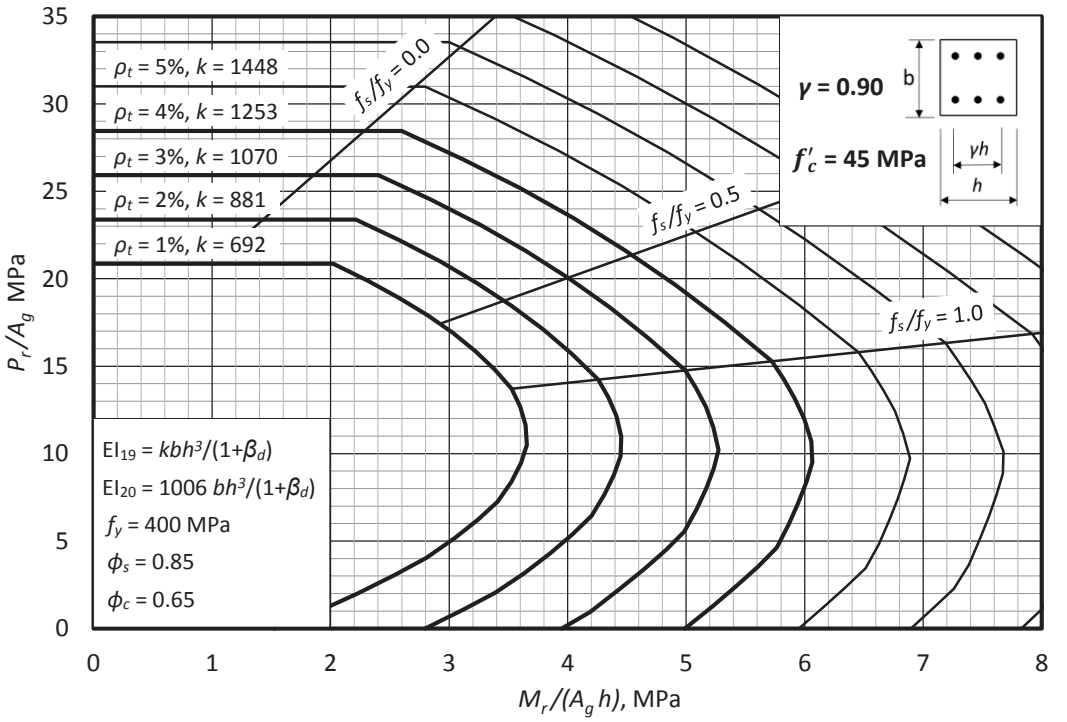


Table 7.13.1 Circular Tied or Spiral Columns

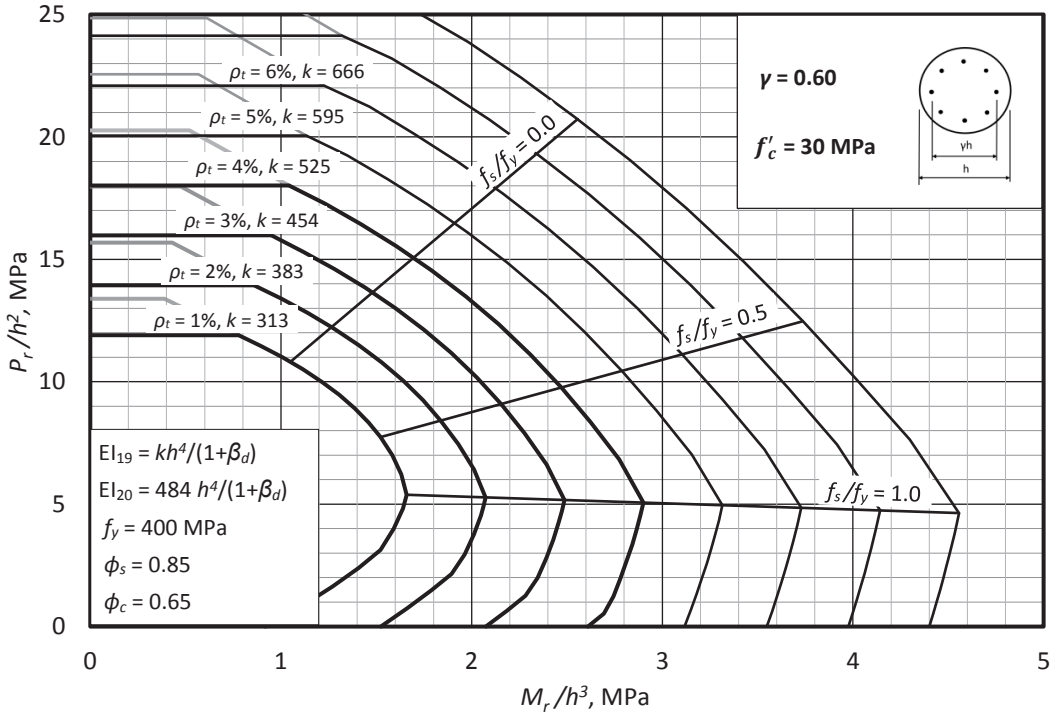


Table 7.13.2 Circular Tied or Spiral Columns

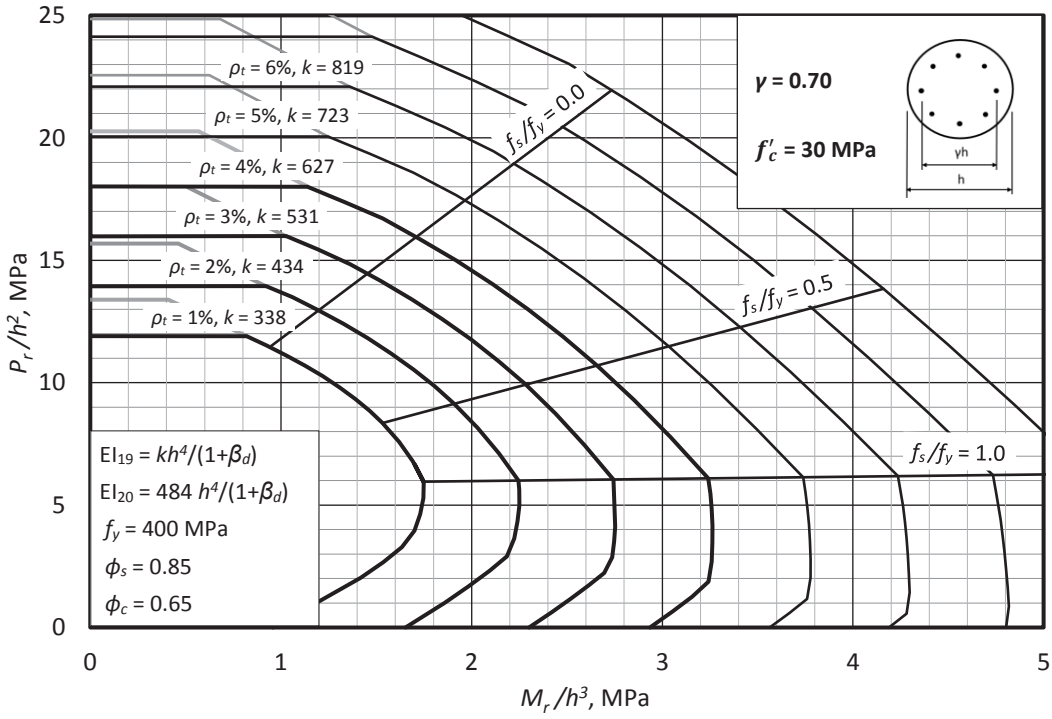
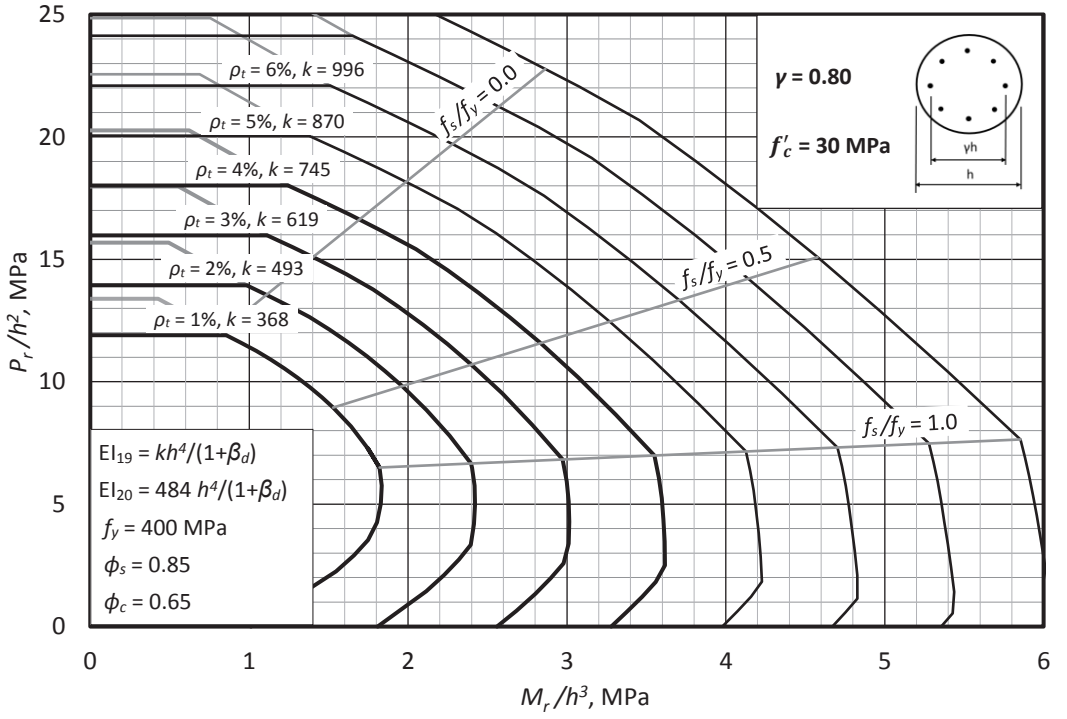


Table 7.13.3 Circular Tied or Spiral Columns



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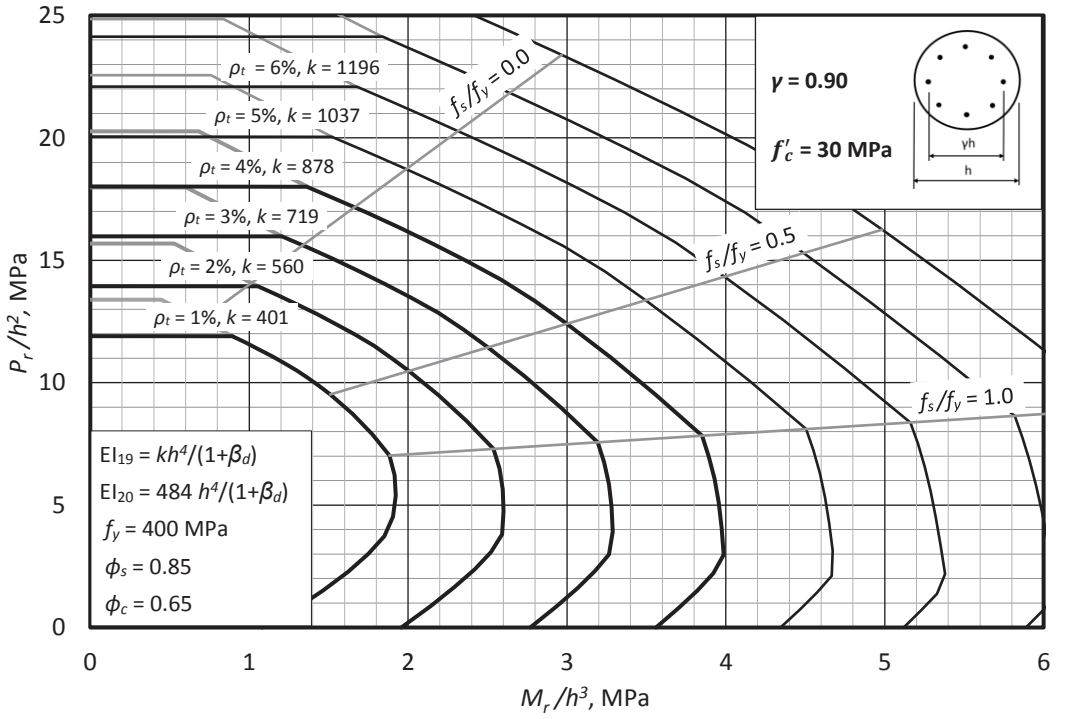


Table 7.13.5 Circular Tied or Spiral Columns

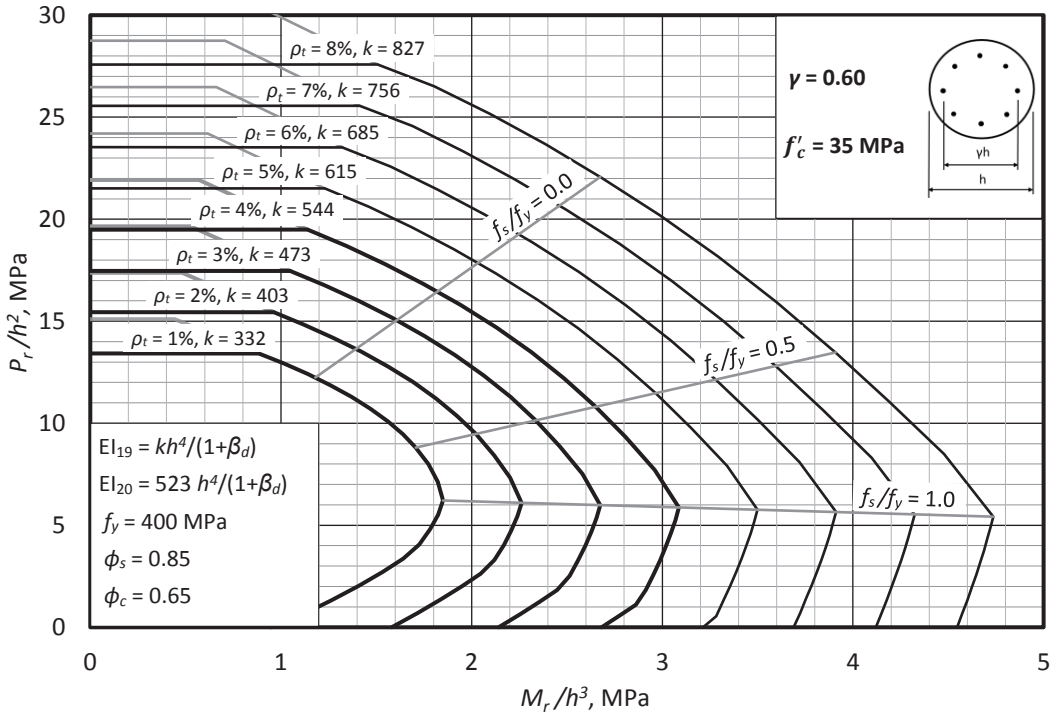


Table 7.13.6 Circular Tied or Spiral Columns

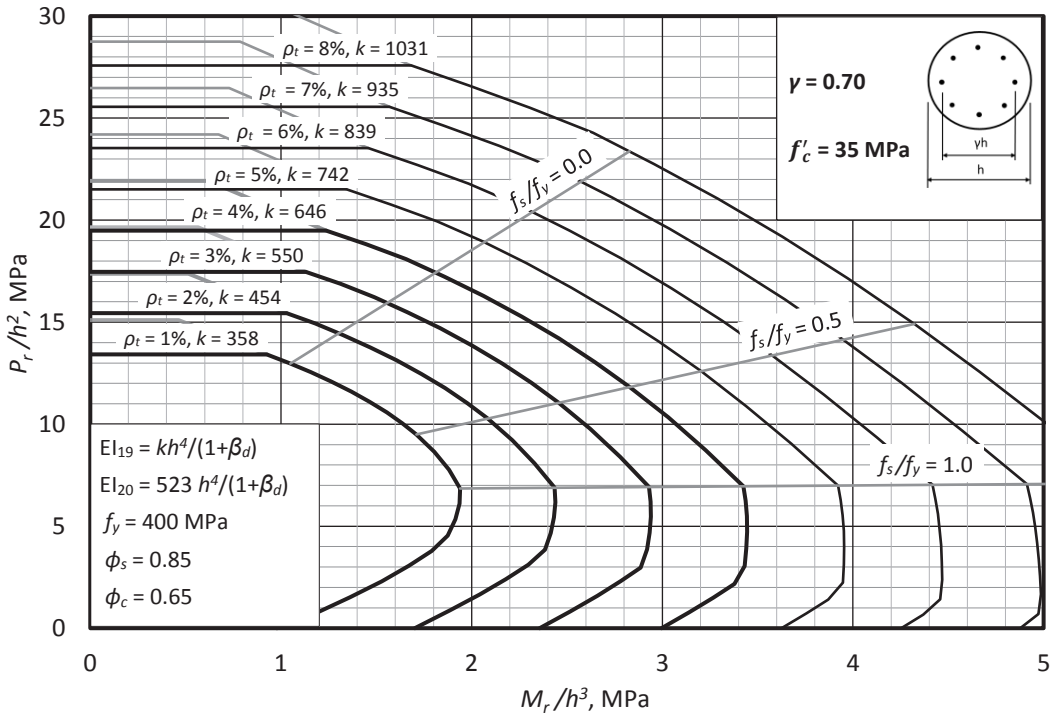


Table 7.13.7 Circular Tied or Spiral Columns

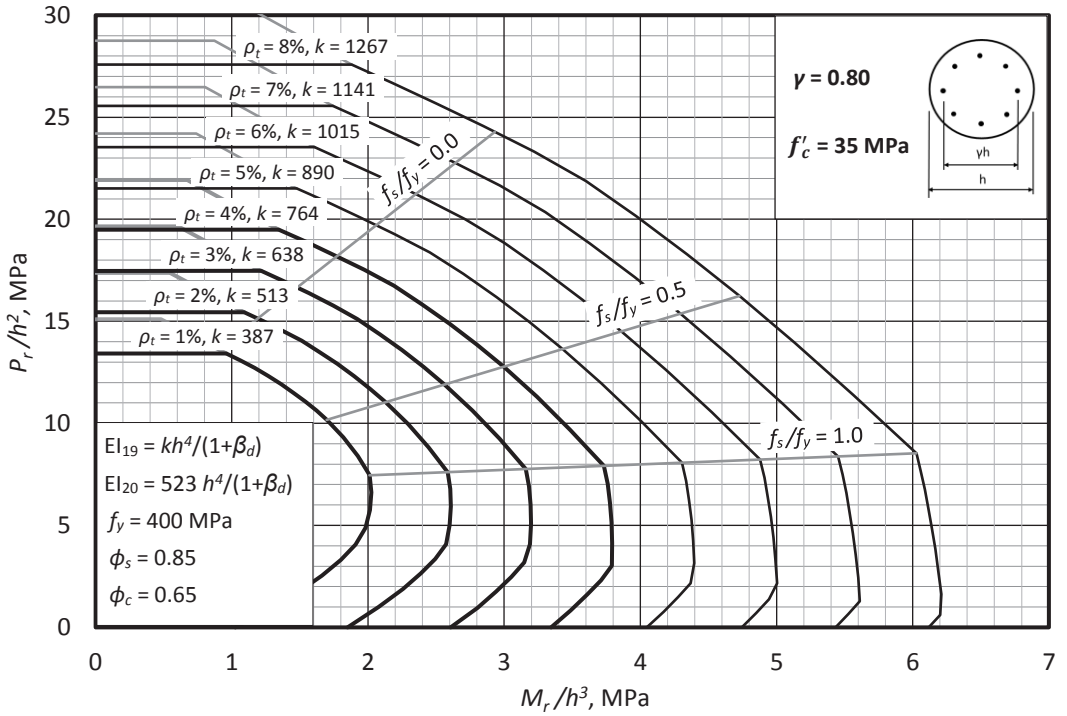


Table 7.13.8 Circular Tied or Spiral Columns

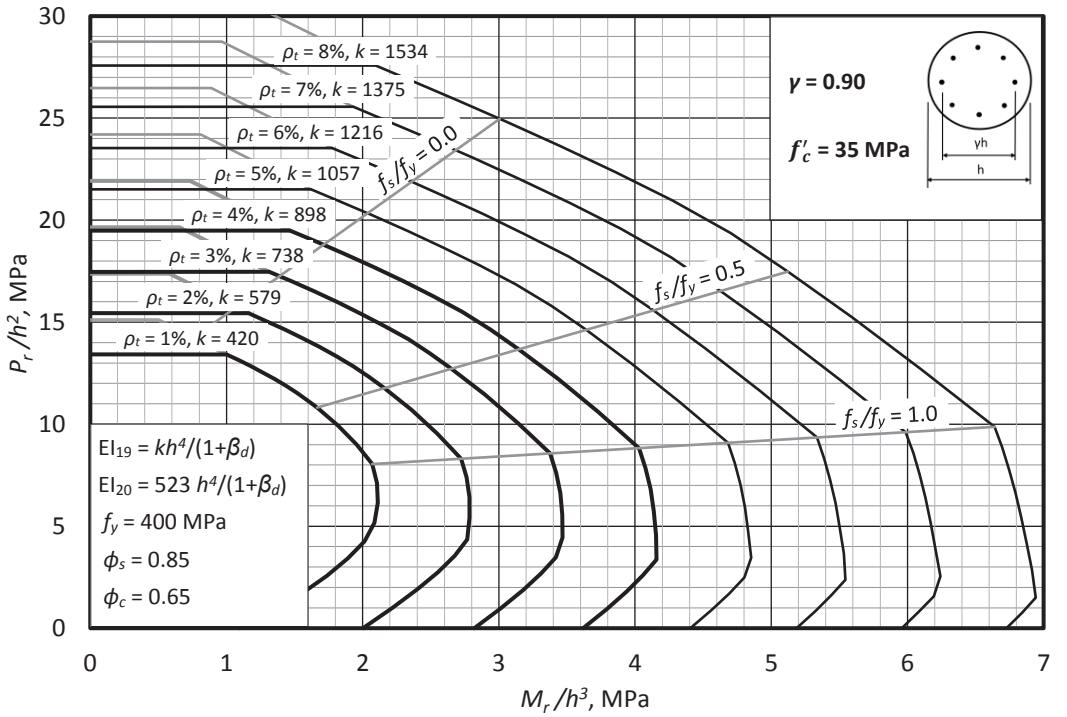


Table 7.13.9 Circular Tied or Spiral Columns

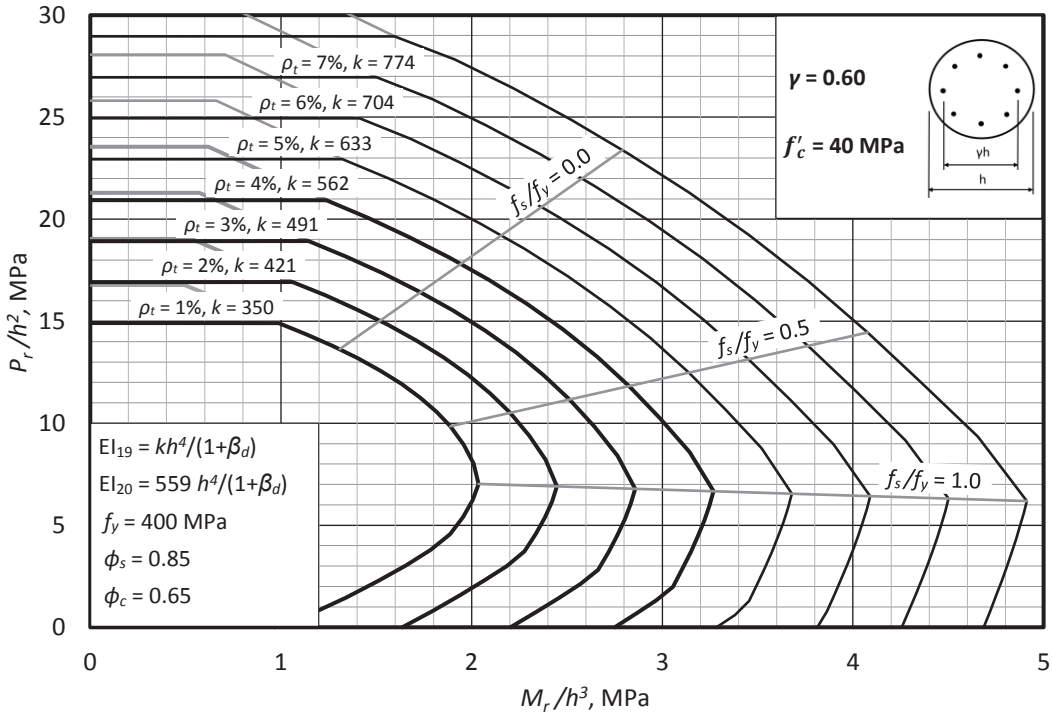


Table 7.13.10 Circular Tied or Spiral Columns

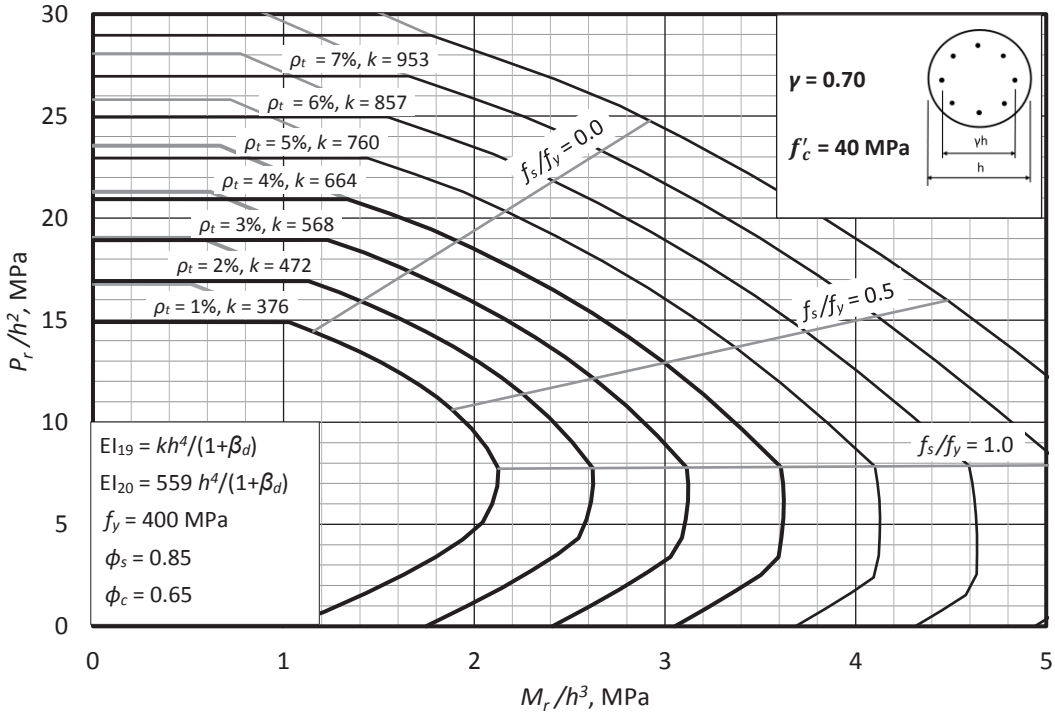


Table 7.13.11 Circular Tied or Spiral Columns

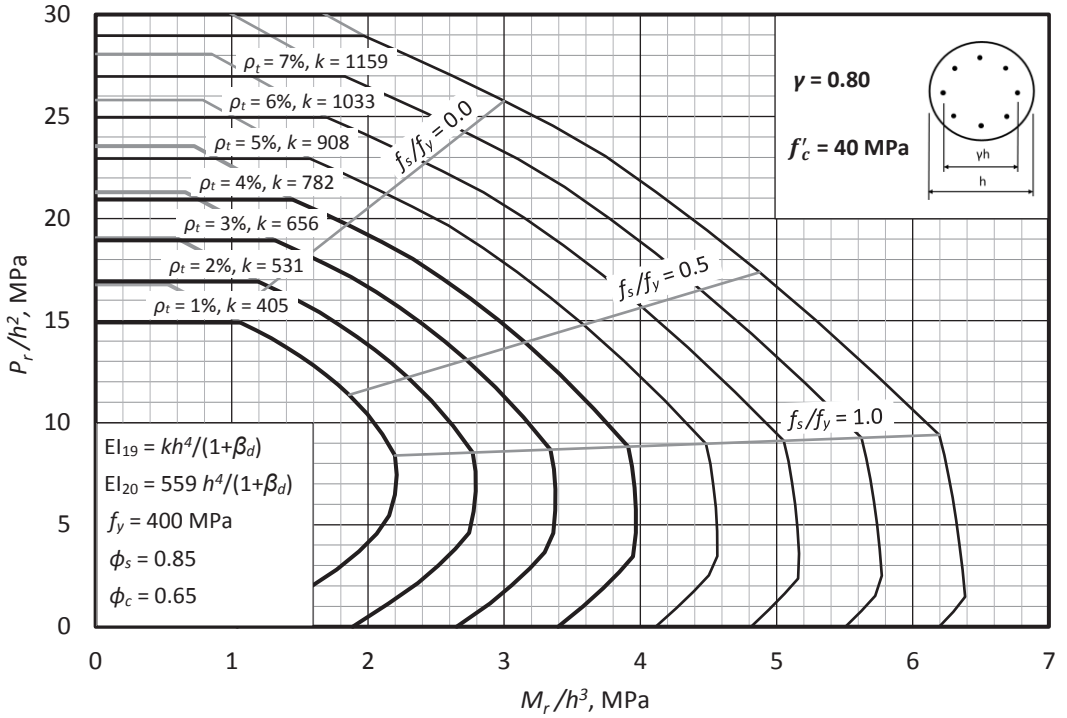


Table 7.13.12 Circular Tied or Spiral Columns

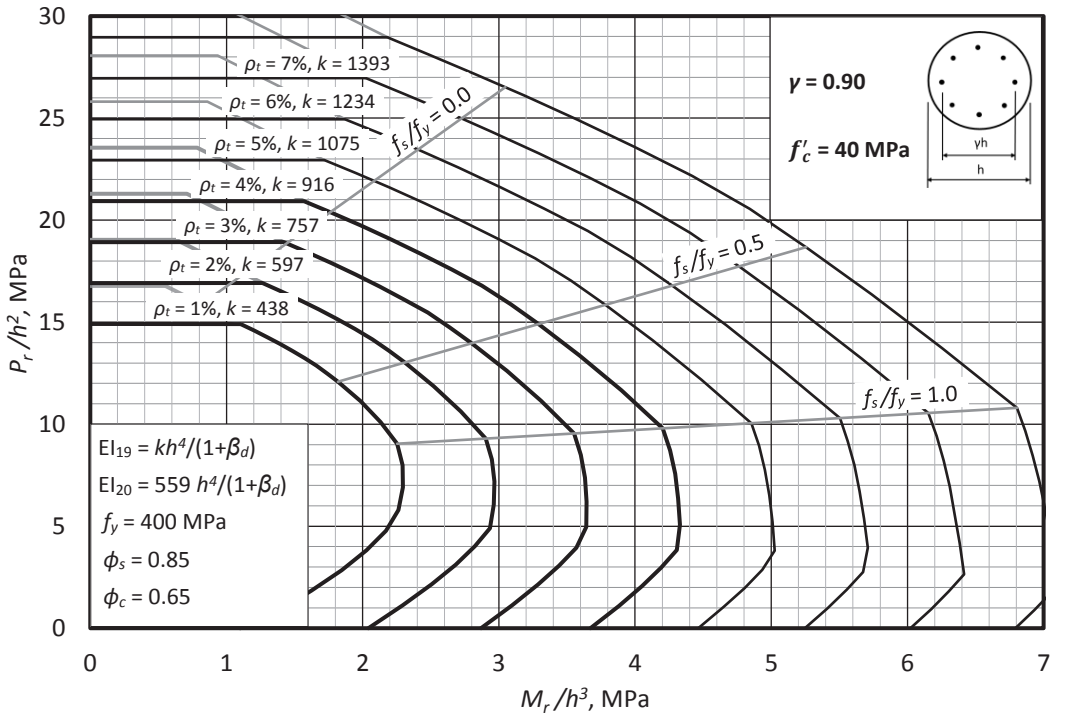


Table 7.13.13 Circular Tied or Spiral Columns

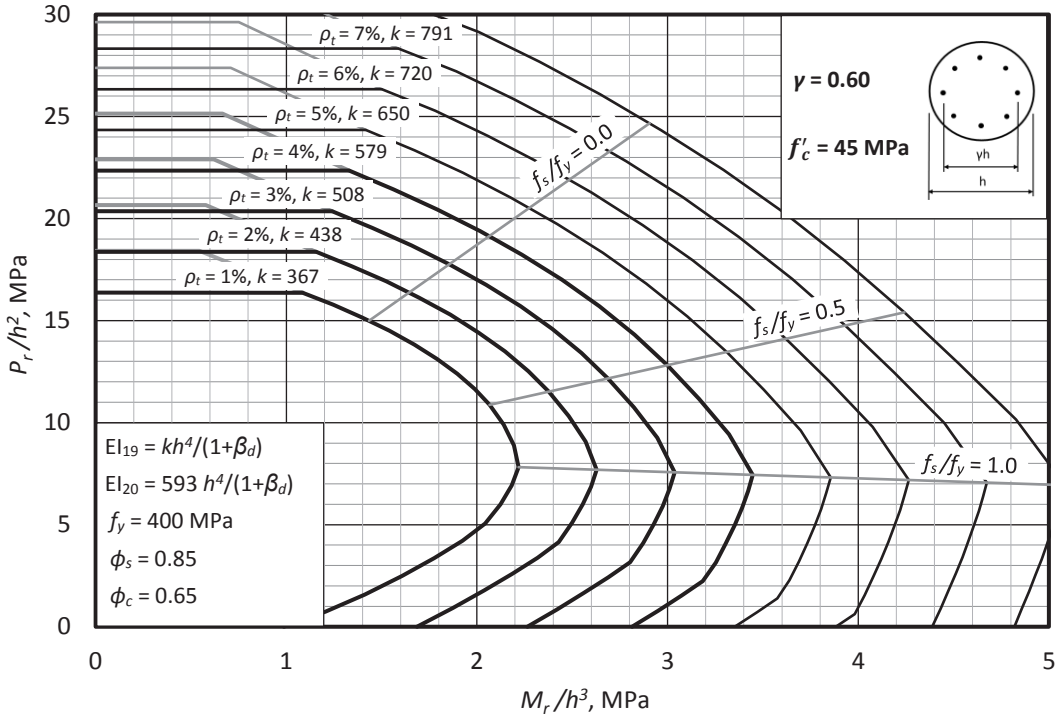


Table 7.13.14 Circular Tied or Spiral Columns

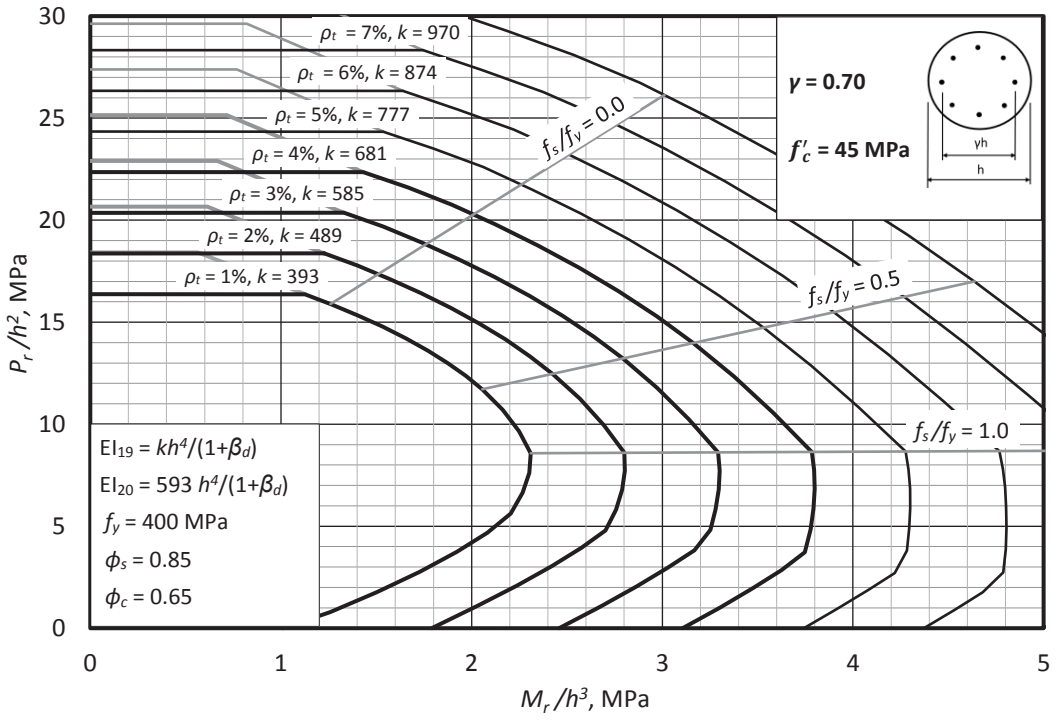


Table 7.13.15 Circular Tied or Spiral Columns

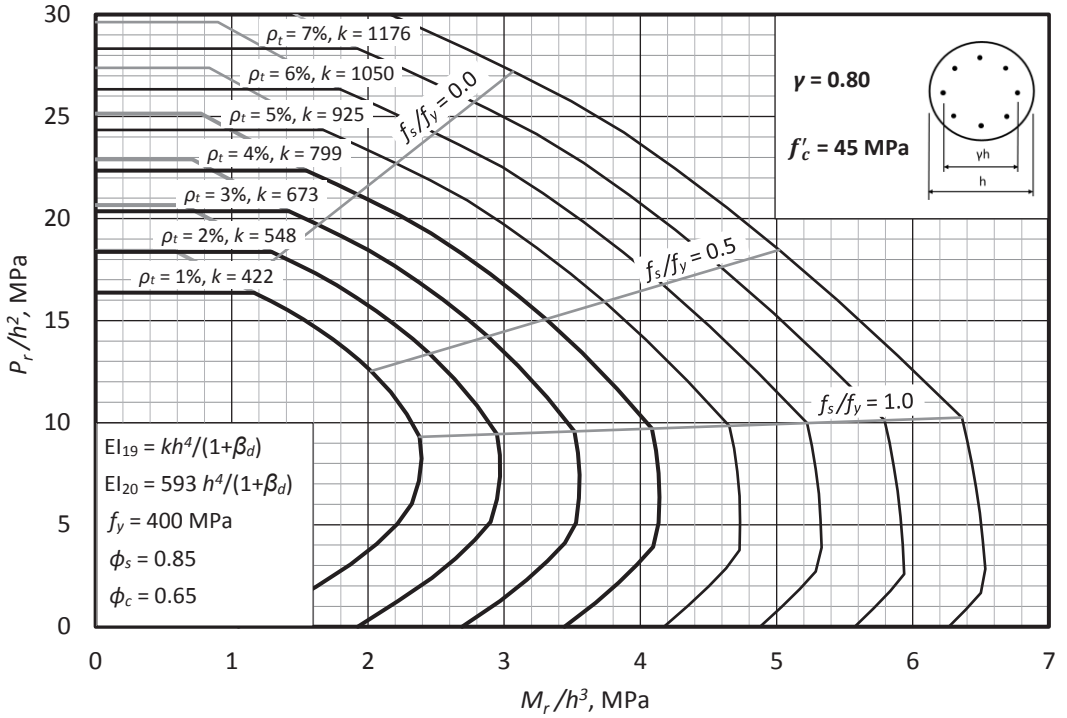
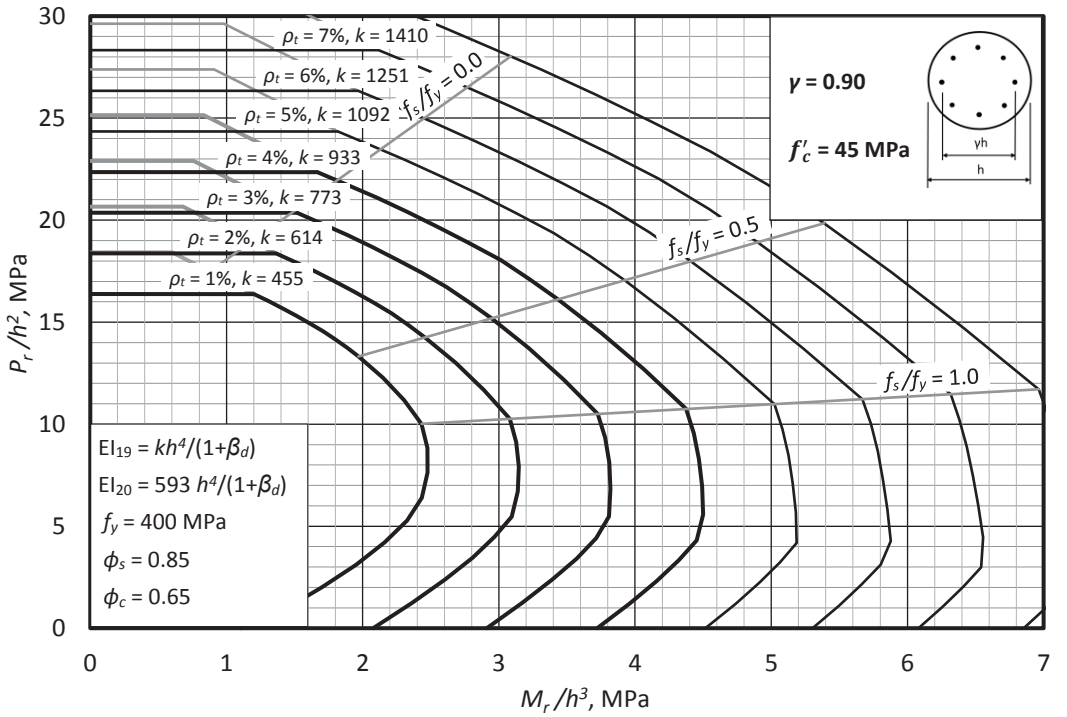


Table 7.13.16 Circular Tied or Spiral Columns



Notes for tension Tables 12.5(A), (B) and (C)

NP – Not practical. Resulting edge distance, c_{a1}, yields less than 20 mm cover.

1 Design strengths in table are for single cast-in anchors near one edge only. The values do not apply where the distance between adjacent anchors is less than $3h_{ef}$, or where the perpendicular distance, c_{a2}, to the edge distance being considered, c_{a1}, is less than $1.5h_{ef}$.

2 In seismic regions where ($I_e F_a S_a$ (0.2) ≥ 0.35) and where the requirements of clause D.4.3.5.2 are met, the design strengths in the table must be reduced by 25% in accordance with D.4.3.5.4. Designs in accordance with D.4.3.5.3 (a) involve the consideration of nominal concrete breakout strengths and probable steel anchor strengths, neither of which are reflected in Tables 12.5 (A), (B) or (C) and must be calculated separately.

3 For design purposes the tensile strength of the anchor steel, f_{uta}, must not exceed $1.9f_{ya}$ or 860 MPa.

4 Design strengths in the table are based on resistance modification factor "*R*", of Section D.5.3. Factored tensile load N_f must be computed from the load combinations referenced in Clause 8.3.2. Design strengths for concrete breakout, N_{br}, pullout, N_{pr}, and sideface blowout, N_{sbr}, are based on Condition B. Where supplementary reinforcement is provided to satisfy Condition A, design strengths for N_{br} and N_{sbr} may be increased by the ratio of $R_{(condition\ A)} / R_{(condition\ B)}$. This increase does not apply to pullout strength, N_{pr}.

5 Design strengths for concrete breakout in tension, N_{br}, are based on N_{br} determined in accordance with Eq. (D-6) and apply to headed and hooked anchors. To determine the design strength of headed bolts with embedment depth, h_{ef}, greater than 275 mm in accordance with Eq. (D-7), multiply the table value by $3.9(h_{ef}^{5/3})/[10(h_{ef}^{1.5})]$.

6 Where analysis indicates that there will be no cracking at service load levels ($f_t < f_r$) in the region of the anchor, the design strengths for concrete breakout in tension, N_{br}, may be increased 25%.

7 The design strengths for pullout in tension, N_{pr}, for headed bolts with diameter, d_a, less than 45 mm are based on bolts with regular hex heads. The design strengths for 45 mm and 50 mm bolts are based on heavy hex heads. For bolts with d_a less that 45 mm having heads with a larger bearing area, A_{brg}, than assumed, the design strengths may be increased by multiplying by the bearing area of the larger head and dividing by the bearing area of the regular hex head.

8 The design strengths for pullout in tension, N_{pr}, for hooked bolts with hook-length, e_h, between 3 and 4.5 times diameter, d_a, may be determined by interpolation.

9 Where analysis indicates there will be no cracking at service load levels ($f_t < f_r$) in the region of the anchor, the design strengths for pullout in tension, N_{pr}, may be increased 40%.

10 The design strengths for side-face blowout in tension, N_{sbr}, are applicable to headed bolts only and where edge distance, c_{a1}, is less than $0.4h_{ef}$. The values for $0.4h_{ef}$ are shown for interpolation purposes only. The design strengths for bolts with diameter, d_a, less than 45 mm are based on bolts with regular hex heads. The design strengths for 45 mm and 50 mm bolts are based on bolts with heavy hex heads. For bolts with d_a less than 45 mm having heads with a larger bearing area, A_{brg}, than assumed, the design strengths may be increased by multiplying by the square root of the quotient resulting from dividing the bearing area of the larger head by the bearing area of the regular hex head ($\sqrt{A_{brg(larger)} / A_{brg(smaller)}}$).

Notes for shear Tables 12.6(A), (B) and (C)

NP – Not practical. Resulting edge distance, c_{a1}, yields less than 20 mm cover.

1 Design strengths in table are for single cast-in anchors near one edge only. The values do not apply where the distance to an edge measured perpendicular to c_{a1} is less than $1.5c_{a1}$. See Note 9.

The values do not apply where the distance between adjacent anchors is less than $3c_{a1}$, where c_{a1} is the distance from the center of the anchor to the edge in the direction of shear application.

2 Unlike the case for tension, in seismic regions where ($I_e F_a S_a(0.2) \geq 0.35$), the shear design strengths in the table need not be reduced by *25% for shear breakout capacity*.

3 Concrete pryout strength, V_{cpr}, is to be taken equal to the tension breakout strength, N_{cbr}, where h_{ef} is less than 65 mm, and $2N_{cbr}$, where h_{ef} is equal to or greater than 65 mm. Condition B (see D.5.3) must be assumed even where supplementary reinforcement qualifying for Condition A is present.

4 For design purposes the tensile strength of the anchor steel, f_{uta}, must not exceed $1.9f_{ya}$ or 860 MPa.

5 Design strengths in table 12.6 are based on resistance modification factor of Section D.5.3. Factored shear load V_f must be computed from the load combinations referenced in Clause 8.3.2. Design strengths for concrete breakout, V_{cbr}, are based on Condition B. Where supplementary reinforcement is provided to satisfy Condition A, this design strength may be increased by the ratio of $R_{(condition\ A)} / R_{(condition\ B)}$. This does not apply to pryout capacities, for which condition "B" is always assumed.

6 Where analysis indicates that there will be no cracking at service load levels ($f_t < f_r$) in the region of the anchor, the design strengths for concrete breakout in shear, V_{cbr}, may be increased 40%.

7 In regions of members where analysis indicates cracking at service level loads, the strengths in the table for concrete breakout, V_{cbr}, may be increased in accordance with the factors in D.7.2.7 if edge reinforcement is provided in accordance with that section.

8 The design strengths for concrete breakout, V_{br}, are based on the shear load being applied perpendicular to the edge. If the load is applied parallel to the edge, the strengths may be increased 100%.

9 Where the anchor is located near a corner with an edge distance perpendicular to direction of shear, c_{a2}, less than $1.5c_{a1}$, design strengths for concrete breakout, V_{br}, shall be reduced by multiplying by modification factor, $\psi_{ed,V}$, determined from Eq. (D.41). The calculated values in the table do not apply where two edge distances perpendicular to direction of shear, c_{a2}, are less than $1.5c_{a1}$. See D.7.2.4.

10 This value of thickness, *h,* is not practical since the head or hook would project below the bottom surface of the concrete. It was chosen to facilitate mental calculation of the actual edge distance, c_{a1}, since the variable used in the calculation of c_{a1} is a function of embedment depth, h_{ef}.

11 Linear interpolation for intermediate values of edge distance, c_{a1} is permissible. Linear interpolation for intermediate values of embedment depth, h_{ef}, is unconservative.

12 For 20 mm cover and for $c_{a1} = 0.25h_{ef}$ and $0.50h_{ef}$, see portion of table for $h = h_{ef}$.

13 For 20 mm cover and for $c_{a1} = 0.25h_{ef}$ and $0.50h_{ef}$, see portion of table for $h = h_{ef}$. For $c_{a1} = h_{ef}$, see portion of table for $h = 1.5h_{ef}$.

Table 12.5(A)
Factored resistance for single cast-in anchors subject to tensile loads
(f_c' = 20 MPa)[1, 2, 4]

d_a mm (in)	h_{ef} mm	N_{sar} – tension strength of anchor (kN)							N_{cbr} – tension breakout[4, 5, 6] (kN)					N_{cpr} – pullout[9] (kN)			N_{sbr} – sideface blowout[4, 10] (kN)		
		f_{uta} – for design purpose[3] (MPa)							c – edge distance					head[7]	"J" or "L" hook[8]		c – edge distance		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$\geq 1.5h_{ef}$		$e_h = 3d_a$	$e_h = 4.5d_a$	38 mm cover	$0.25h_{ef}$	$0.4h_{ef}$
6.35 (0.25)	50	5.6	5.8	7.3	8.7	10.2	11.6	12.1	6.6	NP	NP	7.7	10.3	7.9	1.4	2.1	12.8	NP	NP
	75	5.6	5.8	7.3	8.7	10.2	11.6	12.1	10.1	NP	NP	14.2	18.9	7.9	1.4	2.1	12.8	NP	NP
	100	5.6	5.8	7.3	8.7	10.2	11.6	12.1	14.1	NP	15.5	21.8	29.1	7.9	1.4	2.1	12.8	NP	13.4
	125	5.6	5.8	7.3	8.7	10.2	11.6	12.1	18.6	NP	21.7	30.5	40.6	7.9	1.4	2.1	12.8	NP	16.8
	150	5.6	5.8	7.3	8.7	10.2	11.6	12.1	23.4	NP	28.5	40.1	53.4	7.9	1.4	2.1	12.8	NP	20.2
9.525 (0.375)	50	13.7	14.2	17.7	21.2	24.8	28.3	29.4	6.6	NP	NP	7.7	10.3	11.0	3.2	4.8	15.1	NP	NP
	75	13.7	14.2	17.7	21.2	24.8	28.3	29.4	10.1	NP	NP	14.2	18.9	11.0	3.2	4.8	15.1	NP	NP
	100	13.7	14.2	17.7	21.2	24.8	28.3	29.4	14.1	NP	15.5	21.8	29.1	11.0	3.2	4.8	15.1	NP	15.9
	125	13.7	14.2	17.7	21.2	24.8	28.3	29.4	18.6	NP	21.7	30.5	40.6	11.0	3.2	4.8	15.1	NP	19.9
	150	13.7	14.2	17.7	21.2	24.8	28.3	29.4	23.4	NP	28.5	40.1	53.4	11.0	3.2	4.8	15.1	NP	23.9
12.7 (0.5)	50	24.9	25.8	32.2	38.6	45.1	51.5	53.6	6.6	NP	NP	7.7	10.3	19.5	5.7	8.5	20.1	NP	NP
	75	24.9	25.8	32.2	38.6	45.1	51.5	53.6	10.1	NP	NP	14.2	18.9	19.5	5.7	8.5	20.1	NP	NP
	100	24.9	25.8	32.2	38.6	45.1	51.5	53.6	14.1	NP	15.5	21.8	29.1	19.5	5.7	8.5	20.1	NP	21.2
	125	24.9	25.8	32.2	38.6	45.1	51.5	53.6	18.6	NP	21.7	30.5	40.6	19.5	5.7	8.5	20.1	NP	26.5
	150	24.9	25.8	32.2	38.6	45.1	51.5	53.6	23.4	NP	28.5	40.1	53.4	19.5	5.7	8.5	20.1	NP	31.8
	175	24.9	25.8	32.2	38.6	45.1	51.5	53.6	28.6	29.4	35.9	50.5	67.3	19.5	5.7	8.5	20.1	23.2	37.1
	200	24.9	25.8	32.2	38.6	45.1	51.5	53.6	34.2	36.0	43.9	61.7	82.2	19.5	5.7	8.5	20.1	26.5	42.4

Table 12.5(A) continued from previous page

d_a mm (in)	h_{ef} mm	N_{sar} – tension strength of anchor (kN)							N_{cbr} – tension breakout[4, 5, 6] (kN)					N_{cpr} – pullout[9] (kN)			N_{sbr} – sideface blowout[4, 10] (kN)		
		f_{uta} – for design purpose[3] (MPa)							c – edge distance					head[7]	"J" or "L" hook[8]		c – edge distance		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$\geq 1.5h_{ef}$		$e_h = 3d_a$	$e_h = 4.5d_a$	38 mm cover	$0.25h_{ef}$	$0.4h_{ef}$
15.875 (0.625)	75	39.7	41.0	51.3	61.5	71.8	82.0	85.3	10.1	NP	NP	14.2	18.9	30.5	8.8	13.3	25.1	NP	NP
	100	39.7	41.0	51.3	61.5	71.8	82.0	85.3	14.1	NP	15.5	21.8	29.1	30.5	8.8	13.3	25.1	NP	26.5
	125	39.7	41.0	51.3	61.5	71.8	82.0	85.3	18.6	NP	21.7	30.5	40.6	30.5	8.8	13.3	25.1	NP	33.1
	150	39.7	41.0	51.3	61.5	71.8	82.0	85.3	23.4	NP	28.5	40.1	53.4	30.5	8.8	13.3	25.1	NP	39.7
	175	39.7	41.0	51.3	61.5	71.8	82.0	85.3	28.6	29.4	35.9	50.5	67.3	30.5	8.8	13.3	25.1	28.9	46.3
	200	39.7	41.0	51.3	61.5	71.8	82.0	85.3	34.2	36.0	43.9	61.7	82.2	30.5	8.8	13.3	25.1	33.1	52.9
	225	39.7	41.0	51.3	61.5	71.8	82.0	85.3	40.0	42.9	52.3	73.6	98.1	30.5	8.8	13.3	25.1	37.2	59.6
	250	39.7	41.0	51.3	61.5	71.8	82.0	85.3	46.2	50.3	61.3	86.2	114.9	30.5	8.8	13.3	25.1	41.4	66.2
19.05 (0.75)	100	58.6	60.7	75.8	90.8	106.1	121.2	126.0	14.1	NP	15.5	21.8	29.1	43.9	12.7	19.1	30.2	NP	31.8
	125	58.6	60.7	75.8	90.8	106.1	121.2	126.0	18.6	NP	21.7	30.5	40.6	43.9	12.7	19.1	30.2	NP	39.7
	150	58.6	60.7	75.8	90.8	106.1	121.2	126.0	23.4	NP	28.5	40.1	53.4	43.9	12.7	19.1	30.2	NP	47.6
	175	58.6	60.7	75.8	90.8	106.1	121.2	126.0	28.6	29.4	35.9	50.5	67.3	43.9	12.7	19.1	30.2	34.7	55.6
	200	58.6	60.7	75.8	90.8	106.1	121.2	126.0	34.2	36.0	43.9	61.7	82.2	43.9	12.7	19.1	30.2	39.7	63.5
	225	58.6	60.7	75.8	90.8	106.1	121.2	126.0	40.0	42.9	52.3	73.6	98.1	43.9	12.7	19.1	30.2	44.7	71.5
	250	58.6	60.7	75.8	90.8	106.1	121.2	126.0	46.2	50.3	61.3	86.2	114.9	43.9	12.7	19.1	30.2	49.6	79.4
	300	58.6	60.7	75.8	90.8	106.1	121.2	126.0	59.4	66.1	80.6	113.3	151.0	43.9	12.7	19.1	30.2	59.6	95.3
22.225 (0.875)	100	81.1	83.9	104.8	125.7	146.7	167.6	174.3	14.1	NP	15.5	21.8	29.1	59.8	17.3	26.0	35.2	NP	37.1
	150	81.1	83.9	104.8	125.7	146.7	167.6	174.3	23.4	NP	28.5	40.1	53.4	59.8	17.3	26.0	35.2	NP	55.6
	200	81.1	83.9	104.8	125.7	146.7	167.6	174.3	34.2	36.0	43.9	61.7	82.2	59.8	17.3	26.0	35.2	46.3	74.2
	300	81.1	83.9	104.8	125.7	146.7	167.6	174.3	59.4	66.1	80.6	113.3	151.0	59.8	17.3	26.0	35.2	69.5	111.2
	375	81.1	83.9	104.8	125.7	146.7	167.6	174.3	81.2	92.4	112.6	158.3	211.1	59.8	17.3	26.0	35.2	86.9	139.0
	450	81.1	83.9	104.8	125.7	146.7	167.6	174.3	105.1	121.4	148.0	208.1	277.5	59.8	17.3	26.0	35.2	104.3	166.8
	625	81.1	83.9	104.8	125.7	146.7	167.6	174.3	168.3	198.7	242.2	340.7	454.2	59.8	17.3	26.0	35.2	144.8	231.7

Table 12.5(A) continued from previous page

d_a mm (in)	h_{ef} mm	N_{sar} – tension strength of anchor (kN)							N_{cbr} – tension breakout[4, 5, 6] (kN)					N_{cpr} – pullout[9] (kN)			N_{sbr} – sideface blowout[4, 10] (kN)		
		f_{uta} – for design purpose[3] (MPa)							c – edge distance					head[7]	"J" or "L" hook[8]		c – edge distance		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$\geq 1.5h_{ef}$		$e_h = 3d_a$	$e_h = 4.5d_a$	38 mm cover	$0.25h_{ef}$	$0.4h_{ef}$
25.4 (1.0)	150	106.3	110.1	137.4	164.8	192.5	219.9	228.6	23.4	NP	28.5	40.1	53.4	78.0	22.6	34.0	40.2	NP	63.5
	225	106.3	110.1	137.4	164.8	192.5	219.9	228.6	40.0	42.9	52.3	73.6	98.1	78.0	22.6	34.0	40.2	59.6	95.3
	300	106.3	110.1	137.4	164.8	192.5	219.9	228.6	59.4	66.1	80.6	113.3	151.0	78.0	22.6	34.0	40.2	79.4	127.1
	375	106.3	110.1	137.4	164.8	192.5	219.9	228.6	81.2	92.4	112.6	158.3	211.1	78.0	22.6	34.0	40.2	99.3	158.9
	450	106.3	110.1	137.4	164.8	192.5	219.9	228.6	105.1	121.4	148.0	208.1	277.5	78.0	22.6	34.0	40.2	119.1	190.6
	525	106.3	110.1	137.4	164.8	192.5	219.9	228.6	130.9	153.0	186.5	262.3	349.7	78.0	22.6	34.0	40.2	139.0	222.4
	625	106.3	110.1	137.4	164.8	192.5	219.9	228.6	168.3	198.7	242.2	340.7	454.2	78.0	22.6	34.0	40.2	165.5	264.8
29 (1.125)	150	133.9	138.6	173.1	207.5	242.3	276.8	287.9	23.4	NP	28.5	40.1	53.4	98.8	28.7	43.0	45.3	NP	71.5
	225	133.9	138.6	173.1	207.5	242.3	276.8	287.9	40.0	42.9	52.3	73.6	98.1	98.8	28.7	43.0	45.3	67.0	107.2
	300	133.9	138.6	173.1	207.5	242.3	276.8	287.9	59.4	66.1	80.6	113.3	151.0	98.8	28.7	43.0	45.3	89.4	143.0
	375	133.9	138.6	173.1	207.5	242.3	276.8	287.9	81.2	92.4	112.6	158.3	211.1	98.8	28.7	43.0	45.3	111.7	178.7
	450	133.9	138.6	173.1	207.5	242.3	276.8	287.9	105.1	121.4	148.0	208.1	277.5	98.8	28.7	43.0	45.3	134.0	214.5
	525	133.9	138.6	173.1	207.5	242.3	276.8	287.9	130.9	153.0	186.5	262.3	349.7	98.8	28.7	43.0	45.3	156.4	250.2
	625	133.9	138.6	173.1	207.5	242.3	276.8	287.9	168.3	198.7	242.2	340.7	454.2	98.8	28.7	43.0	45.3	186.2	297.9
31.75 (1.25)	150	170.0	176.0	219.8	263.6	307.8	351.6	365.6	23.4	NP	28.5	40.1	53.4	121.9	35.4	53.1	50.3	NP	79.4
	225	170.0	176.0	219.8	263.6	307.8	351.6	365.6	40.0	42.9	52.3	73.6	98.1	121.9	35.4	53.1	50.3	74.5	119.1
	300	170.0	176.0	219.8	263.6	307.8	351.6	365.6	59.4	66.1	80.6	113.3	151.0	121.9	35.4	53.1	50.3	99.3	158.8
	375	170.0	176.0	219.8	263.6	307.8	351.6	365.6	81.2	92.4	112.6	158.3	211.1	121.9	35.4	53.1	50.3	124.1	198.6
	450	170.0	176.0	219.8	263.6	307.8	351.6	365.6	105.1	121.4	148.0	208.1	277.5	121.9	35.4	53.1	50.3	148.9	238.3
	525	170.0	176.0	219.8	263.6	307.8	351.6	365.6	130.9	153.0	186.5	262.3	349.7	121.9	35.4	53.1	50.3	173.7	278.0
	625	170.0	176.0	219.8	263.6	307.8	351.6	365.6	168.3	198.7	242.2	340.7	454.2	121.9	35.4	53.1	50.3	206.8	330.9

Table 12.5(A) continued from previous page

d_a mm (in)	h_{ef} mm	N_{sar} – tension strength of anchor (kN)							N_{cbr} – tension breakout[4, 5, 6] (kN)					N_{cpr} – pullout[9] (kN)			N_{sbr} – sideface blowout[4, 10] (kN)		
		f_{uta} – for design purpose[3] (MPa)							c – edge distance					head[7]	"J" or "L" hook[8]		c – edge distance		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$\geq 1.5h_{ef}$		$e_h = 3d_a$	$e_h = 4.5d_a$	38 mm cover	$0.25h_{ef}$	$0.4h_{ef}$
34.925 (1.375)	150	203.6	210.7	263.1	315.5	368.4	420.9	437.7	23.4	NP	28.5	40.1	53.4	147.5	42.8	64.2	55.3	NP	87.4
	225	203.6	210.7	263.1	315.5	368.4	420.9	437.7	40.0	42.9	52.3	73.6	98.1	147.5	42.8	64.2	55.3	81.9	131.1
	300	203.6	210.7	263.1	315.5	368.4	420.9	437.7	59.4	66.1	80.6	113.3	151.0	147.5	42.8	64.2	55.3	109.2	174.7
	375	203.6	210.7	263.1	315.5	368.4	420.9	437.7	81.2	92.4	112.6	158.3	211.1	147.5	42.8	64.2	55.3	136.5	218.4
	450	203.6	210.7	263.1	315.5	368.4	420.9	437.7	105.1	121.4	148.0	208.1	277.5	147.5	42.8	64.2	55.3	163.8	262.1
	525	203.6	210.7	263.1	315.5	368.4	420.9	437.7	130.9	153.0	186.5	262.3	349.7	147.5	42.8	64.2	55.3	191.1	305.8
	625	203.6	210.7	263.1	315.5	368.4	420.9	437.7	168.3	198.7	242.2	340.7	454.2	147.5	42.8	64.2	55.3	227.5	364.1
38.1 (1.5)	300	247.4	256.1	319.8	383.5	447.9	511.6	532.0	59.4	66.1	80.6	113.3	151.0	175.6	51.0	76.4	60.4	119.1	190.6
	375	247.4	256.1	319.8	383.5	447.9	511.6	532.0	81.2	92.4	112.6	158.3	211.1	175.6	51.0	76.4	60.4	148.9	238.3
	450	247.4	256.1	319.8	383.5	447.9	511.6	532.0	105.1	121.4	148.0	208.1	277.5	175.6	51.0	76.4	60.4	178.7	285.9
	525	247.4	256.1	319.8	383.5	447.9	511.6	532.0	130.9	153.0	186.5	262.3	349.7	175.6	51.0	76.4	60.4	208.5	333.6
	625	247.4	256.1	319.8	383.5	447.9	511.6	532.0	168.3	198.7	242.2	340.7	454.2	175.6	51.0	76.4	60.4	248.2	397.2
44.45 (1.75)	300	333.4	345.1	430.9	516.8	603.5	689.3	716.9	59.4	66.1	80.6	113.3	151.0	278.0	69.4	104.0	76.0	149.9	239.9
	375	333.4	345.1	430.9	516.8	603.5	689.3	716.9	81.2	92.4	112.6	158.3	211.1	278.0	69.4	104.0	76.0	187.4	299.9
	450	333.4	345.1	430.9	516.8	603.5	689.3	716.9	105.1	121.4	148.0	208.1	277.5	278.0	69.4	104.0	76.0	224.9	359.8
	525	333.4	345.1	430.9	516.8	603.5	689.3	716.9	130.9	153.0	186.5	262.3	349.7	278.0	69.4	104.0	76.0	262.4	419.8
	625	333.4	345.1	430.9	516.8	603.5	689.3	716.9	168.3	198.7	242.2	340.7	454.2	278.0	69.4	104.0	76.0	312.4	499.8
50.8 (2.0)	300	438.7	454.1	567.0	680.0	794.1	907.0	943.2	59.4	66.1	80.6	113.3	151.0	356.7	90.6	135.9	86.0	169.8	271.7
	375	438.7	454.1	567.0	680.0	794.1	907.0	943.2	81.2	92.4	112.6	158.3	211.1	356.7	90.6	135.9	86.0	212.3	339.6
	450	438.7	454.1	567.0	680.0	794.1	907.0	943.2	105.1	121.4	148.0	208.1	277.5	356.7	90.6	135.9	86.0	254.7	407.5
	525	438.7	454.1	567.0	680.0	794.1	907.0	943.2	130.9	153.0	186.5	262.3	349.7	356.7	90.6	135.9	86.0	297.2	475.5
	625	438.7	454.1	567.0	680.0	794.1	907.0	943.2	168.3	198.7	242.2	340.7	454.2	356.7	90.6	135.9	86.0	353.8	566.0

Table 12.5(B)
Factored resistance for single cast-in anchors subject to tensile loads
(f_c' = 30 MPa)

d_a mm (in)	h_{ef} mm	N_{sar} – tension strength of anchor (kN)							N_{cbr} – tension breakout[4, 5, 6] (kN)					N_{cpr} – pullout[9] (kN)			N_{sbr} – sideface blowout[4, 10] (kN)		
		f_{uta} – for design purpose[3] (MPa)							c – edge distance					head[7]	"J" or "L" hook[8]		c – edge distance		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	≥ $1.5h_{ef}$		e_h = $3d_a$	e_h = $4.5d_a$	38 mm cover	$0.25h_{ef}$	$0.4h_{ef}$
6.35 (0.25)	50	5.6	5.8	7.3	8.7	10.2	11.6	12.1	8.1	NP	NP	9.4	12.6	11.8	2.1	3.2	15.6	NP	NP
	75	5.6	5.8	7.3	8.7	10.2	11.6	12.1	12.4	NP	NP	17.3	23.1	11.8	2.1	3.2	15.6	NP	NP
	100	5.6	5.8	7.3	8.7	10.2	11.6	12.1	17.3	NP	19.0	26.7	35.6	11.8	2.1	3.2	15.6	NP	16.5
	125	5.6	5.8	7.3	8.7	10.2	11.6	12.1	22.8	NP	26.5	37.3	49.8	11.8	2.1	3.2	15.6	NP	20.6
	150	5.6	5.8	7.3	8.7	10.2	11.6	12.1	28.7	NP	34.9	49.1	65.4	11.8	2.1	3.2	15.6	NP	24.7
9.525 (0.375)	50	13.7	14.2	17.7	21.2	24.8	28.3	29.4	8.1	NP	NP	9.4	12.6	16.5	4.8	7.2	18.5	NP	NP
	75	13.7	14.2	17.7	21.2	24.8	28.3	29.4	12.4	NP	NP	17.3	23.1	16.5	4.8	7.2	18.5	NP	NP
	100	13.7	14.2	17.7	21.2	24.8	28.3	29.4	17.3	NP	19.0	26.7	35.6	16.5	4.8	7.2	18.5	NP	19.5
	125	13.7	14.2	17.7	21.2	24.8	28.3	29.4	22.8	NP	26.5	37.3	49.8	16.5	4.8	7.2	18.5	NP	24.4
	150	13.7	14.2	17.7	21.2	24.8	28.3	29.4	28.7	NP	34.9	49.1	65.4	16.5	4.8	7.2	18.5	NP	29.2
12.7 (0.5)	50	24.9	25.8	32.2	38.6	45.1	51.5	53.6	8.1	NP	NP	9.4	12.6	29.3	8.5	12.7	24.7	NP	NP
	75	24.9	25.8	32.2	38.6	45.1	51.5	53.6	12.4	NP	NP	17.3	23.1	29.3	8.5	12.7	24.7	NP	NP
	100	24.9	25.8	32.2	38.6	45.1	51.5	53.6	17.3	NP	19.0	26.7	35.6	29.3	8.5	12.7	24.7	NP	26.0
	125	24.9	25.8	32.2	38.6	45.1	51.5	53.6	22.8	NP	26.5	37.3	49.8	29.3	8.5	12.7	24.7	NP	32.4
	150	24.9	25.8	32.2	38.6	45.1	51.5	53.6	28.7	NP	34.9	49.1	65.4	29.3	8.5	12.7	24.7	NP	38.9
	175	24.9	25.8	32.2	38.6	45.1	51.5	53.6	35.1	36.1	44.0	61.8	82.4	29.3	8.5	12.7	24.7	28.4	45.4
	200	24.9	25.8	32.2	38.6	45.1	51.5	53.6	41.9	44.1	53.7	75.5	100.7	29.3	8.5	12.7	24.7	32.4	51.9

Table 12.5(B) continued from previous page

d_a mm (in)	h_{ef} mm	N_{sar} – tension strength of anchor (kN)							N_{cbr} – tension breakout[4, 5, 6] (kN)					N_{cpr} – pullout[9] (kN)			N_{sbr} – sideface blowout[4, 10] (kN)		
		f_{uta} – for design purpose[3] (MPa)							c – edge distance					head[7]	"J" or "L" hook[8]		c – edge distance		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$\geq 1.5h_{ef}$		$e_h = 3d_a$	$e_h = 4.5d_a$	38 mm cover	$0.25h_{ef}$	$0.4h_{ef}$
15.875 (0.625)	75	39.7	41.0	51.3	61.5	71.8	82.0	85.3	12.4	NP	NP	17.3	23.1	45.7	13.3	19.9	30.8	NP	NP
	100	39.7	41.0	51.3	61.5	71.8	82.0	85.3	17.3	NP	19.0	26.7	35.6	45.7	13.3	19.9	30.8	NP	32.4
	125	39.7	41.0	51.3	61.5	71.8	82.0	85.3	22.8	NP	26.5	37.3	49.8	45.7	13.3	19.9	30.8	NP	40.5
	150	39.7	41.0	51.3	61.5	71.8	82.0	85.3	28.7	NP	34.9	49.1	65.4	45.7	13.3	19.9	30.8	NP	48.6
	175	39.7	41.0	51.3	61.5	71.8	82.0	85.3	35.1	36.1	44.0	61.8	82.4	45.7	13.3	19.9	30.8	35.5	56.7
	200	39.7	41.0	51.3	61.5	71.8	82.0	85.3	41.9	44.1	53.7	75.5	100.7	45.7	13.3	19.9	30.8	40.5	64.8
	225	39.7	41.0	51.3	61.5	71.8	82.0	85.3	49.0	52.6	64.1	90.1	120.2	45.7	13.3	19.9	30.8	45.6	72.9
	250	39.7	41.0	51.3	61.5	71.8	82.0	85.3	56.6	61.6	75.1	105.5	140.7	45.7	13.3	19.9	30.8	50.6	81.0
19.05 (0.75)	100	58.6	60.7	75.8	90.8	106.1	121.2	126.0	17.3	NP	19.0	26.7	35.6	65.8	19.1	28.7	37.0	NP	38.9
	125	58.6	60.7	75.8	90.8	106.1	121.2	126.0	22.8	NP	26.5	37.3	49.8	65.8	19.1	28.7	37.0	NP	48.6
	150	58.6	60.7	75.8	90.8	106.1	121.2	126.0	28.7	NP	34.9	49.1	65.4	65.8	19.1	28.7	37.0	NP	58.4
	175	58.6	60.7	75.8	90.8	106.1	121.2	126.0	35.1	36.1	44.0	61.8	82.4	65.8	19.1	28.7	37.0	42.6	68.1
	200	58.6	60.7	75.8	90.8	106.1	121.2	126.0	41.9	44.1	53.7	75.5	100.7	65.8	19.1	28.7	37.0	48.6	77.8
	225	58.6	60.7	75.8	90.8	106.1	121.2	126.0	49.0	52.6	64.1	90.1	120.2	65.8	19.1	28.7	37.0	54.7	87.5
	250	58.6	60.7	75.8	90.8	106.1	121.2	126.0	56.6	61.6	75.1	105.5	140.7	65.8	19.1	28.7	37.0	60.8	97.3
	300	58.6	60.7	75.8	90.8	106.1	121.2	126.0	72.8	80.9	98.7	138.7	185.0	65.8	19.1	28.7	37.0	72.9	116.7
22.225 (0.875)	100	81.1	83.9	104.8	125.7	146.7	167.6	174.3	17.3	NP	19.0	26.7	35.6	89.7	26.0	39.0	43.1	NP	45.4
	150	81.1	83.9	104.8	125.7	146.7	167.6	174.3	28.7	NP	34.9	49.1	65.4	89.7	26.0	39.0	43.1	NP	68.1
	200	81.1	83.9	104.8	125.7	146.7	167.6	174.3	41.9	44.1	53.7	75.5	100.7	89.7	26.0	39.0	43.1	56.8	90.8
	300	81.1	83.9	104.8	125.7	146.7	167.6	174.3	72.8	80.9	98.7	138.7	185.0	89.7	26.0	39.0	43.1	85.1	136.2
	375	81.1	83.9	104.8	125.7	146.7	167.6	174.3	99.4	113.1	137.9	193.9	258.5	89.7	26.0	39.0	43.1	106.4	170.3
	450	81.1	83.9	104.8	125.7	146.7	167.6	174.3	128.7	148.7	181.3	254.9	339.9	89.7	26.0	39.0	43.1	127.7	204.3
	625	81.1	83.9	104.8	125.7	146.7	167.6	174.3	206.1	243.4	296.7	417.2	556.3	89.7	26.0	39.0	43.1	177.4	283.8

Table 12.5(B) continued from previous page

d_a mm (in)	h_{ef} mm	N_{sar} – tension strength of anchor (kN)							N_{cbr} – tension breakout[4, 5, 6] (kN)					N_{cpr} – pullout[9] (kN)			N_{sbr} – sideface blowout[4, 10] (kN)		
		f_{uta} – for design purpose[3] (MPa)							c – edge distance					head[7]	"J" or "L" hook[8]		c – edge distance		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$\geq 1.5h_{ef}$		$e_h = 3d_a$	$e_h = 4.5d_a$	38 mm cover	$0.25h_{ef}$	$0.4h_{ef}$
25.4 (1.0)	150	106.3	110.1	137.4	164.8	192.5	219.9	228.6	28.7	NP	34.9	49.1	65.4	117.1	34.0	51.0	49.3	NP	77.8
	225	106.3	110.1	137.4	164.8	192.5	219.9	228.6	49.0	52.6	64.1	90.1	120.2	117.1	34.0	51.0	49.3	73.0	116.7
	300	106.3	110.1	137.4	164.8	192.5	219.9	228.6	72.8	80.9	98.7	138.7	185.0	117.1	34.0	51.0	49.3	97.3	155.6
	375	106.3	110.1	137.4	164.8	192.5	219.9	228.6	99.4	113.1	137.9	193.9	258.5	117.1	34.0	51.0	49.3	121.6	194.6
	450	106.3	110.1	137.4	164.8	192.5	219.9	228.6	128.7	148.7	181.3	254.9	339.9	117.1	34.0	51.0	49.3	145.9	233.5
	525	106.3	110.1	137.4	164.8	192.5	219.9	228.6	160.4	187.4	228.4	321.2	428.3	117.1	34.0	51.0	49.3	170.2	272.4
	625	106.3	110.1	137.4	164.8	192.5	219.9	228.6	206.1	243.4	296.7	417.2	556.3	117.1	34.0	51.0	49.3	202.7	324.3
29 (1.125)	150	133.9	138.6	173.1	207.5	242.3	276.8	287.9	28.7	NP	34.9	49.1	65.4	148.1	43.0	64.5	55.4	NP	87.6
	225	133.9	138.6	173.1	207.5	242.3	276.8	287.9	49.0	52.6	64.1	90.1	120.2	148.1	43.0	64.5	55.4	82.1	131.3
	300	133.9	138.6	173.1	207.5	242.3	276.8	287.9	72.8	80.9	98.7	138.7	185.0	148.1	43.0	64.5	55.4	109.4	175.1
	375	133.9	138.6	173.1	207.5	242.3	276.8	287.9	99.4	113.1	137.9	193.9	258.5	148.1	43.0	64.5	55.4	136.8	218.9
	450	133.9	138.6	173.1	207.5	242.3	276.8	287.9	128.7	148.7	181.3	254.9	339.9	148.1	43.0	64.5	55.4	164.2	262.7
	525	133.9	138.6	173.1	207.5	242.3	276.8	287.9	160.4	187.4	228.4	321.2	428.3	148.1	43.0	64.5	55.4	191.5	306.4
	625	133.9	138.6	173.1	207.5	242.3	276.8	287.9	206.1	243.4	296.7	417.2	556.3	148.1	43.0	64.5	55.4	228.0	364.8
31.75 (1.25)	150	170.0	176.0	219.8	263.6	307.8	351.6	365.6	28.7	NP	34.9	49.1	65.4	182.9	53.1	79.6	61.6	NP	97.3
	225	170.0	176.0	219.8	263.6	307.8	351.6	365.6	49.0	52.6	64.1	90.1	120.2	182.9	53.1	79.6	61.6	91.2	145.9
	300	170.0	176.0	219.8	263.6	307.8	351.6	365.6	72.8	80.9	98.7	138.7	185.0	182.9	53.1	79.6	61.6	121.6	194.5
	375	170.0	176.0	219.8	263.6	307.8	351.6	365.6	99.4	113.1	137.9	193.9	258.5	182.9	53.1	79.6	61.6	152.0	243.2
	450	170.0	176.0	219.8	263.6	307.8	351.6	365.6	128.7	148.7	181.3	254.9	339.9	182.9	53.1	79.6	61.6	182.4	291.8
	525	170.0	176.0	219.8	263.6	307.8	351.6	365.6	160.4	187.4	228.4	321.2	428.3	182.9	53.1	79.6	61.6	212.8	340.5
	625	170.0	176.0	219.8	263.6	307.8	351.6	365.6	206.1	243.4	296.7	417.2	556.3	182.9	53.1	79.6	61.6	253.3	405.3

Table 12.5(B) continued from previous page

d_a mm (in)	h_{ef} mm	N_{sar} – tension strength of anchor (kN)							N_{cbr} – tension breakout[4, 5, 6] (kN)					N_{cpr} – pullout[9] (kN)			N_{sbr} – sideface blowout[4, 10] (kN)		
		f_{uta} – for design purpose[3] (MPa)							c – edge distance					head[7]	"J" or "L" hook[8]		c – edge distance		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$\geq 1.5h_{ef}$		$e_h = 3d_a$	$e_h = 4.5d_a$	38 mm cover	$0.25h_{ef}$	$0.4h_{ef}$
34.925 (1.375)	150	203.6	210.7	263.1	315.5	368.4	420.9	437.7	28.7	NP	34.9	49.1	65.4	221.3	64.2	96.3	67.8	NP	107.0
	225	203.6	210.7	263.1	315.5	368.4	420.9	437.7	49.0	52.6	64.1	90.1	120.2	221.3	64.2	96.3	67.8	100.3	160.5
	300	203.6	210.7	263.1	315.5	368.4	420.9	437.7	72.8	80.9	98.7	138.7	185.0	221.3	64.2	96.3	67.8	133.8	214.0
	375	203.6	210.7	263.1	315.5	368.4	420.9	437.7	99.4	113.1	137.9	193.9	258.5	221.3	64.2	96.3	67.8	167.2	267.5
	450	203.6	210.7	263.1	315.5	368.4	420.9	437.7	128.7	148.7	181.3	254.9	339.9	221.3	64.2	96.3	67.8	200.6	321.0
	525	203.6	210.7	263.1	315.5	368.4	420.9	437.7	160.4	187.4	228.4	321.2	428.3	221.3	64.2	96.3	67.8	234.1	374.5
	625	203.6	210.7	263.1	315.5	368.4	420.9	437.7	206.1	243.4	296.7	417.2	556.3	221.3	64.2	96.3	67.8	278.7	445.9
38.1 (1.5)	300	247.4	256.1	319.8	383.5	447.9	511.6	532.0	72.8	80.9	98.7	138.7	185.0	263.4	76.4	114.6	73.9	145.9	233.5
	375	247.4	256.1	319.8	383.5	447.9	511.6	532.0	99.4	113.1	137.9	193.9	258.5	263.4	76.4	114.6	73.9	182.4	291.8
	450	247.4	256.1	319.8	383.5	447.9	511.6	532.0	128.7	148.7	181.3	254.9	339.9	263.4	76.4	114.6	73.9	218.9	350.2
	525	247.4	256.1	319.8	383.5	447.9	511.6	532.0	160.4	187.4	228.4	321.2	428.3	263.4	76.4	114.6	73.9	255.4	408.6
	625	247.4	256.1	319.8	383.5	447.9	511.6	532.0	206.1	243.4	296.7	417.2	556.3	263.4	76.4	114.6	73.9	304.0	486.4
44.45 (1.75)	300	333.4	345.1	430.9	516.8	603.5	689.3	716.9	72.8	80.9	98.7	138.7	185.0	417.1	104.0	156.0	93.0	183.6	293.8
	375	333.4	345.1	430.9	516.8	603.5	689.3	716.9	99.4	113.1	137.9	193.9	258.5	417.1	104.0	156.0	93.0	229.5	367.2
	450	333.4	345.1	430.9	516.8	603.5	689.3	716.9	128.7	148.7	181.3	254.9	339.9	417.1	104.0	156.0	93.0	275.4	440.7
	525	333.4	345.1	430.9	516.8	603.5	689.3	716.9	160.4	187.4	228.4	321.2	428.3	417.1	104.0	156.0	93.0	321.3	514.1
	625	333.4	345.1	430.9	516.8	603.5	689.3	716.9	206.1	243.4	296.7	417.2	556.3	417.1	104.0	156.0	93.0	382.6	612.1
50.8 (2.0)	300	438.7	454.1	567.0	680.0	794.1	907.0	943.2	72.8	80.9	98.7	138.7	185.0	535.0	135.9	203.8	105.4	208.0	332.8
	375	438.7	454.1	567.0	680.0	794.1	907.0	943.2	99.4	113.1	137.9	193.9	258.5	535.0	135.9	203.8	105.4	260.0	416.0
	450	438.7	454.1	567.0	680.0	794.1	907.0	943.2	128.7	148.7	181.3	254.9	339.9	535.0	135.9	203.8	105.4	312.0	499.1
	525	438.7	454.1	567.0	680.0	794.1	907.0	943.2	160.4	187.4	228.4	321.2	428.3	535.0	135.9	203.8	105.4	364.0	582.3
	625	438.7	454.1	567.0	680.0	794.1	907.0	943.2	206.1	243.4	296.7	417.2	556.3	535.0	135.9	203.8	105.4	433.3	693.3

Table 12.5(C)
Factored resistance for single cast-in anchors subject to tensile loads (f'_c = 40 MPa)

d_a mm (in)	h_{ef} mm	N_{sar} – tension strength of anchor (kN)							N_{cbr} – tension breakout[4, 5, 6] (kN)					N_{cpr} – pullout[9] (kN)			N_{sbr} – sideface blowout[4, 10] (kN)		
		f_{uta} – for design purpose[3] (MPa)							c – edge distance					head[7]	"J" or "L" hook[8]		c – edge distance		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	≥ $1.5h_{ef}$		$e_h = 3d_a$	$e_h = 4.5d_a$	38 mm cover	$0.25h_{ef}$	$0.4h_{ef}$
6.35 (0.25)	50	5.6	5.8	7.3	8.7	10.2	11.6	12.1	9.3	NP	NP	10.9	14.5	15.7	2.8	4.2	18.1	NP	NP
	75	5.6	5.8	7.3	8.7	10.2	11.6	12.1	14.3	NP	NP	20.0	26.7	15.7	2.8	4.2	18.1	NP	NP
	100	5.6	5.8	7.3	8.7	10.2	11.6	12.1	20.0	NP	21.9	30.8	41.1	15.7	2.8	4.2	18.1	NP	19.0
	125	5.6	5.8	7.3	8.7	10.2	11.6	12.1	26.3	NP	30.6	43.1	57.5	15.7	2.8	4.2	18.1	NP	23.8
	150	5.6	5.8	7.3	8.7	10.2	11.6	12.1	33.1	NP	40.3	56.6	75.5	15.7	2.8	4.2	18.1	NP	28.5
9.525 (0.375)	50	13.7	14.2	17.7	21.2	24.8	28.3	29.4	9.3	NP	NP	10.9	14.5	22.0	6.4	9.6	21.4	NP	NP
	75	13.7	14.2	17.7	21.2	24.8	28.3	29.4	14.3	NP	NP	20.0	26.7	22.0	6.4	9.6	21.4	NP	NP
	100	13.7	14.2	17.7	21.2	24.8	28.3	29.4	20.0	NP	21.9	30.8	41.1	22.0	6.4	9.6	21.4	NP	22.5
	125	13.7	14.2	17.7	21.2	24.8	28.3	29.4	26.3	NP	30.6	43.1	57.5	22.0	6.4	9.6	21.4	NP	28.1
	150	13.7	14.2	17.7	21.2	24.8	28.3	29.4	33.1	NP	40.3	56.6	75.5	22.0	6.4	9.6	21.4	NP	33.7
12.7 (0.5)	50	24.9	25.8	32.2	38.6	45.1	51.5	53.6	9.3	NP	NP	10.9	14.5	39.1	11.3	17.0	28.5	NP	NP
	75	24.9	25.8	32.2	38.6	45.1	51.5	53.6	14.3	NP	NP	20.0	26.7	39.1	11.3	17.0	28.5	NP	NP
	100	24.9	25.8	32.2	38.6	45.1	51.5	53.6	20.0	NP	21.9	30.8	41.1	39.1	11.3	17.0	28.5	NP	30.0
	125	24.9	25.8	32.2	38.6	45.1	51.5	53.6	26.3	NP	30.6	43.1	57.5	39.1	11.3	17.0	28.5	NP	37.5
	150	24.9	25.8	32.2	38.6	45.1	51.5	53.6	33.1	NP	40.3	56.6	75.5	39.1	11.3	17.0	28.5	NP	44.9
	175	24.9	25.8	32.2	38.6	45.1	51.5	53.6	40.5	41.6	50.8	71.4	95.2	39.1	11.3	17.0	28.5	32.8	52.4
	200	24.9	25.8	32.2	38.6	45.1	51.5	53.6	48.3	50.9	62.0	87.2	116.3	39.1	11.3	17.0	28.5	37.5	59.9

Table 12.5(C) continued from previous page

d_a mm (in)	h_{ef} mm	N_{sar} – tension strength of anchor (kN)							N_{cbr} – tension breakout[4, 5, 6] (kN)					N_{cpr} – pullout[9] (kN)			N_{sbr} – sideface blowout[4, 10] (kN)		
		f_{uta} – for design purpose[3] (MPa)							c – edge distance					head[7]	"J" or "L" hook[8]		c – edge distance		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$\geq 1.5h_{ef}$		$e_h = 3d_a$	$e_h = 4.5d_a$	38 mm cover	$0.25h_{ef}$	$0.4h_{ef}$
15.875 (0.625)	75	39.7	41.0	51.3	61.5	71.8	82.0	85.3	14.3	NP	NP	20.0	26.7	60.9	17.7	26.5	35.6	NP	NP
	100	39.7	41.0	51.3	61.5	71.8	82.0	85.3	20.0	NP	21.9	30.8	41.1	60.9	17.7	26.5	35.6	NP	37.4
	125	39.7	41.0	51.3	61.5	71.8	82.0	85.3	26.3	NP	30.6	43.1	57.5	60.9	17.7	26.5	35.6	NP	46.8
	150	39.7	41.0	51.3	61.5	71.8	82.0	85.3	33.1	NP	40.3	56.6	75.5	60.9	17.7	26.5	35.6	NP	56.1
	175	39.7	41.0	51.3	61.5	71.8	82.0	85.3	40.5	41.6	50.8	71.4	95.2	60.9	17.7	26.5	35.6	40.9	65.5
	200	39.7	41.0	51.3	61.5	71.8	82.0	85.3	48.3	50.9	62.0	87.2	116.3	60.9	17.7	26.5	35.6	46.8	74.9
	225	39.7	41.0	51.3	61.5	71.8	82.0	85.3	56.6	60.7	74.0	104.1	138.7	60.9	17.7	26.5	35.6	52.6	84.2
	250	39.7	41.0	51.3	61.5	71.8	82.0	85.3	65.4	71.1	86.7	121.9	162.5	60.9	17.7	26.5	35.6	58.5	93.6
19.05 (0.75)	100	58.6	60.7	75.8	90.8	106.1	121.2	126.0	20.0	NP	21.9	30.8	41.1	87.8	25.5	38.2	42.7	NP	44.9
	125	58.6	60.7	75.8	90.8	106.1	121.2	126.0	26.3	NP	30.6	43.1	57.5	87.8	25.5	38.2	42.7	NP	56.2
	150	58.6	60.7	75.8	90.8	106.1	121.2	126.0	33.1	NP	40.3	56.6	75.5	87.8	25.5	38.2	42.7	NP	67.4
	175	58.6	60.7	75.8	90.8	106.1	121.2	126.0	40.5	41.6	50.8	71.4	95.2	87.8	25.5	38.2	42.7	49.1	78.6
	200	58.6	60.7	75.8	90.8	106.1	121.2	126.0	48.3	50.9	62.0	87.2	116.3	87.8	25.5	38.2	42.7	56.2	89.8
	225	58.6	60.7	75.8	90.8	106.1	121.2	126.0	56.6	60.7	74.0	104.1	138.7	87.8	25.5	38.2	42.7	63.2	101.1
	250	58.6	60.7	75.8	90.8	106.1	121.2	126.0	65.4	71.1	86.7	121.9	162.5	87.8	25.5	38.2	42.7	70.2	112.3
	300	58.6	60.7	75.8	90.8	106.1	121.2	126.0	84.0	93.5	113.9	160.2	213.6	87.8	25.5	38.2	42.7	84.2	134.8
22.225 (0.875)	100	81.1	83.9	104.8	125.7	146.7	167.6	174.3	20.0	NP	21.9	30.8	41.1	119.6	34.7	52.0	49.8	NP	52.4
	150	81.1	83.9	104.8	125.7	146.7	167.6	174.3	33.1	NP	40.3	56.6	75.5	119.6	34.7	52.0	49.8	NP	78.7
	200	81.1	83.9	104.8	125.7	146.7	167.6	174.3	48.3	50.9	62.0	87.2	116.3	119.6	34.7	52.0	49.8	65.5	104.9
	300	81.1	83.9	104.8	125.7	146.7	167.6	174.3	84.0	93.5	113.9	160.2	213.6	119.6	34.7	52.0	49.8	98.3	157.3
	375	81.1	83.9	104.8	125.7	146.7	167.6	174.3	114.8	130.6	159.2	223.9	298.5	119.6	34.7	52.0	49.8	122.9	196.6
	450	81.1	83.9	104.8	125.7	146.7	167.6	174.3	148.6	171.7	209.3	294.3	392.4	119.6	34.7	52.0	49.8	147.5	236.0
	625	81.1	83.9	104.8	125.7	146.7	167.6	174.3	238.0	281.0	342.6	481.8	642.3	119.6	34.7	52.0	49.8	204.8	327.7

Table 12.5(C) continued from previous page

d_a mm (in)	h_{ef} mm	N_{sar} – tension strength of anchor (kN)							N_{cbr} – tension breakout[4, 5, 6] (kN)					N_{cpr} – pullout[9] (kN)			N_{sbr} – sideface blowout[4, 10] (kN)		
		f_{uta} – for design purpose[3] (MPa)							c – edge distance					head[7]	"J" or "L" hook[8]		c – edge distance		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$\geq 1.5h_{ef}$		$e_h = 3d_a$	$e_h = 4.5d_a$	38 mm cover	$0.25h_{ef}$	$0.4h_{ef}$
25.4 (1.0)	150	106.3	110.1	137.4	164.8	192.5	219.9	228.6	33.1	NP	40.3	56.6	75.5	156.1	45.3	67.9	56.9	NP	89.9
	225	106.3	110.1	137.4	164.8	192.5	219.9	228.6	56.6	60.7	74.0	104.1	138.7	156.1	45.3	67.9	56.9	84.2	134.8
	300	106.3	110.1	137.4	164.8	192.5	219.9	228.6	84.0	93.5	113.9	160.2	213.6	156.1	45.3	67.9	56.9	112.3	179.7
	375	106.3	110.1	137.4	164.8	192.5	219.9	228.6	114.8	130.6	159.2	223.9	298.5	156.1	45.3	67.9	56.9	140.4	224.7
	450	106.3	110.1	137.4	164.8	192.5	219.9	228.6	148.6	171.7	209.3	294.3	392.4	156.1	45.3	67.9	56.9	168.5	269.6
	525	106.3	110.1	137.4	164.8	192.5	219.9	228.6	185.2	216.4	263.7	370.9	494.5	156.1	45.3	67.9	56.9	196.6	314.5
	625	106.3	110.1	137.4	164.8	192.5	219.9	228.6	238.0	281.0	342.6	481.8	642.3	156.1	45.3	67.9	56.9	234.0	374.4
29 (1.125)	150	133.9	138.6	173.1	207.5	242.3	276.8	287.9	33.1	NP	40.3	56.6	75.5	197.5	57.3	86.0	64.0	NP	101.1
	225	133.9	138.6	173.1	207.5	242.3	276.8	287.9	56.6	60.7	74.0	104.1	138.7	197.5	57.3	86.0	64.0	94.8	151.6
	300	133.9	138.6	173.1	207.5	242.3	276.8	287.9	84.0	93.5	113.9	160.2	213.6	197.5	57.3	86.0	64.0	126.4	202.2
	375	133.9	138.6	173.1	207.5	242.3	276.8	287.9	114.8	130.6	159.2	223.9	298.5	197.5	57.3	86.0	64.0	158.0	252.7
	450	133.9	138.6	173.1	207.5	242.3	276.8	287.9	148.6	171.7	209.3	294.3	392.4	197.5	57.3	86.0	64.0	189.6	303.3
	525	133.9	138.6	173.1	207.5	242.3	276.8	287.9	185.2	216.4	263.7	370.9	494.5	197.5	57.3	86.0	64.0	221.1	353.8
	625	133.9	138.6	173.1	207.5	242.3	276.8	287.9	238.0	281.0	342.6	481.8	642.3	197.5	57.3	86.0	64.0	263.3	421.2
31.75 (1.25)	150	170.0	176.0	219.8	263.6	307.8	351.6	365.6	33.1	NP	40.3	56.6	75.5	243.8	70.8	106.1	71.1	NP	112.3
	225	170.0	176.0	219.8	263.6	307.8	351.6	365.6	56.6	60.7	74.0	104.1	138.7	243.8	70.8	106.1	71.1	105.3	168.5
	300	170.0	176.0	219.8	263.6	307.8	351.6	365.6	84.0	93.5	113.9	160.2	213.6	243.8	70.8	106.1	71.1	140.4	224.6
	375	170.0	176.0	219.8	263.6	307.8	351.6	365.6	114.8	130.6	159.2	223.9	298.5	243.8	70.8	106.1	71.1	175.5	280.8
	450	170.0	176.0	219.8	263.6	307.8	351.6	365.6	148.6	171.7	209.3	294.3	392.4	243.8	70.8	106.1	71.1	210.6	337.0
	525	170.0	176.0	219.8	263.6	307.8	351.6	365.6	185.2	216.4	263.7	370.9	494.5	243.8	70.8	106.1	71.1	245.7	393.1
	625	170.0	176.0	219.8	263.6	307.8	351.6	365.6	238.0	281.0	342.6	481.8	642.3	243.8	70.8	106.1	71.1	292.5	468.0

Table 12.5(C) continued from previous page

d_a mm (in)	h_{ef} mm	N_{sar} – tension strength of anchor (kN)							N_{cbr} – tension breakout[4, 5, 6] (kN)					N_{cpr} – pullout[9] (kN)			N_{sbr} – sideface blowout[4, 10] (kN)		
		f_{uta} – for design purpose[3] (MPa)							c – edge distance					head[7]	"J" or "L" hook[8]		c – edge distance		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$\geq 1.5h_{ef}$		$e_h = 3d_a$	$e_h = 4.5d_a$	38 mm cover	$0.25h_{ef}$	$0.4h_{ef}$
34.925 (1.375)	150	203.6	210.7	263.1	315.5	368.4	420.9	437.7	33.1	NP	40.3	56.6	75.5	295.1	85.6	128.4	78.3	NP	123.6
	225	203.6	210.7	263.1	315.5	368.4	420.9	437.7	56.6	60.7	74.0	104.1	138.7	295.1	85.6	128.4	78.3	115.8	185.3
	300	203.6	210.7	263.1	315.5	368.4	420.9	437.7	84.0	93.5	113.9	160.2	213.6	295.1	85.6	128.4	78.3	154.5	247.1
	375	203.6	210.7	263.1	315.5	368.4	420.9	437.7	114.8	130.6	159.2	223.9	298.5	295.1	85.6	128.4	78.3	193.1	308.9
	450	203.6	210.7	263.1	315.5	368.4	420.9	437.7	148.6	171.7	209.3	294.3	392.4	295.1	85.6	128.4	78.3	231.7	370.7
	525	203.6	210.7	263.1	315.5	368.4	420.9	437.7	185.2	216.4	263.7	370.9	494.5	295.1	85.6	128.4	78.3	270.3	432.5
	625	203.6	210.7	263.1	315.5	368.4	420.9	437.7	238.0	281.0	342.6	481.8	642.3	295.1	85.6	128.4	78.3	321.8	514.9
38.1 (1.5)	300	247.4	256.1	319.8	383.5	447.9	511.6	532.0	84.0	93.5	113.9	160.2	213.6	351.2	101.9	152.9	85.4	168.5	269.6
	375	247.4	256.1	319.8	383.5	447.9	511.6	532.0	114.8	130.6	159.2	223.9	298.5	351.2	101.9	152.9	85.4	210.6	337.0
	450	247.4	256.1	319.8	383.5	447.9	511.6	532.0	148.6	171.7	209.3	294.3	392.4	351.2	101.9	152.9	85.4	252.7	404.4
	525	247.4	256.1	319.8	383.5	447.9	511.6	532.0	185.2	216.4	263.7	370.9	494.5	351.2	101.9	152.9	85.4	294.9	471.8
	625	247.4	256.1	319.8	383.5	447.9	511.6	532.0	238.0	281.0	342.6	481.8	642.3	351.2	101.9	152.9	85.4	351.0	561.7
44.45 (1.75)	300	333.4	345.1	430.9	516.8	603.5	689.3	716.9	84.0	93.5	113.9	160.2	213.6	556.1	138.7	208.1	107.4	212.0	339.2
	375	333.4	345.1	430.9	516.8	603.5	689.3	716.9	114.8	130.6	159.2	223.9	298.5	556.1	138.7	208.1	107.4	265.0	424.1
	450	333.4	345.1	430.9	516.8	603.5	689.3	716.9	148.6	171.7	209.3	294.3	392.4	556.1	138.7	208.1	107.4	318.0	508.9
	525	333.4	345.1	430.9	516.8	603.5	689.3	716.9	185.2	216.4	263.7	370.9	494.5	556.1	138.7	208.1	107.4	371.1	593.7
	625	333.4	345.1	430.9	516.8	603.5	689.3	716.9	238.0	281.0	342.6	481.8	642.3	556.1	138.7	208.1	107.4	441.7	706.8
50.8 (2.0)	300	438.7	454.1	567.0	680.0	794.1	907.0	943.2	84.0	93.5	113.9	160.2	213.6	713.4	181.2	271.7	121.7	240.1	384.2
	375	438.7	454.1	567.0	680.0	794.1	907.0	943.2	114.8	130.6	159.2	223.9	298.5	713.4	181.2	271.7	121.7	300.2	480.3
	450	438.7	454.1	567.0	680.0	794.1	907.0	943.2	148.6	171.7	209.3	294.3	392.4	713.4	181.2	271.7	121.7	360.2	576.4
	525	438.7	454.1	567.0	680.0	794.1	907.0	943.2	185.2	216.4	263.7	370.9	494.5	713.4	181.2	271.7	121.7	420.3	672.4
	625	438.7	454.1	567.0	680.0	794.1	907.0	943.2	238.0	281.0	342.6	481.8	642.3	713.4	181.2	271.7	121.7	500.3	800.5

Table 12.6(A)
Factored resistance for single cast-in anchors subject to shear loads (f_c' = 20 MPa)[1, 2, 3, 5]

d_a mm (in)	h_{ef} mm	V_{sar} – shear strength of anchor (kN)							V_{cbr} – shear breakout (kN)[5, 6, 7, 8, 9]											
		f_{uta} – for design purpose[4] (MPa)							$h = h_{ef}$[10], c_{a1} = [11]						$h = 1.5h_{ef}$ c_{a1} = [11, 12]			$h = 2.25h_{ef}$ c_{a1} = [11, 12]		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$
6.35 (0.25)	50	3.2	3.3	4.1	4.9	5.7	6.5	6.8	1.3	NP	NP	1.8	2.8	5.6	2.3	3.4	6.8	4.2	4.8	8.3
	75	3.2	3.3	4.1	4.9	5.7	6.5	6.8	1.5	NP	NP	3.4	5.1	10.2	4.2	6.2	12.5	7.7	8.9	15.4
	100	3.2	3.3	4.1	4.9	5.7	6.5	6.8	1.5	NP	2.3	5.2	7.9	15.8	6.4	9.6	19.3	11.8	13.7	23.7
	125	3.2	3.3	4.1	4.9	5.7	6.5	6.8	1.5	NP	3.2	7.3	11.0	22.0	9.0	13.4	27.0	16.5	19.1	33.1
	150	3.2	3.3	4.1	4.9	5.7	6.5	6.8	1.5	NP	4.2	9.6	14.5	29.0	11.8	17.7	35.4	21.7	25.1	43.5
9.525 (0.375)	50	7.7	8.0	10.0	11.9	13.9	15.9	16.6	1.5	NP	NP	2.1	3.1	6.3	2.6	3.8	7.7	4.7	5.4	9.4
	75	7.7	8.0	10.0	11.9	13.9	15.9	16.6	1.8	NP	NP	4.2	6.3	12.5	5.1	7.6	15.3	9.4	10.8	18.8
	100	7.7	8.0	10.0	11.9	13.9	15.9	16.6	1.8	NP	2.8	6.4	9.7	19.3	7.9	11.8	23.6	14.5	16.7	29.0
	125	7.7	8.0	10.0	11.9	13.9	15.9	16.6	1.8	NP	3.9	9.0	13.5	27.0	11.0	16.5	33.0	20.2	23.4	40.5
	150	7.7	8.0	10.0	11.9	13.9	15.9	16.6	1.8	NP	5.1	11.8	17.7	35.5	14.5	21.6	43.4	26.6	30.7	53.2
12.7 (0.5)	50	14.0	14.5	18.1	21.7	25.4	29.0	30.1	1.6	NP	NP	2.3	3.4	6.8	2.8	4.2	8.4	5.1	5.9	10.3
	75	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.0	NP	NP	4.5	6.8	13.6	5.6	8.3	16.7	10.2	11.8	20.5
	100	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.1	NP	3.2	7.4	11.1	22.2	9.1	13.6	27.2	16.7	19.3	33.4
	125	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.1	NP	4.5	10.4	15.6	31.2	12.7	19.0	38.1	23.4	27.0	46.8
	150	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.1	NP	5.9	13.6	20.5	41.0	16.7	25.0	50.1	30.7	35.5	61.5
	175	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.1	2.6	7.5	17.1	25.8	51.6	21.1	31.5	63.2	38.7	44.7	77.5
	200	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.1	3.2	9.1	21.0	31.5	63.1	25.8	38.5	77.2	47.3	54.6	94.6

Table 12.6(A) continued from previous page

d_a mm (in)	h_{ef} mm	V_{sar} – shear strength of anchor (kN)							V_{cbr} – shear breakout (kN)[5, 6, 7, 8, 9]												
		f_{uta} – for design purpose[4] (MPa)							$h = h_{ef}$[10], c_{a1} = [11]						$h = 1.5h_{ef}$ c_{a1} = [11, 12]			$h = 2.25h_{ef}$ c_{a1} = [11, 12]		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$
15.875 (0.625)	75	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.1	NP	NP	4.8	7.3	14.6	6.0	8.9	17.8	10.9	12.6	21.9
	100	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.3	NP	3.4	7.9	11.9	23.8	9.7	14.5	29.1	17.8	20.6	35.7
	125	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.4	NP	5.0	11.5	17.4	34.7	14.2	21.2	42.5	26.1	30.1	52.1
	150	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.4	NP	6.6	15.2	22.9	45.8	18.7	27.9	56.0	34.4	39.7	68.7
	175	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.4	2.9	8.3	19.2	28.9	57.7	23.6	35.2	70.6	43.3	50.0	86.6
	200	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.4	3.6	10.2	23.4	35.3	70.5	28.8	43.0	86.3	52.9	61.1	105.8
	225	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.4	4.3	12.1	27.9	42.1	84.1	34.4	51.3	103.0	63.1	72.9	126.2
	250	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.4	5.0	14.2	32.7	49.3	98.5	40.2	60.1	120.6	73.9	85.4	147.9
19.05 (0.75)	100	33.0	34.1	42.6	51.1	59.7	68.2	70.9	2.4	NP	3.6	8.3	12.6	25.1	10.3	15.3	30.7	18.8	21.7	37.7
	125	33.0	34.1	42.6	51.1	59.7	68.2	70.9	2.5	NP	5.3	12.2	18.3	36.7	15.0	22.4	44.9	27.5	31.8	55.0
	150	33.0	34.1	42.6	51.1	59.7	68.2	70.9	2.6	NP	7.2	16.6	25.0	50.0	20.4	30.5	61.2	37.5	43.3	75.0
	175	33.0	34.1	42.6	51.1	59.7	68.2	70.9	2.6	3.2	9.1	21.0	31.6	63.2	25.8	38.6	77.4	47.4	54.8	94.9
	200	33.0	34.1	42.6	51.1	59.7	68.2	70.9	2.6	3.9	11.2	25.7	38.6	77.2	31.5	47.1	94.5	58.0	66.9	115.9
	225	33.0	34.1	42.6	51.1	59.7	68.2	70.9	2.6	4.7	13.3	30.6	46.1	92.2	37.6	56.2	112.8	69.2	79.9	138.3
	250	33.0	34.1	42.6	51.1	59.7	68.2	70.9	2.6	5.5	15.6	35.9	54.0	107.9	44.1	65.9	132.1	81.0	93.5	162.0
	300	33.0	34.1	42.6	51.1	59.7	68.2	70.9	2.6	7.2	20.5	47.1	71.0	141.9	58.0	86.6	173.7	106.5	122.9	212.9
22.225 (0.875)	100	45.6	47.2	58.9	70.7	82.5	94.3	98.0	2.5	NP	3.8	8.7	13.2	26.3	10.7	16.0	32.2	19.7	22.8	39.4
	150	45.6	47.2	58.9	70.7	82.5	94.3	98.0	2.7	NP	7.6	17.4	26.2	52.4	21.4	32.0	64.1	39.3	45.4	78.6
	200	45.6	47.2	58.9	70.7	82.5	94.3	98.0	2.8	4.3	12.0	27.7	41.7	83.4	34.1	50.9	102.1	62.6	72.3	125.2
	300	45.6	47.2	58.9	70.7	82.5	94.3	98.0	2.8	7.8	22.1	50.9	76.7	153.2	62.6	93.5	187.6	115.0	132.8	230.0
	375	45.6	47.2	58.9	70.7	82.5	94.3	98.0	2.8	10.9	30.9	71.2	107.1	214.2	87.5	130.7	262.1	160.7	185.6	321.4
	450	45.6	47.2	58.9	70.7	82.5	94.3	98.0	2.8	14.4	40.7	93.5	140.9	281.5	115.0	171.8	344.6	211.3	244.0	422.5
	625	45.6	47.2	58.9	70.7	82.5	94.3	98.0	2.8	23.5	66.6	153.1	230.5	460.8	188.2	281.3	564.1	345.8	399.3	691.5

Table 12.6(A) continued from previous page

d_a mm (in)	h_{ef} mm	V_{sar} – shear strength of anchor (kN)							V_{cbr} – shear breakout (kN)[5, 6, 7, 8, 9]												
		f_{uta} – for design purpose[4] (MPa)							$h = h_{ef}$[10], c_{a1} = [11]						$h = 1.5h_{ef}$ c_{a1} = [11, 12]			$h = 2.25h_{ef}$ c_{a1} = [11, 12]		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$
25.4 (1.0)	150	59.8	61.9	77.3	92.7	108.3	123.7	128.6	2.8	NP	7.9	18.1	27.3	54.5	22.3	33.3	66.7	40.9	47.2	81.8
	225	59.8	61.9	77.3	92.7	108.3	123.7	128.6	3.0	5.4	15.4	35.4	53.2	106.4	43.5	64.9	130.2	79.9	92.2	159.7
	300	59.8	61.9	77.3	92.7	108.3	123.7	128.6	3.0	8.4	23.7	54.4	82.0	163.8	66.9	100.0	200.5	122.9	142.0	245.9
	375	59.8	61.9	77.3	92.7	108.3	123.7	128.6	3.0	11.7	33.1	76.1	114.5	229.0	93.5	139.7	280.2	171.8	198.4	343.6
	450	59.8	61.9	77.3	92.7	108.3	123.7	128.6	3.0	15.4	43.5	100.0	150.6	301.0	122.9	183.7	368.4	225.9	260.8	451.7
	525	59.8	61.9	77.3	92.7	108.3	123.7	128.6	3.0	19.4	54.8	126.0	189.7	379.3	154.9	231.5	464.2	284.6	328.7	569.2
	625	59.8	61.9	77.3	92.7	108.3	123.7	128.6	3.0	25.2	71.1	163.7	246.5	492.6	201.2	300.7	603.0	369.7	426.9	739.3
29 (1.125)	150	75.3	78.0	97.3	116.7	136.3	155.7	161.9	2.9	NP	8.2	18.8	28.3	56.5	23.1	34.5	69.1	42.4	48.9	84.7
	225	75.3	78.0	97.3	116.7	136.3	155.7	161.9	3.2	5.7	16.2	37.4	56.3	112.5	46.0	68.7	137.7	84.4	97.5	168.8
	300	75.3	78.0	97.3	116.7	136.3	155.7	161.9	3.2	8.9	25.1	57.7	86.9	173.8	71.0	106.1	212.7	130.4	150.6	260.8
	375	75.3	78.0	97.3	116.7	136.3	155.7	161.9	3.2	12.4	35.1	80.7	121.5	242.8	99.2	148.2	297.2	182.2	210.4	364.4
	450	75.3	78.0	97.3	116.7	136.3	155.7	161.9	3.2	16.3	46.1	106.1	159.7	319.2	130.4	194.8	390.7	239.6	276.6	479.1
	525	75.3	78.0	97.3	116.7	136.3	155.7	161.9	3.2	20.5	58.1	133.7	201.3	402.3	164.3	245.5	492.4	301.9	348.6	603.7
	625	75.3	78.0	97.3	116.7	136.3	155.7	161.9	3.2	26.7	75.5	173.6	261.4	522.5	213.4	318.9	639.6	392.1	452.8	784.1
31.75 (1.25)	150	95.6	99.0	123.6	148.3	173.1	197.8	205.6	3.0	NP	8.4	19.4	29.2	58.3	23.8	35.6	71.3	43.7	50.5	87.5
	225	95.6	99.0	123.6	148.3	173.1	197.8	205.6	3.3	5.9	16.8	38.6	58.1	116.1	47.4	70.9	142.1	87.1	100.6	174.3
	300	95.6	99.0	123.6	148.3	173.1	197.8	205.6	3.4	9.4	26.5	60.9	91.6	183.2	74.8	111.8	224.2	137.5	158.7	274.9
	375	95.6	99.0	123.6	148.3	173.1	197.8	205.6	3.4	13.1	37.0	85.0	128.1	256.0	104.6	156.2	313.3	192.1	221.8	384.1
	450	95.6	99.0	123.6	148.3	173.1	197.8	205.6	3.4	17.2	48.6	111.8	168.3	336.5	137.5	205.4	411.9	252.5	291.6	505.0
	525	95.6	99.0	123.6	148.3	173.1	197.8	205.6	3.4	21.7	61.2	140.9	212.1	424.0	173.2	258.8	519.0	318.2	367.4	636.3
	625	95.6	99.0	123.6	148.3	173.1	197.8	205.6	3.4	28.1	79.5	183.0	275.6	550.8	225.0	336.2	674.2	413.3	477.3	826.5

Table 12.6(A) continued from previous page

d_a mm (in)	h_{ef} mm	V_{sar} – shear strength of anchor (kN)							V_{cbr} – shear breakout (kN)[5, 6, 7, 8, 9]												
		f_{uta} – for design purpose[4] (MPa)							$h = h_{ef}$[10], c_{a1} = [11]						$h = 1.5h_{ef}$ c_{a1} = [11, 12]			$h = 2.25h_{ef}$ c_{a1} = [11, 12]		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$
34.925 (1.375)	150	114.5	118.5	148.0	177.5	207.3	236.7	246.2	3.1	NP	8.7	19.9	30.0	60.0	24.5	36.6	73.4	45.0	52.0	90.0
	225	114.5	118.5	148.0	177.5	207.3	236.7	246.2	3.4	6.1	17.3	39.7	59.8	119.5	48.8	72.9	146.3	89.7	103.5	179.3
	300	114.5	118.5	148.0	177.5	207.3	236.7	246.2	3.5	9.8	27.7	63.8	96.1	192.1	78.5	117.3	235.1	144.2	166.5	288.3
	375	114.5	118.5	148.0	177.5	207.3	236.7	246.2	3.5	13.7	38.8	89.2	134.3	268.5	109.7	163.9	328.6	201.5	232.6	402.9
	450	114.5	118.5	148.0	177.5	207.3	236.7	246.2	3.5	18.0	51.0	117.3	176.6	352.9	144.2	215.4	432.0	264.8	305.8	529.6
	525	114.5	118.5	148.0	177.5	207.3	236.7	246.2	3.5	22.7	64.2	147.8	222.5	444.7	181.7	271.4	544.4	333.7	385.4	667.4
	625	114.5	118.5	148.0	177.5	207.3	236.7	246.2	3.5	29.5	83.4	191.9	289.0	577.7	236.0	352.6	707.1	433.5	500.6	866.9
38.1 (1.5)	300	139.2	144.1	179.9	215.7	251.9	287.8	299.2	3.7	10.2	28.9	66.5	100.1	200.0	81.7	122.1	244.8	150.1	173.3	300.2
	375	139.2	144.1	179.9	215.7	251.9	287.8	299.2	3.7	14.3	40.5	93.2	140.3	280.4	114.5	171.2	343.2	210.4	243.0	420.8
	450	139.2	144.1	179.9	215.7	251.9	287.8	299.2	3.7	18.8	53.2	122.5	184.4	368.6	150.6	225.0	451.2	276.6	319.4	553.2
	525	139.2	144.1	179.9	215.7	251.9	287.8	299.2	3.7	23.7	67.1	154.3	232.4	464.5	189.7	283.5	568.6	348.6	402.5	697.1
	625	139.2	144.1	179.9	215.7	251.9	287.8	299.2	3.7	30.8	87.1	200.5	301.9	603.3	246.5	368.3	738.5	452.8	522.8	905.4
44.45 (1.75)	300	187.5	194.1	242.4	290.7	339.5	387.8	403.2	3.9	10.7	30.3	69.6	104.8	209.5	85.6	127.9	256.4	157.2	181.5	314.4
	375	187.5	194.1	242.4	290.7	339.5	387.8	403.2	4.0	15.5	43.7	100.6	151.5	302.9	123.7	184.9	370.7	227.3	262.5	454.5
	450	187.5	194.1	242.4	290.7	339.5	387.8	403.2	4.0	20.3	57.5	132.3	199.2	398.1	162.6	243.0	487.3	298.8	345.0	597.5
	525	187.5	194.1	242.4	290.7	339.5	387.8	403.2	4.0	25.6	72.5	166.7	251.0	501.7	205.0	306.2	614.1	376.5	434.8	752.9
	625	187.5	194.1	242.4	290.7	339.5	387.8	403.2	4.0	33.3	94.1	216.5	326.0	651.7	266.2	397.8	797.7	489.1	564.7	978.0
50.8 (2.0)	300	246.8	255.4	319.0	382.5	446.7	510.2	530.6	4.0	11.1	31.5	72.4	109.1	218.0	89.1	133.1	266.9	163.6	188.9	327.2
	375	246.8	255.4	319.0	382.5	446.7	510.2	530.6	4.2	16.3	46.0	105.9	159.4	318.6	130.2	194.5	390.0	239.1	276.1	478.2
	450	246.8	255.4	319.0	382.5	446.7	510.2	530.6	4.3	21.7	61.5	141.4	212.9	425.6	173.9	259.8	521.0	319.4	368.8	638.7
	525	246.8	255.4	319.0	382.5	446.7	510.2	530.6	4.3	27.4	77.5	178.2	268.3	536.4	219.1	327.4	656.5	402.5	464.8	804.9
	625	246.8	255.4	319.0	382.5	446.7	510.2	530.6	4.3	35.6	100.6	231.5	348.6	696.7	284.6	425.2	852.8	522.8	603.7	1045.5

Table 12.6(B)
Factored resistance for single cast-in anchors subject to shear loads (f_c' = 30 MPa)[1, 2, 3, 5]

d_a mm (in)	h_{ef} mm	V_{sar} – shear strength of anchor (kN)							V_{cbr} – shear breakout (kN)[5, 6, 7, 8, 9]											
		f_{uta} – for design purpose[4] (MPa)							$h = h_{ef}$[10], c_{a1} = [11]						$h = 1.5h_{ef}$, c_{a1} = [11, 12]			$h = 2.25h_{ef}$ c_{a1} = [11, 12]		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$
6.35 (0.25)	50	3.2	3.3	4.1	4.9	5.7	6.5	6.8	1.6	NP	NP	2.3	3.4	6.8	2.8	4.2	8.3	5.1	5.9	10.2
	75	3.2	3.3	4.1	4.9	5.7	6.5	6.8	1.8	NP	NP	4.2	6.3	12.5	5.1	7.7	15.3	9.4	10.9	18.8
	100	3.2	3.3	4.1	4.9	5.7	6.5	6.8	1.8	NP	2.8	6.4	9.7	19.3	7.9	11.8	23.6	14.5	16.7	29.0
	125	3.2	3.3	4.1	4.9	5.7	6.5	6.8	1.8	NP	3.9	9.0	13.5	27.0	11.0	16.5	33.0	20.2	23.4	40.5
	150	3.2	3.3	4.1	4.9	5.7	6.5	6.8	1.8	NP	5.1	11.8	17.7	35.5	14.5	21.6	43.4	26.6	30.7	53.2
9.525 (0.375)	50	7.7	8.0	10.0	11.9	13.9	15.9	16.6	1.8	NP	NP	2.6	3.8	7.7	3.1	4.7	9.4	5.8	6.7	11.5
	75	7.7	8.0	10.0	11.9	13.9	15.9	16.6	2.3	NP	NP	5.1	7.7	15.3	6.3	9.3	18.7	11.5	13.3	23.0
	100	7.7	8.0	10.0	11.9	13.9	15.9	16.6	2.3	NP	3.4	7.9	11.8	23.6	9.7	14.4	28.9	17.7	20.5	35.5
	125	7.7	8.0	10.0	11.9	13.9	15.9	16.6	2.3	NP	4.8	11.0	16.5	33.0	13.5	20.2	40.5	24.8	28.6	49.6
	150	7.7	8.0	10.0	11.9	13.9	15.9	16.6	2.3	NP	6.3	14.4	21.7	43.4	17.7	26.5	53.2	32.6	37.6	65.2
12.7 (0.5)	50	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.0	NP	NP	2.8	4.2	8.4	3.4	5.1	10.3	6.3	7.3	12.6
	75	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.5	NP	NP	5.5	8.4	16.7	6.8	10.2	20.4	12.5	14.5	25.0
	100	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.6	NP	3.9	9.0	13.6	27.2	11.1	16.6	33.3	20.4	23.6	40.8
	125	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.6	NP	5.5	12.7	19.1	38.2	15.6	23.3	46.7	28.6	33.1	57.3
	150	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.6	NP	7.2	16.7	25.1	50.2	20.5	30.6	61.4	37.6	43.5	75.3
	175	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.6	3.2	9.1	21.0	31.6	63.2	25.8	38.6	77.4	47.4	54.8	94.9
	200	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.6	3.9	11.2	25.7	38.6	77.2	31.5	47.1	94.5	58.0	66.9	115.9

Table 12.6(B) continued from previous page

d_a mm (in)	h_{ef} mm	V_{sar} – shear strength of anchor (kN)							V_{cbr} – shear breakout (kN)[5, 6, 7, 8, 9]												
		f_{uta} – for design purpose[4] (MPa)							$h = h_{ef}$[10], c_{a1} = [11]						$h = 1.5h_{ef}$, c_{a1} = [11, 12]			$h = 2.25h_{ef}$ c_{a1} = [11, 12]		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$
15.875 (0.625)	75	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.6	NP	NP	5.9	8.9	17.8	7.3	10.9	21.8	13.4	15.5	26.8
	100	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.8	NP	4.2	9.7	14.6	29.1	11.9	17.8	35.6	21.8	25.2	43.7
	125	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.9	NP	6.1	14.1	21.3	42.5	17.4	26.0	52.1	31.9	36.9	63.8
	150	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.9	NP	8.1	18.6	28.1	56.1	22.9	34.2	68.6	42.1	48.6	84.2
	175	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.9	3.6	10.2	23.5	35.4	70.7	28.9	43.1	86.5	53.0	61.2	106.1
	200	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.9	4.4	12.5	28.7	43.2	86.3	35.3	52.7	105.7	64.8	74.8	129.6
	225	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.9	5.3	14.9	34.2	51.5	103.0	42.1	62.9	126.1	77.3	89.3	154.6
	250	22.3	23.1	28.8	34.6	40.4	46.1	48.0	2.9	6.2	17.4	40.1	60.4	120.7	49.3	73.7	147.7	90.6	104.6	181.1
19.05 (0.75)	100	33.0	34.1	42.6	51.1	59.7	68.2	70.9	2.9	NP	4.4	10.2	15.4	30.7	12.6	18.8	37.6	23.1	26.6	46.1
	125	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.1	NP	6.5	14.9	22.5	44.9	18.3	27.4	55.0	33.7	38.9	67.4
	150	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.2	NP	8.8	20.3	30.6	61.2	25.0	37.4	75.0	46.0	53.1	91.9
	175	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.2	4.0	11.2	25.7	38.7	77.4	31.6	47.3	94.8	58.1	67.1	116.2
	200	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.2	4.8	13.7	31.4	47.3	94.6	38.6	57.7	115.8	71.0	82.0	141.9
	225	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.2	5.8	16.3	37.5	56.5	112.9	46.1	68.9	138.1	84.7	97.8	169.4
	250	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.2	6.7	19.1	43.9	66.1	132.2	54.0	80.7	161.8	99.2	114.5	198.4
	300	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.2	8.9	25.1	57.7	86.9	173.8	71.0	106.1	212.7	130.4	150.6	260.8
22.225 (0.875)	100	45.6	47.2	58.9	70.7	82.5	94.3	98.0	3.1	NP	4.6	10.7	16.1	32.2	13.2	19.6	39.4	24.2	27.9	48.3
	150	45.6	47.2	58.9	70.7	82.5	94.3	98.0	3.3	NP	9.3	21.3	32.1	64.1	26.2	39.1	78.5	48.1	55.6	96.3
	200	45.6	47.2	58.9	70.7	82.5	94.3	98.0	3.5	5.2	14.8	33.9	51.1	102.2	41.7	62.4	125.1	76.7	88.5	153.3
	300	45.6	47.2	58.9	70.7	82.5	94.3	98.0	3.5	9.6	27.1	62.4	93.9	187.7	76.7	114.6	229.7	140.9	162.6	281.7
	375	45.6	47.2	58.9	70.7	82.5	94.3	98.0	3.5	13.4	37.9	87.1	131.2	262.3	107.1	160.1	321.1	196.8	227.3	393.6
	450	45.6	47.2	58.9	70.7	82.5	94.3	98.0	3.5	17.6	49.8	114.6	172.5	344.8	140.9	210.5	422.1	258.8	298.8	517.4
	625	45.6	47.2	58.9	70.7	82.5	94.3	98.0	3.5	28.8	81.5	187.5	282.4	564.4	230.5	344.5	690.8	423.5	489.1	847.0

Table 12.6(B) continued from previous page

d_a mm (in)	h_{ef} mm	V_{sar} – shear strength of anchor (kN)							V_{cbr} – shear breakout (kN)[5, 6, 7, 8, 9]											
		f_{uta} – for design purpose[4] (MPa)							$h = h_{ef}$[10], c_{a1} = [11]						$h = 1.5h_{ef}$, c_{a1} = [11, 12]			$h = 2.25h_{ef}$ c_{a1} = [11, 12]		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$
25.4 (1.0)	150	59.8	61.9	77.3	92.7	108.3	123.7	128.6	3.5	NP	9.6	22.2	33.4	66.8	27.3	40.7	81.7	50.1	57.9	100.2
	225	59.8	61.9	77.3	92.7	108.3	123.7	128.6	3.7	6.7	18.8	43.3	65.2	130.3	53.2	79.5	159.5	97.8	112.9	195.6
	300	59.8	61.9	77.3	92.7	108.3	123.7	128.6	3.7	10.2	29.0	66.7	100.4	200.6	82.0	122.5	245.6	150.6	173.9	301.1
	375	59.8	61.9	77.3	92.7	108.3	123.7	128.6	3.7	14.3	40.5	93.2	140.3	280.4	114.5	171.2	343.2	210.4	243.0	420.8
	450	59.8	61.9	77.3	92.7	108.3	123.7	128.6	3.7	18.8	53.2	122.5	184.4	368.6	150.6	225.0	451.2	276.6	319.4	553.2
	525	59.8	61.9	77.3	92.7	108.3	123.7	128.6	3.7	23.7	67.1	154.3	232.4	464.5	189.7	283.5	568.6	348.6	402.5	697.1
	625	59.8	61.9	77.3	92.7	108.3	123.7	128.6	3.7	30.8	87.1	200.5	301.9	603.3	246.5	368.3	738.5	452.8	522.8	905.4
29 (1.125)	150	75.3	78.0	97.3	116.7	136.3	155.7	161.9	3.6	NP	10.0	23.0	34.6	69.2	28.3	42.2	84.7	51.9	59.9	103.8
	225	75.3	78.0	97.3	116.7	136.3	155.7	161.9	3.9	7.0	19.9	45.8	68.9	137.8	56.3	84.1	168.7	103.4	119.4	206.8
	300	75.3	78.0	97.3	116.7	136.3	155.7	161.9	3.9	10.9	30.7	70.7	106.5	212.8	86.9	129.9	260.5	159.7	184.4	319.4
	375	75.3	78.0	97.3	116.7	136.3	155.7	161.9	3.9	15.2	43.0	98.8	148.8	297.4	121.5	181.5	364.1	223.2	257.7	446.3
	450	75.3	78.0	97.3	116.7	136.3	155.7	161.9	3.9	20.0	56.5	129.9	195.6	391.0	159.7	238.6	478.6	293.4	338.8	586.7
	525	75.3	78.0	97.3	116.7	136.3	155.7	161.9	3.9	25.2	71.2	163.7	246.5	492.7	201.3	300.7	603.1	369.7	426.9	739.4
	625	75.3	78.0	97.3	116.7	136.3	155.7	161.9	3.9	32.7	92.4	212.6	320.2	639.9	261.4	390.6	783.3	480.3	554.5	960.4
31.75 (1.25)	150	95.6	99.0	123.6	148.3	173.1	197.8	205.6	3.7	NP	10.3	23.7	35.7	71.4	29.2	43.6	87.4	53.6	61.9	107.1
	225	95.6	99.0	123.6	148.3	173.1	197.8	205.6	4.0	7.3	20.5	47.3	71.2	142.2	58.1	86.8	174.1	106.7	123.2	213.4
	300	95.6	99.0	123.6	148.3	173.1	197.8	205.6	4.1	11.5	32.4	74.5	112.2	224.3	91.6	136.9	274.6	168.3	194.4	336.6
	375	95.6	99.0	123.6	148.3	173.1	197.8	205.6	4.1	16.0	45.3	104.2	156.8	313.5	128.1	191.4	383.7	235.3	271.7	470.5
	450	95.6	99.0	123.6	148.3	173.1	197.8	205.6	4.1	21.0	59.5	136.9	206.2	412.1	168.3	251.5	504.4	309.3	357.1	618.5
	525	95.6	99.0	123.6	148.3	173.1	197.8	205.6	4.1	26.5	75.0	172.5	259.8	519.3	212.1	317.0	635.7	389.7	450.0	779.3
	625	95.6	99.0	123.6	148.3	173.1	197.8	205.6	4.1	34.4	97.4	224.1	337.5	674.6	275.6	411.7	825.7	506.2	584.5	1012.3

Table 12.6(B) continued from previous page

d_a mm (in)	h_{ef} mm	V_{sar} – shear strength of anchor (kN)							V_{cbr} – shear breakout (kN)[5, 6, 7, 8, 9]											
		f_{uta} – for design purpose[4] (MPa)							$h = h_{ef}$[10], c_{a1} = [11]						$h = 1.5h_{ef}$, c_{a1} = [11, 12]			$h = 2.25h_{ef}$ c_{a1} = [11, 12]		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$
34.925 (1.375)	150	114.5	118.5	148.0	177.5	207.3	236.7	246.2	3.8	NP	10.6	24.4	36.7	73.5	30.0	44.8	89.9	55.1	63.7	110.2
	225	114.5	118.5	148.0	177.5	207.3	236.7	246.2	4.1	7.5	21.1	48.6	73.2	146.3	59.8	89.3	179.1	109.8	126.8	219.6
	300	114.5	118.5	148.0	177.5	207.3	236.7	246.2	4.3	12.0	34.0	78.2	117.7	235.3	96.1	143.6	288.0	176.6	203.9	353.1
	375	114.5	118.5	148.0	177.5	207.3	236.7	246.2	4.3	16.8	47.5	109.2	164.5	328.8	134.3	200.7	402.5	246.8	284.9	493.4
	450	114.5	118.5	148.0	177.5	207.3	236.7	246.2	4.3	22.1	62.4	143.6	216.2	432.2	176.6	263.8	529.1	324.4	374.6	648.6
	525	114.5	118.5	148.0	177.5	207.3	236.7	246.2	4.3	27.8	78.7	181.0	272.5	544.7	222.5	332.5	666.7	408.8	472.0	817.4
	625	114.5	118.5	148.0	177.5	207.3	236.7	246.2	4.3	36.1	102.2	235.1	354.0	707.5	289.0	431.8	866.0	530.9	613.1	1061.7
38.1 (1.5)	300	139.2	144.1	179.9	215.7	251.9	287.8	299.2	4.5	12.5	35.4	81.4	122.6	245.0	100.1	149.5	299.8	183.8	212.3	367.6
	375	139.2	144.1	179.9	215.7	251.9	287.8	299.2	4.5	17.5	49.6	114.1	171.8	343.4	140.3	209.6	420.4	257.7	297.6	515.4
	450	139.2	144.1	179.9	215.7	251.9	287.8	299.2	4.5	23.1	65.2	150.0	225.9	451.4	184.4	275.6	552.6	338.8	391.2	677.5
	525	139.2	144.1	179.9	215.7	251.9	287.8	299.2	4.5	29.0	82.2	189.0	284.6	568.9	232.4	347.2	696.4	426.9	493.0	853.7
	625	139.2	144.1	179.9	215.7	251.9	287.8	299.2	4.5	37.7	106.7	245.5	369.7	738.9	301.9	451.0	904.5	554.5	640.3	1108.9
44.45 (1.75)	300	187.5	194.1	242.4	290.7	339.5	387.8	403.2	4.7	13.1	37.1	85.2	128.4	256.6	104.8	156.6	314.0	192.5	222.3	385.0
	375	187.5	194.1	242.4	290.7	339.5	387.8	403.2	4.9	18.9	53.6	123.2	185.6	370.9	151.5	226.4	454.1	278.4	321.4	556.7
	450	187.5	194.1	242.4	290.7	339.5	387.8	403.2	4.9	24.9	70.4	162.0	244.0	487.6	199.2	297.6	596.9	365.9	422.6	731.8
	525	187.5	194.1	242.4	290.7	339.5	387.8	403.2	4.9	31.4	88.7	204.2	307.4	614.5	251.0	375.1	752.1	461.1	532.5	922.1
	625	187.5	194.1	242.4	290.7	339.5	387.8	403.2	4.9	40.8	115.3	265.2	399.3	798.1	326.0	487.2	977.0	599.0	691.6	1197.8
50.8 (2.0)	300	246.8	255.4	319.0	382.5	446.7	510.2	530.6	4.9	13.6	38.6	88.7	133.6	267.0	109.1	163.0	326.9	200.4	231.4	400.7
	375	246.8	255.4	319.0	382.5	446.7	510.2	530.6	5.1	19.9	56.4	129.7	195.2	390.2	159.4	238.2	477.7	292.9	338.2	585.6
	450	246.8	255.4	319.0	382.5	446.7	510.2	530.6	5.2	26.6	75.3	173.2	260.8	521.3	212.9	318.2	638.1	391.2	451.7	782.3
	525	246.8	255.4	319.0	382.5	446.7	510.2	530.6	5.2	33.5	94.9	218.3	328.7	656.9	268.3	401.0	804.1	493.0	569.2	985.8
	625	246.8	255.4	319.0	382.5	446.7	510.2	530.6	5.2	43.6	123.2	283.5	426.9	853.3	348.6	520.8	1044.4	640.3	739.4	1280.5

Table 12.6(C)
Factored resistance for single cast-in anchors subject to shear loads (f_c' = 40 MPa)[1, 2, 3, 5]

d_a mm (in)	h_{ef} mm	V_{sgr} – shear strength of anchor (kN)							V_{cbr} – shear breakout (kN)[5, 6, 7, 8, 9]											
		f_{uta} – for design purpose[4] (MPa)							$h = h_{ef}$[10], c_{a1} = [11]						$h = 1.5h_{ef}$, c_{a1} = [11, 12]			$h = 2.25h_{ef}$ c_{a1} = [11, 12]		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$
6.35 (0.25)	50	3.2	3.3	4.1	4.9	5.7	6.5	6.8	1.9	NP	NP	2.6	3.9	7.9	3.2	4.8	9.6	5.9	6.8	11.8
	75	3.2	3.3	4.1	4.9	5.7	6.5	6.8	2.1	NP	NP	4.8	7.2	14.5	5.9	8.8	17.7	10.9	12.5	21.7
	100	3.2	3.3	4.1	4.9	5.7	6.5	6.8	2.1	NP	3.2	7.4	11.2	22.3	9.1	13.6	27.3	16.7	19.3	33.5
	125	3.2	3.3	4.1	4.9	5.7	6.5	6.8	2.1	NP	4.5	10.4	15.6	31.2	12.7	19.0	38.1	23.4	27.0	46.8
	150	3.2	3.3	4.1	4.9	5.7	6.5	6.8	2.1	NP	5.9	13.6	20.5	41.0	16.7	25.0	50.1	30.7	35.5	61.5
9.525 (0.375)	50	7.7	8.0	10.0	11.9	13.9	15.9	16.6	2.1	NP	NP	2.9	4.4	8.9	3.6	5.4	10.9	6.7	7.7	13.3
	75	7.7	8.0	10.0	11.9	13.9	15.9	16.6	2.6	NP	NP	5.9	8.8	17.7	7.2	10.8	21.6	13.3	15.3	26.5
	100	7.7	8.0	10.0	11.9	13.9	15.9	16.6	2.6	NP	3.9	9.1	13.7	27.3	11.2	16.7	33.4	20.5	23.7	41.0
	125	7.7	8.0	10.0	11.9	13.9	15.9	16.6	2.6	NP	5.5	12.7	19.1	38.2	15.6	23.3	46.7	28.6	33.1	57.3
	150	7.7	8.0	10.0	11.9	13.9	15.9	16.6	2.6	NP	7.2	16.7	25.1	50.2	20.5	30.6	61.4	37.6	43.5	75.3
12.7 (0.5)	50	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.3	NP	NP	3.2	4.8	9.7	4.0	5.9	11.8	7.3	8.4	14.5
	75	14.0	14.5	18.1	21.7	25.4	29.0	30.1	2.8	NP	NP	6.4	9.6	19.3	7.9	11.8	23.6	14.5	16.7	28.9
	100	14.0	14.5	18.1	21.7	25.4	29.0	30.1	3.0	NP	4.5	10.4	15.7	31.4	12.8	19.2	38.5	23.6	27.2	47.2
	125	14.0	14.5	18.1	21.7	25.4	29.0	30.1	3.0	NP	6.4	14.6	22.0	44.1	18.0	26.9	53.9	33.1	38.2	66.1
	150	14.0	14.5	18.1	21.7	25.4	29.0	30.1	3.0	NP	8.4	19.2	29.0	57.9	23.7	35.4	70.9	43.5	50.2	86.9
	175	14.0	14.5	18.1	21.7	25.4	29.0	30.1	3.0	3.7	10.5	24.3	36.5	73.0	29.8	44.6	89.3	54.8	63.2	109.5
	200	14.0	14.5	18.1	21.7	25.4	29.0	30.1	3.0	4.6	12.9	29.6	44.6	89.2	36.4	54.4	109.2	66.9	77.3	133.8

Table 12.6(C) continued from previous page

d_a mm (in)	h_{ef} mm	V_{sar} – shear strength of anchor (kN)							V_{cbr} – shear breakout (kN)[5, 6, 7, 8, 9]											
		f_{uta} – for design purpose[4] (MPa)							$h = h_{ef}$[10], c_{a1} = [11]						$h = 1.5h_{ef}$, c_{a1} = [11, 12]			$h = 2.25h_{ef}$ c_{a1} = [11, 12]		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$
15.875 (0.625)	75	22.3	23.1	28.8	34.6	40.4	46.1	48.0	3.0	NP	NP	6.8	10.3	20.6	8.4	12.6	25.2	15.5	17.9	30.9
	100	22.3	23.1	28.8	34.6	40.4	46.1	48.0	3.2	NP	4.9	11.2	16.8	33.6	13.7	20.5	41.1	25.2	29.1	50.4
	125	22.3	23.1	28.8	34.6	40.4	46.1	48.0	3.4	NP	7.1	16.3	24.6	49.1	20.1	30.0	60.1	36.9	42.6	73.7
	150	22.3	23.1	28.8	34.6	40.4	46.1	48.0	3.4	NP	9.4	21.5	32.4	64.8	26.5	39.5	79.3	48.6	56.1	97.2
	175	22.3	23.1	28.8	34.6	40.4	46.1	48.0	3.4	4.2	11.8	27.1	40.8	81.6	33.3	49.8	99.9	61.2	70.7	122.5
	200	22.3	23.1	28.8	34.6	40.4	46.1	48.0	3.4	5.1	14.4	33.1	49.9	99.7	40.7	60.9	122.0	74.8	86.4	149.6
	225	22.3	23.1	28.8	34.6	40.4	46.1	48.0	3.4	6.1	17.2	39.5	59.5	119.0	48.6	72.6	145.6	89.3	103.1	178.5
	250	22.3	23.1	28.8	34.6	40.4	46.1	48.0	3.4	7.1	20.1	46.3	69.7	139.3	56.9	85.0	170.6	104.6	120.7	209.1
19.05 (0.75)	100	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.4	NP	5.1	11.8	17.8	35.5	14.5	21.7	43.4	26.6	30.8	53.3
	125	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.6	NP	7.5	17.2	25.9	51.9	21.2	31.7	63.5	38.9	44.9	77.8
	150	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.7	NP	10.2	23.5	35.4	70.7	28.9	43.2	86.6	53.1	61.3	106.1
	175	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.7	4.6	12.9	29.7	44.7	89.4	36.5	54.6	109.4	67.1	77.5	134.2
	200	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.7	5.6	15.8	36.3	54.6	109.2	44.6	66.7	133.7	82.0	94.6	163.9
	225	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.7	6.7	18.8	43.3	65.2	130.3	53.2	79.5	159.5	97.8	112.9	195.6
	250	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.7	7.8	22.0	50.7	76.4	152.6	62.4	93.2	186.8	114.5	132.3	229.1
	300	33.0	34.1	42.6	51.1	59.7	68.2	70.9	3.7	10.2	29.0	66.7	100.4	200.6	82.0	122.5	245.6	150.6	173.9	301.1
22.225 (0.875)	100	45.6	47.2	58.9	70.7	82.5	94.3	98.0	3.6	NP	5.4	12.4	18.6	37.2	15.2	22.7	45.5	27.9	32.2	55.8
	150	45.6	47.2	58.9	70.7	82.5	94.3	98.0	3.9	NP	10.7	24.6	37.1	74.1	30.3	45.2	90.7	55.6	64.2	111.1
	200	45.6	47.2	58.9	70.7	82.5	94.3	98.0	4.0	6.0	17.0	39.2	59.0	118.0	48.2	72.0	144.4	88.5	102.2	177.0
	300	45.6	47.2	58.9	70.7	82.5	94.3	98.0	4.0	11.1	31.3	72.0	108.4	216.7	88.5	132.3	265.3	162.6	187.8	325.2
	375	45.6	47.2	58.9	70.7	82.5	94.3	98.0	4.0	15.5	43.7	100.6	151.5	302.9	123.7	184.9	370.7	227.3	262.5	454.5
	450	45.6	47.2	58.9	70.7	82.5	94.3	98.0	4.0	20.3	57.5	132.3	199.2	398.1	162.6	243.0	487.3	298.8	345.0	597.5
	625	45.6	47.2	58.9	70.7	82.5	94.3	98.0	4.0	33.3	94.1	216.5	326.0	651.7	266.2	397.8	797.7	489.1	564.7	978.0

Table 12.6(C) continued from previous page

d_a mm (in)	h_{ef} mm	V_{sar} – shear strength of anchor (kN)							V_{cbr} – shear breakout (kN)[5, 6, 7, 8, 9]											
		f_{uta} – for design purpose[4] (MPa)							$h = h_{ef}$[10], c_{a1} = [11]						$h = 1.5h_{ef}$, c_{a1} = [11, 12]			$h = 2.25h_{ef}$ c_{a1} = [11, 12]		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$
25.4 (1.0)	150	59.8	61.9	77.3	92.7	108.3	123.7	128.6	4.0	NP	11.1	25.6	38.6	77.1	31.5	47.1	94.4	57.9	66.8	115.7
	225	59.8	61.9	77.3	92.7	108.3	123.7	128.6	4.3	7.7	21.7	50.0	75.3	150.5	61.5	91.9	184.2	112.9	130.4	225.8
	300	59.8	61.9	77.3	92.7	108.3	123.7	128.6	4.3	11.8	33.5	77.0	115.9	231.7	94.6	141.4	283.6	173.9	200.8	347.7
	375	59.8	61.9	77.3	92.7	108.3	123.7	128.6	4.3	16.5	46.8	107.6	162.0	323.8	132.3	197.6	396.3	243.0	280.6	485.9
	450	59.8	61.9	77.3	92.7	108.3	123.7	128.6	4.3	21.7	61.5	141.4	212.9	425.6	173.9	259.8	521.0	319.4	368.8	638.7
	525	59.8	61.9	77.3	92.7	108.3	123.7	128.6	4.3	27.4	77.5	178.2	268.3	536.4	219.1	327.4	656.5	402.5	464.8	804.9
	625	59.8	61.9	77.3	92.7	108.3	123.7	128.6	4.3	35.6	100.6	231.5	348.6	696.7	284.6	425.2	852.8	522.8	603.7	1045.5
29 (1.125)	150	75.3	78.0	97.3	116.7	136.3	155.7	161.9	4.2	NP	11.5	26.5	40.0	79.9	32.6	48.7	97.8	59.9	69.2	119.8
	225	75.3	78.0	97.3	116.7	136.3	155.7	161.9	4.5	8.1	23.0	52.9	79.6	159.1	65.0	97.1	194.8	119.4	137.9	238.8
	300	75.3	78.0	97.3	116.7	136.3	155.7	161.9	4.5	12.5	35.5	81.6	122.9	245.7	100.4	150.0	300.8	184.4	212.9	368.8
	375	75.3	78.0	97.3	116.7	136.3	155.7	161.9	4.5	17.5	49.6	114.1	171.8	343.4	140.3	209.6	420.4	257.7	297.6	515.4
	450	75.3	78.0	97.3	116.7	136.3	155.7	161.9	4.5	23.1	65.2	150.0	225.9	451.4	184.4	275.6	552.6	338.8	391.2	677.5
	525	75.3	78.0	97.3	116.7	136.3	155.7	161.9	4.5	29.0	82.2	189.0	284.6	568.9	232.4	347.2	696.4	426.9	493.0	853.7
	625	75.3	78.0	97.3	116.7	136.3	155.7	161.9	4.5	37.7	106.7	245.5	369.7	738.9	301.9	451.0	904.5	554.5	640.3	1108.9
31.75 (1.25)	150	95.6	99.0	123.6	148.3	173.1	197.8	205.6	4.3	NP	11.9	27.4	41.2	82.4	33.7	50.3	100.9	61.9	71.4	123.7
	225	95.6	99.0	123.6	148.3	173.1	197.8	205.6	4.7	8.4	23.7	54.6	82.2	164.2	67.1	100.2	201.0	123.2	142.3	246.4
	300	95.6	99.0	123.6	148.3	173.1	197.8	205.6	4.8	13.2	37.4	86.1	129.6	259.0	105.8	158.1	317.1	194.4	224.5	388.7
	375	95.6	99.0	123.6	148.3	173.1	197.8	205.6	4.8	18.5	52.3	120.3	181.1	362.0	147.9	221.0	443.1	271.7	313.7	543.3
	450	95.6	99.0	123.6	148.3	173.1	197.8	205.6	4.8	24.3	68.7	158.1	238.1	475.9	194.4	290.5	582.5	357.1	412.4	714.1
	525	95.6	99.0	123.6	148.3	173.1	197.8	205.6	4.8	30.6	86.6	199.2	300.0	599.7	245.0	366.0	734.0	450.0	519.6	899.9
	625	95.6	99.0	123.6	148.3	173.1	197.8	205.6	4.8	39.8	112.5	258.8	389.7	778.9	318.2	475.4	953.4	584.5	675.0	1168.9

Table 12.6(C) continued from previous page

d_a mm (in)	h_{ef} mm	V_{sar} – shear strength of anchor (kN)							V_{cbr} – shear breakout (kN)[5, 6, 7, 8, 9]											
		f_{uta} – for design purpose[4] (MPa)							$h = h_{ef}$[10], c_{a1} = [11]						$h = 1.5h_{ef}$, c_{a1} = [11, 12]			$h = 2.25h_{ef}$ c_{a1} = [11, 12]		
		400	414	517	620	724	827	860	38 mm cover	$0.25h_{ef}$	$0.5h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$	h_{ef}	$1.5h_{ef}$	$3h_{ef}$
34.925 (1.375)	150	114.5	118.5	148.0	177.5	207.3	236.7	246.2	4.4	NP	12.2	28.2	42.4	84.8	34.6	51.8	103.8	63.7	73.5	127.3
	225	114.5	118.5	148.0	177.5	207.3	236.7	246.2	4.8	8.6	24.4	56.1	84.5	169.0	69.0	103.1	206.8	126.8	146.4	253.6
	300	114.5	118.5	148.0	177.5	207.3	236.7	246.2	5.0	13.9	39.2	90.3	135.9	271.7	111.0	165.8	332.5	203.9	235.4	407.7
	375	114.5	118.5	148.0	177.5	207.3	236.7	246.2	5.0	19.4	54.8	126.1	190.0	379.7	155.1	231.7	464.7	284.9	329.0	569.8
	450	114.5	118.5	148.0	177.5	207.3	236.7	246.2	5.0	25.5	72.1	165.8	249.7	499.1	203.9	304.6	610.9	374.6	432.5	749.0
	525	114.5	118.5	148.0	177.5	207.3	236.7	246.2	5.0	32.1	90.8	209.0	314.7	628.9	256.9	383.9	769.8	472.0	545.0	943.8
	625	114.5	118.5	148.0	177.5	207.3	236.7	246.2	5.0	41.7	118.0	271.4	408.7	816.9	333.7	498.6	1000.0	613.1	707.9	1226.0
38.1 (1.5)	300	139.2	144.1	179.9	215.7	251.9	287.8	299.2	5.2	14.4	40.9	94.0	141.5	282.9	115.5	172.6	346.2	212.3	245.1	424.5
	375	139.2	144.1	179.9	215.7	251.9	287.8	299.2	5.2	20.2	57.3	131.8	198.4	396.6	162.0	242.0	485.4	297.6	343.6	595.1
	450	139.2	144.1	179.9	215.7	251.9	287.8	299.2	5.2	26.6	75.3	173.2	260.8	521.3	212.9	318.2	638.1	391.2	451.7	782.3
	525	139.2	144.1	179.9	215.7	251.9	287.8	299.2	5.2	33.5	94.9	218.3	328.7	656.9	268.3	401.0	804.1	493.0	569.2	985.8
	625	139.2	144.1	179.9	215.7	251.9	287.8	299.2	5.2	43.6	123.2	283.5	426.9	853.3	348.6	520.8	1044.4	640.3	739.4	1280.5
44.45 (1.75)	300	187.5	194.1	242.4	290.7	339.5	387.8	403.2	5.5	15.1	42.8	98.4	148.2	296.2	121.0	180.8	362.6	222.3	256.7	444.6
	375	187.5	194.1	242.4	290.7	339.5	387.8	403.2	5.6	21.9	61.9	142.3	214.3	428.3	175.0	261.4	524.3	321.4	371.2	642.8
	450	187.5	194.1	242.4	290.7	339.5	387.8	403.2	5.6	28.8	81.3	187.1	281.7	563.1	230.0	343.7	689.2	422.6	487.9	845.0
	525	187.5	194.1	242.4	290.7	339.5	387.8	403.2	5.6	36.2	102.5	235.7	355.0	709.5	289.8	433.1	868.5	532.5	614.9	1064.8
	625	187.5	194.1	242.4	290.7	339.5	387.8	403.2	5.6	47.1	133.1	306.2	461.1	921.6	376.5	562.5	1128.1	691.6	798.6	1383.1
50.8 (2.0)	300	246.8	255.4	319.0	382.5	446.7	510.2	530.6	5.7	15.7	44.5	102.4	154.3	308.3	126.0	188.2	377.4	231.4	267.2	462.7
	375	246.8	255.4	319.0	382.5	446.7	510.2	530.6	5.9	23.0	65.1	149.7	225.4	450.6	184.1	275.0	551.6	338.2	390.5	676.2
	450	246.8	255.4	319.0	382.5	446.7	510.2	530.6	6.0	30.7	86.9	200.0	301.2	601.9	245.9	367.4	736.8	451.7	521.6	903.3
	525	246.8	255.4	319.0	382.5	446.7	510.2	530.6	6.0	38.7	109.6	252.0	379.5	758.5	309.9	463.0	928.5	569.2	657.3	1138.3
	625	246.8	255.4	319.0	382.5	446.7	510.2	530.6	6.0	50.3	142.3	327.3	492.9	985.3	402.5	601.4	1206.0	739.4	853.8	1478.6