

Concrete Design Handbook – 4th Edition

CHAPTER 1: 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.

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Chapter 1: Additional Design Aids
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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										
a	r			M _{AB} = M _{BA}	0.1	0.3	0.5	0.7	0.9	M _{AB}	M _{BA}	M _{AB}	M _{BA}	M _{AB}	
0.1	0.4	0.583	5.49	0.0921	0.0905	0.0053	0.1727	0.0806	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. $\times wL^2$	Concentrated Load F.E.M. — Coef. $\times PL$									
				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. $\times WL^2$	
	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

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

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

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

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

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