Table 2.9 Modification factor K_{12} for compression members (BS 5268 Part 2 1988 Table 22)

$E/\sigma_{c,\|}$	Values of slenderness ratio $\lambda(=L_e/i)$																			
	<5	5	10	20	30	40	50	60	70	80	90	100	120	140	160	180	200	220	240	250
	Equivalent L_e/b (for rectangular sections)																			
	<1.4	1.4	2.9	5.8	8.7	11.6	14.5	17.3	20.2	23.1	26.0	28.9	34.7	40.5	46.2	52.0	57.8	63.6	69.4	72.3
400	1.000	0.975	0.951	0.896	0.827	0.735	0.621	0.506	0.408	0.330	0.271	0.225	0.162	0.121	0.094	0.075	0.061	0.051	0.043	0.040
500	1.000	0.975	0.951	0.899	0.837	0.759	0.664	0.562	0.466	0.385	0.320	0.269	0.195	0.148	0.115	0.092	0.076	0.063	0.053	0.049
600	1.000	0.975	0.951	0.901	0.843	0.774	0.692	0.601	0.511	0.430	0.363	0.307	0.226	0.172	0.135	0.109	0.089	0.074	0.063	0.058
700	1.000	0.975	0.951	0.902	0.848	0.784	0.711	0.629	0.545	0.467	0.399	0.341	0.254	0.195	0.154	0.124	0.102	0.085	0.072	0.067
800	1.000	0.975	0.952	0.903	0.851	0.792	0.724	0.649	0.572	0.497	0.430	0.371	0.280	0.217	0.172	0.139	0.115	0.096	0.082	0.076
900	1.000	0.976	0.952	0.904	0.853	0.797	0.734	0.665	0.593	0.522	0.456	0.397	0.304	0.237	0.188	0.153	0.127	0.106	0.091	0.084
1000	1.000	0.976	0.952	0.904	0.855	0.801	0.742	0.677	0.609	0.542	0.478	0.420	0.325	0.255	0.204	0.167	0.138	0.116	0.099	0.092
1100	1.000	0.976	0.952	0.905	0.856	0.804	0.748	0.687	0.623	0.559	0.497	0.440	0.344	0.272	0.219	0.179	0.149	0.126	0.107	0.100
1200	1.000	0.976	0.952	0.905	0.857	0.807	0.753	0.695	0.634	0.573	0.513	0.457	0.362	0.288	0.233	0.192	0.160	0.135	0.116	0.107
1300	1.000	0.976	0.952	0.905	0.858	0.809	0.757	0.701	0.643	0.584	0.527	0.472	0.378	0.303	0.247	0.203	0.170	0.144	0.123	0.115
1400	1.000	0.976	0.952	0.906	0.859	0.811	0.760	0.707	0.651	0.595	0.539	0.486	0.392	0.317	0.259	0.214	0.180	0.153	0.131	0.122
1500	1.000	0.976	0.952	0.906	0.860	0.813	0.763	0.712	0.658	0.603	0.550	0.498	0.405	0.330	0.271	0.225	0.189	0.161	0.138	0.129
1600	1.000	0.976	0.952	0.906	0.861	0.814	0.766	0.716	0.664	0.611	0.559	0.508	0.417	0.342	0.282	0.235	0.198	0.169	0.145	0.135
1700	1.000	0.976	0.952	0.906	0.861	0.815	0.768	0.719	0.669	0.618	0.567	0.518	0.428	0.353	0.292	0.245	0.207	0.177	0.152	0.142
1800	1.000	0.976	0.952	0.906	0.862	0.816	0.770	0.722	0.673	0.624	0.574	0.526	0.438	0.363	0.302	0.254	0.215	0.184	0.159	0.148
1900	1.000	0.976	0.952	0.907	0.862	0.817	0.772	0.725	0.677	0.629	0.581	0.534	0.447	0.373	0.312	0.262	0.223	0.191	0.165	0.154
2000	1.000	0.976	0.952	0.907	0.863	0.818	0.773	0.728	0.681	0.634	0.587	0.541	0.455	0.382	0.320	0.271	0.230	0.198	0.172	0.160

2.14.4 Slenderness ratio λ

The slenderness ratio of posts is given by the following general expression:

$$\lambda = \frac{\text{effective length}}{\text{least radius of gyration}} = \frac{L_e}{i}$$

For rectangular or square sections it may also be obtained from the following expression:

$$\lambda = \frac{\text{effective length}}{\text{least lateral dimension}} = \frac{L_e}{b}$$

The maximum slenderness ratio for members carrying dead and imposed loads is limited to either $L_e/i = 180$ or $L_e/b = 52$. Values greater than these limits indicate that a larger section is required.

Guidance on the effective length to be adopted, taking end restraint into consideration, is given in BS 5268 Table 21, reproduced here as Table 2.10.

2.14.5 Ratio of modulus of elasticity to compression stress

The ratio of modulus of elasticity to compression stress $E/\sigma_{c,par}$ must also be calculated to obtain K_{12} from Table 2.9. Here E is E_{min} for the timber grade, and $\sigma_{c,par}$ is $\sigma_{c,g,par}$ × load duration factor K_3. Hence

$$\text{Ratio} = \frac{E_{min}}{\sigma_{c,g,par} K_3}$$

Table 2.10 Effective length of compression members (BS 5268 Part 2 1988 Table 21)

End conditions	Effective length / Actual length L_e/L
Restrained at both ends in position and in direction	0.7
Restrained at both ends in position and one end in direction	0.85
Restrained at both ends in position but not in direction	1.0
Restrained at one end in position and in direction and at the other end in direction but not in position	1.5
Restrained at one end in position and in direction and free at the other end	2.0

2.14.6 Eccentrically loaded posts

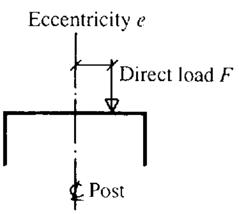

Figure 2.6 *Eccentrically loaded post*

In situations where the direct load is applied eccentrically, as shown in Figure 2.6, a bending moment will be induced equal to the applied load multiplied by the eccentricity:

$$\text{Eccentricity moment } M_e = Fe$$

The effect of this moment should be checked by ensuring first that the applied bending stress $\sigma_{m,a}$ is less than the permissible bending stress $\sigma_{m,adm}$, and then that the interaction quantity given by the following formula is less than unity:

$$\text{Interaction quantity} = \frac{\sigma_{m,a,par}}{\sigma_{m,adm,par}(1 - 1.5\sigma_{c,a,par}K_{12}/\sigma_e)} + \frac{\sigma_{c,a,par}}{\sigma_{c,adm,par}} \leqslant 1$$

where

$\sigma_{m,a,par}$ applied bending stress parallel to grain
$\sigma_{m,adm,par}$ permissible bending stress parallel to grain
σ_e Euler critical stress $= \pi^2 E_{min}/(L_e/i)^2$
$\sigma_{c,a,par}$ applied compression stress parallel to grain
$\sigma_{c,adm,par}$ permissible compression stress parallel to grain (including K_{12} factor)

2.14.7 Design summary for timber posts

The design procedure for axially loaded timber posts may be summarized as follows:

(a) Determine the effective length L_e dependent on end fixity.