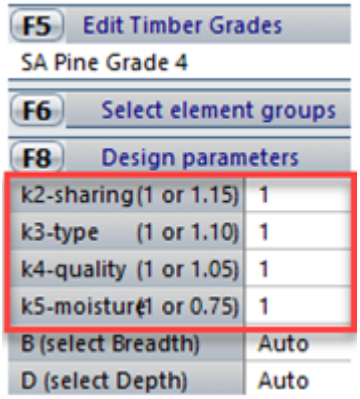
PROKON Support Portal

Load Duration Factor, k1 (SABS 0163 - 2: 2001 Allowable Stress Design)

Michael - 2020-01-29 - 0 Comments - in T01:Timber member design

When using Prokon's Timber Design Module, it is important to note that the Load Duration Factor, k_1, has not been included within the Design Parameters input dialog.



When specifying the use of the SABS 0163-2: 2001 Allowable Stress Design code, the code states that the allowable stress, f, is equal to the grade stress, p, multiplied by the modification factor, k.

$$f = p * k$$

The program adjusts the allowable stress for all modification factors except k_1, as this is dependent on the type of loading. Prokon's Analysis Modules (SUMO and Frame) allow the user to define the type of loading on the structure and therefore it is up to the *user to modify the loading* at the analysis stage in accordance with the code.

When a member is subjected to bending and an axial force (either compression or tension), the calculated stress is required to be adjusted to accommodate for either of the following interaction equations:

$$\frac{\sigma_{bx}}{f_{bx}} + \frac{\sigma_{by}}{f_{by}} + \frac{\sigma_t}{f_t} \leq 1$$

or

$$\frac{\sigma_{bx}}{f_{bx}} + \frac{\sigma_{by}}{f_{by}} + \frac{\sigma_c}{f_c} \leq 1$$

Where:

σ_{bx} and σ_{by} - Calculated bending stress about either the x or y-axis;

σ_c and σ_t - Calculated compressive or tensile stress parallel to the grain;

f_{bx} and f_{by} - Allowable bending stress about either the x or y-axis;

f_c and f_t - Allowable compressive and tensile stress parallel to the grain.

The calculated bending, tensile and compressive stress results for the above-mentioned interaction equations are obtained from Prokon's Analysis packages. Therefore, the following derivation needs to be applied to the above-mentioned interaction equation to evaluate how the loads can be adjusted in conjunction with the load modification factor, k_1, described in the code.

$$\frac{\sigma}{f} + \ldots \leq 1$$

$$\frac{\frac{W}{A}}{p * k_1} + \ldots \leq 1$$

But:

$$k_1 = \frac{W}{W * C_f}$$

$$\frac{\frac{W}{A}}{p * \frac{W}{W * C_f}} + \ldots \leq 1$$

W – Type of load (self-weight, imposed, wind etc.);

A – Area subjected loading;

p – Material grade stress;

C_f – Load duration coefficient.

Therefor from the above derivation, to have the required effect on the interaction equation, the type of load, W, must be multiplied by the load duration coefficient, C_f, described in the table below (Refer to 6.3.3 of SABS 0163-2: 2001).

1	2	3
Duration-of-load coefficient, C_{m}, C_{fi} and C_{rw}	**Duration of load**	**Description of load**
1,0 (permanent)	More than 3 months	Self-weight loads, earth pressure, loads from contents of tanks and silos or similar retaining structures Imposed loads that are removed and replaced at regular intervals such that the structure remains loaded for a substantial proportion of its life
0,8 (medium term)	1 d to 3 months	Snow loads, traffic loads on bridges Imposed loads that are applied at frequent intervals (These loads include some imposed floor loads as defined in SABS 0160)
0,66 (short term)	Less than 1 d	Normal wind loads Imposed loads on scaffolding and concrete shuttering Other imposed loads that are applied at infrequent intervals (These loads include the imposed roof loads as defined in SABS 0160, with the exception of the 0,9 kN point load (see below))
0,5 (very short term)	Less than 1 h	0,9 kN point load