

RULES OF THUMB FOR STEEL STRUCTURES

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Executive Director, SAISC

With the advent of proper engineering theory and the power of the computer, the old rules have been largely forgotten, although they will always survive in what is perhaps the most powerful of all the rules of thumb: If it looks wrong, it might just be wrong.

INTRODUCTION

Rules of thumb have a proud history in engineering. In fact, there was a time when they constituted almost the whole body of engineering 'theory'. The old master craftsmen and those who called themselves architects etc, only had their experience, and those of others, to go on, and such experience got laid down in rules such as that a dome will be unlikely to collapse if it is built to certain proportions. With the advent of proper engineering theory and the power of the computer, the old rules have been largely forgotten, although they will always survive in what is perhaps the most powerful of all the rules of thumb:

If it looks wrong, it might just be wrong.

A corollary to this rule is that a highly experienced engineer or structural steel draughtsman will typically be able to draw a final structure, and assign quite accurate member sizes, without making a single calculation. We are here trying to capture just a little of that internal computer that tells these people what 'looks right'.

The rules below can be used for any of the following purposes:

- The engineer can get a reasonable estimate of the required size of a member to resist a given force, even without recourse to a computer or handbook.
- The initial size of a member can be guessed for input into calculations or a computer model.
- The initial configuration chosen for structures can be closer to the optimal or to values that will not cause problems.
- They allow a quick check of the order of magnitude of member sizes, quantities, etc.

The approach with the shortcut calculations and the other rules of thumb listed below has been to aim to err on the conservative side. There is no guarantee that they are correct however, and people are encouraged to use and test them and to give feedback to the SAISC at info@saisc.co.za.

SHORTCUT CALCULATIONS

Basic assumptions

The formulae below, are based on the following assumptions:

- Grade S355JR steel is the standard
- Only I-sections are used for beams
- The symbols have the following meaning:

- A = cross sectional area, in mm^2
- b = width of flange or leg length of angle, in mm
- C_c = factored compressive resistance, in kN
- d = outer diameter of a circular hollow section, in mm
- h = depth of section, in mm
- I = moment of inertia, in mm^4
- KL = effective length of column or span of beam, in m
- m = mass of steel element, in kg/m

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