



# 6 RULES OF THUMB FOR STRUCTURAL STEEL DESIGN

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When it comes to structural design, many architects I've spoken with have expressed the desire for a "rule of thumb" that might lead to more efficient design for their sub-consultants. In response to their inquiries, I am offering the following guidelines for sizing structural steel.

## 1. How deep is a foot?

For purlins, calculate 1/2 inch of depth for every foot of span. (If a steel purlin must span 24 feet between girders, it should be at least 12" deep.) For girders, calculate 3/4 inch of depth for every foot of span. (If a steel girder must span 24 feet between columns, it should be at least 18" deep.)

## 2. Deeper is cheaper.

All other things being equal, a deeper wide-flange beam will be more economical than a shallower one. There are exceptions to this rule, but it is generally correct.

## 3. Cantilever "one-to-three".

Cantilevered steel beams are commonly used to support architectural features, giving the illusion of an unsupported or "flying" edge. How far is too far for a cantilever to stick out? Generally speaking, if a cantilever exceeds 1/3 of the total backspan, economy is lost and may lead to design difficulties. So if your beam has a 30' backspan, try to keep an adjacent cantilever to less than 10' long.

## 4. 12 inches isn't always 12 inches.

One common misconception is that all steel members have an actual depth equal to their nominal depth. This is true with angles, structural tubes (also known as hollow structural sections) and channels. An HSS 12x12 is truly 12" by 12" and a C12 is truly 12" deep. In contrast, a wide-flange steel beam, also known as an I-beam or a W-shape, can vary. For instance, the most commonly used W12 beams vary from 11 7/8" to 12 1/2" actual depth. The heaviest W12 section is 16 7/8" deep.

## 5. Repetition, Repetition, Repetition.

The more regular the column layout, the more economical the project becomes. The economy comes from greater repetition of beam sizes, column sizes, and connections, which leads to more efficient fabrication and installation.

## 6. Make the right connection.

Structural steel connections generally only account for 1% of the overall steel budget. However - especially when dealing in renovation work - the connection requirements can sometimes drive the member sizing. Be aware of specific non-standard conditions that may require extra thought in the connection design.

No rule of thumb can be applied to all situations, but remembering these will help achieve a more efficient preliminary layout. Your friendly neighborhood structural engineer is an expert in structural steel design, so when in doubt, don't hesitate to call with questions.

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