Steel Tools™

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Are you still writing equations on the backs of envelopes? Maybe it's time you visited www.aisc.org/steeltools.

More than 200 phone and e-mail inquiries come to AISC's Steel Solutions Center each week. Your questions help us identify ways in which we can make your life easier. That's why we created Steel Tools™.

Our series of electronic tools are an alternative to back-of-envelope calculations. They help engineers save time, especially in the early design stages of a project. Steel Tools are fast, easy to use, and best of all, they're free.

Have you ever wondered if stiffeners and doubler plates were really needed at every beam-to-column moment connection?

Are there times you need to determine the most economical floor-framing configuration and you have only five minutes to do it?

If you answered yes to either of these questions, then the Steel Tools featured on the following pages will help you. **Clean Columns** and **Parametric Bay Studies** are Visual Basic enhanced Excel spreadsheets that can deliver immediate results with limited user input.

Keep reading and be sure to visit www.aisc.org/steeltools to discover how the Steel Solutions Center and Steel Tools can make designing in steel even easier. ★

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PARAMETRIC BAY STUDIES

Does this sound familiar to you?

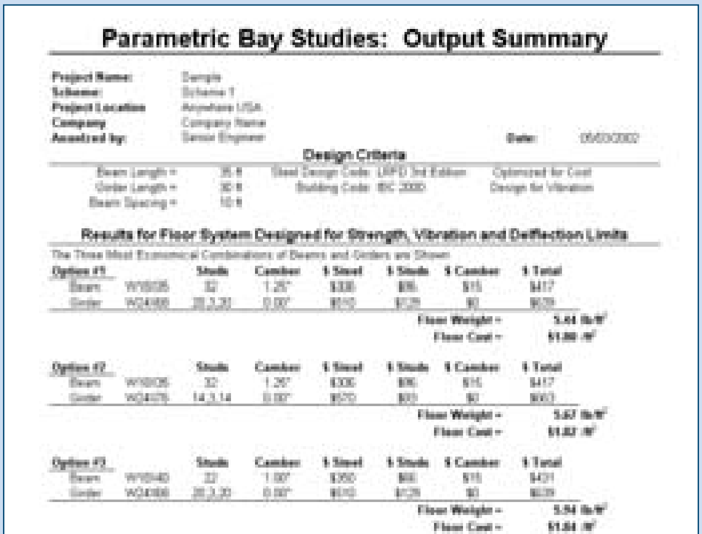
Can I get an economical 40′ bay with 18″ beams? Or should I go with a 30′ bay? Wait, two 30′ beams running in the short direction? Or should it be three? Or should they be running in the long direction? In which case they would be spaced closer together. And if I go with fewer beams, that can simplify erection, but I'm not sure that 16-gage deck is readily available. But if I use 22-gage deck it will flap in the breeze when the crane picks it up.

Should I camber the beams? And what about the girders? Or is it is cheaper to just increase the size of the beam? Which would decrease the number of studs required…I've got to look at vibration too. Now what?

Parametric Bay Studies was created to help engineers answer these questions in a matter of minutes. This Steel Tool can design a typical bay in a composite steel framed structure and optimize the design for either the overall weight or the relative cost of the framing system. Each design is based on strength and serviceability limits, such as vibration for walking excitation from AISC's *Design Guide 11*. Best of all, each run takes less than a minute, so the criteria can quickly be changed to zero in on the best scheme.

A unique feature of this tool is the ability to enter fabrication cost data for structural steel and in-place welded studs, and the cost to camber an individual beam. The default values have been set by the Steel Solutions Center based on an informal poll of fabricators. With the early involvement of a steel fabricator on a project, more accurate cost information can be obtained.

An example of a typical output screen is shown in the figure. Visit www.aisc.org/steeltools today to download **Parametric Bay Studies** and start saving time and frustration.



LIMITATIONS

- Steel beams composite with concrete slab on metal deck only.
- Typical interior bay designs (girders are assumed to support beams on both sides, the vibration analysis can be unconservative if applied at exterior bays).
- 50 ksi steel. ★

CLEAN COLUMNS

Least weight is not least cost.
Least weight is not least cost.

AISC has been saying this for years. Now, we'd like to show you.

Many engineers don't realize that column stiffeners can increase the cost of a moment connection by an equivalent of 1000 pounds of steel. Chapter 3 of AISC's *Design Guide 13: Wide-Flange Column Stiffening at Moment Connections*, indicates that increasing the column size can truly reduce the overall cost of your steel framing!

The cost of the steel frame consists of four parts: material, detailing, fabrication and erection. Increasing the column size to eliminate stiffener and doubler plates can result in a significant cost savings. The additional material cost is offset by the reduction in the fabrication and detailing costs. Based on his nearly 50 years in the steel industry, Bill Liddy puts it like this, "Structural steel material is selling at 1970's prices while the cost of fabrication labor has continued to rise. You can increase the columns by over 100 lb/ft and still save money."

The heavier column section also can enhance the performance of the frame, specifically with improved stiffness. The performance of the structure depends on each member and its interactions with other members. The increased weight of the column can create an opportunity to reduce the weight of other frame members and save even more money.

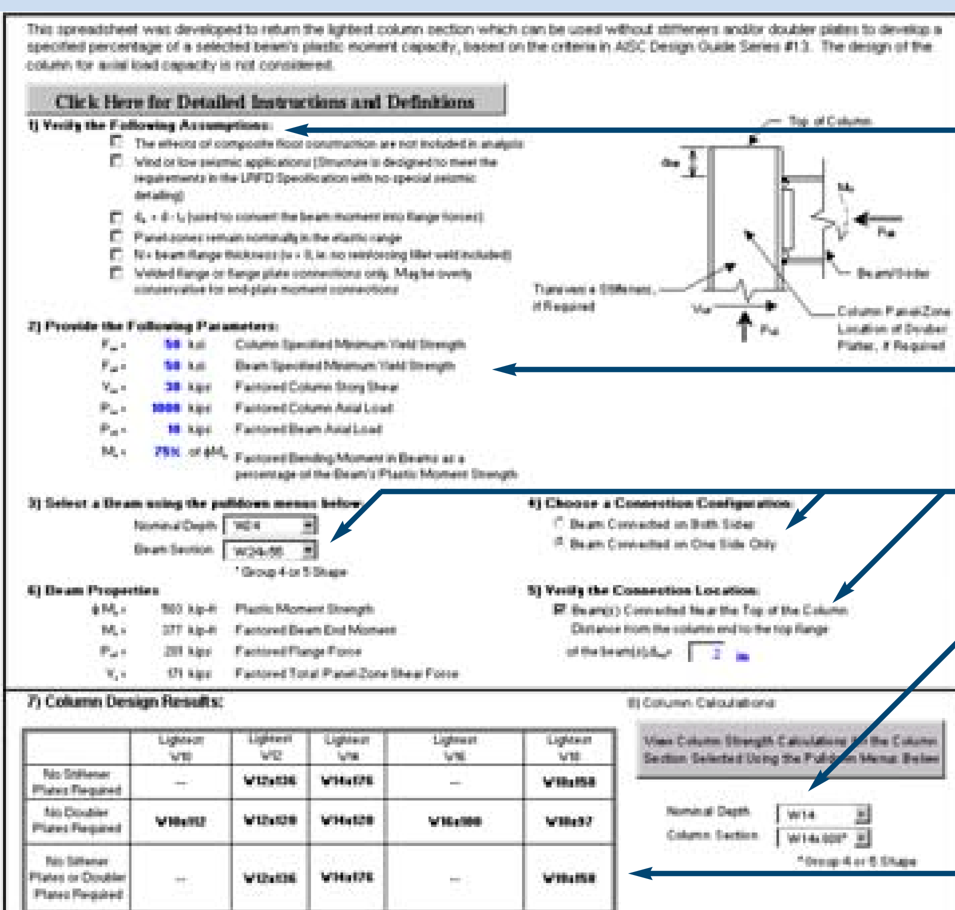
With **Clean Columns** you quickly can find the minimum weight column section that can be used without stiffeners and/or doubler plates to develop a specified percentage of a selected beam's plastic moment capacity, based on the criteria presented in *Design Guide 13*. Once you know the joint forces, this Steel Tool takes only a few minutes to identify the lightest, unreinforced column section.

"You can increase column sizes by more than 100 lb/ft to eliminate stiffeners and doubler plates and still save money."

Talk to your favorite fabricator, or consult chapter 3 of *Design Guide 13* for more information on the cost of stiffener and doubler plates.

LIMITATIONS

- This Steel Tool was developed to quickly estimate the required column size and should not replace calculations by a structural engineer.
- The tool applies in wind or low-seismic applications (when the structure is designed to meet the requirements in the LRFD *Specification* with no special seismic detailing).
- The effects of floor composite construction are not considered.
- Only W12, W14, W16 and W18 columns are used.
- Keep in mind that column sections larger than W14×426 might not be produced domestically. ★



It is important to ensure that the assumptions apply to the given connection.

Enter the material properties of the connected elements and loads at the joint.

Set the connection geometry.

View detailed calculations for any column section.

Compare the lightest column indicated to the design section. If the cost of the additional material is less than the cost of fabricated reinforcing, increase the column weight to save money.