

# Meet the Experts

at MSC's Online Chats

## STEEL JOISTS

On January 8, 2002, Richard A. Phaneuf, P.E., Chief Engineer at Valley Joist, Marlon Broekemeier, P.E., Engineering Manager with Vulcraft, Tim Holtermann from Canam, and Don Murphy from the Steel Joist Institute joined *Modern Steel Construction* readers online to answer questions about steel joists.

**Q.** Do you know of any good references for designing for uplift for steel joists?

**A.** We'd recommend the SJI *Technical Digest No. 6 for Uplift* (for more information, visit [www.steeljoist.org](http://www.steeljoist.org)) and *Designing with Steel Joists, Joist Girders and Steel Deck* by Fisher, West and Van de Pas and published by Vulcraft.

**Q.** How many consultants out there require in their specs that joist manufacturers to submit detailed cut sheets and calculations for each joist on the job?

**A.** Most typical steel joist jobs do not require a calculation submittal.

**Q.** Are there any good references for determining old joist designa-

tions? For example, I once saw a drawing call out a "Longspan underslung joist type 3214" and did not know where to find properties.

**A.** SJI has produced the *60-year Steel Joist Manual* that lists all the standard designations from the past 60 years.

**Q.** Is there a physical meaning for the "section number" called on several joist tables; for example, the chords area?

**A.** There may be a correlation between the "section number" and the chord size for a specific manufacturer, but there is not an industry-wide universal size related to the chord number.

**Q.** A basic question...What is the meaning of the "9" in a 26K9 bar

joist? I believe that the "26" is the depth in inches and it is a K series joist, but what is the "9"?

**A.** A: The "9" is commonly referred to as the chord size that relates to an approximate size for the chord. The actual size of chord may vary between manufacturers. It is most commonly used to match to the standard SJI load tables to select a load value.

**Q.** When using a joist on a low-rise metal building where the roof and the frame to which a joist is to be attached is sloped (and thus the joist is not plumb), does the vertical load (such as live load) on the joist need to be resolved into a load applied through the strong axis of the joist and a load applied in the plane of the roof-taken up with bridging? Is there a maximum

slope to which steel joist should be designed in this manner?

**A.** For joists on a side-slope, the horizontal component of load can be taken by the metal deck diaphragm and not the top chord and bridging if the deck has sufficient strength and is designed accordingly. However, for a metal building with a standing seam roof, the deck diaphragm would not be an option.

**A.** I take this as meaning that the joist is not perpendicular to the ground. We usually place cross-bolted bridging rows at least at the center of the span to keep the joist from sweeping during steel erection. Then the roof system would later be called upon to take the in-plane resultant load component. So with a standing seam roof, the joist top chord and bridging would need to resist the out of plane forces.

**Q.** Considering side sloped joists—what about the dead load of the joist wanting to twist the joist itself?

**A.** The joist self-weight component would need to be resisted by the bridging. However, the slope would need to be severe, or the joists very heavy, before a detailed analysis is needed. With joists placed on a side-slope, bridging anchorage is more critical than bridging size. The bridging can take the load in tension as long as there is a path to resolve the forces.

**Q.** Should we only insist on calculation sheets for special joists or should we require them for all? I tend to think that we should only require them on larger projects at the minimum.

**A.** To answer the joist calculation-sheet question, it depends on what you are doing with them. The majority of the consultants do not request calculations for any joists. If you have a concern that the manufacturer is not designing the joists properly, you should request calculations for review. Otherwise, it is probably more important to review the joist approval drawings thoroughly to make sure that all the load information, etc. is on these drawings to be incorporated into the joist design.

**Q.** Why does Vulcraft not publish the *Designing with Steel Joists and Joist Girders* book any more?

**A.** Vulcraft is in the process of revising and printing a new version of *Designing with Steel Joists and Joist Girders*. It should be available mid-April 2002.

**Q.** On large warehouse roofs there is frequently an uplift requirement in the center of the building of 5 psf. Even at this small load, additional bridging is required. Why is this? Would it be possible to design the joist for the uplift without requiring added bridging, and would that be less expensive than installing bridging?

**A.** For typical K-series, joists, the end web member may have a slenderness ratio of close to 200 with a  $K = 1.0$  for the typical gravity load design. If the bottom chord bridging is not present,  $K$  should be taken as 2.0, which would require a very significantly stiffer web. If  $K = 2.0$  for the end web, it may no longer be possible to use a round bar for the end web, which is the industry standard. This in turn would change the configuration of other joist components, such as the seat, which would add considerably to cost.

**A.** The bottom chord goes into compression and is not attached at the ends to the structure; therefore, the horizontal bridging row near the first bottom chord panel point is required for the uplift forces. This row of bridging is cheaper than designing the joist to do the job.

**Q.** So an option would be to “x-brace” between rows of bridging to transfer the load back to the supporting rafter, where the bracing would be located near the edges of the roof and any intermediate locations if necessary? I’ve heard tying bridging across the building ridge is becoming unpopular if an unbalanced load condition is used on opposite slopes.

**A.** Yes, the “x” to resolve forces is a good idea.

**Q.** What’s the status of the conflict between OSHA and SJI?

**A.** There are no longer any remaining legal challenges between SJI and OSHA.

**Q.** So SJI now will satisfy all OSHA requirements?

**A.** SJI will meet the OSHA rules as they will currently be applied. Research is still ongoing relative to column-joist stability and the procedures to be used when this part of the rule takes effect in July 2003.

**Q.** If I have two joist 26K10 coming from two different suppliers, can I expect to have different chord sizes?

**A.** Yes—and different geometric panels, too. Each manufacturer will design the joist to take the specified loads.

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