

Takeaways From a Virtual Panel on Building Retrofitting

To offer valuable insights around evaluating, modifying and reinforcing joists, we spoke with three industry experts with extensive experience from a spectrum of different perspectives. Hear from Craig Huhtala, Walt Worthley and Bruce Brothersen in this edition of SJI Peer Perspectives.

- Craig Huhtala, P.E., Meyer Borgman Johnson
- Walt F. Worthley, Jr., P.E., Chief Engineer, Valley Joist
- Bruce F. Brothersen, P.E., Senior Research Engineer, Vulcraft

When joists or Joist Girders need to be evaluated or modified

We first explored when joists or Joist Girders typically need to be evaluated or modified. “The most common scenario is when there’s a need to change out mechanical equipment on the roof,” says Walt. “Sometimes, a new customer or client comes into a building and needs new, potentially heavier, mechanical equipment. This is what prompts a retrofit, and it happens often when there’s a change in the use of the building, like when converting from a retail building to an education building.”

Bruce and Craig agreed. “It’s new loading. We’re talking about heavier or new mechanical units for repurposing spaces. Sometimes this is done to support manufacturing facilities or clean rooms or whatever it might be,” Craig adds.

Other scenarios include weather preparedness and ADA compliance. “If there’s a new building addition, sometimes it’s higher. Here in Minnesota, we deal with a lot of snow, so snow drifting is a huge concern. Another instance would be bringing the building up to ADA compliance by adding elevators,” says Craig.

Evaluating existing joist strength and reinforcing where needed

The small metal tag located on the joist itself or the joist tag is where it all starts when it comes to evaluating or reinforcing a joist. The joist tag has the manufacturer’s name, the file number for that project, and the mark number for that joist. “If you can get the information on the joist metal tag, you should be able to get its capacity from the manufacturer if they still have the records,” says Walt. Otherwise, the process can be tedious. “Then you have to model the entire joist in a design program and load it until you get an overstress condition somewhere. For an existing joist, the best-case scenario is if you can get the information from the manufacturer,” says Walt.

Surprisingly, there are many factors to consider. “Yes, reinforcing joists oftentimes is more of an art and there’s a lot of variables that go into it, like what additional material to supply and how much, how the existing joist is welded, how the connections are done, and other factors. It’s hard to say that there’s a one size fits all. Every situation is a little bit different, and you may have to alter your perspective based on the situation,” adds Bruce.

Collecting information on existing joists

“Well, again, the first thing you want to do in any situation is go to the metal tag on the joist and find the manufacturer,” says Walt. “Yes, if a metal tag is available, that is the best little piece of information that leads to the complete story. Quite often, the names of buildings change. They almost always change from what the joist manufacturer calls it to what the tenant calls it,” says Bruce.

Our experts agreed that another key piece of information is when the building was erected. “Especially in a lot of older buildings, I find that sometimes new tenants come in and they want to paint the joists if it’s an exposed ceiling and, when they go through, they remove all the stuff they don’t think should be there, including the joist tag,” says Craig. “Unfortunately, I don’t always work with joists that were created by joist companies still in business. In those cases, we aren’t able to get any sort of information from the tag, and then you have to measure the joists. My biggest tip for collecting information is to know what information is required to identify and analyze the joist and to be systematic about collecting it.”

To tear down and start over or to modify the build

Knowing that we can’t always ignore the issue of cost, there are cases when a decision must be made: modify or start over. Walt shares, “The consideration is always how extensive the modifications are. There are situations where the loading the client is trying to achieve would require extensive modifications and extensive work to reinforce the joists to bring them up to the capacity they need.”

What it really comes down to is the integrity of the repair. “You have to consider whether there’s access or whether there’s availability for a repair to be made. It depends what’s built up around the joist and whether you can actually get additional steel in there to make the welds or connections you need. Quite often in older structures, even though the steel is still good, it can be corroded and questionable as to what kind of joist it originally was. In those cases, sometimes it’s just better to rebuild,” Bruce says.

Accessibility considerations

Though it’s not always the first consideration, it’s arguably the most important one. “Especially in older buildings, hard lath and plaster ceilings can make accessibility very difficult for any sort of retrofitting,” says Craig. Walt adds, “Anytime you’re considering a modification, when you’re looking at it, try to consider whether they’ll be able to readily access the area for welding. In retrofitting, sometimes there’s not much room to work. It’s easy to draw it, but it may not be easy to actually make that weld or repair. So, take the person who ultimately has to make that repair into consideration because that alone will result in a higher quality of the repair.”

On their favorite and most challenging projects

“There was a major airport in the western United States that built a canopy over the drop-off lane so that arriving passengers would be sheltered from the rain or snow. That canopy was shaped like an airplane wing and it overhung the existing terminal building,” shares Bruce. “There was a large snowstorm that filled up part of that canopy. But when there was too much snow, it slid off of the canopy and onto the terminal, causing a

partial collapse to the roof over the ticket counters. Obviously, this needed immediate action, and the structural engineer for the airport was able to give me a call right away. He explained the situation and because he already had the joist tag information, I was able to help him understand how this happened and get repairs underway,” says Bruce. “The repair took less than a day, and I was glad to help the airport.”

“I think one of my favorite projects was modifying a building for a new tenant,” says Craig. “We had to shorten joists and add large mechanical units to the roof. We used spreader beams, following the methodology outlined in the SJI Technical Digest 12. Overall, I enjoy maximizing the reuse of structures where possible, and I think sometimes steel joists get a bad rap for not being able to be modified easily. I like to try to change that perception where possible.”

Grains of knowledge about building retrofitting

“It’s really important to give repair orders in step-by-step instructions. That way, the people doing the repair know exactly what to do and in what sequence to do it,” says Bruce. “It’s also helpful to give instructions for things that we may not necessarily think about. Like if I’m in Minnesota with Craig and I have to make this repair on a January day, I may need to preheat the steel so that I can make the proper weld. Anything I can do to help that person out in the field is really going to pay off in the integrity of the repair.”

“My advice would be to remember the metal tag before they even start and do a quick check of what additional capacity they’re looking for,” adds Walt. “If you can find the joist information beforehand and find the structural drawings, take a good look at them. If you’re trying to increase the capacity by a large amount, you’re probably not going to be able to do a modification of the joist.”

“Overall, there’s a lot of knowledge in the industry and I think SJI is a great resource. All the joist manufacturers I’ve been able to contact have been willing to share their knowledge and help out with successful project completions,” says Craig. “I’d advise others to not be afraid to lean on the experience of others and recognize that when you don’t necessarily have all of the answers, there’s probably someone in the industry who does, and I think it’s important to reach out to them. Also, the [SJI Joist Investigation Form](#) is a great tool. It really is a great place to start, and it’s been extremely valuable to our firm.”

For more on the benefits of designing and building with steel joists and Joist Girders, visit steeljoist.org.

Note: Joist tag information is typically useful if the original project was constructed after 2000. Most companies do not have information prior to that. It’s best to locate the original construction documents. While the tag can be helpful, it is designed to assist the erector in putting the right joist in the right place.