



Roof Penetration Framing

Creative Ways to Outsmart an Unpredictable Steel Market

By Bob Hasulak

Many factors impact the choice of steel construction in the U.S. How can a structural engineer stay nimble and creative in utilizing steel construction? Here are a few tips regarding the market, considering roof penetration framing as an example.

Roof penetrations at mechanical openings are traditionally constructed of structural steel framing, such as L4x4x1/4 angles welded between existing beams or joists. Recently, pre-engineered products have entered the market as an alternative to welded steel framing. One manufacturer, QuickFrames USA, LLC, provides a bolt-on, adjustable frame where no field welding or cutting is required. Another manufacturer, Chicago Clamp, provides end connections for traditionally cut steel framing that eliminate the need for welding.

Use Historical Insights to Plan Ahead

When working alongside a design-build firm in the planning of a new structure, you must consider all aspects of design and durability. Maybe you have experienced a time when an uptick in steel prices has caused your distributor to hike its costs, or perhaps a lack of steel availability has halted the building's progress. Pay attention to predictions put out by market analysts. Most recently in 2016, some U.S. manufacturers have seen a 20% increase in the price of steel.

A structural engineer might consider a concrete framing system when steel prices rise or when a potential vendor proposes less-than-ideal rates. Don't forget that, according to AISC, the "cost differential of structural steel and concrete framing systems has remained relatively constant with a five percent savings gained by selecting structural steel." When steel prices rise, the cost of other building materials often experience an increase as well, so it is important to look at the greater context.

Review previous jobs with which you have been personally involved. Consider any delays you have seen as a result of changes with steel, and the significance of the impact on your work. If you see a pattern – or even a single instance – in which your work suffered, take note. Then you can start to flesh out the likelihood of a similar

situation and make changes to specifications, details, or suppliers to avoid it.

For example, consider difficulties in the detailing process such as a lack of mechanical coordination that required multiple resubmissions. Choosing pre-engineered adjustable products can reduce the need for detailing and custom fabrication during construction. Manufacturers of pre-engineered products can provide stock supply rated for maximum loads, and some even provide site-specific engineering that is included within the cost of the product.

Be Strategic when Specifying Products

One of the most common ways that steel could impact your work is through its role in the products you specify. Ask vendors hard questions like what they would do if steel prices happened to surge during the lifecycle of the job, and whether or not they have a significant store of steel and other necessary materials. Typically, a manufacturer may hold a one month supply. If you understand a vendor's approach to potential roadblocks and upsets, you can then decide upon the best-prepared supplier – and create a plan if anything goes awry. Be sure you do not dismiss steel products entirely if one vendor does not answer all your questions thoroughly. Other vendors might be able to.

Remain Open to Innovation

Structural engineering is an enduring field. This speaks to the importance of the career, but it can also be the reason that some practitioners get stuck in a comfort zone. If someone has done something a certain way for 20 years and knows that his company has done the same thing for 50 years before that, it is unlikely that he or she will want to change practices. However, this can be a big problem as stagnancy can harm your progress and your profits.

For roof penetrations, many structural engineers stick to the traditional method of welded angle frames since it is historically what their client expects. However, new adjustable roof penetration frames can offer flexibility at a slight savings on new construction, where

traditionally welded frames could be hoisted into place, and can be nearly 50% cheaper compared to welding frames into an existing structure. The installation time can be as little as ¼ of the time spent to field weld frames in place.

Just as technology becomes more efficient and refined over the years, the same is happening with construction products if you look for them.

Consider Tangential Implications

The costs of using steel in construction rarely (if ever) are limited to the raw material itself. Ancillary elements to take into account include the costs of associated labor, the impact steel might have on the project's level of risk, and what long-term costs may be down the road, especially regarding maintenance.

For example, welding is a highly specialized skill and the expense of the necessary labor can be significant. Welding also requires special inspection to ensure the welds are adequate, which adds to time and cost. Furthermore, the potential risk is increased with welding due to the presence of hazardous flames and fumes. OSHA reports that fatal injuries occur in four of every 1,000 workers over a lifetime from welding, cutting, and brazing. New roof penetration products that require no field welding or cutting could save direct and indirect costs.

Steel is usually a solid material to choose, thanks to its durability and longevity, but it can also be susceptible to damage. The most common type of damage in steel structures is moisture damage. The good news is that proper precautions upfront, like choosing the appropriate protective coatings, can reduce the likelihood of corrosion. Pre-engineered roof frames are constructed of light gauge framing and are galvanized or painted for protection. Conventional frames are typically painted, but must be touched up in the field after welding.

So if the availability and price of steel can make a big difference on your job site directly, plan ahead, be strategic in your specifications, seek out innovation whenever possible, and look at how steel factors into the bigger picture. ■

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