conference preview

MINIMIZING HAZARDS, BY DESIGN

BY WAYNE J. CREASAP II

Safety can and should be just as important in the design process as it is during manufacturing and construction.

BY NOW, ALMOST EVERYONE in the industrial maintenance and construction industry is familiar with OSHA's "Focus Four" hazards: falls, struck-by, caught-in-between and electrical.

These four culprits account for the majority of construction-related fatalities and severe injuries and can be easily encountered throughout the construction process—so much so that OSHA has developed several resources to help companies identify and eliminate them. These include specialized training modules dedicated to the Focus Four as part of the required training in OSHA's 10-hour and 30-hour training courses for construction, general industry and maritime work.

But remember, OSHA standards cover the minimum requirements for an employer to eliminate or control hazards on the job. By using these standards as a baseline to build from, companies can implement risk-management practices to help identify hazards and further reduce or eliminate them before they become problems on the job.

Safe for All

The focus of any building project is on who will be occupying the structure after it is built, but it often fails to account for the health and safety of those building it, those who have to maintain it or ultimately, those who have to remove it. The American Society of Safety Engineers (ASSE) has been working on American National Standards Institute (ANSI) standards aimed at implementing risk-management practices and prevention-through-design techniques to drill down on leading practices that will assist employers in gauging risk and eliminating common hazards on the job. Several of these components are aimed at reducing hazards throughout the life-cycle of a building, from design through construction, operation, demolition and waste treatment. Often, the hierarchy of controls is used to help eliminate or reduce hazards, with the use of personal protective equipment (PPE) as the last line of defense.

Wayne Creasap (**wcreasap @tauc.org**) is senior director of environmental health and safety with The Association of Union Constructors (TAUC).

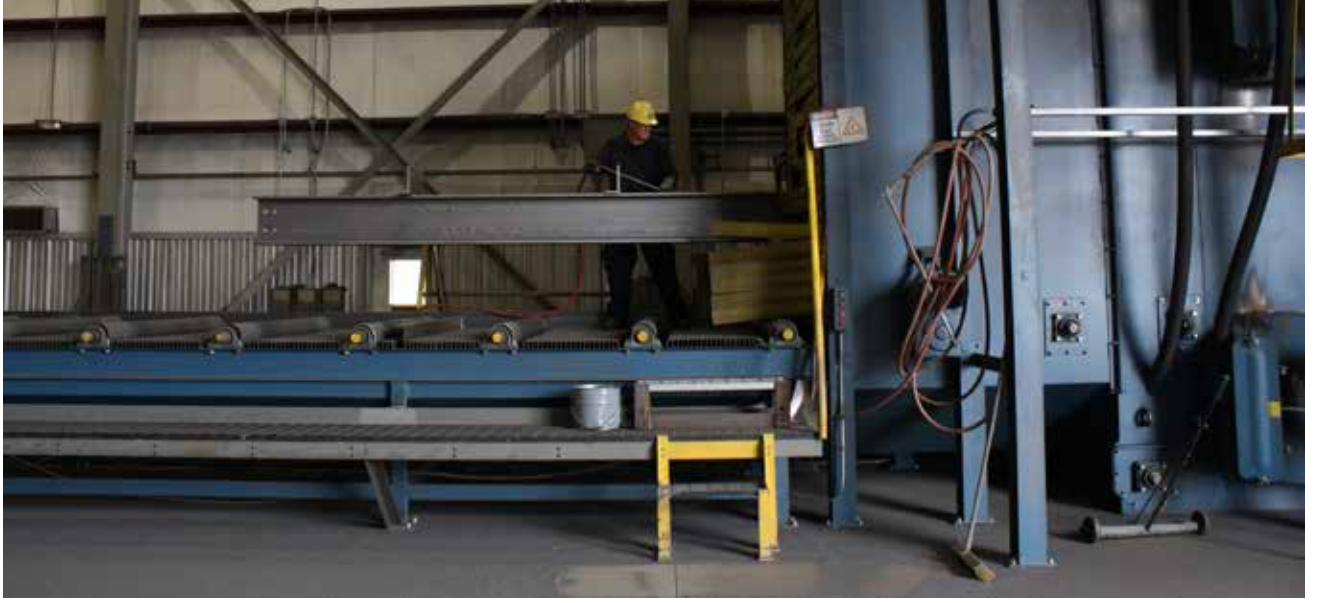
Steel fabricators and erectors are faced with several safety and health challenges when fabricating and building a project. The International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers Union developed a list of "Deadly Dozen" hazards for both steel fabrication and erection activities. Many of these hazards are related to various OSHA standards, and the majority of them are Focus Four-related. Here, we'll take a look at some of these hazards and determine how we can preplan and come up with design solutions that will better protect shop workers during fabrication and ironworkers during steel erection.

Shop Hazards

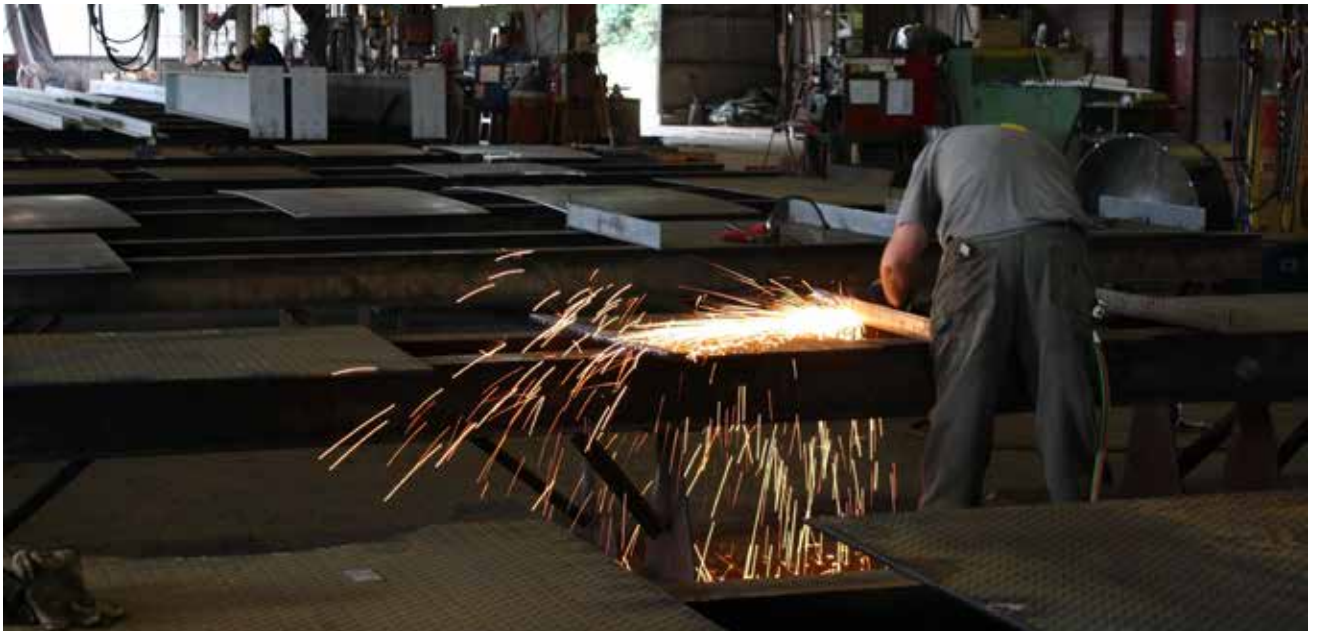
Here are the Deadly Dozen in the shop:

1. Exposure to toxic welding fumes that create serious health hazards
2. Striking hazards during material handling and loading and unloading of trucks
3. Dismemberment by shear presses, punch presses and other equipment
4. Rigging failure and use of chains, slings, plate dogs and other rigging equipment
5. Hazards related to overhead rail cranes, gantry cranes and other cranes
6. Hazards pertaining to use of forklifts and jacks
7. Exposure to toxic paints and chemicals through inhalation and skin absorption
8. Exposures to airborne metals, dust and compounds during grinding and hot-work operations
9. Electrical hazards, de-energizing equipment and lockout tag-out systems
10. Improper signals, communication and clearances
11. Exposure to heat illness and dehydration
12. Lack of protective eyewear, leathers, gloves, hearing conservation equipment and other PPE

Several items on the list involve exposure to welding fumes and toxic metals from grinding and hot work, as well as chemical exposure to paints and other coatings. Employing the hierarchy of controls, can we design systems that will eliminate these hazards? If not, can we substitute a different product that will be just as effective, but not as harmful to the employees working on or around it? With a little preplanning, we can de-



▲▼ Safety considerations in the shop run the gamut from proper and efficient material handling to exposure to and protection from airborne metals and compounds during hot-work operations.



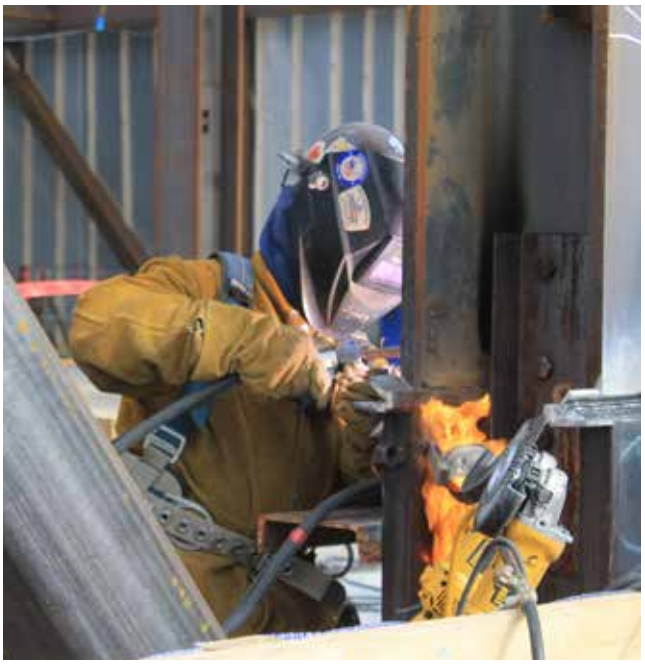
sign a system that reduces employee risk to these exposures—and at the same time make them more productive.

Welding fumes are common in fabrication shops, and in recent years we have done a much better job of protecting employees from the toxins in these fumes. Instead of using natural ventilation or fans, or skipping straight to respirators, many companies have employed the use of ventilation systems with high-efficiency particulate air (HEPA) filtration to reduce or eliminate employee exposure to welding fumes. Mostly, these units are aftermarket installations where the building has been around for several years and the systems are installed later.

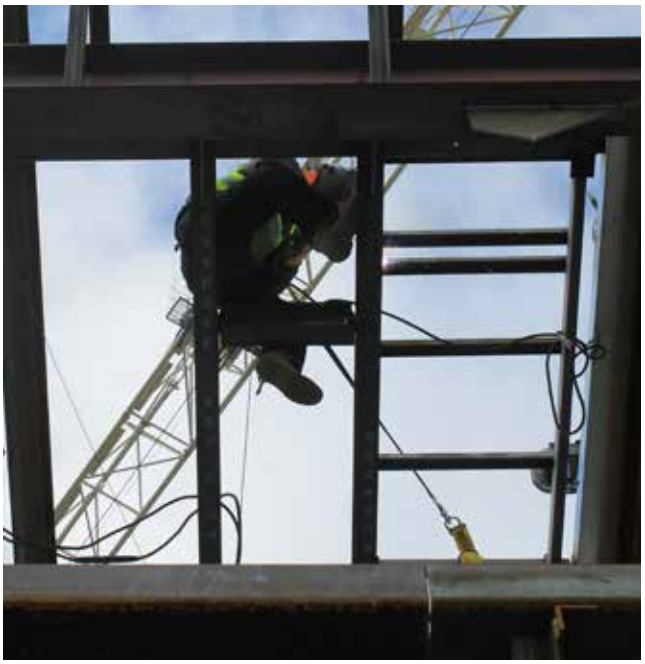
Even with the new installations, these systems require advanced planning to ensure the greatest efficiency and ease of use for the workers. Otherwise, if they are too difficult to use or maintain, employees will not use them and then the investment becomes worthless. Preplanning is the key, and employing hazard analysis will help to determine the best location for the system. Is it out of the way when materials arrive, yet accessible when needed? Is it easy to get to for filter changes and maintenance? You might find the need to discuss these issues with your employees or safety committee. They can offer valuable input on location and real-life use and will help prevent problems after the system is installed.

Additionally, are there other systems that can be used that are more automated? Can some of the welding be done remotely or with robots to reduce human exposure? The benefits here are reduced employee exposure to welding fumes and other metals and less dependence on and cost associated with implementing a respiratory protection program. Further, quality and productivity may increase under certain circumstances.

Shop hazards also include a lot of struck-by and caught-in-between hazards. Forklifts, overhead cranes and rigging play an important part of safe material handling. However, we should be asking what systems are in place to ensure the greatest efficiency and reducing the number of times an item is lifted or moved. Are things discussed and planned out in advance for the fabrication of each piece for a specific project? Or are managers and employees scrambling to make things fit and meet deadlines? Are those pieces scheduled and fabricated in a way that will enable them to be sequenced properly and erected more efficiently on-site?



Personal protective equipment is the last line of defense when it comes to safety.



Fall-arrest systems can be as simple or elaborate as needed but require training and engagement with employees.

Field Hazards

Here are the Deadly Dozen on-site:

1. Falls through unprotected or inadequate floor opening covers
2. Collapse of unsecured open web steel joists
3. Lack of fall protection and inadequate use of fall-arrest equipment
4. Falls during installation of floor and roof decking
5. Material handling injuries during steel erection and reinforcing steel activities
6. Column collapse due to anchor bolt failure and/or insufficient concrete strength
7. Structural collapse of unsupported reinforcing steel columns, walls and decks
8. Struck-by injuries from falling objects, tools and materials.
9. Caught-between injuries during hoisting and rigging operations
10. Impalement from unprotected reinforcing dowels or other vertical projections
11. Electrical hazards and injuries from high-voltage power lines
12. Heat illness and toxic exposure to chemicals and airborne contaminants

As with the list of shop hazards, almost every item here is associated with one of the Focus Four. Risk can be minimized by working with the fabricator to ensure that pieces are fabricated and sequenced properly. Additionally, preplanning and design can help eliminate a number of fall hazards. For example, assembling pieces on the ground can help minimize risk associated with falls, falling objects and material handling when erecting multiple pieces in the air; using aerial lifts can also help minimize fall hazards (though it should be noted that proper fall-arrest equipment needs to be used in aerial lifts as well). Again, PPE is the last line of defense in our hierarchy of controls and is only as good as how it is used. How often do we see employees on this equipment wearing harnesses but that aren't actually tethered to the lift? And more importantly, what do we do about it?

Additionally, working within OSHA's steel erection rules, contractors can save time and resources by preplanning and working with the engineer and fabricator to design and install proper fall-arrest systems for a specific job, such as horizontal lifeline and perimeter cable systems, that will protect ironworkers from fall hazards and increase their productivity. Systems can be as simple or elaborate as needed and will require a certain level of training and engagement with employees to ensure they are used properly. In addition, falls associated with decking operations can be minimized through sequencing.

While working with engineers to emphasize and design safety systems might seem like an additional, unnecessary stop, it's not. It benefits all workers in the shop and field, as well as those who will maintain the building. It saves money associated with potential injuries and illnesses. And most importantly, it's the right thing to do. Be an agent of change and keep the dialogue going. ■

This article is a preview of Session R4 "Minimizing Hazards by Design" at NASCC: The Steel Conference, taking place March 22–24 in San Antonio. Learn more about the conference at ***www.aisc.org/nascc****.*