



SESAC CONNECTOR SAFETY PROCEDURE

Overview

OSHA defines “connecting” as the process of placing or connecting structural components or other steel materials using a crane or other hoisting device. Connecting can be one of the most dangerous jobs an ironworker can perform. For this reason it is imperative that employees of SESAC are aware of the dangers associated with connecting steel. Lets keep in mind a few startling statistics.

- Every year 35 ironworkers die due to work related injuries.
- 2,200 workdays are lost yearly due to ironworker accidents.

Note: Please remember that all job sites are different and may require unique and specific safety requirements depending on the complexity of the project. The following is meant to be a guide to awareness and prevention of general safety hazards common to many different types of projects. Always consult your project superintendent for site specific safety issues and regulations required for each project.

Goals

Following review of this procedure, all employees of SESAC shall be able to

1. Recognize the 5 common hazards connectors face on the job.
2. Identify and describe the preventative measures required to minimize these hazards.
3. Identify and describe recommended procedures for making safe double connections.

Part I. 5 Common Hazards Associated with Connecting Steel

Connecting steel is a dangerous job with many potential hazards. It is imperative that all ironworkers requesting the connectors position on a project has consulted the project superintendent for their approval. If you will be connecting on the project, remember these 5 hazards.

1. Connecting requires the worker to walk on very small and sometimes narrow surfaces to perform their duties. Exposure to such limited roof area is a major cause of falls.

2. Another hazard of connecting is the potential to drop tools, bolts, or other items. This presents a potential hazard for personnel working below the connectors. Even at lower heights, the repercussions of dropping an item from the building can be deadly.
3. Steel joists tend to be flimsy before they are permanently fastened to the building. Joists can lose their bearing causing not only the connector to fall but also sending the joist to the ground endangering the workers below.
4. At times, connectors may find themselves in a position between the moving load and the existing structure. With incoming loads sometimes difficult to control, connectors find themselves in a potential crushing position or a position to be knocked from the structure.
5. Just as a steel joist can lose its bearing, other steel members can separate at the connection causing the connector to be crushed or thrown off the building. As with joist, the falling member also creates a severe hazard to those working below the connector.

Part II: Avoidance

1. Proper Fall Protection Equipment

OSHA's basic fall protection requirements as outlined in subpart R, require connectors having a fall exposure of more than two stories or 30 feet above the previous level must be tied off. If the fall exposure is between 15 and 30 feet, connectors must be supplied with and wear a proper personal fall arrest system and be able to tie off at any point and time.

SESAC takes pride in exceeding the fall protection standards set forth by OSHA by enforcing a **100% fall protection requirement for all employees exposed to a fall of 6 feet and higher.**

Employees working at or above 6 feet are required to wear a personal fall arrest system. Personal fall arrest systems may take many forms, but the basic components are as follows:

- **Anchorage/Anchorage Connector**
 - Anchorage - Commonly referred to as a tie-off point (i.e. beam).
 - Anchorage Connector – Used to join the connecting device to the anchorage (i.e. cross-arm strap).

- **Body Wear** – The personal protective equipment worn by the worker (i.e. full-body harness).
- **Connecting Device** – The critical link which joins the body wear to the anchorage/anchorage connector (i.e. shock-absorbing lanyard or retractable lifeline).

*Hint: A helpful hint to remember the components of a personal fall arrest system is to just remember **A, B, C**. Consult SESAC full Fall Protection Program for additional information.*

2. Keep Your Tools Secure

Use caution when using tools while connecting steel, and always place tools not in use securely in your tool belt. Be aware of other workers' tools left on existing members as well as fasteners and other materials left in the way. Stepping on or stepping over these hazards can result in a fall. Do your part to keep your work area clean and keep all your tools and materials secure. If you find loose items in a potentially harmful area pick them up and put them in your bolt bag. This will protect you and your co-workers.

3. Evaluate Your Situation

When you are up on a structure connecting steel, it is important to carefully evaluate your situation. Be mindful of the position you need to be in to make the piece. Examine alternative positions and practices available to connect safely and efficiently. In other words, put yourself in a position that is as safe and as effort reducing as possible when connecting. If you're unsure of the best way to handle the next piece of steel, consult your project superintendent and crane operator for additional input.

Another common error related to your position is reaching too far to get control of the member. Reaching can put you in an unsafe and unbalanced position causing a fall from the structure. Use your signals correctly and always let the crane do the work and bring the piece to you.

Be aware of your position in reference to the existing structure. If placed in a situation where the incoming load can pin your body between itself and the existing structure, it can cause serious crushing injuries. Always acknowledge where possible crush points may occur and avoid them.

Remember: Hoisted materials can be unstable and difficult to control until they are properly fastened to the structure. Watch carefully at the incoming

load as it swings toward you. Injury can easily occur if even bumped by the load.

4. Always Use Taglines During Connection

Taglines not only reduce the distance a connector must reach for control of a piece, they also reduce the amount of effort required to adjust the member as it moves. Make sure yourself and your ground crew members discuss how and when taglines will be used during erection. Use common sense when utilizing taglines and again do not overextend your reach when grabbing a tagline. Use proper signals and let the crane bring the piece and the tagline to you.

5. Use Clear and Visible Hand Signals

Hand signals remain an integral part of day to day steel erection practices. Connectors must use clear and accurate signals to allow the operator to bring the member to them in a safe and efficient manner. It is important for your safety and the safety of your fellow workers that you know the signals and how to properly use them.

Note: SESAC utilizes the standard crane hand signals during steel erection.

The following tips will increase the safety of crane signaling during hoisting:

- Always keep the arm you are using to signal away from your body for better visibility.
- Only one person at one time is to signal the crane operator.
- Make your signals clear and definite using sharp and accurate movements.
- Discuss signaling with the operator before any hoisting to better establish the best position and communication method for everyone.
- If working at great distance or positions out of site of the operator, be sure to use radio communication to remain in constant contact.
- Immediately stop all hoisting if you are confused as to which signal to use, are unsure about the visibility or loose contact with the operator at any point.

6. Be Aware of Joist Hazards

Steel Joists have the tendency to lose bearing and collapse when not properly secured. The following two criteria must be met before joists can support any load....including ironworkers.

- Both sides of at least one end must be attached by either welding or bolting.
- All required erection bridging must be installed.

SESAC supports panelizing joist bays on the ground when feasible. This method not only reduces fall exposure, but if planned properly can prove to be a more efficient method.

If penalization is not used during erection, consult your project superintendent on the best techniques for joist installation.

Part III. Procedure for Making Safe Double Connections

Double connections sometimes have a greater tendency to separate during erection. For this reason it is important to follow these guidelines for safe and efficient double connections.

Before connecting any beams, set the columns correctly following these steps:

Step 1: Remove the top nut and one of the two washers on the anchor bolts. Note: If leveling nuts are being used, remove the top nut and one washer. Make sure the correct number of washers or leveling nuts are on each anchor bolt and that the anchor bolts are clean oiled and have threads that are in good condition. If these conditions are not met, consult your superintendent immediately.

Step 2: As the column is hoisted and approaches, check to see that the bolt holes are in the proper orientation.

Step 3: Check the piece mark numbers for the specified direction. Avoid placing columns in the wrong direction as repacking and rotating columns can cause avoidable hazards.

Step 4: Use clear and correct signals to direct the crane operator when setting a column on the anchor bolts.

Step 5: Once the column is set, place all the washers and the bolts and snug tight the nuts.

Step 6: Slowly slack the hoist line, verify that the column is stable and then cut the column loose.

Note: If any anchor bolts are loose or damaged immediately call your supervisor. Loose or damaged anchor bolts can cause a column to fall over injuring you or your coworkers.

After the columns have been set properly, discuss with your supervisor to determine the starting point and direction the work will proceed. It is important that all members of the erection crew are on the same page as to the direction that the steel will be erected. Repositioning and switching wrong beams is an avoidable hazard.

Watch for Mistakes

As the beam is swung into place by the crane:

- Watch for beam ends not coped or missing bolt holes as the member approaches. Immediately signal your supervisor if there is a problem.
- Grab the tagline and turn the beam into the proper position before the crane is swung into its final position.
- As the beam is lowered down between the two columns, place the far end in the column web first and hoist down on the crane to make your end. Placing the opposite end inside the column web first will help reduce binding and reduce unnecessary hazard causing swing.
- Always install a minimum of two bolts at each end or connection. Check with your supervisor ahead of time to determine the required number of bolts for cantilevered connections, splices and other specific members.

To help prevent accidental separation of connections the new standard requires fabricators to provide one of the following design three designs for double connections

1. Clipped end Connection consisting of
 - a. A notch in the clip at one end of the beam, an extra "safety" bolt hole in the other clip and extra holes in the column.
 - b. When the first beam is attached at the column, the connector must install a snug tight third bolt in addition to the normal minimum of two bolts.
 - c. This "extra" bolt is called the safety bolt, and must remain in place when the double is made.
 - d. The notch allows the second beam to be attached without removing the safety bolt preventing separation of the connection.

2. Staggered Connection consisting of
 - a. Extra holes in the column and the clips on the end of the beam offset.
 - b. When the first beam is made, the connector must be sure to install the bolt that will not be covered when a second beam is attached.
 - c. The safety bolt must be snug tight during the connection.
 - d. When the second beam is attached, the offset allows the safety bolt to remain undisturbed helping to prevent separation of the connection.

3. Safety Seat Method provides support for the first beam and an additional attachment to the column.
 - a. First, the seat must be adequately bolted or welded to the column.
 - b. After the first beam is inserted it must be bolted snug tight to the seat.
 - c. If the double connection is to be made immediately, insert the second beam and fasten using the shared bolts.
 - d. If the double is to be made later, install at least two bolts into the column before proceeding.
 - e. Make sure all bolts are snug tight.

When working on a multi-tiered building, column splices may be necessary.

For welded column splices, maintain tension on the hoist until you fill in ALL the bolt holes using one washer and nut and the proper length bolt.

For all other column splices use the following guidelines:

1. SLIGHTLY loosen one of the plates to allow the new column to easily slip into position. DO NOT REMOVE THE NUTS COMPLETELY!
2. Re-tighten the splice plate.
3. Install approximately 50% of the bolts in a staggered pattern.
4. Make sure the correct bolt length is used. This can be determined by making sure that all threads of the nut are filled after tightening.
5. After the last nut is tightened, slowly slack the hoist line, verify column stability, and then cut the column loose.

This concludes SESAC Connector Safety Procedure

Remember to follow these guidelines, communicate with your co-workers including your operator and always put safety first.