HIOSH DIRECTIVE

DIRECTIVE NO.: CPL 02-01-034 (CPL 2-1.34)	EFFECTIVE DATE: August 27, 2003 Re-issued w/amendments: February 13, 2012
SUBJECT: Inspection policy and procedures for OSHA's steel erection standards for construction	

This CPL was originally adopted by HIOSH on August 27, 2003, as CPL 2-1.34. Since the original adoption of CPL 2-1.34, OSHA has amended some of the questions and answers in Chapter 4 as well as renumbered this directive as CPL 02-01-034. This directive incorporates all of the changes into the original document.

Reminder: HIOSH does not use "de minimus".

The HIOSH standard for steel erection contains many differences from the federal steel erection standard. Please refer to the HIOSH standard section 12-110-50 to see the differences.

Amendments incorporated into this directive:

OSHA Instruction CPL 02-01-040, July 18, 2004

OSHA Instruction CPL 02-01-046, September 30, 2009

OSHA INSTRUCTION

U.S. DEPARTMENT OF LABOR — Occupational Safety and Health Administration

DIRECTIVE NUMBER: CPL 2-1.34 | **EFFECTIVE DATE:** Friday, March 22, 2002

SUBJECT: Inspection policy and procedures for OSHA's steel erection standards for construction.

ABSTRACT

Purpose: This instruction describes OSHA's inspection policy and procedures and provides clarification to ensure uniform enforcement by field enforcement personnel of the steel erection standards for construction.

Scope: OSHA-wide

References: Construction Safety and Health Standards, Subpart R, 29 CFR 1926.750-761, Subpart M, 1926.502 and §1926.105; Federal Register, Vol. 66, No. 12, January 18, 2001, pages 5196-5280, Final Rule; Safety Standards for Steel Erection; Federal Register, Vol. 66, No. 137, July 17, 2001, pages 37137-37139, Final Rule; Delay of Effective Date; OSHA Instruction CPL 2.103, The Field Inspection Reference Manual (FIRM); and Occupational Safety and Health Act of 1970, Section 5(a)(1).

Cancellations: All interpretations (including letters of interpretation and memoranda) of the previous version of Subpart R issued prior to January 18, 2001.

State Plan Impact: This instruction describes a Federal Program change for which State adoption is not required.

Action Offices: National, Regional and Area Offices

Originating Office: Directorate of Construction

Effective Date: The effective date for the steel erection standard is January 18, 2002 except that §1926.754(c)(3) will not take effect until July 18, 2006. Certain other provisions are subject to a phase-in period (see Chapter 1, Section X).

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Executive Summary

This instruction implements the inspection policy and procedures necessary for uniform enforcement of OSHA's new steel erection standard. To achieve this objective, the Agency has included in this instruction a list of anticipated questions and answers along with a Compliance Officer Guide containing inspection tips.

Significant Changes

The new standard addresses the hazards that have been identified as the major causes of injuries and fatalities in the steel erection industry. Concepts addressed by the standard include:

- Site layout and construction sequence
- Site-specific erection plan
- Hoisting and rigging
- Structural steel assembly
- Column anchorage
- Beams and columns
- Open web steel joists
- Systems-engineered metal buildings
- Falling object protection
- Fall protection
- Training

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CHAPTER 1.

BACKGROUND

I. Purpose. This instruction describes OSHA's inspection policy and procedures and provides clarification to ensure uniform enforcement by field enforcement personnel of the steel erection standards for construction.

II. Scope. This instruction applies OSHA-wide.

III. Cancellation. All interpretations (including letters of interpretation and memoranda) regarding the previous version of Subpart R issued prior to January 18, 2001 are cancelled.

IV. Significant Changes. The new standard's provisions that are significantly different from the previous steel erection standard include:

A. Site layout and construction sequence.

1. Requires notification of proper curing of concrete in footings, piers, etc. for steel columns.
2. Requires controlling contractor to provide erector with a safe site layout .

B. Site-specific erection plan.

1. Requires pre-planning of key erection elements, including coordination with controlling contractor before erection begins, in certain circumstances.

C. Hoisting and rigging.

1. Provides additional crane safety for steel erection.
2. Minimizes employee exposure to overhead loads through pre-planning and work practice requirements.
3. Prescribes proper procedure for multiple lifts (Christmas-treeing).

D. Structural steel assembly.

1. Provides safer walking/working surfaces by eliminating tripping hazards and minimizing slips through new slip resistance requirements (effective July 18, 2006).
2. Provides specific work practices regarding safely landing deck bundles and protecting against fall hazards from interior openings.

E. Column anchorage.

1. Requires 4 anchor bolts per column along with other column stability requirements.
2. Requires procedures to ensure adequacy of anchor bolts that have been modified in the field.

F. Beams and columns.

1. Eliminates collapse hazards associated with making double connections at columns.

G. Open web steel joists.

1. Erection bridging and attachment requirements to minimize risk of collapse of lightweight steel joists.

2. Requirements for bridging terminus anchors, with illustrations and drawings in a non-mandatory appendix.

3. Requirements addressing how to place loads on steel joists to minimize risk of collapse.

H. Systems-engineered metal buildings.

1. Requirements to minimize collapse in the erection of these specialized structures.

I. Falling object protection.

1. Performance provisions that address hazards of falling objects in steel erection.

J. Fall protection.

1. Deckers in a Controlled Decking Zone (CDZ) and connectors must be protected at heights greater than two stories or 30 feet.

2. Connectors between 15 feet and two stories or 30 feet must wear fall arrest or restraint equipment and be able to be tied off or be provided another means of fall protection. Deckers working between 15 feet and two stories or 30 feet may be protected by a CDZ.

3. Requires fall protection for all others engaged in steel erection at heights greater than 15 feet.

K. Training.

1. Requires qualified person to train exposed workers in fall protection.

2. Requires qualified person to train exposed workers engaged in special, high risk activities.

V. References.

A. Construction Safety and Health Standards, Subpart R, 29 CFR 1926.750-761 and Subpart M, 1926.502.

B. Federal Register, Vol. 66, No. 12, January 18, 2001, pages 5196-5280, Final Rule; Safety Standards for Steel Erection.

C. Federal Register, Vol. 66, No. 137, July 17, 2001, pages 37137-37139, Final Rule; Delay of Effective Date.

D. OSHA Instruction CPL 2.103, Field Inspection Reference Manual (FIRM)

E. Occupational Safety and Health Act of 1970, Section 5(a)(1).

VI. Application. This instruction applies to construction, alteration and/or repair involving steel erection activities.

VII. Action Information.

A. Responsible Office. Directorate of Construction (DOC)

B. Action Offices. Regional Offices, Area Offices, State Plan States

C. Information Offices. Information copies of this Instruction are provided to OSHA Directorate heads and the Solicitor of Labor (SOL)

VIII. Action. Regional Administrators and Area Directors shall ensure that compliance officers are familiar with the contents of this instruction and that the enforcement guidelines are followed. This instruction will be re-evaluated after one year.

IX Federal Program Change. This instruction describes a Federal program change for which State adoption is not required. States were notified on July 18, 2001 of the requirement to adopt a standard equivalent to the Federal standard for steel erection by January 18, 2002.

NOTE: In order to effectively enforce safety and health standards, guidance to compliance staff is necessary. Although adoption of this instruction is not required, States are expected to have standards, enforcement policies and procedures which are at least as effective as those of Federal OSHA.

X. Phase-in of certain requirements.

A. Component requirements. Component requirements are provisions that address the safety of certain structural members. These are provisions that: prohibit shear connectors on members before they are erected (§1926.754(c)(1)(i)); require all columns to be anchored by a minimum of 4 anchor bolts, which must meet specified strength requirements (§1926.755(a)) (there is a comparable requirement for systems-engineered metal buildings, §1926.758(b)); set requirements for double connections (§1926.756(c)(1)) (there is a comparable requirement for systems-engineered metal

buildings §1926.758(e)); require column splices to be at a specified height and meet a strength requirement (§1926.756(d)); require perimeter columns to have holes or other devices for perimeter safety cables (§1926.756(e)); in some instances require a vertical stabilizer plate to stabilize steel joists (§1926.757(a)(1)(i)); require certain joists to be strong enough to allow one employee to release the hoisting cable without the need for erection bridging (§1926.757(a)(3)), and require certain joists to be fabricated to allow for field bolting during erection (§1926.757(a)(8)(i)).

1. For building construction, the component requirements of the final rule will not be applied: (1) where the building permit was obtained prior to January 18, 2001, or (2) where steel erection began on or before September 16, 2001 (see volume 66 of the Federal Register, page 37137-37139).

2. For bridge construction, the component requirements of the final rule will not be applied where: (1) the bridge project has a contract date before January 18, 2001; or (2) steel erection began on or before September 16, 2001.

B. Column joist requirements in §1926.757(a)(3).

1. Until July 18, 2003, for all joists at or near columns that span 60 feet or less, employers will be considered to be in compliance with §1926.757(a)(3) if they erect these joists either by: (1) installing bridging or otherwise stabilizing the joist prior to releasing the hoisting cable, or (2) releasing the cable without having a worker on the joists. This will allow the joist industry the necessary time to develop joists that will meet the requirement.

C. General Schedule Inspection Delay

1. The Agency will not conduct general schedule inspections of steel erection until March 18, 2002.

CHAPTER 2.

STANDARD OVERVIEW

I. This section is a quick overview of the subjects addressed in the new standard. References to sections of the standard that pertain to these subjects are included.

A. <u>§1926.750 Scope of coverage for Subpart R, Steel Erection, Final Rule (§1926.750-761 and Appendices A-H).</u>

1. Defines what activities are always covered by Subpart R [§.750(b)(1)]

2. Provides examples of job activities that are covered only when they occur during and as a part of steel erection [§.750(b)(2)]

3. Lists specific activities that are not covered [§.750(a)]

4. Defines the duties of the controlling contractor as including, but not limited to, the duties specified in §§1926.752(a) and (c), 1926.755(b)(2), 1926.759(b), and 1926.760(e). [§.750(c)]

B. <u>§1926.751 Definitions</u>.

Key terms used throughout the standard are defined in this section.

C. <u>§1926.752 Site layout and construction sequence</u>.

1. Prior to commencement of steel erection:

a. Controlling contractor must ensure that the steel erector is provided with written notification that concrete has attained sufficient strength for steel erection activities [§.752(a)(1)]

Note: The steel erector is prohibited from erecting steel until it receives written notification that the concrete has cured enough to support steel erection [§.752(b)]

b. Controlling contractor must ensure that the steel erector is provided with written notification of any repairs, replacements and modifications to anchor bolts.[§.752(a)(2)] – *requirements are also found in § .755(b)*

c. Controlling contractor must ensure that the worksite has adequate access and storage areas [§.752(c)]

d. Hoisting operations must be pre-planned to reduce employee exposures to overhead loads [§.752(d)]

2. Allows *Site-specific erection plans* as substitute for certain requirements *(Appendix A contains sample plans)* [§.752(e)].

a. Safety latches on hooks activated [§.753(c)(5)]

b. Setting joists 60'+ at/near columns in tandem [§.757(a)(4)]

c. Landing decking on steel joists [§.757(e)(4)]

D. <u>§1926.753 Hoisting and rigging</u>.

1. Crane safety: All provisions of §1926.550 apply to hoisting and rigging with the exception of §1926.550(g)(2). In addition, §1926.753(c) through (e) contain additional hoisting and rigging requirements. [§.753]

2. Pre-shift inspection requirements

a. Pre-shift inspection must be done by a competent person [§.753(c)]
b. Qualified rigger (rigger who is also a qualified person) must inspect the rigging prior to each shift. [§.753(c)(2)]

3. Responsibilities during crane operations

a. Safety latches on hooks may not be deactivated unless a qualified rigger determines it is safer to place purlins and joists without them, or equivalent protection is provided in a site specific erection plan [§.753(c)(5)]
b. The standard allows employees engaged in initial steel erection or hooking/unhooking to work under loads in some specific instances. When that occurs, the load must be rigged by a qualified rigger [§.753(d)]
c. Operators are responsible for operations under their control and have the authority to stop and refuse to handle loads until safety has been assured [§.753(c)(2)(iv)]

4. Rules for crane operations

   a. Prohibits the use of cranes to hoist personnel unless all provisions of §1926.550 are met except §1926.550(g)(2) [§.753(c)(4)]
   b. When employees work under loads (allowed in specified instances), requirements in this section must be followed [§.753(d)]
   c. Multiple lift rigging ("Christmas Treeing") is permitted as long as the requirements in this section are met [§.753(e)]

E. <u>§1926.754 Structural steel assembly and stability</u>.

1. Stability requirements

   a. Structural stability must be maintained at all times during the erection process [§.754(a)]. This section contains a number of specific requirements for stability (Note: Requirement for four anchor bolts found in §1926.755(a)(1))
   b. Additional requirements for multi-story structures [§.754(b)]
   c. Requirements applicable when plumbing up [§.754(d)]

2. Decking requirements

   a. Requirements for hoisting, landing, and placing metal decking [§.754(e)(1)]
   b. Requirements for installing metal decking at roof and floor holes/openings [§.754(e)(2)]

3. Other requirements

   a. Requirements for skeletal steel walking surfaces [§.754(c)] (NOTE: These do not go into effect until July 18, 2006).

F. <u>§1926.755 Column anchorage</u>.

1. General requirements for stability

   a. Minimum of 4 anchor bolts required on columns [§.755(a)(1)]
   b. Requirement to withstand 300 pound load [§.755(a)(2)]
   c. All columns must be evaluated by competent person [§.755(a)(4)]

2. Repair, replacement, or field modification of anchor rods/bolts

   a. Approval required by the project structural engineer [§.755(b)(1)]
   b. Written notification to steel erector [§.755(b)(2)]

G. <u>§1926.756 Beams and columns</u>.

1. This section of the standard focuses on increasing safety for employees involved in connecting solid web beams and columns.

   a. Requires that solid web structural members remain attached to the hoisting line until members are secured with at least two bolts per connection drawn up wrench tight [§.756(a)(1)]
   b. Competent person shall determine if more than two bolts are necessary to ensure the stability of cantilevered members [§.756(a)(2)]
   c. Solid web structural members used as diagonal bracing shall be secured by at least one bolt per connection drawn up wrench tight [§.756(b)]
   d. Requires that one wrench-tight bolt or a seat (or seat equivalent) secure the first member and column throughout the entire double connection process [§.756(c)]
   e. Requires column splices to be designed to resist a minimum eccentric gravity load of 300 pounds (136.3 kg) [§.756(d)]
   f. Sets requirements for the erection of perimeter columns [§.756(e)]

H. <u>§1926.757 Open web steel joists</u>.

1. This section focuses on increasing safety for employees involved in connecting open web steel joists. (Some requirements may be modified through a site-specific erection plan [§§.757(a)(4) and .757(e)(4)])

   a. Requirements for stabilizing steel joists and girders before releasing hoisting cables [§.757(a)]
   b. Requirements for attaching steel joists and steel joist girders (includes requirements for "K," "LH," and "DLH" series steel joists) [§.757(b)]
   c. Requirements for the erection of steel joists (short span and long span) [§.757(c)]
   d. Requirements for the erection of erection bridging (short span and long span) [§.757(d)]
   e. Requirements for landing and placing loads on joists [§.757(e)]

I. <u>§1926.758 Systems-engineered metal buildings</u>.

1. All the requirements of the standard apply to the erection of systems-engineered metal buildings except §1926.755 (column anchorage) and §1926.757 (open web steel joist). In addition:

   a. All columns are to have a minimum of four anchor rods/bolts [§.758(b)]
   b. The rigid frames must have 50% of their bolts or the number specified by manufacturer (whichever is greater) installed and tightened before the hoisting equipment is released [§.758(c)]
   c. Construction loads prohibited unless the framework is adequately secured [§.758(d)]
   d. Requirements for girt and eave-to-strut connections [§.758(e)]
   e. Steel joists must be secured before releasing hoisting cables, allowing employees on the joist, or placing construction loads on the joists. [§.758(f)]
   f. Purlins and girts are not to be used as anchorages for fall arrest systems unless written approval is obtained from a qualified person [§.758(g)]
   g. Only after permanent bridging has been installed and fall protection provided can purlins be used as a walking/working surface when installing safety systems [§.758(h)]
   h. Limitations on placing construction loads on joists [§.758(i)]

J. §1926.759 Falling object protection

1. All materials, equipment, and tools that are not being used must be secured against accidental displacement [§.759(a)]

2. The controlling contractor must bar other construction processes below steel erection unless overhead protection is provided for the employees working below [§.759(b)]

K. §1926.760 Fall protection

1. All employees must be protected at 15 feet, except for deckers in controlled decking zones and connectors [§.760(a)]

2. Exception for connectors – protected at 30 feet or two stories, whichever is less [§.760(b)]

3. Controlled decking zone requirements [§.760(c)]

4. Exception for deckers in controlled decking zones - protected at 30 feet or two stories above lower deck, whichever is less [§.760(c)(1)]

5. Criteria for fall protection [§.760(d)]

6. Responsibility of controlling contractors to choose whether to accept responsibility for fall protection equipment [§.760(e)]

L. <u>§1926.761 Training</u>.

1. Requirements found in this section supplement those found in §1926.21

2. Training conducted by qualified person(s) [§.761(a)]

3. Requirements that must be included in training [§.761(b)]

4. Special training programs required for multiple lift rigging, connectors, and controlled decking zones [§.761(c)(1) through (3)(ii)]

CHAPTER 3.

COMPLIANCE OFFICER GUIDE AND INSPECTION TIPS

I. INTRODUCTION.

This section is designed to assist compliance officers in the practical aspects of conducting enforcement inspections under the new Steel Erection rule. The suggestions below should be considered helpful hints.

The new steel erection rule addresses a wide range of issues related to steel erection safety. The new standard not only addresses fall protection for iron workers, but places a heavy emphasis on maintaining the structural integrity of the building during the erection process.

> **NOTE On Effective Date:** See Steel Erection Delay Notice (Federal Register #66 pages 37137-37139) to determine if component requirements of the new standard are in effect for a particular project. A number of provisions in the final rule address the safety of certain structural components. These provisions ("component requirements") contain requirements for these components to help ensure that the structure can be erected safely. There are provisions that: prohibit shear connectors on members before they are erected (§1926.754(c)(1)(i)); require all columns to be anchored by a minimum of 4 anchor bolts, which must meet specified strength requirements (§1926.755(a)) (there is a comparable requirement for systems-engineered metal buildings, §1926.758(b)); set requirements for double connections (§1926.756(c)(1)) (there is a comparable requirement for systems-engineered metal buildings §1926.758(e)); require column splices to be at a specified height and meet a strength requirement (§1926.756(d)); require perimeter columns to have holes or other devices for perimeter safety cables (§1926.756(e)); in some instances require a vertical stabilizer plate to stabilize steel joists (§1926.757(a)(1)(i)); require certain joists to be strong enough to allow one employee to release the hoisting cable without the need for erection bridging (§1926.757(a)(3)), and require certain joists to be fabricated to allow for field bolting during erection (§1926.757(a)(8)(i)).

1. For building construction, the component requirements of the final rule will not be applied: (1) where the building permit was obtained prior to January 18, 2001, or (2) where steel erection began on or before September 16, 2001 (see volume 66 of the Federal Register, page 37137-37139).

2. For bridge construction, the component requirements of the final rule will not be applied where: (1) the bridge project has a contract date before January 18, 2001; or (2) steel erection began on or before September 16, 2001.

The Agency will not conduct general schedule inspections of steel erection until March 18, 2002.

3. OPENING CONFERENCE.

Consider obtaining the information outlined below at the opening conference and during the initial observations of the steel erection site. Note that a number of the tips suggest asking for various documents. This does not mean that those documents are required by the standard. *While it is advisable to obtain the documents mentioned below, the only documents an employer is required to have are those specified in Subpart R or other standards.*

A. During the opening conference with the controlling contractor, consider doing the following:

1. Obtain a copy of the blueprints and consult with someone knowledgeable in blueprint reading (engineer). Note the name of the structural engineer of record from the blueprints.

2. Find out when the steel erection began and on what date they obtained the permits for the job. (This information will only be important during the first few months after the standard becomes effective.)

3. Ask for a copy of the written notification to the steel erector that the concrete in the footings, piers and walls and the mortar in the masonry piers and walls has attained the required strength [.752(a)(1)]. You will also want to find out when the concrete was poured, how long after the pour they waited before allowing steel erection to begin, and what compressive strength of concrete was required.

4. Ask if there have been any changes to anchor bolts. Ask for a copy of the written notifications of repairs/replacements/modifications.

5. Determine if, prior to the erection of columns, they provided written notification to the steel erector if any repairs, replacements and modifications to the anchor bolts were conducted. [§§.752(a)(2) and .755(b)]. Were these repairs, replacements and modifications performed with approval of the project structural engineer of record? If so, obtain a copy.

6. Was the fall protection provided by the steel erector left in the area where steel

erection activity has been completed for use by other trades?

a. If yes, ask the following: Did you or your authorized representative direct the steel erector to leave the fall protection in place? Have you or your authorized representative inspected and accepted control and responsibility of the fall protection prior to authorizing persons other than steel erectors to work in the area? (the answer to both of these questions must be yes to be in compliance with §1926.760(e))

b. If no, the controlling contractor is not required to take any further action with regard to this section.

B. During the opening conference with the steel erector, consider doing the following:

1. Determine if they are using open web joists (also known as bar joists).

2. Determine the current stage of the erection process.

3. Ask for a copy of the lift procedure (if kept).

4. Determine who is the competent person and qualified rigger.

5. Determine if they are using a site specific steel erection plan (a plan is only required in some circumstances. See Chapter 2, Section I, Paragraph C).

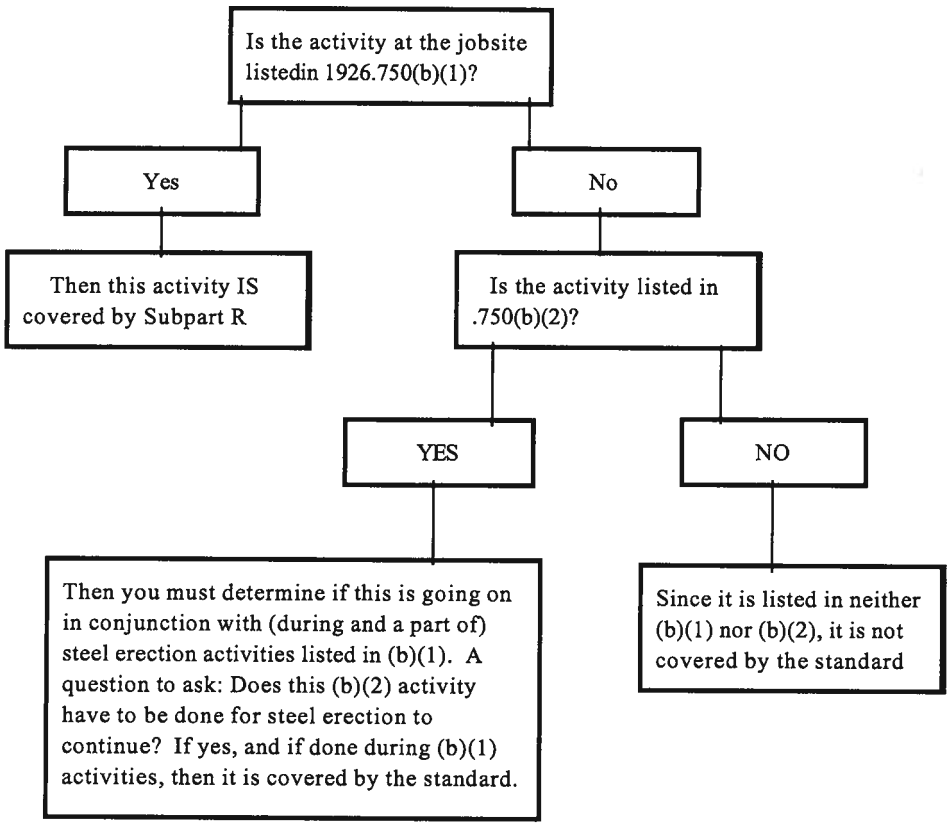
III. STANDARD SECTIONS. The following is a section-by-section description of observations the CSHO should make and questions the CSHO should ask while performing a steel erection inspection.

A. SCOPE - §1926.750.

1. Subpart R does NOT cover - precast concrete, electrical transmission towers, communication and broadcast towers, or tanks. NOTE on tanks: a tank is defined as a container for holding gases, liquids, or solids. Subpart R does apply to the construction of the steel structure that supports a tank. Construction of the tank would be covered under Subpart E - 1926.105.

2. The CSHO must initially determine if the activity being inspected is covered by Subpart R. The first question to ask: Is this activity listed in §1926. 750(b)(1)? If so, then it is covered by the standard.

3. If the activity is listed only in §1926.750(b)(2), then you must determine if it is going on in conjunction with ("during and [is] a part of") steel erection activities listed in §1926.750(b)(1). A question also to ask: Does this (b)(2) activity have to be done for the steel erection to continue? The following flow chart may help:



NOTE: Paragraph .750(b)(2) lists a number of activities that are covered by subpart R when they occur during and are a part of the steel erection activities described in paragraph (b)(1).

Paragraph (b)(2) explicitly states that coverage depends on whether an activity occurs during and is a part of steel erection. For example, there are standing seam metal roofing systems that incorporate a layer of insulation under the metal roof. In the installation process, a row of insulation is installed, which is then covered by a row of metal roofing. Once that row of roofing is attached, the process is repeated, row by row, until the roof is completed. The installation of the row of insulation is a part of the installation of the metal roofing (which is steel erection), and so the installation of the insulation is covered by Subpart R.

B. DEFINITIONS - §1926.751.

The following definitions, which are in the standard, should be helpful when conducting the walk around inspection (see photos in Chapter 5):

1. *Anchored bridging* means that the steel joist bridging is connected to a bridging terminus point.

2. *Bolted diagonal bridging* means diagonal bridging that is bolted to a steel joist or joists.

3. *Bridging clip* means a device that is attached to the steel joist to allow the bolting of the bridging to the steel joist.

4. *Bridging terminus point* means a wall, a beam, tandem joists (with all bridging installed and a horizontal truss in the plane of the top chord) or other element at an end or intermediate point(s) of a line of bridging that provides an anchor point for the steel joist bridging.

5. *Choker* means a wire rope or synthetic fiber rigging assembly that is used to attach a load to a hoisting device.

6. *Cold forming* means the process of using press brakes, rolls, or other methods to shape steel into desired cross sections at room temperature.

7. *Column* means a load-carrying vertical member that is part of the primary skeletal framing system. Columns do not include posts.

8. *Competent person* (also defined in §1926.32) means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

9. *Connector* means an employee who, working with hoisting equipment, is placing and connecting structural members and/or components.

10. *Constructibility* means the ability to erect structural steel members in accordance with Subpart R without having to alter the overall structural design.

11. *Construction load* (for joist erection) means any load other than the weight of the employee(s), the joists and the bridging bundle.

12. *Controlled decking zone* (CDZ) means an area in which certain work (for example, initial installation and placement of metal decking) may take place without the use of guardrail systems, personal fall arrest systems, fall restraint systems, or safety net systems and where access to the zone is controlled.

13. *Controlled load lowering* means lowering a load by means of a mechanical hoist drum device that allows a hoisted load to be lowered with maximum control using the gear train or hydraulic components of the hoist mechanism. Controlled load lowering requires the use of the hoist drive motor, rather than the load hoist brake, to lower the load.

14. *Controlling contractor* means a prime contractor, general contractor, construction manager or any other legal entity which has the overall responsibility for the construction of the project -- its planning, quality and completion.

15. *Critical lift* means a lift that (1) exceeds 75 percent of the rated capacity of the crane or derrick, or (2) requires the use of more than one crane or derrick.

16. *Decking hole* means a gap or void more than 2 inches (5.1 cm) in its least dimension and less than 12 inches (30.5 cm) in its greatest dimension in a floor, roof or other walking/working surface. Pre-engineered holes in cellular decking (for wires, cables, etc.) are not included in this definition.

17. *Derrick floor* means an elevated floor of a building or structure that has been designated to receive hoisted pieces of steel prior to final placement.

18. *Double connection* means an attachment method where the connection point is intended for two pieces of steel which share common bolts on either side of a central piece.

19. *Double connection seat* means a structural attachment that, during the installation of a double connection, supports the first member while the second member is connected.

20. *Erection bridging* means the bolted diagonal bridging that is required to be installed prior to releasing the hoisting cables from the steel joists.

21. *Fall restraint system* means a fall protection system that prevents the user from falling any distance. The system is comprised of either a body belt or body harness, along with an anchorage, connectors and other necessary equipment. The other components typically include a lanyard, and may also include a lifeline and other devices.

22. *Final interior perimeter* means the perimeter of a large permanent open space within a building such as an atrium or courtyard. This does not include openings for stairways, elevator shafts, etc.

23. *Girt* (in systems-engineered metal buildings) means a "Z" or "C" shaped member formed from sheet steel spanning between primary framing and supporting wall material.

24. *Headache ball* means a weighted hook that is used to attach loads to the hoist load line of the crane.

25. *Hoisting equipment* means commercially manufactured lifting equipment designed to lift and position a load of known weight to a location at some known elevation and horizontal distance from the equipment's center of rotation. "Hoisting equipment" includes but is not limited to cranes, derricks, tower cranes, barge-mounted derricks or cranes, gin poles and gantry hoist systems. A "come-a-long" (a mechanical device, usually consisting of a chain or cable attached at each end, that is used to facilitate movement of materials through leverage) is not considered "hoisting equipment."

26. *Leading edge* means the unprotected side and edge of a floor, roof, or formwork for a floor or other walking/working surface (such as deck) which changes location as additional floor, roof, decking or formwork sections are placed, formed or constructed.

27. *Metal decking* means a commercially manufactured, structural grade, cold rolled metal panel formed into a series of parallel ribs; for this subpart, this includes metal floor and roof decks, standing seam metal roofs, other metal roof

systems and other products such as bar gratings, checker plate, expanded metal panels, and similar products. After installation and proper fastening, these decking materials serve a combination of functions including, but not limited to: a structural element designed in combination with the structure to resist, distribute and transfer loads, stiffen the structure and provide a diaphragm action; a walking/working surface; a form for concrete slabs; a support for roofing systems; and a finished floor or roof.

28. *Multiple lift rigging* means a rigging assembly manufactured by wire rope rigging suppliers that facilitates the attachment of up to five independent loads to the hoist rigging of a crane (Note: Under §1926.753(e)(2), components from several manufacturers may be assembled by a qualified rigger. See Question and Answer #18).

29. *Opening* means a gap or void 12 inches (30.5 cm) or more in its least dimension in a floor, roof or other walking/working surface. For the purposes of this subpart, skylights and smoke domes that do not meet the strength requirements of §1926.754(e)(3) shall be regarded as openings (Note: The definition of "opening" in subpart R is different than the definition of "opening" in subpart M).

30. *Permanent floor* means a structurally completed floor at any level or elevation (including slab on grade).

31. *Personal fall arrest system* means a system used to arrest an employee in a fall from a working level. A personal fall arrest system consists of an anchorage, connectors, a body harness and may include a lanyard, deceleration device, lifeline, or suitable combination of these. The use of a body belt for fall arrest is prohibited.

32. *Positioning device* means a body belt or body harness rigged to allow an employee to be supported on an elevated, vertical surface, such as a wall or column and work with both hands free while leaning.

33. *Post* means a structural member with a longitudinal axis that is essentially vertical, that: (1) weighs 300 pounds or less and is axially loaded (a load presses down on the top end), or (2) is not axially loaded, but is laterally restrained by the above member. Posts typically support stair landings, wall framing, mezzanines and other substructures.

34. *Project structural engineer of record* means the registered, licensed

professional responsible for the design of structural steel framing and whose seal appears on the structural contract documents.

35. *Purlin* (in systems-engineered metal buildings) means a "Z" or "C" shaped member formed from sheet steel spanning between primary framing and supporting roof material.

36. *Qualified person* (also defined in §1926.32) means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project.

37. *Safety deck attachment* means an initial attachment that is used to secure an initially placed sheet of decking to keep proper alignment and bearing with structural support members.

38. *Shear connector* means headed steel studs, steel bars, steel lugs, and similar devices which are attached to a structural member for the purpose of achieving composite action with concrete.

39. *Steel erection* means the construction, alteration or repair of steel buildings, bridges and other structures, including the installation of metal decking and all planking used during the process of erection.

40. *Steel joist* means an open web, secondary load-carrying member of 144 feet (43.9 m) or less, designed by the manufacturer, used for the support of floors and roofs. This does not include structural steel trusses or cold-formed joists.

41. *Steel joist girder* means an open web, primary load-carrying member, designed by the manufacturer, used for the support of floors and roofs. This does not include structural steel trusses.

42. *Steel truss* means an open web member designed of structural steel components by the project structural engineer of record. For the purposes of this subpart, a steel truss is considered equivalent to a solid web structural member.

43. *Structural steel* means a steel member, or a member made of a substitute material (such as, but not limited to, fiberglass, aluminum or composite members). These members include, but are not limited to, steel joists, joist

girders, purlins, columns, beams, trusses, splices, seats, metal decking, girts, and all bridging, and cold formed metal framing which is integrated with the structural steel framing of a building.

44. *Systems-engineered metal building* means a metal, field-assembled building system consisting of framing, roof and wall coverings. Typically, many of these components are cold-formed shapes. These individual parts are fabricated in one or more manufacturing facilities and shipped to the job site for assembly into the final structure. The engineering design of the system is normally the responsibility of the systems-engineered metal building manufacturer.

45. *Tank* means a container for holding gases, liquids or solids.

46. *Unprotected sides and edges* means any side or edge (except at entrances to points of access) of a walking/working surface, for example a, floor, roof, ramp or runway, where there is no wall or guardrail system at least 39 inches (1.0 m) high.

C. SITE LAYOUT, SITE-SPECIFIC ERECTION PLAN AND CONSTRUCTION SEQUENCE - §1926.752.

This section of the standard sets forth OSHA's requirements for communication between the controlling contractor and the steel erector prior to the beginning of steel erection, and pre-planning by the steel erector to minimize overhead exposure during hoisting operations.

1. During an inspection, visually determine the following:

   a. Did the controlling contractor provide adequate road access on the site for the delivery and movement of derricks, cranes, trucks, steel erection materials and other equipment? (Note: This requirement does not apply to roads outside of the construction site.) [§.752(c)(1)]
   b. Did the controlling contractor provide means and methods for pedestrian and vehicular control? [§.752(c)(1)]
   c. Did the controlling contractor provide a firm, properly graded, drained area, readily accessible to the work with adequate space for the safe storage of materials and safe operation of the erectors' equipment? [§.752(c)(2)]
   d. Did the controlling contractor either bar other construction processes below steel erection or provide overhead protection for the employees below? (This relates only to protection from falling objects other than materials being hoisted.) [§.759(b)]

2. Site-specific erection plan [§.752(e)]. A site-specific erection plan is required only when the contractor has decided to use alternative means to protect employees from three specific hazards:

   a. When safety latches on hooks are being deactivated or made inoperable. [§.753(c)(5)]
   b. When joists (which span more than 60 feet) at or near columns are not being set in tandem with all bridging installed. [§.757(a)(4)]
   c. When bundles of decking are being placed on steel joists before all bridging has been installed and anchored and all joist bearing ends attached. [§.757(e)(4)]

3. If it is determined that any of the above three conditions exist, a site-specific erection plan is required. The employer may use Appendix A as a framework for the plan. Methods for providing alternative worker protection from the above three conditions must be specified in the plan.

4. Determine if there is a plan available at the site. (Note: The plan does not need to be in writing - only §1926.757(e)(4)) requires a written plan.

D. <u>HOISTING AND RIGGING - §1926.753</u>.

The requirements of §1926.753 supplement the existing crane and rigging standards in §1926.251 and §1926.550. The requirements of Subpart R cover every type of crane. All the provisions of §1926.550 apply to hoisting and rigging with the exception of §1926.550(g)(2).

1. Questions to ask the steel erector:

   a. Who is the qualified rigger?
   b. Did they do a pre-shift inspection of the rigging?
   c. Who is the competent person assigned to inspect the crane?

2. Questions to ask the crane operator and/or qualified rigger:

   a. Do they have load charts, operator manual or riggers' handbook?
   b. Has the heaviest anticipated lift been calculated?
      (Note: See the June 1994 booklet "Mobile Crane Inspection Guidelines for OSHA Compliance Officers")

3. Paragraph(c)(2) requires the qualified rigger inspect the below-hook rigging before each shift. Section 1926.251 inspection procedures will be applied for each type of rigging equipment to be used during the shift. In addition, paragraph (c)(5)(i) allows the safety latch on hoisting hooks to be deactivated when the qualified rigger makes a determination that it is safer for the connectors during the placement of purlins and single joists (Note that a safety latch is required to be used only where: (1) the manufacturer has equipped the hook with a latch, or (2) when working under suspended loads pursuant to §1926.753(d)).

   a. Observe hooks with deactivated safety latches for anything other than single joists or purlins.
   b. Refer to the site-specific erection plan for equivalent protection.
   c. Talk to the qualified rigger.

4. Paragraph (d) addresses the hazards associated with overhead loads. Specifically, these hazards include failure of the lifting device, which would create a crushing hazard, and items falling from the load, which creates a struck-by and crushing hazard, among others. Given the nature of the loads used in steel erection, either of these events could result in serious injury or death.

   a. See if employees are exposed to overhead loads. If you see employees working under loads, determine if the route was pre-planned (and exposure minimized) by interviewing the competent person, crane operator, etc. (The exception being connectors doing initial connection; or riggers hooking or unhooking of the load. These employees may work under the load.)

5. <u>MULTIPLE LIFT RIGGING PROCEDURE (MLRP)</u>.

Paragraph (e)(1) lists the prerequisite conditions for multiple lift procedures (MLRP assembly, maximum of 5 pieces of steel per lift, only beams or similar structural members allowed, only by specifically trained employees, and the crane manufacturer must allow.)

   a. If the steel erector is performing multiple-lifts:

      (1) Request a copy of their multiple-lift procedure (if kept).
      (2) Determine the number of pieces being lifted (no more than 5 are allowed).

(3) Check for certification of the rigging assembly from the qualified rigger (whether a manufacturer supplied rigging or the qualified rigger assembled it) and inspect the rigging equipment.
(4) Review the rigging chart and calculate the total load.
(5) Check the crane for controlled load lowering capability.
(6) Assure that the rigging is 7 feet or more apart.

b. The MLRP rigging assembly must be specifically designed for the structural steel members to be lifted. The design must incorporate the maximum anticipated load for each component part as it will be used in the assembly.

c. On a manufacturer-assembled rig, check for a tag or other means to specify the limits of the rig.

d. On a qualified rigger-assembled rig, check that the qualified rigger certified the maximum loading of the assembly and its component parts.

E. STRUCTURAL STEEL ASSEMBLY - §1926.754.

1. Paragraph (a): This paragraph requires that structural stability be maintained throughout the structural steel erection process. While guy wires (steel cable) are not specifically required, they are often used for this purpose. (See also §. 755(a)(4)). These guy wires may also be used to plumb the building and add support to resist wind conditions.

a. Look for guying and bracing and see if any apparent problems exist.

2. Paragraph (c)(1): Shear connectors and similar devices. The standard requires that, where used, shear connectors must be field-installed rather than shop-installed.

a. Check steel beams for shear connectors. There should not be any shear connectors on beams without the decking or other walking/working surface in place, unless conventional fall protection is used (see Q & A # 25).
b. Ask the steel erector if they field-install shear connectors and what procedures are followed.

3. Paragraph (c)(3): **THIS PROVISION ONLY APPLIES AFTER JULY 18, 2006**. Once in effect, this will require documented or certified slip resistance of

any painted or coated structural steel that an employee would walk on.

a. After July 18, 2006, observe the following conditions: Does the site have any painted or coated steel? If so, ask the steel erector for documentation or certification of slip resistance. This would probably be something the steel erector would obtain from the steel fabricator and/or paint manufacturer certifying the slip resistance of the paint.

4. Paragraph (d)(1): Plumbing-up.

a. Look for plumbing-up equipment. Guy wires (steel cable) and turnbuckles are generally used to plumb structures. Check for proper installation -- see if the wire rope components (U clips) were installed according to the manufacturers' requirements.

5. Paragraph (e)(1)(i) (general prohibition against using bundle packaging and strapping for hoisting): This hazard usually occurs while unloading trucks, when the metal decking bundles are tightly packed together and the rigging is difficult to attach and the end of the bundle is lifted with the bundles banding straps.

a. Ask the steel erector or observe if these straps are marked as approved for lifting.

6. Paragraph (e)(1)(iii)-(iv)(requirements for landing metal decking bundles). Generally, the competent person (foreman) will layout specific locations for the placement of bundles of decking for the ease of installation.

a. Look for metal decking landed on joists. Climb the ladder and ensure that bridging is installed and all joist ends are attached. Check the placement of the decking bundles. Refer to §1926.757(e)(4) for specific requirements.

b. Look for metal decking landed on solid web framing members. Check placement and support of bundles.

7. Paragraph (e)(2): Roof and floor holes and openings.

a. Look for any "decking holes" and "openings" on the site. Framed openings in metal decking must have structural members turned down. Any openings (as defined in the standard) that do exist because of constructibility or design constraints must be covered or employees

protected by fall protection [.760(a)(1)].

8. Paragraph (e)(3): Covers for roof and floor openings. Look for any covers on the site. If covers exist:

   a. Are they secured?
   b. Are they painted, or marked visibly with "HOLE" or "COVER"?

F. COLUMN ANCHORAGE - §1926.755.

1. Paragraph (a) contains requirements to ensure that columns remain stable during the erection process.

2. Paragraph (a)(1) requires 4 anchor rods/bolts on all columns. However, this requirement does not include posts. The standard defines these terms as follows: A column is a load-carrying vertical member that is part of the primary skeletal framing system. A post is a structural member with a longitudinal axis that is essentially vertical, that: (1) is axially loaded (a load presses down on the top end) and weighs 300 pounds or less, or (2) is not axially loaded, but is laterally restrained by the above member. Posts typically support stair landings, wall framing, mezzanines and other structures.

   a. Determine whether a vertical member is a column. If it is, check if it has the required 4 anchor rods/bolts. Remember that a post can have less than 4.

3. Paragraph (a)(2) requires that columns be able to withstand a specified load.

   a. Check for unusually small bolts, insufficient length or failure.
   b. Request documentation of the design criteria from the contractor.

4. Paragraph (a)(3) is intended to ensure that the column is properly set.

   a. If leveling nuts are used, make sure the weight of the column rests on all 4 nuts. If shims are used, look for loose shims or instances where only a few shims are supporting the load.

5. Paragraph (a)(4) requires that a competent person evaluate the columns to determine whether guying or bracing is needed. If guying or bracing is needed, it must be provided. All columns need to be evaluated; in some instances the 4 anchor bolts/rods may not provide sufficient stability.

a. Ask the contractor who their competent person is and ask the competent person if and how this evaluation was performed.

6. Paragraph (b) requires that all anchor bolt/rod repairs be approved by the project structural engineer of record and that all such repairs be communicated in writing to the steel erector.

a. Ask for a copy of the notification when it is suspected that anchorage bolts/rods have been damaged, repaired, replaced or field-modified.

G. BEAMS AND COLUMNS - §1926.756.

1. Paragraph (c)(1): Double connections at columns and /or at beam webs over columns.

a. Ask the steel erector's representative/competent person if the structure's design includes double connections at columns and/or beam webs over columns. If the answer is yes, you should observe the double connection operation.

b. Ask the employer the following questions on how the connectors are being protected during this type operation:

(1) Are the connectors able to maintain at least 1-bolt and nut at least wrench tight at a common connection hole at all times? Among the ways of doing this are to use clipped end connections or staggered connections.
(2) If not, is the erector using seats or equivalent connection devices that were supplied with the member?
(3) If a seat or equivalent device is used, is it attached to both the supporting member and the first member before the nuts on the shared bolts are removed?
(4) If a seat or equivalent device is used, has it been adequately bolted or welded to both a supporting member and the first member before the nuts on the shared bolts are removed to make the double connection?

2. Paragraph (d): Column splices.

a. If a need arises to determine if column splices were designed to resist a minimum eccentric gravity load of 300 pounds located 18 inches from the extreme outer face of the column in each direction at the top of the

column shaft, ask the project structural engineer of record.

b. The perimeter columns must extend a minium of 48 inches above the finish floor and have holes or other devices attached to them at 42 - 45 inches above the finish floor (and also at the mid-point) to permit the installation of perimeter safety cables. If this requirement is not met, and the employer claims that constructibility does not allow meeting the requirement, ask the employer why constructibility does not allow this and what the employer is doing in the mean time to provide protection to the employees exposed to the perimeter.

H. OPEN WEB STEEL JOISTS - §1926.757.

Some of the most serious risks facing the ironworker are encountered during the erection of open web steel joists, particularly from landing loads on unbridged joists and improperly placing loads on joists.

1. Questions to ask the steel erector and the ironworkers with regard to steel joists:

   a. What type of joists are you installing?
   b. What's the elevation?
   c. Are you installing joists in bays? If so, how many joists per bay and how many bays?
   d. What are the spans of the joists and are there different types of joists being installed?
   e. Are you familiar with the Steel Joist Institute and/or OSHA's requirements for the safe installation of steel joists?
   f. Can I see the steel erection drawings and can you explain the joist pattern?
   g. Are you following a site specific erection plan? If so, may I see a copy?
   h. How are you bracing/bridging the joists? Diagonal and/or horizontal?
   i. What bridging is required? What type of bridging is being used?
   j. When is the erection bridging installed and by whom is it installed?
   k. How much and what type of erection bridging is required by the plans?
   l. At what point during the installation process is the erection bridging installed?
   m. Is all the erection bridging designated in the drawings being installed? If not, why not?
   n. How are you lifting the joists?
   o. What are the qualifications of the crane operator?

p. How are the joists rigged? Is a qualified rigger being used?

q. Is the erection bridging installed before or after releasing the joist from the crane?

r. How are the joists released from the crane? (Open hooks? Remote release? Ironworker walks the joists? From an aerial lift?)

s. Are the joist connections bolted or welded? If welded, do welds meet the standard's requirements [.757(b)]?

t. Are joists in bays of 40 feet or more bolted? If not, why not? If the employer claims that constructibility does not allow field-bolting, ask its basis for making that claim.

u. What type of fall protection is being used during joist installation and during the installation of erection bridging?

v. Are you setting joists in tandem?

w. How are you securing your joists - are both sides of the seat at one end of the joist secured?

x. Have there been any stability problems? Problems with anchor bolts or wall pockets?

y. Have there been any change orders? May I see the change log (if kept)?

z. Are you field bolting your joists at the columns?

aa. Are the columns framed in at least two directions?

bb. When landing joists, how are you securing them against accidental displacement?

cc. What kind of bridging terminus points are you using? Please identify them.

dd. Are you placing any loads on the joists? If so, what are they (e.g., bundles of bridging or deck or joists)? How much load is being placed on the joists and across how many joists is the load spread?

I. SYSTEMS-ENGINEERED METAL BUILDINGS - §1926.758.

1. When performing an inspection on a systems-engineered metal building, be aware that all the requirements in subpart R apply to these structures except for §1926.755 (column anchorage) and §1926.757 (steel joist erection).

   a. Check column base plates for four anchor bolts/rods [§.758(b)]

   b. Check for any double connections on the structure and ensure that either a seat or similar connection device is being used for double connections.

   c. If joists are being installed, observe the operation to ensure that joists are fully bolted or welded prior to release of the hoisting cable, allowing

an employee on the joists or placing any construction load on the joist.

J. FALLING OBJECT PROTECTION - §1926.759.

1. Under paragraph (b), when it is necessary to have work performed below on-going steel erection activities (other than hoisting), effective overhead protection must be provided to those workers to prevent injuries from falling objects.

2. If this protection is not provided, work by other trades is not to be permitted below steel erection work -- the controlling contractor must institute measures to keep employees out of the area below the steel erection activities.

   a. Check the site for unsecured materials, tools and equipment that are not in use [§.759(a)].
   b. If you see workers below where steel erection activities are being performed, ask some of the employees if they know of any tools or other materials that have fallen from the worksite above. If they have, look into what falling hazards are present and what has and is being done to protect the employees.

K. FALL PROTECTION - §1926.760.

1. Paragraph (a): The first thing that needs to be determined is if the activity is covered by Subpart R (see §1926.750(b)) or by Subpart M.

   a. Ask the general contractor about their fall protection program and what they require their subcontractors to follow. Then ask the erectors. Check to see if the employers are effectively communicating and enforcing the standard. If the erector allows employees to work unprotected between 15 and 30 feet, make sure that the unprotected workers meet the connector definition or are working on the leading edge of a decking operation in a CDZ (see definitions of connector, leading edge, and controlled decking zone).

   b. Establish by observation and asking employees the following:

      (1) What fall protection system are you using?
      (2) Who are the connectors? (Note: Come-a-longs and chain-falls are not hoisting equipment, so employees cannot be considered connectors simply on the basis of using these to move steel into place.)
      (3) How often do you inspect your fall protection equipment?

(4) For decking operations between 15 and 30 feet/2 stories, are you using fall protection or CDZs?
(5) Are all employees over 30feet/2 stories protected by conventional fall protection?

2. Paragraph (c): Controlled decking zone

   a. If the employer is using a CDZ between 15 and 30 feet/2 stories, observe the operation to determine if the employer is complying with the requirements of §1926.760(c).
   b. Physically inspect CDZ from outside the zone if possible. Measure the size and ask employees working in the zone about their training and what activities are performed in the zone.

3. Paragraph (a)(2): Perimeter cables

   a. Look at the perimeter cables. Do they meet the criteria of §1926.502(g)? Are the perimeter cables being installed as soon as the metal decking is completed?

L. TRAINING - §1926.761.

Section 1926.761 supplements §1926.21(b)(2) training requirements. Failure to train on hazards not covered by this section should be cited under §1926.21(b)(2) (for example: training on falling objects, bolting, impalement hazards from rebar). Subpart R does not require a certification that training has been conducted.

1. Employees must be provided the training prior to exposure to the hazard.

   a. Ask the employer whether it trained the employees or relied on a third-party trainer. If a third-party trainer was used, ask how the employer determined that the training meets the standard.
   b. Subpart R does not include a testing requirement. However, an effective training program necessarily involves some means of determining whether the instruction was understood. Ask the employer how it makes this determination (this can be done in a variety of ways, such as formal oral, or written tests, observation, or through discussion). Also, ask employees about their training.

2. Section (a): Requires that all training required by this section be provided by a qualified person.

3. A qualified person, is defined in §1926.751 as one who by possession of a recognized degree, certificate, or professional standing, or by extensive knowledge, training, and experience has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project.

CHAPTER 4.

QUESTIONS AND ANSWERS

Note: Several questions and answers that appeared in the draft version of this directive have been removed pending further consideration.

I. GENERAL GUIDANCE.

Question 1: What is the effective date of the standard?
Answer: The effective date for the final rule has been changed to January 18, 2002. Note also that the effective date of §1926.754(c)(3)(slip resistance requirement for coated skeletal structural steel) is July 18, 2006.

~~NOTE: The Agency will not conduct general schedule inspections of steel erection until March 18, 2002~~.

For more information on how the new standard will be phased-in, see Question and Answer 2 below.

Question 2: On February 1, 2002, a contractor receives the columns at the site to be erected. They have only 2 anchor bolts, and column splice locations do not meet the standard's requirements. The design and/or fabrication of these columns was done prior to the new effective date (January 18, 2002) of the final rule. Is the contractor required to comply with §1926.755 (a)(1)(requirement for 4 anchor bolts) and §1926.756(d) (requirement for column splice height)?

Answer: In two situations the component requirements (provisions that address the safety of certain structural members) of the final rule will not be applied: (1) where the building permit was obtained prior to January 18, 2001, or (2) where steel erection began on or before September 16, 2001 (see volume 66 of the Federal Register, page 37137-37139). Steel erection begins when a steel erection activity covered by the standard begins.

In this scenario, the answer depends on when the building permit was obtained and when steel erection began. If the building permit was obtained before January 18, 2001 (the date the final rule was published), these component requirements would not be applied to these columns. If steel erection began on or before September 16, 2001, the component requirements would not apply, irrespective of when the building permit was obtained. Otherwise, the requirements would apply.

For bridge construction, OSHA will exempt a bridge project from the component requirements of the new steel erection standard if: (1) the project has a contract date before January 18, 2001; or (2) steel erection began on or before September 16, 2001.

Question 3: Which provisions in the standard are considered "component requirements"?

Answer: A number of provisions in the final rule address the safety of certain structural components. These provisions contain design requirements for these components to help ensure that the structure can be erected safely. For example, there are provisions that prohibit shear connectors on members before they are erected (§1926.754(c)(1)(i)); require all columns to be anchored by a minimum of 4 anchor bolts, which must meet specified strength requirements (§1926.755(a)) (there is a comparable requirement for systems-engineered metal buildings, §1926.758(b)); set requirements for double connections (§1926.756(c)(1)) (there is a comparable requirement for systems-engineered metal buildings §1926.758(e)); require column splices to be at a specified height and meet a strength requirement (§1926.756(d)); require perimeter columns to have holes or other devices for perimeter safety cables (§1926.756(e)); in some instances require a vertical stabilizer plate to stabilize steel joists (§1926.757(a)(1)(i)); require certain joists to be strong enough to allow one employee to release the hoisting cable without the need for erection bridging (§1926.757(a)(3)), and require certain joists to be fabricated to allow for field bolting during erection (§1926.757(a)(8)(i)).

II. SECTION 1926.750-SCOPE.

Question 4(a): The structural steel and decking has been completed on floor 4. Structural steel is being erected for floor 6. Is the installation of an item listed only in §1926.750(b)(2) on floor 4 considered steel erection?

Answer: No. The activities listed in §1926.750(b)(1) are covered by the standard. The activities listed in §1926.750(b)(2) are covered by the standard only if they are installed "during and are a part of" steel erection activities listed in (b)(1).
In this scenario no (b)(1) activities are taking place on the 4th floor, the ongoing steel erection activities have progressed to the 6th floor, and the installation of the (b)(2) item is not part of the work on floor 6. The work on floor 4 is not covered by Subpart R.

Question 4(b): Some structural steel work (listed in (b)(1)) is taking place in the northeast corner of floor 5. In the southwest corner of floor 5, some work listed in (b)(2) is taking place. Is the installation of the (b)(2) item covered by subpart R?

Answer: No. As long as the §1926.750(b)(1) activities can proceed irrespective of the progress on the §1926.750(b)(2) activities, the (b)(2) activities are excluded from coverage under Subpart R.

Question 5: When a tank is to be supported by a structure that falls under the scope of Subpart R, does construction of the tank also fall within the scope of Subpart R?

Answer: No. 1926.750(a) excludes tank construction from the scope of Subpart R. It is excluded because it is considered to be a specialized industry based upon its unique use of

cylindrical construction techniques. The construction of the tank itself would not be steel erection even though the structure supporting the tank is covered by subpart R.

Question 6: When installing an integrated metal roof decking system, which includes the metal banding, insulation, and screw down clips, is the entire process considered steel erection?

Answer: Yes. These operations take place in a repeating sequence of steps. Once the banding is in place, a row of insulation is put down, metal decking is laid over it and then secured with clips. The metal decking forms both the structural and weather-proofing roof surface. Working from that completed row, the next row of insulation and decking is then installed and the process repeated across the building.

The installation of the metal roof decking is covered by subpart R under 1926.750(b)(1). Because the metal banding, insulation and screw-down clips are installed "during and [as] a part of" the installation of the metal decking, these activities are covered by subpart R under 1926.750(b)(2).

Question 7: Is the construction of a house framed with metal studs within subpart R?

Answer: No. Metal studs are not mentioned in §1926.750, and while the installation of "structural steel" is covered, the definition of structural steel in §1926.751 includes metal studs only where those studs are "integrated with the structural steel framing of a building." Since such a house has no such structural steel framing, but simply the cold-formed metal studs, a house framed with metal studs is not covered by subpart R. The use of one or several hotformed I-beams in such a structure would not constitute "structural steel framing" [emphasis added], so their use in such a house would not change the answer; subpart R would apply only to the installation of the hot-formed I-beams.

Question 8: When would the installation of metal studs be covered by subpart R?

Answer: The installation of metal studs is covered by subpart R when the studs are "integrated with the structural steel framing of a building." For example, in some buildings, the skeletal frame is composed of hot-formed columns and beams. However, the filler walls and roof structure, which are attached to that frame, are constructed with metal studs. In that case, the installation of the metal studs are covered by subpart R.

Question 9: Is the installation of metal stairways, and the installation of an iron fence and gate outside a completed building, considered "miscellaneous metals" and covered by subpart R?

Answer: Yes. The activities listed in §1926.750 (b)(1), which are covered by Subpart R, include installing "miscellaneous metals, [and] ornamental iron . . ." An iron fence and gate have traditionally been considered ornamental iron, and so are covered. Metal stairways have also

traditionally been considered miscellaneous metals and would be covered by the standard.

Question 10: Scenario: A prefabricated tank is installed on a pad. The tank has connection points for a catwalk pre-installed by the manufacturer. The catwalk will be installed by a crane crew after the tank is installed. Do the fall protection requirements of Subpart R apply to the installation of the catwalk?

Answer: Yes, the installation of the catwalk on a completed tank is covered by Subpart R. Catwalks traditionally have been considered "miscellaneous metals." The installation of miscellaneous metals are covered by Subpart R pursuant to §1926.750(b)(1). Therefore, fall protection by use of a guardrail system, safety net system, personal fall arrest system, positioning device system or fall restraint system is required by §1926.760 (a)(1) at heights more than 15 feet above a lower level.

Question 11: Subpart R does not apply to transmission towers. Some power lines are supported with steel poles. Is the installation of these steel poles covered by subpart R?

Answer: No. Although such poles are not "towers," 1926 Subpart V (Power Transmission and Distribution) is a more specifically applicable standard. Under 1926.950(a), Subpart V applies to "the construction of electric transmission and distribution lines and equipment." "Equipment" is defined in §1926.960(s) as including "fittings, devices, appliances, fixtures, apparatus, and the like, used as part of, or in connection with, an electrical power transmission and distribution system, or communication systems." Steel poles used to support power lines meet this definition. Therefore, the installation of these poles is covered by 1926 Subpart V, not Subpart R.

III. SECTION 1927.752-SITE LAYOUT, SITE-SPECIFIC ERECTION PLAN AND CONSTRUCTION SEQUENCE.

Question 12: Before any steel erection begins, who is responsible for performing the test to determine whether the concrete has cured to 75% of the intended minimum compressive design strength or cured enough so that it can support the loads imposed during steel erection?

Answer: The controlling contractor must ensure that written notification is given to the steel erector that the concrete has cured to the level required by the standard. The standard does no require any specific entity to perform the test. The choice of who will do the test is left to the controlling contractor. Since it is the controlling contractor's responsibility to ensure that the notification is given to the steel erector, the controlling contractor must select an entity that has the expertise to perform the test. The controlling contractor may do the test itself if it has the expertise to do so. In the preamble of the final rule (page 5206), OSHA stated:

In the proposed rule, the controlling contractor would have had to provide the ASTM test results

to the steel erector. The final rule has been changed to reflect that the controlling contractor must ensure that the test results are provided to the steel erector. This rephrasing will allow the controlling contractor to have a contractor familiar with the ASTM test methods perform the test and provide the results to the steel erector.

Question 13: Can the controlling contractor contract with subcontractors to perform the work required by §1926.752(a)? If so, is the controlling contractor still responsible for these duties after subcontracting them out?

Answer: Under §1926.752 (a), the controlling contractor "shall ensure that the steel erector is provided" with written notification that the concrete has cured to the specified degree. While the controlling contractor may contract with subcontractors to do the requisite tests and provide the written notification, the controlling contractor remains responsible for ensuring that the subcontractor does that work. If the subcontractor fails to do the test and provide the notification, the controlling contractor may be cited for a violation under §1926.752(a).

Question 14: Section 1926.752(a)(1) requires the controlling contractor to ensure that the steel erector is provided with written notifications that the concrete and masonry meet certain specified strength requirements. To what extent is the controlling contractor responsible for the accuracy of the strength assessments in the written notifications?

Answer: As explained in Q&A #12, the controlling contractor can choose to either: (1) conduct the tests itself, if it has the expertise to do so; or (2) select an entity that has the expertise to do the test. If the controlling contractor does the tests itself, it is responsible for the accuracy of the tests.

If the controlling contractor selects someone else to do the tests, it is responsible for exercising reasonable care in the selection of the testing entity. As long as it has a reasonable basis for believing that the testing entity is competent and capable of doing the work, and the controlling contractor has no actual knowledge that the tests results are wrong, erroneous test results will not constitute a violation of 1926.752(a).

Question 15: Section 1926.752(a)(1) and (b) require that an appropriate ASTM standard test method be used to determine that field-cured concrete/mortar testing samples have attained 75% of the intended minimum compressive strength or sufficient strength to support loads imposed during steel erection before that erection begins. Can I rely on cure time instead of doing such a test?

Answer: No. The standard does not provide that cure time may be used instead of the ASTM test. Because of the many factors that influence cure rates (temperature, humidity, ingredient ratios, etc.), cure time is an unreliable means of assessing how much the concrete has cured.

Question 16(a): Does the written notification from the controlling contractor to the steel erector about concrete footings, etc. in §1926.752(a) and (b) have to be

maintained on site?

Answer: Once the written notification is given to the erector, there is no requirement that it be maintained at the site.

Question 16(b): Does the anchor bolt repair, replacement or field-modification approval from the Structural Engineer of Record (SER) required by §1926.755(b)(1) have to be maintained on site?

Answer: No. Where an anchor bolt repair, replacement or field-modification is made, §1926.752(a)(2) requires that the controlling contractor ensure that the steel erector is provided with written notification that the requirements in §1926.755(b) were met. Section 1926.755(b)(1) requires that, prior to erection, the repair, replacement or field-modification must be approved by the SER. Once the written notification is given to the erector under §1926.752(a)(2), there is no requirement that it be maintained at the site. Also, there is no requirement that a record of the SER's approval be maintained at the site.

IV. SECTION 1926.753-HOISTING AND RIGGING

Question 17: Section 1926.753(e)(4) requires the members be rigged at least 7 feet apart on a multiple lift rigging assembly (Christmas tree rig). If they are rigged 7' apart and the connector needs to slacken the line to unhook the lower beam, the beam above now has less than 7' of clearance. Does a 7' clearance need to be maintained at all times?

Answer: No. The 7 feet specifically refers to the distance as rigged.

Question 18: Does the standard permit a qualified rigger to design and assemble a "multiple lift rigging" assembly on the jobsite by mixing components from one rigging supplier or by mixing components from several rigging suppliers?

Answer: Yes. In §1926.751, "Multiple lift rigging" is defined as "a rigging assembly manufactured by wire rope rigging suppliers . . . ." The use of the plural "suppliers" reflects that an assembly may be made from components from more than one manufacturer. This is also reflected in the fact that §1926.753(e)(2) allows a qualified rigger to certify the capacity of an assembly instead of a manufacturer: "Components of the multiple lift rigging assembly shall be specifically designed and assembled with a maximum capacity for total assembly and for each individual attachment point. This capacity, certified by the manufacturer <u>or a qualified rigger</u>, shall be based on the manufacturer's specifications with a 5 to 1 safety factor for all components." [Emphasis added].

The preamble to the final rule also shows that an assembly may be either put together from separately produced manufactured components, or obtained as a single, manufactured unit: "[t]he rigging must be certified by the qualified rigger who assembles it or the manufacturer who

provides the entire assembly to ensure that the assembly can support the whole load . . . ." (Volume 66 of the Federal Register at page 5211). The provision, then, permits a qualified rigger to assemble the multiple lift rigging from manufactured components. These may be from either a single or multiple suppliers.

Question 19: How often must the multiple lift rigging assembly be inspected?

Answer: In §1926.753(c)(2), the standard requires a qualified rigger to inspect the rigging before every shift in accordance with §1926.251, *Rigging equipment for material handling*. Additional inspections of the rigging assembly where service conditions warrant are required under §1926.251(a)(6).

Question 20: Section 1926.753(c)(1)(i) requires a pre-shift visual inspection of cranes to be done by a competent person. Section 1926.753(c)(1)(iv) states that "the [crane] operator shall be responsible for those operations under the operator's direct control. Whenever there is any doubt as to safety, the operator shall have the authority to stop and refuse to handle loads until safety has been assured."

Scenario: The crane is rented, and the operator is supplied by the crane rental company. The steel erector designates the operator as the competent person for purposes of the pre-shift inspection requirements. Is the steel erector still responsible for compliance with the pre-shift inspection requirements? Is the steel erector responsible for crane operations under the direct control of the operator?

Answer: Under §1926.750(a), "the requirements of [subpart R] apply to employers engaged in steel erection unless otherwise specified." Section 1926.753 (c)(1)(iv) specifies the operator as responsible for operations that are "under the operator's direct control." However, those are only operations involving the actual operation of the crane.

While an operator may be designated as a competent person for purposes of the pre-shift inspection, §1926.753(c)(1)(i) does not specify who is responsible for compliance with the pre-shift inspection requirements. Therefore, a designation by the steel erector of the crane owner's operator as the competent person would not absolve the steel erector of responsibility for making sure that the pre-shift inspection was done (Note, though, that the steel erector is not expected to have the same level of expertise regarding those inspections as either the crane owner or the competent person).

Question 21: Does §1926.753(e) permit beams of different sizes to be lifted in a multiple lift?

Answer: Yes.

Question 22: Section 1926.753(e)(2) requires that the capacity of each multiple lift rigging component and the total assembly be certified by the manufacturer or

qualified rigger. Does that certification have to be in writing?

Answer: Yes, a certification is a written document.

V. SECTION 1926.754-STRUCTURAL STEEL ASSEMBLY.

Question 23: Section 1926.754 (b)(3) requires a "fully planked or decked floor or nets" in multi-story structures within two stories or 30 feet, whichever is less. Section 1926.760 requires workers above 15 feet to be protected from falls, with two exceptions: section 1926.760(b)(3) and (c) allows workers engaged in certain steel erection activities (initial connecting; decking in a Controlled Decking Zone) below 30 feet to work without using fall protection. Can an employer's requirement that all workers be protected by fall arrest systems, including those engaged in connecting and decking, take the place of compliance with the 1926.754(b)(3) floor/net requirement?

Answer: While OSHA encourages employers to exceed the fall protection requirements of the standard and have all workers use fall protection, section 1926.754(b)(3) provides additional safeguards. Therefore, such an employer would be required to comply with 1926.754(b)(3). However, compliance staff retain their normal discretion to determine, on a case by case basis, that violations are de minimis where there is no direct or immediate relationship to safety or health, and the employer's use of personal fall protection systems at all times may be a factor in such a determination. See OSHA's Field Operations Manual, CPL 02-00-148 (Nov. 9, 2009), section VIII.
Note: *Question and answer for #23 was modified by CPL 02-01-048, April 30, 2010*

Question 24: Prior to installation of a bridge girder, a contractor welds a limited number of shear connectors (the minimum needed for a fall protection system) on the top flange of the girder. Each shear connector is encapsulated by a split collar, a tee joint and line post/anchor post (or a round pipe). These are designed to serve as supports for horizontal lifelines in a fall protection system. Is this a violation of §1926.754(c)(1)(i)?

Answer: In this scenario, the spacing and height requirements for the supports would essentially eliminate the tripping hazards. Since the shear studs will be encapsulated by a fall protection anchor device, prior to the beam being erected, the provision in §1926.754(c)(1)(i) regarding shear connectors does not apply. Section 1926.753(c)(1)(i) does not apply when: (1) the shear connector studs are encapsulated by the line post or anchor post prior to erecting the member; and (2) the encapsulated studs serve as an integral part of the fall protection system's fixed anchor point.

Question 25: If an employer requires the use of fall protection for all workers, including workers engaged in connecting and decking, would the employer still be required to comply with 1926.754(c)(1) – would the employer still be prohibited from erecting beams, joists or beam attachments with shop-installed shear connectors?

Answer: While OSHA encourages employers to exceed the fall protection requirements of the standard and have all workers use fall protection, section 1926.754(c)(1) is an engineering control that helps prevent tripping, which helps to prevent injury from falling on a shear connector and helps to prevent falls. Therefore, such an employer would be required to comply with section 1926.754(c)(1). However, compliance staff retain their normal discretion to determine, on a case by case basis, that violations are de minimis where there is no direct or immediate relationship to safety or health, and the employer's use of personal fall protection systems at all times may be a factor in such a determination. See OSHA's Field Operations Manual, CPL 02-00-148 (November 9, 2009), section VIII.
Note: *Question and answer for #25 was modified by CPL 02-01-048, April 30, 2010*

Question 26: If a roof void is 11 inches by 25 feet, does it need to be covered for steel erection purposes (§1926.754(e)(3) and definition of "opening").

Answer: No. The definition of "opening" in §1926.751 refers to a gap or void whose *least* dimension is 12 inches (30.5 cm) or more. Thus a roof void whose least dimension is 11 inches would not be an "opening" under subpart R and would not need to be covered during steel erection. Note that this void is too large to be considered a "decking hole" (a term that is also defined in §1926.751) under subpart R since its *greatest* dimension is more than 12 inches.

Question 27: Is §1926.754(b)(3)(fully planked floor or nets) a form of interior fall protection?

Answer: This provision requires that fully planked or decked floors or nets be maintained within two stories or 30 feet, whichever is less. Use of nets to meet the provision would provide interior fall protection. Use of decked floors does not provide the equivalent of fall protection (such floors do limit interior fall distances as workers ascend to or descend from their work locations).

Question 28: Are bundle packaging and strapping that have been designed for hoisting purposes marked accordingly? If not, who is responsible under §1926.754(e)(1)(i) for determining whether they are designed for hoisting? How is this determination to be made?

Answer: Under §1926.754(e)(1)(i), employers engaged in steel erection are responsible for ensuring that bundle packaging and strapping, if used for hoisting, are specifically designed for hoisting purposes. Some manufacturers design metal decking bundle packaging and strapping, applied at the factory to keep bundles together, to be used as a lifting device. However, subpart R does not require that they be so marked. We are not aware that the manufacturers mark these bundles uniformly or consistently.

When bundle packaging/strapping is used for hoisting, it is considered rigging. Under §1926.753(c)(2), a qualified rigger must inspect the rigging prior to each shift in accordance

with §1926.251. Therefore, the employer would use a qualified rigger in making this determination.

VI. SECTION 1926.755-COLUMN ANCHORAGE.

Question 29: To make a field repair to an anchor rod (anchor bolt), must there be a written order from the project's engineer of record?

Answer: Section 1926.755(b)(1) prohibits such repairs "without the approval of the project structural engineer of record." While the standard requires approval, it does not require the approval to be in writing.

Question 30: The requirements in §1926.755(b) apply to the "repair, replacement or field modification of anchor rods (anchor bolts)." Is hitting an anchor bolt with a hammer to line it up with the base plate holes considered a modification?

Answer: Generally, hitting an anchor bolt with a hammer to line it up with the base plate holes would not be considered a modification, since those minor adjustments do not normally affect the structural integrity of the rod or the concrete. However, unbending a bolt is considered a modification since that will weaken it.

VII. SECTION 1926.757-OPEN WEB STEEL JOISTS.

Question 31: Is it acceptable to use a forklift to raise and set in place roof joists?

Answer: Yes. It is acceptable to use a forklift to raise and set joists in steel erection provided all the necessary safety requirements for landing and placing loads contained in §1926.757(e)are followed. In addition, the employer must comply with the requirements of §1926.602 - Material handling equipment - for the use and operation of the forklift equipment itself.

Question 32: Section 1926.757(a)(3) requires: "where steel joists at or near columns span 60 feet or less, the joist shall be designed with sufficient strength to allow one employee to release the hoisting cable without the need for erection bridging." Joist manufactures have stated that, for some lengths, there are no existing joist designs that would provide the necessary stability (even with the stabilizer plate). These are primarily joists in the 55-60 foot length range. The policy set out by OSHA in Instruction CPL 02-01-034 (CPL 2-1.34) issued on March 22, 2002 and extended by OSHA Notice 03-03(CPL 02) (03-03 CPL 2) on July 18, 2003, will expire on July 18, 2004. Have the manufactures been able to design a joist to meet the requirements of the standard? And if not, how will OSHA enforce this provision?

Answer: The industry has conducted a number of tests to determine if joists that are now available would meet the requirements of 1926.757(a)(3). Their tests showed that of the joists now available, some would meet the requirement, but only if erectors followed a number of erection criteria that are not in the steel erection standard. Also, for some spans and dimensions,

there still are no joists that would meet the requirement (even if those additional criteria were followed).

Therefore, the enforcement policy that was scheduled to expire on July 18, 2004, will remain in effect indefinitely. That policy is as follows: for all joists at or near columns that span 60 feet or less, employers will be considered to be in compliance with §1926.757(a)(3) if they erect these joists either by: (1) installing bridging or otherwise stabilizing the joist prior to releasing the hoisting cable, or (2) releasing the cable without having a worker on the joists.
Note: *Question and answer for #32 was modified by CPL 02-01-040, July 18, 2004*

Question 33: Is installation of "erection bridging" considered connecting?

Answer: Yes.

Question 34: If workers are on a one story building that is 20' tall (top of steel) and the joists require horizontal bridging, is fall protection is required for employees installing this bridging?

Answer: Normally, yes. Fall protection by use of a guardrail system, safety net system, personal fall arrest system, positioning device system or fall restraint system is required by §1926.760 (a)(1) to be provided at heights more than 15 feet above a lower level. The requirements in §1926.760(a)(1) apply irrespective of whether the building is single or multistory. The connector exception will not normally apply in situations like this. Horizontal bridging is not erection bridging. These workers typically will not be working with hoisting equipment when installing horizontal bridging. So, employees installing horizontal bridging at a height of 20 feet, on a single story building, working without hoisting equipment, would be required to have fall protection in accordance with §1926.760(a)(1).

Question 35: Section 1926.757(c)(2) requires that joists over 60 feet be attached in accordance with §1926.757(b). Section 1926.757(b) allows either bolting or welding of the joist ends. However, §1926.757(a)(8) requires that all joists over 40 feet be bolted (with an exception for constructibility). Do these provisions conflict?

Answer: No. Section 1926.757(b)(2) refers to the final connection of the member; §1926.757(a)(8) refers to the initial connection of the member. They work together as follows:

> Under §1926.757(c)(2), there are several requirements that must be met before the hoisting cables can be released from these joists. One of these requirements is that the joist be attached as specified in §1926.757(b)(2). Under that provision, the final connection can be either a bolted or welded connection.
>
> In contrast, §1926.757(a)(8) refers to the <u>initial</u> connection of certain members. Under this provision, these members must be initially bolted (unless constructability does not

allow). However, the final connection can be either bolted or welded. The initial bolting is typically done with an erection bolt, which would either be replaced with a high-strength bolt for the final connection or the final connection would be welded.

So, §1926.757(c)(2)'s requirement that joists over 60 feet be attached in accordance with §1926.757(b) means that there must be a final connection -- whether bolted or welded -- that meets the §1926.757(b) requirements before the hoisting cable is released. While these joists had to be initially bolted, the final connection could be either by bolting or welding.

Question 36(a): Section 1926.757(c)(3) and (d) contain requirements that refer to Table A (Erection Bridging for Short Span Joists) and Table B (Erection Bridging for Long Span Joists). How do I read these tables?

Answer: Joists are manufactured in a variety of types and lengths. Some types need no erection bridging at any length. Other types need bridging if they are a certain length or greater.

Each table has two columns. The left-hand column, titled "Joist," identifies specific types of joists. The right-hand column, titled "Span," indicates at what length erection bridging is required. Many of the joists have "NM" (for "not mandatory") marked in the Span column. That means that the type of joist designated does not require erection bridging, irrespective of its length. (**NOTE: the definition of "NM" printed in the Tables is incorrect** -- it says "NM=diagonal bolted bridging not mandatory for joists under 40 feet." The clause "for joists under 40 feet" was mistakenly taken from the proposed rule, and was not supposed to be included in the final rule. Please disregard that clause; it will be removed in later printings).

Other joists have numbers marked in the Span column. For example, in Table A, Joist 12K1 has "23-0" marked in the Span column. That means that 12K1 joists that are 23 feet 0 inches in length or longer require erection bridging. Shorter lengths of this type of joist do not require erection bridging.

In Table B, joist 32LH06 has "47-0 through 60-0" in the Span column. That means that 32LH06 joists 47 feet long, up through 60 feet long, require erection bridging.

Also in Table B, joist 32LH09 has "NM through 60-0" in the Span column. That means that erection bridging is not required for lengths through 60 feet. However, lengths over 60 feet 0 inches do require erection bridging.

Once it is determined that erection bridging is required, the erection bridging must be installed in accordance with §1926.757(d).

Questions 36(b): Section 1926.757(c)(3) states that, "[o]n steel joists that do not require erection bridging under Tables A and B, only one employee shall be allowed on the joist until all bridging is installed and anchored." If a joist does not require

erection bridging under the Tables, what bridging is required under this provision before allowing additional employees on the joist?

Answer: Under this provision, if a steel joist does not require erection bridging (bolted diagonal bridging) under §1926.757(c)(3), bridging that is called for in the erection drawings must be installed prior to additional employees going out on the joist. This includes any horizontal bridging or bolted diagonal bridging that is specified in the drawings.

Question 37: Section 1926.757(a)(6) requires that, "[w]hen steel joists are landed on a structure, they shall be secured to prevent unintentional displacement prior to installation." Do all joists remaining in a bundle have to be re-secured each time a joist is removed to be installed?

Answer: In the preamble to the final rule, OSHA stated that this provision:

> *"addresses the hazard that arises when a single steel joist or a bundle of joists are placed on the structure and then left unattended and unattached. . . [T]he bundles must remain intact prior to installation until the time comes for them to be set. This paragraph also prevents those ironworkers who are shaking out the filler joists from getting too far ahead of those workers welding the joists, a practice that leaves many joists placed but unattached. Paragraph (b)(3) of this section . . . requires that at least one end of each steel joist be attached immediately upon placement in its final erection position and before additional joists are placed. Another example of a situation addressed by this paragraph is if the exact dimensions of a piece of mechanical equipment to be installed in the decking are not known. A common practice, when this occurs, is to leave a joist unattached until the dimension is known. This paragraph requires such a joist to be secured . . .pending its final attachment."* (Volume 66 of the Federal Register at page 5231).

The joists remaining in the bundle do not have to be re-secured while workers are in the process of removing them from the bundle and installing them. However, if, for example, an erector lands all of the joist bundles for a section of a building and will not install the joists until the following day, the joists must be secured to prevent unintentional displacement.

VIII. SECTION 1926.759-FALLING OBJECT PROTECTION.

Question 38: An 80 foot long beam has been initially connected, if ironworkers are now bolting-up the beam, is the controlling contractor required to protect (or bar) operations under the beam in areas where the ironworkers are not working in accordance with §1926.759(b)? For example, if an ironworker is working at one end of a beam bolting-up, and another is bolting-up the other end (80 feet away), do operations below the middle of the beam have to be protected or barred?

Answer: As stated in the preamble to the final rule (page 5243), the intent of this provision is to protect employees from falling objects. If there are no tools or materials located at the middle of the beam that could be displaced, then employees working below the middle of the beam would not be subjected to the hazard of falling objects. In that case, protection/barring of operations would not be required below the middle area of the beam.

IX. SECTION 1926.760-FALL PROTECTION.

~~***Question 39: Section 1926.760(c) says that employees in a CDZ can work unprotected up to 30 feet. However, in 1926.760(c)(1), it requires employees at the leading edge to be protected from fall hazards of "more than two stories or 30 feet, whichever is less." At which height, 30 feet or two stories, is conventional fall protection required to be used to protect deckers?***~~

~~Answer: The answer depends on whether the building is single or multi-story, and, if multistory, whether two stories is less than 30 feet. Under paragraph §1926.760(c), a CDZ "may" be established up to 30 feet and used as a substitute for fall protection required in 1926.760(a), depending on certain prerequisites being met. Under 1926.760(c)(1), one of the prerequisites for using a CDZ instead of fall protection as high as 30 feet is that, if the building is multi-story, two stories must be 30 feet. Otherwise, where two stories are less than 30 feet, the CDZ may be used as a substitute for fall protection only up to two stories. In a single story structure, the prerequisite is automatically met -- the CDZ can be used as a fall protection substitute up to 30 feet.~~

Question 40: Does some decking need to be in place for a CDZ to begin?

Answer: A CDZ can be implemented in an area where metal decking is being installed and forms the leading edge of the work surface. One or more panels will normally need to be installed before the control line is erected. These panels can be installed while workers are positioned on ladders, elevated platforms, protected by conventional fall protection, or otherwise protected from falling.

Question 41: A CDZ is defined as an area where certain work may take place "without the use of guardrail systems, personal fall arrest systems, fall restraint systems, or safety net systems . . ." Are employees required to use a positioning device when working in a CDZ?

Answer: No. Positioning device systems, as defined in the standard, are systems used on vertical surfaces, such as walls or columns. In a CDZ, workers are installing the horizontal surface on which they will be standing and working. No mention was made of positioning device systems in the CDZ definition since (as defined) they are not to be used while on a horizontal surface.

Question 42: A connector initially connects one end of a beam. Do OSHA standards allow the connector to then walk across the beam to connect the other end while the beam remains suspended from the crane?

Answer: Yes; this practice is allowed in steel erection. At the time of the SENRAC negotiations, it was a common industry practice to have the ironworker walk across the beam while it is still connected to the crane. This is evidenced by the American National Standard

Institute's 1989 consensus standard for Steel erection Safety Requirements (ANSI A10.13-1989), section 9.2 and 9.4. Section 9.2 states: "When connectors are working at the same connecting point, they shall connect one end of the structural member before going out to connect the other end . . .".

It is also reflected in the Steel Joist Institute's 1994 manual for steel joists, section 105 A.2., which specifically recognizes that two erectors may be on certain joists if the joist is "stabilized by the hoisting cables . . ." For example, in section 105 A. 2. (for LH and DLH series joists), it states that "a maximum weight of two erectors shall be allowed on any unbridged joist if 1) the joist is stabilized by the hoisting cable(s) . . .".

In view of the industry history recognizing this as a safe practice, where a connector initially connects one end of a beam and then walks across to connect the other end while the beam remains suspended from the crane, the violation of 1926.550 for being on a crane load is considered *de minimis* and no citation will be issued.

Question 43: Does a connector have to be tied off above 15 feet while moving to an initial beam connection location and while moving to or from subsequent beam connection locations if the crane is busy getting the next piece?

Answer: No. The process of connecting includes moving on the steel to and from initial and subsequent points at which these connections are made.

Question 44: Under §1926.760 (c)(2), only those employees involved in "leading edge work" are allowed to have access to the CDZ. The rule defines the term "leading edge" but not "leading edge work." What constitutes leading edge work in a CDZ?

Answer: In a CDZ, leading edge work consists of the placement and initial installation (by safety deck attachments, which typically are tack welds) of decking to create a deck. The leading edge of the deck changes location as this work progresses.

~~***Question 45: At what height are connectors required to be protected from falls? Is there a conflict between §§1926.760(b)(1) and 1926.760(b)(3)?***~~

~~Answer: There is not a conflict between §1926.760(b)(1) and §1926.760(b)(3). Section 1926.760(b)(3) requires that at all times between 15 and 30 feet, an employee must be provided with fall protection equipment and be able to tie-off. This provision addresses circumstances under which an employer must provide fall protection, whereas, §1926.760(b)(1) addresses when an employee must use the fall protection equipment.~~

~~For clarification, under the requirements of §1926.760(b)(1), connectors working on a single story structure do not need to tie-off until they are above 30 feet since the 2-story criteria would not apply. Furthermore, connectors working on a multi-story structure do not need to tie-off until they are above 2 stories or 30 feet, whichever is less.~~

Question 46: Section 1926.760(c)(2) states that "access to a CDZ shall be limited to only those employees engaged in leading edge work." Installation of perimeter fall protection does not meet the standard's definition of leading edge work. Are workers prohibited from installing perimeter fall protection in a CDZ?

Answer: Installation of perimeter cables inside a CDZ will be considered a *de minimis* violation of 1926.760(c)(2) where all of the following conditions are met: (1) the workers installing the perimeter cables are protected by conventional fall protection; (2) their work does not interfere with the deckers, and (3) they have been trained on the hazards associated with decking. In a situation where all three conditions are met, the violation will be considered *de minimis* and a citation for that provision will not be issued

Question 47: Section 1926.760(c)(2) requires that access to a CDZ be limited to those engaged in leading edge work. Typically one crew lays down the metal decking and another crew comes behind and tack welds the sheets in place. Can the tack weld work be done in a CDZ?

Answer: Yes. Tack welding, if done for safety deck attachments, can be done in a CDZ. Section 1926.760(c)(6) gives criteria for performing safety deck attachments in the CDZ and states that they shall be performed from the leading edge back. However, 1926.760(c)(7) does not allow final deck attachments to be performed in a CDZ.

Question 48: Section 1926.760(c)(3) & Appendix D: The suggested example in the appendix states that "any other means that restricts access" may be used instead of control lines. What are some examples of other means?

Answer: Section 1926.760(c)(3) requires that the boundaries of the CDZ be marked "by the use of control lines or the equivalent." In a CDZ, the control line restricts access by visually warning employees of an unprotected area (66 FR 5247). Control lines can be made of rope, wire, tape, or other equivalent materials, but they must clearly designate the CDZ. Examples of other acceptable methods would be a perimeter wall, guardrail system, or even a restraint system rigged so that non-leading edge workers could not access the area. In contrast, a line painted on the floor would not be considered to be equivalent to control lines since it would be less visible than a control line.

Question 49: When do perimeter cables have to be installed?

Answer: Section 1926.760(a)(2) requires perimeter safety cables to be installed in multi-story structures. Under this provision, they must be installed "as soon as the metal decking has been installed." Employers may choose to install them earlier.

Question 50: Section 1926.760: Can controlling contractors require connectors to tie off between 15 and 30 feet?

Answer: Yes. The standard does not prohibit controlling contractors from imposing stricter requirements than those in the standard.

Question 51: Section 1926.760(d)(2) states that "fall arrest system components shall be used in fall restraint systems and shall conform to the criteria in §1926.502 . . . either body belts or body harnesses shall be used in fall restraint systems." Section 1926.502 prohibits the use of body belts. Is this section internally inconsistent?

Answer: No. Section 1926.502(d) prohibits the use of body belts "as part of a personal fall arrest system." A fall restraint system, as defined in §1926.751, is a system that "prevents the user from falling any distance;" rather than arresting a fall towards a lower level, it prevents it. Therefore, body belts are permitted to be used in restraint systems.

Question 52: Section 1926.760(e) requires that fall protection provided by the steel erector remain in place after steel erection in that area has been completed to be used by other trades only if the controlling contractor directs the steel erector to leave it and inspects and accepts responsibility for it. What, if any, documentation does OSHA require when the steel erector leaves and the fall protection is left in place under this provision?

Answer: No written documentation is required by the standard.

X. SECTION 1926.761-TRAINING

Question 53: Can third-party training be used to comply with §1926.761? Can an employer be cited for deficiencies in the third party training of employees?

Answer: Third party training can be used to comply with the requirements of §1926.761. The preamble to this section states:

> *The employer can choose the provider, method, and frequency of training that is appropriate for the employees being trained. The provider may be an outside, professional training organization or other qualified entity, or the employer may develop and conduct the training in-house* [Volume 66 Federal Register at page 5152].

The preamble also states that *"the program must meet the requirements of this section, and each employee must be provided the training prior to exposure to the hazard."* [same Federal Register page as above]. It is the responsibility of the employer to take reasonable steps to assess the third party trainer's ability to adequately train the employees in accordance with this section. For example, discussing the curriculum and instructors' qualifications with the third party trainer to determine if they were sufficient, coupled with evaluating the employee's knowledge after completing the training, would be considered reasonable steps.

If a third party training program is deficient, and an employer failed to take reasonable steps to assess it, or used it knowing that it was deficient, the employer may be cited.

Question 54: Does a steel erector need to provide refresher training to its employees? When would an employee have to be given additional training?

Answer: ~~There is no specific requirement for scheduled retraining. However, where technologies or techniques of steel erection have changed, resulting in new hazards, the employee would have to be trained regarding the new technologies, techniques, and associated hazards. Training in the recognition and avoidance of any new hazards, including unique, site-specific hazards, would be required under §1926.21(b)(2). Page 5251 of the preamble to the final steel erection standard states~~:*The standard requires retraining whenever there is a change in the workplace, protective systems used, or where the employee's work practices or misuse of protective equipment indicate that they have not retained the requisite knowledge or skills. Also where technologies or techniques of steel erection have changed, resulting in new hazards, the employee would have to be trained regarding the new technologies, techniques, and associated hazards.*

> ~~*While retraining/refresher training is not specifically addressed*~~*, the employer is responsible for making sure that it has programs necessary to comply with the training requirements in §1926.21(b)(2): 'The employer shall instruct each employee in the recognition of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury.' Steel erection involves progressive sequences of erection, so that the work environment on any one day may involve entirely different or unique new hazards than the day before and that new employees may enter into the erection process when it is already underway. In order to apply §1926.21 during steel erection activities, an employer would have to assess the type of training needed on a continuing basis as the environment and changes in personnel occur. It is the employer's responsibility to determine if an employee needs retraining in order to strengthen skills required to safely perform the assigned job duties and whenever the work environment changes to include newly recognized or encountered hazards. This is a key element in the employer's accident prevention program.* [Volume 66 Federal Register at page 5152]

Question 55: Is receiving training through union apprenticeship programs the only way to meet the requirements of this standard?

Answer: No. ~~Appendix E of the final rule states that "the training requirements of §1926.761 will be deemed to have been met if employees have completed a training course on steel erection . . . that has been approved by the U.S. Department of Labor Bureau of Apprenticeship."~~ *(HIOSH has not adopted Appendix E).* Union apprenticeship programs are mentioned in the preamble as an example
of an option an employer might choose for training its employees. However, union apprenticeship programs are not the only way to provide employee training.

An employer may elect to identify a qualified person (in or out of the employer's organization) or a third party organization whose training program meets the requirements of section §1926.761 to train those employees. The new steel erection standard defines a qualified person in section §1926.751 (definitions) as:

> *..[o]ne who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project.*

As discussed in the answer to Question 53, the employer is responsible for assessing the third party organization's or qualified person's qualifications and experience as they relate to the training program requirements and subject areas described in section 1926.761. The proficiency of the employees in their work activities as determined by the employer is important evidence of an effective training program. [see page 5152 of January 18, 2001 FR]

Question 56: Does any required training under §1926.761 have to be documented? Does the employer have to keep a record of employee training?

Answer: No.

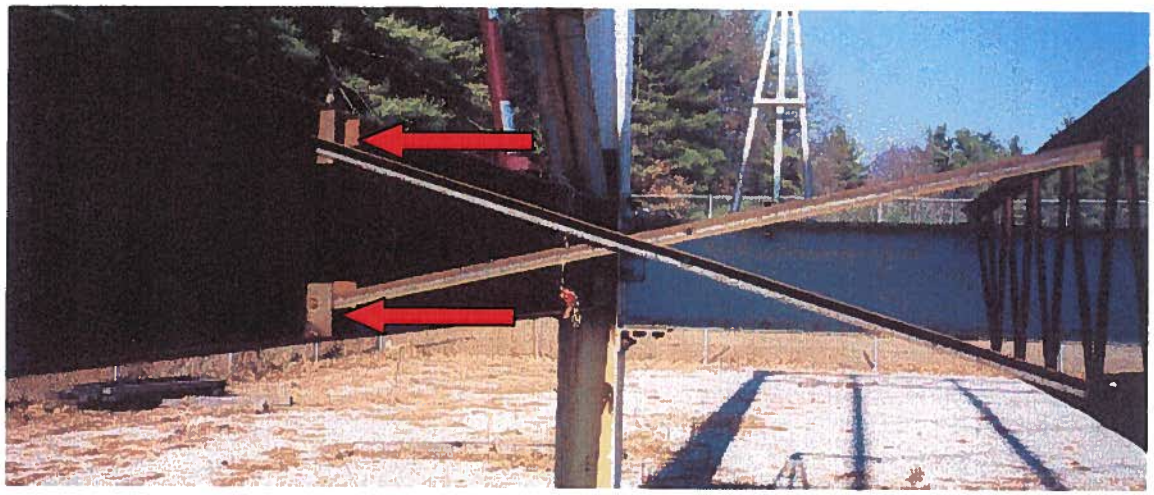
CHAPTER 5.

DEFINITIONS AND PHOTOS

The photographs and illustrations in this section are simply examples, for illustrative purposes only. They are not intended to be comprehensive depictions. While we hope that they are helpful in understanding some of the standard's terms and provisions, they are not to be viewed as modifying the standard.

Anchored bridging

Steel joist bridging is connected to a bridging terminus point.

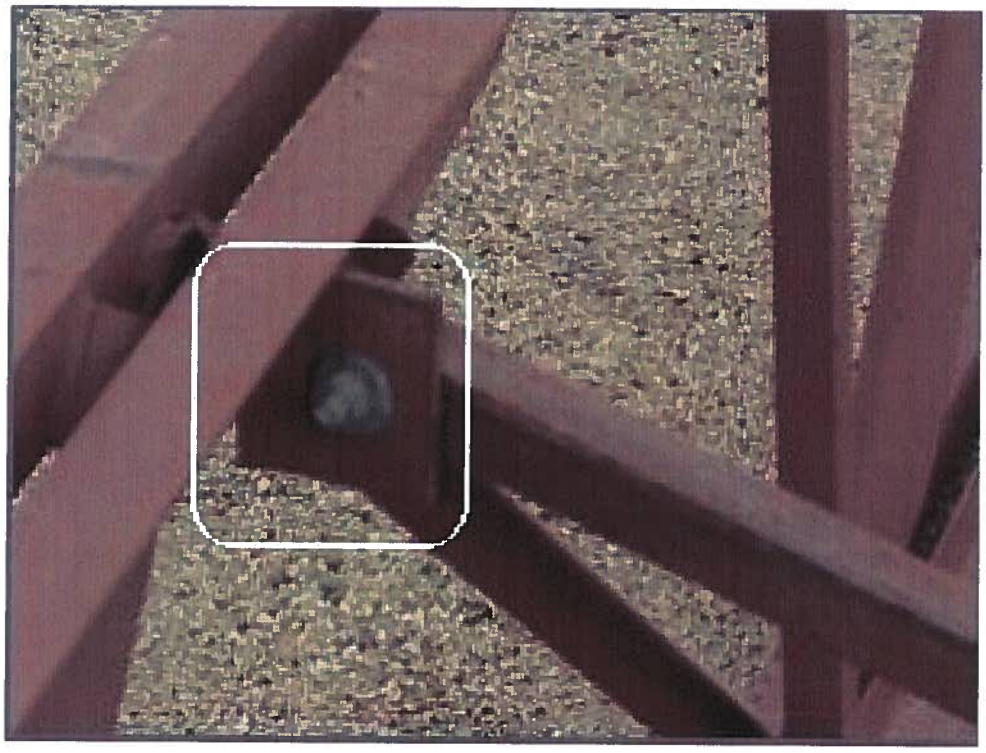


Bolted diagonal bridging

Diagonal bridging that is bolted to a steel joist or joists.

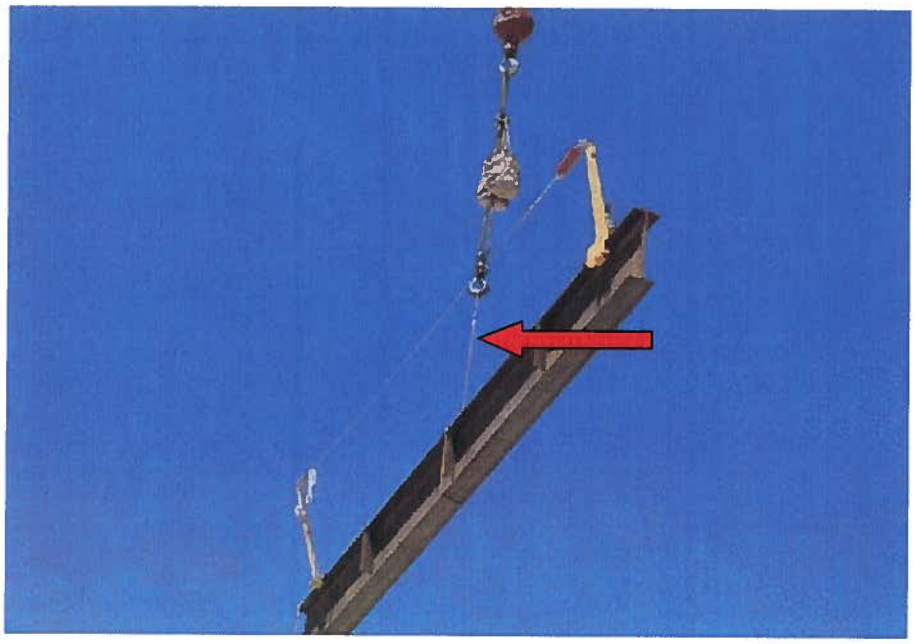
Bridging clip

A device that is attached to the steel joist to allow the bolting of the bridging to the steel joist.



Choker

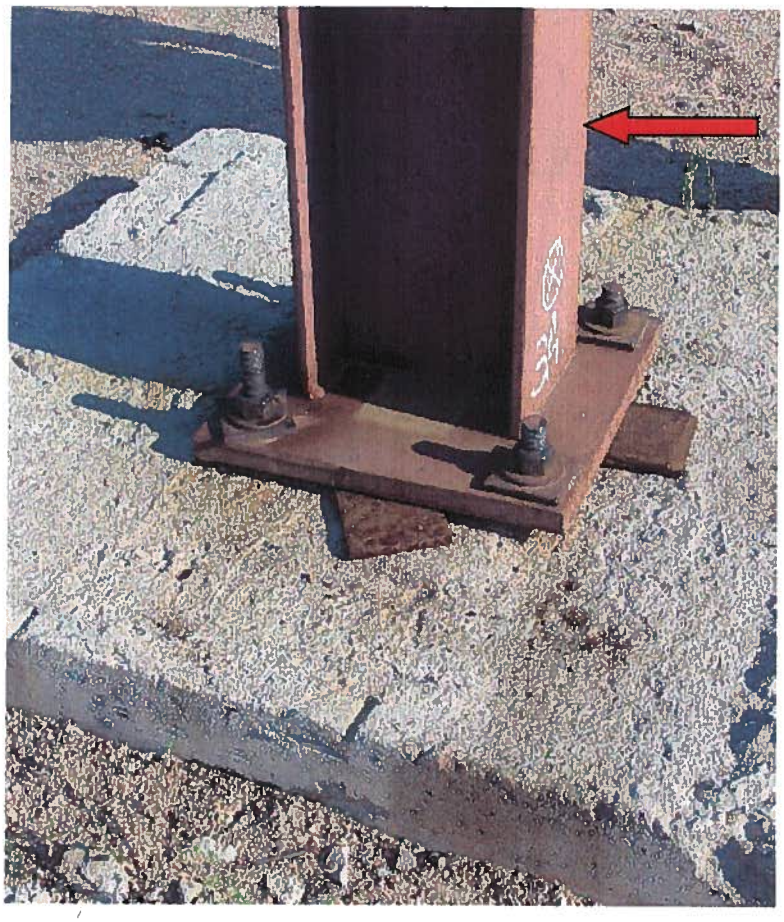
A wire rope or synthetic fiber rigging assembly that is used to attach a load to a hoisting device.



Column

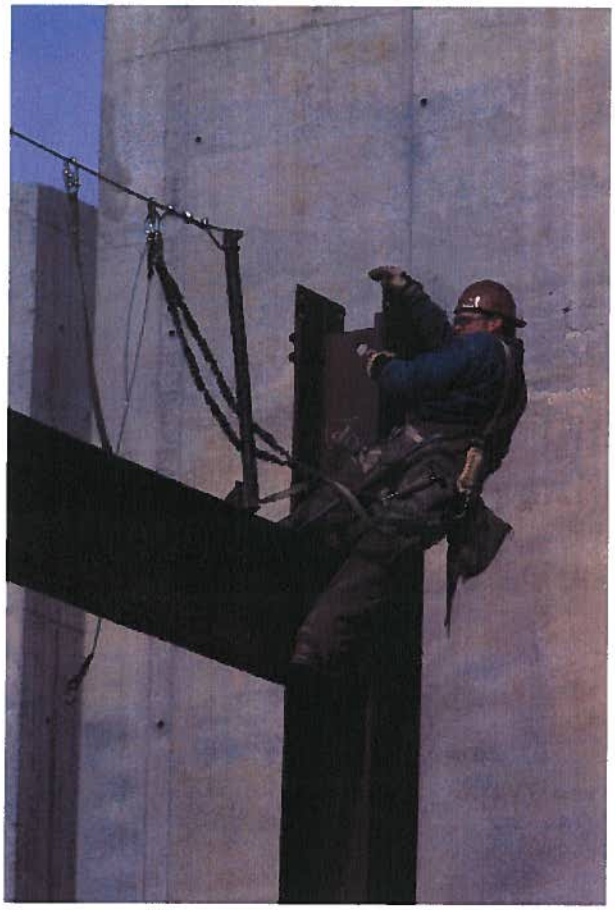
A load-carrying vertical member that is part of the primary skeletal framing system.

(Columns do not include posts)



Connector

An employee who, working with hoisting equipment, is placing and connecting structural members and/or components.



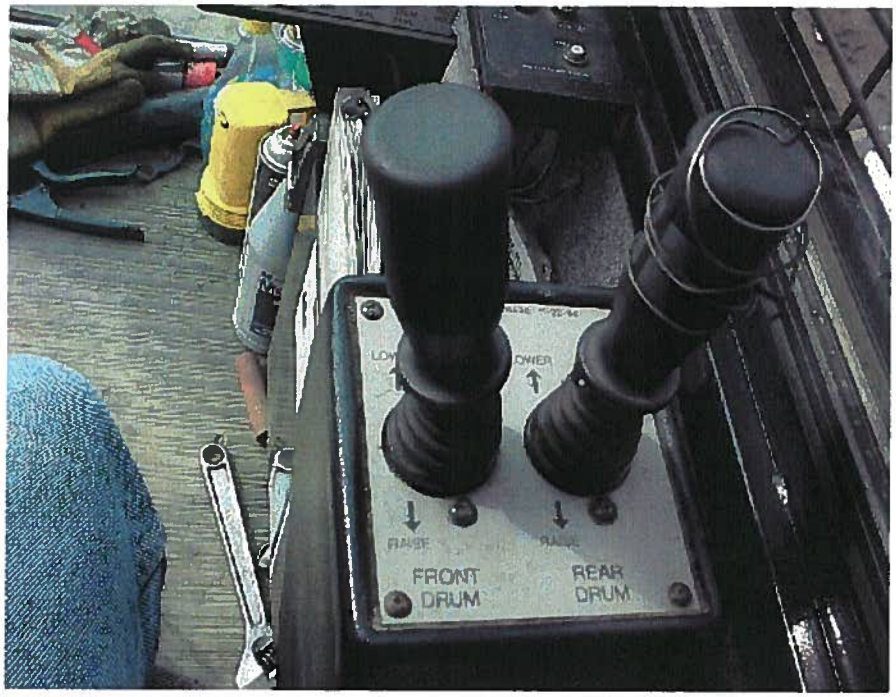
Controlled decking zone (CDZ)

An area in which certain work may take place without the use of guardrail systems, personal fall arrest systems, fall restraint systems, or safety net systems and where access to the zone is controlled.

(For example, initial installation and placement of metal decking)

Controlled load lowering

Lowering a load by means of a mechanical hoist drum device that allows a hoisted load to be lowered with a maximum control using the gear train or hydraulic components of the hoist mechanism. Controlled load lowering requires the use of the hoist drive motor, rather than the load hoist brake, to lower the load.

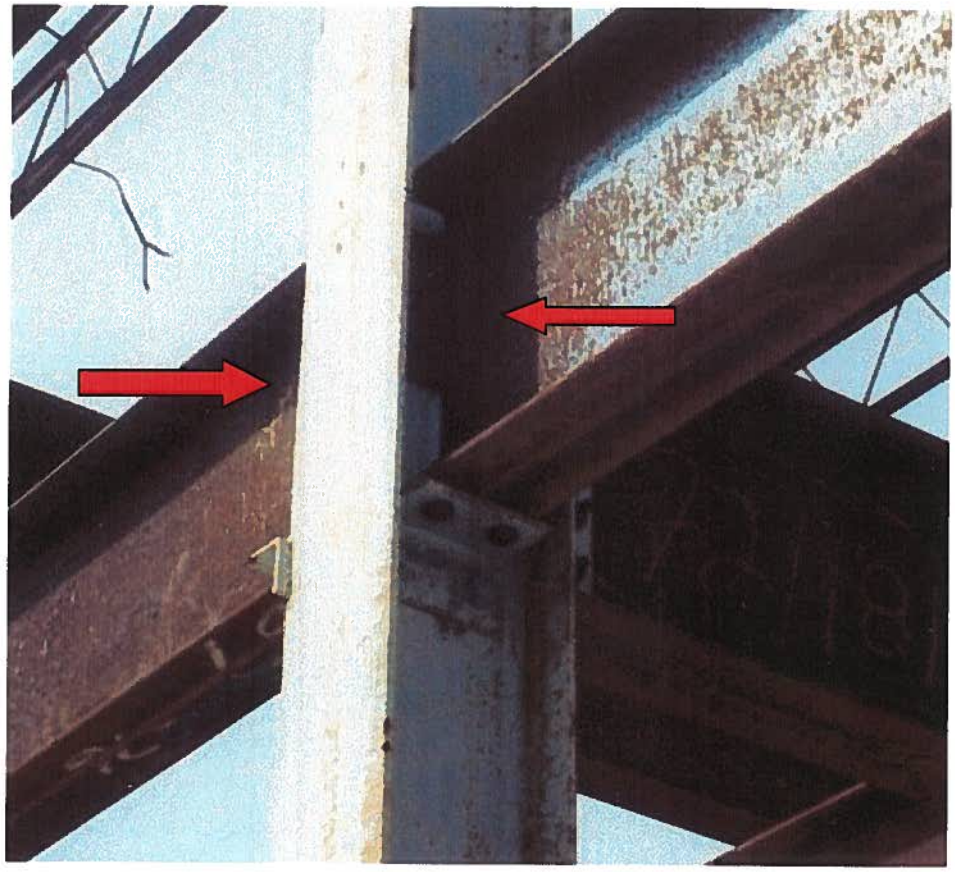


Critical lift

A lift that (1) exceeds 75 percent of the rated capacity of the crane or derrick, or (2) requires the use of more than one crane or derrick.

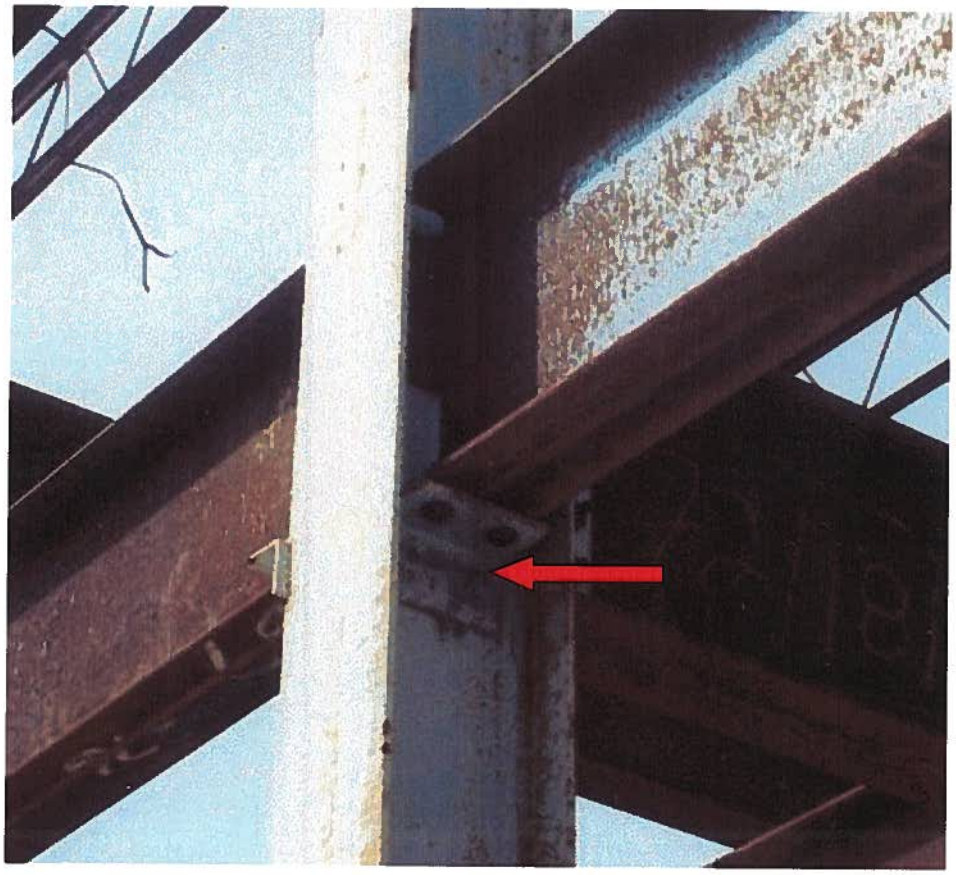
Double connection

Attachment method where the connection point is intended for two pieces of steel which share common bolts on either side of a central piece.



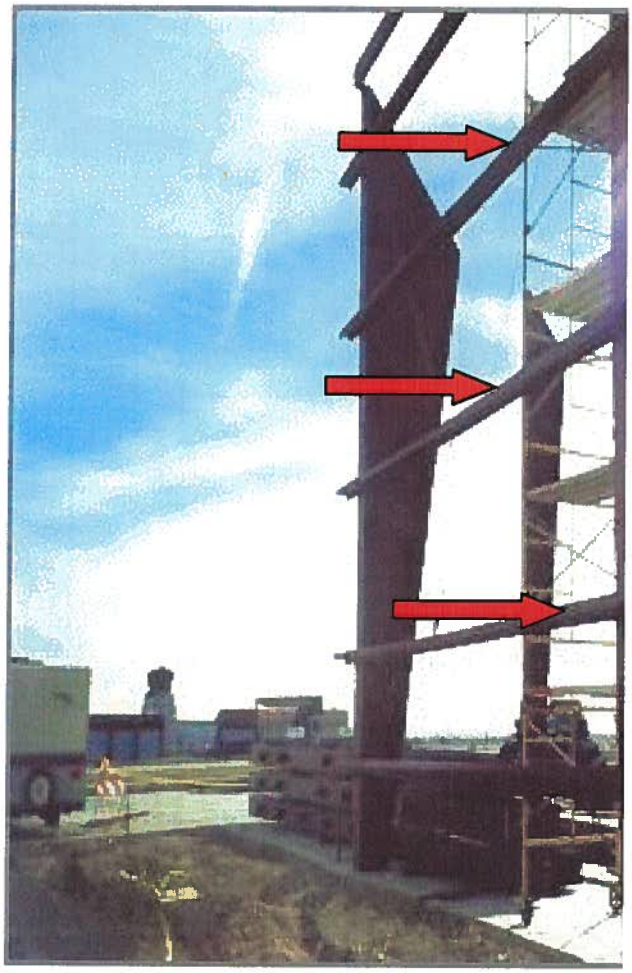
Double connection seat

A structural attachment that, during the installation of a double connection, supports the first member while the second member is connected.

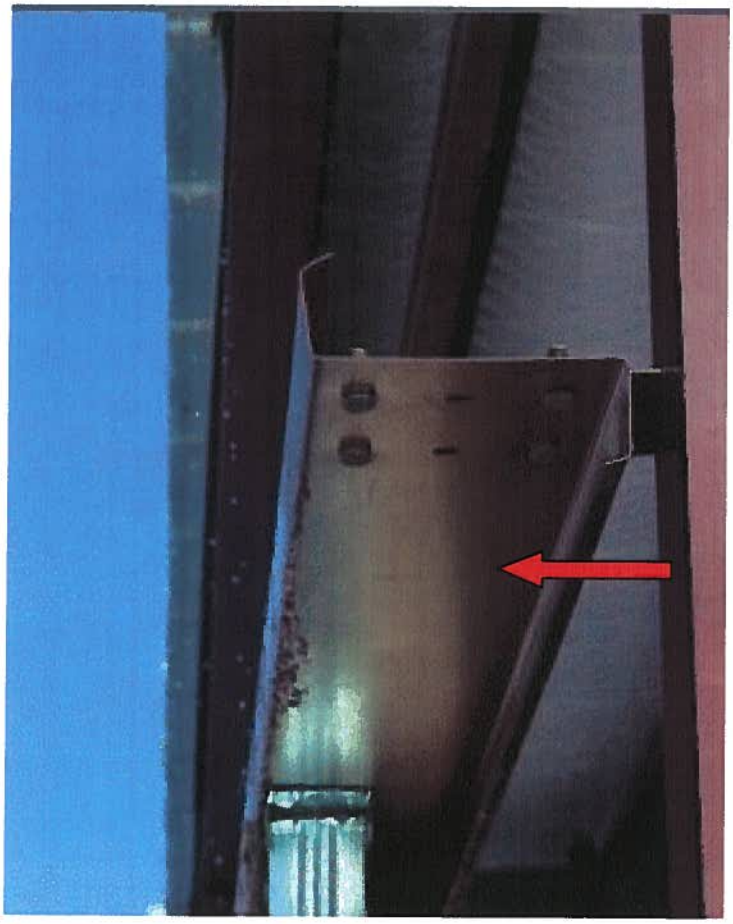


Girt

In systems-engineered metal buildings, a "Z" or "C" shaped member formed from sheet steel spanning between primary framing and supporting wall materials.

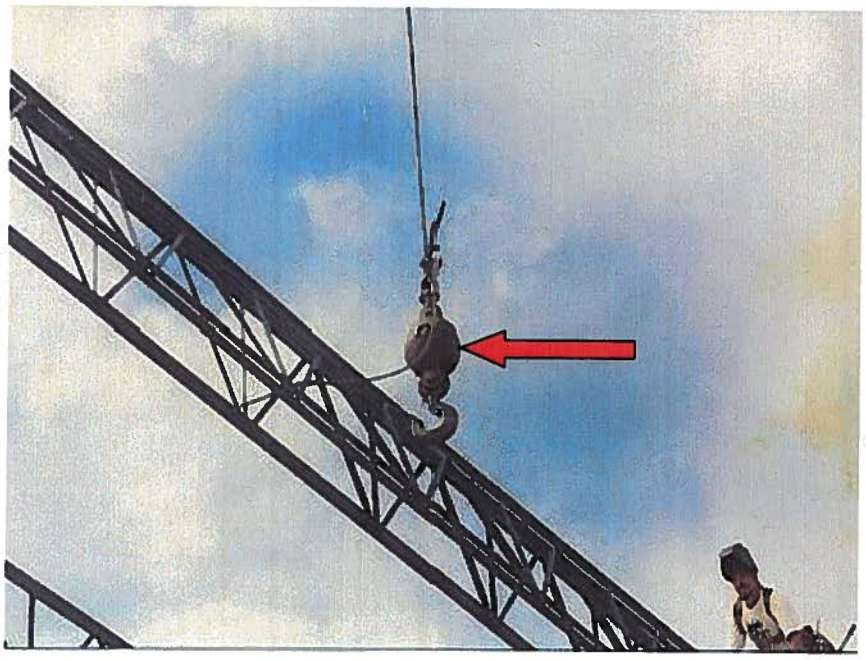


“Z” shaped girt



Headache ball

A weighted hook that is used to attach loads to the hoist load line of the crane.



Hoisting equipment

Commercially manufactured lifting equipment designed to lift and position a load of known weight to a location at some known elevation and horizontal distance from the equipment's center of rotation.

A "come-a-long" (a mechanical device usually consisting of a chain or cable attached at each end, that is used to facilitate movement of materials through leverage) is NOT considered "hoisting equipment."

Leading edge

An unprotected side and edge of a floor, roof, or formwork for a floor or other walking/working surface which changes location as additional floor, roof, decking or formwork sections are placed, formed or constructed.

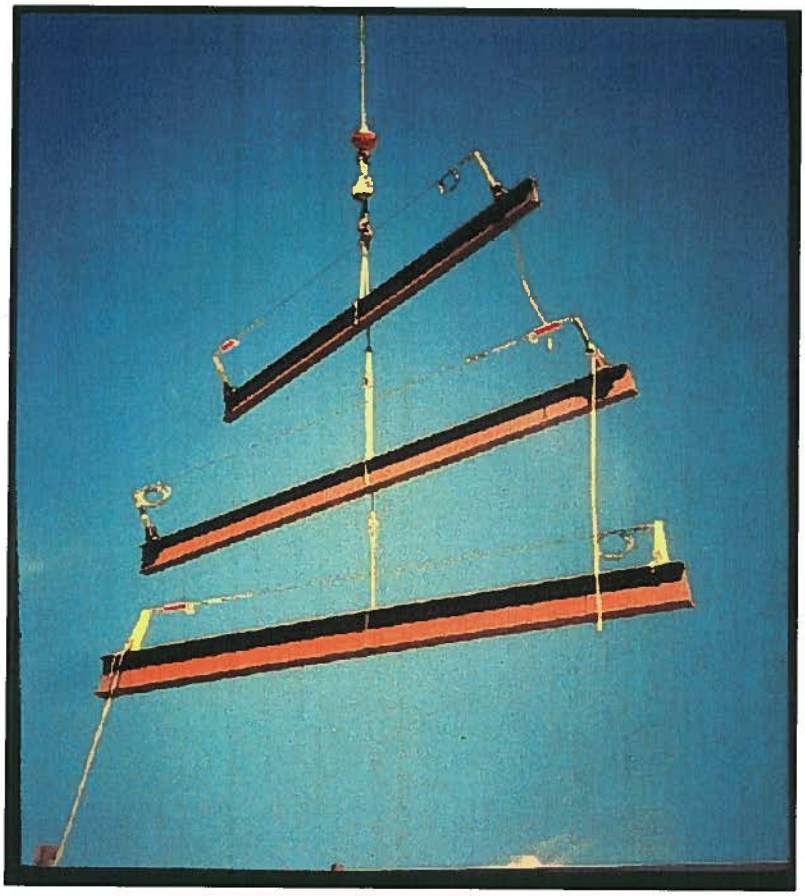
Metal decking

Commercially manufactured, structural grade, cold rolled metal panel formed into a series of parallel ribs.

(Metal decking includes metal floor and roof decks, standing seam metal roofs, other metal roof systems and other products such as bar gratings, checker plate, expanded metal panels, and similar products)

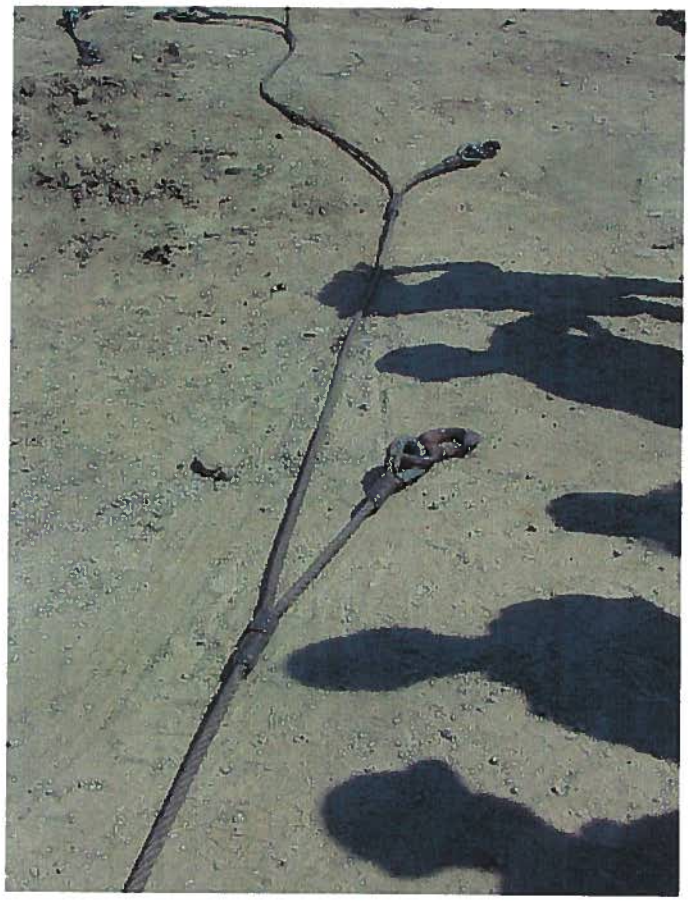
Multiple lift rigging procedure (MLRP)

("Christmas Treeing")



Multiple lift rigging

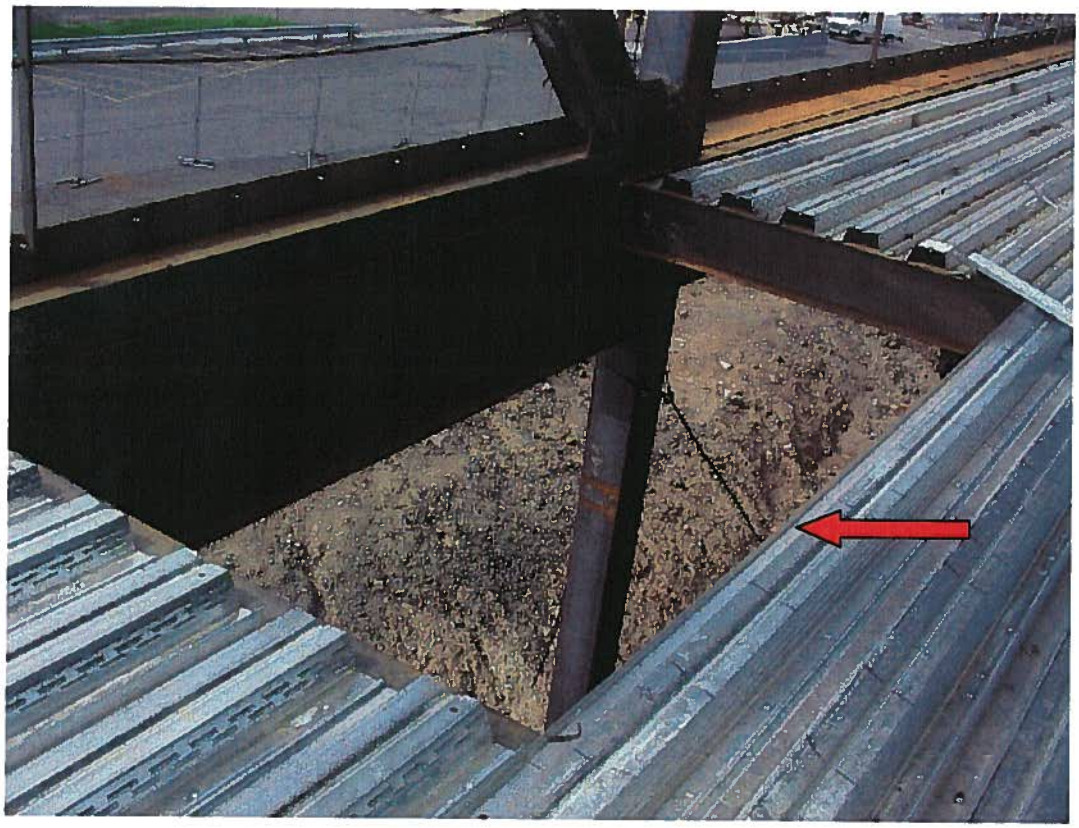
A rigging assembly manufactured by wire rope rigging suppliers that facilitates the attachment of up to five independent loads to the hoist rigging of a crane.



Opening

A gap or void 12 inches or more in its least dimension in a floor, roof or other walking/working surface.

(Skylights and smoke domes that do not meet the strength requirements of a cover, are considered openings)



Personal fall arrest system

A system used to arrest an employee in a fall from a working level. System consists of an anchorage, connectors, a body harness and may include a lanyard, deceleration device, lifeline or suitable combination of these.

(The use of a body belt for fall arrest is prohibited.)

Positioning device

A body belt or body harness rigged to allow an employee to be supported on an elevated, vertical surface, such as a wall or column and work with both hands free while leaning.

Post

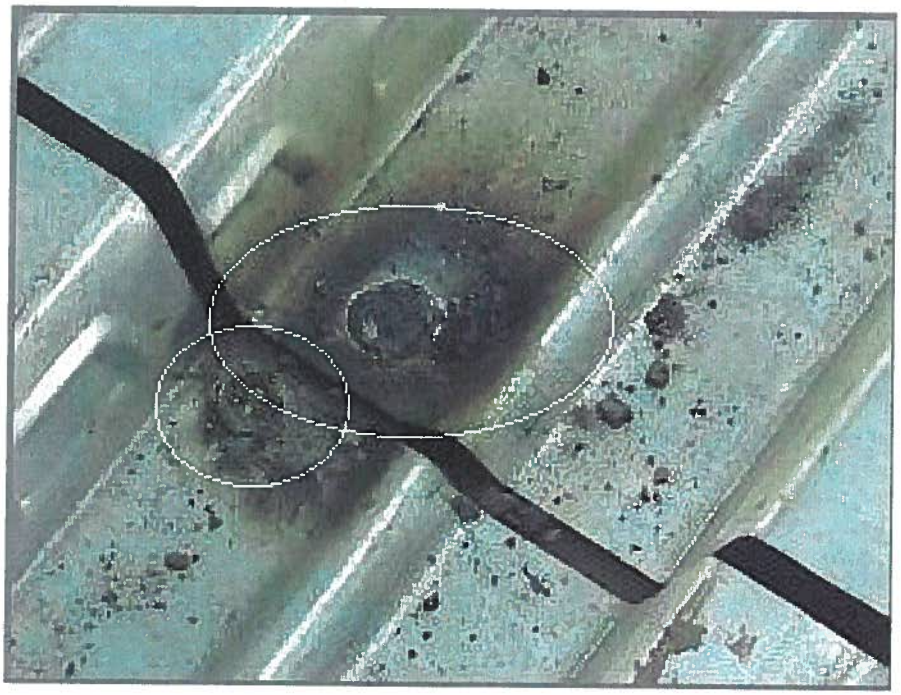
A structural member with a longitudinal axis that is essentially vertical, that: (1) is axially loaded (a load presses down on the top end) and weighs 300 pounds or less, or (2) is not axially loaded, but is laterally restrained by the above member. Posts typically support stair landings, wall framing, mezzanines and other substructures.

Purlin

In systems-engineered metal buildings, a "Z" or "C" shaped member formed from sheet steel spanning between primary framing and supporting roof material.

Safety deck attachment

An initial attachment that is used to secure an initially placed sheet of decking to keep proper alignment and bearing with structural support members.



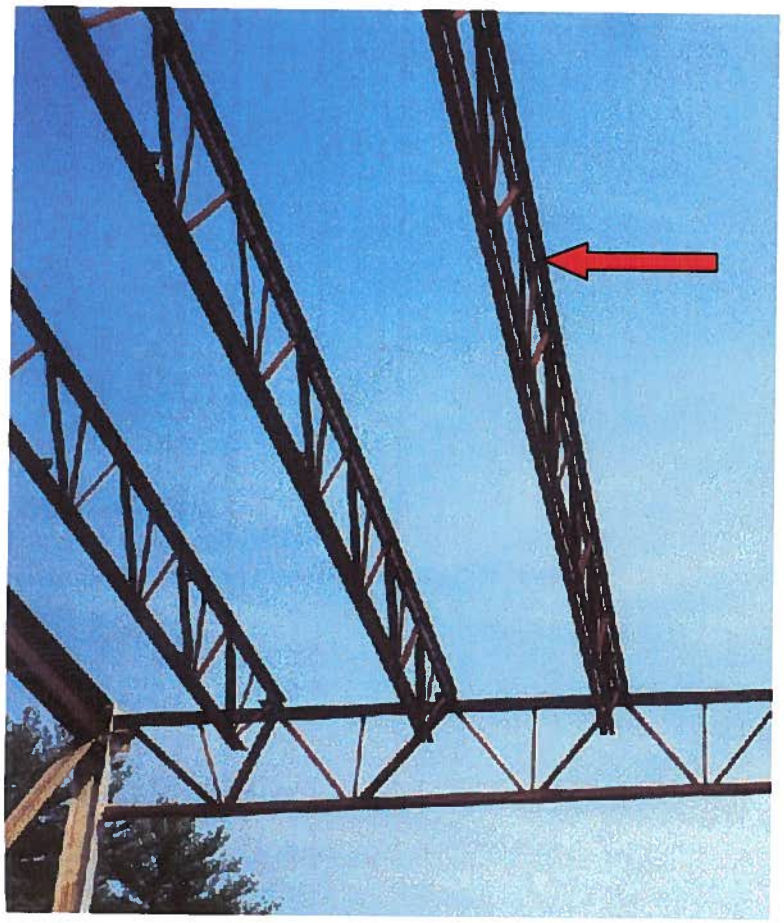
Shear connector

Steel bars, steel lugs, headed steel studs, and similar devices that are attached to a structural member for the purpose of achieving composite action
with concrete.

Steel joist

An open web, secondary load-carrying member of 144 feet or less, designed by the manufacturer, used for the support of floors and roofs.

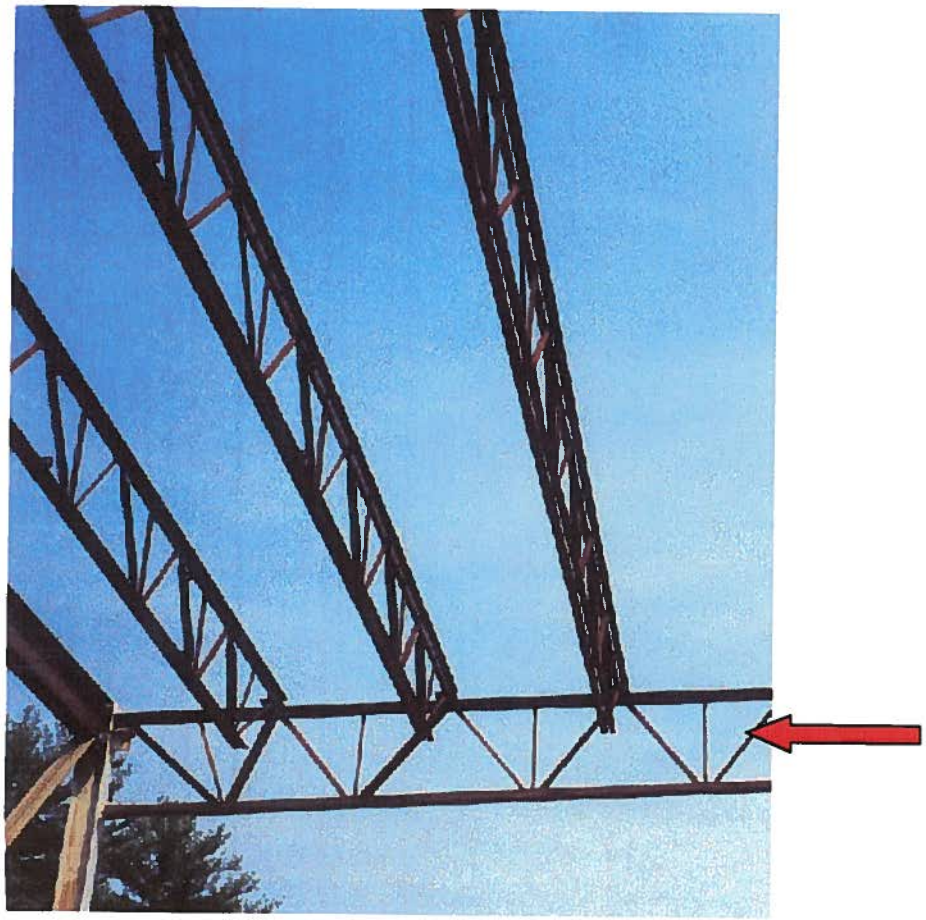
(This does not include structural steel trusses or cold-formed joists)



Steel joist girder

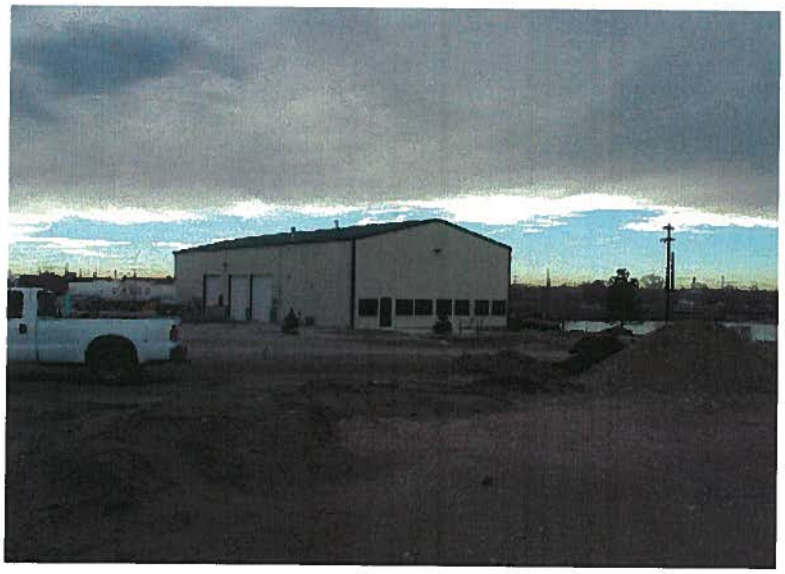
An open web, primary load carrying member, designed by a manufacturer, used for the support of floors and roofs.

(This does not include structural steel trusses or cold-formed joists)



Systems-engineered metal building

Field-assembled building system consisting of framing, roof and wall coverings.



CHAPTER 6.

ILLUSTRATIONS OF CONCEPTS

[RESERVED: ILLUSTRATIONS ARE BEING PREPARED AND WILL BE ADDED]

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