

Casino Collapse



OSHA Steel Erection Standard



Draft 7 15 2019

September 20, 1932



41st Street in Manhattan
RCA building (now called the GE building)

July 2015

- Issues?



Photo: Paul Jasinski

Sep 2016





July 2017

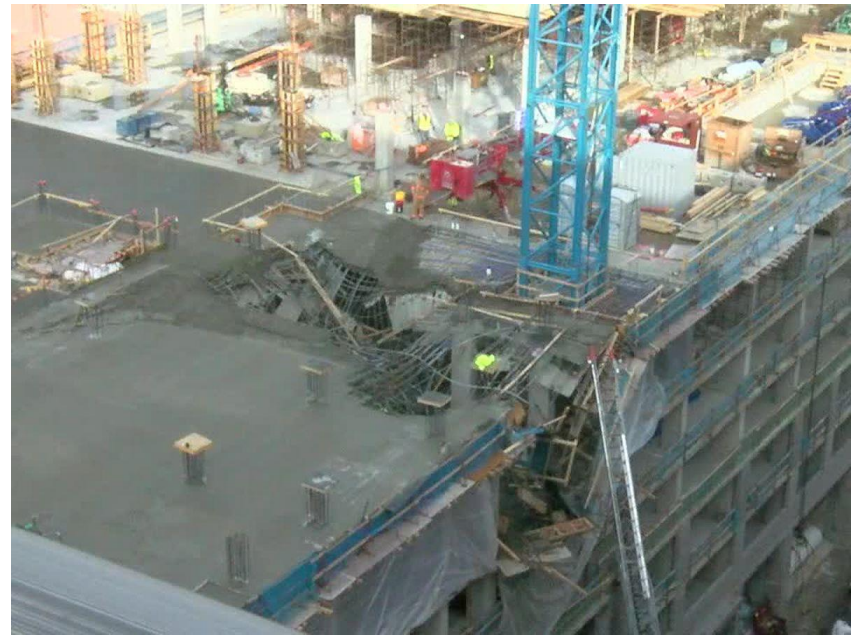
151 N. Franklin

August 2019



Nov 2019

- Cincinnati
- Too few bolts connecting horizontal steel support beams with vertical steel columns was the cause of January's construction accident at Horseshoe Casino Cincinnati, according to the report of the Occupational Safety and Health Administration.
- Preston Delph, 58, was on the sixth floor



Oct 2019

- New Orleans
- 3 dead



Oct 2019



Oct 2019

Citation and Notification of Penalty

Company Name: Suncoast Projects, LLC, dba Hub Steel
Inspection Site: 1031 Canal St., New Orleans, LA 70112

Citation 1 Item 4 Type of Violation: **Serious**

29 CFR 1926.754(a): Structural stability was not maintained at all times during the erection process:

On or about October 12, 2019, at the Hard Rock Hotel construction site at 1031 Canal St., New Orleans, LA, employees performed steel erection activities where steel beams on the sixteenth floor were not connected to columns on the fifteenth floor per the contract documents and did not meet the specified load requirements, exposing employees and other workers at the jobsite to struck-by and crushing hazards.

Follow AISC Steel Construction Manual, 13th Edition, Table 7-1, Available Shear Strength of Bolts.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:

05/12/2020

Proposed Penalty:

\$9446.00

Oct 2019



**Table 7-1
Available Shear
Strength of Bolts, kips**

Nominal Bolt Diameter, d , in.					$5/8$		$3/4$		$7/8$		1	
Nominal Bolt Area, in. ²					0.307		0.442		0.601		0.785	
ASTM Desig.	Thread Cond.	F_{nv}/Ω (ksi)	ϕF_{nv} (ksi)	Load- ing	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n
		ASD	LRFD		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Group A	N	27.0	40.5	S	8.29	12.4	11.9	17.9	16.2	24.3	21.2	31.8
	X	34.0	51.0	D	16.6	24.9	23.9	35.8	32.5	48.7	42.4	63.6
Group B	N	34.0	51.0	S	10.4	15.7	15.0	22.5	20.4	30.7	26.7	40.0
	X	42.0	63.0	D	20.9	31.3	30.1	45.1	40.9	61.3	53.4	80.1
A307	-	13.5	20.3	S	4.14	6.23	5.97	8.97	8.11	12.2	10.6	15.9
				D	8.29	12.5	11.9	17.9	16.2	24.4	21.2	31.9
Nominal Bolt Diameter, d , in.					$1\ 1/8$		$1\ 1/4$		$1\ 3/8$		$1\ 1/2$	
Nominal Bolt Area, in. ²					0.994		1.23		1.48		1.77	
ASTM Desig.	Thread Cond.	F_{nv}/Ω (ksi)	ϕF_{nv} (ksi)	Load- ing	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n
		ASD	LRFD		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Group A	N	27.0	40.5	S	26.8	40.3	33.2	49.8	40.0	59.9	47.8	71.7
	X	34.0	51.0	D	53.7	80.5	66.4	99.6	79.9	120	95.6	143
Group B	N	34.0	51.0	S	33.8	50.7	41.8	62.7	50.3	75.5	60.2	90.3
	X	42.0	63.0	D	67.6	101	83.6	125	101	151	120	181
A307	-	13.5	20.3	S	13.4	20.2	16.6	25.0	20.0	30.0	23.9	35.9
				D	26.8	40.4	33.2	49.9	40.0	60.1	47.8	71.9
ASD	LRFD	For end loaded connections greater than 38 in., see AISC Specification Table J3.2 footnote b.										
$\Omega = 2.00$	$\phi = 0.75$											

A crane was lifting beams from a semitrailer Tuesday morning at a nine-story apartment building under construction in Evanston when the beam fell onto the workers.

Oct 2018



Cont.

"A crane was unloading stabilization columns from the back of a truck when the crane's rigging failed,"

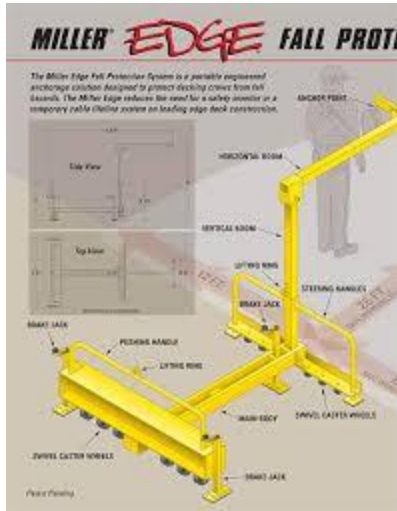


May 2017

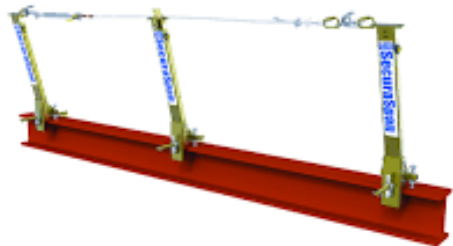
- Laying grating
- Fell 8 feet
- Broke vertebra in back



Leading Edge



Mar 2018



May 2017

- According to Wilmington police, the 44-year-old ironworker was working on the warehouse roof when he fell to his death in Wilmington



May 2016



Photo Joe Castro - TX

December 2015

- South Chicago Heights
- Employee 1 was operating a Powered Industrial Vehicle (forklift) while lifting a steel column using a nylon strap.
- As employee 1 was lifting the column, the strap broke causing the column to strike employee 2.
- Employee 2 was fatally injured as a result of the incident.



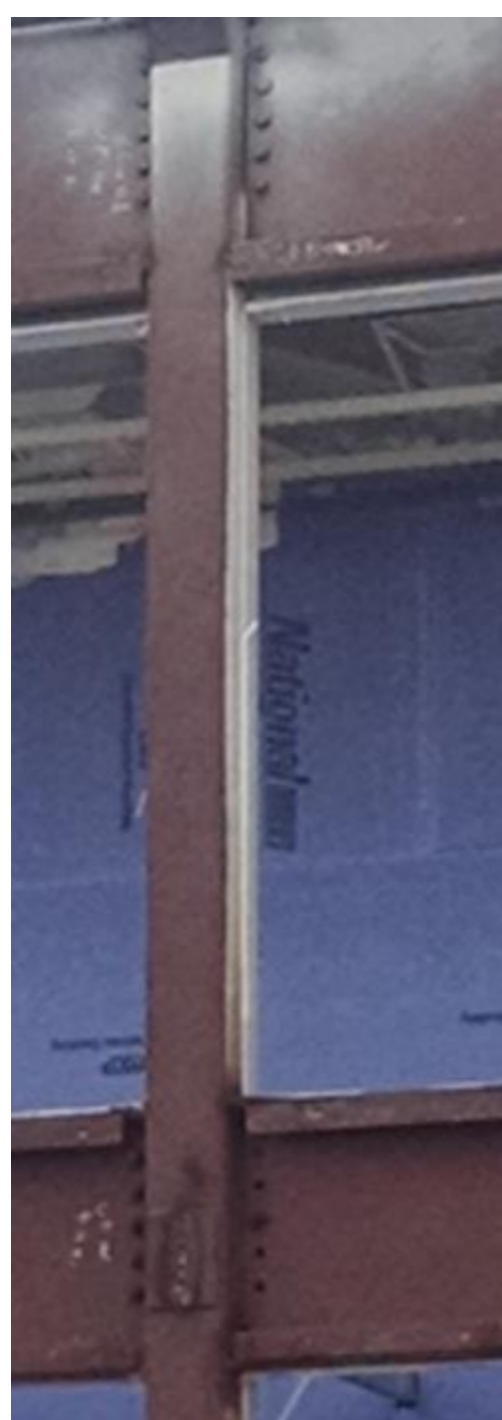
Lifting with a forklift and fiber slings is dangerous.

July 2015



Photo: Chris Markum - Oklahoma

May 2015



Quebec Bridge Disaster

- August 9, 1907
- 50 ironworkers and 36 other workers were killed.
- 20,000 ton sector fell.
- Cantilever beams buckled.
- Ironworkers expected to only work 10 years before death or serious injury.



Golden Gate Bridge

- 11 workers died.
- Installed first safety net on a bridge.
- 19 workers saved.



State of Illinois Building

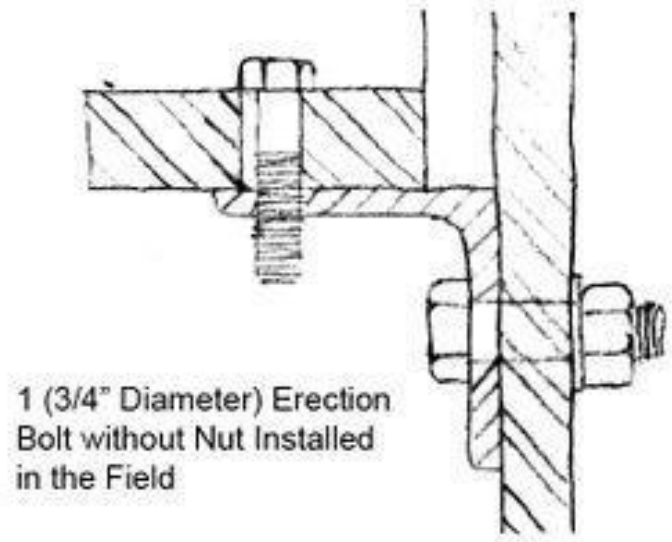
- December 11, 1981
- 3 Ironworkers and 2 others died in 100 foot fall.
- $\frac{3}{4}$ lifting bar failed.
- “Heard a pop.”
- \$8500 penalty by OSHA.



Name at least five requirements before riding in a suspended platform.

US Post Office Collapse

- Chicago, IL
- November 3, 1993
- 3 workers died
- U.S. Court of Appeals Seventh Circuit affirmed that (PDM) was willfully in violation of the OSHA Act. The conviction and \$1 million penalty were affirmed.



Changes in fabrication made the use of the one-inch diameter bolts impossible. Had to switch to $\frac{3}{4}$ -inch diameter bolts.

Workshop

- Roof Collapse
- Site GC onsite daily
- Seat failed due to Inadequate Design by Engineering company
- Ironworker not two bolt as required
- Who is cited?



1926.105(a)

- Safety nets shall be provided when workplaces are more than 25 feet above the ground or water surface, or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts is impractical.



Need for a Standard

- 1996 was the worst year for ironworker fatalities since 1987.
- That year, 49 ironworkers died.
- That was huge jump from 1995's 35 deaths.
- In 1987, there were 53 deaths.
- Falls accounted for 38 out 49 fatalities.
- Metal decking was the activity that resulted in the most fall deaths.
- Many were below the OSHA requirements for fall protection of 25 feet



Final Rule

- Published:
January 18, 2001.
- Effective Date:
January 18, 2002.
- Painted Surface
Provision 2006.



Highlights of the New Standard



Ironworkers welding at the edge of the deck opening, using the cables as a fall arrest system.

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- **Site Preparation**
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- **(Non-Hoist) Overhead Hazards**
§ 1926.759 Falling Object Protection
- **Fall Protection**
§ 1926.760 Fall Protection (for connectors, deckers, and all others)
- **Training**
§ 1926.761 Training (general and specialized)

§ 1926.750 Scope

- The standard covers all employers engaged in steel erection activities.
- Two lists of activities:
 - Primary: all activities in .750 (b)(1) are covered (connecting, bracing, guying...)
 - Ancillary: all listed in .750 (b)(2) are covered *when they occur during and are a part of steel erection activities* (sealing, caulking, elevator beams...)



§ 1926.750 Scope

- Does *not* include:
 - electrical transmission towers;
 - communication and broadcast towers;



Ironworker using rope grabs to make tower connection.

§ 1926.750(c)

Specific Controlling Contractor Duties

- Written notification to the steel erector:
 - Concrete in piers/walls is cured re ASTM spec.
 - Anchor bolt modifications/repairs approved by project engineer (.752(a); .755(b)).
 - Adequate on-site access roads (.752(c)).



Before and after photos.

Access (continued)

- Aerial lifts must be used on firm surfaces.



Only parts of the job were graded.

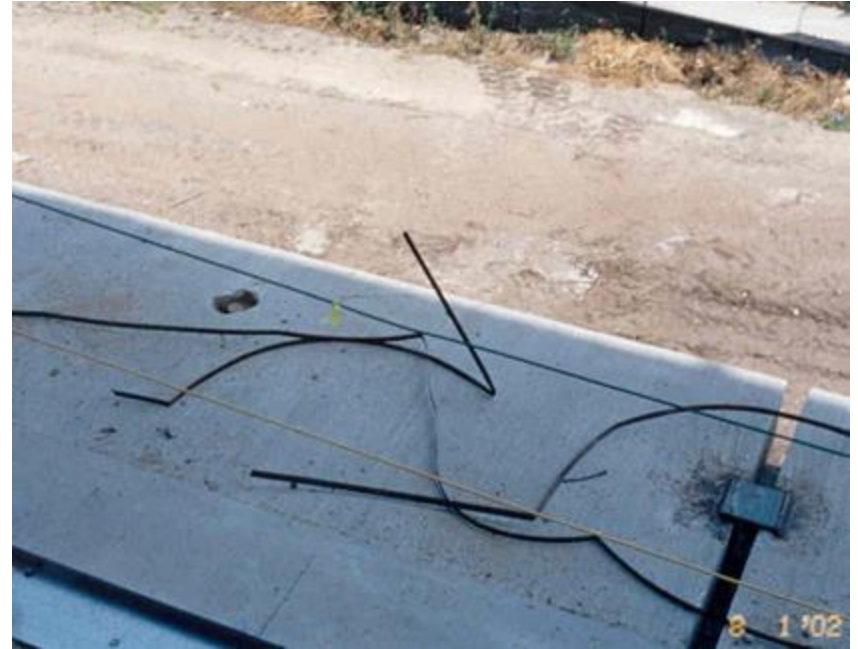
Controlling Contractor Duties

- Preclude work below steel erection unless there is overhead protection 1926.759(b)



Controlling Contractors

- Controlling contractors will also have to choose whether or not to accept and take custody of **fall protection** systems.
- 1926.760(e)



Electric wire is not acceptable as a guardrail - Batavia, IL.

§ 1926.752

Site Layout, Construction Plan, and Erection Sequence

- Certification of:
 - proper curing of concrete in footings, piers, etc for steel columns.
 - anchor bolt repairs, modifications.
- Pre-plan hoisting operations.



§ 1926.752

Hoisting and Rigging

- **Qualified rigger** to inspect rigging before each shift.



Quick release device for hoisting columns. Pin must be able to lift the column with a safety factor of 6, similar to a sling.

2000

Worker awarded \$20.9 million for severed arm

BY CARLOS SADOVI
Staff Reporter

A Cook County jury has awarded an ironworker nearly \$21 million after the man's arm was severed in 1999 by a plummeting 500-pound beam.

Rick Blaisdell, 38, of East Dundee was working at Benedictine University in Lisle on buildings being erected by Frederick Quinn Co. of Addison.

The heavy beam fell as it was being hoisted over the heads of the workers, severing Blaisdell's left arm, said his lawyers, Daniel V. O'Connor and Marc Taxman of Anesi, Ozmon, Rodin, Novak and Kohen Ltd.

"The beam was being lifted by a crane 45 feet in the air over the heads of the ironworkers; the cardinal rule is that you do not lift over the heads of people," Taxman said.

After hearing testimony in a civil

trial that began Sept. 18 in front of Judge Irwin Solganick, a jury agreed Friday with Blaisdell's lawyers that the general contractor was negligent and awarded the \$20.9 million, which could be a state record.

Since the accident, Blaisdell's arm has been reattached but has lost mobility, his lawyers said.

Representatives of the contractor could not be reached. Appeals in these types of cases, however, are common.

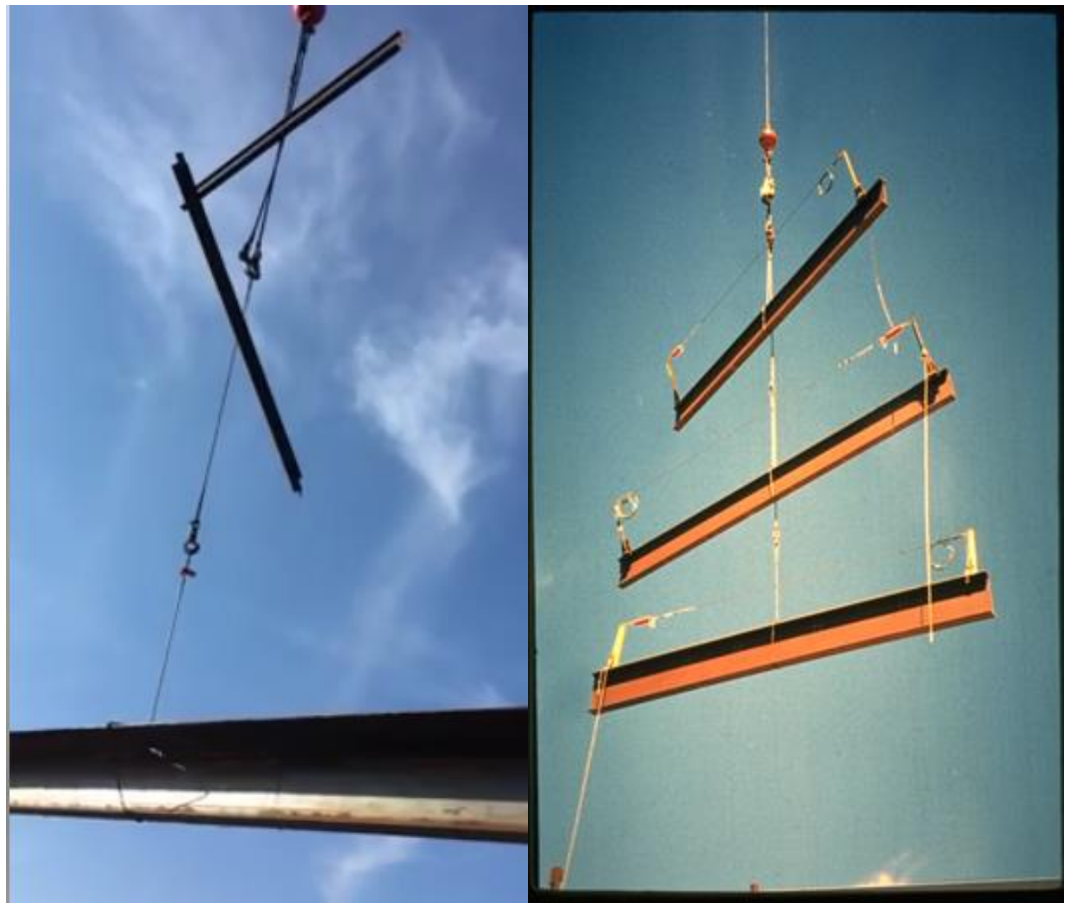
December 2014

- The Fire Department said four people were injured when a steel I-beam came down at a construction site around 9:15am at the northeast corner of Lake and Canal streets, on the west bank of the Chicago River.



Multiple Lifts

- § 1926.753
- Maximum of 5 pieces
- Similar pieces (no deck bundles)
- Trained rigger
- Crane manufacturer must not prohibit it
- 7 foot spacing



Lambeau Field



March 2013

- Lawsuit against CA company contracted to design and operate a gantry crane that would lift and move the 600-ton stator at AR nuke plant.
- While the stator was suspended, the **lifting device failed** and caused the gantry to collapse, dropping the stator approximately 30 feet. It killed 24-year-old ironworker Wade C. Walters and knocked the plant's Unit 2 offline.
- Gantry's safe lifting capacity was 577 tons.



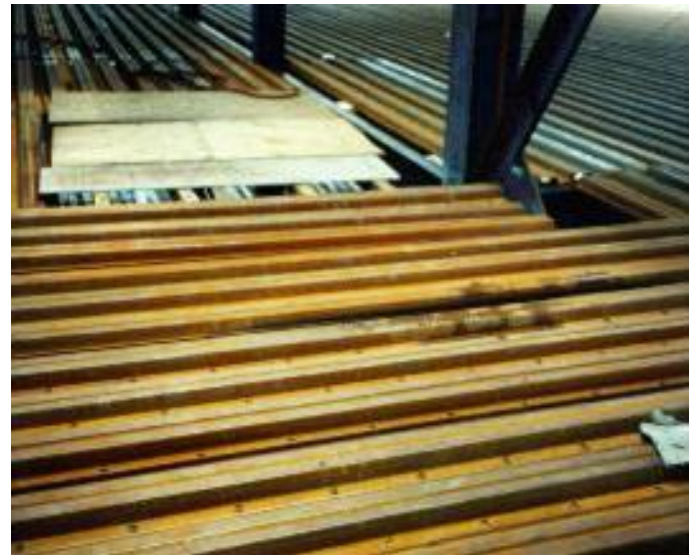
§ 1926.754

Structural Steel Assembly

Cover marked and secured.



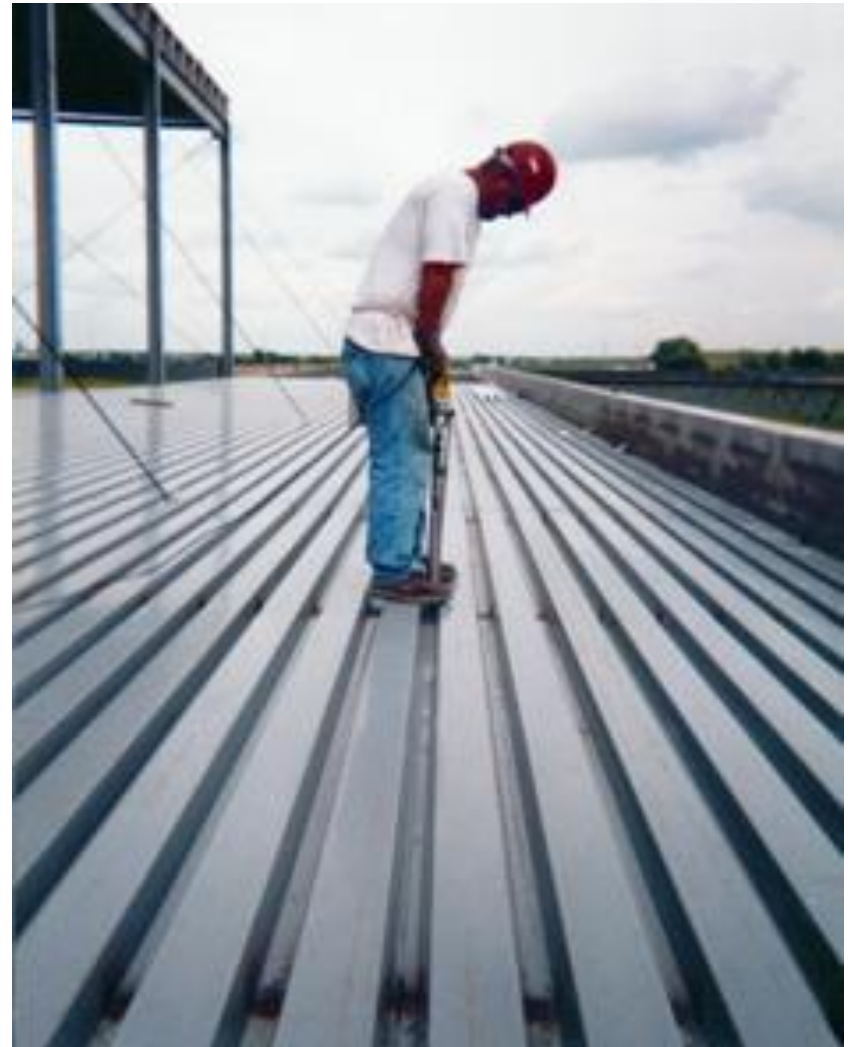
No securement or marking to indicate the opening.



- Covers for floor or roof openings shall be secured and marked with the word HOLE or COVER.

Dekalb

- \$12,434,000 settlement for an ironworker and his wife after the worker suffered a brain injury from a fall of 18 feet after a defective piece of roof decking shifted during installation at a car dealership.
- “I had to pay \$250,000 out of my pocket.”



§ 1926.754

Structural Steel Assembly

- Holes and openings shall be decked over or have employees protected per 760.



Opening in decking netted to comply with 1926.760(b).

§ 1926.755

Column Anchorage

- Requires 4 anchor bolts per column:
 - contains design strength requirements and other column stability requirements.
- Assure the adequacy of anchor bolts modified in the field.



Column would not align with the j-bolts, so the steel erector cut holes and welded tabs to hold column.

Column Anchorage



Four bolts used

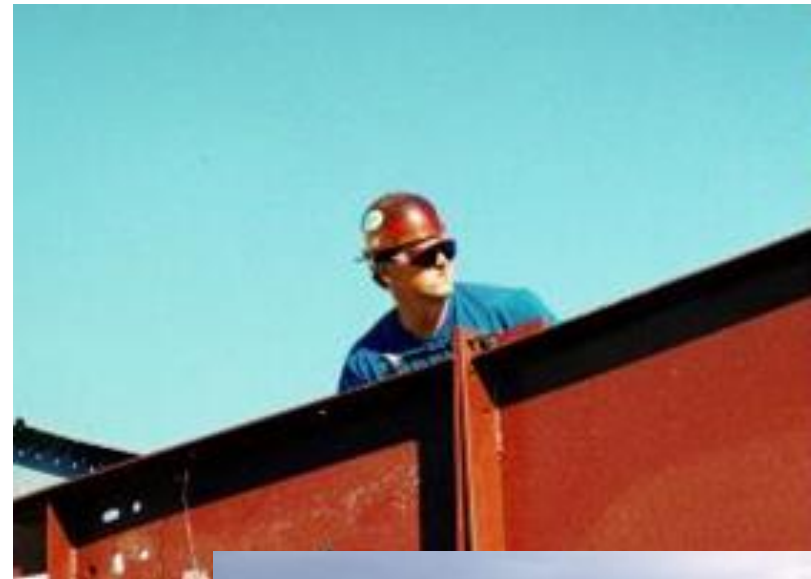


Missing two nuts

§ 1926.756

Beams and Columns

- Two bolts per connection prior to releasing hoisting line.
- One bolt is installed wrench tight. Two will be installed.
- The spud wrench holds the beam until the other connector can make his initial connection.



July 2013

- 300-foot barn that was under construction as part of the \$80 million Equine Complex.
- The steel frame structure fell when a worker released a rafter from a crane before proper bracing was completed.
- Once the rafter was let go, "the building racked and fell to the ground," according to OSHA documents.



Ramco Erectors also cited for failing to instruct employees on unsafe conditions.

§ 1926.756

Beams and Columns

- Requirements to facilitate quick installation of perimeter safety cables:
 - Perimeter columns extend 48 inches;
 - Have holes or other devices for perimeter cable;
 - Feasibility exception in app F.



§ 1926.756

Beams and Columns

- Requires one bolt to remain connected for double connections unless seat or equivalent used.
- Seats for double connections shall be designed for the load during the double connection process.



\$64 Million

- December 2007:
Ronald Bayer, age 36, sued Panduit on for negligence, claiming to have been severely injured (paralyzed) in a workplace.
- Plaintiff claimed that studs placed in iron beams he was walking on caused him to trip, and proper harnessing equipment to prevent the fall had not been installed.
- November 2012:
The jury, however, ruled that Panduit was 80 percent responsible for the accident, and Bayer was only 20 percent responsible.

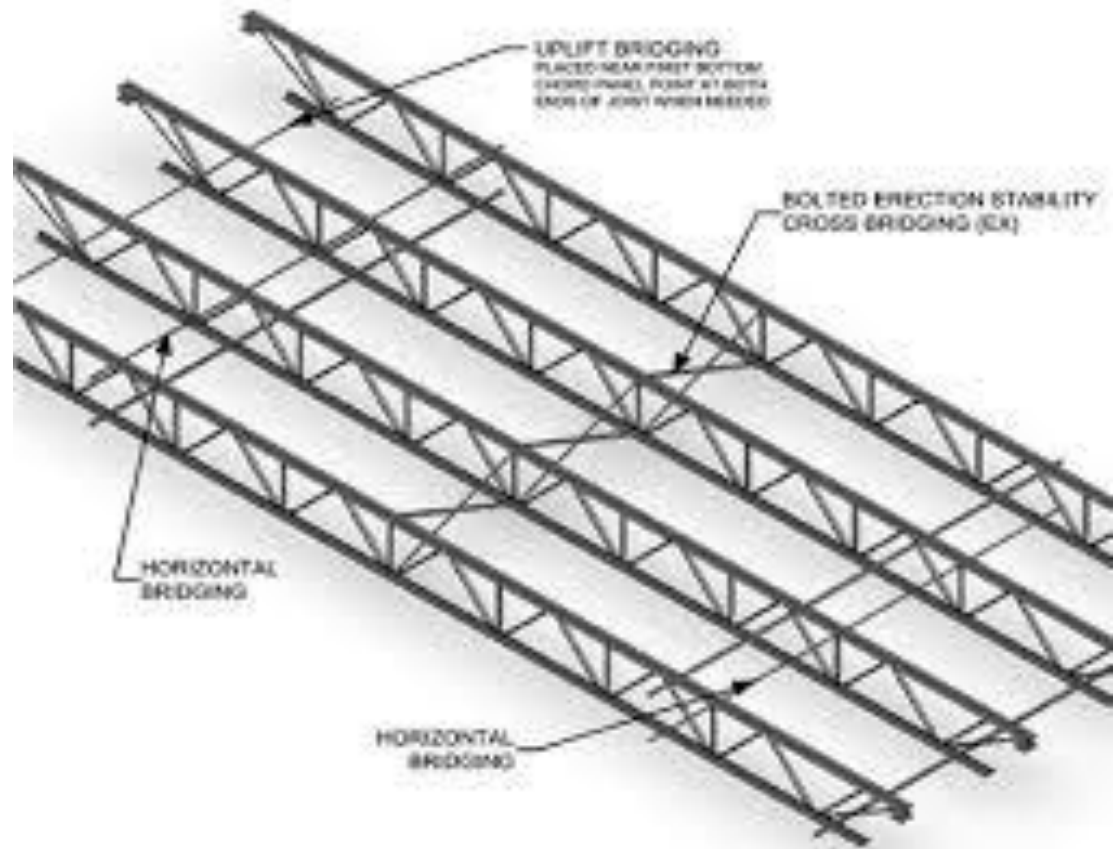


§ 1926.757

Open Web Steel Joists

Erection bridging depends on joist type.

May be allowed as low as 23 feet and as high as 60 feet in certain beams.



1926.757

- Decking Bundles
- The bundle of decking is placed on a minimum of three steel joists;
- At least one row of bridging is installed and anchored;
- The edge of the construction load shall be placed within 1 foot (.30 m) of the bearing surface of the joist end



July 2014

- Using a Beemer style of fall protection.
- Free fall distance is over 6 feet, so manufacturer must approve design and fall arrest system.
- Many connect out of aerial lifts or use horizontal lifelines.



§ 1926.760

Fall Protection

- Between 15 and 30 feet, fall protection required for all **except:**
 - Deckers in controlled decking zone (CDZ)
 - Connectors



Connectors must be provided and wear equipment necessary to be tied-off, or be provided with other means of fall protection.

2011



- Malta, IL
- Connecting out of aerial lifts.
- Horizontal lifelines used also.

March 2015

- What hazard is there with using this lanyard?



Fabric Lanyards

- Cannot be used on sharp edges.
- ANSI Z359



October 2014



Many jobs can be connected out of aerial lifts.

§ 1926.760

Fall Protection

- Perimeter cables required:
 - must be installed “as soon as the metal decking has been installed.”



§ 1926.760

Fall Protection

Custody of Fall Protection Equipment:

- Controlling contractor must choose to **EITHER**
 - accept responsibility for maintaining fall protection equipment left be erector, **OR**
 - ensure that it is removed (.760(e)).



Perimeter cable system

Decking

- Deckers must use fall protection above 30 feet.
- Between 15 and 30 feet, a controlled decking zone could be used.
- The Retractable lanyard must be LE (or Leading Edge).



Use of a fall arrest cable parallel with leading edge set back behind the decker is the most common method in IL.

Bridges

- Fall Protection is most commonly done by fall arrest systems.
- The vertical component is offset to allow walkthrough.
- Workers use a double lanyard system.



May 2015



Amesbury, MA bridge

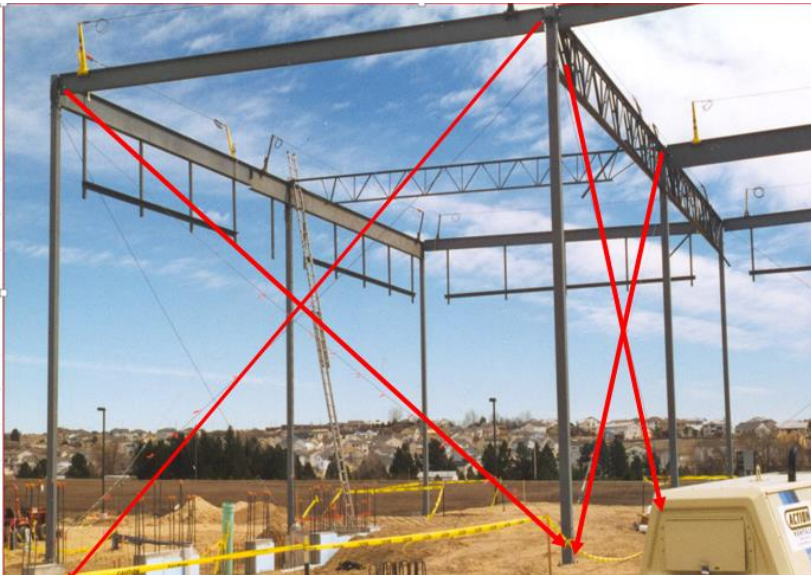
Temporary Bracing

- Three union Iron Workers were killed July 31 when a 150-foot section of a seven-story parking garage under construction at Portland International Airport collapsed.
- The steel erector failed to provide temporary bracing and guys to the erected steel columns to secure them against any lateral load due to wind and/or any incidental construction load.



Columns

- Columns evaluated whether guying and bracing needed



Bracing



April 2015

- Argyle, TX
- One killed, several hurt.
- Gusts 30 mph.
- Wright said the Northstar Builders Group was responsible for the construction, which is part of a \$45-million bond package that includes new tennis courts and new turf for the athletic fields.



September 2015

- Smithfield, RI
- 6 injured



Citation 2 Item 1 Type of Violation: **Willful**

29 CFR 1926.754(a): Structural stability was not maintained at all times during the erection process:

(a) Worksite - Indoor Practice Facility: On or about 9/1/2015, the employer did not install adequate bracing during the steel frame erection process to ensure the structural stability of the framework.

Date By Which Violation Must be Abated:

Proposed Penalty:

Corrected During Inspection

\$53900.00

Patrick J. Griffin
Area Director

Struck By

- February 2011
- Employee # 1 was killed when the entire western cantilevered bay of the steel canopy structure collapsed and one of its steel members struck him.
- The steel beam was a component of a steel canopy structure that consisted of three bays: a western cantilevered bay, a center bay and an eastern cantilevered bay.
- The shoring towers were inappropriately placed and the stability of the structure was compromised.



§ 1926.761 Training

- Qualified person to train workers in use and operation of fall protection equipment.
- Qualified person to train workers in specific activities:
 - “Christmas-treeing”
 - connecting
 - CDZ procedures



May 2015

- Toledo, OH
- 40 foot fall
- Notman has 4 fractured vertebrae, a fractured pelvis, multiple broken bones in his arm and hand, along with a shattered elbow.



The Future?

Written Assessment Contents:

Content Domain	Number of Questions
Cutting & Welding [29102-09, 29106-09, 30112-11]	10
Rigging [30106-11, 30107-11, 38201-11, 38301-11]	24
Cranes and Forklifts [30105-11, 30203-11, 30207-11]	10
Structural Ironworking [30109-11, 30205-11, 30312-12]	10
Tools and Equipment of the Trade [30103-11, 30316-12]	5
Fastening [30104-11]	5
Plumbing, Aligning, and Guying [30110-11, 30208-11]	7
Trade Drawings [30108-11, 30204-11]	5
Joists and Girders [30113-11, 30206-11]	5
Trade Math and Field Fabrication [30115-11, 30201-11]	7
Trade Safety [30102-11]	5
Metal Decking and Stud Welding [30114-11, 30304-12]	7
Total Number of Questions	100

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