Steel Erection

Controlling Related Hazards

References

- EM 385-1-1 Section 27
- 29 CFR 1926.750 ; Subpart R
- NFGS 1525 (Latest)
- Manufacturer's Material
- Accident Abstracts

Potential Contractor Mishap Outcomes

- Falls off of structural steel
- Struck by falling objects, tools, bolts etc.
- Structural steel collapse
- Struck by suspended steel.
- Riveting related fires.
- **Leading to property damage, injury, death**

Direct Causes of Steel Erection Related Mishaps

- Working without fall protection.
- Not guying or bracing vertical structures.
- No temporary floor
- Working near fall hazard without training.
- Improper selection, use and maintenance of fall protection systems.
- Unsafe work practices.

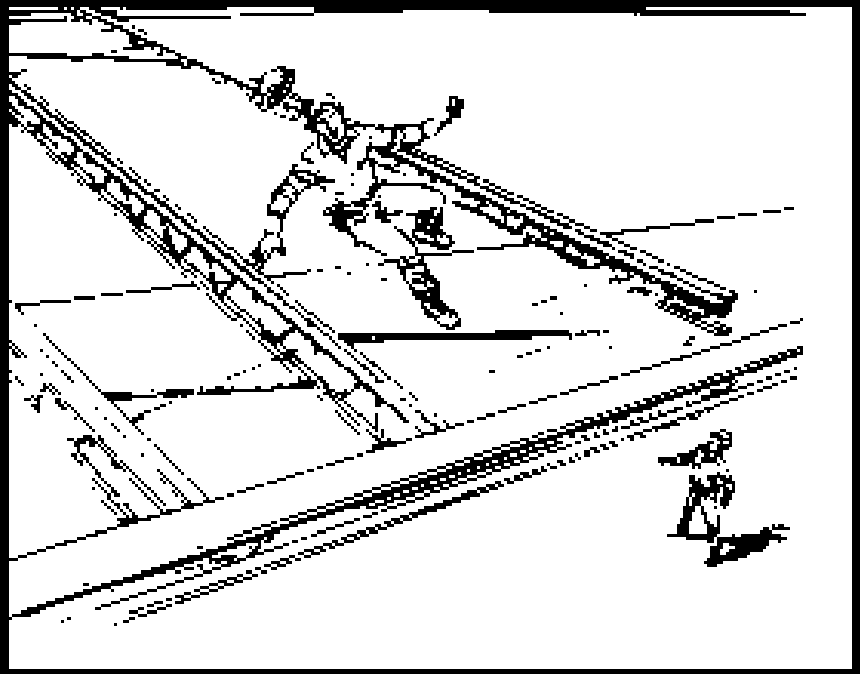
Indirect Causes of Steel Erection Related Mishaps

- Lack of fall protection training.
- No SOP for operation.
- Lack of fall safety supervision.
- Failure to apply AHA by site superintendent.
- Inadequate site-specific safety training prior to phase of work.

Indirect Causes of Steel Erection Related Mishaps (continued)

- Approved safety plan not implemented.
- Proper equipment, materials & protective system not provided.
- Daily inspections of protective systems and surrounding area not performed.
- Lack of management leadership.

Fatal Mishap



- Worker connecting X bracing.
- Only one end of bar joist he was was welded.
- Worker was sitting on unwelded end.
- He dislodged the joist and fell 24 feet.
- No fall protection.
- What would have prevented this incident ?

Controlling Steel Erection Related Hazards

Contractors must use various methods to protect their workers from the hazards associated with working on roofs. These include: Following EM-385 Section 27, Most recent Guide Specifications, and Safety Plan/AHA.Contractor review of associated Accident Abstracts also helpful !

Material and Equipment

- Impact wrenches must have means to retain socket.
- Containers must be used for pins, bolts, and rivets to prevent dropping on workers.
- Safety wire must be used on the snap and handle of pneumatic riveting hammer.

Guying and Supporting Vertical Structures

- Applies to structural steel and reinforcing steel for walls, piers, columns.
- Vertical structures must be guyed and supported.
- Guying/supporting deigned to prevent collapse.

Hoisting Line Load Release

- During final placement of solid web steel.
- Load must not be removed from hoisting line until members are secured.
- Members must have at least two bolts or 10% of the bolts, whichever is greater at each connection..
- Bolts must be wrench tight.

X-Mas Treeing

- This practice is not permitted.
- Although OSHA permits EM 385 does not.

Open Web Steel Joists

- Must not be placed on structural steel unless framework is permanently bolted.
- No load placed on steel joists until bridging is complete and permanent.
- Hoisting cables must not be removed from joist until enough top and bottom chord bridging is attached for lateral restraint.

Lateral Bracing

- Needed when bar joist and columns are not framed in at least two directions.
- A bar joist must be field bolted at columns to provide lateral stability.
- Joists or trusses 40 feet or longer must have an installed center row of bolted bridging before slacking hoisting line.
- No loads placed of open web joists until 2 bolts or 10% whichever is greater at all connections.

Riveting, Bolts, and Pins

- Riveting should not be done near combustibles.
- Fire prevention precautions necessary if combustibles are present.
- When bolts, drift pins, and rivets are being knocked out, they must be kept from falling.

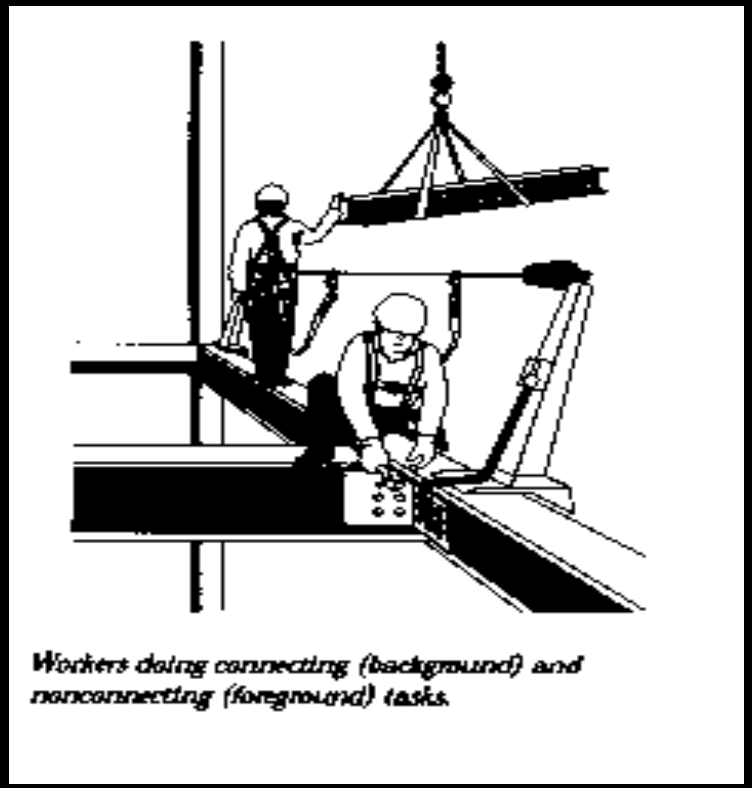
Fall Protection

- Must be provided.
- Whenever workers are exposed to a fall of 6 feet or greater.
- Section 21 of EM-385-1-1 applies.
- Note: OSHA does not hold contractors to 6 foot rule during erection activities, EM 385 is more stringent !

Limiting Fall Hazard Exposure

- One way to limit exposure is to use elevating devices.
- Less time is spent on the iron.
- Must ensure workers never tie-off to the structure.
- Fall protection required ?

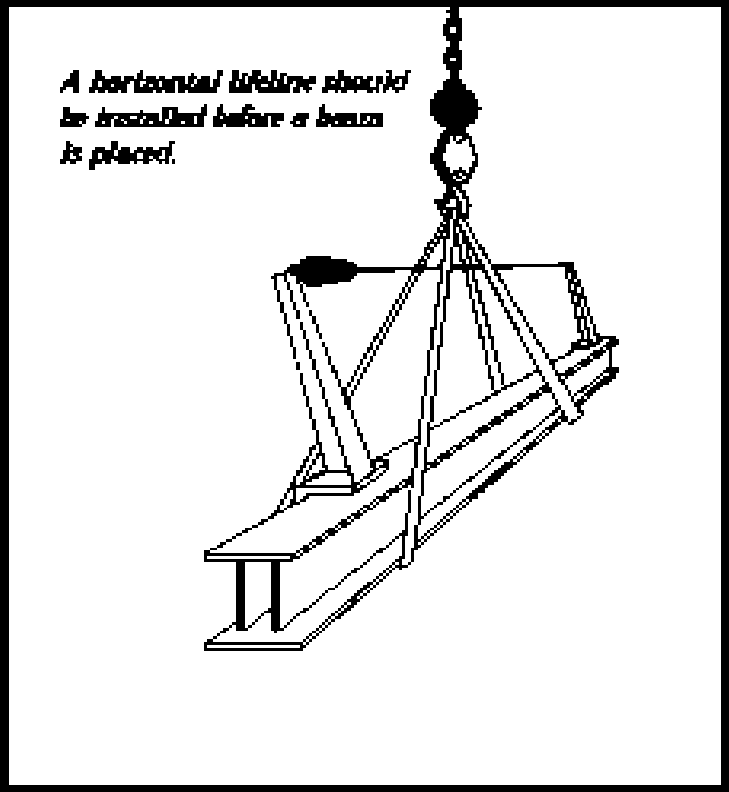
Protected Workers



Workers doing connecting (background) and nonconnecting (foreground) tasks.

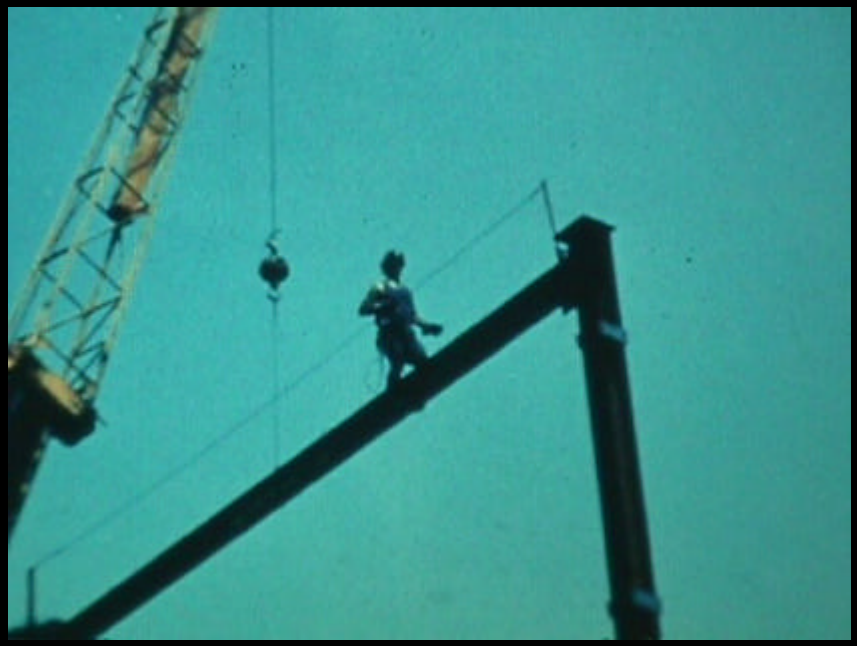
- Two workers doing two different jobs.
- Both protected from the fall hazard.
- This is an ideal situation.

Horizontal Life Lines



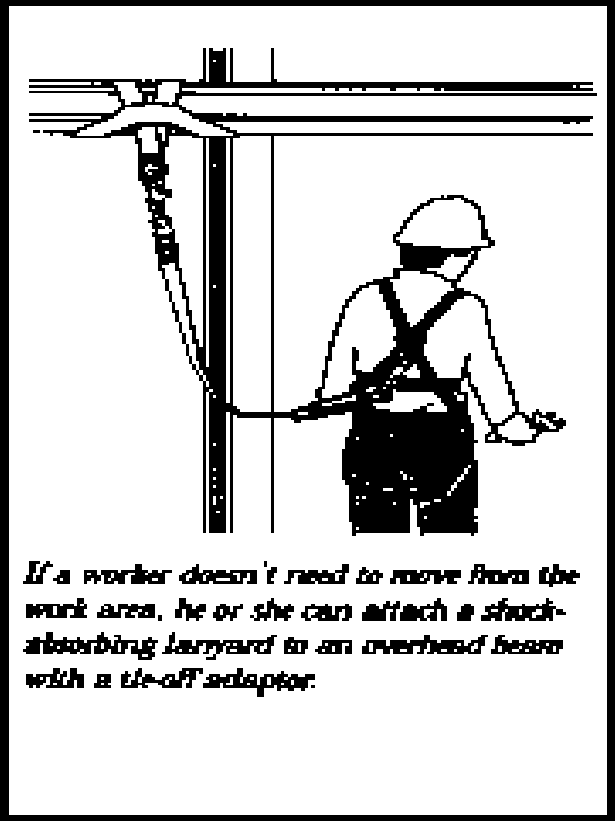
- There are many manufactured horizontal life line systems on the market.
- It is best to install them on the ground.

Horizontal Lifeline



- This worker is using a horizontal lifeline.
- Remember horizontal lifelines require careful design.
- Must be designed, installed and used under the direction of a qualified person.

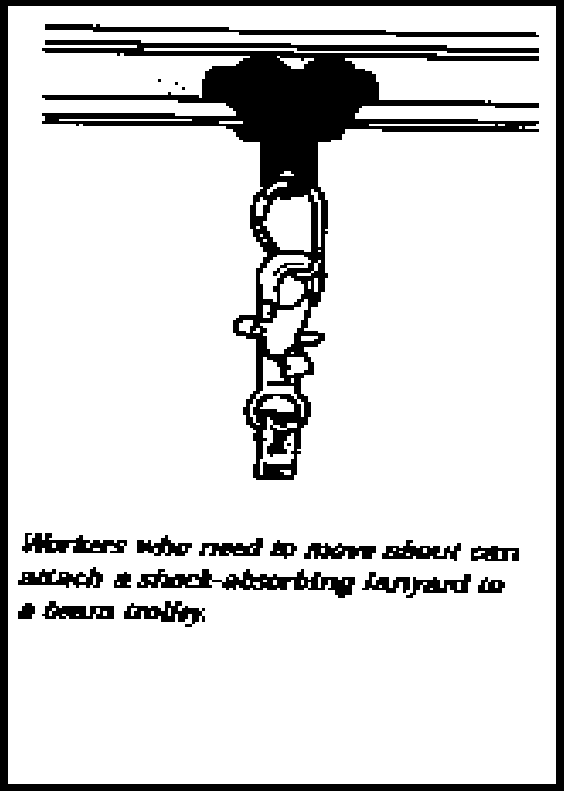
Stationary Anchor Point



If a worker doesn't need to move from the work area, he or she can attach a shock-absorbing lanyard to an overhead beam with a tie-off adaptor.

- This worker is using a cross arm strap.
- This anchor point is in a good position above the worker.
- Workers should not wrap their lanyard directly around steel.

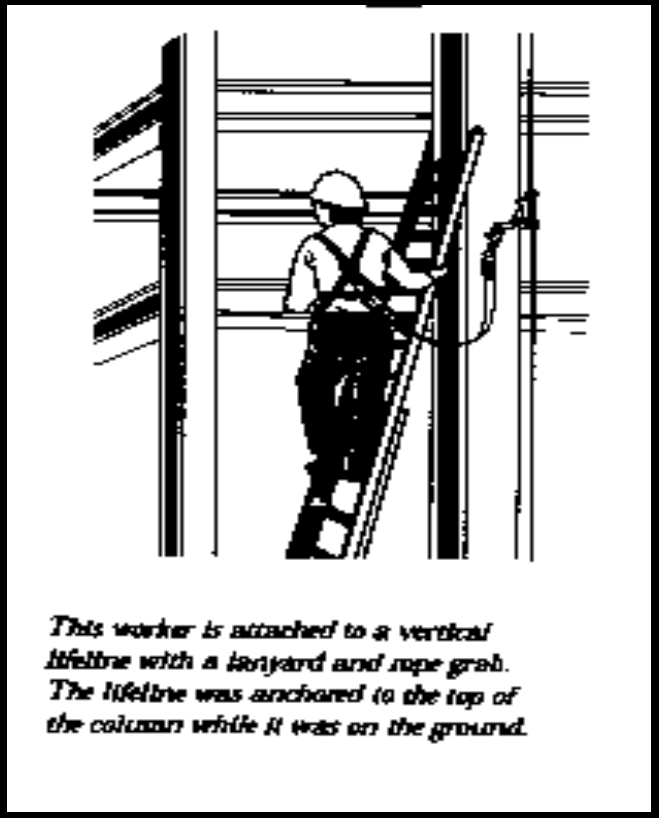
Mobile Anchor Points



Workers who need to move about can attach a shock-absorbing lanyard to a beam trolley.

- Often mobility is necessary.
- This anchor point rides along the beam.
- Often referred to as a beam trolley.

Vertical Life Line and Column



This worker is attached to a vertical lifeline with a lanyard and rope grab. The lifeline was anchored to the top of the column while it was on the ground.

- Best to attach lifeline to top of column while still on the ground.
- This affords protection from the ground up.
- Retractable can also be installed at top of column while on ground.

Temporary Flooring

- Derrick or erection floors must be fully planked or decked over (except for access)
- Maintained with two stories or 30 feet (whichever is less) of workers.
- If temporary floor is not possible and personnel lifting platforms or scaffolds are not used, then safety nets required when fall distance exceeds two stories or 25 feet.

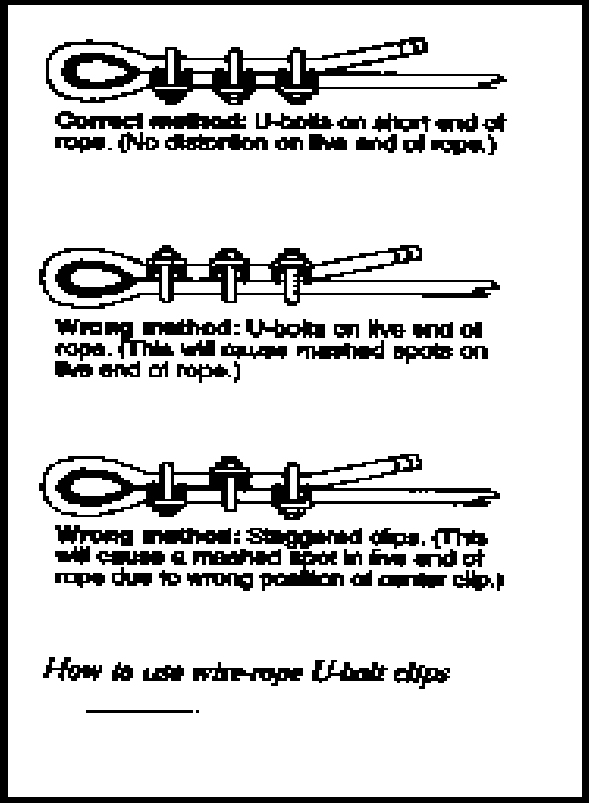
Temporary Flooring Con't

- Design of temporary flooring must be approved by a registered engineer.
- Planking/decking must be strong enough to carry working load.
- Planking at least full 2 inches thick.
- Laid tight and secured.
- Placing and moving temporary flooring under a fall protection systems outlined in AHA accepted by designated authority.

Perimeter Safety Line

- After temporary floor, a perimeter safety line is required.
- Must be 1/2 inch wire rope.
- Approximately 42 inches above deck.
- Attached to all perimeter columns, taught and flagged.
- Must remain place until walls are installed.

Perimeter Safety Line Construction



- Often the weakest link is the U-bolt application.
- Proper size, number and method of application is crucial.
- Top example is correct.

Permanent Flooring

- Installed as erection members progress.
- No more than eight stories between erection floor and last permanent floor.
- No more than two floors of unfinished bolting or welding above foundation of uppermost permanent floor.
- More than two floors only if column is continuous and approved by designated authority: in no case, no more than 4 floors.

Good, Bad or Ugly ?

- What's good about this work area ?
- What's bad about this operation ?
- Is this worker protected ?

During a site visit you see this. Is there a problem ?