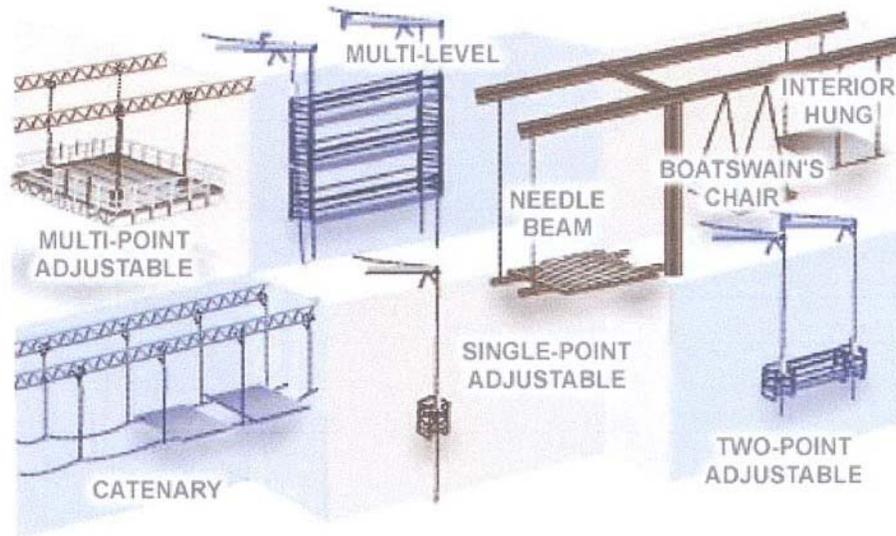


## Suspended Scaffolds:

Suspended scaffolds are platforms suspended by ropes, or other non-rigid means, from an overhead structure. Because two-point scaffolds are the most common type of suspended scaffold, this eTool uses the Two-Point module to describe requirements that apply to all suspended scaffolds. Requirements specific to the other types are described only in their respective modules.



- **Two-point (swing stage):** Platform supported by hangers (stirrups) suspended by two ropes from overhead supports and equipped with a means to permit the platform to be raised and lowered.
- **Single-point Adjustable:** Platform suspended by one rope from an overhead support and equipped with a means to permit the platform to be moved to desired working levels.
- **Catenary:** Platform supported by two essentially horizontal and parallel ropes attached to structural members of a building. Additional vertical pickups may also provide support.
- **Multi-point Adjustable:** Platform(s) suspended by more than two ropes from overhead supports and equipped with a means to permit the platform to be raised and lowered. Includes chimney hoists.
- **Interior Hung:** Platform suspended from the ceiling or roof structure by fixed-length supports.
- **Needle Beam:** A platform suspended from needle beams.
- **Multi-level:** Two-point or multi-point adjustable suspension scaffold with a series of platforms at various levels resting on common stirrups.
- **Float (ship):** Braced platform resting on two parallel bearers and hung from overhead supports by ropes of fixed length.

- **Overview**

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### **Why Is Scaffold Safety Important?**

When OSHA revised its Scaffolds standard in 1996, Bureau of Labor Statistics studies showed that 25 percent of workers injured in scaffold accidents had received no scaffold safety training, and 77 percent of scaffolds were not equipped with guardrails.

OSHA estimates that informed employers and workers, in compliance with correct safety standards, can save as many as 50 lives and prevent 4,500 accidents every year.

### **What Is a Scaffold?**

A scaffold is defined as an elevated, temporary work platform. There are three basic types of scaffolds:

- Supported scaffolds, which consist of one or more platforms supported by rigid, load-bearing members, such as poles, legs, frames, outriggers, etc.
- Suspended scaffolds, which are one or more platforms suspended by ropes or other non-rigid, overhead support.
- Other scaffolds, principally manlifts, personnel hoists, etc., which are sometimes thought of as vehicles or machinery, but can be regarded as another type of supported scaffold.



### **Common Hazards Associated with All Scaffolds**

- Falls from elevation, due to lack of fall protection;
- Collapse of the scaffold, caused by instability or overloading;
- Being struck by falling tools, work materials, or debris; and
- Electrocution, principally due to proximity of the scaffold to overhead power lines.

(These hazards will be addressed within the two specific groups below.)

### **Who Uses Scaffolds**

Workers on scaffolds can be divided into two groups:

- [Erectors/Dismantlers](#)
- [Users](#)

- **Erectors/Dismantlers**

Erectors and dismantlers are workers whose principal activity involves assembling and disassembling scaffolding before other work can commence, and after that work, or a portion of it, has been completed.

## **Training and Competent Person Requirements**

OSHA requires employers to provide training by a competent person to each employee who is involved in erecting and/or disassembling a scaffold. A competent person is defined as one who:

- Is capable of identifying existing and predictable hazards, and
- Has authorization to take prompt corrective measures to eliminate them.

## **Requirements for Designing and Constructing Scaffolds**

Scaffolds must be designed by a qualified person and be constructed and loaded in accordance with that design. OSHA defines a qualified person as one who:

- Possesses a recognized degree, certificate, or professional standing; or
- Has extensive knowledge, training and experience; and therefore,
- Can solve or resolve problems related to the work or the project.

A qualified person must do adequate preplanning to assure the safe erection and use of the scaffold.

Preplanning includes:

- Determining the type of scaffold necessary for the job,
- Determining the maximum load of the scaffold,
- Assuring a good foundation, and
- Avoiding electrical hazards.

## **Common Hazards**

- Access
- Collapse
- Electrical
- Falls
- Instability
- Struck-by

## **Other References**

- [Training Requirements, 1926.454](#)
- [General Requirements, 1926.451\(a\)\(6\)](#)

- **Users**

Scaffold users are those whose work requires them, at least some of the time, to be supported by scaffolding to access the area of a structure where that work is performed.

## **Training or Competent Person Requirements**

Employers are required by OSHA standards to have a qualified person provide training to each employee who performs work while on a scaffold. The training must enable employees to recognize the hazards associated with the type of scaffold being used and to understand the procedures to control or minimize those hazards.

OSHA defines a qualified person as one who:

- Possesses a recognized degree, certificate, or professional standing, or
- Has extensive knowledge, training and experience.

## **Common Hazards**

- Access
- Collapse
- Electrical
- Falls
- Struck-by

## **Other References**

- [1926.451\(f\)](#)
- [1926.454\(a\)](#)

## Two-point (swing stage)

Two-point adjustable suspension scaffolds, also known as swing-stage scaffolds, are perhaps the most common type of suspended scaffold. Hung by ropes or cables connected to stirrups at each end of the platform, they are typically used by window washers on skyscrapers, but play a prominent role in high-rise construction as well. **Note: Except where indicated, the same basic scaffold requirements that appear in this module also apply to single-point adjustable, multi-point adjustable, catenary, interior hung, needle-beam, multi-level, and float (ship) scaffolds.**

Review the elements of suspended scaffold safety with the following modules:

[Anchorage](#)

[Support](#)

[Access](#)

[Fall Protection](#)

[Platform](#)

[Stability](#)

[Electrical Hazards](#)

[Personnel Training and Competent Person](#)



## Anchorage

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The safe use of a suspended scaffold begins with secure anchorage. The weight of the scaffold and its occupants must be supported by both the structure to which it is attached and by each of the scaffold components that make up the anchorage system. **Note:** Except where indicated, these requirements also apply to multi-level, single-point adjustable, multi-point adjustable, interior hung, needle-beam, catenary, and float (ship) scaffolds.

[Tiebacks](#)  
[Counterweights](#)  
[Direct Connections](#)



## Tiebacks

- Tiebacks must be **secured to a structurally sound anchorage** on the building or structure, which may include structural members, but not vents, electrical conduit, or standpipes and other piping systems. [[1926.451\(d\)\(3\)\(ix\)](#)]
- Tiebacks must be installed **perpendicular to the face of the building** or structure ([Figure 1](#)), or opposing angle tiebacks must be installed. Single tiebacks installed at an angle are prohibited. [[1926.451\(d\)\(3\)\(x\)](#)]
- Tiebacks must be **equivalent in strength** to the suspension ropes and hoisting rope. [[1926.451\(d\)\(3\)\(vii\)](#) and [1926.451\(d\)\(5\)\(iv\)](#)]



## Workers Killed When Scaffolds Without Tiebacks Fall

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### Case Reports from OSHA files

- Two employees were working on a two-point suspension scaffold without safety belts, lifeline, or tiebacks. They attempted to move a hook to reposition it when the hook slipped off the parapet, causing one end of the scaffold to drop. The victim fell five stories to his death. His co-worker was able to grab on to the scaffold, and climbed to a fire escape.
- A worker was on a two-point suspension scaffold that was suspended by cornice hooks at the top of a parapet wall (approximately 42 ft.). The cornice hooks were not tied back with a secondary tieback



**Figure 1.** An example of a parapet hook tieback that is perpendicular to the face

system. The left side of the parapet wall collapsed, causing the left cornice hook to fall and the left end of the scaffold to fall to the ground. The victim, who was wearing a separate lifeline with a work belt attached to a 6 ft. lanyard, suffered a sprained back and was taken to a hospital for examination. The scaffold had not been tied back according to the manufacturer's specifications. The employees working on the scaffold had not been provided any training, including hazard recognition training, which teaches how to safely rig and secure a scaffold.

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## Counterweights

- Suspended scaffold outrigger beams must be stabilized by:
  - **Counterweights**, or
  - **Bolts or other direct connections** to the floor or deck.  
[\[1926.451\(d\)\(3\)\]](#)
- Counterweights used to balance adjustable suspension scaffolds must be **capable of resisting**:
  - **At least 4 times the tipping moment** imposed by the scaffold when it is operating at the *rated load* of the hoist, or
  - **A minimum of 1½ times the tipping moment** imposed by the scaffold when it is operating at the *stall load* of the hoist, whichever is greater.  
[\[1926.451\(a\)\(2\)\]](#)



## Inadequate Counterweights Cause Two Deaths

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### Case Report from OSHA files

- A 53-year-old painting foreman and a 28-year-old painter were killed when their scaffold collapsed. They were working on a 48-foot-high tank from a two-point suspension scaffold supported by two steel outriggers. The scaffold manufacturer specified 600 pounds of counterweight for this scaffold and load, but the painters had rigged the scaffold using only 200 pounds of counterweight (100 pounds per outrigger). The outriggers were not tied off or otherwise secured. No personal fall protection equipment was being used by either worker. While the two men were working on the scaffold, their weight caused the outriggers to slip, and the scaffold, rigging, and victims fell to the ground.
-

- Only items **specifically designed as counterweights** may be used to counterweight scaffold systems. [[1926.451\(d\)\(3\)\(iii\)](#)]
- Masonry units, rolls of roofing felt, and other similar **construction materials shall not be used as counterweights**. [[1926.451\(d\)\(3\)\(iii\)](#)]
- Counterweights **must not be made of flowable materials** such as sand, gravel, and similar materials that can be easily dislocated. [[1926.451\(d\)\(3\)\(ii\)](#)]
- Counterweights **must be secured by mechanical means** to the outrigger beams ([Figures 2 & 3](#)) to prevent accidental displacement. [[1926.451\(d\)\(3\)\(iv\)](#)]
- Counterweights **must not be removed** from an outrigger beam until the scaffold is assembled. [[1926.451\(d\)\(3\)\(v\)](#)]



**Figure 2.** These counterweights are supposed to be secured to the outrigger system by a steel plate clamped with bolts...



**Figure 3.** The scaffold, the counterweight violation was caused by this fall protection violation. If the counterweights had come completely loose, what would have secured the lifelines when the scaffold came down?

## Direct Connections

- Suspended scaffold outrigger beams must be stabilized by:
  - **Bolts or other direct connections** to the floor or deck, or
  - **Counterweights**. [[1926.451\(d\)\(3\)](#)]
- Direct connections to roofs and floors must be **capable of resisting**:
  - **at least 4 times the tipping moment** imposed by the scaffold when it is operating at the *rated load* of the hoist, or
  - **a minimum of 1½ times the tipping moment** imposed by the scaffold when it is operating at the *stall load* of the hoist, whichever is greater. [[1926.451\(a\)\(2\)](#)]



## **Scaffold Attachments Fail; Two Die**

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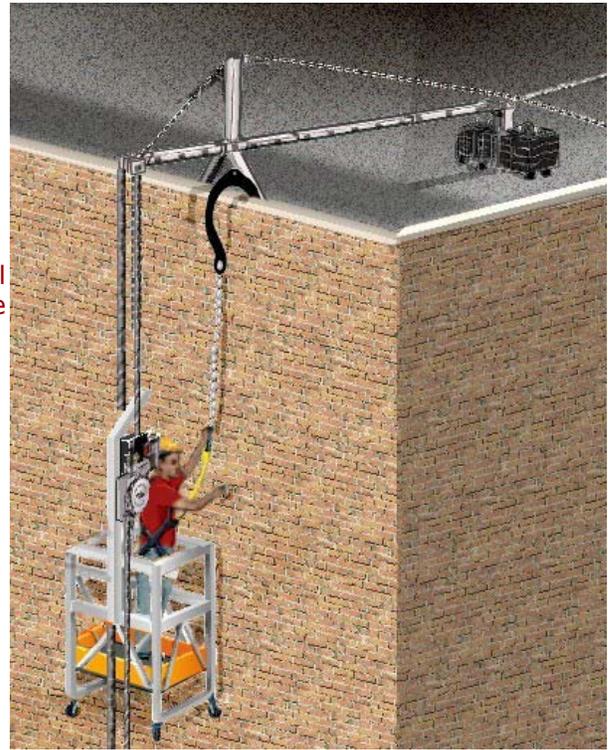
### **Case Report from OSHA files**

- Two employees were sandblasting a 110-foot water tank while working on a two-point suspension scaffold 60-70 feet above the ground. The scaffold attachment point failed, releasing the scaffold cables, and the scaffold fell to the ground. The employees were not tied off independently, nor was the scaffold equipped with an independent attachment system.
-

## Single-point Adjustable

A single-point adjustable scaffold consists of a platform suspended by one rope from an overhead support and equipped with means to permit the movement of the platform to desired work levels. The most common among these is the scaffold used by window washers to clean the outside of a skyscraper (also known as a boatswain's chair). **Note: The requirements on this page are specific to single-point adjustable scaffolds only. For requirements that apply to all types of suspended scaffolds, please refer to the Two-point (swing stage) module of this eTool.**

[General Requirements](#)  
[Non-mandatory Guidelines](#)  
[Boatswain's Chairs](#)



## General Requirements

- The **supporting rope** between the scaffold and the suspension device must be kept vertical unless:
  - The rigging has been **designed by a qualified person**, [\[1926.452\(o\)\(2\)\(i\)\]](#)
  - The scaffold is **accessible to rescuers**, [\[1926.452\(o\)\(2\)\(ii\)\]](#)
  - The support rope is **protected from rubbing** during direction changes [\[1926.452\(o\)\(2\)\(iii\)\]](#), and
  - The scaffold is positioned so **swinging cannot bring it into contact** with other surfaces, [\[1926.452\(o\)\(2\)\(iv\)\]](#)
- When **combining two single-point scaffolds** to form a two-point suspension system, the resulting scaffold must comply with [1926.452\(p\)](#) requirements. [\[1926.452\(o\)\(1\)\]](#)

## Non-mandatory Guidelines

- The **maximum intended load** for these single-point adjustable suspension scaffolds is 250 lbs. [\[1926 Subpart L Appendix A \(o\)\]](#)

## Boatswain's Chairs

- Boatswain's chair **tackle** must consist of:
  - Correct-size **ball bearings or bushed blocks** containing safety hooks, and
  - Properly eye-spliced **first-grade manila rope**, or other rope of equivalent strength, durability, etc. [[1926.452\(o\)\(3\)](#)].
- **Seat slings** must:
  - Pass through **four corner holes** in the seat,
  - **Cross on the underside** of the seat,
  - Be **rigged to prevent slippage** which could cause the chair to be out-of-level [[1926.452\(o\)\(4\)](#)], and
  - be at least **5/8-inch diameter** fiber, synthetic, or other **first-grade manila rope** of equivalent criteria (strength, slip resistance, durability, etc.). [[1926.452\(o\)\(5\)](#)]
- Seat slings **used for gas or arc welding** must be made of at least 3/8-inch wire rope. [[1926.452\(o\)\(6\)](#)]
- **Non-cross-laminated** wood chairs must be **reinforced on the underside** with cleats to keep the board from splitting. [[1926.452\(o\)\(7\)](#)]

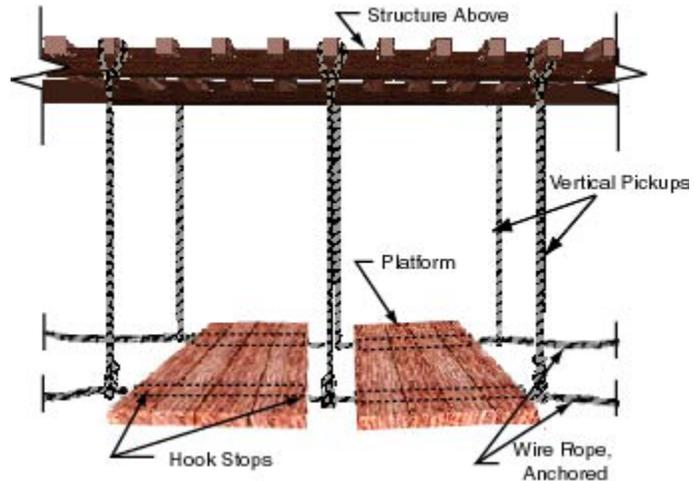
*Non-mandatory guidelines from Subpart L Appendix A:*

- **Wood seats** for boatswain's chairs must be:
  - Not less than 1 inch thick (if made of **non-laminated wood**), or
  - 5/8-inch thick (if made of **marine-quality plywood**). [[1926 Subpart L Appendix A \(o\)](#)]

## Catenary

A catenary scaffold is a scaffold consisting of a platform supported by two essentially horizontal and parallel ropes attached to structural members of a building or other structure.

**Note:** The requirements on this page are specific to catenary scaffolds only. For requirements that apply to all types of suspended scaffolds, please refer to the Two-point (swing stage) module of this eTool.



[General Requirements](#)  
[Non-mandatory Guidelines](#)

## General Requirements

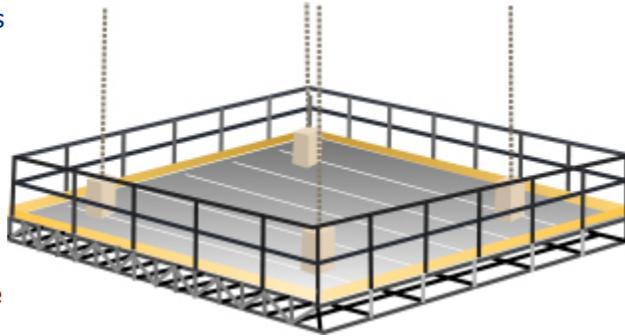
- Catenary scaffolds may not have:
  - More than **one platform between consecutive vertical pickups**, and
  - More than **two platforms altogether**. [[1926.452\(r\)\(1\)](#)]
- Platforms supported by wire rope must have **hook-shaped stops on each of the platform to prevent them from slipping** off the wire ropes. These hooks must be positioned so that they prevent the platform from falling if one of the horizontal wire ropes breaks. [[1926.452\(r\)\(2\)](#)]
- Wire ropes **must not be over-tightened** to the point that a scaffold load will overstress them. [[1926.452\(r\)\(3\)](#)]
- Wire ropes must be **continuous and without splices** between anchors. [[1926.452\(r\)\(4\)](#)]
- Each employee on a catenary scaffold must be **protected by a personal fall-arrest system**. [[1926.451\(q\)\(1\)\(i\)](#)]

## Non-mandatory Guidelines

- Catenary scaffolds have a **maximum intended load of 500 pounds**. [[1926 Subpart L Appendix A \(r\)\(1\)](#)]
- No more than **two employees at a time** are permitted on a catenary scaffold. [[1926 Subpart L Appendix A \(r\)\(2\)](#)]
- **Maximum capacity** of come-along is **2,000 pounds**. [[1926 Subpart L Appendix A \(r\)\(3\)](#)]
- **Vertical pickups** must be spaced **no more than 50 feet apart**. [[1926 Subpart L Appendix A \(r\)\(4\)](#)]
- Ropes must be **equivalent in strength** to at least ½ inch-diameter improved plow steel wire rope. [[1926 Subpart L Appendix A \(r\)\(5\)](#)]

## Multi-point Adjustable

A multi-point adjustable scaffold consists of a platform (or platforms) suspended by more than two ropes from overhead supports and equipped with means to raise and lower the platform(s) to desired work levels. An example of this type of scaffold is a chimney hoist, used in chimney-cleaning operations.



Note: The requirements on this page are specific to multi-point adjustable scaffolds only. For requirements that apply to all types of suspended scaffolds, please refer to the Two-point (swing stage) module of this eTool.

[General Requirements](#)

[Non-mandatory Guidelines](#)

## General Requirements

- Multi-point adjustable scaffolds must be **suspended from**:
  - **Metal outriggers,**
  - **Brackets,**
  - **Wire rope slings,**
  - **Hooks,** or
  - Means that meet **equivalent criteria** for strength, durability, etc. [[1926.452\(q\)\(3\)](#)]
- When two or more scaffolds are used they must **not be bridged together** unless:
  - Their **design allows** them to be connected,
  - The bridge **connections are articulated,** and
  - The hoists are **properly sized.** [[1926.452\(q\)\(1\)](#)]
- If bridges are not used, **passage between platforms** can be made only when they are at the **same height** and are **abutting.** [[1926.452\(q\)\(2\)](#)]

## Non-mandatory Guidelines

The following guidelines apply only to masons' multi-point adjustable suspension scaffolds:

- For a **maximum intended load of 50 pounds** per square foot, each outrigger beam must be at least a **standard 7 inch, 15 foot, 15.3 pound steel I-beam.** [[1926 Subpart L Appendix A \(q\)\(2\)](#)]
- Beams must **not project more than 6 feet 6 inches** beyond the bearing point. [[1926 Subpart L Appendix A \(q\)\(2\)](#)]
- Overhangs exceeding 6 feet 6 inches must be composed of **stronger outrigger beams or multiple beams.** [[1926 Subpart L Appendix A \(q\)\(2\)](#)]

## Interior Hung

An interior hung suspension scaffold consists of a platform suspended from the ceiling or roof structure by fixed-length supports. **Note:** The requirements on this page are specific to interior hung scaffolds only. For requirements that apply to all types of suspended scaffolds, please refer to the Two-point (swing stage) module.

[General Requirements](#)  
[Non-mandatory Guidelines](#)



### General Requirements

- Interior hung scaffolds must be **suspended from roof structures** (e.g., ceiling beams). [[1926.452\(t\)\(1\)](#)]
- Roof structures must be **inspected for strength** before scaffolds are erected. [[1926.452\(t\)\(2\)](#)]
- Suspension ropes/cables must be **connected** to overhead supports by **shackles, clips, thimbles, or equivalent means**. [[1926.452\(t\)\(3\)](#)]

### Non-mandatory Guidelines

- **Bearers** must:
  - Have dimensions of **2 x 10 inches**, and
  - Be **used on edge**. [[1926 Subpart L Appendix A \(t\)](#)]
- For an intended maximum load of 25 to 50 lbs. per square foot, the **maximum span is 10 feet**. [[1926 Subpart L Appendix A \(t\)](#)]
- For an intended maximum load of 75 lbs. per square foot, the **maximum span is 7 feet**. [[1926 Subpart L Appendix A \(t\)](#)]

## Needle Beam

This simple type of scaffold consists of a platform suspended from needle beams, usually attached on one end to a permanent structural member. **Note:** The requirements on this page are specific to needle beam scaffolds only. For requirements that apply to all types of suspended scaffolds, please refer to the Two-point (swing stage) module of this eTool.



[General Requirements](#)  
[Non-mandatory Guidelines](#)

### General Requirements

- Scaffold support beams must be **installed on edge**. [\[1926.452\(u\)\(1\)\]](#)
- **Ropes or hangers** must be used for supports. (**Exception:** One end of the scaffold may be supported by a permanent structural member.) [\[1926.452\(u\)\(2\)\]](#)
- Ropes must be **securely attached** to needle beams. [\[1926.452\(u\)\(3\)\]](#)
- **Support connections** must be arranged to **prevent the needle beam from rolling** or becoming displaced. [\[1926.452\(u\)\(4\)\]](#)
- **Platform units must be attached by bolts** or equivalent means. Cleats and overhang are **not** considered adequate means of attachment. [\[1926.452\(u\)\(5\)\]](#)

### Non-mandatory Guidelines

- For a **maximum intended load of 25 pounds** per square foot:
  - **Beams** must be **4 x 6 inches** in cross section, with
  - A maximum **beam span of 10 feet**, and
  - The **platform span** must be no more than **8 feet**.
- **Ropes:**
  - Must be attached to the needle beam by a **scaffold hitch or eye splice**, and
  - The **loose end** must be tied by a **bowline knot** or a **round turn and a half hitch**. [\[1926 Subpart L Appendix A \(u\)\(1\)\]](#)
- **Rope strength** must at least be equal to 1-inch diameter, first-grade manila rope. [\[1926 Subpart L Appendix A \(u\)\(2\)\]](#)

## Multi-Level

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A multi-level scaffold is a two-point or multi-point adjustable suspension scaffold with a series of platforms at various levels resting on common stirrups. **Note:** The requirements on this page are specific to multi-level scaffolds only. For requirements that apply to all types of suspended scaffolds, please refer to the Two-point (swing stage) module of this eTool.

### General Requirements



## General Requirements

- Multi-level suspended scaffolds must be equipped with **additional independent support lines** that are:
  - **Equal in number** to the number of points supported,
  - **Equal in strength** to the suspension ropes, and
  - **Rigged to support the scaffold** if the suspension ropes fail. [[1926.452\(v\)\(1\)](#)]
- Independent support lines and suspension ropes must **not be anchored to the same points**. [[1926.452\(v\)\(2\)](#)]
- Supports for platforms must be **attached directly to support stirrups** (not to other platforms). [[1926.452\(v\)\(3\)](#)]

## Float (ship)

A float, or ship, scaffold is a suspension scaffold consisting of a braced platform resting on two parallel bearers and hung from overhead supports by ropes of fixed length. **Note: The requirements on this page are specific to float (ship) scaffolds only. For requirements that apply to all types of suspended scaffolds, please refer to the Two-point (swing stage) module of this eTool.**

[General Requirements](#)

[Non-mandatory Guidelines](#)



### General Requirements

- Platforms must be **supported by and securely fastened to a minimum of two bearers** extending at least 6 inches beyond the platform on both sides; [\[1926.452\(s\)\(1\)\]](#)
- **Rope connections** must not allow the platform to shift or slip. [\[1926.452\(s\)\(2\)\]](#)
- When only **two ropes are used** with each float: [\[1926.452\(s\)\(3\)\]](#)
  - Ropes must be **arranged to provide four ends** that are securely fastened to overhead supports [\[1926.452\(s\)\(3\)\(i\)\]](#), and
  - Each rope must:
    - Be **hitched to one end** of the bearer,
    - **Pass under the platform** and be **hitched again at the other end**, and
    - **Leave enough rope** for supporting ties. [\[1926.452\(s\)\(3\)\(ii\)\]](#)
- Each employee on a float (ship) scaffold must be **protected by a personal fall-arrest system**. [\[1926.451\(q\)\(1\)\(i\)\]](#)

### Non-mandatory Guidelines

- For a **maximum intended load of 750 pounds**:
  - **Platforms** must be made of **¾-inch plywood**. [\[1926 Subpart L Appendix A \(s\)\(2\)\]](#)
  - **Bearers** must be:
    - Made from **2 x 4-inch or 1 x 10-inch rough lumber**, and
    - **Free of knot and flaws** [\[1926 Subpart L Appendix A \(s\)\(3\)\]](#), and
  - **Ropes** must have **strength equivalent** to at least 1 inch-diameter, first-grade manila rope. [\[1926 Subpart L Appendix A \(s\)\(4\)\]](#)