Scaffolding
What is a Scaffold?

An elevated, temporary work platform
Three Basic Types:

- Supported
- Suspended
- Aerial Lifts
Do employees working on scaffolds need to be trained?
Employees working on scaffolds need to be trained.

All employees must be trained by a qualified person to recognize the hazards associated with the type of scaffold being used and how to control or minimize those hazards. The training must include fall hazards, falling object hazards, electrical hazards, proper use of the scaffold, and handling of materials.
Hazards

- Falls from elevation
- Struck by
- Electrocution
- Scaffold collapse
- Bad planking
Hazards

Falls from elevation – can be caused by slipping, unsafe access, and lack of fall protection.
Struck by – from falling tools and debris.
Electrocution – from overhead power lines.
Scaffold collapse – often caused by instability of overloading.
Bad planking – may give way to materials or occupant load.
Fall Hazards

Falls may occur:

✓ While climbing
✓ Working
✓ Equipment failure
Fall Hazards

Often occur:

While climbing – on or off the scaffold.
Working – on unguarded scaffold platforms.
Equipment failure - When scaffold platforms or planks fail
Protecting Workers from Falls

- Guardrails, and/or
- Personal Fall Arrest Systems (PFAS)
Falls

If a worker on a scaffold can fall more than 10 feet, he or she must be protected by – Guardrails and/or Personal Fall Arrest Systems (PFAS)
Guardrails

- Front edge
- Top rails
- Midrails
- Toeboards
Guardrails should be installed along open sides and ends. Along the Front edge – of platforms not more than 14 inches from the work. For lathing and plastering, a gap of 18 inches is permitted.

**Top rails** – should be no less than 38 and no more than 45 inches tall.

**Midrails** – should be placed halfway between top rail and platform. For construction work, midrails may not be spaced more 19 inches apart.

**Toeboards** – must be at least 3-1/2 inches high. Open spacing between the toe board and platform can not exceed ¼ inches.
Personal Fall Arrest Systems (PFAS)

- Anchorage
- Lifeline
- Body harness

Must be trained to properly use PFAS
In addition to meeting the requirements of 1926.502(d), personal fall-arrest systems used on scaffolds are to be attached by lanyard to a vertical lifeline, horizontal lifeline, or scaffold structural member.
Fall Protection Requirements

- PFAS instead of guardrails
- PFAS & guardrails
- PFAS on erectors and dismantlers

The ends of this scaffold are not properly guarded
PFAS instead of guardrails - can be used on scaffolding when there are no guardrail systems. When working from the following systems: boatswains’ chair, catenary, float, needle beam, ladder, and pump jack. Also use PFAS when working from the boom/basket of an aerial lift.

Fall arrest and guardrail systems - must be used when working on single – and two-point adjustable suspension scaffolds and self-contained adjustable scaffolds that are supported by ropes.

PFAS on erectors and dismantlers – A competent person must determine the feasibility and safety of providing fall protection for employees erecting or dismantling supported scaffolds.
Falling Object Protection

- Hardhats
- Barricade
- Panels or screens
- Canopy or net
Falling Objects

Wear Hardhats

**Barricade** area below scaffold to forbid entry into that area

**Panels or screens** use if material is stacked higher than toe board

**Canopy or net** - build or erect below the scaffold that will contain or deflect falling objects
Overhead Power Lines

Ten foot rule recommended
Scaffolds must be far enough from overhead power lines that neither they, nor any conductive materials (e.g. building materials, paint roller extension poles, scaffold components) that may be handled on them, come closer than 10 feet to the line. **Exception** – insulated lines of less than 300 volts have a safe distance of only 3 feet.

**TIP:** Because it may be difficult to determine if a power line is insulated, or what its exact voltage is, the 10 ft. rule should always be applied.

**Scaffolds** may be **closer** to overhead power lines than specified if such proximity is **necessary** for the type work being done, if the power company or electrical system operator has been notified and has either: De-energized the lines; relocated the lines or installed protective coverings to prevent accidental contact with the lines.
Scaffold Support Example #1

Inadequate support – in danger of collapse?
In Example #1
What is wrong?

No base plates – no adequate means of leveling
Missing cross braces
Footings must be capable of supporting the loaded scaffold with settling or displacement
Unstable objects may not be used to support scaffolds or platform units
Scaffold Support Example #2

Good support
Example #2

Illustrates one way to ensure a stable foundation, when a sill is used, is to secure it to the baseplate
Essential Elements of Safe Scaffold Construction

- Appropriate construction
- Proper access
- Competent person
Appropriate construction – To control the risk of a scaffold falling or collapsing, employers must assure that scaffolds are build within OSHA standards relating to strength and structural integrity.

Proper Access – Direct access to or from another surface is permitted only when the scaffold is not more than 14 inches horizontally and not more than 24 inches vertically from the other surface. **Ramps and walkways** 6 feet above lower levels must have guardrails. No ramp shall incline more than 1:3, or 20 degrees. If a ramp or walkway has a slope more than 1:8 it must have cleats securely fastened to the planks not more than 14 inches apart, to provide footing.
Scaffold Platform Construction

Platforms must:

✓ Fully planked
✓ Able to support
✓ 18 inches wide

This is not a properly constructed scaffold
Scaffold Construction

Platforms must be **Fully planked** - or decked with no more than 1 inch gaps

**Able to support** - their own weight, plus four times the intended load.

Scaffolds **Able to support** - their own weight, plus four times the intended load.
Scaffold Platform Construction

✓ Gaps
✓ Support
✓ Overlap

Planks not properly overlapped
Scaffold Construction

Gaps – No gaps larger than 1 inch are permitted between adjacent planks or deck units, or between the platform and the uprights. **Exception** – A larger gap (NOT TO EXCEED 9-1/2 inches) is permitted when the employer can demonstrate, a 1 inch or less gap is not feasible.

Overlap – platforms at least 12 inches over supports, unless restrained to prevent movement.
Scaffold Platform Construction

- No paint
- Graded wood
- Fully planked
- Matching components
- Stability
- Locking
Scaffold Construction

No paint - on wood platforms

Graded wood – Solid sawn wood, fabricated planks, and fabricated platforms may be used as scaffold planks following the recommendations by the manufacturer or a lumber grading association or inspection agency. Load carrying timber members should be a minimum of 1,500 lb-f/in² construction grade lumber.

Fully planked – between front upright and guardrail support

Matching components – component pieces used must match and be of the same type

Stability – In order to assure stability, supported scaffolds must be set on base plates, mud sills or, other adequate firm foundation.

Locking – apply wheel locks and brace pins.
Scaffold Height

No more than four times its minimum base dimension
Height

The height of the scaffold should not be more than four times its minimum base dimension unless guys, ties or braces are used.
Final Rule
Summary and Explanation

Q: When is a competent person required for scaffolding?

See answer on next slide:
A competent person is required for scaffolding:

To - select and direct employees who erect, dismantle, move or alter scaffolds.

To – determine if it is safe for employees to work on or from a scaffold during storms or high winds and to ensure that a personal fall arrest system or wind screens protect these employees.

To – train employees involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting scaffolds to recognize associated work hazards.

To – inspect scaffolds and scaffold components for visible defects before each work shift and after any occurrence which could effect the structural integrity of the scaffold.

The competent person must be 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.
Q: When is a qualified person required for scaffolding?

Same as the competent person with the following exceptions: To - design and load scaffold in accordance with that design. To – design rigging, and platforms for suspension scaffolds and make swaged attachments or spliced eyes on wire suspension ropes.

A Qualified Person is one who by possession of a recognized degree, certificate, or professional standing, or by extensive knowledge, training, and experience has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project.
Final Rule
Summary and Explanation

Q: When is an engineer required?
An engineer is required:

To design – the direct connections of masons’ multi-point adjustable scaffolds; scaffolds that are to be moved when employees are on them; pole scaffolds over 60 feet; tube and coupler over 125 feet; frame scaffolds over 125 feet and to design brackets on fabricated frame scaffolds used to support cantilevered loads in addition to workers.

The standard requires a registered professional engineer to perform these duties.
Platform Ends

Unless cleated or restrained by hooks, must extend over support by at least 6 inches.

What's wrong here?

No Cleats
Platform Ends – What’s wrong?

Each end of a platform, unless cleated or otherwise restrained by hooks, must extend over its support by at least 6 inches.
Supported Scaffolds

- Supports
- Restraints
- Foundation

This support is not adequate!
Support

**Supports** – Platforms supported by legs, outrigger beams, brackets, poles uprights, posts, & frames

**Restraints** – Guys, ties and braces must be installed at locations where horizontal scaffold components support both inner and outer legs. This must be repeated every 20 vertical feet for narrow scaffolds (3 feet or less in width), and every 26 vertical feet for scaffolds greater than 3 feet in width.

**Foundation** – Scaffold poles, legs, posts, frames, and uprights must be on base plates and mud sills or other firm foundations.
This is a great example of what can happen when construction workers fail to investigate the site where their scaffold is being erected, and base plates are not used. The scaffold in question (now taken down) punched a hole through the downtown sidewalk. The workers failed to realize that the sidewalk was only made from blacktop, and it had a basement under it. EXAMPLE OF POINT LOADING!!
Proper Scaffold Access

Permitted types of access:

✓ Ladders  
✓ Stair towers  
✓ Ramps & walkways

May use building stairs and come out window
Provide access when scaffold platforms are more than 2 feet above or below a point of access.

**Ladders** – such as portable, hook-on (must be positioned so as not to tip), attachable (hook-on and attachable ladders must be specifically designed for use with the type of scaffold on which they are used), stairway type (must be positioned so that the bottom step is not more than 24 inches above the scaffold support level and have rest platforms at vertical intervals of 12 feet), and built-ins (specifically designed and build for use as ladder rungs, not be used as a work platform, rest platforms provided at a maximum of 35 foot vertical intervals).

**Stair Towers** – must have a stair rail consisting of a top rail and a mid rail on each side of the stairwell. Top rail shall be capable of serving as a handrail.

**Ramps & walkways** – when 6 feet or more above a lower level must have guardrails.
Scaffold Access

- Crossbraces
- Other scaffold
- Ladders
- End Frames

Do not access by crossbraces
Access

Crossbraces – No access by crossbraces

Other scaffold – can access from another scaffold, structure or hoist provided the gap between is no greater than 14 inches horizontally and/or 24 inches vertical.

Ladders – when using ladders, bottom rung must not be more than 24 inches high.

End Frames – may be used provided they are designed for access.
Suspension Scaffolds

✓ Platform suspension
✓ Recognize hazards
✓ Prevent swaying
✓ Support
✓ Competent person
✓ PFAS
Platforms suspended by ropes or wires – rope must be capable of supporting 6 times the intended load.

Recognize hazards – All employees working on, erecting or dismantling scaffolds must be trained to recognize hazards.

Prevent swaying – All suspension scaffolds must be tied or otherwise secured to prevent swaying, as determined by a competent person.

Support – devices must rest on surfaces that can support four times the load.

Competent person – evaluate connections to ensure the supporting surfaces can support load. Inspect ropes for defects before beginning each work shift.

PFAS – must have anchors independent of the scaffold support system.
Moving Scaffolds

Employees can’t be on a moving scaffold unless:

- Level surface
- 2 to 1 ration
- Outriggers
- Competent person

Employees can’t be on scaffold part beyond the wheels
Moving Scaffolds

Employees can’t be on a moving scaffold unless: The surface is level; height to base ration is 2 to 1; outriggers are installed on both side of the scaffold; competent person must be on site to supervise. NOTE: Employees can’t be on scaffold part beyond the wheels.
Employee was operating an aerial lift, with an extendable boom rotating work platform.

The boom was fully extended and the machine apparently ran over some bricks, causing the boom to flex or spring, throwing the employee from the basket.

The employee fell (head first) 37 feet to a concrete surface below.
Don’t use Shore or Lean-to Scaffolds

Shore scaffold
supported scaffold which is placed against a building or structure and held in place with props

Lean-to scaffold
supported scaffold which is kept erect by tilting it toward and resting it against a building or structure
Using Scaffolds

- Snow or Ice
- Storms or High Winds
- Tag lines
- Protect suspension ropes

A covered scaffold has special wind load considerations
Using Scaffolds

**Snow or Ice** – Do not work on snow or ice covered platforms or during storms or high winds.

**Tag lines** – Use tag lines on swinging loads.

**Protect suspension ropes** – from heat and acid
Fatal Fact – Ice & No Guardrails

A laborer was working on the third level of a tubular welded frame scaffold which was covered with ice and snow.

The scaffold was not fully decked, there was no guardrail and no access ladder.

The worker slipped and fell head first 20 feet to the pavement below.
Overhead Bricklaying from Supported Scaffolds

A guardrail or personal fall arrest system is required on all sides except the side where the work is being done.
Competent Person

✓ Identify hazards
✓ Corrective action
✓ Storm / High Winds
✓ Trainer
✓ Crew selection
Competent Person

Person capable of identifying and promptly correcting hazards. Determines if it’s safe to work on a scaffold during storms or high winds. Trains workers to recognize hazards. Selects qualified workers to conduct work.
Scaffold Inspection

✓ A competent person will inspect scaffolds for visible defects before each shift and after any alterations
✓ Defective parts must be immediately repaired.

Deformed bearer
Scaffold Erection

Erected only under the supervision of a Competent Person.
Scaffold Erection

Scaffolds can only be erected, moved, dismantled, or altered under the supervision of a competent person. Competent person selects and directs these workers and determines the feasibility of fall protection.
A scaffold at a church being constructed in Tennessee. Someone must have been watching over these folks, because they finished the job without the scaffold falling down.
Training Requirements

✓ Electrical presence
✓ Falling objects
✓ Fall protection
✓ Proper use
✓ Load capacities
✓ Retrain
Training

Employees who perform work while on a scaffold must be trained on scaffold hazards and procedures to control the hazards. The training must include: The nature of any electrical hazards, fall hazards, and falling object hazards in the work area; the correct procedures for dealing with those hazards; the proper use of the scaffold, and the proper handling of materials on the scaffold; the maximum intended load and the load-carrying capacity of the scaffold; and any other pertinent requirements. Employees shall retrain when there is reason to believe the employee lacks the necessary skill and understanding; changes at the worksite present additional hazards; changes in the types of scaffolds, fall protection, falling object protection, or other equipment; inadequacies in an affected employee’s work.
Training Erectors

✓ Recognize hazards
✓ Correct procedures
Scaffold Erectors

Scaffolds are to be erected, moved, dismantled, or moved only by experienced and trained employees who have been selected for that work by the competent person.
Avoid the Main Hazards of Scaffolds

✓ Falls from elevation
✓ Scaffold collapse
✓ Bad Planking
✓ Getting struck by falling tools or debris
✓ Electrocution
Remember to:

Use appropriate scaffold construction methods

- Erect, move, or alter scaffold properly
- Protect from falling objects or tools

Ensure stable access

Use a competent person

- Train on scaffold construction and the hazards involved with scaffolds
- Inspect scaffold before each shift and after alteration
- Determine fall protection requirements
Quiz Time

To complete the Scaffold Training Module, please click here for the quiz