
Scaffolds

- **29 CFR 1926 – Subpart L**

Presented by:

Objectives

- At the end of this course, students will be able to:
 - Familiarize themselves with OSHA's minimum requirements for scaffolds
 - Recognize safe design, setup, and use of scaffolds
 - Identify common scaffolding hazards
 - Identify common abatement methods for scaffolding hazards

Scaffolds

- 1926.450 - Scope, application and definitions applicable to this subpart
- 1926.451 - General requirements
- 1926.452 - Additional requirements applicable to specific types of scaffolds
- 1926.453 - Aerial lifts
- 1926.454 - Training requirements



Scaffolds

29 CFR 1926 Subpart L - Appendices

- Appendix A - Scaffold Specifications
- Appendix B - (Reserved) Criteria for Determining the Feasibility of Providing Safe Access and Fall Protection for Scaffold Erectors and Dismantlers
- Appendix C - List of National Consensus Standards
- Appendix D - List of Training Topics for Scaffold Erectors and Dismantlers
- Appendix E - Drawings and Illustrations

Note: *These appendices are non-mandatory.*

Scope and Application

1926.450(a)

- Covers all scaffolds used in workplaces
 - Two categories for scaffolds
 - » Supported
 - » Suspended
- Aerial lifts are covered in 1926.453
- Does not apply to crane or derrick suspended personnel platforms, which are covered by 1926.1431(a)-(e)

General Requirements

1926.451(a)(6)

- Designed by qualified person
- Constructed and loaded in accordance with that design
- Appendix A (non-mandatory) provides guidelines to assist in complying with requirements



What makes this a good scaffold set up?



What is wrong with this scaffold set up?



General Requirements

1926.451(a)(1)

- Scaffold and scaffold components must support own weight and 4 times the maximum **intended** load.
 - Includes personnel, equipment, and supply loads.



What are the hazards in this picture?



Scaffold Platform Construction 1926.451(b)(1)



- Platforms on working levels of scaffolds must be fully planked or decked between front uprights and the guardrail supports.

Scaffold Platform Construction 1926.451(b)(1)(i)-(ii)

- No more than 1” space between adjacent units, and between platform and uprights.
- Where necessary [e.g., to fit around uprights] maximum opening of 9½”.



Scaffold Platform Construction

1926.451(b)(2)

- Platforms used solely as walkways or performing scaffold erection or dismantling must be at least 18" wide.



Scaffold Platform Construction

1926.451(b)(2)(i)

- The following scaffold platforms must be at least 12” wide:
 - Ladder jack
 - Top plate bracket
 - Roof bracket
 - Pump jack scaffold



Scaffold Platform Construction

1926.451(b)(3)

- Front edge of all platforms:
 - No more than 14” from the face of the work
- Exception:
 - Maximum distance – 3” for outrigger scaffolds
 - Maximum distance – 18” for plastering and lathing operations



Scaffold Platform Construction 1926.451(b)(4), (b)(5)(i)-(ii)

- End of platform must extend over support at least 6", unless cleated or restrained.
- Platforms 10' or shorter not to extend more than 12" over support.
- Platforms more than 10' not to extend more than 18" over support.



Scaffold Platform Construction

1926.451(b)(6)

- Each abutted end of scaffold planks must rest on a separate support surface.



Scaffold Platform Construction

1926.451(b)(7)

- When overlapping multiple platforms, overlap must occur only over supports and not less than 12” unless restrained to prevent movement.



Scaffold Platform Construction 1926.451(b)(10)

- Scaffold components must not be intermixed unless compatible and integrity maintained.
- No modifications of mixed scaffold components unless approved by a competent person.



Criteria for Supported Scaffolds

1926.451(c)(1)

- Height to base width ratio of more than 4:1, must be restrained from tipping by:
 - Guying
 - Tying
 - Bracing, *or*
 - Equivalent



Criteria for Supported Scaffolds 1926.451(c)(1)(ii)

- Guys, ties, and braces must be installed per manufacturer's recommendations or at the closest horizontal member to the 4:1 height.
 - Vertically every 20' – 3' or less in width
 - Vertically every 26' – more than 3' wide
 - Each end and horizontal intervals not to exceed 30'



Criteria for Supported Scaffolds 1926.451(c)(2)

- Poles, legs, posts, frames, and uprights must bear on base plates and mud sills or other adequate firm foundation.
- Concrete slab is a firm foundation and does not require mud sills.



Criteria for Supported Scaffolds

1926.451(c)(2)



Criteria for Supported Scaffolds 1926.451(c)(2)(ii)

- Unstable objects must not be used to support scaffolds or platform units.



Criteria for Supported Scaffolds 1926.451(c)(2)(ii)



Criteria for Supported Scaffolds 1926.451(c)(2)(iii)

- Unstable objects must not be used as working platforms.

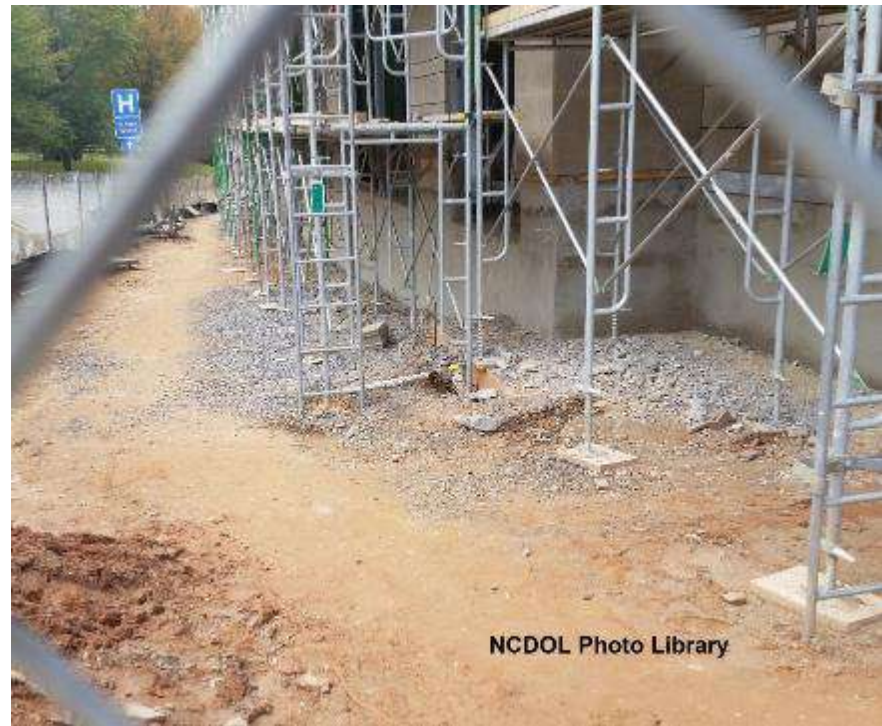


Criteria for Supported Scaffolds 1926.451(c)(2)(iv)-(v)

- Front-end loaders and similar equipment must not be used to support scaffold platforms unless designed by manufacturer.
- Forklifts used to support scaffold platform must have entire platform attached to forks.
- Forklift not to be moved horizontally while platform is occupied.

Criteria for Supported Scaffolds 1926.451(c)(3)

- Poles, legs, posts, frames, and uprights must be plumb and braced to prevent swaying and displacement.

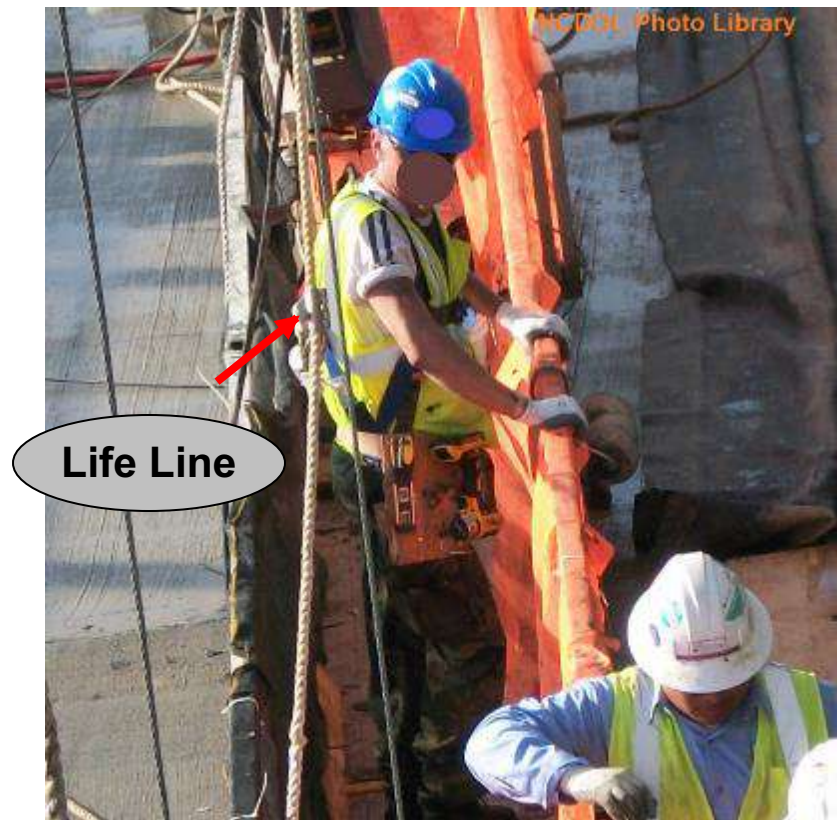


Criteria for Suspended Scaffolds 1926.451(d)



Criteria for Suspended Scaffolds 1926.451(d)(1)

- All suspension scaffold support devices such as outrigger beams, cornice hooks, parapet clamps, etc., shall rest on surfaces capable of supporting at least 4 times the imposed load from the scaffold.



Criteria for Suspended Scaffolds 1926.451(d)(3)(iii)-(v)

- Only use counterweights specifically designed for the system in use.
- Counterweights must be secured by mechanical means to outrigger beams to prevent accidental displacement.
- Do not remove counterweights until final disassembly.



Criteria for Suspended Scaffolds 1926.451(d)(3)(vii)-(x)

- Tiebacks must be:
 - Equivalent strength to suspension ropes
 - Secured to structurally sound anchorage on building
 - Installed perpendicular to face of building or structure



Scaffold Access

1926.451(e)(1)-(6)

- Safe access must be provided to scaffold platforms.
 - Portable ladders
 - Hook-on ladders
 - Stair towers
 - Attachable ladders
 - Stairway-type ladders
 - Integral prefabricated scaffold access



Scaffold Access

1926.451(e)(4)

- Scaffold stairway/towers
 - Stairrail – toprail and midrail
 - Stairrails – 28"-37" from surface of tread
 - Landing platform – at least 18" wide by 18" long at each level
 - Stairway must be at least 18" wide
 - Treads and landings – slip-resistant surfaces



Scaffold Access

1926.451(e)(6)

- Integral prefabricated scaffold access frames
 - Designed and constructed for use as ladder rungs
 - Rung length of at least 8”
 - Uniformly spaced within each frame section



Scaffold Access

1926.451(e)(6)

- Maximum spacing between rungs of 16 $\frac{3}{4}$ "
- Have rest platforms at 35' maximum vertical intervals on all supported scaffolds more than 35' high
- Not to be used as a work platform if less than 11 $\frac{1}{2}$ ", unless using fall protection



Scaffold Access

1926.451(e)(9)(iv)

- Cross bracing on tubular welded frame scaffolds must not be used as means of access or egress.



Scaffold Use

1926.451(f)(1-4)

- Scaffold and scaffold components must not be overloaded.
- Inspected for defects by competent person.
- Immediately replaced, repaired, or removed from service if found damaged.



Scaffold Use

1926.451(f)(7-13)

- Erected, moved, dismantled, or altered only under supervision of competent person
- No work on snow, ice covered platforms
- Tag lines on swinging loads
- Protect suspension ropes from heat, acid, or corrosive substances
- No work during storms or high winds
- No debris allowed to accumulate on platforms

Scaffold Use

1926.451(f)(6)

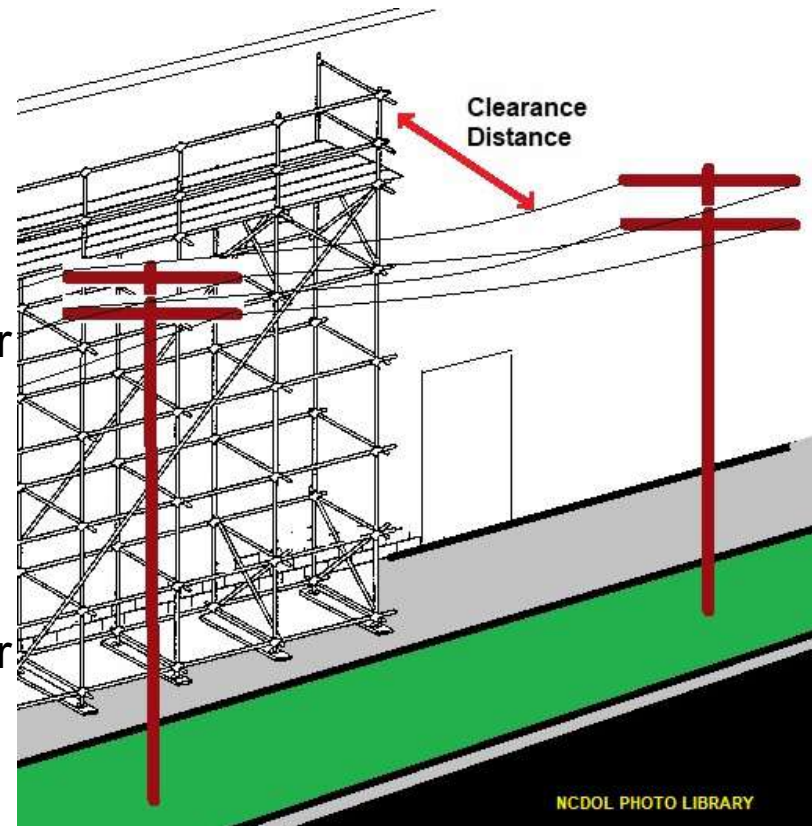
- Clearance between scaffolds and power lines:

- *Insulated lines*

- Less than 300 volts – 3'
- 300 volts to 50 kV – 10'
- More than 50 kV – 10' + 0.4" for each 1 kV over 50 kV

- *Uninsulated lines*

- Less than 50 kV – 10'
- More than 50 kV – 10' + 0.4" for each 1 kV over 50 kV



Fall Protection

1926.451(g)

- Fall protection (Personal Fall Arrest System (PFAS) or guardrails)
 - **1926.451(g)(1)(i-vi)**
 - » PFAS and guardrails on suspension scaffolds
 - **1926.451(g)(2)**
 - » PFAS required for erectors and dismantlers where feasible
 - **1926.451(g)(4)(ii)**
 - » Toprails 38”- 45” high
 - **1926.451(g)(4)(iv)**
 - » Midrails midway between toprail and platform surface
 - **1926.451(g)(4)(xv)**
 - » Use cross-bracing in lieu of toprails or midrails in some cases

Fall Protection

1926.451(g)(1)

- Employees on scaffold more than 10' above a lower level must be protected from falling to that lower level.



Fall Protection

1926.451(g)(1)(ii)

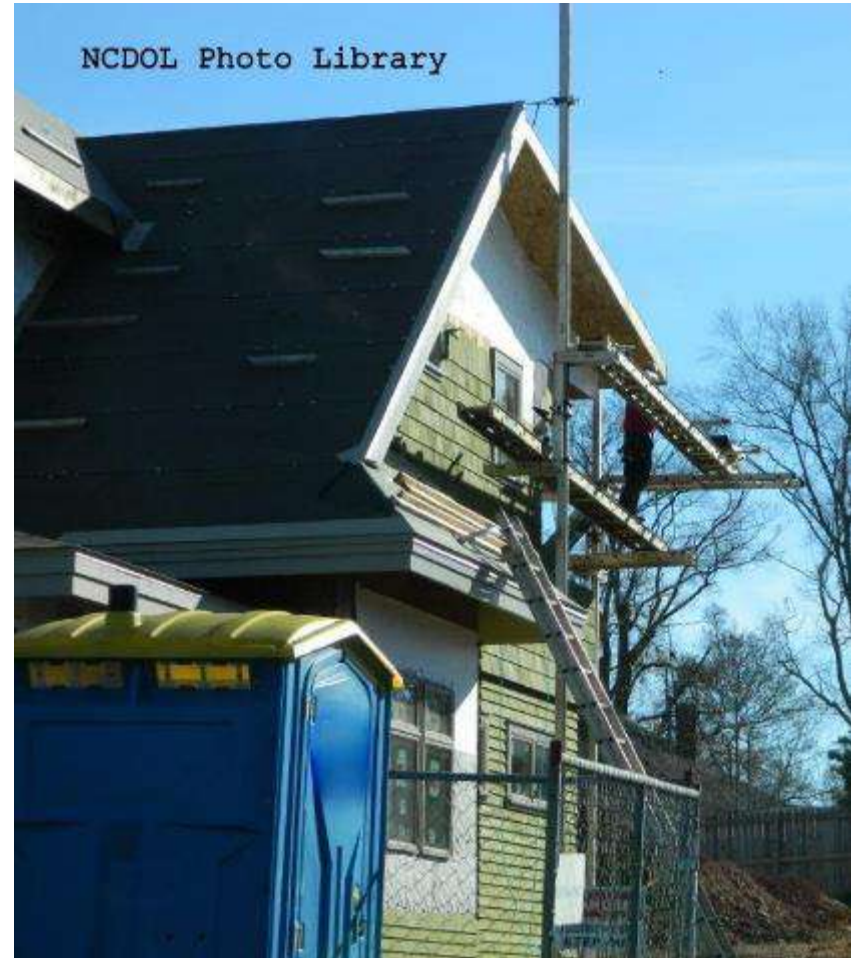
- Employees on single-point or two-point adjustable suspension scaffold must be protected by **both** a personal fall arrest system and guardrail system.



Fall Protection

1926.451(g)(2)

- Employers must provide fall protection if feasible and does not create a greater hazard.
- Competent person must determine:
 - Feasibility and safety of providing fall protection during erecting and dismantling supported scaffold.



Fall Protection

1926.451(g)(4)

- **1926.451(g)(4)** - Guardrail systems that comply with Appendix A meet these requirements
- **1926.451(g)(4)(i)** - Guardrail systems must be installed along all open sides and ends of platforms
- **1926.451(g)(4)(xiii)** - Steel or plastic banding must not be used as a toprail or midrail



Fall Protection

1926.451(g)(4)(xv)

- Crossbracing may be used in place of the top or midrail when the crossing point of the braces is between:
 - 38”- 48” above work platform for toprail
 - 20”- 30” above work platform for midrail



Which is good? Which is bad and ugly?



Falling Object Protection

1926.451(h)(1)

- Hardhats are required for employees on scaffolds.



Falling Object Protection

1926.451(h)(1)

- Erection of debris nets protect workers below from falling hand tools, debris, and other small objects.



Falling Object Protection

1926.451(h)(2)(i)

- Area below the scaffold to which objects can fall must be barricaded.
- Employees must not be permitted to enter the hazard area.



NCDOL Photo Library

Fall Protection

1926.451(h)(2)(iii)

- Where tools, material, or equipment is piled higher than top edge of toe board, paneling or screening extending from the toe board to the top of guardrail must be installed.



Falling Object Protection

1926.451(h)(4)(ii)

- Toe board must be erected along edge of platform to prevent tools, materials, or equipment falling from scaffold.
 - Minimum height – 3½”
 - Securely fastened



Pole Scaffold

1926.452(a)(1)-(8)

- Pole scaffolds are an older type of supported scaffold in which every structural component, including uprights, braces and platforms are made of wood.
- Runners extend over minimum of 2 poles.
- Bearers extend minimum of 3” over outside edges of runners.
- Bearers and runners not spliced between poles.
- Since they are scratch built and seldom re-useable, they are rarely used today.

Pole Scaffold

1926.452(a)(10)

- Pole scaffolds over 60' in height must be designed by registered professional engineer.
 - Must be constructed and loaded in accordance with that design.
 - Non-mandatory **Appendix A** can be used to comply with design and loading requirements for scaffolds **under** 60 feet in height.



Tube and Coupler Scaffolds

1926.452(b)(10)

- Tube and coupler scaffolds over 125 feet in height must be designed by a registered professional engineer.
 - Must be constructed and loaded in accordance with such design.
 - Non-mandatory Appendix A can be used to comply with design and loading requirements for scaffolds **under** 125 feet in height.



Fabricated Frame Scaffolds

1926.452(c)(6)

- Scaffolds over 125 feet in height above base plates must be designed by a registered professional engineer.
- Must be constructed and loaded in accordance with such design.



Bricklayers Square Scaffold

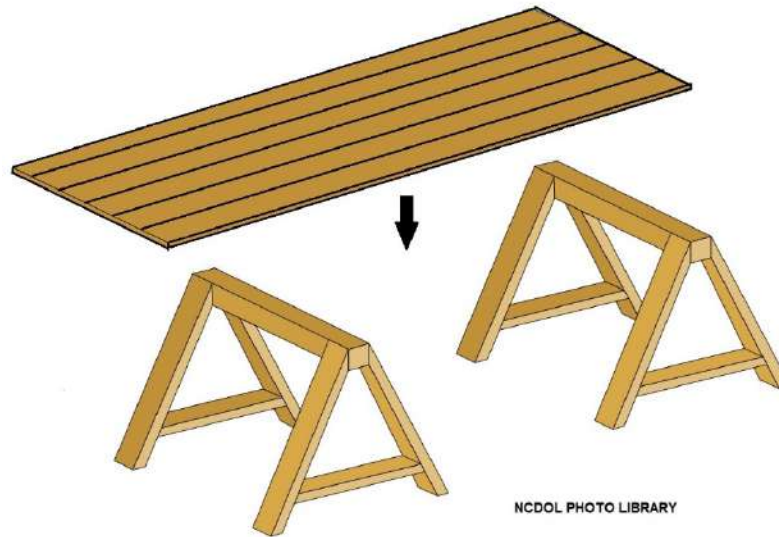
1926.452(e)

- These are scaffolds often made of wood used primarily for masonry.
- Shall not exceed three tiers in height and shall be so constructed and arranged that one square rests directly above the other.
- Upper tiers shall stand on a continuous row of planks laid across the next lower tier and shall be nailed down or otherwise secured to prevent displacement.

Horse Scaffold

1926.452(f)(1)-(2)

- Scaffolds must not be constructed or arranged more than two tiers or **10 feet**, whichever is less.
- Each horse must be placed directly over the horse in the tier below.



Form Scaffolds

1926.452(g)(1)

- Each bracket, except those for wooden bracket-form scaffolds, must be attached to the supporting formwork or structure by one or more of the following:
 - Nails
 - A metal stud attachment device
 - Welding
 - Hooking over a secured structural supporting member

Roof Bracket Scaffold

1926.452(h)(1)

- Scaffold must be constructed to fit pitch of roof.
- Must provide a level support for platform.
- Platform must be at least 12" wide.



Outrigger Scaffold

1926.452(i)(4)-(6)

- Outrigger beams must be secured in place to prevent movement and securely braced at the fulcrum point to prevent tipping.
- Entire supporting structure shall be securely braced to prevent any horizontal movement.



Pump Jack Scaffold

1926.452(j)(2)

- Poles must be secured to **structure** by rigid triangular bracing or equivalent – bottom, top, and other points as necessary.
- Supported scaffold poles must bear on firm foundation.



Pump Jack Scaffold

1926.452(j)(4)

- Work benches must ***not*** be used as scaffold platforms.
 - Is there safe access to this scaffold?
 - Is there a fall protection violation?



Pump Jack Scaffold

1926.452(j)(5)

- Wood poles must be properly constructed.
 - Are the poles properly secured?
 - Is there a fall protection issue?



Are there pump jack scaffold violations here?



Ladder Jack Scaffold

1926.452(k)

- Platforms must not exceed a height of 20 feet.
- Ladders must meet requirements of Subpart X – Stairways and Ladders.
- Ladders must be placed, fastened, or equipped with devices to prevent slipping.
- Platforms must not be bridged one to another.
- Platform must be at least 12” wide.



Mobile Scaffolds

1926.452(w)

- Scaffolds must be properly braced.
- Casters and wheel must be locked while in use.
- Platforms must not extend out beyond base supports.
 - Unless outriggers are used.
- Caster stems and wheel stems must be pinned.



Mobile Scaffolds

1926.452(w)

- Employees must not ride on scaffolds unless:
 - Surface is within 3 degrees of level.
 - Height to base ratio is 2:1 or less.
 - Outrigger frames, when used, installed on both sides.
 - Employees are not on any part of scaffold that extends beyond wheels or supports.



Mobile Scaffolds

1926.452(w)

- Power systems used to propel mobile scaffolds must be designed for such use.
- Forklifts, trucks, and similar motor vehicles must not be used to propel scaffolds.
 - Unless scaffold is designed for such propulsion systems.



Other Types of Scaffolds

- Window jack scaffolds
- Chicken ladders
- Step, platform, and trestle ladder scaffolds
- Needle beam
- Float (ship)
- Catenary scaffold
- Interior hung scaffold
- Multi-level scaffold
- Two-point (swing stage)

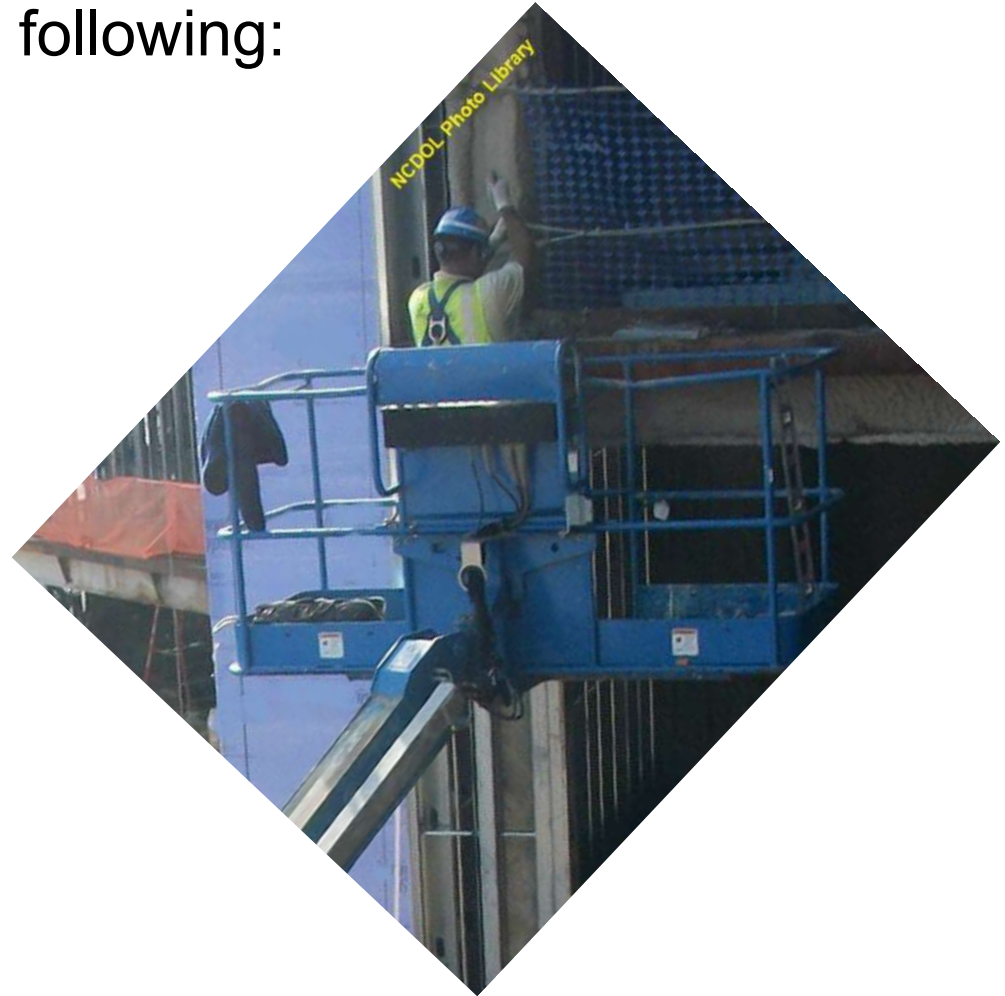


Aerial Lifts

1926.453(a)(1)

- Aerial lifts include the following:

- Extensible boom platforms
- Aerial ladders
- Articulating boom platforms
- Vertical towers
- Combination of any such device



Aerial Lifts

1926.453(b)(2)

- Extensible and articulating boom platforms:
 - Lift controls tested each day prior to use.
 - Only authorized personnel must operate.
 - Belting off to adjacent pole, structure, etc. not permitted.
 - Employees must always stand firmly on floor of basket.



Aerial Lifts

1926.453(b)(2)

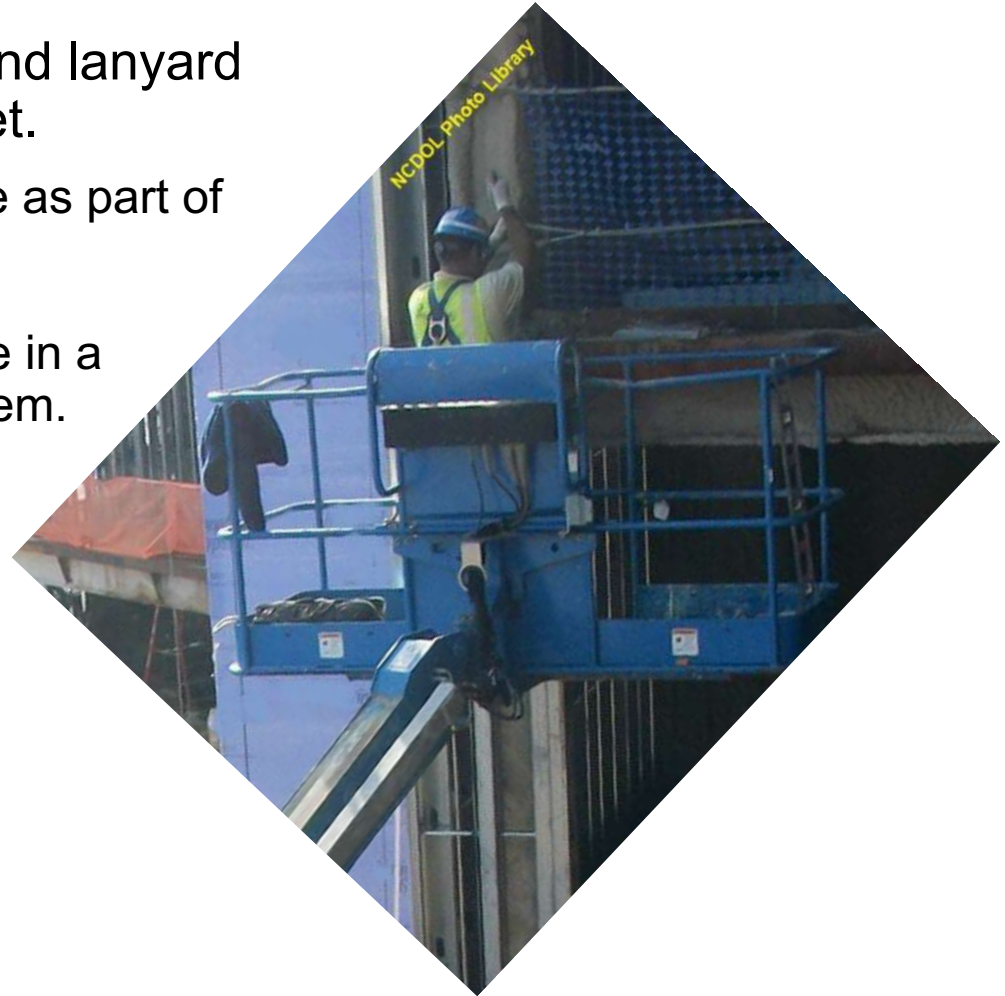
- Brakes must be set.
- When outrigger used – positioned on pads or solid surface.
- Boom and basket load limits not exceeded.
- Aerial lift must not be moved while in working position.
- **Exception** – *Equipment specially designed for operation.*



Aerial Lifts

1926.453(b)(2)

- Body belt must be worn, and lanyard attached to boom or basket.
 - » Body belts not acceptable as part of fall arrest system.
 - » Body belts are acceptable in a tethering or restraint system.



Scissor Lifts are Not Aerial Lifts 1926.453

- Scissor lifts are ***not*** aerial lifts.
 - Not covered under 1926.453
 - » Letter of interpretation – 8/1/00
 - Scissor lifts **meet the definition of a scaffold** and must comply with requirements of a mobile scaffold.



Training Requirements

1926.454(a)

- Trainer must be qualified in the subject matter.
- Topics for employees who *perform work on the scaffold*:
 - Nature of electrical, fall and falling object hazards
 - Correct procedures for:
 - » *Dealing with electrical hazards*
 - » *Erecting, maintaining, and disassembling fall protection systems*
 - » *Falling object protection systems being used*
 - Proper use of the scaffold and materials on scaffold
 - Load capacities of scaffolds
 - Requirements of this subpart

Training Requirements

1926.454(b)(2)

- Employees that are *involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting* a scaffold must be trained by a competent person.
- Topics:
 - Nature of scaffold hazards
 - Correct procedures for erecting, disassembling, moving, operating, repairing, inspecting, and maintaining the type of scaffold in question
 - Design criteria, maximum intended load-carrying capacity and intended use of the scaffold
 - Other pertinent requirements of this subpart

Training Requirements

1926.454(c)

● Retraining

- Employer has reason to believe that an employee lacks the skill or understanding needed for safe work involving the erection, use or dismantling of scaffolds.
- Where changes at the worksite present a new hazard.
- Where changes in the types of scaffolds, fall protection, falling object protection, or other equipment present a new hazard.
- Where inadequacies in an affected employee's work involving scaffolds indicate that the employee has not retained the requisite proficiency.

Summary

- In this course, we discussed the following:
 - OSHA's minimum requirements for scaffolds
 - Safe design, setup, and use of scaffolds
 - Hazard identification
 - Abatement methods



Thank You For Attending!

Final Questions?