

Slide 1

The Associated General Contractors of America and
OSHA present.....

Safety Training for the
Focus Four Hazards
in the Construction Industry

Slide 2

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What Are the
Focus Four Hazards?

Slide 5

Electrical
Hazards



Slide 6

Struck-By
Hazards




Slide 7

Caught-In-Between Hazards



Slide 8

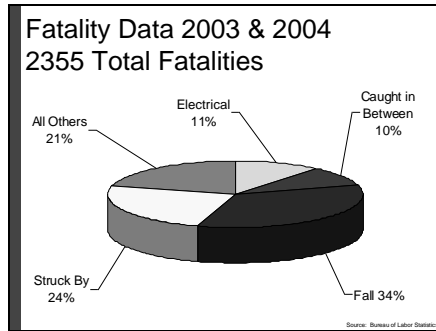
Fall Hazards



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Fatality/Injury Data

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Slide 11

- Primary Causes of Electrocuting Fatalities**
- Contact with Overhead Powerlines
 - Contact with Live Circuits in Panels
 - Poorly Maintained Cords and Tools
 - Lightning Strikes

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- Primary Causes of Struck-by Fatalities**
- Falling Objects
 - Rigging Failure
 - Loose or Shifting Materials
 - Equipment Tipover or Malfunction
 - Lack of Overhead Protection
 - Vehicle and Equipment Strikes
 - Backing Incidents
 - Workers on Foot
 - Flying Objects

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Primary Causes of Caught-in-Between Fatalities

- Trench/Excavation Collapse
- Rotating Equipment
- Unguarded Parts
- Equipment Rollovers
- Equipment Maintenance

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Primary Causes of Fall-Related Fatalities

- Unprotected sides, edges and holes
- Improperly constructed walking/working surfaces
- Improper use of access equipment
- Failure to properly use PFAS (Personal Fall Arrest System)
- Slips and Trips (housekeeping)

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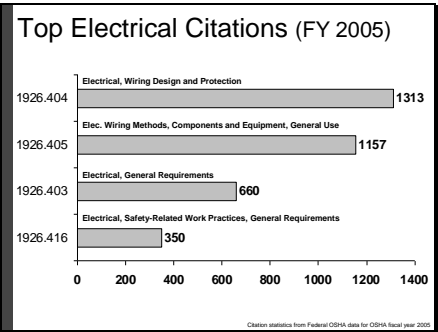
Citations

Slide 16

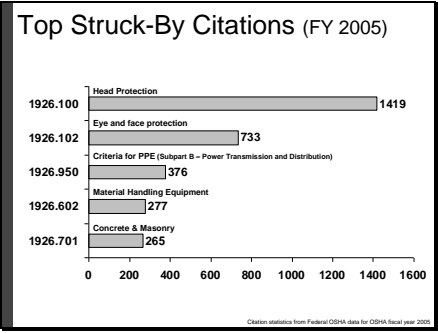
Top 10 Focus Four Citations (FY 2005)			
Subject	Citations	Total Dollar Value	Description
1926.401	8,419	\$7,882,185	Scaffolding
1926.501	5,728	\$7,176,729	Fall Protection Scope/Applications/Definitions
1926.1053	2,122	\$964,811	Ladders
1926.051	1,794	\$2,104,967	Excavations, General Requirements
1926.303	1,581	\$823,501	Fall Protection Training Requirements
1926.20	1,560	\$868,881	Construction, General Safety and Health Provisions
1926.100	1,519	\$792,414	Head Protection
1926.403	1,379	\$1,285,758	Manually Propelled Mobile Ladder Stands and Scaffolds
1926.404	1,313	\$644,886	Electrical, Wiring Design and Protection
1926.052	1,264	\$3,117,087	Excavations, Requirements for Protective Systems
1926.405	1,157	\$344,814	Elec. Wiring Methods, Components and Equip, Gen'l Use

Citation statistics from Federal OSHA data for OSHA fiscal year 2005

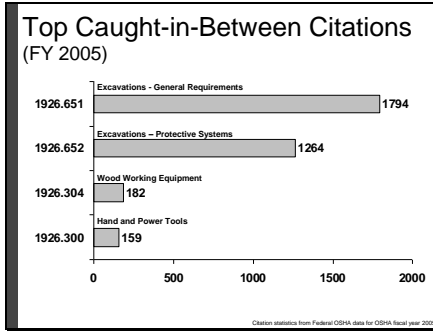
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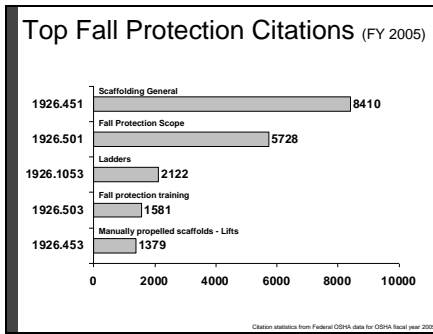
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Fatality & Statistical Analysis

- 85% of all citations and 90% of dollars applied as fines are related to the Focus Four Hazards
- 79% of all fatalities are related to the Focus Four Hazards



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NIOSH FACE
Fatality Assessment and Control Evaluation Program
Division of Safety Research • 1095 Willowdale Road • Morgantown, West Virginia 26505 • Phone (304)285-5988

- NIOSH Fatality Assessment and Control Evaluation program (FACE) examples of fatalities caused by the Focus Four hazards
 - Electrocution
 - Struck-by
 - Caught-in
 - Fall

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Electrical Hazards

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Temporary Wiring and Lighting Systems

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Electrical Harm

Estimated Effects of AC Currents (U.S. Standard 60 Hz)	
1 millamp (mA)	Barely perceptible
16 mA	Maximum current an average man can grasp and "let go"
20 - 30 mA	Paralysis of respiratory muscles
100 mA	Ventricular fibrillation threshold
2 Amps	Cardiac standstill and internal organ damage
15/20/30 Amps	Common U.S. household breakers

PATH:
Harm is related to the path by which current passes through the body.

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Ground Fault Circuit Interrupters (GFCI)

- Monitors current flow between the hot and neutral wires
- Trip between 4-6 mA in 1/40th of a second

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How GFCIs Work

Ground-Fault Circuit Interrupter

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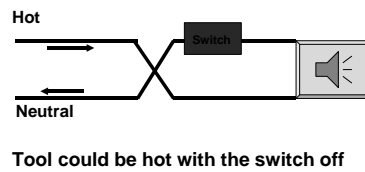
Assured Equipment Grounding Program

- Inspection is your primary protection
- Best practice recommends documented testing every 3 months
- Color coding most common:



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Reverse Polarity Diagram



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Reverse Polarity

- Hot wire and neutral wire are reversed
- Even though a switch is off, the circuit could be hot



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Electrical Extension Cords

- The primary insulation is cut
- If the insulation was also cut on the conductors, exposing bare wires, they could come in contact with someone
- Damage is often caused by repeated stretching or being run over



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Electrical

- Wiring like this must be protected in closed boxes
- There is the potential of electric shock from loose wire nuts or exposed conductors



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Electrical Panel Boxes

- Live electrical panels must be completely covered with a hard cover (original intended equipment)
- Employees could be exposed to live wires around the perimeter of this box
- No Cardboard!



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Arc Flash Prevention

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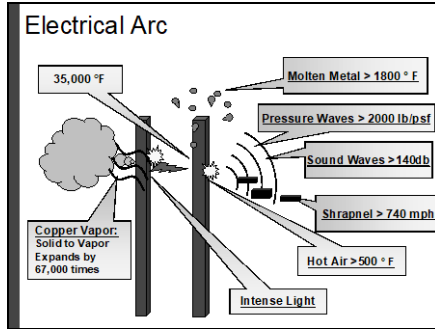
An electric arc:

- Typically lasts less than a second
- Has extremely high radiant (heat) energy
- Is explosive in nature (exerts great force)
- Can ignite or melt conventional work clothing

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Slide 38

NFPA 70E Requirements

- Arc flash boundaries must be known
- Safe approach distances established and maintained
- Marking equipment relative to hazards
- Electrically safe (voltage rated) tools
- PPE (ATPV, Arc Thermal Performance Value)
- Training

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The Best Way to Work on Energized Electrical Equipment?

DON'T!

- Shut it down and lock it out
- Establish an electrically safe working condition

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Overhead Powerlines



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Slide 42

The Sad
Reality



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Power Line Facts

- Overhead lines are typically not insulated. Any covering is generally a weather protection, not insulation.
- Over 90 percent of the contacts occur on overhead distribution lines
- Operators are normally safe if they stay on the equipment
- Ground personnel are over 8 times more likely to be killed

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Electrical Damage to the Body

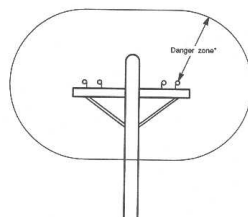
- If you touch a power line, electricity will attempt to travel through your body
- When electricity travels through the body, it heats up and burns body tissue internally
- Electricity leaves the body violently, causing burns or even blowing an exit hole



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Maintain Safe Working Clearance

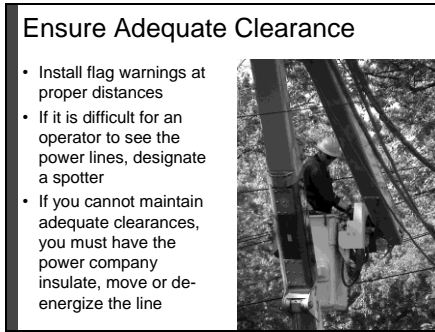
- All equipment – ladders, scaffolds, cranes, trucks, forklifts, etc. – MUST maintain a minimum 10 foot clearance from 50 kV or less
- Add .4 inches for every kV over 50 kV



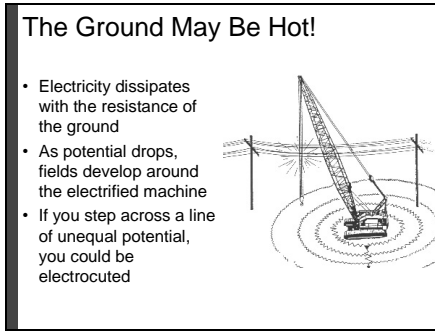
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If Contact Occurs

- Stay on the machine if possible
- Warn all others to stay away
- Notify power company immediately
- Attempt to move away but assure line is not "connected"

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Bail Out Procedures

- If you must get out, jump with your feet together
- Do not touch the machine
- Hop or shuffle out of the area



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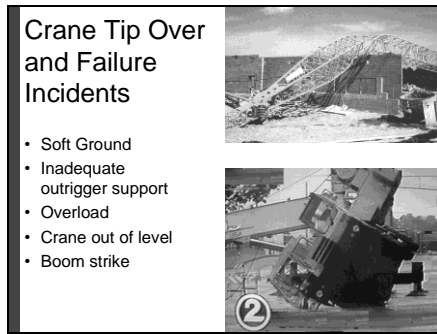
Incident Free

- Planning
- Training
- Inspection
- Oversight
- Lessons learned
- Re-evaluate

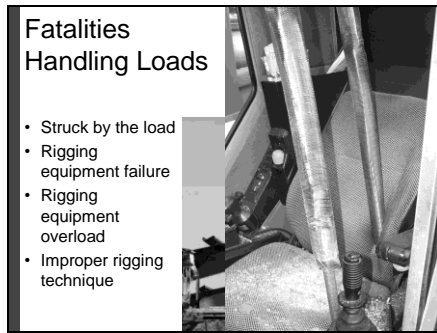
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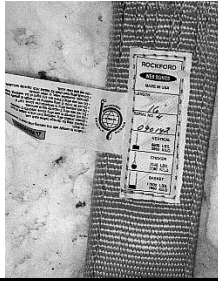
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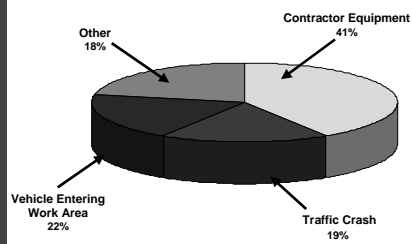
Inspect All Slings

- Slings must be inspected before each use
- Slings should have tags that indicate capacities



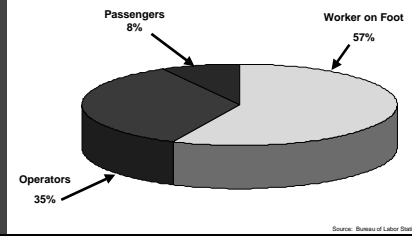
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Highway Worker Fatalities



Slide 57

Highway Equipment Related Fatalities



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Equipment & Vehicle Hazards



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Striking Workers on Foot



Slide 60

Poor Worker Position

- This worker is out of the driver's mirror view



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Pinned In/Under Equipment

- A truck driver was working between the frame and dump box of a dump truck
- The dump box dropped suddenly, crushing his head



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Slide 63

Equipment Does Roll Over!



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Wear Your Seat Belt!

- When there is a roll-over hazard, there must be a seat belt
- Always wear the seat belt
- Only ride in the seat provided
- No riding in buckets, on fenders or on steps



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Backing Equipment

- Have audible back-up alarms
- Have a spotter to direct the operator if visibility is restricted
- Keep adequate clearance behind the vehicle
- Always pay attention to backing equipment



Slide 66

High Visibility Clothing

- High visibility clothing refers to reflective garments that workers should wear whenever their work place contains hazards related to low visibility or when they work near vehicles or moving equipment



Slide 67

Loading Equipment

- Trailer secure and on a level surface
- Inspect the deck for debris, blocking or chains
- Have a spotter help properly align the equipment up the ramps
- Be sure equipment is properly secured



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Maintenance Hazards



Workers under equipment that is insufficiently supported



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Materials Handling and Storage



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Stack and Store Materials Properly

- No more than 4:1 height to base ratio
- Secure all loads
- Stack, block, and interlock
- Keep at least 6' back from edges
- Be prepared for heavy weather



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Transporting & Unloading Material

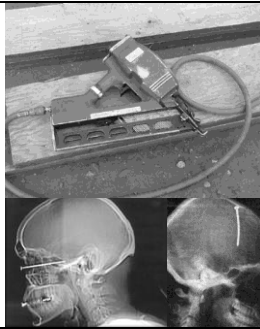
- Pipes, stacks of material, etc., can roll off a truck when bindings are removed
- Unsecured material can fall from forklifts and other equipment



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Air Nailers

- Penetration checks must be made
- Safety's must be operational
- All proper PPE must be worn



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Pneumatic Nailers

- Never load the tool until you are ready to use it
- Always insert the fastener before cocking the tool
- Never cock the tool against the hand or point the tool at anyone
- Always check penetrations and use proper loads
- Wear appropriate PPE



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Incident Free

- Planning
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- Oversight
- Lessons learned
- Re-evaluate

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Caught in Between Hazards



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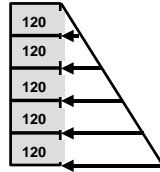
Trench & Excavation



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Soil Mechanics

- Soil weighs about 100 – 140 lb/cu.ft.
- Each foot of depth adds more pressure side pressure
- Once the pressure exceeds the ability of the soil to support itself, failure is possible



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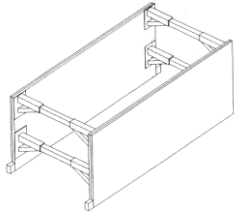
Basic Requirements CFR 1926.650-654

- Work must be supervised by a "Competent Person"
- Protection is required over 5 feet deep or if there is a possibility of a cave-in
- Excavations must be inspected daily and/or with changes
- Access/Egress is required over 4 feet deep
- A rescue plan must be in place

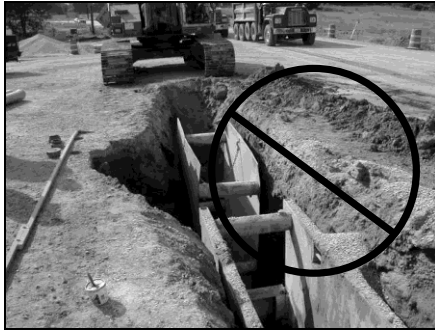
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Trench Shields or Boxes

- Engineered for Type C soils
- Can be used with all classes of soils
- Shields can be moved horizontally with workers inside
- Worker must stay inside shields



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Barricade Excavations

- Excavations must be barricaded or marked if they are not readily visible



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Utility Strikes



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Rescue

- A rescue plan must be in place
- Rescue of a buried worker is a slow and tedious process



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Causes of Fatalities Crushing



Caught under the truss boom during dismantling

Caught between crane and carriage

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Swinging/Rotating Equipment



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Barricade Swing Radius

- Barricade the swing radius
- Maintain 2' distance from fixed objects



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Mechanical Moving Parts



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Preventing / Controlling / Abating Maintenance Hazards

- Lockout equipment
 - Place an energy-isolating device over the energy source
 - Bleed off stored energy
 - Lock it until the repair/maintenance work is completed
- Tag out the equipment (when Lockout is not possible)
 - Place a tag over the energy source and start-up mechanisms
 - Label it with a written warning that remains in place until the work is done
 - Block disabled equipment

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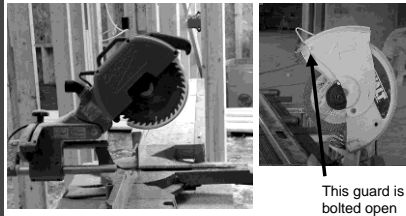
Machine Guarding

- Install and maintain all guards on tools and heavy equipment



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Miter Saws



Guards must cover the blade and only retract as the blade cuts through material.

This guard is bolted open

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Grinders & Abrasive Saws

- Guards must remain in place and eye protection must be worn
- Best practice is to use face shields and hearing protection



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Dumping Trucks

- Stay clear of dump trucks while they are dumping
- Trucks can become unstable with the boxes raised
- Watch for spillage out of the end gates
- If an end gate chain breaks, you could be covered in material



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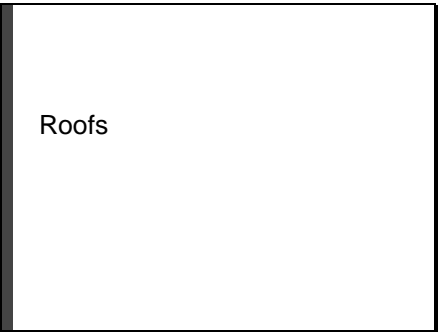
Incident Free

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- Lessons learned
- Re-evaluate

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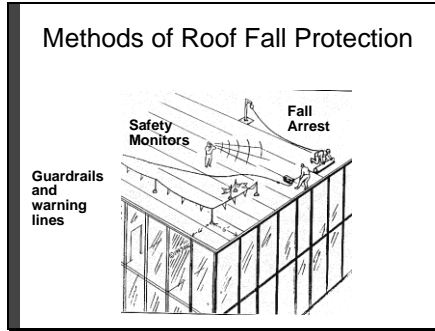
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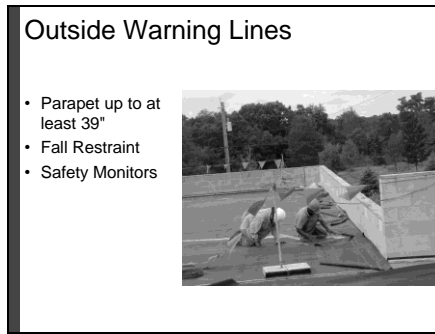
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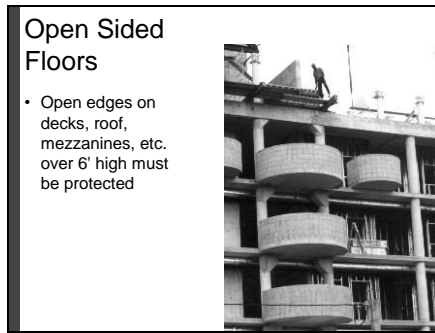
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Slide 99



Slide 100

Stay Back from Edges

- Stay away from edges unless work requires it
- Always face the edge
- Work from your knees



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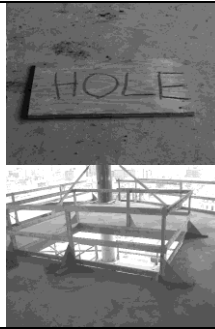
Don't Create a Greater Hazard



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Holes

- Covers
- Guardrails



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Access Ways

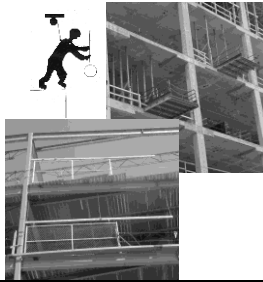
- Offset guardrails are recommended
- Watch for tripping hazards at tops of ladders and stairs



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Material Handling Platforms & Hoist Areas

- Material handling platforms must have guardrails
- When the guardrails are opened to receive material, workers must be tied off
- Gates are preferred to removable rails



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Slip & Trip Hazards - Housekeeping!

- Watch trip hazards
- Here trash creates a trip hazard for everyone in the building



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Stairways

- Stair pans should not be used for access until poured, and until guardrails and handrails installed
- Be sure all debris is removed immediately



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Scaffolds & Ladders



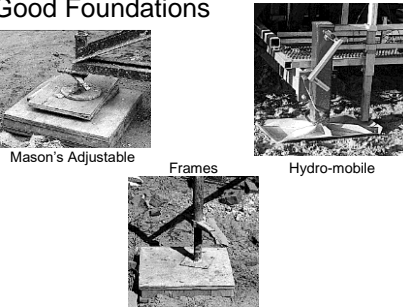
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Scaffold Requirements

- Be on a firm foundation with base plates
- Be plumb, square and adequately braced
- Have a fully planked work deck
- Have guardrails over 10 feet
- Be tied-in over 4:1 height to base ratio
- Have an adequate means of access and egress

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Good Foundations




Mason's Adjustable Frames Hydro-mobile

This slide illustrates three different methods for providing a stable foundation for mobile scaffolding. The 'Mason's Adjustable' method shows a platform on a single adjustable leg. The 'Frames' method shows a platform supported by a four-legged frame. The 'Hydro-mobile' method shows a platform on a mobile cart with wheels.

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Access

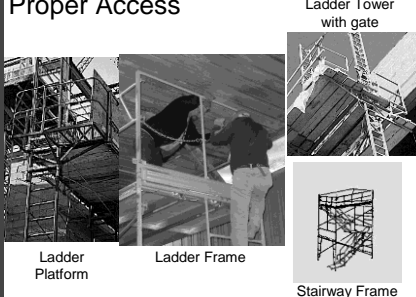
- No access by cross braces
- Bottom rung can not be more than 24" high
- You must use a ladder or frames designed to be used as ladders



The photograph shows a mobile scaffolding unit with a built-in ladder. The ladder is integrated into the frame, and the unit is positioned on a concrete surface.

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Proper Access



Ladder Platform Ladder Frame Ladder Tower with gate Stairway Frame

This slide displays four different types of access equipment. The 'Ladder Platform' shows a person on a platform with a ladder. The 'Ladder Frame' shows a person on a frame with a ladder. The 'Ladder Tower with gate' shows a tower with a gate. The 'Stairway Frame' shows a frame with a staircase.

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Baker-type Scaffolds

- Baker scaffolds can be unstable
- Never use a double stack without outriggers



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Falling Object Protection 1926.451(h)

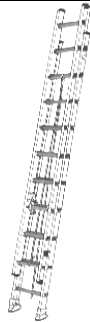
- Toe boards at edges of platforms
- Use panels or screens when accessed from below
- Barricade areas below
- Use canopies where walkways cross underneath



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Ladder Types

- Type I-AA ladders are extra heavy duty and can handle up to 375 lbs.
- Type I-A ladders are heavy-duty and can handle up to 300 lbs.
- Type I ladders can hold up to 250 lbs.
- Type II ladders can hold 225 lbs.
- Type III ladders are for light duty only and can hold up to 200 lbs.



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Read the Warning Labels

- Labels are there for a reason!



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Proper Ladder Climbing

- Use both hands to climb a ladder
- Always face the ladder when climbing, descending or working
- Avoid the top two steps of a stepladder and the top four rungs on other ladders

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Don't Lean a Step Ladder

- The support leg can contact the ground causing the step leg to kick out
- Also employees should not work from the top or second step



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**Do Not Stand On
The Top Step!!!**




DANGER Do Not Stand On Top
When This Step - YOU CAN
LOSE YOUR BALANCE

Obey the Labels!!


NO!

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Working Above Railings

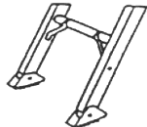


When employees work above railings, they must be protected from falling over the railings.

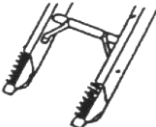


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Set Feet Properly



Firm Base
Set both feet level and on the pads



Soft Base
Set on the spikes and seat the ladder in the ground.

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Proper Access Ladders

- Ladders should be set at 1 horizontal to 4 vertical
- Ladders must be secured
- Ladder access ways must be guarded
- Ladders must extend 3' above the landing surface, or an adequate grabrail must be provided



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Bridges



Slide 123

Bridge Fall Protection

- Bridge edges must be protected
- When working over water flotation devices must be worn



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Falls While Decking



Leading edges must be protected

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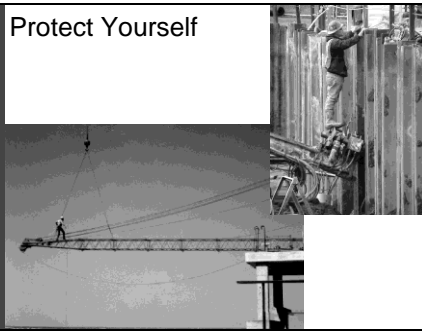
Equipment

- Do not jump from equipment
- Use three point contact at all times
- Be sure of your footing
- Do not strain your shoulders
- Be sure steps are clear of mud and ice



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Protect Yourself



Slide 127

Proper Seats



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Competent Person

- A **competent person** is someone who:
 - Is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and
 - Has the authorization to take prompt corrective measures to eliminate them

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Incident Free

- Planning
- Training
- Inspection
- Oversight
- Lessons learned
- Re-evaluate

Summary

- The focus four hazards are responsible for the majority of physical, financial, and emotional losses in construction — **and they exist on nearly every jobsite.**
- It takes a well-trained crew (the entire crew!) and lots of pre-planning to recognize and respond to those hazards. **Safety is everyone's responsibility — ALL of the time.**
