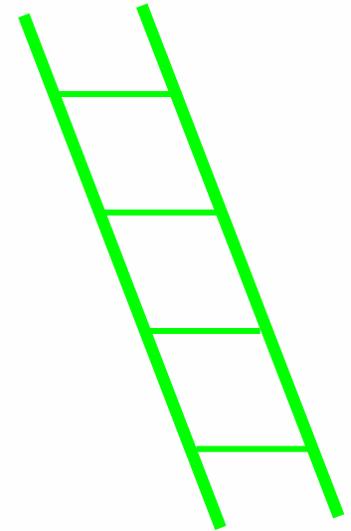
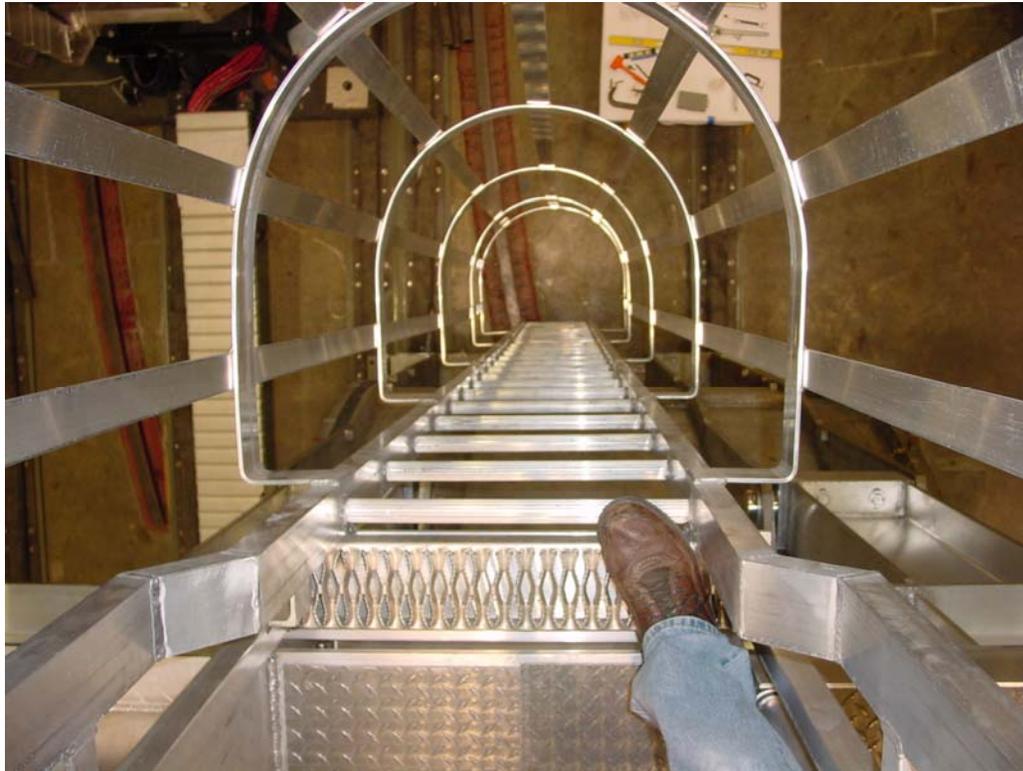
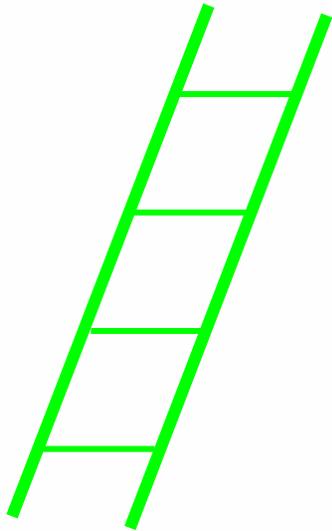




**Marshall Space Flight Center  
Safety, Health & Environmental Training**

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# Ladder Safety



*Presented by:*  
**MSFC Industrial Safety Department  
September 2004**



# OSHA Views On Ladder Safety

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“The most recent accident statistics suggest that the working men and women in America abuse and misuse ladders in the workplace as a rule rather than an exception.”

“Remember that practically all falls from ladders can be traced to using them in an unsafe manner. When a fall occurs, the person who falls usually gets hurt. This means that you must observe ladder safety rules because you are the one who will get hurt if you don't. Others may be injured also.”

“OSHA requires that safe equipment be furnished for use. But it is the responsibility of the user to **USE THIS SAFE EQUIPMENT SAFELY.**

- A fall from a ladder can *kill*.
- It can *disable* a person for the rest of their life.
- Or it can *injure* him so severely that his earning power is cut off for a long time.

None of these are happy prospects. They can be avoided by working safely on and around ladders.”

(<http://www.cdc.gov/elcosh/docs/d0100/d000170/d000170.html>)



# What Will You Gain From This Course?

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## You will be able to:

- ✓ Recognize the hazards of ladder use
- ✓ Follow 4 basic rules for safe ladder use:
  - ✓ Pick the right ladder for the job
  - ✓ Inspect a ladder for defects before using
  - ✓ Set the ladder up correctly
  - ✓ Control risk of injury & falls while on the ladder
- ✓ Recognize & control the high hazards of work near power lines
- ✓ Identify ladder defects that require removal from service
- ✓ Maintain, store, & transport ladders properly
- ✓ Name the basic types of ladders
- ✓ Identify regulatory requirements that apply to ladders

*A ladder is an appliance usually consisting of two side rails joined at regular intervals by cross-pieces called steps, rungs, or cleats, on which a person may step in ascending or descending. [OSHA 1910.21]*



# Hazards of Ladder Use

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## // Common Mishaps

- Falls
- Slips
- Contact with electricity
- Struck by object

## // Contributing Behaviors

- Using wrong ladder for job
- Using unsafe ladder
- Unsafe ladder set-up
- Not preventing tip-over
- Over-reaching
- Not seeing electrical dangers
- Using in adverse conditions
- Using ladder for functions it wasn't designed for
- Other unsafe work practices



## // Common Contributing Factors

- Unstable or uneven surface
- Slippery surface
- Oil or grease on ladder
- Ladder damage or deterioration
- Object fell off ladder
- Object dropped during overhead work
- Insufficient lighting
- Weather conditions



## Ladder Stories From MSFC Employees

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- // Center employee's husband falls from 10 foot ladder after standing on top step. He was installing gutters & lost his balance. Fortunately, he was not injured...just a few bruises & a very sore body.**
- // Center employee loses his balance & falls off ladder as he was sawing off tree limbs. He made a trip to the emergency room & received numerous stitches. (Read his story in the 'It Could Happen to You' database on the SHE Web page.)**
- // Center employee's husband falls off ladder & breaks BOTH arms. He was constructing a gazebo over a concrete pad when the mishap occurred.**



## 4 Basic Rules For Ladder Safety

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-  Pick the right ladder for the job
-  Inspect ladder for defects before using
-  Set the ladder up correctly
-  Control risk of injury & falls while on the ladder  
(follow established safe work practices)





# Choosing The Right Ladder For The Job

## // Is there a built-in ladder you can use?

- Design of fixed ladders addresses most location hazards
- Portable ladders reach locations not accessed frequently

## // How high do you need to reach?

- Ladders should reach 3 feet beyond point you want to access

## // How much weight will be on the ladder?

- Stay within duty rating marked on ladder (body weight + tools & materials)

## // Which ladder type offers the most stability?

- Choose one that is self-supporting, or leans against an immovable object

## // What material should ladder be made of?

- Use fiberglass or wood near sources of electricity
- Wood ladders are much heavier than fiberglass or aluminum

## // Additional considerations:

- Would use of a scaffold or aerial lift provide greater safety?
- Does the work require a special-purpose ladder?
- How will materials & tools be handled while working?
- What can be done to prevent falls?





# Ladder Duty Ratings

Ladder Type	Duty Rating	Description
Type 1AA	375 lbs.	Special-duty professional ladder
Type 1A	300 lbs.	Extra-heavy-duty professional ladder
Type 1	250 lbs.	Heavy-duty industrial ladder
Type 2	225 lbs.	Medium-duty commercial ladder
Type 3	200 lbs.	Light-duty household ladder

*Duty Rating tells you the 'safe working load', or 'weight capacity' of a ladder*



# Inspect Ladder Before Each Use

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**// Follow manufacturer's guidelines for inspection**

**// Check the condition of:**

- Wood, if applicable (no cracks or splits)
- Metal or fiberglass, if applicable (no bends or breaks)
- Rungs or steps (tight, secure, unbroken, & free of slippery substances)
- All hardware & fittings (properly & securely attached)
- Locking parts & braces (securely fastened, working properly)
- Movable parts (operate without binding, or too much free play)
- Side rails (no damage, warping, or twisting)
- Feet (working as designed)
- Hinges, if applicable (in good working order)

**// Never use painted ladders – paint can hide some safety defects**

**// Never use a damaged or defective ladder**



# Unsafe For Use

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## Remove ladders from service if they have:

- Structural defects (bends, breaks, warping, etc.)
- Corrosion
- Defective or missing parts
- Makeshift devices of wire or rope substituted for stepladder spreaders
- Cracks or splits in wood
- Steps or rungs that are loose & able to move
- Loose hardware or fittings
- Movable parts that bind, or have too much free play
- Frayed or badly worn ropes on extension ladders
- Been exposed to fire or strong chemicals (dispose of ladder)

## Place “Do Not Use” tag on ladder

## Repair ladders to original design condition

- Only qualified personnel permitted to make repairs
- Follow manufacturer’s instructions

*Include ladder inspections in work area preventive maintenance schedules*



# Set Ladder Up Properly

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## // Procedures For All Portable Ladders

- Place ladder feet firmly & evenly on ground or floor
- Make sure ladder is sitting straight & secure before climbing it
- If one ladder foot sits in a low spot, build up surface with firm material
- Never try to make a ladder reach farther by setting it on boxes, barrels, bricks, blocks or other unstable bases
- Don't let ladders lean sideways; level them before using
- If ladder feet could slip, brace them to prevent slippage
- Use non-slip shoes on ladder feet whenever there is any possibility of slipping
- Never set up or use a ladder in a high wind, especially lightweight metal or fiberglass types
- Never set ladder up in front of a door unless the door is locked or a guard is posted
- Don't use ladders on ice or snow unless absolutely necessary -- use spike or spur-type shoes on ladder feet & check proper grip before climbing
- Keep areas near top & bottom of ladder clear of obstacles

## // For Stepladders

- Open stepladder fully, & lock the spreaders or braces



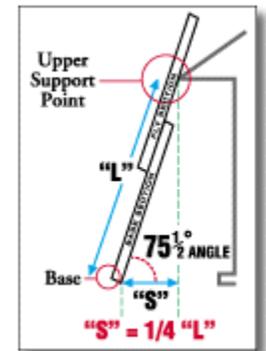
# Straight & Extension Ladder Set-Up

## Four Steps

1. Lay the ladder on the ground, with the base resting against the bottom of the wall & the top pointing away from the wall.
2. Starting at the top of the ladder, lift the end over your head & walk under the ladder to the wall, moving your hands from rung to rung as you go.
3. When the ladder is upright & the top touches the wall, pull out the base so that its distance away from the wall is  $\frac{1}{4}$  of the ladder length up the wall.
  - Base needs to be 1 foot away for every 4 feet of ladder between ground & wall
4. Reverse process to take ladder down. You'll be walking backwards, so check for obstacles in your path before starting. Lower ladder slowly, to keep it from falling on you or making unplanned contact with objects & others.

## More Rules

- Position ladder feet so that they are level & on solid ground
- Both side rails of ladder must rest against the wall or other support
- Tie upper part of ladder to immovable object whenever possible
- If using ladder to get onto roof or other surface, at least 3 rungs of ladder must be above that surface
- Use 2 people for extension ladder work: ground support person holds ladder bottom to prevent movement & keeps others from disturbing ladder





# Control Injury Risks of Ladder Work

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## // Climbing & Standing

- Keep steps & rungs free of grease, oil, wet paint, mud, snow, ice, paper & other slippery materials, & clean debris off shoes before climbing
- Always face ladder when climbing up or down
- Use both hands & keep a secure grip on side rails or rungs – maintain 3-point contact at all times:
  - 2 hands & 1 foot OR 1 hand & 2 feet
- Never carry heavy or bulky loads up a ladder -- climb up first, then use a hand line to pull material and tools up, and/or use a tool belt
- Keep feet in the center of steps or rungs when climbing & standing
- Keep belt buckle between ladder side rails, to avoid overreaching or leaning too far to one side
  - Move ladder to a new position, when you can no longer reach comfortably & safely
- Never climb onto a portable ladder from the side, above the top, or from another ladder
- Never slide down a ladder

*Some situations will require fall protection equipment for climbing & working on ladders*



# Control Injury Risks of Ladder Work

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## # Working From A Ladder

- Never use a ladder when under the influence of alcohol, drugs, or medication, or in ill health
- Wear shoes with clean, non-skid soles (leather soles can be too slippery)
- Move slowly & carefully, avoiding distractions that make you twist away from the ladder
- Allow only one person at a time on a ladder, unless specifically designed for 2 people
- Never push or pull anything sideways -- side loading can tip ladder out from under you
- Stay off the top 2 steps of a stepladder, & the top 4 rungs of straight or extension ladders
- Don't try to move an occupied ladder by rocking, jogging, or pushing it away from its support
- Never move a mobile ladder while someone is on it
- Don't leave tools or materials on top of ladders – they can cause injury when they fall
- Take special care in high traffic areas:
  - Use warning signs or barricades to guide people away from ladder base -- or have someone hold & guard the bottom of the ladder; prop nearby doors open, or lock them shut
- Stay off outdoor ladders during bad weather, whenever possible
- Never use a ladder as a horizontal platform, plank, scaffold, or material hoist
- Never use ladder on a scaffold platform -- if you need to reach higher, build a higher scaffold
- Be cautious about homemade ladders & never use cleats fastened across a single narrow rail, post, or pole
- If you get sick, dizzy or panicky while on a ladder, don't try to climb down in a hurry – wait
  - Drape your arms around the rungs & rest your head against the ladder until you feel better; then climb down slowly & carefully



# Control Electrical Hazards of Ladder Work

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- # Before ladder use, carefully check area for power lines & electrical sources
- # Never use metal ladders near exposed electrical wiring or power lines
- # Use ladders with wood or fiberglass side rails around electricity – fiberglass is best (least conductive material)
- # If an overhead power line is 50 kV or less, stay at least 10 feet away (including ladder & all other tools)
- # For all other power lines, keep at least 35 feet away
- # Don't count on a power line to be insulated, no matter what it looks like
- # Pick a route without overhead power lines for carrying ladder to the work area
- # Carry ladders horizontally – never upright – to avoid contact with power lines





# Maintain & Store Ladders Properly

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- # Keep all ladder accessories, especially shoes for ladder feet, in good condition
- # Never sit on ladder side rails
- # Never store materials on a ladder
- # Wood ladders:
  - Ladders to be used outdoors should be treated with a clear finish or transparent penetrating preservative to prevent weather damage
  - Linseed oil treatment also helps rustproof metal parts of a wood ladder.
  - Never paint a wood ladder – paint can fill & hide dangerous cracks
  - Store where they will not be exposed to excessive heat or dampness
- # Store fiberglass ladders away from sunlight & other ultraviolet light sources
- # Properly support & secure ladders for transit, to avoid damage from vibration & bumping against other objects
- # Store ladders on or in racks that give them proper support, & prevent them from toppling on nearby people
- # Lubricate metal bearings of extension ladder rung locks & pulleys periodically, & as needed between regular maintenance periods
- # Verify secure attachment of fixed ladders periodically, & maintain corrosion resistant coatings per manufacturer's instructions



# Basic Ladder Type: **Portable, Non-Self-Supporting**



Single Ladder

- Only one section
- Can't adjust length
- Size = length of side rail



Extension Ladder

- Two or more sections traveling in guides or brackets
- Can adjust length
- Size = length of each section's side rail, added together



Sectional Ladder

- Two or more sections combined to function as a single ladder
- Can't adjust length
- Size = overall length of assembled sections

*"Portable" means it can be readily moved & carried [OSHA 1926.1050(b)]*



# Basic Ladder Type: **Portable, Self-Supporting**



## Stepladder

- Has flat steps & a hinged back
- Can't adjust length
- Size = length of side rails along the front



## Platform Ladder

- Ladder provided with a working-level platform
- Can't adjust length
- Size = length of front rail from platform to ladder base

## Trestle Ladder

- Two sections hinged at top, to form equal angles with base of ladder
- Can't adjust length
- Size = length of side rails along the front



## Extension Trestle Ladder

- A trestle ladder base locked together with a single ladder
- Can adjust length of vertical single ladder
- Size = length of the trestle ladder base



## Stepstool



- Foldable, with flat steps & no platform
- Designed for climbing on ladder top cap & all steps
- Less than 32 inches in total length; side rails may continue above top cap

*"Portable" means it can be readily moved & carried [OSHA 1926.1050(b)]*



## Special Purpose Ladder

- Designed to combine features of above ladder types, to adapt to a specific functional use



# Basic Ladder Type: **Fixed, Non-Movable**

- May include cages, wells, and/or ladder safety devices, as required by standards



### Individual-Rung Ladder

- Each rung of ladder is individually attached to a structure, building, or equipment



### Rail Ladder

- Side rails joined at regular intervals by rungs or cleats, & fastened to building, structure, or equipment in full length or in sections



### Through Fixed Ladder

- Person getting off at the top must step between ladder's side rails to reach the landing

### Side-Step Fixed Ladder (not shown)

- Person getting off at the top must step to the side of ladder's side rails to reach the landing

*“Fixed” means it is permanently attached to a structure, building, or equipment, and cannot be readily moved or carried [OSHA 1910.21(e) and 1926.1050(b)]*



# Basic Ladder Types: Semi-Fixed, Movable & Other



## Side-Rolling Ladder

- Supported by attachments to a guide rail, which is usually fastened to shelves
- Can't adjust length
- Plane of ladder is the same as plane of ladder motion

## Trolley Ladder (not shown)

- Supported by attachments to an overhead track
- Can't adjust length
- Plane of ladder is at right angle to plane of ladder motion



## Job-Made Ladder

- Ladder fabricated by employees, usually at a construction site
- Not commercially manufactured



## Ladder Stand

- Mobile, fixed size, self-supporting ladder consisting of a wide flat tread ladder in the form of stairs
- Assembly may include handrails

*“Fixed” means it is permanently attached to a structure, building, or equipment, and cannot be readily moved or carried [OSHA 1910.21(e) and 1926.1050(b)]*



# Ladder Regulations

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## # OSHA 1910 Subpart D: Walking and Working Surfaces

- *Ladder construction, care & use to insure safety under normal conditions of use*
- 1910.21: Definitions
  - 1910.21(c): Definitions (portable wood ladders)
  - 1910.21(d): Definitions (portable metal ladders)
  - 1910.21(e): Definitions (fixed ladders)
- 1910.25: Portable Wood Ladders
- 1910.26: Portable Metal Ladders
- 1910.27: Fixed Ladders

## # OSHA 1926 Subpart X: Ladders

- *Ladders used in construction, alteration, repair (including painting and decorating), and demolition workplaces*
- 1926.1050: Scope, Application, and Definitions
- 1926.1051: General requirements
- 1926.1053: Ladders
- 1926.1060: Training Requirements
- Subpart X Appendix A: Ladders

*Ladders used with scaffolds are covered under OSHA Scaffolding Standards*

## # ANSI Standards

- *Specifications for construction materials and design, tests, labeling/marketing, and use*
- ANSI A14.1: Portable Wood Ladders
- ANSI A14.2: Portable Metal Ladders
- ANSI A14.3: Fixed Ladders
- ANSI A14.5: Portable Reinforced Plastic Ladders
- ANSI A14.4: Job-Made Ladders
- Subpart X Appendix A: Ladders