Collaborative Bachelor's Degree Program of Fire Protection and Safety Engineering Technology between Southwest Jiaotong University and Oklahoma State University, U.S.A.

FPST 2023 Industrial and Occupational Safety

Dropped Objects

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Objectives

- Recognize items that typically fall while working at heights
- Identify common causes of dropped objects
- Understand the hazards associated with dropped objects
- Understand requirements of a Drop Prevention Program
- Become familiar with equipment and best practices to prevent dropped objects

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Working at heights posses unique hazards for workers, not just from falling

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Frequently Dropped Items

- Communication Devices
- Equipment
- Keys
- Parts/Supplies
- Tool - Equipment Bags
- Tools





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Common Causes

- Eyes not on task
- Failure to follow procedure or standard
- Failure to identify hazard or risk
- Improper method of performing task
- Failure to secure

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Cost of Dropped Objects

- One wind industry company
  - Radios
    - 22 dropped radios in 2013
    - Average cost of radio = $450.00
    - Estimated Cost = $10,000.00
  - Overall
    - 152 dropped items in 2013
    - Estimated Cost = $100,000.00

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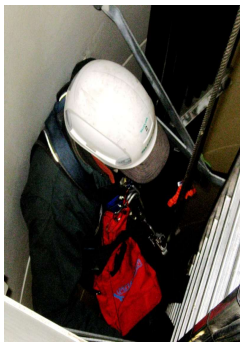
Case Study

"Just before I got down to the second deck, I was hit in the helmet with a wrench. I was able to climb down on my own. My partner was getting on the ladder with a wrench in his back pocket- it came out of his pocket and fell down the ladder. We had the hatches tied open to make climbing easier. I went to the doctor and was treated and released. It could have been a lot worse"



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Case Study – Lessons Learned

- All dropped object incidents are extremely serious
- Dropped objects can lead to serious injury
- Only one person should be on a ladder section at a time
- All hatches should be kept shut when not in use
- All tooling should be transported in approved bags or holsters
- All drops can be eliminated through **proper training, use of countermeasures, and implementation of best practices**

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Best Practices – Object Security

- When it is not possible to keep tools, equipment, and parts greater than four feet away from any unprotected opening or edge the item shall be secured using one or more of the following methods:
  - Tool/Equipment Bags, Pouches, and Holsters
  - Tool/Equipment Bungee Tethers
  - Heavy Duty Tool/Equipment Tethers
  - Magnetic trays
  - Radio Holsters

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Object Security

- Verify a tether's integrity before use
- Use a lanyard that is rated for the tool weight
- Verify the tool's attachment point to ensure that it will hold the tool
- Weigh tools so that the lanyard rating is known
- Use a retractable tether to avoid entanglement
- Anchor all tools weighing more than 10 lb to a structure, not a person whenever possible, to transfer shock loads from a person to a structure

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Object Security

- Don't tether to a structure without verifying the anchor point's strength
- Don't use tethers that require excessive force to use
- Don't modify or customize tethers
- Don't assume a tether is a foolproof device
- Don't use a tool tether as personal fall protection
- Don't use a tool tether where they could become entangled in moving machinery
- Don't use tethers as lifting devices

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Drops Prevention Equipment

- Tool bags, pouches, and holsters
  - secure tooling or other objects while not in use
- When to use
  - Working around open hatches or unprotected openings
  - Climbing or working on ladder
  - Opening hatch, vents, or other unprotected openings
  - Working on top of areas not protected by a toe board

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Tool and Equipment Tethers/Lanyards

- Tethers and lanyards are used in conjuncture with D-Rings or Quick Spins
- Attach tools to lanyards or tethers when using them:
  - By open hatches or unprotected openings
  - Working while on ladder
  - On top of areas not protected by a toe board

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Quick Spin

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Drops Prevention Equipment

- Magnetic trays
  - Recommended practice
    - Use within 4 feet of unprotected openings
- Use when working:
  - By open hatches, vents or other unprotected openings
  - On a ladder
  - Nacelle working next to open hoist hatch, vents, or other unprotected openings
  - On top of areas not protected by a toe board

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Drops Prevention Equipment

- Radio holsters
  - Recommended practice
    - Use within 4 feet of unprotected openings when radio is not in use
- Use when:
  - Working by open hatches, vents or other unprotected openings
  - Climbing or working on a ladder
  - Nacelle working next to open hoist hatch, other unprotected openings
  - On top of areas not protected by a toe bo
- What it you're using the radio?

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Equipment – D Rings and Quick Spins

- D-Rings and Quick Spins are fastened to hand tools and used to connect tools to lanyards and tethers
- Attach lanyards or tethers to tools using D-Rings or Quick Spins when:
  - Working by open hatches, vents or other unprotected openings
  - Climbing or working on a ladder
  - On top of areas not protected by a toe board

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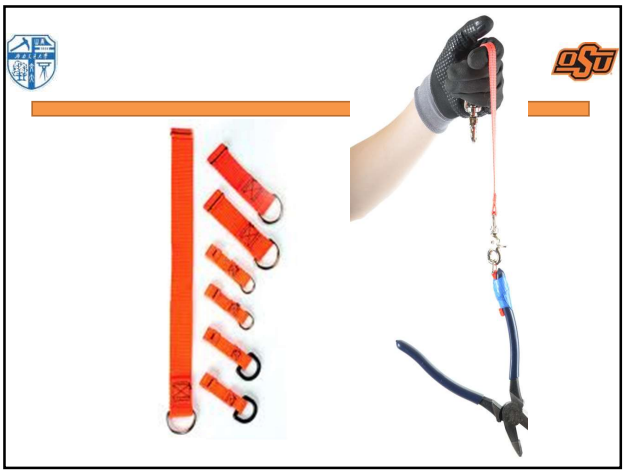

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Best Practices - General

- Create employee awareness of dropped objects
- Train employees to recognize and mitigate the risk of dropped items
- Add dropped objects to risk assessments and JSA's
- Address the hazards associated with dropped objects in pre-job briefings
- During the pre-job briefing, plan for keeping tools, parts and equipment secure
- Mitigate or eliminate conditions that create dropped item hazards

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Best Practices – Housekeeping

- All hole covers must be in place when not in use
- Anything that isn't needed, like loose nuts, bolts, or unused parts, should be secured or removed
- Items stored at height should be kept in closed containers and be kept at least 4 feet from openings

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Best Practices – On the Ground

- Establish minimum parking distances away from overhead work
- Post the JSA/Permit to Work on or near the site entrance in a conspicuous location

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Best Practices - Hoisting

- Only allow closed topped lifting bag

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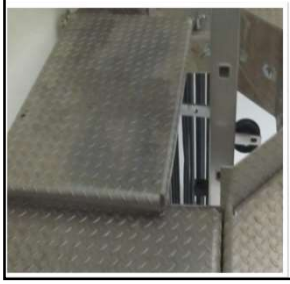
Best Practices - Climbing



- Only one person is allowed on an individual ladder section at one time
- Don't be under someone who is performing work on the ladder section above
- All hatches must remain closed unless in use

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Best Practices – Up Top

- Secure materials within 4 feet of unprotected openings or edges
- Cover/close openings such as hatches and air vents

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- How much energy was generated by the falling wrench?

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- E=mgh
  - Where:
    - E = energy in joules ($J = \frac{kg \cdot m^2}{s^2}$)
    - m = mass in kilograms
    - g = acceleration due to gravity (9.81 m/sec^2)
    - h = total height the object falls
  - Top of nacelle = 278 ft
  - Weight of wrench = 4.75 oz
  - E= (0.1347 kg) (9.81 m/sec$^{2)}$ (84.73) = 112 J

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Soccer Stadium Video