Fall Protection

Working Safely at Heights Above 6 feet

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Building Safety For Tomorrow

28 January 2011

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Agenda

1. What's The Risk
2. Hierarchy of Fall Protection Options
3. Fall Prevention Measures
4. Fall Arrest Systems
5. Okaloosa Schools Roofing Examples
6. Take-Aways

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Industry Fall Experience

- Falls are the number one cause of death in the construction industry
- In the US, 38% of construction fatalities were fall-related
- Fatal falls in construction occurred:
  - 45% from roofs
  - 32% from scaffolds and ladders
  - 14% through openings
- Second most frequently cited OSHA violation in construction, >20 citations per workday

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Where to Begin?

- OSHA Standards
  - Subpart M, Fall Protection, 29 CFR1926.500 to 1926.503
  - Falls are the leading cause of construction fatalities
- ANSI Standards
  - Z359.1 Fall Protection in General Industry
  - 1264.1 Safety Requirements for Workplace Floor and Wall Openings, Stairs and Railing Systems
- Jacobs HSE Procedures
  - HSEP 2.5 – Competent Person Designation
  - HSEP 13.8 – Fall Protection
  - HSEP 15.2 – Scaffolding
  - HSEP 17.9 – Aerial & Scissors Lifts
  - HSEP 17.10 – Forklift Mounted Work Platforms

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Hierarchy of Fall Protection Options

1. Fall Elimination
2. Design Safety and Engineered Controls
3. Fall Prevention
   - Proper/Safe Access
     - Ladders, Scaffolds, Stairs, Ramps, Backfill
   - Guardrail Protection
     - Scaffolds
     - Elevated Work Platforms (Mobile & Moveable)
     - Openings & Unprotected Edges
4. Fall Arrest
   - Personal Fall Arrest System
   - Horizontal Lifelines (HLL)

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Lessons Learned from Fall Incidents

1. Work performed outside the scope of the scheduled activity (deviated from the plan, supervisor did not train worker in the plan)
2. Involved violations of fall protection policy and plans
3. Tie-off point locations were insufficient including tying off too low (at foot level) or not tying off at all
4. Inadequate Fall Protection Plan and poor SPA
5. Jacobs supervision and subcontractor foremen not “significantly” engaged in monitoring subs activities regarding the fall protection plan
6. Aerial lifts and scissors lifts improperly used to hoist materials

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Lessons Learned from Fall Incidents

1. Tendency to use fall arrest equipment as primary means of protection and lack of discipline in execution
2. Rescue plan inadequate
3. Competent Person and Qualified Person requirements were in question
4. Workers struck objects during their fall which caused severe bruising.
5. Wind conditions exceeded safe limits.
6. Sites previously recognized for very good HSE performance – It can happen anytime/anywhere.

What's Wrong With This Picture?

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Fall Prevention Measures – Safe Access

1. Ladders
2. Scaffolds
3. Stairs
4. Ramps
5. Backfill

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Ladder Rack Trench Box

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Does This Ladder Look OK?

Take a Closer Look!

Access to Bridge Girder

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Access to Concrete Tank

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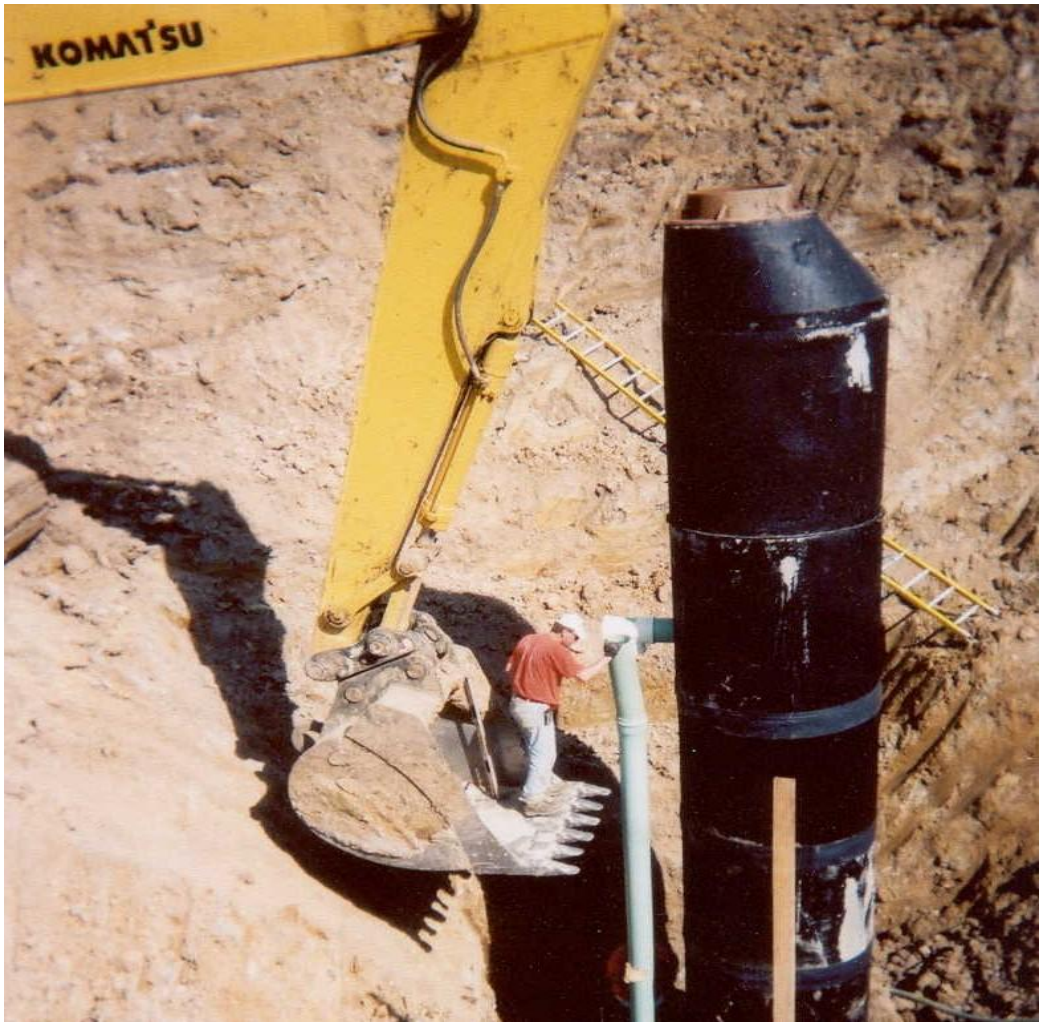
Improvised Ladder Scaffold? Not Quite!

Fall Prevention Measures – Guard Rails

1. Scaffolds
2. Elevated Work Platforms
    - Mobile (MEWP)
    - Moveable (MWP)
3. Openings
4. Unprotected Edges

What Type of MEWP is This?



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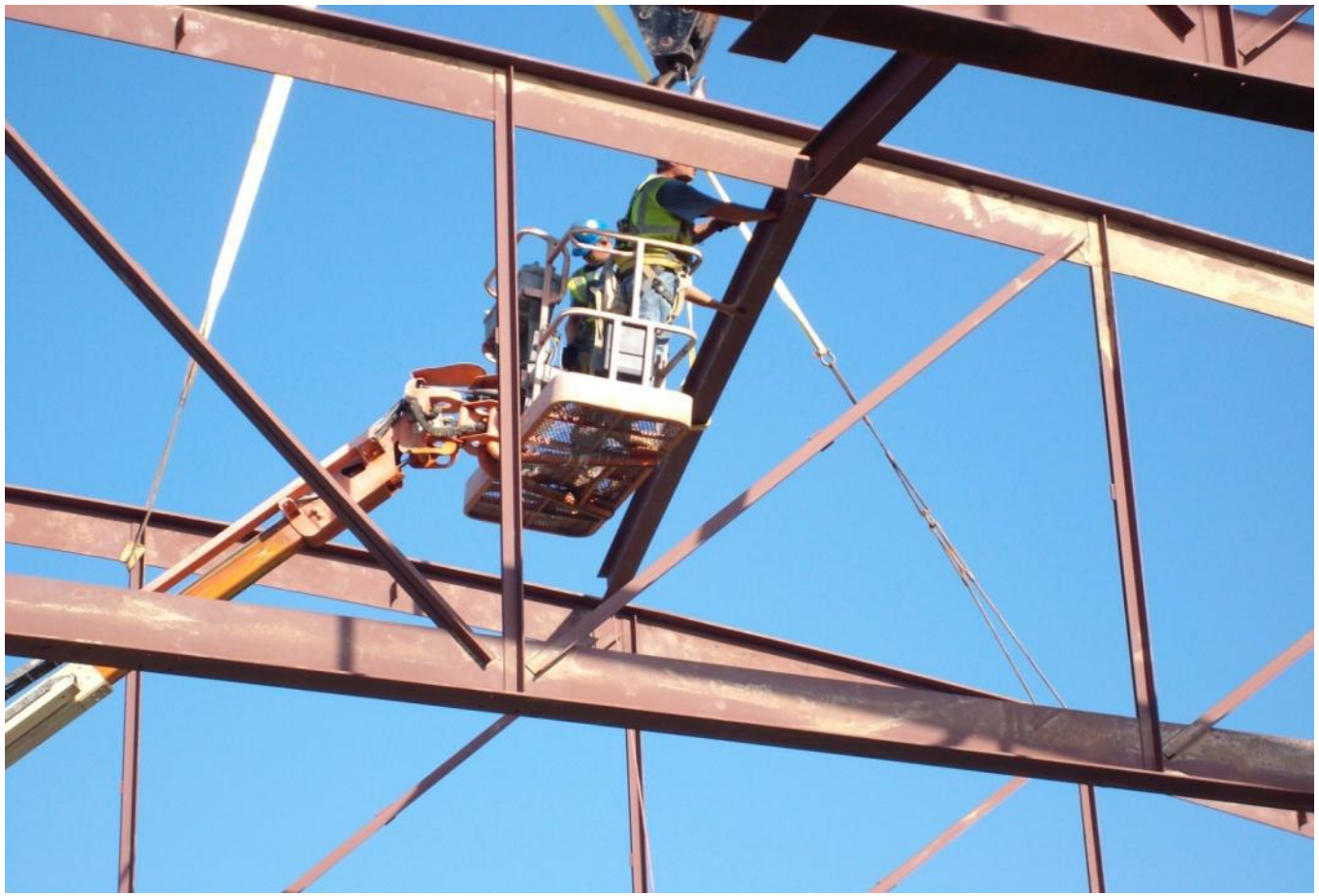
Forklift Mounted Work Platform – Not Quite!

Proper Use of Forklift Mounted Work Platform

Erecting Steel Bridging from Aerial Lift



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Removing Formwork from Scissors Lift

Scissor Lift Overturned by High Winds

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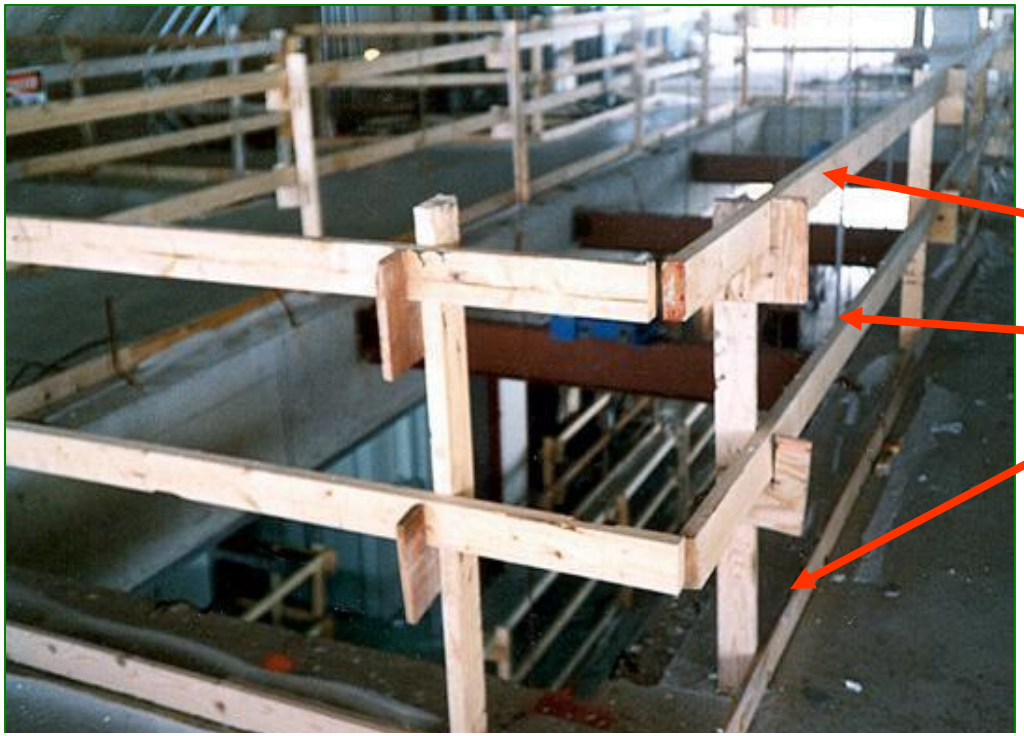
Moveable Work Platform (eg. Baker Scaffold)

Proper Perimeter Protection of Floor Opening



- Top rails 42” + - 3”
- Mid rail at 21 inches
- Toe boards at least 3 1/2 inches high

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Floor Opening Protection

Guardrails on Top of Formwork

The Three Stooges At Work!

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Are the Harnesses Connected to Anything?

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What's Holding the Other End of that Board?

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What about Fall Protection?

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Fall Arrest Measures – Used as Last Resort

1. Personal Fall Arrest System
2. Horizontal Lifelines (HLL)
3. Vertical Lifelines (VLL)

Full Body Harness

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Full Body Harness

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100% Tie-Off Using Two Lanyards

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Retractable Lanyards Reduce Fall Distance

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Straight Ladder Fall Protection

Ladder climbing device

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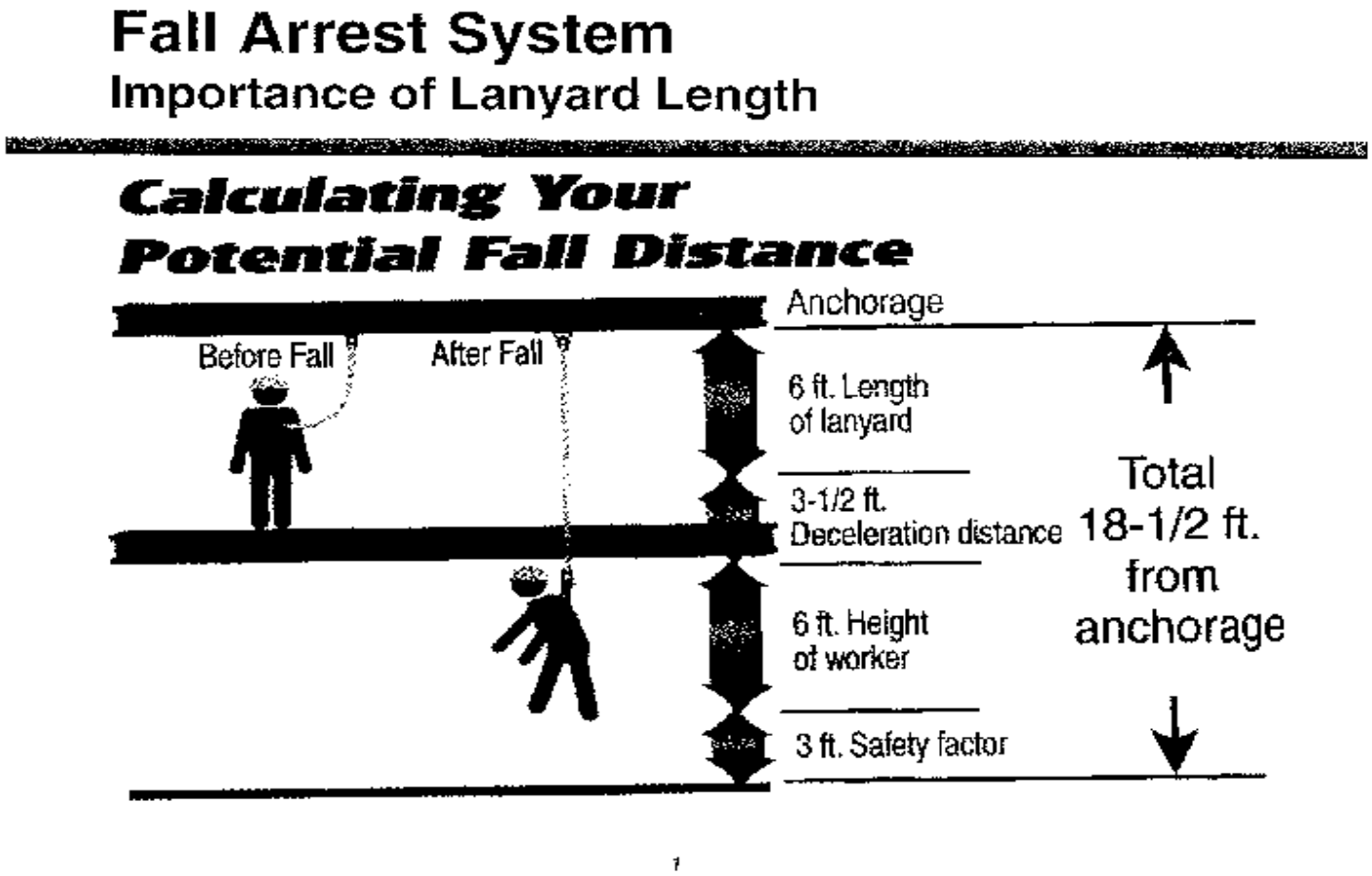
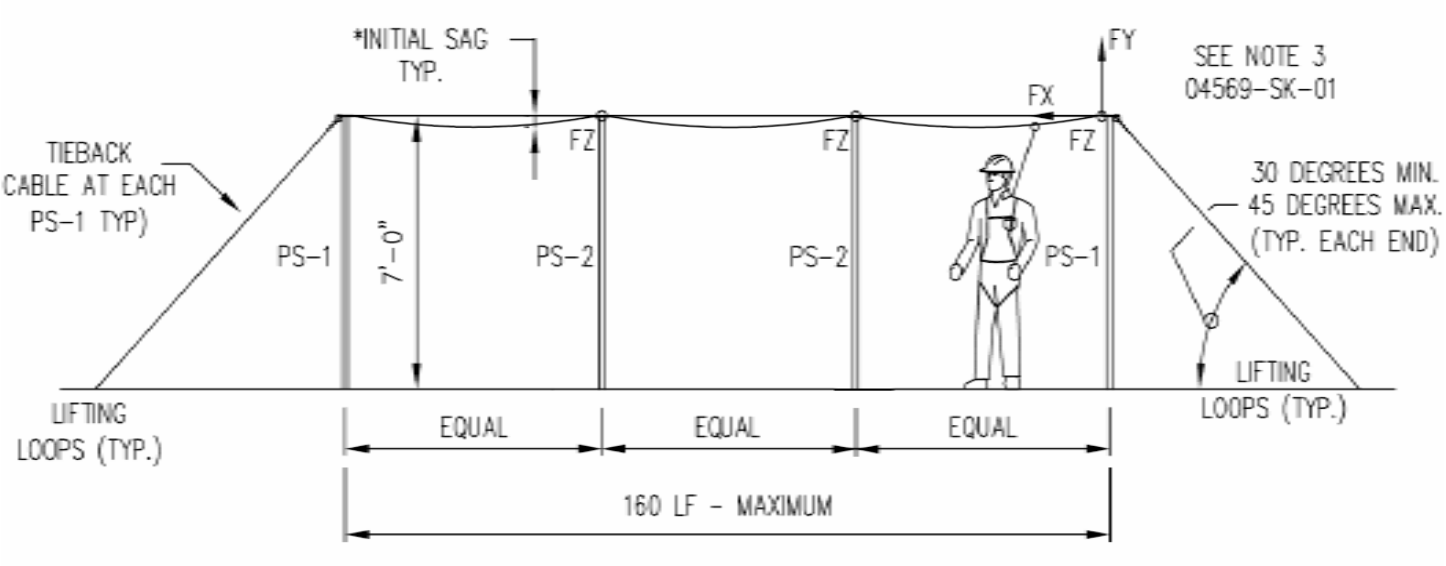
Calculating Potential Fall Distance



What is a Horizontal Lifeline?



HLL Applications on Bridges & Buildings

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Advantages and Disadvantages of HLL's

Advantages

1. Mobility over a large work area
2. Cost effective over platforms & railings
3. Ease of installation

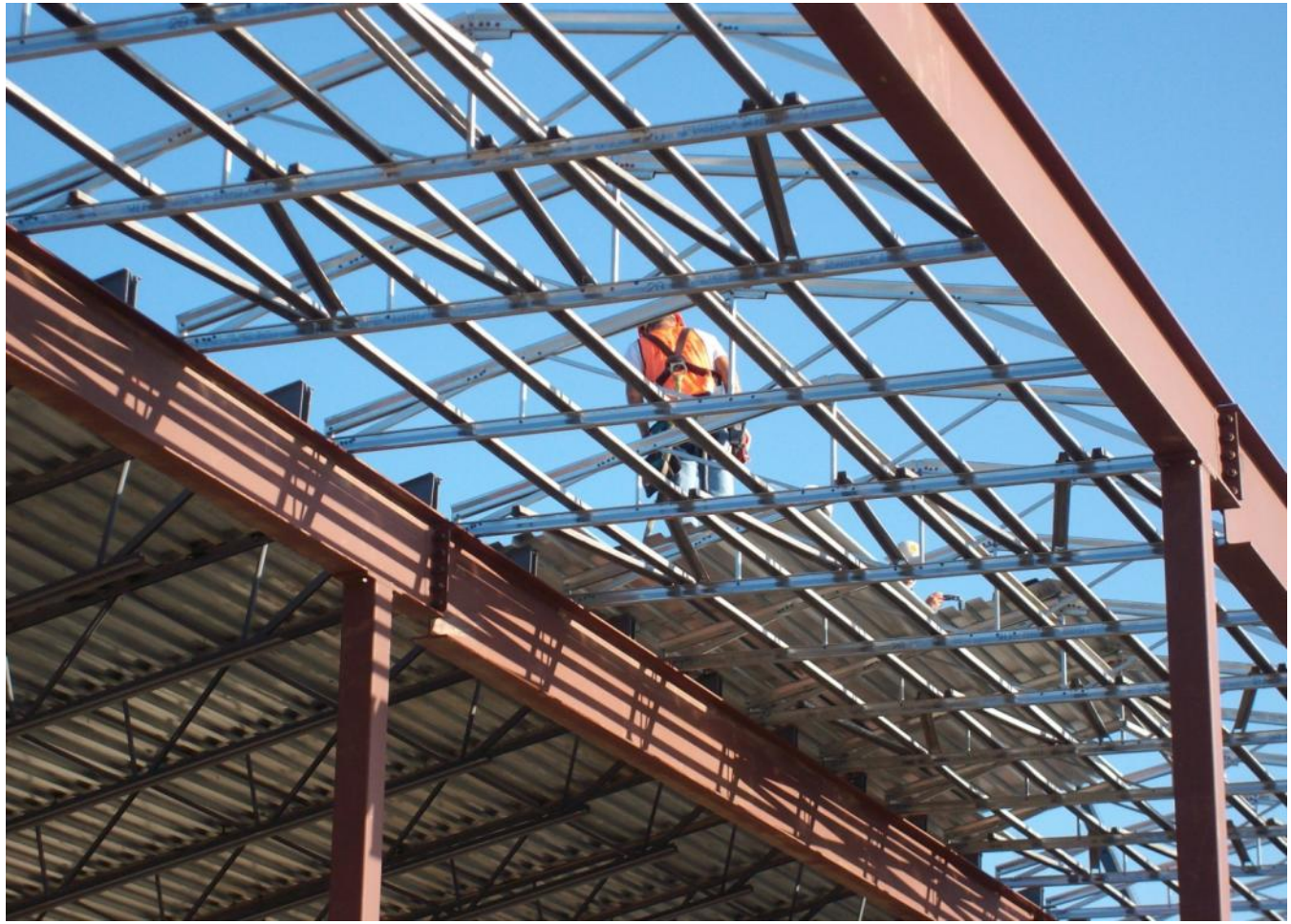
Disadvantages

1. Requires greater vertical clearance envelope
2. Requires continuous control/training/inspection
3. Requires complex engineering & documentation of every component, device, hardware, etc.

Things to Remember with HLL's

1. Requires Qualified Person to engineer
2. Requires Competent Person to install/inspect
3. HLL's are complex; Not just a cable strung between two anchorage points
4. Can be Permanent or Temporary, Single Span or Multi-Span, Single vs. Multi-User
5. Must Calculate Maximum Workers per HLL
6. Fall Clearance, Initial Sag, Pendulum Effect

Roof Decking with Fall Arrest System



Has Anyone Seen The Rescue Plan?

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Okaloosa Roofing Projects

- History
  - 12 Years of Annual Roofing Projects
  - 2M+ SF of Total Roofing Installed
- Roof Types
  - Sloped: Standing Seam Metal
  - Flat: Modified System with Tapered Insulation
- Fall Protection Methods
  - Warning Lines (6ft setback with flagging)
  - Leading Edge Guardrail (Cables)
  - Mobile Anchorage Systems (Up to 3 people)
  - Horizontal Lifelines (On Sloped Roofs)
- Planning Fall Protection into the Project

Flat Roofing with Leading Edge Warning Line

Flat Roofing with Perimeter Cable Protection

Flat Roofing with Warning Line & Cart Anchor

AES Raptor R1000 Mobile Fall Protection Cart

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Sloped Roofing with Fall Restraint Lines

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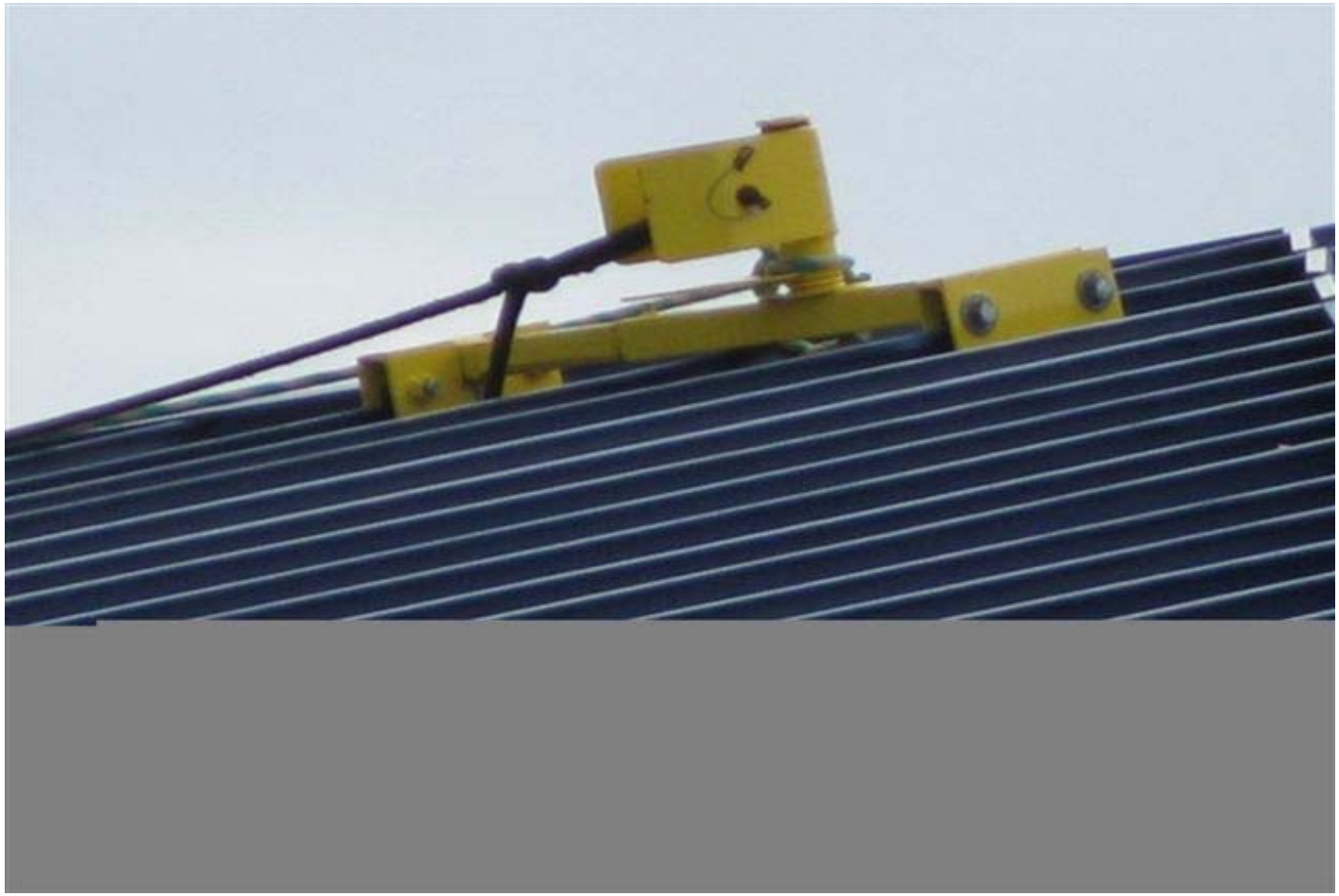
Standing Seam Roof Clamp – Anchor Device



Dynamic Standing Seam Roof Clamp

Fabricated Anchor – Good Intentions!

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What Not To Do When Roofing

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What Not To Do When Roofing

Fall Prevention Planning – Take Aways

1. Identify all elevated work activities
2. Determine the appropriate means of protection using the Fall Prevention Hierarchy of:
   - **i) eliminating the work at elevation**
   - **ii) preventing exposure by means of aerial lifts, guardrails, etc. or**
   - **iii) controlling the exposure by use of a fall arrest system only as a last resort**
3. Develop a site-specific Fall Prevention plan; and then a separate SPA for each work activity
4. Identify the “Competent Person” and verify their credentials
5. Assign a Jacobs Supervisor, especially to subcontractor work
6. Create and drill with your site-specific rescue plan
7. Execute Jacobs Fall Prevention and Protection – HSEP 13.8

Fall Arrest Systems – Take Aways

Used only as a last resort-

1. Identify and engineer appropriate anchorage with documented capacities
2. Locate anchorage tie-off at shoulder height minimum; avoid foot level tie-offs
3. Select the appropriate lanyard (single, double -Y), and connecting means (i.e. lanyard or retractable device)
4. Teach employees how to wear, inspect and maintain its condition and document this training
5. Calculate proper clearance distances to eliminate swing fall hazards
6. Determine proper access/egress to elevated work
7. Consider worker mobility and whether a Horizontal Lifeline System or fixed overhead anchorage is best
8. Develop a site-specific rescue plan and conduct rescue drills