Session 94

Three Point Control for Ladders

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Research on Handholds in industry to support bodyweight by Kurt Beschorner and Justin Young:

“Use Horizontal handholds wherever design permits to promote ladder stability hence safety”
Work/Access by Ladder: Three Point **Contact** v. Three Point **Control**

- **Contact** is a vertical side rail, shoulder or hip for **balance only** using three limbs; **Control** is same but …..

- **Control** is **horizontal handholds** with known **dynamic strength** capability, men 120%+ body wt

- **Optimum Handhold** is 1-1.5” (2.5-3.8 cm) **solid rounded** horizontal grip

Ref: Professional Safety Journal article: Three Point Control, Nov 2012

119 Ladder-related Deaths in 2014 USA (BLS/USDOL)
Walk-Through

Fixed Ladders

Climbing Principle

If falling starts, a horizontal handhold will hold the weight of the climber:

A vertical handhold will not prevent a fall because the hand can slide

Rung size/shape 1-1.5” Rounded (2.5-3.8 cm)
Roof Access: Hatch Walk-in/Walk-out
Eliminates Painful, Dangerous Crawl in and crawl out!

No Guardrail  w/Guardrail
Industry Standard in USA
For all ladders: *Hold Rungs!*

Best Practice

Justin Young thesis: link FallSafety.com
Portable ladder: hold Rungs (right) not SideRails (left)
15 deg. angle helps Ladder Extension act independently of Ladder

Generation 2 Ladder Extension
Force stays on ladder with 15 deg. slope:
G2 force is at ladder joint not the extension
G1 force is at resting point of extension

Leaning fall exposure G1

Leaning fall exposure G1

No leaning to side: G2
15 deg offset keeps extension from ladder test
Paint, Caulk etc. **without Leaning**

Reduce fall exposure

Leaning is #1 fall cause
Three Point Control G2
Walk-Through Ladder Extension

Extends a ladder by required 3ft
NOTE: 50%+ OSHA citations for ladders less than 3ft

“Intuitive” Horizontal Handhold
Tools for Portable Ladder Slide Control

1 Good

“Side rail end cover”

Neoprene rubber adhesive strip

2 Better

Popular ladder slide control accessory
Construction Sites

1. Walk-up and over
2. Walk-Through
Testing G2 to ANSI A14.5

Initial testing methodology was taken from A14.5—2007 Fig 4A. The static test was modified from the Fig4 to include the GSP and load test each device (left and right).

2.3.3 Simulated In-Use Inclined Load Test.

Note: This is a design verification test.

The ladder shall be extended to its maximum working length and supported as shown in Fig. 4. The load shall be applied equally to both side rails on the lowest stair above the overlap of extension ladders and at the first stair at midpoint or above on other ladders. The load shall be applied using two 3-1/2 inch steps, each loaded next to a rail and centrally loaded through an isolator bar on the climbing side of the ladder. All supporting and loading apparatus shall conform to that shown in Fig. 4 or shall be such as to produce equivalent results.

The ladder shall be loaded in increments with Table 14. The full load shall be applied for a period of one minute before release. The ladder shall sustain this load without ultimate failure. Permanent deformation (set) shall be allowed.

This test shall be used only for design verification. It shall not be employed for quality control or field inspection purposes.

NOTES:
1. This illustration shows the test setup before the load is applied.
2. The test platform follows the test load as the ladder deflects into the wall.
3. The angle of inclination shall be 75-1/2°, except that for combination ladders in the extension ladder orientation a slightly modified angle shall be used so that the tread portions of the steps are horizontal (level).

1000 lbs test

Weight Cradle #1 = 150lbs
Weight Cradle #2 = 150lbs
Total = 300lbs
Ladders are:
The Leading Cause of death in US Construction
Ladder Extension helps:
Reduce risk* by Training workers to hold Ladder Rungs and Horizontal Grab Bars
*Design change helps reduce up to one billion unsafe ladder handholds/day by reducing side rail contacts
OSHA Alliance

Three-Point Control link:

http://www.designforconstructionsafety.org/media.shtml
Questions?


www.FallSafety.com

An Educational Web Site for high work

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Ref: Work of Justin Young, UMICH, NIOSH grant
Work of Kurt Beschorner, UPITT, NIOSH grant