STEEL ERECTORS SAFETY ASSOCIATION OF COLORADO

Fall Arrest System Drop Testing Report

Cable Choker Anchor
VS.
Sliding Beam Anchor (Beamer)
Attached to Structural Steel

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Prepared by,

MSC Safety Solutions
12071 Tejon St. STE 200
Westminster, CO 80234
www.mscss.us

1. Introduction

1.1. Objective:

The objective is to proof test all the components involved in the following fall arrest system. This testing was done in accordance with the performance standards set forth in the Occupational Safety and Health Administration standard 1926.502 and under the guidance of the Safety Standards for Fall Protection in the Construction Industry Preamble.

1.2. Definitions:

For the purposes of this report, the following definitions apply:

Anchorage
The terminating component of a fall protection system that is intended to support any forces applied to the system.
Deceleration Distance
The vertical distance between the user's fall arrest attachment at the onset of fall arrest forces during a fall, and after the fall arrest attachment comes to a complete stop.
Energy Absorbing Lanyard
The type of equipment tested. A component of a fall arrest system, the main purpose of which is to absorb fall energy as it limits fall distances. Each energy absorbing lanyard has a catalog record of 6 ft in length.
Fall Arrest System
The collection of equipment components that are configured to arrest a free fall.
Free Fall
The act of falling before a fall protection system begins to apply forces to arrest the fall.
Free Fall Distance
The amount of distance fallen by simulaid before any deployment of the energy absorbing lanyard.
Hanging Load
Load as measured by the load cell and data collection system when the simulaid was hanging on the HLL after the fall.
Harness, Full Body
A body support designed to contain the torso and distribute the fall arrest forces over at least the upper thighs, pelvis, chest and shoulders.
Horizontal Lifeline(HLL).
A component of a horizontal lifeline subsystem, consisting of a flexible line with connectors or other coupling means at both ends for securing it horizontally between two anchorages or anchorage connectors.
Lanyard
A component consisting of a flexible rope, wire rope, or strap, which typically has a connector at each end for connecting to the body support and to a fall arrester, energy absorber, anchorage connector, or anchorage.
Peak Load
Maximum load measured by the load cell and the data collection system.
Self-Retracting Lanyard (SRL)
A device containing a drum wound line that automatically locks at the onset of a fall to arrest the user, but that automatically pays out from and retracts onto the drum during normal movement of the person to whom the line is attached. After onset of a fall, the device automatically locks the drum and arrests the fall.
Simulaid
Simulaids are manikins that represent an actual human, they are the best way to maintain the reality of a fall without using a live subject. The head and body are built of dense, flexible, life-like vinyl.
Swing Fall.
A pendulum like motion that occurs during and/or after a vertical fall. A swing fall results when an authorized person begins a fall from a position that is located horizontally away from a fixed anchorage.
Total Fall Distance
The total amount of distance fallen by the simulaid including deployment of energy absorbing lanyard, harness stretch, and HLL sag.
Vertical Lifeline.
A component, element or constituent of a lifeline subsystem consisting of a vertically suspended flexible line and along which a fall arrester travels.

1.3. Components:

- Type 1 six-foot adjustable length shock absorbing web lanyard w/pack, #74N locking snaps at each end.42” deceleration.

- One sliding beam anchor (beamer)

- One galvanized 6’ long 5/16” diameter cable choker anchor, often referred to as a “cheater”

1.4. Testing Conditions:

Ambient Temperature= 91 Degrees Fahrenheit
Wind= SE 11.185 MPH
Condition= Scattered clouds
Humidity = 22 %
Barometer= 29.97 hg

1.5. Testing method:

Two 225 lb. test simulaids were dropped on two different fall protection systems semi-simultaneously to directly compare the different methods of fall arrest. One simulaid was attached to structural steel using a 6' long, 5/16" diameter galvanized cable choker anchor. The other simulaid was attached to the structural steel using a sliding beam anchor (Beamer). Both simulaids were attached (tied off) to the anchors using six-foot adjustable length shock absorbing web lanyards. The determination to use 225 lb. test simulaids with a 1.4 multiplier was based on the widely accepted practice that the multiplier compensates for the damping effect, or absorption, of a falling workers body, and ensures the equipment is tested to maximum capacity.

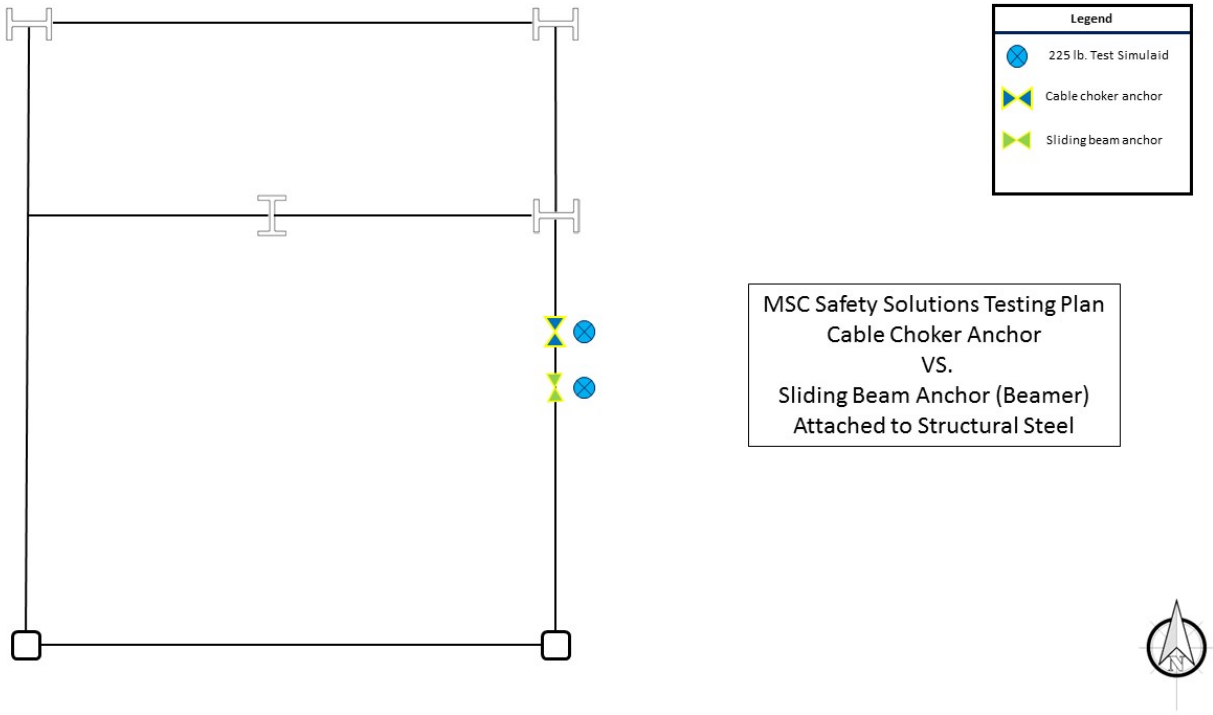
The formula used is as follows:

225 lb Rigid Simulaid x 1.4 (force absorbed by dynamic human body) = 315 lb. Fully clothed / tooled worker.

1.6. Anchorage Configurations:

*Choker was configured in a basket hitch

1.7. Testing configuration:



2.Test Observations:

2.1. Fall Metrics

Six-foot adjustable length shock absorbing web lanyard attached to sliding beam anchor

Lanyard Length Pre - Test	Lanyard Length Post Test	Total Fall Distance	Free Fall Distance	Deceleration Distance	Damage /distortion to anchorage
6’ - 1”	10’- 3”	16’	11’-10”	4’ 2”	None

Six-foot adjustable length shock absorbing web lanyard attached to cable choker anchor

Lanyard Length Pre - Test	Lanyard Length Post Test	Total Fall Distance	Free Fall Distance	Deceleration Distance	Damage /distortion to anchorage
6’- 1”	10’-3 ½”	18’- 10”	14’-7 1/2”	4’- 2 1/2”	Minor Bending

3.Conclusions:

The results and recommendations presented from this successful drop (proof) test on cable choker and sliding beam anchors, provided invaluable data for the total fall distance that can be expected when using these systems. All safety system components were examined after the test and there was no major physical damage. The drop test performed, and the data shown above, provides documentation for the proof test of these safety systems. The simulaids do not have the same elasticity as a human body making these results conservative to real-life conditions. The elastic state that a human body exerts during a fall would absorb some of the energy from the safety system. The result would be slightly less deceleration (pull out) than what is shown in the tables.

Based on this testing, it is reasonable to assume the following:

1. A worker “tied off” using a six-foot adjustable length shock absorbing web lanyard attached to a choker anchor, configured in a basket hitch, anchored to structural steel at his/her feet, would not contact a lower walking/working surface of => 19’

2. A worker “tied off” using a six-foot adjustable length shock absorbing web lanyard attached to a sliding beam anchor, anchored to structural steel at his/her feet, would not contact a lower walking/working surface of => 16’-6”

3. The total fall distance in both scenarios could be reduced if the worker:

    1. Raised the anchorage point by straddling the beam that the fall arrest system was attached to. This would reduce the total fall distance and reduce the impact on the shock absorbing lanyard, thus reducing deceleration distance.
    2. Tied off to the anchorage using a self - retracting web lanyard. In a separate test, when a simulaid was attached to a cable choker anchor using a self-retracting web lanyard, the total fall distance was 13’ – 3 ¾”. Using a self-retracting lanyard with a cable choker anchor reduced the total fall distance by 5’ – 8 ¼” when compared to using a 6’ adjustable web lanyard.

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The information contained within this report is for informational purposes only. Fall arrest systems must be installed, evaluated and used only by a competent person.

4.Photographic Evidence: