



Fall Arrest System Drop Testing Report

60' Self Retracting Lanyard

Attached to 3"x 3" x 1/4" Welded Angle HLL

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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 lifeline (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

Simulaid 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.

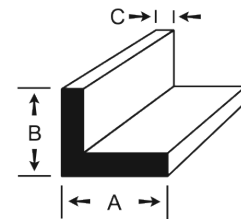
A component, element or constituent of a lifeline subsystem consisting of a vertically suspended flexible line and along which a fall arrester travels.

1.3. Components:

- One 60' leading edge 3/16" diameter self retracting lifeline



- A36 steel angles 3"x 3" x 1/4"



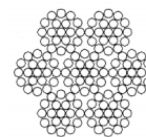
- Eight 3/8" galvanized drop forged cable clips



- Two double locking snap hooks



- 3/8" 7 x 19 Galvanized Aircraft Cable
- Specification Requirements:
- Performance Standard & Dimensions:
- Federal Specification MIL-DTL-83420M
- Type: I
- Composition: A
- Construction: 7 x 19
- Material: Drawn galvanized high carbon steel
- per Federal Specification
- MIL-DTL-83420M
- Minimum Breaking Strength: 14,400 lbs



Part Numbers	Nominal (inch)	Working Load Limit (lbs)	Minimum Breaking Strength (lbs)
0545502	3/32	200	1,000
0545503	1/8	400	2,000
0545504	5/32	560	2,800
0545505	3/16	840	4,200
0545506	1/4	1400	7,000
0545507	5/16	1960	9,800
0545508	3/8	2880	14,400

1.4. Recording Apparatus:

1. One Dillon ED Xtreme 5000 LB capacity dynamometers



2. One Dillon Communicator



3. One Surface Pro 4



1.5. Testing Conditions:

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

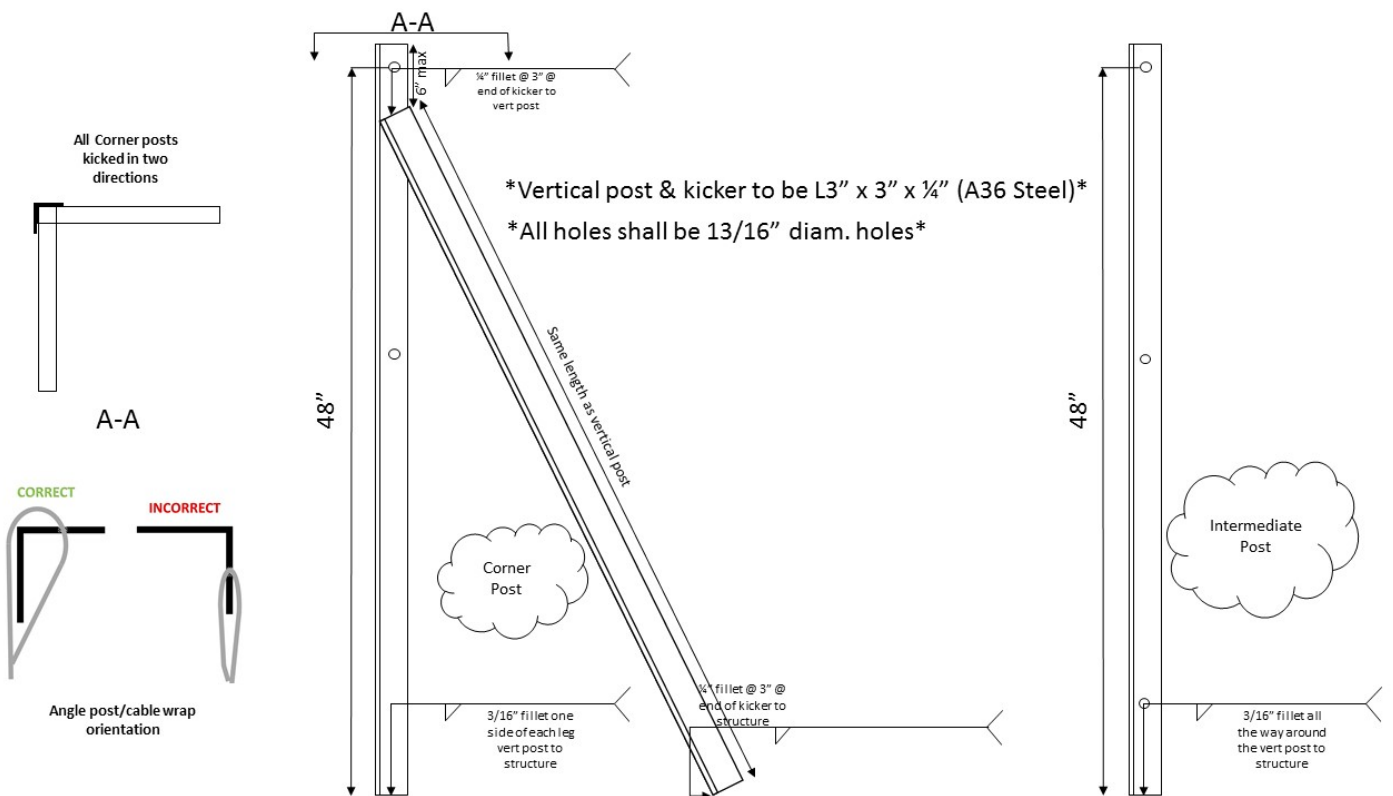
1.6. Testing method:

One 225 lb. test simulaid was dropped on a 3/8" aircraft cable Horizontal Life Line (HLL) anchored by welded angle posts. The simulaid was attached (tied off) to the HLL using a 60-foot self-retracting lifeline. The determination to use a 225 lb. test simulaid 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:

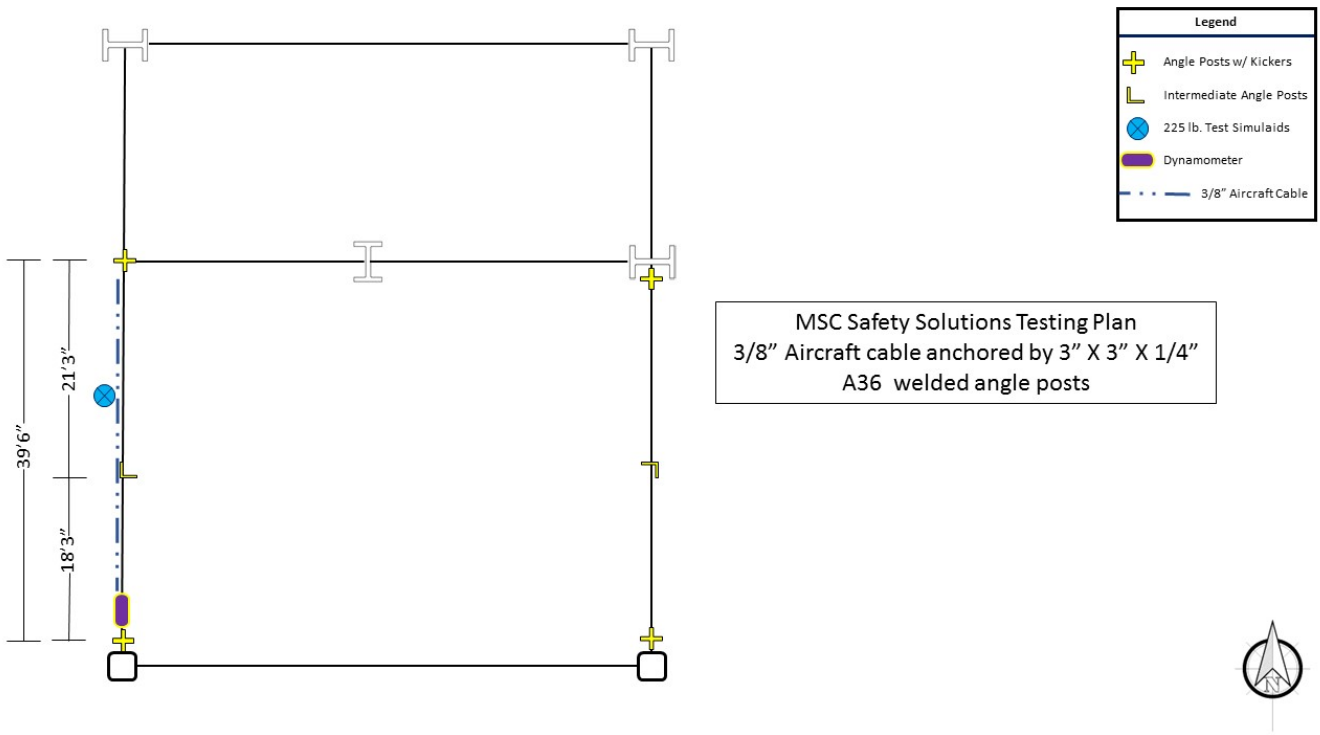
225 lb Rigid Simulaid x 1.4 (force absorbed by dynamic human body) = 315 lb. Fully clothed / tooled worker.

1.7. Anchorage Configurations:





1.8. Testing configuration:



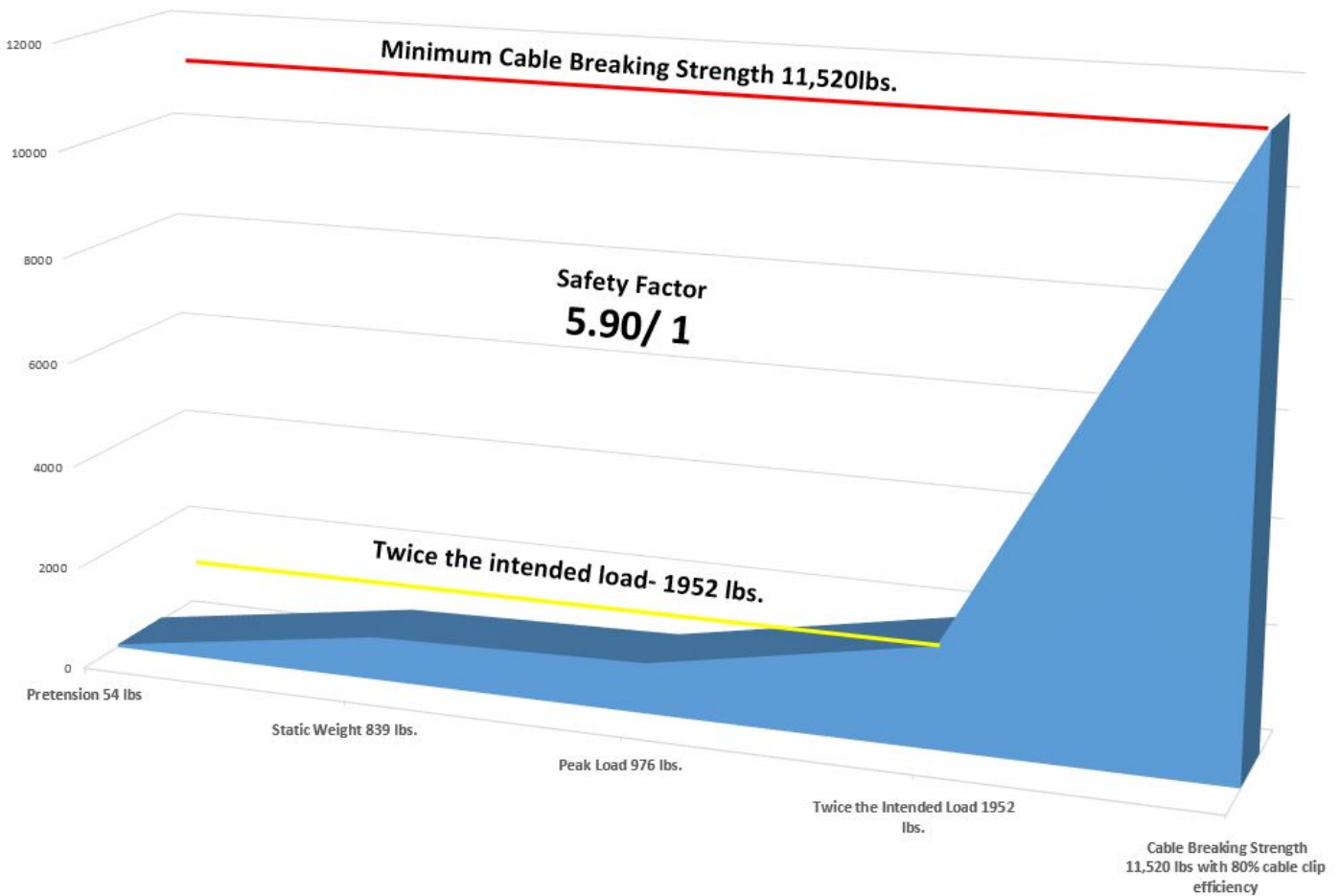
2.1. Fall Metrics

60-foot self-retracting lifeline attached to 3/8" aircraft cable Horizontal Life Line (HLL) anchored by welded angle posts

Lanyard Length Pre - Test	Lanyard Length Post Test	Total Fall Distance	Free Fall Distance	Deceleration Distance	Damage /distortion to anchorage	Damage /distortion to wire rope
4' - 8"	9'	12- 2"	7'- 6"	4' 4"	None	Minor Bending

2.2. Loading Metrics

60-foot self-retracting life line attached to 3/8" aircraft cable Horizontal Life Line (HLL) anchored by welded angle posts



3. Conclusions:

The results and recommendations presented from this successful drop (proof) test on 60-foot self-retracting lifeline, attached to a 3/8" cable and anchored by 3" X 3" X 1/4" welded angle, provided invaluable data for the total fall distance that can be expected when using this system. 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 simulaid does 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 walking on the top flange of a beam and "tied off" using a 60-foot self-retracting lifeline, attached to a 3/8" cable suspended at 48" above the walking /working surface, would not contact a lower walking/working surface of => 12'-3".
2. The total fall distance could be reduced if the worker:
 1. Raised the anchorage point by:
 - A. Straddling the beam that the fall arrest system was attached to.
 - Or
 - B. Installing the HLL higher than the 48" that was tested in this scenario.

These recommendations would reduce the total fall distance and reduce the impact to the self-retracting lifeline, thus reducing deceleration distance.

The total fall distance would also be increased if the worker:

1. Attached the self-retracting lifeline to an elevation lower than the 48" above the walking working surface.
2. Did not keep the retractable attachment point in line with the worker causing a swing fall scenario.

***ANSI/ASSE Z 359.6-2009 A 5.3-Swing Falls.** "In fall arrest systems, anchorages shall be located directly above the worker(s) to eliminate swing falls, wherever it is reasonably practical to do so. Where it is not reasonably practical to prevent swing falls, the swing-drop distance shall not exceed 4.0 ft." *

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4. Photographic Evidence:



