ABOUT THE NEW STANDARD FOR ELECTRIC ARC TESTING FALL ARREST HARNESSES

ASTM F 887- 05, "Standard Specifications for Personal Climbing Equipment"
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I. WHAT'S IN THE NEW STANDARD

The scope of the standard covers acceptance testing of climber straps, body belts, positioning straps, harnesses and shock absorbing lanyards used by workers in climbing poles, towers and other structures. Minimum performance criteria for arc resistance of harnesses and shock absorbers are included for workers who may be exposed to thermal hazards of momentary electric arcs or flame.

This subject is similar to the new NFPA 70E Electrical Safety standard which also addresses the hazards of electric arc exposure for workers wearing personal protective equipment. The goal is to provide additional levels of protection to workers in high-voltage electrical environments. The ASTM F 887 standard deals particularly with full body harnesses and lanyards worn by workers for fall protection.

Included in the new standard are criteria for:

- arc flash exposure and drop testing for harnesses and lanyards
- prohibition against ignition or melting of webbing used in harness and lanyard construction
- harness sizing
- lanyard classifications, based on shock absorber type
- harness and lanyard designs must also meet the requirements of the ANSI fall protection standard, Z359.1 (current revision)

Description of the Hazard

Climbers working near energized electrical sources face special hazards due to sudden, unexpected arc flashes that can ignite or melt clothing and protective gear. The concern is for workers equipped with standard fall protection harnesses and shock absorbing lanyards that may be damaged by the high heat of an electric arc and possibly fail to arrest a subsequent fall.

Investigation of past accidents involving arc flash revealed the danger of injury to workers burned by the ignition and melting of clothing following the initial flash of electrical energy. The new standard addresses this potential hazard with criteria that prohibit materials in construction of safety harnesses and lanyards capable of sustaining an open flame, or melting after arc flash exposure.

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Harness Testing

The objective of the new standard is to verify by testing that fall protection harnesses and shock absorbing lanyards will continue to perform as intended to stop a fall after being exposed to a severe electric arc flash. Testing is performed in two consecutive steps: first, an arc flash exposure and next, by dynamic drop testing.

The severity of arc flash is measured in terms of the heat energy imparted by the electric current. The ASTM F 887 standard specifies exposures of 40 cal/cm^2. This exposure level is considered to be a very high risk category, typically encountered only by working on energized parts like voltage-testing in switchgear greater than 1000 Volts.

The test method is defined by another ASTM standard, F 1958/ F 1958M – 99, "Standard Test Method for Determining the Ignitability of Non-flame-Resistant Materials for Clothing by Electric Arc Exposure Method Using Mannequins." As the title implies, arc testing of the harness is performed with the harness fitted to a test dummy. The harness is then hit with a momentary arc of high-voltage electrical current by electrodes placed close to the test specimen. The force of the arc flash appears to one witnessing the test as a violent explosion of heat and light. Harnesses are tested separately with exposure at the front and back. Shock absorbing lanyards are configured for the test with the shock absorber element exposed at the front of the mannequin.

The arc exposure test of harnesses and lanyards also contains criteria for ignition and melting. No part of the harness or lanyard is permitted more than 5 seconds of after-flame, nor is melting and dripping permitted following the arc flash exposure.

Following the arc flash exposure, each harness is subjected to a feet-first and head-first drop test according to the procedures in ANSI Z359.1-1992(R1999), "Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components." These tests subject each arc-exposed harness to a 6 ft free-fall with a 220 pound mass. To pass these tests, the harnesses must retain the torso test mass in an upright position.

Shock absorbing lanyards are tested according to the ANSI Z359.1 requirements for this integral subsystem. Testing includes a 6 ft free-fall with a 220 pound mass. The shock absorbing lanyard must retain the test mass and reduce the maximum arrest forces to less than 1,800 pounds with a maximum deceleration distance of 42 inches.

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Harness Sizing

In addition to the requirements for electric arc flash testing, the new standard specifies harness sizing. The standard instructs manufacturers to build harnesses in five sizes: small, medium, large, X-large and XX-large. Sizes are determined according to the wearer's height and chest size (measured wearing winter clothing), rather than by weight.

Requirements of ANSI Z359.1 (current revision) - Heavier Webbing

The new F 887 standard incorporates the requirements of the current industry benchmark standard for fall protection harnesses, ANSI Z359.1. Harnesses manufactured under the specifications of F 887 must also meet the specifications, tests and requirements of ANSI Z359.1 (current revision). There is one exception: webbing must have a higher breaking strength - increased to 7,000 pounds minimum tensile strength. This is intended to provide additional capacity in the harness to withstand normal wear in use as well as the loss of strength resulting from degradation in a potential arc flash.

Shock Absorbing Lanyard Classifications

The new standard classifies shock absorbing lanyards according to the style of shock absorber. Performance requirements are the same for both classes. Designations are as follows:

Type A - deceleration force reduction by separation of woven materials
Type B - deceleration force reduction by stretch of woven materials

II. APPLICATIONS FOR FULL BODY HARNESSES MEETNG ASTM F887

There are many occasions where workers are exposed to the hazard of a high-energy electric arc flash and where the need exists to:

- protect the worker in a fall after arc flash, or
- retrieve the worker who may be incapacitated in a confined space following an arc flash event.

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Work at height near energized electrical sources includes:

- power transmission tower climbing,
- broadcast and telecommunication RF tower climbing,
- installation and repair of roof-mounted electrical equipment,
- in-plant maintenance and repair of electrical machinery.

Work in confined spaces should also be considered, for example:

- maintenance performed in electrical vaults,
- work performed in electrical runs or cargo holds of ocean-going ships,
- work in trenches where exposed electrical cables are present, and
- maintenance and repair inside pressure vessels.

This list is by no means exhaustive. Rather, it is intended to give the reader an idea of the wide range of potentially hazardous work environments where arc-resistant full body harnesses and shock absorbing lanyards are needed.

The use of qualified arc-resistant protective equipment can occur in almost any industry where high voltage electricity is a complicating factor in the work environment.

III. WHAT MSA IS DOING

MSA Fall Protection in Englewood, Colorado is working on a series of full body harnesses and shock absorbing lanyards that will comply with the new ASTM F887 standard. MSA harness designs include:

- Improvements to the patented MSA TechnaCurv™ harness design in both vest style and crossover style harness configurations,
- Versions to include a detachable waist belt with positioning D-rings,
- Versions with dielectric covers to protect hardware elements,
- Versions with an integral shock absorbing lanyard,
- A new harness design that contains no metal above the waist.

MSA has obtained SEI certification on the MSA ArcSafe™ line of full body harnesses in January 2005. Shock absorbing lanyards were submitted for testing to the High Current Lab at Kinetrics, in Toronto, ON as part of third-party

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certification by the Safety Equipment Institute in the USA. Testing is was completed in December 2005. Third party certification of the MSA arc-resistant family of shock absorbing lanyards is expected to be issued in the First Quarter 2006.

MSA full body harnesses and shock absorbing lanyards will fill an important niche in the market for personal protective equipment. MSA equipment will be certified to the most stringent standards now available for workers exposed to high voltage electrical hazards. MSA's test and certification program will meet the requirements of ASTM F887 and ANSI Z359.1. MSA will also test and certify all accessory elements supplied with these harness products. This additional testing will assure end-users that their complete MSA fall protection or rescue/retrieval body-support ensemble has been fully tested to protect the worker in a fall or in a confined space after an electric arc flash event