Review of Upcoming Changes to the ANSI Z359.1 Fall Arrest Standard

ANSI Z359.1-1992(R1999), "Safety Requirements for Fall Arrest Systems, Subsystems and Components"

Changes are underway to the fall protection equipment standard for general industry, ANSI Z359.1-1992(R1999). The benchmark standard, which has become incorporated into many industrial fall protection programs, was last updated in 1999 with only minor editorial revisions. The proposed new standard is nearing completion and contains many important new requirements.

This paper will examine what has been changed and added to the new ANSI Z359.1 standard in its draft form. Note that further revision may take place before the standard is published. We will review highlights of the more significant changes which will affect many US employers, workers, safety professionals, manufacturers and others with a stake in the US national consensus standard for fall protection. We will also discuss the estimated schedule for release of the new standard and where to go for comment or further information.

I. ANSI Z359, A "FAMILY OF STANDARDS"

The scope of the draft standard has expanded beyond fall arrest into other work applications. The proposed new standard continues to adhere to the "systems approach" of the original 1992 edition. The new Z359 will add four new sections that comprise the "family of standards" which make up the complete document. The sections of the new standard include:

- Z359.0 – Definitions and Nomenclature Used for Fall Protection and Fall Arrest
- Z359.1 – Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components
- Z359.2 – Minimum Requirements for a Comprehensive Managed Fall Protection Program
- Z359.3 – Safety Requirements for Positioning and Travel Restraint Systems
- Z359.4 – Safety Requirements for Assisted Rescue and Self-Rescue Systems, Subsystems and Components

Z359.0 – Definitions and Nomenclature Used for Fall Protection and Fall Arrest – functions as a dictionary of specialized terms compiled from the other four sections. It defines each of the terms used through out the new standard.

Z359.1 - Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components – contains product design criteria and test procedures for fall arrest components, subsystems and systems, just as in the current version of the standard. Several new requirements have been added.

Z359.2 – Minimum Requirements for a Comprehensive Managed Fall Protection Program - This is an entirely new section which is directed at employers and safety professionals rather than product manufacturers. The new program standard sets out detailed requirements for a comprehensive fall protection program and forms the basis for the other four sections in the standard.

Z359.3 - Safety Requirements for Positioning and Travel Restraint Systems - is another all-new section and established minimum design and test requirements for equipment used in work positioning and travel restraint.

Z359.4 – Safety Requirements for Assisted-Rescue and Self-Rescue Systems, Subsystems and Components - is also entirely new. It includes minimum design and test requirements for equipment used in rescue and retrieval of workers after a fall.

II. HIGHLIGHTS OF PROPOSED CHANGES

Z359.0 – Definitions and Nomenclature Used for Fall Protection and Fall Arrest

This part functions as a dictionary of specialized terms compiled from the other four sections. It defines each of approximately 150 terms used through out the new standard, from “Activation Distance” to “Working Line.”

Z359.1 - Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components

This part contains product design criteria and test procedures for fall arrest components, subsystems and systems, just as in the current version of the standard. However, it has been revised with several important new requirements. Here is a summary of the key changes proposed in Z359.1:

1. Gate Strength Requirements Have Increased for Snaphooks and Carabiners

   The current standard requires a test for 220 pounds force against the gate face and 350 pounds force against the side of the gate. The gate mechanism may not disengage from the nose of the snaphook or carabiner.

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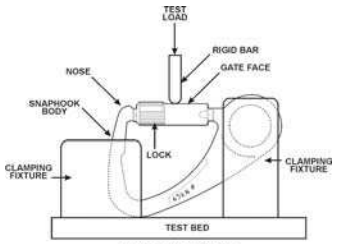
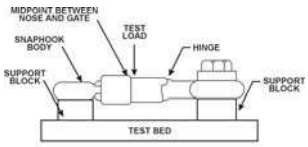
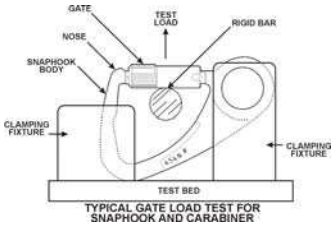
The new standard will increase the strength requirement to 3,600 pounds in all directions of potential loading to the gate. Test procedures will change to exert static loads on the gate face, gate side and from inside the gate outward, forcing the gate away from the nose of the device. Refer to the illustrations, below.



ANSI Z359 / FIGURE 1
GATE FACE LOAD



ANSI Z359 / FIGURE 2
GATE SIDE LOAD TESTING
OF SNAPHOOK AND CARABINER



TYPICAL GATE LOAD TEST FOR
SNAPHOOK AND CARABINER

2. <u>A Front Attachment Element for Fall Arrest Is Now Included In Standard</u>

The current standard states that only the dorsal (back) D-ring may be used for attachment of a personal fall arrest system. The revised standard will change to include attachment of the fall arrest system to a front-mounted D-ring, located approximately in the area of the sternum, as illustrated by the harness in the figure, below:

Front-mounted D-ring attachment element for limited fall arrest

MSA TechnaCurv™ Full Body Harness

Connection at the front D-ring is limited, however, to systems that restrict free fall distance to 2 ft or less and limit the maximum fall arrest loads on the front D-ring to 900 pounds force, or less.

This arrangement will be particularly useful in products selected by climbers and rope access workers.

3. Additional Testing and Warnings for Twin-Leg Shock Absorbing Lanyards

Concerns over potential mis-use applications involving twin-leg shock absorbing lanyards have prompted additional test requirements and warnings for these products in the proposed Z359.1 standard.

Twin-leg, or Y-lanyard designs are not mentioned in the current standard. The new standard will include a 5,000 pound static test of the joint between the two lanyard legs, in the area shown by the figure, below.

MSA Diamond™ Twin Leg Lanyard

There will also be an added warning on the product label to attach only the center snaphook to the back d-ring of the harness. More warnings will be included in user instructions, such as a warning not to attach the unused leg of the lanyard to any point on the harness except attachment points specifically approved by the harness manufacturer for that purpose.

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Z359.2 – Minimum Requirements for a Comprehensive Fall Protection Program

SCOPE

The scope of the new Comprehensive Fall Protection Program ("Program") standard identifies this as a guideline for employers with new or existing fall protection programs.

PURPOSE

- Identify, evaluate and eliminate (or control) fall hazards through planning
- Ensure proper training of personnel
- Ensure proper installation and use of fall protection and rescue equipment
- Implement safe fall protection and rescue procedures

EXCEPTIONS

- Does not apply to construction industry (SIC Division C). This industry is currently served by ANSI Standard A10.32-05.

DUTIES, POLICIES AND TRAINING

The new Program standard places emphasis on endorsement by company management of the employer's fall protection program. The standard sets out clear, unambiguous duties and responsibilities for each participant in the program, as listed below:

- Employers
- Program Administrator
- Qualified Person
- Competent Person
- Authorized Person
- Competent Rescuer
- Authorized Rescuer
- Trainers

Training is also defined for each role in the organization, as are the requirement s for the trainers themselves.

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Z359.2 – Minimum Requirements for a Comprehensive Fall Protection Program

TRAINING AND EVALUATIONS

Training, from administrators, safety engineers, supervisors, at-risk workers and rescue personnel, is extensively addressed by the Program standard. This strong emphasis is based on years of experience of the Z359 committee members and their firmly held belief that, without proper training, fall protection equipment and procedures are inadequate to the task of reducing worker injury and death.

Therefore, the Program standard sets new goals for achieving improved training practices throughout the industry. Z359.2 incorporates by reference another ANSI Standard, Z490.1, Criteria for Accepted Practices in Safety, Health and Environmental Training. Together, the Z359.1 and Z490.1 provide employers with a comprehensive roadmap to enhanced fall protection training.

FALL PROTECTION PROCEDURES

Section 4 of the Program Standard sets out general and specific requirements for fall protection procedures. The procedural scheme is based around the Fall Hazard Survey Report. The report is written by trained safety professional, at the Qualified Person or Competent Person level. It identifies each fall hazard at the work location and goes on to recommend one or more methods for eliminating or controlling each identified fall hazard.

FALL PROTECTION HIERARCHY

In descending order of preference:

- Elimination or Substitution
- Passive Fall Protection
- Fall Restraint
- Fall Arrest
- Administrative Controls

Starting with Elimination or Substitution – for example, eliminating a hazard by lowering the work surface to ground level, or substituting a process, sequence or procedure so that workers no longer approach a fall hazard.

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Z359.2 – Minimum Requirements for a Comprehensive Fall Protection Program

Passive fall protection – isolating or separating the hazard or work practice from workers through the use of guardrails or by covering exposed fl0oor openings.
Fall Restraint – secures the worker to an anchor using a lanyard short enough to prevent the worker's center of mass from reaching the fall hazard.
Fall arrest – includes systems designed to stop a worker's fall after a fall has begun.
Administrative Controls - are work practices or procedures that signal or warn a worker to avoid approaching a fall hazard.

DESIGN REQUIREMENTS FOR FALL PROTECTION SYSTEMS IN NEW FACILITIES

Section 5 of the Program Standard addresses concerns for the control of fall hazards in new facilities by going upstream, to the architects and engineers who design new plants, factories and other buildings.

The new standard provides guidelines for designers to eliminate or control fall hazards in the facilities planning stage, when the cost of doing so is the least burdensome to building owners and occupants. This is a concept widely taught but seldom practiced in the building industry. ANSI Z359.2 enters into the record a practical and cost effective method to reduce fall hazards in new buildings that will influence best safety practices for the next generation

ANCHOR SYSTEMS

The program standard establishes strength criteria for various fall protection anchors, simplifying in one section the design requirements for Fall Arrest, Horizontal Lifelines, Work Positioning, Travel Restraint and Rescue systems.

Fall Arrest

- Non-Certified Anchor
  5,000 lbf static strength
- Certified Anchor
  Designed, selected and installed by Qualified Person
  Static strength two times maximum arresting force

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Z359.2 – Minimum Requirements for a Comprehensive Fall Protection Program

Work Positioning
- Non-Certified Anchor
  3,000 lbf static strength
- Certified Anchor
  Static strength two times foreseeable force

Restraint and Travel Restriction
- Non-Certified Anchor
  1,000 lbf static strength
- Certified Anchor
  Static strength two times foreseeable force

Rescue Systems
- Non-Certified Anchor
  3,000 lbf static strength
- Certified Anchor
  Static strength five times the applied load

In each case, anchors are divided into two categories, Certified and Non-Certified. Certified anchors are those which have been selected under the supervision of a Qualified Person who documents, by a process of testing or analysis by a nationally accepted engineering methodology, and attests to their capacity.

Non-Certified anchors are those anchors that a competent person can judge to be capable of supporting the predetermined anchor forces prescribed by the standard. Fall protection systems connected to non-certified anchors must, in all cases, limit potential free fall distance to 6 ft or less and be equipped with an energy absorbing device which limits maximum arrest forces to 900 pounds or less.

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Z359.2 – Minimum Requirements for a Comprehensive Fall Protection Program

ROPE ACCESS

The Program Standard addresses for the first time in national consensus standards the system of work referred to as Rope Access. Rope access is a growing practice involving skilled rope techniques to access work while suspended vertically.

The new standard recognizes and codifies basic principles for this work practice, including the use of two rope lines and the need to operate as a multi-worker team. The Program Standard breaks new ground, bringing Rope Access within the fall protection community and adding national recognition to this important work tool.

RESCUE PROCEDURES

No fall protection program would be complete without provisions for prompt rescue after a worker has fallen and remains suspended, unable to evacuate himself or herself to a safe working level.

Planning for prompt rescue means getting to the rescue subject within 6 minutes after an accidental fall. This takes planning and coordination on the part of the employer's safety professionals.

If your plan calls for assistance by professional rescue services, such as the fire department or local search and rescue teams, then advance planning must be undertaken. Involvement of outside services must logically take place prior to an actual emergency, and includes a documented plan and written confirmation by the rescue agency.

If an in-house rescue team is in your plan, then team members must be trained and equipped for the task, including regularly scheduled simulations and documented plans and instructions for their use.

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Z359.2 – Minimum Requirements for a Comprehensive Fall Protection Program

INCIDENT INVESTIGATIONS

A Comprehensive Managed Fall Protection Program also includes requirements for incident investigation in the event of accidental death, injury or property damage. To be effective, these investigations must be conducted promptly, with well established reporting procedures and documented results.

EVALUATING PROGRAM EFFECTIVENESS

A critical component in fall hazard elimination and control is regular evaluation of the effectiveness of the Managed Fall Protection Program. It is a continuous process of improvement to build on program strengths and correct deficiencies. The evaluations should examine the Program to determine if it has accomplished its objectives and whether they have been achieved according to the written Managed Fall Protection Program.

Part of continuous improvement includes regularly schedule program reviews and drills, such as the rescue drill illustrated in the picture above.

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Z359.3 – Safety Requirements for Work Positioning and Travel Restraint Systems

We now move on to ANSI Z359.3, the new product standard for work positioning and travel restraint systems. Before examining the product requirements, it is useful to understand what we mean by these terms:

Work Positioning Defined:
"Supporting a worker on a vertical surface while working with hands free"

Work positioning systems are designed to prevent a fall from occurring. When a fall hazard is present, positioning systems must be used in conjunction with a separate and independent personal fall arrest system.

Travel Restraint Defined:
"Limiting a worker's travel in such a manner that they cannot reach a fall hazard zone"

Restraint systems do not support a portion of the worker's weight. They are used only on walking/working surfaces with a slope between zero and 18.4 degrees

FULL BODY HARNESSES

MSA TechnaCurv™ Full Body Harness

Full body harnesses must meet the requirements of ANSI Z359.1 for fall arrest. In addition, the work positioning and travel restraint attachment elements (D-rings) must withstand a dynamic strength test consisting of a 3.3 ft free fall with a 220 pound test weight.

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Z359.3 – Safety Requirements for Work Positioning and Travel Restraint Systems

WORK POSITIONING AND TRAVEL RESTRAINT LANYARDS

Lanyards under this section must be designed and tested to withstand a static load of 5,000 pounds force without breaking.

Z359.4 – Safety Requirements for Assisted Rescue and Self-Rescue Systems, Subsystem and Components

SCOPE

This new standard establishes Requirements for design, performance, marking, qualification, instruction, training, use, maintenance and removal from service of products used in rescue and evacuation.

Equipment covered in the standard:

- Connectors
- Harnesses
- Lanyards
- Anchorage Connectors
- Winches/Hoists
- Descent Control Devices
- Rope Tackle Blocks
- Self-Retracting Lanyards with Integral Rescue Capability

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Z359.4 – Safety Requirements for Assisted Rescue and Self-Rescue Systems, Subsystem and Components

PURPOSE AND APPLICATION

This standard is directed at rescue systems utilized in pre-planned rescue applications for one to two persons at a time where a fall hazard exists.

EXCEPTIONS

Exceptions include construction, sports-related activities, rope access rescue techniques utilized by certified rescue technicians, or other tasks that have established national consensus standards.

Competent Person must determine suitability of equipment in this standard for activities conducted in hazardous atmospheres.

The standard does not preclude trained rescue professionals, such as fire service rescue teams, from using the equipment when desired. However, the standard does not specifically intend for products to be used in emergency rescue situations where equipment is covered by other standards, including the National Fire Protection Association NFPA 1983 standard for Life Safety Equipment.

SYSTEM REQUIREMENTS

For one-person rescue system, capacity is 130 to 310 pounds

For two-person rescue system, capacity is 160 to 600 pounds.

Connectors must meet the requirements of ANSI Z359.1

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Z359.4 – Safety Requirements for Assisted Rescue and Self-Rescue Systems, Subsystem and Components

FULL BODY HARNESS

Harnesses under this section must meet all the requirements of ANSI Z359.1 for full body harnesses.

The dorsal (back) D-ring is suitable for rescue applications unless otherwise prohibited by the manufacturer.

Other rescue/retrieval attachments must meet:

- 3,600 pound static load test
- dynamic test with a 2.0 ft free fall distance with a 220 pound test weight

EVACUATION HARNESS

Evacuation harnesses are for rescue only and not for fall arrest. They must securely hold the body whether the person is conscious or unconscious.

Body support must be accomplished by a combination of webbing straps supporting the body around the shoulders and thighs.

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Z359.4 – Safety Requirements for Assisted Rescue and Self-Rescue Systems, Subsystem and Components

RESCUE LANYARDS AND ANCHORAGE CONNECTORS

These components of the rescue system must meet the applicable requirements for lanyards and anchorage connecting devices in ANSI Z359.1.

SELF RETRACTING LANYARD COMPONENT WITH INTEGRAL RESCUE CAPABILITY

MSA Lynx™ Rescuer

Operation

- Engages in rescue mode at any time, not possible to inadvertently change to or from rescue mode
- Raise or lower with minimum 3:1 mechanical advantage
- In rescue mode, will automatically stop and hold a load if rescuer relinquishes control
- Means to stabilize device during use in rescue mode
- May be manually or powered with speed control and manual back-up
- Static Strength
- 3,100 lbf

Function

- Must raise, lower and hold the load while carrying 125% of maximum capacity and 75% of minimum capacity

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Z359.4 – Safety Requirements for Assisted Rescue and Self-Rescue Systems, Subsystem and Components

SYNTHETIC ROPE TACKLE BLOCK

- Rope
  Synthetic rope with minimum breaking strength of 4,500 pounds tensile
- Static Strength
  3,100 lbf
- Dynamic Strength
  Withstand a 2 ft free-fall with a 220 lb weight and continue to function
- Function
  - Raise, lower and hold a load
  - Secondary brake to prevent uncontrolled lowering
  - Minimum mechanical advantage of 3:1

MSA Rescue Utility System

DESCENT DEVICES

MSA Anthron™ Descender

- Descent Energy and Capacity
  - Single and multiple-use devices
  - Automatic and manually controlled
- Descent Speed
  Between 1.6 ft/sec and 6.6 ft/sec
- Static Strength
  2,700 lbf
- Dynamic Strength
  Withstand a 2 ft free-fall with a 220 lb test weight and continue to function
- Function
  - Lower at a controlled rate
  - Manually controlled devices must stop descent if control is released, or if excessive pressure is applied (panic grab)

Traditional sports-climbing descenders, such as figures-of-eight and racks, are outside the scope of the new standard.

Review of Upcoming Changes to the ANSI Z359.1 Fall Arrest Standard

Z359.4 – Safety Requirements for Assisted Rescue and Self-Rescue Systems, Subsystem and Components

PERSONNEL HOISTS

MSA Dyna-Hoist™

- Operation
  - Manually operated or powered by an external power source
  - Powered units must have manual back-up cranking capability
  - Raise and lower with a maximum force to operate of 30 pounds
- Static Strength
  - 3,100 pounds exerted at termination of the line on the drum
- Functional Criteria
  - Stop and hold a load
  - Back-up brake system

III. VALUE ADDED BY THE NEW STANDARD

First, the new standard addresses a critical need for guidance in creating fall protection programs:

- Clear Lines of Authority and Responsibility
- Detailed Job Planning
- Expanded Training

The scope of the new standard has increased, to include additional work tasks and equipment types:

- Work Positioning
- Travel Restraint
- Rescue
- Rope Access

Lastly, the new standard improves strength and performance of products intended to protect worker health and safety:

- Increased snaphook & carabiner gate strength
- Additional testing for twin leg lanyards
- Establishes minimum requirements for positioning, restraint and rescue components

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IV. SCHEDULE FOR RELEASE

The ASSE estimates publication of the new standard around the end of 2006 or beginning of 2007.

Provisions of Z359.1 dealing with gate strength will take effect on March 1, 2007.

Public comment period still open on Z359.0, Z359.1 and Z359.3. For further information, contact the ASSE at the phone or email address listed below.

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