

- o Z359.0 – Definition of Terms and Arrest
- o Z359.1 – Safety Requirements for Personal Fall Arrest Subsystems and Components
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- o Z359.4 – Safety Requirements for Positioning and Travel Restraint Systems, Subsystems and Components

# ANSI Z359

## Understanding the New ANSI Z359-2007 Standard

**MILLER**<sup>®</sup>  
by SPERIAN

# Understanding the New ANSI Z359-2007 Standard

## Purpose of Document

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This document provides a basic understanding of ANSI Z359-2007 and the key changes that have been incorporated into the Standard. It is intended to provide only the highlights of the new Standard. It is not an exhaustive, all inclusive, account of every change in the Standard. A great deal of care was given to the accuracy of the information contained in this document, however, the final source used as a reference should be the actual Standards themselves. For a detailed account of all changes, obtain an official copy of the new Standard from the American Society of Safety Engineers (ASSE) through their web site: [www.asse.org](http://www.asse.org)

## Who is ANSI?

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The **American National Standards Institute (ANSI)** coordinates the development and use of *voluntary consensus standards* in the United States. An ANSI Standard implies a consensus of those substantially concerned with its scope and provisions, and is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an ANSI Standard does not in any respect preclude anyone, whether they have approved the Standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the Standard. ***It is important to remember that the ANSI Standards are not the law.*** ANSI Standards are subject to periodic review and users are cautioned to always reference the latest editions.

## What is ANSI Z359.1?

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ANSI Z359.1 "American National Standard Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components" was originally published in 1992 and later revised in 1999 (editorial changes only). The purpose of this Standard was to address the variety of equipment being developed in the rapidly growing field of Fall Protection.

The Standard included the following equipment: harnesses, lanyards (including self-retracting lanyards), lifelines, energy absorbers, anchorage connectors, fall arresters, and components of the equipment including connectors, rope, straps, thread and thimbles. This Standard applies to fall arrest equipment used in General Industry and non-construction occupations. The Construction Industry has its own set of Standards (ANSI A10.32-2004).

## **Why the changes to ANSI Z359.1?**

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The original Standards published in 1992 and later revised in 1999 were always intended to be the first in a series of Standards to address a full comprehensive fall protection program. While the original Standards only addressed Fall Arrest Systems, equipment used for positioning, travel restraint and rescue, which is quite different, was to be addressed later in the series. The changes being made at this time to Z359.1 are finally the start to creating the remainder of the series.

## **What are the current changes to the Standard?**

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The single Z359.1 Standard is expanded to now include five (5) sub-sections. These sub-sections are:

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

**Each of these sub-sections to the Standard has been approved by the ANSI Committee and has an effective date of November 24, 2007.**

The intention is to create 12 additional sub-sections which are listed below. Work continues on these sub-sections by various ANSI committees. No effective completion dates have been announced.

<p><b><i>ANSI Z359.5</i></b> Safety Requirements for Personal Fall Arrest Systems</p>	<p><b><i>ANSI Z359.11</i></b> Requirements for Full-Body Harness for Personal Fall Arrest System</p>	<p><b><i>ANSI Z359.15</i></b> Safety Requirements for Vertical Lifelines for Personal Fall Arrest Systems</p>
<p><b><i>ANSI Z359.6</i></b> Safety Requirements and Specifications for Personal Fall Arrest Systems</p>	<p><b><i>ANSI Z359.12</i></b> Safety Requirements for Connecting Components for Personal Fall Arrest Systems</p>	<p><b><i>ANSI Z359.16</i></b> Safety Requirements for Fall Arresters for Personal Fall Arrest Systems</p>
<p><b><i>ANSI Z359.7</i></b> Requirements for Third-Party and Self-Certification for Personal Fall Arrest Systems</p>	<p><b><i>ANSI Z359.13</i></b> Safety Requirements for Lanyards and Energy Absorbers for Personal Fall Arrest Systems</p>	<p><b><i>ANSI Z359.17</i></b> Safety Requirements for Horizontal Lifelines for Personal Fall Arrest Systems</p>
<p><b><i>ANSI Z359.8</i></b> Managed Fall Protection Program</p>	<p><b><i>ANSI Z359.14</i></b> Safety Requirements for Self-Retracting Devices for Personal Fall Arrest Systems</p>	<p><b><i>ANSI Z359.18</i></b> Safety Requirements for Anchorage Connectors for Personal Fall Arrest Systems</p>

**What are the key significant changes within each of the new sub-sections?**

**ANSI Z359.0-2007 Definitions and Nomenclature Used for Fall Protection and Fall Arrest**

The ANSI Z359.0 sub-section of the Standard provides terminology and definitions used throughout the family of Z359 Standards. This sub-section was created from the original ANSI Z359.1, Section 2. It has been separated out for ease of reference.

# ANSI Z359.1-2007 Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components

This sub-section includes a few key changes and additions:

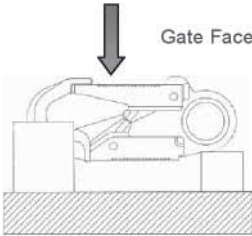
1. The definition section(s) of the original Standard has been removed. All terminology and definitions are now encompassed in sub-section ANSI Z359.0.
2. The gate hook strength of snap hooks and carabiners has significantly changed. Section 3.2.1.4

Tensile Test



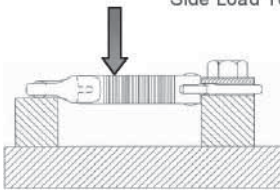
- Tensile loads that a snap hook and carabiner must withstand of 5,000 lbs. (22.2kN) remain the same as the existing Standard.

Gate Face Test



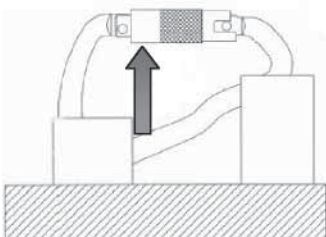
- Gate face strength requirements have changed from 220 lbs. (1kN) (old Standard) to 3,600 lbs. (16kN) (new Standard).

Side Load Test



- Side of gate strength requirements have changed from 350 lbs. (1.55kN) (old Standard) to 3,600 lbs. (16kN) (new Standard).

Minor Axis Test



- Minor axis strength of non-captive eye snap hooks or carabiners must be 3,600 lbs. (16kN). This is new to the Standard.

3. Addition of requirements and markings for harnesses with a front-mounted attachment element or "front D-ring" Section 3.2.2.5a.

Previously, the ANSI Z359.1 Standard only allowed the front D-ring to be used for ladder climbing, fall restraint and positioning. Section 3.2.2.5a allows the front D-ring to be used in a fall arrest system that:

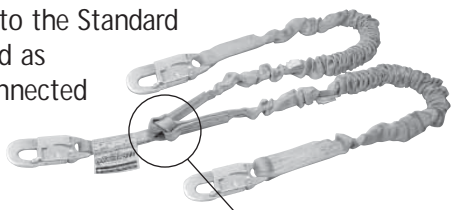
- (a) Limits the maximum free fall distance to two (2) ft. (0.6m)
- (b) Limits the maximum arrest force to 900 lbs. (4.0kN).

Miller Front D-ring Harness



The new Standard also details the strength and performance testing requirements for the front D-ring in Sections 4.3.3.1a and 4.3.3.2a.

4. Addition of double-legged lanyards to the Standard in Section 3.2.3.7a. They are defined as lanyards with two (2), integrally connected legs and shall have a minimum of 5,000 lbs. (22.2kN) breaking strength when statically tested in accordance with 4.3.4.1.3. Double-legged lanyards must also be marked with several warnings pertaining to their use.



Miller Double-Legged Manyard® II Shock-Absorbing Lanyard

These warnings include:

- Connect only the center snap hook to the fall arrest attachment element
- Do not attach the leg of the lanyard which is not in use to the harness, except to attachment points specifically designated by the manufacturer for this purpose
- Do not modify the lanyard to create more than a 6 ft. (1.8m) free fall
- Do not allow the legs of the lanyard to pass under arms, between legs or around the neck

5. Under "Equipment Rigging and Use," Section 7.2, anchorages used for a Personal Fall Arrest System (PFAS) shall be capable of sustaining static loads in the direction permitted by the PFAS:
  - (a) two times the maximum arrest force permitted by the System when certification exists
  - (b) or 5,000 lbs. (22.2kN) in the absence of certification. The old Standard required 3,600 lbs. (16.0kN) without certification.
  
6. To help distinguish new connectors from existing connectors (i.e. snap hooks and carabiners), they shall now be marked as follows:
  - Year of manufacture
  - Manufacturer's identification
  - Part number
  - Load rating for the major axis of the connector stamped or otherwise permanently marked on the device
  - Load rating for gate stamped or otherwise permanently marked on the gate mechanism
  - Markings for connectors shall be sufficient to provide traceability
  - For connectors that are non-integral, include the Standard number "Z359.1 (07)"

## **ANSI Z359.2-2007 Minimum Requirements for a Comprehensive Managed Fall Protection Program**

This new sub-section to the Standard requires a formal managed fall protection program for organizations where employees are exposed to fall hazards. This Standard establishes guidelines and requirements for an employer's managed fall protection program including:

1. Policies, Duties and Training
2. Fall Protection Procedures
3. Eliminating and Controlling Fall Hazards
4. Rescue Procedures
5. Incident Investigations
6. Evaluating Program Effectiveness

The reason this Standard was established is defined in the "Purpose" section 1.2.1 of the Standard.

Developing and implementing a comprehensive managed fall protection program is the most effective method to:

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

The Standard in Section 3 establishes clear roles and responsibilities for several key personnel that are instrumental for a well-managed fall protection program. These roles would include the employer, Program Administrator, Qualified Person, *Competent* Person, Authorized Person, *Competent* Rescuer, Authorized Rescuer, Qualified Person Trainer, *Competent* Person Trainer and *Competent* Rescuer Trainer. Please refer to the Standard for complete information concerning roles and responsibilities.

Fall Protection and Rescue Training is addressed in Section 3.3 and references ANSI/ASSE Z490.1 "Criteria for Accepted Practices in Safety, Health and Environmental Training" as the Standard to which these programs must comply.

Section 4 of the Standard addresses the requirement to have written fall protection procedures whenever one or more authorized persons are routinely exposed to any fall hazard. These procedures are written based upon a fall hazard survey required for every workplace activity where authorized persons are exposed to a fall hazard. This survey shall identify one or more methods to eliminate or control each identified fall hazard.

Section 5.1 of the Standard details the preferred fall protection hierarchy that shall be used when choosing methods to eliminate or control fall hazards. The preferred hierarchy is as follows:

1. Elimination or Substitution: Remove the hazard
2. Passive Fall Protection: Isolate or separate hazard from workers
3. Fall Restraint: Prevent the person(s) from reaching the fall hazard
4. Fall Arrest: Attach a person to a system designed to stop a fall after it has begun
5. Administrative Controls: Establish work practices or procedures to warn an authorized person to avoid approaching a fall hazard

A detailed set of requirements for anchorage systems is provided in Section 5.4 and outlined below. Also provided in Section 5.4 is the definition of non-certified systems versus certified systems. This has a bearing on the load requirements specified.

### Static Load Requirements

	<u>Non-Certified</u>	<u>Certified</u>
Fall Arrest Systems	5,000 lbs. (22.2 kN)	2 X maximum arresting force
Work Positioning Systems	3,000 lbs. (13.3 kN)	2 X foreseeable force
Restraint & Travel Systems	1,000 lbs. (4.5 kN)	2 X foreseeable force
Rescue Systems	3,000 lbs. (13.3 kN)	5 X applied load
Horizontal Lifelines	Must sustain at least two times the maximum tension developed in the lifeline during fall arrest in the direction applied by lifeline forces	

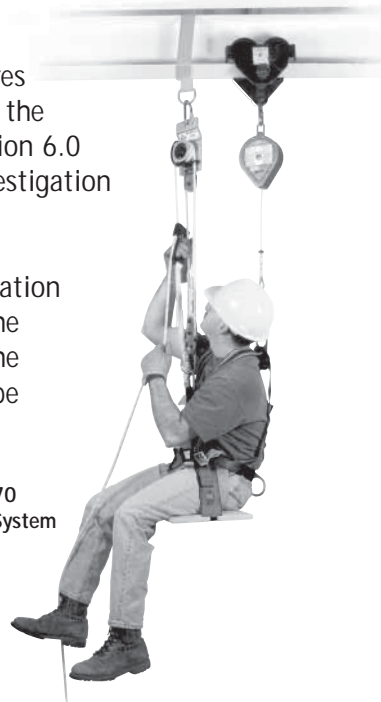
Inspection, maintenance and storage procedures are covered in Section 5.5 of the Standard. All fall protection equipment and anchorages must be inspected at the beginning of each eight-hour shift by an authorized person and at least once per year (or more frequently if required by manufacturer) by a *competent* person or a *competent* rescuer as appropriate to verify equipment is safe for use.

Written or electronic records of inspection should be kept on file for service life of product.

Additionally, rope access standards and procedures are addressed for the first time in Section 5.6 of the Standard. Rescue procedures are covered in Section 6.0 followed by procedures required for incident investigation in Section 7.

Lastly, a critical component in fall hazard elimination and control is to evaluate the effectiveness of the managed fall protection program. Section 8 of the Standard provides evaluation criteria that shall be used in such evaluations.

Miller Series 70  
Universal Rescue System



## **ANSI Z359.3-2007 Safety Requirements for Positioning and Travel Restraint Systems**

This sub-section to the Standard provides the minimum guidelines for the system design, manufacture and test of personal work positioning and travel restraint systems. These systems are not to be used as fall arrest systems but shall be supplemented with a secondary fall protection system.

Positioning systems allow the workers to be supported on an elevated vertical or inclined surface such as a wall, and work with both hands free.

A travel restraint system limits travel in such a manner that the user is not exposed to a fall hazard. Travel restraint systems are only permitted on a walking/working surface with a slope of between 0 and 18.4 degrees.

Rope and webbing used in manufacturing of lanyards shall be of virgin synthetic material and have the strength, aging, abrasion and heat resistance equal or greater than polyamides.

If chain is used, it must be grade 80 alloy with a minimum nominal chain size of 9/32" (*7.1mm*). All chain fittings shall meet or exceed breaking strength of chain size selected. Lanyards and harnesses used in positioning systems shall have a minimum breaking strength of 5,000 lbs. (*22.2 kN*).

All buckles and adjusters must withstand a tensile force of 4,000 lbs. (*17.8kN*) while all D-rings, O-rings and oval rings must withstand a tensile force of 5,000 lbs. (*22.2kN*). All snap hooks, carabiners and harnesses must meet the requirements specified in ANSI Z359.1-2007.

## **ANSI Z359.4-2007 Safety Requirements for Assisted-Rescue and Self-Rescue Systems, Subsystems and Components**

The purpose of this sub-section to the Standard is to provide requirements for the performance, design, marking, qualification, instruction, training, use, maintenance and removal from service of equipment used in the assisted-rescue and self-rescue systems for one (1) or two (2) persons. This equipment would include connectors, harnesses, lanyards, anchorage connectors, winches/hoists, descent control devices, rope tackle blocks and self-retracting lifelines with integral retrieval capability.

The capacity of the rescue system shall be from 130 lbs. (59kg) to 310 lbs. (140kg) for one (1) person and 130 lbs. (59kg) to 620 lbs. (280kg) for two (2) person systems. All connective hardware used shall comply with the requirements of ANSI Z359.1-2007.

Section 3.2.2 “Body Support Components” details the requirements of the major components used in typical rescue systems.

Full-body harnesses shall meet the requirements of ANSI Z359.1-2007. Unless prohibited by the manufacturer, the dorsal attachment element is suitable for rescue. Any other attachment elements designated for rescue must be statically tested to 3600 lbs. (16.0kN). Evacuation harnesses shall not be used for fall protection and shall at a minimum provide support for the body during rescue whether conscious or unconscious.



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Rescue lanyards, anchorage connectors and self-retracting lanyards with rescue (RSRL) capability shall all meet the requirements of ANSI Z359.1-2007.

In addition, the Standard provides greater detail on the requirements for the RSRL, including:

- Ability to engage in rescue mode at any time and not inadvertently change to and from rescue mode
- Minimum mechanical advantage of 3:1
- Automatically stop and hold the load if the rescuer relinquishes control
- Must have a means to stabilize the device during use in rescue mode
- Devices that use a power source shall have a means to limit applied lifting force and speed and provide a manual back-up means of operation

Synthetic rope tackle block devices defined as, “a load lifting and/or lowering device that does not include a winding or traction drum but uses pulleys to achieve a mechanical lifting advantage” are detailed in Section 3.2.6. Among the highlights of these requirements are:

- Rope must be made of virgin synthetic material and have strength, aging, abrasion and heat resistance characteristics equal to or superior to polyamides and minimum breaking strength of not less than 4500 lbs. (20.0kN)

- Have a secondary braking means to prevent uncontrolled lowering of load
- Have a minimum mechanical advantage of 3:1

Descent device requirements are defined in Section 3.2.7 and are highlighted below:

- Capacity of 310 lbs. (*140kg*)
- Descent devices are classified as single use or multiple use. Single use must have a minimum descent energy rating of 30,000 ft./lb. and multiple use devices a minimum descent energy rating of 300,000 ft./lb.
- Descent speeds for automatic descent control devices shall be a maximum of 6.6 feet/second (*2.1m/sec.*) and a minimum of 1.6 feet/second (*5.3m/sec.*). Manual descent devices shall not exceed 6.6 feet/second (*2.1m/sec.*). Hand-operated devices shall not exceed 6.6 feet/second (*2.1m/sec.*) after the control device is released
- Static load of 2,700 lbs. (*12.0kN*)
- Rope and webbing must be made of virgin synthetic material and have strength, aging, abrasion and heat resistance characteristics equal to or superior to polyamides and minimum breaking strength of not less than 3,000 lbs. (*13.3kN*)
- Wire rope must be stainless steel or galvanized steel strand with the minimum breaking strength of 3,000 lbs. (*13.3kN*)
- Snap hooks and carabiners shall meet the requirements of ANSI Z359.1-2007

Personnel hoists requirements are detailed in Section 3.2.8 of which the highlights are listed below:

- Capacity of 310 lbs. (*140kg*) when designed for raising/lowering one person or 620 lbs. (*280kg*) for two persons. The device shall be identified as to the number of persons it is rated for.
- The hoist shall permit operation by one person and shall automatically stop and hold the load if the operator relinquishes control
- Hoists with powered operation shall have a means to limit applied lifting/lowering force and speed
- Shall support static load of 3,100 lbs. (*13.8kN*) applied directly to the point of hoist line attachment to drum
- Maximum force required to raise and lower the load shall be 30 lbs. (*.13kN*). When control is released the hoist shall stop within 4 in. (*10.2cm*)

- Hoists shall be equipped with a secondary brake system that engages in the event the primary brake is disabled. This brake must stop the load within 24 in. (61.0cm)
- Snap hooks and carabiners must meet ANSI Z359.1-2007
- Rope and webbing must be made of virgin synthetic material and have strength, aging, abrasion and heat resistance characteristics equal to or superior to polyamides and minimum breaking strength of not less than 4,500 lbs. (20.0kN)
- Wire rope must be stainless steel or galvanized steel strand with the minimum breaking strength of 3,400 lbs. (15.1kN)

Additionally, the Standard provides detailed qualification testing, marking and instruction requirements.

All equipment must be inspected by the rescuer before each use and by a *competent* person other than the rescuer at intervals of no more than one year. Inspection criteria shall be established by the rescuer's organization which equals or exceeds the manufacturer's instructions. These inspections shall be documented and maintained by the rescuer's organization.

## References

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- 1) ANSI Z359.0 – 2007 Definitions and Nomenclature Used for Fall Protection and Fall Arrest (Draft), American National Standard, American Society of Safety Engineers, Des Plaines, Illinois, 2007
- 2) ANSI Z359.1 – 2007 Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components (Draft), American National Standard, American Society of Safety Engineers, Des Plaines, Illinois, 2007
- 3) ANSI Z359.2 – 2007 Minimum Requirements for a Comprehensive Managed Fall Protection Program (Draft), American National Standard, American Society of Safety Engineers, Des Plaines, Illinois, 2007
- 4) ANSI Z359.3 – 2007 Safety Requirements for Positioning and Travel Restraint Systems (Draft), American National Standard, American Society of Safety Engineers, Des Plaines, Illinois, 2007
- 5) ANSI Z359.4 – 2007 Safety Requirements for Assisted-Rescue and Self-Rescue Systems, Subsystems and Components (Draft), American National Standard, American Society of Safety Engineers, Des Plaines, Illinois, 2007

Notes:

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## Conclusion

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Protecting workers at heights requires a holistic approach that extends beyond standards and regulations. Meeting new or established standards for safety requirements and product performance provides a starting point for safety on the job site. The introduction of the new ANSI Z359-2007 Standard for fall protection attempts to provide a solution to minimize serious injuries often caused by misuse, poor product selection, inadequate training or possibly damaged/worn equipment.

**Miller T.I.P.S.™ for Total Compliance** addresses other important considerations to assure a safe environment when working at heights.

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### TRAINING

**Professional Fall Protection Training** – Key to worker safety, on-site awareness, and proper selection & use of fall protection equipment.



### INSPECTION

**Equipment Inspection & Maintenance** – Failure is not an option – when in doubt, throw it out!



### PRODUCTS

**Proper Product Selection & Use** – All work environments differ, use the right equipment for the job!



### STANDARDS

**Addressing the New ANSI Z359 Standard** – Meeting voluntary industry standards indicates that products pass accepted testing procedures.

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Globally, Miller Fall Protection is committed to providing value-added fall protection products and services to those specifying, selecting and using our equipment. While safety at heights is our ultimate goal, enhancing worker comfort, trust and increased productivity are also qualities that products bearing the Miller name have strived to maximize for over 60 years.

The Miller® brand name is more than a line of quality products. The name represents greater value-added services and expertise that only the leader in fall protection can provide.



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