

ANSI/ASSP Z359.16-2016

Safety Requirements for Climbing Ladder Fall Arrest Systems Part of the Fall Protection Code

The American Society of Safety Engineers (ASSE) is now the American Society of Safety Professionals (ASSP). ASSP continues to be the Secretariat for the committee producing this standard and continues to hold the copyright to this standard. There is no change to the content and requirements in the standard. The only change is on the cover indicating the organizational name change of the standards developing organization from ASSE to ASSP.



**AMERICAN SOCIETY OF
SAFETY PROFESSIONALS**



PREVIEW ONLY

This document is copyright protected and may not be reproduced or distributed to any other party.

The information and materials contained in this publication have been developed from sources believed to be reliable. However, the American Society of Safety Engineers (ASSE) as secretariat of the ANSI accredited Z359 Committee or individual committee members accept no legal responsibility for the correctness or completeness of this material or its application to specific factual situations. By publication of this standard, ASSE or the Z359 Committee does not ensure that adherence to these recommendations will protect the safety or health of any persons or preserve property.

American National Standard

**Safety Requirements for
Climbing Ladder Fall Arrest Systems**

PREVIEW ONLY

This document is copyright protected and may not be reproduced or distributed to any other party.

Secretariat

American Society of Safety Engineers

529 N. Northwest Highway
Park Ridge, Illinois 60068

Approved November 2, 2016

American National Standards Institute, Inc.

American National Standard

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer. Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution. The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he/she has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards. The American National Standards Institute does not develop standards and will in no circumstance give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretation should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

Caution Notice: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Published February 2017 by:

American Society of Safety Engineers
520 N. Northwest Highway
Park Ridge, Illinois 60068
(847) 699-2929 • www.asse.org

Copyright ©2017 by American Society of Safety Engineers
All Rights Reserved.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

Printed in the United States of America

Foreword (This Foreword is not a part of American National Standard Z359.16-2016.)

This standard, national in scope, was developed by an Accredited Standards Committee functioning under the procedures of the American National Standards Institute, with the American Society of Safety Engineers (ASSE) as secretariat.

It is intended that every employer whose operations fall within the scope and purpose of the standard will adopt the guidelines and requirements detailed in this standard.

The need for this standards activity grew out of the continuing development of a series of fall protection-related standards. The focus is to tie the elements of those standards together and provide the tools with which employers may develop the programs that incorporate those elements. This standard also brings together the administrative requirements of those fall protection standards. It should be noted, as in all Z359-series standards, that this standard applies to occupational activities. It does not apply to sports activities such as mountaineering.

Neither the standards committee, nor the secretariat, states that this standard is perfect or in its ultimate form. It is recognized that new developments are to be expected, and that revisions of the standard will be necessary as the state-of-the-art progresses and further experience is gained. It is felt, however, that uniform guidelines for fall protection programs are very much needed and that the standard in its present form provides for the minimum criteria necessary to develop and implement a comprehensive managed fall protection program.

The Z359 Committee acknowledges the critical role of design in influencing the use of proper fall protection equipment. Designs which eliminate fall hazards through the proper application of the hierarchy of safety controls are the preferred method for fall protection. Design deficiencies often increase the risk for employees who may be exposed to fall hazards: examples are 1) lack of rail systems to prevent falls from machines, equipment and structures; 2) failure to provide engineered anchorages where use of personal fall arrest systems are anticipated; 3) no provision for safe access to elevated work areas; 4) installation of machines or equipment at heights, rather than floor/ground level to preclude access to elevated areas; 5) failure to plan for the use of travel restriction or work positioning devices. To that end, this series of standards also provides guidance for design considerations for new buildings and facilities.

Basic fall safety principles have been incorporated into these standards, including hazard survey, hazard elimination and control and education and training. The primary intent is to ensure a proactive approach to fall protection. However, the reactive process of accident investigation is also addressed to ensure that adequate attention is given to causation of falls.

The Z359 Committee solicits public input that may suggest the need for revisions to this standard. Such input should be sent to the Secretariat, ASC Z359, American Society of Safety Engineers, 520 N. Northwest Highway, Park Ridge, Illinois 60068.

This standard was developed and approved for submittal to ANSI by the American National Standards Committee on Standards for Fall Protection, Z359. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the Z359 Committee had the following members:

Randall Wingfield, Chair
Basil Tominna, P.E., Vice Chair
Timothy R. Fisher, CSP, CHMM, ARM, CPEA, Secretary
Jennie Dalesandro, Administrative Technical Support

Organization Represented

Name of Representative

3M	Raymond Mann Judd Perner
American Airlines	Len Bradley
American Society of Safety Engineers	Jubal D. Hamernik, Ph.D., P.E. John Stephen Frost, CSP
Bashlin Industries, Inc.	Bradley S. McGill
Boeing Company	Chuck Orebaugh Joey R. Junio, P.E.
Buckingham Mfg. Co., Inc.	James Rullo
Chevron	DeForest Canfield Craig Berkenmeier, ARM
Clear Channel Outdoor J	Joshua Ockmond, CSP Jim Poage
ClimbTech LLC	Dan Rossi Karl Guthrie
Dynamic Industries, Inc.	Eric Patrick Gary LoPiccolo
Elk River, Inc.	Brandon Muffoletto, CSP Delisa Calhoun
Ellis Fall Safety Solutions, LLC	Erik Arendall J. Nigel Ellis, Ph.D., P.E., CSP, CPE John T. Whitty, P.E.
ExxonMobil Corporation	Freddie Johnson
FallTech	Dustin Hawkins Warren Faber
Flexible Lifeline Systems	Hugh Armstrong Michael Bailey, P.E.
General Motors	Ken Mahnick, P.E.
Gorbelt Inc.	Allen Baughman Kevin Duhamel
Gravitec Systems, Inc.	Randall Wingfield Dave Lough
Hartford Steam Boiler Inspection & Insurance Co.	Jerry Kucharski, CFPS Timothy Healey
High Engineering Corp.	William R. Parsons, P.Eng. Greg Small, P.Eng., M.Eng.
Honeywell Safety Products	Bradley Rohlf Chris Huber
Indianapolis Power and Light	David Baldwin David H. Pate, CUSA
INSPEC International Ltd.	Paul Clarke, CEng, MIMechE Andrew Diamond, MInstP, BSc (Hons)

ISEA – International Safety Equipment Association

Lawrence Livermore National Security

Liberty Mutual Group

Lighthouse Safety LLC

LJB Inc.

Martin/Martin Consulting Engineers

Monsanto

MSA

Murdock Webbing Co. Inc.

National Association of Tower Erectors

Pamela R. Huck, Inc.

PenSafe

Petzl America

Pigeon Mountain Industries, Inc.

Reliance Industries, LLC

Rigid Lifelines

Rooftop Anchor, Inc.

Safety Connection, Inc.

Safety Equipment Institute

Safety Through Engineering, Inc. (dba STE, Inc.)

Shell Exploration & Production Co.

Skylotec North America, LP

Southern Weaving Co.

Sparkling Clean Window Company & Surface Solutions

SPRAT – Society of Professional Rope

Access Technicians

Sturges Manufacturing Co., Inc.

SureWerx/PeakWorks

Tractel Inc.

Dan Shipp

Eric Miller

Louis Renner, CSP

Steve McConnell, CSP, CIH

Cal Sparks

Matthew Zaffini

John Corriveau

Mark Benes

Thomas Kramer, P.E., CSP

Rupert Noton, CEng, MIStructE

Andrew Emmons, P.E.

Matthew Schneider, P.E.

Adam Chapin

Rob Willis

Tim Bissett

Robert Golz

Greg Pilgrim

Gordon Lyman

Don Doty

Pamela Huck, CSP

Keith Smith

Jeremiah Wangsgard

Jeff Bowles

Kim Hunter

Dan Henn

W. Joe Shaw

Arnie Galpin, P.E.

John Kemp

Kynan Wynne

Tyson Munford, P.E.

Clint Honeycutt, Sr.

Janice Honeycutt

Steve Sanders

Michael C. Wright, P.E., CPE, CSP

Mark Williams

Edward Grosse

Gregory Byers

Mark Conover

Michael Masterson, Jr.

Andrew Broadway

Curtiss Burdette

Sam Terry

Art Schneider

Loui McCurley

Cedric Smith

Richard Griffith

Tyler Griffith

Tim Accursi

Ken Lemke

Doug Knapp

Catalin Anesia

Transport Workers Union
Travelers
Tritech Fall Protection Systems, Inc.

U.S. Air Force Safety Center

U.S. Bureau of Reclamation

U.S. Department of Interior – BSEE

U.S. Department of the Navy

UL LLC
United Auto Workers
Vertical Access LLC

Walt Disney Parks & Resorts

Western Area Power Administration

WJE

James Mark
Scott H. Richert, CSP, ARM, ALCM
Chris Moemke, EIT
John Seto, P.E.
Mark S. Kantorowicz
Robert Baker
Shawn Smith, CSP
Shaun Reed
John M. Cushing, Jr.
Simon Baughman
Basil Tominna, P.E.
Shawn Smith, MEng, CSP
Beverly Wooten Stutts
Matthew S. Uptmor, OHST
Kelly Streeter, P.E.
Keith Luscinski
Ken Young, P.E.
Ian Bevan
Patrick T. Nies
Will Schnyer
Daniel Gach, AIA, NCARB
Jason Kamman, CSP, CHST

Subgroup Z359.16 had the following members:

Judd Perner (Chair)
Tim Accursi
Tim Bissett
Lynn Camp
Paul Clarke, CEng, MIMechE
Mark Conover
Jeremy T. Deason, P.E.
J. Nigel Ellis, Ph.D., P.E., CSP, CPE
Bob Golz
Dustin Hawkins
Pamela Huck, CSP
Thomas Kramer, P.E., CSP
Jack Lamberson
William R. Parsons, P.Eng.
Bradley Rohlf
John Seto
Keith Smith

Contents

SECTION	PAGE
1. Scope, Purpose, Application, Exceptions and Interpretations.....	8
1.1 Scope	8
1.2 Purpose and Application	8
1.3 Exceptions	9
1.4 Interpretations	9
2. Definitions	9
3. Requirements	9
3.1 System Requirements	9
3.2 Carrier Sleeve	11
3.3 Carrier, Carrier Mounting Brackets and Fasteners	14
4. Testing	15
4.1 Test Equipment and Test Specimens	15
4.2 Test Procedures	17
5. Markings and Instructions	23
5.1 Marking Requirements	23
5.2 Instruction Requirements	24
6. Inspection, Maintenance and Storage	26
6.1 Inspection	26
6.2 Maintenance and Storage	27
7. Use and Training	28
7.1 Equipment Use	28
7.2 Training	28
8. References	28
Appendix A: Use of CLFAS in Combination with Climb Assist Systems	30
Appendix B: Figures	31

STANDARD REQUIREMENTS**1. SCOPE, PURPOSE, APPLICATION, EXCEPTIONS AND INTERPRETATIONS**

1.1 Scope. This standard establishes requirements for the performance, design, marking, qualification testing, instructions for use, inspection, maintenance, storage and removal from service of vertically oriented Climbing Ladder Fall Arrest Systems (CLFAS) consisting of flexible and rigid carriers with multiple attachment points and associated carrier sleeves for users within the capacity range of 130 to 310 pounds (59 to 141kg). See Figure 1 for examples of CLFAS equipment.

1.2 Purpose and Application.

1.2.1 This standard applies to manufacturers, distributors, purchasers and authorized persons that use climbing ladder fall arrest systems in occupations requiring personal protection against falls from heights. It applies only to installations that are vertical (90 +/- 1 degrees) when viewed from the front elevation and within 15 degrees of vertical when viewed from the side elevation and that do not slope towards the climber. See Figure 2 for installation configurations.

1.2.2 Before any equipment shall bear the marking "Z359.16" or be represented in any way as being in compliance with this standard, all applicable requirements of this standard shall be met through qualification and verification testing according to ANSI/ASSE Z359.7, *Qualification and Verification Testing of Fall Protection Products*.

1.2.3 Unless otherwise specified, the values stated in this standard are expressed as nominal values. Except for temperature limits, values which are not stated as maxima or minima shall be subject to a tolerance of +/- 5%. Unless otherwise specified, the ambient temperature for testing shall be between 35°F (1.7°C) and 100°F (37.8°C) and the temperature limits shall be subject to an accuracy of +/- 2°F (+/- 1°C).

1.2.4 In this standard, values for measurement are followed by an equivalent in parentheses, but only

EXPLANATORY INFORMATION

(Not part of American National Standard Z359.16)

E1.2.1 *This is a voluntary consensus standard. The legal requirements for protection against falls from heights are established by applicable regulatory bodies governing occupational safety.*

the first stated value shall be regarded as the requirement. Equivalent values in parentheses are not considered the requirement as these values can be approximate.

1.2.5 This standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed in Section 8. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

1.2.6 All equipment within the scope of this standard that is marked or represented in any way as being in compliance with an ANSI/ASSE Z359 standard shall meet the requirements of this standard within 180 days of this standard's publication date.

1.3 Exceptions. The requirements of this standard do not address material handling or sports related activities.

1.4 Interpretations. Requests for interpretations of this standard shall be in writing and addressed to the Secretariat of this standard.

2. DEFINITIONS

Refer to ANSI/ASSE Z359.0, *Definitions and Nomenclature Used for Fall Protection and Fall Arrest*, for definitions of terms used in this standard.

3. REQUIREMENTS

3.1 System Requirements.

3.1.1 Number of Climbers. CLFAS shall be designed for a minimum of two simultaneous users.

E3.1.1 The two user minimum is necessary to facilitate rescue. The maximum number of simultaneous users allowed on the system should be determined by a competent person based on job site conditions and any limitations set by the manufacturer.

3.1.2 Installation.

3.1.2.1 To restrict lateral movement of flexible car-

E3.1.2.1 Cable guide spacing should take into